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DOMICILIO MINATO-KU, TOKYO, JAPON

74. APODERADO RAMIRO CASTRO DUQUE

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2

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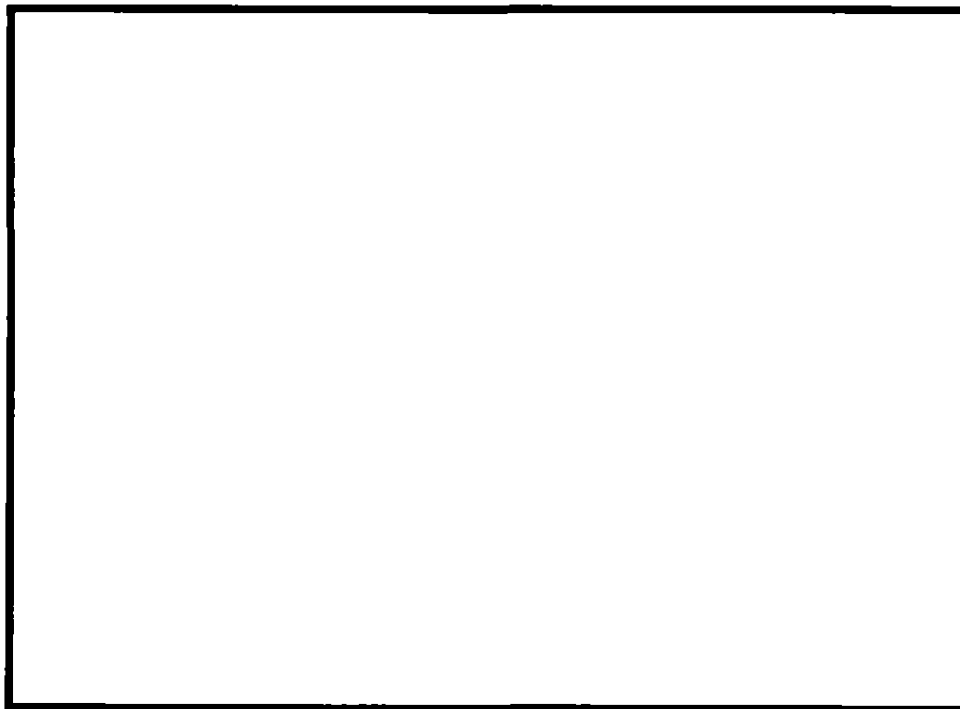
Instrucciones para el diligenciamiento del presente formulario, ver reverso de esta página.

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ANEXOS

- ☒ Comprobante de pago de la tasa de presentación de la solicitud. \$422.000
- ☐ Documento que acredite la existencia y representación legal cuando el solicitante sea persona jurídica.
- ☐ Poderes, si fuere el caso.
- ☐ Documento de cesión del inventor al solicitante o a su causante.
- ☐ Declaraciones
- ☒ Copia de la solicitud internacional. (Resumen, descripción, reivindicaciones, dibujos)
- ☒ Traducción de la solicitud internacional al castellano. (Resumen, descripción, reivindicaciones, dibujos)
- ☐ Copia del examen preliminar efectuado por la IPEA.
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- ☐ De ser el caso, copia del contrato de acceso.
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- ☐ De ser el caso, información sobre otras solicitudes de patente o títulos obtenidos en el extranjero por el mismo titular o su causante, relacionadas parcial o totalmente con la invención de esta solicitud.
- ☒ Otros Tarjeta de propietarios.

11 FIGURA CARACTERÍSTICA:



12 Solicito la concesión de la patente

NOMBRE: RAMIRO CASTRO DUQUE

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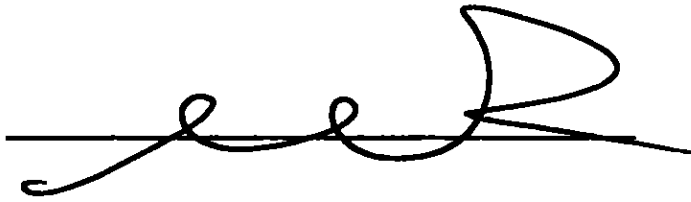
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ning of each regular issue of the PCT Gazette.

(54) Title: SYSTEM FOR WHIPPING A FLUID SLURRY AND METHOD THEREFORE

(57) Abstract: The present invention relates to the mixing of dry beverage mixes with water. It presents an apparatus for whipping a fluid slurry comprising of an inlet for receiving an unwhipped fluid slurry, a whipping chamber connected to the inlet for whipping the unwhipped fluid slurry, an impeller located in the whipping chamber, one or more indentations in the surface of the whipping chamber, wherein the impeller induces fluid turbulence that produces a whipped fluid slurry when the impeller rotates above the indentations, and an outlet for discharging the whipped fluid slurry.

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X**SYSTEM FOR WHIPPING A FLUID SLURRY AND METHOD THEREFORE****BACKGROUND OF THE INVENTION**

This application is based on Provisional Application No. 60/305,473, filed July 13, 2001.

Technical Field

The present invention relates generally to a beverage dispensing device, and more particularly to a device which whips an unwhipped fluid slurry into a whipped, mixed beverage.

Description of the Related Art

Many consumers purchase hot beverages from vending machines. These vending machines often contain a variety of coffee and chocolate drinks as well as other hot drinks. Often times specialty drinks such as lattes, cappuccinos or espressos are served in the vending machines.

Some prior art vending machines mix a dry beverage mix and hot water in a cup located in a general receiving area by adding the hot water to the dry mix and allowing the agitation from the pouring action of the hot fluid to dissolve the mixture into the fluid. While this will dissolve simple soluble mixes, the pouring action is insufficient to thoroughly dissolve a more complex mix, thereby leaving a residue of mix at the bottom of the cup. Additionally, this method does not provide for a frothing action to produce a cr me that is common to such drinks as lattes, cappuccinos or espressos.

Other prior art vending machines mix the dry beverage mix and the hot water within the vending machine. These machines provide some sort of mixing chamber in the vending machine to aid in ensuring that the mix is properly dissolved into solution. However, these previous mixing apparatuses have not been able to provide a sufficient froth that might compare to such beverages obtained from a coffee vending merchant. Specifically, the prior art used a smooth mixing chamber and a stirring mechanism such as an impeller to stir the mix. However, this method also failed to provide the agitation sufficient to produce a suitable froth or
10 crème.

6

BRIEF SUMMARY OF THE INVENTION

The present invention presents an apparatus for whipping a fluid slurry comprising of an inlet for receiving an unwhipped fluid slurry, a whipping chamber connected to the inlet for whipping the unwhipped
5 fluid slurry, an impeller located in the whipping chamber, one or more indentations in the surface of the whipping chamber, wherein the impeller induces fluid turbulence that produces a whipped fluid slurry when the impeller rotates above the indentations, and an outlet for discharging the whipped fluid slurry.

10 A method of whipping a fluid slurry, the method comprising the steps of receiving a fluid slurry into a whipping chamber, whipping the fluid slurry by rotating an impeller in the whipping chamber, using one or more indentations within the surface area of the whipping chamber to induce turbulent fluid flow in the whipping chamber, and discharging the
15 whipped fluid slurry from the whipping chamber.

A system for providing a whipped fluid slurry, the system comprising a container for storing a mix, a fluid for mixing with the mix to create an unwhipped fluid slurry, a whipping device comprising of a whipping chamber wherein the whipping chamber has an impeller and
20 indentations in the surface within the chamber, wherein the whipping device is connected to the storage container and receives the mix and the fluid for whipping, a discharge outlet from the whipping device a

dispensing area whereby the whipped fluid slurry is dispensed from the discharge outlet.

The foregoing has outlined some of the more pertinent objects and features of the present invention. These objects should be construed to
5 be merely illustrative of some of the more prominent features and applications of the invention. Many other beneficial results can be attained by applying the disclosed invention in a different manner or modifying the invention as will be described. Accordingly, other objects and a fuller understanding of the invention may be had by referring to the
10 following Detailed Description of the Preferred Embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference should be made to the following Detailed Description taken in connection with the accompanying drawings

5 in which:

Figure 1 illustrates the exterior of a typical beverage dispenser in which the present invention may be utilized;

Figure 2 illustrates the interior of a typical beverage dispenser that utilizes the present invention;

10 Figure 3 illustrates a close up view of the mixing area and the whipping chamber;

Figure 4 illustrates the present invention in its component parts;

Figure 5 illustrates the whipping chamber in greater detail;

15 Figure 6A illustrates the mixing chamber side of an impeller used in the present invention;

Figure 6B illustrates the whipper motor side of the same impeller in 6A;

Figure 6C illustrates the mixing chamber side of an alternative impeller;

20 Figure 6D illustrates the whipper motor side of an alternative impeller; and

Figure 7 illustrates the exterior view of the backside of the whipping chamber.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention presents a device that whips an unwhipped fluid/dry beverage mix or fluid slurry into a whipped, mixed beverage. Upon receiving the unwhipped fluid slurry into a whipping chamber, an impeller
5 rotates at sufficient speed such that cavitations are created near indentations located in the wall of the whipping chamber. The cavitations are caused by a low pressure region near the interface between the indentations and the chamber wall, resulting in greater fluid mixing and creating a foaming or frothing action within the fluid. The froth is
10 desirable when the fluid is intended to be a hot, whipped beverage such as hot chocolate or a specialized coffee drink.

Figure 1 illustrates the outside of the exterior of a typical beverage dispenser in which the present invention may be utilized. In Figure 1, the face of beverage dispenser 100 is provided. During its typical use, a
15 customer will insert coins into coin slot 105, and depress the alpha-numeric keypad 110 in order to choose a particular type of drink. Once the drink is selected, the beverage is mixed utilizing the present invention and dispensing the whipped drink into a container in the beverage receiving area at 120, where the customer is able to obtain the product
20 from the beverage dispenser.

Figure 2 illustrates the interior of a typical beverage dispenser that utilizes the present invention. In Figure 2, dry beverage mix 230 is stored

within the beverage dispenser in container 232. When a customer places an order for a drink using alpha-numeric pad 110, a cup, corresponding to the ordered drink is sent from the cup storage unit, 240, into the drink dispensing area 235. Upon the cup being sent, an electronic controller

5 ports hot water from the water storage tank within the machine (not shown) into the mixing chamber through line 305 (see Figure 3). In the preferred embodiment, prior to the hot water entering the mixing chamber 220, the impeller begins to rotate. This begins immediately prior to the mix porting to the mixing chamber and the initial in-rush of hot water

10 provides for a "washing" action within the chamber. Just after the first in-rush of hot water, the mix corresponding to the selected beverage is sent by an auger located in ____ (not shown) into the whipping chamber inlet 220 via chute 233. Chute 233 collects and directs the dry mix into 220 and prevents the dry mix from splashing into the main components

15 of dispenser 100. As the dry mix enters the mixing chamber 220, and comes into contact with the hot water and impeller in the whipping chamber 225, it is an-unwhipped fluid slurry. As the unwhipped fluid slurry becomes stirred by the impeller, pressure builds up in the mixing chamber and discharges the mix fluid through output hose 215 into the

20 waiting cup in the beverage dispenser 235.

Figure 3 illustrates a close up view of the mixing area and the whipping chamber which incorporates the present invention. In Figure 3,

dry beverage mix 330 is guided into the whipping chamber inlet 320 by product chute 333. As described above, hot water enters the chamber via port 305. The impeller begins to rotate upon receiving an order and when the mix and water or the unwhipped fluid slurry enters the whipping chamber 325, the impeller (not visible here) begins to stir or whip the unwhipped fluid slurry into a whipped or mixed combination. The mixed combination is discharged through discharge tube 315. Discharge tube 315 carries the mixed fluid slurry into the beverage receiving area 335 for the customer to receive the ordered beverage. Depending on the drink associated with the particular mix, a restrictor 310 may be added to the outlet of 325 to place a back pressure on the whipping chamber. As will be shown later, this back pressure will cause a greater formation of crème to occur.

Figure 4 illustrates the present invention and its component parts.

In Figure 4, the unwhipped fluid slurry enters the whipping chamber through the exhaust vent cap 12. Exhaust port 32 is provided to allow excess steam from the hot water/impeller action to escape from the chamber away from the dry mix and chute 233. This prevents a caking of the dry mix at or near the chute area.

Mixing bowl 14 is located directly underneath exhaust cap 34. Hot water enters through water inlet 30 and combines with the dry beverage mix in the mixing bowl to become the unwhipped fluid slurry.

The unwhipped fluid slurry then enters into the whipping chamber 15 via both gravity and a vacuum drag created by the impeller operation in the whipping chamber.

As the slurry enters the whipping chamber 16, the water and dry
5 beverage mix are whipped or stirred by the impeller 20, which is connected to whipper motor 26 through a hole in mounting block 24 and mounting base 22. Mounting base 22 creates a seal with the motor and shaft and whipping impeller. Screw caps 18 are inserted into the mounting block 24 in order to firmly attach the mounting base to the
10 whipping motor.

The present invention has indentations located in the interior surface of the whipping chamber 16 closest to the impeller surface. In the preferred embodiment, as the impeller reaches its intended speed, the rotation of the fluid begins to reach the speed of the impeller. The
15 rotation creates a low pressure region within the whipping chamber nearest to the mixing bowl, which causes the unwhipped fluid slurry from the mixing bowl to be drawn into the whipping chamber. This causes the pressure interior to the whipping chamber (but near the interface between the impeller and chamber wall) to rise as more unwhipped fluid slurry is
20 pulled into the whipping chamber. When the rapidly rotating, higher pressure fluid slurry passes near the interface between the indentations

and the chamber, a low pressure region near the interface is created due to the indentations, which causes cavitations to occur within the fluid.

These cavitations have a two fold effect. First, they cause a greater sheering effect of the fluid slurry than would occur just from the rotating fluid. This sheering effect in turn enhances dissolving and mixing the dry beverage mix in the water. Additionally, the cavitations can create a bubbling or foaming effect in the fluid mixture, which may be desirable for creating the crème or froth needed in serving certain hot beverages. However, those skilled in the art will understand that should frothing not be desirable, the speed of the impeller, or side of the indentation may be adjusted so as to maintain the sheering effect preventing the cavitations.

The impeller may rotate at various speeds, from approximately 8500 to 17,000 rpms within the whipping chamber, depending on a variety of factors including the design of the indentation, the type of drink and impeller design. It is important to note that the relationship between the speed of the impeller and the size and shape of the indentations are determined so that cavitation occurs within the chamber. A slower impeller rotation may be used with a different indentation configuration and achieve the same result. The same holds true for a higher impeller revolution rate. Those skilled in the art will understand that higher speeds will exaggerate the effect of the present invention and cause more

crème or froth to be created, but will work at lower speeds. In the preferred embodiment, the impeller operates at 17,000 rpms.

As the whipping impeller rotates in the whipping chamber, the mixed fluid is discharged through the output 28 due to the higher
5 pressure within the whipping chamber compared to the lower pressure region exterior to the whipping chamber.

Should the type of specialty drink require it, in order to increase the time that the fluid is in contact with the impeller/indentation combination, the pressure interior to the whipping chamber can be increased by placing
10 a restrictor on the discharge time. This increase pressure is not great enough to reduce any cavitations and increases the contact time between the fluid and the present invention to create a greater amount of cavitations thereby creating extra crème or froth for the drink.

The mixing chamber as shown in Figure 4 may be for a specialty
15 drink such as an espresso type drink, and the output restrictor 38 maintains the interior whipping pressure sufficiently high to ensure that the discharged product has sufficient amount of crème. However, those skilled in the art will understand that a restrictor is not necessary for the invention to operate, but only enhances the frothing or crème produced.

20 Figure 5 illustrates the whipping chamber in greater detail. In Figure 5, the whipping chamber 500 comprises of an inlet 501 and a mixing chamber 510. Within the mixing chamber are indentations 520.

Additionally, an indentation for the discharge outlet 530 is contained in the mixing chamber.

As mentioned above, one other effect of the cavitations is to create a greater frothing of the mixture. Because of the relative inelasticity of fluid as compared to a fluid/air mixture of froth, the froth is the last to be discharged from the whipping chamber. This causes the froth to be placed on top of the beverage in the container in the receiving area. This presents a very pleasing and appealing presentation of the product to the consumer and is very desirable for certain types of hot beverages that the consuming public purchases, such as lattés, espressos and cappuccinos.

The combination of the indentations in the whipping chamber, the rate of motor speed for the impeller, the impeller configuration, and the restriction on the outlet if utilized, comprise to create the necessary ingredients for the shearing effect and the cavitations produced in the whipping chamber. As mentioned above, these combinations can be varied to produce the same effect. The use of the indentations in the whipping chamber along with the motor speed impeller configurations and restriction on the outlet, combine to achieve reliability and throughput which allows the impeller geometry to be bigger with a smaller pitch. Additionally, a higher degree of quality is maintained in the dispensed fluid due to the dynamic mixing action in the whipping chamber.

Figure 6A illustrates a view of a preferred embodiment of an impeller as used in the present invention, the view being from the mixing chamber side. Impeller 620 contains two sets of breakers. Breakers 652 are angular shaped which assists in bringing the fluid up to speed by the 5 impeller. Breakers 654 are perpendicular to breakers 652 and provide the same function of dynamically moving the fluid. Thus, these breakers assist in creating the fluid velocity necessary to mix the slurry and create the cavitations.

Figure 6B illustrates a view of the same impeller in 6A from the 10 side of the impeller motor. Impeller 620 contains structural supports 656 that help support the impeller during the revolutions. Snap detent groove 660 allows for mechanical attachment of the impeller arm to the whipping motor. The snap detent has a "D" shaped positioning registration to assist in proper alignment of the impeller arm to the 15 whipping motor, and provides positive drive while preventing the impeller from slipping during rotation.

While Figures 6A and 6B show an impeller configuration used in the preferred embodiment, those skilled in the art will understand that different impeller configurations may be utilized as well. Figure 6C 20 illustrates a chamber side view of an alternative impeller. In Figure 6C, breaker 60 assists in the dynamic fluid movement while the remainder of the impeller remains smooth. This type of impeller may have serrations

on its edge to assist in fluid movement. Figure 6D shows the side of the impeller connected to the drive motor.

Figure 7 illustrates the exterior view of the backside of the whipping chamber. In Figure 7, whipping chamber 716 is shown with the discharge outlet 720 and restrictor 738 on the end of the discharge outlet. As described above, restrictor 738 restricts the discharge of the fluid from the whipping chamber and creates enough back pressure to cause a greater fluid contact time in the whipping chamber while the fluid is being rotated by the impeller.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is set forth in the following claims.

CLAIMS

1. An apparatus for whipping a slurry comprising of:
a whipping chamber;
an impeller located in the whipping chamber wherein the impeller
5 induces dynamic fluid flow within the chamber; and
one or more interfaces between the surface of the chamber and
one or more indentations, wherein turbulence is induced in the fluid flow
near the interface.
2. The apparatus in claim 1 wherein the turbulence is caused by
10 cavitations near the interface.
3. The system in claim 1 wherein the turbulence creates a shearing
effect in the slurry near the interface.
4. The apparatus in claim 1 wherein one of the indentations is an
outlet orifice to discharge the fluid.
- 15 5. The apparatus in claim 1 further comprising:
a discharge outlet; and
a restrictor to increase the time the slurry remains in contact with
the interface prior to exiting the discharge outlet.
6. The apparatus in claim 1 wherein the impeller further comprises at
20 least one breaker located on the side of the impeller nearest to the
indentations.

7. The apparatus in claim 1 wherein the impeller further has serrations located on the side of the impeller nearest to the indentations.
8. The apparatus in claim 1 wherein the impeller rotates at least at 8500 revolutions per minute.
- 5 9. A method of whipping a slurry, the method comprising the steps of:
- whipping the slurry by rotating an impeller in a whipping chamber;
- inducing turbulence in the whipping chamber by using one or more indentations within the surface of the whipping chamber at an interface
- 10 between the indentation and the chamber; and
- discharging the whipped slurry from the whipping chamber.
10. The method of claim 9, further comprising the step of rotating the impeller at least at 8500 revolutions per minute.
11. The method of claim 9 further comprising the step of cavitating the
- 15 slurry near the interface.
12. The method of claim 9 further comprising the step of providing at least one breaker on the surface of the impeller closest to the indentation in the whipping chamber.
13. The method of claim 12 further comprising the step of creating
- 20 turbulence at the interface using the breaker.
14. The method of claim 9 further comprising the step of restricting the discharge of the whipped slurry using a restrictor.

15. The method of claim 9 further comprising the step of creating a shearing effect in the slurry near the indentation.

16. The method of claim 9 further comprising the step of using serrations on the side of the impeller nearest to the indentations.

5 17. A system for providing a whipped beverage, the system comprising:

a customer order system;

a dry beverage mix electronically connected to the customer order system;

10 a whipping chamber for mixing the dry beverage and hot water from a customer order;

an impeller located interior to the whipping chamber;

one or more indentations in the surface of the chamber;

15 a discharge outlet from the whipping chamber to dispense the whipped slurry into a customer receptacle.

18. The system in claim 17 wherein the impeller rotates faster than 8500 revolutions per minute.

19. The system in claim 17 further comprising of an interface between the indentations and the chamber wherein cavitations caused by
20 turbulence near the interface occur as the impeller rotates near the indentations.

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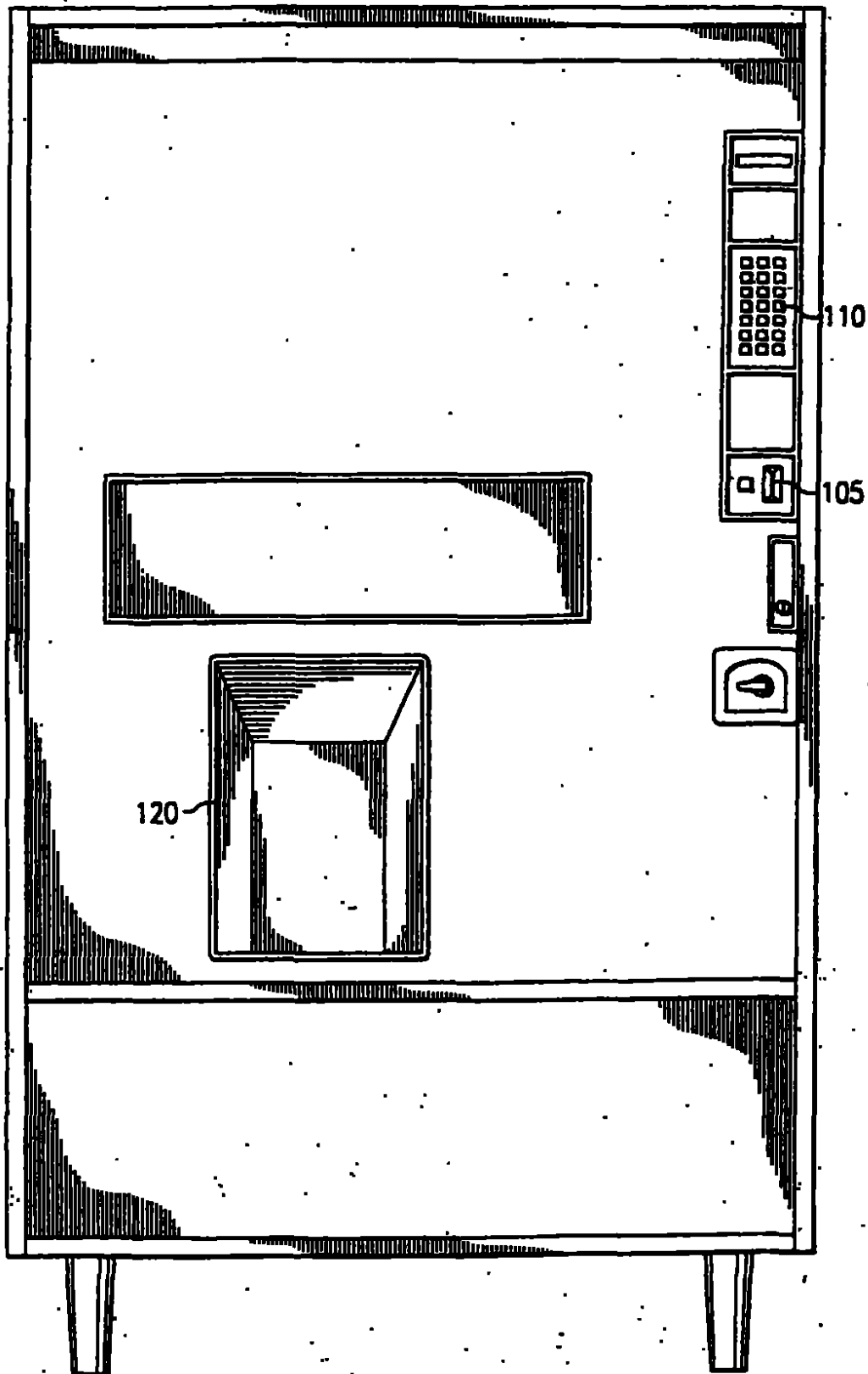
20. The system in claim 17 further comprising of a shearing effect near the interface that is produced as the impeller rotates near the interface.
21. The system in claim 17 wherein one of the indentations is the discharge orifice.
- 5 22. The system in claim 17 wherein the discharge outlet has a restrictor located on it to restrict the discharged whipped fluid slurry.
23. The system in claim 17 wherein the impeller further comprises at least one breaker located on the side of the impeller nearest to the indentations.
- 10 24. The system in claim 17 wherein the impeller further has serrations located on the side of the impeller nearest to the indentations.

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FIG. 1



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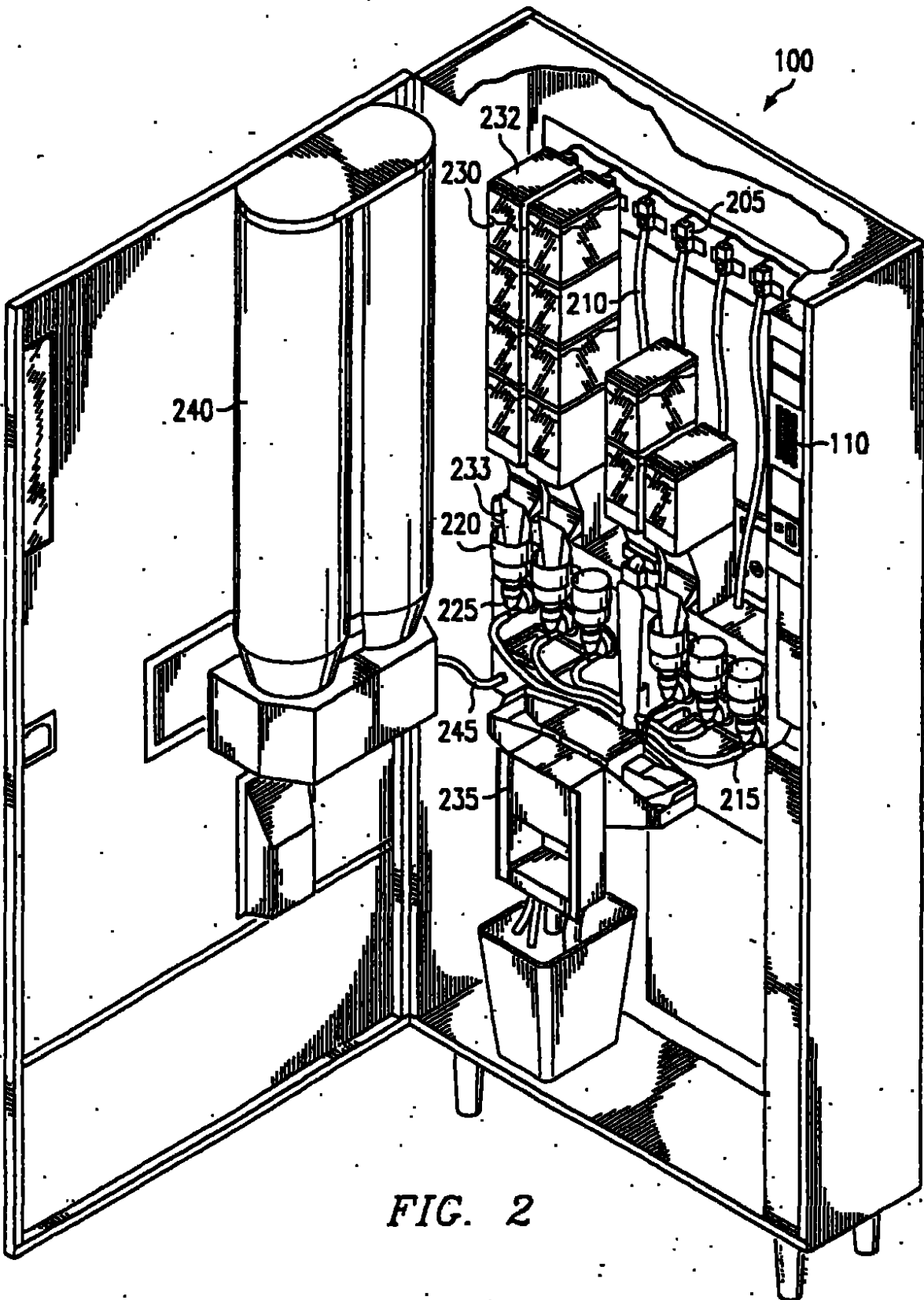


FIG. 2

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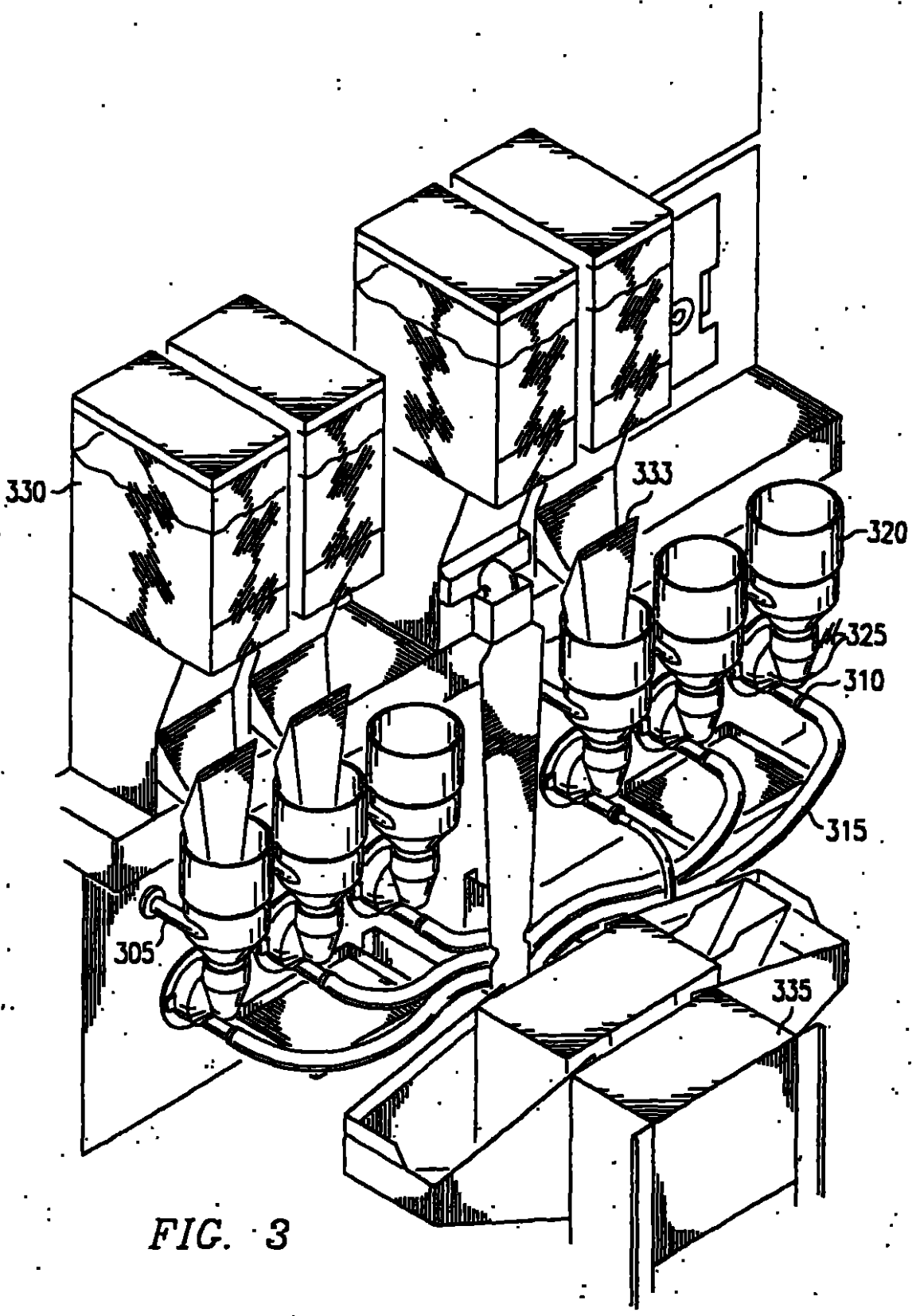
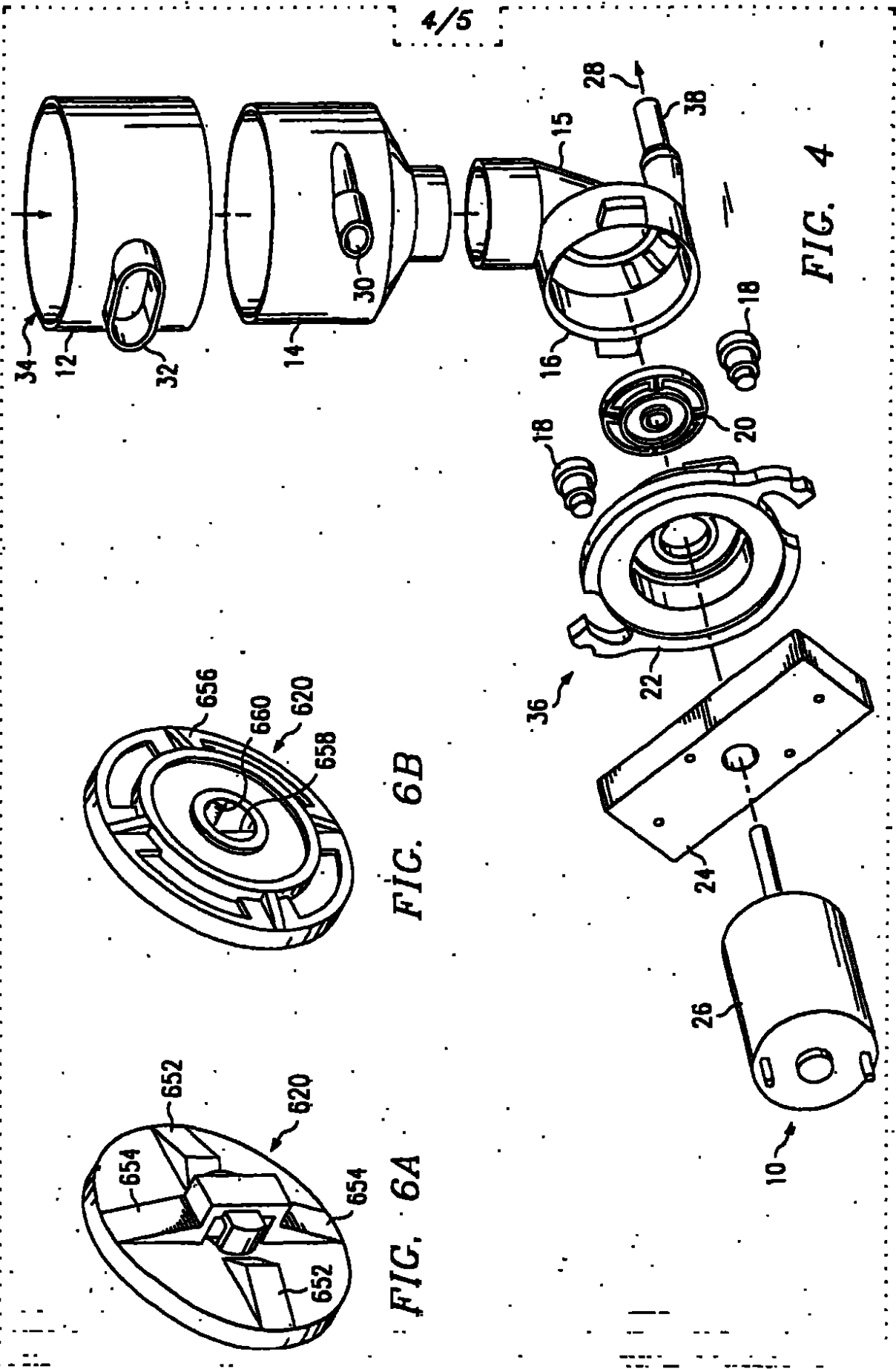


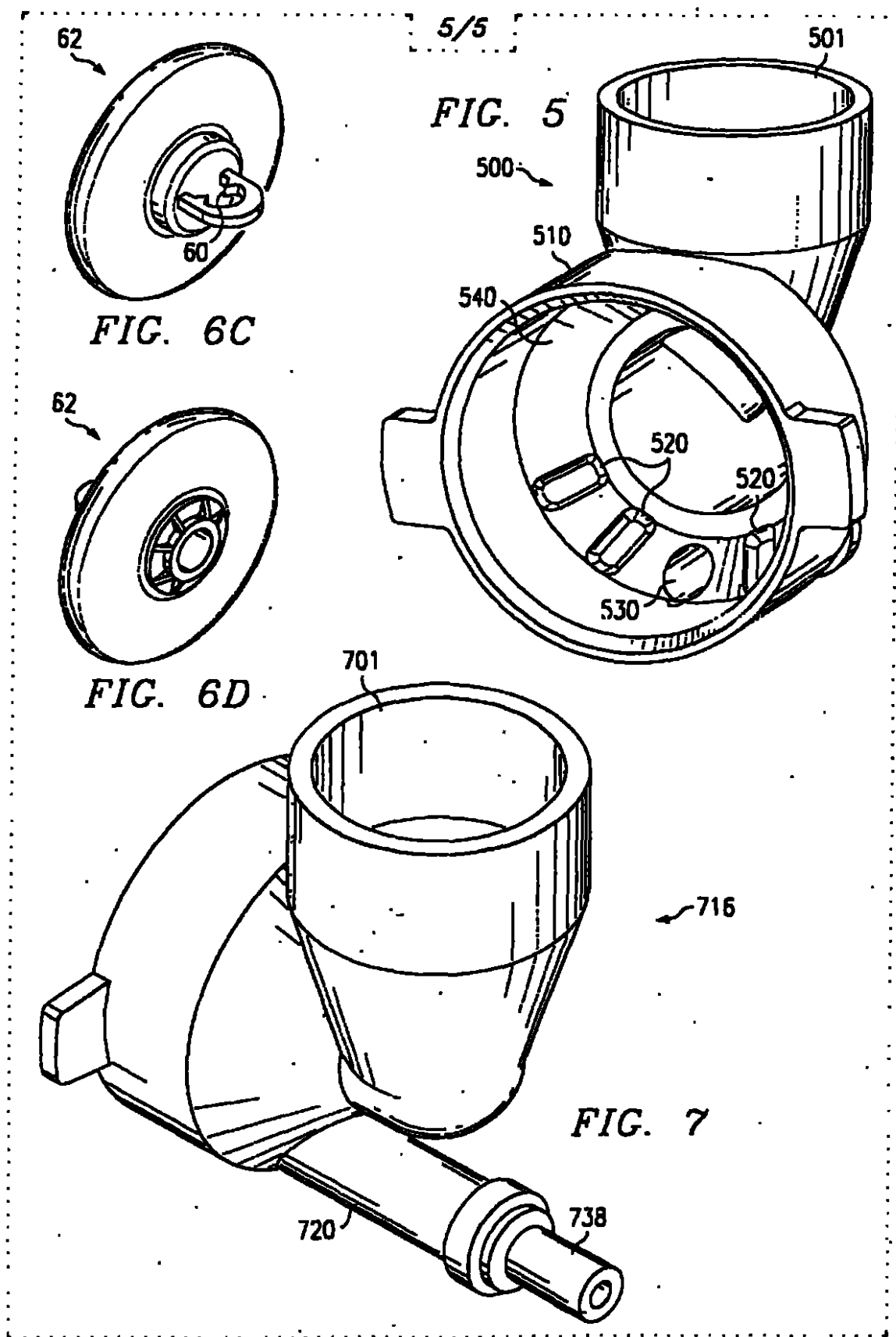
FIG. 3

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2819



PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 13039.191 WO

Box No. I TITLE OF INVENTION SYSTEM FOR WHIPPING A FLUID SLURRY AND METHOD THEREFORE	
Box No. II APPLICANT ☐ This person is also inventor	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
CRANE MERCHANDISING SYSTEMS, INC. 12955 Enterprise Way Bridgeton, MO 63044-1200 US	Telephone No. (314) 298-3500 Facsimile No. (314) 298-3555 Teleprinter No. Applicant's registration No. with the Office
State (that is, country) of nationality: United States	State (that is, country) of residence: United States
This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
SETTLE, Gregory G. 3213 Bassett Road Pacific, MO 63069 US	This person is: ☐ applicant only ☐ applicant and inventor ☒ inventor only (If this check-box is marked, do not fill in below.) Applicant's registration No. with the Office
State (that is, country) of nationality:	State (that is, country) of residence:
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.	
Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
HULSEY, WILLIAM N. III HUGHES & LUCE, L.L.P. 1717 Main Street, Suite 2800 Dallas, TX 75201 US	Telephone No. (214) 939-5672 Facsimile No. (214) 939-5849 Teleprinter No. Agent's registration No. with the Office 33,402
☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) NEWKIRK, Franklin D. 675 Highway Y Winfield, MO 63389 US		This person is: ☐ applicant only ☐ applicant and inventor ☒ inventor only (If this check-box is marked, do not fill in below.)
Applicant's registration No. with the Office		State (that is, country) of nationality:
State (that is, country) of residence:		This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)		This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only (If this check-box is marked, do not fill in below.)
Applicant's registration No. with the Office		State (that is, country) of nationality:
State (that is, country) of residence:		This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)		This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only (If this check-box is marked, do not fill in below.)
Applicant's registration No. with the Office		State (that is, country) of nationality:
State (that is, country) of residence:		This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)		This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only (If this check-box is marked, do not fill in below.)
Applicant's registration No. with the Office		State (that is, country) of nationality:
State (that is, country) of residence:		This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)		This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only (If this check-box is marked, do not fill in below.)
Applicant's registration No. with the Office		State (that is, country) of nationality:
State (that is, country) of residence:		This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box
☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.		

Box No. V DESIGNATION OF STATES

Mark the applicable check-boxes below; at least one must be marked.

The following designations are hereby made under Rule 4.9(a):

Regional Patent

- ☒ **AP** ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZM Zambia, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT (if other kind of protection or treatment desired, specify on dotted line)
- ☒ **EA** Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** European Patent: AT Austria, BE Belgium, CH & LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, TR Turkey, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GQ Equatorial Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | | |
|---|--|--|
| ☒ AE United Arab Emirates | ☒ GM Gambia | ☒ NZ New Zealand |
| ☒ AG Antigua and Barbuda | ☒ HR Croatia | ☒ OM Oman |
| ☒ AL Albania | ☒ HU Hungary | ☒ PH Philippines |
| ☒ AM Armenia | ☒ ID Indonesia | ☒ PL Poland |
| ☒ AT Austria | ☒ IL Israel | ☒ PT Portugal |
| ☒ AU Australia | ☒ IN India | ☒ RO Romania |
| ☒ AZ Azerbaijan | ☒ IS Iceland | ☒ RU Russian Federation |
| ☒ BA Bosnia and Herzegovina | ☒ JP Japan | |
| ☒ BB Barbados | ☒ KE Kenya | ☒ SD Sudan |
| ☒ BG Bulgaria | ☒ KG Kyrgyzstan | ☒ SE Sweden |
| ☒ BR Brazil | ☒ KP Democratic People's Republic of Korea | ☒ SG Singapore |
| ☒ BY Belarus | ☒ KR Republic of Korea | ☒ SI Slovenia |
| ☒ BZ Belize | ☒ KZ Kazakhstan | ☒ SK Slovakia |
| ☒ CA Canada | ☒ LC Saint Lucia | ☒ SL Sierra Leone |
| ☒ CH & LI Switzerland and Liechtenstein | ☒ LK Sri Lanka | ☒ TJ Tajikistan |
| ☒ CN China | ☒ LR Liberia | ☒ TM Turkmenistan |
| ☒ CO Colombia | ☒ LS Lesotho | ☒ TN Tunisia |
| ☒ CR Costa Rica | ☒ LT Lithuania | ☒ TR Turkey |
| ☒ CU Cuba | ☒ LU Luxembourg | ☒ TT Trinidad and Tobago |
| ☒ CZ Czech Republic | ☒ LV Latvia | |
| ☒ DE Germany | ☒ MA Morocco | ☒ TZ United Republic of Tanzania |
| ☒ DK Denmark | ☒ MD Republic of Moldova | ☒ UA Ukraine |
| ☒ DM Dominica | ☒ MG Madagascar | ☒ UG Uganda |
| ☒ DZ Algeria | ☒ MK The former Yugoslav Republic of Macedonia | ☒ US United States of America |
| ☒ EC Ecuador | ☒ MN Mongolia | |
| ☒ EE Estonia | ☒ MW Malawi | ☒ UZ Uzbekistan |
| ☒ ES Spain | ☒ MX Mexico | ☒ VN Viet Nam |
| ☒ FI Finland | ☒ MZ Mozambique | ☒ YU Yugoslavia |
| ☒ GB United Kingdom | ☒ NO Norway | ☒ ZA South Africa |
| ☒ GD Grenada | | ☒ ZM Zambia |
| ☒ GE Georgia | | ☒ ZW Zimbabwe |
| ☒ GH Ghana | | |

Check-boxes below reserved for designating States which have become party to the PCT after issuance of this sheet:

- | | | |
|--------------------------------|--------------------------------|--------------------------------|
| ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ |

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

23

Box No. VI PRIORITY CLAIM

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) 13 July 2001 (13.07.01)	60/305,473	US		
item (2) 09 May 2002 (09.05.02)	10/142,317	US		
item (3)				
item (4)				
item (5)				

☐ Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office) identified above as:

☒ all items ☐ item (1) ☐ item (2) ☐ item (3) ☐ item (4) ☐ item (5) ☐ other, see Supplemental Box

* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(b)(II)):

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA / EPO

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year) Number Country (or regional Office)

Box No. VIII DECLARATIONS

The following declarations are contained in Boxes Nos. VIII (i) to (v) (mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):

Number of
declarations

- | | | |
|---|--|---|
| ☐ Box No. VIII (i) | Declaration as to the identity of the inventor | : |
| ☐ Box No. VIII (ii) | Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent | : |
| ☐ Box No. VIII (iii) | Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application | : |
| ☐ Box No. VIII (iv) | Declaration of inventorship (only for the purposes of the designation of the United States of America) | : |
| ☐ Box No. VIII (v) | Declaration as to non-prejudicial disclosures or exceptions to lack of novelty | : |

Box No. IX CHECK LIST; LANGUAGE OF FILING

This international application contains:

(a) the following number of sheets in paper form:

request (including declaration sheets) : 5
 description (excluding sequence listing part) : 15
 claims : 4
 abstract : 1
 drawings : 5

Sub-total number of sheets : 30

sequence listing part of description (actual number of sheets if filed in paper form, whether or not also filed in computer readable form; see (b) below) : 0

Total number of sheets : 30

(b) sequence listing part of description filed in computer readable form

(i) ☐ only (under Section 801(a)(i))(ii) ☐ in addition to being filed in paper form (under Section 801(a)(ii))

Type and number of carriers (diskette, CD-ROM, CD-R or other) on which the sequence listing part is contained (additional copies to be indicated under item 9(ii), in right column):

This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):

Number of items

1. ☒ fee calculation sheet : 1
2. ☐ original separate power of attorney : 0
3. ☒ original general power of attorney : 1
4. ☐ copy of general power of attorney; reference number, if any: : 0
5. ☐ statement explaining lack of signature : 0
6. ☐ priority document(s) identified in Box No. VI as item(s): : 0
7. ☐ translation of international application into (language): : 0
8. ☐ separate indications concerning deposited microorganism or other biological material : 0
9. ☐ sequence listing in computer readable form (indicate also type and number of carriers (diskette, CD-ROM, CD-R or other)) : 0
 - (i) ☐ copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application) : 0
 - (ii) ☐ (only where check-box (b)(i) or (b)(ii) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter : 0
 - (iii) ☐ together with relevant statement as to the identity of the copy or copies with the sequence listing part mentioned in left column : 0
10. ☒ other (specify): return postcard : 1

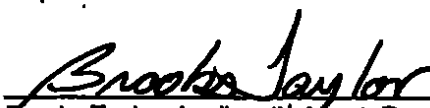
Figure of the drawings which should accompany the abstract:

Language of filing of the international application: English

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

HUGHES & LUCE, L.L.P.



Brooks Taylor, Applicant's Agent, Reg. No. P-52,278

12 July 2002

Date

For receiving Office use only

1. Date of actual receipt of the purported international application:

3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:

4. Date of timely receipt of the required corrections under PCT Article 11(2):

5. International Searching Authority (if two or more are competent): ISA /

6. ☐ Transmittal of search copy delayed until search fee is paid

2. Drawings:

☐ received:☐ not received:

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

PCT

FEE-CALCULATION SHEET

Annex to the Request

For receiving Office use only

International Application No.

Date stamp of the receiving Office

Applicant's or agent's
file reference

13039.191 WO

Applicant

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE \$240.00 T
2. SEARCH FEE \$866.00 S

International search to be carried out by EPO
(If two or more International Searching Authorities are competent to carry out the international search, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL-FEE

Basic Fee

Where item (b) of Box No. IX applies, enter Sub-total number of sheets } 30
Where item (b) of Box No. IX does not apply, enter Total number of sheets }

b1 first 30 sheets \$407.00 b1

b2 x = \$0.00 b2
number of sheets in excess of 30 fee per sheet

b3 additional component (only if sequence listing part of description is filed in computer readable form under Section 801(a)(i), or both in that form and on paper, under Section 801(a)(ii)):

400 x = \$0.00 b3
fee per sheet

Add amounts entered at b1, b2 and b3 and enter total at B \$407.00 B

Designation Fees

The international application contains 115 designations.

5 x \$88.00 = \$440.00 D
number of designation fees payable (maximum 3) amount of designation fee

Add amounts entered at B and D and enter total at I \$847.00 I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT (if applicable) \$30.00 P

5. TOTAL FEES PAYABLE \$1983.00

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

TOTAL

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☒ authorization to charge deposit account (see below) ☐ postal money order ☐ cash ☐ coupons
☐ cheque ☐ bank draft ☐ revenue stamps ☐ other (specify):

AUTHORIZATION TO CHARGE (OR CREDIT) DEPOSIT ACCOUNT

(This mode of payment may not be available at all receiving Offices)

☒ Authorization to charge the total fees indicated above.
☒ (This check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.
☒ Authorization to charge the fee for priority document.

Receiving Office: RO/ US

Deposit Account No.: 00000

Date: 12 July 2002

Name: Brooks Taylor

Signature: Brooks Taylor

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ US

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use

Identification of IPEA		Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference 13039:191 WO
International application No. PCT/US02/21921	International filing date (day/month/year) 12 July 2002 (12.07.2002)	(Earliest) Priority date (day/month/year) 13 July 2001 (13.07.2001)
Title of invention SYSTEM FOR WHIPPING A FLUID SLURRY AND METHOD THEREFORE		
Box No. II APPLICANT(S)		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) CRANE CO. 100 First Stamford Place Stamford, CT 06902 US		Telephone No.: (314) 298-3599
		Facsimile No.: (314) 298-3555
		Teleprinter No.:
State (that is, country) of nationality: US		State (that is, country) of residence: US
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)		
State (that is, country) of nationality:		State (that is, country) of residence:
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)		
State (that is, country) of nationality:		State (that is, country) of residence:
☐ Further applicants are indicated on a continuation sheet.		

Form PCT/IPBA/401 (July, 1998)

See Notes to the demand form

013039.00191:148651.01

272

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is ☒ agent ☐ common representative
 and ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.
☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.
☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority,
 in addition to the agent(s)/common representative appointed earlier.

Name and address: (Family name followed by given name; for a legal entity, full official designation.
 The address must include postal code and name of country.)

SCHELL, John
 HUGHES & LUCE, L.L.P.
 1717 Main Street, Suite 2800
 Dallas, Texas 75201
 US

Telephone No.:
 (512) 482-6918

Facsimile No.:
 (512) 482-6859

Teleprinter No.:

Agent's registration No. with the Office:
 Reg. No.: 50,776

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION**Statement concerning amendments: ***

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filed

the description ☒ as originally filed
☐ as amended under Article 34

the claims ☒ as originally filed
☐ as amended under Article 19 (together with any accompanying statement)
☐ as amended under Article 34

the drawings ☒ as originally filed
☐ as amended under Article 34

2. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). (This check-box may be marked only where the time limit under Article 19 has not yet expired.)

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English

☒ which is the language in which the international application was filed.

☐ which is the language of a translation furnished for the purposes of international search.

☒ which is the language of publication of the international application.

☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby elects all eligible States (that is, all States which have been designated and which are bound by Chapter II of the PCT) excluding the following States which the applicant wishes not to elect: _____

Box No. VI CHECKLIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | | |
|----|---|---|--------|
| 1. | translation of international application | : | sheets |
| 2. | amendments under Article 34 | : | sheets |
| 3. | copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. | copy (or, where required, translation) of statement under Article 19 | : | sheets |
| 5. | letter | : | sheets |
| 6. | other (specify): | : | sheets |

For International Preliminary Examining Authority use only

- | received | not received |
|--------------------------|--------------------------|
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |

The demand is also accompanied by the item(s) marked below:

- | | |
|---|---|
| 1. ☒ fee calculation sheet | 5. ☐ statement explaining lack of signature |
| 2. ☐ original separate power of attorney | 6. ☐ sequence listing in computer readable form |
| 3. ☐ original general power of attorney; | 7. ☒ other (specify): return postcard |
| 4. ☐ copy of general power of attorney; reference number if any: | reference number, if any: 13039:191 WO |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

HUGHES & LUCE, L.L.P.

John Schell, Reg. No. 50,776

February 12, 2003

Date

For International Preliminary Examining Authority use only.

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.

☐ The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82..

For International Bureau use only.

Demand received from IPEA on:

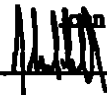
279

PCT

FEE CALCULATION SHEET

CHAPTER II

Annex to the Demand for international preliminary examination

International application No. PCT/US02/21921		For International Preliminary Examining Authority use	
Applicant's or agent's file reference: 13039:191 WO		Date stamp of the IPEA	
Applicant: CRANE CO.			
Calculation of prescribed fees			
1. Preliminary examination fee		\$750.00	P
2. Handling fee (<i>Applications from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (for all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.</i>)		\$146.00	H
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box		\$896.00	
		TOTAL	
Mode of payment			
☒ authorization to charge deposit account with the IPEA (see below)		☐ cash	
☐ cheque		☐ revenue stamps	
☐ postal money order		☐ coupons	
☐ bank draft		☐ other (specify)	
AUTHORIZATION TO CHARGE 90R CREDIT DEPOSIT ACCOUNT) (this mode of payment may not be available at all IPEAs)		IPEA/US	
☒ Authorization to charge the total fees indicated above.		Deposit Account No.: 50-1343 (Hughes & Luca, L.L.P)	
☒ (this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.		Date: 12 February 2003 (12.02.2003)	
		Name: John Schell	
		Signature: 	

SYSTEM FOR WHIPPING A FLUID SLURRY AND METHOD THEREFORE**BACKGROUND OF THE INVENTION**

This application is based on Provisional Application No. 60/305,473, filed July 13, 2001.

5 Technical Field

The present invention relates generally to a beverage dispensing device, and more particularly to a device which whips an unwhipped fluid slurry into a whipped, mixed beverage.

Description of the Related Art

10 Many consumers purchase hot beverages from vending machines. These vending machines often contain a variety of coffee and chocolate drinks as well as other hot drinks. Often times specialty drinks such as lattes, cappuccinos or espressos are served in the vending machines.

Some prior art vending machines mix a dry beverage mix and hot
15 water in a cup located in a general receiving area by adding the hot water to the dry mix and allowing the agitation from the pouring action of the hot fluid to dissolve the mixture into the fluid. While this will dissolve simple soluble mixes, the pouring action is insufficient to thoroughly dissolve a more complex mix, thereby leaving a residue of mix at the
20 bottom of the cup. Additionally, this method does not provide for a frothing action to produce a cr  me that is common to such drinks as lattes, cappuccinos or espressos.

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Other prior art vending machines mix the dry beverage mix and the hot water within the vending machine. These machines provide some sort of mixing chamber in the vending machine to aid in ensuring that the mix is properly dissolved into solution. However, these previous mixing apparatuses have not been able to provide a sufficient froth that might compare to such beverages obtained from a coffee vending merchant. Specifically, the prior art used a smooth mixing chamber and a stirring mechanism such as an impeller to stir the mix. However, this method also failed to provide the agitation sufficient to produce a suitable froth or crême.

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BRIEF SUMMARY OF THE INVENTION

The present invention presents an apparatus for whipping a fluid slurry comprising of an inlet for receiving an unwhipped fluid slurry, a whipping chamber connected to the inlet for whipping the unwhipped fluid slurry, an impeller located in the whipping chamber, one or more indentations in the surface of the whipping chamber, wherein the impeller induces fluid turbulence that produces a whipped fluid slurry when the impeller rotates above the indentations, and an outlet for discharging the whipped fluid slurry.

10 A method of whipping a fluid slurry, the method comprising the steps of receiving a fluid slurry into a whipping chamber, whipping the fluid slurry by rotating an impeller in the whipping chamber, using one or more indentations within the surface area of the whipping chamber to induce turbulent fluid flow in the whipping chamber, and discharging the whipped fluid slurry from the whipping chamber.

A system for providing a whipped fluid slurry, the system comprising a container for storing a mix, a fluid for mixing with the mix to create an unwhipped fluid slurry, a whipping device comprising of a whipping chamber wherein the whipping chamber has an impeller and indentations in the surface within the chamber, wherein the whipping device is connected to the storage container and receives the mix and the fluid for whipping, a discharge outlet from the whipping device a

dispensing area whereby the whipped fluid slurry is dispensed from the discharge outlet.

The foregoing has outlined some of the more pertinent objects and features of the present invention. These objects should be construed to
5 be merely illustrative of some of the more prominent features and applications of the invention. Many other beneficial results can be attained by applying the disclosed invention in a different manner or modifying the invention as will be described. Accordingly, other objects and a fuller understanding of the invention may be had by referring to the
10 following Detailed Description of the Preferred Embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference should be made to the following Detailed Description taken in connection with the accompanying drawings

5 in which:

Figure 1 illustrates the exterior of a typical beverage dispenser in which the present invention may be utilized;

Figure 2 illustrates the interior of a typical beverage dispenser that utilizes the present invention;

10 Figure 3 illustrates a close up view of the mixing area and the whipping chamber;

Figure 4 illustrates the present invention in its component parts;

Figure 5 illustrates the whipping chamber in greater detail;

15 Figure 6A illustrates the mixing chamber side of an impeller used in the present invention;

Figure 6B illustrates the whipper motor side of the same impeller in 6A;

Figure 6C illustrates the mixing chamber side of an alternative impeller;

20 Figure 6D illustrates the whipper motor side of an alternative impeller; and

Figure 7 illustrates the exterior view of the backside of the whipping chamber.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention presents a device that whips an unwhipped fluid/dry beverage mix or fluid slurry into a whipped, mixed beverage. Upon receiving the unwhipped fluid slurry into a whipping chamber, an impeller rotates at sufficient speed such that cavitations are created near indentations located in the wall of the whipping chamber. The cavitations are caused by a low pressure region near the interface between the indentations and the chamber wall, resulting in greater fluid mixing and creating a foaming or frothing action within the fluid. The froth is desirable when the fluid is intended to be a hot, whipped beverage such as hot chocolate or a specialized coffee drink.

Figure 1 illustrates the outside of the exterior of a typical beverage dispenser in which the present invention may be utilized. In Figure 1, the face of beverage dispenser 100 is provided. During its typical use, a customer will insert coins into coin slot 105, and depress the alpha-numeric keypad 110 in order to choose a particular type of drink. Once the drink is selected, the beverage is mixed utilizing the present invention and dispensing the whipped drink into a container in the beverage receiving area at 120, where the customer is able to obtain the product from the beverage dispenser.

Figure 2 illustrates the interior of a typical beverage dispenser that utilizes the present invention. In Figure 2, dry beverage mix 230 is stored

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within the beverage dispenser in container 232. When a customer places an order for a drink using alpha-numeric pad 110, a cup, corresponding to the ordered drink is sent from the cup storage unit, 240, into the drink dispensing area 235. Upon the cup being sent, an electronic controller

5 ports hot water from the water storage tank within the machine (not shown) into the mixing chamber through line 305 (see Figure 3). In the preferred embodiment, prior to the hot water entering the mixing chamber 220, the impeller begins to rotate. This begins immediately prior to the mix porting to the mixing chamber and the initial in-rush of hot water

10 provides for a "washing" action within the chamber. Just after the first in-rush of hot water, the mix corresponding to the selected beverage is sent by an auger located in ____ (not shown) into the whipping chamber

~~inlet 220 via chute 233.~~ Chute 233 collects and directs the dry mix into

220 and prevents the dry mix from splashing into the main components

15 of dispenser 100. As the dry mix enters the mixing chamber 220, and comes into contact with the hot water and impeller in the whipping chamber 225, it is an unwhipped fluid slurry. As the unwhipped fluid slurry becomes stirred by the impeller, pressure builds up in the mixing chamber and discharges the mix fluid through output hose 215 into the

20 waiting cup in the beverage dispenser 235.

Figure 3 illustrates a close up view of the mixing area and the whipping chamber which incorporates the present invention. In Figure 3,

dry beverage mix 330 is guided into the whipping chamber inlet 320 by product chute 333. As described above, hot water enters the chamber via port 305. The impeller begins to rotate upon receiving an order and when the mix and water or the unwhipped fluid slurry enters the whipping chamber 325, the impeller (not visible here) begins to stir or whip the unwhipped fluid slurry into a whipped or mixed combination. The mixed combination is discharged through discharge tube 315. Discharge tube 315 carries the mixed fluid slurry into the beverage receiving area 335 for the customer to receive the ordered beverage.

Depending on the drink associated with the particular mix, a restrictor 310 may be added to the outlet of 325 to place a back pressure on the whipping chamber. As will be shown later, this back pressure will cause a greater formation of crème to occur.

Figure 4 illustrates the present invention and its component parts.

In Figure 4, the unwhipped fluid slurry enters the whipping chamber through the exhaust vent cap 12. Exhaust port 32 is provided to allow excess steam from the hot water/impeller action to escape from the chamber away from the dry mix and chute 233. This prevents a caking of the dry mix at or near the chute area.

Mixing bowl 14 is located directly underneath exhaust cap 34. Hot water enters through water inlet 30 and combines with the dry beverage mix in the mixing bowl to become the unwhipped fluid slurry.

D39

The unwhipped fluid slurry then enters into the whipping chamber 15 via both gravity and a vacuum drag created by the impeller operation in the whipping chamber.

As the slurry enters the whipping chamber 16, the water and dry beverage mix are whipped or stirred by the impeller 20, which is connected to whipper motor 26 through a hole in mounting block 24 and mounting base 22. Mounting base 22 creates a seal with the motor and shaft and whipping impeller. Screw caps 18 are inserted into the mounting block 24 in order to firmly attach the mounting base to the whipping motor.

The present invention has indentations located in the interior surface of the whipping chamber 16 closest to the impeller surface. In the preferred embodiment, as the impeller reaches its intended speed, the rotation of the fluid begins to reach the speed of the impeller. The rotation creates a low pressure region within the whipping chamber nearest to the mixing bowl, which causes the unwhipped fluid slurry from the mixing bowl to be drawn into the whipping chamber. This causes the pressure interior to the whipping chamber (but near the interface between the impeller and chamber wall) to rise as more unwhipped fluid slurry is pulled into the whipping chamber. When the rapidly rotating, higher pressure fluid slurry passes near the interface between the indentations

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and the chamber, a low pressure region near the interface is created due to the indentations, which causes cavitations to occur within the fluid.

These cavitations have a two fold effect. First, they cause a greater sheering effect of the fluid slurry than would occur just from the rotating fluid. This sheering effect in turn enhances dissolving and mixing the dry beverage mix in the water. Additionally, the cavitations can create a bubbling or foaming effect in the fluid mixture, which may be desirable for creating the crème or froth needed in serving certain hot beverages. However, those skilled in the art will understand that should frothing not be desirable, the speed of the impeller, or side of the indentation may be adjusted so as to maintain the sheering effect preventing the cavitations.

~~The impeller may rotate at various speeds, from approximately~~
8500 to 17,000 rpms within the whipping chamber, depending on a variety of factors including the design of the indentation, the type of drink and impeller design. It is important to note that the relationship between the speed of the impeller and the size and shape of the indentations are determined so that cavitation occurs within the chamber. A slower impeller rotation may be used with a different indentation configuration and achieve the same result. The same holds true for a higher impeller revolution rate. Those skilled in the art will understand that higher speeds will exaggerate the effect of the present invention and cause more

crème or froth to be created, but will work at lower speeds. In the preferred embodiment, the impeller operates at 17,000 rpms.

As the whipping impeller rotates in the whipping chamber, the mixed fluid is discharged through the output 28 due to the higher pressure within the whipping chamber compared to the lower pressure region exterior to the whipping chamber.

Should the type of specialty drink require it, in order to increase the time that the fluid is in contact with the impeller/indentation combination, the pressure interior to the whipping chamber can be increased by placing a restrictor on the discharge time. This increase pressure is not great enough to reduce any cavitations and increases the contact time between the fluid and the present invention to create a greater amount of cavitations thereby creating extra crème or froth for the drink.

The mixing chamber as shown in Figure 4 may be for a specialty drink such as an espresso type drink, and the output restrictor 38 maintains the interior whipping pressure sufficiently high to ensure that the discharged product has sufficient amount of crème. However, those skilled in the art will understand that a restrictor is not necessary for the invention to operate, but only enhances the frothing or crème produced.

Figure 5 illustrates the whipping chamber in greater detail. In Figure 5, the whipping chamber 500 comprises of an inlet 501 and a mixing chamber 510. Within the mixing chamber are indentations 520.

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Additionally, an indentation for the discharge outlet 530 is contained in the mixing chamber.

As mentioned above, one other effect of the cavitations is to create a greater frothing of the mixture. Because of the relative inelasticity of fluid as compared to a fluid/air mixture of froth, the froth is the last to be discharged from the whipping chamber. This causes the froth to be placed on top of the beverage in the container in the receiving area. This presents a very pleasing and appealing presentation of the product to the consumer and is very desirable for certain types of hot beverages that the consuming public purchases, such as lattes, espressos and cappuccinos.

The combination of the indentations in the whipping chamber, the ~~rate of motor speed for the impeller~~, the impeller configuration, and the restriction on the outlet if utilized, comprise to create the necessary ingredients for the shearing effect and the cavitations produced in the whipping chamber. As mentioned above, these combinations can be varied to produce the same effect. The use of the indentations in the whipping chamber along with the motor speed impeller configurations and restriction on the outlet, combine to achieve reliability and throughput which allows the impeller geometry to be bigger with a smaller pitch. Additionally, a higher degree of quality is maintained in the dispensed fluid due to the dynamic mixing action in the whipping chamber.

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Figure 6A illustrates a view of a preferred embodiment of an impeller as used in the present invention, the view being from the mixing chamber side. Impeller 620 contains two sets of breakers. Breakers 652 are angular shaped which assists in bringing the fluid up to speed by the
5 impeller. Breakers 654 are perpendicular to breakers 652 and provide the same function of dynamically moving the fluid. Thus, these breakers assist in creating the fluid velocity necessary to mix the slurry and create the cavitations.

Figure 6B illustrates a view of the same impeller in 6A from the
10 side of the impeller motor. Impeller 620 contains structural supports 656 that help support the impeller during the revolutions. Snap detent groove 660 allows for mechanical attachment of the impeller arm to the whipping motor. The snap detent has a "D" shaped positioning
15 registration to assist in proper alignment of the impeller arm to the whipping motor, and provides positive drive while preventing the impeller from slipping during rotation.

While Figures 6A and 6B show an impeller configuration used in the preferred embodiment, those skilled in the art will understand that different impeller configurations may be utilized as well. Figure 6C
20 illustrates a chamber side view of an alternative impeller. In Figure 6C, breaker 60 assists in the dynamic fluid movement while the remainder of the impeller remains smooth. This type of impeller may have serrations

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AA

on its edge to assist in fluid movement. Figure 6D shows the side of the impeller connected to the drive motor.

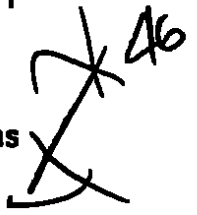
Figure 7 illustrates the exterior view of the backside of the whipping chamber. In Figure 7, whipping chamber 716 is shown with the discharge outlet 720 and restrictor 738 on the end of the discharge outlet. As described above, restrictor 738 restricts the discharge of the fluid from the whipping chamber and creates enough back pressure to cause a greater fluid contact time in the whipping chamber while the fluid is being rotated by the impeller.

10 Having thus described our invention, what we claim as new and desire to secure by Letters Patent is set forth in the following claims.

45

CLAIMS

1. An apparatus for whipping a slurry comprising of:
a whipping chamber;
an impeller located in the whipping chamber wherein the impeller
5 induces dynamic fluid flow within the chamber; and
one or more interfaces between the surface of the chamber and
one or more indentations, wherein turbulence is induced in the fluid flow
near the interface.
2. The apparatus in claim 1 wherein the turbulence is caused by
10 cavitations near the interface.
3. The system in claim 1 wherein the turbulence creates a shearing
effect in the slurry near the interface.
4. ~~The apparatus in claim 1 wherein one of the indentations is an~~
outlet orifice to discharge the fluid.
- 15 5. The apparatus in claim 1 further comprising:
a discharge outlet; and
a restrictor to increase the time the slurry remains in contact with
the interface prior to exiting the discharge outlet.
6. The apparatus in claim 1 wherein the impeller further comprises at
20 least one breaker located on the side of the impeller nearest to the
indentations.



7. The apparatus in claim 1 wherein the impeller further has serrations located on the side of the impeller nearest to the indentations.

8. The apparatus in claim 1 wherein the impeller rotates at least at 8500 revolutions per minute.

5 9. A method of whipping a slurry, the method comprising the steps of:

whipping the slurry by rotating an impeller in a whipping chamber;

inducing turbulence in the whipping chamber by using one or more indentations within the surface of the whipping chamber at an interface

10 between the indentation and the chamber; and

discharging the whipped slurry from the whipping chamber.

10. The method of claim 9, further comprising the step of rotating the impeller at least at 8500 revolutions per minute.

15 11. The method of claim 9 further comprising the step of cavitating the slurry near the interface.

12. The method of claim 9 further comprising the step of providing at least one breaker on the surface of the impeller closest to the indentation in the whipping chamber.

20 13. The method of claim 12 further comprising the step of creating turbulence at the interface using the breaker.

14. The method of claim 9 further comprising the step of restricting the discharge of the whipped slurry using a restrictor.

15. The method of claim 9 further comprising the step of creating a shearing effect in the slurry near the indentation.

16. The method of claim 9 further comprising the step of using serrations on the side of the impeller nearest to the indentations.

5 17. A system for providing a whipped beverage, the system comprising:

a customer order system;

a dry beverage mix electronically connected to the customer order system;

10 a whipping chamber for mixing the dry beverage and hot water from a customer order;

an impeller located interior to the whipping chamber;

~~one or more indentations in the surface of the chamber;~~

15 a discharge outlet from the whipping chamber to dispense the whipped slurry into a customer receptacle.

18. The system in claim 17 wherein the impeller rotates faster than 8500 revolutions per minute.

19. The system in claim 17 further comprising of an interface between the indentations and the chamber wherein cavitations caused by
20 turbulence near the interface occur as the impeller rotates near the indentations.

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20. The system in claim 17 further comprising of a shearing effect near the interface that is produced as the impeller rotates near the interface.

21. The system in claim 17 wherein one of the indentations is the discharge orifice.

5 22. The system in claim 17 wherein the discharge outlet has a restrictor located on it to restrict the discharged whipped fluid slurry.

23. The system in claim 17 wherein the impeller further comprises at least one breaker located on the side of the impeller nearest to the indentations.

10 24. The system in claim 17 wherein the impeller further has serrations located on the side of the impeller nearest to the indentations.

SYSTEM FOR WHIPPING A FLUID SLURRY AND METHOD THEREFORE**ABSTRACT OF THE DISCLOSURE**

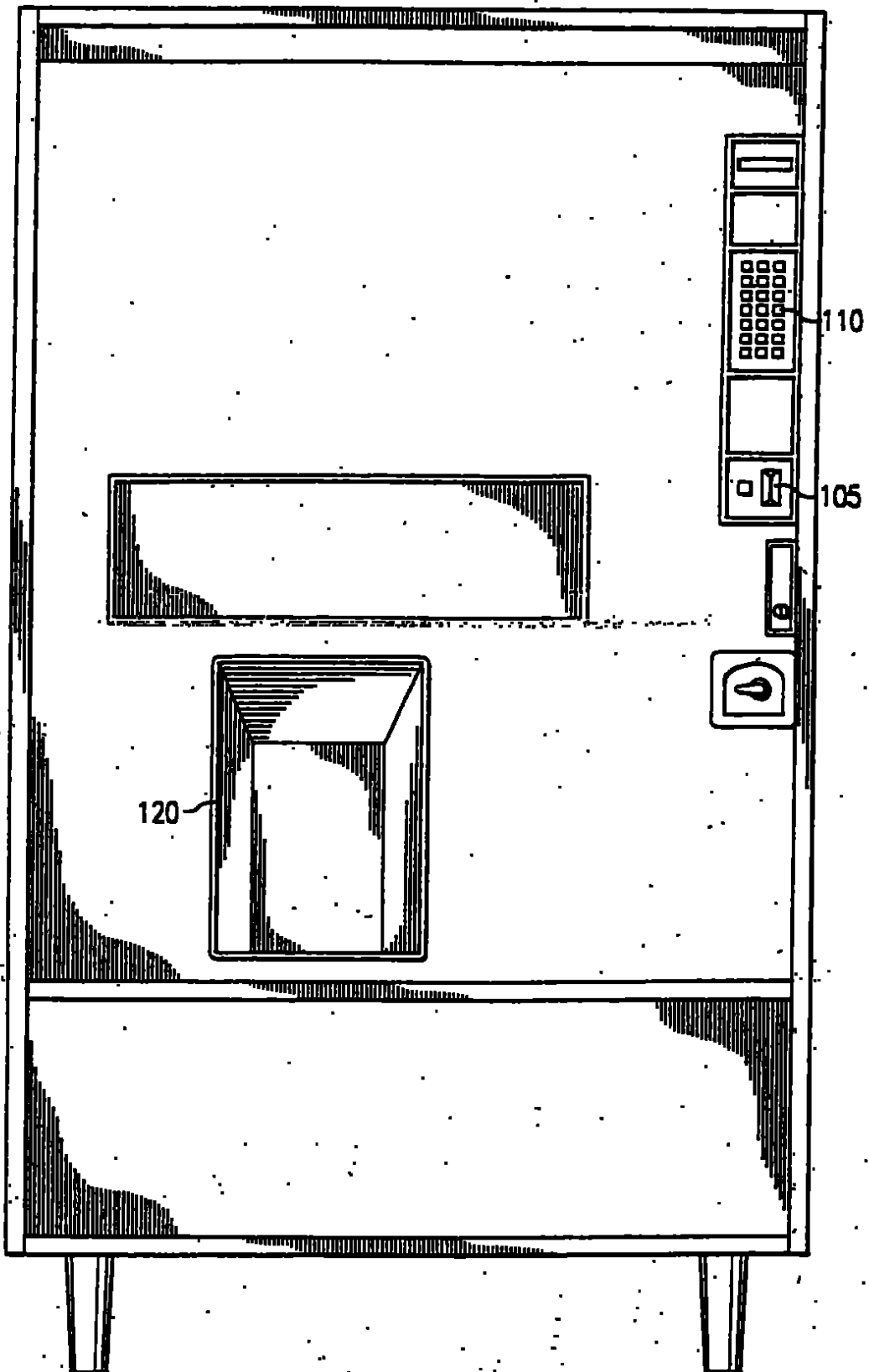
The present invention relates to the mixing of dry beverage mixes with water. It presents an apparatus for whipping a fluid slurry comprising of an inlet for receiving an unwhipped fluid slurry, a whipping chamber connected to the inlet for whipping the unwhipped fluid slurry, an impeller located in the whipping chamber, one or more indentations in the surface of the whipping chamber, wherein the impeller induces fluid turbulence that produces a whipped fluid slurry when the impeller rotates above the indentations, and an outlet for discharging the whipped fluid slurry.

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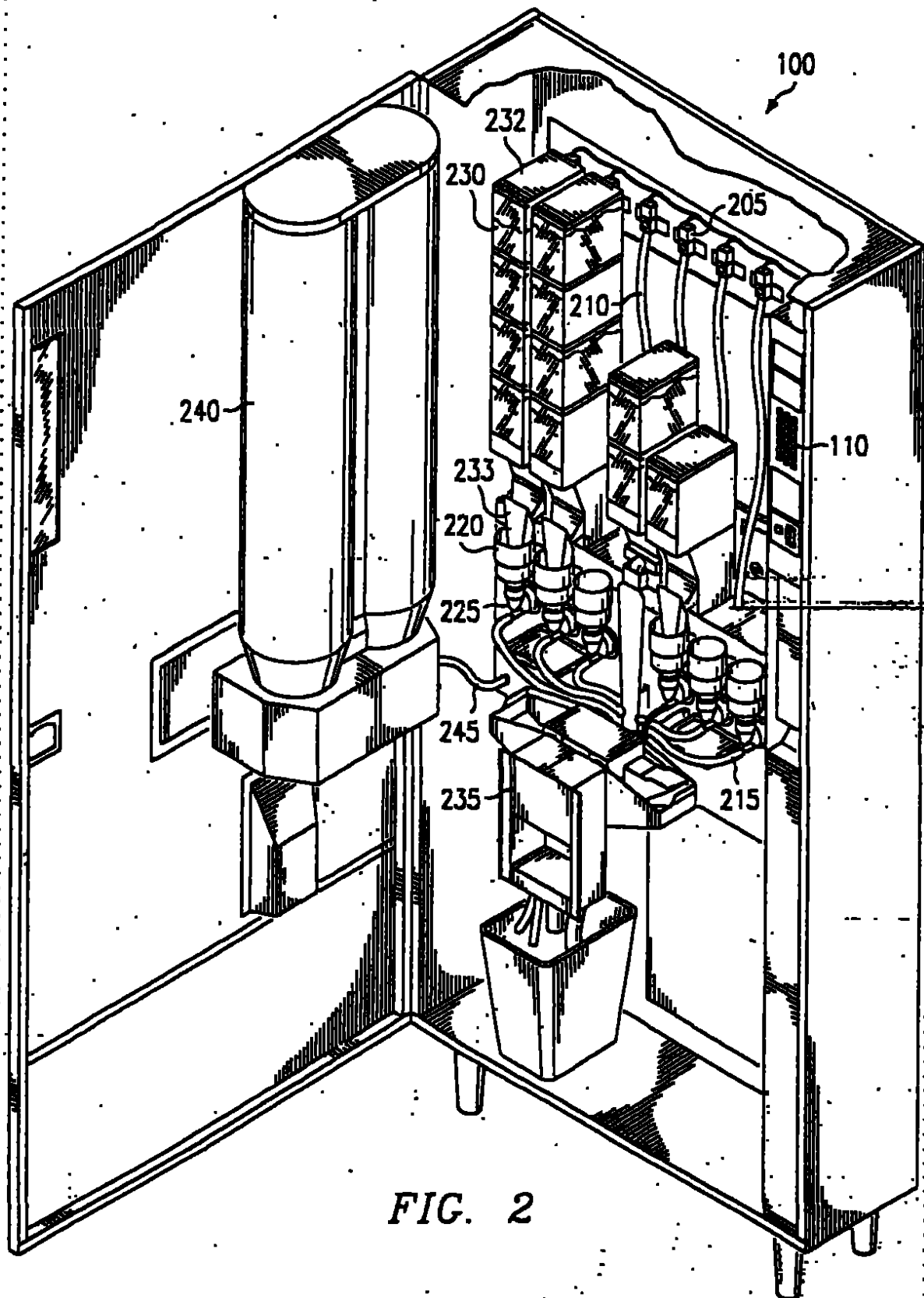
FIG. 1

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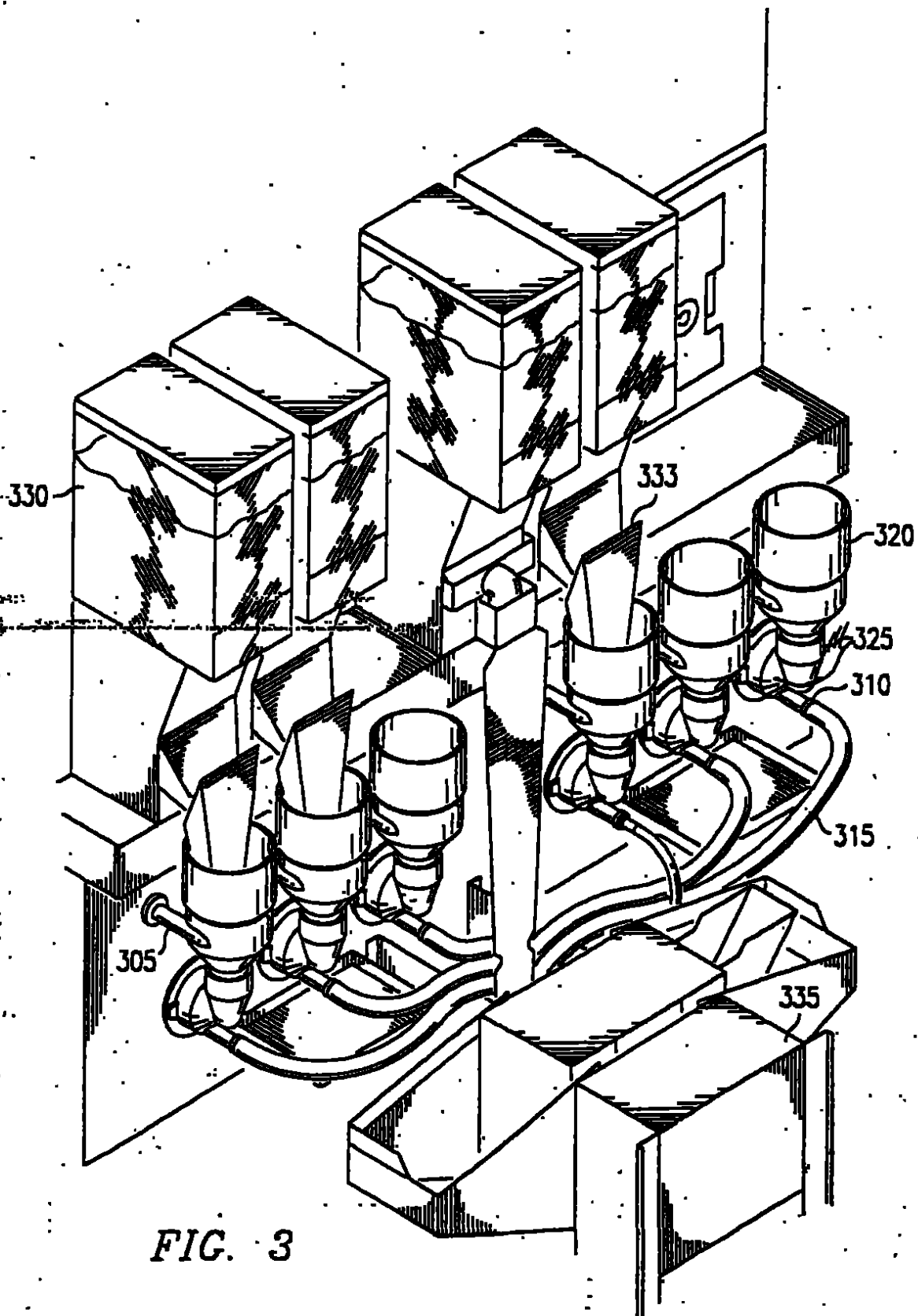


FIG. 3

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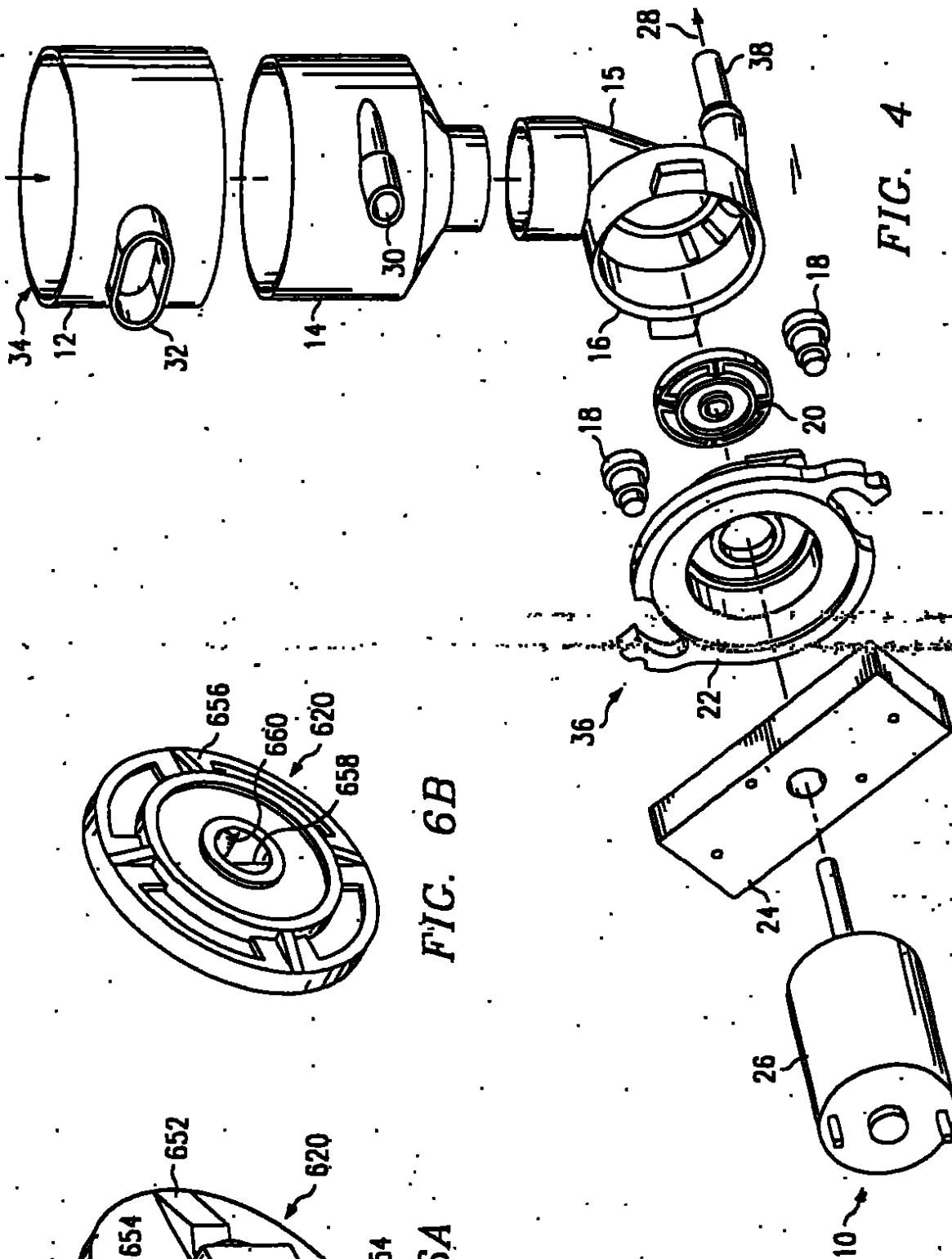


FIG. 4

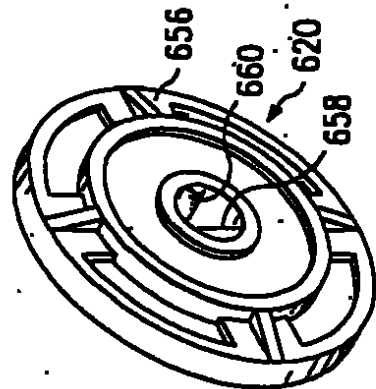


FIG. 6B

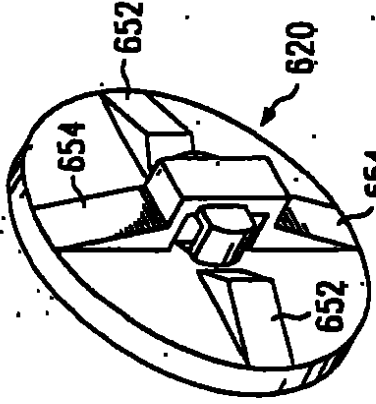


FIG. 6A

SA

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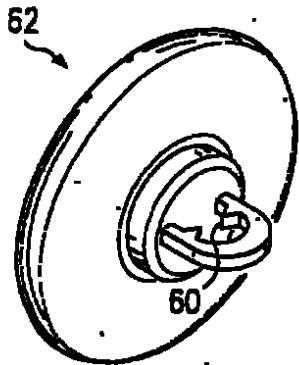


FIG. 6C

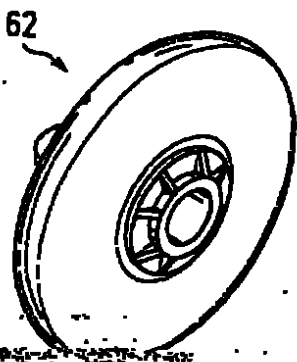


FIG. 6D

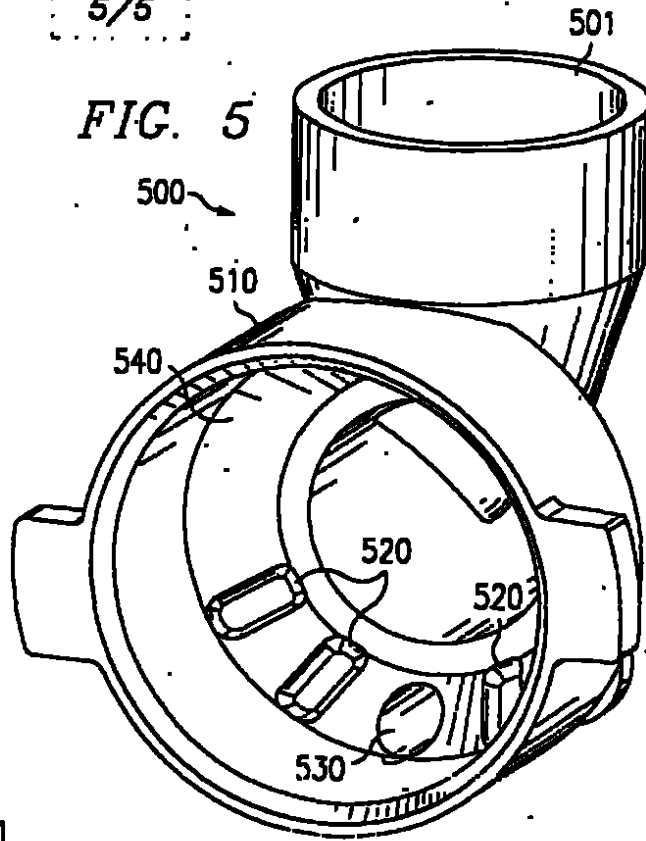


FIG. 5

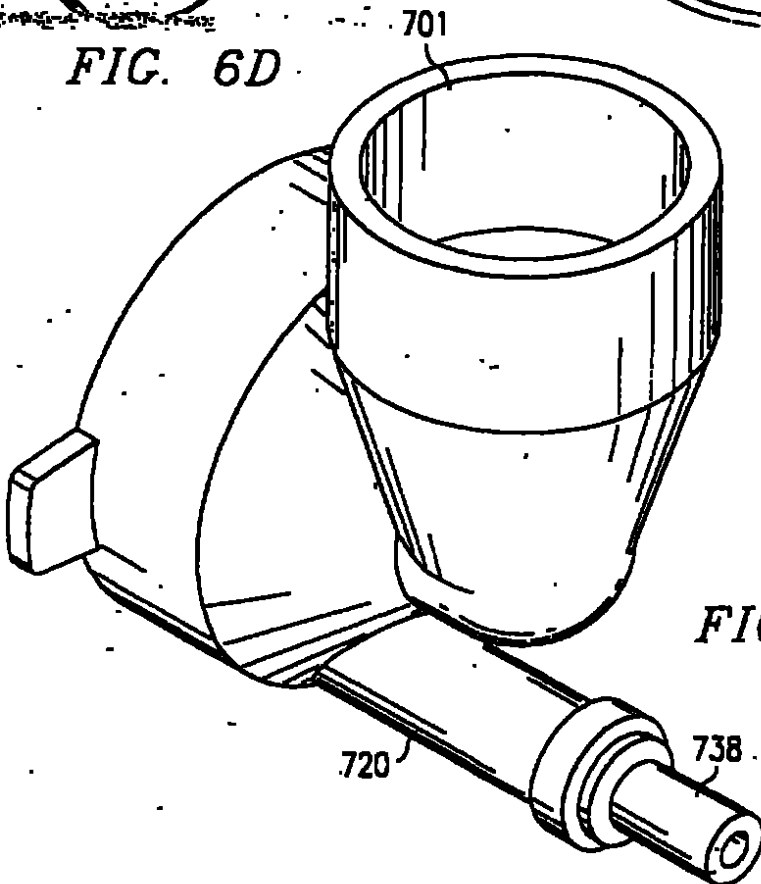


FIG. 7

PATENT COOPERATION TREATY

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✓

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:
HUGHES & LUCE, L.L.P.
Attn. JOHN SCHELL
1717 Main Street, Suite 2800
Dallas, Texas 75201
UNITED STATES OF AMERICA

RECEIVED

DEC 29 2003

DAVIS MUNCK

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing (day/month/year) 04/12/2003	
Applicant's or agent's file reference 13039.191 WO	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/US 02/21921	International filing date (day/month/year) 12/07/2002
Applicant CRANE CO.	

DOCKETED

JAN - 5 2003

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the International application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the International application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for International publication.

Within 19 months from the priority date, a demand for International preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3018	Authorized officer Hans Pettersson
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These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

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The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 48.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 13039.191 WO	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, Item 5 below.	
International application No. PCT/US 02/21921	International filing date (day/month/year) 12/07/2002	(Earliest) Priority Date (day/month/year) 13/07/2001
Applicant CRANE CO.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/21921

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A47J31/40 A47J31/44 B01F3/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A47J B01F B02C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 795 062 A (K.M. JOHNSON) 18 August 1998 (1998-08-18) the whole document	1-24
A	EP 0 081 449 A (THE GOODYEAR TIRE & RUBBER COMP.) 15 June 1983 (1983-06-15) claim 1; figures 1-5	1
A	EP 0 986 983 A (CRANE COMP.) 22 March 2000 (2000-03-22) the whole document	1
A	US 3 938 784 A (G.C. MORETON) 17 February 1976 (1976-02-17) the whole document	1
A	US 6 176 090 B1 (L.W. UFEMA) 23 January 2001 (2001-01-23) the whole document	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

25 November 2003

Date of mailing of the international search report

04/12/2003

Name and mailing address of the ISA

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Authorized officer

Bertram, H

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/21921

160

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US005795062A

261

United States Patent [19]

[11] Patent Number: 5,795,062

Johnson

[45] Date of Patent: Aug. 18, 1998

[54] MILKSHAKE MACHINE

[75] Inventor: Kevin M. Johnson, Natick, Mass.

[73] Assignee: Hamilton Beach/Procter-Silex, Inc.,
Glen Allen, Va.

[21] Appl. No.: 724,771

[22] Filed: Oct. 3, 1996

[51] Int. Cl.⁶ B01F 15/02; B01F 7/26[52] U.S. Cl. 366/136; 366/137; 366/196;
366/307; 366/314; 366/317; 241/46.016;
241/97; 99/510; 99/340[58] Field of Search 366/136, 137,
366/279, 302, 307, 314, 315, 316, 317,
196; 241/46.016, 46.014, 46.013, 97, 80;
99/510, 348, 511

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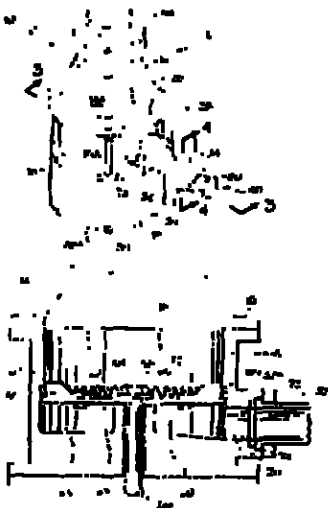
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Submittal sheet and drawing showing Badger 1 1/3 HP
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In-sink-Erator Division, Racine, Wisconsin, admitted to be
prior art.Sketch showing prior art drink mixing apparatus utilizing
commercially-available waste disposer.Primary Examiner—Tony G. Soohoo
Attorney, Agent, or Firm—Roger S. Dybvig

[57] ABSTRACT

A milkshake machine or similar apparatus uses the grinding and shredding principles employed by conventional impeller-type waste disposers. The milkshake machine has a housing that defines an upper grinding chamber and a lower receiving chamber separated by a rotatable impeller disk that mixes together and drives ingredients to be mixed against shredding surfaces on the inner wall of the grinding chamber. The receiving chamber has a discharge outlet, and a return inlet is provided in the housing above the grinding chamber. A discharge conduit is connected at one end to the discharge outlet at has a return port and a discharge spout at its opposite end. A return conduit is connected at one end to the return port of the discharge conduit and at its opposite end to the return inlet. A valve mechanism is provided to divert the mixed and ground ingredients expelled into the discharge conduit either into the return conduit and back into the grinding chamber or out of the discharge spout. The valve mechanism may be operated manually or by a solenoid or other suitable actuator, and a timer mechanism may be provided to toll the mixing cycle. A rinse inlet may also be provided in the housing to receive a cleaning solution on demand for cleaning the apparatus. The timer mechanism and the automatic valve mechanism may be used to control a cleaning or rinsing cycle.

28 Claims, 4 Drawing Sheets



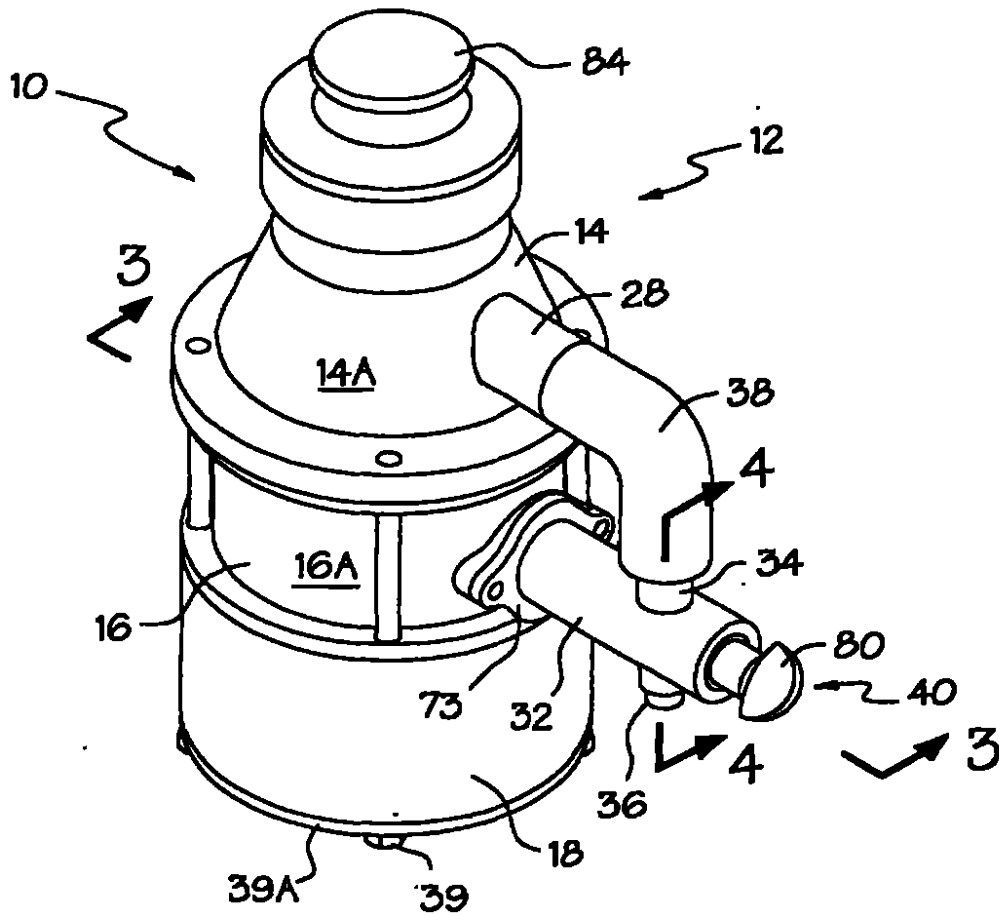
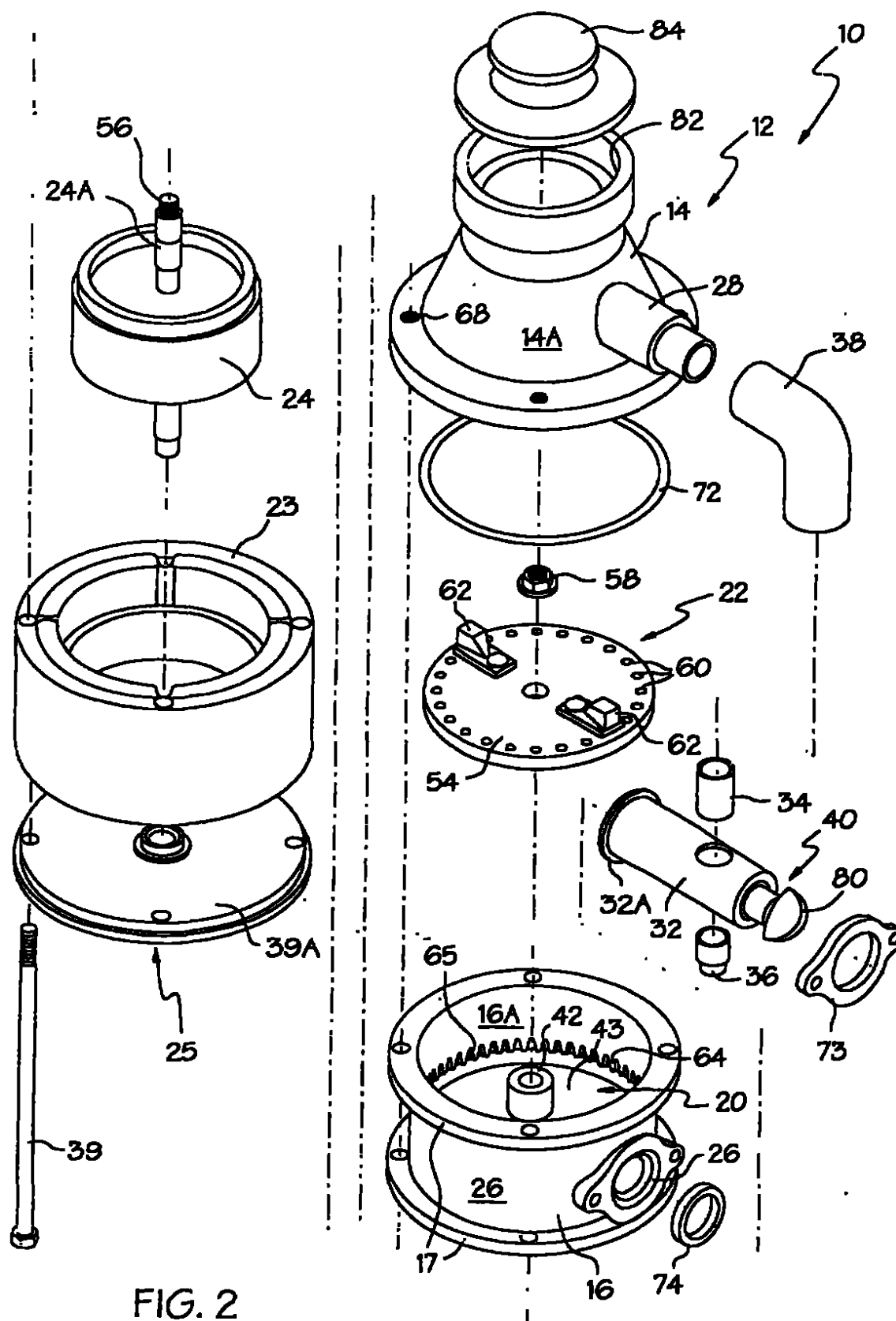
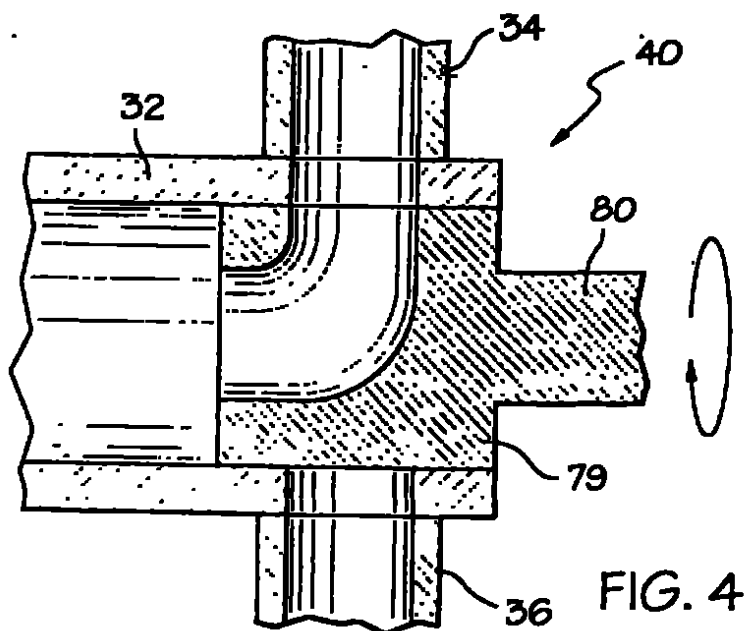
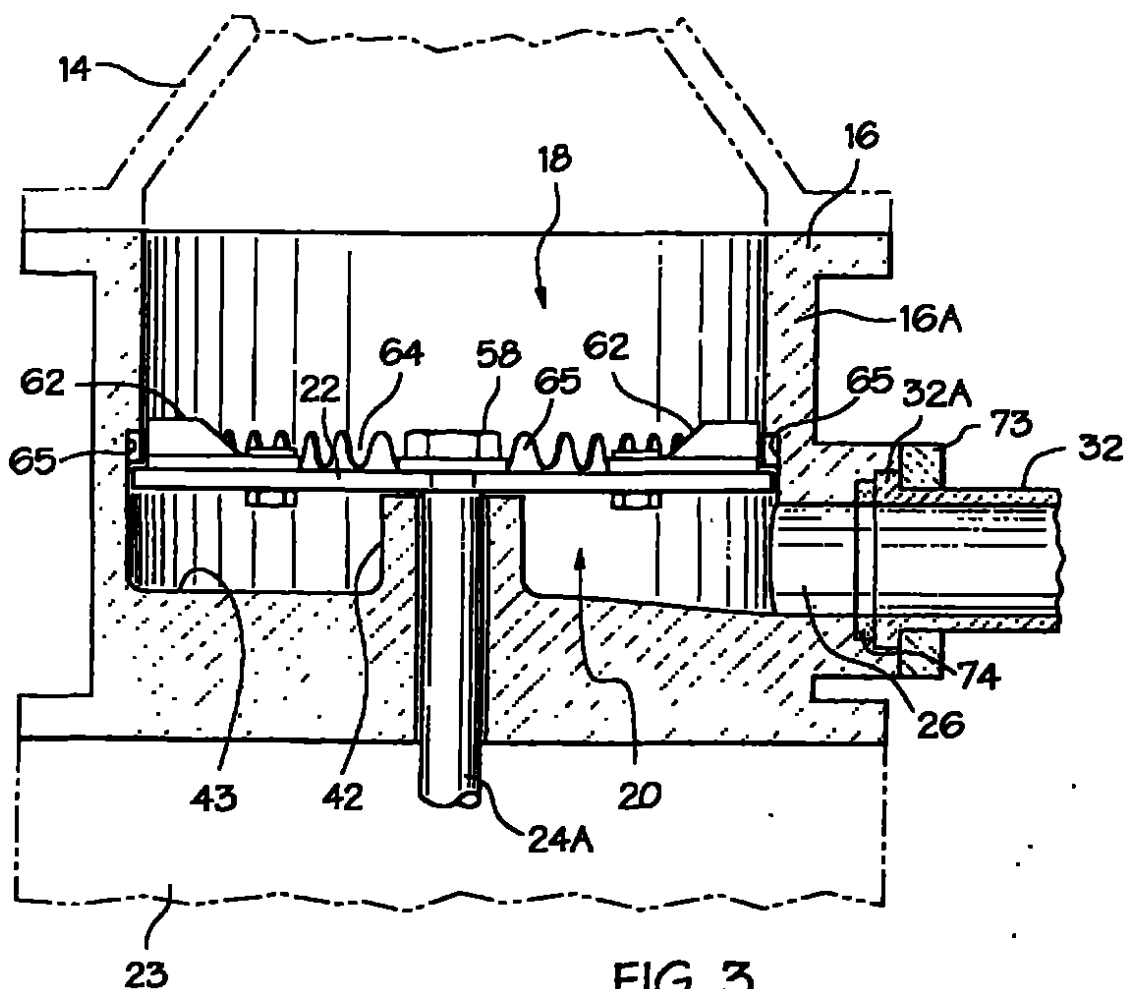
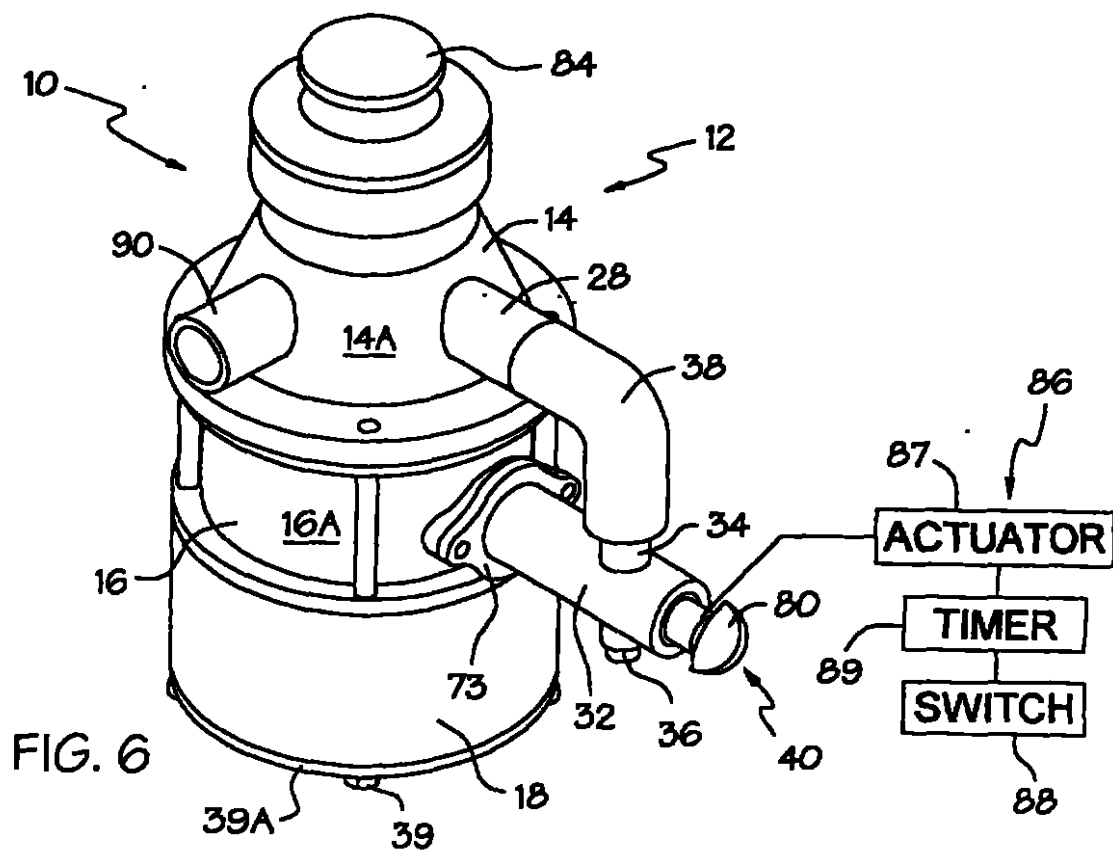
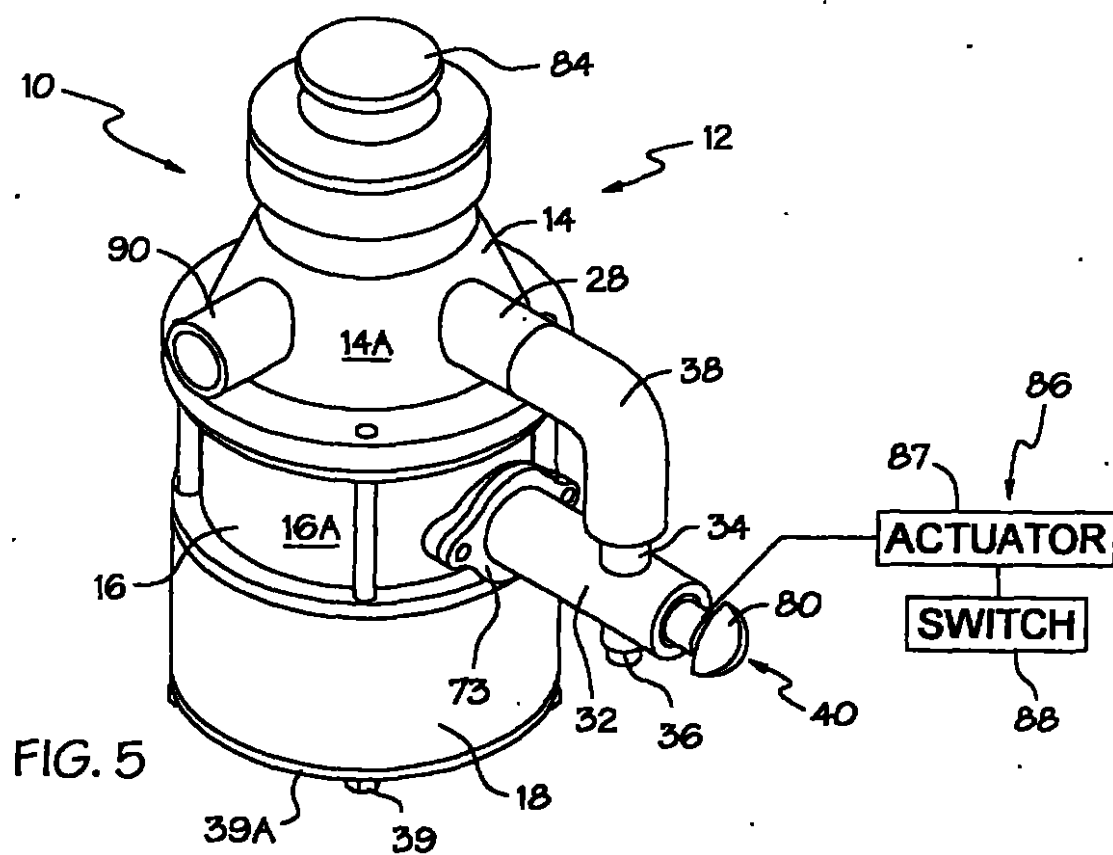


FIG. 1





63



MILKSHAKE MACHINE

FIELD OF THE INVENTION

This invention relates to apparatus, particularly milkshake machines, for mixing solids and liquids into a flowable mixture suitable for drinking.

BACKGROUND OF THE INVENTION

Conventional milkshake machines typically comprise a mixing blade or disk mounted on a rotating shaft. Ingredients to be mixed are placed in a separate mixing container, and the rotating shaft and blade are immersed in the ingredients. The container is routinely grasped by the operator and agitated and reciprocated relative to the shaft and blade, especially when hard-packed ice cream is used. This agitation may lead to hand injuries to the operator if the mixing blade pierces the container while it is grasped by the operator, which is especially likely if a paper or cardboard mixing container is used.

The mixing times of such conventional milkshake machines are vastly increased if hard-packed ice cream or any other hard ingredient is used in the milkshakes. Although improved milkshake machines have been developed in an attempt to overcome the lengthened mixing time caused by the use of hard-packed ice cream, these improved milkshake machines still require several seconds to satisfactorily mix a milkshake made from hard-packed ice cream. Examples of such improved milkshake machines are found in U.S. Pat. Nos. 5,150,967, 5,328,263, and 5,439,289, which disclose machines that provide automated reciprocal movement of the mixing blade into and out of the mixing cup.

Other known milkshake machines use mixing principles that differ from the rotatable shaft and blade concept discussed above. For example, the machine shown in U.S. Pat. No. 1,854,087 employs a rotor element rotating in close proximity to a stator element so as to develop a centrifugal action which draws down and mixes the liquid and solid ingredients and subjects them to the disruptive action of the closely-spaced rotating surfaces. Ingredients to be mixed are placed in a hopper above the rotor element and, upon mixing, are subsequently discharged into a cup removably mounted beneath the rotor element. This closely rotating rotor/stator configuration and its underlying principles are similar, although not identical, to the configuration and underlying grinding and shredding principles employed by conventional, commercially-available impeller-type waste disposers.

SUMMARY OF THE INVENTION

The primary object of this invention is to provide a milkshake machine or similar apparatus for mixing solids and liquids into a flowable mixture suitable for drinking that is capable of satisfactorily mixing the ingredients, regardless of their original consistency, in only a few seconds.

Another object of this invention is to provide a milkshake machine or similar apparatus in which the operator is not exposed or potentially exposed to the mixing components as the milkshake is being mixed. A related object is to provide a milkshake machine or similar apparatus wherein the ingredients are not mixed in a mixing container separate or detached from the rest of the apparatus.

Still another object of this invention is to provide a milkshake machine or similar apparatus that has a simple and inexpensive construction, is easily operated, and is easily cleaned and maintained.

In accordance with this invention, a milkshake machine or similar apparatus uses the grinding and shredding principles employed by a conventional, commercially-available impeller-type waste disposer to mix, comminute, and pulverize the ingredients of a milkshake. The apparatus comprises a housing having an upper opening for receiving ingredients to be mixed and a return inlet. The housing defines both an upper grinding chamber having a cylindrical inner wall with a plurality of shredding surfaces and a lower receiving chamber located beneath the grinding chamber having a discharge outlet. A discharge conduit is connected at one end to the discharge outlet and has a return port and a discharge spout at its opposite end. A return conduit is connected at one end to the return port of the discharge conduit and at its opposite end to the return inlet.

A rotatable impeller disk is located within the housing and separates the grinding chamber and the receiving chamber. A suitable motor drives the impeller disk so that its peripheral margin rotates in close proximity to the shredding surfaces on the inner wall of the grinding chamber, thereby defining a circumferential discharge gap between the periphery of the impeller disk and the inner wall of the grinding chamber. The impeller disk has a plurality of impellers mounted thereon near its periphery. As the impeller disk is rotated, the ingredients in the grinding chamber are mixed together and centrifugally driven by the impellers against the shredding surfaces on the inner wall of the grinding chamber. The mixed and ground or comminuted ingredients pass through the discharge gap into the receiving chamber and are expelled through the discharge outlet into the discharge conduit.

A valve mechanism is provided between the return port and the discharge spout of the discharge conduit and includes a diverter movable between a return position and a discharge position. With the diverter in the return position, ingredients expelled into the discharge conduit are diverted through the return port into the return conduit and returned to the grinding chamber for further processing. With the diverter in the discharge position, ingredients expelled into the discharge conduit are diverted out of the discharge spout and into an awaiting container such as a paper cup.

The diverter may be moved manually or the valve mechanism may include an actuator for moving the diverter. An optional timer may be used to toll the mixing cycle. In addition, the timer may be set or programmed to toll mixing cycles of various duration. The timer may also be set or programmed to control a cleaning or rinsing cycle whereby a cleaning liquid is automatically supplied to the apparatus through a rinse inlet in the housing, circulated through the apparatus, and discharged through the discharge spout. To prevent splashing during operation, a removable imperforate lid is preferably used to cover the upper opening in the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an apparatus in accordance with this invention for mixing solids and liquids into a flowable mixture suitable for drinking. It will be noted that the illustrated apparatus is intended primarily for use as a milkshake machine, but an apparatus in accordance with this invention may be used to mix other types of ingredients.

FIG. 2 is an exploded, perspective view of the apparatus of FIG. 1.

FIG. 3 is a fragmentary, sectional view, with parts shown in phantom lines, of a portion of the apparatus of FIG. 1 taken along lines 3—3 thereof.

FIG. 4 is a simplified, fragmentary sectional view of a portion of the apparatus of FIG. 1 taken along lines 4-4 thereof.

FIGS. 5 and 6 are partially-schematic perspective views similar to FIG. 1, but showing further embodiments of the apparatus of FIG. 1.

DETAILED DESCRIPTION

With reference to FIGS. 1 and 2, a milkshake machine or similar apparatus in accordance with this invention, generally designated 10, uses the grinding and shredding principles employed by commercially-available impeller-type waste disposers to mix, comminute, and pulverize the milkshake ingredients. The apparatus 10 comprises a housing, generally designated 12, formed from a generally conical upper housing 14 and a generally cylindrical lower housing 16. With reference also to FIG. 3, the housing 12 defines a cylindrical upper grinding chamber 18 and a lower receiving chamber 20 separated by an impeller disk 22. A stator 23 is secured to the bottom of the lower housing 16 and houses a conventional electric motor armature or rotor assembly 24 having a shaft 24A, thereby forming a drive motor assembly generally designated 25.

A discharge outlet 26 is formed in the wall 16A of the lower housing 16 opening from the receiving chamber 20. Similarly, a return inlet 28 is formed in the wall 14A of the upper housing 14 above the grinding chamber 18. A discharge conduit 32 is connected at one end to the discharge outlet 26 and has a return port 34 and a discharge port or spout 36 at its opposite end. A return conduit 38 is connected at one end to the return port 34 and at its opposite to the return inlet 28. A valve mechanism, generally designated 40, is disposed between the return port 34 and the discharge spout 36 to control the path of ingredients in the discharge conduit 32.

Generally, the grinding and shredding principles employed by the instant invention are commonly employed by conventional, commercially-available impeller-type waste disposers, such as waste disposers manufactured by Emerson Electric Co., In-Sink-Erator Division, of Racine, Wis. For purposes of this invention, grinding and shredding capabilities equivalent to a $\frac{1}{2}$ horsepower disposer are considered sufficient for the applications described herein. In this respect, a known $\frac{1}{2}$ horsepower disposer has a $\frac{4}{4}$ cup grinding chamber and an impeller disk speed of 1725 RPM. Other examples of conventional impeller-type disposer using such grinding shredding principles are found in U.S. Pat. Nos. 2,322,058, 2,842,320, and 2,879,949, the disclosures of which are hereby incorporated herein by reference.

One skilled in the art will recognize that the components of the apparatus 10 which contact the milkshake ingredients must be made from high quality, food grade material in order to be acceptable for household or commercial food preparation. In addition, a suitable external vanity housing (not shown) is preferably used to enhance the outward appearance of the apparatus 10. The vanity housing may include suitable sound-insulating material (not shown) to reduce the noise level of the apparatus 10 when in use.

With reference to FIG. 2, the illustrated stator 23 is connected to the upper housing 14 and the lower housing 16 by four bolts 39, only one of which is shown in FIG. 2, but it will be understood that other motor configurations not so connected to the upper housing 14 and the lower housing 16 may be used. The lower housing 16 has a hollow, cylindrical hub 42 projecting upwardly from the floor 43 thereof

through which the shaft 24A of the rotor 24 extends into the grinding chamber 18. The bolts 39 extend through a lower cover plate 39A covering to the bottom of the stator 18, through apertures 41 in the stator 18, through apertures 17A in the upper and lower flanges 17 of the lower housing 16, and into tapped bores 68 in the upper housing 14.

With reference also to FIG. 3, the impeller disk 22 is drivingly secured to the threaded upper end 56 of the rotor shaft 24A by a mounting nut 58. Consequently, the impeller disk 22 will rotate with the shaft 24A. Of course, one skilled in the art will recognize that suitable bearings, thrust washers, and the like (not shown) will also be used in the connection of the impeller disk 22 to the rotor shaft 24A. In addition, it is preferable to provide a suitable flexible seal (not shown) around the shaft 24A of the rotor 24 to prevent liquid within the grinding chamber 18 from passing through the hub 42 and damaging the motor assembly 25.

The impeller disk 22 is so sized and located that the peripheral margin of the impeller disk 22 will rotate in close proximity to the inner wall surface 16A of the lower housing 16. However, the impeller disk 22 does not contact the wall surface 16A so that a circumferential discharge gap 61 remains between the impeller disk 22 and the inner wall surface 16A of the lower housing 16. The impeller disk 22 has a plurality of small openings or drains 60 that permit air, liquid, and small particles to pass through the impeller disk 22 from the grinding chamber 18 to the receiving chamber 20. In addition, the impeller disk 22 has a pair of diametrically-opposed impellers 62 mounted near its periphery, the details of which are not critical to an understanding of this invention. Therefore, impellers configured other than the impellers 62 shown in FIGS. 2 and 3 may be used. The illustrated impellers 62 are pivotally or rotatably mounted on the impeller disk 22 to swivel 360 degrees with respect to the disk 22, thereby reducing the likelihood of jams, which is a feature also commonly found in commercially-available impeller-type waste disposers.

Upon actuation of the motor assembly 25, the impeller disk 22 is rotated and the impellers 62 centrifugally swirl the ingredients in the grinding chamber 18. The swirling ingredients are mixed together and centrifugally forced against tooth-like shredding/grinding surfaces 64 formed on the inner wall 16A of the grinding chamber 18, which shredding/grinding surfaces 64 define recesses 65 that open to the discharge gap 61. The ingredients are repeatedly forced against the shredding/grinding surfaces 64 until sufficiently reduced to a size to create a flowable mixture which can pass through the discharge gap 61 between the periphery of the impeller disk 22 and the inner wall surface 16A of the lower housing 16 (or through the drains 60 in the impeller disk 22). The shredding/grinding surfaces 64 may be formed by a shredding/grinding ring (not shown) separate from the lower housing 16, as common in conventional, impeller-type waste disposer, or the shredding/grinding surfaces 64 may be formed as an integral part of the lower housing 16. Once the ingredients are sufficiently reduced in size and pass into the receiving chamber 20, they are centrifugally expelled through the discharge outlet 26 by additional impellers or paddles (not shown) on the bottom surface of the impeller disk 22, such as shown and described in U.S. Pat. No. 5,340,036, although other suitable constructions may be used to expel the ground ingredients.

The apparatus 10 is assembled by mounting the upper housing 14 atop the lower housing 16 to form the housing 12, which is connected to the drive motor assembly 25. The upper housing 14 has four tapped bores 68 aligned with the apertures 17A in the flanges 17 of the lower housing 16.

64

5

which are in turn aligned with corresponding apertures 41 in the stator 18. The bolts 39 pass through the apertures 41 and 17A and the threaded upper ends thereof are received in the tapped bores 68 in the upper housing 14 to secure the lower cover plate 39A, the stator 18, the lower housing 16, and the upper housing 14 together. A rubber O-ring 72 is disposed between the upper housing 14 and the lower housing 16 to provide a liquid-tight seal at the junction therebetween.

As briefly described above and further in accordance with this invention, the discharge conduit 32, which has an annular flange 32A, is connected to the discharge outlet 26 by a retainer 73 secured to the lower housing 16 by a pair of screws 75 (FIG. 3). A gasket 74 provides a liquid-tight seal between the discharge outlet 24 and the discharge conduit 32. The discharge conduit 32 may comprise a horizontally-extending pipe or tube which is preferably formed from plastic or other material suitable for food handling, and the downwardly-facing discharge spout 36 is located at the end of the discharge conduit 32 remote from the discharge outlet 26. The upwardly facing return port 34 is provided in the discharge conduit diametrically opposite the discharge spout 36, but could be at any other suitable location relative to the discharge spout 36. The return conduit 38, which may be a rubber hose, is connected at one end to the return port 34 in a suitable manner, such as by a conventional hose fitting (not shown), and leads to the return inlet 28 in the upper housing 14.

With reference also to FIG. 4, a suitable valve mechanism 40 is disposed at the free end of the discharge conduit 32 between the return port 34 and the discharge spout 36 of the discharge conduit 32 to control the path of mixed and ground ingredients discharged through the discharge outlet 26 and into the discharge conduit 32. Although the details of the valve mechanism 40 are not crucial to an understanding of this invention and other valve configurations may be used, the valve mechanism 40 may be a typical ball valve having a stop-cock or diverter 79 movable between a discharge position wherein the ground ingredients are discharged out of the spout 36 and a return position, shown in FIG. 4, wherein the ground ingredients are diverted through the return port 34 and pass through the return conduit 38 back into the grinding chamber 18 through the return inlet 28. The diverter 79 may be moved between the discharge position and the return position by use of a handle 80 drivably connected to the diverter 79.

In operation of the apparatus 10, ingredients to be mixed, such as hard-packed ice cream, milk, flavoring, nuts, cookies, candies, etc., are placed in the grinding chamber 18 through an opening 82 in the upper housing 14. Thereafter, an impermeable lid 84 is preferably placed over the opening 82 by the operator to prevent splashing. With the diverter 79 in the return position, the drive motor assembly 25 is activated for a short period of time, perhaps as little as 1 to 3 seconds, after which time the valve mechanism 40 is actuated to move the diverter 79 to the discharge position. Accordingly, the mixed and ground ingredients are then discharged out of the spout 36 and into a container (not shown) located beneath the spout 36. Of course, the necessary mixing time will depend upon the nature of the ingredients used and the preference of the user as to consistency.

The embodiment shown in FIGS. 1 and 2 has a manually-operable valve mechanism 40. However, it is contemplated that other embodiments of the apparatus in accordance with this invention may use a solenoid-operated or other suitable automatic valve mechanism, generally designated 86, as shown partially schematically in FIG. 5. In the embodiment of FIG. 5, a solenoid or other suitable actuator 87 is used to

6

move the diverter 79 between the return position and the discharge position. A control switch 88 could be used to control the apparatus 10 so that mixing begins when the switch 88 is actuated and the actuator 87 moves the diverter 79 to the discharge position when the switch is released. A slight delay after the switch 88 is released before the drive motor assembly 25 is disengaged may be useful to expel the mixed ingredients through the discharge spout 36.

FIG. 6 illustrates a more complex embodiment utilizing a suitable timer mechanism 89, which may be an electronic timer or a mechanical timer, to control the operation of the automatic valve mechanism 86, and thereby the duration of the mixing cycle. A timer mechanism 89 that is user-adjustable to toll various time periods would provide a user with the ability to vary the duration of the mixing cycle, depending on the nature of the ingredients used for the milkshake. For example, the timer mechanism 89 could be set or programmed for a short time period of 1 to 3 seconds for mixing typical milkshakes, but a longer cycle could be set or programmed for cleaning purposes, as will be described below. The timer mechanism 89 could, however, simply be used to sound or emit a bell, buzzer, or other alarm signal to notify the operator that the mixing cycle is complete and that the diverter 79 should be moved to the discharge position.

Although the details of the foregoing automatic valve mechanism 86 and the timer mechanism 89 are not discussed further herein, it will be recognized that such details would be readily available to one having ordinary skill in the art.

With continued reference to FIGS. 5 and 6, the apparatus 10 may also include a rinse inlet 90 for receiving rinse water or a cleaning solution. The rinse inlet 90 may be configured in a manner similar to the return inlet 28. It is contemplated that the rinse inlet 90 will be connected to a source of water or a cleaning solution, or both, that can be supplied on demand to the apparatus 10 for cleaning purposes. In this respect, it is further contemplated that the controls discussed above, namely the automatic valve mechanism 86 and the timer 89, may be set or programmed to operate a cleaning or rinsing cycle.

During a cleaning or rinsing cycle, a predetermined amount of water or a cleaning solution is automatically supplied to the apparatus 10 through the rinse inlet 90. (One skilled in the art will recognize that a suitable valve mechanism will likely be used to regulate or control the supply of water or cleaning solution.) The water or cleaning solution is circulated throughout the apparatus 10 for a specified cleaning cycle to clean the working parts of the apparatus 10. At the expiration of the cleaning cycle, the water or cleaning solution is discharged from the spout 36. If a detergent-based cleaning solution is used, a rinse cycle consisting of only water might be desirable to wash away any detergent residue from the initial cleaning cycle. Thus, an operator could clean the apparatus 10 by actuating a control switch, for example, to initiate a cleaning and/or rinsing cycle, as described above. The details of the specific controls for automatically providing a cleaning or rinsing cycle are not discussed further herein, as such details would be readily available to one skilled in the art.

One skilled in the art will recognize that the apparatus illustrated in FIGS. 1 through 6 without vanity shields are similar in appearance to a conventional, commercially-available impeller-type waste disposer. However, such illustration is used primarily for purposes of describing the invention. Preferably, an apparatus 10 in accordance with

this invention is not a modified disposer as described above. Instead, it is preferable to specifically construct the apparatus 10 as a milkshake machine that merely utilizes the grinding and shredding principles employed by conventional, commercially-available impeller-type waste disposers as described above.

In addition to constructing the apparatus 10 as described above to use the grinding and shredding principles employed by conventional, commercially-available impeller-type waste disposer, a milkshake machine or similar apparatus may also be constructed by simply modifying a conventional, commercially-available impeller-type waste disposer. The modifications would include the addition of the discharge conduit 32, the return conduit 38, and the valve mechanism 40, as described above, with the return conduit 38 leading from the discharge conduit 32 to a dishwasher drain inlet commonly found in commercially-available disposers. However, such a modified disposer would not be generally acceptable for sale as a commercial or household food preparation appliance without replacing the components that contact the ingredients with food grade replacements. Moreover, a milkshake machine or similar apparatus constructed simply from a modified waste disposer would substantially retain its appearance as a disposer, which would not ordinarily encourage use in food preparation. Still, a modified waste disposer would satisfactorily achieve the aforementioned objects of this invention.

Although the presently preferred embodiments of this invention have been described, it will be understood that within the purview of the invention various changes may be made within the scope of the following claims.

Having thus described my invention, I claim:

1. A conventional, commercially-available impeller-type waste disposer modified to be an apparatus, such as a milkshake machine, for mixing solids and liquids into a flowable mixture suitable for drinking, said disposer comprising (a) a housing having an upper opening for receiving ingredients to be ground into a flowable mixture and a dishwasher drain inlet, said housing defining both an upper chamber having a cylindrical inner wall with a plurality of shredding surfaces and a lower chamber located beneath the upper chamber and having a discharge outlet, (b) a rotatable impeller disk disposed within said housing separating the upper chamber and the lower chamber, said impeller disk having its peripheral margin rotating in close proximity to the inner wall of the upper chamber and defining a discharge gap therebetween, said impeller disk further having a plurality of impellers mounted thereon near the periphery thereof such that, as said impeller disk is rotated, the ingredients in the upper chamber are mixed together and driven against the shredding surfaces on the inner wall of the upper chamber, pass through the discharge gap into the lower chamber, and are expelled through the discharge outlet, and (c) a motor for rotating the impeller disk, wherein said modifications comprise:

- a discharge conduit connected at one end to the discharge outlet and having a return port and a discharge spout at its opposite end;
- a return conduit connected at one end to the return port of the discharge conduit and at its opposite end to the dishwasher drain inlet; and
- a valve mechanism intermediate the return port and the discharge spout of said discharge conduit, said valve mechanism having a diverter movable between a return position wherein ingredients expelled into said discharge conduit are diverted through said return port

into said return conduit and returned to the upper chamber for further processing and a discharge position wherein ingredients expelled into said discharge conduit are diverted out of the discharge spout.

2. The modified disposer of claim 1 wherein the diverter is moved manually from the return position to the discharge position.

3. The modified disposer of claim 1 wherein said modifications further comprise a timer for tolling a mixing cycle.

4. The modified disposer of claim 1 wherein said valve mechanism includes an actuator for moving the diverter from the return position to the discharge position.

5. The modified disposer of claim 4 wherein said modifications further comprise a timer for tolling a mixing cycle, and wherein the actuator of said valve mechanism is responsive to said timer to move the diverter from the return position to the discharge position.

6. The modified disposer of claim 5 wherein said timer is programmable to toll mixing cycles of various durations.

7. The modified disposer of claim 4 wherein said modifications further comprise a control switch, and wherein the actuator is responsive to said control switch to move the diverter from the return position to the discharge position.

8. The modified disposer of claim 1 wherein said modifications further include a rinse inlet formed in said housing.

9. The modified disposer of claim 8 wherein said valve mechanism includes an actuator for moving the diverter from the return position to the discharge position and a timer for tolling a cleaning cycle, wherein the actuator of said valve mechanism is responsive to said timer to move the diverter from the return position to the discharge position, and wherein the modifications further comprise a control switch for initiating a cleaning cycle whereby a cleaning liquid is supplied to the apparatus through said rinse inlet, circulated through said apparatus with said diverter in the return position, and discharged through said discharge spout at the end of the cleaning cycle.

10. The modified disposer of claim 1 wherein said modifications further comprise a removable imperforate lid covering the upper opening in said housing.

11. An apparatus, such as a milkshake machine, for mixing solids and liquids into a flowable mixture suitable for drinking, comprising:

- a housing having an upper opening for receiving ingredients to be mixed and a return inlet, said housing defining both an upper chamber having a cylindrical inner wall with a plurality of shredding surfaces and a lower chamber located beneath the upper chamber and having a discharge outlet;
- a discharge conduit connected at one end to the discharge outlet and having a return port and a discharge spout at its opposite end;
- a return conduit connected at one end to the return port of said discharge conduit and at its opposite end to the return inlet;
- a rotatable impeller disk disposed within said housing separating the upper chamber and the lower chamber, said impeller disk having its peripheral margin rotating in close proximity to the shredding surfaces on the inner wall of the upper chamber and defining a discharge gap therebetween, said impeller disk further having a plurality of impellers mounted thereon near the periphery thereof such that, as said impeller disk is rotated, the ingredients in the upper chamber are mixed together and driven against the shredding surfaces on the inner wall of the upper chamber, pass through the discharge gap into the lower chamber, and are expelled through the discharge outlet into said discharge conduit;

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65

a motor for rotating the impeller disk; and
 a valve mechanism intermediate the return port and the discharge spout of the discharge conduit, said valve mechanism having a diverter movable between a return position wherein ingredients expelled into said discharge conduit are diverted through the return port into said return conduit and returned to the upper chamber for further processing and a discharge position wherein ingredients expelled into said discharge conduit are diverted out of the discharge spout.

12. The apparatus of claim 11 wherein the diverter is moved manually from the return position to the discharge position.

13. The apparatus of claim 11 further comprising a timer for tolling a mixing cycle.

14. The apparatus of claim 11 wherein said valve mechanism includes an actuator for moving the diverter from the return position to the discharge position.

15. The apparatus of claim 14 further comprising a timer for tolling a mixing cycle, and wherein the actuator of said valve mechanism is responsive to said timer to move the diverter from the return position to the discharge position.

16. The apparatus of claim 15 wherein said timer is programmable to toll mixing cycles of various durations.

17. The apparatus of claim 14 further comprising a control switch, and wherein the actuator is responsive to said control switch to move the diverter from the return position to the discharge position.

18. The apparatus of claim 11 wherein said housing has a rinse inlet.

19. The apparatus of claim 18 wherein said valve mechanism includes an actuator for moving the diverter from the return position to the discharge position and a timer for tolling a cleaning cycle, wherein the actuator of said valve mechanism is responsive to said timer to move the diverter from the return position to the discharge position, and wherein the apparatus further comprises a control switch for initiating a cleaning cycle whereby a cleaning liquid is supplied to the apparatus through said rinse inlet, circulated through said apparatus with said diverter in the return position, and discharged through said discharge spout at the end of the cleaning cycle.

20. The apparatus of claim 11 further comprising a removable imperforate lid covering the upper opening in said housing.

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(54) Comminuting apparatus.

(57) A pellet feeder (A) feeds pellets of vulcanized rubber or other materials and water or another fluid at controlled rates into a mixing tank (30). An agitator (32) mixes the pellets and fluid into a slurry. The slurry is pumped from the mixing tank to a mill (C) by a pump (34). The mill has a receiving region (70) defined between a stator (48) and a rotor (68) for receiving the slurry. The stator and rotor define a peripheral grinding zone (72) around the slurry receiving region. An impeller (74) has vanes which extend from the upper surface of the rotor to an abrasive surface (82) of the stator such that the impeller vanes are ground at the same rate as the stator and rotor wear to maintain a fluid seal around the impeller blades. Fluid cylinders (50, 52) maintain a constant pressure between the stator and rotor. The stator has a plurality of

recesses (88, 88') which preferably have downstream extending relief areas (214). The rotor also has a plurality of recesses (104, 104') which have tapered portions along a downstream edge, such as sloping relief areas (220), for wedging the pellets into the grinding zone. The rotor and stator are made of a vitreous bonded stone having a median pore size of about 50 microns.

EP 0 081 449 A2

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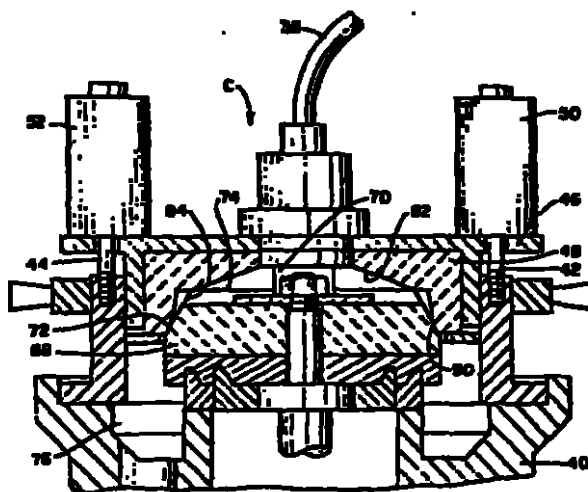


FIG. 1A

67

COMMINUTING APPARATUS

This application pertains to the art of particle
comminuting and more particularly to one pass
comminuting of centimeter sized pellets or particles
5 to micron sized particulates. The invention is
particularly applicable to comminuting vulcanized
rubber and will be described with particular reference
thereto. However, it is to be appreciated that the
invention has other applications such as comminuting
10 coal, thermoplastics, thermosetting plastics, woods,
ceramics, glass, resins, and other materials.

To facilitate reprocessing of vulcanized rubber
and other elastomeric materials for reuse, the
materials are commonly reduced to micron sized
15 particles. Heretofore, various methods and apparatus
have been employed to reduce the elastomeric materials
to micron size. However, the prior art apparatus have
had certain drawbacks, particularly when used for
commercial production. One method for producing small
20 particulates has been to subject material to a
cryogenic temperature. The embrittled material is
ground by conventional grinding techniques. Commonly,
the ground particles are large and must be refrozen
and ground another time before they can be reused
25 efficiently. Thus, this technique is expensive and
finds great difficulty in producing particles in the
lower micron range. Others have used abrasion devices
for reducing the particle size of rubber and other
elastomers. However, abrasion devices have relatively
30 low particle yields. Further, abrasion devices have
an inherent temperature increase that causes a hazard
of the rubber combusting. Moreover, the elevated
temperatures involved in prior art methods tend to
degrade the material being processed.

BAD ORIGINAL

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Accordingly, it has been found desirable to provide an effective method and apparatus for comminuting of a vulcanized rubber and other elastomers to micron sized particles to facilitate reuse. The present invention provides an apparatus which although relatively simple in design and operation efficiently produces micron sized particles.

In accordance with the invention, there is provided a comminuting apparatus which comprises a stator and a rotor. The stator and the rotor define a receiving region therebetween for receiving a mixture of fluid and pellets to be comminuted. Peripherally around the receiving region, the stator and the rotor have peripheral abrasive surfaces for defining a grinding zone therebetween. At least the rotor, and preferably but not necessarily the stator, has at least one recess extending from the receiving region into the grinding zone to provide a path for the received pellets into the grinding zone. The recess has an outward sloping portion along a trailing edge away from the direction of rotation which assists in passing the pellets into the grinding zone.

The invention may take form in various parts and arrangements of parts. The FIGURES are only for purposes of illustrating a preferred embodiment of the invention and are not to be construed as limiting the invention.

FIGURE 1 is a side elevational view in partial section of a comminuting apparatus in accordance with the present invention;

FIGURE 1A is an enlarged copy of the stator/rotor region of FIGURE 1 with additional reference numerals.

FIGURE 2 is a bottom view of the face of the stator of FIGURE 1;

FIGURE 3 is a sectional view through section 3-3 of the stator of FIGURE 2;

FIGURE 4 is a side elevational view of the rotor of FIGURE 1;

5 FIGURE 5 is a top view of the rotor of FIGURE 1 with the impeller in phantom;

FIGURES 6A through 6I are enlarged cross sectional views of a pellet being received between the stator and rotor of a comminuting apparatus with progressive rotation of the rotor, the stator and rotor spacing being exaggerated for the ease of illustration;

10 FIGURE 7 is a schematic diagram of an electric control circuit for the comminuting apparatus in accordance with the present invention;

15 FIGURE 8 is a diagrammatic illustration in partial sectional view of an alternate embodiment of a comminuting system in accordance with the present invention;

FIGURE 9 is a bottom view of the stator of FIGURE 8;

20 FIGURE 10 is a sectional view through section 10-10 of FIGURE 9;

FIGURE 11 is a top view of the rotor of FIGURE 8;

FIGURE 12 is a sectional view through section 12-12 of the rotor of FIGURE 11; and

25 FIGURE 13 is a sectional view through section 13-13 of FIGURE 11.

With reference to FIGURE 1, a feeding means A feeds fluid and pellets of the vulcanized rubber or other elastomer to be comminuted at coordinated rates. Preferably, the pellets are chunks which have a maximum cross sectional dimension on the order of a centimeter or less. The apparatus may be scaled up to handle larger pellets. A mixing means B receives the pellets and fluid and mixes them into a slurry. The

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slurry is fed to a mill C which grinds the pellets into micron sized particles preferably with 90% of the particles by number having a diameter on the order of 20 microns or less.

5 The feeding means A includes a pellet feeding means for feeding pellets at a selectable rate and a fluid feeding means for feeding fluid commensurate with the rate that the slurry is fed to the mill. The pellet feeding means includes a hopper 10 which
10 discharges the pellets into a vibratory feeder 12. The vibratory feeder includes a generally horizontal trough 14 which is mounted on springs 16 and vibrated by a motor 18. The vibratory feeder 12 moves the pellets at a rate controlled by the speed or duty
15 cycle of the motor 18. Optionally, a plurality of vibratory feeders may be used. The fluid feeding means includes a water or other fluid inlet 20 and a level controlled valve 22.

 The mixing means B includes a mixing tank 30 which
20 receives pellets from the pellet feeding means and fluid from the fluid feeding means. An agitating means 32 mixes the pellets and fluid into a slurry. The slurry is pumped by a positive displacement pump 34 driven by a variable speed pump motor 36 from the
25 mixing tank 30 through a feed line 38 to the mill C. The pump 34 is a progressing cavity positive displacement pump or other pump which supplies the slurry to the mill with a generally constant pressure. The fluid level in the mixing tank is maintained
30 substantially constant by the fluid feeding means which adds fluid at the same rate that pump 34 pumps fluid from the tank. The slurry feed line 38 is of sufficiently small diameter that the slurry velocity maintains the pellets suspended in the slurry but not
35 so small that the pump 34 or pump motor 36 are overloaded.

269

The mill C has a mill housing 40 upon which are mounted a plurality, four in the preferred embodiment, of upward extending posts, including posts 42 and 44. A stator mounting bracket 46 in which a stator 48 is mounted is slidably disposed on the posts for longitudinal, but not rotational, movement relative thereto. Connected between each of the posts and the stator mounting bracket 46 is a plurality of fluid cylinders, including cylinders 50 and 52 for urging the stator mounting bracket and stator relative to the mill housing with a preselected force or load. When comminuting vulcanized rubber between a stator and a 10 inch rotor, a load of 2000-10,000 pounds has been found to produce satisfactory results, 3850 pounds of load being preferred.

A rotor motor 60, such as 100 horsepower motor, is mounted in a mill frame which is rigidly secured to the mill housing 40. The rotor motor 60 is coupled to a shaft 62 which is supported on the mill housing 40 by a thrust bearing 64. Mounted on the end of the mill shaft 62 is a rotor plate 66 for supporting a rotor 68.

A central portion of the rotor 68 and the stator 48 define a receiving region 70 for receiving the pellet and fluid slurry from the mixing means B. A peripheral region of the stator 48 and rotor 68 define a grinding zone 72 for comminuting the pellets into micron sized particles.

An impeller 74 is disposed in the said receiving region 70 to facilitate movement of the pellets into the grinding zone 72. The particles and the fluid passing from the grinding zone 72 are collected in a trough 76 and pass through an outlet pipe 78. Downstream, not shown, the comminuted rubber particles and the fluid are separated.

With continuing reference to FIGURES 1 and 1A and further reference to FIGURES 2 and 3, the stator 48 is a unitary abrasive structure.

5 The stator 48 has a central, slurry receiving aperture 80 surrounded by a receiving region 70 (FIG. 1A) defined by a generally conical shaped upper stator abrasive surface 82 and by a generally peripheral stator abrasive surface 84 which itself surrounds the receiving region 70.

10 The stator 48 has a plurality, four in the preferred embodiment, of stator recesses, such as recess 86, which provide fluid communication between the slurry receiving region 70 (FIG. 1A) and the grinding zone 72 (FIG. 1A).

15 Each of the stator recesses, note stator recess 86, extends generally radially from a first or receiving region end 88 to a second or grinding zone end 90.

20 With continued reference to FIGURES 1 and 1A and further reference to FIGURES 4 and 5, the rotor 68 is a unitary abrasive structure. The rotor has a central receiving region surface 100, for the lower portion of the central receiving region 70 (FIG. 1A), which supports the impeller 74, consisting of a base plate
25 120 and vertical vanes 121, and a peripheral generally conical shaped abrasive surface 102 extending there-around. The stator and rotor peripheral abrasive surfaces 84 and 102 interact to define the grinding zone 72 (FIG. 1A) therebetween.

30 The rotor 68 has a plurality of recesses, eight in the preferred embodiment such as recess 104, which provide a path for the pellets between the slurry receiving region 70 (FIG. 1A) and the grinding zone 72 (FIG. 1A).

Each rotor recess, note rotor recess 104, has a receiving region end 106 and a grinding zone end 108. Further, each rotor recess has an upstream portion 110 in the direction of the rotation which is larger than the pellets and a trailing portion 112 which is smaller than the upstream portion. The trailing portion 112 wedges the pellets against the stator peripheral abrasive surface 84 and into the grinding zone 72 (FIG. 1A).

With reference to FIGURES 1, 1A, 4 and 5, the impeller 74 is mounted on the rotor 68 for rotation therewith. The impeller 74 includes a base plate 120 which is mounted on the rotor receiving region surface 100 and a plurality of removably attached generally vertical vanes 121. Generally vertical is to connote that the vanes extend within the slurry receiving region 70 (FIG. 1A) and between the rotor receiving region surface 100 and stator receiving region abrasive surface 82 and impel the fluid and pellets toward the rotor recesses such as recess 104. In the preferred embodiment, there are eight impeller vanes 121 each disposed adjacent the trailing edge of a corresponding one of the eight rotor recesses 104. Each vane 121 has a top, or outward edge 122 which engages the stator receiving region abrasive surface 82. As the stator and rotor peripheral abrasive surfaces 84 and 102 wear, the stator receiving region abrasive surface 82 wears the outward impeller edge 122 at a corresponding rate. This maintains a fluid seal between the impeller vanes 121 and the stator receiving region surface 82 to improve the impelling action. The impeller tends to draw the slurry from the mixing means B (FIG. 1), changes the slurry flow from axial to radial, and impels the slurry with substantially even pressure into the grinding zone 72 (FIG. 1A).

As the rotor turns, the impelling action of the impeller 74 pumps the pellets and fluid into the rotor recesses 104, etc. The centrifugal force from the rotation of the rotor recesses further urges the pellets and fluid through the rotor recesses. The highest pressure is developed at the outer or second end 108 of the rotor recesses. When a rotor recess 104 aligns with a stator recess 86, the stator recess 86 provides a path to the lower pressure in the receiving region 70. This pressure differential allows pellets and fluid to flow from the rotor recess 1.- into the stator recess 86 and back into the slurry receiving region 70. This creates a turbulence in the slurry receiving region 70 maintaining the pellets suspended in the fluid. Further, the pellets tend to be wedged into the grinding zone 72.

With reference to FIGURES 6A-6I, a view is taken of cutaway portions of upper stator 48 and lower rotor 68, shown for convenience as a horizontal view, as the rotor 68 rotates past the stator 48 from left to right. The view is taken in a direction from the stator grinding zone end 90 toward the stator abrasive surface 82 in the region of the stator peripheral abrasive surface 84.

In FIGURE 6A a pellet 130 is received in the rotor recess 104 and carried along the stator. When the rotor recess 104 aligns with the stator recess 86 (FIGURES 6B and 6C), the pellet tends to move toward the stator recess 86. Although some pellets may return to the receiving region 70 (FIG. 1A) through the stator recess, other pellets are caught between the recesses as they move out of alignment (FIGURES 6D and 6E). As the rotor and stator recesses move further out of alignment, the pellets are stretched

271

and wedged into the grinding zone 72 (FIGURES 6F, 6G and 6I). The pellet is stretched between the rotor and stator recesses 104 and 86 and peripheral abrasive surfaces 102 and 84 as the recesses 104 and 86 move
5 apart.

With particular reference to FIGURE 6H, at least one and preferably both of the stator and rotor peripheral abrasive surfaces 84 and 102 have a plurality of pores, such as pore 132, which have a median pore
10 size of about 10-200 microns. Between pores, the abrasive surfaces have substantially smooth regions 134. Although shown separated for ease of illustration, the smooth regions 134 of the stator and rotor slide generally along each other creating a shearing
15 interaction. This cuts the vulcanized rubber of the pellets into smaller particles, generally on the order of the size of pores 132.

As the rotor continues to rotate (FIGURE 6I), the rubber spirals outward from the rotor and stator
20 recesses towards the edge of the rotor and stator peripheral abrasive surfaces 102 and 84. Along this path compression, rolling action, and continued interaction of the vulcanized rubber with the pores and flat surfaces comminutes the pellets into micron size
25 particles.

The composition of the stator and rotor grinding surfaces 84 and 102 is such that the median pore size is 10-200 microns. A pore size of 50 microns has been
30 found to be effective for comminuting vulcanized rubber to particles having by weight a median diameter of 50 microns and by number 90% of the particles having a diameter of less than 20 microns. In the preferred embodiment, the rotor and stator are constructed of silicon carbide with a grit size in the

range of 36 to 60 mesh or aluminum oxide with a grit size in the range of 46 to 80 mesh. Other pore sizes may be used to obtain larger or smaller comminuted particles or when comminuting pellets of other materials. Preferably these abrasives are vitreous bonded with about 22% glass by weight, although resin bonding and other bonding techniques may be used. These compositions have an interconnected porosity. To provide for a relatively long life, the rotor and stator are a P hardness or higher, the preferred embodiment being a T hardness, as commonly defined by the grinding wheel industry. Generally, the grits will not have the smooth surfaces 134 as the stones are manufactured. To achieve these flat surfaces, the stones are lapped together to wear sharper naturally occurring edges flat. The stator and rotor recesses may be cut or molded into the stone composition.

With reference to FIGURE 7, an electric control circuit is provided to maintain the concentration of pellets in the grinding zone within a range which produces satisfactory results.

Briefly stated, the control circuit adjusts the feed rate of pellets into the mixing tank to maintain the power drawn by the rotor motor 60 substantially constant. The control increases the pellet feed rate relative to the fluid feed rate when the motor draws less than a preselected amount of power and reduces the pellet feed rate relative to the fluid feed rate when more than the preselected amount of the power is drawn.

The electrical control circuit includes first and second electric power lines 150 and 152. A watt transducer 154 is connected with the rotor motor 60 to monitor the amount of power (kilowatts) drawn thereby.

72
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A digital kilowatt meter 156 is connected with the watt transducer to provide a visual display of the instantaneous amount of power being drawn by the rotor motor. A calibration circuit 158 connects the watt transducer with a maximum kilowatt selector means 160. The maximum kilowatt selection means 160 has dials, or the like, on which an operator selects a maximum power which the rotor motor is to be allowed to draw. When the amount of power monitored by the watt transducer 154 is below the amount of power selected by the operator, the maximum power selector means 160 is in its activated state. When the amount of power monitored by the watt transducer meets or exceeds the selected maximum power, the maximum power selector means takes on its deactivated state. In its activated state, the maximum watt selector means 162 closes a normally open relay contact 162 and opens a normally closed relay contact 164. The normally open maximum power selector contact 162 controls the coil of a pilot relay 170. The maximum power pilot relay 170 has a normally open contact 172, shown in the lower portion of FIG. 7 which is used in controlling the vibratory feeding means 12. When the monitored power meets or exceeds the selected maximum power, the maximum power selector means 160 takes on its deactivated state opening the normally open contacts 162 and 172 and closing the normally closed contact 164. The maximum watt selector normally closed relay contact 164 controls an indicator lamp 166 for indicating that pellets are not being fed to the mixing tank.

To protect the pump motor 36, a pump motor overload control means is provided. A speed controller 180 controls the speed at which the pump motor 36 is operated. A speed selection potentiometer 182 allows the operator to select the speed at

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which the pump motor is to be operated and a speed indicator 184 provides a visual indication of the present pump motor speed. The speed controller produces a signal which varies in proportion to the amount of current being drawn by the pump motor 36 on a pair of terminals 186. A maximum current selector means 190 has dials, or the like, on which the operator selects a maximum current at which the pump motor is to be operated. The maximum current selector means 190 compares the selected maximum current with the current indicated on terminals 186. The maximum current selector means maintains the pump motor current below the maximum by controlling the pellet feeding means 12 to keep the slurry sufficiently fluid. When the current drawn by the pump motor 36 exceeds the maximum current, the maximum current selector means closes a normally closed contact 192 and opens a normally open contact 194. The normally closed contact 192 controls an indicator lamp 196 which indicates that the pump motor is running with less than the maximum current. The normally open maximum current selector contact 194 controls a maximum current pilot relay 200. The maximum current pilot relay 200 controls a normally open contact 202 for controlling the rate at which pellets are fed into the mixing tank. The normally open maximum power pilot relay contact 172 and the normally open maximum current pilot relay contact 202 are connected in series with the vibratory feeding means 12. A variable solid state device 204 controls the amount of power delivered to the vibratory feeder means motor 18 to control its frequency and amplitude of vibration.

FIGURES 8-13 illustrate another stator and rotor configuration in accordance with the present invention. In the embodiment of FIGURES 8-13 like

73
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elements with the embodiment of FIGURES 1-5 are denoted with the same reference numerals followed by a prime (''). Referring to FIGURE 8, there is shown a mill housing 40' which is stationarily mounted.

- 5 Extending upward from the mill housing are a plurality of upward extending posts, including posts 42' and 44'. The posts extend slidably through apertures in a stator support bracket 46' which holds a stator 48'. This enables the stator support bracket to move
- 10 longitudinally on the posts but prohibits it from rotating. Connected to each of the posts is a plurality of fluid cylinders, including cylinders 50' and 52' for urging the stator support bracket toward the mill housing with a selected constant force. When
- 15 comminuting vulcanized rubber in a grinding zone of about 40 to 45 square inches, a load of 2000 to 10,000 pounds has been found to produce satisfactory results for 10 inch diameter stators and rotors. A preferred load to be exerted by the cylinders is 3850 pounds of
- 20 force for 10 inch diameter stators and rotors. Increases in the slurry pressure from the pump increase the preferred load. Decreases in the slurry pressure and decreases in the toughness of the comminuted material decrease the preferred load. The
- 25 fluid, preferably hydraulic, cylinders continue to exert the same force as the stator moves longitudinally to compensate for wear on the stator and rotor abrasive surfaces. Because the stator and rotor are urged together by the fluid cylinders with a constant
- 30 load but not held at a fixed spacing, the rotor and stator may undergo limited longitudinal movement with respect to each other as the pellets pass into the grinding zone. A mill shaft 62' rotates a plate 66' and a rotor 68' in mating cooperation with the stator.

The rotor and stator define a slurry receiving region 70' and a grinding zone 72' therebetween. An impeller 74' is mounted on the rotor for rotation therewith.

With continuing reference to FIGURE 8 and further
5 reference to FIGURES 9 and 10, the stator includes a plurality of stator recesses extending outward from the receiving region 70' into a peripheral abrasive surface 84'. Because each of the stator recesses is the same, a stator recess 86' is described in detail
10 and it is to be appreciated that the description applies by analogy to the other stator recesses. The stator recess 86' has an upstream edge 210 which is first engaged as the rotor 68' rotates. The stator 48' has a trailing edge 212 opposite to the upstream edge 210. An enlarged portion or relief area 214
15 which tapers generally between the full depth of the recess 86' to the level of the stator peripheral abrasive surface 84' extends downstream from the stator recess trailing edge 212. The stator recess 86' has an inside or receiving region end 216 in communication with the slurry receiving recess 86' and an outer or grinding zone end 218 in the grinding zone 72'.

With reference to FIGURES 8, 11, 12 and 13, the
25 rotor 68' has a central receiving region surface 100' disposed adjacent the slurry receiving region 70' and a peripheral abrasive surface 102'. Extending outward from the slurry receiving region 70' into the grinding zone 72' are a plurality of generally P-shaped rotor recesses 104', in the preferred embodiment 8 P-shaped
30 rotor recesses. Because each of the plurality of rotor recesses is substantially identical, a typical rotor recess 104' is described in detail and it is to be appreciated that the description applies by analogy

74

to the other rotor recesses. The rotor recesses 104' have an upstream edge 110' in the direction of rotation and a trailing edge 112' opposite the upstream edge 110'. The trailing edge 112' includes a downstream enlarged portion or relief area 220 in which a recess base wall tapers or cams generally from the lowest depth of the recess 104' toward the rotor peripheral abrasive surface 102'. The rotor recess relief area 220 has an arched perimeter, in the preferred embodiment. Each rotor recess 104' further has a first or receiving region end 106' disposed in fluid communication with the recess 104', for receiving slurry, and a second or outer end 108' separated by a small land 222 on the peripheral abrasive surface 102' from the edge of the rotor 68'.

As the rotor 68' and impeller 74' rotate, the pellets are impelled outward into the rotor recesses 104' by the impeller 74'. Centrifugal force from the rotation of the rotor 68' accelerates the pellets with greater pressure toward the outer end 108' of the rotor recesses 104'. As the rotor recesses 104' come into alignment with the stator recesses 86', the stator recesses 86' provide a return path for some of the fluid and pellets to the receiving region 70'. Other pellets become wedged or cammed between the stator recess relief area 214 and either the rotor recess relief area 220 or the rotor peripheral abrasive surface and other pellets become wedged between the rotor recess relief area 220 and the stator recess relief area 214 or the stator peripheral abrasive surface 102'. With continued rotation, the pellets are stretched and wedged into the grinding zone 72' and are comminuted as described above.

The invention has been described with reference to the preferred alternate embodiments. Obviously, alterations and modifications will occur to others

upon reading and understanding the preceding detailed description of the preferred and alternate embodiments. It is intended that the invention be construed as including all such alterations and modifications which come within the scope of the appended claims or the equivalents thereof.

WHAT IS CLAIMED IS

5 1. Comminuting apparatus having an opposing
stator and rotor with peripheral abrasive surfaces,
said rotor revolving about an axis characterized by
said stator and rotor having opposing surfaces defin-
ing a receiving region therebetween for receiving a
10 mixture of fluid and vulcanized rubber or vulcanized
rubber-like pellets to be reduced in size, at least
two recesses on said stator with an orientation in an
outward flow direction from said axis, at least the
same number of similarly oriented recesses on said
15 rotor and an outward sloping portion at an outward end
of said rotor recesses oriented in a direction
generally opposed to the direction of rotation about
said axis;

20 supplying means for supplying the fluid and
pellet mixture to said receiving region;

pressurizing means for increasing the pressure
along said rotor recesses disposed within the receiv-
ing region; and

25 urging means for urging at least one of said
stator and rotor toward the other.

30 2. The apparatus of claim 1 further character-
ized by said means for increasing pressure including
an impeller, a plurality of generally vertically
disposed vanes on said impeller extending substan-
tially from said rotor receiving region surface to and
into engagement with the stator receiving region
surface having an abrasive surface such that the
abrasive surface grinds the impeller vanes at a rate
commensurate with the rate of wear between said rotor

and stator peripheral abrasive surfaces to maintain a fluid seal between said impeller vanes and said stator abrasive surface to provide the pressure increase along the rotor recesses.

5 3. The apparatus of claim 1 or 2 including a mill housing and a support bracket on the mill housing mounted for movement in the axial direction but fixed in the rotational direction, and further characterized by said means for urging at least one of the stator
10 and rotor toward the other including at least one fluid cylinder operatively connected between said bracket and said mill housing for urging at least one of the stator and rotor peripheral abrasive surfaces toward the other with a constant pressure,
15 to maintain the force between said stator and rotor peripheral abrasive surfaces substantially constant as the peripheral abrasive surfaces wear, said fluid cylinders allowing said stator and rotor to undergo limited movement as the pellets pass from the rotor
20 recesses into the grinding zone.

4. The apparatus of any preceding claim further characterized by said peripheral abrasive surfaces surrounding said receiving region to define a grinding zone therebetween, said rotor recess having a first
25 end in fluid communication with said receiving region and terminating at a second end at the outward end of said recess and on the rotor peripheral abrasive surface to provide a path for the pellets from said receiving region to a grinding zone, said rotor recess
30 further having an upstream edge generally in a direction of rotation and a trailing edge generally opposite said upstream edge, said trailing edge having said outward sloping portion at least generally adjacent said rotor recess second end.

76
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5. The apparatus of any preceding claim further characterized by at least one stator recess extending from the receiving region outward into the stator peripheral abrasive surface, to provide a return path for fluid and pellets pumped to a higher pressure by centrifugal force of the rotating rotor back to the receiving region causing turbulence and assisting in maintaining the pellets and fluid in a slurry.

6. The apparatus of any preceding claim further characterized by said rotor and stator peripheral abrasive surfaces being disposed along a truncated conical region.

7. The apparatus of claim 4,5 or 6 further characterized by said rotor recess further including an enlarged portion extending downstream from said trailing edge, said rotor recess enlarged portion having a sloping base wall of diminishing depth away from said rotor recess upstream edge.

8. The apparatus of claim 1-5 or 7 further characterized by said stator and rotor peripheral abrasive surfaces being disposed generally horizontally.

9. The apparatus of any of claims 5-8 further characterized by said stator recess having an enlarged portion extending generally peripherally from a trailing edge.

10. The apparatus of claim 9 further characterized by said stator recess enlarged portion having diminishing depth in the downstream direction, whereby pellets are wedged between the stator and rotor recess enlarged portions.

11. The apparatus of any of claims 2-10 further characterized by said impeller being connected with said rotor for rotation therewith, each of said

impeller vanes having a radially outer edge which is disposed substantially adjacent said rotor peripheral abrasive surface, and each impeller vane being disposed adjacent a downstream edge of one of said rotor recesses.

12. The apparatus of any preceding claim further characterized by said supplying means including:

a hopper for holding pellets to be comminuted;
pellet feeding means for feeding the pellets
into a mixing tank at a selectable rate;
fluid feeding means for feeding a fluid into a
mixing tank;
agitator means for mixing the pellets and
fluid in the mixing tank into a slurry;
pumping means for pumping the pellet and fluid
slurry from the mixing tank to a slurry receiving
region;

said fluid feeding means feeding fluid into
the mixing tank at substantially the same rate that
the pumping means pumps fluid to the receiving region
to maintain the level of fluid in the mixing tank
substantially constant; and

concentration control means for maintaining the
concentration of pellets in the slurry generally
constant.

13. The apparatus of claim 12 further characterized by said concentration control means including means for sensing the torsional load on the rotating means, said load sensing means being operatively connected with said pellet feeding means for adjusting the rate at which pellets are fed to the mixing tank such as to maintain a generally constant torsional load on the rotating means.

14. The apparatus of claim 12 or 13 further characterized by said pellet feeding means being a vibratory feeder, and said load sensing means being operable to start and stop said vibratory feeder in response to the load exceeding and falling below a preselected load.

15. The apparatus of claim 14 further characterized by said concentration control means including means for sensing the torsional load on said pumping means, said pump load sensing means being operatively connected with said pellet feeding means for adjusting the rate at which pellets are fed to said mixing tank to maintain a generally constant torsional load on the pumping means.

16. The apparatus of any preceding claim further characterized by at least one of said stator and rotor peripheral abrasive surfaces being constructed of a material having a median pore size of about 10-200 microns.

17. The apparatus of claim 16 further characterized by said median pore size being about 50 microns.

18. A method of comminuting vulcanized rubber or rubber like pellets with the apparatus of claim 4 with a median diameter of at least one-eighth inch to particles having a median diameter by number of less than 50 microns in a single pass, the method comprising:

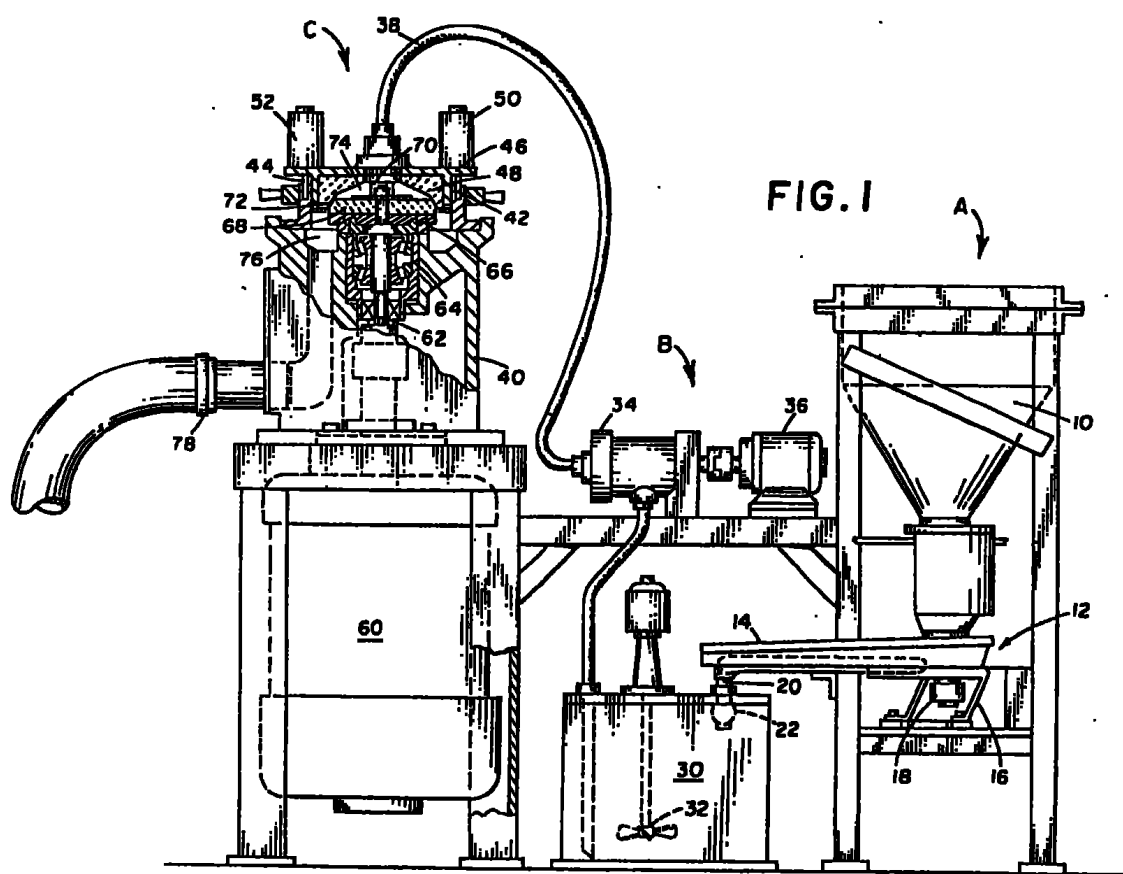
receiving the slurry of pellets and water in said receiving region disposed between said rotor and stator, said rotor and stator having peripheral abrasive surfaces surrounding the receiving region for defining a grinding zone therebetween; urging the pellets along said outward extending recesses in said rotor abrasive surface

by rotating said rotor, said rotor recess having a sloping portion along said trailing edge relative to the direction of rotation;

5 wedging the pellets between said rotor recess sloping portion and said stator peripheral abrasive surface and into the grinding zone;

10 continuing rotation of said rotor comminuting the pellets into particles between said stator and rotor peripheral abrasive surfaces until the particles have a median diameter of less than 50 microns.

15 19. The method of comminuting of claim 18 further characterized by said stator having a plurality of stator recesses extending from said receiving region into said stator peripheral abrasive surface, such that rotation of the rotor and impeller urges received pellets and fluid into the rotor recesses, centrifugal force increases the pressure along the rotor recess and achieves the highest pressure adjacent an outer end of the rotor recess, when the rotor and stator recesses come into alignment, the higher pressure at the outer end of the rotor recess relative to the lower pressure in the receiving region causing the stator recess to provide a return path for pellets and fluid agitating the pellets and fluid in the receiving region maintaining the pellets suspended in the fluid.



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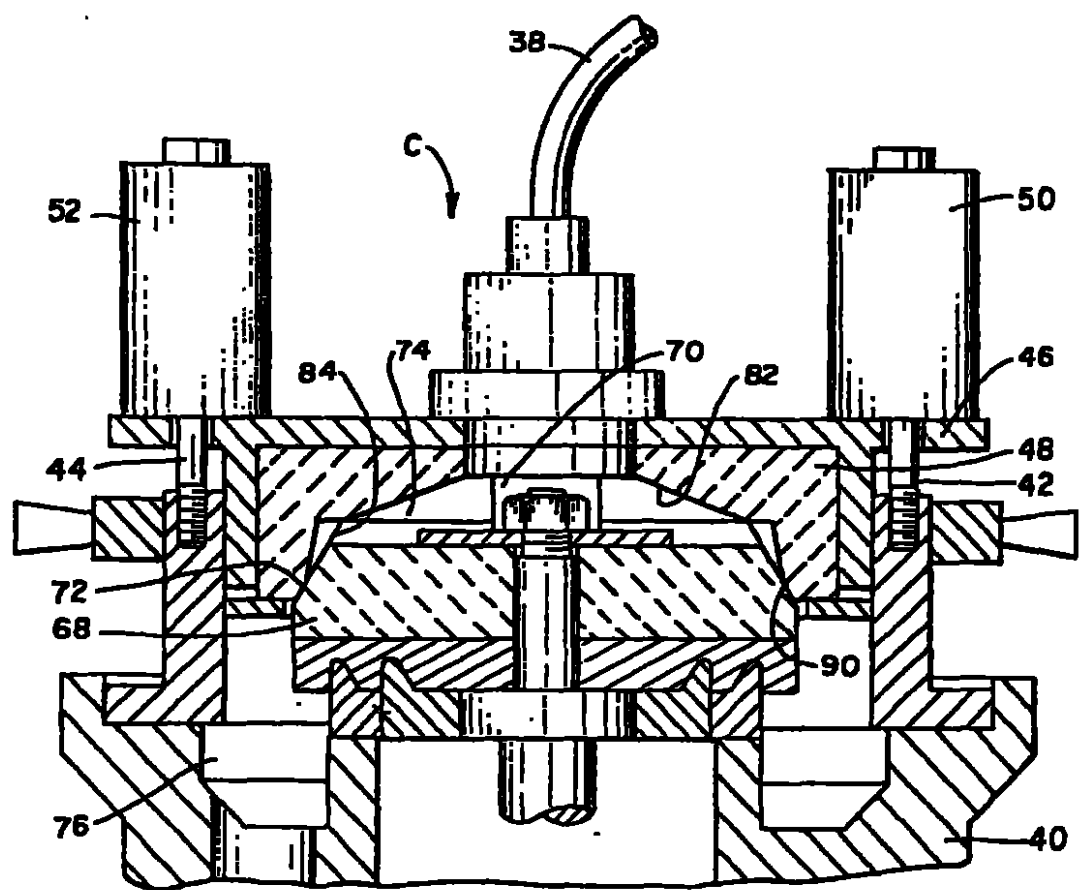


FIG. 1A

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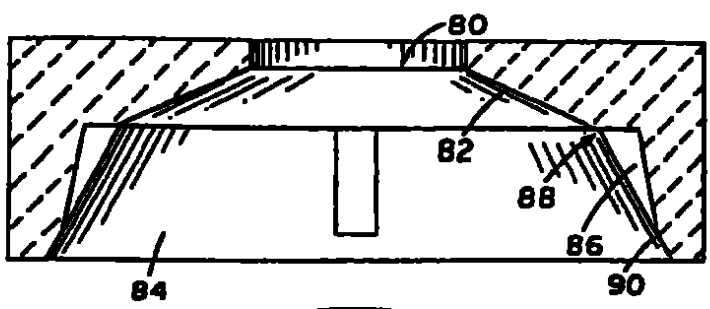


FIG. 3

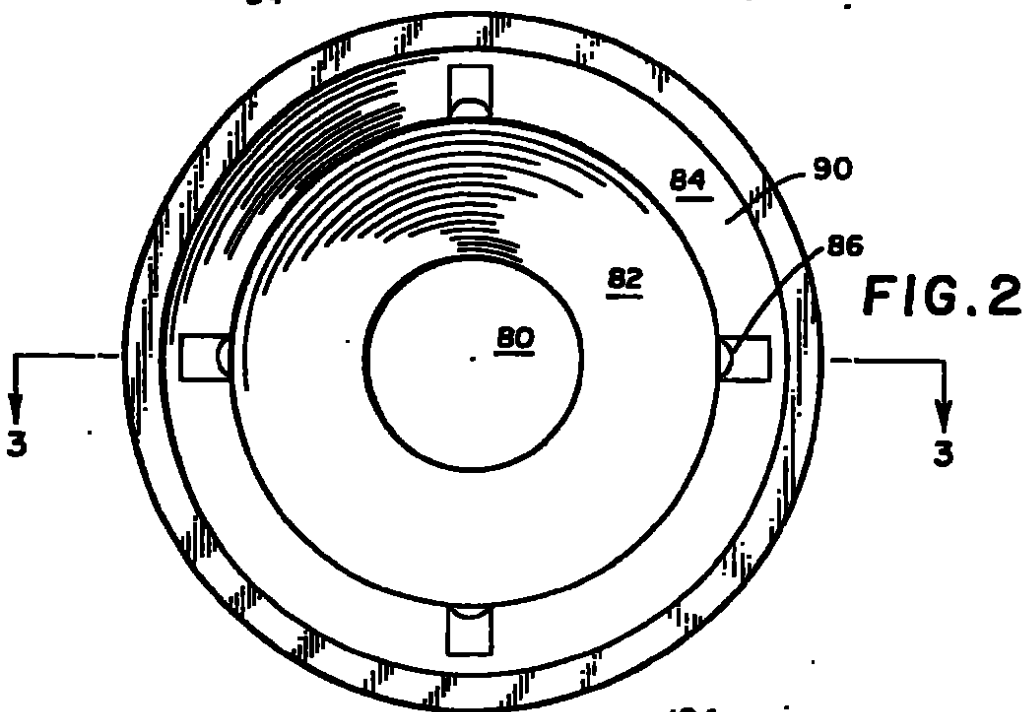


FIG. 2

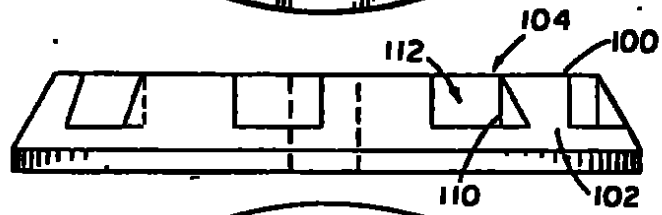


FIG. 4

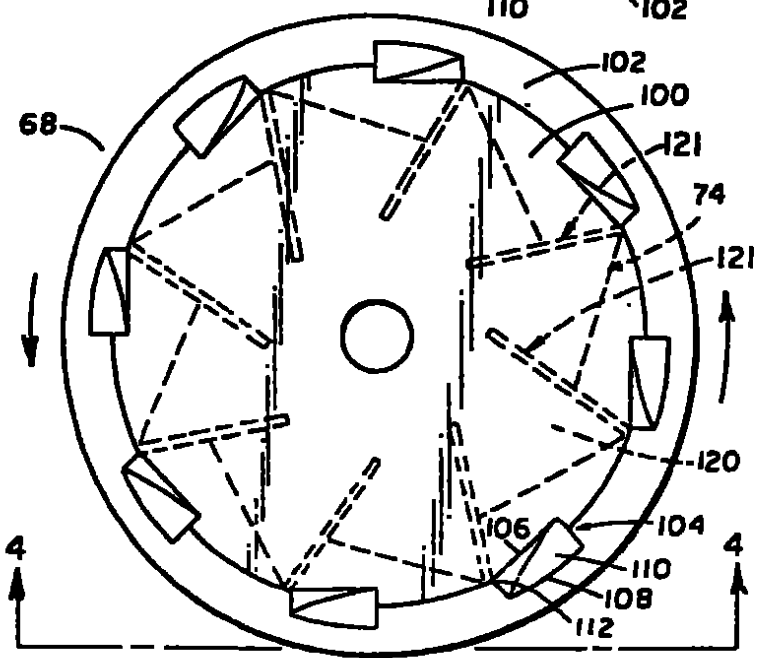


FIG. 5

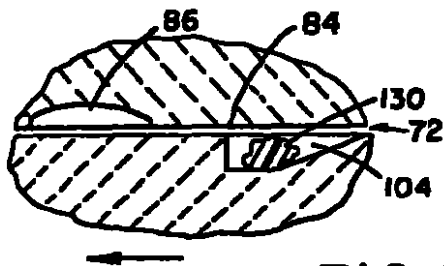


FIG. 6A

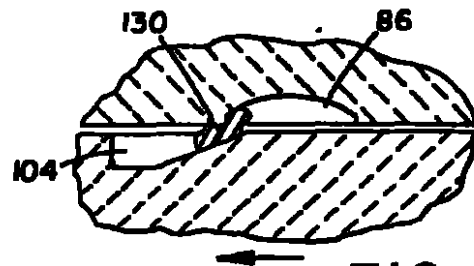


FIG. 6E

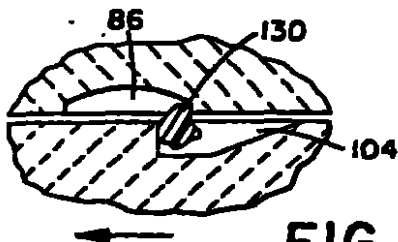


FIG. 6B

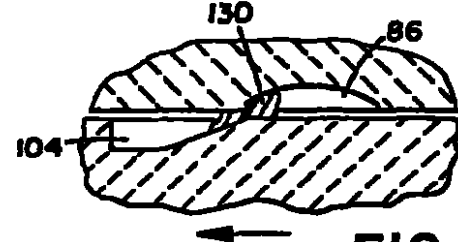


FIG. 6F

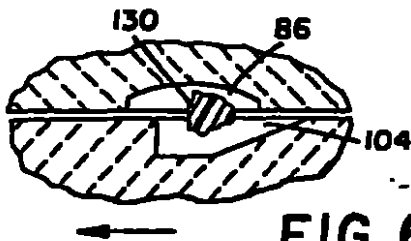


FIG. 6C

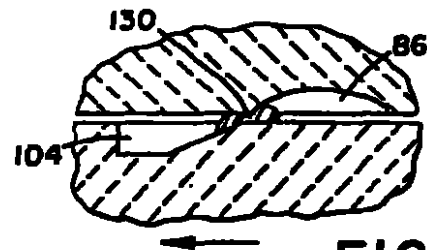


FIG. 6G

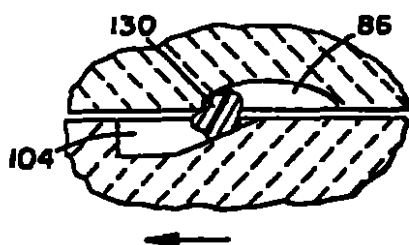


FIG. 6D

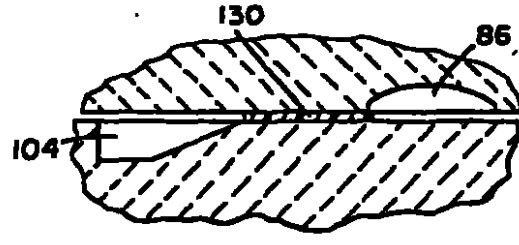


FIG. 6I

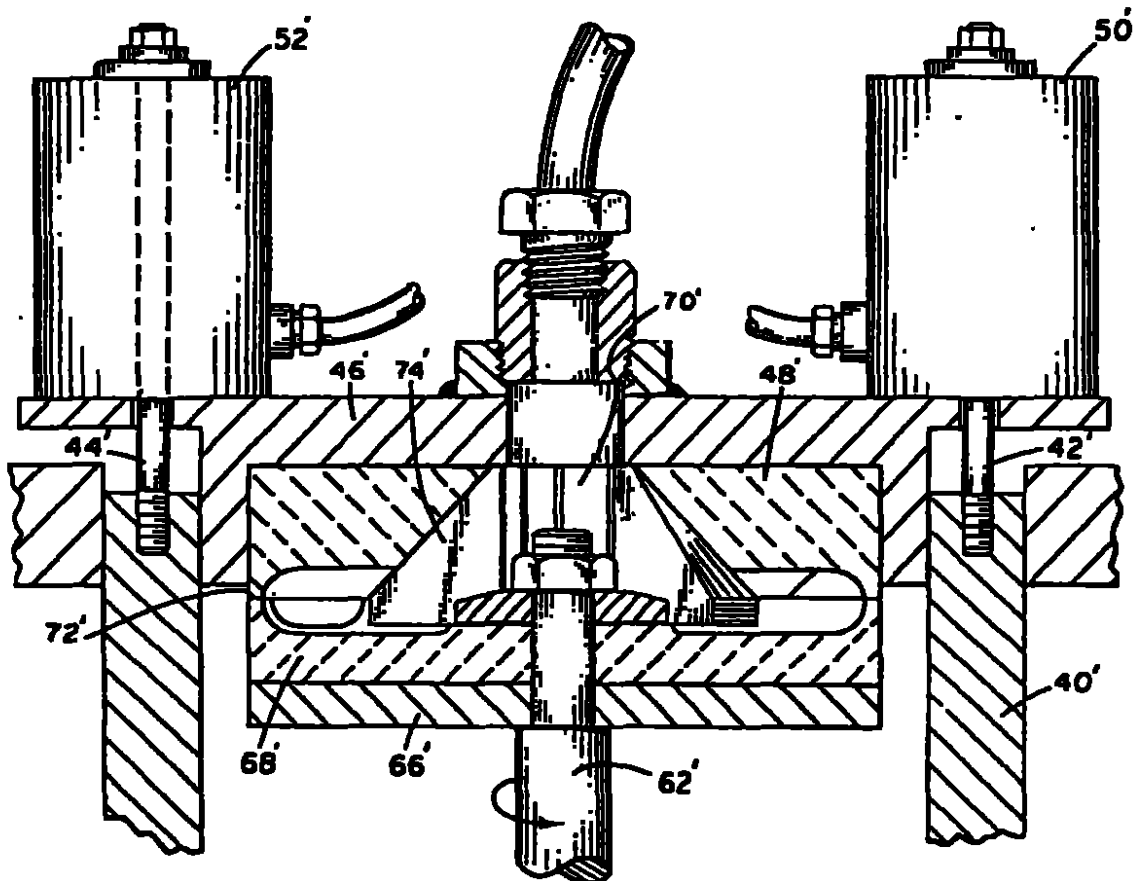


FIG. 8

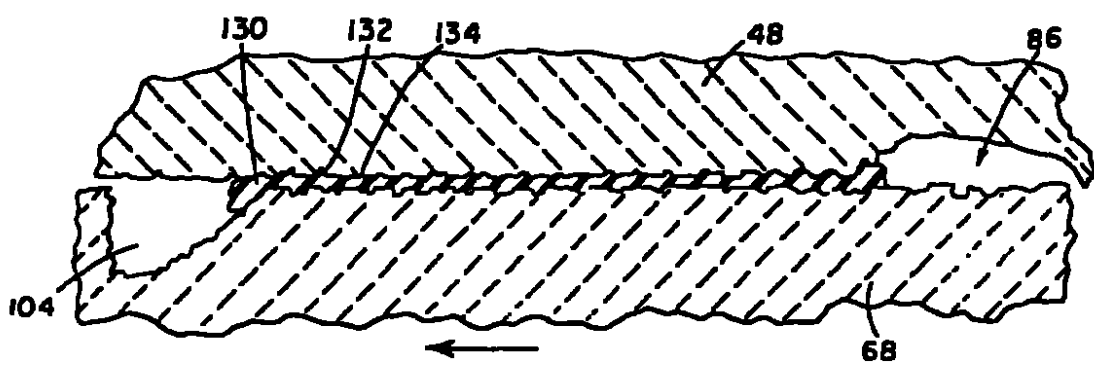


FIG. 6H

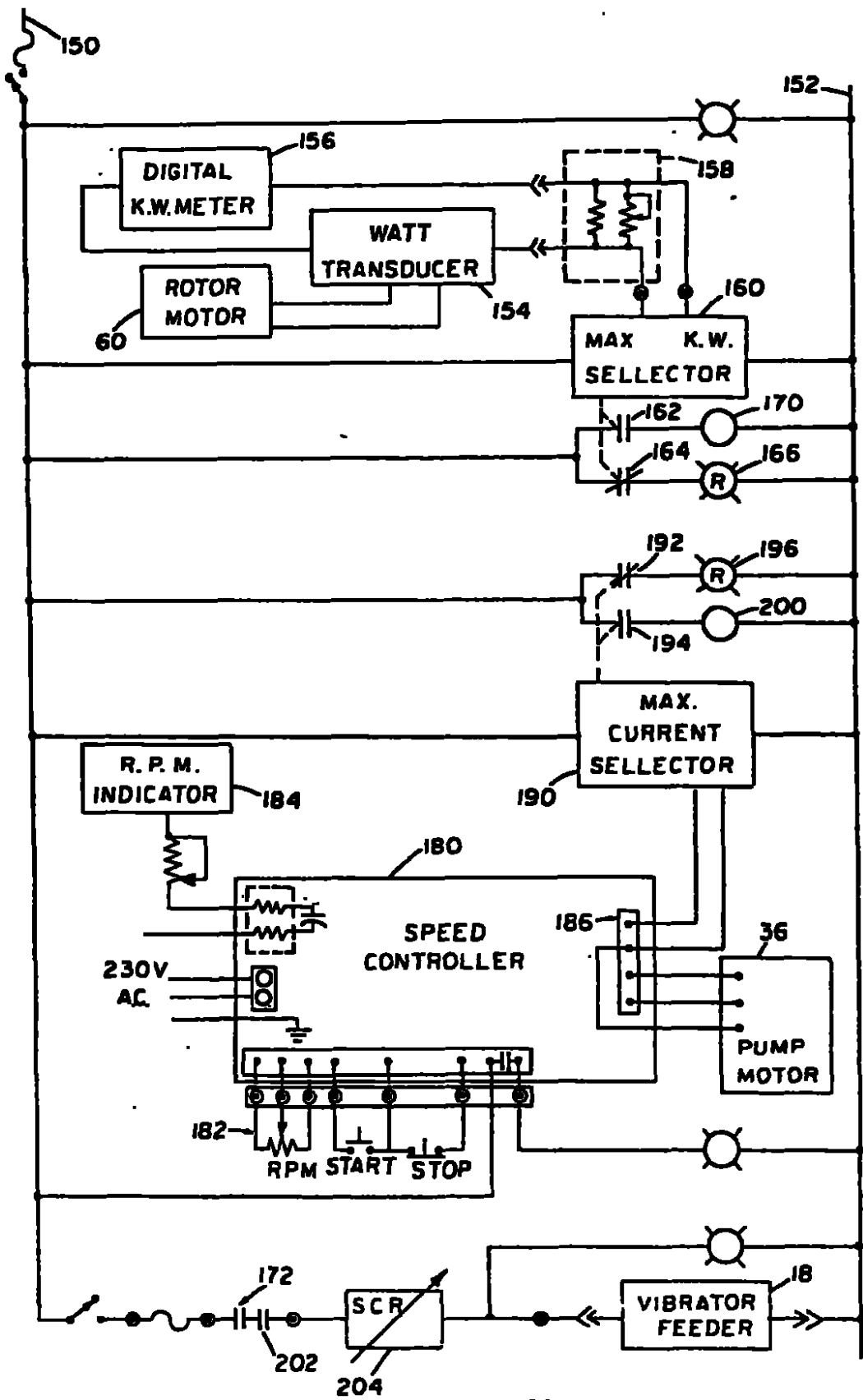


FIG.7

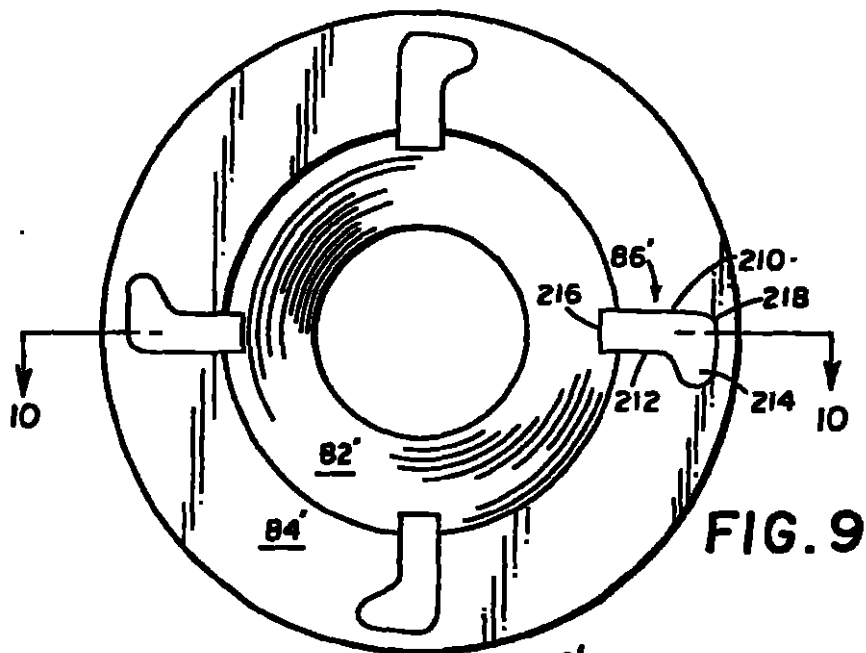


FIG. 9

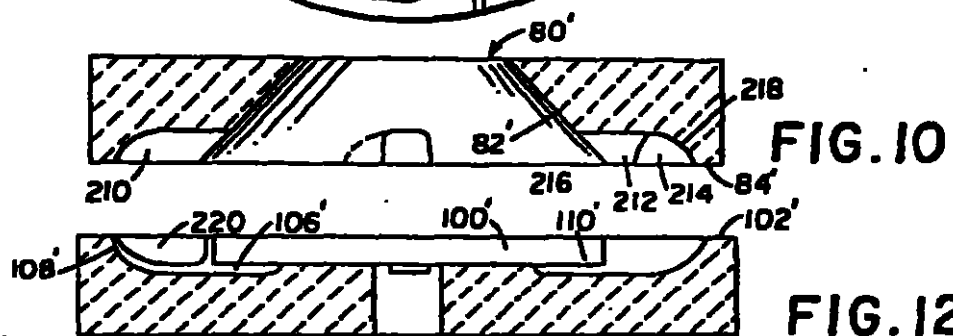


FIG. 10

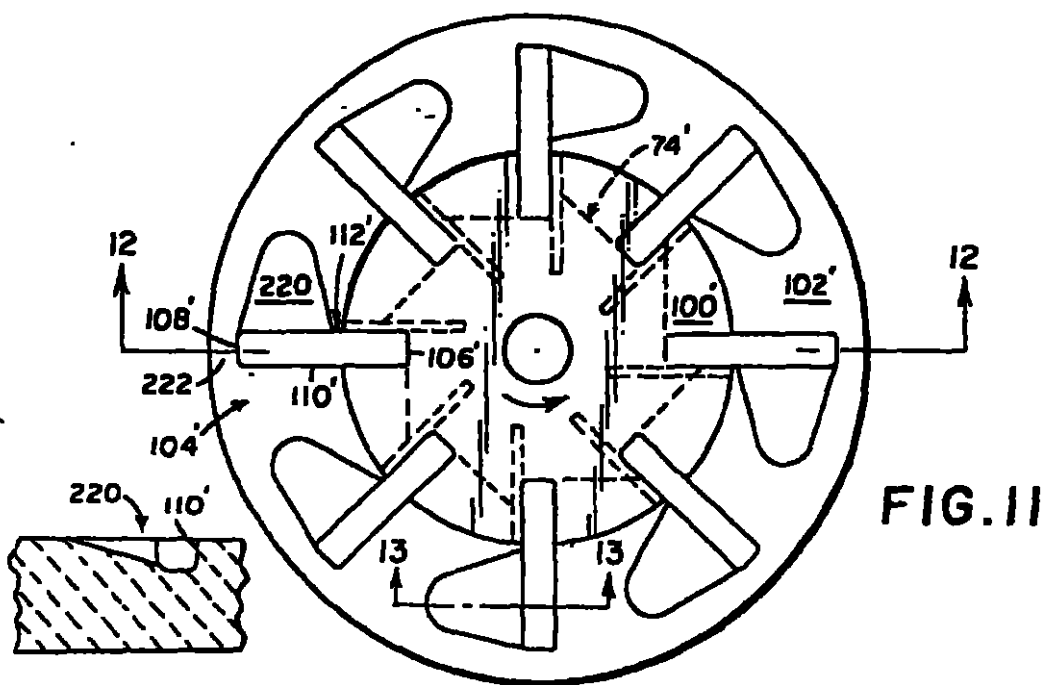


FIG. 11

FIG. 13

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(64) Comminuting apparatus.

(57) A pellet feeder (A) feeds pellets of vulcanized rubber or other materials and water or another fluid at controlled rates into a mixing tank (30). An agitator (32) mixes the pellets and fluid into a slurry. The slurry is pumped from the mixing tank to a mill (C) by a pump (34). The mill has a receiving region (70) defined between a stator (48) and a rotor (88) for receiving the slurry. The stator and rotor define a peripheral grinding zone (72) around the slurry receiving region. An impeller (74) has vanes which extend from the upper surface of the rotor to an abrasive surface (82) of the stator such that the impeller vanes are ground at the same rate as the stator and rotor wear to maintain a fluid seal around the impeller blades. Fluid cylinders (50, 52) maintain a constant pressure between the stator and rotor. The stator has a plurality of recesses (86, 86') which preferably have downstream extending relief areas (214). The rotor also has a plurality of recesses (104, 104') which have

tapered portions along a downstream edge, such as sloping relief areas (220), for wedging the pellets into the grinding zone. The rotor and stator are made of a vitreous bonded stone having a median pore size of about 50 microns.

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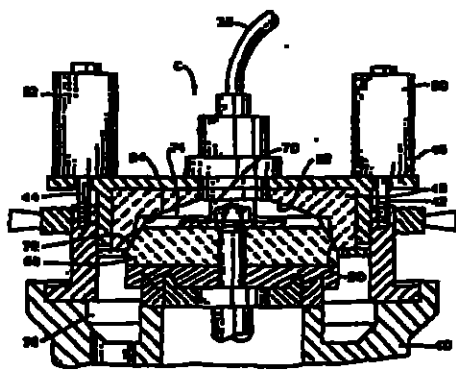


FIG. 1A



European Patent
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EUROPEAN SEARCH REPORT

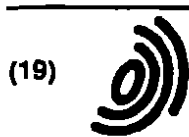
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Application number

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DOCUMENTS CONSIDERED TO BE RELEVANT			EP 82630099.8
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
A	DE - A1 - 2 936 194 (LITTON SYSTEMS, INC.) --	1	B 02 C 2/10 B 29 H 19/06
A	DE - A1 - 2 944 061 (JOHNSON) ----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 7)
			B 02 C B 29 H
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 18-06-1985	Examiner URBAN
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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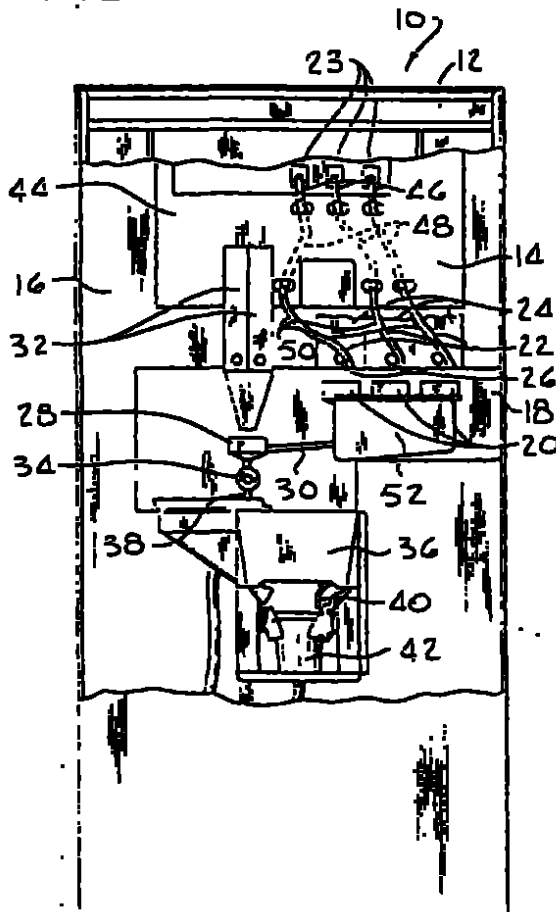
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(54) Hot beverage vending machine

(57) A hot beverage vending machine adapted for making coffee drinks from a freeze dried mixture by utilizing mixing bowls (20) and delivery tubes (30) surrounded by a heater shroud (52). A smooth edge whipper (72) is utilized to whip the coffee mixture to the proper consistency after it leaves the mixing bowl (20) to provide the proper crema appearance in the cup (42). The mixture is directed into a cup (42) by an adjustable outlet tube (46) so that the coffee mixture is directed against the side of the cup (42) below the full line (86). The adjustable outlet tube (40) also contributes to the proper drink appearance by reducing the number of large bubbles in the cup (42).

FIG. 1



EP 0 986 983 A1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to vending machines and more particularly to vending machines which vend hot beverages such as coffee and tea.

[0002] Different hot beverages require different brewing cycles, temperatures and mixtures to produce a desired product. For example, espresso coffee is preferably delivered to a cup at a temperature of at least 149°F (65°C) and should have certain appearance attributes which are expected by a customer who purchases such a product. If these requirements are not met, it is likely that a customer will not make future purchases of the product from the vending machine.

[0003] Unfortunately, many hot beverage vending machines currently available are not designed to produce espresso coffee at the desired temperature from the very first cup taken from the machine, without increasing the hot water reservoir temperature too high. Also, they do not provide the desired appearance attributes in the cup, for example, the proper thickness and consistency of crema (foam or cream) on the surface of the coffee, because of the way in which the product is produced and delivered to the cup.

[0004] In addition, in high humidity geographic locations, the use of freeze dried coffee, particularly espresso coffee, the product canister dispensing nozzles, the delivery tubes and mixing bowls which prepare and deliver the espresso mixture to the cup, tend to clog and require frequent service and cleaning.

SUMMARY OF THE INVENTION

[0005] The present invention overcomes the above described difficulties and disadvantages associated with prior art hot beverage vending machines for producing espresso coffee by providing a machine that delivers the coffee at the desired temperature and provides the desired appearance of the drink in the cup. The vending machine of the present invention is designed to provide heating and insulation of the delivery and supply tubes of the hot water and coffee mixture as it passes through the machine so that the basic hot water reservoir temperature is maintained at its normal temperature of approximately 185°F (85°C) and yet delivers the mixture to the cup at the desired temperature of at least 149°F (65°C). In addition, the mixture is whipped through a whipper assembly which imparts the desired foam to the mixture and it is then delivered to the cup so that the flow of mixture from the delivery tube directed against the side of the cup below the full line but above the bottom so the desired foam appearance in the cup is achieved. Also, it has been discovered that heating the area around the product canister dispensing nozzles, mixing bowls and delivery tubes substantially reduces clogging of those areas when freeze dried es-

presso coffee, as well as other drinks, are being prepared in the machine.

[0006] To achieve the above mentioned results the present invention provides a vending machine for vending hot liquid drinks which includes a hot water tank having an outlet; a hot water metering device connected to the outlet of the hot water tank for supplying a predetermined quantity of hot water; a product canister having an outlet; a product and hot water mixing bowl; a hot water delivery tube connecting the hot water metering device with the mixing bowl to supply a predetermined quantity of hot water to the bowl; a product metering device connected to the outlet of the product canister for supplying a predetermined amount of product to the mixing bowl; a whipper mechanism for whipping the mixture; a mixture delivery tube connected to the mixing bowl and whipper mechanism to supply the whipper mechanism with the mixture; a heater shroud covering a substantial portion of the mixture delivery tube for heating the mixture passing therethrough to maintain it at a predetermined temperature; a cup station; and a mixture output tube connected to the whipper mechanism and delivering the mixture therefrom to the cup station.

[0007] The present invention also provides such a vending machine wherein the mixture output tube has an outlet and adjacent the cup station disposed to direct the mixture into a cup positioned in the cup station so that the stream of mixture engages the side of the cup at a position below the final mixture surface level in the cup and above the bottom of the cup. Also, in its preferred form the present invention provides that the heater shroud includes an elongate sheet metal contoured strip and at least one strip heater attached thereto and extending for a substantial portion of the length of the delivery tube in engagement therewith.

[0008] The vending machine of the present invention also includes a whipper mechanism having a cylindrical whipper with smooth side walls and an annular-shaped outer circumferential surface and mounted for rotation about its central axis; a cylindrical housing closed at both ends and containing the whipper and axially aligned therewith and having an interior circumferential wall in close proximity to the outer circumferential surface of the whipper providing a circumferential passage therebetween through which the mixture can pass so as to provide the desired whipping, a mixture inlet disposed on one side of the whipper and a mixture outlet disposed on another side of the whipper. In addition, the whipper mechanism preferably includes a removable plug closing one end of the cylindrical housing and having an inner surface in close proximity to the other side of the whipper adjacent the outlet. The mixture outlet is preferably smaller than the mixture inlet and the output tube is smaller than the mixture delivery tube, to reduce any additional foaming that might otherwise occur.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a front elevational view partially cut away to show the interior of the preferred embodiment of the present invention;

Fig. 2 is an enlarged front view in partial cross-section, of the heater shroud around the mixing bowls and delivery tubes of the preferred embodiment;

Fig. 3 is an end view of the heater shroud of Fig. 2;

Fig. 4 is an expanded view of the whipper assembly of the preferred embodiment;

Fig. 5 is a cross-sectional view through the central axis of the whipper assembly, without the end cap;

Fig. 6 is an enlarged view of the cup station of the embodiment of Fig. 1 with a cup in position for receiving liquid;

Fig. 7 is a side view of the mounting for the mixture delivery tube in the cup station; and

Fig. 8 is a view in the direction of line 8-8 on Fig. 7.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0010] A hot drink/coffee vending machine 10 is shown in Fig. 1. Its external appearance is of a conventional coffee vending machine with its outer service door 12 partially cutaway to show the construction of the preferred embodiment of the present invention. Generally, the vending machine includes a hot water tank 14 positioned in the upper portion of the vending machine and which is of a generally rectangular construction and fastened to the rear wall 16 of the vending machine.

[0011] Mounted in the machine to a bracket 18 in front of and below the tank 14 are a plurality of product and water mixing bowls 20. Hot water supply lines 22 supply each of the mixing bowls 20 with hot water. Each of the supply lines 22 is connected to a respective metering solenoid dispensing valve 23 which provides the desired amount of hot water from the tank 14 to prepare a cup of coffee or the like. Respective product storage canisters 24, mounted within the vending machine 10 and shown with their tops as partially cutaway, supply a predetermined amount of product, such as freeze dried coffee, to the respective mixing bowl 20 via a nozzle 26 which drops a predetermined amount of product into the open upper portion of the respective mixing bowl 20.

[0012] Mixing bowls 20 are of a generally conventional construction as disclosed, for example, in United States Patent No. 5,192,002.

[0013] A further mixing bowl 28, of the same general construction as mixing bowls 20, is mounted to bracket 18 and receives through a mixture delivery tube 30 the mixture from any of the mixing bowls 20. Condiment storage canisters 32 are positioned above mixing bowl 28 for supplying condiments, such as lightener or sugar, to the mixture, if required, which is then mixed in the

mixing bowl 28. The mixture, either with or without any added condiment, then passes from mixing bowl 28 into a whipper mechanism 34 which, when activated for certain mixtures, whips the mixture to a desired consistency. After whipping, the mixture then passes to the cup station 36 through a mixture delivery tube 36 that supplies the mixture through a mixture output tube 40 to a cup 42 positioned in the cup station 36.

[0014] Hot water tank 14 is provided with an insulated cover 44 surrounding at least the front portion of the hot water tank 14 for reducing heat loss. To this end, the hot water supply tubes 22 have flexible tubing such as silicone tubing 46, connected to the output of the metering solenoid dispensing valves 23 and connecting to respective stainless steel tubing portions 48 which extend between the insulation and the tank 14 in engagement therewith so as to reduce heat loss as the hot water passes from the tank 14 to the mixing bowls 20. As the stainless steel tubing portions 48 exit the insulated covering 44 further flexible silicone tubing 50 connects the stainless steel tubing portions 48 to the inlets 51 (see Fig. 3) of respective mixing bowls 20.

[0015] Surrounding tube 30 at the base of the mixing bowls 20 is a heater shroud 52 which is essentially an elongated contoured sheet metal strip. As best seen in Figs. 2 and 3, shroud 52 is formed of an outer sheet metal plate 54 and inner sheet metal plate 56 and a layer of insulation 58 sandwiched between the plates. The plates are held together by bolts 60. The shroud 52 is fastened to the bracket 18 such as by thumb screws (not shown). An upper sheet metal cap plate 62 closes the upper portion of heater shroud 52, forming part thereof, and engages the lower conical surfaces 64 of mixing bowls 20 to produce some heating of the bowls. A heater strip 62 of conventional construction, also forming part of the heater shroud 52, is mounted to the bottom surface of the inner plate 56 and is in engagement with the inner plate 56 which is, in turn, engaged with mixture delivery tube 30 along a substantial portion of its length within the shroud in order to heat the tube. Thus, as mixture leaves the exit tube 64 of any of the mixing bowls 20 through the connector tubes 66 and enters the tube 30 the mixture is heated to maintain the temperature of the mixture at a desired level, such as the 149°F (65°C) minimum desired for making espresso coffee. As one skilled in the art would realize, the thickness of the insulation 58, temperature of heating strip 62 and general configuration of the heater shroud 52 can be adjusted to achieve the desired output temperature of the mixture through mixture delivery tube 30. It is also notable that the heater shroud substantially reduces the clogging of product in the delivery nozzles of product storage canister 24, mixing bowls 20 and tube 30 from a build up of unmixed freeze dried coffee and moisture when it is used in geographically humid areas. This advantage is attained as a result of the heating of the air around these components which reduces the moisture in the air in the immediate area of the components. This provides a sub-

stantial advantage by reducing necessary service calls to clean out the clogged areas.

[0016] After the mixture is delivered to the mixing bowl 28 and condiment added or not as selected by the customer the mixture then passes to the whipper mechanism 34. As best seen in Figs. 4 and 5, the whipper mechanism 34 includes a generally cylindrical housing 66 with a mixture inlet 68 and mixture outlet 70 with an adaptor 71. The whipper 72 has smooth sidewalls 74 and 76 and an annular shaped outer circumferential surface 78 which extends adjacent the inner cylindrical sidewall of housing 66. The clearance between the outer circumferential surface 78 of whipper 72 and the inner circumferential surface of housing 66 is adjusted to provide the desired amount of "crema" (foam or cream on top of the coffee in the cup) in the mixture when delivered to the cup. This may require some adjustment in a particular construction, but for the purpose of the preferred embodiment it was determined that satisfactory results were obtained if the whipper circumferential diameter was 1.180 inches (3 cm), the internal diameter of the cylindrical housing 66 in the area of the whipper was 1.250 inches (3.175 cm), the inside diameter of adaptor 71 was .140 inches (0.36 cm) and the tubing 38 had an inside diameter of 3/16 inches (0.48 cm). The criteria for establishing these dimensional relationships was that the crema on the mixture delivered to the cup must be less than approximately two millimeters in thickness and with relatively small bubbles in the crema layer.

[0017] Cylindrical housing 66 is enclosed at both ends. As seen in Fig. 5, a rear wall 80 encloses one end of housing 66 except for the passage of the drive shaft of drive motor 82 through the rear wall which is sealed by seals 84 and 86 against leakage of the mixture through the rear wall. The front of the cylindrical housing 66 is sealed by a plug 88 which is frictionally fitted in the end of the housing 66, and a further seal is provided by a removable elastomeric cap 89 which fits over the end of the housing. The plug 88 is removable so that the whipper mechanism 34 can be cleaned. Once the plug 88 is removed the whipper 72 can be removed by engaging a hook tool in the eye 90 provided on the end of whipper 72 for this purpose. It is to be noted that the level of mixture within the whipper mechanism 34 generally never reaches the level where it would be engaged by the eye 90 and the whipping action affected thereby. Also, contained within housing 66 and mounted to the rear wall 80 is a splatter shield 92. As the mixture enters the whipper mechanism 34 through the inlet 68 it impinges upon shield 92 and is directed away from the seals 86 and 84 down around the internal circumferential surface of housing 66.

[0018] After the mixture leaves the whipper mechanism 34 through adaptor 71 and mixture delivery tube 36 it is carried to the mixture output tube 40 where it is delivered to the cup. As best seen in Figs. 6 through 8, the mixture output tube 40 is so positioned and arranged

in the cup station 36 that the mixture exits the output end 94 of tube 40 so that it is directed down the side 96 of the cup 42. It is also directed to engage the side 96 of cup 42 at a position below the final filling level 98 of the mixture in cup 42 in order to minimize the appearance of drink mixture marking above the full level inside the cup. The mixture is also directed against the side of the cup so that it does not directly impinge on the inside bottom of the cup since this produces undesirable formation of larger bubbles. To achieve the adjustment desired on directing the mixture against the side of the cup an adjustable output tube support bracket 100, as shown in Figs. 7 and 8, is provided. Mixture output tube 40 is welded or otherwise secured to a first L-shaped bracket 102 in which threaded studs 104 are mounted. A second L-shaped bracket 106 is provided with a pair of laterally elongated holes 108 and a pair of vertically elongated holes 110. A third bracket 112 is provided with threaded studs 114 engageable in the holes 110. The studs 104 mounted to bracket 102 are received in the laterally elongated openings 108 and nuts are applied to each of these for securing the output tube in a desired vertical and lateral location. The third bracket 112 is also provided with threaded studs 116 for securement of the bracket to the cup station 36. Thus, once the vending machine 10 is assembled the output tube 40 can be positioned and adjusted so that the mixture impinges on the cup 42 in the desired location as described above.

[0019] As an example of operation of the present invention, when a cup of espresso is being prepared, the customer makes his selection and inserts his money into the machine in a conventional manner. Freeze dried espresso product is dispensed from one of the canisters 24 by its associated nozzle 26 into one of the three mixing bowls 20. Simultaneously, the machine controls are operated by software in a microprocessor (not shown) to control the associated solenoid 23 to dispense the measured amount of hot water from the hot water tank 14 into the same mixing bowl 20. The mixture of water and product passes through the mixing bowl 20 and into the mixture delivery tube 30. Tube 30 has been preheated by the heating strip 62 operating continuously to heat the area around the mixing bowls and tube 30.

[0020] The mixture then passes into mixing bowl 28 which, in the case of making espresso, generally a condiment from containers 32 is not added, except possibly sugar, and thereafter the mixture passes from mixing bowl 28 into whipper mechanism 34. In the whipper mechanism the mixture passes through the inlet 68 and impinges upon the shield 92 and is then spread into the cylindrical interior of the housing 66 and directed toward the whipper 72. The mixture then passes around the clearance between the outer edge 78 of the whipper and the inner sidewall of housing 66 and is whipped by the whipper as it passes. Starting and stopping of the whipper motor 82 is controlled by the microprocessor programming which is determined by trial and error for a given machine construction to achieve the desired

amount of crema in the final mixture in the cup. The mixture then exits the whipper through outlet 70, adaptor passing through the mixture delivery tube 38 to the mixture output tube 40 in cup station 36. The mixture then impinges on the sidewall of cup 42, as shown in Fig. 6, to fill the cup and put the proper appearance of foam on the upper surface of the cup without leaving deposits above the fill line 96 in the cup. Although this is especially good for making espresso, it is also good for making other drinks as well.

[0021] In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

[0022] As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Claims

1. A vending machine for vending hot liquid drinks, comprising:

a hot water tank (14) having an outlet;
a hot water metering device (23) connected to the outlet of the hot water tank (14) for supplying a predetermined quantity of hot water;
a product canister (24) having an outlet;
a product and hot water mixing bowl (20);
a hot water delivery tube (22) connecting the hot water metering device (23) with the mixing bowl (20) to supply a predetermined quantity of hot water to the bowl (20);
a product metering device (26) connected to the outlet of the product canister (24) for supplying a predetermined amount of product to the mixing bowl (20);
a whipper mechanism (34) for whipping the mixture;
a mixture delivery tube (30) connected to the mixing bowl (20) and whipper mechanism (34) to supply the whipper mechanism (34) with the mixture;
a heater shroud (52) covering a substantial portion of the mixture delivery tube (30) for heating the mixture passing therethrough;
a cup station (36); and
a mixture output tube (40) connected to the whipper mechanism (34) and delivering the mixture therefrom to the cup station (36).

2. A vending machine according to claim 1, wherein the mixture output tube (40) has an outlet end (94) adjacent the cup station (36) disposed to direct the mixture into a cup (42) positioned in the cup station

(36) so that the stream of mixture engages the side of the cup (42) at a position below the final mixture surface level (96) in the cup (42).

3. A vending machine according to claim 1 or claim 2, wherein the heater shroud (52) includes an elongate sheet metal contoured strip (54, 56) and at least one strip heater (62) attached thereto and extending for a substantial portion of the length of the delivery tube (30) in engagement therewith.

4. A vending machine according to any one of claims 1 to 3, wherein the output tube (40) is smaller than the mixture delivery tube (30).

5. A vending machine for vending hot liquid drinks, comprising:

a hot water tank (14);
a product canister (24);
a product and hot water mixing bowl (20),
means (23, 26) for supplying a predetermined amount of hot water from the hot water tank (14) and product from the product canister (24) to the mixing bowl (20) for mixing of the same;
means (34) for whipping the mixture received from the mixing bowl (20);
means (30) for delivering the mixture from the mixing bowl (20) to the whipping means (34);
means (52) for heating the mixture delivery means (30) so as to substantially maintain the temperature of the mixture from the mixing bowl (20) to the whipping means (34);
a cup station (36); and
means (40) for delivering the mixture from the whipping means (34) to the cup station (36) for filling a cup positioned therein.

6. A vending machine according to claim 5, wherein the means for delivering the mixture from the whipping means (34) to the cup station (36) is a tube (40) which has an outlet end (94) so positioned and arranged adjacent the cup station (36) to direct the mixture into a cup (42) positioned in the cup station (36) so that the stream of mixture engages the side of the cup (42) at a position below the final mixture surface level (96) in the cup (42).

7. A vending machine according to claim 5 or claim 6, wherein the heating means (52) includes an elongate sheet metal contoured strip (54, 56) extending for a substantial portion of the length of the delivery tube (30) in engagement therewith.

8. A vending machine according to any one of claims 5 to 7, wherein the means for supplying a predetermined amount of hot water includes stainless steel tubes (48) disposed in heat transfer relation to the

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hot water tank (14) and an insulative cover (44) covering the steel tubes (48) and adjacent tank portions.

9. A vending machine according to any one of claims 1 to 8, wherein the whipper mechanism or whipping means (34) includes:

a cylindrical whipper (72) with smooth side walls (74, 76) and an annular-shaped outer circumferential surface (78) and mounted for rotation about its central axis;
a cylindrical housing (66) closed at both ends and containing the whipper (72) and axially aligned therewith and having an interior circumferential wall in close proximity to the outer circumferential surface (78) of the whipper (72) providing a circumferential passage therebetween through which the mixture can pass, a mixture inlet (68) disposed on one side of the whipper (72) and a mixture outlet (70) disposed on another side of the whipper (72).

10. A vending machine according to claim 9, including a removable plug (88) closing one end of the cylindrical housing (66) and having an inner surface in close proximity to the other side of the whipper (72) adjacent the outlet (74).
11. A vending machine according to claim 9 or claim 10, wherein the mixture outlet (70) is smaller than the mixture inlet (68).

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FIG. 1

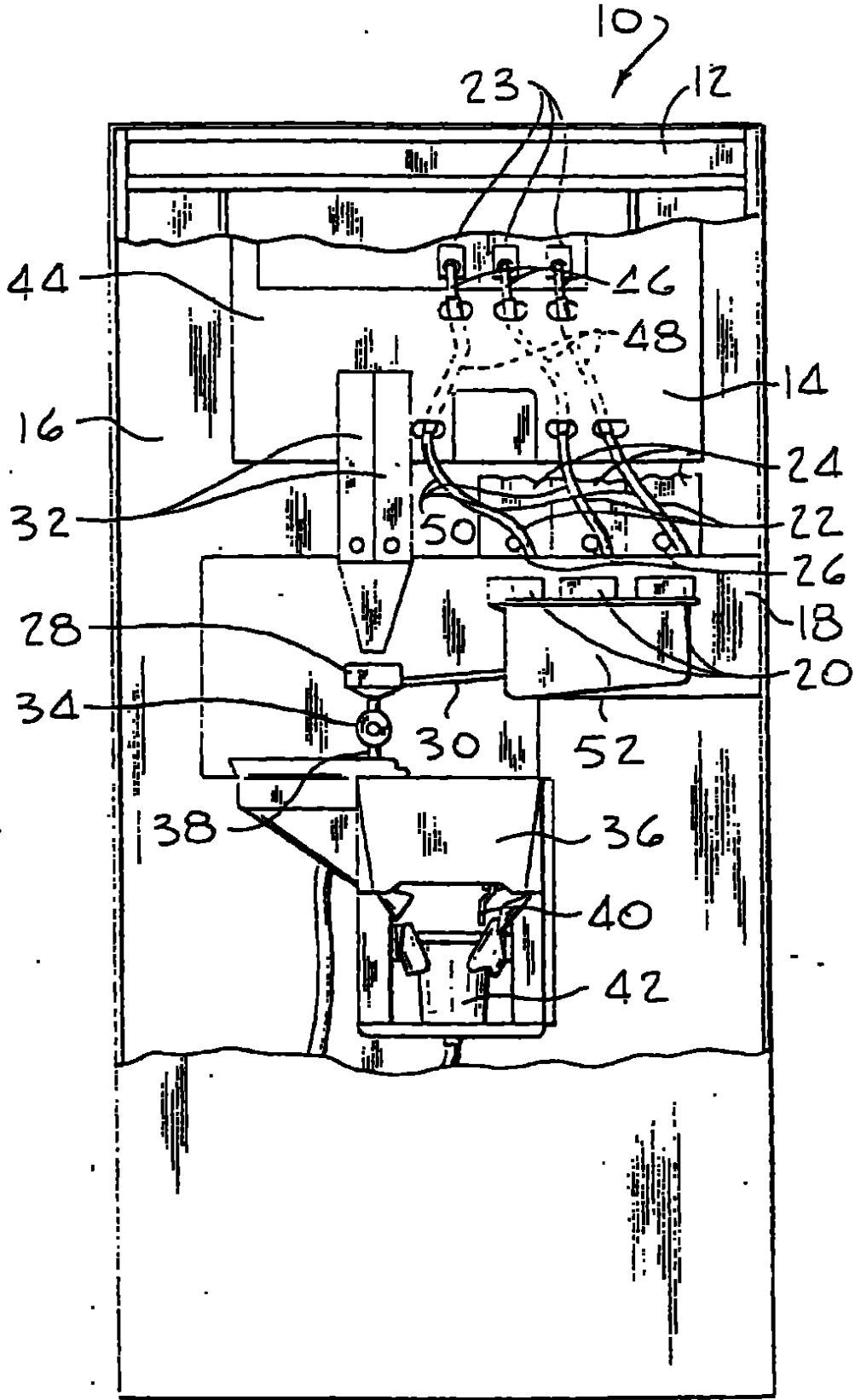
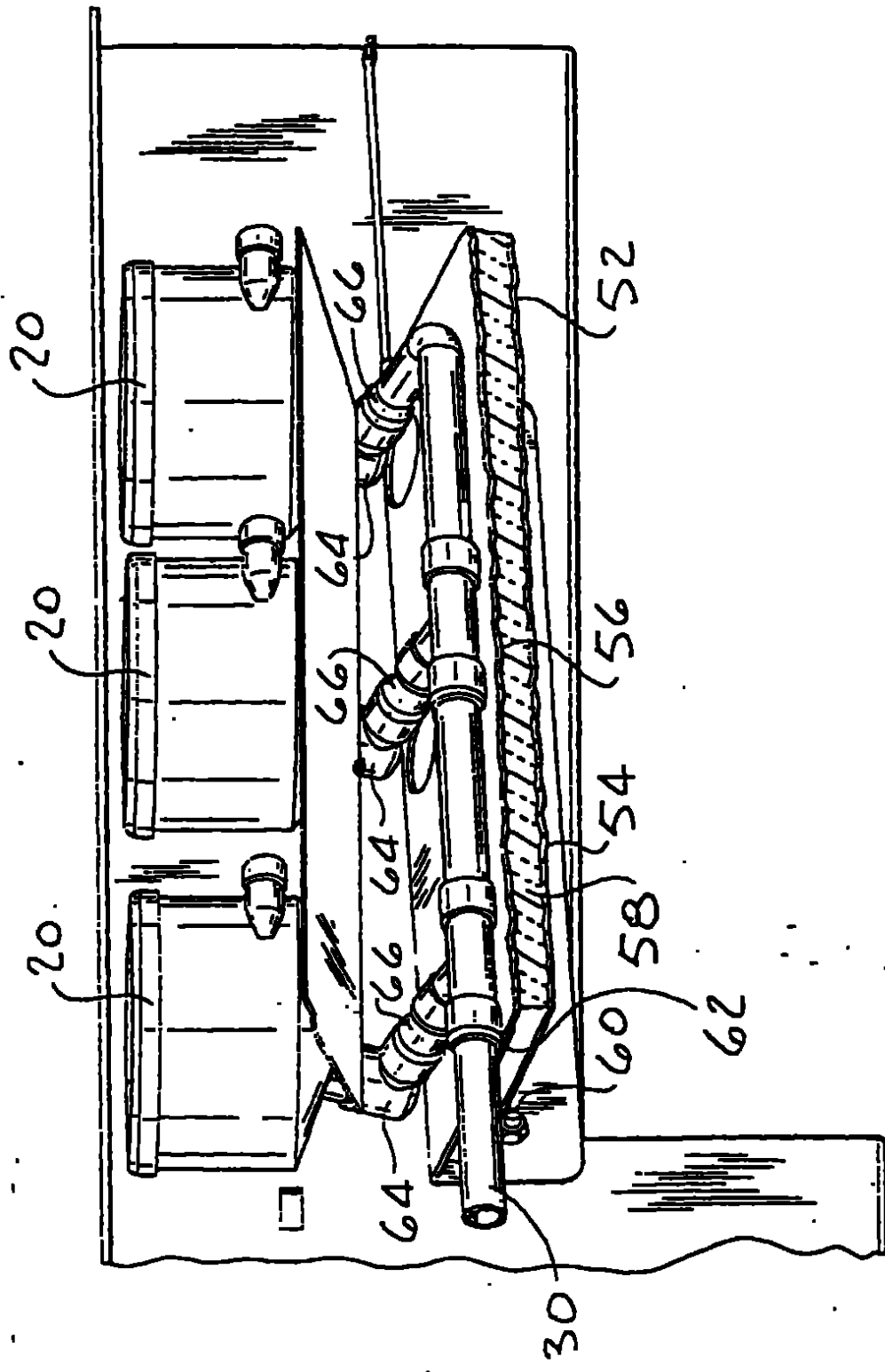
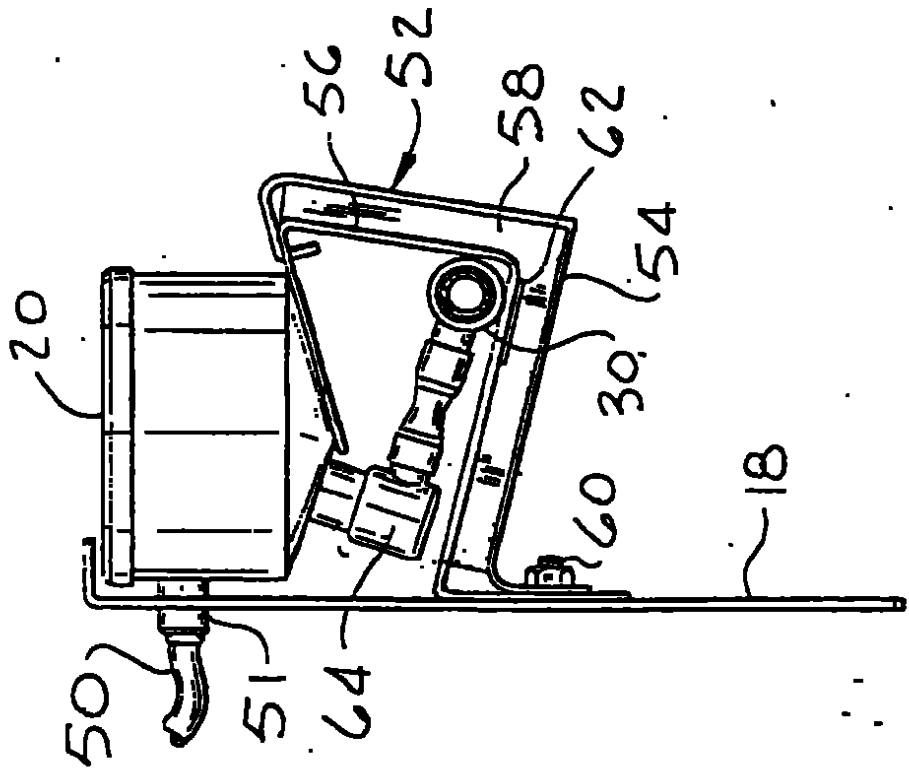


FIG. 2



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FIG. 3



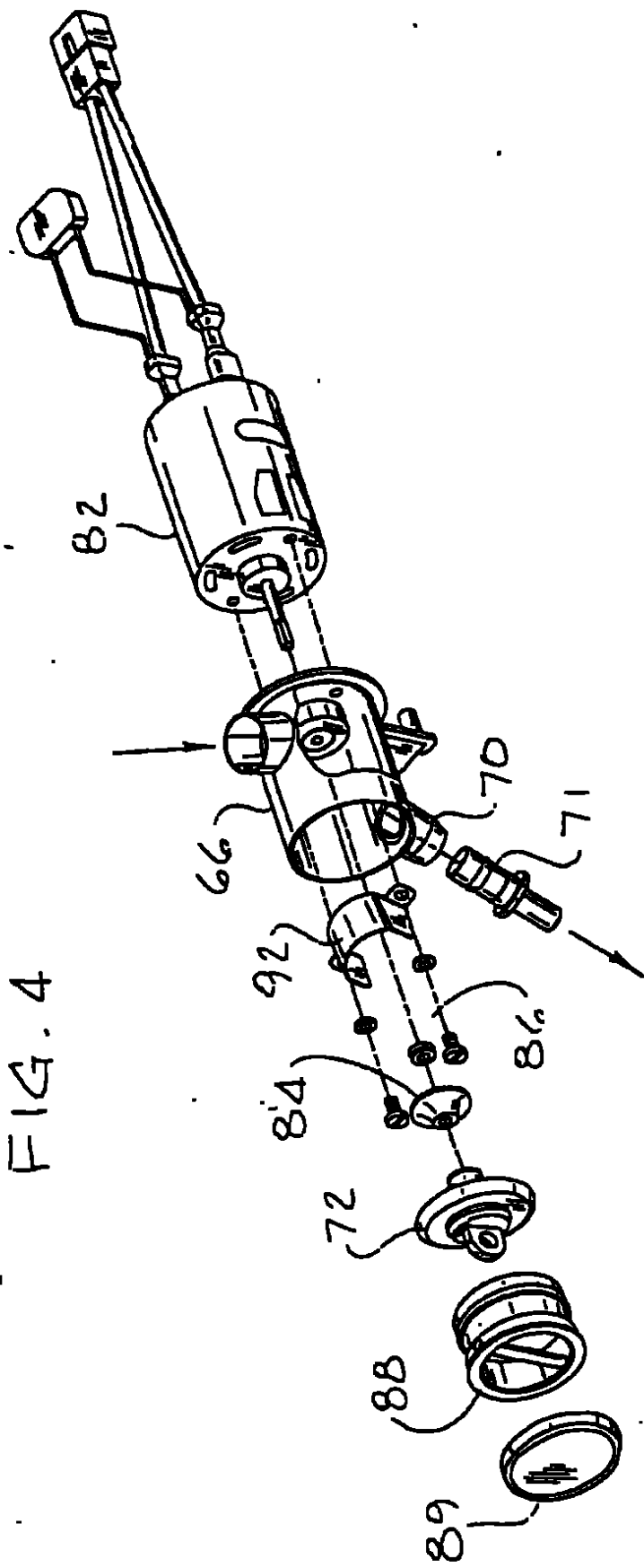


FIG. 4

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FIG. 5

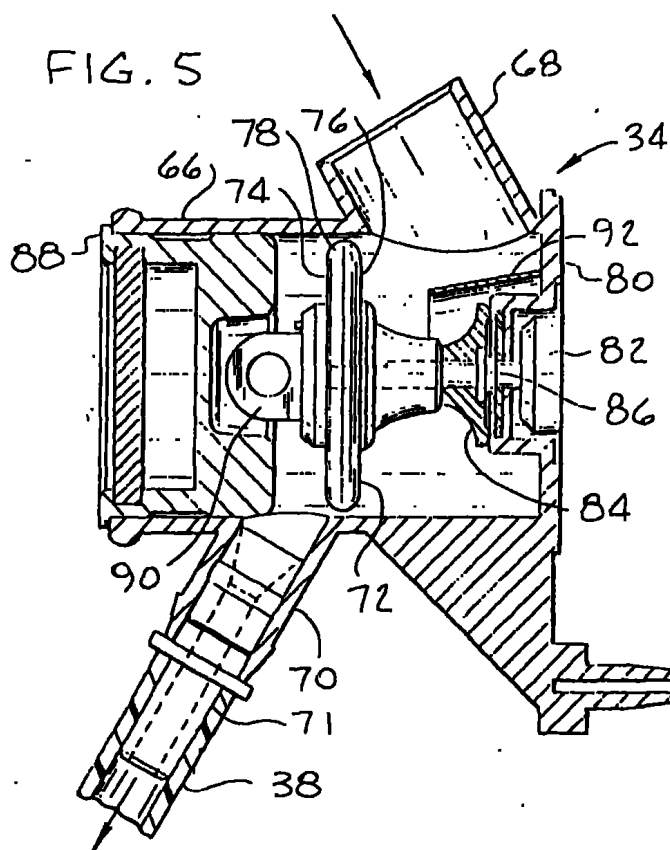


FIG. 6

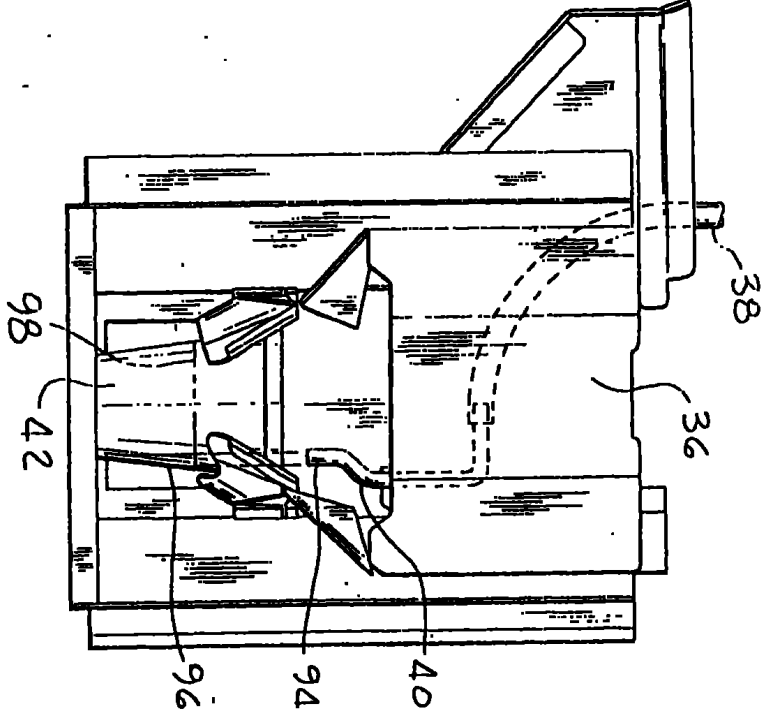


FIG. 7

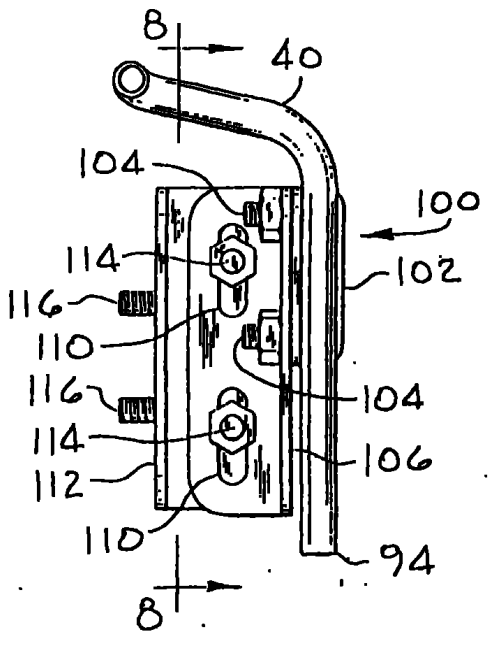
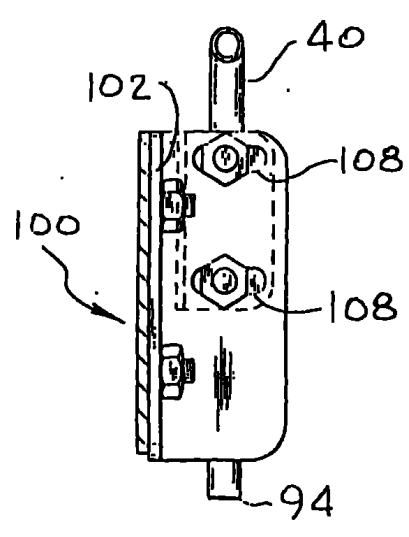


FIG. 8



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European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 30 7354

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (InCL7)
A	DE 197 14 979 A (KWANGJU ELECTRONICS CO) 6 November 1997 (1997-11-06) * the whole document *	1,5	A47J31/40
A	GB 1 367 354 A (GKN SANKEY LTD) 18 September 1974 (1974-09-18) * the whole document *	2,6	
A	US 2 843 293 A (BURGOYNE) 15 July 1958 (1958-07-15) * the whole document *	1,5	
A	GB 1 369 218 A (GKN SANKEY LTD) 2 October 1974 (1974-10-02) * the whole document *	9,11	
A,D	US 5 192 002 A (REESE) 9 March 1993 (1993-03-09) * the whole document *	1,5	
A	US 5 265 518 A (REESE) 30 November 1993 (1993-11-30) * the whole document *	1,5	
A	GB 2 140 390 A (SANDEN CORPORATION) 28 November 1984 (1984-11-28) * the whole document *	1,5	TECHNICAL FIELDS SEARCHED (InCL7) A47J 607F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 6 December 1999	Examiner Riege1, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date O : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 150 (3-97) (precis)

[54] BLENDER

[75] Inventor: George C. Moreton, Winston-Salem, N.C.

[73] Assignee: Electronic Data Controls Corporation, Winston-Salem, N.C.

[22] Filed: Aug. 24, 1973

[21] Appl. No.: 391,466

[52] U.S. Cl. 259/8; 259/9; 259/96

[51] Int. Cl.² B01F 7/04; B01F 7/18

[58] Field of Search 259/6, 7, 8, 9, 10, 43, 259/44, 65, 66, 67, 68, 69, 169, 96

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Primary Examiner—Harvey C. Hornsby

Assistant Examiner—Alan Cantor

Attorney, Agent, or Firm—Richards, Shefts & Pinckney

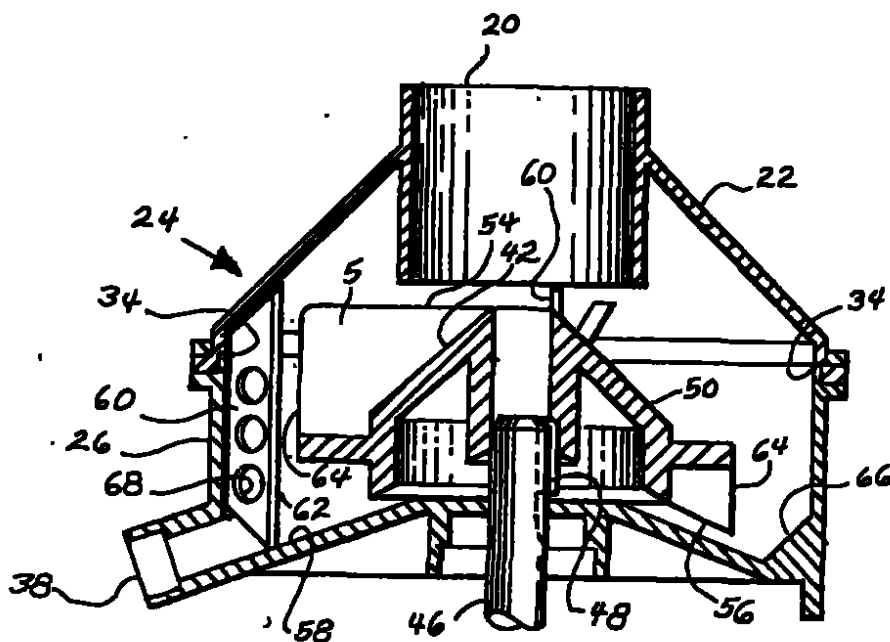
[57] ABSTRACT

A blender for mixing beverages that has a cylindrical upright, substantially closed, frustoconically bottomed

blending bowl with an intake port at the top and a discharge port at the outer edge of the bottom of the bowl. A motor driven impeller is mounted for rotation about a longitudinal axis in the bowl and has blades projecting radially therefrom for coaction with stationary blades that extend inwardly from the bowl wall. One stationary blade is located just past the discharge port in the direction of impeller rotation to force the contents out the discharge port, which is located within the longitudinal extent of the stationary blades for this purpose. The impeller blades have edges complementary to the stationary blade edges and inclined with respect thereto and in a direction to direct the contents longitudinally toward the discharge port, for which latter purpose the impeller blades have bottom edges that are complementary to the sloping bottom wall.

In an alternative embodiment, the blending bowl and impeller are horizontally disposed with the intake port at the rear end and the discharge port at the bottom of the front end, and the bowl being forwardly radially enlarged to facilitate advancement of its contents. The intake port is laterally offset in the direction of impeller rotation and a radially inwardly extending baffle plate is provided laterally opposite the inlet. The impeller blades are triangularly shaped and the stationary blades are complementarily triangularly shaped with one stationary blade just past the discharge port in the direction of impeller rotation.

22 Claims, 8 Drawing Figures



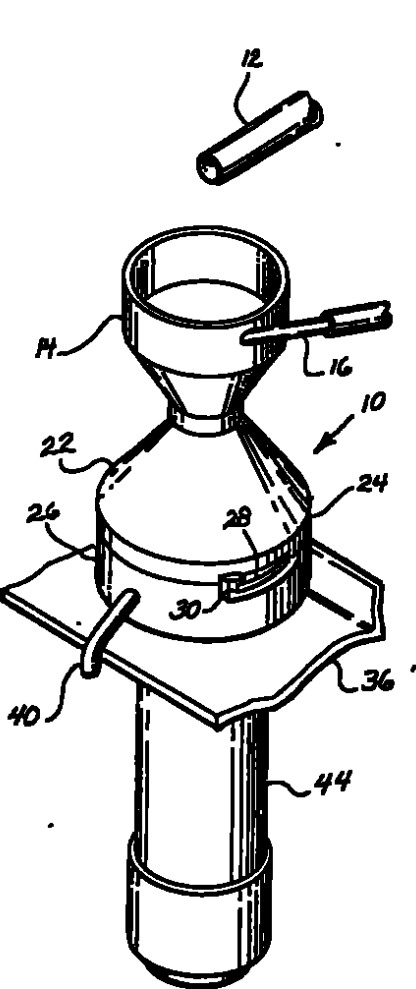


Fig. 1

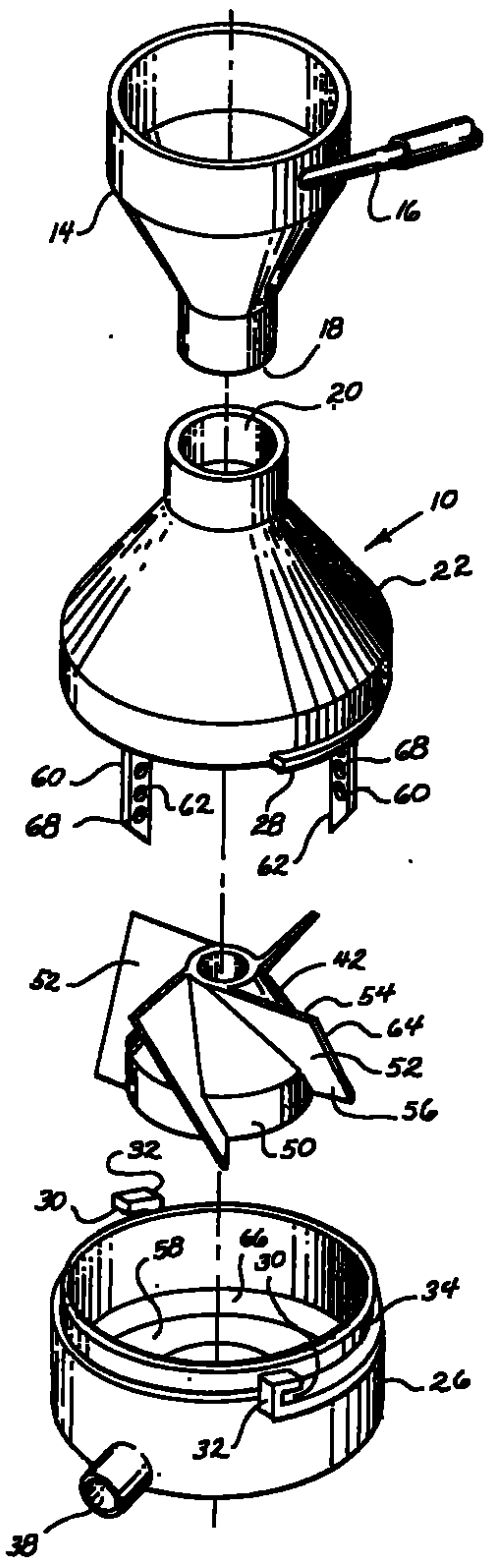


Fig. 2

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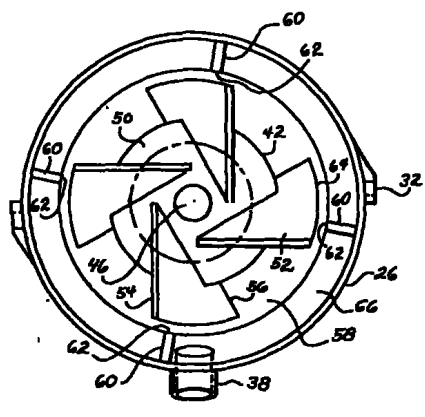


Fig. 4

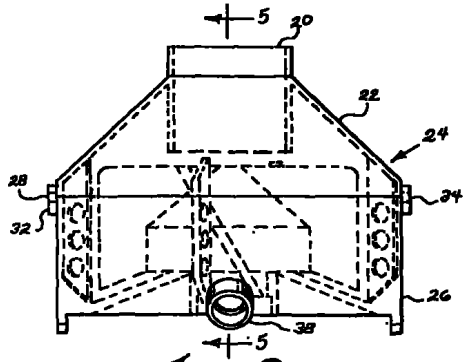


Fig. 3

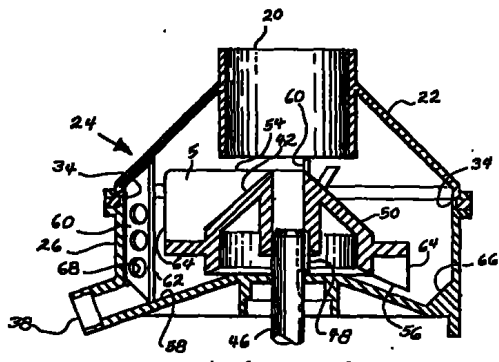


Fig. 5

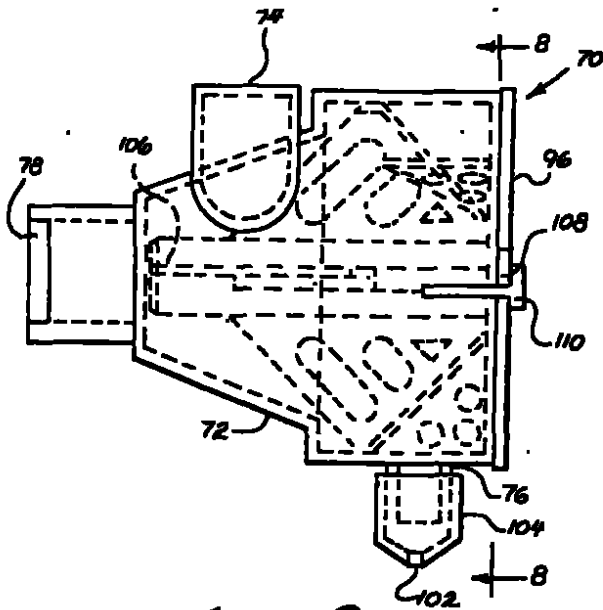


Fig. 6

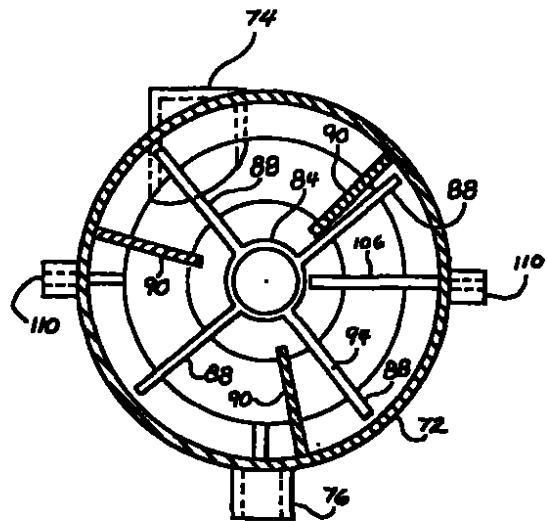


Fig. 8

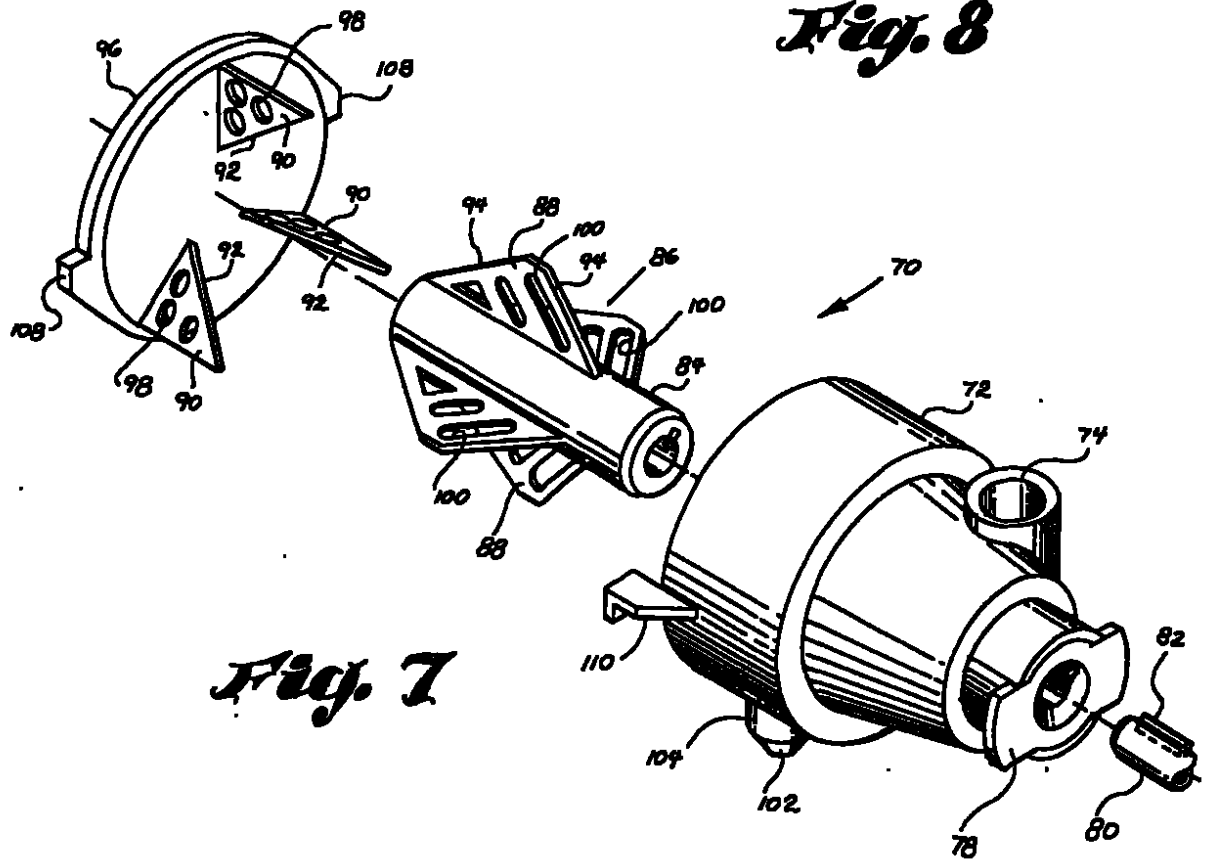


Fig. 7

BLENDER

BACKGROUND OF THE INVENTION

This invention relates to blenders for mixing liquids, liquids and powders, or similar products. More particularly, it pertains to beverage blenders in which a dry powder, for example, is mixed with a liquid such as water to produce a potable beverage.

Beverage blenders of this general type are commonly included in vending machines of the type that dispense soft drinks, coffee, cocoa, and other beverages so that a relatively small volume of dry powder supply can be used with tap water to provide a large number of drinks without frequent replenishing and without a large liquid reservoir, but at the same time it is of course important that the blending be accomplished rapidly and automatically to satisfy customer demands.

A typical prior art example of a blender of this type is disclosed in Joschko U.S. Pat. No. 3,168,292, issued Feb. 2, 1965, for a Beverage Mixing Device. That device has a horizontally disposed cylindrical casing mounted on a panel, and has a laterally offset inlet port located generally adjacent the top of one end of the casing and an outlet port located at the bottom of the other end. An impeller rotates on a longitudinal axis within the casing and has axially aligned blades that have a greater radial extent at the inlet end of the casing than at the outlet end, which is said to produce enhanced mixing near the inlet and smooth flow at the outlet.

The present invention represents a substantial advance over the prior art and particularly over the blender of the Joschko patent as it provides faster, more uniform blending and rapid discharge.

SUMMARY OF THE INVENTION

Briefly described, the blender of the present invention is comprised of a substantially closed blending bowl having spaced intake and discharge ports, stationary blades, an impeller, and means for rotating the impeller. The impeller is mounted in the bowl for rotation about a longitudinal axis and has radially extending blades disposed intermediate the intake and discharge ports. The stationary blades extend longitudinally and radially inwardly from the bowl into close proximity to the impeller blades for cooperation with them for enhanced mixing. One of the stationary blades is disposed adjacent the discharge port in the direction of impeller rotation to facilitate discharge through the discharge port.

In the preferred embodiment, the blending bowl is disposed vertically and has a bottom wall which slopes downwardly and towards the discharge port to facilitate discharge. The impeller and stationary blades may have complementary adjacent edges to provide a shearing action for enhanced mixing and the impeller blades may also be inclined to direct the contents of the blending bowl longitudinally toward the discharge port and to provide enhanced shearing coaction with the stationary blades.

In an alternate embodiment, the blending bowl is disposed horizontally with the intake port located adjacent the rear end of the bowl and the discharge port located adjacent the bottom of its forward end, and blending bowl may be forwardly radially enlarged to facilitate advancement of its contents. The intake port may be laterally offset in the direction of impeller rota-

tion, and a baffle plate extending radially inwardly from the bowl may be located laterally opposite the intake port to confine the contents of the bowl and facilitate longitudinal advancement to the discharge port.

The present invention also is directed to a blender embodying a generally vertically disposed bowl that has a bottom wall adjacent a discharge port, with the bottom wall sloping outwardly toward the discharge port to facilitate discharge as a vertically disposed impeller rotates in the bowl.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a blender according to the preferred embodiment of the present invention;

FIG. 2 is an exploded perspective view of the blender of FIG. 1;

FIG. 3 is a front elevation of the blending bowl and impeller of the blender of FIG. 1;

FIG. 4 is a plan view of the bowl and impeller of FIG. 3 with the top of the bowl removed;

FIG. 5 is a vertical section taken along line 5—5 of FIG. 3;

FIG. 6 is a side elevational view of an alternative embodiment of the blender of the present invention;

FIG. 7 is an exploded perspective view of the blender of FIG. 6; and

FIG. 8 is a vertical section taken along line 8—8 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The blender 10 of the preferred embodiment of the present invention is designed for use in a beverage dispensing machine of the type in which a dry powder product and a liquid, such as water, are blended to form a soft drink, coffee, cocoa, or some other beverage that is dispensed in a measured quantity.

The blender 10 is generally vertically disposed for receipt of a measured amount of dry product from a feed tube 12 opening centrally above a funnel-shaped upper portion 14 of the blender 10, with a measured quantity of liquid being fed through a conduit 16 tangentially into the funnel-shaped upper portion 14 for swirling of the liquid in a manner that clears any dry product from the upper portion 14 and also enhances the blending action described hereinafter. The funnel-shaped upper portion 14 has a bottom opening 18 of sufficient size to allow the dry product and liquid to flow freely therethrough into and through an intake port 20 in the dome 22 of a blending bowl 24 disposed therebelow. As seen in FIGS. 3 and 5, the intake port 20 extends cylindrically into the bowl 24 to control product flow into the center of the bowl and to minimize back splashing therefrom.

The funnel-shaped upper portion 14 is supported on the blending bowl dome 22 with the bottom opening 18 of the upper portion 14 seated in the intake port 20 of the dome 22, and the dome enlarges downwardly to the same direction as a cylindrical base 26 of the blending bowl 24 on which the dome 22 is mounted by engagement of radially protruding flanges 28 on the dome 22 in slots 30 formed in mating lug projections 32 on the base 26. The dome 22 and base 26 are complementarily recessed annularly as indicated at 34 for retention of the dome 22 on the base 26 against lateral movement while the engagement of the flanges 28 and lug projections 32 prevent vertical separation of these parts. The base 26 in turn is fixed to a horizontal plat-

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form 36 of a dispensing machine (not shown), adjacent to which platform 36 a discharge port 38 is formed at the bottom outer edge of the base 26 for discharge of blended beverage from the discharge port 38 through a spout 40 into a cup or other receptacle (not shown). With this arrangement the blending bowl 24 is substantially closed, with the intake port 20 being adjacent one end of the bowl and the discharge port 38 adjacent the other end.

The dry mix and liquid are blended within the bowl 24 by the action of an impeller 42 that is mounted for rotation about a vertical axis coaxial with the axis of the blender 10. This impeller is driven by an electric motor 44 mounted on the bottom of the dispenser platform 36 and has a drive shaft 46 extending upwardly through the platform 36 coaxially into the blending bowl 24 for drivingly mounting thereon of the impeller 42, which is secured for rotation therewith by a key plate 48.

The impeller 42 has a hub 50 that tapers downwardly and outwardly in a frustoconical configuration to an enlarged cylindrical configuration and has four radially projecting blades 52 that are disposed intermediate the intake and discharge ports 20, 38 for blending of the bowl contents in the space therebetween, and that are inclined downwardly from upper leading edges 54 to bottom trailing edges 56, with this blade inclination being related to the direction of impeller rotation to direct the contents of the blending bowl 24 longitudinally downward toward the discharge port 38. The frustoconical shape of the hub 50 and the centrifugal force imparted by the rotating impeller blades 52 directs the contents radially outward toward the discharge port 38, which outward direction is enhanced by the shape of the bottom wall 58 of the blending bowl base 26, which slopes downwardly and outwardly in a frustoconical configuration toward the level of the discharge port 38, which, as seen in FIG. 5, is in effect a continuation of the adjacent portion of the bottom wall 58 of the blending bowl base 26. To enhance the mixing action and to assure substantially complete discharge of the contents from the blending bowl 24 through the discharge port 38, the trailing edges 56 of the impeller blades 52 extend downwardly and outwardly to provide a configuration complementary to the frustoconical configuration of the bottom wall 58 of the blending bowl base 26.

The impeller blades 52 terminate radially at a relatively short spacing from the cylindrical wall of the blending bowl base 26, in which space are disposed four vertically extended stationary blades 60, each of which is secured to the blending bowl dome 22 and extends downwardly into the blending bowl base 26 along the cylindrical wall thereof. The inner vertical edges 62 of the stationary blades 60 are disposed in close proximity to and complementary with the adjacent outer edges 64 of the impeller blades 42 for shearing coaction therewith in blending the contents of the bowl 24, with the aforementioned inclination of the impeller blades 52 enhancing such shearing coaction.

The stationary blades 60 extend downwardly into contact with the bottom wall 58 of the blending bowl base 26, which has a short upwardly and outwardly sloping outer portion 66 that connects the main frustoconical surface with the cylindrical wall and is of generally the same radial extent as the bottom edge of the stationary blades 60. The aforementioned discharge port 38 opens into this outer portion 66 and is, there-

4

fore, disposed within the longitudinal extent of the stationary blades 60.

The stationary blades 60 not only enhance the blending action in cooperation with the impeller blades 52, but one of the stationary blades 60 is located immediately adjacent the discharge port 38 in the direction of impeller rotation, as seen in FIGS. 3, 4 and 5, to facilitate discharge of the contents of the blender through the discharge port 38 by restricting circular flow of the contents, thereby building pressure at the discharge port that causes discharge of the contents through the port. Without disposition of this stationary blade just past the discharge port the contents of the blender would be less imposed toward the discharge port and would, therefore, require a greater length of time to complete emptying of the blender. Thus, this stationary blade location, in cooperation with the downwardly and outwardly sloping bottom wall 58 and the downwardly inclined impeller blades 52 results in a rapid discharge of the contents from the blender, which is of particular importance in a beverage dispensing machine because of the reduced power requirements and particularly because of the reduced time necessary to deliver a beverage to the user of the machine. The resulting faster cycling of the machine also allows more drinks to be dispensed in a given period of time for the benefit of the owner or operator of the machine.

Of course, to have a short cycle or blending period, it is necessary that a full blending action can be accomplished in the cycle time. This is obtained in the blender of the present invention by the combination of stationary and impeller blades and the shearing coaction of the edges as described hereinabove. The blending is also enhanced by providing apertures 68 in the stationary blades 60. All of these factors also contribute to the creation of substantial turbulence not only to accomplish rapid blending but also importantly to produce substantial aeration for taste qualities and for economy of cost per drink.

In an alternate form of the present invention, a generally horizontally disposed blender 70 is utilized, having a substantially closed blending bowl 72 that enlarges radially from a rear end adjacent which a downwardly opening intake port 74 is located to a forward end adjacent the bottom of which a discharge port 76 is located. The rear end of the blending bowl 72 extends cylindrically for mounting in the frame of a beverage dispensing machine and has an end flange 78 for locking to a machine frame. The shaft 80 of a drive motor (not shown) extends through the rear end of the blending bowl 72 and carries a key plate 82 that locks the shaft 80 in the hub 84 of an impeller 86 disposed coaxially within the blending bowl 72 for rotation by the shaft 80.

The impeller 86 has four radially projecting blades 88 disposed intermediate the intake port 74 and the discharge port 76 for blending of dry product and liquid received through the intake port 74 and advancing longitudinally through the blending bowl 72 and ultimately through the discharge port 76.

As in the case of the embodiment of FIGS. 1-5, the impeller blades 88 operate in cooperation with stationary blades 90 mounted in the blending bowl 72 and projecting radially therein with inner edges 92 in close proximity to and shaped complementary with the outer edges 94 of the impeller blades 88. These complementary edges 92, 94 taper from relatively near the base of the impeller blades 88 at the forward end of the blend-

5

ing bowl 72 to adjacent the cylindrical wall of the bowl intermediate the ends thereof. Thus, as seen in FIGS. 6 and 7, the impeller blades 88 are triangular with one side thereof being the inner edge secured to the impeller hub 84 and the other sides converging to an apex closely adjacent the blending bowl wall, and the stationary blades 90 are triangularly shaped with an inclined base side forming the aforementioned inner edge 92 adjacent the impeller blade 88 and the other triangular sides extending longitudinally at the blending bowl wall and radially along an end cap 96 forming the forward end of the blending bowl 72. These stationary blades 90 are secured to the end cap 96 and extend therefrom into the blending bowl 72 so that the discharge port 76 is disposed within the longitudinal extent of the stationary blades 90. As in the case of the embodiment of FIGS. 1-5, these stationary blades 90 are formed with apertures 98, and in this embodiment the impeller blades 88 are also formed with apertures 100 for enhanced turbulence and shearing action.

Also as in the embodiment of FIGS. 1-5 one of the stationary blades 90 is disposed closely adjacent the discharge port 76 in the direction of impeller rotation to facilitate discharge of the blended contents of the bowl 72, with the discharge also being controlled by the size of the opening 102 in the discharge adapter 104 that is disposed exteriorly over the discharge port 76. This adapter 104 may be changed to use adapters with different size openings for more rapid or slower discharge depending upon the blending cycle required for the particular material being blended.

The discharge port 76 is located at the bottom of the forward end of the blending bowl 72 and the intake port 74 is disposed near the top of the rear of the bowl 72, but laterally offset in the direction of impeller rotation so that the product and liquid introduced through the intake port 74 will be directed downwardly rather than upwardly or partially upwardly were the intake port 74 located centrally or to the opposite side. Also to retain the contents against upward movement and thereby to facilitate longitudinal advance, a baffle plate 106 is secured to the wall of the blending bowl 72 and extends radially inwardly therefrom laterally opposite the intake port 74. This baffle plate 106 is shaped to cooperate with but not to interfere with the operation of the impeller blades 88.

The aforementioned end cap 96 is secured to the forward end of the blending bowl 72 by radial projections 108 on the end cap 96 that engage hook-shaped flanges 110 extending from the blending bowl 72 longitudinally over the radial projections 108. This projection-flange connection prevents longitudinal separation of the end cap 96 and blending bowl 72, and the stationary blades 90, which are fixed to the end cap 96, prevent lateral relative movement of the end cap 96 and blending bowl 72.

From the foregoing descriptions, it will be apparent that fast uniform blending and rapid discharge are produced by the various embodiments of the present invention, which is not intended to be limited by the detailed description and illustrations herein, but is intended to be capable of variation within the scope of the invention and is not to be limited by this disclosure or otherwise except as defined in the appended claims.

I claim:

1. A blender for mixing liquids, liquids and powders, or similar products, said blender comprising a substantially closed blending bowl having spaced intake and

6

discharge ports, an impeller mounted in said bowl for rotation about a longitudinal axis and having radially extending blades disposed intermediate said intake and discharge ports, means for rotating said impeller, and longitudinally extending stationary blades extending radially inwardly from said bowl into close proximity to said impeller blades for cooperation therewith, one of said stationary blades being disposed adjacent said discharge port and past said port in the direction said impeller advances product, said one blade thereby obstructing advance of the product past said discharge port to facilitate discharge of product through said discharge port.

2. A blender according to claim 1 and characterized further in that said stationary and impeller blades have complementary adjacent edges.

3. A blender according to claim 2 and characterized further in that said impeller has a base from which said blades extend radially, and said complementary edges of said stationary and impeller blades taper radially outwardly from relatively near said base of said impeller blades at one end of said bowl to adjacent the wall of said bowl intermediate the ends thereof.

4. A blender according to claim 2 and characterized further in that said impeller blades are inclined with respect to said stationary blades to provide enhanced shearing coaction therewith.

5. A blender according to claim 4 and characterized further in that said impeller blades are inclined forwardly in the direction of impeller rotation from said discharge port toward said intake port, thereby directing the contents of said blending bowl longitudinally toward said discharge port.

6. A blender according to claim 1 and characterized further in that said discharge port is disposed within the longitudinal extent of said stationary blades.

7. A blender according to claim 1 and characterized further in that said stationary blades have apertures therethrough for enhanced mixing action.

8. A blender according to claim 7 and characterized further in that said impeller blades have apertures therethrough for enhanced mixing action.

9. A blender according to claim 1 and characterized further in that said blending bowl is disposed vertically with said intake port adjacent the top thereof and said discharge port adjacent the bottom thereof.

10. A blender according to claim 9 and characterized further in that said impeller blades are inclined forwardly in the direction of impeller rotation from said discharge port upwardly toward said intake port, thereby directing the contents of said blending bowl downwardly toward said discharge port.

11. A blender according to claim 9 and characterized further in that the bottom wall of said blending bowl slopes downwardly and outwardly toward said discharge port.

12. A blender according to claim 11 and characterized further in that said impeller blades have bottom edges extending in a configuration complementary to said sloping bottom wall of said blending bowl.

13. A blender according to claim 11 and characterized further in that said discharge port is located at the outer edge of said sloping bottom wall.

14. A blender according to claim 13 and characterized further in that said sloping bottom wall is frusto-conically shaped.

15. A blender according to claim 1 and characterized further in that said blending bowl is disposed horizon-

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tally with said intake port located adjacent the rear end thereof and said discharge port located adjacent the bottom of the forward end thereof.

16. A blender according to claim 15 and characterized further in that said blending bowl is forwardly radially enlarged to facilitate advancement of the contents thereof.

17. A blender according to claim 15 and characterized further in that said intake port is laterally offset in the direction of impeller rotation.

18. A blender according to claim 17 and characterized further by a baffle plate extending radially inwardly from said blending bowl and laterally opposite said intake port to confine the contents of said blending bowl to facilitate longitudinal advancement thereof.

19. A blender for mixing liquids, liquids and powders, or similar products, said blender comprising a substantially closed blending bowl generally vertically disposed and having a bottom wall, an intake port adjacent one end of said bowl and a discharge port adjacent the other end thereof, said discharge port being disposed adjacent the outer edge of said bottom wall and said

8

bottom wall sloping downwardly toward said outer edge thereof, an impeller mounted in said bowl for rotation about a generally vertical longitudinal axis and having radially extending blades disposed intermediate said intake and discharge ports and extending over said bottom wall, and means for rotating said impeller.

20. A blender according to claim 19 and characterized further in that said impeller blades have edges adjacent said bottom wall and said impeller blades are inclined forwardly in the direction of impeller rotation from said discharge port upwardly toward said intake port, thereby directing the contents of said blending bowl longitudinally toward said discharge port.

21. A blender according to claim 19 and characterized further in that said impeller blades have edges extending in a configuration complementary to said sloping bottom wall of said blending bowl.

22. A blender according to claim 19 and characterized further in that said sloping bottom wall is frustoconically shaped.

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(51) **FROZEN CAPPUCCINO AND FRUIT
SMOOTHIE MACERATOR**

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(*) Notice: Under 35 U.S.C. 154(h), the term of this
patent shall be extended for 0 days.

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366/144; 366/290**

(58) Field of Search **62/68, 342, 343;
366/144, 290, 292, 318**

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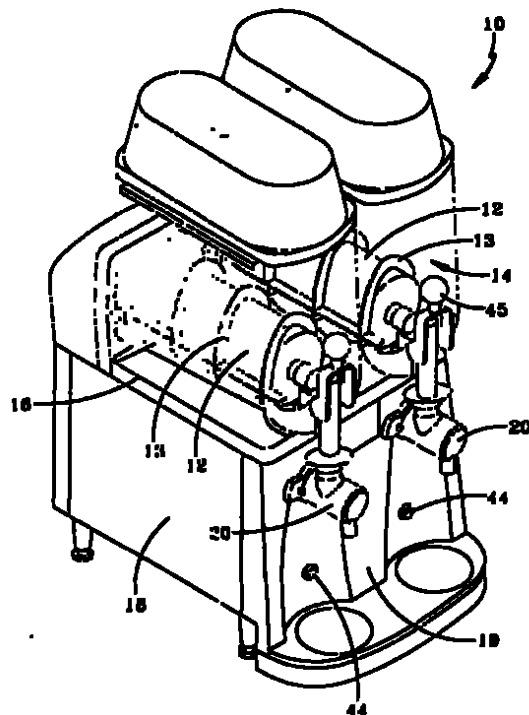
Primary Examiner—William E. Topolcai

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McNees, Wallace & Nurick

(57) **ABSTRACT**

An apparatus for transforming a frozen confection having a coarse texture into a confection having a smooth texture and lighter appearance. The apparatus is comprised of a maceration assembly used in conjunction with a frozen confection machine. The apparatus includes a motor, an electrical connection between the motor and a power supply and a mounting bracket for mounting the motor to the confection machine. Extending from the motor is at least one rotatable motor shaft. The shaft extends through a mount having an integral mount cylinder with a seal seat. A sealing device such as an o-ring, is positioned within the seal seat. A whipping device is attached to the rotatable shaft which extends into a maceration chamber. The maceration chamber has an inlet for receiving frozen confection and an outlet for discharging a semi-frozen confection slurry and is hollow and open at one end, the open end sliding over the whipping device and mount, while forming a seal with the sealing device. A detector detects the presence of an object below the maceration chamber outlet, so as to activate the motor and rotate the whipping device so that coarse frozen confection entering the inlet is macerated within the maceration chamber by the whipping device immediately prior to the discharge through the outlet as a smooth semi-frozen slurry.

18 Claims, 4 Drawing Sheets



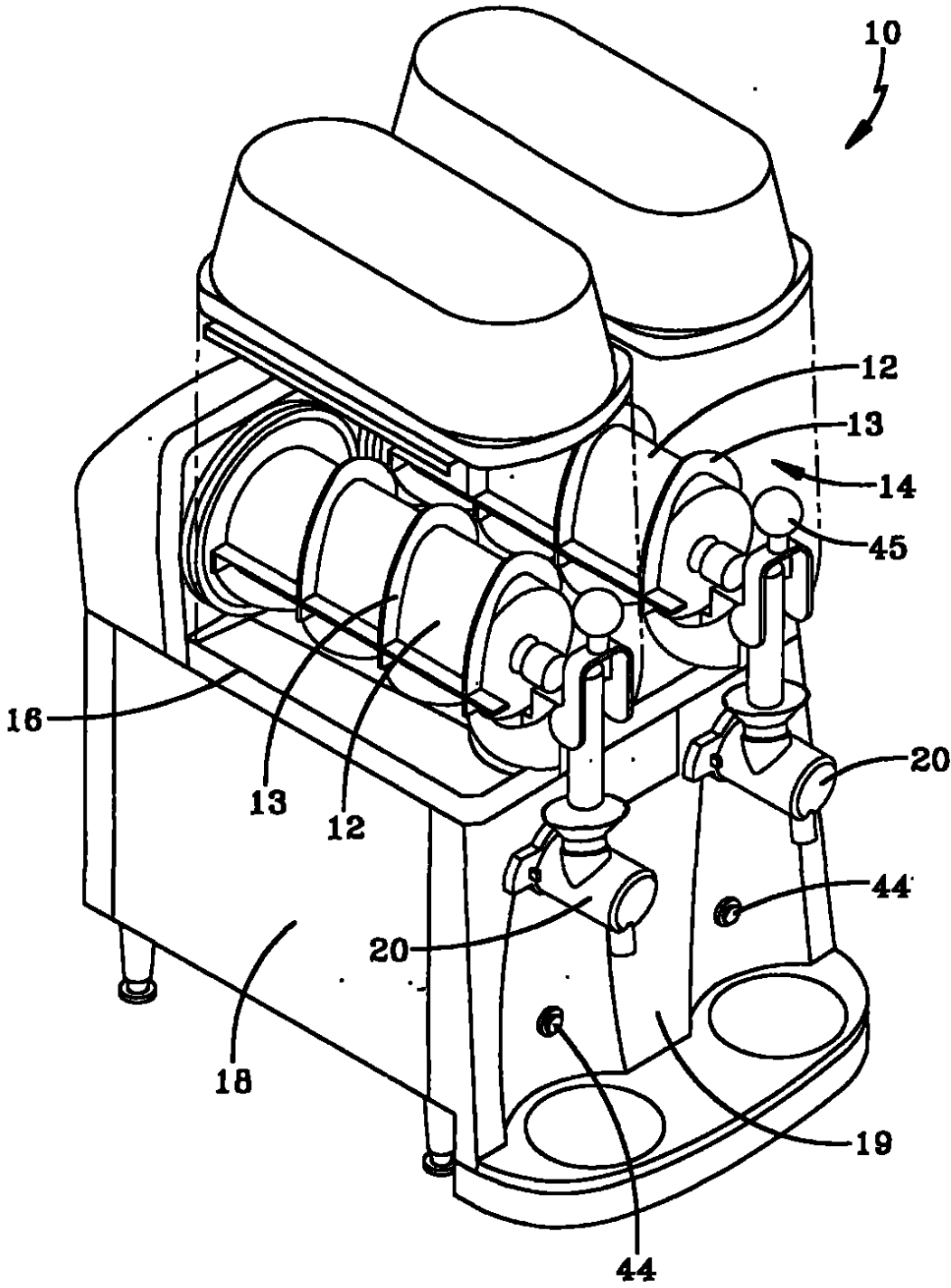
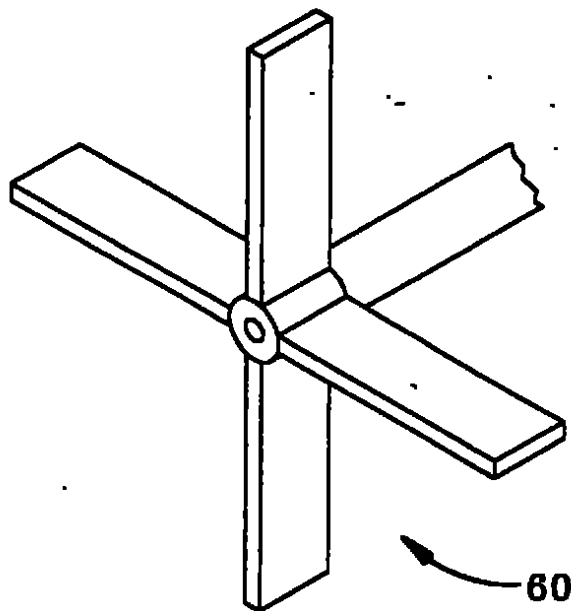
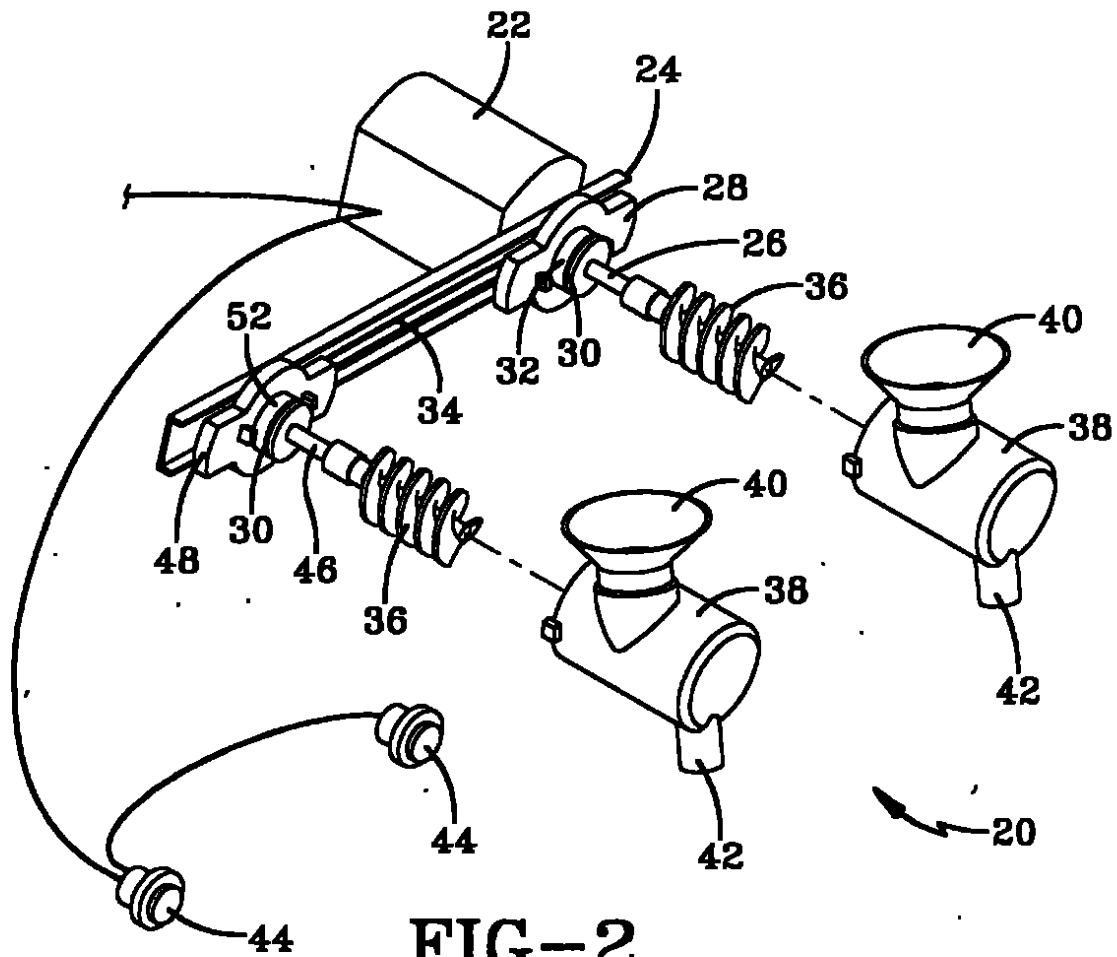


FIG-1

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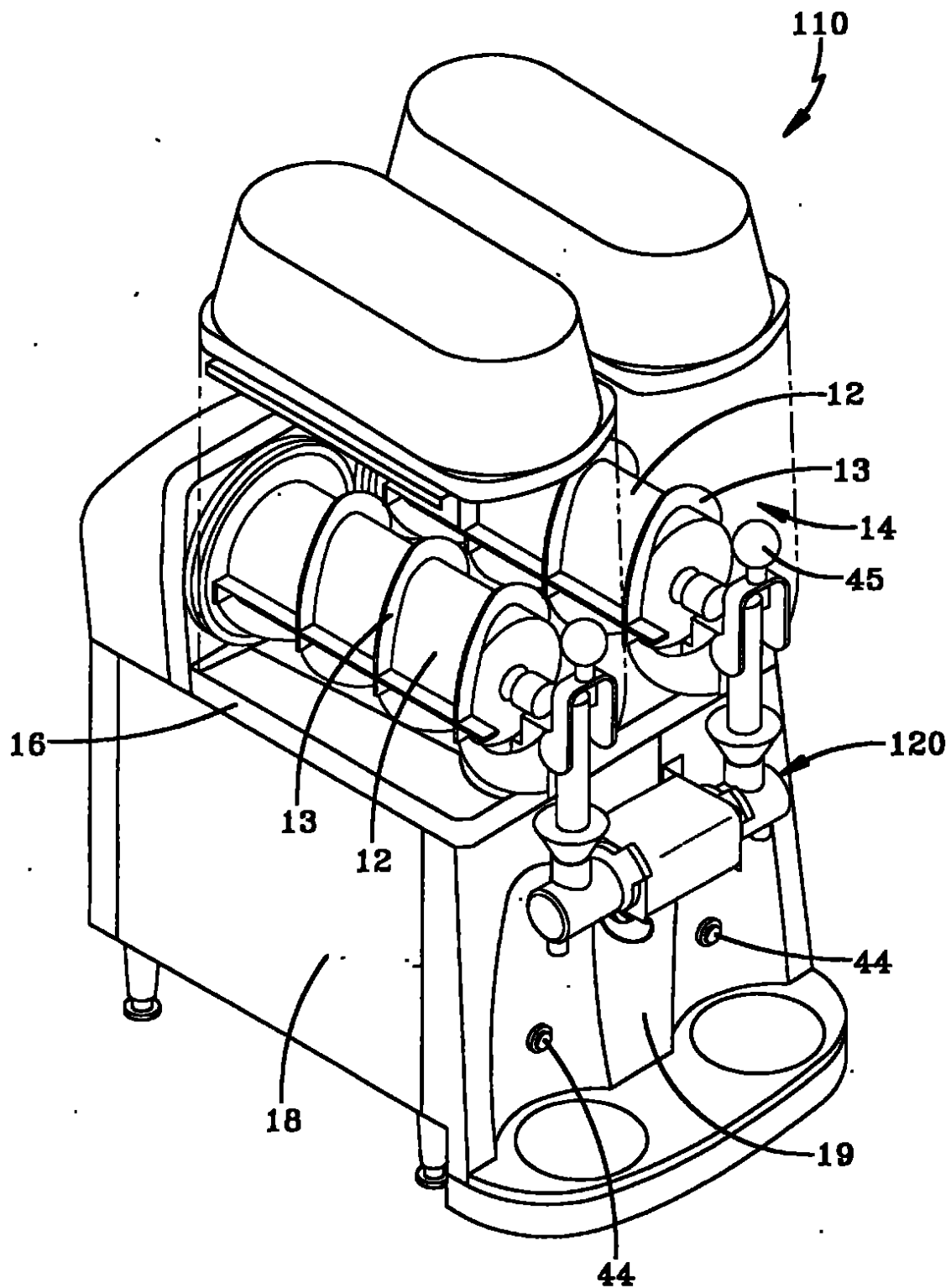


FIG-4

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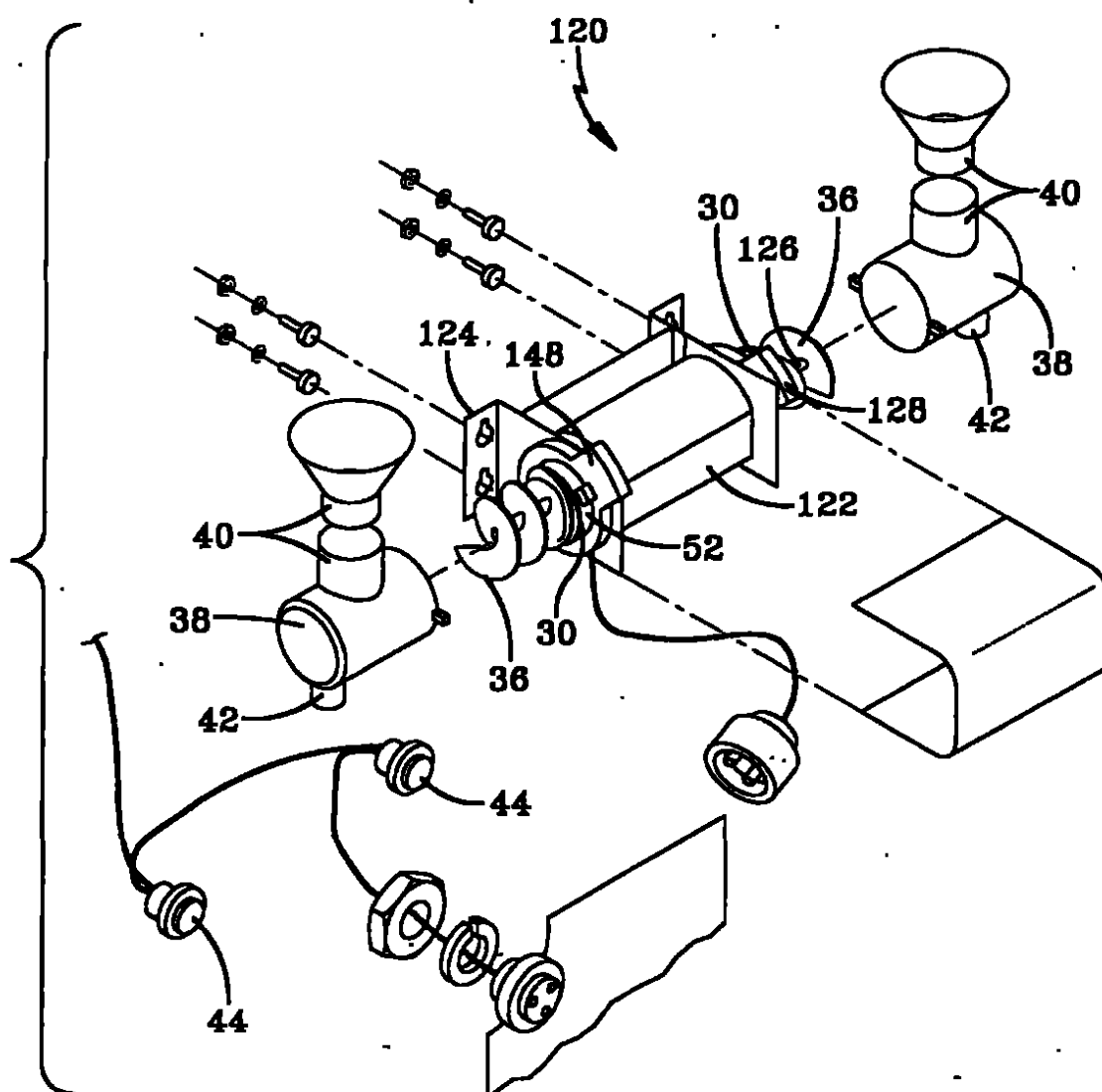


FIG-5

1

FROZEN CAPPUCCINO AND FRUIT SMOOTHIE MACERATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to dispensing equipment for soft serve confections and specifically to dispensing equipment for frozen cappuccino.

2. Description of the Prior Art

Soft serve confections are very popular, having expanded from the corner ice cream store. The soft serve confection business is now available in the corner convenience store. Many different types of frozen confections are now available, since the equipment to make and dispense is now readily available and can be placed on a counter where it is readily accessible to both the customer and the person responsible for maintaining and servicing the equipment.

The equipment currently used is well known, being in use for many years. While some modification and improvements have been made, the confection is maintained in the frozen state by a refrigeration unit contained within a central drum that is maintained at a preselected temperature below the freezing temperature of the fluid that is to be dispensed as frozen or semi-frozen product. As fluid is moved over the surface of the drum, the temperature is reduced below its freezing temperature, and the fluid crystallizes as a solid material on the drum surface. The crystallized soft material is removed from the surface of the drum by an auger that is activated by the user using an activation device, typically a handle that activates the auger by pulling the handle forward. The auger moves over the surface of the drum and scrapes or removes the frozen material from the drum surface while moving the material toward the dispensing assembly located below the handle. While this assembly is commonly used and works well with most liquids, the texture of the frozen product will be a function of the liquid that is frozen.

U.S. Pat. No. 5,494,194 to Topper et al. recognized that the texture of the frozen product is important. This patent recognizes that certain viscous materials such as ice cream can have their texture degraded by repeated compression and decompression of the confection, causing undesirable ice crystals to form. These ice crystals degrade the taste and texture of the confection. To avoid the formation of ice crystals in the confection, Topper et al. moves the confection from a storage container through the refrigeration unit to the dispenser by minimizing the compression of the confection. While this solution is very effective for maintaining the texture of viscous materials that may form ice crystals as a result of repeated compression and decompression cycles, it does not provide a solution for liquids that form ice crystals as they are cooled below their freezing temperature on the drum of a refrigeration unit. One such liquid is cappuccino that is having increased popularity as a frozen confection.

Other examples of means for dispensing frozen product from similar refrigeration units are illustrated in U.S. Pat. No. 5,275,309 to Baron et al. and U.S. Pat. No. 5,553,744 to Sawyer, III. Sawyer, III discloses a bottled water dispenser that includes an ice maker and an ice crusher.

While certain confections have a smooth texture as they form a frozen confection during refrigeration, other confections under certain conditions can and do form ice crystals that degrade the taste of the confection. What is needed is a simple, inexpensive device that can be easily fitted to existing frozen confection machines and that can minimize

2

the effect of the crystallization process, forming a smooth confection that improves the taste of the confection.

SUMMARY OF THE INVENTION

The present invention is an apparatus that can be attached to an existing soft serve confection machine or that can be provided as an integral part of a new soft serve confection machine. The apparatus includes a maceration assembly that can receive a predetermined quantity of soft serve product and modify the product. The soft serve product is produced in well known frozen confection machines that utilize a central refrigeration unit typically housed within a metal drum. Soft serve product is formed on the cool metal drum as it solidifies. The soft serve product will have a varying consistency, depending upon the type of frozen confection being produced. In some cases, the confection will form a smooth product. For some confections, rather coarse crystals are formed during solidification. The solidified confection is removed from the metal drum and is translated toward a discharge port as the drum rotates in relation to an auger. The soft serve product will have a varying consistency, depending upon the type of frozen confection being produced. In some cases, the frozen product will form a smooth product. However, the present invention is most suitable for use with those confections that form large ice crystal, in that the product modification forms a smooth confection.

The maceration assembly typically is mounted outside of the portion of the frozen confection machine that houses the refrigeration unit, although this is not necessary. However, the maceration chamber must be positioned to receive the frozen confection after it leaves the refrigeration unit and before it is dispensed into a receiving container for consumption. The maceration chamber is an enclosed unit that includes a first opening through which the frozen confection is received and a second opening through which the frozen confection is dispensed. Extending into the maceration chamber is a whipper assembly. The whipper assembly consists of a whipping device mounted on a rotatable shaft. The whipping device can be any mechanical assembly such as an auger, an impeller, blades projecting at an angle from the motor shaft or such that can act on the frozen confection. The rotatable shaft extends outward from a standard motor assembly that rotates at a predetermined speed.

A detector is activated to activate the motor and initiate rotation of the whipper assembly upon detection of a predetermined condition. The detector can be activated by the predetermined conditions in a number of ways. As frozen confection is translated by the whipping device to a discharge port or point where it enters the maceration chamber, presence of the frozen confection may be detected as it exits the refrigeration unit and enters the maceration chamber. The detection of the confection activates the motor which in turn causes the whipper assembly to rotate. The action of the whipper assembly blends the frozen confection, modifying its consistency as it moves past a whipping device and is dispensed or discharged through the second opening. The blended confection is noticeable smoother and more appealing to the consumer. In addition, the blended confection also has an appearance of a lighter color than when it is discharged from the frozen confection machine.

An advantage of the present invention is that it can be readily adapted to existing confection machines that yield product having large, grainy-type of crystals with little effort. The use of the present invention with existing confection machines will modify the product so that the texture of the product will be smoother and creamier. Because the

modification can be made with little effort, the cost of the modification is low.

Another advantage of the present invention is that it can be readily removed from existing machines. This feature makes it very easy to clean. If necessary, it also makes the present invention easy to remove if the type of confection produced by the machine is changed to one which has a smooth texture.

Still another advantage of the present invention is that it can be incorporated into the design of a new machine. While the maceration chamber remains easy to remove for cleaning purposes, the motors that drive the whipping device are internal to the confection machine, so as to be less obtrusive.

Other features and advantages of the present invention will be apparent from the following more detailed description of the preferred embodiment, taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

Whenever possible, the same reference numbers will be used throughout the figures to refer to the same parts.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a frozen cappuccino machine that incorporates the maceration chamber of the present invention;

FIG. 2 is an exploded view of the frozen cappuccino machine of FIG. 1;

FIG. 3 is a perspective view of a blades assembly used as a whipper;

FIG. 4 is a perspective view of a frozen cappuccino machine that has been retrofitted with the maceration chamber of the present invention; and

FIG. 5 is an exploded view of the frozen cappuccino machine of FIG. 4.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 is a perspective view of a new frozen cappuccino machine 10 that incorporates the maceration assembly 20 of the present invention. The cappuccino machine of FIG. 1 is a unit that has two separate refrigeration units 12 over which are auger units 13 and two separate fluid compartments 14 for holding the fluid so that two different flavors of cappuccino are available at any one time. Compartments 14 are separated by a flat plate-like surface 16 from a housing 18 which hold the electrical and mechanical assemblies for the cappuccino machine. Housing 18 includes a front panel 19. It will be understood that a unit having a single compartment 14 for dispensing a single flavor can be provided.

Referring now to FIG. 2, a dual whipper assembly 20 includes a motor 22 located within housing 18 that is supported by a mounting bracket 24. Mounting bracket 24 is attached by any convenient method to housing 18. Motor shaft 26 of motor 22 extends through an aperture (not shown) in mounting bracket 24 and housing 18. A pair of mounts 28, 48 are mounted to housing 18, preferably by attachment to mounting bracket 24. A second rotatable shaft 46 is mounted to mount 48. A drive belt 34 extends between motor shaft 26 and second rotatable shaft 46 so that activation of motor 22 causes rotation of both shafts 26, 46. O-rings or seals 30 are positioned within depressions or seal seats that extends 360 around each integral mount cylinder 32, 52 that extend axially from mounts 28, 48. The o-rings are preferably neoprene or other rubber substitutes, but may be any plastic that is moldable, flexible and can form an

effective seal. When o-rings 30 are assembled into the depressions, the outer diameters of the assembled o-rings 30 are slightly larger than the diameter of mount cylinder 32, 52. Attached to each shaft 26, 46 is an impeller 36. The impeller in the preferred embodiment is made of a plastic and is press-fit onto the shaft. A preferred plastic is nylon, which is light in weight and will not contribute to shaft imbalance. While a metal impeller such as stainless steel may be used and affixed to the shaft by any convenient means such as a set screw, plastic, such as nylon is preferred since it is effective and inexpensive being made by injection molding. Replacement parts can be made cheaply and worn parts can be disposed of, with no concern for refurbishment. A maceration chamber 38 is open at one end so it can slide over impeller 36 and mount cylinders 32, 52, the inner diameter of each maceration chamber 38 being larger than impeller 36 and mount cylinders 32, 52. However, maceration chamber 38 being hollow, its inner diameter is slightly smaller than the outer diameter of assembled o-rings 30. To position maceration chamber 38 over o-ring 30, a small amount of force is required. However, the force fit of the inner diameter of chamber 38 over o-ring 30 creates a seal between maceration chamber 38 and impeller mount cylinders 32, 52 by o-rings 30. Maceration chamber 38 is also made from plastic in the preferred embodiment, for the same reasons that plastic is preferred for the impeller. Plastic is also easy to remove and clean. A preferred plastic is a clear or translucent nylon. In addition to being cost effective, it provides visual access to the interior of the chamber, making it easier to ascertain that cleanliness is being maintained.

Maceration chamber 38 includes an inlet 40 and an outlet 42. As shown in FIG. 2, inlet 40 is in the form of a funnel-shaped device, and outlet 43 lies on the underside of maceration chamber 38. In the preferred embodiment inlet 40 is a separate funnel-shaped device preferably made from plastic that slides into an aperture on the upper portion of chamber 38. However, inlet 40 can assume any desirable shape and may even be molded included as an element in a single piece maceration chamber 38. Referring again to FIG. 1, maceration chamber 38 extends outward from front panel 19 of housing 18 being located so that confection in the form of frozen confection is transferred from the refrigeration unit into maceration chamber 38. Inlet 40 must have an opening large enough to permit the frozen confection to move freely from the refrigeration unit into the maceration chamber. On front panel 19 are detectors 44 that detects when a cup or a container is placed below outlet 42 of either maceration chamber 38. The detection of the cup by detector 44 closes a switch thereby automatically activating motor 22. Activation of motor 22 causes rotation of shafts 26, 46. As either handle 45 is engaged to cause frozen confection to be removed from the refrigeration unit and transferred from compartments 14, the frozen confection is transferred through inlets 42 where it is engaged in maceration chamber 38 by whipping device which acts to whip the frozen confection while moving it in the direction of outlet 42. The effect of the whipping device on the frozen confection is to macerate or fracture the large ice crystals of the confection into much smaller ice crystals, thereby changing the texture from a coarse grainy texture to a smooth, consistent texture that is lighter in appearance. While the maceration chamber 38 and whipping device shown as an auger 32 act as a whipper assembly, it will be understood that the auger-like impeller may be replaced by any suitable mechanical device that can act in the same manner to macerate the large ice crystals into smaller ice crystals. For example, a whipping device that consists of a bladed assembly 60 extending at

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substantially right angles to the motor shaft as shown in FIG. 3 has been found to perform satisfactorily. While the embodiment discussed above utilizes a single motor to drive the dual whipper assemblies, each whipper assembly 20 can be operated independently by a dedicated motor.

In another embodiment of the present invention, a maceration assembly is retrofitted to an existing cappuccino machine. Referring to FIG. 4, a dual whipper assembly 120 is assembled to the front panel of an existing cappuccino machine 110. The cappuccino machine 110 of FIG. 4 also has two separate refrigeration units 12 over which are auger units 13 and two separate fluid compartments 14 for holding the fluid so that two different flavors of cappuccino are available at any one time. Compartments 14 are separated by a flat plate-like surface 16 from a housing 18 which holds the electrical and mechanical assemblies for the cappuccino machine. Housing 18 includes a front panel 19. Frozen confection is dispensed from either compartment by engaging one of handles 45, which activates auger and discharges frozen confection from one of compartments 14. It will be understood that a unit having a single compartment 14 for dispensing a single flavor can be provided.

While dual whipper assembly 120 operates on frozen confection in the same manner to produce the same improved result, whipper assembly 120 is assembled to cappuccino machine 110 in a slightly different manner than whipper assembly 20 is assembled to new cappuccino machine 10. Referring now to FIG. 5, a dual whipper assembly 120 includes a motor 122 that is supported by a mounting bracket 124 located outside of housing 18. Mounting bracket 124 is attached by any convenient method to housing 18, but is bolted on to housing in the preferred embodiment. Motor 122 includes motor shaft 126 that extends in opposite directions outward from motor 122 through apertures in mounting bracket 124. A pair of mounts 128, 148 are mounted on opposed sides to mounting bracket 124. O-rings or seals 30 are positioned within depressions that extend 360° around each mount cylinder 32, 52 that extend axially from mounts 128, 148. Maceration chambers 38 are assembled to mounts 128, 148 over o-rings 30 and impellers 36 in the manner previously described.

Maceration chamber 38 is as previously described including an inlet 40 in the form of a funnel-shaped device and an outlet 42 on the underside of maceration chamber 38. Front panel 19 of cappuccino machine 110 is retrofitted with detectors 44 that detects when a cup or a container is placed below outlet 42 of either maceration chamber 38 and operates as previously described by detecting the presence of a cup and automatically activating motor 122.

While detectors 44 can be any suitable device such as electronic sensors, position sensors and the like, capable of detecting the proximity of a cup or container, optical detectors are preferred since they are readily available and inexpensive.

In operation, liquid cappuccino is placed into compartments 14. While the invention is described in terms of frozen cappuccino, it will be understood by those familiar with the production of this confection that cappuccino as used herein and within the industry is actually a combination of flavored additives such as vanilla, chocolate, Irish cream or other coffee-like flavoring along with creaming agents, sugar and other additives. This liquid, placed into the compartment or compartments 14, is not cappuccino such as is purchased in a coffee shop. Frozen cappuccino is formed on a central drum, which is maintained at a temperature of the frozen cappuccino. However, due to the solidification process for

6

cappuccino, it freezes as large ice-like crystals. A customer places a cup below outlet 42 of a maceration chamber 38. The presence of the cup is detected by an optical sensor 40, which immediately activates motor 22 causing rotation of an impeller within the whipper assembly.

The customer activates handle 45 on the cappuccino machine which activates auger 13, causing coarse-grained frozen cappuccino to be transported into inlet 40, where it falls into the interior of maceration chamber 38. The frozen cappuccino is then whipped by whipper assembly 20 and moved toward outlet 42. The whipping reduces the size of the ice crystals causing a more uniform, smoothly textured frozen confection. The mechanical action of the whipper assembly on the frozen confection reduces the size of the crystals and also melts a small amount of the confection, but not enough to affect the frozen nature of the confection. This small amount of melted confection combines with the remaining amount of the crystals, which still form the bulk of the confection, to create a semi-frozen, flowable slurry of uniform texture. While a small amount of air may be blended with the confection, its contribution to the uniform texture is small.

While the above description has been directed to freezing of a liquid concoction referred to as "cappuccino" that is combination of flavored additives such as vanilla, chocolate, Irish cream or other coffee-like flavoring along with creaming agents, sugar and other additives, the machine also works effectively with a concoction referred to as "fruit smoothies." Fruit smoothies, as used within the industry, are comprised of a combination of fruit-flavored base flavoring along with creaming agents, sugar and other additives. Like the "cappuccino" the fruit smoothies also form rather large crystals when frozen in standard confection machines. Thus, the present invention is also effective in improving the texture and the consistency of this frozen confection.

Although the present invention has been described in connection with specific examples and embodiments, those skilled in the art will recognize that the present invention is capable of other variations and modifications within its scope. These examples and embodiments are intended as typical of, rather than in any way limiting on, the scope of the present invention as presented in the appended claims.

What is claimed is:

1. A confection apparatus for producing frozen confection having a smooth texture, comprised of:

a machine for producing frozen confection having a central refrigeration unit housed within a metal drum, an assembly for removing frozen confection formed on the metal drum and translating the frozen confection toward a discharge port, and means for activating the assembly for removing frozen confection;

a maceration assembly mounted to the frozen confection machine, the assembly including a chamber having an inlet for receiving frozen confection from the discharge port of the machine, a whipping device positioned within the chamber for reducing the size of the frozen confection crystals and whipping the frozen confection into a semi-frozen slurry of smooth, uniform texture that moves the frozen confection to an outlet of the chamber, the whipping device rotatably attached to a motor shaft;

a motor that rotates the motor shaft when activated; and a detector for activating the motor upon detecting the presence of a predetermined condition.

2. The confection apparatus of claim 1 wherein the detector detects the presence of a cup below the chamber outlet.

7

3. The confection apparatus of claim 1 wherein the detector detects activation of the assembly for removing frozen confection from the frozen confection machine.

4. The confection apparatus of claim 1 wherein the detector detects a discharge of frozen confection from the frozen confection machine into the inlet of the maceration assembly.

5. The confection apparatus of claim 1 wherein the motor is integral with the maceration assembly which is mounted to the frozen confection machine below the discharge port.

6. The confection apparatus of claim 1 wherein the motor is mounted on a mounting bracket within the frozen confection machine, and the motor shaft extends through the frozen confection machine and into the maceration assembly mounted below the discharge port of the frozen confection machine.

7. A confection apparatus for producing frozen confection having a smooth texture, comprising:

a machine for producing frozen confection having a central refrigeration unit housed within a metal drum, an assembly for removing frozen confection formed on the metal drum and translating the frozen confection toward a discharge port, and means for activating the assembly for removing frozen confection; and

a maceration assembly mounted to the machine for receiving frozen confection from the machine discharge port, the maceration assembly including a motor, an electrical connection between the motor and a power supply, a mounting bracket for mounting the motor to the machine, at least one rotatable motor shaft connected to the motor, a mount having an integral mount cylinder with a seal seat through which extends the at least one motor shaft, a sealing device positioned within the seal seat, a whipping device attached to the at least one rotatable shaft, a maceration chamber having an inlet for receiving frozen confection and an outlet for discharging a semi-frozen slurry of confection, the chamber being hollow and open at one end, the open end of the chamber sliding over the whipping device and mount while forming a seal with the sealing device, and

a detector for detecting the presence of an object below the maceration chamber outlet so as to activate the motor and rotate the whipping device while the object is present below the outlet so that confection entering the inlet is macerated within the maceration chamber by the whipping device immediately prior to the discharge through the outlet.

8

8. The assembly of claim 7 wherein the detector is an optical detector.

9. The assembly of claim 7 wherein the detector is an electronic proximity sensor.

10. The assembly of claim 7 wherein the whipping device is an impeller.

11. The assembly of claim 7 wherein the whipping device is an auger.

12. The assembly of claim 7 wherein the whipping device is a plurality of blade-shaped projections extending at a predetermined angle from the motor shaft.

13. The assembly of claim 7 wherein the inlet of the maceration chamber further includes a removable funnel.

14. The assembly of claim 7 wherein the inlet of the maceration chamber is an integral funnel-shaped opening.

15. The assembly of claim 7 wherein the maceration chamber is made from a plastic material.

16. The assembly of claim 15 wherein the plastic material is nylon.

17. The assembly of claim 7 wherein the whipping device is made from plastic.

18. A method for transforming a frozen confection having a coarse texture into a confection having a smooth texture, comprising the steps of:

producing a frozen confection having a coarse texture in a frozen confection machine having a central refrigeration unit housed within a metal drum, an assembly for removing frozen confection formed on the metal drum and translating the frozen confection toward a discharge port, and means for activating the assembly for removing frozen confection;

discharging the coarse frozen confection into an assembly mounted to the frozen confection and below its discharge port, the assembly including a chamber having an inlet for receiving frozen confection from the discharge port of the machine, a whipping device positioned within the chamber, the whipping device rotatably attached to a motor shaft and an outlet;

activating a motor attached to the motor shaft, causing rotation of the whipping device;

whipping the coarse frozen confection into a semi-frozen slurry and transporting the semi-frozen slurry to the outlet; and

discharging the semi-frozen slurry from the outlet.

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100
101

PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

HULSEY, William, N., III
Hugues & Luce, L.L.P.
1717 Main Street, Suite 2800
Dallas, TX 75201
United States of America

Date of mailing (day/month/year) 21 September 2002 (21.09.02)	
Applicant's or agent's file reference 13039.191 WO	IMPORTANT NOTIFICATION
International application No. PCT/US02/21921	International filing date (day/month/year) 12 July 2002 (12.07.02)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 13 July 2001 (13.07.01)
Applicant CRANE MERCHANDISING SYSTEMS, INC. et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk (*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
13 July 2001 (13.07.01)	60/305,473	US	21 Augu 2002 (21.08.02)
09 May 2002 (09.05.02)	10/142,317	US	21 Augu 2002 (21.08.02)

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer SEYMANY Malathib Telephone No. (41-22) 338.83.38
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PATENT COOPERATION TREATY

102

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

MUNCK, William, A.
900 Three Galleria Tower
13155 Noel Road
Dallas, TX 75240
United States of America

Date of mailing (day/month/year) 28 August 2003 (28.08.03)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 13039.191 WO	
International application No. PCT/US02/21921	International filing date (day/month/year) 12 July 2002 (12.07.02)

1. The following indications appeared on record concerning:		
☒ the applicant	☐ the inventor	☐ the agent ☐ the common representative
Name and Address CRANE CO. 12955 Enterprise Way Bridgeton, MO 63044-1200 United States of America	State of Nationality US	State of Residence US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
☐ the person	☐ the name	☒ the address ☐ the nationality ☐ the residence
Name and Address CRANE CO. 100 First Stamford Place Stamford, CT 06902 United States of America	State of Nationality US	State of Residence US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:
--

4. A copy of this notification has been sent to:	
☒ the receiving Office	☐ the designated Offices concerned
☒ the International Searching Authority	☒ the elected Offices concerned
☒ the International Preliminary Examining Authority	☐ other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740-1435	Authorized officer Marek LASKOWSKI (Fax 338-71-30) Telephone No. (41-22) 338 8152
---	---

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

HULSEY, William, N., III
Hugues & Luce, L.L.P.
1717 Main Street, Suite 2800
Dallas, TX 75201
United States of America

Date of mailing (day/month/year)

18 March 2003 (18.03.03)

Applicant's or agent's file reference

13039.191 WO

International application No.

PCT/US02/21921

IMPORTANT NOTIFICATION

International filing date (day/month/year)

12 July 2002 (12.07.02)

1. The following indications appeared on record concerning:



the applicant



the inventor



the agent



the common representative

Name and Address

SETTES, Gregory, G.
3213 Bassett Road
Pacific, MO 63069
United States of America

State of Nationality

State of Residence

US

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:



the person



the name



the address



the nationality



the residence

Name and Address

STETTES, Gregory, G.
3213 Bassett Road
Pacific, MO 63069
United States of America

State of Nationality

State of Residence

US

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:



the receiving Office



the designated Offices concerned



the International Searching Authority



the elected Offices concerned



the International Preliminary Examining Authority



other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740-1435

Authorized officer

JEANNEROT Jocelyn

Telephone No. (41-22) 338 8958

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

HULSEY, William, N., III
Hugues & Luce, L.L.P.
1717 Main Street, Suite 2800
Dallas, TX 75201
United States of AmericaDate of mailing (day/month/year)
18 March 2003 (18.03.03)Applicant's or agent's file reference
13039.191 WOInternational application No.
PCT/US02/21921

IMPORTANT NOTIFICATION

International filing date (day/month/year)
12 July 2002 (12.07.02)

1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representativeName and Address
CRANE MERCHANDISING SYSTEMS, INC.
12955 Enterprise Way
Bridgeton, MO 63044-1200
United States of AmericaState of Nationality
USState of Residence
US

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☒ the name ☐ the address ☐ the nationality ☐ the residenceName and Address
CRANE CO.
12955 Enterprise Way
Bridgeton, MO 63044-1200
United States of AmericaState of Nationality
USState of Residence
US

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office ☒ the designated Offices concerned
☐ the International Searching Authority ☐ the elected Offices concerned
☐ the International Preliminary Examining Authority ☐ other:The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740-1435

Authorized officer

JEANNEROT Jocelyn

Telephone No: (41-22) 338 8958

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF RECEIPT OF DEMAND BY COMPETENT INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

(PCT Rules 59.3(e) and 61.1(b), first sentence
and Administrative Instructions, Section 601(a))

To: WILLIAM N. HULSEY HUGHES & LUCE, L.L.P. 1717 MAIN STREET, SUITE 2800 DALLAS, TEXAS 75201		Date of mailing (day/month/year) 22 APR 2003
Applicant's or agent's file reference 13039.191WO		IMPORTANT NOTIFICATION
International application No. PCT/US02/21921	International filing date (day/month/year) 12 Jul 2002	Priority date (day/month/year) 13 Jul 2001
Applicant CRANE MERCHANDISING SYSTEMS, INC.		

1. The applicant is hereby notified that this International Preliminary Examining Authority considers the following date as the date of receipt of the demand for international preliminary examination of the international application:

12 FEBRUARY 2003

(12-02-03)

2. That date of receipt is:

- ☒ the actual date of receipt of the demand by this Authority (Rule 61.1(b)).
- ☐ the actual date of receipt of the demand on behalf of this Authority (Rule 59.3(e)).
- ☐ the date on which this Authority has, in response to the invitation to correct defects in the demand (Form PCT/IPEA/404), received the required corrections.

3. ☐ **ATTENTION:** That date of receipt is **AFTER** the expiration of 19 months from the priority date. Consequently, the election(s) made in the demand does (do) not have the effect of postponing the entry into the national phase until 30 months from the priority date (or later in some Offices) (Article 39(1)). Therefore, the acts for entry into the national phase must be performed within 20 months from the priority date (or later in some Offices) (Article 22). For details, see the *PCT Applicant's Guide*, Volume II.

- ☐ (If applicable) This notification confirms the information given by telephone, facsimile transmission or in person on:

4. Only where paragraph 3 applies, a copy of this notification has been sent to the International Bureau.

Name and mailing address of the IPEA/ Assistant Commissioner for Patent, Box PCT Washington, D.C. 20231 Attn:RO/US	Authorized officer Terry Johnson-Vessels
Facsimile No. 703-305-3230	Telephone No. (703) 305-3624

Form PCT/IPEA/402 (July 1998)

705

REQUISITOS NECESARIOS PARA PRESE TRAMITE

SECRETARIA Y CHANCERIA

Indicaciones: 00001606 00000000

Folios: 105

Fecha (2004): 2004-01-14 16:46:32

Tramite : 011 PCI-PROLIM 379 PASL MCI 411 PASL MCI

Dependencia: 2020 DIVISION DE NUEVAS INVENCIONES

USUARIO RADICADOR

PATENTE DE INVENCION

MODELO DE UTILIDAD

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- Indicación de que se solicita la concesión de una patente.
- Datos de identificación del solicitante o de la persona que se presenta la solicitud.
- Descripción de la invención.
- Dibujos de ser estos pertinentes.
- Comprobante de pago de las tasas establecidas.

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DISEÑO INDUSTRIAL

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- Indicación de que se solicita el registro de Diseño Industrial
- Datos de identificación del solicitante o de la persona que presenta la solicitud.
- Representación gráfica y fotográfica del Diseño Industrial o muestra del Material que incorpora el diseño.
- Comprobante de pago de las tasas establecidas

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ESQUEMA DE TRAZADO

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- Indicación de que solicita el registro de un Esquema de trazado.
- Datos de identificación del solicitante o de la persona que presenta la solicitud.
- Representación gráfica del esquema de trazado
- Comprobante de pago de las tasas establecidas.

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Firma Responsable

Fecha:



2020
Bogotá, D.C.,

Doctor:
Ramiro Castro Duque

Oficio N° 03241

ASUNTO:	Radicación N°	04-1686
	Solicitud Internacional	PCT/US2002/21921
	Fecha inicio fase nacional	13/02/2004
	Trámite	011
	Evento	379
	Actuación	430
	Folios	001

Como resultado del examen de forma, realizado con fundamento en el artículo 38 de la Decisión 486 de la Comisión de la Comunidad Andina, artículo 27 del Tratado de Cooperación en Materia de Patentes (PCT), regla 51 bis del Reglamento y Circular Única de la Superintendencia de Industria y Comercio, se le comunica que:

- ❑ La solicitud no contiene la traducción de las reivindicaciones tal como fueron presentadas. (Numeral 5.2.5, capítulo quinto del título décimo de la Circular Única de la SIC).
- ❑ La solicitud nacional no contiene la traducción de la solicitud Internacional tal como fue presentada. (Numeral 5.2.5, capítulo quinto del título décimo de la Circular Única de la SIC).
- ❑ La solicitud no contiene la copia del documento en que consta la cesión del derecho a la patente del inventor al solicitante o a su causante. (Art. 26-k) Decisión 486).
- ❑ La solicitud no contiene el poder debidamente otorgado, con el lleno de los requisitos exigidos por los artículos 63 y subsiguientes del Código de Procedimiento Civil. Adicionalmente, deberá presentar el documento que acredita la existencia y representación legal de la sociedad solicitante, cuando ésta fuere persona jurídica.

En cumplimiento de lo dispuesto por el artículo 39 de la Decisión 486, se le requiere para que dentro del término de dos meses siguientes a la fecha de notificación del presente oficio, complete los requisitos anteriormente enunciados. En caso de no dar cumplimiento al presente requerimiento, la solicitud se considerará abandonada y perderá su prelación.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única N° 10 de 2001.


ALIX CARMENZA CESPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones.

El anterior requerimiento fue notificado por fijación en lista de fecha, 27 de Mayo 2004.