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OWENS - BROCKWAY GLASS CONTAINER

DOMICILIO

TOLEDO, OHIO, ESTADOS UNIDOS DE AMERICA

74. APODERADO

JUAN PABLO CADENA SARMIENTO

22. SANTAFE DE BOGOTA, D.C.

PETITORIO

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1 SOLICITUD DE:

☒ Patente de Invención. ☐ Patente de Modelo de Utilidad.

☐ Capítulo I. ☒ Capítulo II.

2 SOLICITANTE (71)	Nombre: OWENS - BROCKWAY GLASS CONTAINER INC. Dirección: One SeaGate, Toledo, OH, 43666, Estados Unidos de América Nacionalidad o Domicilio: Estados Unidos Lugar de Constitución: Estados Unidos Teléfono: Fax: E-mail:	IDENTIFICACION C.C. ☐ NIT ☐ C.E. ☐ Otro ☐ Cual _____ Número _____
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3 REPRESENTANTE O APODERADO	Nombre: JUAN PABLO CADENA SARMIENTO Dirección: Cra. 7 No. 16-56 Piso 9 Teléfono: 380-2200 Fax: 380-2700 E-mail:	IDENTIFICACION C.C. ☒ NIT ☐ C.E. ☐ Otro ☐ Cual _____ Número 80.410.337 TP 57492
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4 INVENTOR (ES) (72)	Nombre: David J. Bauer, Thomas G. Green, D. Wayne Leidy, Matthew D. Redd, Jay E. Werner, Michael R. Wildgen Dirección: 9683 Sheffield Road, Perrysburg, OH 43551, US; 5555 Birch Hollow Court, Sylvania, OH 43560, US; 9921 Parliament Place, Perrysburg, OH 43551, US; 2328 Valley Stream Boulevard, Maumee, OH 43537, US; 839 Butterfield Drive, Toledo, OH 43615, US; 653 Deer Run, Perrysburg, OH 43551, Estados Unidos de América (Respectivamente) Nacionalidad o Domicilio: Estados Unidos de América (Respectivamente)
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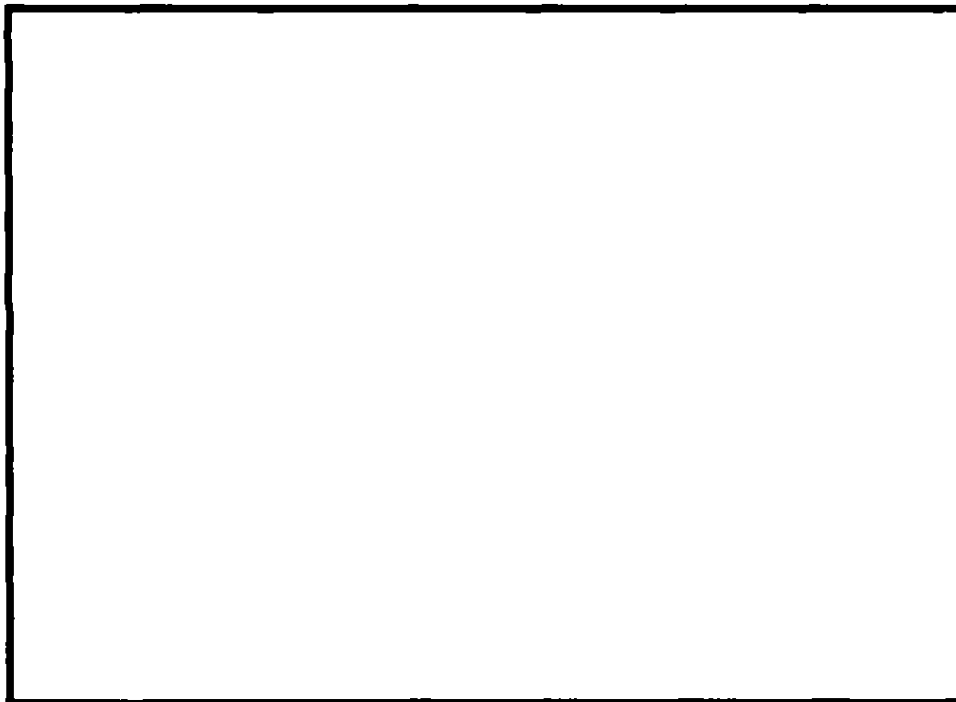
Instrucciones para el diligenciamiento del presente formulario, ver reverso de esta página.

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ANEXOS

- ☒ Comprobante de pago de la tasa de presentación de la solicitud. \$443.000
- ☐ Documento que acredite la existencia y representación legal cuando el solicitante sea persona jurídica.
- ☒ Poderes, si fuere el caso. Fotocopia Autenticada
- ☐ Documento de cesión del inventor al solicitante o a su causante.
- ☐ Declaraciones
- ☒ Copia de la solicitud internacional. (Resumen, descripción, reivindicaciones, dibujos)
- ☒ Traducción de la solicitud internacional al castellano. (Resumen, descripción, reivindicaciones, dibujos)
- ☒ Copia del examen preliminar efectuado por la IPEA.
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- ☐ Arte final 12x12.
- ☐ De ser el caso, información sobre otras solicitudes de patente o títulos obtenidos en el extranjero por el mismo titular o su causante, relacionadas parcial o totalmente con la invención de esta solicitud.
- ☒ Otros: Tarjeta de propietarios.

11 FIGURA CARACTERÍSTICA:



12. Se dio la concesión de la patente:

NOMBRE: JUAN PABLO CADENA SARMIENTO

FIRMA:

C. 80.410.337 de Usquén N.º 57492 del C.S.I.

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CONCEPTO

CANT. HISTORICO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	1 TRAMITES DE SOL. DE PATENTE DE IN	443,000.00
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RESPONSABLE : _____

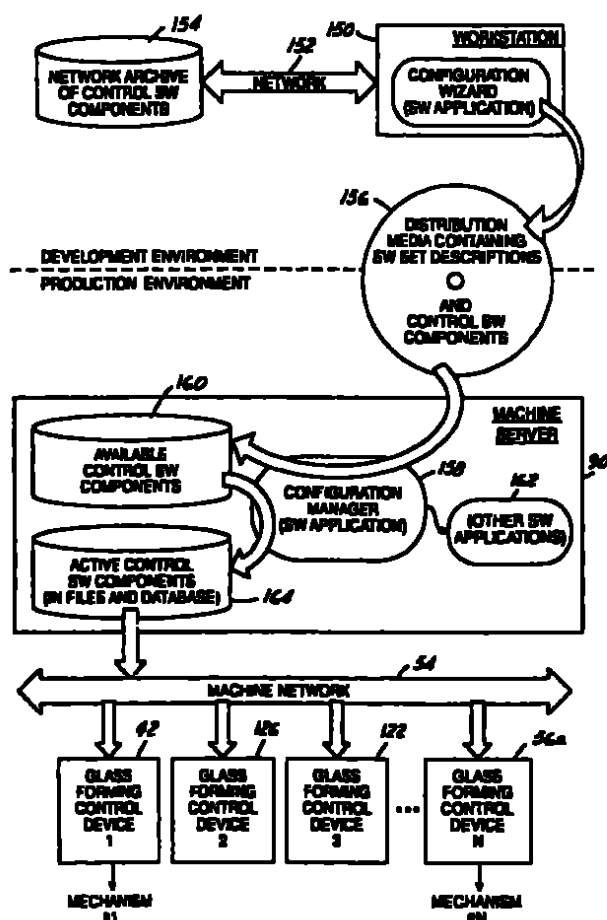
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10/235,126 3 September 2002 (03.09.2002) US</p> <p>(71) Applicant (for all designated States except US):
OWENS-BROCKWAY GLASS CONTAINER INC.
[US/US]; One SeaGate, Toledo, OH. 43666 (US).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only): BAUER, David, J.
[US/US]; 9683 Sheffield Road, Perrysburg, OH 43551</p> | <p>(US). GREEN, Thomas, G. [US/US]: 5555 Birch Hollow Court, Sylvania, OH 43560 (US). LEIDY, D. Wayne [US/US]: 9921 Parliament Place, Perrysburg, OH 43551 (US). REDD, Matthew, D. [US/US]; 2328 Valley Stream Boulevard, Maumee, OH 43537 (US). WERNER, Jay, E. [US/US]; 839 Butterfield Drive, Toledo, OH 43615 (US). WILDGEN, Michael, R. [US/US]: 653 Deer Run, Perrysburg, OH 43551 (US).</p> <p>(74) Agent: BRUSS, H., G.; Owens-Illinois, Inc., One SeaGate, 25-LDP, Toledo, OH 43666 (US).</p> <p>(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MY, NZ, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.</p> |
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- (54) Title: GLASSWARE FORMING MACHINE CONTROL SYSTEM**



(57) Abstract: A glassware forming machine system (10) includes a glassware forming machine (24) having first operating mechanisms for converting gobs of molten glass into articles of glassware, a gob delivery system (12 to 22) having second operating mechanisms for delivering gobs of molten glass to the glassware forming machine, a ware handling system (26 to 32) having third operating mechanisms for receiving and conveying articles of glassware from the glassware forming machine, and an electronic control system (34 or 120) for controlling and coordinating operation of the first, second and third operating mechanisms. The electronic control system includes a machine controller (37 or 37a) coupled to the first operating mechanisms of the glassware forming machine for controlling and coordinating operation of the first operating mechanisms to produce articles of glassware. A gob delivery controller (58 or 78a, 80a, 82a, 84a) is coupled to the second operating mechanisms of the gob delivery system for controlling and coordinating operation of the second operating mechanisms to deliver gobs of molten glass to the glassware forming machine. A ware handling controller (56 or 56a, 62a) is coupled to the third operating mechanisms of the ware handling system for controlling and coordinating operation of the third mechanisms to convey articles of glassware from the glassware forming machine. A serial data bus (54) interconnects the machine controller, the gob delivery controller and the ware handling controller for communication with each other to coordinate with each other operation of the first, second and third operating mechanisms.



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TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN,

— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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GLASSWARE FORMING MACHINE CONTROL SYSTEM

The present invention is directed to glassware forming machine systems, and more particularly to an integrated and networked electronic control for a glassware forming machine system.

Background and Objects of the Invention

5 The science of glass container manufacture is currently served by the so-called individual section or IS machine. Such machines include a plurality of separate or individual manufacturing sections, each of which has a multiplicity of operating mechanisms for converting one or more charges or gobs of molten glass into hollow glass containers and transferring the containers through successive stages of the machine section. In general, an IS machine system
10 includes a source of glass with a control tube and a needle mechanism for generating one or more streams of molten glass, a shear mechanism for cutting the molten glass into individual gobs, and a gob distributor for distributing the individual gobs among the individual machine sections. Each machine section includes one or more blank molds in which a glass gob is initially formed in a blowing or pressing operation, one or more invert arms for transferring the blanks to blow molds
15 in which the containers are blown to final form, a take-out mechanism for removing the formed containers onto a deadplate, and a sweepout mechanism for transferring molded containers from the deadplate onto a machine conveyor. The conveyor receives containers from all sections of the IS machine and conveys the containers to a loader for transfer to an annealinglehr. Operating mechanisms in each section also provide for closure of mold halves, movement of baffles and
20 blow nozzles, control of cooling wind, etc. U.S. Patent 4,362,544 includes a background

discussion of the art of both "blow and blow" and "press and blow" glassware forming processes, and discusses an electropneumatic individual section machine adapted for use in either process.

The operating mechanisms of each machine section were initially operated by pneumatic valves carried by a valve block and responsive to cams mounted on a timing shaft coupled to the machine. Synchronism among the mechanisms within each section, and among the various sections of the machine, was therefore controlled by the timing shaft and the valve drive cams. U.S. Patent 4,152,134 discloses a control arrangement in which a machine supervisory computer (MSC) is connected to a plurality of individual section computers (ISCs), each associated with a corresponding section of the IS machine. Each individual section computer is connected through an associated section operator console (SOC) to solenoid valves in an electropneumatic valve block, which are individually responsive to electronic valve control signals from the section computer and operator console for controlling operation of the associated section operating mechanisms. A timing pulse generator is connected to the machine supervisory computer and to the individual section computers for synchronizing operation within and among the individual sections. The individual section computer and the section operator console illustrated in the noted patent were subsequently combined in a computerized section operator console (COM-SOC, a trademark of applicant's assignee).

U.S. Patents 5,580,366 and 5,624,473 disclose an automated glassware manufacturing system in which a forming supervisory computer (FSC) is connected by an ethernet bus to a plurality of computerized section operator consoles (COM-SOCs). Each COM-SOC is connected by a bitbus to an associated intelligent control output module (ICOM). In commercial applications, this connection is by a serial data bitbus. Each ICOM has outputs connected to associated valve blocks for operating pneumatically driven glassware forming mechanisms in the associated machine section. Each COM-SOC and ICOM also receive input from a master timing

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module for coordinating operation of the various machine sections, and each ICOM unit receives emergency and program stop inputs for terminating machine operation.

It has also been proposed to employ electrically driven operating mechanisms in glass machine systems, particularly in the gob delivery (flow control tube, needles, gob shear and gob distributor) and ware conveyor (machine conveyor, cross-conveyor, radial transfer conveyor and lehr loader) ends of the machine system. It has also been proposed to employ electrically servo-driven operating mechanisms for the invert arm, take-out tongs and sweepout mechanism of each machine section. In glassware machine systems that combine electrically and pneumatically driven operation, the electrical operating mechanisms are driven by stand-alone controllers that receive the same timing signals as are provided to the COM-SOC units to coordinate operation of all mechanisms, but are otherwise not connected to the COM-SOC units or the forming supervisory computer.

In distributed glassware forming machine system control arrangements of the type discussed above, there is generally an excess of computing power and electronic memory over and above what is needed for normal operation of the system. Furthermore, to the extent that operation controllers are stand-alone units, they do not provide information feedback to a forming supervisory computer for desired quality and cost control purposes. It is therefore a general object of the present invention to provide a glassware forming machine control system that is integrated in the sense that the control electronics for all of the system operating mechanisms are interconnected to each other for optimum coordination and control purposes, and preferably are also connected to a forming supervisory computer for downloading new or revised control information to the various controllers and uploading operating information, as needed for information, quality or cost control purposes.

Summary of the Invention

A glassware forming machine system in accordance with exemplary embodiments of the invention includes a glassware forming machine having first operating mechanisms for converting gobs of molten glass into articles of glassware, a gob delivery system having second
5 operating mechanisms for delivering gobs of molten glass to the glassware forming machine, a ware handling system having third operating mechanisms for receiving and conveying articles of glassware from the glassware forming machine, and an electronic control system for controlling and coordinating operation of the first, second and third operating mechanisms. The electronic control system includes a machine controller coupled to the first operating mechanisms of the
10 glassware forming machine for controlling and coordinating operation of the first operating mechanisms to produce articles of glassware. A gob delivery controller is coupled to the second operating mechanisms of the gob delivery system for controlling and coordinating operation of the second operating mechanisms to deliver gobs of molten glass to the glassware forming machine. A ware handling controller is coupled to the third operating mechanisms of the ware
15 handling system for controlling and coordinating operation of the third mechanisms to convey articles of glassware from the glassware forming machine. A serial data bus interconnects the machine controller, the gob delivery controller and the ware handling controller for communication with each other to coordinate with each other operation of the first, second and third operating mechanisms.

20 In the exemplary preferred embodiments of the invention, the electronic control system further includes a machine server coupled to the serial data bus for transmitting control information to the machine, gob delivery and ware handling controllers, and for monitoring operation of the controllers. The machine server preferably includes facility for downloading control information from an external source, such as a forming system computer, a web terminal

or an operator console connected to the machine sever by a second serial data bus. In the exemplary preferred embodiments of the invention, at least some of the operating mechanisms include pneumatic operating mechanisms operated by valves responsive to electronic control signals, and the controller or controllers coupled to such mechanisms provide such electronic control signals. A machine valve controller may be coupled to the serial data bus independently of the other controllers for controlling air supply to the pneumatic operating mechanisms. In the exemplary preferred embodiments of the invention, the first operating mechanisms of the glassware forming machine include both pneumatic operating mechanisms and electrical operating mechanisms. The machine controller includes a valve controller coupled to the pneumatic operating mechanisms and a servo controller coupled to the electrical operating mechanisms. The valve controller and the servo controller are separately coupled to the serial data bus for communication with each other and with other controllers connected to the bus.

Brief Description of the Drawings

The invention, together with additional objects, features and advantages thereof, will be best understood from the following description, the appended claims and the accompanying drawings in which:

FIG. 1 is a functional block diagram of an individual section glassware forming machine system in accordance with which the present invention preferably is implemented;

FIG. 2 is a functional block diagram of a glassware forming machine control system in accordance with one presently preferred embodiment of the invention;

FIGS. 3A and 3B together comprise a functional block diagram of a glassware forming machine control system in accordance with a second preferred embodiment of the invention;

FIG. 4 is a schematic diagram that illustrates implementation of control programming in the system of FIG. 2 or 3A-3B; and

FIGS. 5 and 6 are functional block diagrams of exemplary control boards in the controllers of FIGS. 2 and 3A-3B in accordance with two additional aspects of the invention.

5 **Detailed Description of Preferred Embodiments**

FIG. 1 illustrates an IS machine glassware forming system 10 in accordance with a presently preferred implementation of the invention. A reservoir or bowl 12 contains molten glass (form a forehearth). Glass flow from the bowl is controlled by the position of a control tube 14 and the motion of needles 16 to feed one or more streams of molten glass to a gob shear mechanism 18. Shear mechanism 18 severs individual gobs of molten glass, which are fed through a chute 20 and a gob distributor 22 to an IS machine 24. Chute 20 includes facility for controlled redirection of molten glass gobs in the event that one or more sections of IS machine 24 are shut down. IS machine 24 includes a plurality of individual sections, within each of which the gobs are formed into individual articles of glassware. Each section terminates in a sweepout station 24a-24n, from which the articles of glassware are delivered to a series of conveyors 26. Conveyors 26 typically include a machine conveyor for receiving articles of glassware from the various machine sections in sequence, a cross-conveyor for conveying the articles of glassware to alehr loader 28, and a radial transfer conveyor for transferring the articles of glassware from the machine conveyor to the cross-conveyor. A blow-off station 30 is positioned along the machine conveyor for selectively removing articles of glassware from the conveyor. Lehr loader 28 loads the containers in batches into an annealing lehr 31. The containers are delivered by lehr 31 to the so-called cold end 32 of the manufacturing process, at which the containers are inspected for commercial variations, sorted, labeled, packaged and/or stored for further processing.

System 10 illustrated in FIG. 1 includes a multiplicity of operating mechanisms for performing operations on the glass, moving glass work pieces through sequential steps of the manufacturing operation, and otherwise performing functions in the system. Such operating mechanisms include, for example, control tube 14, needles 16, gob shear 18, gob distributor 22, sweepouts 24a-24n, conveyor(s) 26 and Lehr loader 28. In addition, there are a number of operating mechanisms within each section of IS machine 24, such as mechanisms for opening and closing the molds, mechanisms for in and out motion of the funnels, baffles and blowheads, take-out tongs and invert arms. The following table lists some of these mechanisms and corresponding U.S. patents that disclose electronic control of the associated mechanisms:

Table 1

<u>Mechanism(s)</u>	<u>U.S. Patent(s)</u>
Control Tube 14	6,289,697
Needle(s) 16	5,779,749, 5,885,317
Gob Shear 18	5,772,718
Chute 20	4,459,146
GOB Distributor 22	5,405,424
Conveyor(s) 26	6,076,654
Blow-Off 30	5,897,677
Lehr Loader 28	5,893,449, 5,950,799
Take-Out	6,241,448, 6,367,287
Invert	4,548,637
Sweepouts 24a-24n	4,199,344, 5,160,015

FIG. 2 is a functional block diagram of a glassware forming machine control system 34 in accordance with one presently preferred embodiment of the invention. There is a control section 36 (only one being illustrated) for each section of IS machine 24 (FIG. 1). For example, in an eight-section IS machine, there are eight control sections 36, one for each section

of the machine. Each control section 36 includes a machine controller 37 coupled to the first operating mechanisms of the glassware forming machine for controlling and coordinating operation of such operating mechanisms to provide articles of glassware. This machine controller in the embodiment of FIG. 1 includes an ethernet-enabled intelligent control output module (EICOM) 38 hardwired to an associated valve block 40 for controlling the valves and thereby applying air to the pneumatic operating mechanisms. The machine controller in the illustrated embodiment of the invention also includes a servo controller 42, which is connected by a serial bus 44 to electrical drive units 46, 48, 50 respectively associated with the take-out, invert and sweepout mechanisms of the associated machine section. Exemplary take-out, invert and sweepout drive systems are illustrated in patents noted above in Table 1. Servo controller 42 is electronically hardwired to EICOM 38. EICOM 38 is connected by a serial bus 47 to an associated COM-SOC unit 49. A remote operator console (ROC) 51 is either permanently or selectively connected to COM-SOC unit 49 for operator variation of control parameters within the COM-SOC unit. EICOM 38 is also connected to a machine control panel (MCP) 52 for monitoring and selective variation of section operating parameters. EICOM 38 controls operation of pneumatic valves 40 for operating the pneumatically driven operating mechanisms of the machine section, while servo controller 42 controls operation of the electrically driven operating mechanisms.

All of the EICOM valve controllers 38 and servo controllers 42 of the N machine sections are individually connected to a serial bus 54, such as a machine ethernet bus. Bus 54 is also connected to a servo ware handling controller 56 and a servo gob delivery controller 58. Servo ware handling controller 56 is connected by a serial bus 60 to a machine conveyor drive controller 62, a cross-conveyor drive controller 64, a radial transfer conveyor drive controller 66 and a lehr loader drive controller 68. Servo ware handling controller 56 is also hardwired to a

number of start/stop control mechanisms 70, to a Lehr loader lubrication controller 72 and to a sensor 74 associated with Lehr 30 (FIG. 1). Likewise, servo gob delivery controller 58 is connected by a serial bus 76 to a control tube drive controller 78, a needle drive controller 80, a gob shear drive controller 82 and a gob distributor drive controller 84. Tube drive controller 78 is associated with control tube mechanism 14 (FIG. 1), needle drive controller 80 is associated with needle mechanism 16, shear drive controller 82 is associated with gob shear 18, and gob distributor drive controller 84 is associated with gob distributor 82. In the same way, machine conveyor drive controller 62, cross-conveyor drive controller 64 and radial transfer drive controller 66 are associated with conveyors 26 in FIG. 1, and Lehr loader drive controller 68 is associated with Lehr loader 28. Servo gob delivery controller 58 is also hardwired to a number of start/stop mechanisms 86, and to a needle lube mechanism 88 for controlling lubrication of needles 16.

The machine controller associated with each machine section, including EICOM valve controller 38 and servo controller 42, servo ware handling controller 56 and servo gob delivery controller 58 (both of which operate for all sections of the IS machine) are interconnected by bus 54 for communication with each other to coordinate with each other operation of the various associated operating mechanisms. All of the controllers are also connected by bus 54 through a machine server 90 to a higher level bus 92, such as an ethernet bus for the entire glass plant. Bus 92 provides for connection of machine server 90 to a connection 94 for coupling to the world wide web or internet to monitor system operation from a remote site, and to a forming supervisory computer (FSC) 96 associated with the entire glass plant. Connection 94 permits machine server 90 to download control information and/or upload production data from and to a remote site. FSC 96 may include facility for scheduling operations, and generating management, production and other reports. In this connection, a hot bottle counter 98 is connected by a

suitable serial bus 100 for feeding production information to forming supervisory computer 96. FSC 96 is also connected by a serial bus 102 to a gob weight sensor host computer (GWC) 104, which is connected by a serial bus 106 to a gob weight sensor 108 associated with each machine section 1-N. GWC host computer 104 is also connected to servo gob delivery controller 58 by a serial bus 109, and by a serial bus 110 to the COM-SOC units 48 of the N control sections 36. Machine server 90 is also connected by bus 54 to a machine lube controller 112, and to one or more network user interface stations 114.

FIGS. 3A and 3B together illustrate a modified glassware forming machine electronic control system 120. Reference numerals in FIGS. 3A and 3B that are identical to those employed in FIGS. 1 and 2 indicate corresponding identical or similar components, while modified components are indicated by the letter suffixes. In system 120 of FIGS. 3A and 3B, there is a machine valve controller 122 (FIG. 3A) coupled to bus 54 for controlling supply of air to pneumatic operating mechanisms that are not associated with any specific machine section. Controller 122 is connected by a serial bus 124 to the COM-SOC valve controller 126 disposed in each machine control section 36a. Within each machine control section 36a, a machine controller 37a includes a servo controller 42 and COM-SOC valve controller 126. COM-SOC valve controller 126 is connected by a serial bus 127 to servo controller 42 as in FIG. 2, to a COM-SOC display panel 128 for providing operator display of section operating parameters and conditions, and to a liquid cooled mold (LCM) controller 130 for controlling cooling of the glassware blank and blow molds in the associated machine section. Liquid mold cooling control is illustrated, for example, in U.S. Patent 6,412,308, the disclosure of which is incorporated herein by reference for purposes of background. Machine valve controller 122 is also connected by a serial bus 132 to a multi sync generator (MSG) 134, to a controller 136 for gob deflector chute (FIG. 1) and to a bottle detection system (BDS) hub computer 138. A plurality of bottle

H/10

detection system sensors and actuators 140 are also connected to bus 132 for providing bottle detection input to hub computer 138 and receiving actuator control outputs from computer 138. MSG 134 synchronizes operation of the several machine sections.

Referring now to FIG. 3B, another difference between electronic control system 120 and electronic control system 34 (FIG. 2) is that servo gob delivery controller 58 in FIG. 2 is now divided into a servo tube controller 78a, a servo needle controller 80a, a servo shear controller 82a and a servo gob controller 84a. Controllers 78a-84a are each individually connected to serial bus 54 for separate communication with each other and with the other controllers connected to bus 54. Servo tube controller 78a is connected to servo tube drives 78, which are illustrated as separate drives in FIG. 3B for controlling the two axes (rotary and axial) of tube motion. (The separate axes of tube, needle and gob motion are combined in FIG. 2 for simplicity.) Likewise, servo needle controller 80a is connected to separate drives 80 for each needle, typically up to four needles for a so-called quad or four-gob machine system. Servo shear controller 82a is connected to servo shear drive 82, and servo gob controller 84a is connected to drives 84 for each of the gob delivery scoops. Combined servo ware handling controller 56 in FIG. 2 is divided in FIG. 3B into a servo machine conveyor controller 62a coupled to machine conveyor drive 62, and a servo ware handling controller 56a coupled to cross-conveyor drive 64, radial transfer conveyor drive 66 and three drives 68 for the three axes of lehr loader 28 (FIG. 1). Servo machine conveyor controller 62a is also connected to a blow-off controller 142 for controlling operation of blow-off mechanism 30 (FIG. 1) selectively to remove ware from the machine conveyor. Servo tube controller 78a is connected to tube drives 78 by a serial data bus 76a, servo needle controller 80a is connected to needle drives 80 by a serial bus 76b, servo shear controller 82a is connected to servo shear drive 82 by a serial bus 76c, servo gob controller 84a is connected to the four servo gob delivery drives 84 by a serial data bus 76d, servo machine

conveyor controller 62a is connected to drive 62 by a serial data bus 60a and servo ware handling controller 56a is connected to drives 64, 66, 68 by a serial data bus 60b.

5 Data busses 54, 92 in FIGS. 2-3B preferably comprise relatively high-speed busses, such as ethernet busses. The ethernet busses may be connected to the various controllers in a hub configuration as illustrated in the drawings, or through ethernet switches as desired to facilitate communication. Serial data bus 44 within each machine control section 36 or 36a may comprises a medium-speed bus, such as a so-called "firewire" (IEEE 1394) serial data bus. Bus 47 in FIG. 2 preferably is a bitbus. Busses 102, 106, 60 and 76 in FIG. 2 may comprise serial data busses of any suitable configuration and protocol. Busses 76a, 76b, 76c, 76d, 60a and 60b in FIG. 3B 10 may comprise medium-speed serial data busses, such as "firewire" busses. Busses 124, 127 and 132 in FIG. 3A may comprise relatively low-speed busses, such as serial data busses employing so-called CANbus technology.

FIG. 4 illustrates one important advantage of the present invention, as illustrated in either FIG. 2 or FIGS. 3A-3B. That is, all control programming for all of the glassware 15 forming system controllers can be entered, downloaded and monitored through a single machine sever 90. The system automatically manages all of the many control program versions of the several controllers in the glass container forming system. This avoids all of the effort and errors of manually updating each control program, and avoids the burden of shutting down the entire forming system when only a few of the control devices require an update. The system also 20 manages the situation where updates to one of the control device programs requires a corresponding update to other device control programs. The system also prevents the situation in which a unique untested combination of control device program versions or revision levels are unintentionally deployed, potentially creating interaction problems. The system also reduces the

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amount of process down-time required to load and enable new control program updates, and simplifies reversion to previous control programs where needed.

Referring to FIG. 4, a work station 150 is illustrated as being connected by a network 152 to an archive 154 of previously employed control programming. A control program developer may employ suitable configuration wizard programming to compile a set of control programs, which may be stored on a suitable medium 156, such as a CD-ROM or DVD, for loading into machine server 90. As an alternative, operator work station 150 may comprise one of the network user interfaces 114 (FIGS. 2 and 3A) connected to machine server 90 by bus 54, or may be connected to machine server 90 through bus 92, either directly or through the internet. A configuration manager program 158 within machine server 90 loads the new control programming into a memory 160 of available control programs. Configuration manager 158 also has access to a memory 162 of other control programs previously developed. If the new control programming is consistent with the hardware and controllers connected to machine server 90, configuration manager 158 may load the new control programming into a file 164 of active control programming for down-loading to the appropriate controllers by means of bus 54. In addition to providing a central facility for storing, monitoring and down-loading all control programming, the system of the present invention has the advantage of reducing the amount of memory required in the various device controllers. In other words, it is not necessary for servo controller 42, servo ware handling controller 56, servo gob delivery controller 58, etc. in FIGS. 2-3B to have sufficient memory to store a library of control programming inasmuch as the control programming required for immediate operation can be readily and rapidly downloaded from machine server 90. Furthermore, the ability or requirement for substantial operator variation of the control programming at the various controllers can be greatly reduced. A graphic user interface for all devices of the machine system may be provided at a single station. There is

complete "top to bottom" communication of programming, parameters and status information, as well as time-critical control information. The invention also offers advantages in improved scalability and price/performance optimization, while having the capability for supporting additional peripheral devices as needed for further development.

5 FIGS. 5 and 6 illustrate two controller configurations for the various electronic controllers discussed in connection with FIGS. 1-4. FIG. 5 illustrates a controller configuration 170 without on-board non-volatile storage, while FIG. 6 illustrates a controller configuration 172 with on-board non-volatile storage. Referring to FIG. 5, controller configuration 170 is connected to a host computer 176, such as machine server 90 in FIGS. 2-3A, by means of a bus
10 177. Controller configuration 170 includes an application motherboard 178 having software (SW) readable application-specific indicia 180, such as a DIP switch. This indicia identifies the application for which the controller is intended, such as a servo ware handling controller 56 (FIG. 2) for example. An interchangeable processor module 182 is removably connected to board 178, such as by means of a socket 184. Processor module 182 includes prestored programming for
15 reading application identification indicia 180, communicating such indicia to host computer 176 through network 177, and then downloading from the host computer control programming needed for operation in connection with the specific operating mechanisms for which controller configuration 170 is to be used. For example, if controller configuration 170 is to be used as a servo ware handling controller 56 in FIG. 2, upon initial application of power or at any other
20 suitable time for resetting control programming, host computer 176 (machine server 90 in this example) may download through network 177 (bus 54 in this example) all of the control programming needed for operation of machine conveyor drive 62, cross-conveyor drive 64, radial transfer drive 66 and Lehr loader drive 68. On the other hand, if controller configuration 170 in FIG. 5 is intended for use as a machine valve controller 122 (FIG. 3A), and application

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identification indicia 180 so indicates, then machine valve controller 120 would obtain the necessary control programming from machine server 90, and download the control programming to chute controller 136 by means of serial data bus 132 (FIG. 3A). In this instance, network host computer 176 in FIG. 5 would comprise machine valve controller 122 in FIG. 3A, and network 5 175 would comprise serial bus 132.

Controller configuration 172 in FIG. 6 is particularly useful for controllers connected to the next higher level controller 176 by a relatively slow network connection 186. Controller configuration 172 includes a processor module 188 removably and interchangeably mounted on a motherboard 190, such as by means of a socket 192. Processor module 188 10 includes application-specific control programming in non-volatile storage 194, and programming 196 for comparison of the programming stored in memory 194 to the application-specific indicia 180 on motherboard 190. Upon initial application of power, application-independent boot software 198 causes processor identification software 196 to compare the application-specific programming in memory 194 with the application-identifying indicia 180 on the motherboard to 15 confirm that processor module 174 is suitable for that specific application. For example, if controller configuration 172 in FIG. 6 is employed as a chute controller 136 in FIG. 3A and the processor module 188 fails, an operator would replace the failed processor module with a new processor module. However, inasmuch as all processor modules would generally appear identical, it is necessary to confirm that the new processor module 188 contains the required programming 20 for use as a chute controller. This is accomplished by comparing the application-specific programming in memory 194 to the application-identifying indicia 180 before initiating operation of the chute control mechanism. If the comparison is satisfactory, then chute control can begin. However, if the comparison is not satisfactory, the operator would be advised to replace the new processor module with one appropriate for chute control, or alternatively to download new

control programming from host computer 176 through network 186 (bus 54, machine controller 122 and bus 132 in FIG. 3A) to configure the new processor module as one suitable for chute control.

5 There has thus been disclosed a glassware forming machine system, and more particularly an electronic control system for controlling operation of glassware forming and transfer mechanisms, that fully satisfies all of the objects and aims previously set forth. The invention has been discussed in conjunction with a number of presently preferred embodiments thereof, and various modifications and variations have also been discussed. Other modifications and variations will readily suggest themselves to persons of ordinary skill in the art. The
10 invention is intended to embrace these and all other modifications and variations as fall within the spirit and broad scope of the appended claims.

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Claims

1.

1 A glassware forming machine system (10) that includes a glassware forming
2 machine (24) having first operating mechanisms for converting gobs of molten glass into articles
3 of glassware, a gob delivery system (12 to 22) having second operating mechanisms for delivering
4 gobs of molten glass to said glassware forming machine, a ware handling system (26 to 32) having
5 third operating mechanisms for receiving and conveying articles of glassware from said glassware
6 forming machine, and an electronic control system (34 or 120) for controlling and coordinating
7 operation of said first, second and third operating mechanisms, including:

8 a machine controller (37 or 37a) coupled to said first operating mechanisms of said
9 glassware forming machine for controlling and coordinating operation of said first operating
10 mechanisms to produce articles of glassware,

11 a gob delivery controller (58 or 78a, 80a, 82, 84a) coupled to said second
12 operating mechanisms of said gob delivery system for controlling and coordinating operation of
13 said second operating mechanisms to deliver gobs of molten glass to said glassware forming
14 machine,

15 a ware handling controller (56 or 56a, 62a) coupled to said third operating
16 mechanisms of said ware handling system for controlling and coordinating operation of said third
17 mechanisms to convey articles of glassware from said glassware forming machine, and

18 a serial data bus (54) interconnecting said machine controller, said gob delivery
19 controller and said ware handling controller for communication with each other to coordinate with
20 each other operation of said first, second and third operating mechanisms.

2.

1 The system set forth in claim 1 wherein said electronic control system further
2 includes a machine sever (90) coupled to said serial data bus for transmitting control information
3 to said machine, gob delivery and ware handling controllers, and for monitoring operation of said
4 controllers.

3.

1 The system set forth in claim 2 wherein said machine server (90) includes facility
2 for down-loading control information from an external source.

4.

1 The system set forth in claim 3 wherein said machine server includes facility for
2 downloading control information and uploading production data to remote locations through the
3 world wide web (94).

5.

1 The system set forth in claim 2 wherein said machine server (90) includes a
2 configuration manager (158) that monitors control programs at said controllers to ensure that
3 such control programs are consistent with each other.

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6.

1 The system set forth in claim 5 wherein said machine server (90) includes facility
2 for receiving new or revised control programming for one of said controllers, accessing a library
3 of current control programming for other of said controllers, and downloading said new or revised
4 control programming to said one controller when said new or revised programming is consistent
5 with said current programming.

7.

1 The system set forth in claim 1 wherein at least some of said first, second and third
2 operating mechanisms include pneumatic operating mechanisms operated by valves (40)
3 responsive to electronic control signals, and wherein at least one of said machine, gob delivery
4 and ware handling controllers is adapted to provide said electronic control signals to said valves.

8.

1 The system set forth in claim 7 wherein said electronic control system further
2 includes a machine valve controller (122), coupled to said serial data bus (54) independently of
3 other said controllers, for controlling air supply to at least some of said pneumatic operating
4 mechanisms.

9.

1 The system set forth in claim 8 wherein each of said pneumatic operating
2 mechanisms includes an associated valve drive module (126), and wherein a second serial bus
3 (124) connects said valve drive modules to said machine valve controller.

10.

1 The system set forth in claim 1 wherein said first operating mechanisms of said
2 glassware forming machine include both pneumatic operating mechanisms (40) and electrical
3 operating mechanisms (46, 48, 50), and

4 wherein said machine controller includes a valve controller (38 or 126) coupled
5 to said pneumatic operating mechanisms and a servo controller (42) coupled to said electrical
6 operating mechanisms, said valve controller and said servo controller being separately coupled
7 to said serial data bus (54).

11.

1 The system set forth in claim 10 wherein each of said electrical operating
2 mechanisms (46, 48, 50) includes an associated electrical drive module, and wherein said machine
3 controller (37 or 37a) further includes a second serial data bus (44) connecting said servo
4 controller (42) to said drive modules.

12.

1 The system set forth in claim 1 wherein said glassware forming machine includes
2 a plurality of machine sections (24a to 24n) each having said first operating mechanisms, and
3 wherein said electronic control system includes a plurality of said machine controllers (37 or 37a)
4 each coupled to an associated set of first operating mechanisms and each connected to said data
5 bus (54).

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13.

1 The system set forth in claim 1 wherein said first operating mechanisms include
2 electrical operating mechanisms selected from the group consisting of take-out (46), invert (48)
3 and sweep-out (50) mechanisms, said second operating mechanisms include electrical operating
4 mechanisms selected from the group consisting of control tube (78), needle (80), shear (82) and
5 gob distribution (84) mechanisms, and wherein said third operating mechanisms include electrical
6 operating mechanisms selected from the group consisting of machine conveyor (62), cross-
7 conveyor (64), radial transfer (66) and lehr loader (68) mechanisms.

14.

1 The system set forth in claim 1 wherein at least one of said controllers includes:
2 an application motherboard (172) including electronically readable indicia (180)
3 associated with use of said motherboard in combination with a specific operating mechanism, and
4 a processor module (192) interchangeably mounted on said motherboard, including
5 application-specific control programming (194) in non-volatile memory for comparison to said
6 readable indicia to determine whether said processor module can be used for controlling said
7 specific operating mechanism.

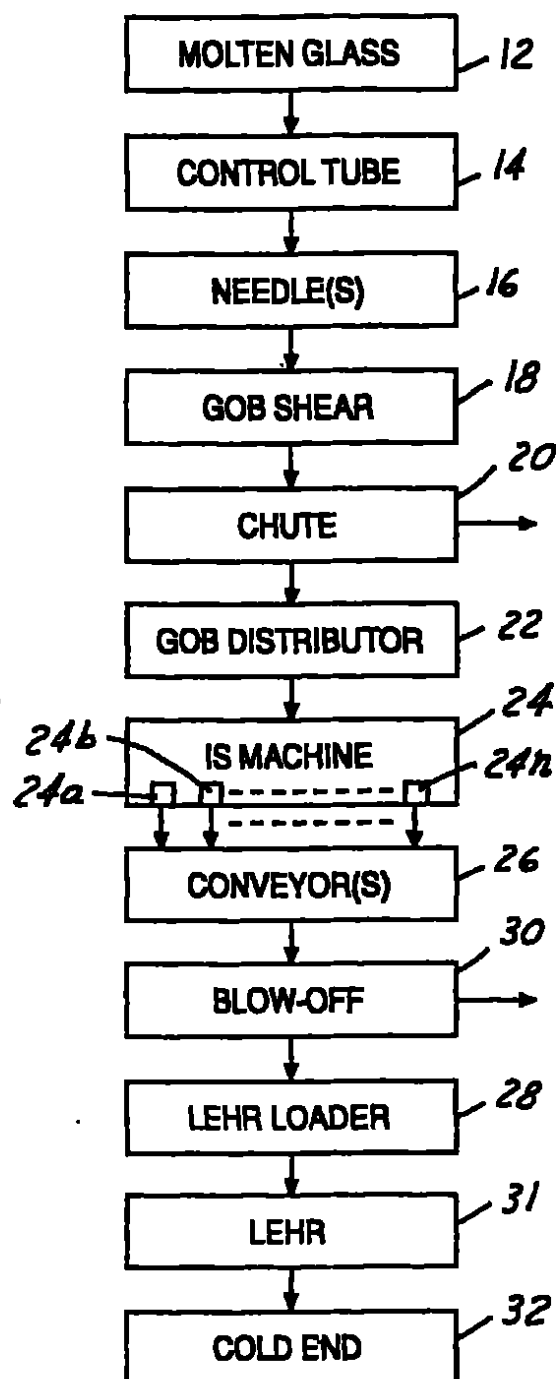
15.

1 The system set forth in claim 1 wherein said electronic control system includes a
2 host computer (176) coupled to said network and having stored therein control programming for
3 at least one of said controllers, and

4 wherein at least one of said controllers includes:

5 an application motherboard (170 or 172) including electronically readable indicia
6 (180) associated with use of said motherboard in combination with a specific operating
7 mechanism, and

8 a processor module (184, 192) interchangeably mounted on said motherboard,
9 including programming for reading said indicia, communicating said indicia to said host computer,
10 and then downloading from said host computer control programming needed for operating said
11 specific operating mechanism.

FIG. 1

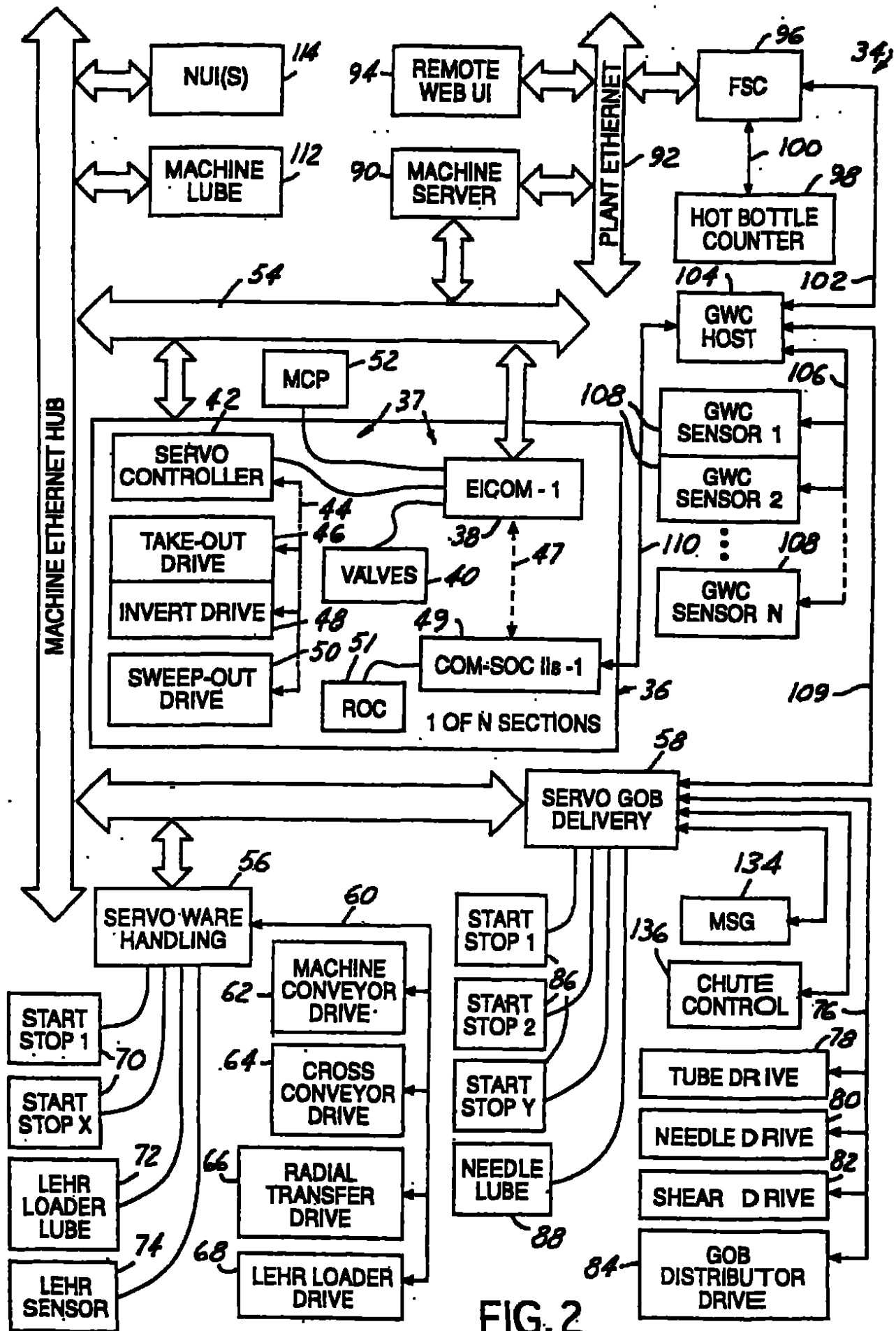


FIG. 2

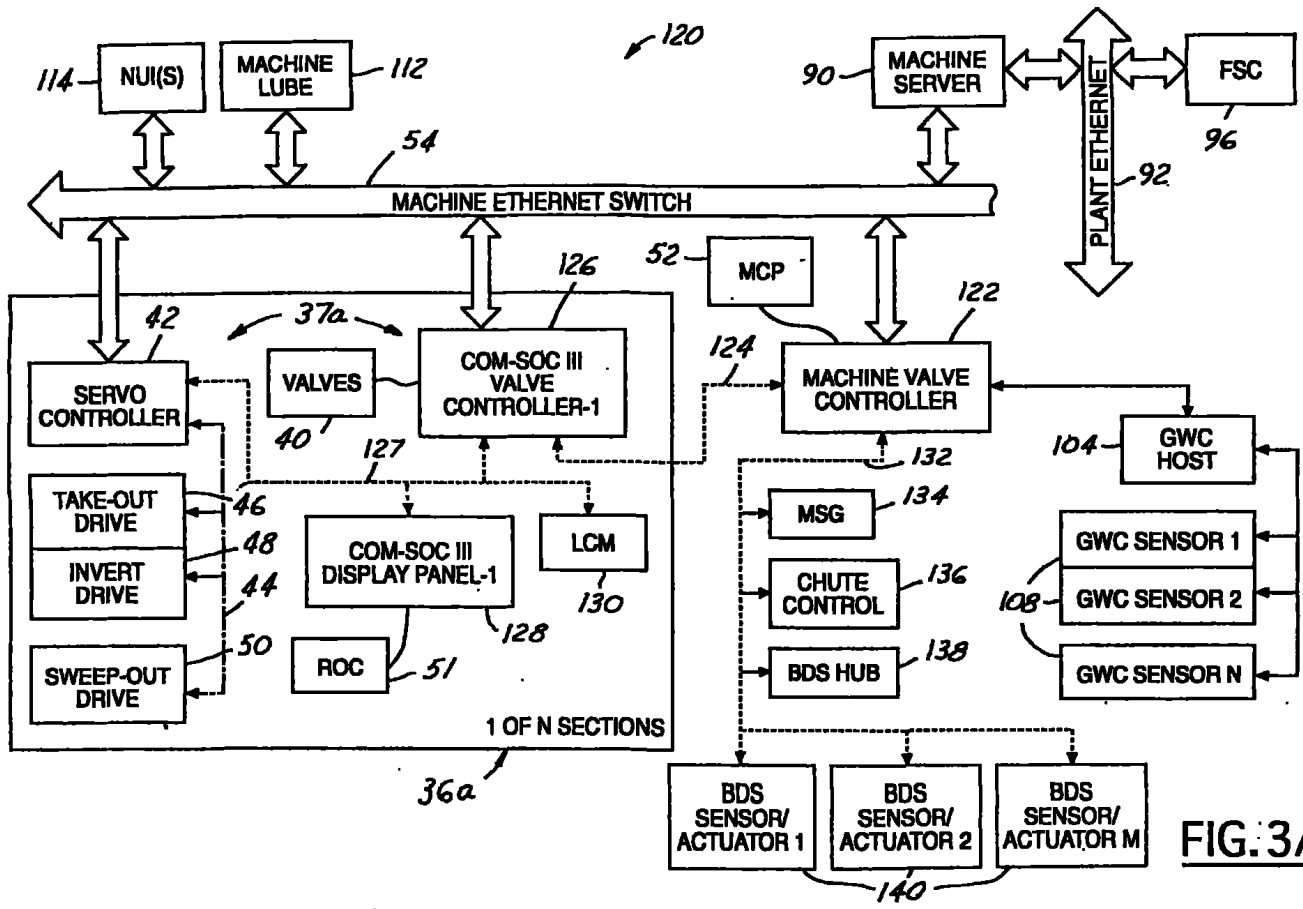


FIG. 3A

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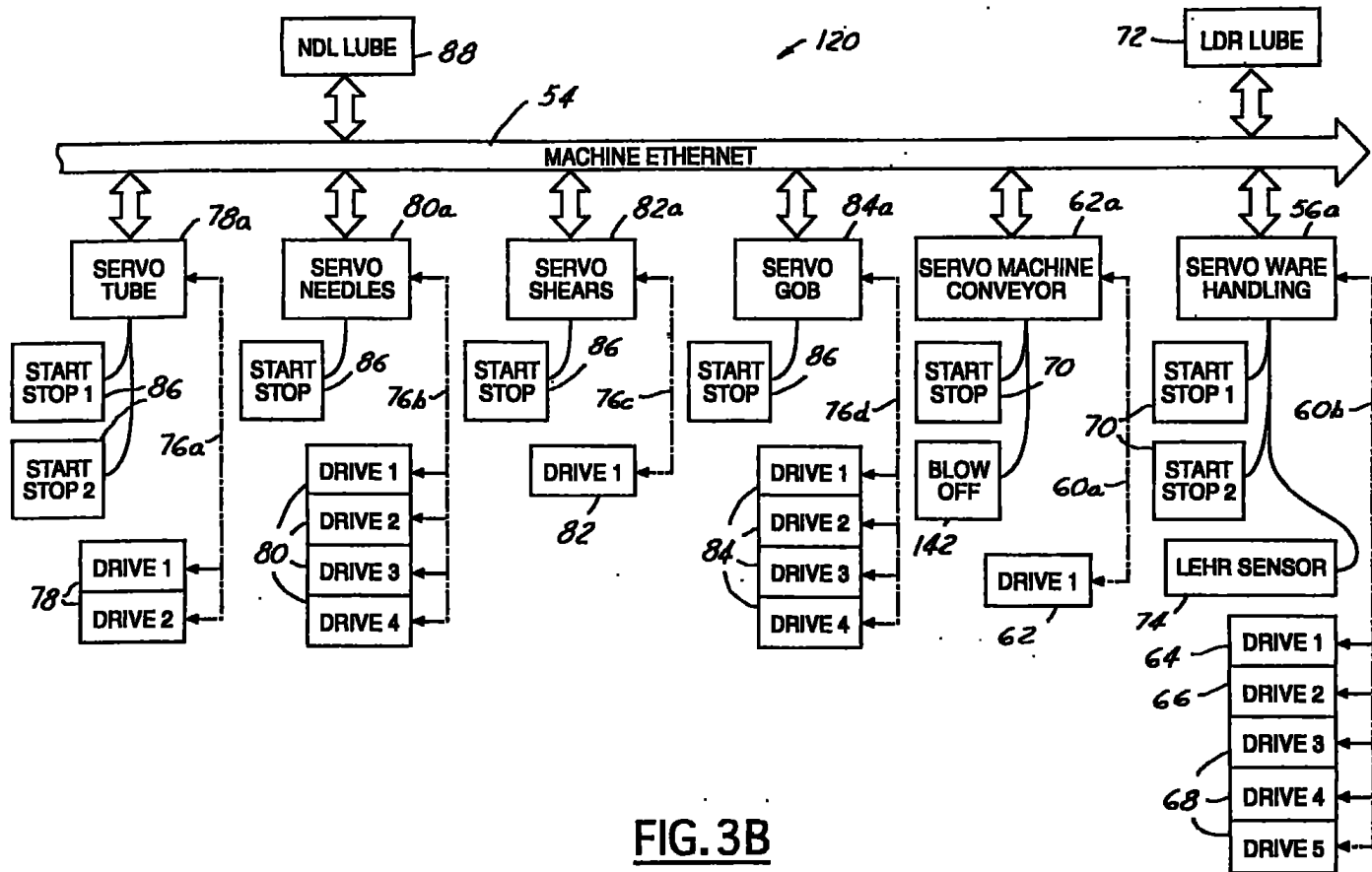


FIG. 3B

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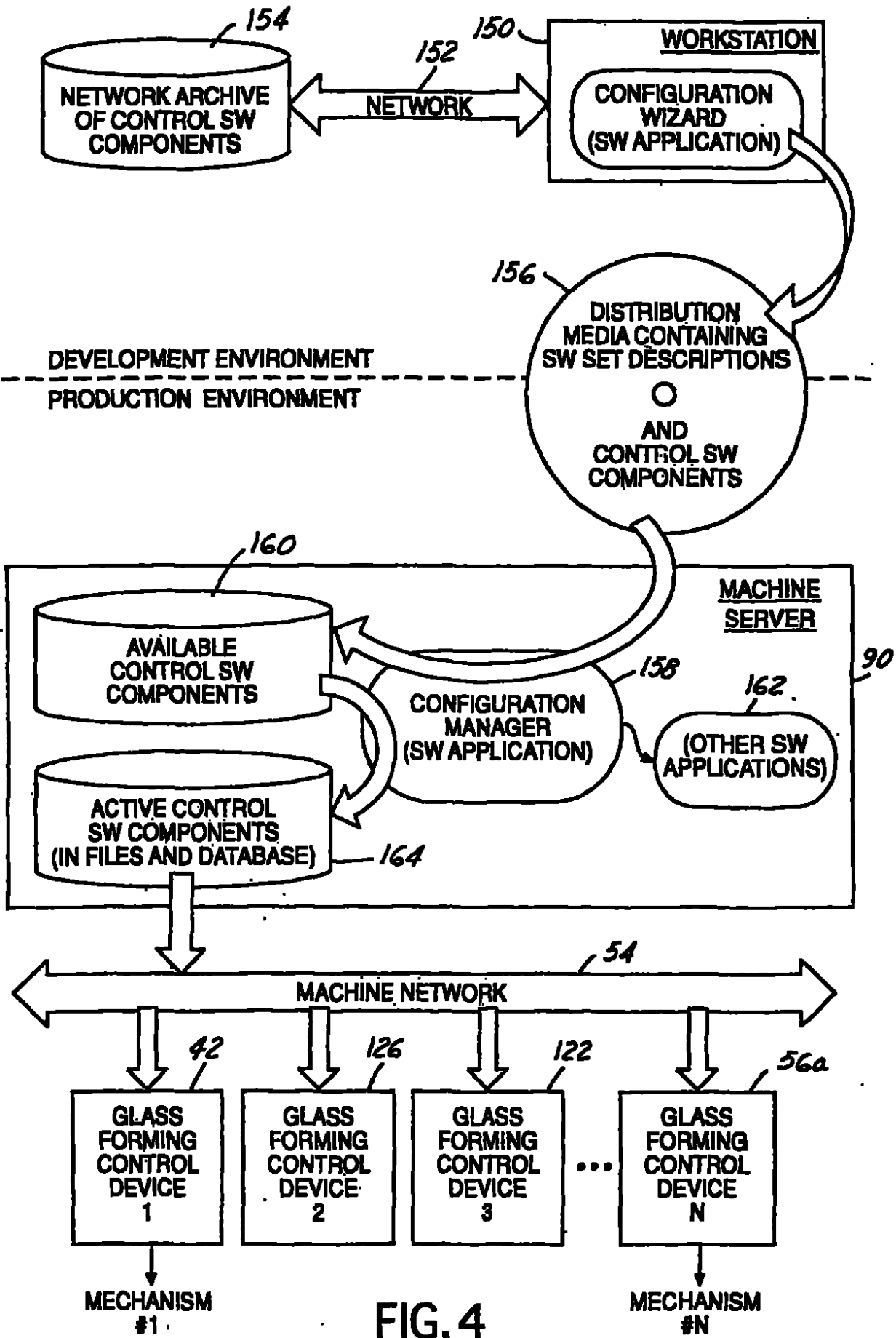


FIG. 4

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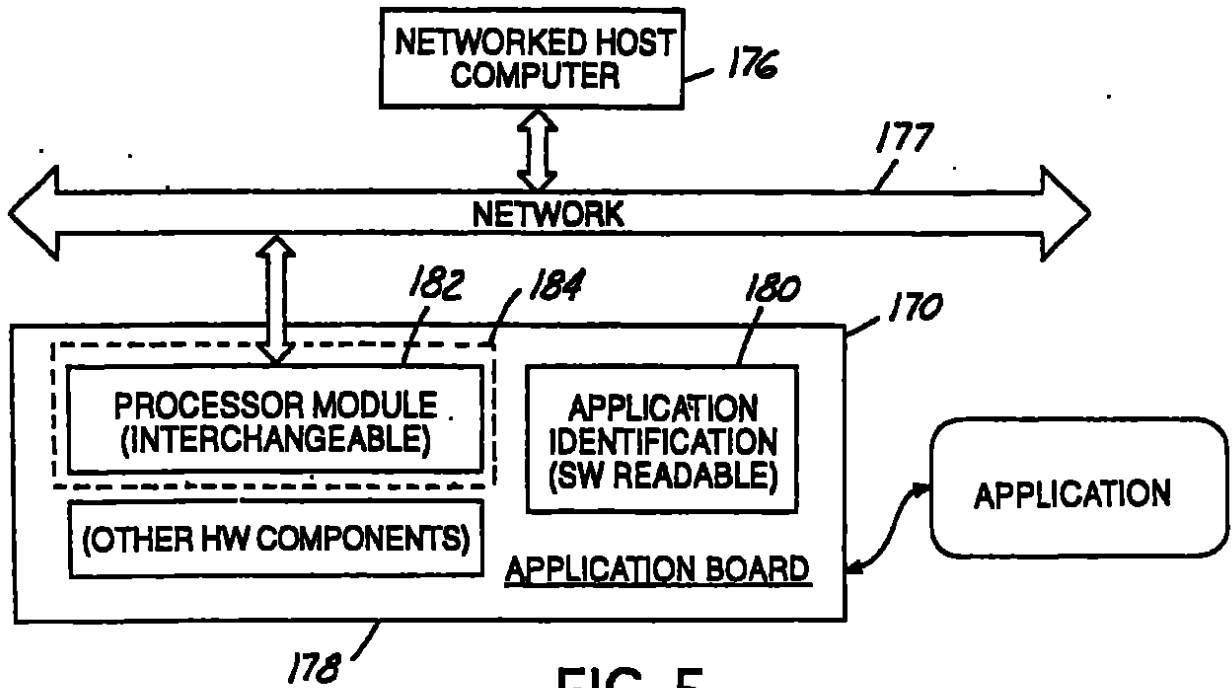


FIG. 5

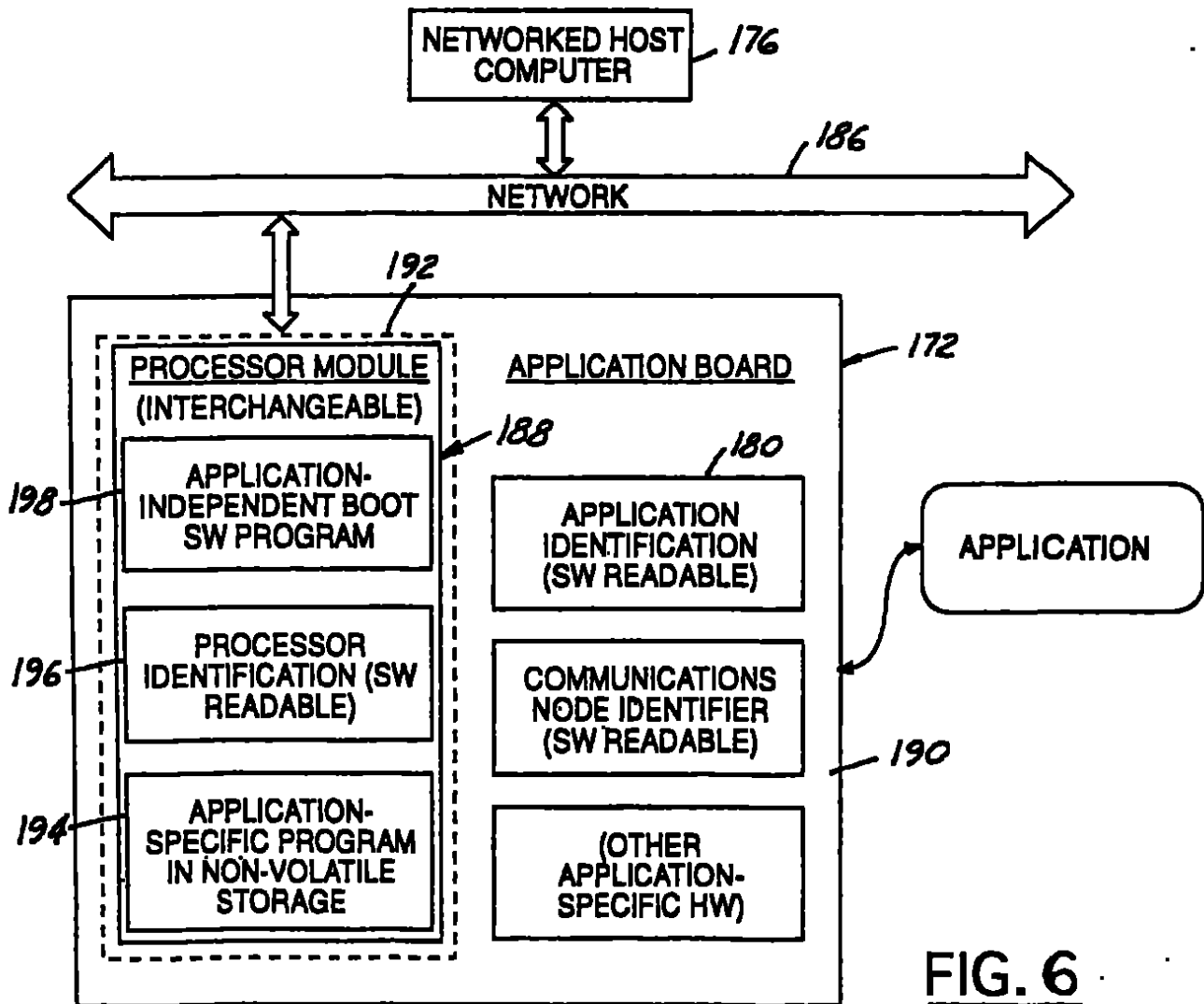


FIG. 6

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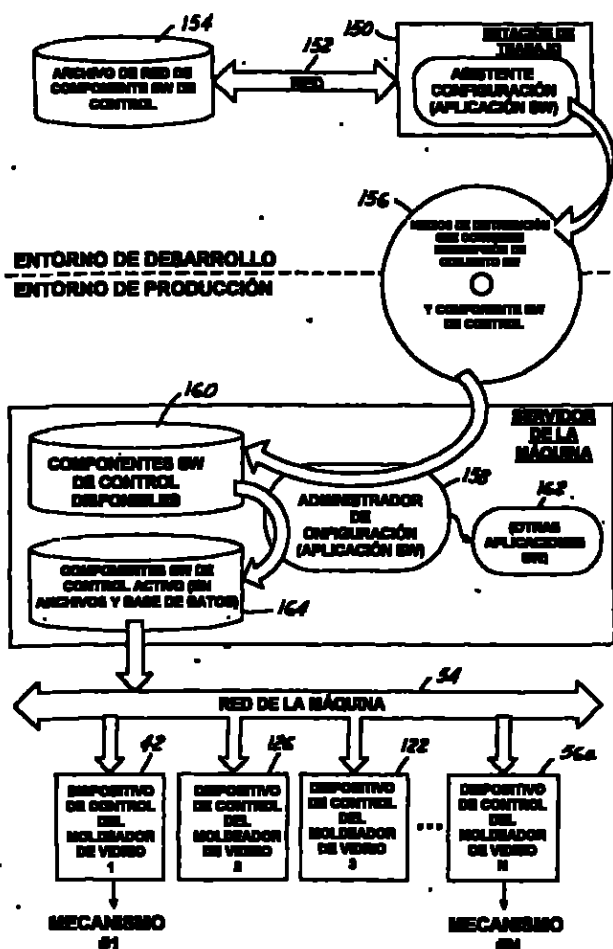
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[Continúa en la página siguiente]

(54) Título: SISTEMA DE CONTROL PARA MÁQUINA DE MOLDEO DE CRISTALERÍA



(57) Extracto: Un sistema de máquina para moldeado de cristalería (10) incluye una máquina para moldeado de cristalería (24) que tiene primeros mecanismos de operación para convertir bulbos de vidrio fundido en artículos de cristalería, un sistema de entrega de bulbos (12 a 22) que tiene segundos mecanismos de operación para entregar bulbos de vidrio fundido a la máquina para moldeado de cristalería, un sistema de manipulación de producto (28 a 32) que tiene terceros mecanismos de operación para recibir y transportar artículos de cristalería de la máquina para moldeado de cristalería, y un sistema de control electrónico (34 ó 120) para controlar y coordinar la operación de los mecanismos de operación primeros, segundos y terceros. El sistema de control electrónico incluye un controlador de la máquina (37 ó 37a) acoplado a los primeros mecanismos de operación de la máquina para moldeado de cristalería para controlar y coordinar la operación de los primeros mecanismos de operación para producir artículos de cristalería. Un controlador de entrega de bulbos (58 ó 78a, 80a, 82a, 84a) se acopla a los segundos mecanismos de operación del sistema de entrega de bulbos para controlar y coordinar la operación de los segundos mecanismos de operación para entregar bulbos de vidrio fundido a la máquina para moldeado de cristalería. Un controlador de manipulación de producto (56 ó 58a, 62a) se acopla a los terceros mecanismos de operación del sistema de manipulación de producto para controlar y coordinar la operación de los terceros mecanismos para transportar artículos de cristalería de la máquina para moldeado de cristalería. Un bus serial de datos (54) interconecta el controlador de la máquina, el controlador de entrega de bulbos y el controlador de manipulación de producto para comunicación entre sí para coordinar mutuamente la operación de los mecanismos de operación primeros, segundos y terceros.

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(84) Países designados (regionales): Patente ARIPO (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Patente Eursiática (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Patente Europea (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), Patente OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

VC, VN, YU, ZA, ZM, ZW, patente ARIPO (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), patente Eursiática (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), patente Europea (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

Declaraciones bajo la Regla 4.17:

— en cuanto al derecho del solicitante de solicitar y que se le conceda una patente (Regla 4.17(ii)) para las siguientes designaciones AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ,

— en cuanto al derecho del solicitante a reivindicar prioridad de la solicitud anterior (Regla 4.17(iii)) para todas las designaciones

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Para códigos de dos letras y otras abreviaturas, remítase a las "Notas Guía sobre Códigos y Abreviaturas" que aparece al comienzo de cada edición regular del Boletín Oficial PCT.

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SISTEMA DE CONTROL PARA MÁQUINA DE MOLDEO DE CRISTALERÍA

La presente invención se dirige sistemas para máquina de moldeo de cristalería y, más particularmente, a un control electrónico integrado y en red para un sistema para máquina de moldeo de cristalería.

Antecedentes y Objetos de la Invención

La ciencia de la manufactura de envases de vidrio se sirve actualmente de la denominada máquina de sección individual o máquina IS. Tales máquinas incluyen una pluralidad de secciones de manufactura separadas o individuales, cada una de las cuales tiene una multiplicidad de mecanismos de operación para convertir una o más cargas o bulbos de vidrio fundido en envases de vidrio huecos y transferir los envases a través de etapas sucesivas de la sección de la máquina. En general, un sistema de máquina IS incluye una fuente de vidrio con un tubo de control y un mecanismo de aguja para generar una o más corrientes de vidrio fundido, un mecanismo cizallador para cortar el vidrio fundido en bulbos individuales, y un distribuidor de bulbos para distribuir los bulbos individuales entre secciones individuales de la máquina. Cada sección de la máquina incluye uno o más moldes de blancos en los cuales se forma inicialmente un bulbo de vidrio en una operación de soplado o prensado, uno o más brazos de inversión para transferir los blancos a moldes de soplado en los cuales los envases se soplan en una forma final, un mecanismo de extracción para sacar los envases formados y pasarlos a una placa neutra, y un mecanismo de barrido para transferir los envases moldeados de la placa neutra a un transportador de la máquina. El transportador recibe envases de todas las secciones de la máquina IS y transporta los envases a un cargador para transferirlos a un horno de recocido. Mecanismos de operación en cada sección facilitan igualmente el cierre de las mitades de los moldes, el movimiento de los deflectores y boquillas de soplado, el control del aire de enfriamiento, etc. La Patente de

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los Estados Unidos 4,362,544 incluye una discusión de los antecedentes del arte de procesos de moldeo de cristalería por métodos de "soplar y soplar" y "prensar y soplar", y discute una máquina de sección individual electro-neumática, adaptada para uso en cualquiera de los dos procesos.

Los mecanismos de operación de cada sección de la máquina se operaron inicialmente por válvulas neumáticas portadas por un bloque de válvulas y sensibles a levas montadas sobre un eje temporizador acoplado a la máquina. Por lo tanto, el sincronismo entre los mecanismos en cada sección y entre las diferentes secciones de la máquina se controlaba por el eje temporizador y las levas de impulsión de las válvulas. La Patente de los Estados Unidos 4,152,134 divulga una disposición de control en la cual un computador para supervisión de la máquina (MSC) se conecta a una pluralidad de computadores de sección individual (ISCs), cada uno asociado con una sección correspondiente de la máquina IS. Cada computador de sección individual se conecta a través de una consola de operario de sección asociada (SOC) a válvulas solenoides en un bloque de válvulas electro-neumáticas, que son individualmente sensibles a señales de control electrónico de válvula provenientes del computador de la sección y de la consola del operador para controlar la operación de los mecanismos asociados de operación de sección. Un generador de pulsos de temporización se conecta al computador para supervisión de la máquina y a los computadores de la sección individual para sincronizar la operación en las secciones individuales y entre ellas. El computador de la sección individual y la consola de operador de sección ilustrada en la patente anotada se combinaron en forma subsiguiente en una consola de operador de sección computarizada (COM-SOC, una marca registrada del cesionario del solicitante).

Las Patentes de los Estados Unidos 5,580,366 y 5.624,473 divulgan un sistema automatizado para la manufactura de cristalería en el cual un computador de supervisión del moldeo (FSC) se conecta por un bus de ethernet a una pluralidad de consolas de operador de sección computarizada (COM-SOCs). Cada COM-SOC se conecta por un bus de

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bits a un módulo asociado de salida de control inteligente (ICOM). En aplicaciones comerciales, esta conexión se efectúa por un bus de bits serial de datos. Cada ICOM tiene salidas conectadas a bloques asociados de válvulas para operar mecanismos de moldeo de cristalería accionados neumáticamente en la sección asociada de la máquina. Cada COM-SOC e ICOM reciben también entrada de un módulo temporizador maestro para coordinar la operación de las diferentes secciones de la máquina, y cada unidad ICOM recibe entradas de emergencia y parada del programa para terminar la operación de la máquina.

Igualmente se ha propuesto emplear mecanismos de operación accionados eléctricamente en sistemas para máquinas de vidrio, particularmente en los extremos de la entrega de bulbos (tubo de control de flujo, agujas, cizallador de bulbos y distribuidor de bulbos) y transportador de producto (transportador de la máquina, transportador transversal, transportador de transferencia radial y cargador del horno) del sistema de la máquina. Igualmente se ha propuesto emplear mecanismos de operación servo accionados eléctricamente para el brazo de inversión, las lengüetas de extracción y el mecanismo de barrido de cada sección de la máquina. En sistemas de máquinas para cristalería que combinan operación accionada eléctrica y neumáticamente, los mecanismos eléctricos de operación se accionan por controladores autónomos que reciben las mismas señales de afinación que se proveen a las unidades COM-SOC para coordinar la operación de todos los mecanismos, pero, por otro lado, no están conectados a las unidades COM-SOC o al computador de supervisión de moldeo.

En disposiciones de control de sistema para máquina de moldeo de cristalería distribuido del tipo discutido más arriba, existe por lo general un exceso de potencia informática y memoria electrónica sobre y por encima de la requerida para la operación normal del sistema. Más aún, en la medida en que los controladores de operación son unidades autónomas, éstos no suministran retroalimentación de información a un computador de supervisión de moldeo para los fines de control de calidad



y costos. Por lo tanto, es un objeto general de la presente invención proveer un sistema de control para máquina de moldeo de cristalería que se integra en el sentido que la electrónica de control para todos los mecanismos de operación del sistema se interconectan entre sí para efectos de coordinación y control óptimos y, preferiblemente, se conectan también a un computador de supervisión de moldeo para descargar información de control nueva o revisada a los diferentes controladores y cargar información de operación, según se requiera, con fines de control de información, calidad o costos.

Sumario de la Invención

Un sistema para máquina de moldeo de cristalería, de acuerdo con incorporaciones prototípicas de la invención, incluye una máquina de moldeo de cristalería que tiene primeros mecanismos de operación para convertir bulbos de vidrio fundido en artículos de cristalería, un sistema de entrega de bulbos que tiene segundos mecanismos de operación para entregar bulbos de vidrio fundido a la máquina de moldeo de cristalería, un sistema de manipulación de cristalería que tiene terceros mecanismos de operación para recibir y transportar artículos de cristalería de la máquina de moldeo de cristalería, y un sistema electrónico de control para controlar y coordinar la operación de los mecanismos de operación primeros, segundos y terceros. El sistema de control electrónico incluye un controlador de la máquina acoplado a los primeros mecanismos de operación de la máquina de moldeo de cristalería para controlar y coordinar la operación de los primeros mecanismos de operación para producir artículos de cristalería. Un controlador de entrega de bulbos se acopla a los segundos mecanismos de operación del sistema alimentador de bulbos para controlar y coordinar la operación de los segundos mecanismos de operación para entregar bulbos de vidrio fundido a la máquina de moldeo de cristalería. Un controlador de manejo de producto se acopla los terceros mecanismos de operación del sistema de manipulación de producto para controlar y coordinar la operación de los terceros mecanismos para transportar artículos de cristalería de la máquina de moldeo de cristalería. Un bus serial de datos

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interconecta el controlador de la máquina, el controlador de la alimentación de bulbos y el controlador de manipulación de cristalería para comunicación entre sí para coordinar mutuamente la operación de los mecanismos de operación primeros, segundos y terceros.

En las incorporaciones prototípicas preferidas de la invención, el sistema de control electrónico incluye además un servidor de la máquina acoplado al bus serial de datos para transmitir información de control a la máquina, los controladores de la entrega de bulbos y manipulación de producto, y para monitorear la operación de los controladores. El servidor de la máquina incluye preferiblemente una instalación para descargar información de control de una fuente externa, tal como un computador del sistema de moldeo, una red terminal o una consola de operador conectada al servidor de la máquina por un segundo bus serial de datos. En las incorporaciones prototípicas preferidas de la invención, por lo menos algunos de los mecanismos de operación incluyen mecanismos neumáticos de operación operados por válvulas sensibles a señales de control electrónico, y el controlador o controladores acoplados a dichos mecanismos proveen tales señales de control electrónico. Un controlador de válvulas de la máquina puede acoplarse al bus serial de datos independientemente de los demás controladores para controlar el suministro de aire a los mecanismos neumáticos de operación. En las incorporaciones prototípicas preferidas de la invención, los primeros mecanismos de operación de la máquina de moldeo de cristalería incluyen tanto mecanismos neumáticos de operación como mecanismos eléctricos de operación. El controlador de la máquina incluye un controlador de válvulas acoplado a los mecanismos neumáticos de operación y un servo controlador acoplado a los mecanismos eléctricos de operación. El controlador de las válvulas y el servo controlador se acoplan separadamente al bus serial de datos para comunicación entre sí y con otros controladores conectados al bus.

Breve Descripción de los Dibujos

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La invención, junto con sus objetos, características y ventajas adicionales, se entenderá mejor a partir de la siguiente descripción, las reivindicaciones anexas y los dibujos acompañantes en los cuales:

FIG. 1 es un diagrama funcional en bloques de un sistema para máquina de moldeo de cristalería de sección individual, de acuerdo con el cual se implementa preferiblemente la presente invención;

FIG. 2 es un diagrama funcional en bloques de un sistema de control para máquina de moldeo de cristalería, de acuerdo con una incorporación actualmente preferida de la invención;

FIGS. 3A y 3B juntas comprenden un diagrama funcional en bloques de un sistema de control para máquina de moldeo de cristalería, de acuerdo con una segunda incorporación preferida de la invención:

FIG. 4 es un diagrama esquemático que ilustra la implementación de una programación de control en el sistema de FIG. 2 ó 3A-3B; y

FIGS. 5 y 6 son diagramas funcionales en bloques de tarjetas de control prototípicas en los controladores de FIGS. 2 y 3A-3B, de acuerdo con dos aspectos adicionales de la invención.

Descripción Detallada de Incorporaciones Preferidas

FIG. 1 ilustra un sistema de moldeo de cristalería de una máquina IS 10, de acuerdo con una implementación actualmente preferida de la invención. Un depósito o tazón 12 contiene vidrio fundido (proveniente de un ante-crisol). El flujo de vidrio del tazón se controla por la posición de un tubo de control 14 y el movimiento de las agujas 16 para alimentar una o más corrientes de vidrio fundido a un mecanismo cizallador de bulbos 18. El mecanismo cizallador 18 corta bulbos individuales de vidrio fundido, los cuales se alimentan a través de un tobogán 20 y un distribuidor de bulbos 22 a una máquina IS 24. El tobogán 20 incluye una instalación para el re-direccionamiento controlado de los bulbos de vidrio fundido en caso que una o más secciones de la máquina IS 24 queden fuera de servicio. La máquina IS 24 incluye una pluralidad de

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secciones individuales, dentro de cada una de las cuales se moldean los bulbos en artículos individuales de cristalería. Cada sección termina en una sección de barrido 24a-24n, desde las cuales los artículos de cristalería se entregan a una serie de transportadores 26. Los transportadores 26 incluyen por lo general un transportador de la máquina para recibir artículos de cristalería de las diferentes secciones de la máquina de manera secuencial, un transportador transversal para transportar los artículos de cristalería a un cargador del horno 28, y un transportador de transferencia radial para transferir los artículos de cristalería del transportador de la máquina al transportador transversal. Una estación de soplado 30 se ubica a lo largo del transportador de la máquina para retirar selectivamente artículos de cristalería del transportador. El cargador del horno 28 carga los envases en lotes en un horno de recocido 31. Los envases se entregan por el horno 31 al denominado extremo frío 32 del proceso de manufactura, en el cual los envases se inspeccionan para detectar posibles variaciones comerciales, se clasifican, etiquetan, empaican y/o almacenan para procesamiento posterior.

El sistema 10 ilustrado en FIG. 1 incluye una multiplicidad de mecanismos de operación para ejecutar operaciones sobre el vidrio, mover las piezas trabajadas de vidrio a través de pasos consecutivos de la operación de manufactura y realizar otra clase de funciones en el sistema. Tales mecanismos de operación incluyen, por ejemplo, el tubo de control 14, las agujas 16, el cizallador de bulbos 18, el distribuidor de bulbos 22, los barridos 24a-24n, el transportador(es) 26 y el cargador del horno 28. Además, hay un número de mecanismos de operación en cada sección de la máquina IS 24, tales como mecanismos para abrir y cerrar los moldes, mecanismos para movimiento de entrada y salida de los embudos, deflectores y cabezales de soplado, lengüetas de extracción y brazos de inversión. La siguiente tabla enumera algunos de estos mecanismos y las patentes correspondientes de los Estados Unidos que divulgan el control electrónico de los mecanismos asociados:

Table 1

<u>Mecanismo(s)</u>	<u>Patente(s) de los Estados Unidos</u>
Tubo de Control 14	6,289,697
Aguja(s) 16	5,779,749, 5,885,317
Cizallador de Bulbos 18	5,772,718
Tobogán 20	4,459,146
Distribuidor de bulbos 22	5,405,424
Transportador(es) 26	6,076,654
Soplado 30	5,897,677
Cargador del Horno 28	5,893,449, 5,950,799
Extractor	6,241,448, 6,367,287
Inversión	4,548,637
Mecanismos de Barrido 24a-24n	4,199,344, 5,160,015

FIG. 2 es diagrama funcional en bloques de un sistema de control para máquina de moldeo de cristalería 34 de acuerdo con una incorporación actualmente preferida de la invención. Hay una sección de control 36 (ilustrándose tan solo una) para cada sección de la máquina IS 24 (FIG. 1). Por ejemplo, en una máquina IS de ocho secciones, hay ocho secciones de control 36, una para cada sección de la máquina. Cada sección de control 36 incluye un controlador de la máquina 37 acoplado a los primeros mecanismos de operación de la máquina de moldeo de cristalería para controlar y coordinar la operación de tales mecanismos de operación para proporcionar artículos de cristalería. Este controlador de la máquina en la incorporación de FIG. 1 incluye un módulo de salida de control inteligente habilitado con ethernet (EICOM) 38 cableado a un bloque asociado de válvulas 40 para controlar las válvulas y aplicar así aire a los mecanismos neumáticos de operación. El controlador de la máquina en la incorporación ilustrada de la invención incluye asimismo un servo controlador 42, que se conecta por un bus serial 44 a unidades de accionamiento eléctrico 46, 48, 50 respectivamente asociadas con los mecanismos de extracción, inversión y barrido de la sección asociada de la máquina. Los sistemas prototípicos de accionamiento de extracción,

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inversión y barrido se ilustran en las patentes anotadas más arriba en la Tabla 1. El servo controlador 42 se encuentra electrónicamente cableado a EICOM 38. EICOM 38 está conectado por un bus serial 47 a una unidad COM-SOC asociada 49. Una consola de operador remoto (ROC) 51 se conecta ya sea permanente o selectivamente a la unidad COM-SOC 49 para variación por el operador de los parámetros de control en la unidad COM-SOC. EICOM 38 se encuentra igualmente conectada a un panel de control de la máquina (MCP) 52 para monitoreo y variación selectiva de los parámetros de operación de las secciones. EICOM 38 controla la operación de las válvulas neumáticas 40 para operar los mecanismos de operación accionados neumáticamente de la sección de la máquina, mientras que el servo controlador 42 controla la operación de los mecanismos de operación accionados eléctricamente.

Todos los controladores de válvulas EICOM 38 y los servo controladores 42 de las N secciones de la máquina se conectan individualmente a un bus serial 54, tal como un bus ethernet de la máquina. El bus 54 se conecta asimismo a un servo controlador de manipulación de cristalería 56 y un servo controlador de entrega de bulbos 58. El servo controlador de manipulación de cristalería 56 se conecta por un bus serial 60 a un controlador de accionamiento del transportador de la máquina 62, a un controlador de accionamiento del transportador transversal 64, un controlador de accionamiento del transportador de transferencia radial 66 y un controlador de accionamiento del cargador del horno 68. El servo controlador de manipulación de cristalería 56 se encuentra cableado asimismo a un número de mecanismos de control de arranque/parada 70, a un controlador de lubricación del cargador del horno 72 y a un sensor 74 asociado con el horno 30 (FIG. 1). Análogamente, el controlador de entrega de bulbos 58 está conectado por un bus serial 76 a un controlador de accionamiento de los tubos de control 78, un controlador de accionamiento de las agujas 80, un controlador de accionamiento del cizallador de bulbos 82 y un controlador de accionamiento del distribuidor de bulbos 84. El controlador de accionamiento del tubo 78 se asocia con el

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mecanismo de tubos de control 14 (FIG. 1), el controlador de accionamiento de las agujas 80 se asocia con el mecanismo de agujas 16, el controlador de accionamiento del cizallador 82 se asocia con el cizallador de bulbos 18, y el controlador de accionamiento del distribuidor de bulbos 84 se asocia con el distribuidor de bulbos 82. En la misma forma, el controlador de accionamiento del transportador de la máquina 62, el controlador de accionamiento del transportador transversal 64 y el controlador de accionamiento de la transferencia radial 66 se asocian con los transportadores 26 in FIG. 1, y el controlador de accionamiento del cargador del horno 68 se asocian con el cargador del horno 28. El servo controlador de entrega de bulbos 58 se encuentra igualmente cableado a un número de mecanismos de arranque/parada 86, y a un mecanismo de lubricación de las agujas 88 para controlar la lubricación de las agujas 16.

El controlador de la máquina asociado con cada sección de la máquina, incluidos el controlador de las válvulas EICOM 38 y el servo controlador 42, el servo controlador de manipulación de cristalería 56 y el servo controlador de entrega de bulbos 58 (dos de los cuales operan para todas las secciones de la máquina IS) están interconectados por el bus 54 para comunicación entre sí para coordinar mutuamente la operación de los diferentes mecanismos de operación asociados. Además, todos los controladores están conectados por el bus 54 a través de un servidor de la máquina 90 a un bus de más alto nivel 92, tal como un bus de ethernet para toda la planta de vidrio. El bus 92 posibilita la conexión del servidor de la máquina 90 a una conexión 94 para acoplamiento a la Worldwide Web o Internet para monitorear la operación del sistema desde un lugar remoto, y a un computador de supervisión de moldeo (FSC) 96 asociado con toda la planta de vidrio. La conexión 94 permite al servidor de la máquina 90 descargar información de control y/o cargar datos de la producción desde/a un sitio remoto. El FSC 96 puede incluir una instalación para programar operaciones y generar informes de gestión, producción y otros informes. En este contexto, un contador de botellas calientes 98 se conecta por un bus serial apropiado 100 para alimentar información de producción al

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computador de supervisión de moldeo 96. El FSC 96 se conecta asimismo por un bus serial 102 a un computador central, sensor de peso de bulbos (GWC) 104, el cual se conecta por un bus serial 106 a un sensor de peso de bulbos 108 asociado con cada sección de la máquina 1-N. El computador central GWC 104 está también conectado a un servo controlador de entrega de bulbos 58 por un bus serial 109 y por un bus serial 110 a las unidades COM-SOC 48 de las N secciones de control 36. El servidor de la máquina 90 se conecta asimismo por el bus 54 a un controlador de lubricación de la máquina 112 y a una o más estaciones de interfaz de usuario de red 114.

FIGS. 3A y 3B juntas ilustran un sistema de control electrónico de una máquina de moldeo de cristalería modificada 120. Los numerales de referencia en FIGS. 3A y 3B, que son idénticos a los empleados en FIGS. 1 y 2, indican componentes correspondientes idénticos o similares, mientras que componentes modificados se indican por los sufijos de letras. En el sistema 120 de FIGS. 3A y 3B, hay un controlador de válvulas de la máquina 122 (FIG. 3A) acoplado al bus 54 para controlar el suministro de aire a los mecanismos neumáticos de operación, los cuales no están asociados con ninguna sección específica de la máquina. El controlador 122 se conecta por un bus serial 124 al controlador de válvulas COM-SOC 126, dispuesto en cada sección de control de la máquina 36a. En cada sección de control de la máquina 36a, un controlador de la máquina 37a incluye un servo controlador 42 y el controlador de válvulas COM-SOC 126. El controlador de válvulas COM-SOC 126 se conecta por un bus serial 127 al servo controlador 42, como se representa en FIG. 2, a un panel de presentación COM-SOC 128, para suministrar una visualización al operador de los parámetros y condiciones de operación de las secciones, y a un controlador de molde enfriado por líquido (LCM) 130 para controlar el enfriamiento de los blancos de cristalería y los moldes de soplado en la sección asociada de la máquina. El control de enfriamiento de los moldes con líquido se ilustra, por ejemplo, en la Patente de los Estados Unidos 6,412,308, cuya divulgación se incorpora aquí por referencia para efectos

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de antecedentes. El controlador de válvulas de la máquina 122 se encuentra igualmente conectado por un bus serial 132 a un generador multi-sincrónico (MSG) 134, a un controlador 136 para el tobogán deflector de los bulbos 20 (FIG. 1) y a un computador concentrador del sistema de detección de botellas (BDS) 138. Una pluralidad de sensores y accionadores del sistema de detección de botellas 340 se conecta asimismo al bus 132 para suministrar entrada de detección de botellas a un computador concentrador 138 y recibir del computador 138 salidas de control de los accionadores. El MSG 134 sincroniza la operación de las diferentes secciones de la máquina.

Con referencia ahora a FIG. 3B, otra diferencia entre el sistema de control electrónico 120 y el sistema de control electrónico 34 (FIG. 2) es que el servo controlador de entrega de bulbos 58 en FIG. 2 se encuentra ahora dividido en un servo controlador de tubos 78a, un servo controlador de agujas 80a, un servo controlador del cizallador 82a y un servo controlador de bulbos 84a. Los controladores 78a-84a se conectan cada uno individualmente al bus serial 54 para comunicación separada entre sí y con los otros controladores conectados al bus 54. El servo controlador de los tubos 78a se conecta a servo accionamientos de tubos 78, los cuales se ilustran como accionamientos separados en FIG. 3B para controlar los dos ejes (giratorio y axial) del movimiento del tubo. (Los ejes separados de movimiento del tubo, la aguja y el bulbo se combinan en FIG. 2 a efectos de simplicidad). Análogamente, el servo controlador de las agujas 80a se conecta a accionamiento separados 80 para cada aguja, típicamente hasta cuatro agujas para un llamado sistema de máquina quad o de cuatro bulbos. El servo controlador del cizallador 82a se conecta al accionamiento del servo cizallador 82, y el servo controlador de bulbos 84a se conecta a los accionamientos 84 para cada una de las cucharas de entrega de bulbos. El servo controlador combinado de manipulación de cristalería 56 en FIG. 2 se divide en FIG. 3B en un servo controlador del transportador de la máquina 62a acoplado al accionamiento del transportador de la máquina 62, y a un servo controlador de manipulación de cristalería 56a acoplado al accionamiento del transportador transversal 64, al accionamiento del

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transportador de transferencia radial 66 y los tres accionamiento 68 de los tres ejes del cargador del horno 28 (FIG. 1). De igual manera, el servo controlador del transportador de la máquina 62a se conecta a un controlador de soplado 142 para controlar la operación del mecanismo de soplado 30 (FIG. 1), selectivamente para retirar cristalería del transportador de la máquina. El servo controlador del tubo 78a se conecta a accionamientos del tubo 78 por un bus serial de datos 76a, el servo controlador de las agujas 80a se conecta a los accionamientos de las agujas 80 por un bus serial 76b, el servo controlador del cizallador 82a se conecta al accionamiento del servo cizallador 82 por un bus serial 76c, el servo controlador de bulbos 84a se conecta a los cuatro accionamientos de servo entrega de bulbos 84 por un bus serial de datos 76d, el servo controlador de transportador de la máquina 62a se conecta al accionamiento 62 por un bus serial de datos 60a y un servo controlador de manipulación de cristalería 56a se conecta a los accionamientos 64, 66, 68 por un bus serial de datos 60b.

Los buses de datos 54, 92 en FIGS. 2-3B comprenden preferiblemente buses de velocidad relativamente alta, tales como buses de ethernet. Los buses de ethernet pueden conectarse a varios controladores en una configuración de concentrador, como se ilustra en los dibujos, o a través de conmutadores ethernet, según se desee, para facilitar la comunicación. El bus serial de datos 44 en cada sección de control de la máquina 36 ó 36a puede comprender un bus de velocidad media, tal como el denominado bus serial de datos "firewire" (IEEE 1394). El bus 47 en FIG. 2 es preferiblemente un bus de bits. Los buses 102, 106, 60 y 76 en FIG. 2 pueden comprender buses seriales de datos de cualquier configuración y protocolo apropiados. Los buses 76a, 76b, 76c, 76d, 60a y 60b en FIG. 3B pueden comprender buses seriales de datos de velocidad media, tales como buses "firewire". Los buses 124, 127 y 132 en FIG. 3A pueden comprender buses de velocidad relativamente baja, tales como buses seriales de datos que emplean la denominada tecnología CANbus.

FIG. 4 ilustra una importante ventaja de la presente invención, como se ilustra en cualquiera de FIG. 2 ó FIGS. 3A-3B. Es

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decir, toda la programación de control para todos los controladores del sistema de moldeo de cristalería puede ingresarse, descargarse y monitorearse a través de un sencillo servidor de la máquina 90. El sistema maneja automáticamente la totalidad de las múltiples versiones de programa de control de los distintos controladores en el sistema de moldeo de envases de vidrio. Esto evita todo el esfuerzo y todos los errores de actualizar manualmente cada programa de control, y evita la carga de parar todo el sistema de moldeo cuando sólo unos cuantos de los accionamientos de control requieren una actualización. El sistema maneja además la situación en que actualizaciones de uno de los programas de los accionamientos de control requiere una actualización correspondiente a otros programas de accionamientos de control. De igual manera, el sistema evita la situación en la cual una combinación única no probada de versiones de programa de dispositivo de control o niveles de revisión se despliega en forma no intencional, creando potencialmente problemas de interacción. El sistema reduce asimismo la cantidad de tiempo de parada de procesos, requerida para cargar y posibilitar nuevas actualizaciones de programa de control, y simplifica la reversión a programas previos de control donde sea necesario.

Con referencia a FIG. 4, una estación de trabajo 150 se ilustra estando conectado por una red 152 a un archivo 154 de programación de control empleada previamente. Un desarrollador de programas de control puede emplear una programación asistente de configuración apropiada para compilar un conjunto de programas de control, que pueden almacenarse en un medio adecuado 156, tal como un CD-ROM o DVD, para cargarlos en un servidor de la máquina 90. Como alternativa, la estación de trabajo del operador 150 puede comprender una de las interfaces de usuario de red 114 (FIGS. 2 y 3 A) conectadas al servidor de la máquina 90 por el bus 54, o puede conectarse al servidor de la máquina 90 a través del bus 92, ya sea directamente o a través de la Internet. Un programa administrador de configuración 158 en el servidor de la máquina 90 carga la nueva programación de control en una memoria 160 de programas de control

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disponibles. El administrador de configuración 158 tiene también acceso a una memoria 162 de los demás programas de control desarrollados previamente. Si la nueva programación de control es consistente con el hardware y los controladores conectados al servidor de la máquina 90, el administrador de configuración 158 puede cargar la nueva programación de control en un archivo 164 de programación de control activo para descargar a los controladores apropiados por medio del bus 54. Además de proveer una instalación central para almacenar, monitorear y descargar toda la programación de control, el sistema de la presente invención tiene la ventaja de reducir la cantidad de memoria requerida en los diferentes controladores de unidad lectora. En otras palabras, no es necesario para el servo controlador 42, el servo controlador de manipulación de cristalería 56, el servo controlador de entrega de bulbos 58, etc., en FIGS. 2-3B disponer de suficiente memoria para almacenar una biblioteca de programación de control, puesto que la programación de control requerida para la operación inmediata puede descargarse fácil y rápidamente del servidor de la máquina 90. Más aún, la capacidad o requerimiento de variación sustancial para el operador de la programación de control en los diferentes controladores pueden reducirse en gran medida. Puede proveerse una interfaz gráfica de usuario para todas las aplicaciones del sistema de la máquina en una estación única. Existe una completa comunicación "de arriba a abajo" de la programación, los parámetros e información del estado, así como información de control crítica en términos de tiempo. De igual manera, la invención ofrece ventajas en la mejor ampliación de escala y optimización precio/rendimiento, teniendo al mismo tiempo la capacidad de soportar dispositivos periféricos adicionales, según se requiera, para desarrollo posterior.

FIGS. 5 y 6 ilustran dos configuraciones de controladores para los distintos controladores electrónicos discutidos en conexión con FIGS. 1-4. FIG. 5 ilustra una configuración de controladores 170 sin almacenamiento no volátil en tarjeta, mientras que FIG. 6 ilustra una configuración de controladores 172 con almacenamiento no volátil en

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tarjeta. Con referencia a FIG. 5, la configuración de controladores 170 se conecta a un computador central 176, tal como un servidor de la máquina 90 en FIGS. 2-3A, mediante un bus 177. La configuración de controladores 170 incluye una tarjeta madre de aplicaciones 178 que posee indicaciones específicas de aplicaciones de lectura SW 180, tal como un conmutador de paquete en línea dual (DIP switch). Estos indicios identifican la aplicación para la cual está previsto el controlador, tal como un servo controlador de manipulación de cristalería 56 (FIG. 2), por ejemplo. Un módulo procesador intercambiable 182 se conecta en forma desmontable a la tarjeta 178, tal como mediante un enchufe 184. El módulo procesador 182 incluye programación pre-almacenada para leer las indicaciones de identificación de aplicaciones 180, comunicar tales indicaciones a un computador central 176 a través de la red 177, y descargar luego del computador central programación de control necesaria para operación en conexión con mecanismos de operación específicos, para los cuales va a usarse la configuración de los controladores 170. Por ejemplo, si la configuración de los controladores 170 se va a utilizar como un servo controlador de manipulación de cristalería 56 en FIG. 2, al momento de la aplicación inicial de energía o en cualquier otro momento apropiado para re-inicializar programación de control, el computador central 176 (servidor de la máquina 90 en este ejemplo) puede descargar a través de la red 177 (bus 54 en este ejemplo) toda la programación de control necesaria para operación del accionamiento del transportador de la máquina 62, el accionamiento del transportador transversal 64, el accionamiento de transferencia radial 66 y el accionamiento del cargador del horno 68. De otro lado, si la configuración de los controladores 170 en FIG. 5 está prevista para uso como un controlador de válvulas de la máquina 122 (FIG. 3A), y las indicaciones de identificación de aplicaciones 180 así lo indica, entonces el controlador de válvulas de la máquina 120 obtendría la programación de control necesaria del servidor de la máquina 90, y descargaría la programación de control al controlador del tobogán 136 mediante un bus serial de datos 132 (FIG. 3 A). En este caso, el

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X
X
X

computador central de la red 176 en FIG. 5 comprendería el controlador de válvulas de la máquina 122 en FIG. 3 A, y la red 175 comprendería el bus serial 132.

La configuración de controladores 172 en FIG. 6 es particularmente útil para controladores conectados al controlador de nivel próximo más alto 176 mediante una conexión de red relativamente lenta 186. La configuración de los controladores 172 incluye un módulo procesador 188 instalado en forma desmontable e intercambiable en una tarjeta madre 190, tal como mediante un enchufe 192. El módulo procesador 188 incluye programación de control específica de aplicaciones en un almacenamiento no volátil 194, y programación 196 para comparación de la programación almacenada en la memoria 194 con las indicaciones específicas de aplicaciones 180 en la tarjeta madre 190. Al momento de la aplicación inicial de energía, el software de arranque independiente de aplicaciones 198 hace que el software de identificación del procesador 196 compare la programación específica de aplicaciones en la memoria 194 con las indicaciones de identificación de aplicaciones 180 en la tarjeta madre para confirmar que el módulo procesador 174 es apropiado para esa aplicación específica. Por ejemplo, si la configuración de controladores 172 en FIG. 6 se emplea como un controlador del tobogán 136 en FIG. 3A y el módulo procesador 188 falla, un operador reemplazará el módulo procesador defectuoso con un nuevo módulo procesador. No obstante, puesto que todos los módulos procesadores aparecerían, por lo general, idénticos, es necesario confirmar que el nuevo módulo procesador 188 contiene la programación requerida para uso como un controlador del tobogán. Esto se logra comparando la programación específica de aplicaciones en la memoria 194 con las indicaciones de identificación de aplicaciones 180 antes de iniciar la operación del mecanismo de control del tobogán. Si la comparación es satisfactoria, entonces puede comenzar el control del tobogán. No obstante, si la comparación no es satisfactoria, se avisaría al operador que reemplace el nuevo módulo procesador con un control apropiado para control del tobogán o, alternativamente, que

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descargue nueva programación de control del computador central 176 a través de la red 186 (bus 54, controlador de la máquina 122 y el bus 132 en FIG. 3A) para configurar el nuevo módulo procesador como uno adecuado para el control del tobogán.

Se ha divulgado por consiguiente un sistema para máquina de moldeo de cristalería y, más particularmente, un sistema de control electrónico para controlar la operación de mecanismos de moldeo y de transferencia de cristalería, que satisface completamente todos los objetivos y propósitos expuestos previamente. La invención se ha discutido en conjunción con un número de incorporaciones actualmente preferidas de la misma, y se han discutido asimismo diferentes modificaciones y variaciones. Otras modificaciones y variaciones se sugerirán fácilmente por sí mismas a personas de habilidad ordinaria en el arte. La invención tiene el propósito de abarcar todas y las demás modificaciones y variaciones en la medida que caigan dentro del espíritu y el amplio ámbito de las reivindicaciones anexas.

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X**Reivindicaciones**

1.

Un sistema para máquina de moldeo de cristalería (10) que incluye una máquina de moldeo de cristalería (24) que tiene primeros mecanismos de operación para convertir bulbos de vidrio fundido en artículos de cristalería, un sistema de entrega de bulbos (12 a 22) que tiene segundos mecanismos de operación para entregar bulbos de vidrio fundido a dicha máquina de moldeo de cristalería, un sistema de manipulación de cristalería (26 a 32) que tiene terceros mecanismos de operación para recibir y transportar artículos de cristalería de dicha máquina de moldeo de cristalería, y un sistema de control electrónico (34 ó 120) para controlar y coordinar la operación de dichos mecanismos de operación primeros, segundos y terceros, que incluye:

un controlador de la máquina (37 ó 37a) acoplado a dichos primeros mecanismos de operación de dicha máquina de moldeo de cristalería para controlar y coordinar la operación de dichos primeros mecanismos de operación para producir artículos de cristalería,

un controlador de entrega de bulbos (58 ó 78a, 80a, 82, 84a) acoplado a dichos segundos mecanismos de operación de dicho sistema de entrega de bulbos para controlar y coordinar la operación de dichos segundos mecanismos de operación para entregar bulbos de vidrio fundido a dicha máquina de moldeo de cristalería,

un controlador de manipulación de cristalería (56 ó 56a, 62a) acoplado a dichos terceros mecanismos de operación de dicho sistema de manipulación de cristalería para controlar y coordinar la operación de dichos terceros mecanismos para transportar artículos de cristalería de dicha máquina de moldeo de cristalería, y

un bus serial de datos (54) que interconecta dicho controlador de la máquina, dicho controlador de entrega de bulbos y dicho controlador de manipulación de cristalería para comunicación entre sí para coordinar mutuamente la operación de dichos mecanismos de operación primeros, segundos y terceros .

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2.

El sistema expuesto en la reivindicación 1, en donde dicho sistema de control electrónico incluye además un servidor de la máquina (90) acoplado a dicho bus serial de datos para transmitir información de control a dicha máquina, entrega de bulbos y controladores de manipulación de cristalería, y para monitorear la operación de dichos controladores.

3.

El sistema expuesto en la reivindicación 2, en donde dicho servidor de la máquina (90) incluye una instalación para descargar información de control de una fuente externa.

4.

El sistema expuesto en la reivindicación 3, en donde dicho servidor de la máquina incluye una instalación para descargar información de control y cargar datos de producción a sitios remotos a través de la World Wide Web (94).

5.

El sistema expuesto en la reivindicación 2 en donde dicho servidor de la máquina (90) incluye un administrador de configuración (158) que monitorea programas de control en dichos controladores para garantizar que dichos programas de control sean consistentes entre sí.

6.

El sistema expuesto en la reivindicación 5 en donde dicho servidor de la máquina (90) incluye una instalación para recibir programación de control nueva o revisada para uno de dichos controladores, acceder a una biblioteca de programación de control actual para otro de dichos controladores, y descargar dicha programación de

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control nueva o revisada a dicho controlador cuando dicha programación nueva o revisada es consistente con dicha programación actual.

7.

El sistema expuesto en la reivindicación 1 en donde por lo menos algunos de dichos mecanismos de operación primeros, segundos y terceros incluyen mecanismos neumáticos de operación operados por válvulas (40), sensibles a señales de control electrónico, y en donde por lo menos uno de dichos controladores de máquina, entrega de bulbos y manipulación de cristalería se adapta para suministrar dichas señales de control electrónico a dichas válvulas.

8.

El sistema expuesto en la reivindicación 7 en donde dicho sistema de control electrónico incluye además un controlador de válvulas de la máquina (122), acoplado a dicho bus serial de datos (54) independientemente de los otros dichos controladores, para controlar el suministro de aire a por lo menos algunos de dichos mecanismos neumáticos de operación.

9.

El sistema expuesto en la reivindicación 8 en donde cada uno de dichos mecanismos neumáticos de operación incluye un módulo de accionamiento de válvulas asociado (126), y en donde un segundo bus serial (124) conecta dichos módulos de accionamiento de válvulas a dicho controlador de válvulas de la máquina.

10.

El sistema expuesto en la reivindicación 1 en donde dichos primeros mecanismos de operación de dicha máquina de moldeo de cristalería incluyen mecanismos neumáticos de operación (40) y mecanismos eléctricos de operación (46, 48, 50), y

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en donde dicho controlador de la máquina incluye un controlador de válvulas (38 ó 126) acoplado a dichos mecanismos neumáticos de operación y un servo controlador (42) acoplado a dichos mecanismos eléctricos de operación, estando dicho controlador de válvulas y dicho servo controlador acoplados separadamente a dicho bus serial de datos (54).

11.

El sistema expuesto en la reivindicación 10 en donde cada uno de dichos mecanismos eléctricos de operación (46, 48, 50) incluye un módulo de accionamiento eléctrico asociado, y en donde dicho controlador de la máquina (37 ó 37a) incluye además un segundo bus serial de datos (44) que conecta dicho servo controlador (42) a dichos módulos de accionamiento.

12.

El sistema expuesto en la reivindicación 1 en donde dicha máquina de moldeo de cristalería incluye una pluralidad de secciones de la máquina (24a - 24n), que tiene cada una primeros mecanismos de operación, y en donde dicho sistema de control electrónico incluye una pluralidad de dichos controladores de la máquina (37 ó 37a), acoplado cada uno a un conjunto asociado de primeros mecanismos de operación y conectado cada uno a dicho bus de datos (54).

13.

El sistema expuesto en la reivindicación 1 en donde dichos primeros mecanismos de operación incluyen mecanismos eléctricos de operación seleccionados del grupo conformado por mecanismos de extracción (46), inversión (48) y barrido (50), dichos segundos mecanismos de operación incluyen mecanismos eléctricos de operación seleccionados del grupo conformado por mecanismos de tubo de control (78), agujas (80), cizallador (82) y distribución de bulbos (84), y en donde

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dichos terceros mecanismos de operación incluyen mecanismos eléctricos de operación seleccionados del grupo conformado por mecanismos de transportadores de la máquina (62), transportadores transversales (64), de transferencia radial (66) y cargador del horno (68).

14.

El sistema expuesto en la reivindicación 1 en donde por lo menos uno de dichos controladores incluye:

una tarjeta madre de aplicaciones (172) que incluye indicaciones legibles electrónicamente (180) asociados con el uso de dicha tarjeta madre en combinación con un mecanismo de operación específica, y

un módulo procesador (192) montado en forma intercambiable en dicha tarjeta madre, que incluye programación de control específica de aplicaciones (194) en memoria no volátil para comparación con dichos indicios legibles para determinar si dicho módulo procesador puede utilizarse para controlar dicho mecanismo de operación específica.

15.

El sistema expuesto en la reivindicación 1 en donde dicho sistema de control electrónico incluye un computador central (176) acoplado a dicha red y que tiene almacenada en él programación de control para al menos uno de dichos controladores, y

en donde por lo menos uno de dichos controladores incluye:

una tarjeta madre de aplicaciones (170 ó 172) que incluye indicaciones electrónicamente legibles (180) asociadas con el uso de dicha tarjeta madre en combinación con un mecanismo de operación específica, y

un módulo procesador (184, 192) montado de manera intercambiable en dicha tarjeta madre, que incluye programación para leer dichas indicaciones, que comunica dichas indicaciones a dicho computador central, y que luego descarga de dicho computador central programación de control necesaria para operar dicho mecanismo de operación específica.

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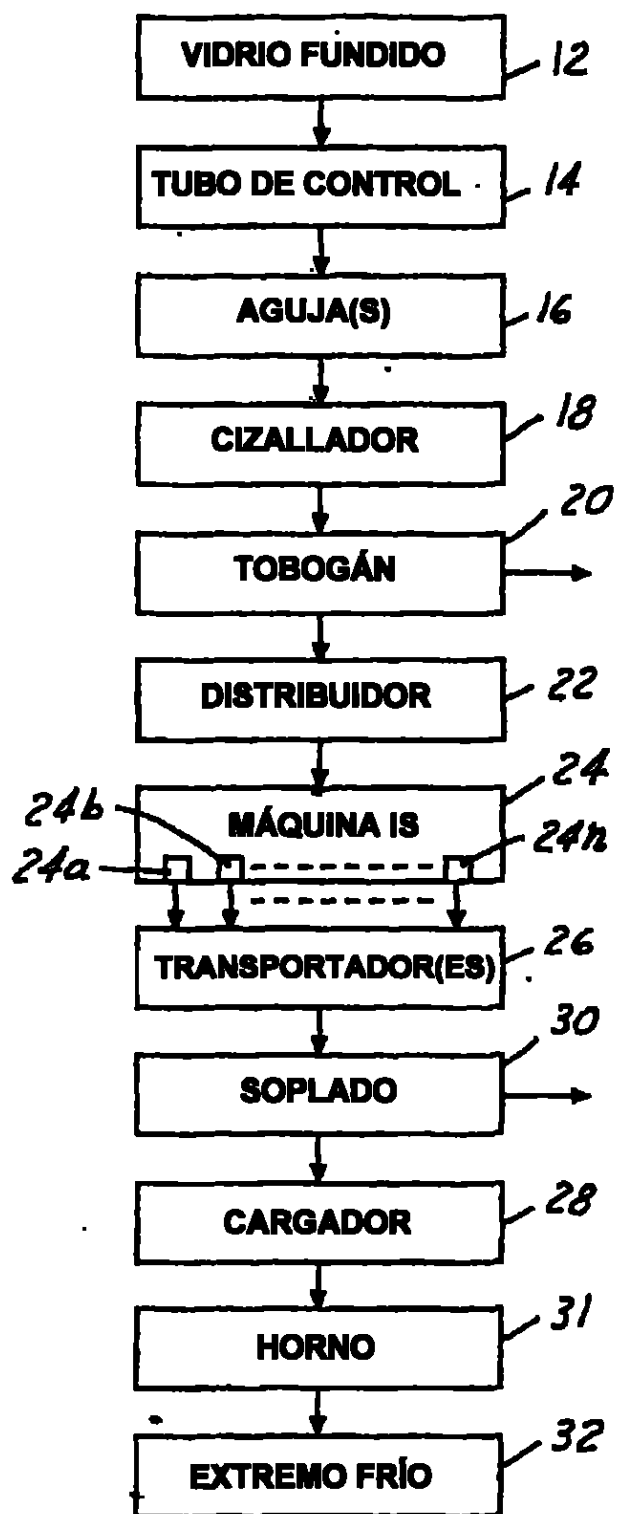


FIG. 1

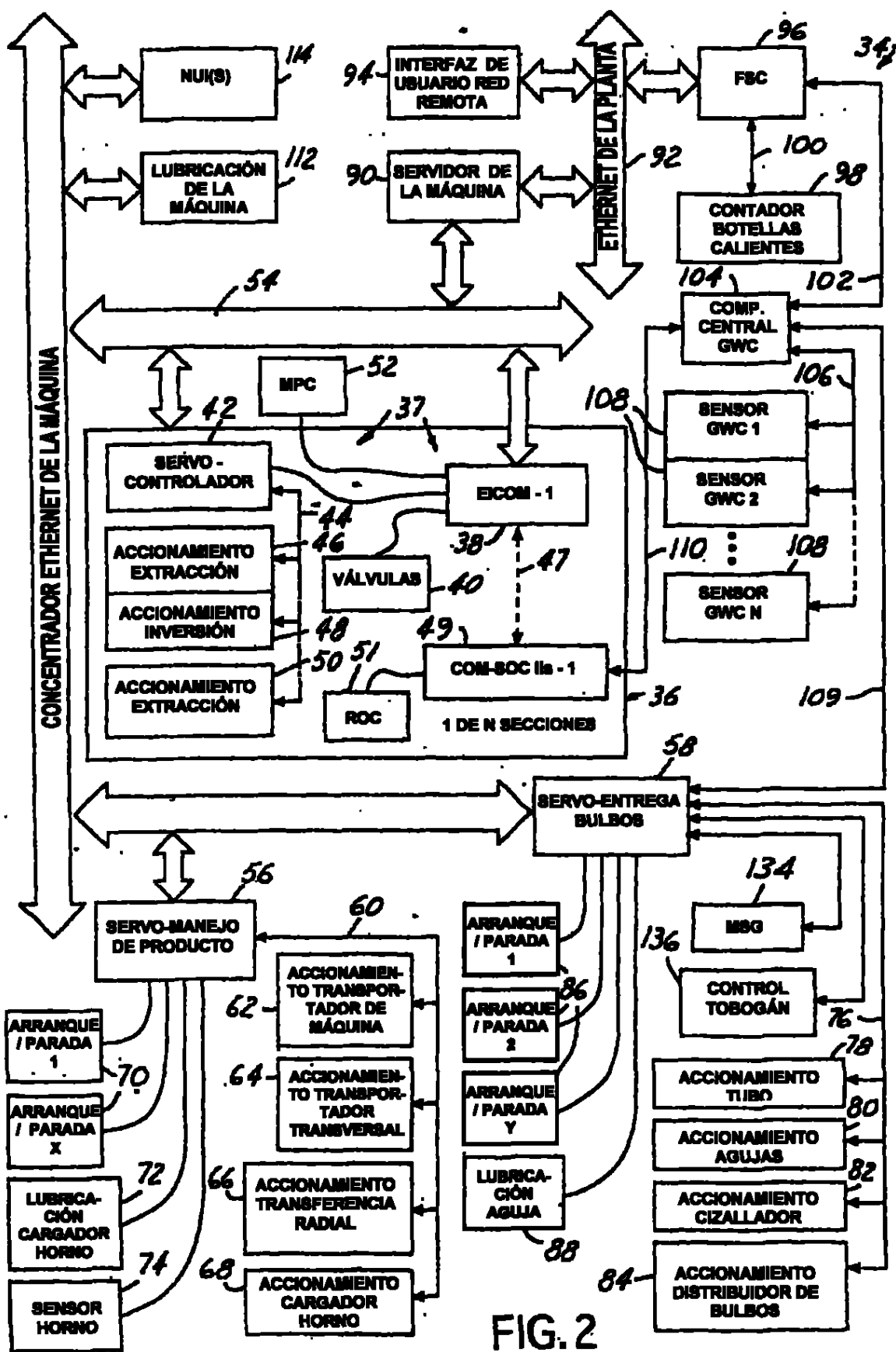


FIG. 2

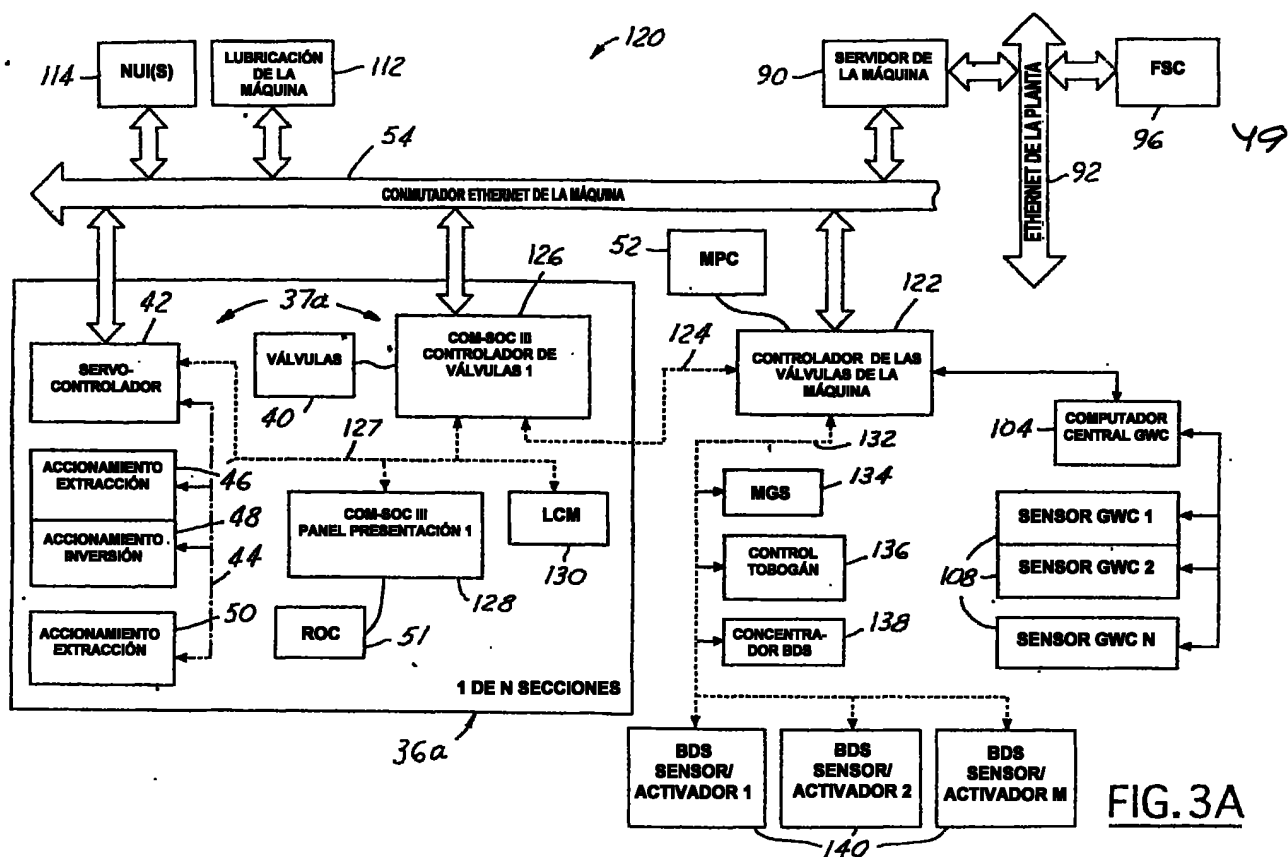
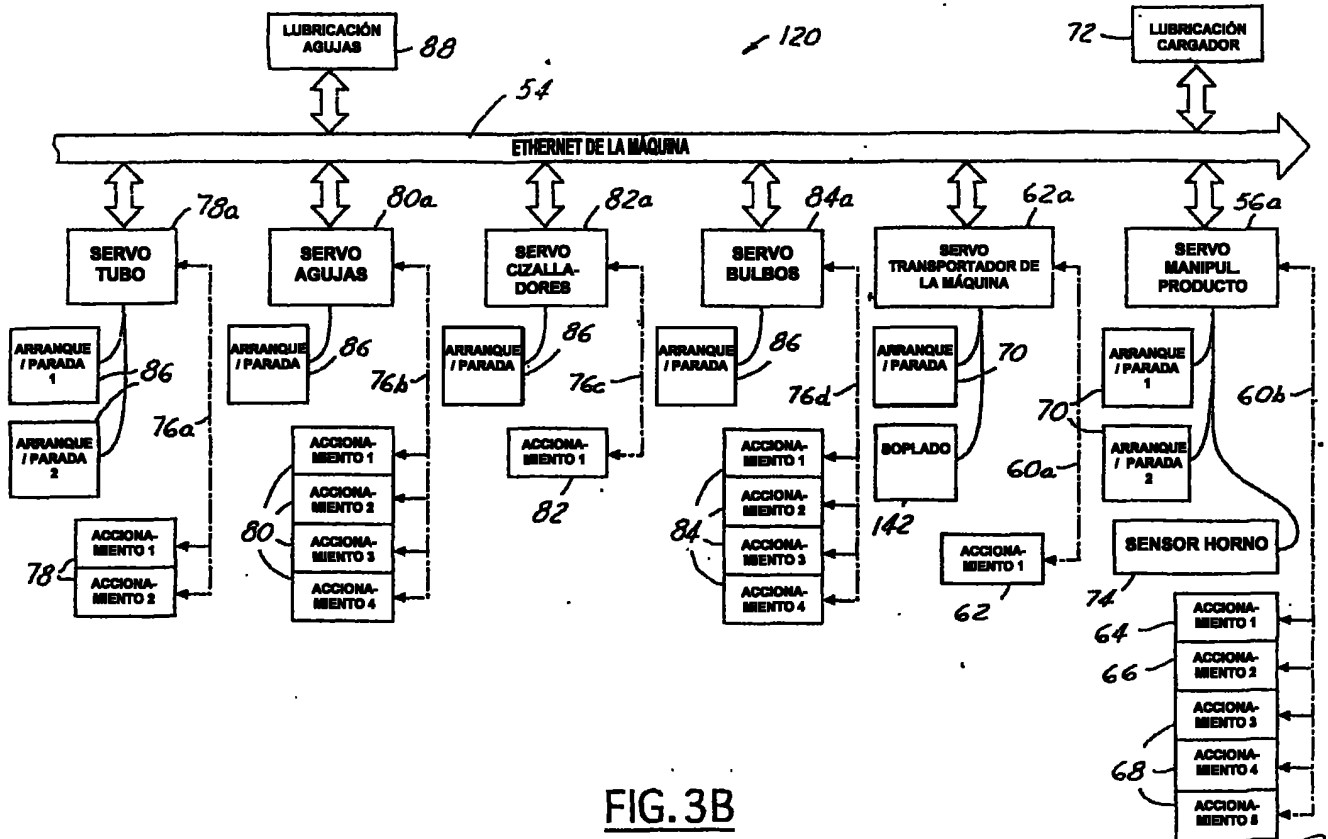


FIG. 3A



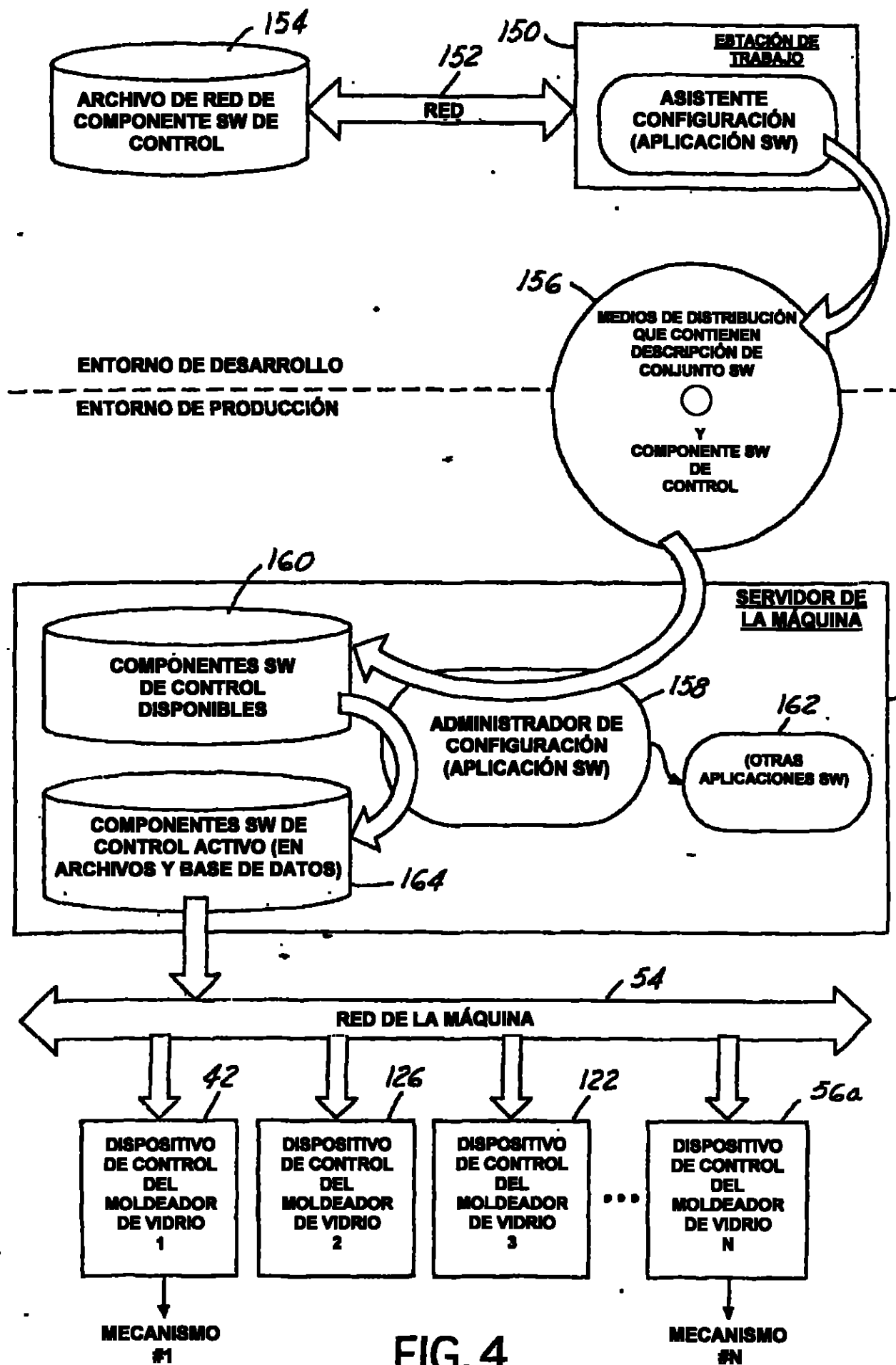


FIG. 4

Fig 52
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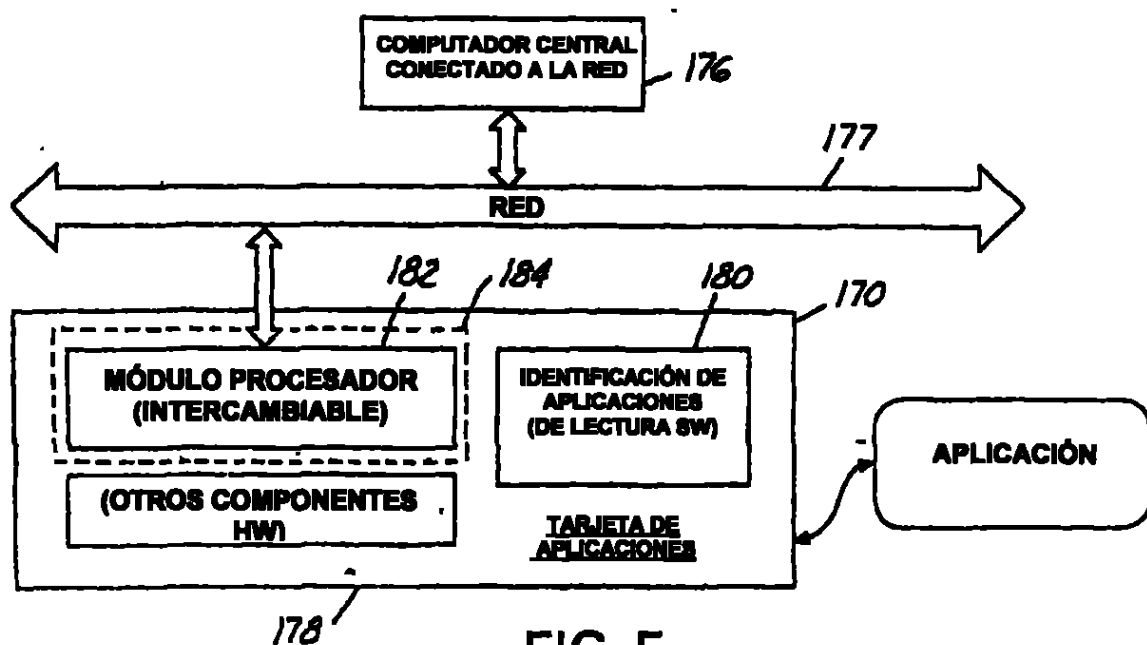


FIG. 5

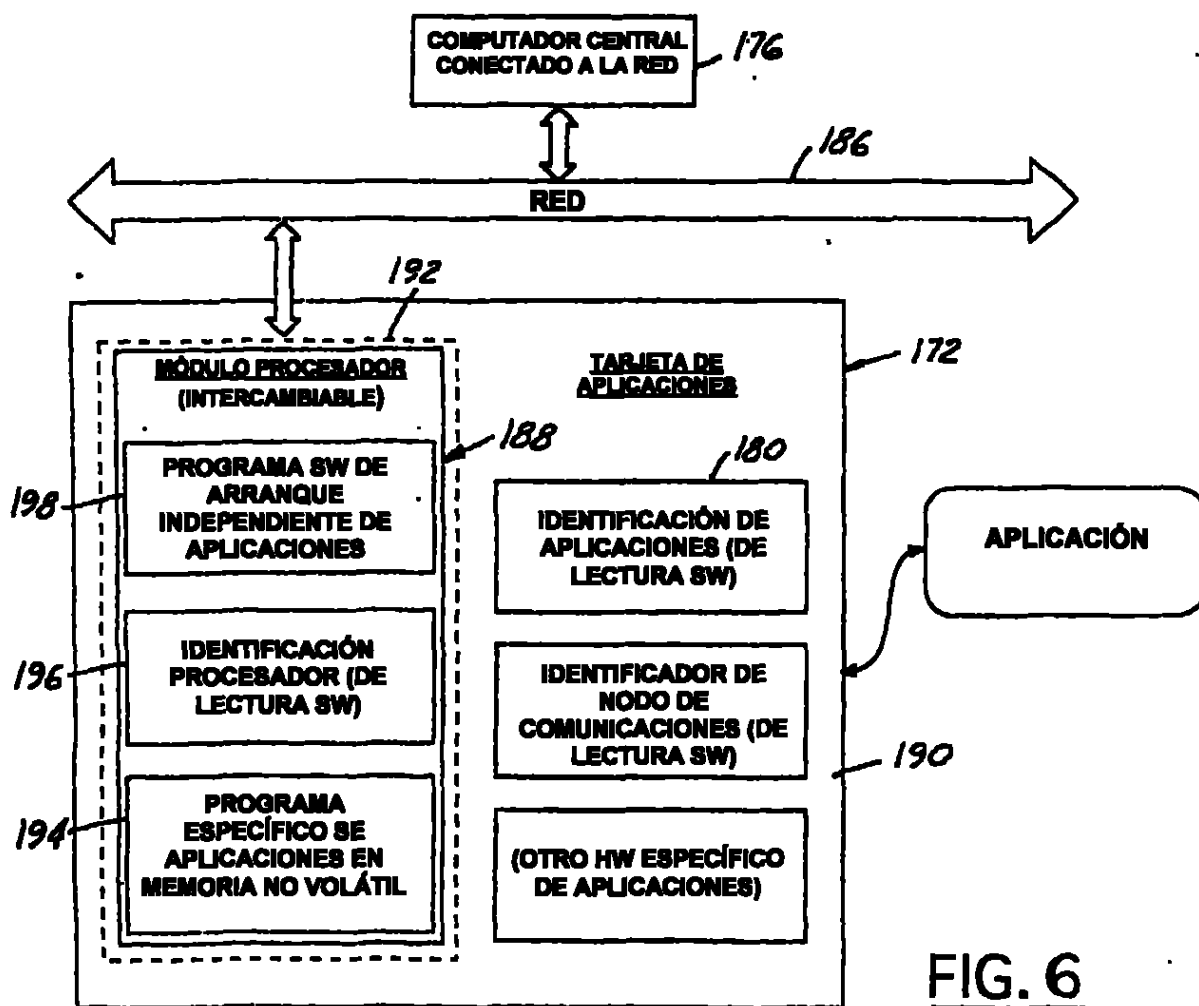


FIG. 6

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 17964PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA416)	
International application No. PCT/US 03/27548	International filing date (day/month/year) 03.09.2003	Priority date (day/month/year) 03.09.2002
International Patent Classification (IPC) or both national classification and IPC C03B9/41		
Applicant OWENS-BROCKWAY GLASS CONTAINER INC.		
1. This International preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 5 sheets, including this cover sheet. ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of sheets.		
3. This report contains indications relating to the following items: I ☒ Basis of the opinion II ☐ Priority III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV ☐ Lack of unity of invention V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI ☐ Certain documents cited VII ☐ Certain defects in the international application VIII ☐ Certain observations on the international application		
Date of submission of the demand 03.05.2004	Date of completion of this report 07.12.2004	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Marrec, P Telephone No. +31 70 340-3793 	

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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/US 03/27548**

I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-16 as originally filed

Claims, Numbers

1-15 as originally filed

Drawings, Sheets

1/8-8/6 as originally filed

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

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

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/US 03/27548**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	5,6,8-11,13-15
	No: Claims	1-4,7,12
Inventive step (IS)	Yes: Claims	-
	No: Claims	1-15
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	-

2. Citations and explanations

see separate sheet

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Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following document :

D1: EP1 184 754 A2

- 1) The solution proposed in claims 1-4, 7, 12 of the present application cannot be considered as being novel (Article 33(2) PCT) for the following reasons:
 - 1.1) D1 discloses an architecture to control a simple separate operating system for forming gobs, an operating system for delevering gobs and a later for handling the glassware.

In more details, document D1 discloses (the references in parentheses applying to this document):

A glassware forming machine system (paragraph 0001 and 0006) that includes :
- a glassware forming machine (central section 3, paragraph 0011) having first operating mechanisms (paragraph 0011) for converting gobs of molten glass into articles of glassware,

- a gob delivery system (top section 4, paragraph 0010) having second operating mechanisms (paragraph 0010) for delivering gobs of molten glass to said glassware forming machine,

- a ware handling system (bottom section 5, paragraph 0012) having third operating mechanisms for receiving and conveying articles (conveyor belt, paragraph 0012) of glassware from said glassware forming machine,

- and an electronic control system (10, paragraph 0014) for controlling and coordinating operation of said first, second and third operating mechanisms, including:

- a machine controller (intelligent peripheral unit 41a, paragraph 0016) coupled to said first operating mechanisms of said glassware forming machine for controlling and coordinating operation of said first operating mechanisms to produce articles of glassware,

- a gob delivery controller (intelligent peripheral unit 41b, paragraph 0016) coupled to said second operating mechanisms of said gob delivery system for controlling and coordinating operation of said second operating mechanisms to deliver gobs of molten glass to said glassware forming machine,

- a ware handling controller (intelligent peripheral unit 41c, paragraph 0016) coupled to said third operating mechanisms of said ware handling system for

controlling and coordinating operation of said third mechanisms to convey articles of glassware from said glassware forming machine,
and

- a serial data bus (lines 40-41, paragraph 0006, and also field bus architecture, paragraph 0016) interconnecting (lines 2-11, paragraph 0016) said machine controller, said gob delivery controller and said ware handling controller for communication with each other to coordinate with each other operation of said first, second and third operating mechanisms.

Therefore the solution proposed in claim 1 is not new.

- 1.2) Dependent claims 2-4, 7, 12 and 13 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to novelty, the reasons being as follows:

Document D1 also discloses the use a machine server, the possibility of down loading and/or uploading information from an external source (70, 72), the mechanism of the machines being able to be operated by valves (paragraph 0014), a plurality of controllers (plurality of intelligent peripheral unit, column 1, lines 39).

- 2) The solution proposed in dependent claims 5, 6, 8-11 and 13-15 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons.

In claims 5, 6, 8-11 and 13-15, a slight constructional change in the glassware forming system of claim 1 is defined which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject-matter of claims 5, 6, 8-11 and 13-15 also lacks an inventive step.

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**TRATADO SOBRE COOPERACIÓN INTERNACIONAL
EN MATERIA DE PATENTES**

PCT

**INFORME DE EXAMEN PRELIMINAR INTERNACIONAL
(Artículo 36 y Regla 70 PCT)**

No. de Expediente del Solicitante o Apoderado 17964PCT	PROCEDIMIENTO POSTERIOR Véase comunicación sobre el envío del informe de examen preliminar internacional (Formulario PCT/IPEA/416)	
No. Solicitud Internacional PCT/US 03/27548	Fecha Internacional de Presentación (día/mes/año) 03.09.2003	Fecha de Prioridad (día/mes/año) 03.09.2002
Clasificación Internacional de Patente (IPC) o Clasificación Nacional e IPC C03B9/41		
Solicitante OWENS-BROCKWAY GLASS CONTAINER INC.		

1. Este informe de examen preliminar internacional fue elaborado por la Oficina Encargada del Examen Preliminar Internacional y se envía al solicitante según Artículo 36.

2. Este INFORME comprende un total de **5** hojas, inclusive esta portada

☐ Además se adjuntan ANEXOS al informe; en este caso se trata de hojas con descripciones, reivindicaciones y/o dibujos, que se modificaron y que sirven de base para este informe, y/o hojas con correcciones efectuadas por esta oficina (véase Regla 70.16 y Sección 607 de las instrucciones bajo el PCT).

Estos anexos comprenden en total de hojas.

3. Este informe contiene datos con respecto a los siguientes puntos:

- I ☒ Base del Informe
- II ☐ Prioridad
- III ☐ Sin elaboración de un dictamen sobre novedad, actividad inventiva y posibilidad de aplicación industrial
- IV ☐ Falta de unidad de la invención
- V ☒ Comprobación justificada según Regla 66.2(a)(II) con respecto a la novedad, la actividad inventiva y la posibilidad de aplicación industrial; documentos y explicaciones sustentando esta comprobación
- VI ☐ Ciertos documentos enumerados
- VII ☐ Ciertas deficiencias del registro internacional
- VIII ☐ Ciertas observaciones relacionadas con la solicitud internacional

Fecha de presentación de la petición 03.05.2004	Fecha de la conclusión de este informe 07.12.2004
Nombre y dirección postal de la Oficina Encargada del Examen Preliminar Internacional (IPEA) Oficina Europea de Patentes – P.B. 6818 Patentaan 2 NL-2280 HV Rijswijk – Pays Bas Tel.: +31 70 340 – 2040 Tx:31 651 epo nl Fax: +31 70 340 - 3016	Empleado Autorizado Marrec, P Teléfono No.: +31 70 340-3783

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I. Base del Informe

1. Con respecto a los elementos de la solicitud internacional (*hojas intercambiables que se han suministrado a la oficina receptora en respuesta a una invitación bajo Artículo 14 se tienen en este informe por "presentadas originalmente" y no se anexan a este informe puesto que no contienen correcciones (Reglas 70.16 y 70.17)*):

Descripción, páginas

1-16 versión original

Reivindicaciones, No.

1-15 versión original

Dibujos, Hojas

1/6-6/6 versión original

2. En lo concerniente al idioma: Todos los elementos indicados más arriba estuvieron a disposición de la oficina o le fueron enviados en el idioma en el cual se radicó la solicitud internacional, salvo indicación en contrario consignada bajo este punto.

Estos elementos estuvieron a disposición de esta oficina o le fueron enviados en el idioma siguiente: en este caso se trata de:

- ☐ el idioma de la traducción enviada para efectos de la búsqueda internacional (según la regla 23.1 (b)).
☐ el idioma de publicación de la solicitud internacional (según la regla 48.3 (b)).
☐ el idioma de la traducción enviada para los efectos del examen preliminar internacional (según la regla 55.2 y/o 55.3).

3. En lo que concierne a la secuencia de nucleótidos y/o aminoácidos, divulgada en la solicitud internacional, el examen preliminar internacional se llevó a cabo sobre la base del listado de secuencias:

- ☐ contenido en la solicitud internacional, por escrito.
☐ presentado con la solicitud internacional, en formato de lectura por computador.
☐ remitido posteriormente a la oficina, por escrito.
☐ remitido posteriormente a la oficina, en formato de lectura por computador.
☐ se ha rendido la declaración, según la cual el listado de secuencias por escrito y suministrado posteriormente no va más allá de la divulgación hecha en la solicitud en el momento en que se radicó.
☐ se ha rendido la declaración, según la cual las informaciones registradas en formato de lectura por computador corresponden al listado de secuencias, presentados por escrito.

4. Las modificaciones han acarreado la anulación:

- ☐ de la descripción, páginas:
☐ de las reivindicaciones, Nos.:
☐ de los dibujos, hojas:

INFORME DE EXAMEN PRELIMINAR INTERNACIONAL

Solicitud Internacional No. PCT/US 03/27548

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5. ☐ El presente informe se preparó sin tener en cuenta (algunas de) las modificaciones, ya que éstas, por las razones aducidas, en concepto de la oficina van más allá del contenido de divulgación en la versión presentada originalmente (Regla 70.2 (c))

(Hojas intercambiables que incluyan modificaciones de esta índole deben indicarse en el punto 1 y anexarse al presente informe.)

6. Observaciones adicionales, si son necesarias:

- V. Declaración motivada bajo Artículo 35(2) en cuanto a la novedad, la actividad inventiva y la posibilidad de aplicación industrial; documentos y explicaciones que sustentan esta declaración

1. DECLARACIÓN

Novedad (N)	Si: Reivindicaciones 5,8,8-11,13,15 No: Reivindicaciones 1-4,7,12
Actividad Inventiva (IS)	Si: Reivindicaciones No: Reivindicaciones 1-15
Possibilidad de Aplicación Industrial (IA)	Si: Reivindicaciones 1-15 No: Reivindicaciones

2. Documentos y explicaciones

Véase hoja separada

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Re Ítem V

Declaración motivada bajo Regla 66.2(a)(II) en cuanto a la novedad, la actividad inventiva y la posibilidad de aplicación industrial; citas y explicaciones que sustentan esta declaración

Se hace referencia al siguiente documento:

D1: EP1 184 754 A2

- 1) La solución propuesta en las reivindicaciones 1-4, 7, 12 de la presente solicitud no pueden considerarse novedosas (Artículo 33(2) PCT) por las siguientes razones:**
- 1.1) D1 divulga una arquitectura para controlar un sencillo sistema separado de operación para formar bulbos, un sistema de operación para entregar los bulbos y uno posterior para manipular la cristalería.**

Entrando en más detalles, el documento D1 divulga (las referencias entre paréntesis se aplican a este documento):

Un sistema para una máquina de moldeo de cristalería (párrafo 0001 y 0006) que incluye:

- una máquina de moldeo de cristalería (sección central 3, párrafo 0011) que cuenta con primeros mecanismos de operación (párrafo 0011) para convertir los bulbos de vidrio fundido en artículos de cristalería,**
- un sistema de entrega de bulbos (sección superior 4, párrafo 0010) que cuenta con segundos mecanismos de operación (párrafo 0010) para entregar bulbos de vidrio fundido a dicha una máquina de moldeo de vidrio,**
- un sistema de manipulación de producto (sección inferior 5, párrafo 0012) que cuenta con terceros mecanismos de operación para recibir y transportar artículos (cinta transportadora párrafo 0012) de cristalería provenientes de dicha máquina de moldeo de cristalería,**
- y un sistema de control electrónico (10, párrafo 0014) para controlar y coordinar la operación de dichos mecanismos de operación primeros, segundos y terceros, que incluye:**

- un controlador de la máquina (unidad periférica inteligente 41a, párrafo 0016) acoplado a dichos primeros mecanismos de operación de dicha máquina de moldeo de cristalería para controlar y coordinar la operación de dichos primeros mecanismos de operación para producir artículos de cristalería,**
- un controlador de entrega de bulbos (unidad periférica inteligente 41 b, párrafo 0016) acoplado a dichos segundos mecanismos de operación de dicho sistema de entrega de bulbos para controlar y coordinar la operación de dichos segundos mecanismos de operación para entregar bulbos de vidrio fundido a dicha máquina de moldeo de cristalería,**
- un controlador de manipulación de producto (unidad periférica independiente 41c, párrafo 0016) acoplado a dichos terceros mecanismos de operación de dicho sistema de manipulación de producto para**

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controlar y coordinar la operación de dichos terceros mecanismos para transportar artículos de cristalería provenientes de dicha máquina de moldeo de cristalería, y

– un bus serial de datos (renglones 40-41, párrafo 0006, y además arquitectura de bus de campo, párrafo 0016) que interconecta (renglones 2-11, párrafo 0016) dicho controlador de la máquina, dicho controlador de entrega de bulbos y dicho controlador de manipulación de producto para comunicación entre sí para coordinar mutuamente la operación de dichos mecanismos de operación primeros, segundos y terceros.

Por consiguiente, la solución propuesta en la reivindicación 1 no es novedosa.

- 1.2) Las reivindicaciones dependientes 2-4, 7, 12 y 13 no parecen contener características adicionales de ningún tipo que, en combinación con las características de cualquier reivindicación a la cual se refieran, satisfagan los requerimientos del PCT con respecto a la novedad, siendo las razones las siguientes:

Documento D1 divulga igualmente el uso de un servidor de la máquina, la posibilidad de descargar y/o cargar información proveniente de una fuente externa (70, 72), estando el mecanismo de las máquinas en capacidad de ser operados por válvulas (párrafo 0014), una pluralidad de controladores (pluralidad de unidades periféricas inteligentes, columna 1, renglones 39).

- 2) No puede considerarse que la solución propuesta en las reivindicaciones dependientes 5, 6, 8-11 y 13-15 de la presente solicitud involucre una actividad inventiva (Artículo 33(3) PCT) por las siguientes razones:

En las reivindicaciones 5, 6, 8-11 y 13-15, se define un leve cambio de construcción en el sistema modelador de cristalería de la reivindicación 1, el cual está implícito en el ámbito de la práctica habitual seguida por las personas expertas en el arte, especialmente porque las ventajas así obtenidas pueden preverse fácilmente. En consecuencia, el asunto de las reivindicaciones 5, 6, 8-11 y 13-15 carece asimismo de actividad inventiva.

PATENT COOPERATION TREATY

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67From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

BRUSS, H.G.
Owens-Illinois, Inc.
One SeaGate, 25-LDP
Toledo, OH 43666
ETATS-UNIS D'AMERIQUE

Owens-Illinois, Inc.

JUL 16 2004

WRITTEN OPINION

(PCT Rule 66)

INTELLECTUAL
PROPERTY SECTIONDate of mailing
(day/month/year)

06/07/2004

Applicant's or agent's file reference
17964PCT

REPLY DUE

within 1 / 00 months/days
from the above date of mailing

International application No.

PCT/US03/27546

International filing date (day/month/year)

03/09/2003

Priority date (day/month/year)

03/09/2002

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

C03B9/41

Applicant

OWENS-BROCKWAY GLASS CONTAINER INC.

1. This written opinion is the first drawn up by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).**How?** By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.**Also** For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

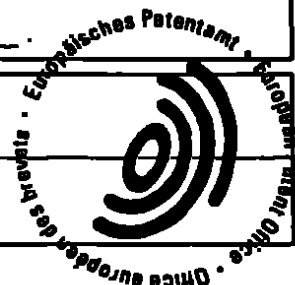
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 03/01/2005

Name and mailing address of the IPEA/

European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Netherlands
Tel.: (+31-70) 340-2040
Fax: (+31-70) 340-3016

Authorized officer

Examiner

Formalities officer
(incl. extension of time limits)
Tel. (+49-89) 2399 2828

Form PCT/IPEA/408 (cover sheet) (march 2002)

I. Basis of the opinion

1. The basis of this written opinion is the application as originally filed.

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability

1. In light of the documents cited in the international search report, it is considered that the invention as defined in at least some of the claims does not appear to meet the criteria mentioned in Article 33(1) PCT, i.e. does not appear to be novel and/or to involve an inventive step (see international search report, in particular the documents cited X and/or Y and corresponding claims references).
2. If amendments are filed, the applicant should comply with the requirements of Rule 66.8 PCT and indicate the basis of the amendments in the documents of the application as originally filed (Article 34 (2) (b) PCT) otherwise these amendments may not be taken into consideration for the establishment of the international preliminary examination report. The attention of the applicant is drawn to the fact that if the application contains an unnecessary plurality of independent claims, no examination of any of the claims will be carried out.

NB: Should the applicant decide to request detailed substantive examination, then an international preliminary examination report will normally be established directly. Exceptionally the examiner may draw up a second written opinion, should this be explicitly requested.

TRATADO DE COOPERACIÓN
EN MATERIA DE PATENTES

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Remitente:

ADMINISTRACIÓN ENCARGADA DEL EXAMEN PRELIMINAR INTERNACIONAL

A:

BRUSS, H.G.
Owens-Illinois, Inc.
One SeaGate, 25-LDP
Toledo, OH 43666
ESTADOS UNIDOS DE AMÉRICA

PCT

CONCEPTO ESCRITO
(regla 66 PCT)

No. de expediente del solicitante o apoderado		Fecha de envío (día/mes/año)
17964 PCT		06/07/2004
No. de Solicitud Internacional	Fecha de Presentación Internacional (día/mes/año)	Fecha de Prioridad (día/mes/año)
PCT/US 03/27548	03/08/2003	03/08/2002
Clasificación de Patente Internacional (IPC) o ambas, clasificación nacional e IPC		
C03B9/41		
Solicitante		
OWENS-BROCKWAY GLASS CONTAINER INC.		

- El presente concepto escrito es el primero redactado por esta Administración Encargada del Examen Preliminar Internacional.
- Este concepto contiene indicaciones relativas a los siguientes ítems:

I	☒	Base del Informe
II	☐	Prioridad
III	☐	Ausencia de formulación de opinión en cuanto a la novedad, la actividad inventiva y la posibilidad de aplicación industrial
IV	☐	Ausencia de unidad de la invención
V	☒	Declaración bajo regla 66.2 (a)(i) en cuanto a la novedad, la actividad inventiva / la posibilidad de aplicación industrial; citas y explicaciones en apoyo de esta declaración
VI	☐	Ciertos documentos citados
VII	☐	Irregularidades en la solicitud internacional
VIII	☐	Ciertas observaciones relacionadas con la solicitud internacional
- Por el presente se invita al solicitante a responder a este concepto.
¿Cuándo? Véase el límite de tiempo indicado más arriba en el texto. El solicitante puede, antes de la expiración de esa fecha límite, solicitar a esta Administración que le otorgue una prórroga. Véase Regla 66.2(d).
¿Cómo? Enviando una respuesta escrita acompañada, donde sea apropiado, de correcciones, de acuerdo con la Regla 66.3.
En lo concerniente al formato y al idioma de las correcciones, véase Reglas 66.8 y 66.9.
Además Para una oportunidad adicional de enviar correcciones, véase Regla 66.4
Para la obligación del examinador de considerar correcciones y/o argumentos, véase Regla 66.4 bis.
Para una comunicación informal con el examinador, véase Regla 66.6
Si no se envía una respuesta, el informe de examen preliminar internacional se establecerá sobre la base de este concepto.
- La fecha final en la cual tiene que establecerse el informe de examen preliminar internacional de acuerdo con la Regla 66.2 es: 03/01/2005

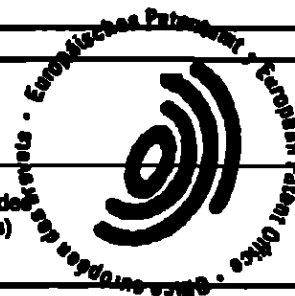
Nombre y dirección postal de la Oficina Encargada del Examen Preliminar Internacional (IPEA)



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Empleado Autorizado
Examinador

Funcionario encargado de formalidades
(Incl. ampliación de límites de fechas)
Tel. (+49-89) 2399 2828



I. Base del Informe

La base de este informe de examen preliminar la constituye la solicitud tal como se radicó originalmente.

V. Declaración motivada bajo Regla 66.2(a)(ii) en cuanto a la novedad, la actividad inventiva y la posibilidad de aplicación industrial

1. A la luz de los documentos citados en el informe de búsqueda internacional, se considera que la invención como se define en por lo menos algunas de las reivindicaciones, que han sido objeto de un informe de búsqueda internacional, no parece satisfacer los criterios mencionados en Artículo 33(1) PCT, es decir, no parece ser novedosa y/o implicar una actividad inventiva (véase informe de búsqueda internacional, en particular los documentos citados X y/o Y y referencias de reivindicaciones correspondientes).
2. Si se presentan correcciones, el solicitante debe cumplir los requerimientos de la Regla 66.8 PCT e indicar la base de las correcciones en los documentos de la solicitud tal como se radicarón originalmente (Artículo 34 (2) (b) PCT); de lo contrario, estas correcciones pueden no tomarse en cuenta para el establecimiento del informe de examen preliminar internacional. Se llama la atención del solicitante al hecho que si la solicitud contiene una pluralidad innecesaria de reivindicaciones independientes, no se llevará a cabo examen de ninguna de las reivindicaciones.

NB: Si el solicitante decide pedir un examen considerable detallado, entonces, por lo general, se establecerá normalmente un informe de examen preliminar internacional en forma directa. De manera excepcional el examinador redactará un segundo concepto por escrito, si éste se solicita explícitamente.

67 AS 96.450
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**EUROPEAN PATENT OFFICE
PATENT COOPERATION TREATY**

International Application No.: PCT/US03/27548
Applicant: Owens-Brockway Glass Container Inc.
International Filing Date: 03 September 2003
In Response to: Written Opinion Mailed 06 July 2004

RESPONSE TO WRITTEN OPINION

European Patent Office
P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Netherlands

Sir:

This is in response to the Written Opinion mailed 06 July 2004. The period for response was set at one month, this reply therefore being due on 06 August 2004.

The "reasoned statement" set forth in the Written Opinion states that "at least some of the claims" do not "appear to be novel and/or involve an inventive step" in light of the documents cited in the International Search Report, "In particular the documents cited X and /or Y." This "reasoned statement" appears to be in the nature of a form paragraph that could be applied equally as well to any international application, particularly inasmuch as there were no category Y documents cited in the International Search Report on the present application.

Turning to the documents cited in the International Search Report, EP 1184754 discloses a glass machine control system that includes a multi-tier or layered network arrangement. Central units 50-52 are connected to each other by a first network 54, and to associated peripheral units 60-62 by second networks 56-58. Central units 50-52 also are connected by a network 71 to a main monitor 70, and through a separate communication system to a remote technical assistance station 72. It is noted that the central units 50-52 are dedicated to specific types of driven elements, with drive system central unit 50 being dedicated to controlling peripheral units operated by motors 64, timing system central unit 51 being dedicated to pneumatically driven peripheral units 65, and utility system central unit 52 being dedicated to peripheral sensors 66.

US 5609663 discloses a glass manufacturing system in which computers are interconnected by networks.

DE 10139809 discloses a control system for controlling operation of the glass feeder portion of a glassware manufacturing system.

JP 08337425 relates to a glassware manufacturing system in which individual sections of a glassware forming machine are controlled by associated section computers 3S1-3Sn. The auxiliary computer 4 monitors conditions at the several sections, presumably through associated sensors. The computers are interconnected by a bus B, which is also connected through a junction computer 6 to a personal computer 5.

EP 1122218 discloses a star network communication hub arrangement for interconnecting electronic devices of a glassware forming machine system.

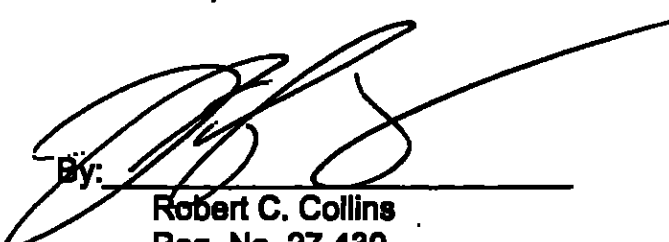
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None of the documents cited in the Search Report disclose or suggest a glassware forming machine system that includes a machine controller coupled to first operating mechanisms of the glassware forming machine for converting gobs of molten glass into articles of glassware, a gob delivery controller coupled to second operating mechanisms of a gob delivery system for delivering gobs of molten glass to the glassware forming machine, a ware handling controller coupled to third operating mechanisms of a ware handling system for receiving and conveying articles of glassware from the glassware forming machine, and a serial data bus interconnecting the machine controller, the gob delivery controller and the ware handling controller for communication with each other to coordinate with each other operation of the first, second and third operating mechanisms, all as recited in application independent claim 1. Independent claim 1 and associated dependent claims 2-15 therefore are allowable over the materials cited in the International Search Report.

It is therefore believed and respectfully submitted that all claims 1-15 meet the novelty, inventive step and industrial applicability requirements of the PCT.

Respectfully Submitted,

REISING, ETHINGTON, BARNES,
KISSELLE, P.C.

By: 

Robert C. Collins
Reg. No. 27,430
Phone: (248) 689-3500
Fax: (248) 689-4071

RCC/dc

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**OFICINA EUROPEA DE PATENTES
TRATADO DE COOPERACIÓN EN MATERIA DE PATENTES**

Solicitud Internacional No.: PCT/US03/27548

Solicitante: Owens-Brockway Glass Container Inc.

Fecha de Presentación Internacional: 03 de septiembre de 2003

En respuesta: Concepto escrito enviado por correo el
06 de julio de 2004

RESPUESTA AL CONCEPTO ESCRITO

Oficina Europea de Patentes
P.B. 5818 Patentlaan2
NL-2280 HV Rijswijk – Holanda

Señor:

El presente es en respuesta al Concepto Escrito enviado por correo el 06 de julio de 2004. El plazo de respuesta se fijó en un mes, venciendo por lo tanto esta respuesta el 06 de agosto de 2004.

La "declaración motivada" expuesta en el Concepto Escrito establece que "por lo menos algunas de las reivindicaciones" no "parecen ser novedosas y/o involucrar una actividad inventiva" a la luz de los documentos citados en el Informe de Búsqueda Internacional, "en particular los documentos citados X y/o Y." Esta "declaración motivada" parece ser de la naturaleza de un párrafo de un formulario que podría aplicarse igualmente a cualquier solicitud internacional, particularmente en la medida en que en el Informe de Búsqueda Internacional no se citaban documentos de categoría Y con respecto a la presente solicitud.

Volviendo a los documentos citados en el Informe de Búsqueda Internacional, EP 1184754 divulga un sistema de control para máquina de vidrio que incluye una disposición de red multi-tramo o multicapa. Las unidades centrales 50-52 se conectan entre sí por una primera red 54, y a unidades periféricas asociadas 60-62 por segundas redes 56-58. Las unidades centrales 50-52 se conectan asimismo por una red 71 a un monitor principal 70, y a través de un sistema de comunicación separado a una estación de asistencia técnica remota 72. Se anota que las unidades centrales 50-52 están dedicadas a tipos específicos de elementos accionados, dedicándose la unidad

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central del sistema de accionamiento 50 a controlar unidades periféricas operadas por motores 64, dedicándose la unidad central del sistema temporizador 51 a unidades periféricas accionadas neumáticamente 65, y dedicándose la unidad central del sistema utilitario 52 a sensores periféricos 66.

US 5609663 divulga un sistema de manufactura de vidrio en el cual los computadores están interconectados por redes.

DE 10139809 divulga un sistema de control para controlar la operación de la porción del alimentador de vidrio de un sistema de manufactura de cristalería.

JP 08337425 se refiere a un sistema de manufactura de cristalería en el cual secciones individuales de una máquina para moldeo de cristalería se controlan por computadores de sección asociados 3S1-3Sn. El computador auxiliar 4 monitorea las condiciones en las diferentes secciones, presumiblemente a través de sensores asociados. Los computadores están interconectados por un bus B, el cual se conecta igualmente a través de un computador de empalme 6 a un computador personal 5.

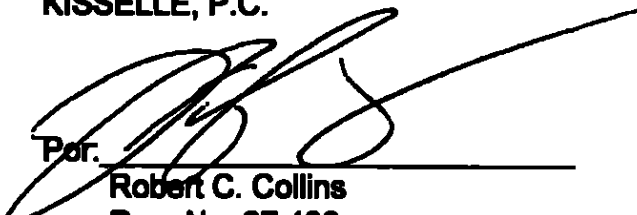
EP 1122218 divulga una disposición de concentrador de comunicación de red en estrella para interconectar dispositivos electrónicos de un sistema de máquina para moldeo de cristalería.

Ninguno de los documentos citados en el Informe de Búsqueda divulga o sugiere un sistema de máquina para moldeo de cristalería que incluya un controlador de máquina acoplado a primeros mecanismos de operación de la máquina para moldeo de cristalería para convertir bulbos de vidrio fundido en artículos de cristalería, un controlador de entrega de bulbos acoplado a segundos mecanismos de operación de un sistema de entrega de bulbos para entregar bulbos de vidrio fundido a la máquina para moldeo de cristalería, un controlador de manipulación de producto acoplado a terceros mecanismos de operación de un sistema de manipulación de producto para recibir y transportar artículos de cristalería de la máquina para moldeo de cristalería, y un bus serial de datos que interconecta el controlador de la máquina, el controlador de entrega de bulbos y el controlador de manipulación de producto para comunicación entre sí para coordinar mutuamente la operación de los mecanismos de operación primeros, segundos y terceros, todos como se enumera en la reivindicación independiente 1 de la solicitud. Por lo tanto, la reivindicación independiente 1 y las reivindicaciones dependientes asociadas 2-15 son admisibles con respecto a los materiales citados en el Informe de Búsqueda Internacional.

En consecuencia, se considera y se expone respetuosamente que todas las reivindicaciones 1-15 satisfacen los requerimientos de novedad, actividad inventiva y posibilidad de aplicación industrial del PCT.

Respetuosamente,

REISING, ETHINGTON, BARNES,
KISSELLE, P.C.

Por. 

Robert C. Collins

Reg. No. 27,430

Teléfono: (248) 689-3500

Fax: (248) 689-4071

RCC/dc

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

Owens-Illinois, Inc.

BRUSS, H.G.
Owens-Illinois, Inc.
One SeaGate, 25-LDP
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ETATS-UNIS D'AMERIQUE

MAY 28 2004

INTELLECTUAL
PROPERTY SECTIONNOTIFICATION OF RECEIPT
OF DEMAND BY COMPETENT INTERNATIONAL
PRELIMINARY EXAMINING AUTHORITY(PCT Rules 59.3(e) and 61.1(b), first sentence
and Administrative Instructions, Section 601(a))

By fax in advance

Fax: + 1 419 247 8555

Date of mailing
(day/month/year) 19-05-2004Applicant's or agent's file reference
17964PCT

IMPORTANT NOTIFICATION

International application No.
PCT/US03/27548International filing date (day/month/year)
03/09/2003Priority date (day/month/year)
03/09/2002

Applicant

OWENS-BROCKWAY GLASS CONTAINER INC.

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

03/05/2004

2. This date of receipt is:

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

3. ☒ **ATTENTION:** That date of receipt is after the expiration of 19 months from the priority date. Consequently, in respect of some Offices, the demand does not have the effect of postponing the entry into the national phase until 30 months from the priority date (or later in some Offices) (Article 39(1)) and the acts for entry into the national phase must therefore be performed within 20 months from the priority date (or later in some Offices). However, in respect of some other Offices, the time limit of 30 months (or later) may nevertheless apply. See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

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

19/05/04, by fax

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

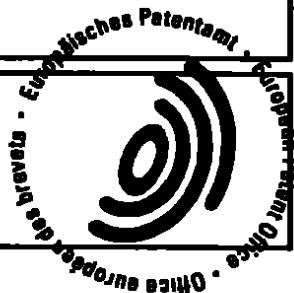
Name and mailing address of the IPEA/

European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Netherlands
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MEMORANDUM OF RESPONSE

TO: Ms. Joyce Murphy
DATE: February 2, 2005
FROM: Robert C. Collins
RE: OI Docket 17964 PCT (1100)
Application: PCT/US03/27548

This memorandum is in response to the International Preliminary Examination Report dated December 7, 2004 and enclosed with your fax of January 28, 2005. I recommend that a copy of this Memorandum be forwarded to each associate when instructing the associate to enter the national phase so that the associate will be able to file a response to the International Preliminary Examination Report if appropriate.

The examiner in the Report suggests that all application claims are either anticipated by or obvious in view of EP 1184754. This document discloses a glass machine control system that includes a multi-tier or layered network arrangement. As shown in FIG. 1, the forming system includes a glassware forming machine 2 having sections 3 and operating mechanisms in each section for converting gobs of molten glass into articles of glassware. The system also includes a gob delivery system 4 having operating mechanisms for delivering gobs of molten glass to the glassware forming machine 2, and a ware handling system 5 with operating mechanisms for receiving and conveying the articles of glassware. However, the key distinction between the present invention on the one hand and the disclosure of the EP reference of the other lies in the way in which the operating mechanisms are controlled.

FIG. 2 of the EP reference shows the basic block diagram of the control system of that reference, and FIG. 3 is a more detailed diagram of the system illustrated in FIG. 2 (column 3, lines 21-26). It will be noted in both FIGS. 2 and 3 that the operating mechanisms are not divided by sections of the system - e.g., the glassware forming machine section, the gob delivering section and the ware handling section - but rather are divided by the type of actuators involved (column 3, lines 22-26). For example, the peripheral unit 41a in FIG. 2 is connected strictly to actuators 43a such as a solenoid valve for controlling a machine section (column 3, lines 12-13). In the same way, periphery unit 41b in FIG. 2 is connected strictly to motors, of which one example is a motor for controlling the gob distributor 19 in FIG. 1 (column 3, lines 14-17). The peripheral unit 41c in FIG. 2 is connected strictly to sensors 43c, of which one stated example is a load cell for measuring the weight of an article of glassware (column 3, lines 17-20).

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FIG. 3 of the EP reference is stated to be an expansion of FIG. 2. FIG. 3 presupposes dividing machine 2 into three separate machine systems: a drive system for controlling the electric motors of machine 2; a timing system for controlling pneumatic article molding movements; and a utility system for accessory checks (column 3, lines 22-26). In FIG. 3, there is a central unit 50 that operates through peripheral units 60 to control motors 64, of which the stated examples are the feeder and rotary tube motor, the distributor and scissor assembly motor, both of which would be in the gob delivery system, the conveyor motor which would be in the ware handling system, and distributor motors, electric-punch motors, scissor servo motors, pusher motors, inverter unit servo motors and take-out server motors, all of which would be in the glassware forming machine (column 3, lines 44-56). Likewise, in FIG. 3, the timing unit 51 and the peripheral unit 61 operate pneumatic articles 65, of which the stated examples are solenoid valves for operating pneumatic motors, section controlled push buttons, machine controlled push buttons and generic customer inputs and outputs (column 4 lines 4-7). The utility unit 52 and the utility peripheral units 62 are connected strictly to sensors that provide inputs indicative of operation, of which examples are lasers for checking the position and size of the articles of glassware, load cells for weighing the articles and a device for controlling the height and position of the rotary tube as a function of the weight of the articles (column 4, lines 13-17).

In summary, the control system of the cited EP reference is divided as a function of the types of actuators (e.g., electric or pneumatic) being actuated and the sensors being monitored. The reference does not disclose or suggest provision of a machine controller for operating the mechanisms of the glassware forming machine, a gob delivery controller for controlling and coordinating operation of the operating mechanisms of the gob delivery system, and a ware handling controller for controlling and coordinating operation of the glassware conveyor. The advantage of such a system, as claimed in the present application, is that the system is modular and can readily be expanded, contracted and/or modified as conditions require. In a given machine section, for example, all of the motors, valves, actuators and sensors are connected to one controller (see FIG. 2 or FIG. 3A), and not separate controller as in the EP reference. The same is true for the ware handling and gob distributor systems (see FIGS. 2A and 3B).

Thus, the invention of claim 1 is neither anticipated by nor obvious in view of the EP reference.

MEMORANDO DE RESPUESTA

PARA: Ms. Joyce Murphy

FECHA: Febrero 2 de 2005

DE: Robert C. Collins

REF.: Listado de Casos OI 17964 PCT (1100)
Solicitud: PCT/US03/27548

Este memorando es en respuesta al Informe de Examen Preliminar Internacional, de fecha diciembre 7 de 2004 e incluido con su fax de enero 28 de 2005. Recomendé que una copia de este Memorando se enviara a cada asociado cuando se impartieran instrucciones al asociado para ingresar a la fase nacional, de modo que el asociado esté en capacidad de presentar una respuesta al Informe de Examen Preliminar Internacional, si se considera pertinente.

El examinador sugiere en el Informe que todas las reivindicaciones de la solicitud se anticipan por o son obvias a la luz de EP 1184754. Este documento divulga un sistema de control para una máquina de vidrio que incluye una disposición de red multi-tramo o multicapa. Como se representa en FIG. 1, el sistema de moldeo incluye una máquina para moldeo de cristalería 2 que tiene secciones 3 y mecanismos de operación en cada sección para convertir bulbos de vidrio fundido en artículos de cristalería. El sistema incluye asimismo un sistema de entrega de bulbos 4 que tiene mecanismos de operación para entregar bulbos de vidrio fundido a la máquina para moldeo de cristalería 2, y un sistema de manipulación de producto 5 con mecanismos de operación para recibir y transportar los artículos de cristalería. Sin embargo, la distinción clave entre la presente invención, de una parte, y la divulgación de la referencia EP, por el otro, radica en la forma en que se controlan los mecanismos de operación.

FIG. 2 de la referencia EP muestra el diagrama básico en bloques del sistema de control de esa referencia, y FIG. 3 es un diagrama más detallado del sistema ilustrado en FIG. 2 (columna 3, renglones 21-26). Se observará en ambas FIGS. 2 y 3 que los mecanismos de operación no están divididos por secciones del sistema - verbigracia, la sección de la máquina para moldeo de cristalería, la sección de entrega de los bulbos y la sección de manipulación de producto - sino más bien por el tipo de accionadores involucrados (columna 3, renglones 22-26). Por ejemplo, la unidad periférica 41a en FIG. 2 se conecta estrictamente a los accionadores 43a tal como una válvula solenoide para controlar una sección de la máquina (columna 3, renglones 12-13). De la misma forma, la unidad periférica 41b en FIG. 2 se conecta estrictamente a motores, de los cuales un ejemplo es un motor para controlar el distribuidor de bulbos 19 en FIG. 1 (columna 3, renglones 14-17). La unidad periférica 41c en FIG. 2 se conecta estrictamente a los sensores 43c, de los cuales un ejemplo indicado es una celda de carga para medir el peso de un artículo de cristalería (columna 3, renglones 17-20).

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Se indica que FIG. 3 de la referencia EP es una ampliación de FIG. 2. FIG. 3 presupone dividir la máquina 2 en tres sistemas separados de la máquina: un sistema de accionamiento para controlar los motores eléctricos de la máquina 2; un sistema temporizador para controlar los movimientos neumáticos de moldeo del artículo; y un sistema utilitario para controles accesorios (columna 3, renglones 22-26). En FIG. 3, hay una unidad central 50 que opera a través de las unidades periféricas 60 para controlar los motores 64, de los cuales los ejemplos indicados son el motor del alimentador y del tubo rotatorio, el motor del distribuidor y del conjunto cizallador, dos de los cuales estarían en el sistema de entrega de bulbos, el motor del transportador que estaría en el sistema de manipulación de producto, y los motores del distribuidor, los motores eléctricos de estampado, los servomotores del cizallador, los motores impulsores, los servomotores de unidad de inversión y los servomotores de extracción, todos los cuales estarían en la máquina para moldeo de cristalería (columna 3, renglones 44-56). Análogamente, en FIG. 3, la unidad temporizadora 51 y la unidad periférica 61 operan artículos neumáticos 65, de los cuales los ejemplos indicados son válvulas solenoides para operar motores neumáticos, botones controlados de sección, botones controlados de la máquina y entradas y salidas genéricos de cliente (columna 4 renglones 4-7). La unidad utilitaria 52 y las unidades periféricas utilitarias 62 se conectan estrictamente a sensores que proporcionan entradas indicativas de operación, ejemplos de los cuales son rayos láser para comprobar la posición y tamaño de los artículos de cristalería, celdas de carga para pesar los artículos y un dispositivo para controlar la altura y la posición del tubo rotatorio como función del peso de los artículos (columna 4, renglones 13-17).

En resumen, el sistema de control de la citada referencia EP se divide como función de los tipos de accionadores (verbigracia, eléctricos o neumáticos) que se accionan y los sensores que se monitorean. La referencia no divulga o sugiere la provisión de un controlador de la máquina para operar los mecanismos de la máquina para moldeo de cristalería, un controlador de entrega de bulbos para controlar y coordinar la operación de los mecanismos de operación del sistema de entrega de bulbos, y un controlador de manipulación de producto para controlar y coordinar la operación del transportador de cristalería. La ventaja de tal sistema, reivindicado en la presente solicitud, es que el sistema es modular y puede ampliarse fácilmente, reducirse y/o modificarse según lo exijan las condiciones. En una sección dada de la máquina, por ejemplo, todos los motores, válvulas, accionadores y sensores se conectan a un controlador (véase FIG. 2 ó FIG. 3A), y no un controlador separado como en la referencia EP. Lo mismo es cierto para los sistemas de manipulación de producto y distribuidor de bulbos (ver FIGS. 2A y 3B).

Por consiguiente, la invención de la reivindicación 1 ni se anticipa ni es obvia a la luz de la referencia EP.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/2754828
4
X

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C03B9/41 605B19/042

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 C03B 605B

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, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 184 754 A (BOTTERO SPA) 6 March 2002 (2002-03-06) paragraphs '0006!-'0015!	1-15
X	US 5 609 663 A (LISKA TIMOTHY J ET AL) 11 March 1997 (1997-03-11) column 1, line 1 -column 1, line 31	1-15
X,P	DE 101 39 809 A (SIEMENS AG) 6 March 2003 (2003-03-06) the whole document	1-15
X,P	DE 101 39 808 A (SIEMENS AG) 6 March 2003 (2003-03-06) the whole document	1-15
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☒ 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
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- *L* document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

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

Date of the actual completion of the international search

4 December 2003

Date of mailing of the international search report

17/12/2003

Name and mailing address of the ISA

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Marrec, P

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US03/27548

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 04, 30 April 1997 (1997-04-30) & JP 08 337425 A (KIRIN TECHNO SYST:KK), 24 December 1996 (1996-12-24) abstract	1-15
X	EP 1 122 218 A (OWENS BROCKWAY GLASS CONTAINER) 8 August 2001 (2001-08-08) the whole document	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/27548

39
⑧

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1184754	A	06-03-2002	IT T020000793 A1	08-02-2002
			EP 1184754 A2	06-03-2002
			US 2002052669 A1	02-05-2002
US 5609663	A	11-03-1997	DE 19532794 A1	15-05-1996
			FR 2724743 A1	22-03-1996
			GB 2300494 A , B	06-11-1996
			IT MI951865 A1	06-03-1996
			JP 8123519 A	17-05-1996
DE 10139809	A	06-03-2003	DE 10139809 A1	06-03-2003
			WO 03016227 A1	27-02-2003
DE 10139808	A	06-03-2003	DE 10139808 A1	06-03-2003
			WO 03016228 A1	27-02-2003
JP 08337425	A	24-12-1996	NONE	
EP 1122218	A	08-08-2001	AU 1670801 A	02-08-2001
			BR 0100235 A	28-08-2001
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			CZ 20010362 A3	17-10-2001
			EE 200100058 A	15-10-2001
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			JP 2001294432 A	23-10-2001
			PL 345527 A1	13-08-2001
			ZA 200100834 A	08-08-2001

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 17964 PCT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 03/27548	International filing date (day/month/year) 03/09/2003	(Earliest) Priority Date (day/month/year) 03/09/2002
Applicant OWENS-BROCKWAY GLASS CONTAINER INC.		

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

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

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

1. Basis of the report

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

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

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

☐ contained in the international application in written form.

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

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

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

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

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

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

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

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

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

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

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

☐ as suggested by the applicant.

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

4
☐ None of the figures.

INTERNATI NAL SEARCH REPORT

International Application No

PCT/US 03/27548

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C03B9/41 G05B19/042

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 C03B G05B

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X,P	DE 101 39 808 A (SIEMENS AG) 6 March 2003 (2003-03-06) the whole document	1-15
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- *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.
- *G* document member of the same patent family

Date of the actual completion of the international search

4 December 2003

Date of mailing of the international search report

17/12/2003

Name and mailing address of the ISA

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Marrec, P

3782

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 04, 30 April 1997 (1997-04-30) & JP 08 337425 A (KIRIN TECHNO SYST:KK), 24 December 1996 (1996-12-24) abstract -----	1-15
X	EP 1 122 218 A (OWENS BROCKWAY GLASS CONTAINER) 8 August 2001 (2001-08-08) the whole document -----	1-15

1

INTERNATI NAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/27548

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 1184754	A	06-03-2002	IT	T020000793 A1	08-02-2002
			EP	1184754 A2	06-03-2002
			US	2002052669 A1	02-05-2002
US 5609663	A	11-03-1997	DE	19532794 A1	15-05-1996
			FR	2724743 A1	22-03-1996
			GB	2300494 A , B	06-11-1996
			IT	MI951865 A1	06-03-1996
			JP	8123519 A	17-05-1996
DE 10139809	A	06-03-2003	DE	10139809 A1	06-03-2003
			WO	03016227 A1	27-02-2003
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			WO	03016228 A1	27-02-2003
JP 08337425	A	24-12-1996	NONE		
EP 1122218	A	08-08-2001	AU	1670801 A	02-08-2001
			BR	0100235 A	28-08-2001
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			CN	1310143 A	29-08-2001
			CZ	20010362 A3	17-10-2001
			EE	200100058 A	15-10-2001
			EP	1122218 A2	08-08-2001
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			JP	2001294432 A	23-10-2001
			PL	345527 A1	13-08-2001
			ZA	200100834 A	08-08-2001

EUROPEAN PATENT OFFICE

34

Patent Abstracts of Japan

PUBLICATION NUMBER : 08337425
PUBLICATION DATE : 24-12-96

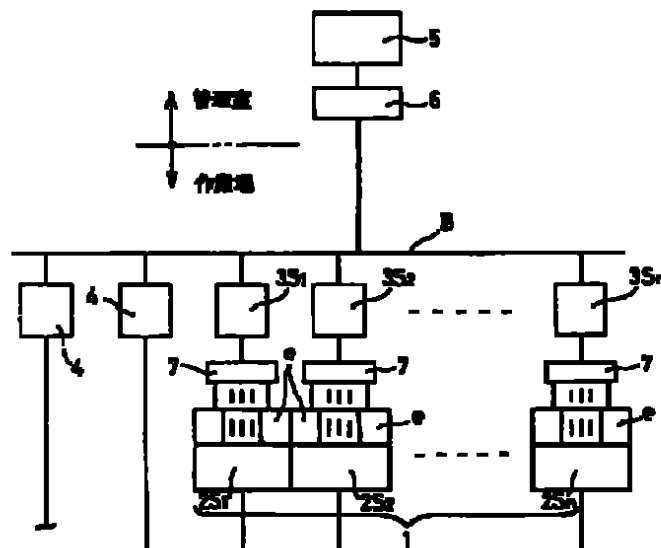
APPLICATION DATE : 09-06-95
APPLICATION NUMBER : 07168036

APPLICANT : KIRIN TECHNO SYST:KK;

INVENTOR : KUNISAWA KOJI;

INT.CL. : C03B 9/41

TITLE : BOTTLE MAKING MACHINE CONTROL SYSTEM



ABSTRACT : PURPOSE: To provide a control system having a communication means capable of easily providing a control system for a bottle making machine with an auxiliary computer dealing with freshly required functions at every necessary time.

CONSTITUTION: This control system consists of section computers $3S_1, 3S_2 \dots 3S_n$ which output operation signals to the constituting elements of the discrete sections computers $2S_1, 2S_2 \dots 2S_n$ of the bottle making machine 1, the auxiliary computer 4 which monitors the operating conditions of the discrete sections, a personal computer 5 which is a computer for management to manage the bottle making stages, inputs a control information and outputs a management information and a junction computer 6 which is attached to the personal computer 5, maintains the control information and relays the communication among the section computers and the auxiliary computer 4 and the personal computer 5. The communication of the section computers $3S_1, 3S_2 \dots 3S_n$, the auxiliary computer 4 and the junction computer 6 with each other is made possible by LAN of a bus type.

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Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) EP 1 184 754 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.03.2002 Bulletin 2002/10

(51) Int Cl.⁷: G05B 19/042

(21) Application number: 01118601.2

(22) Date of filing: 02.08.2001

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

• Silvestro, Roberto
12100 Cuneo (IT)
• Abelli, Fulvia
12024 Castiglione Saluzzo (IT)
• Seela, Carlo
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(30) Priority: 08.08.2000 IT TO000793

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(74) Representative: Boggio, Luigi et al
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10121 Torino (IT)

(72) Inventors:
• Nittardi, Bruno
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(54) Control system for a machine for producing hollow glass articles

(57) The control system is defined by at least one subsystem for controlling electric motors, and by a subsystem for controlling pneumatic article molding movements, each subsystems including a central unit (50, 51), a plurality of peripheral units (60, 61), and a second-level serial bus (56, 57) interposed between the respective central unit (50, 51) and respective peripheral units (60, 61). A first-level serial bus (54) is connected between the two central units (50, 51); the peripheral units (60, 61) are intelligent types; and the first-level bus (54) and second-level buses (56, 57) are "fieldbuses" in CANbus technology and employ a CANopen protocol.

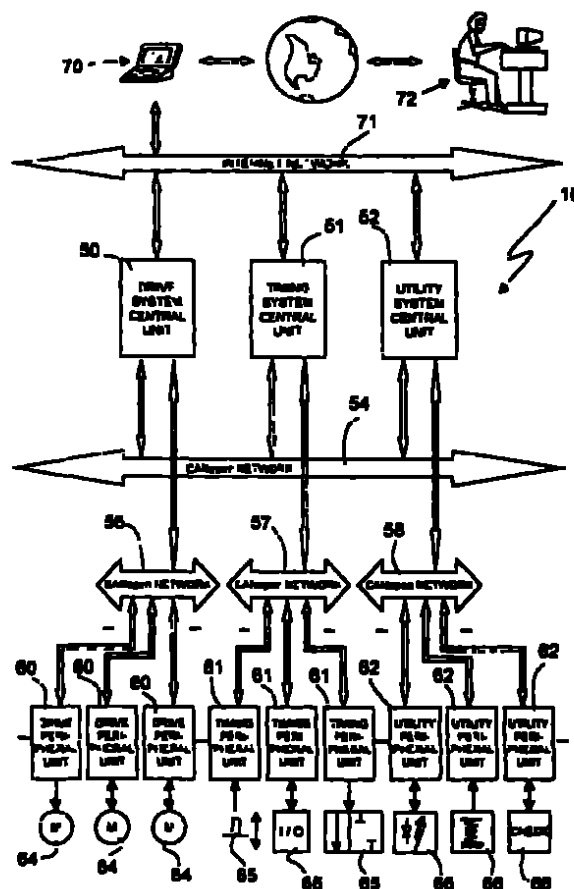


Fig.3

Description

[0001] The present invention relates to a control system for a so-called I.S. machine for producing hollow glass articles.

[0002] As is known, currently used machines for producing hollow glass articles normally have centralized architecture, in which all the input/output peripheral units are wired one by one on the rack connected to the centralized control system. That is, the peripheral units are connected directly to the centralized control system; and the centralized control system comprises dedicated central control units (CPUs) operating with other analog and digital input/output boards by means of a serial bus.

[0003] Though satisfactory at one time in terms of performance, the above architecture is no longer capable of handling all the functions now required or requested by users. In many applications, in fact, CPU times are critical, on account of the high time percentage required to perform elementary functions, such as reading and writing over the serial bus.

[0004] Moreover, using the above architecture, adding or changing functions is difficult if not impossible, so that developing new functions (such as weighing the articles produced) calls for additional CPUs, thus creating interface problems and making the architecture much more complex (and therefore less reliable). As a result, design, installation, wiring and maintenance of both the machine and relative documentation involve a good deal of time and cost.

[0005] It is an object of the present invention to provide a control system designed to eliminate the aforementioned drawbacks.

[0006] According to the present invention, there is provided a control system for a machine for producing hollow glass articles, characterized by, in combination:

- a central control unit;
- a plurality of intelligent peripheral units; and
- a serial bus interposed between said central control unit and said intelligent peripheral units.

[0007] A non-limiting embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a block diagram of a system for producing hollow glass articles;

Figure 2 shows an overall block diagram of the control system according to the invention;

Figure 3 shows a more detailed block diagram of the control system according to the invention.

[0008] Number 1 in Figure 1 indicates a system for producing hollow glass articles, and which comprises a machine 2 and a control system 10.

[0009] Machine 2 is configured in known manner to produce a plurality of articles simultaneously. More specifically,

machine 2 roughly comprises:

- a plurality of parallel central article-molding sections 3;
- a top section 4 - in the example shown, a single section - for forming and supplying glass gobs; and
- a single bottom section 5 for unloading and checking the articles.

[0010] Top section 4 comprises a molten glass feeder 15 connected to two punches 15a moving back and forth linearly to push the molten glass and form two beads; a scissor assembly 16 for cutting the glass beads into individual gobs; a plate 17 (so-called gob baffle) movable between a noninterference rest position and an intercepting work position in which it diverts the glass gobs away from the underlying members to an unloading channel 18, e.g. for cleaning; and a distributor 19 rotating in a given sequence to guide each glass gob to a given central section underneath.

[0011] Each central section 3 (not shown in detail in Figure 1) comprises a rough mold movable between an open and a closed position, receiving one glass gob at a time, and producing a semifinished glass article from each gob; an inverter unit, which grips the semifinished article and turns it over into a finish mold, also movable between an open and a closed position, and in which the hollow glass article is completed; a take-out device, which removes the finished articles from the finish mold and transfers them onto a fixed platform; and a pusher 26 for transferring the finished articles to bottom section 5.

[0012] Bottom section 5 is defined by a conveyor belt 5, which extends from the frame of machine 2 to a collecting section 32, and along which are installed various article checking units, such as load cells for weighing the articles, and a laser unit 33 for checking the position and size of the articles. In particular, an ejector 31 is provided along the path of conveyor belt 30 to remove any rejected articles off the belt.

[0013] Machine 2 is equipped with a panel 35 (shown only schematically) having a plurality of push-buttons 36 and indicator lights 37 relating to particular operating stages of machine 2. Push-buttons 36 can be operated by a technician, e.g. to stop the machine in an emergency, and each correspond to a respective indicator light 37.

[0014] The above members (feeder 15, scissor assembly 16, plate 17, distributor 19, rough and finish molds, inverter unit, take-out device, pusher 26, conveyor belt 30 and ejector 31) are controlled each, in known manner not shown in detail, by a respective electric motor or pneumatic actuator, in turn controlled by control system 10, which also handles the information received from sensors on machine 2 or the operator commands entered using push-buttons 36, and turns on indicator lights 37.

[0015] The overall structure of control system 10 is

shown in Figure 2 and in detail in Figure 3.

[0016] As shown in Figure 2, control system 10 has a "fieldbus" architecture, including at least one central control unit 40 (e.g. an industrial PC with or without an operator interface) for process control; a plurality of intelligent peripheral units 41a, 41b, 41c; a serial bus ("fieldbus") 42 interposed between central control unit 40 and intelligent peripheral units 41a-41c; and a plurality of members 43a, 43b, 43c controlled by intelligent peripheral units 41a-41c or receiving information from them for local processing. For example, Figure 2 shows an actuator 43a (e.g. a solenoid valve for controlling one section) which receives control signals from respective intelligent peripheral unit 41a; a servomotor 43b (e.g. for controlling distributor 19) which exchanges control/feedback signals with respective intelligent peripheral unit 41b; and a sensor 43c (e.g. a load cell) which transmits signals, relative to detected quantities, to respective intelligent peripheral unit 41c (e.g. the weight of the article on the load cell at that time).

[0017] Figure 3 shows a preferred embodiment of the Figure 2 architecture, which presupposes dividing machine 2 into three separate machine systems: a drive system controlling the electric motors of machine 2; a timing system controlling pneumatic article molding movements; and a utility system for accessory checks.

[0018] Control system 10 in Figure 3 therefore comprises three separate central units 50, 51, 52 for the drive system, timing system and utility system respectively; and a two-level fieldbus structure comprising a first-level bus 54 connecting the various central units, and three second-level buses 56-58, each connecting a respective central unit 50-52 to respective peripheral units 60-62. In this case, too, peripheral units 60-62 are intelligent types to decentralize local decision-making processes wherever possible and reduce the computing load of central units 50-52.

[0019] Both first-level bus 54 and second-level buses 56-58 are preferably CANbus-technology, CANopen-protocol "fieldbuses", which provide a four-wire connection and implement a communication protocol between central units 50-52 (first-level bus 54) and between each central unit 50-52 and respective peripheral units 60-62 (second-level buses 56-58).

[0020] Peripheral units 60, connected to the drive central unit 50 over second-level bus 56, each control operation of a respective motor or servomotor 64 of machine 2 by supplying control signals and, if provided for, receiving relative operating signals. More specifically, peripheral units 60 control, among other things, the following motors and relative inputs/outputs (start, stop, emergency, fault, etc.): feeder and rotary-tube motor; distributor and scissor assembly motor; conveyor motor; electronic-distributor servomotor; electronic-punch servomotor; electronic-scissor servomotor; pusher motor; inverter unit servomotor; take-out servomotor.

[0021] Peripheral units 61, connected to timing central unit 51 over second-level bus 57, are each connect-

ed to a respective member 65 for controlling pneumatic article molding movements and transmitting user commands. For example, peripheral units 61 are connected to the following members: solenoid valves controlling the pneumatic motors; section control push-buttons; machine control push-buttons; generic customer inputs and outputs.

[0022] Peripheral units 62, connected to utility central unit 52 over second-level bus 58, are each connected to a respective utility member 66 and exchange with them control and detection signals. For example, peripheral units 62 are connected to the following members: lasers for checking the position and size of the articles and respective inputs/outputs; load cells for weighing the articles; and a device for controlling the height and position of the rotary tube as a function of the weight of the articles.

[0023] In Figure 3, central units 50-52 are connected, over a centralized network 71 (e.g. an Ethernet network - registered trademark), to a main monitor 70, which is also connected, over a national/international communications system shown symbolically, to a remote technical assistance station 72, e.g. for real-time controlling operation of the machine and remote fault-finding.

[0024] The information to be made available to central units 50-52 and peripheral units 60-62 is thus routed along first-level bus 54; while the local information only used within each machine system (drive, timing, utility) is routed along the respective second-level bus 56, 57, 58 and is only shared within the machine system concerned. Diagnostic information ensuring correct operation of machine 2 is shared by the whole of control system 10. For example, in the event of a fault on an actuator or member 64, 65 essential to the operation of machine 2, the fault information can be transferred immediately from the respective peripheral unit to all the peripheral units 60-62, even those forming part of different machine systems, to command immediate performance of any necessary safety operations or even to shut down machine 2 entirely.

[0025] The advantages of the control system described are as follows:

- fewer production system cables and easier wiring;
- faster design, testing, delivery and start-up;
- lower cost;
- easy control system expansion by simply extending the network, with no need to revise the entire control system to accommodate additional peripheral units;
- interchangeable peripheral units, by CANopen protocol buses permitting connection to elements of any make;
- network connection of the various machine systems, by all the information common to the various machine systems being available over one dedicated channel (first-level bus 54) with no additional wiring;
- redundant control facility: two central control units

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can be provided for each machine system, and control switched from one to the other in the event of fault, without stopping the machine;

- decentralization of the control system, by the control panel containing the central unit, and the peripheral units being located in field close to the relative actuators;
- remote help Internet connection over an Ethernet network.

[0026] Clearly, changes may be made to the control system as described herein without, however, departing from the scope of the present invention. In particular, it may also be used for machines other than the one described, e.g. with a double top feed section, with 1 to 4 punches 15 (each producing a respective bead), and with a different number of molds (according to the number of glass gobes).

Claims

1. A control system (10) for a machine (2) for producing hollow glass articles, characterized by, in combination:
 - a central control unit (40) ;
 - a plurality of intelligent peripheral units (41a, 41b, 41c); and
 - a serial bus (42) interposed between said central control unit (40) and said intelligent peripheral units (41a, 41b, 41c).
2. A control system as claimed in Claim 1, characterized in that said bus (42) is a "fieldbus".
3. A control system as claimed in Claim 2, characterized in that said bus (42) is in CANbus technology and employs a CANopen protocol.
4. A control system as claimed in any one of the foregoing Claims, characterized by at least one subsystem for controlling electric motors; and in that said subsystem for controlling electric motors comprises a drive central unit (50), a plurality of drive peripheral units (60), and a second-level drive bus (58) interposed between said drive central unit and said drive peripheral units.
5. A control system as claimed in any one of the foregoing Claims, characterized by a subsystem for controlling pneumatic article molding movements.
6. A control system as claimed in any one of the foregoing Claims, characterized by at least one subsystem for controlling electric motors, and a subsystem for controlling pneumatic article molding movements; and in that said subsystem for controlling electric motors comprises a drive central unit (50), a plurality of drive peripheral units (60), and a second-level drive bus (58) interposed between said drive central unit and said drive peripheral units.
7. A control system as claimed in Claim 6, characterized in that said drive peripheral units (60) are intelligent types and are each connected to a respective motor (64) in the group comprising: feeder and rotary-tube motor; distributor and scissor motor; conveyor motor; electronic-distributor servomotor; electronic-punch servomotor; electronic-scissor servomotor; pusher motor; inverter servomotor; and take-out servomotor.
8. A control system as claimed in Claim 6 or 7, characterized in that said subsystem for controlling pneumatic article molding movements comprises a timing central unit (51), a plurality of timing peripheral units (61), and a second-level timing bus (57) interposed between said timing central unit (51) and said timing peripheral units (61).
9. A control system as claimed in Claim 8, characterized by a first-level bus (54) connected to said drive central unit (50) and to said timing central unit (51).
10. A control system as claimed in Claim 8 or 9, characterized in that said timing peripheral units (61) are intelligent types and are each connected to a respective actuator (65) in the group comprising: solenoid valves; section control push-buttons; machine control push-buttons; generic inputs and outputs.
11. A control system as claimed in any one of Claims 6 to 10, characterized by a utility control subsystem comprising a utility central unit (52), a plurality of utility peripheral units (62), and a second-level utility bus (58) interposed between said utility central unit (52) and said utility peripheral units (62).
12. A control system as claimed in Claim 11 when dependent on Claim 9, characterized in that said first-level bus (54) is connected to said utility central unit (52).
13. A control system as claimed in Claim 11 or 12, characterized in that said utility peripheral units (62) are intelligent types and are each connected to a respective checking element (66) in the group comprising: lasers for checking the position and size of the articles and respective inputs/outputs; load cells; and a device for controlling the height and position of rotary members.

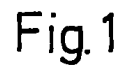


Fig. 1

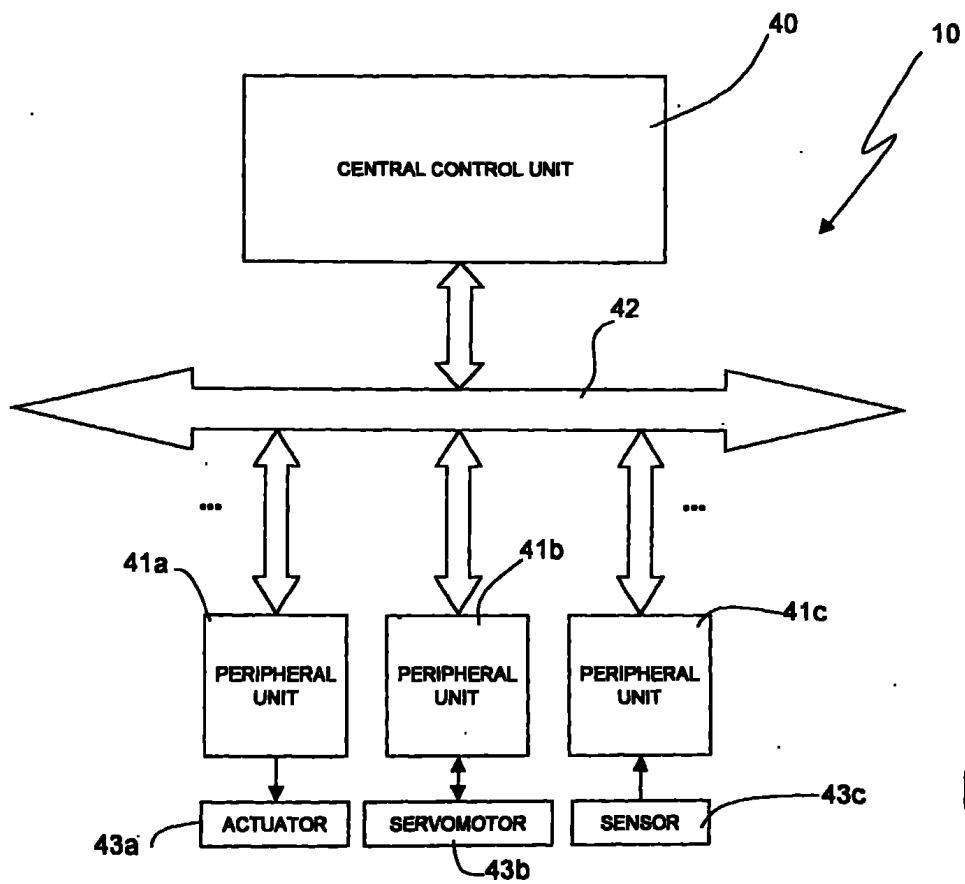


Fig.2

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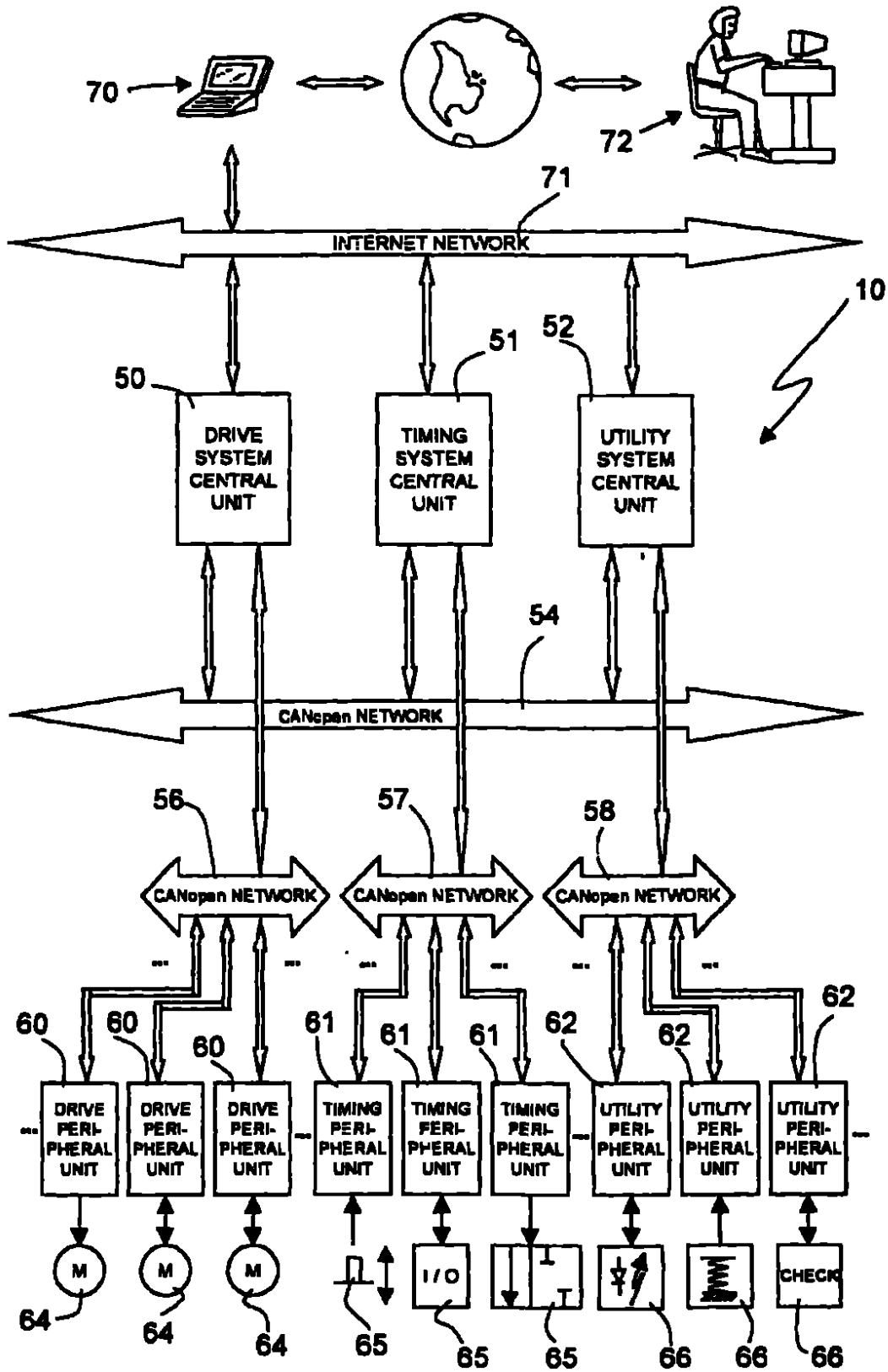


Fig.3



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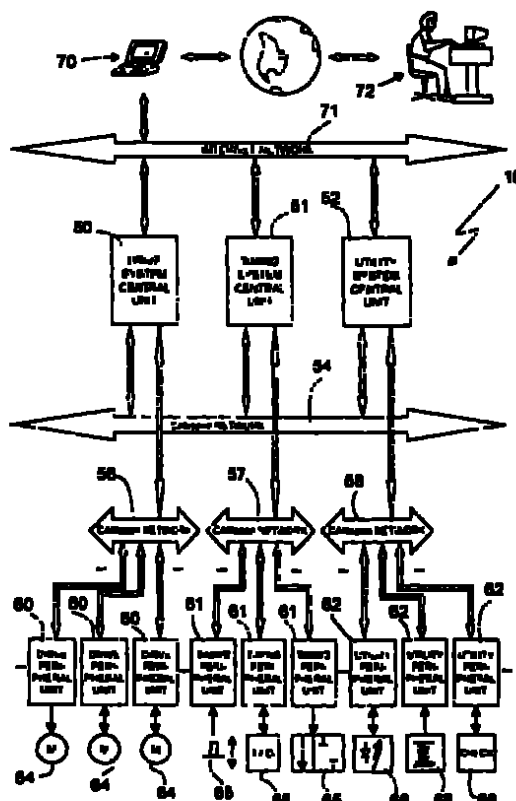


Fig.3



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Application Number
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Place of search THE HAGUE		Date of completion of the search 17 September 2002	Examiner Hauser, L
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United States Patent [19]

[11] Patent Number: 5,609,663

Nguyen et al.

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[54] GLASS OR PLASTIC CONTAINER
MANUFACTURING SYSTEM

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[57] ABSTRACT

[21] Appl. No.: 300,883

A system for manufacturing glass and plastic containers is disclosed which has at least two computers connected by a network or more than one network. Each computer has a local virtual network process which establishes a connection with the other node, notifies that other node when its database(s) are open or closed and establishes a connection of its own database(s) so that a node can transparently communicate with any other node on its network or on any connected network.

[22] Filed: Sep. 6, 1994

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[52] U.S. Cl. 65/160; 364/473.02; 65/DIG. 13;
425/162; 425/125

[58] Field of Search 65/DIG. 13; 364/473,
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425/162, 135; 264/40.1; 379/219

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3 Claims, 2 Drawing Sheets

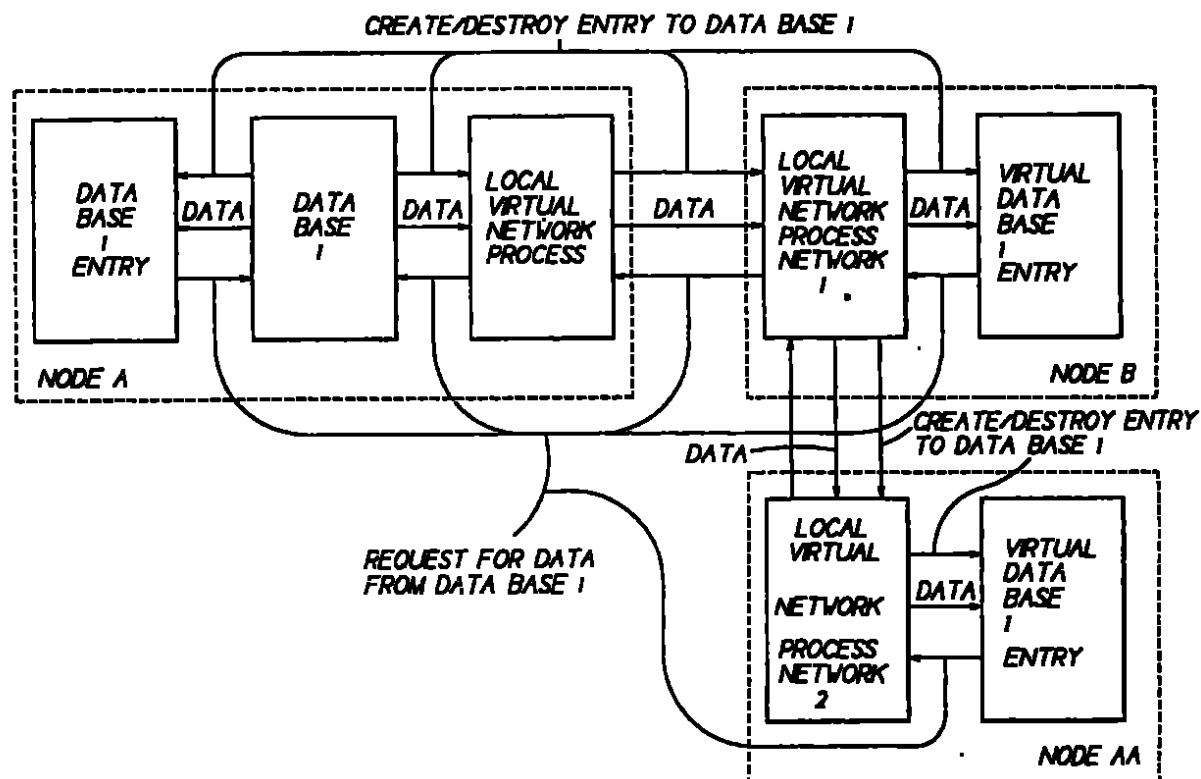


FIG. 1

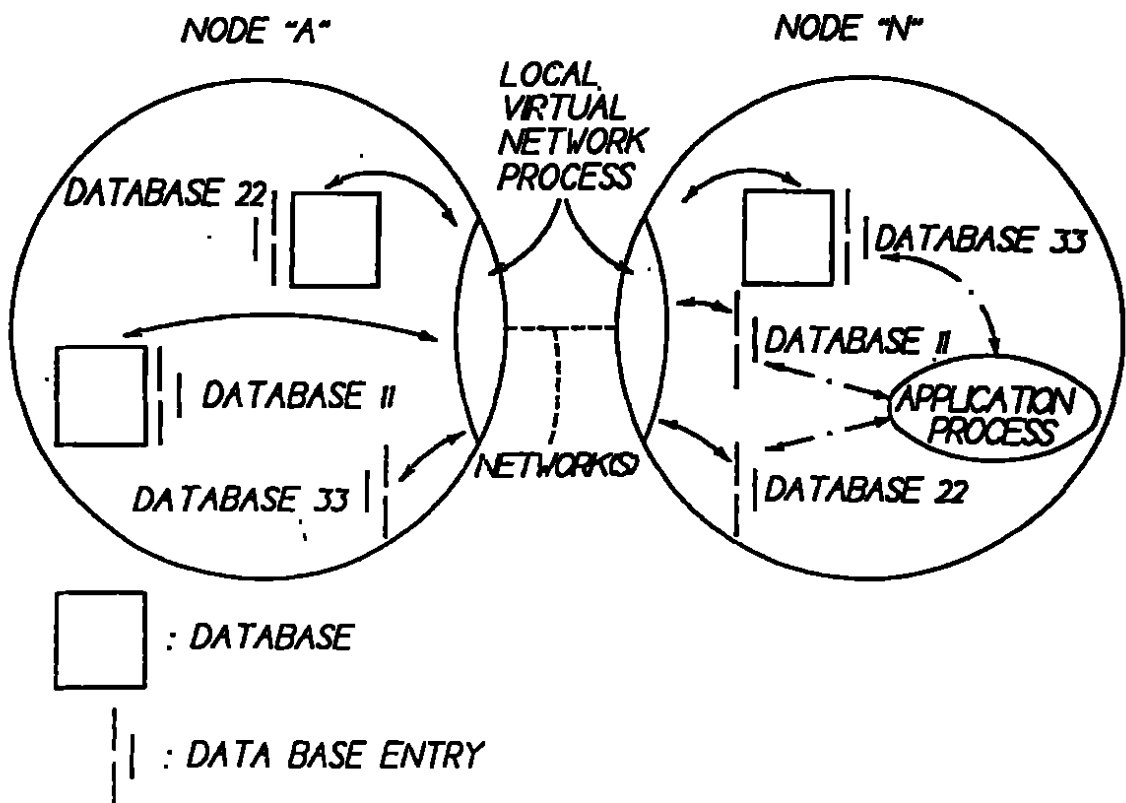
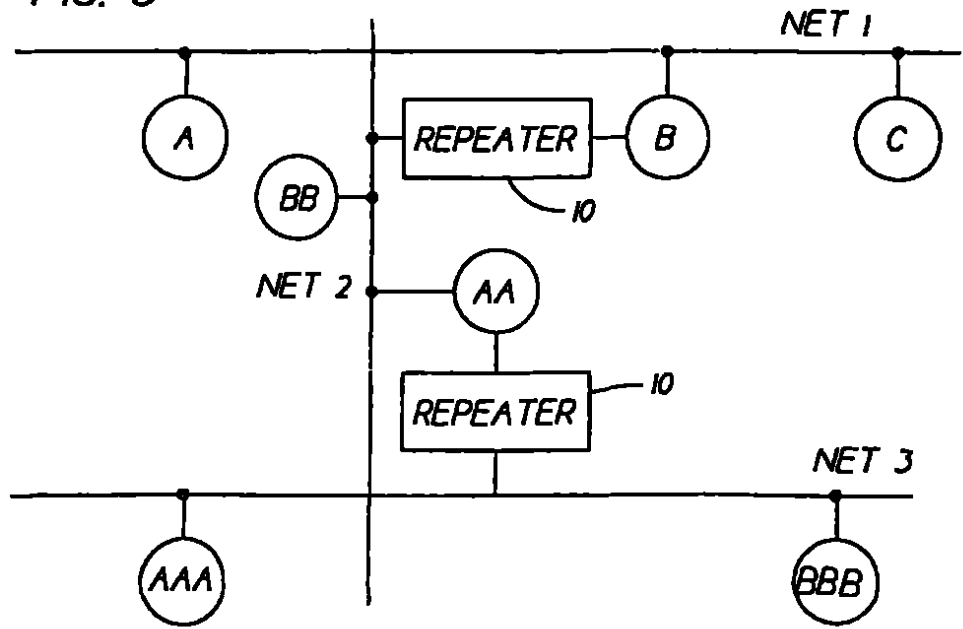
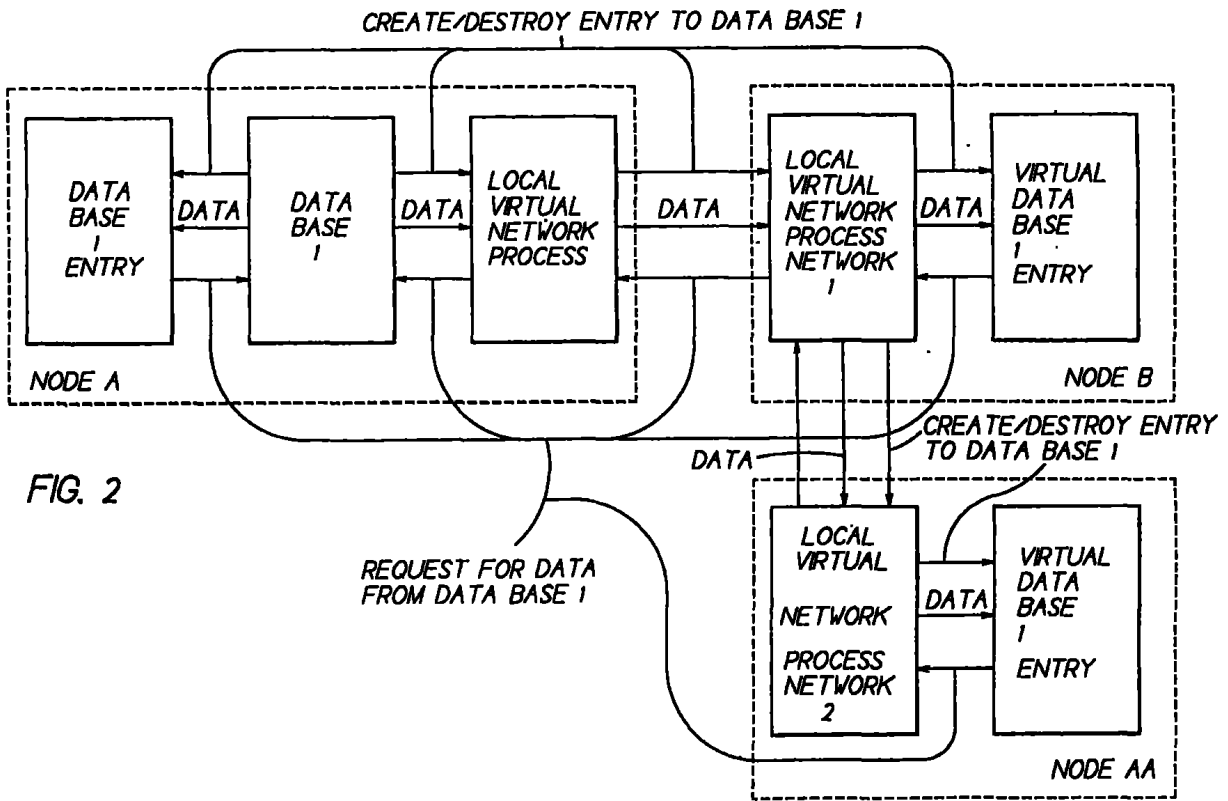


FIG. 3





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GLASS OR PLASTIC CONTAINER MANUFACTURING SYSTEM

The present invention relates to systems which manufacture glass or plastic containers. Such systems may include machines which form the containers, feeders which deliver the required input to these machines and inspection machines which verify the quality of the formed containers.

In state of the art glass container manufacture, the ingredients which define glass are melted and then conditioned in a forehearth, such as disclosed in U.S. Pat. No. 4,680,051, to define a uniform molten glass temperature. The forehearth delivers the molten glass to a feeder such as disclosed in U.S. Pat. No. 4,551,163, which discharges a continuous shaped runner or runners of molten glass. A shear mechanism cuts the runner(s) into discrete gobs and these gobs are delivered by a gob distributor, such as disclosed in U.S. Pat. No. 4,599,101, to tracks which deliver the gob(s) to individual sections of an I.S. machine, such as disclosed in U.S. Pat. No. 4,685,947. Containers formed by a section of this machine are pushed onto a conveyor by a pusher mechanism such as shown in U.S. Pat. No. 4,705,552. These containers may then be inspected for quality by an inspection machine such as disclosed in U.S. Pat. No. 4,490,800. Each of these mechanisms and machines may be controlled by one or more computers and each of these computers can be referred to as a node. For example, a conventional 12 section I.S. machine may have a computer controlling each section and a machine supervisory computer and the pusher shear, gob distributor forehearth and feeder may each have a single computer.

Each computer may have one or more databases which are accessed via an entry in that computer. A network (LAN-Local Area Network, WAN-Wide Area Network) connects these computers. In such networks, a collection of data is established that can be accessed in whole or in part by the individual computers on the network. The computers within an environment (domain) may be on a number of networks that have different platforms. GATEWAYS make it possible for a computer (node) on one platform to access data from such a collection of data which is on a different platform. Such access is often unidirectional and the gateway translates the data from one platform to another platform. The GATEWAY acts as a central data server for one network's data for nodes on another network. The information concerning the location of the data must be stored in the GATEWAY. Such a gateway is disclosed in copending U.S. Ser. No. 08/196,307, U.S. Pat. No. 5,475,601, filed Feb. 15, 1994, and assigned to the assignee of this application.

It is accordingly an object of the present invention to provide transparent communication from any node (computer) in an environment or domain to any other node either on the same network or on any other network in the domain.

Other objects and advantages of the present invention will become apparent from the following portion of this specification and from the accompanying drawings which illustrate, in accordance with the mandata of the patent statutes a presently preferred embodiment incorporating the principles of the invention.

REFERRING TO THE DRAWINGS

FIG. 1 is a schematic representation of the disclosed invention;

FIG. 2 is a schematic drawing illustrating the operation of the local virtual network processes; and

FIG. 3 is a schematic drawing showing how the invention can be used in a multi network domain.

FIG. 1 shows two nodes (A and N). A node is a computer which has one or more databases. The two nodes are either on the same network or on different networks. As shown, node A has two databases identified as database 11 and database 22 and can represent any two devices within the system environment (domain) such as an I.S. machine and a shear mechanism for that machine. Node N which can be any other node on the same network or on any other network in the domain has a single database—database 33 which could represent other devices within the system such as a forehearth or an inspection machine. To access a database, a process must go through a database entry. A local database entry for each database is conventionally created on the node in which the database resides and is created and destroyed with that database. Coincidentally, a virtual database entry is created for each local database on the other nodes in the domain by the LVNP (as described in the following paragraph). Its functionality to all application processes is identical to its sibling, the local database entry.

To establish direct transparent communication from any node (computer) to any database in any other node, a Local Virtual Network Process (LVNP) is located in each node. The LVNP has four main functions:

1. to establish a connection with all the other LVNP'S residing on nodes in its domain;
2. to notify other LVNP'S in the domain to create and destroy virtual database entry(s) when a database in the node in which it resides opens or closes;
3. upon notification from other LVNP(s) on in the domain, create or destroy virtual database entries in its node; and
4. to maintain communication between the database(s) which reside in the same node and all of its virtual database entries that appear on all the nodes in the domain.

The LVNP along with other LVNP's in the domain automatically and dynamically create connections among the LVNP'S in the domain. This process is independent of the processes that access the databases. In order to automatically establish connections among themselves, the LVNP'S must use an addressing scheme. The address could be, but is not limited, to the combination of all the addresses from all intermediate nodes. The local virtual network process broadcasts a connection packet to all nodes belonging to its domain. The LVNP in the receiving node(s) creates a data entry point in its node completing the connection process. The connection process involves creating an address that is used by the database entry to route data to its associated database. If the receiving LVNP detects more than one physical network connection in its node, it will propagate the packet with its node address appended to the packet. To enable a transparent connection from one node in one network to a node in any other network, a data repeater function is required within the node. At least one of the nodes on the first network has to be physically connected to the second network and must also perform the repeating function. With this approach, the new on-line database can be transparently accessed from all nodes that belong to its domain and this may be comprised of multiple physical networks.

Example of establishing a connection across networks as a result of a new database process "11" started on node A (FIG. 2):

- At B, a virtual database entry "11" has the connecting address such as: 1B1A
- At C, a virtual database entry "11" has the connecting address such as: 1C1A

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- At BB, a virtual database entry "11" has the connecting address such as: \BB\B\A
- At AA, a virtual database entry "11" has the connecting address such as: \AA\B\A
- At AAA, a virtual database entry "11" has the connecting address such as: \AAA\AA\B\A
- At BBB, a virtual database entry "11" has the connecting address such as: \BBB\AA\B\A

In the preferred embodiment, there are three different networks in the environment or domain; NET1, NET2, NET3. Nodes A, B and C are on one network NET1, AA, and BB are on the second network NET2, and Nodes AAA and BBB are on the third network NET3. Additionally, while Node B is on the first network NET1, it could also be on the second network NET2 and while Node AA is on the second network NET2, it could also be on the third network NET3.

As shown in FIG. 2, one Repeater 10 bridges or connects Node B, which is on the first network NET1 to the second network NET2 and a second Repeater 10 bridges or connects Node AA which is on the second network NET2 to the third network NET3. The repeaters are bidirectional. While the repeaters are shown outside of their associated node (AA, B), they could be a part of the associated node.

Each node within the domain can accordingly have multiple database processes since when a database process is running, it connects to the local virtual network process. The virtual network process on each node creates a virtual database entry to make available the new database.

We claim:

1. A system for manufacturing glass or plastic containers such as an I.S. machine and an associated shear mechanism comprising:

a plurality of nodes,

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network means for connecting said plurality of nodes, each of said nodes including a local virtual network process for

- a) notifying all of the other local virtual network processes when a database is opened or closed in its node,
- b) creating or destroying a local virtual database entry when notified that a database has been opened or closed in another of said nodes,
- c) establishing a connection with any other of said nodes, and
- d) maintaining communication between any database on its node and each of said local virtual database entries.

2. A system for manufacturing glass or plastic containers according to claim 1, wherein

said network means comprises a first network and a second network,

said plurality of nodes includes at least one node on said first network and at least one node on said second network, and

said one node on said first network includes repeater means.

3. A system for manufacturing glass or plastic containers according to claim 2, wherein

said network means comprises a third network,

said plurality of nodes includes at least one node on said third network, and

said one node on said second network includes repeater means.

* * * * *

⑩ BUNDESREPUBLIK
DEUTSCHLAND



DEUTSCHES
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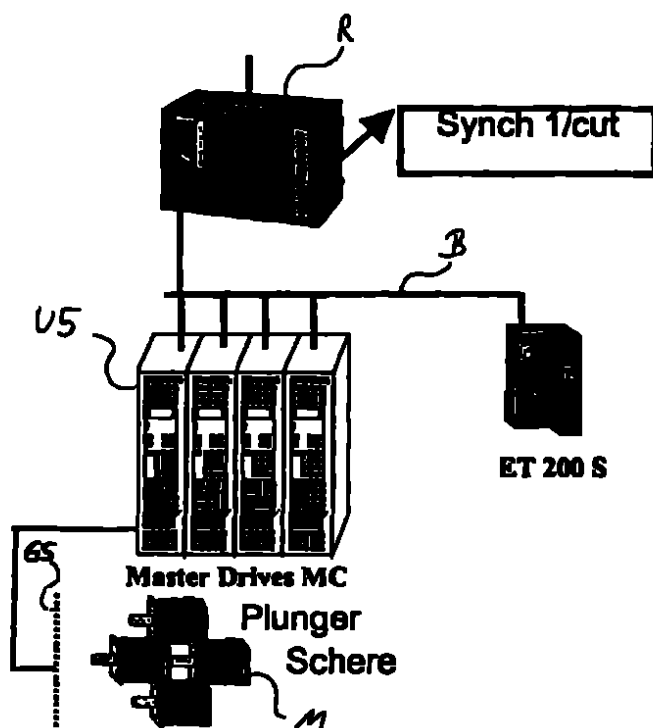
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⑫ Erfinder:
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DE; Schultheiss, Roland, Dipl.-Ing., 91056 Erlangen,
DE

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen
Prüfungsantrag gem. § 44 PatG ist gestellt

⑭ Einrichtung und Verfahren zur Regelung und/oder Steuerung mindestens einer Speiseeinheit einer Glasformungsmaschine

⑮ Die Erfindung betrifft ein Verfahren und eine Einrichtung zur Regelung und/oder Steuerung mindestens einer Speiseeinheit einer Glasformungsmaschine (G). Dabei werden durch eine zentrale Regelung und/oder Steuerung (R) mindestens zwei Servoschwen der Speiseeinheit (SP) in einem Achsverbund über vordefinierte Funktionen angesteuert, wobei ein externes binäres Taktsignal optional ist.



DE 101 39 809 A 1

Beschreibung

[0001] Die Erfindung bezieht sich auf eine Einrichtung und ein Verfahren zur Regelung und/oder Steuerung mindestens einer Speiseeinheit einer Glasformungsmaschine.

[0002] Eine Glasformungsmaschine übernimmt die automatisierte Formung von Glasbehältern während der Glasherstellung. Eine Ausbildung einer Glasformungsmaschine ist die Individual Section Maschine (IS-Maschine). Sie lässt sich beispielsweise in folgende Hauptaggregate unterteilen:

Tropfenspeiser (Feeder)

[0003] Der Tropfenspeiser ist nach dem Glaswannenofen und der Arbeitswanne angeordnet. Das flüssige Glas verlässt die Arbeitswanne über eine beheizte Rinne (Feeder, Speiser). Die Rinne ist dabei in Zonen geteilt und temperaturgeregt. Die letzte Sektion stellt den Tropfenspeiser dar, in dem das Glas durch einen lochförmigen Abfluss abfließt. Der Glasabfluss wird über ein höhenverstellbares Drehröhr gesteuert und mittels eines frequenzmodulierten einwirkenden Stößels (Plunger) so eingeschnitten, dass die Tropfengrößen damit bereits vordefiniert sind.

Schere (Shear)

[0004] Die Schere ist verantwortlich für das Durchtrennen des flüssigen Glasstranges, welcher vom Tropfenspeiser bereits eingeschnitten die Schere erreicht. Auswechselbare Messer mit V- oder C-Schliff schnüren den Glasstrang von allen Seiten gleichzeitig zur Mitte hin ein und durchtrennen diesen vollständig. Dieser Schneidevorgang muss möglichst schnell erfolgen, da das kalte Messer in Verbindung mit dem heißen Glas abhängig von der Berührungszeit eine Schnittmarke im Fertigprodukt hinterlässt. Für Anpassungen der Glasschnittmenge und -qualität können verschiedene Bewegungsprofile in einer Regelung und Steuerung hinterlegt sein. Üblich sind bei Behälterglas (0,7 Liter Flaschen) Tropfengewichte im Bereich von ca. 200 Gramm. Die Glasbehältermasse wird mit einer Wiederholgenauigkeit von $\pm 0,5$ Gramm bei einem Durchsatz von bis zu 250 Tropfen pro Minute erreicht.

Tropfenverteiler

[0005] Durch den Tropfenverteiler werden die Glasropfen in die Vorformen der verschiedenen IS-Maschinensektionen geleitet. Ein Tropfenverteiler kann etwa 12 IS-Sektionen mit bis zu 250 Glasschnitten pro Minute (cuts/min) beschicken. Ein "C" kann hierbei beispielsweise ein einfach-, Zweifach-, Dreifach- oder Vierfachtropfen sein.

Individual Sections

[0006] Die flüssigen Glasropfen werden vom Tropfenverteiler in die Vorformen der IS-Maschine geleitet. Jede Sektion ist für sich unabhängig (individual) und wird einzeln vom Tropfenverteiler bedient. Je nach Ausführung wird eine Sektion mit bis zu vier Tropfen gleichzeitig versorgt. Das Vorformen wird in der Regel durch einen Metallstempel bewerkstelligt, der das Glas in die Vorform drückt und in der Mitte ein Loch ausbildet (Press-Blas-Verfahren). Der vorgeformte Glaskolben wird anschließend durch ein Schwemkorn in die Endform befördert und mittels Druckluft zum endgültigen Behälter geblasen, beispielsweise eine Flasche. Nach dem Öffnen der Endform schiebt ein Greifer die glühende Flasche auf ein Längsband. Die Flaschen werden dabei ggf. noch auf ein Quersband umgelenkt, bevor sie dann

mit einem Einschieber Gruppenweise in eine Temperiereinheit (Kühlofen) geschoben werden.

[0007] Die Ansteuerung der Schere bzw. die Synchronisation mit dem Tropfenspeiser-, verteiler und der IS-Maschine erfolgt über die Steuerung der IS-Maschine. Hierbei ist ein komplexer Programmablauf mit einem komplexen Timing aller Komponenten zu berücksichtigen, was durch eine Vielzahl von Rechneinheiten, beispielsweise Einzelprozessoren, im Stand der Technik gelöst wird. Taktschläger ist in der Regel dabei der Feeder. Den Stand der Technik kennzeichnen aufwendige und daher kostspielige Mehrprozessorspeziallösungen zum Beherrschen eines Nockensteuerwerks dieser Größenordnung. Sie bestehen in der Regel aus einem Hauptprozessor und mehreren autarken Einzelprozessoren mit üblicherweise einem Prozessor pro Sektion, welche über ein maschinenweites binäres Taktsignal, das von der Speiseeinheit (Plunger) generiert wird (ein Takt pro Schnitt), synchronisiert werden. Außer der Taktadatenverbindung sind weitere Busverbindungen vorhanden, die der Parametrierung und Zusatzdatenübertragung dienen.

[0008] Aufgabe der Erfindung ist es, den Betrieb mindestens einer Speiseeinheit von Glasformungsmaschinen zu verbessern.

[0009] Auslösen der Bewegung (Startbefehl) durch ein binäres Taktsignal, welches vom Feeder über einen Nährungschalter oder durch Servoansteuerung generiert wird. Plunger, Schere und Tropfenverteiler haben getrennte Steuerungen. Diese sind gekoppelt über ein binäres Taktsignal, um ein Synchronisieren zu ermöglichen. Ebenso ist über das Bussystem ein Parameterraustausch möglich.

Vorteile

1) Speziallösungen für die Antriebsteuerung der Schere, die aufgrund der schnellen Reaktion auf ein externes binäres Bit nötig waren, können durch eine Standardlösung ersetzt werden.

2) Diese Lösung handhabt zwei oder mehr Servoachsen der Speiseeinheit in einem Achsverbund über Funktionen wie Gleichlauf, Kurvenscheibe oder ähnliche Funktionen und nicht zwingend über ein externes binäres Taktsignal.

3) Die Ansteuerung der Antriebe kann Analog oder aber auch über digitale Bussysteme (z. B. Profibus MC) erfolgen.

Vorteile

Alle Antriebe der Speiseeinheit werden in einer Standard-Steuerung gehandhabt (Beherrschung eines geforderten geringen Jitters, Kostenreduzierung)

Aufgrund der Standardsteuerung ist eine Anbindung an eine Hauptsteuerung (R) über ein Bussystem (B) möglich.

[0010] Die Achsen werden mit einer Steuerung als Achsverbund realisiert.

[0011] Weiterhin wird das binäre Taktsignal über Position des Antriebs generiert und ausgegeben.

[0012] Ausführungsbeispiele der Erfindung sind in den Abbildungen dargestellt. Dabei zeigen:

[0013] Fig. 1 einen symbolhaften Aufbau einer Glasformungsmaschine,

[0014] Fig. 2 einen schematischen Aufbau eines einheitlichen Bussystems mit zentraler Steuerung und/oder Regelung einer Glasformungsmaschine.

[0015] Fig. 3 eine zentrale Steuerung und/oder Regelung zum Betrieb einer Speiseeinheit einer Glasformungsmaschine.

schine mit Analogein- und -ausgängen und

[0016] Fig. 4 eine zentrale Steuerung und/oder Regelung zum Betrieb einer Speiseeinheit einer Glasformungsmaschine mit einem Bussystem.

[0017] Im Beispiel ist eine SIMOTION-C Steuerung (R) 5 der Firma SIMMENS gezeigt, die über analoge Ein- und Ausgänge einen Antrieb der Glasformungsmaschine (G) ansteuert. Je nach Anforderung ist dies auch über ein Bussystem (B) möglich.

Patentansprüche

1. Verfahren zur Regelung und/oder Steuerung mindestens einer Speiseeinheit einer Glasformungsmaschine, dadurch gekennzeichnet, dass durch eine zentrale Regelung und/oder Steuerung (R) mindestens zwei Servoachsen der Speiseeinheit (SP) in einem Achsverbund über vordefinierte Funktionen angesteuert werden, wobei ein externes binäres Taktsignal optional ist. 15
2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass durch eine zentrale Regelung und/oder Steuerung (R) mindestens zwei Servoachsen der Speiseeinheit (SP) in einem Achsverbund über vordefinierte Funktionen angesteuert werden, wobei ein Kennsignal von der zentralen Regelung und/oder Steuerung (R) erzeugt wird. 20
3. Einrichtung zur Regelung und/oder Steuerung mindestens einer Speiseeinheit einer Glasformungsmaschine, dadurch gekennzeichnet, dass eine zentrale Regelung und/oder Steuerung (R) von mindestens zwei Servoachsen der Speiseeinheit (SP) in einem Achsverbund über vordefinierte Funktionen angesteuert, wobei ein externes binäres Taktsignal optional ist. 25
4. Einrichtung nach Anspruch 3, dadurch gekennzeichnet, dass eine zentrale Regelung und/oder Steuerung (R) mindestens zwei Servoachsen der Speiseeinheit (SP) in einem Achsverbund über vordefinierte Funktionen angesteuert, wobei ein Kennsignal von der zentralen Regelung und/oder Steuerung (R) erzeugt wird. 30

Hierzu 3 Seite(n) Zeichnungen

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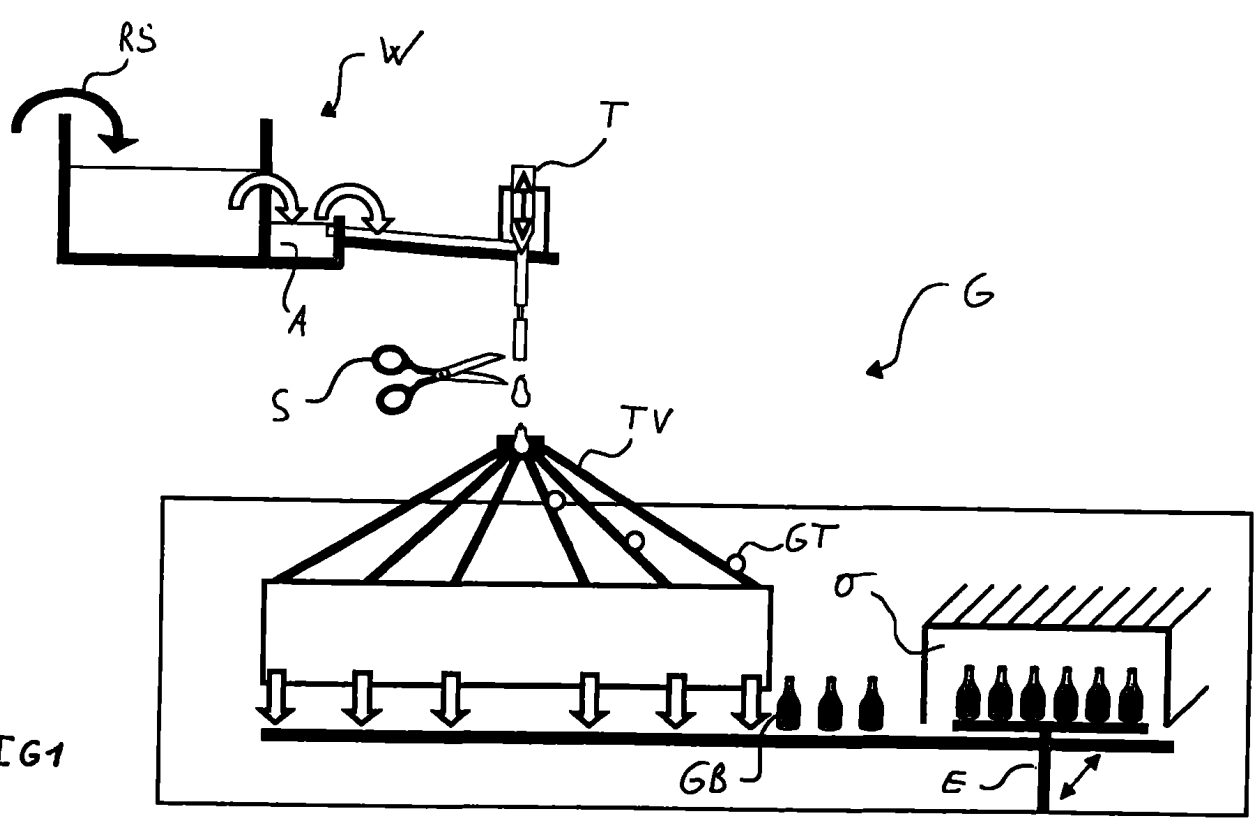


FIG 1

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6. März 2003

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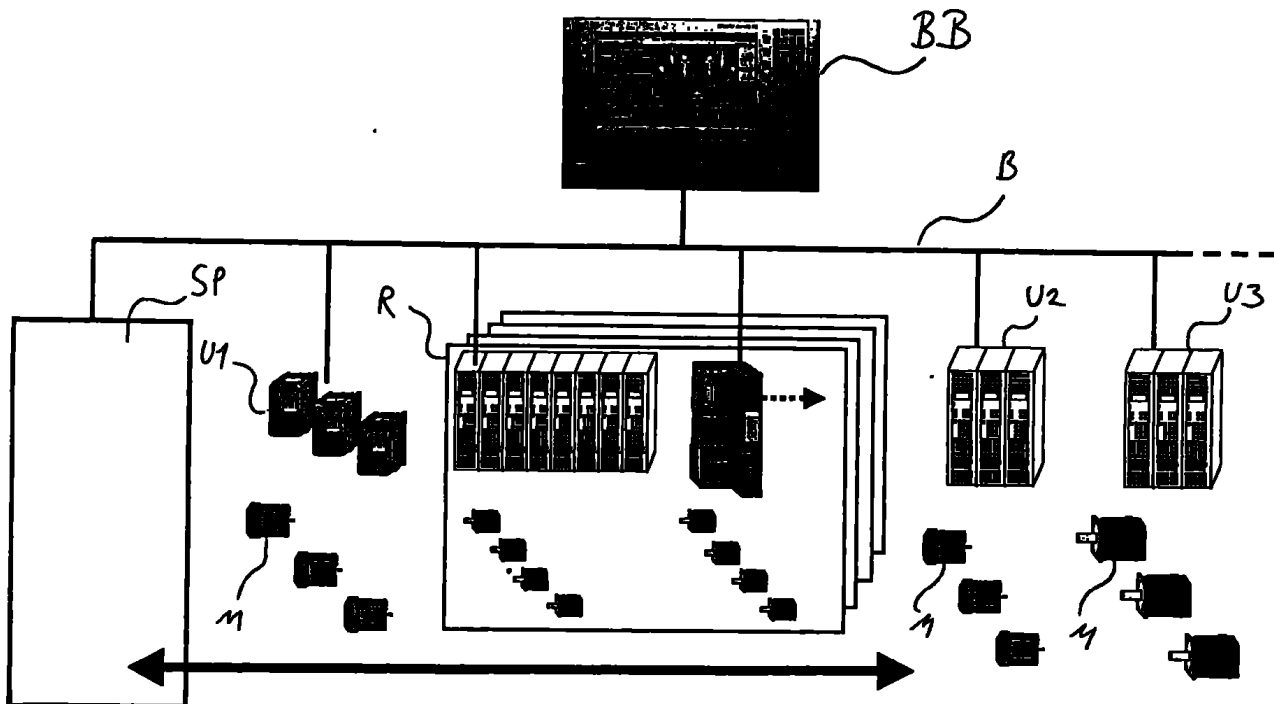
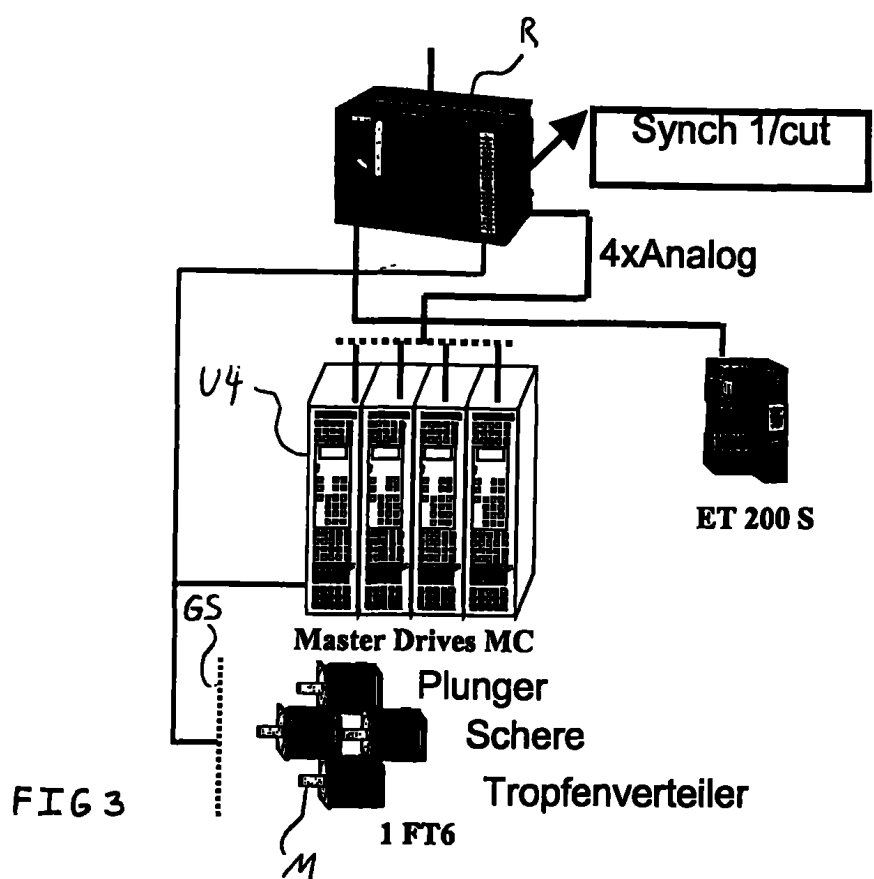


FIG 2





⑩ **BUNDESREPUBLIK
DEUTSCHLAND**



**DEUTSCHES
PATENT- UND
MARKENAMT**

⑫ **Offenlegungsschrift**
⑩ **DE 101 39 808 A 1**

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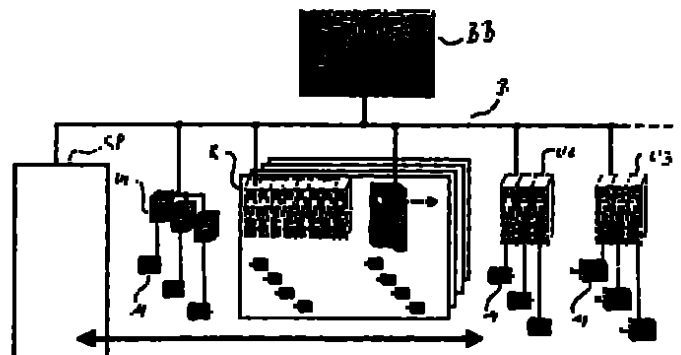
⑦② Erfinder:
Burgstahler, Ralph, Dipl.-Ing. (FH), 76870 Kandel,
DE; Schutheiss, Roland, Dipl.-Ing., 91056 Erlangen,
DE

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

Prüfungsantrag gem. § 44 PatG ist gestellt

⑤④ Einrichtung und Verfahren zur Regelung und/oder Steuerung einer Glasformungsmaschine

⑤⑤ Die Erfindung betrifft ein Verfahren und eine Einrichtung zur Regelung und/oder Steuerung einer Glasformungsmaschine (G). Dabei werden durch eine zentrale Regelung und/oder Steuerung (R) über mindestens ein jeweils einheitliches Bussystem (B) Parametrierdaten und/oder Synchronisationsdaten und/oder Bewegungsinformation und/oder Bewegungsablaufdaten übermittelt.



DE 101 39 808 A 1

Beschreibung

[0001] Die Erfindung bezieht sich auf eine Einrichtung und ein Verfahren zur Regelung und/oder Steuerung einer Glasformungsmaschine.

[0002] Eine Glasformungsmaschine übernimmt die automatisierte Formung von Glasbehältern während der Glasherstellung. Eine Ausbildung einer Glasformungsmaschine ist dabei die Individual Section Maschine (IS-Maschine). Sie lässt sich beispielsweise in folgende Hauptaggregate unterteilen:

Tropfenspeiser (Feeder)

[0003] Der Tropfenspeiser ist nach dem Glaswannenofen und der Arbeitswanne angeordnet. Das flüssige Glas verlässt die Arbeitswanne über eine beheizte Rinne (Feeder, Speiser). Die Rinne ist dabei in Zonen geteilt und temperaturregelt. Die letzte Sektion stellt den Tropfenspeiser dar, in dem das Glas durch einen lochförmigen Abfluss abfließt. Der Glasabfluss wird über ein höhenverstellbares Drehrohr gesteuert und mittels eines frequentiert eintauchenden Stößels (Plunger) so eingeschnitten, dass die Tropfengrößen damit bereits vordefiniert sind.

Schere (Shear)

[0004] Die Schere ist verantwortlich für das Durchtrennen des flüssigen Glasstranges, welcher vom Tropfenspeiser bereits eingeschnitten die Schere erreicht. Auswechselbare Messer mit V- oder C-Schliff schnitten den Glasstrang von allen Seiten gleichzeitig zur Mitte hin ein und durchtrennen diesen vollständig. Dieser Schneidevorgang muss möglichst schnell erfolgen, da das kalte Messer in Verbindung mit dem heißen Glas abhängig von der Berührungszeit eine Schnittmarke im Fertigprodukt hinterlässt. Für Anpassungen der Glasschnittmenge und -qualität können verschiedene Bewegungsprofile in einer Regelung und Steuerung hinterlegt sein. Üblich sind bei Behälterglas (0,7 Liter Flaschen) Tropfengewichte im Bereich von ca. 200 Gramm. Die Glasbehältermasse wird mit einer Wiederholgenauigkeit von $\pm 0,5$ Gramm bei einem Durchsatz von bis zu 250 Tropfen pro Minute erreicht.

Tropfenverteiler

[0005] Durch den Tropfenverteiler werden die Glaspfropfen in die Vorformen der verschiedenen IS-Maschinenaktionen geleitet. Ein Tropfenverteiler kann etwa 12 IS-Sektionen mit bis zu 250 Glasschnitten pro Minute (cuts/min) beschicken. Ein "Cut" kann hierbei beispielsweise ein einfach-, Zweifach-, Dreifach- oder Vierfachtropfen sein.

Individual Sections

[0006] Die flüssigen Glaspfropfen werden vom Tropfenverteiler in die Vorformen der IS-Maschine geleitet. Jede Sektion ist für sich unabhängig (individual) und wird einzeln vom Tropfenverteiler bedient. Je nach Ausführung wird eine Sektion mit bis zu vier Tropfen gleichzeitig versorgt. Das Vorformen wird in der Regel durch einen Metallstempel bewerkstelligt, der das Glas in die Vorform drückt und in der Mitte ein Loch ausbildet (Press-Blas-Verfahren). Der vorgeformte Glas Kolben wird anschließend durch ein Schwenkarm in die Endform befördert und mittels Druckluft zum endgültigen Behälter geblasen, beispielsweise eine Flasche. Nach dem Öffnen der Endform schiebt ein Greifer die glühende Flasche auf ein Längsband. Die Flaschen werden da-

bei ggf. noch auf ein Querband umgelenkt, bevor sie dann mit einem Einschieber Gruppenweise in eine Temperiereinheit (Kühlofen) geschoben werden.

[0007] Die Ansteuerung der Schere bzw. die Synchronisation mit dem Tropfenspeiser-, verteiler und der IS-Maschine erfolgt über die Steuerung der IS-Maschine. Hierbei ist ein komplexer Programmablauf mit einem komplexen Timing aller Komponenten zu berücksichtigend was durch eine Vielzahl von Rechereinheiten, beispielsweise Einzelprozessoren, im Stand der Technik gelöst wird. Taktschläger ist in der Regel dabei der Feeder. Den Stand der Technik kennzeichnen aufwendige und daher kostspielige Mehrprozessorspeziallösungen zum Beherrschen eines Nockensteuerwerks dieser Größenordnung. Sie bestehen in der Regel aus einem Hauptprozessor und mehreren autarken Einzelprozessoren mit üblicherweise einem Prozessor pro Sektion, welche über ein maschinenweites binäres Taktsignal, das von der Speiseeinheit (Plunger) generiert wird (ein Takt pro Schnitt), synchronisiert werden. Außer der Taktdatenverbindung sind weitere Busverbindungen vorhanden, die der Parametrierung und Zusatzdatenübertragung dienen.

[0008] Aufgabe der Erfindung ist es, den Betrieb von Glasformungsmaschinen zu verbessern.

[0009] Die zentrale Regelung und/oder Steuerung einer IS-Glasformungsmaschine erfolgt durch die Erfindung. Dieses umfasst die korrekte Zeitansteuerung aller Aggregate durch Start- und Stopbefehle. Hierzu gehören unter anderem die korrekte Regelung und/oder Steuerung von Feeder, Schere, Tropfenverteiler, Sektionen, Bänder, Einschieber etc. Die Start- und Stopbefehle werden zentral beispielsweise als großes Nockensteuerwerk mit über 1200 Nocken bei einer Sektionsmaschine mit über zehn Sektionen abgebildet. In einem Maschinenumlauf (360°) werden beispielsweise in ca. 2,4 Sekunden über 1200 Nocken ausgelöst.

[0010] Die Erfindung ermöglicht die zentrale Verwaltung und/oder die Steuerung der gesamten Maschinenstart- und stopzeitpunkte (Nocken) mit einem zentralen System. Durch eine komfortable Vorverarbeitung, sowie einer automatischen Priorisierung erfolgt die dezentralen Nockenausgabe auf Ein- und Ausgängen bzw. an den Antrieben mit einem einheitlichen Bussystem, wie beispielsweise einem taktsynchronen Bussystem PROFIBUS DP.

[0011] Das Bussystem übernimmt in der Glasformmaschine unter anderem die Aufgaben:

- a) Übertragung von Parametrierungsinformation
- b) Übertragung von Synchronisierungsinformation und
- c) Übertragung von Bewegungsinformation und/oder Bewegungsablaufdaten.

Vorteile

- zentrale Lösung ist kostengünstiger
- einheitliches Bussystem für alle Datenübertragungsaufgaben geeignet, einschließlich der Synchronisierung, ein externe Synchronisierung kann damit entfallen
- Ermöglichung einer einheitlichen Projektierung, Parametrierung und Bedienung (zentral/dezentral)
- Skalierbarkeit des Systems, bei TANDEM, 2x Zentrale CPUs.

[0012] Als weitere Vorteile ergeben sich:

- zentrales Nockenmanagement für die gesamte Maschine

- zentrales aufbereiten der Nocken über Software (z. B. sektions- und winkelbezogen als Matrix 80 x 360) (Spalten entspricht Ausgängen x Zeilen (0,1° Winkel möglich), Priorisierung etc.)

Einsetzen von maschinenspezifischen Speziallösungen, die zur Zeit im Stand der Technik realisiert werden und

Entfall einer externen Verdrahtung des Synchronisationsignals. Die Synchronisation wird über das einheitliche Bussystem vorgenommen.

Erläuterung

[0013] Im angeführten Beispiel ist die zentrale Regelung und/oder Steuerung durch ein SIMOTION P-System der Firma SIEMENS realisiert. Auf diesem läuft das Nockensteuerwerk ab. Die berechneten Nocken werken über einen Profibus DP auf die Ein- und Ausgänge sowie die Antriebe der Sektionen gegeben. Die dargestellte Konfiguration pro Sektion erfolgt dabei beispielsweise jeweils zehn bis zwölf mal pro Maschine.

[0014] Ein Ausführungsbeispiel der Erfindung ist in der Zeichnung dargestellt. Dabei zeigen:

[0015] Fig. 1 einen symbolhaften Aufbau einer Glasformungsmaschine und

[0016] Fig. 2 einen schematischen Aufbau eines einheitlichen Bussystems mit zentraler Steuerung und/oder Regelung.

[0017] Die Umrichter U1 bis U3 übernehmen die Ansteuerung und Drehzahlregelung der Motoren M. Sie werden von der zentralen Steuerung und/oder Regelung R über das einheitliche Bussystem B angesteuert. Über eine Bedien- und Beobachtungseinheit BB lassen sich Parametrierdaten und/oder Synchronisationsdaten und/oder Bewegungsinformation und/oder Bewegungsablaufdaten übermitteln. Als Bussystem B kann beispielsweise ein Profibus DP verwendet werden. Die Umrichter U1 bis U3 können beispielsweise Micromaster und Master Drives der Firma SIEMENS verwendet werden.

[0018] Die Regelung und/oder Steuerung (R) kann beispielsweise folgende Funktionen der Glasformungsmaschine G übernehmen:

Drehzahlregelung
Hil-Schleichgang
Fahren auf Festanschlag
Positionieren
Drehzahl-, Winkelgleichlauf
Elektrische Getriefunktion
Kurvenscheibe
komplexes, umfangreiches und zentrales Nockenmanagement.

[0019] Die Motoren M können beispielsweise als Norm-Asynchronmotoren und Servomaschinen ausgebildet sein. Sie können folgende Komponenten der Glasformungsmaschine G ansteuern:

Drehrohr
Drehrohr Höhe
Tüfler
Längsbund
Umlenkecke
Querband
Hinschieber X, Hinschieber Y, Hinschieber Z.

Patentansprüche

1. Verfahren zur Regelung und/oder Steuerung einer Glasformungsmaschine, dadurch gekennzeichnet, dass durch eine zentrale Regelung und/oder Steuerung (R) über mindestens ein jeweils einheitliches Bussystem (B) Parametrierdaten und/oder Synchronisationsdaten und/oder Bewegungsinformation und/oder Bewegungsablaufdaten übermittelt werden.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass ein zentrales Nockenmanagement für die Glasformungsmaschine (G) durch die zentrale Regelung und/oder Steuerung (R) vorgenommen wird.

3. Einrichtung zur Regelung und/oder Steuerung einer Glasformungsmaschine, dadurch gekennzeichnet, dass durch eine zentrale Regelung und/oder Steuerung (R) über mindestens ein jeweils einheitliches Bussystem (B) Parametrierdaten und/oder Synchronisationsdaten und/oder Bewegungs- und/oder Bewegungsablaufdaten übermittelbar sind.

4. Einrichtung nach Anspruch 3, dadurch gekennzeichnet, dass ein zentrales Nockenmanagement für die Glasformungsmaschine (G) durch die zentrale Regelung und/oder Steuerung (R) durchführbar ist.

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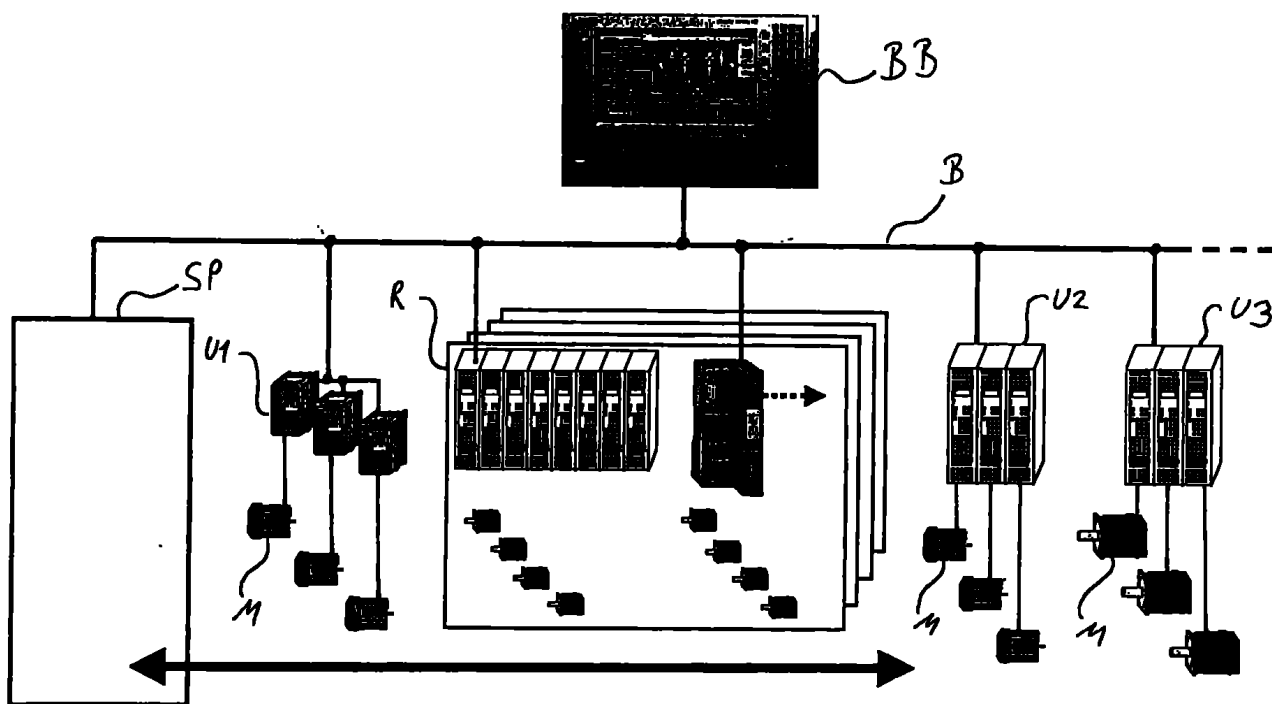


FIG 2

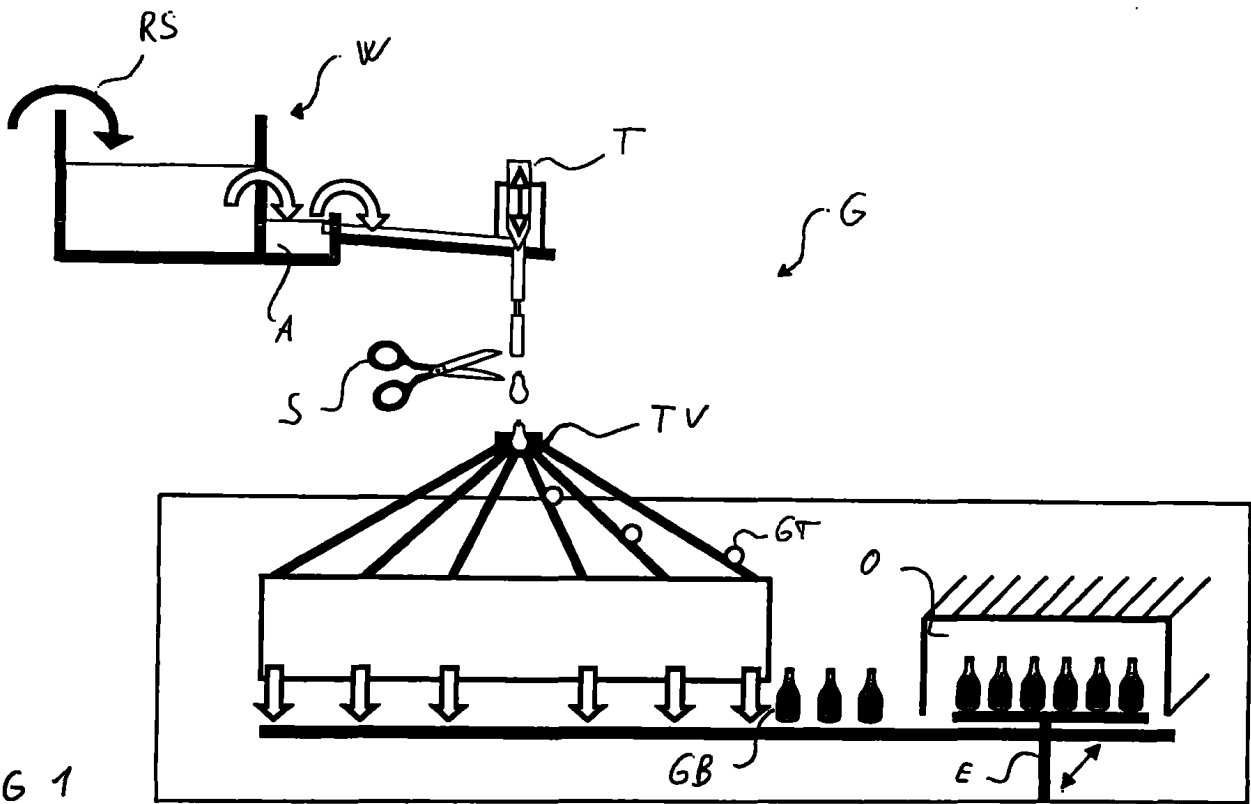


FIG 1

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(54) Glassware forming system with star network communication configuration

(57) A glassware forming system (10) that includes a plurality of electronic devices (18a through 18d) for performing operations on articles of glassware (14). These devices may comprise devices for controlling the glassware forming operation by controlling one or more operating mechanisms of a glassware forming system, or may comprise devices for inspecting articles of glassware for commercial variations that may affect commercial acceptability of the glassware and call for possible adjustment or repair of the glassware forming system. A network interconnects the devices for intercommunication among the devices, and includes a star network

hub (24) and conductors connecting the hub to the plurality of devices in a star network configuration for bidirectional communication among the devices through the hub. The star network hub includes a hub controller (26) for controlling operation of the hub according to a CAN bus communication protocol, circuitry (32, 38) for sensing initiation of communication from one of the devices, and circuitry (36, 38, 40) for blocking transmission of such communication to the device from which the communication is initiated and enabling communication from the device through the star network hub to all other devices connected to the hub.

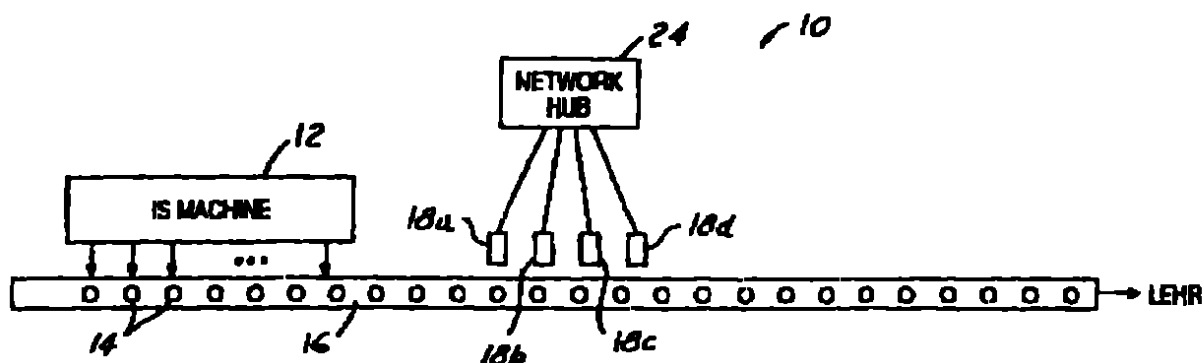


FIG. 1

Description

[0001] The present invention is directed to manufacture of glassware such as hollow glass containers, and more particularly to a communication system for implementing automatic control of one or more aspects of a glassware forming system.

Background and Summary of the Invention

[0002] The science of glass container manufacture is currently served by the so-called individual section machine. Such machines comprise a plurality of separate or individual manufacturing sections, each of which includes a multiplicity of operating mechanisms for converting hot gobbs or charges of molten glass into hollow glass containers. In general, each section includes one or more blank molds in which a glass gob is initially formed in a blowing or pressing operation, an invert arm for transferring each blank or parison to a blow mold in which the container is blown to final form, tongs for removing the containers onto a deadplate, and a sweep-out mechanism for sweeping the containers from the deadplate onto a conveyor. Additional mechanisms in the machine provide for closure of mold halves, movement of baffles and blow nozzles, control of mold cooling wind, etc. Other controllable mechanisms control operation of the conveyor, inspection of containers passing along the conveyor, transfer of the containers to an annealinglehr, etc. U.S. Patents 4,762,544, 5,580,366 and 5,624,473 illustrate systems of this character.

[0003] It is a general object of the present invention to provide a network for interconnecting the operating devices of a glassware manufacturing system for bidirectional communication employing a CANbus communication protocol, in which the length of the interconnection cables need not be identical, which exhibits reduced noise susceptibility, and in which an operating device may be disconnected from the communication network for replacement or repair without interrupting communications among the remaining devices.

[0004] A glassware forming system in accordance with one aspect of the present invention includes a plurality of electronic devices for performing operations on articles of glassware. These devices may comprise devices for controlling the glassware forming operation by controlling one or more operating mechanisms of a glassware forming system, or may comprise devices for inspecting articles of glassware for commercial variations that may affect commercial acceptability of the glassware and call for possible adjustment or repair of the glassware forming system. A network interconnects the devices for intercommunication among the devices, and includes a star network hub and conductors connecting the hub to the plurality of devices in a star network configuration for bidirectional communication among the devices through the hub. The star network hub includes a hub controller for controlling operation of

the hub according to a CANbus communication protocol, circuitry for sensing initiation of communication from one of the devices, and circuitry for blocking transmission of such communication to the device from which the communication is initiated and enabling communication from the device through the star network hub to all other devices connected to the hub. The star network hub preferably also includes circuitry responsive to termination of communication from the one device for delaying enablement of communication from other devices to accommodate differences in length of the interconnection conductors or fiberoptics.

Brief Description Of The Drawings

[0005] The invention, together with additional objects, features and advantages thereof, will be best understood from the following description, the appended claims and the accompanying drawings in which:

FIG. 1 is a schematic diagram of a portion of a glassware manufacturing system embodying a star network communication system in accordance with one presently preferred embodiment of the invention;

FIG. 2 is a functional block diagram of the communication system illustrated in FIG. 1;

FIG. 3 is a functional block diagram of the star network hub illustrated in FIG. 2;

FIGS. 4A-4C are fragmentary schematic diagrams of the field programmable gate array (FPGA) illustrated in FIG. 3;

FIG. 5 is a partial block diagram of a second embodiment of the invention;

FIG. 6 is a state diagram that illustrates operation of each channel in the embodiment of FIG. 5; and
FIG. 7 is a detailed block diagram of each channel in the embodiment of FIG. 5.

Detailed Description Of Preferred Embodiments

[0006] FIG. 1 illustrates a portion 10 of a glassware manufacturing system in accordance with the present invention. An individual section machine 12 manufactures articles 14 of glassware and places the articles in sequence on an endless belt conveyor 16. The hot glassware is transported by conveyor 16 through a sequence of inspection stations 18a-18d, and thence to an annealinglehr for stress relief, etc. Machine 12 may be as disclosed, for example, in U.S. Patent 4,362,544.

[0007] In accordance with the present invention illustrated in FIGS. 1 and 2, inspection devices 18a-18d are interconnected in a star communication configuration with a star network hub 24. In accordance with the present invention, the star configuration in which devices 18a-18d are connected to network hub 24 may be an unbalanced star configuration or network, in which the lengths of the interconnections are or may be unequal.

In a presently preferred embodiment of the invention, the devices communicate with each other through network hub 24 employing the so-called CANbus communication protocol, which is a high efficiency serial communication protocol and described, for example, in ISO 11898 specifications, which are incorporated herein by reference. Devices 18a-18d are connected to network hub 24 by bidirectional conductors, with transceivers being positioned in hub 24 and in each of the devices in accordance, for example, with ISO specification 11992, also incorporated herein by reference.

[0008] FIG. 3 is a functional block diagram of network hub 24. A hub CAN controller 26 contains suitable programming for supervising and arbitrating communications. Hub CAN controller 26 provides a clock signal and a Hub CAN Transmit signal to a field programmable gate array (FPGA) 28, which in turn provides a Hub CAN Receive signal to hub CAN controller 26. FPGA 28 is connected to a plurality of transceivers 30 for communication with devices 18a-18d, 20 through suitable connections.

[0009] FIGS. 4A-4C are schematic diagrams of circuitry contained within FPGA 28. FPGA 28 provides the necessary logic needed to pass one device's communication message to all other devices and to hub CAN controller 26. When hub CAN controller 26 sends the message, it must be sent back to itself since a transceiver is not present. FIG. 4A shows the logic for getting messages from the various devices to the hub CAN controller.

[0010] According to CAN protocol, the receive signal from each device stays at a high logical level or recessive state when the device is not sending a message. When a device begins to send a message, the CAN Receive signal from that device will change to a low logic level or dominant state. When no devices are sending a message, all of the Device CAN Receive signals are at a high or recessive state. This will cause all of the Filtered Out Device signals to be at a low logic level, and the Combined CAN Out signal to be at a high logic level. Thus, all inputs to AND gate 32 in FIG. 4A are initially high, and the Hub CAN Receive output to hub CAN controller 26 (FIG. 3) is high. The Hub CAN Transmit input to inverter 34 and NOR gate 36 (FIG. 4C) is high, and all of the Filtered Out Device inputs to gate 36 are low. The Combined CAN Out output from gate 36 is thus initially high.

[0011] FIG. 4B illustrates two channels 38, 40 for generating associated Filtered Out Device signals, in this case for a device 1 (channel 38) and device N (channel 40). In both channels 38, 40, the Device CAN Receive inputs are initially high and the Combined CAN Out inputs to OR gates 42 are initially high. Thus, as noted above, the Filtered Out Device signals from each channel 38, 40 are initially low, and the Device CAN Transmit outputs are initially high. Each channel 38, 40 includes an AND gate 44 that receives a Device CAN Receive input for the associated device through an inverter 46,

and which receives the output of OR gate 42 directly, through a 0.1 microsecond delay 48, and through a 1.5 microsecond latch 50 and inverter 52.

[0012] If device 1 begins sending a message (e.g., inspection device 18a in FIGS. 1 and 2), the Device CAN Receive signal for that device will change to a low logic level. This input to channel 38 operates through inverter 46 and gate 44 to switch the Filter Out Device signal for device 1 to a high logic level because the other inputs to AND gate 44 are already at a high logic level. This switching of the Filtered Out Device signal for device 1 will cause the Combined CAN Out signal (FIG. 4C) to change to a low logic level. Thus, in channel 38 of FIG. 4B, the Device CAN Transmit signal for device 1 will remain high due to the Filtered Out Device signal for device 1. This inhibits transmission of the message from device 1 back to device 1 since such retransmission would lock the channel in that state. In the meantime, the Device CAN Transmit signals for the other channels (e.g., channel 40) will change to a low logic level since both the Filtered Out Device signals and the Combined CAN Out signal will be at a low logic level. Thus, communication from device 1 is enabled for transmission to devices 2-N, but is inhibited from retransmission back to device 1 by generation of the Filtered Out Device signal in channel 38 for device 1.

[0013] When the Device 1 CAN Receive signal later returns the high logic level, the Filtered Out Device 1 signal (FIG. 4B) will return to the low logic level. The Combined CAN Out signal (FIG. 4C) changes back to the high logic level. For the devices other than the transmitting device (device 1 in this example), the Device CAN Transmit signals (FIG. 4B) return to the high logic level. However, the 0.10 microsecond delay 48 and the 1.5 microsecond positive edge-triggered latch 50 will maintain the Filtered Out Device signal for device 1 at the low logic level for 1.5 microseconds. The Device CAN Receive signal for each associated device 2-N will have no effect during the 1.5 microsecond delay period that the latches 50 are active. After this 1.5 microsecond time delay period, the Device CAN Receive signal will be enabled to change the Filtered Out Device signals for devices 2-N.

[0014] This latching of the Filtered Out Device signals is used to prevent false errors from being detected during the CAN acknowledgment bit portion of the communication messages. According to CAN communication protocol, a transmitting device (device 1 in the present example) sends a recessive state bit at the end of a message calling for acknowledgment. Any other device that successfully received the message must reply with a dominant bit, which the transmitting device is waiting to detect. To accommodate the possibility of different cable lengths between each device and the network hub, the delays before each device's acknowledgment arrives can vary. Use of latch delays 50 prevents each device from detecting an error due to time differences with another device's trailing edge of the acknowledge bit. In a

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hub implementation employing CAN protocol at a speed of 250,000 bits per second, 4 microseconds is required to transmit one bit. Every bit is sampled by CAN Controller 26 in each device at about 2.5 microseconds into the bit time. The delay of 1.5 microseconds at latches 50 is selected to ensure that bit information transmitted to the various devices will be at the correct logic level at the time it is sampled.

[0015] FIG. 5 is a partial block diagram of another embodiment of the invention, which illustrates that the transceiver 30 for each channel is connected to a corresponding transceiver in each device 18a-18c and 20. The transmitting state of each device is dependent upon whether the dominant state is generated by that device or another. In determining the logic for setting the output state of the transmitter (TXn), the inherent delay in the transceiver must be taken into consideration. When the transmitter (TXn) is put in a dominant state, it will be up to 75 nsec. later before the receiver (RXn) will register the change in state. This can create problems in determining the proper state of the transmitter during these transition periods. FIG. 6 is a state diagram for the RX signal from the transceiver to FPGA 28, the transmit (TXn) signal from the FPGA, and the combined receive (CRXn) signal from the other CAN channels. There are six definable states for each channel, as follows:

State 1 - This is the normal State of the network when none of the devices are trying to communicate. The receive input will be in its recessive state (RXn=H), the combined receive input from all the other devices will be recessive (CRXn=H), and the state of the transmit line will be recessive (TXn=H). State 2 - This State has the RXn input dominant (RXn=L), the CRXn input recessive (CRXn=H), and the transmit output recessive (TXn=H). This State is a transitory condition that is caused by the delays through the transceiver and the high clock speed of the state machine. It can be entered into through three different sets of circumstances.

State 1 to State 2- This is the most likely entry means into State 2. The device connected to the channel in question begins transmission (RXn goes low.) Since no other devices are transmitting at that time, the CRXn input will be in a recessive state. (This will change later when the dominant state of RXn is transmitted to the other devices and returned to RXn through the CRXn input.) Under these conditions the dominant state should not be broadcast back to the originating device on that channel, which would cause the network can get locked in the dominant state. Therefore, TXn should remain recessive allowing the connected device to control the state of the RXn input. State 3 to State 2 - This transition is a temporary condition that can arise because of the delay in

the transceiver reporting back a change in state for its network segment (75 nsec. delay). If during the acknowledge part of the transmission two devices register a dominant input on the same clock cycle, both TX outputs would be in a high state. If the CRXn input goes recessive before the local device, the channel could momentarily be in State 2 until the local device returns to a recessive state. This transition is possible but not very likely to occur.

State 6 to State 2 - This transition is also a temporary condition due to transceiver delay. The controlling device has returned to the recessive state and the local TX output has changed to the recessive state, but the RX input has not yet registered the change because of the delay through the transceiver.

State 3 - This State is the normal State for a transmission where the dominant state is originated from the local device. The RXn input will be low, and the CRXn input will also be low because the dominant state that is being transmitted to the other devices is being reported back to their associated RX inputs. By looking at FIG. 6, it can be seen that all but the local RX inputs are combined to make the CRX input. Therefore, after the transceiver delays have expired, the CRX input will also be in the dominant state. Since the local device is initiating the dominant state, the local TX output will remain recessive. This State can only be entered from State 2.

State 4 - While this State can only be entered from State 3, there are two possible exits from this State. If the local device is the only device that was transmitting the dominant state, then the CRX input should return to the recessive state after the transceiver delay has elapsed and return this channel to State 1, if however, after 75 nsec. (length of transceiver delay), the CRX input has not gone recessive, then another device is also transmitting a dominant state and the output of the local TX should change from recessive to dominant. If more than one channel is transmitting a dominant state, the channel should ideally go directly from State 3 to State 5 when the local RX input goes recessive, but there is no direct way to distinguish between the two possibilities (State 3 to 5 or State 3 to 4). The only way of determining which case is currently active is by going into State 4 and seeing if the CRX input lasts more than 75 nsec. This momentary error in output state should not create a communications problem because it occurs at the bit transitions and the bit is not sampled until much later in the bit time. State 5 - This is a transitory State that occurs because of transceiver delays. It occurs when the dominant state is generated from a device other than the local one (CRX=L). There can be as much as 75 nsec. delay from when the TX output goes

dominant to when it is reported by the RX input. The channel will be in this State until the receiver (RX) catches up with the transmitter (TX). This State is entered from either State 1 or State 4, and in both cases is only a transitional State needed to get to the final State, which is State 6.

State 6 - This State is the result of the dominant state being generated by a device other than the local device (CRX input). The only difference between this State and State 3 is the condition of the TX output. Since the dominant state is externally generated, it must be communicated to the local device by pulling the TX output low (dominant state). The channel will stay in this State until the CRX input goes back to the recessive state. When the CRX input goes recessive, then the channel will transition through State 2 on its way back to State 1. This State is entered because of the transceiver delays.

[0016] The logic for each channel to support the state diagram in FIG. 6 is shown in FIG. 7. It has been simplified to minimize space required within the FPGA. The logic looks only at those States that would cause the TX output to go low. A shift register is used to determine the length of time the channel stays in State 4. By using a 40 MHz clock, a three stage shift register provides the required 75 nsec. delay. If a different clock frequency is used, the number of stages in the shift register must also be changed.

[0017] There has thus been disclosed a glassware forming system, which employs a star network configuration for communication among operating devices, that fully satisfies all of the objects and aims previously set forth. Although the communication system of the present invention has been disclosed in conjunction with a presently preferred implementation for inspecting hot glassware between an individual section machine and an annealinglehr (FIG. 1), other implementations are contemplated. For example, the communication system of the present invention can be employed for communication between and among computers for operating individual sections of the glassware forming machine, as disclosed for example in above-referenced noted U.S. Patents 5,580,388 and 5,624,473. The communication system of the present invention can also be employed for communication among hot end and/or cold end inspection equipment as disclosed, for example, in above-referenced U.S. Patent 4,762,544. The network hub in the preferred embodiments of the invention employs a field programmable gate array, which is a commercially available programmable logic device that contains an array of hardware logic elements that are variably configurable to process signal data. However, FPGA 28 could be replaced by an array of standard hardware logic elements, if desired. Other modifications and variations will readily suggest themselves to persons of ordinary skill in the art. The invention is intended to embrace all such modifications and variations as fall within the

spirit and broad scope of the appended claims.

Claims

1. A glassware forming system that includes a plurality of electronic devices (18a through 18d) for performing operations on articles of glassware and a network interconnecting said devices for intercommunication among said devices, characterized in that said network includes::

a star network hub (24) and means connecting said hub to said plurality of devices in a star network configuration for bidirectional communication among said devices through said hub, said star network hub including:
a hub controller (26) for controlling operation of said hub according to a CANbus communication protocol,
means (32, 38) for sensing a communication transmitted from one of said devices, and
means responsive to said sensing means and to said hub controller for blocking transmission of said communication to said one of said devices and for enabling communication from said one of said devices through said star network hub to all other devices connected to said hub.

2. The system set forth in claim 1 wherein said devices (18a through 18d) are responsive to operating conditions for controlling at least one aspect of operation of an individual section machine glassware forming system (10) that includes an individual section machine (12) with a plurality of individual sections for forming glass gobbs into articles (14) of glassware and a conveyor (18) for receiving and transporting articles of glassware from the machine.

3. The system set forth in claim 1 or 2 wherein said star network hub further includes a plurality of transceivers (30) for connection to said devices.

4. The system set forth in claim 1 or 2 wherein said sensing means and said means responsive to said sensing means comprise a field programmable gate array (28).

5. The system set forth in claim 1 or 2 wherein said star network hub (24) further includes means (48, 50) responsive to termination of communication from said one of said devices for delaying enablement of communication from other of said devices to accommodate differences in lengths of said connecting means.

6. The system set forth in claim 1 or 2 wherein said

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means responsive to said sensing means comprises a plurality of channels (38 through 40), one for each of said devices, with each said channel including a gate (44) having an output for enabling communication from the associated device, one input 5 for receiving communication from the associated device, and a second input coupled to said output through delay means (48, 50) for delaying enablement of communication from said associated device. 10

7. The system set forth in claims wherein said devices (18a through 18d) comprise means for inspecting glassware from said conveyor. 15

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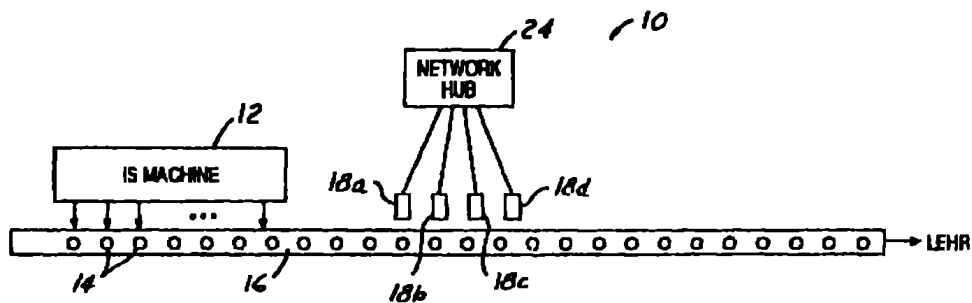


FIG. 1

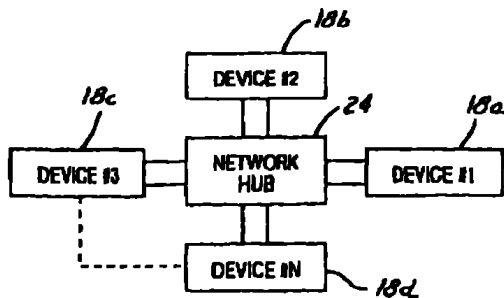


FIG. 2

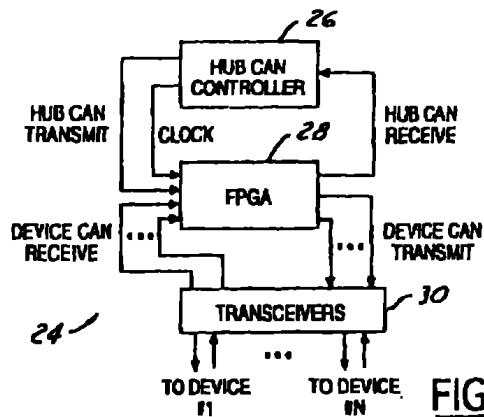


FIG. 3

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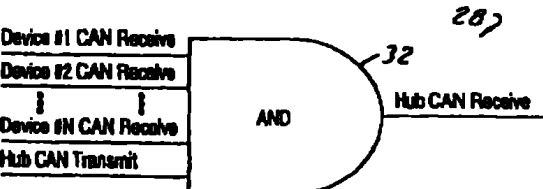


FIG. 4A

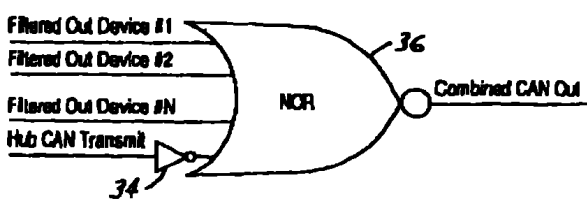


FIG. 4C

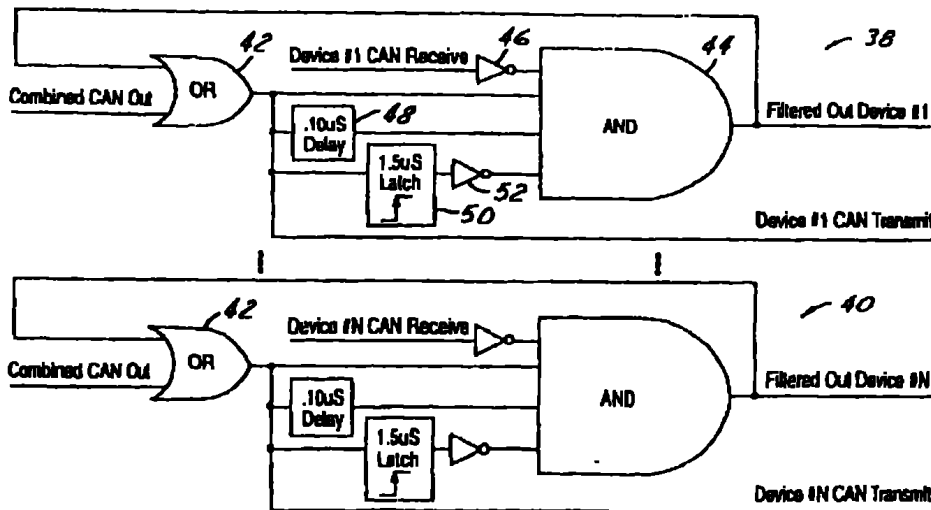


FIG. 4B

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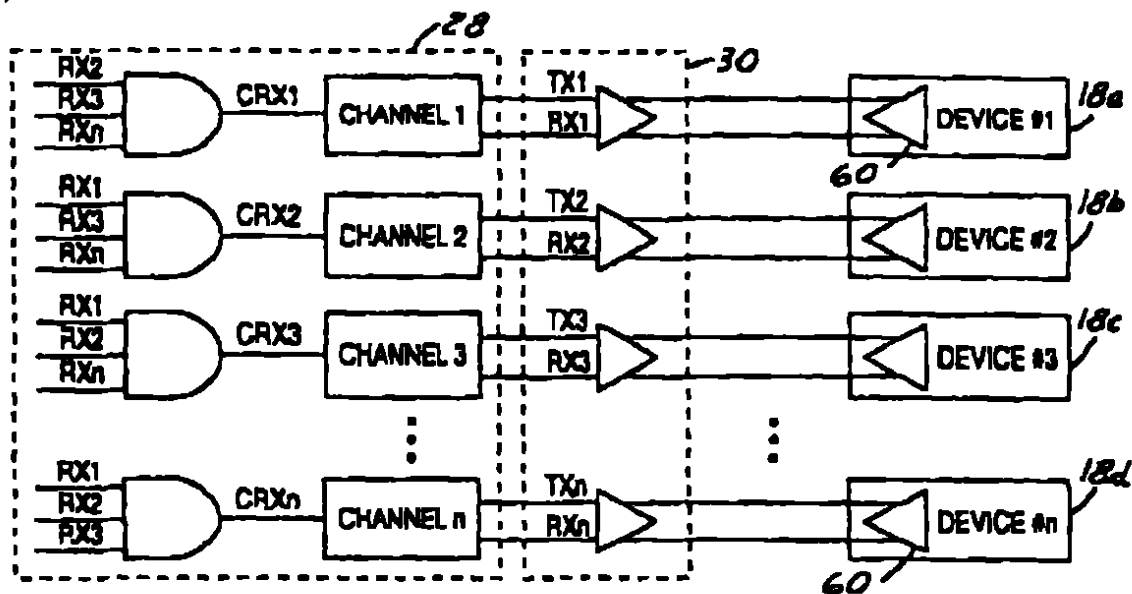


FIG. 5

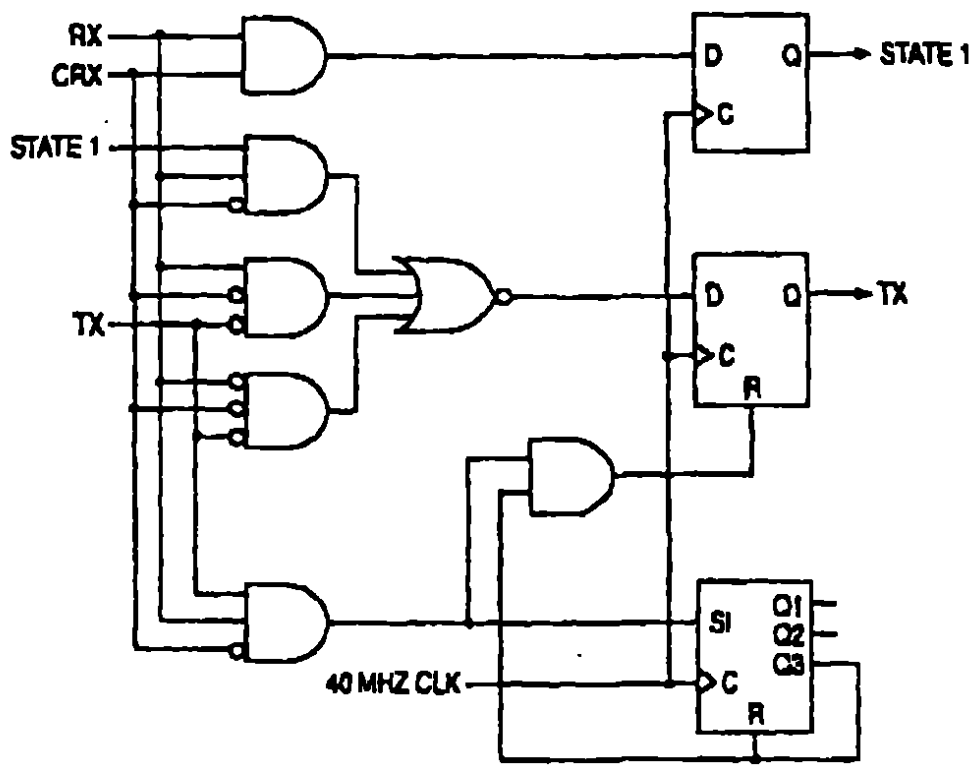


FIG. 7

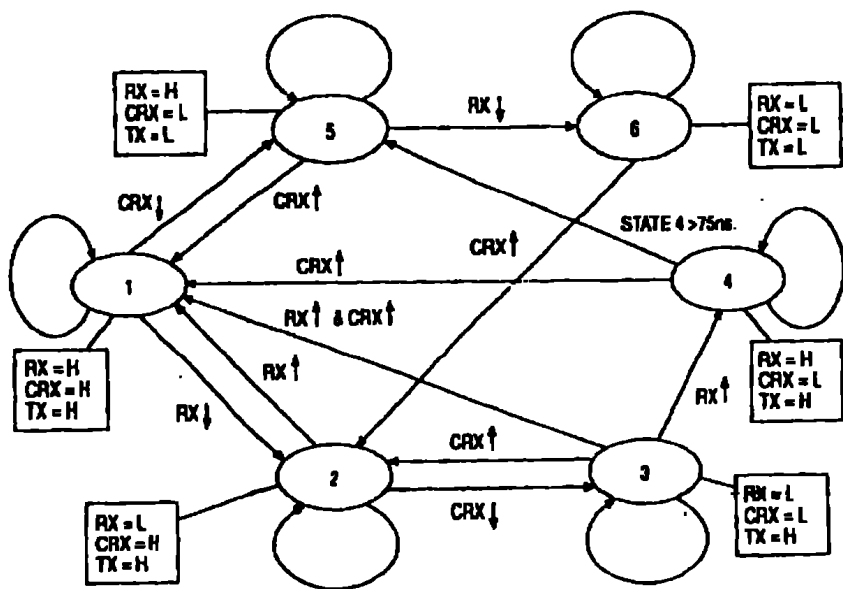


FIG.6



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To this effect they hereby empowered to file applications, formulate descriptions, amendments, declarations, oppositions, cancellations, nullities, appeals and claims; to pay taxes, quotas and assessments prescribed by law, renounce or waive the rights granted or in the process of granting; to receive all kinds of documents and valuables, giving the respective release of receipt, and, in general, to take before said authorities the necessary steps to such effect, and any measures that they may deem pertinent to the safeguard of my (our) interest(s) with all the other necessary legal powers.

Este poder comprende la facultad de ratificar o confirmar en mi (nuestro) nombre lo actuado así como la facultad de desistir, transigir, comprometer, y la de sustituirlo en todo o en parte y revocar sustituciones. Asimismo nombro(amos) a: JUAN PABLO CADENA SARMIENTO y/o BEATRIZ JARAMILLO y/o CARLOS H. PALACIO EASTMAN y/o HECTOR GOMEZ MEJIA, domiciliado(s) en la Carrera 7 No. 16-56 Piso 9, mis (nuestros) apoderados en Colombia, con facultades para recibir notificaciones y designar apoderados judiciales o extrajudiciales.

This power includes the faculty to ratify or confirm desist, settle and compromise on my (our) behalf, and to substitute this power in whole or in part and to revoke substitutions. At the same time I (We) hereby appoints JUAN PABLO CADENA SARMIENTO and/or BEATRIZ JARAMILLO and/or CARLOS H. PALACIO EASTMAN and/or HECTOR GOMEZ MEJIA, domiciled in Carrera 7 No. 16-56, Piso 9, my (our) attorney(s) in fact, with powers to receive notifications and to designate judicial and extrajudicial attorneys.

Otorgado y firmado en

Granted and signed in PERRYSBURG, OHIO

hoy de de 200_

this 2 day of DEC. 200_4

Firma
Nombre
Cargo

Signature
Name
Title
ROBERT E. LACHMILLER
VICE-PRESIDENT

CERTIFICADO NOTARIAL (SOCIEDAD)

NOTARIAL CERTIFICATE (CORP RATION)

Hoy de
personalmente compareció ante mí

a quien conozco, y de quien me consta que firmó el anterior documento, debidamente juramentado declaró y dijo que él (ella) es

de OWENS - BROCKWAY GLASS CONTAINER INC

Sociedad legalmente constituida para un período de duración que aún no ha terminado; que el declarante está autorizado por dicha compañía para conferir este poder; que el sello estampado por él al pie de tal poder, en nombre y representación de la expresada compañía, es el sello oficial de ella; y que el objeto para el cual se confiere este instrumento está comprendido dentro del objeto social de la sociedad.

El suscrito Notario hace constar que tuvo a la vista las pruebas de la existencia de la sociedad.

Estado de
con fecha

y que quien confiere el presente poder es su representante.

On this 2 day of DECEMBER 2004 at
personally appeared before me

ROBERT E. LACHMILLER

to me known, and known to me to be the person who signed the foregoing instrument who being by me duly sworn did depose and say that he (she) is the

VICE-PRESIDENT

of OWENS - BROCKWAY GLASS CONTAINER INC

Which is legally constituted for a term not yet expired, that deponent is authorized by said Company to confer this Power of Attorney: that the seal affixed hereunto by the deponent in the name and on behalf of said Corporation is the corporate seal thereof; and that the purpose for which this instrument is granted is included within the corporate purpose of company.

The undersigned Notary Public attests that he has seen the documents that prove the existence of the company.

State of Ohio
under date of 12-2-04

and that he (she) who grants the power of attorney is its Representative.

Notario Público. (sello)

15 FEB. 2005

NOTARIO CUARENTA

Notary Fernando María Sánchez

Regist. B.C. Colombia

CERTIFICADO NOTARIAL
PERSONA NATURAL

ROBIN S. RAYNER
Notary Public, State of Ohio
My Commission Expires 12/31/2005

NOTARIAL CERTIFICATE
NATURAL PERSON

Hoy de de , comparació(eron)
ante mí

On this day of of
personally appeared before me

a quien (es) conozco y me consta que es(son) la(s) persona(s) firmante(s) del documento que precede y quien(es) declare(n) que otorgan el mismo para los fines y propósitos que en él se expresan.

Notario Público (sello)

who is(are) known to me and who I attest executed the foregoing document and he (they) declared he (they) grant(s) the document for the uses and purposes therein expressed.

Notary Public (Seal)

LEGALIZACION POR APOSTILLA ES REQUERIDA.

LEGALIZATION BY APOSTILLE IS REQUIRED.

APOSTILLE

(Convention de la Haye du 5 octobre 1961)

1. Country: United States of America

This public document

2. has been signed by REBECCA E. BHAER

3. acting in the capacity of Clerk of Court of Common Pleas

4. bears the seal/stamp of Court of Common Pleas, Wood County

CERTIFIED

5. at Columbus, Ohio

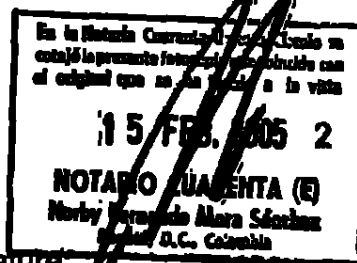
6. December 20, 2004

7. by the Secretary of State of Ohio.

8. No. 200417

9. Seal/Stamp:

10. Signature:



J. Kenneth Blackwell
J. Kenneth Blackwell
Secretary of State of Ohio

This certification certifies only the authenticity of the signature of the official who signed the document, the capacity in which that official acted, and where appropriate, the identity of the seal or stamp which the document bears. This certification does not imply that the contents of the document(s) are correct, nor that they have the approval of this office.

109108

CERTIFICATE OFFICIAL CHARACTER

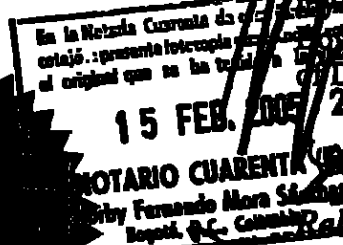
THE STATE OF OHIO

WOOD COUNTY

COMMON PLEAS COURT

I, THE UNDERSIGNED Clerk of the Court of Common Pleas, a Court of Law and Record of said County, do hereby certify that **ROBIN S. RAYNER** before whom the annexed instrument was taken and whose name is subscribed in the certificate of proof thereof, was, at the time of taking the same, a Notary Public in and for said County, duly sworn and acting as such, and authorized to take the same that had authority to take the proofs and acknowledgments of deeds to be recorded in the State; that the impression of HIS/HER official seal is not required by the laws of the State of Ohio to be filed in my office; and that HIS/HER commission expires **FEBRUARY 17, 2008**. And further that I am well acquainted with HIS/HER handwriting, and verily believe the signature thereto to be HIS/HER genuine signature; and further, that the annexed instrument is executed and acknowledged according to the laws of the State of Ohio.

In Testimony Whereof, I hereunto subscribe my name and affix the seal of said Court at Bowling Green, Ohio, this 8th day, of December, 2004.



Rebecca E. Bhaer
Rebecca E. Bhaer
Clerk of Courts, Wood County, OH

TRADUCCION OFICIAL NO. 033/2004.-

TRADUCCION DE LOS SELLOS QUE SE ENCUENTRAN EN EL PODER OTORGADO POR OWENS - BROCKWAY GLASS CONTAINER INC., COMPAÑIA DOMICILIADA EN ONE -SEA GATE, TOLEDO OHIO 43666, ESTADOS UNIDOS DE AMERICA, A LOS DOCTORES JUAN PABLO CADENA SARMIENTO Y/O BEATRIZ JARAMILLO Y/O CARLOS H. PALACIO EASTMAN Y/O HECTOR GOMEZ MEJIA.

OTORGADO Y FIRMADO EN PERRYSBURG, OHIO, A LOS 2 DIAS DEL MES DE DICIEMBRE DE 2004.

FIRMADO: ROBERT E. LACHMILLER, VICEPRESIDENTE

CERTIFICADO NOTARIAL (SOCIEDAD)

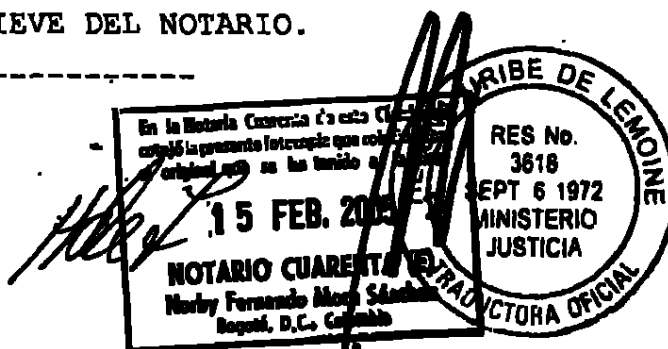
EL DIA 2 DE DICIEMBRE DE 2004 PERSONALMENTE COMPARECIÓ ANTE MI ROBERT E. LACHMILLER, VICEPRESIDENTE DE OWENS - BROCKWAY GLASS CONTAINER INC., UNA SOCIEDAD LEGALMENTE CONSTITUIDA PARA UN PERIODO DE DURACIÓN QUE AUN NO HA TERMINADO; QUE EL DECLARANTE ESTA AUTORIZADO POR DICHA COMPAÑIA PARA CONFERIR ESTE PODER; QUE EL SELLO ESTAMPADO POR EL AL PIE DE TAL PODER, EN NOMBRE Y REPRESENTACIÓN DE LA EXPRESADA COMPAÑIA, ES EL SELLO OFICIAL DE ELLA; Y QUE EL OBJETO PARA EL CUAL SE CONFIERE ESTE INSTRUMENTO ESTA COMPRENDIDO DENTRO DEL DE LA SOCIEDAD. EL SUSCRITO NOTARIO HACE CONSTAR QUE TUVO A LA VISTA LAS PRUEBAS DE LA EXISTENCIA DE LA SOCIEDAD.

ESTADO DE OHIO, EL 2 DE DICIEMBRE, 2004.

Y QUE QUIEN CONFIERE EL PRESENTE PODER ES SU REPRESENTANTE.

FIRMADO: ROBIN S. RAYNER, NOTARIO PUBLICO, ESTADO DE OHIO, CON COMISIÓN HASTA EL 17 DE FEBRERO DE 2008.

HAY SELLO EN RELIEVE DEL NOTARIO.



17/110

CERTIFICADO CON CARÁCTER OFICIAL
ESTADO DE OHIO – CONDADO DE WORD
TRIBUNAL DE ASUNTOS COMUNES

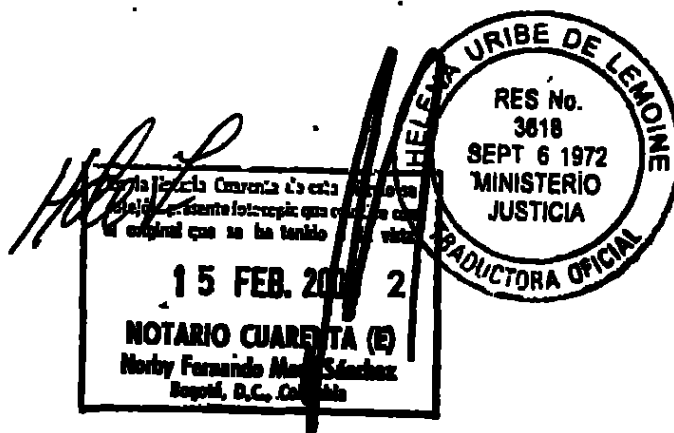
El suscrito funcionario de la Corte de Asuntos Comunes, una Corte de Derecho y Registro de dicho Condado, por medio del presente certifico que ROBIN S. RAYNER ante quien se celebró el anterior documento y cuyo nombre figura en el certificado de prueba era, en el momento de ejecutar dicho acto, Notario Público en y para dicho Condado, debidamente juramentado y autorizado para celebrar dicho acto. Que la ley del Estado de Ohio no exige que su sello sea registrado en este despacho; y que su comisión expira el 17 de Febrero de 2008. Certifico además que estoy familiarizado con la firma de dicho Notario Público y creo que la firma en el documento es la suya; y además, certifico que el instrumento adjunto ha sido ejecutado y reconocido de conformidad con las leyes del Estado de Ohio.

En testimonio de lo anterior, firmo y suscribo mi nombre y coloco el sello de la Corte en la ciudad de Bowling Green, Ohio, a los 8 días del mes de Diciembre del año 2004.

FIRMADO: REBECCA E. BHAER

SECRETARIO DE LAS CORTES, CONDADO DE WORDS, OHIO.

HAY SELLO EN RELIEVE DE LA CORTE



172111

APOSTILLA

CONVENIO DE LA HAYA DEL 5 DE OCTUBRE DE 1961

1. PAIS: ESTADOS UNIDOS DE AMERICA
EL PRESENTE DOCUMENTO PUBLICO
2. HA SIDO FIRMADO POR: REBECCA E. BHAER
3. ACTUANDO EN SU CAPACIDAD DE: SECRETARIO DE LA CORTE DE
ASUNTOS COMUNES
4. LLEVA FIRMA Y SELLO DE: CORTE DE ASUNTOS COMUNES, ESTADO DE OHIO.

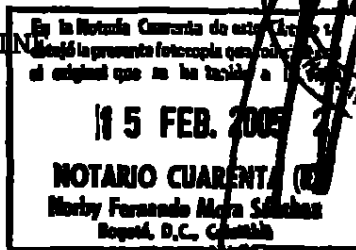
CERTIFICADO

5. EN: COLUMBUS, OHIO
6. EL: 20 DE DICIEMBRE, 2004
7. POR: EL SECRETARIO DE ESTADO DE OHIO
8. BAJO EL NO.: 200417
9. SELLO: SECRETARIO DE ESTADO DE OHIO
10. FIRMADO: J. KENNETH BLACKWELL, SECRETARIO DE ESTADO DE OHIO

LA TRADUCTORA OFICIAL

Helena Uribe de Lemoine

HELENA URIBE DE LEMOINE



REQUISITOS NECESARIOS PARA PRESENTACION Y AGILIZACION DEL TRAMITE

	USUARIO	RADICADOR
PATENTE DE INVENCION ✓	()	(✓)
MODELO DE UTILIDAD	()	(✓)
- Indicación de que se solicita la concesión de una patente.	()	(✓)
- Datos de identificación del solicitante o de la persona que se presenta la solicitud.	()	(✓)
- Descripción de la invención.	()	(✓)
- Dibujos de ser estos pertinentes. ✓	()	(✓)
- Comprobante de Pago de las tasas establecidas.		
COMPLETA ()	INCOMPLETA ()	()
DISEÑO INDUSTRIAL ()		
- Indicación de que se solicita el registro de Diseño Industrial	()	()
- Datos de identificación del solicitante o de la persona que presenta la solicitud.	()	()
- Representación gráfica o fotográfica del Diseño Industrial o muestra del Material que incorpora el diseño.	()	()
Comprobante de pago de las tasas establecidas	()	()
COMPLETA ()	INCOMPLETA ()	()
ESQUEMA DE TRAZADO ()		
- Indicación de que solicita el registro de un Esquema de trazado.	()	()
- Datos de identificación del solicitante o de la persona que presenta La solicitud.	()	()
Representación gráfica del esquema de trazado	()	()
Comprobante de pago de las tasas establecidas.	()	()
COMPLETA ()	INCOMPLETA ()	()

Firma Responsable:

Apudia M Nueva

Fecha:

2020
Bogotá, D.C.,

Doctor:
JUAN PABLO CADENA SARMIENTO
Apoderado
OWENS – BROCKWAY GLASS CONTAINER

Oficio N° 12487

ASUNTO:	Radicación N°	05-19564
	Solicitud internacional	PCT/US2003/027548
	Fecha inicio fase nacional	04/04/2005
	Trámite	011
	Evento	379
	Actuación	430
	Folios	001

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

- La solicitud no contiene la copia del documento en que consta la cesión del derecho a la patente del inventor al solicitante o a su causante. (Art. 26-k) Decisión 486).

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

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


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

El anterior requerimiento fue notificado por fijación en lista de fecha, 11 ABR 2005.

202030