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SUPERINDUSTRIA Y COMERCIO

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Trámite : 011 PCT-PATENT 379 PAGE INCI 538 PETICION
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

Trámite: 011
Evento: 379
Actuación: 538

Señora Jefe de la
DIVISION DE NUEVAS CREACIONES
Superintendencia de Industria y Comercio
E. S. D.

Referencia : Expediente No. 02.069.584
Asunto : Solicitud de patente para "SENSOR DE AIRE EN LÍNEA PARA BOMBA AMBULATORIA DE INFUSIÓN DE DROGAS"
Solicitante : BAXTER INTERNATIONAL INC.
Fecha de Solicitud : 9 de Agosto de 2002
Publicada en : Gaceta 531 del 29 de Agosto de 2003

1. Yo, Emilio FERRERO, identificado como aparece al pie de mi firma, actuando como apoderado en el asunto de la referencia, atentamente, solicito se efectúe el examen de patentabilidad de la solicitud en referencia según lo establecido en el artículo 44 de la Decisión 486 de la Comisión de la Comunidad Andina. Para tal efecto presento junto con este escrito el recibo No. 04 - 3.584 por valor de \$353.000.00, que corresponde a la tasa fijada según lo dispuesto en la resolución No. 37323 del 30 de diciembre de 2003.

2. Ruego atentamente a la Señora Jefe se sirva ordenar que se anexe este recibo, para que se efectúe dicho examen y se continúe con el trámite de la solicitud.

Bogotá, 11 FEB. 2004
Señora Jefe,



EMILIO FERRERO
T.P.A. No. 31.929

COLO 05873 841 003 2
PRP/PRP/ID-000438/WPCL5873

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 4 - 3,584
FECHA : ENERO 19 DE 2004

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CAVELIER ABOGADOS	CONSIGNACION	BANCO POPULAR	050-00110-6	10497413	19/01/2004	38,989,800.00

***** C O N C E P T O *****

CANT. RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	85 EXAMEN DE PATENTABILIDAD DE INVEN	353,000.00
	TOTAL :	\$ 353,000.00

SOM: TRESCIENTOS CINCUENTA Y TRES MIL PESOS

RESPONSABLE : 

RECIBO DE CAJA APLICADO AL ASUNTO No.

Colo 05873 841-003-2

DIVISION DE NUEVAS CREACIONES

RADICACIÓN EXPEDIENTE No. 02-069584

EL EXTRACTO DE LA PRESENTE SOLICITUD DE PATENTE DE INVENCION

PCT FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No 531,

DE FECHA 29 DE AGOSTO DEL 2003, EL TERMINO HABIL SEÑALADO POR

LA LEY EXPIRA EL 26 DE NOVIEMBRE DEL 2003.

NOTA: Dentro del plazo de los seis (6) meses siguientes a partir de la fecha de publicación en la gaceta de Propiedad Industrial, deberá solicitar y cancelar el examen de patentabilidad so pena de que la solicitud caiga en abandono, de acuerdo con lo establecido en el Artículo 44 de la Decisión 486/2000.

SE PRESENTARON OPOSICIONES POR PARTE DE TERCEROS.

SI

NO **X**

Bogotá D.C., NOVIEMBRE de 2005

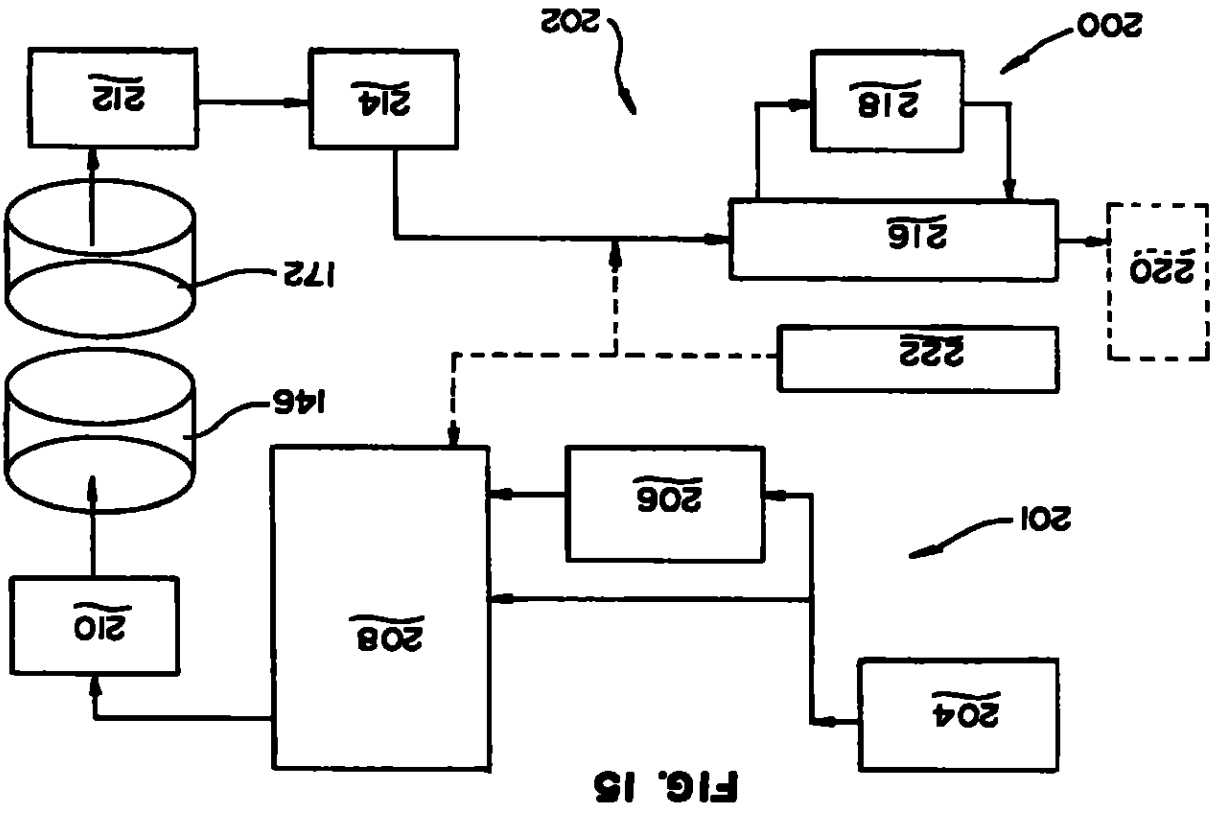
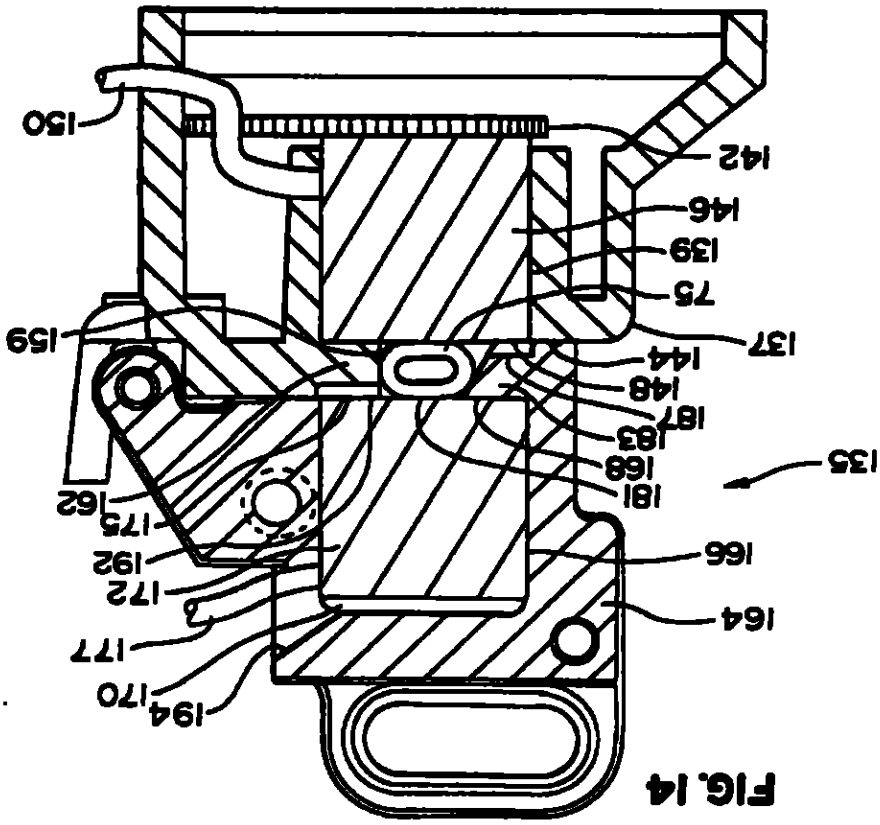
The display drivers are used by the data communication node 42 to activate a display on the gaming device which indicates that the machine is now in a bonus mode or condition.

F. FLOOR CONTROLLER

5 As shown in FIG. 1, the floor controller is directly connected to both the high speed network 38 and a plurality of gaming devices. The floor controller is responsible for monitoring the activity of each of the gaming devices connected thereto and reporting this activity to the database 32. In addition, the floor controller is responsible for transmitting a reconfiguration command to a selected
10 one or more of the gaming devices during certain bonus conditions. These conditions will be described in detail in the operation section below.

The floor controller is connected to the associated gaming devices by current loop networks. Because of the limitations of the current loop network, only a predetermined number of gaming devices can be supported on any one
15 current loop network. In the preferred embodiment, each current loop network supports up to 64 gaming devices. In order for each floor controller to support more than this predetermined number of gaming devices, each floor controller is equipped with a communication board 246, as shown in FIG. 12. The communication board 246 supports up to 16 separate current loop networks. The
20 board is a standard size card that fits into one of the ISA card slots in the back of the floor controller. The board includes a male edge connector (not shown) which mates with a female back plane connector (not shown) in the floor controller. The back plane connector provides the floor controller CPU data, address, and control lines to the communication board 246 to enable the communication board and the
25 floor controller CPU to communicate.

The communication board 246 includes eight separate microcontrollers 248A-248H. The microcontrollers communicate with the floor controller through ISA bus interface logic 247 over buses 249A and 249B. The microcontrollers are



12

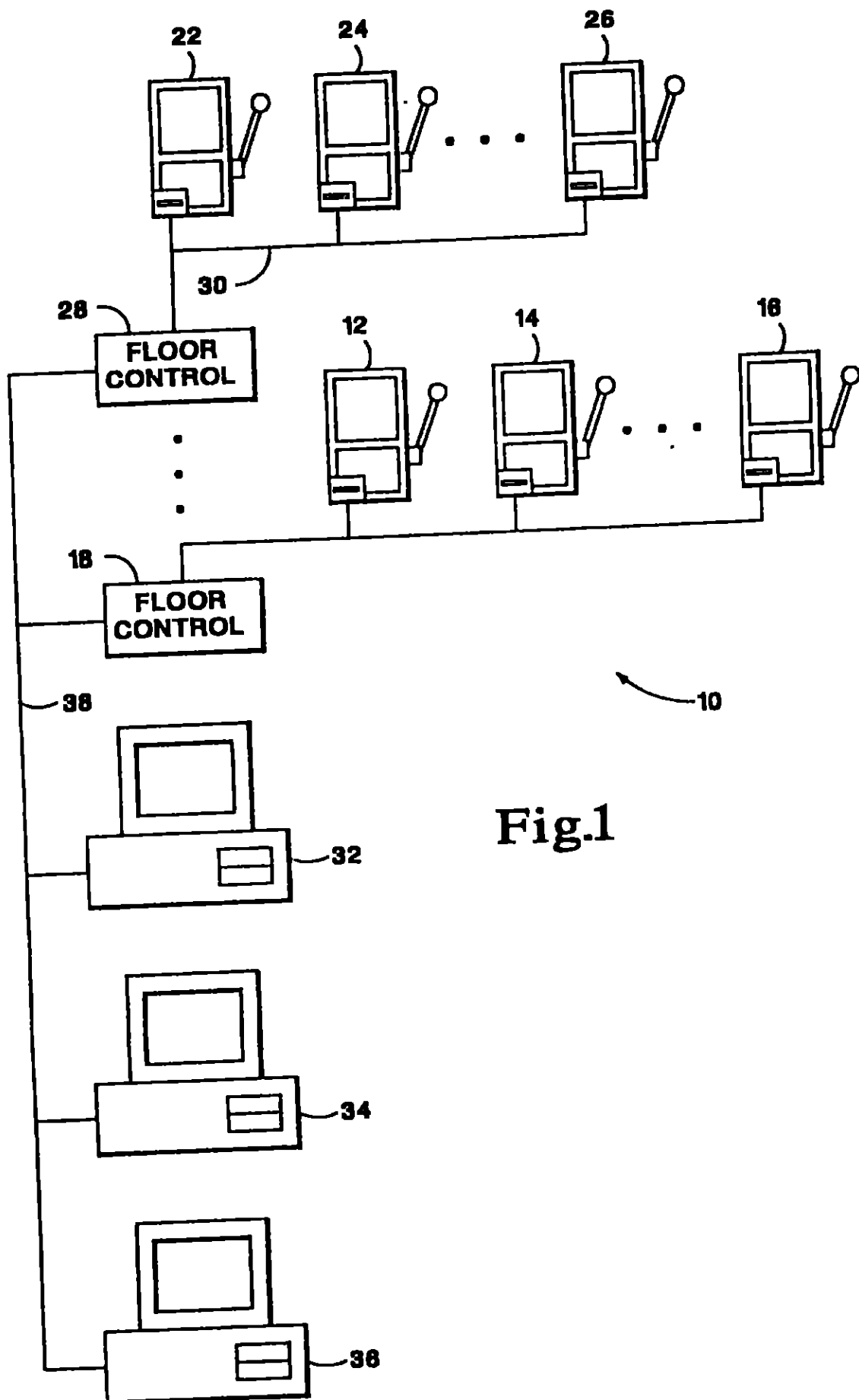


Fig.1

password entry screen includes a reference listing of the software versions in the infusion pump. A "cancel" soft key is provided to exit the routine.

Upon successful entry of a valid password, a configuration/service menu screen as seen in FIG. 12(b) appears. The options include Personality™ configuration utility, device configuration utility, event history, service features, device configuration transfer, download configuration, time set and date set. When an option is highlighted, a message appears giving the particular components of an option. In the example seen in FIG. 12(b), the Personality™ configuration utility includes as components a Personal list, infusion modes and features, infusion limit alerts and alarms, drop sensors, and label library.

Authorized hospital personnel can program clinical feature limits and infusion alert and alarm characteristics. The infusion limit, alarms and alarms are accessed from the Personality™ configuration menu, seen in FIG. 12(c). Upon selection, the infusion limit, alerts and alarms menu seen in FIG. 12(d) is displayed. The settings in the menu apply to the infusion pump 10 as a whole and are not programmable for separate channels.

The authorized hospital personnel can set the size of the air bubble to be detected by the infusion pump 10. Referring to FIG. 13, an air bubble select pop-up window which is displayed upon selection of the air bubble setting is seen. The screen includes a "no change" soft key and a "select" soft key. Options on the bubble size are displayed in a preferred embodiment, four bubble size levels are expressed. In the preferred embodiment described herein, the four bubble size levels are 25 microl, 50 microl, 100 microl, and 150 microl. Each bubble size level will detect air bubbles within a given range. For example, the 25 microl level will detect air bubbles below 10 microl, and will not detect air bubbles above 10 microl; the 50 microl level will detect air bubbles above 50 microl, and will not detect air bubbles below 50 microl; the 100 microl level will detect air bubbles above 100 microl, and will not detect air bubbles below 100 microl; and the 150 microl level will detect air bubbles above 150 microl, and will not detect air bubbles below 150 microl.

Referring now to FIG. 14, the air sensor 135 is seen in detail. Located in the transmitter housing 137 is the transmitter can 139. The transmitter can 139 rests on a retaining plate 142, which biases the transmitter can 139 upwardly against a transmitter platinum face 144. The transmitter can 139 includes an ultrasonic crystal 146 encased in a special epoxy. Contained below the ultrasonic crystal 146 is a copper disk 148 which is approximately the diameter of the ultrasonic crystal 146. The copper disk 148 acts as an electrical barrier against ambient noise such as for example interference from electro-surgical units. A coaxial cable 150 is provided to electrically connect the ultrasonic sensor to a transmitter circuit, as described in detail below. The outer sheath of the coaxial cable 150 is grounded first to the copper disk 148, then to the front face of the ultrasonic crystal 146 closest to the IV tube. The center conductor of the coaxial cable 150 is threaded through a hole in the copper disk 148 to the back face of the ultrasonic crystal 146 furthest from the IV tube. This configuration also helps shield against outside interference. The transmitter housing 137 defines a tube rest area 159 in which the transmitter can 139 and the transmitter housing 137 are flush to define a flat rear wall 162 against which the IV tube 76 is registered when it is loaded. The tube rest area 159 is unobstructed so that no alternate path for the ultrasonic signal is present and a clear

ultrasonic signal can be transmitted directly through the center of the tube. Located in the receiver housing 164 is the receiver can 166. The receiver can 166 is biased downward against a receiver platinum face 168 by a retaining plate 170. The receiver can 166 includes an ultrasonic crystal 172 encased in a special epoxy. Contained above the ultrasonic crystal 172 is a copper disk 175. A coaxial cable 177 is provided to electrically connect the ultrasonic sensor to a receiver circuit, as described in detail below. The outer sheath of the coaxial cable 177 is grounded first to the copper disk 175, then to the ultrasonic crystal 172. The center conductor of the coaxial cable 177 is threaded through a hole in the copper disk 175 to the ultrasonic crystal 172. This configuration helps shield against outside interference.

The receiver housing 164 defines a tube-secure area 181 in which the receiver can 166 is flush with the receiver housing 164 to define a flat area. The tube-secure area 181 includes a downwardly extending step 183, which extends downwardly opposite the upwardly extending rear wall 162. The tube-secure area 181 is unobstructed so that no alternate acoustic path for the ultrasonic signal is present and a clear ultrasonic signal can be received. The tube rest area 159, tube-secure area 181, the upwardly extending rear wall 162, and the downwardly extending step 183 act to secure the tube 76 in the proper position between the transmitter can 139 and the receiver can 166. To further ensure that no alternative acoustic path is provided between the transmitter can 139 and the receiver can 166, the transmitter housing 137 defines an air-insulating area which, when the IV tube 76 is secured, provides an air gap 187 between the receiver 164 and the transmitter housing 137. Likewise, the receiver housing 164 defines an air-insulating area which, when the IV tube 76 is secured, provides an air gap 192 between the transmitter 137 and the receiver housing 164. The air gap 192 provided by the air-insulating area of the receiver housing 164 and the air gap 187 provided by the air-insulating area of the transmitter housing 137 eliminate alternative acoustic paths between the transmitter can 139 and the receiver can 166, so the only path for the ultrasonic signal is through the IV tube 76. The coaxial cable 177 which electrically connects the receiver can 166 to the receiver circuit extends through a wide-angle aperture 194 defined in the receiver housing 164 to enable movement of the receiver housing 164 so the IV tube 76 can be inserted into position.

Referring now to FIG. 15, a first embodiment of a circuit 200 for the air sensor is seen in block diagram. The circuit includes both a transmitter circuit 201 and a receiver circuit 202. The transmitter circuit 201 includes means for generating an oscillation 204 which, in a preferred embodiment, is a 4.5 MHz oscillator. The oscillator 204 provides the primary signal to the air sensor transmitter. In order to provide a test to detect variations in the receiver gain and to check the level of interference, a second signal is provided by a test means 206 for adding an attenuation to the primary signal to derive a test signal in the preferred embodiment, the signal amplitude is reduced by approximately 15 db. On power-up, a test mode is used which utilizes the test signal. During the test mode, the value received by the receiver

46. In the preferred embodiment, this program memory includes a nonvolatile read-only memory (ROM). However, this program memory could also be flash or "battery" backed RAM in order for the program memory to be updated by the floor controller. In the event flash or "battery" back RAM is used the floor controller would download the updated program to the DCN controller and the DCN controller would overwrite the program memory with the downloaded program.

The memory 48 also includes system memory, e.g., static random-access memory (SRAM) for storing the gaming device information. This gaming device information includes at least the following meters: coins-in, coins-out, coins to drop, games played, jackpot occurrences. A separate meter counter is kept in memory 48 for each of these values. To increase reliability of the data, in the preferred embodiment, a redundant set of these counters is kept in a physically separate memory device within memory 48. Moreover, the memory devices storing these counters are nonvolatile so that in the event of a power failure the counts will be retained. The nonvolatile memories can either be battery-backed SRAM or electrically erasable programmable read-only memory (EEPROM). Although memory 48 is shown external to DCN controller 46, much if not all of the memory 48 can be included in the DCN controller 46.

3. NETWORK INTERFACE

The data communication node 42 also includes a network interface 49 for connecting the data communication node 42 to the associated floor controller. The network interface is coupled to the floor controller through a personality board 202, described below.

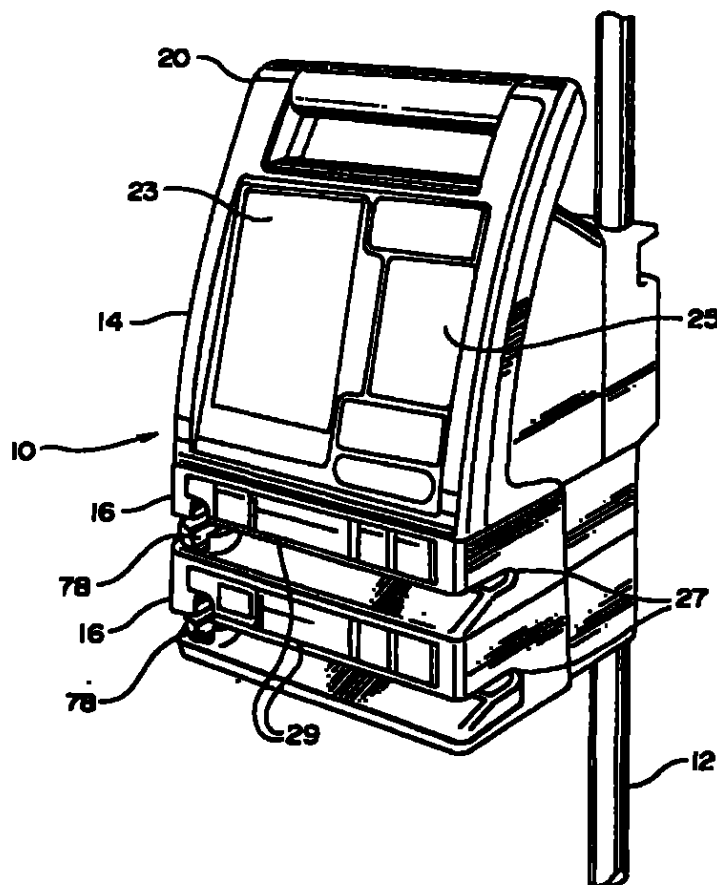
A more detailed drawing of network interface 49 is shown in FIG. 3. In FIG. 3, the DCN controller 46 receives data from the floor controller over conductor 52 which is optically isolated from a connector 51 by optical isolator circuit 54. The DCN controller 46 transmits data to the floor controller over

United States Patent [19][11] **Patent Number:** **6,068,612****Bowman et al.**[45] **Date of Patent:** ***May 30, 2000**[54] **AIR DETECTOR**4,882,575 11/1989 Kwakara 340/608
5,176,631 1/1993 Koenig 604/65[75] **Inventors:** George Bowman, Vernon Hilla; Joseph Matthews, Grayslake, both of Ill.; Kurt Eyster, Santa Barbara, Calif.[73] **Assignee:** Baxter International Inc., Deerfield, Ill.*Primary Examiner*—Corrine McDermott
Assistant Examiner—Cris L. Rodriguez
Attorney, Agent, or Firm—Paul B. Schaafama; Francis C. Kowalik[*] **Notice:** This patent is subject to a terminal disclaimer.[57] **ABSTRACT**[21] **Appl. No.:** 09/113,765[22] **Filed:** Jul. 10, 1998**Related U.S. Application Data**[62] **Division of application No.** 08/629,879, Apr. 10, 1996, Pat. No. 5,843,035.[51] **Int. Cl.⁷** A61M 1/00[52] **U.S. Cl.** 604/122; 604/123; 604/65[58] **Field of Search** 604/65-67, 131, 604/122, 123; 128/DIG. 12, DIG. 13

The present invention provides an apparatus for detecting excessive air in a liquid flow-through tube. The apparatus includes an ultrasonic transmitter for transmitting ultrasonic signals and an ultrasonic receiver for receiving ultrasonic signals. The ultrasonic transmitter and ultrasonic receiver are separated by the IV tube. The apparatus further provides circuit means for generating at least two transmitting signals to actuate the ultrasonic transmitter and circuit means for detecting received signals. Means are provided for determining whether the received signal is indicative of air or liquid in the IV tube. The apparatus further relies on logarithmic detection of air in fluids rather than linear detection which provides a larger safety factor in prediction of air embolus.

[56] **References Cited****U.S. PATENT DOCUMENTS**

4,821,558 4/1989 Patrone et al. 73/19

8 Claims, 22 Drawing Sheets

15

32 is essentially a virtual hard disk for the floor controllers 18 and 32, the floor controllers and the file server can be considered a single host computer for the system 10.

B. DATA COMMUNICATION NODE

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1. OVERVIEW

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In order to communicate with the floor controller, each gaming device includes therein an electronic module 40, as shown in FIG. 2. This module 40 can be inserted into a variety of pre-existing gaming devices. The module allows the host computer to uniquely identify the gaming device on the network, including the device type. The module 40 includes two main subcomponents: a data communication node 42 and a player tracking module 44. The data communication node 42 keeps track of the coins-in, coins-out, coins to drop, games played, jackpot occurrences and other related functions of the associated gaming device. The player tracking module 44 keeps track of the player that is playing the associated gaming device. Together, the data communication node 42 and the player tracking module 44 allow the floor controller connected to the associated gaming device to monitor and control the activity of the gaming device. The system hereinafter described in detail includes the following capabilities: slot accounting, player tracking, bonus jackpots and cashless play.

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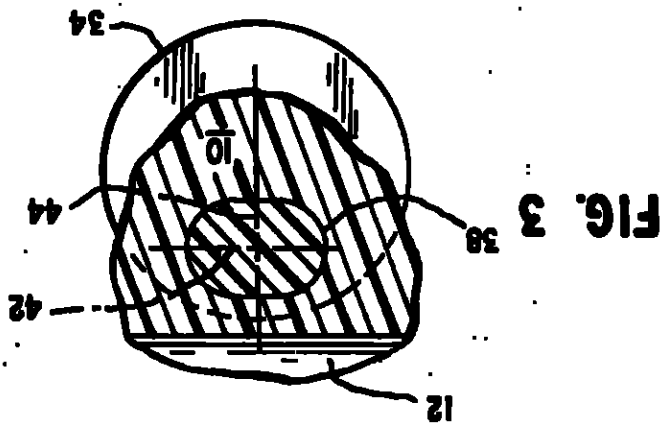
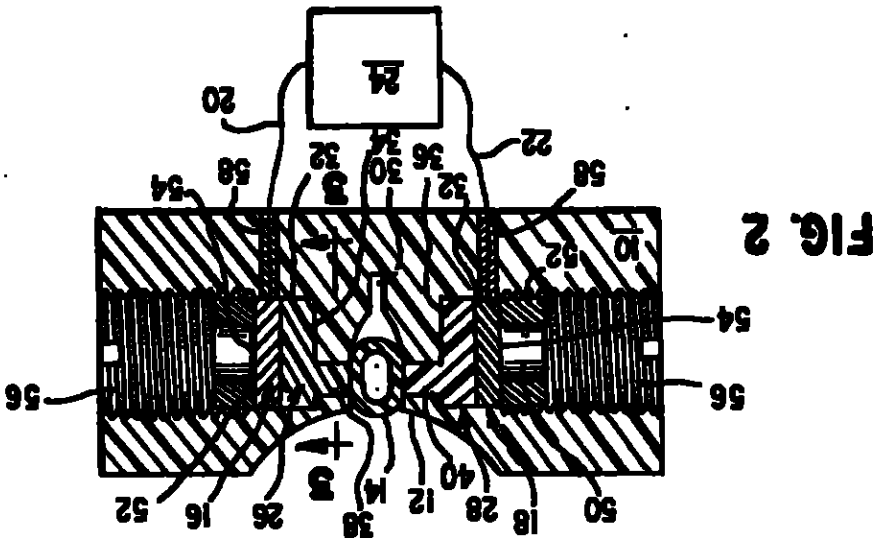
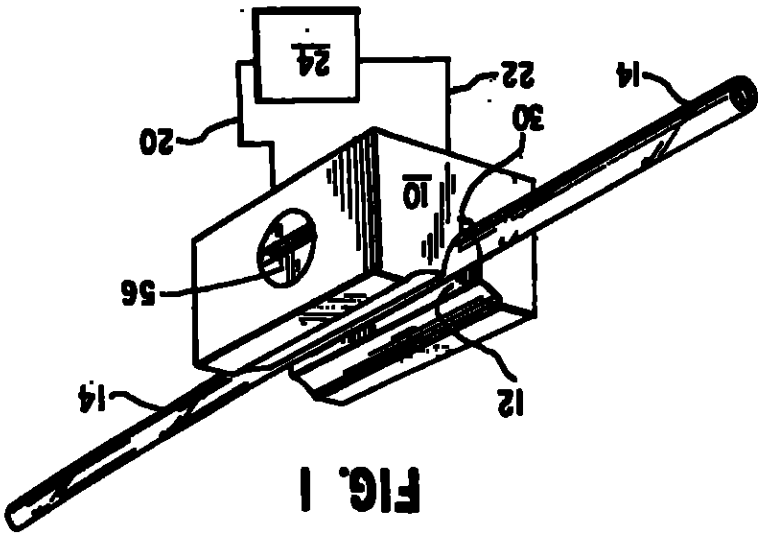
20

2. CONTROLLER AND MEMORY

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The data communication node (DCN) 42 includes a data communication node controller 46, which in the preferred embodiment is an HD6473258P10 controller manufactured by Hitachi of Tokyo, Japan. The DCN 42 is coupled to the player tracking controller 44 through bus interface logic 45. The bus interface logic 45 is conventional interface logic including, for example, transceivers, as is known in the art of digital design.

A memory 48 is connected to the DCN controller 46. The memory includes program memory for storing program instructions for the DCN controller



36 then looks up the record associated with the particular gaming device in the file server 32 to determine the correct fill amount. The terminal 36 also calculates a theoretical hopper balance for the particular device based on the latest meter information, as described further below. If the calculation shows a significant
5 hopper balance, a warning is given on the computer screen from which security can then be alerted.

A fill and jackpot processing terminal 36 prints a fill ticket upon demand. If the calculated hopper balance was nearly zero, the terminal 36 cause the words "computer verified" to be printed on the ticket in place of a supervisor's signature.
10 In the event that the calculated hopper balance was not near zero, an extra signature is required to complete the fill transaction. The system follows a similar procedure for processing hand-paid jackpots.

A dispatch station (not shown) can also be included in the system. The dispatch station allows the casino to monitor activity on the gaming devices and
15 "run the casino" from one location. The dispatch station allows the dispatcher to monitor customer service, maintenance, and security events and direct other casino personnel to handle these situations appropriately. For example, during hopper empties (fills) and jackpot events, as indicated by the dispatcher station, the dispatcher could radio down to the floor to have someone verify the event.
20 The dispatcher station can also indicate when a machine door is opened without a technician card inserted, for example, in which case the dispatcher could take the appropriate course of action.

The above-described system 10 is but one embodiment of the system according to the invention. The system tasks can be allocated in a variety of ways
25 amongst the system computers including floor controllers 18 and 28, file server 32, pit terminal 34 and fill and jackpot terminals 36. In some cases, the pit terminal 34 and fill and jackpot terminals 36 can even be eliminated and their tasks allocated to the floor controller or file server. In fact, because the file server

[34] ULTRASONIC BUBBLE DETECTOR

[75] Inventor: Peter A. St. John, Adelphi, Md.

[73] Assignee: Baxter Travenol Laboratories, Inc.,
Deerfield, Ill.

[21] Appl. No.: 212,633

[22] Filed: Dec. 3, 1980

[51] Int. Cl. G01N 29/02

[52] U.S. Cl. 73/19

[58] Field of Search 73/19, 61 R, 53;
128/663, 660, 214 E

[36] References Cited

U.S. PATENT DOCUMENTS

3,663,842 3/1972 Miller 73/644

3,921,622 11/1973 Cole 73/19

3,974,681 8/1976 Namery 73/19

4,013,464 4/1977 Miller et al. 73/61 R

4,068,321 1/1978 Cosentino et al. 73/19

4,137,940 2/1979 Feisandler 128/214 E

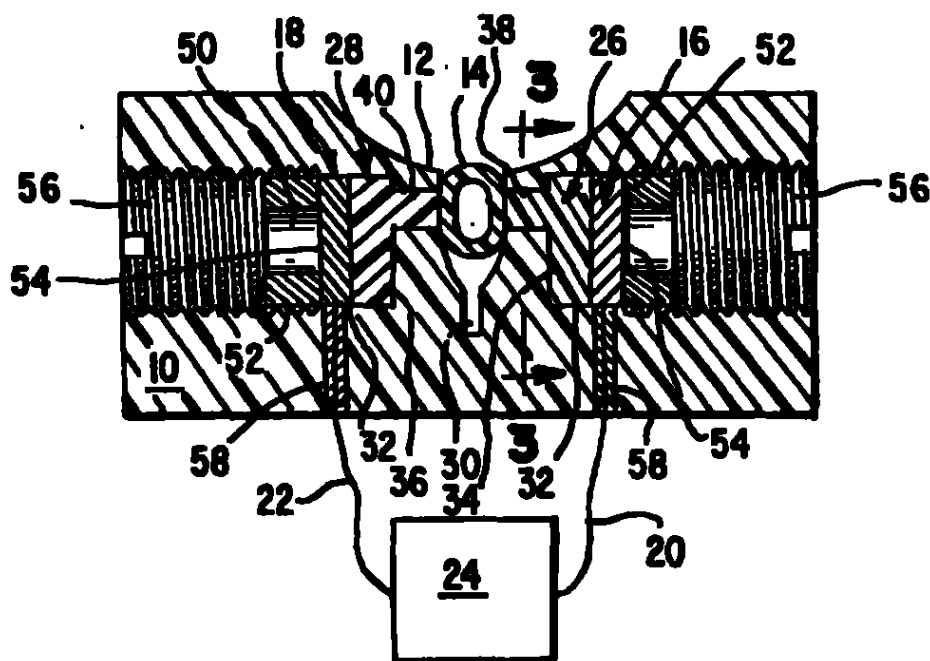
Primary Examiner—Stephen A. Kreitman

Attorney, Agent, or Firm—John P. Kirby, Jr.; Garrettson
Ellis; Thomas A. Kmietek

[57] ABSTRACT

Ultrasonic bubble detection apparatus utilizes a typically one-piece, rigid housing having a channel defined therein for receiving flow tubing in which bubbles are to be detected. First and second ultrasonic sending and receiving transducers are positioned on opposite sides of the channel, with an aperture communicating between each of the transducers and the channel, the aperture being filled with an elastomeric material capable of transmitting ultrasound energy between the channel and each transducer means. An air-containing slot may be positioned at the bottom of the channel to hinder the propagation of ultrasound energy through the housing from the first to the second transducer by a route other than one passing through the elastomeric material. Also, a novel shape for the apertures, and the elastomeric material filling them, is disclosed.

7 Claims, 3 Drawing Figures





Bezeichnung/Protokoll (Anlage)		Communication/Minutes (Annex)		Notification/Procès-verbal (Annexe)	
Datum Date Date	22.07.2002	Blatt Sheet Feuille	2	Anmelde-Nr.: Application No.: Demande n°:	00 943 382.2

According to the description of the present application cancer (P1, L32), arthritis (P1, L19; claim 4) and diabetes (P1, L15; claim 4) are associated with neuropathic pain. Thus the treatment of cancer, arthritis and diabetes implies the treatment of the associated pain.

Thus, it is prejudicial to the novelty of the subject-matter of claims 27-33 of the present application insofar as the same Contracting States are designated.

- 3.) The following document (D) is referred to in this communication; the numbering will be adhered to in the rest of the procedure:

D1: WO 99 01421 A

- 4.) The present application does not meet the requirements of Article 52(1) EPC, because the subject-matter of claims 27-33 does not involve an inventive step in the sense of Article 56 EPC.

D1, which is considered to represent the closest prior art, discloses phenylamino derivatives (ie P5 L1-15, P31 example 208, P46 claim 4) having the same ring structure as compounds described in claims 27-33 for treatment of cancer (P7 L7 claim 26), diabetes (P7 L7, claim 31) and inflammation (Abstract).

According to the description of the present application cancer (P1, L32), diabetes (P1, L15; claim 4) and inflammation (claims 4 and 7) are associated with neuropathic pain. Thus the treatment of cancer and diabetes implies the treatment of the associated pain.

Compounds defined in claims 27-33 differ from compounds disclosed in D1 in the substitution of the phenyl rings. However the replacement of a nitrogen containing hetero cycle by another nitrogen containing hetero cycle or the replacement of an hydrogen atom by another radical is a matter of regular screening.

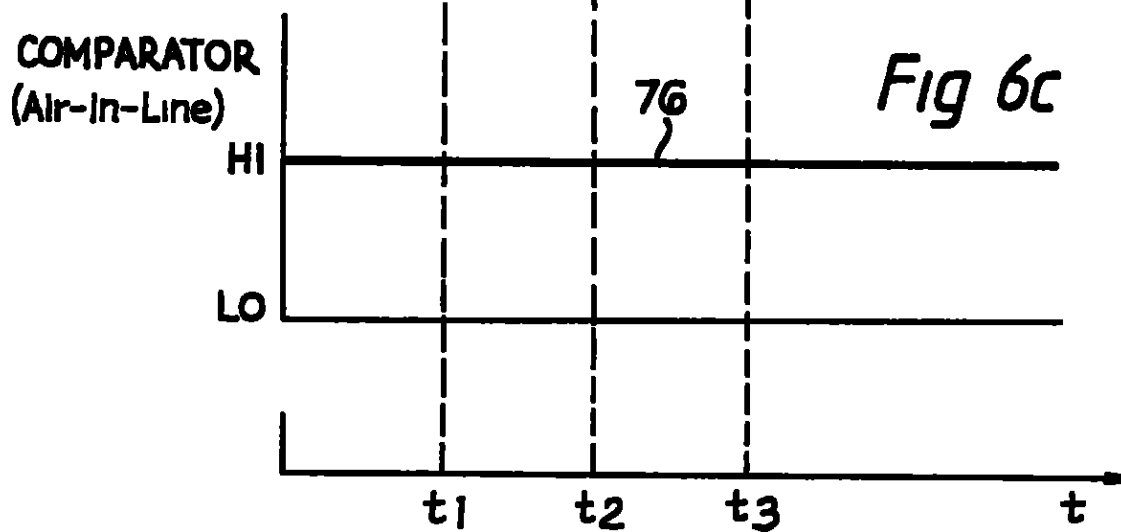
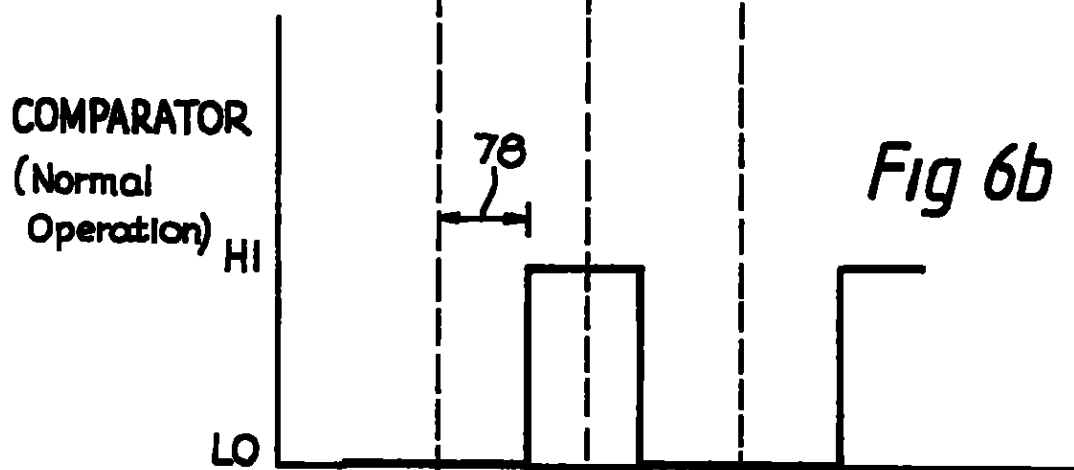
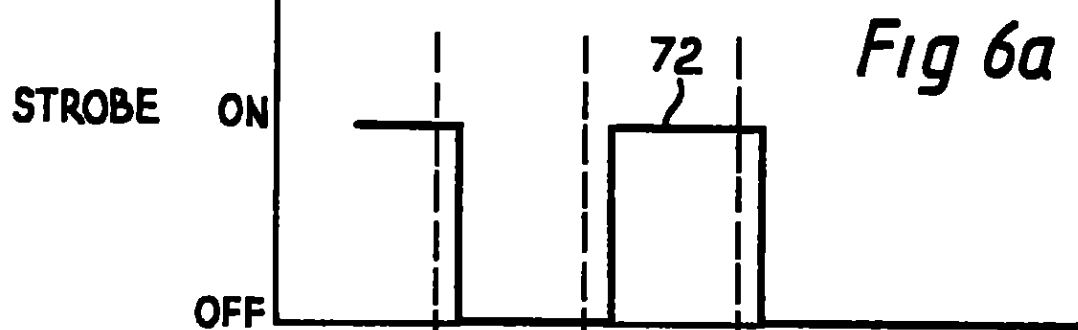
Furthermore there is no evidence or data in the description of the present application, which suggest that chronic pain at all can be treated by compounds

Traja del cancer, diabetes e inflamacion, implica traty del dolor asociado.

Es obvio el reemplazo de 1 N del heterociclo, x otro N.

y del H x otro radical.

No hay datos o evidencia en la descripción de esta solicitud que sugieran que el dolor con. que se trata en las reiv. 27-33.



INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT/US 00/18346

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61K31/41 A61K31/4245 A61K31/42 A61K31/433 A61K31/4196
A61K31/425 A61P25/04

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 A61K

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

NO ES ANTERIORIDAD.
? ANTERIORIDAD: DER WO 99 01421
7 WO 99 01426

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	WO 00 42029 A (BARRETT STEPHEN DOUGLAS ; BRIDGES ALEXANDER JAMES (US); WARNER LAMB) 20 July 2000 (2000-07-20) cited in the application page 4, line 29,30; claim 34	1,7,8, 11-33
P,X	WO 00 35436 A (DUDLEY DAVID THOMAS ; FLORY CRAIG MASON (US); SALTIEL ALAN ROBERT ()) 22 June 2000 (2000-06-22) page 1-2; claim 7; example 208 page 83, line 29	1,4,7,8, 10,12, 13,20
Y	WO 98 37881 A (BRIDGES ALEXANDER JAMES ; WARNER LAMBERT CO (US)) 3 September 1998 (1998-09-03) page 83, line 28; claim 7; example 208	1-33



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 claim 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.
- *S* document member of the same patent family

Date of the actual completion of the international search

12 January 2001

Date of mailing of the international search report

23/01/2001

Name and position of the ISA

Authorized officer

Fig 4

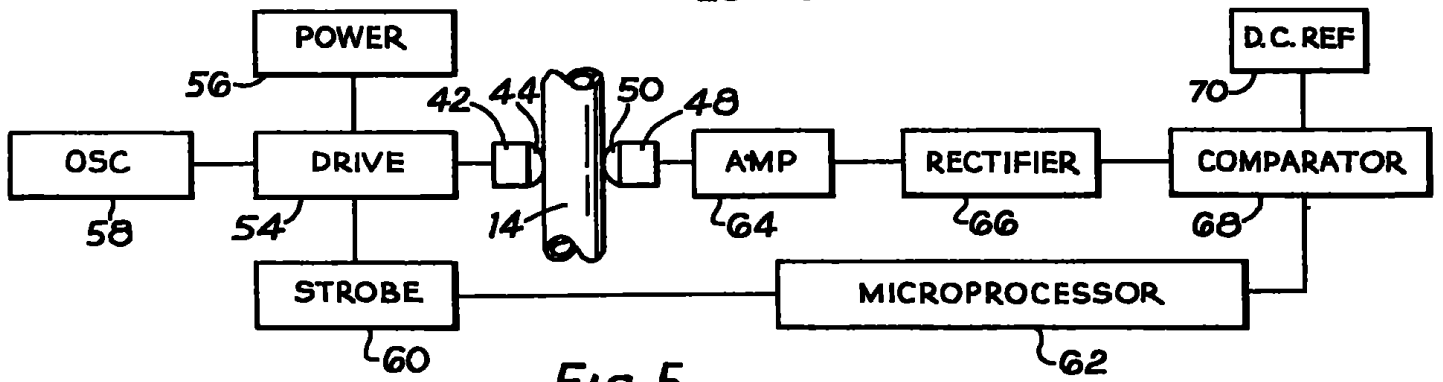
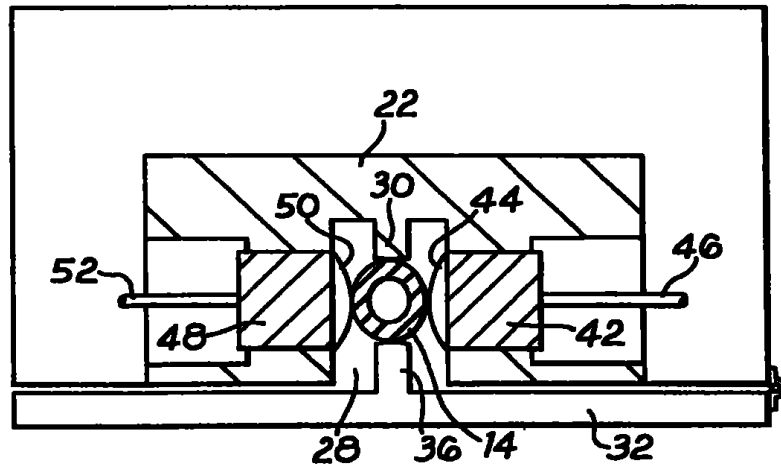


Fig 5

Exp. = 00 053 306

98



Bescheid/Protokoll (Anlage)

Datum
Date 22.07.2002

Communication/Minuties (Annex)

Blatt
Sheet 1
Feuille

Notification/Procès-verbal (Annexe)

Anmelde-Nr.:
Application No.: 00 943 382.2
Demande n°:

The examination is being carried out on the following application documents:

Text for the Contracting States:

AT BE CH LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE

Description, pages:

1-85 as published

Claims, No.:

1-33 as received on 14.12.2001 with letter of 12.12.2001

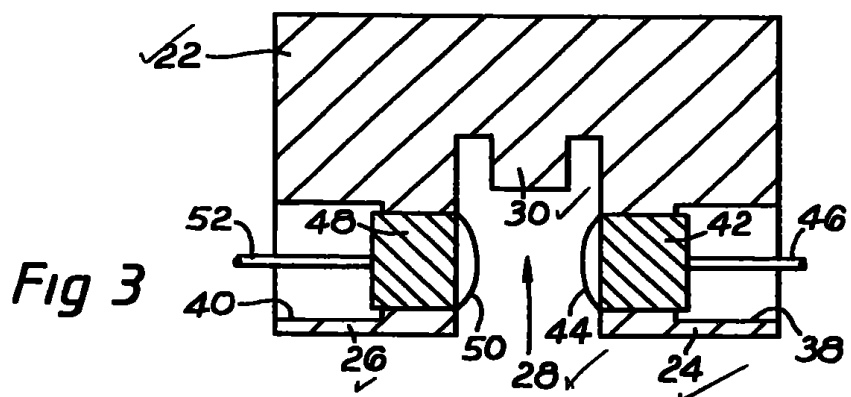
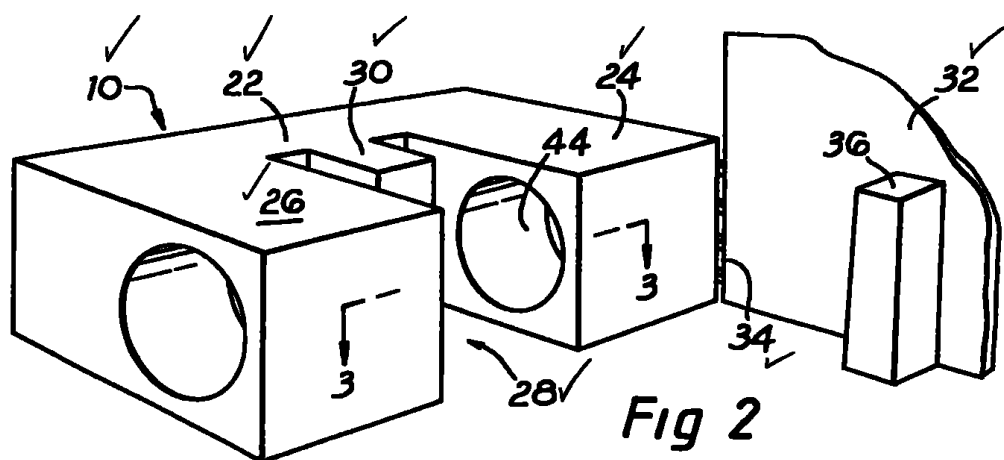
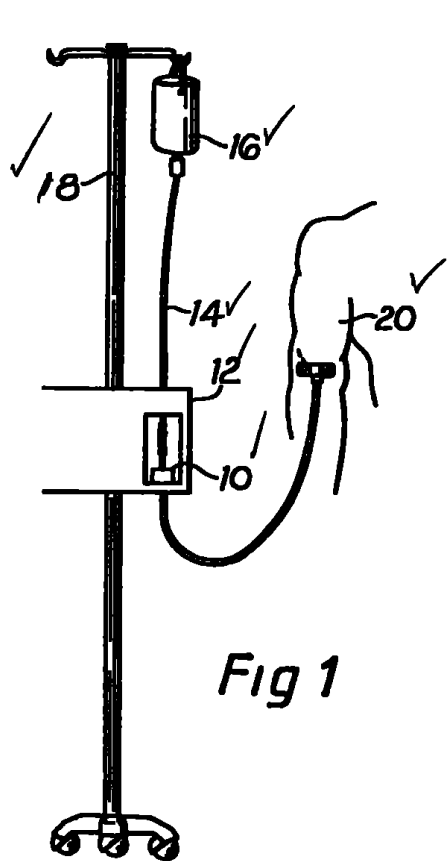
Drawings, sheets:

1/8-8/8 as published

- 1.) The radical X in formula (I) of claim 1 is not defined. Thus the scope of claims 1-26 is not clear according to Article 84 EPC: Therefore no examination for those claims will be performed.
- 2.) The PCT application WO 00/42029 (D2) published on 20.07.2000 claims the priority date of 13.1.1999 and 02.03.1999. It has been supplied to the European Patent Office in one of its official languages and the national fee provided for in Article 22, paragraph 1 or Article 39, paragraph 1 of the Co-operation Treaty has been paid. The requirements of Article 158(2) EPC are thus fulfilled.

Its content as filed is therefore considered as comprised in the state of the art relevant to the question of novelty, pursuant to Article 54(3) and (4) EPC. This earlier application shows:

The use of compounds, as defined in claims 27-33 of the present application, for the treatment of different types of arthritis (claims 33 and 34), diabetes (claim 39) and cancer (claim 28).



Título de la invención **Sacacorchos**

Sector tecnológico al que se refiere

La presente invención se refiere a un sacacorchos perfeccionado de los que se utilizan para extraer el tapón cilíndrico de corcho de las botellas de cristal contenedoras de líquido, especialmente de vino.

Tecnología anterior

Es extensamente conocida la existencia de unos utensillos denominados genéricamente sacacorchos, por ser estos especialmente diseñados para extraer los tapones cilíndricos de corcho de las botellas que taponan, siendo compuestos principalmente por un tirabuzón cuyo extremo puntiagudo se clava en la superficie del tapón a extraer, y tras la penetración manual efectuada mediante la presión y giro efectuado a tal efecto, dispone tal elemento de un brazo extensible articulado, con un punto de apoyo para el cuello de la botella, tras lo cual se precisa efectuar una fuerza física importante para efectuar la correspondiente palanca para extraer el tapón de la botella en cuestión, quedando casi siempre un tramo todavía en su interior, motivando así un esfuerzo complementario para su final consecución. Este segundo tirón, motiva que la botella se agite debido al retroceso

resultante de tal acción, con lo que también se corre el peligro de que se produzca un vertido involuntario del contenido con las consecuencias que ello conlleva.

Descripción de la invención

El sacacorchos que la invención propone, ha sido concebido y estructurado en orden a resolver esta problemática ya que el tapón cilíndrico se extrae de la botella de forma precisa, continua y sin forcejeos innecesarios ya que dispone de un mecanismo a modo de trinquete, que permite su extracción ejerciendo siempre la misma presión o fuerza por lo que el tapón sale suavemente y sin movimientos bruscos, anulándose así toda posibilidad sacudida y vertido de su contenido.

La presión ejercida a la palanca divide el recorrido de la misma en varias etapas, cada una de las cuales el grado de abertura de la misma es considerablemente inferior a la que se deberá ejercer en el caso de efectuar un único recorrido, ya que la palanca se sube y se baja por lo menos dos veces en cada sentido, por lo que se reparte equitativamente la fuerza total. La particularidad más destacada del presente sacacorchos perfeccionado es que va provisto de un brazo acanalado y abatible del cuerpo principal

of comparator 88 should generally track what is input to crystal 42, i.e. the output 72 of strobe 60. As a practical matter, there is some delay between the time when strobe 60 turns Off and the time at which the output 74 of comparator 8 responds. Thus, there is a lag time 78 which must be compensated for. Consequently, microprocessor 82 is programmed to monitor outputs 72 and 74 at time t₁, t₂, etc. in order to avoid a confusing signal such as would be received during time intervals within the time lag 78.

When there is an air-in-line condition, comparator 88 is no longer able to track the output 72 from strobe 60. The result is that for the air-in-line condition, output 78 from comparator 88 is essentially a constant as indicated in Figure 6C. It should also be recognized that when detector 10 has fully circuitry, the output 76 of comparator 88 will also be a constant. Thus, with an alternating output 72 from strobe 60, the output 74 of comparator 88 should also alternate substantially as shown in Figure 6B if there is fluid in tube 14, i.e. a normal operation. On the other hand, according to the logic of microprocessor 82, a constant high or low output 76 from comparator 88 indicates an abnormal condition which must be attended to. Microprocessor 82 can be programmed to provide an alarm signal in abnormal conditions which can be used to cease operation of the device 12.

Claims

1. An ultrasonic detector for detecting the presence of air in a fluid line of an IV infusion device

which detector comprises a transmitter and a receiver which are positioned to pinchingly engage a

portion of the fluid line therebetween.

2. An ultrasonic detector for detecting air in fluid tubing characterized by:

a base formed with a cavity;

a transmitter having a convex lens mounted on said base with said lens protruding into said cavity to

contact said tube; and

a receiver having a convex lens mounted on said base with said lens protruding into said cavity to

contact said tube and pinchingly engage said tube

between said transmitter and said receiver.

3. A detector according to Claim 2 wherein the receiver is mounted on said base relative to said transmitter to establish a gap therebetween, said gap being of a lesser dimension than the outside diameter of said tube to receive said tube in said gap and indent said tube with said transmitter and with said receiver to acoustically couple said tube therebetween.

4. An ultrasonic detector for detecting air in a flexible fluid tube having a predetermined outside diameter characterized by:

a base;

a transmitter mounted on said base; and

a receiver mounted on said base relative to said transmitter to establish a gap therebetween, said gap being of a lesser dimension than the outside diameter of said tube to receive said tube in said gap and indent said tube with said transmitter and with said receiver to acoustically couple said tube therebetween.

5. A detector according to Claim 3 wherein said transmitter has a convex lens protruding into said gap to contact said tube, and said receiver has a convex lens protruding into said gap to contact said tube.

6. A detector according to Claim 2, 3 or 4 wherein said lenses are made of an epoxy material and said transmitter and said receiver respectively comprises piezo-ceramic crystals to which said lenses are attached by an epoxy adhesive.

7. A detector according to Claim 2, 3, 4, 5 or 6 wherein said lens for said transmitter and said lens for said receiver are spherical convex lenses.

8. A detector according to any of Claims 2 to 7 further comprising:

a first pedestal mounted on said base and protruding into said cavity in a direction substantially at right angles to the axis defined between said transmitter and said receiver; and

a second pedestal operatively associated with base for movement into contact with said tube to pinchingly engage said tube between said first pedestal and said second pedestal.

9. A detector according to Claim 8 wherein said second pedestal is mounted on a door and said door is hingedly attached to said base.

10. A detector according to any of Claims 2 to 9 further comprising:

a first pedestal mounted on said base and protruding into said cavity in a direction substantially at right angles to the axis defined between said transmitter and said receiver; and

a second pedestal operatively associated with base for movement into contact with said tube to pinchingly engage said tube between said first pedestal and said second pedestal.

11. A detector according to Claim 10 further comprising means to compare the input to said transmitter with the output of said receiver.

12. A detector according to Claim 10 further comprising means to create an alarm when said output from said receiver does not track with said input to said transmitter.

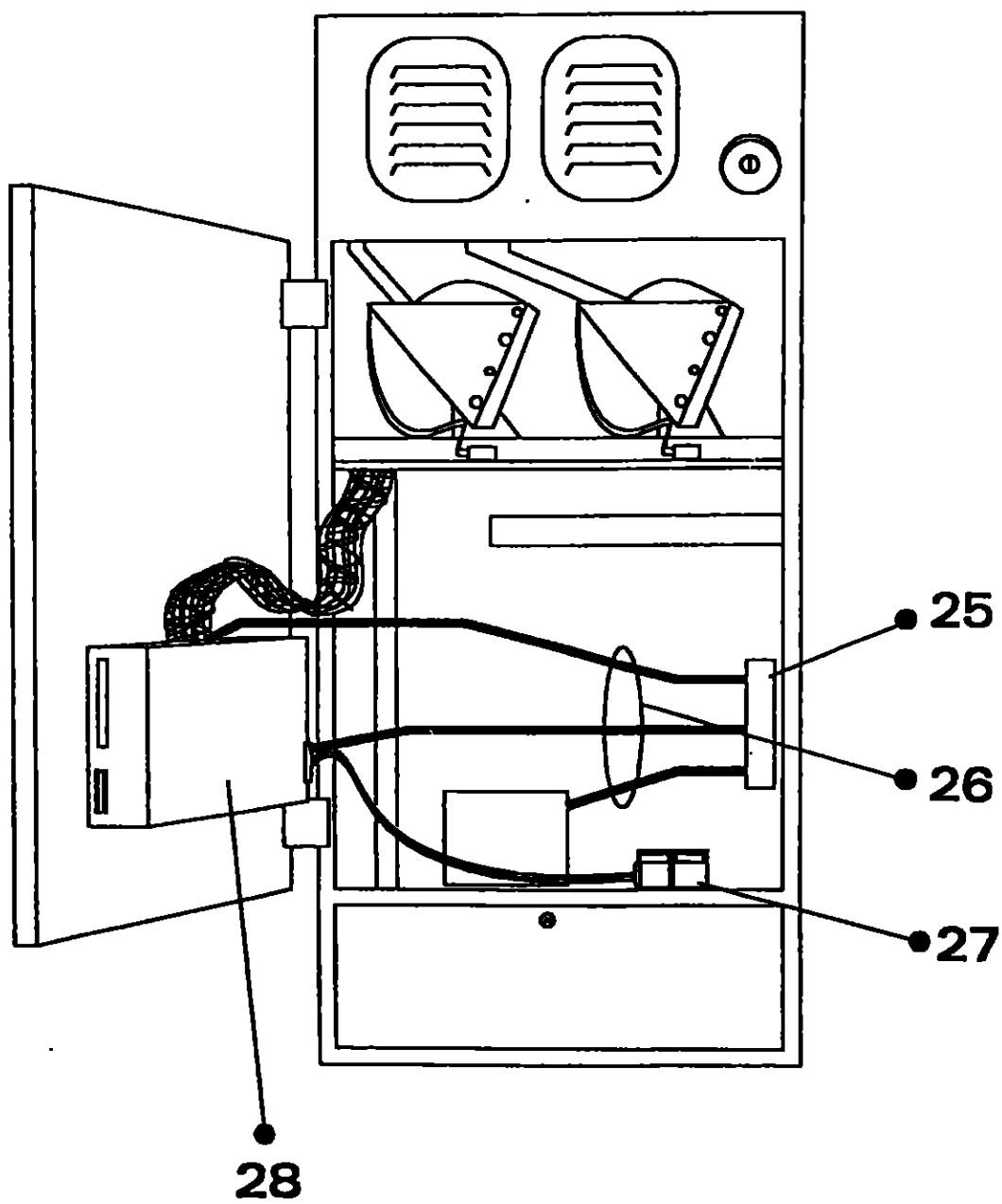


Fig 3.

predetermined intervals. The result is a step input to crystal 42 that alternates between an OFF condition wherein there is no excitation of crystal 42 and an ON condition wherein crystal 42 is excited at its resonant frequency to generate ultrasound energy. Preferably strobe 60 is operated by microprocessor 62 to cause switching between the ON and OFF condition approximately every nine milliseconds. Thus, drive 64 generates a stepped output having an eighteen millisecond cycle.

On the receiver side of detector 10, piezo-electric crystal 48 is mechanically coupled with tube 14 through lens 50 to receive signals emanating from crystal 42. In the electrical circuitry of detector 10, piezo-electric crystal 48 is electrically connected to an amplifier 64 and the output from amplifier 64 is fed directly to filter/rectifier 66. At filter/rectifier 66, this output is substantially changed from a sinusoidal signal to an amplitude modulated signal. The comparator 68 then takes the output from filter/rectifier 66 and compares it with a d.c. reference voltage from comparator 68 which is passed to microprocessor 62.

Microprocessor 62 analyzes the digital output from comparator 68 to determine whether the device 12 is safely operating without air in tube 14. This determination is made according to an algorithm which accounts for the rate of fluid flow through tube 14 in its analysis in order to ignore very small air bubbles, i.e. bubbles of less than approximately fifty microliters, which are of no real medical concern. Also, microprocessor 62 provides input to strobe 60 to regulate its operation. With these connections, microprocessor 62 is able to analyze the output of detector 10 coming from comparator 68 in relation with the input to detector 10 beginning at strobe 60.

The detector 10 will now be described in operation.

In its operation detector 10 is activated by power from source 58. IV tube 14 is operatively associated with detector 10 when it is inserted into cavity 28. This insertion brings convex-shaped acoustic lenses 44 and 50 into direct mechanical coupling with tube 14 and generates an interference fit therebetween which helps hold tube 14 in cavity 28. Door 32 is then closed onto base 22 to bring pedestal 88 into contact with tube 14. This action provides a pinching engagement of tube 14 between the diametrically opposed pedestals 80 and 88 in addition to the pinching engagement of tube 14 between the diametrically opposed lenses 44 and 50.

Operation of device 12 is intended to cause fluid flow through tube 11. Accordingly microprocessor 62 must be capable of interpreting the output it receives from comparator 68. As is well known by the skilled artisan the signal received

by acoustic lens 50, which eventually establishes the output from comparator 68, will vary depending on whether there is fluid or air in tube 14. This of course, results from impedance matching and the fact that fluid will transmit ultrasound energy very well whereas air will not. Thus, it is theoretically sufficient if microprocessor 62 is merely able to distinguish between the two resultant signals. Unfortunately too many adverse possibilities exist for such a simple system to be reliable. As a consequence the present invention incorporates a self-testing feature in its operation.

It happens that an ultrasonic receiver such as piezo-electric crystal 48, which receives signals through a fluid tube from a diametrically opposed transmitter does not clearly distinguish between a transmitter OFF condition and an air-in-line condition. On the other hand, a distinction between a fluid-in-line condition and an air-in-line condition is relatively easily made. Microprocessor 62 uses these comparative distinctions to advantage. Briefly since piezo-electric crystal 42 is alternatively excited into ON and OFF conditions according to cycles established by strobe 60 it follows that piezo-electric crystal 48 will receive respective alternating ON and OFF signals if there is fluid in the tube to transmit the signals. The result is that microprocessor 62 receives an alternating output from parator 62 for the fluid-in-line condition. When an air-in-line condition exists, however despite the fact crystal 42 is still alternatively excited into ON and OFF conditions, crystal 48 no longer receives the ON condition signal. Instead, crystal 48 receives the OFF condition signal and the air-in-line signal. As stated above crystal 48 cannot significantly distinguish between these two signals. The result is that microprocessor 62 receives an essentially steady output signal from comparator 68 for the air-in-line condition.

A representation of the signals used by microprocessor 62 for its logic is presented by the graphs shown in Figures 6A, 6B and 6C. These graphs are aligned for respective conditions at any particular time. Specifically Figure 6A depicts the output 72 of strobe 60 over a determinable time frame. In Figure 6A it can be seen that time t_1 represents an ON condition for strobe 60 just before it changes to an OFF condition. At time t_2 strobe 60 is in the OFF condition and is about to switch back to the ON condition. The condition of strobe 60 at t_3 is similar to its condition at t_1 . Recognize that output 72 could also represent the output of piezo-electric crystal 42. Thus, essentially output 72 represents the ON and OFF states of the ultrasonic transmitter.

Figure 6B depicts the output 74 of comparator 68 under a fluid-in-line condition. As discussed above, when there is fluid in the line the output 74

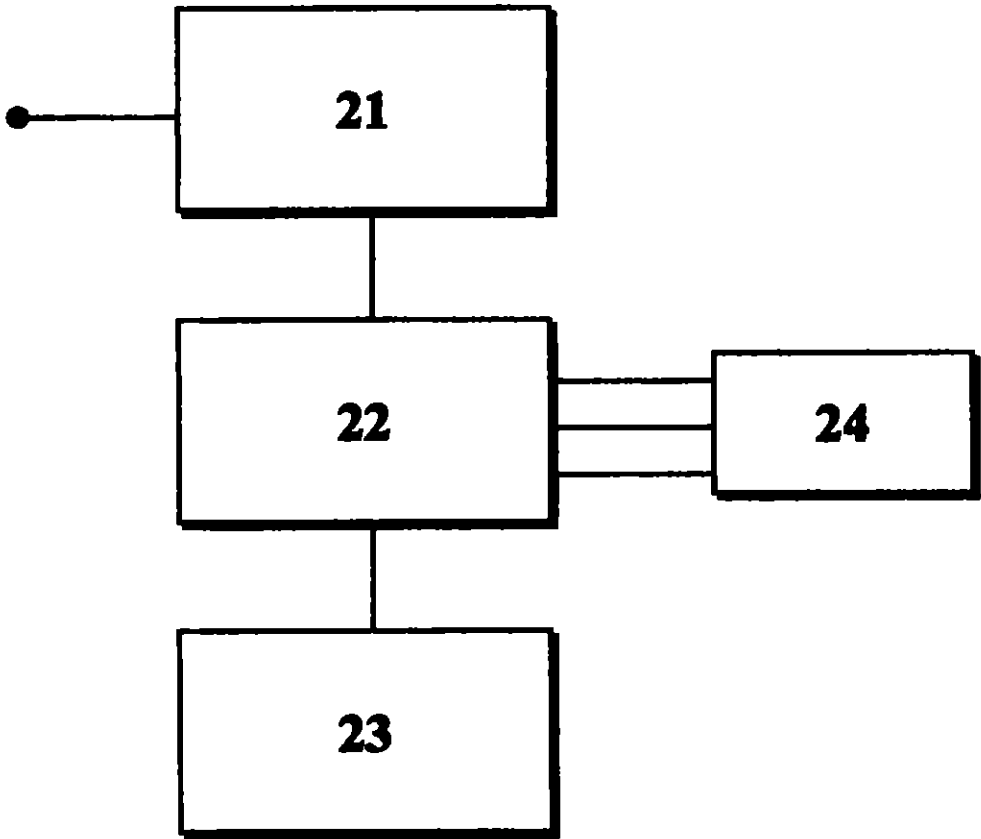


FIG.2

construction and manufactured by processes well known in the pertinent art, such as by injection moulding. Figure 2 also shows a door 32 which is associated with base 22 by means such as the hinge 34. It is to be understood that door 32 need not be directly hinged onto base 22. Instead, and preferably door 32 may be hingedly attached to device 12. In either case it is important that the pedestal 38, which is mounted on door 32, be moveable into a position wherein pedestal 38 protrudes into the cavity 28 between branches 24, 26. It will be appreciated by the skilled artisan that door 32 and pedestal 38 can be of unitary construction and manufactured by a process such as injection moulding.

Figure 3 is a cross-sectional view of detector 10 which shows the interaction of its components. As shown, branch 24 of detector 10 is formed with a housing 36. Likewise, branch 26 is formed with a housing 40. A piezo-electric crystal 42 is mounted in housing 36 and an acoustic lens 44, which is preferably made of an epoxy material is attached to crystal 42 by any appropriate means, such as by an epoxy adhesive well known in the pertinent art. Also, for purposes of the present invention crystal 42 can be made of any well known piezo ceramic material. Further in the preferred embodiment, lens 44 is formed into a spherical convex shape with a relative curvature substantially as indicated in Figure 8. Wiring 46 is provided to electrically connect piezo-electric crystal 42 with appropriate electronic components. For purposes of further discussion the combination of crystal 42 and lens 44 will hereafter be sometimes generally referred to collectively as the ultrasonic transmitter.

An ultrasonic receiver is constructed in a manner similar to the construction of the transmitter and will include a piezo-electric crystal 48 which is mounted in the housing 40 of branch 26. An acoustic lens 50 is attached to crystal 48 and wiring 52 is provided to electrically connect crystal 48 with appropriate electronic componentry. Like the components of the transmitter the receiver components are made of materials well known in the pertinent art. Specifically crystal 48 is made of a piezo-ceramic and the spherically shaped convex lens 50 is made of an epoxy material which is attached to crystal 48 by an epoxy adhesive.

As an alternative to the epoxy material used for acoustic lenses 44 and 50 a polycarbonate material may be used. This could lead to a design in which the lenses 44 and 50 are integrally moulded into the base 22. With this configuration piezo-electric crystals 42 and 48 can be respectively epoxy bonded in a manner well known in the relevant art, to lenses 44 and 50.

The operative placement of tube 14 into detector 10 is best seen in Figure 4 where it can be

appreciated that tube 14 is positioned in cavity 28 with lens 44 substantially diametrically opposed to lens 50. Also, tube 14 is positioned to remain in contact with pedestal 30 when door 32 is moved into position to bring pedestal 30 into contact with tube 14. As shown in Figure 4, lens 44 can be prepositioned relative to lens 50 to pinch tube 14 therebetween when the tube 14 is placed into cavity 28. This pinching action causes indentations of tube 14 at the respective interfaces of tube 14 with lens 44 and 50 to establish good acoustic coupling for the detector 10. Also, this cooperation of structure provides an interference fit between the tube 14 and detector 10 which will help hold tube 14 on detector 10.

The acoustical coupling of lenses 44 and 50 with tube 14 is enhanced by the action of pedestals 30 and 38 on tube 14. As seen in Figure 4, when pedestals 30 and 38 both make contact with tube 14 they like lenses 44 and 50 tend to pinch tube 14. This action causes a slight deformation of tube 14 which urges tube 14 into more immediate contact with lenses 44 and 50. As will be appreciated by the skilled artisan there are competing concerns at play in this cooperation. On the one hand there is the desire to create the maximum beneficial acoustic coupling attainable for detector 10. This requires intimate contact of lenses 44 and 50 with tube 14. On the other hand, there is the desire to minimize distortion of tube 14. This means that the pinching action of detector 10 on tube 14 must be limited to some extent. The balance of these apparently competing interests is best attained by a proper geometrical arrangement of the components of detector 10 needed to accomplish its intended operational specifications.

The preferred electronic componentry necessary for activation of detector 10 is schematically shown in Figure 5. It will be understood by the skilled artisan that all electronic components disclosed for this system are well known in the pertinent art and are commercially available. As shown in Figure 6, tube 14 is placed in operative engagement with piezo-electric crystals 42, 48 through the mechanical coupling of lenses 44, 50 with tube 14 in a manner previously discussed. From the block diagram drawing of Figure 6, it can be seen that piezo-electric crystal 42 serves as an ultrasonic transmitter which generates ultrasound energy according to input received from drive 54. The output from drive 54, which is input for crystal 42 is a step signal generated by the interconnection at drive 54 of power source 56 with oscillator 58 and strobe 60. Specifically power source 56 supplies electrical power for the system while oscillator 58 causes drive 54 to generate a sinusoidal output at the resonant frequency of crystal 42. Simultaneously strobe 60 causes drive 54 to turn ON or OFF at

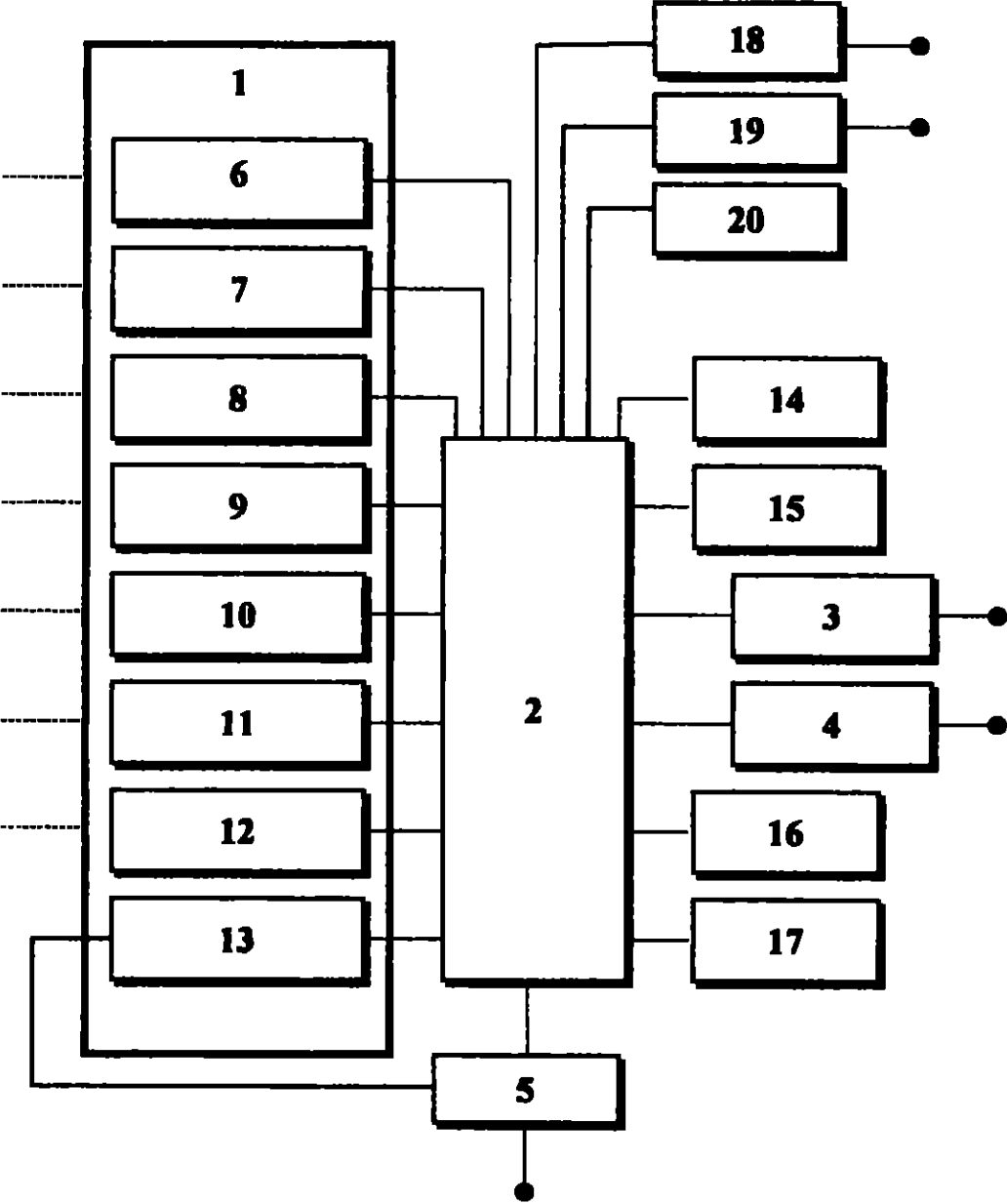


FIG.1

mounted on said base relative to said transmitter to establish a gap therebetween said gap being of a lesser dimension than the outside diameter of said tube to receive said tube in said gap and indent said tube with said transmitter and with said receiver to acoustically couple said tube therebetween

Enhanced impedance matching can be obtained by direct contact between the ultrasonic transducers and the fluid tube. Thus, the need for intermediate structure such as an elastomeric material or sound pipes is obviated. More particularly an ultrasonic transducer having a convex surface which is in direct contact with the fluid tube can be positioned to cause a slight indentation of the tube. This indentation accomplishes a dual purpose. First, it provides good coupling at the flushed interface between transducer and fluid tube which is necessary for proper operation of an ultrasonic system. Second the indentation results from an interface fit between the tube and the transducer which holds the tube in a fixed position relative to the ultrasonic transducers.

The ultrasonic air-in-line detector may provide good ultrasonic coupling by positioning the ultrasonic transducers, both transmitter and receiver into direct contact with the fluid tube. A housing may be provided for the ultrasonic transducers which will create a direct ultrasonic path through the fluid tube and hinder the propagation of ultrasonic energy by other routes. Self testing electronic circuitry may also be provided which will monitor the operation of the air-in-line detector and determine when an inoperative condition exists. An advantage of the present invention is that it provides a cost effective ultrasonic air-in-line detector which is easily manufactured and easy to use.

The preferred embodiment of the ultrasonic air-in-line detector for the present invention used to detect air in a flexible fluid tube comprises a generally U-shaped base which forms a cavity between the branches of the U. An ultrasonic transmitter may be mounted on one branch of the U with its associated convex lens protruding into the cavity. Likewise, an ultrasonic receiver may be mounted on the opposing branch of the U with its associated convex lens protruding into the cavity. A pedestal which may be attached to the base of the U may also protrude into the cavity. The pedestal helps stabilize the fluid tube when the tube is placed into the cavity and held between the lenses of the ultrasonic receiver and ultrasonic transmitter. With the tube so positioned in the cavity a second pedestal can be moved into contact with the tube at a point which is substantially diametrically opposite from the point at which the first pedestal contacts the tube. Thus, the tube is stationarily held in the cavity between the pedestals and be-

tween the convex lenses of the ultrasonic transducer. The lenses may contact the tube at substantially right angles to the line on which the pedestals contact the tube.

The ultrasonic air-in-line detector of the present invention may also include electronic circuitry which is self-testing. This self-test is accomplished by periodically stopping the input to the ultrasonic transmitter and recognizing that a transmitter-off condition is substantially equivalent to an air-in-line condition. Accordingly when the receiver cannot distinguish between a transmitter-on condition and a transmitter-off condition, either there is an air-in-line condition or the circuitry of the system is faulty.

Reference is now made to the accompanying drawings, in which:-

Figure 1 is a front elevational view of the present invention in operative association with other elements of an IV infusion system.

Figure 2 is a perspective view of the detector of the present invention.

Figure 3 is a cross-sectional view of the detector as seen along the line 8-8 in Figure 2;

Figure 4 is a cross-sectional view of the detector as seen in Figure 3 with a fluid tube mounted thereon and restrained therein;

Figure 5 is a block diagram of the electronic componentry used for the present invention; and

Figures 6A, B and C are graphs of the outputs of selected electronic components of the present invention.

Referring initially to Figure 1 the air-in-line detector of the present invention generally designated 10, is shown in operative association with an intravenous (IV) administration system. Specifically the detector 10 is shown mounted on a medical device 12. While the detector 10 of the present invention may be used with any IV infusion device it is particularly well suited for operation with a device such as the one disclosed in U.S. Patent No. 4,617,014. As shown in Figure 1 such a device 12 is operatively connected to cooperate with an IV tube 14 for the purpose of pumping or controlling the flow of fluid through the tube 14. Typically in medical procedures, a fluid source 16 is connected in fluid communication with tube 14 and hung from an IV pole 18. The system is then assembled for the infusion of medical solutions from source 16 to a patient 20.

Reference to Figure 2 shows that detector 10 has a substantially U-shaped base 22 with two oppositely extending branches 24, 26. A cavity 28 is formed between branches 24, 26 and a pedestal 30, which is attached to base 22 at the bottom of the U protrudes into cavity 28. As will be readily appreciated by the skilled artisan base 22 with branches 24, 26 and pedestal 30 can be of unitary

- Conexión directa al reset (11) de la máquina recreativa (puesta a cero de todos los sistemas), permitiendo su puesta en funcionamiento después de que la máquina quede parada o como vulgarmente se dice colgada permitiendo con un gran ahorro operativo poner de nuevo en explotación el recreativo afectado sin necesidad de esperar la visita de un técnico de reparación.
- Conexión directa de inhabilitación (12) de la máquina recreativa, permitiendo su inutilización desde la central de explotación sin necesidad de visita de un técnico de reparación, evitando el costo de la visita y las reclamaciones o pérdidas por mal funcionamiento en la explotación o bien por desacuerdo con el local donde se efectúa la explotación.
- Conexión a la batería (13) del sistema para verificar el buen estado de la misma, dado que como es sabido por envejecimiento éstas dejan de almacenar energía o bien, porque ante prolongadas desconexiones de ésta a la red, la batería en su funcionamiento normal pueda llegar a un nivel de descarga tal que impida el correcto funcionamiento del sistema.

Las conexiones anteriormente descritas sirven para obtener en tiempo real, por parte del equipo instalado en la máquina recreativa, el buen funcionamiento y estado de los parámetros esenciales de la máquina recreativa. Estos parámetros son almacenados como datos lógicos en la memoria RAM del sistema controlador hasta un máximo de treinta días de explotación continuada, si bien este límite tiene un interés meramente práctico dado que en caso necesario se podrá multiplicar esta capacidad de almacenamiento por el mero intercambio de los chips de memoria RAM por otros con mayor capacidad de almacenamiento.

Equipo a instalar en la central de explotación

La central de explotación puede albergarse por su pequeño tamaño (figura 2) en cualquier despacho de la propia oficina de la empresa explotadora y se compone de un módulo de comunicaciones (21) en función del medio de transmisión y/o operador de redes de comunicación elegido que incluyen uno o varios módems que a su vez van conectados a un controlador (22) que puede ser una plataforma propietaria (SUN, Digital, HP) o bien a un ordenador compatible tipo Macintosh o PC, o bien, utilizando un microcontrolador electrónico propietario específico. Como periféricos (24) para el pleno aprovechamiento del sistema serían necesarios pero no imprescindibles un monitor de cualquier tipo que permita visualizar las pantallas de software de gestión, control, detección de fraude y alarmas y una impresora mejor de color para imprimir los informes de alarmas, los listados históricos, gráficos e histogramas de los resultados comparativos de alarmas y explotación.

En caso de recibir una alarma desde una máquina recreativa o tragaperras por una anomalía detectada, sonará una alarma auditiva y óptica en el dicho ordenador o controlador y se

emitirá preferentemente un informe impreso de inmediato para su verificación con fecha y hora del evento, además de constar en la base de datos histórica.

La base de datos histórica será relacional y presentará por los parámetros elegidos por el operador en orden de fechas, códigos de identificación de las máquinas, nombre del local donde se realiza la explotación, direcciones y teléfonos de los locales, códigos de acceso o números del terminal en el caso de operar a través de compañías telefónicas o celulares, número de permiso de la máquina, tipo de máquina y otros disponibles o que fueran de interés para la compañía explotadora, pudiendo además consolidarse los resultados de varias compañías explotadoras y recibirse los datos en una sola central de explotación, con la consiguiente sinergia y ahorro de costes. La central de explotación puede además conectarse por cualquier medio de comunicación a un terminal accesorio (23) fijo o portátil para que personas autorizadas puedan acceder mediante claves de autorización a los datos de la central explotadora.

Consulta de los datos de explotación

Los datos pueden ser consultados accediendo al ordenador o microcontrolador propietario a través de un sistema de acceso jerarquizado por niveles de forma que sea necesario introducir una clave para acceder al programa y se permita diferente importancia en las consultas en función del nivel jerárquico del operario.

Los módulos preferentes de consulta pueden ser:

1. Por generación desde la máquina recreativa.

En caso de existir una alarma en la máquina recreativa, es decir, que se haya detectado una situación anómala en la explotación, se enviarán los datos correspondientes a la alarma detectada, con expresión de su fecha y hora, pero además todos aquellos derivados de la explotación almacenados en la dicha memoria RAM para mejor verificar las posibles causas de la anomalía.

2. Por consulta desde la central.

Por consulta desde la central volcándose automáticamente todos aquellos datos derivados de la explotación almacenados en dicha memoria RAM para mejor verificar las posibles causas de la anomalía.

3. Consultas programadas.

Mediante programación, enviando la central al equipo a instalar en la máquina registro de las horas y días de la semana en los cuales el sistema enviará los datos de la explotación de forma automática y programada a la central.

Mantenimiento y control de la máquina recreativa por medio del sistema:

1. Reset total del controlador de la máquina recreativa.

Ocurre con frecuencia que una descarga estática, un microcorte de corriente o por apagados y encendidos rápidos, los sistemas de microprocesador en los que suelen estar basados los controladores de las máquinas recreativas quedan bloqueados o "colgados" debiendo desplazarse un técnico de mantenimiento con el exclusivo fin de pulsar el interruptor interno de "reset" o reinicialización completa del controlador de la máquina recreativa. Mediante el módulo de in-

ULTRASONIC DETECTOR

The present invention relates to ultrasonic detectors for detecting the presence of air in fluid tubing

The present invention concerns devices useful for the detection of air emboli in fluid lines. More particularly the present invention concerns an ultrasonic device which is engageable with a flexible tube to determine when air rather than fluid, is flowing through the tube. The present invention is particularly but not exclusively useful in the health care field for detecting air-in-line conditions in an IV tube through which medical solutions are being administered.

Intravenous (IV) drug delivery systems have been used in numerous medical procedures for many years. Their efficacy is widely accepted. Always, however whenever medical solutions are administered intravenously there is the danger that a large bolus of air may also be inadvertently administered. The potentially fatal consequences of such an accident are well known.

As might be expected whenever a mechanical device is used in an IV administration system to assist the infusion of medical solutions to a patient, the possibility of an air leak or some other inadvertent introduction of air into the IV line is increased. Accordingly great effort is taken in the design of IV administration systems to insure that the possibility of such an accident is made extremely unlikely. Thus, air-in-line detectors are of great importance to the safe operation of a medical infusion device.

The mere incorporation of an air-in-line detector into the system of a medical infusion device is not sufficient by itself. For any medical device to operate efficiently there must be some means for making periodic safety checks of the system. This is particularly important where air-in-line detectors are concerned. Operation of the system when there is air in the fluid line can, as previously mentioned, have catastrophic consequences. Accordingly it is desirable that an air-in-line detector be able to periodically test itself to ensure its proper operation.

Several devices have been proposed for air-in-line detectors. Typically such devices have employed either an optical system which depends on the light transmissive characteristics of fluids or an ultrasonic system which depends on the ultrasonic energy transmissive characteristic of fluids. The present invention is concerned with ultrasonic detection of air emboli in an IV fluid infusion tube.

A major advantage of using ultrasonic technology for the detection of air in a fluid line is the inconsequential effect of the fluid's opacity. Unlike optical systems which are greatly affected by fluid

opacity ultrasonic systems can substantially ignore this variable. On the other hand, unlike optical systems which are operative merely by properly aligning the system's elements relative to the fluid tube an ultrasonic system in addition to proper alignment of the elements, must also establish proper impedance matching. Essentially this means that a direct ultrasonic energy path must be created through the fluid tube between the transmitter and receiver. Such a path requires effective contact between all aligned elements in the system. Further in order to obtain valid indications of the air-in-line condition, alternate paths which are able to transmit ultrasonic energy between the transmitter and receiver and around the fluid tube must somehow be obstructed.

Various devices have been proposed for ultrasonic air-in-line devices which address these problems. For example, in an attempt to achieve proper impedance matching, the device disclosed in U.S. Patent No. 4,418,566 incorporates an elastomeric material positioned between each transducer and the tube to make direct contact therebetween. U.S. Patent No. 3,974,681 incorporates sound pipes between the transducer and tube for this same purpose. Further since U.S. Patent No. 4,418,566 discloses a single base for supporting both the transmitter and the receiver it also discloses a slot formed therebetween to hinder the propagation of ultrasonic energy by a route other than through the elastomer members which are positioned between the receiver and the transmitter.

It is an object of the invention to provide an improved air-in-line detector. It is a further object of this invention to provide an improved detector for detecting air in a flexible fluid tube.

According to one aspect of this invention there is provided an ultrasonic detector for detecting the presence of air in a fluid line of an IV infusion device which detector comprises a transmitter and a receiver which are positioned to pinchingly engage a portion of the fluid line therebetween.

According to another aspect of this invention there is provided an ultrasonic detector for detecting air in fluid tubing characterized by:

a base formed with a cavity;
a transmitter having a convex lens mounted on said base with said lens protruding into said cavity to contact said tube; and

a receiver having a convex lens mounted on said base with said lens protruding into said cavity to contact said tube and pinchingly engage said tube between said transmitter and said receiver.

According to another aspect of this invention there is provided a detector wherein the receiver is

la invención y unas de tipo RAM por almacenamiento temporal de los datos obtenidos útiles para conocer la explotación y sus alarmas como se describirá mas adelante.

Un módulo de comunicaciones de gran alcance (3), bidireccional dotado de un módem para el envío de los datos procedentes del equipo a instalar en la máquina recreativa hasta la central de la explotadora, pudiendo enviarse los mismos por diferentes medios en función de la disponibilidad y/o precio de los servicios de telecomunicación disponibles, enumerando como opciones posibles en el estado actual de la técnica citaremos el medio radioeléctrico, ya sea la comunicación analógica o digital (radio punto multipunto, sistemas de trunking, radio celular llamada vulgarmente telefonía móvil, buscapersonas bidireccionales, conexión a red telefónica o módems especiales para el envío de datos por medio de la red eléctrica de suministro.

Un modulo de comunicaciones de pequeño alcance (4) bidireccional dotado de un módem que puede ser radioclástico, especial para el envío de datos por la red eléctrica, cuyo objeto es la recepción y el envío de datos e instrucciones entre las diferentes máquinas de la misma compañía explotadora existentes en un mismo local o locales próximos, de forma que se utilice un solo equipo de comunicaciones de gran alcance como el descrito en el número (3) anterior, evitando el uso de múltiples líneas o canales, y agrupando por lo tanto en un entorno local el envío de datos por un solo modulo de gran alcance.

Un modulo de alimentación a la red de corriente alterna o bien obtenida de la corriente continua disponible en la máquina recreativa (5) dotado de filtro y estabilizador de corriente continua con una batería en montaje tampón de forma que esté en carga permanente y el sistema funcione normalmente enviando incluso datos de la explotación a la central aun faltando la corriente eléctrica a la máquina recreativa.

Los subsistemas (1), (2), (3) y (4) anteriormente descritos van interconectados entre sí por un sistema de dos o más hilos bidireccional con niveles lógicos TTL o RS232, dependiendo del medio utilizado. Tanto los módulos de comunicaciones como el módulo controlador van equipados con los correspondientes blindajes para evitar que se produzcan interferencias electromagnéticas o de radiofrecuencia entre los diferentes módulos. Además se emplearán núcleos de ferrita de altas pérdidas para evitar el bloqueo del sistema controlador por la entrada de interferencias debido a radiación electromagnética de los módulos de telecomunicación en caso de ser inalámbricos. Estas medidas antiinterferencias no son vitales pero mejorarán la fiabilidad del invento.

El módulo de interfase (1) va conectado a través de un cableado externo (26) y conecta la

caja (26) donde está alojado el equipo instalado en la máquina (figura 3) a los puntos sensibles de la máquina recreativa (27) incluyendo los contadores (28) que a modo enunciativo y no limitativo en función del tipo de máquina, fabricante y datos deseados por las compañías explotadoras, son los siguientes:

- Conexión a la salida (6) que contabiliza los impulsos que desde el microprocesador de la máquina recreativa se envían al contador de adquisición (electromecánico o electrónico) como contabilidad paralela de éste y sistema antifraude que detecta las manipulaciones del cableado del citado contador que sirve para la lectura de la recaudación por parte del encargado del local y del encargado de la recaudación. La citada conexión irá a una entrada del modulo controlador que leerá en modo continuo la impedancia de salida del citado contador de forma que la mera manipulación del cableado al contador sea detectado por la variación de impedancia registrada en el circuito.
- Conexión para registrar (7) la apertura y cierre de la máquina recreativa desde el circuito existente en la puerta al modulo de control correspondiente permitiendo establecer cuando ha sido visitada y el tiempo que ha permanecido abierta.
- Conexión para monitorización (8) continuada de la alimentación de red eléctrico en corriente alterna de la máquina recreativa, para detectar cuando la máquina ha sido desconectada o ha fallado la tensión de red y la duración de estos periodos durante los cuales es imposible la explotación.
- Conexión al testigo (9) "fuera de servicio" que cuando está permanentemente encendido suele indicar avería y por lo tanto imposibilidad de explotación de la máquina. Asimismo, esta misma conexión cuando está intermitente suele indicar la condición de "falta de carribio" o "avería recuperable" de la máquina recreativa, lo que permite detectar con una entrada digital cualquiera de estas dos situaciones anómalas de explotación.
- Conexión al contador (10) de pagos o premios, que contabiliza los impulsos que desde el microprocesador de la máquina recreativa se envían al contador de pagos (normalmente electromecánico) como contabilidad paralela de este y sistema antifraude que detecta las manipulaciones del cableado del citado contador de pagos que sirve para la lectura de los premios pagados por la máquina al usuario. La citada conexión irá conectada a una entrada del modulo controlador que leerá en modo continuo la impedancia de salida del citado contador de forma que la mera manipulación del cableado al contador sea detectado por la variación de impedancia registrada en el circuito.

①

EUROPEAN PATENT APPLICATION

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⑪ Ultrasonic detector

⑫ An ultrasonic device (10) for detecting the presence of air in the fluid line of an IV infusion device comprises a transmitter (42) and a receiver (48) which are positioned to pinchingly engage a portion of the fluid line therebetween. Both the transmitter (42) and receiver (48) have convex-shaped lenses (44, 50) which contact and cause a slight indentation of the tube (14) for enhanced coupling therebetween. The device (10) may also have a pair of diametrically opposed pedestals (30, 38) which contact and engage the tube (14) from a direction substantially at right angles to the axis defined by the transmitter (42) and receiver (48). These pedestals (30, 38) help hold the tube (14) between the transmitter (42) and receiver (48). The device (10) also includes self-testing electronic componentry which compares the transmitter-off output with the transmitter-on output to determine whether operation is normal or should be stopped because either there is air in the line or the electronic circuitry is faulty.

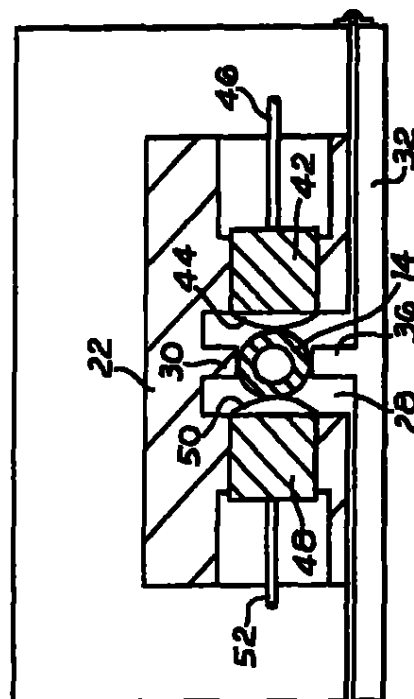


Fig 4

EP 0 306 130 A1

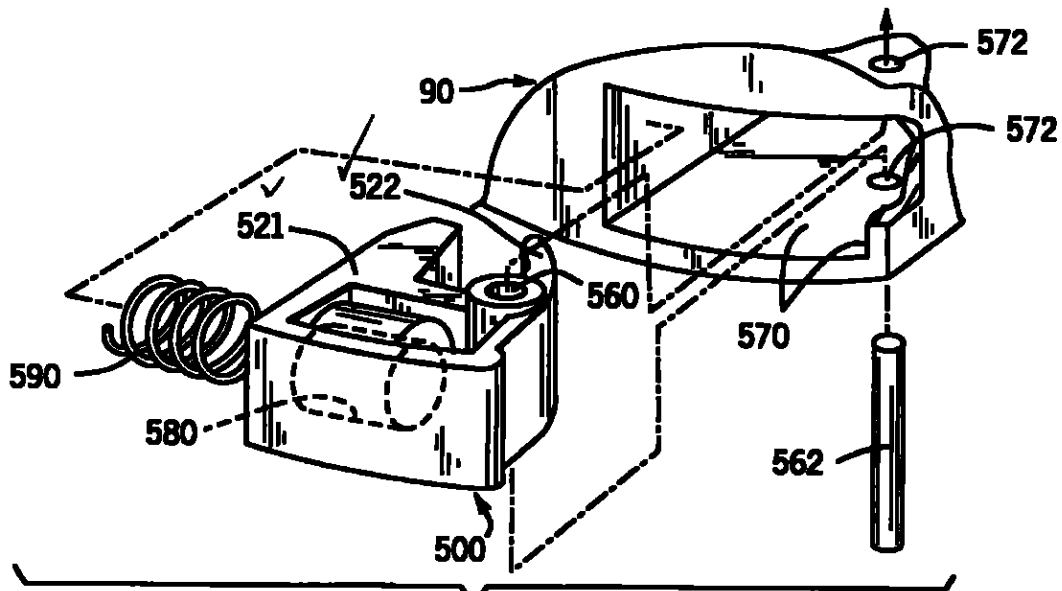


FIG. 13

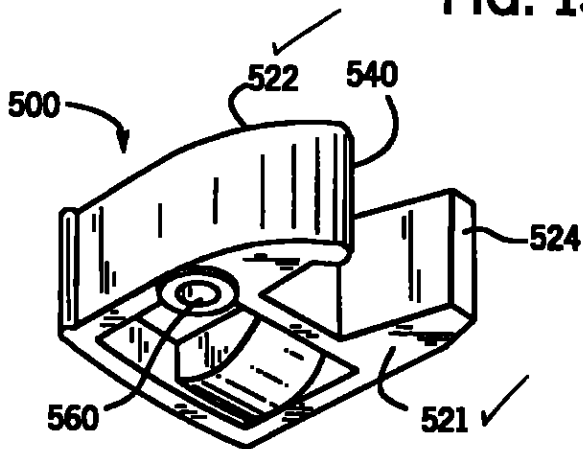


FIG. 14

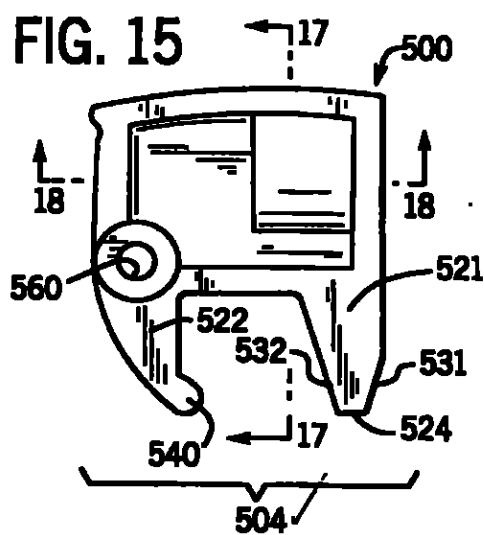


FIG. 15

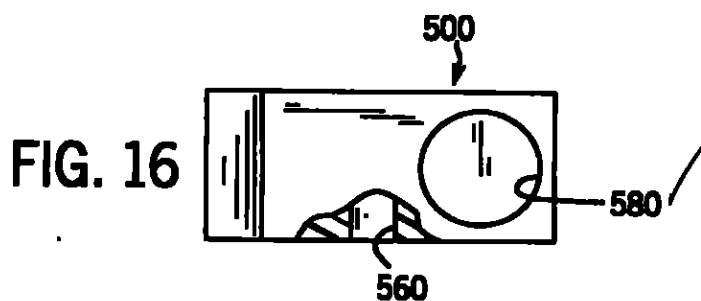


FIG. 16

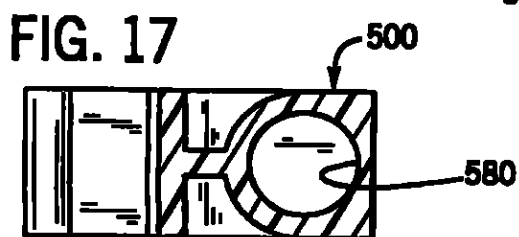


FIG. 17

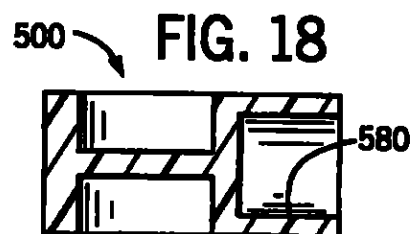
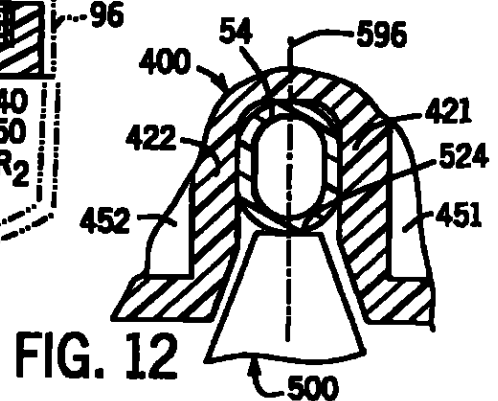
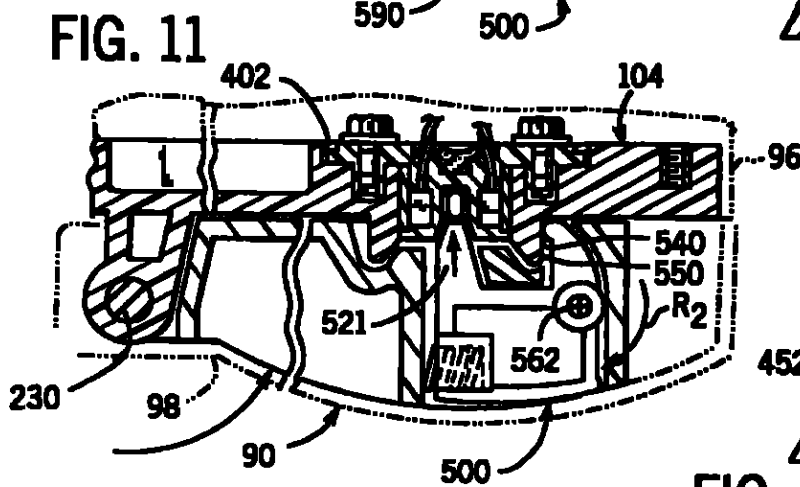
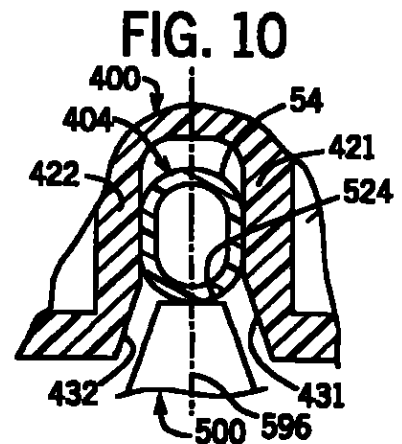
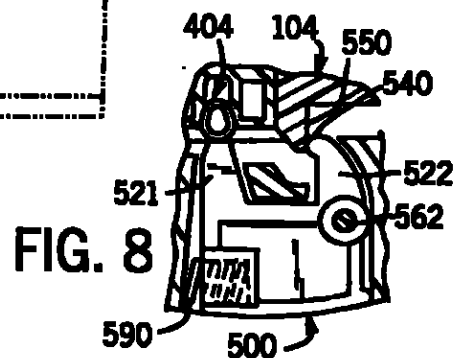
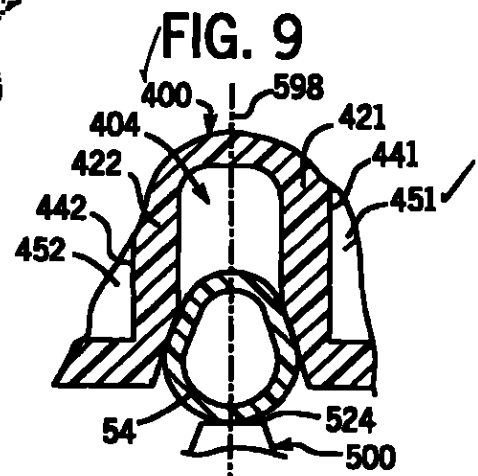
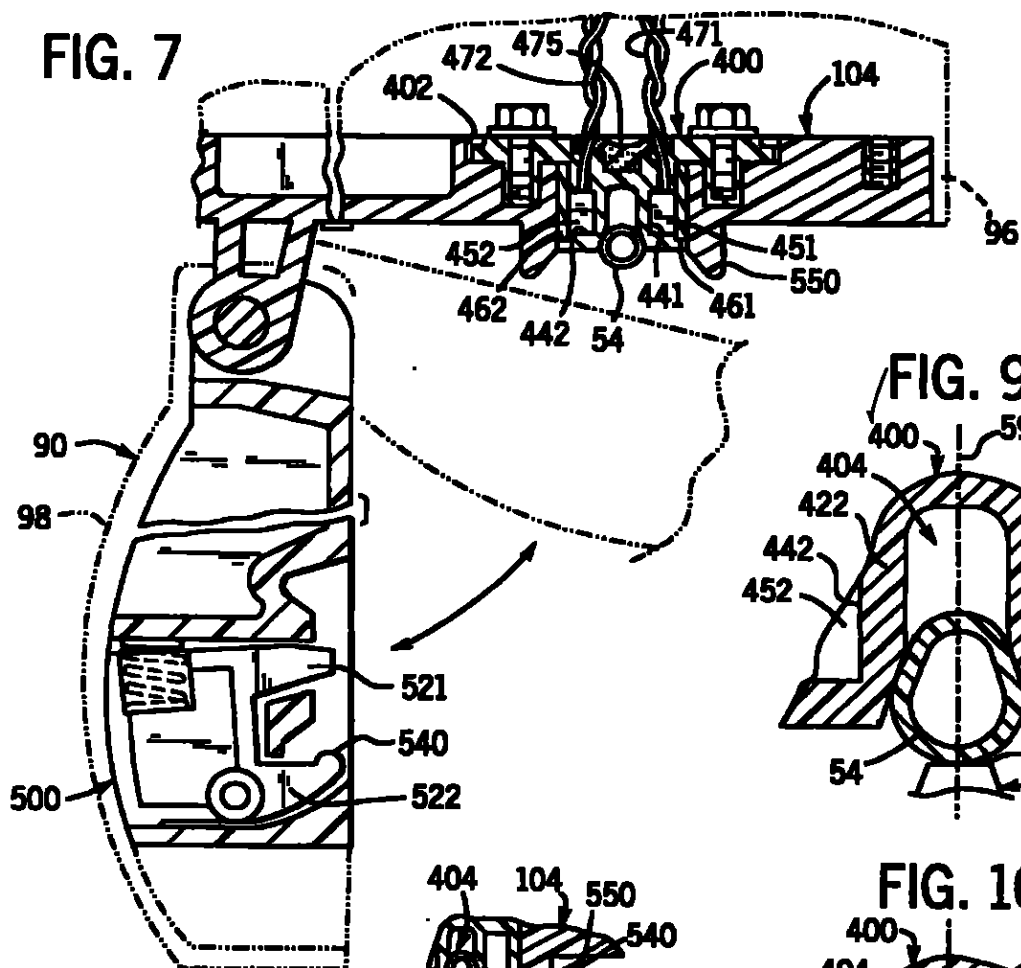


FIG. 18



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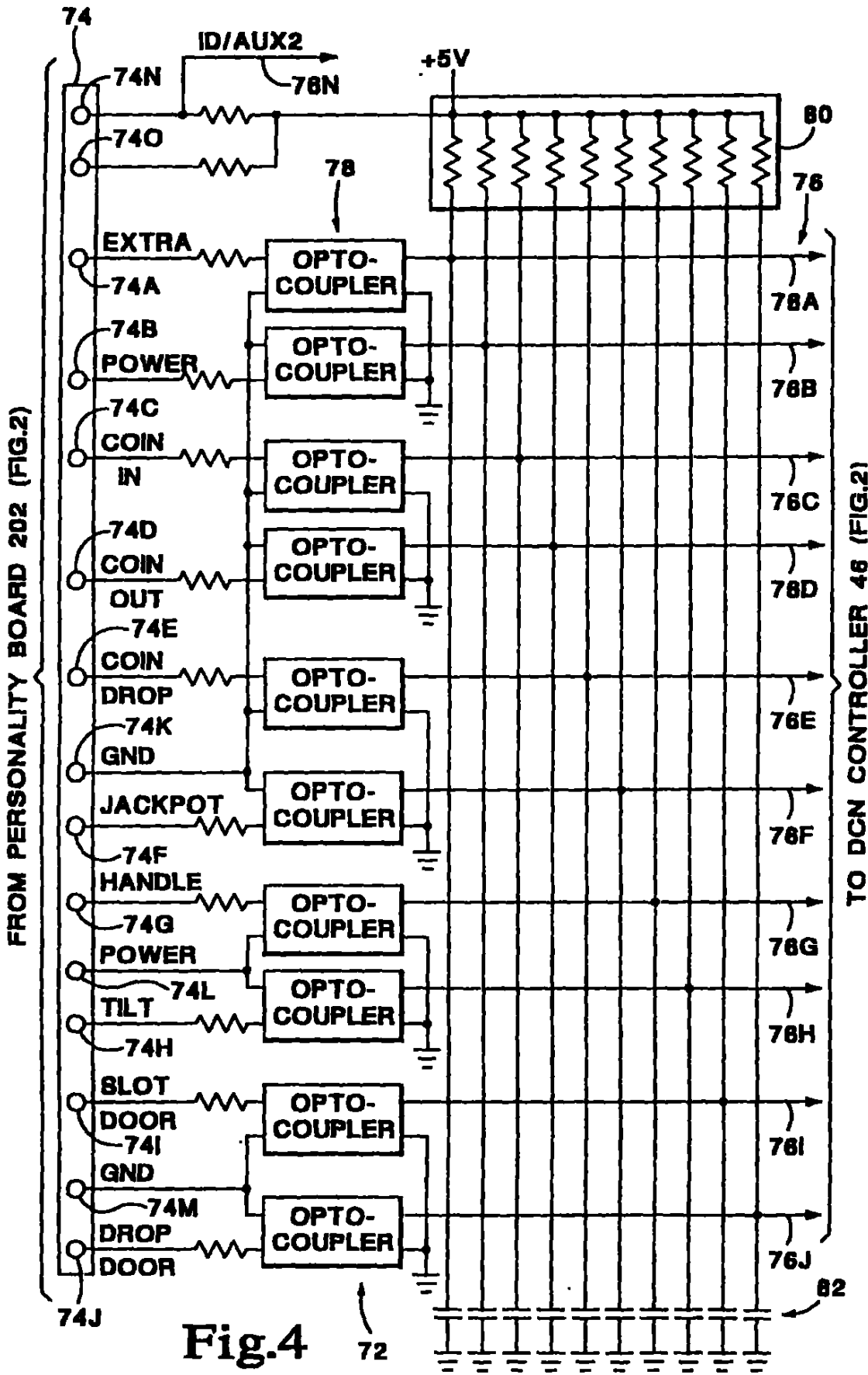
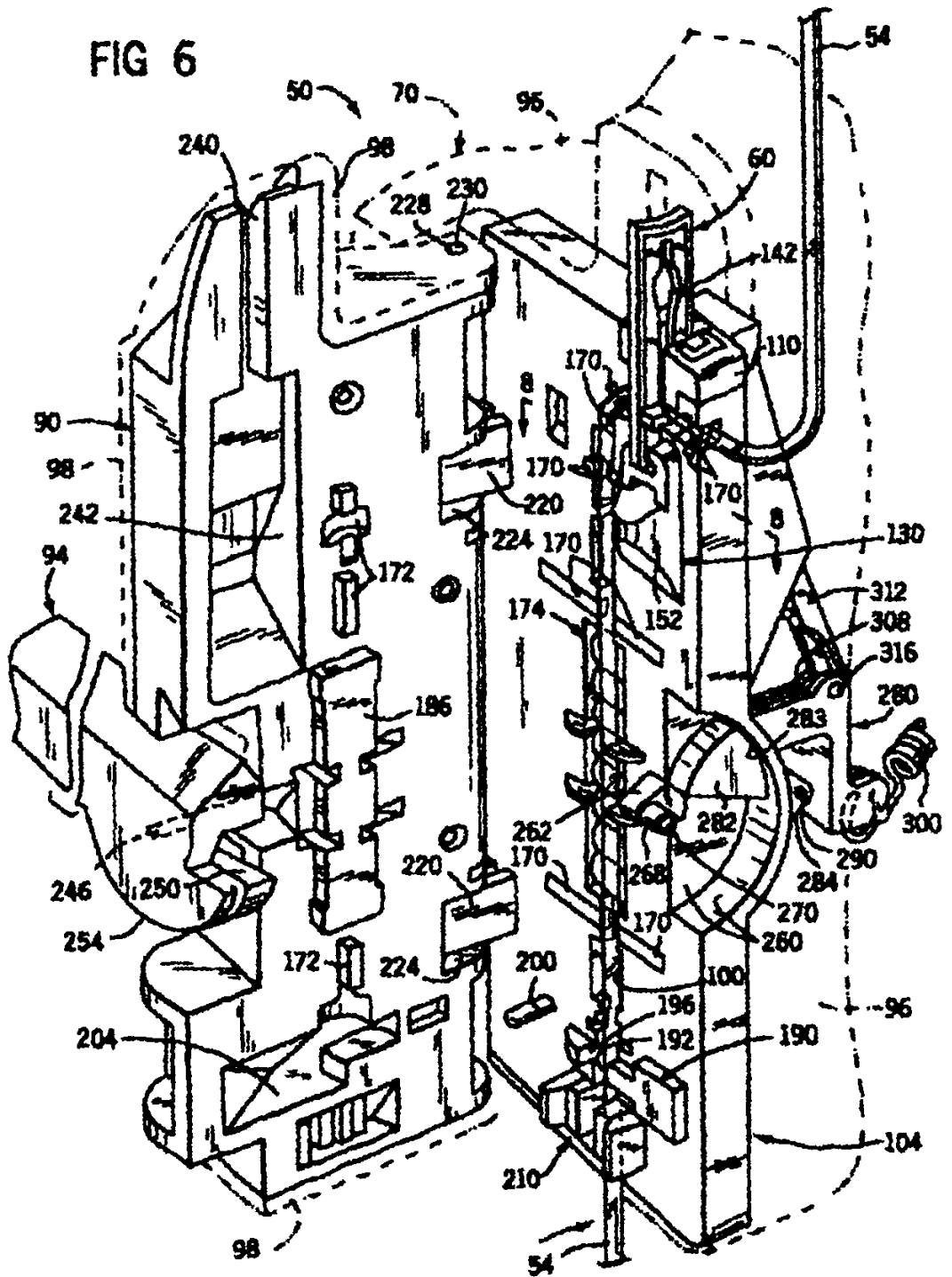
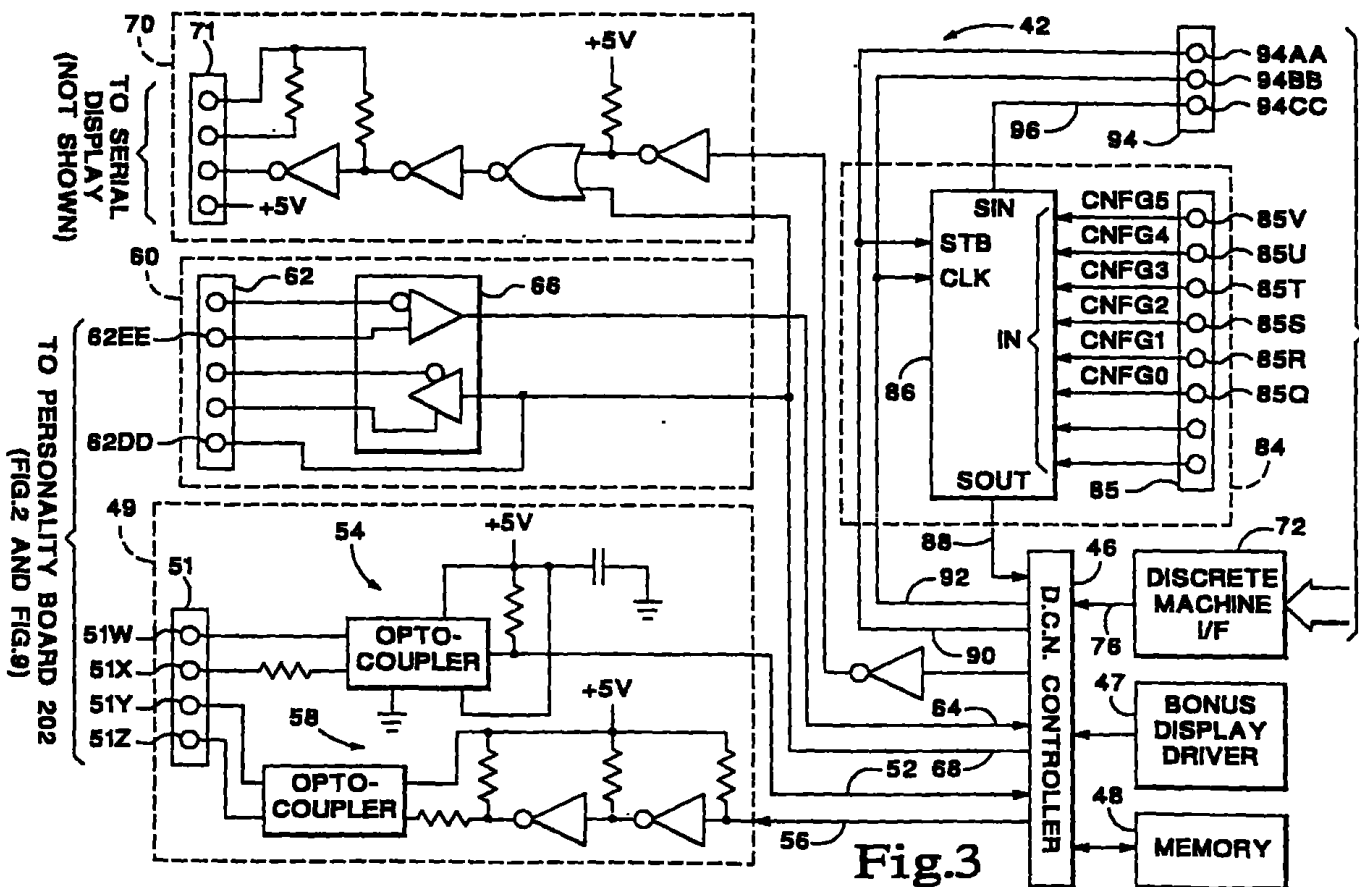


FIG 6



TO PERSONALITY BOARD 202
(FIG.2 AND FIG.8)



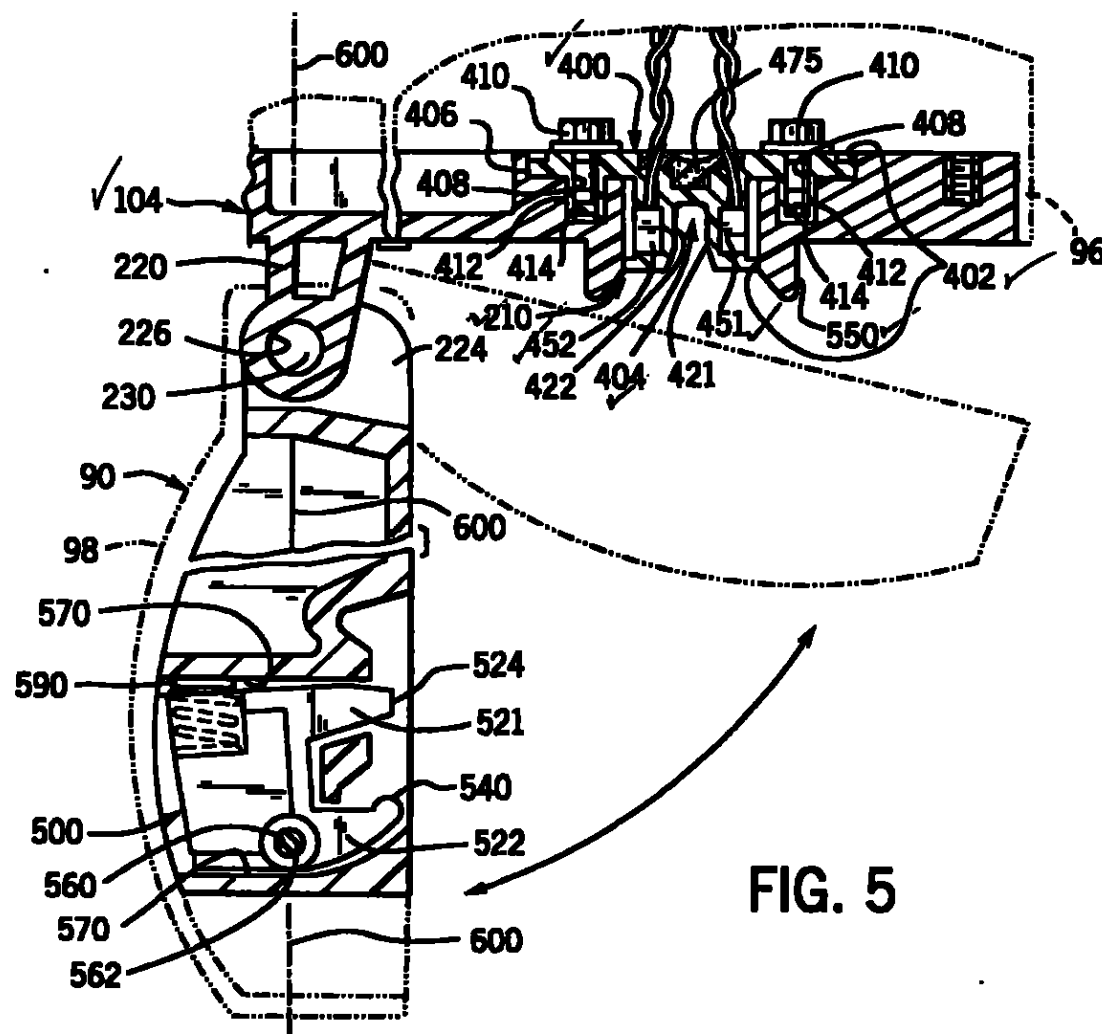
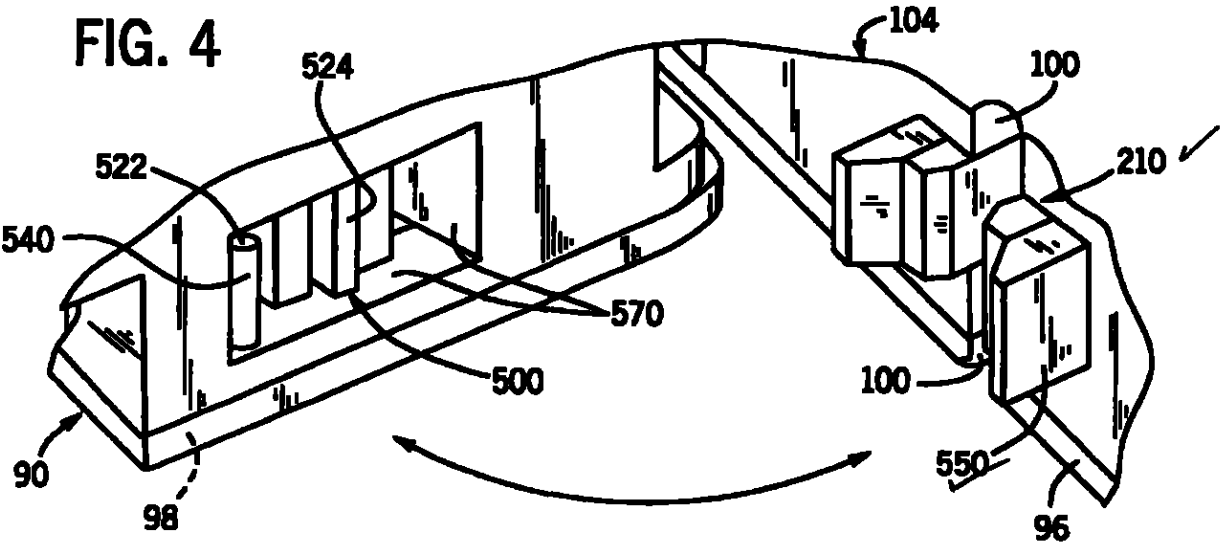


FIG. 5

se instala en cualquier máquina recreativa a controlar. Dicha unidad remota posee un conjunto de interfaces para su conexión a distintas partes de la máquina recreativa para la obtención de datos que son interpretados, procesados y almacenados. Esta unidad remota está interconectada a un módulo de telecomunicaciones bidireccional de largo alcance para enlazar a una o varias unidades centrales, cuyo módulo puede ser radioeléctrico desde ondas kilométricas a nanométricas ya sea por comunicación analógica o digital, por sistemas de trunking, punto multipunto, radio celular llamada popularmente telefonía móvil, buscapersonas bidireccionales, o bien por conexión a red telefónica o módulos especiales para envío de datos por la red eléctrica de suministro que permite obtener remotamente los datos obtenidos por el controlador de la unidad remota en una o varias unidades centrales. Dicha unidad remota posee además otro módulo de comunicaciones de corto alcance bidireccional que puede ser radioeléctrico o especial para el envío de datos por red eléctrica, que conecta entre sí máquinas situadas en un mismo local o locales cercanos, de forma que los datos de explotación se pueden concentrar y ser enviados a la unidad central de explotación a través del módulo de telecomunicaciones de largo alcance. Esta unidad remota incluye también un módulo de alimentación autónomo con una batería que permite operar al sistema aún cuando la máquina recreativa esté desconectada de la red.

La unidad remota incorpora varios módulos interfaces para la obtención de los datos de los contadores de medios de pagos e ingresos, detección de la manipulación de los circuitos de los contadores de pagos e ingresos, detección de apertura y cierre de la máquina recreativa, de falta de suministro en la máquina recreativa de la red eléctrica, de fuera de servicio o averías en la máquina recreativa, de estado bajo en la batería interna de la unidad remota, de alarma del local. Además a través de algunos de estos módulos interfaces se puede apagar, encender y resetear la máquina recreativa remota desde la unidad central. También desde la unidad central se puede realizar un reset de la unidad remota, poner a cero los contadores de pagos e ingresos, desactivar y activar la unidad remota, sincronizar la hora de la unidad remota con la de la central. Dicha unidad remota también incorpora módulos interfaces para la conexión de un teléfono de pago, de un display audiovisual externo que permite el envío de los contenidos audiovisuales.

Este sistema de gestión, control e inspección de máquinas recreativas con o sin premio está caracterizado por constar de una o varias unidades centrales. Dichas unidades centrales poseen uno o varios módulos de comunicaciones en función del medio de transmisión y/o operador de redes de comunicación elegido que a su vez van conectados a un ordenador. La unidad central de explotación podrá disponer de uno o varios sistemas satélites para efectuar consultas desde diferentes emplazamientos incluso a través de sistemas portátiles. La unidad central recibe y procesa los datos obtenidos por las distintas unidades remotas como ingresos y pagos, horas de funcionamiento, tiempo de uso, hora de encendido y apagado. Horado de

apertura de la máquina recreativa remota, manipulación de contadores, averías, fuera de servicio, falta de red eléctrica, alarma del local, bajo estado de la batería interna del equipo, manipulación o cambio de lugar de la unidad remota. Este sistema permite estudiar al usuario de las máquinas por perfiles tales como zonas, horarios, tipos de máquinas y además estudiar en tiempo real la evolución entre los usuarios de los nuevos lanzamientos de máquinas recreativas facilitando el estudio del mercado y efectuar modificaciones de los productos con un corto tiempo de respuesta para mejorar la aceptación de los mismos por el público usuario. Además en las empresas explotadoras transforma la operativa de la recaudación, mantenimiento y servicio técnico abandonando los medios manuales y empleando sistemas de telecomunicaciones para eliminar en gran manera los costos derivados de la dispersión geográfica derivados de las tareas de recaudación, mantenimiento y servicio técnico. Este sistema, al controlar en tiempo real la recaudación y las alarmas de funcionamiento, permite planificar la tesorería de las empresas explotadoras en función de datos objetivos y conocidos con anterioridad al acto de la recaudación, realizando una notable labor de sistema antifraude.

Descripción de los dibujos

El dibujo número 1 es un diagrama de bloques de los módulos que componen el equipo a instalar en la máquina recreativa. El dibujo número 2 es un diagrama de bloques de la central de explotación. El dibujo número 3 es un diagrama de posible implementación del equipo a instalar dentro de la máquina recreativa.

Descripción del modo de realización preferente

Con la presente patente se pretende establecer un sistema efectivo y técnicamente fiable con el fin de solucionar los actuales problemas de la explotación de máquinas recreativas tal y como han sido definidas con anterioridad.

Equipo a instalar en la máquina (25).

El núcleo de la invención es un sistema a instalar dentro de la máquina recreativa, sea cual sea su fabricante o antigüedad, y que va alojado en una caja, en el interior de la cual se alojan los siguientes módulos:

Un conjunto de módulos de interfase electrónico (1) que se encarga, por diversas conexiones a la máquina recreativa o tragaperras, en función del tipo o modelo de la misma de recoger y enviar señales eléctricas de los circuitos de la misma, y adaptar los niveles impedancia y aislar galvánicamente estas conexiones de forma que no altere el funcionamiento de la máquina recreativa.

Un módulo controlador (2) cuya realización preferente puede constar de un microprocesador con múltiples entradas/salidas analógicas y digitales que irán conectadas al módulo de interfase. El controlador estará además dotado de un reloj en tiempo real y un sistema de memorias tipo EPROM que llevará residente un programa firmware con el soporte lógico adecuado a los fines de

scattered, and/or attenuated such that the energy sensed by the receiving transducer 452 is less than the energy received when air bubbles are absent. The output signal from the receiving transducer 452 thus drops as a function of the reduction of the energy transmission owing to the amount of air between the transducers 451 and 452.

The control system for the pump can be adjusted to actuate an alarm and/or terminate pump operation when the output signal from the receiving transducer 452 drops below a predetermined level. Also, the control system may actuate an alarm and/or terminate the pump operation if the output signal from the receiving transducer 452 drops to only a slightly reduced level, but the slightly reduced level of the signal exists continuously, or intermittently, throughout a preselected time period. This would permit a relatively small bubble to pass through the sensor without actuating an alarm or shutting down the pump, but an excessive number of small bubbles in a short period of time would actuate the alarm and/or shut down the pump.

The proper sensing of air bubbles in the liquid flowing through the tubing 54 depends upon the tubing 54 being properly seated within the housing slot 404 between the transducers 451 and 452. If the tubular wall of the tubing 54 does not have good contact with the opposite sidewalls 421 and 422 which define the housing slot 404, then the ultrasonic energy may be scattered, reflected, or otherwise excessively attenuated at the region or regions of poor contact between the tubing 54 and either or both of the slot walls 421 and 422. This can result in the receiving transducer 452 producing a reduced output signal which would be characteristic of air in the liquid flowing through the tubing even when there is no air in the tubing. This will cause a false alarm and/or an unnecessary shutdown of the pump. Consequently, it is desirable to insure that the tubing 54 is properly loaded and seated within the sensor assembly slot 404.

According to the present invention, a novel mechanism is provided to insure that the tubing 54 is properly seated within the sensor assembly slot 404. The mechanism is provided in the door 90 and includes an engaging member 500 (shown removed from the door 90 in FIGS. 13-18 and shown in the door in FIGS. 4 and 5). The engaging member 500 functions, as explained in detail hereinafter, to properly seat the tubing 54 within the sensor assembly housing 400 even though the orientation of the door 90 changes as it approaches the sensor assembly slot 404 (FIG. 5) when the door pivots about the offset pivot axis defined by the door pivot pins 230 (FIG. 5).

The engaging member 500 has a generally U-shaped portion 504 (FIG. 15) which has a first leg 521 and a second leg 522. The first leg 521 has a distal end defining a ram for contacting the tubing 54. The ram includes a distal planar end face 524 (FIG. 15), a first planar side surface 531, and a second planar side surface 532. Each planar side surface 531 and 532 extends from the planar end face 524 at an oblique angle relative to the planar end face 524.

The distal end of the second leg 522 functions as a cam follower and includes a generally semi-cylindrical cam follower surface 540 (FIGS. 7, 8, 9, 14, and 15). The semi-cylindrical cam follower surface 540 is adapted to contact a cam surface 550, which projects perpendicularly outwardly from the face of the housing chassis 104 as shown in FIGS. 4, 5, 7, 8 and 11, as the door 90 closes.

As shown in FIGS. 13-15, the engaging member 500 includes a vertical bore 560 adjacent the inner end of the second leg 522. The bore 560 is adapted to receive a pivot

pin 562 (FIGS. 5 and 13). The pin 562 pivotally mounts the engaging member 500 in a cavity 570 (FIGS. 4, 5 and 13) in the door 90. To this end, the door 90 includes a pair of aligned bores 572 (FIG. 13) for receiving the pin 562. The pin 562 defines a pivot axis about which the engaging member 500 can pivot relative to the door 90. In the preferred embodiment illustrated, the pivot axis of the engaging member 500 defined by the pin 562 is parallel to the pivot axis of the door 90 defined by the door pivot pins 230 (FIG. 5).

As shown in FIGS. 13, 16, 17 and 18, the engaging member 500 defines a blind bore 580. The bore 580 is adapted to receive a helical coil compression spring 590 (FIGS. 5 and 13). The compression spring 590 acts between the engaging member 500 at the end of the bore 580 and the side of the cavity 570 defined by the door 90. The spring 590 functions to bias the engaging member 500 so as to pivot counterclockwise about the pivot axis defined by the pin 562 as viewed in FIGS. 5 and 13.

The spring 590 biases the engaging member 500 so that the semi-cylindrical cam follower surface 540 moves toward the door pivot axis defined by the pivot pin 230 (FIG. 5). As the door 90 is closed, the cam follower surface 540 engages the outwardly extending cam surface 550 (FIG. 8). The spring 590 insures that the cam follower surface 540 will remain engaged with the cam surface 550 as the door 90 is closed through the final few degrees of rotation to the fully closed position (shown in FIG. 11).

As the door 90 closes and the cam follower surface 540 engages the cam surface 550 (FIG. 8), the engagement between the cam surface 550 and cam follower surface 540 causes the engaging member 500 to pivot clockwise as viewed in FIG. 8 against the biasing force of the spring 590. As the door 90 is moved to the completely latched closed position (FIG. 11), the engaging member 500 is rotated further in the clockwise direction (as viewed in FIG. 11). This has the effect of orienting the engaging member ram on the distal end of the first leg 521 so that it enters the sensor assembly slot 404 relatively straight and is not skewed excessively to one side or the other of the slot 404.

In the preferred embodiment, the ram at the distal end of the first leg 521 moves generally along a straight line into the slot 404 during the last few degrees of door rotation as shown in FIGS. 9-12. The ram planar end face 524 is thus substantially perpendicular to the longitudinal axis 598 of the slot 404 when the end face 524 enters the slot 404 as shown in FIGS. 9-12. The engaging member end face 524 thus contacts the tubing 54 in a manner that applies an inward force against the tubing 54 which is substantially centrally oriented relative to the slot 404. This prevents the engaging member ram end face 524 from exerting a force upon the tubing 54 in a skewed direction that might push the tubing 54 toward an inner corner of the slot in a manner that could lead to poor seating contact between a portion of the tubing and portions of one or both of the slot walls 421 and 422.

FIG. 9 illustrates the tubing 54 initially disposed relatively far outwardly in the slot 404. The tubing 54 may be initially located in such a position if the medical technician does not take proper care in pushing the tubing further inwardly when the tubing is loaded in the pump. However, even if the tubing 54 is initially poorly loaded as shown in FIG. 9, the engaging member 500 will still function according to the present invention to properly seat the tubing 54 within the slot 404 so as to provide good contact between the tubing 54 and the slot sidewalls 421 and 422.

DESCRIPCION

Sistema de gestión, control e inspección de fraude de explotación de máquinas recreativas y/o con premio por telecontrol.

Objeto de la invención

Gestión, control e inspección de fraude de explotación de máquinas recreativas y/o con premio, por telecontrol, con el objeto de facilitar la explotación, eliminar el fraude en la recaudación, control en tiempo real de la recaudación, ahorro de costos y estudio de nuevos productos para empresas del sector de recreativos y tragaperras.

Actualmente por la legislación española existen máquinas tipo A recreativas sin premio, B recreativas con premio y C que son máquinas con premios sólo autorizadas en casinos. La presente invención mejora la gestión de la explotación de todo tipo de máquinas recreativas llamadas popularmente tragaperras sin limitarse a la clasificación vigente en el momento de presentación de la patente sobre la explotación de estas máquinas.

Sector de la técnica

El sector de la técnica al que se refiere la presente invención es el de la explotación de máquinas recreativas con o sin premio.

Antecedentes de la invención

La invención objeto de solicitud de patente consiste en un sistema de inspección de fraude y control y gestión en tiempo real de máquinas recreativas entendiendo por este tipo de máquinas tanto aquellas máquinas destinadas al uso recreativo mediante el pago por monedas u otros medios de pago electrónicos, en las que se ofrece al usuario uno o varios juegos, tanto a través de displays (CRT, plasma, LCD, TFT o análogos) como aquellas en las cuales se ofrece un juego donde una o varias bolas o pelotas (pinballs, flippers, futbolines, baloncesto) o de aquellas donde se ejercita la puntería (dardos, tiro con pistolas o similares) o aquellas que exigen la habilidad del jugador mediante el uso de palancas (joysticks) para la obtención de premios así como las máquinas de realidad virtual o simuladores. También se incluyen dentro de las aplicaciones posibles de la presente invención su uso en las máquinas "juke-box" llamadas popularmente gramolas tragaperras que reproducen selecciones musicales previo pago del usuario. Las citadas máquinas recreativas pueden o no premiar con partidas extra o devolviendo monedas a los ganadores o regalando diversos productos.

En cuanto a máquinas con premio vulgarmente denominadas tragaperras se entenderán incluidas aquellas máquinas en las que el jugador mediante la introducción de monedas u otros medios de pago por ejemplo tarjetas de banda magnética o microchip o por radiofrecuencia y mediante la elección de combinaciones cualesquiera (números, cartas, frutas, colores, o similares) reciben aleatoriamente premios en metálico mediante la devolución de monedas, o por abono electrónico en otro medio de pago.

Actualmente la gestión de la explotación de las citadas máquinas exige el desplazamiento periódico de uno o varios operados (recaudación, averías y mantenimiento) a los lugares donde las máquinas estén emplazadas, mientras que la ins-

pección del fraude es inexistente por falta de medios de comprobación. En el caso de máquinas recreativas sin premio, situadas en locales de recreativos, los explotadores pueden revisar varias máquinas en un visita, si la explotadora tiene varias máquinas en un mismo local recreativo. Sin embargo, en las máquinas recreativas con premio el costo de explotación es aún mayor, dada la dispersión geográfica al existir un número limitado de máquinas en un gran número de bares y otros establecimientos de hostelería con gran dispersión geográfica.

El control de recaudación en las dichas máquinas se efectúa normalmente mediante un arqueado con la recolección de las monedas y su confrontación con la lectura de un contador que conectado al controlador electrónico de la máquina recreativa contabiliza cada impulso de paso que el aduvisor de monedas envía por la aceptación de una moneda válida, o por aceptación de un medio electrónico de pago de los antes descritos.

En caso de que la máquina sufra una avería en el periodo de tiempo transcurrido desde que el local notifica a la compañía explotadora la misma, la recaudación es evidentemente nula, hasta que el técnico de reparación tiene ocasión de visitar el local en función de sus rutas o planificación. Además, la máquina puede sufrir averías difícilmente apreciables por el encargado del local de hostelería o incluso por el recaudador que impiden el pleno aprovechamiento de la explotación tales como el rechazo indebido de monedas, la ausencia o el exceso de premios por avería electrónica y otros de difícil previsión y sólo detectables mediante un chequeo estadístico de la admisión de monedas, jugadas efectuadas, tiempo de las mismas y premios integrados que en conjunción informarían de desviaciones respecto al funcionamiento típico de las mismas. Esta comprobación posterior al arqueado puede llevar incluso meses pues el chequeo estadístico solo se puede realizar después de varias visitas de los operados.

En resumen, actualmente la explotación se efectúa mediante medios puramente manuales donde además de la problemática expuesta se suma la posibilidad de fraude en la explotación tanto por parte de los equipos de recaudación y reparación pertenecientes a la propia compañía explotadora como de la manipulación indebida por los encargados del negocio de hostelería o salón de recreativas.

Por otro lado en el caso de nuevos productos es decir de nuevas máquinas recreativas en el mercado el resultado solo puede ser estimado después de meses de explotación, sin que exista en la tecnología actual un medio de conocer en tiempo real los resultados de explotación y parámetros como el horario de juego, el tiempo de juego, lugares geográficos donde diferentes tipos de máquinas tienen mayor o menor aceptación y estudios similares que permitan a los departamentos de ingeniería y comercial de las explotadoras, obtener una rápida y fiable imagen del impacto y posibilidades de los nuevos productos.

Explicación de la invención

Este sistema de gestión, control e inspección de máquinas recreativas con o sin premio está caracterizado por constar de una unidad remota que

As shown in FIG. 6, the crank 280 defines a slot 308 which is adapted to receive one end of a link or arm 312 which is pivotally connected to the crank 280 by means of a pin 316.

The link or arm 312 extends upwardly, and the upper end of the arm 312 (not visible in FIG. 6) extends up through the rear portion of the skirt 110 and is partially pivotally connected to a rear portion of the carrier 130 projecting rearwardly through a slot in the chassis 104.

It will be appreciated that when the door 90 is open, the spring 300 pulls the crank 280 to pivot the crank 280 counterclockwise as viewed in FIGS. 6. This holds the arm 312 and carrier 130 in the elevated position which accommodates insertion or removal of the slide clamp 60. On the other hand, when the door 90 is shut and the door handle 94 is latched closed as explained in detail above, the door handle camming surface 254 engages the cam follower surface 282 of the crank 280 and causes the crank 282 to pivot clockwise. This pulls the carrier 130 (and slide clamp 60 disposed therein) downwardly so as to position the wide part of the clamp aperture 142 around the tubing 54 and permit flow through the tubing. Subsequently, when the door handle 94 is unlatched and lifted upwardly toward the position illustrated in FIG. 6, the spring 300 again causes the crank 280 and arm 312 to return the carrier 130 (and slide clamp 60 carried therein) to the elevated position (FIGS. 6).

When the carrier 130 is returned to the elevated position (FIG. 6), the slide clamp 60 can be removed. It will be appreciated that when the carrier 130 is in the elevated position, the slide clamp 60 is oriented on the tubing 54 in the receiving path such that the tubing 54 is squeezed closed in the narrow portion 144 of the clamp aperture 142. Hence, whenever the door 90 is opened to permit removal of the slide clamp 60, the tubing 54 is always squeezed closed by the slide clamp 60. Thus, if medical personnel fail to close the roller clamp 56 (FIG. 1) prior to removing the tubing 54 from the pump, then there will be no danger of fluid free flowing into the patient even if the lower clamp 190 is opened and the tubing 54 is removed from the pump.

If desired, the pump 50 could be alternatively designed so as to eliminate the above-described movable carrier 130 and linkage mechanism for effecting movement thereof. In such an alternate design, the tubing 54 would just be loaded into the receiving path 100 without locating the slide clamp 60 within the pump. The above-discussed carrier 130 and linkage mechanism for moving it in the pump 50 form no part of the present invention.

The air sensor assembly 210 is illustrated in greater detail in FIGS. 4-12. The air sensor assembly 210 includes a housing 400 which, in the preferred embodiment, is a separately molded piece inserted in an aperture 402 in the main pump housing chassis 104 as shown in FIG. 5. It will be appreciated, however, that the sensor assembly housing 400 could alternatively be provided as a unitary part of the chassis 104 which is regarded as a part of the main pump housing.

As shown in FIG. 4, the tubing receiving path 100 extends through, and is defined in part by, the sensor assembly 210. To this end, the sensor assembly housing 400 defines a slot 404 (FIG. 5) which is a part of the channel-like, tubing-receiving path 100 defined by the pump chassis 104 above and below the air sensor assembly 210. Because the sensor assembly housing 400 is inserted in the pump housing chassis 104, the slot 404 may be characterized as being defined generally by the main housing of the pump. In the preferred embodiment illustrated in FIG. 5, where in the air

sensor assembly housing 400 is a separately molded piece inserted in the chassis 104 in the main pump housing, the slot 404 may also be characterized as being more specifically defined by the air sensor assembly housing 400 per se.

The rear portion of the air sensor assembly housing 400 includes a laterally extending mounting portion 406 (FIG. 5) which defines a pair spaced-apart bores 408 for each receiving a screw 410 threadingly engaged with a threaded insert 412 mounted in a bore 414 in the chassis 104.

As shown in FIG. 9, the air sensor assembly housing 400 includes a first wall 421 and a second wall 422 spaced from the first wall 421. The air sensor assembly housing slot 404 is defined between the first wall 421 and the second wall 422. The walls 421 and 422 are preferably parallel and define facing, parallel surfaces along the sides of the slot 404.

As shown in FIG. 10, the air sensor assembly housing slot 404 is further defined by a first planar outer wall 431 extending at an oblique angle from the first wall 421 and by a second planar outer wall 432 extending at an oblique angle from the second planar wall 422. The distance between the first and second planar outer walls 431 and 432, respectively, increases with increasing distance from the first and second parallel walls 421 and 422. The oblique walls 431 and 432 facilitate insertion of the tubing 54 into the slot 404.

As illustrated in FIG. 9, air sensor assembly housing 400 defines a first cavity 441 and a second cavity 442. A transmitting transducer 451 is disposed in the first cavity 441. A receiving transducer 452 is disposed in the second cavity 442. As shown in FIG. 7, the transducer 451 is covered with a layer of epoxy 461 across the opening of the cavity 441. Similarly, the transducer 452 is covered with a layer of epoxy 462 at the opening of the cavity 442.

As shown in FIG. 7, electrical lead wires 471 from the transducer 451 extend rearwardly through an aperture at the rear of the housing 400. Similarly, electrical lead wires 472 extend rearwardly from the transducer 452 through an aperture in the rear of the housing 400. The lead wires 471 and 472 are connected to the sensing and control circuit forming part of the pump sensing and control system. The rear portion of the housing 400 adjacent the rearwardly extending electrical lead wires 471 and 472 is sealed with a suitable epoxy material 475 (FIGS. 5 and 7).

As described hereinafter in detail, the tubing 54 is initially loaded and seated between the walls 421 and 422 of the housing 400 as shown in FIG. 12. The tubing 54 is lightly compressed laterally so as to establish good contact between the tubing 54 and the housing slot walls 421 and 422. The transmitting transducer 451 may be of any suitable conventional or special type (e.g., piezoelectric) for transmitting ultrasonic energy through the first wall 421, through the adjacent wall of the tubing 54, through the liquid contained in the tubing 54, through the far wall of the tubing 54, and through the housing second wall 422. The transmitted energy is sensed by the receiving transducer 452 which may be of any suitable conventional or special type (e.g., piezoelectric).

When the pump is operating to pump liquid through the tubing 54, the transducers 451 and 452 can be operated so that the output signal from the receiving transducer 452 can be continuously monitored. The output signal from the receiving transducer 452 falls generally within a narrow band or range when the liquid is flowing through the tubing 54 with no entrained air bubbles. However, if air bubbles are present in the liquid flowing through the tubing 54, then the energy transmitted from the first transducer 451 is reflected,



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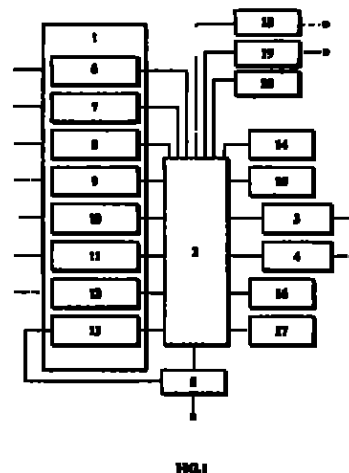
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⑳ Agente: **No consta**

㉑ Título: **Sistema de gestión, control e inspección de fraude de explotación de máquinas recreativas y/o con premio por telecontrol.**

㉒ Resumen:

Sistema de gestión, control e inspección de fraude de explotación de máquinas recreativas y/o con premio por telecontrol. Mediante un equipo a instalar dentro de la máquina recreativa se envía por un módulo de largo alcance radioeléctrico o línea telefónica bidireccional los datos resultantes de la explotación a una central donde se reciben las alarmas resultantes de las anomalías de explotación o fraude en la recaudación de las máquinas. La información recibida en la central permite el mantenimiento a distancia de las máquinas recreativas sin mediar visita de operarios y mediante medios estadísticos permite controlar y señalar desviaciones del funcionamiento típico de las máquinas, evaluar su rentabilidad y su aceptación por el consumidor. A través de otro módulo de comunicaciones de corto alcance radioeléctrico y bidireccional permite concentrar los datos de alarmas y explotación de varias máquinas situadas en un mismo local para su envío posterior a la central de explotación por medio del módulo de comunicaciones de largo alcance.



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SUMMARY OF THE INVENTION

The improved system of the present invention accommodates safe delivery of fluids to a patient. The system is convenient to operate and is easy to set up.

The system permits the use of a door on the pump which is pivotally mounted to the pump housing along an axis which is substantially offset from the tubing-receiving path in the housing. The system functions, upon closing the door, to engage the tubing in the air sensor slot and properly seat the tubing in the slot. This eliminates, or greatly minimizes, the likelihood that the tubing may be improperly loaded in the air sensor slot. Thus, during operation, there will be good contact between the air sensor and the tubing so that the possibility of generating low signal false alarms is substantially minimized, if not eliminated.

According to the present invention, a pump includes a housing defining a slot for receiving the tubing through which the fluid is pumped. A door is pivotally mounted on the housing to pivot between a closed position covering the slot and an open position away from the slot. A pusher means is pivotally mounted to the door for pushing the tubing in the slot.

According to yet another aspect of the invention, the housing contains a sensor assembly defining a slot for receiving tubing through which fluid is pumped. A door is pivotally mounted to the housing on a first axis to swing between (i) a closed position covering the slot, and (ii) an open position spaced away from the slot. An engaging member for pushing the tubing in the slot is pivotally mounted to the door for rotation about a second axis. The engaging member has a ram for contacting the tubing whereby the orientation of the ram relative to the door can change as the ram enters the slot when the door closes.

In a preferred embodiment of the invention, the engaging member includes a cam follower in addition to the ram. The housing defines a cam surface. A spring acts between the engaging member and door for biasing the engaging member to pivot about an axis relative to the door. This urges the cam follower against the cam surface as the door is moved to the closed position. This causes the ram to be oriented so as to enter the slot along a path of motion which is generally parallel to the slot walls.

Numerous other advantages and features of the present invention will become readily apparent from the following detailed description of the invention, from the claims, and from the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings that form part of the specification, and in which like numerals are employed to designate like parts throughout the same,

FIG. 1 is a perspective view of a primary, intravenous administration set;

FIG. 2 is a fragmentary, perspective view of an infusion pump that (1) incorporates features of the present invention, and (2) is mounted on an infusion stand supporting a flexible bag container connected to the administration set which is shown in FIG. 1 and which is illustrated in FIG. 2 as loaded in the infusion pump;

FIG. 3 is an enlarged, fragmentary, perspective view of the front of the infusion pump shown in FIG. 2, and FIG. 3 shows the door in the full open position and the administration set tubing removed from the pump;

FIG. 4 is a fragmentary, greatly enlarged, perspective view of a lower portion of the pump shown in FIG. 3;

FIG. 5 is an enlarged, fragmentary, cross-sectional view taken generally along the view designation 5—5 in FIG. 3, and FIG. 5 shows the pump chassis in cross-section but for ease illustration, omits detailed structure in the housing behind the chassis;

FIG. 6 is a fragmentary, perspective view similar to FIG. 3, but FIG. 7 shows the administration set tubing loaded into the pump;

FIG. 7 is a view similar to FIG. 5, but FIG. 7 shows the tubing partially loaded into the air sensor slot in the pump;

FIG. 8 is a fragmentary, cross-sectional view similar to FIG. 7, but FIG. 8 shows the door moved toward the closed position where the engaging member in the door is beginning to engage the tubing;

FIG. 9 is a greatly enlarged, fragmentary, cross-sectional view similar to FIG. 8;

FIG. 10 is a view similar to FIG. 9, but FIG. 10 shows the position of the tubing after the door has been moved further toward the fully closed position;

FIG. 11 is a view similar to FIG. 7, but FIG. 11 shows the door in the fully closed position; and

FIG. 12 is a greatly enlarged, fragmentary, cross-sectional view similar to FIG. 11, and FIG. 12 shows the air sensor receiving slot region after the door is fully closed;

FIG. 13 is a fragmentary, exploded, perspective view of a portion of the pump door tubing engaging member, pivot pin, and biasing spring;

FIG. 14 is a perspective view of the engaging member viewed from the bottom;

FIG. 15 is a top-plan view of the engaging member;

FIG. 16 is a side elevational view of the engaging member shown partly in cross section;

FIG. 17 is a cross-sectional view taken generally along the plane 17—17 in FIG. 15; and

FIG. 18 is a cross-sectional view taken generally along the plane 18—18 in FIG. 15.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While this invention is susceptible of embodiment in many different forms, this specification and the accompanying drawings disclose only one specific form as an example of the invention. The invention is not intended to be limited to the embodiment so described, however. The scope of the invention is pointed out in the appended claims.

For ease of description, a pump incorporating features of this invention is described in one normal (upright) orientation, and terms such as upper, lower, horizontal, etc., are used with reference to this orientation. It will be understood, however, that the pump of this invention may be stored, transported, and sold in an orientation other than the orientation described.

Figures illustrating the pump show some mechanical elements that are known and that will be recognized by one skilled in the art. The detailed descriptions of such elements are not necessary to an understanding of the invention, and accordingly, are herein presented only to the degree necessary to facilitate an understanding of the novel features of the present invention.

The pump incorporating features of this invention is used with certain conventional components the details of which, although not fully illustrated or described, will be apparent to those having skill in the art and an understanding of the necessary functions of such components.

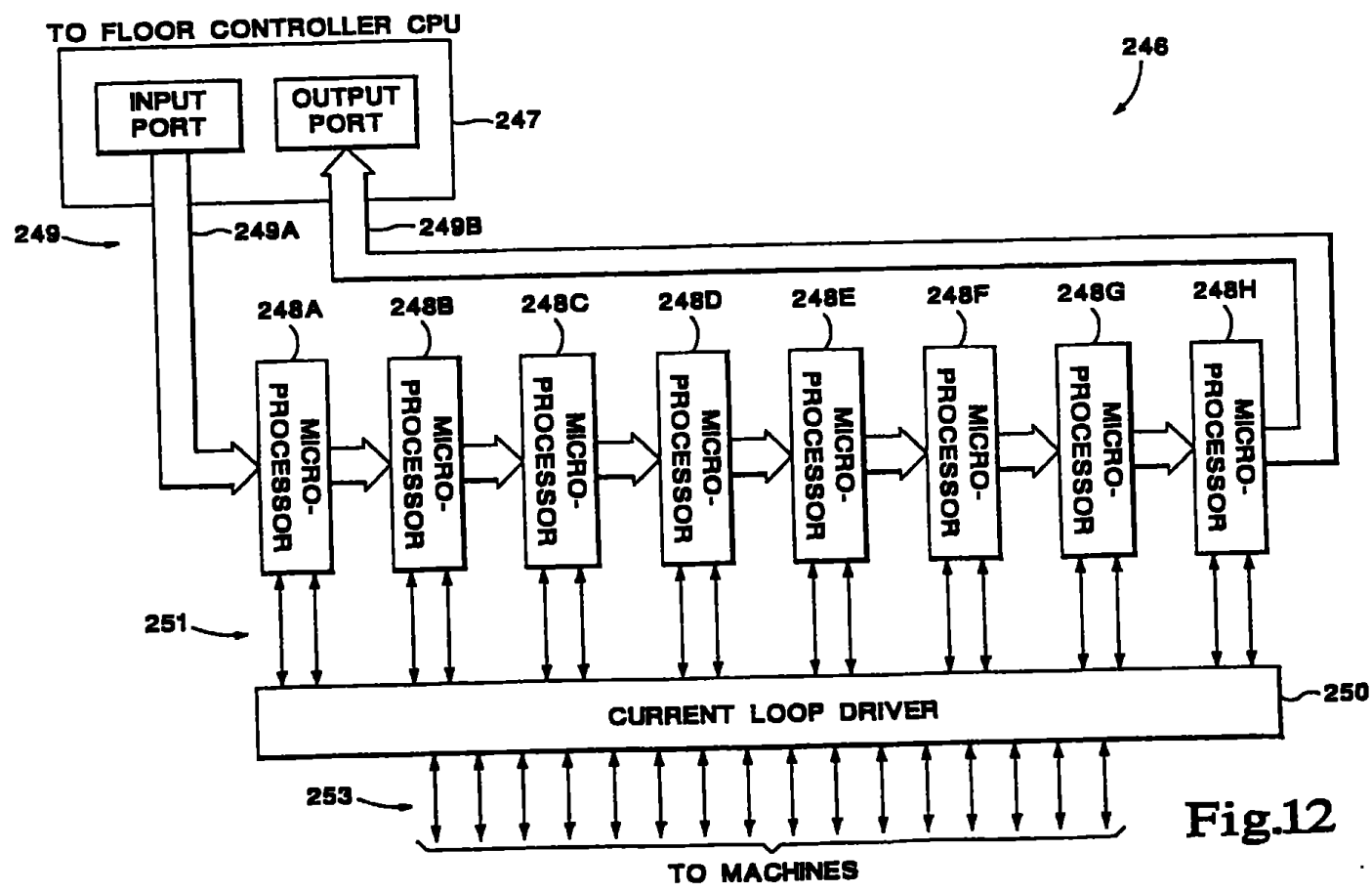


Fig.12

PUMP WITH DOOR-MOUNTED MECHANISM FOR POSITIONING TUBING IN THE PUMP HOUSING

CROSS REFERENCE TO RELATED APPLICATION(S)

Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

REFERENCE TO A MICROFICHE APPENDIX

Not applicable.

TECHNICAL FIELD

This invention relates to a liquid delivery system and is especially suitable for use as part of an infusion pump system designed to deliver parenteral and enteral fluids, as well as whole blood or red blood cell components, using a wide variety of standard intravenous administration sets and fluid containers.

BACKGROUND OF THE INVENTION AND TECHNICAL PROBLEMS POSED BY THE PRIOR ART

One conventional type of infusion pump system employs a peristaltic pump in conjunction with an intravenous administration set. The set consists of flexible thermoplastic tubing through which fluid flows from a suspended container, such as a flexible bag or rigid bottle, to a patient's indwelling vein access device, such as a needle or cannula inserted into the patient. A length of the administration set tubing between the fluid container and the patient is mounted in the peristaltic pump which sequentially squeezes adjacent sections of the tubing so as to pump the fluid via a peristaltic action along the tubing into the patient.

To insure that such pumping systems function satisfactorily, such pumping systems typically include a system for sensing air bubbles in the liquid flowing in the tubing in the pump. If the control system senses a sufficient amount of air, then an alarm is actuated and/or the operation of the pump is terminated. The air sensor control system for the pump may permit a small bubble to be pumped through the tubing without actuating the alarm or shutting the pump down, but the control system will actuate an alarm and/or shut down the pump if the rate of small bubble flow exceeds a preselected value. The pump control system will also generate an alarm and/or shut down the pump if the length of a single bubble has a size which exceeds a predetermined length along the tubing.

A conventional air sensor employed in such peristaltic pumps is a piezoelectric transmitter/sensor assembly which has a slot for receiving a length of the tubing. The tubing, which is typically a flexible polyvinyl chloride material, is squeezed lightly between the opposed walls of the slot. In the piezoelectric transmitter/sensor assembly, there is a piezoelectric transmitter transducer in one of the walls, and there is a piezoelectric receiving transducer in the other wall.

The piezoelectric transmitter transducer is electrically powered to produce mechanical vibrations. The mechanical vibration is transmitted as ultrasonic energy through the wall of the tubing into the liquid. At the receiving side of the slot, the energy passes from the liquid through the wall of the

tubing and into the receiving transducer. The ultrasonic energy is attenuated, scattered, or reflected dependent upon the conditions within the fluid. At the wall opposite the transmitter transducer, the receiver transducer converts the energy into an electrical signal which varies as a function of the energy transmission through the liquid. This signal can be correlated as function of the presence or absence of an air bubble.

If the wall of the tubing is not in good contact with the sides of the slot in the sensor assembly, then the transmission of the ultrasonic energy from the transmitter transducer into and through the wall of the tubing will be degraded. Similarly, there will be a degradation of the ultrasonic energy at the other side of the slot as the energy passes from the tubing wall to the receiving transducer. The signal is greatly attenuated owing to the poor contact between the tubing and the walls of the sensor slot, and this results in the generation of a smaller electrical signal. A sufficiently small signal could be of the same, small magnitude that would occur if there was an air bubble in the fluid. Thus, the control system would provide a false alarm and/or shut down the pump. In view of this, it would be desirable to provide a system in such a pump for facilitating the proper loading of the tubing within the air sensor slot so as to minimize the possibility of false alarms arising from poor contact between the tubing and slot walls.

One type of conventional pump has a door which is pivotally mounted to the pump housing for movement between (1) a closed position covering the tubing in the pump, and (2) an open position which permits loading or unloading of the tubing. Initially, the tubing can be manually loaded in the pump with a length of the tubing pushed at least part way into the air sensor slot. The inside of the pump door has a projecting finger. When the door is closed, the projecting finger engages the tubing and pushes it further into the air sensor slot to ensure good contact between the wall of the tubing and both of the opposed walls of the air sensor slot.

While the above-described, door-mounted pusher finger may function generally satisfactorily, it would be desirable to provide an improved system for ensuring proper positioning of the tubing within the air sensor slot. In particular, it would be especially advantageous to provide a tubing-engaging system which could be mounted on a door and which could accommodate an offset location of the door pivot axis with respect to the air sensor slot. Such an improved system should accommodate engagement of the tubing in the air sensor slot by the door in such a way that the tubing is contacted, and moved further inwardly into the slot, along a path of movement that does not urge the tubing against the slot walls with unequal force or in a manner that would tend to push part of the tubing away from one of the walls and toward the other wall.

The present invention provides an improved pump system which can accommodate designs that have the above-discussed benefits and features, which is convenient to use, and which is cost-effective with respect to its manufacture and operation. The system is especially suitable for use in a peristaltic pump. However, the system is applicable to other types of pumps that have a tubing-receiving slot which can be covered with a door.

The system is easily operated and can be used with a wide variety of standard administration sets and fluid containers. The system is designed to meet the growing demand for hospital-wide standardization, as well as alternate-site, in-home healthcare standardization.

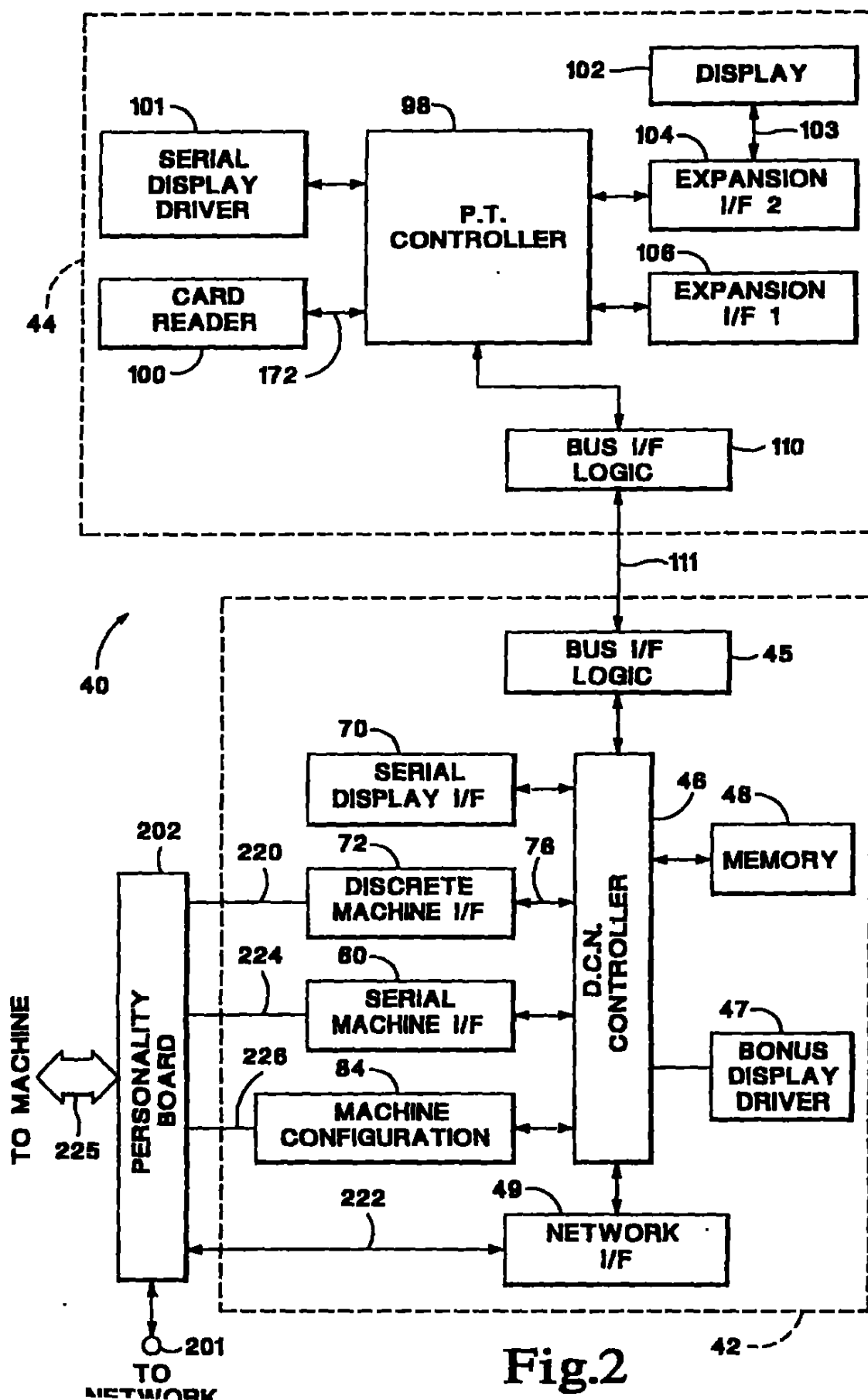


Fig.2

United States Patent [19]

Briggs et al.

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 [45] Date of Patent: Feb. 9, 1999

[54] PUMP WITH DOOR-MOUNTED MECHANISM FOR POSITIONING TUBING IN THE PUMP HOUSING

[75] Inventors: Kenneth D. Briggs, San Jose; Russell M. Sampson, Mountain View, both of Calif.

[73] Assignee: Abbott Laboratories, Abbott Park, Ill.

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[51] Int. Cl.⁶ A61M 1/00

[52] U.S. CL 604/153; 417/53; 417/63

[58] Field of Search 604/153, 152, 604/151, 118-120, 34, 35, 65, 66; 417/53, 63, 4, 474-477, 234

[56] References Cited

U.S. PATENT DOCUMENTS

5,540,561	7/1996	Johnson		604/153 X
5,586,868	12/1996	Lawless et al.		417/53
5,628,731	5/1997	Dodge et al.		604/153

OTHER PUBLICATIONS

Copy of brochure entitled "imed." published by IMED Corporation, Copyright date 1989.

Copy of brochure entitled "Flo-Gard 6301," published by Baxter Healthcare Corporation, Copyright date 1992.

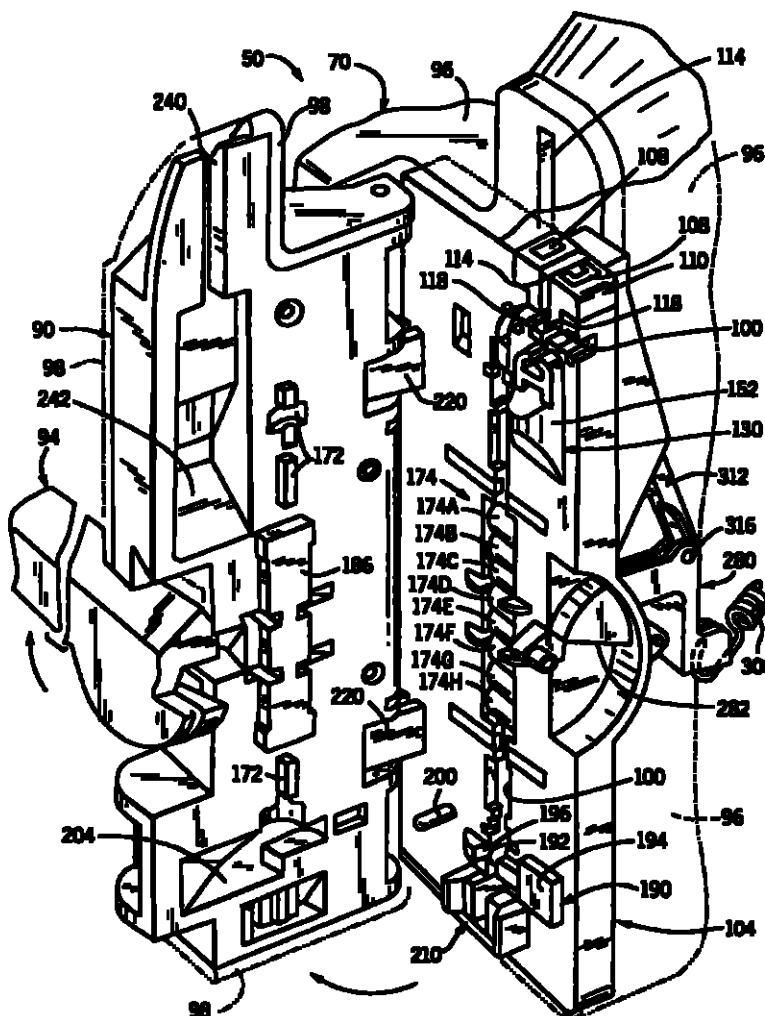
Primary Examiner—John D. Yasko

Attorney, Agent, or Firm—Neal D. Marcus

[57] ABSTRACT

A peristaltic pump is provided with a housing, a pump head in the housing, and a receiving path defined along a housing and pump head for receiving tubing. An air sensor assembly in the pump has a slot for receiving a section of the tubing in the receiving path. A position covering the receiving path and an open position exposing the receiving path. An engaging member is provided for pushing the tubing in the slot. The engaging member is pivotally mounted to the door for rotation about an axis parallel to the door pivot axis. The engaging member has a ram for contacting the tubing. The orientation of the ram relative to the door can change as the ram enters the slot when the door closes so that the tubing is pushed relatively evenly and along a substantially straight line into the slot.

27 Claims, 6 Drawing Sheets



REPUBLICA DE COLOMBIA
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

RAD.:92 348829

LA SECRETARIA GENERAL AD-HOC

CERTIFICA

Que de conformidad con lo dispuesto en el artículo 80 de la Decisión 486 de la Comisión de la Comunidad Andina y las resoluciones de las tasas aplicables; el(la) Doctor(a) **RINCON MARTHA LUCIA**, allegó el(los) siguiente(s) recibo(s) oficial(es) de caja, correspondiente(s) a la(s) tasa(s) de mantenimiento del certificado de Patente de Invención número 24407:

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MARIA CONSUELO CASIJ REY

adpal



US006489896B1

(12) **United States Patent**
Platt et al.

(10) Patent No.: **US 6,489,896 B1**
(45) Date of Patent: **Dec. 3, 2002**

(54) **AIR IN-LINE SENSOR FOR AMBULATORY
DRUG INFUSION PUMP**

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(*) Notice: Subject to any disclaimer, the term of this
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(22) Filed: **Nov. 3, 2000**

(51) Int. Cl.⁷ **G08B 17/00**

(52) U.S. Cl. **340/632; 340/621; 340/603**

(58) Field of Search **340/603, 621,
340/632; 604/122, 123; 128/DIG. 13; 73/19.1**

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,764,166 A * 8/1988 Spani 604/65

4,821,558 A * 4/1989 Pastorek et al. 73/19
4,981,467 A 1/1991 Bobo, Jr. et al. 604/65
5,102,392 A 4/1992 Sakai et al. 604/122
5,123,275 A * 6/1992 Deoni et al. 73/19.3
5,177,993 A * 1/1993 Rockman et al. 73/19.03
5,537,853 A * 7/1996 Flanagan et al. 73/19.3

* cited by examiner

Primary Examiner—Julie Lien

**(74) Attorney, Agent, or Firm—Paul J. Nykaza; Wallenstein
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(57) **ABSTRACT**

An air in-line sensor for detecting air bubbles in a therapeutic solution flowing through a tube utilizes a unitary type sensor having a channel for receiving the tube. The channel has a tube loading section. A signal emitting member is positioned on one side of the tube and a signal receiving member is positioned on an opposite side of the tube. A first air baffle is positioned between the signal emitting and signal receiving members.

34 Claims, 3 Drawing Sheets

