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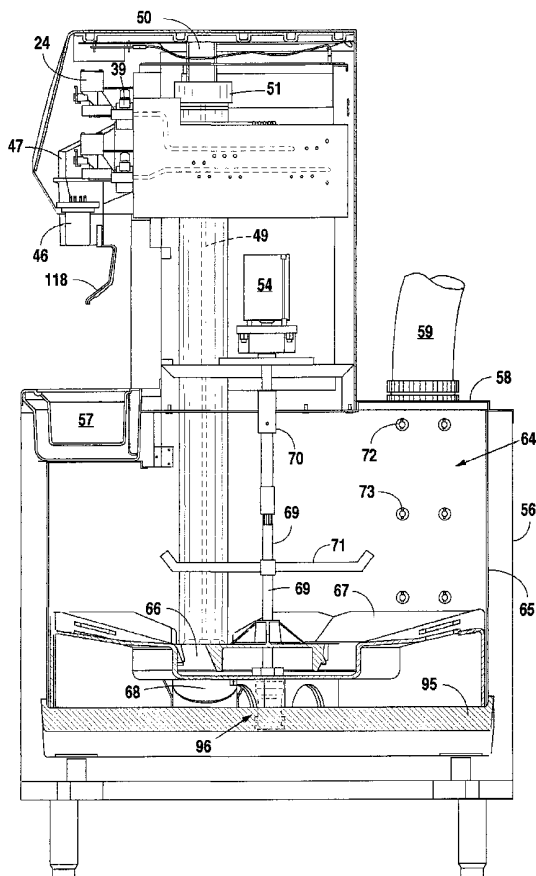
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(54) Title: DISPENSER WITH FEATURES FOR ENHANCED MAINTAINABILITY



(57) Abstract: A dispenser (20) with features for enhanced main-
tainability generally comprises a lower unit (55) having therein an
ice bin (64); an upper unit (21) atop the lower unit providing an
interface (47) for dispensing ice; a conveyor (49) having an in-
let in the ice bin and an outlet in the upper unit; an ice distributor
(66) in a lower portion of the ice bin conveying to the inlet; and a
drive motor (50), associated with the ice distributor, located above
the lower unit. A plurality of optical emitter (72) and receiver
(73) assemblies disposed upon opposite walls of the ice bin. Each
optical emitter assembly comprises an emitter housing (74) and
a selectively removable emitter body (87) comprising an optical
source (82). Each optical receiver assembly (73) comprises a re-
ceiver housing (74) and a selectively removable receiver body (87)
comprising an optical receiver (82). Modular flow control valves
(24) are adapted for substantially simultaneous electrical (32) and
fluid (35) connection with mounting blocks (39) on the upper unit.



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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.

DISPENSER WITH FEATURES FOR ENHANCED MAINTAINABILITYFIELD OF THE INVENTION:

The present invention relates to ice and beverage dispensers. More particularly, the
5 invention relates to the improved arrangement and configuration of various generally known
components of dispenser units for facilitating maintenance and preventing damage during
ordinary operation.

BACKGROUND OF THE INVENTION:

Combination ice and beverage dispenser units, as exemplified by U.S. patent No.
10 5,230,488 issued July 27, 1993 to Strohmeyer *et al.*, are now in common use for, among
other reasons, their ability to provide the consuming public with a variety of beverage
products, including ice, without waste of valuable commercial counter area. To further
enhance this characteristic of combination dispensers, modular flow controllers, such as that
described in U.S. patent application Serial No. 09/496, 441 filed February 2, 2000, have been
15 developed to interface with multi-flavor beverage dispensing air-mix nozzles. Such valves are
designed to be compact, in order to allow as many as possible to be utilized in the smallest of
dispensers. They are also designed to be modularly replaceable in order to ensure that failure
of one may be readily remedied, in the field, without necessity for intervention by a factory-
level service technician. In order to enhance maintainability of such combination dispenser,
20 efforts have been made to ensure that their various components are readily accessible in the
case of failure, which is especially important in the case where a dispenser is built into a
counter top. As an example, U.S. patent No. 5,829,646 issued November 3, 1998 to
Schroeder *et al.* discloses a wheel for conveyance of ice to a delivery chute. In this patent,
however, the wheel is placed at an angle, thereby allowing the drive motor therefor to be
25 readily accessible at the front of the dispenser unit. Finally, redundancy is often built into
dispenser units to ensure that single component failures do not immediately disrupt operation
of the dispenser or cause more catastrophic damage. For example, U.S. patent No. 5,671,606
issued September 30, 1997 to Schroeder *et al.* discloses the use of redundant optical sensors
for determining the level of ice within an exemplary dispenser, thereby ensuring accurate
30 measurement for interface with an automated ice delivery system.

It is an overriding object of the present invention to further develop and incorporate
each of these principles into a combination ice and beverage dispenser unit that is extremely
reliable in operation, yet highly-maintainable in case of component failure. It is, however,
another object of the present invention, to extend such principles with regard for economy,
35 eliminating redundancy where possible through better design.

SUMMARY OF THE INVENTION:

In accordance with the foregoing objects, the present invention – a dispenser with features for enhanced maintainability – generally comprises a lower unit having therein an ice bin; an upper unit atop the lower unit for providing an interface for dispensing ice from the ice bin to the public; a conveyor, such as an auger, belt, or the like, having an inlet in the ice bin and an outlet in the upper unit; an ice distributor, such as a wheel, agitator bar, or the like, in a lower portion of the ice bin for conveying ice within the ice bin to the inlet; and a drive motor operably associated with the ice distributor, the drive motor being located in a space above the lower unit for ready access.

In another embodiment, the dispenser includes a plurality of optical emitter assemblies disposed upon a first interior sidewall of the ice bin and a plurality of optical receiver assemblies oppositely disposed upon a second interior sidewall of the ice bin. Each optical emitter assembly comprises an emitter housing, dependently attached to the first interior sidewall and in fixed electrical communication with a control circuit, and an emitter body comprising an optical source. The emitter body is adapted for removable engagement with the emitter housing for establishing an electrical connection between the optical source and the control circuit. Likewise, each optical receiver assembly comprises a receiver housing, dependently attached to the second interior sidewall and in fixed electrical communication with the control circuit and a receiver body comprising an optical receiver. The receiver body is adapted for removable engagement with the receiver housing for establishing an electrical connection between the optical receiver and the control circuit.

In yet another embodiment, the dispenser is provided with modular flow control valves adapted for substantially simultaneous electrical and fluid connection with mounting blocks on the upper unit. In particular, an electrical connector is fixed in position upon each flow controller such that connection of a fluid connector on the flow controller with a corresponding fluid connector on the mounting block cause substantially simultaneous engagement of the flow controller's electrical connector with a corresponding electrical connector on the mounting block.

Finally, many other features, objects and advantages of the present invention will be apparent to those of ordinary skill in the relevant arts, especially in light of the foregoing discussions and the following drawings, exemplary detailed description and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS:

Although the scope of the present invention is much broader than any particular embodiment, a detailed description of the preferred embodiment follows together with illustrative figures, wherein like reference numerals refer to like components, and wherein:

Figure 1 shows, in perspective view, the enhanced ice and beverage dispenser exemplary of the preferred embodiment of the present invention;

Figure 2 shows, in perspective view, the dispenser of Figure 1 with an upper lid opened for viewing of several internal components;

5 Figure 3 shows, in a side cross-sectional view, several of the various internal components of the dispenser of Figure 1;

Figure 4 shows, in an exploded partial perspective view, details of a portion of the conveyor of the dispenser of Figure 1;

10 Figure 5 shows, in an exploded perspective view, an optical emitter (or detector) assembly of the dispenser of Figure 1;

Figure 6 shows, in an exploded perspective view, details of a bearing assembly internal the dispenser of Figure 1;

Figure 7 shows, in perspective view, the bearing assembly of Figure 6;

15 Figure 8 shows, in a cross-sectional view taken along line 8—8 in Figure 7, the bearing assembly of Figure 6;

Figure 9 shows, in an exploded cross-sectional view taken along line 9—9 in Figure 5, details of the assembly of Figure 5;

Figure 10 shows, in collapsed cross-sectional view from the same perspective as that of Figure 9, the assembly of Figure 5;

20 Figure 11 shows, in perspective view a modular flow controller and a mounting block of the dispenser of Figure 1; and

Figure 12 shows the controller and mounting block of Figure 11 as operably mated together.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT:

25 Although those of ordinary skill in the art will readily recognize many alternative embodiments, especially in light of the illustrations provided herein, this detailed description is exemplary of the preferred embodiment of the present invention, the scope of which is limited only by the claims appended hereto.

Referring now to the Figures, an ice and beverage dispensing unit 20 is shown to
30 generally comprise an upper unit 21 and a lower unit 55, as is typical in the art as exemplified by U.S. patent No. 5,230,448 issued July 27, 1993 to Strohmeyer *et al.* As particularly shown in Figures 2 and 3, the upper unit 21 comprises a plurality of combination mixing and dispensing valves 22, and ice dispensing nozzle 47 and a micro-controller based control circuit 52. As also shown, the lower unit 55 houses an ice bin 64 atop a cold plate 95. A
35 plurality of inlets 63 is provided to an equal plurality of cooled product lines 62, which enter

through the outer housing 56 of the lower unit 55, through the cold plate 95, and are then routed to the combination mixing and dispensing valves 22. Similarly, a plurality of inlets 61 is provided to an equal plurality of ambient temperature product lines 60, which route directly to the combination mixing and dispensing valves 22, which in the preferred embodiment
5 comprise modular flow controllers 24 in combination with multi-flavor beverage dispensing air-mix nozzles 46. As in other beverage dispensing units, depression of one of the plurality of beverage dispense membrane switches 23 activates the micro-controller based control circuit 52 to control metering of basic syrups and bonus flavors through the cooled and ambient temperature product lines 62, 60 and through the modular flow controllers 24 to the
10 air-mix nozzles 46. Likewise, a catch pan 57 is provided for the overflow of fluid products. In the present invention, however, the modular flow controllers 24 have been modified from prior embodiments in order to enhance their manner of interface with mounting blocks 39 to the ambient temperature product lines 60, cooled product lines 62 and micro-controller based control circuit 52.

15 As shown in Figure 3, the ice and beverage dispensing unit 20 also comprises an ice distributor 66, which in this preferred embodiment is a wheel, agitator bar, or the like, at the base of ice bin 64 for directing ice from ice bin 64 to a recess 68 at the base of ice conveyor 49, which in this preferred embodiment is an auger, belt, or the like. As in prior embodiments, deflection of ice dispense switch 118 causes activation of conveyor motor 50
20 to draw ice from the recess 68 through the ice conveyor 49 to the conveyor top housing 51 and out ice dispensing nozzle 47. Deflection of switch 118 also causes activation of gear motor 54 to operate ice distributor 66 for the supply of ice from within the various locations of ice bin 64 to recess 68, which may be formed separately or as part of a ice distributor shroud 67. The gear motor 54 may also, of course, be operated independently of switch 118
25 on, for example, a timer mechanism, to allow disruption of the ice within the ice bin 64 by an agitator bar 71. In this manner, freezing together of the ice may be prevented during extended periods between dispense operations. In the present invention, however, various modifications of the prior art have been effected in order to allow the gear motor 54 to be positioned in the intermediate space 53 between the upper unit 21 and lower unit 55. In this
30 manner, the area allotted for ice bin 64 is maximized while still allowing access to gear motor 54 for maintenance purposes. Likewise, in order to operate the conveyor motor 50 at an optimum speed, thereby preventing repeated, pulsed starts and stops by the user, an ice dispense speed membrane switch 48 is also provided in the present invention. This switch 48, in communication with the micro-controller based control circuit 52, preferably allows the
35 user to select from either FAST, MEDIUM or SLOW dispense rates upon activation of

switch 118. Those of ordinary skill in the art, however, will recognize the many substantially equivalent alternatives as may be implemented.

As in other prior dispensing units, an ice bin access lid 58 is provided through the outer housing 56 of lower unit 55 to the interior of ice bin housing 65. As has also been
5 previously implemented, a plurality of optical emitter assemblies 72 and corresponding optical detector assemblies 73 are provided in strategic locations of ice bin housing 65 to monitor the level of ice within ice bin 64. In the present invention, however, the optical emitter and detector assemblies 72, 73 have been modularized to allow their selective employment and easy maintenance in case of failure. For example, while prior embodiments
10 have utilized as many as six pairs for redundancy reasons, the preferred implementation now dispenses with the redundancy requirement. In embodiments where the ice bin 64 is in communication with an automated ice delivery system through, for example, ice supply conduit 59, only three emitter-detector assembly pairs 72,73 are required. Likewise, in embodiments wherein ice is manually loaded through ice bin access lid 58, only two emitter-
15 detector assembly pairs 72, 73 are required to indicate to the user the level of ice within ice bin 64.

Referring now to the remaining Figures, details of the various improvements of the present invention are now provided. Although described in the context of a combination ice and beverage dispensing unit 20, it to be appreciated that various aspects of the
20 improvements disclosed herein may be employed singly or in combination with other of the aspects. For example, the enhanced interface between the modular flow controllers 24 and mounting blocks 39 will greatly simplify maintenance of any beverage dispensing unit whether or not the unit has an ice dispensing capability. Likewise, the improved arrangement of components enabling the location of gear motor 54 within the intermediate space 53 atop
25 the lower unit 55 is beneficial for the maintenance of many ice dispensing units whether or not they include a beverage dispensing capability. On the other hand, it will also be appreciated that the combination of the various aspects of the present invention goes far to produce an overall result of a highly maintainable combination ice and beverage dispensing unit 20.

30 The use of an ice distributor 66, such as the illustrated wheel, for the conveyance of ice within an ice bin is exemplified in the art by U.S. patent No. 5,829,646 issued November 3, 1998 to Schroeder *et al.* ("the '646 patent"). By this reference, the full disclosure of U.S. patent No. 5,829,646 is incorporated herein as though now set forth in its entirety. As shown in the single '646 patent, the gear motor for driving such a wheel is typically located adjacent
35 and beneath the wheel in order to avoid a long shaft length. In this manner, binding of the

shaft is prevented. As shown in the '646 patent, prior embodiments have placed the wheel in an upright position in order to allow easier access to the gear motor, for maintenance and/or replacement, than would be possible in embodiments where the gear motor is at the very base of the ice bin beneath a horizontally positioned wheel. In order to maximize the area available for storage of ice within the ice bin 64, however, it is desirable that the wheel be placed in a horizontal plane with the gear motor 54 being placed in the relatively accessible intermediate space 53 between the upper unit 21 and the lower unit 55. Unfortunately, in such an embodiment the weight of the ice within the ice bin 64 upon the ice distributor 66 creates a strong transverse moment arm upon shaft 69. This results in a need to ensure accurate alignment of the shaft 69 with the coupling 70 to the gear motor 54. The present invention overcomes this limitation, however, by the provision of a novel bearing assembly 96 cast within the cold plate 95 beneath the ice distributor 66. As will be better understood further herein, this unique bearing assembly 96 provides several degrees of freedom for shaft 69 to align with the motor coupling 70.

Referring now to Figure 6, the bearing assembly 96 is shown with the lower most portion of shaft 69 in an exploded view. As shown in the Figure, the bearing assembly 96 is mounted upon a stainless steel carrier 97, which comprises an upper flange 98 and a lower flange 99 with an annular groove 100 therebetween. The flanged stainless steel carrier 97 is cast within cold plate 95 directly beneath the center of the ice distributor 66. Although those of ordinary skill in the art will recognize many alternatives, such as screws or bolts, casting the flanged carrier 97 within the cold plate 95 eliminates any concern that bacteria and the like might collect within the threads of other mounting hardware.

The stainless steel carrier 97 is provided with female threading 101 at an upper neck extending out of and above the cold plate 95 for interface with corresponding male threading 105 of a polyacetal socket 102, as shown in Figure 7. As shown in Figure 8, the interior of the polyacetal socket 102 is shaped to form a lower socket cavity 103. Female threading 104 is provided on the interior, top portion of the polyacetal socket 102 for interface with corresponding male threading 112 of polyacetal cap 110. As also shown in Figure 8, an upper socket cavity 111 is formed in the lower portion of the polyacetal cap 110.

The shaft 69 may thus be inserted through an orifice 113 in the polyacetal cap 110 and mated with a polyacetal bearing 106, which is secured to shaft 69 by insertion of a press pin through bore 108 in bearing 106 and bore 107 through shaft 69. Polyacetal cap 110 may then be screwed onto the polyacetal socket 102 securing the bearing 106, and consequently the lower portion of shaft 69, within the bearing assembly 96. Because the orifice 113 is slightly greater in diameter than shaft 69, the shaft may be tilted up to several degrees for alignment

with the coupling 70 to gear motor 54. Finally, although those of ordinary skill in the art will recognize that other designs may be implemented, it is preferred that the socket 102 and bearing 106 comprise a material such as polyacetal in order to prevent the necessity of lubricants in the bearing assembly 96, which might contaminate the ice within the ice bin 64.

5 Previous embodiments of ice dispensers have included means for sensing and controlling the level of ice within the ice bin. For example, U.S. patent No. 5,671,606 issued September 30, 1997 to Schoeder *et al.* ("the '606 patent") discloses an apparatus for monitoring and controlling the level of ice in an ice storage container that includes an emitter mounted within the ice storage container and a detector mounted directly opposite from the
10 emitter. By this reference, the full disclosure of U.S. patent No. 5,671,606 is incorporated herein as though now set forth in its entirety. As described in the '606 patent, the optical emitter assembly 72 and the optical detector assembly 73 of the present invention operate to detect the level of ice within ice bin 64. In this manner, a low ice condition may be indicated through the micro-controller based control circuit 52 to the ice and beverage unit's operator
15 and/or ice may be automatically routed to the ice bin 64 from an ice delivery system in communication with ice supply conduit 59 through the ice bin access lid 58. Exemplary of such an automated ice delivery system is that disclosed in U.S. patent application Serial No. 09/411,457 filed October 1, 1999 ("the '457 application"). By this reference, the full disclosure of U.S. patent application Serial No. 09/411,457 is incorporated herein as though
20 now set forth in its entirety.

Although the optical emitter assembly 72 and optical detector assembly 73 each operate as disclosed in the '606 patent, the assemblies 72, 73 of the present invention differ in that they are easily replaceable. In this manner, redundancy requirements are eliminated, greatly reducing cost to the end user. According to the present invention, instead of a unitary
25 construction for the assemblies 72, 73, a two-part assembly is provided for each. As will be better understood further herein, provision within each assembly 72, 73 is made to ensure that an emitter assembly 72 is not mistaken for a detector assembly 73 and vice versa. In particular, a system of keys and alignment slots is provided unique to each assembly in order that a user may only mate emitter components with the emitter assembly 72 and detector
30 components with the detector assembly 73.

Referring now to Figure 9, in particular, an optical emitter assembly 72 is detailed as exemplary of both the optical emitter assembly 72 and optical detector assembly 73. It is to be understood, however, that the relative alignment of the keys and alignment slots now described should be different for the two assemblies 72, 73, while the remaining components
35 are substantially identical. As shown in the Figure, each assembly generally comprises a body

assembly 115 for operative mating with a housing assembly 116. The body assembly 115 generally comprises a header assembly 80 permanently mated with an acrylonitrile butadiene styrene ("ABS") body 87. Likewise, the housing assembly 116 generally comprises a plurality of female sockets 77 permanently mated within an ABS housing 74. As generally
5 shown in Figure 5, the housing 74 is inserted through an emitter or detector orifice 93 in the ice bin housing 65 and secured thereto with a nut 94 or other similar mounting hardware. Wire leads 79, which are crimped or soldered 78 within the female sockets 77, are then permanently connected to the micro-controller based control circuit 52. Annular female
threading 75 is preferably provided on housing 74 for this purpose. As is shown in Figure 9,
10 recesses 114 are provided for receipt of the female sockets 77, which are preferably held in place with an epoxy to thereby help form a seal of the mounting orifice 93.

Each header assembly 80 generally comprises a printed circuit ("PC") board substrate for mounting of a light emitting diode ("LED") 82, in the case of an optical emitter assembly 72, or a photodetector, in the case of an optical detector assembly 73. The anode 83 or
15 cathode of the LED 82 are then soldered 84 to the PC board 81. Electrical connection is thereby made between the LED 82 and a plurality of male plugs 85, which are arranged in accordance with the positioning of an alignment slot 86 and key 90 as well as the alignment
of alignment slot 89 and key 76 in the body 74 to interface with female sockets 77. A standoff 117 is provided to cause the LED 82 or photodetector to protrude through an emitter
20 orifice 88 or detector orifice, as appropriate. The header assembly 80 is preferably epoxied into the ABS body 87 such that when the body assembly 115 is mated with the housing assembly 116 a complete seal is made of the orifice 93 in the ice bin housing 65. To further ensure that this seal is made, a plurality of annular grooves 91 are provided about body 87 for provision of a plurality of polymeric O-rings 92.

25 In an alternative embodiment, a blank body 87 may be produced wherein orifice 88 is either nonexistent or filled with epoxy so that the emitter and/or detector mounting orifices 93 may be sealed without the necessity of providing the more expensive header assembly 80 and components thereon. In this case one blank body 87 would be configured with alignment slot 89 corresponding to the location of key 76 of the optical emitter assembly 72 and another
30 configuration of the blank body 87 would have its alignment slot 89 corresponding to the location of key 76 of the optical detector assembly 73. While those of ordinary skill in the art will recognize that it is also possible for a general plug to be configured for the emitter and/or detector mounting orifices 93, it is desirable that the ice bin housing 65 be factory provided with at least the housing assembly 116 as now described in order that wiring 79 may be
35 connected to the micro-controller based control circuit 52 by factory personnel rather than

field service technicians. This compromise will allow users to later add automated ice supply systems, which generally require additional emitter and detector pairs, without requiring removal and replacement of the ice bin housing 65 or modification involving wiring to the control circuit 52. Likewise, it is not necessary to provide the expensive header assembly 80 to those users that do not wish to have the capability to interface to such an automated system. In the case of users already implementing automated systems, the modular design of the housing assembly 116 and body assembly 115 facilitate maintenance and repair inasmuch as the service technician is required only to remove the body assembly 115 from the housing assembly 116, by simply pulling the two apart, and replacing it with another, by pushing a new body assembly 115 into the housing assembly 116. Because no soldering is required, the chance for damage to the micro-controller based control circuit 52 and/or an intermittent electrical connection is greatly diminished. The overall result is enhanced reliability and increased user options at an economical price.

It is likewise desired that the modular flow controllers 24 be replaceable as simply as possibly. As shown in Figure 11, each modular flow controller 24 is adapted to interface with a mounting block 39. While the flow controller 24 and mounting block 39 of the present invention are essentially the same as that described in U.S. patent application Serial No. 09/496,441 filed February 2, 2000, the full disclosure of which is by this reference incorporated herein as though now set forth in its entirety, additional provision is added in the present invention to further facilitate coupling and decoupling of the flow controllers 24 to and from their respective mounting blocks 39.

As shown in Figures 11 and 12, and described in the '441 application, each modular flow controller 24 generally comprises a valve assembly 25 and flow control assembly 33. The valve assembly 25 in turn comprises a solenoid actuated valve 26 contained within an inductor shroud 27 by valve retainer 28. A manifold outlet 29 enables flow from the flow control assembly 33 to a nozzle connector fitting 30, which is retained in place by sliding element 31. A male electric connector 32 is provided for controlling communication with the micro-controller based control circuit 52 through the mounting block 39, as will be better understood further herein.

As also described in the '441 application, the flow control assembly generally comprises a flow control body 34 having a drink integrity lock 36 for restricting access to a provided adjustment means within the body 34. A female fluid coupling 35 is provided for interface with a corresponding male fluid coupling 42 on the mounting block 39. According to the improvement of the present invention, however, the male electric connector 32 of the valve assembly 25 and female fluid coupling 35 of the flow control assembly 33 are fixedly

positioned to interface simultaneously with a female electric connector 44 and the male fluid coupling 42, respectively, fixedly attached to the mounting block 39. In this manner, a user may remove a modular flow controller 24 from a mounting block 39 by simply turning off fluid cut-off valve 43, removing flow controller securing bracket 45 from the guide bores 38 and 41 of the mounting block 39 and flow control assembly 33 and thereafter simply pulling the modular controller 24 assembly apart from the mounting block 39. As a result of the simultaneous disconnection of the electrical connectors 32, 44 with the fluid couplings 35, 42 the chance for damage to the electrical connection by pulling of wires or the like is eliminated. This improvement prevents costly factory repair of the mixing and dispensing valves 22 due to careless replacement of the modular flow controllers 24. To replace the modular flow controller 24, the process is simply repeated starting with the simultaneous fluid and electrical connection followed by the insertion of the securing bracket 45 into guide bores 41 and 38 and ending with the opening of fluid cut-off valve 43.

While the foregoing description is exemplary of the preferred embodiment of the present invention, those of ordinary skill in the relevant arts will recognize the many variations, alterations, modifications, substitutions and the like as are readily possible, especially in light of this description, the accompanying drawings and claims drawn thereto. In any case, because the scope of the present invention is much broader than any particular embodiment, the foregoing detailed description should not be construed as a limitation of the scope of the present invention, which is limited only by the claims appended hereto.

CLAIMS:

What is claimed is:

1. A highly-maintainable dispenser for providing a product to the consuming public, said dispenser comprising:
 - 5 a lower unit having therein an ice bin;
an upper unit atop said lower unit, said upper unit providing an interface for dispensing ice from said ice bin to the public;
a conveyor having an inlet and an outlet, said inlet being located within said ice bin and said outlet being in communication with said interface;
 - 10 an ice distributor in a lower portion of said ice bin, said ice distributor being adapted to convey ice within said ice bin to said inlet; and
a drive motor operably associated with said ice distributor, said drive motor being located in a space above said lower unit.
2. The dispenser as recited in claim 1, said dispenser further comprising a shaft disposed
15 between said drive motor and said ice distributor.
3. The dispenser as recited in claim 2, said dispenser further comprising a bearing assembly disposed beneath said ice distributor for receiving a first end of said shaft, said bearing assembly being adapted to facilitate alignment of a second end of said shaft with said drive motor.
- 20 4. The dispenser as recited in claim 3, wherein said bearing assembly comprises:
a carrier member fixedly positioned in a base portion of said lower unit; and
a socket removably attached to said carrier member, said socket being adapted to receive a bearing affixed to said first end of said shaft.
5. The dispenser as recited in claim 4, wherein said socket comprises:
25 a lower portion, said lower portion comprising a lower cavity;
a cap adapted to removably attach to said lower portion, said cap comprising an upper cavity; and
wherein attachment of said cap to said lower portion mates said upper cavity with said lower cavity to receive said bearing.
- 30 6. The dispenser as recited in claim 5, wherein said socket comprises polyacetal.
7. The dispenser as recited in claim 6, wherein said carrier member comprises stainless steel.
8. The dispenser as recited in claim 7, wherein said upper unit is adapted to provide a second interface for dispensing a drink product to the public.

9. The dispenser as recited in claim 8, wherein said lower unit comprises a cold plate, said cold plate being adapted to chill the drink product to be dispensed to the public.
10. The dispenser as recited in claim 9, wherein said carrier member is cast within said cold plate.
- 5 11. The dispenser as recited in claim 8, wherein said second interface comprises:
a plurality of modular dispensing valves; and
a plurality of mounting blocks, said mounting blocks being adapted to receive one each of said modular dispensing valves.
12. The dispenser as recited in claim 11, wherein:
10 said modular dispensing valves each comprise a first electrical connector and a first fluid connector;
said mounting blocks each comprise a second electrical connector and a second fluid connector; and
wherein said first electrical connector is adapted to mate with said second electrical
15 connector and said first fluid connector is adapted to mate with said second fluid connector.
13. The dispenser as recited in claim 13, wherein each said connector is positioned such that mating of said fluid connectors results in substantially simultaneous mating of said electrical connectors.
- 20 14. The dispenser as recited in claim 4, wherein said lower unit comprises:
a plurality of optical emitter assemblies vertically disposed upon a first interior face of said ice bin;
a plurality of optical receiver assemblies vertically disposed upon a second interior face of said ice bin, said second face being opposite said first face; and
25 wherein said each said optical receiver assembly is adapted to receive an optical signal generated by one of said optical emitter assemblies for determining the level of ice within said ice bin.
15. The dispenser as recited in claim 14, wherein each said optical emitter assembly comprises:
30 an emitter housing, said emitter housing being fixedly attached to said first interior face and adapted for fixed electrical communication with a dispenser controller;
an emitter body, said emitter body comprising an optical source; and
wherein said emitter body is adapted to removably mate with said emitter housing for establishing an electrical connection between said optical source and the dispenser controller.

16. The dispenser as recited in claim 15, wherein each said optical receiver assembly comprises:

a receiver housing, said detector housing being fixedly attached to said second interior face and adapted for fixed electrical communication with the dispenser controller;

5 a receiver body, said detector body comprising an optical receiver; and

wherein said receiver body is adapted to removably mate with said receiver housing for establishing an electrical connection between said optical receiver and the dispenser controller.

17. The dispenser as recited in claim 16, wherein:

10 each said emitter assembly comprises a first key and a first slot, said first key being arranged relative to said first slot to facilitate mating of said emitter body with said emitter housing;

each said receiver assembly comprises a second key and second slot, said second key being arranged relative to said second slot to facilitate mating of said receiver body with said receiver housing; and

15 said relative arrangement of said second key with said second slot differs from said relative arrangement of said first key with said first slot.

18. The dispenser as recited in claim 16, wherein said lower unit is adapted for connection of said ice bin with an automated ice delivery system.

20 19. The dispenser as recited in claim 4, said dispenser further comprising a conveyor speed selection switch, said conveyor speed selection switch being adapted to vary the rate at which said conveyor transfers ice from said ice bin to said interface.

20. The dispenser as recited in claim 1, wherein said conveyor comprises an auger.

21. The dispenser as recited in claim 1, wherein said ice distributor comprises a wheel.

25 22. An dispenser for dispensing ice, said dispenser comprising:

an ice bin for holding a quantity of ice;

a mechanism for dispensing ice from within said bin to an outlet;

a detector for determining the level of ice within said bin, said detector comprising:

a control circuit;

30 a plurality of optical emitter assemblies disposed upon a first interior side wall of said ice bin, each said optical emitter assembly comprising:

an emitter housing, said emitter housing being dependently attached to said first interior side wall and in fixed electrical communication with said control circuit;

35 an emitter body, said emitter body comprising an optical source; and

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wherein said emitter body is adapted for removable engagement with said emitter housing for establishing an electrical connection between said optical source and said control circuit;

5 a plurality of optical receiver assemblies disposed upon a second interior side wall of said ice bin, each said optical receiver assembly comprising:

a receiver housing, said receiver housing being dependently attached to said second interior side wall and in fixed electrical communication with said control circuit;

10 a receiver body, said receiver body comprising an optical receiver; and wherein said receiver body is adapted for removable engagement with said receiver housing for establishing an electrical connection between said optical receiver and said control circuit; and

wherein each said optical receiver assembly is adapted to receive an optical signal generated by one of said optical emitter assemblies.

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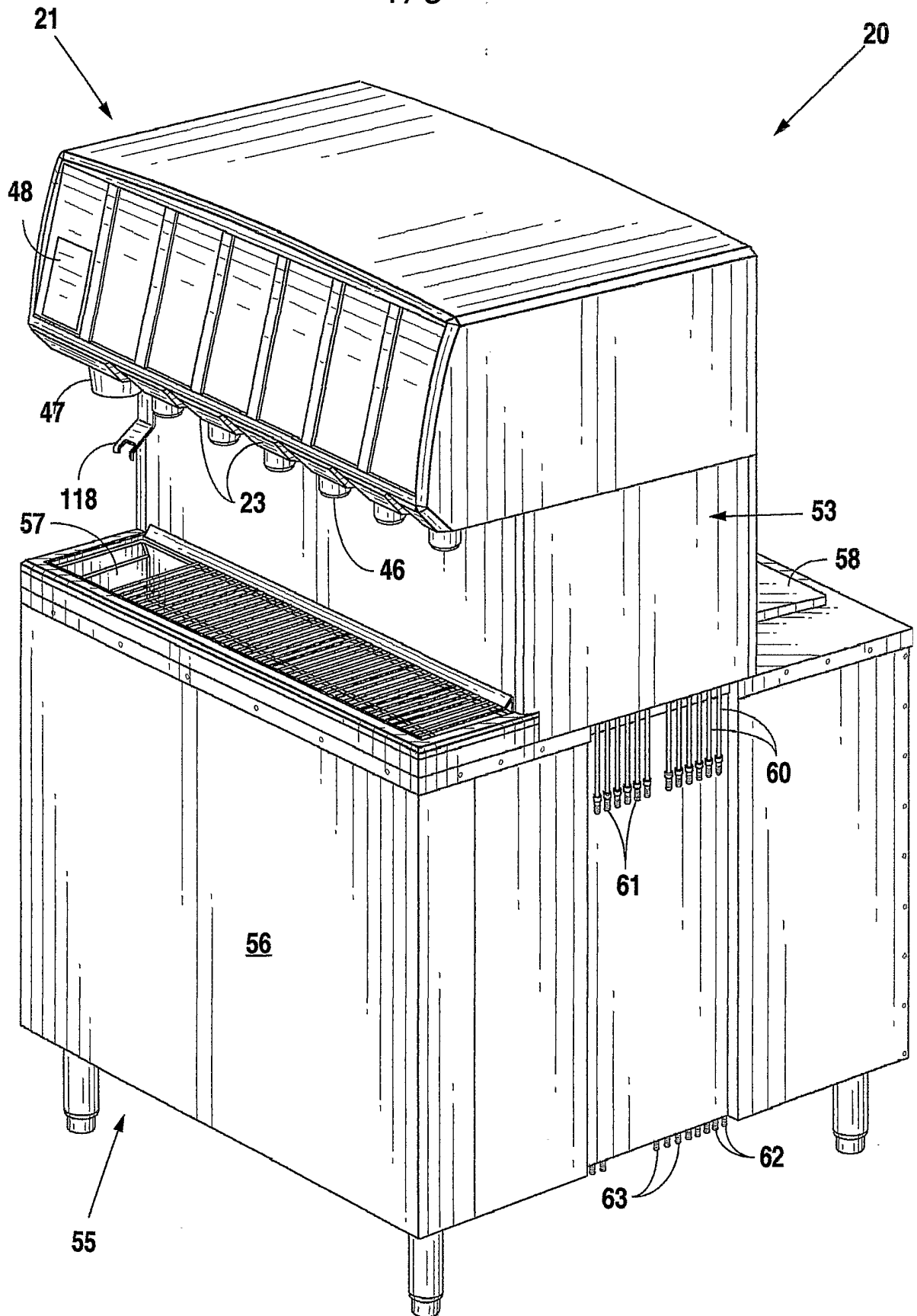


Fig. 1

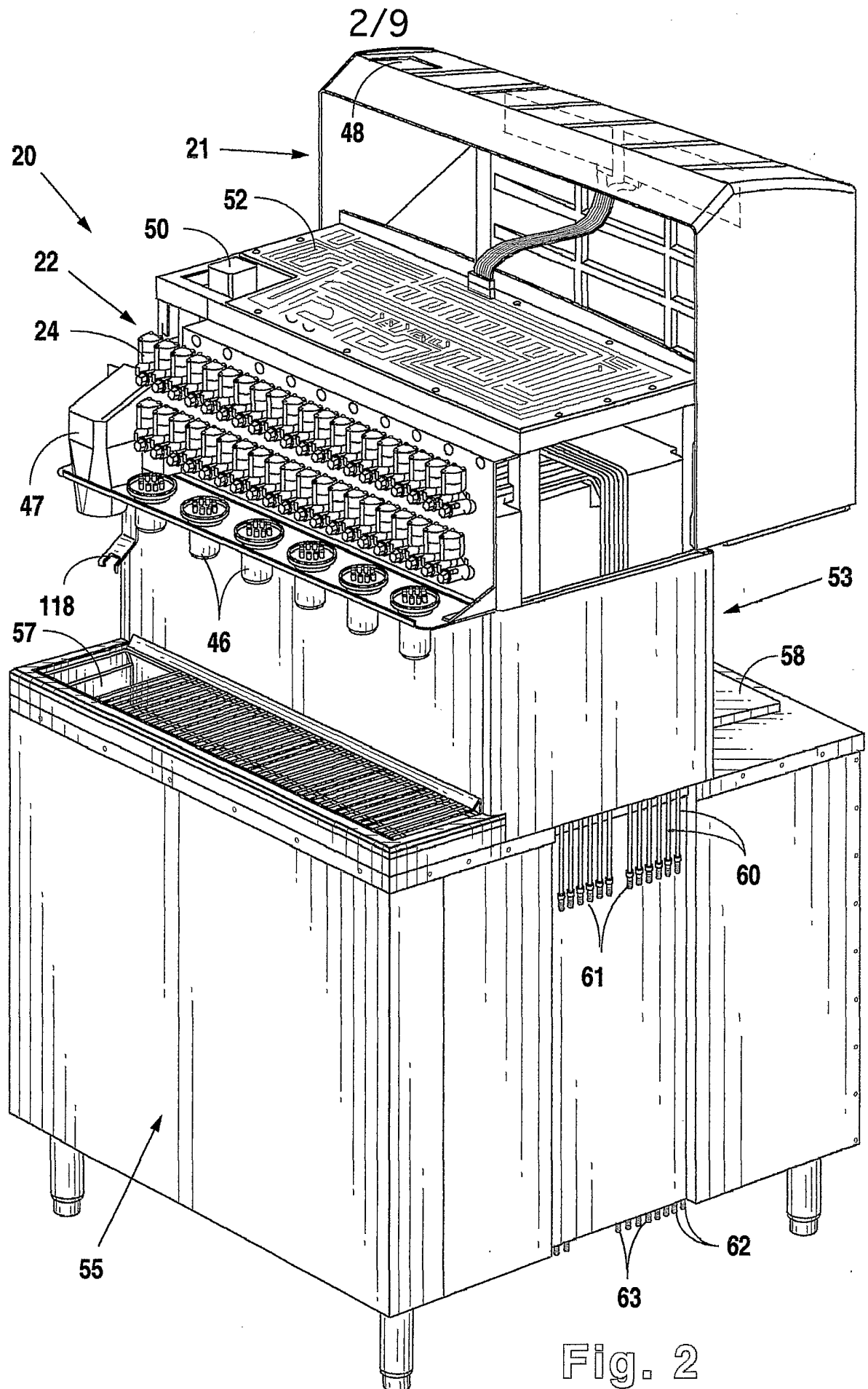
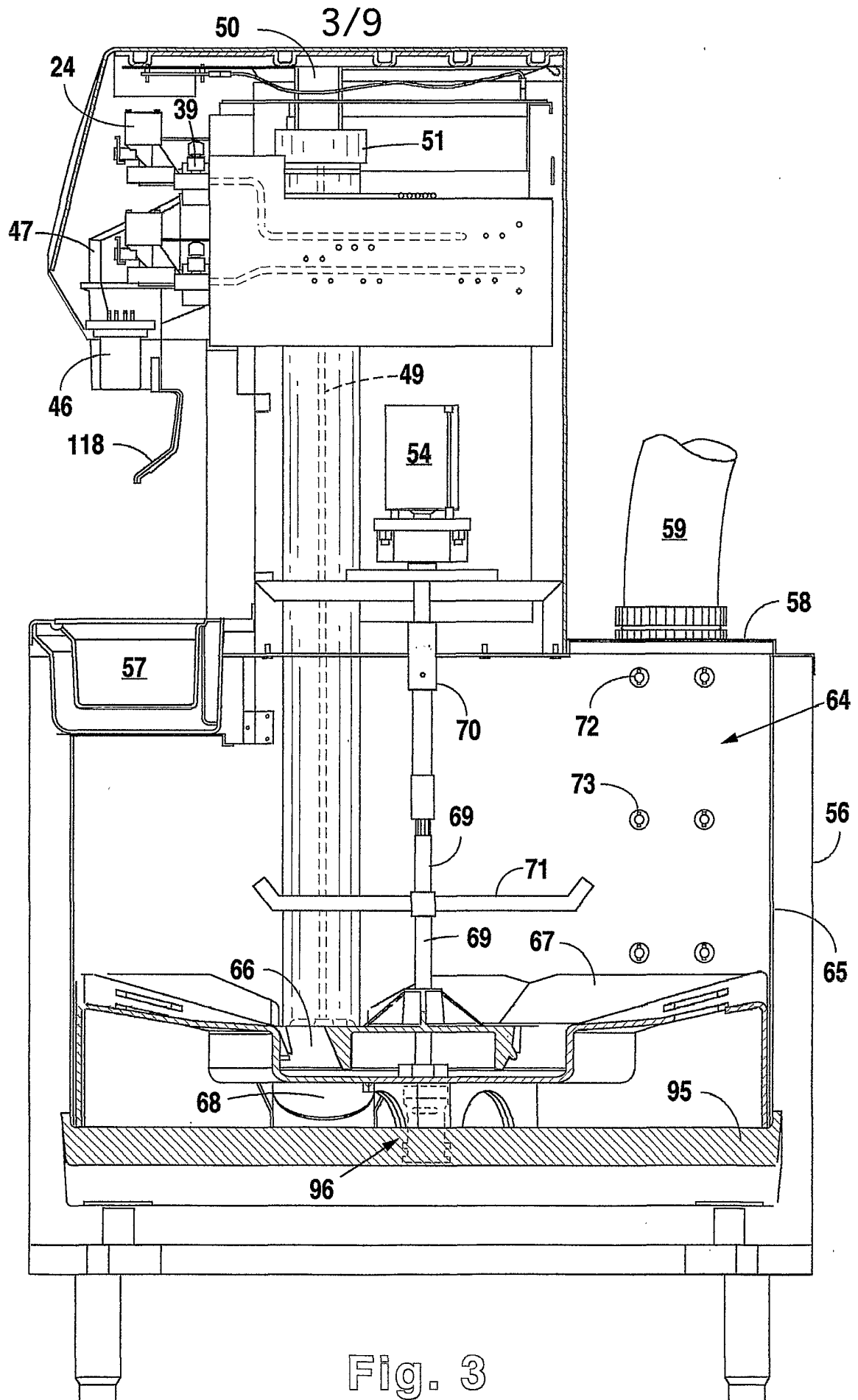


Fig. 2



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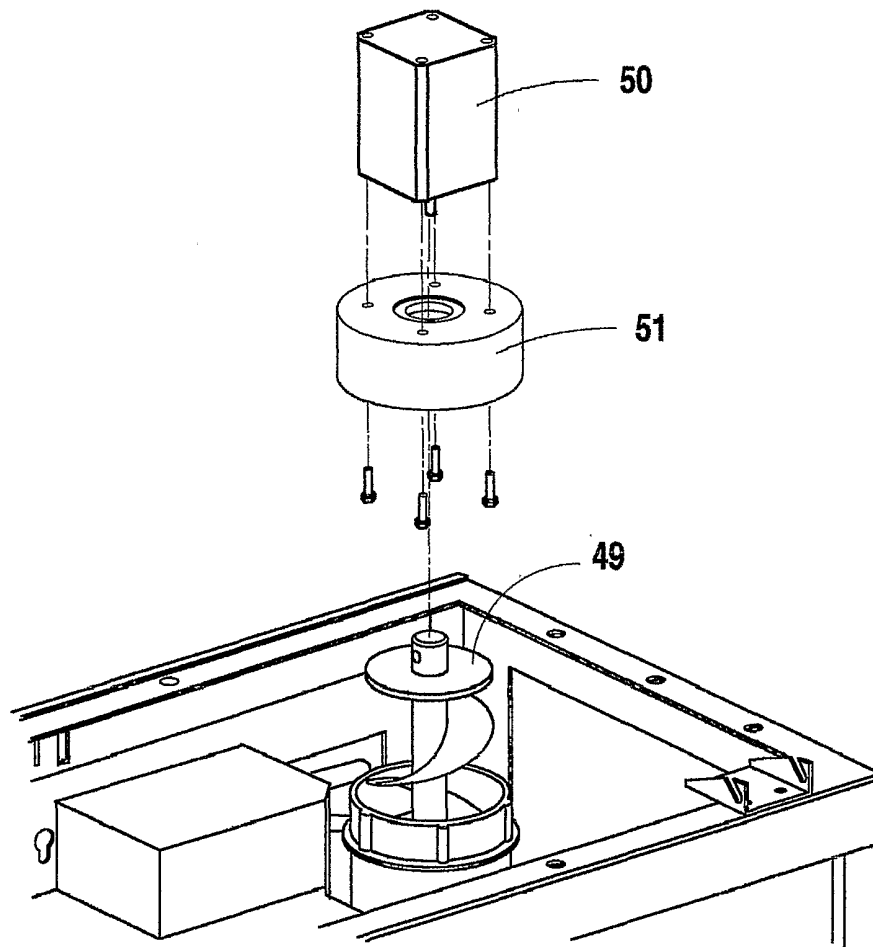


Fig. 4

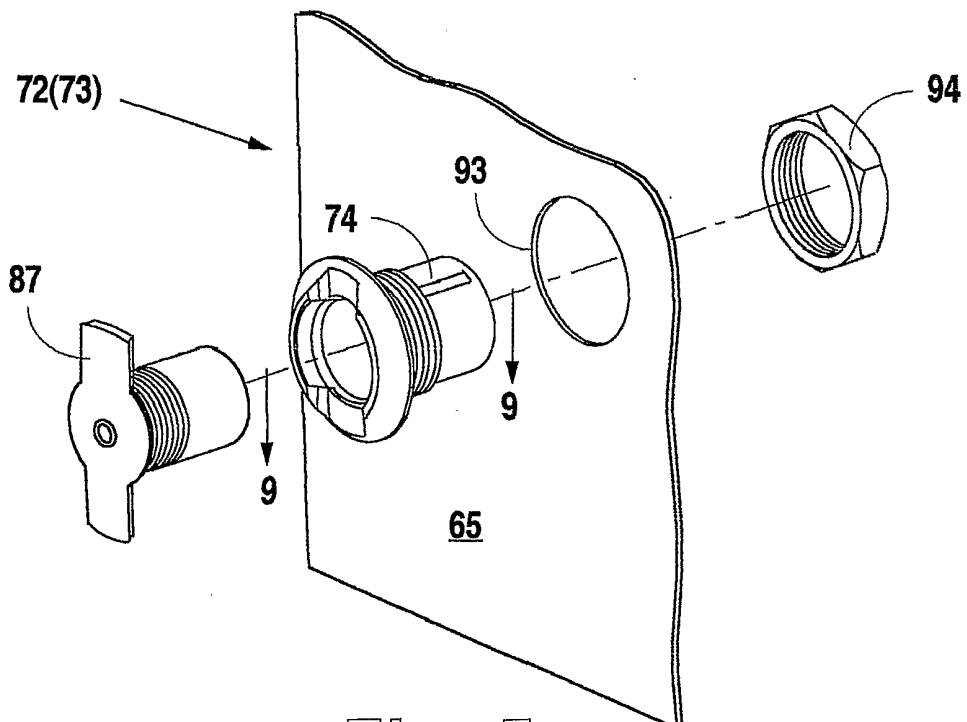


Fig. 5

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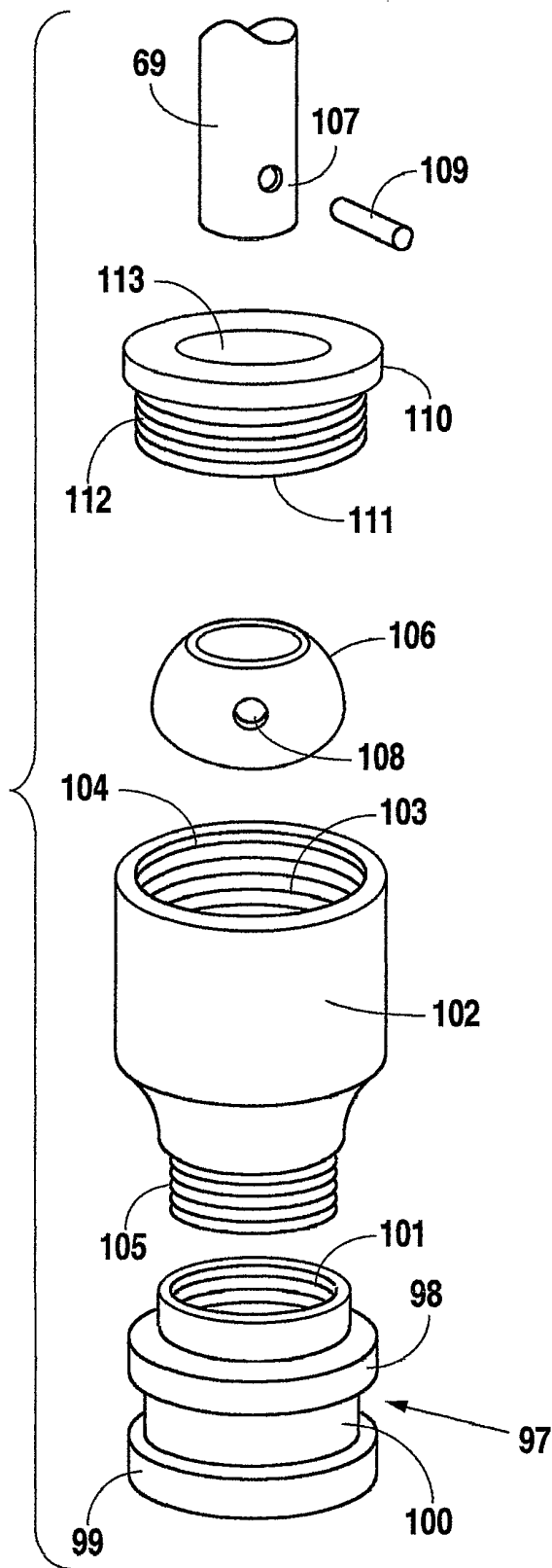


Fig. 6

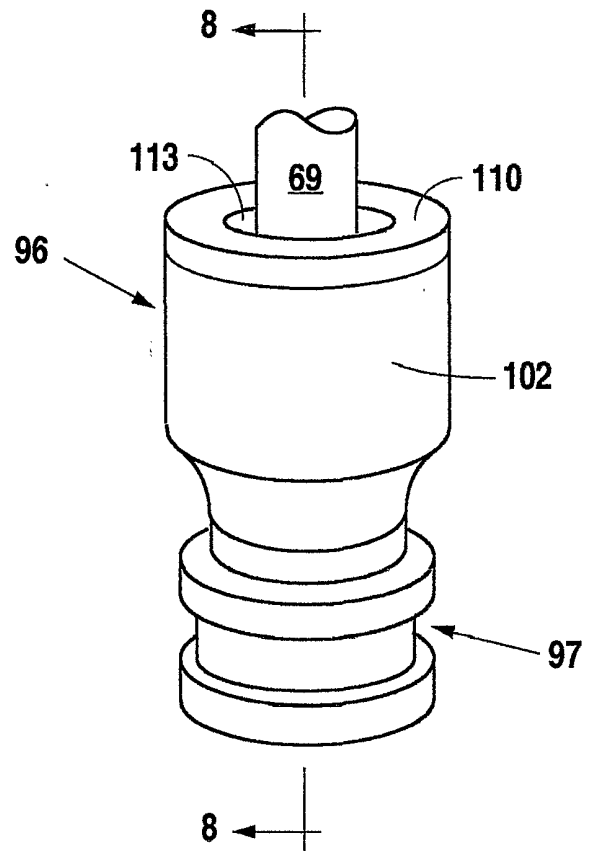


Fig. 7

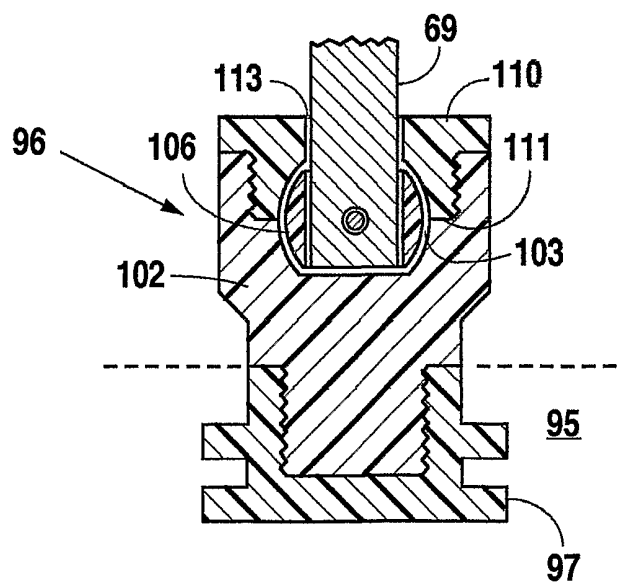


Fig. 8

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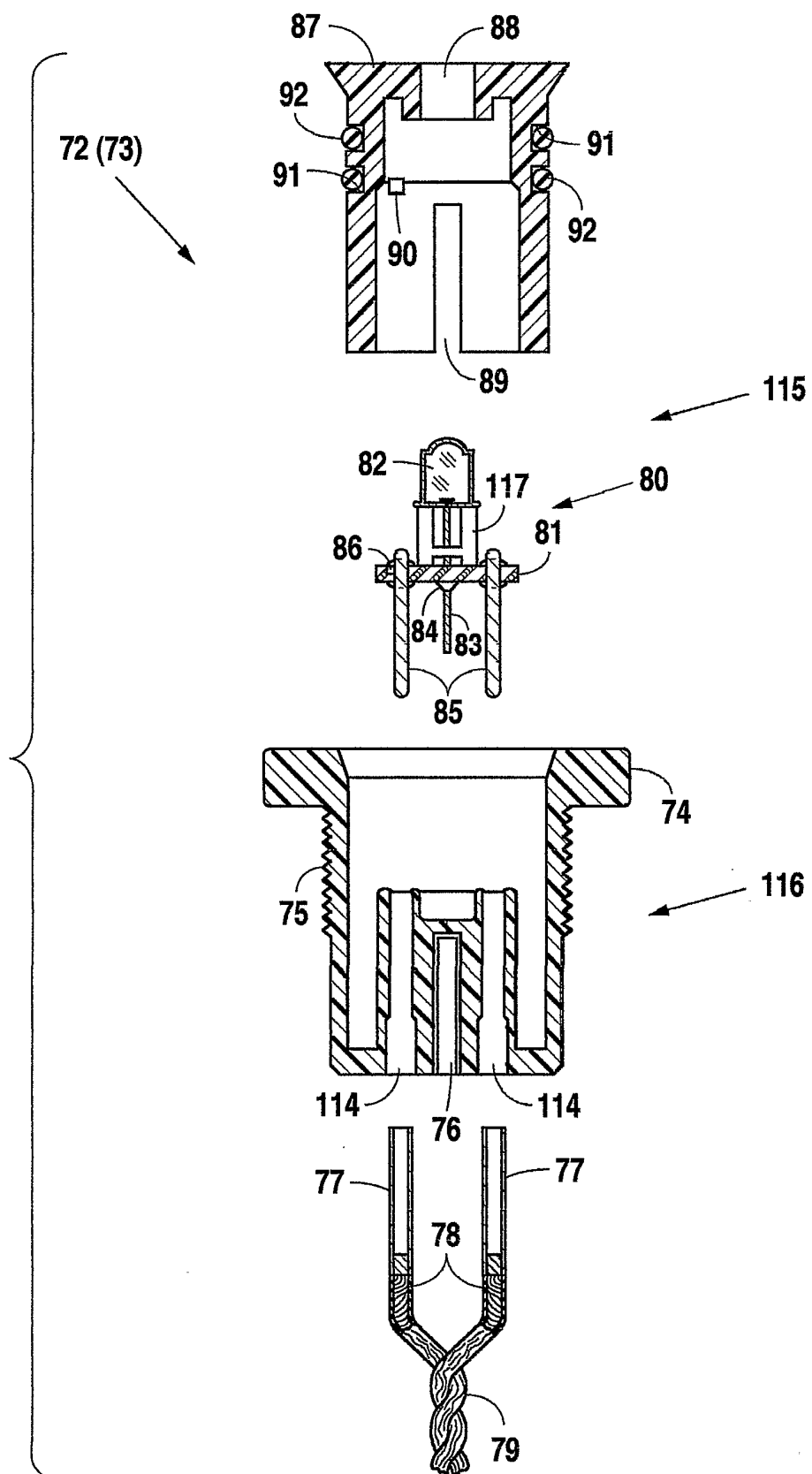
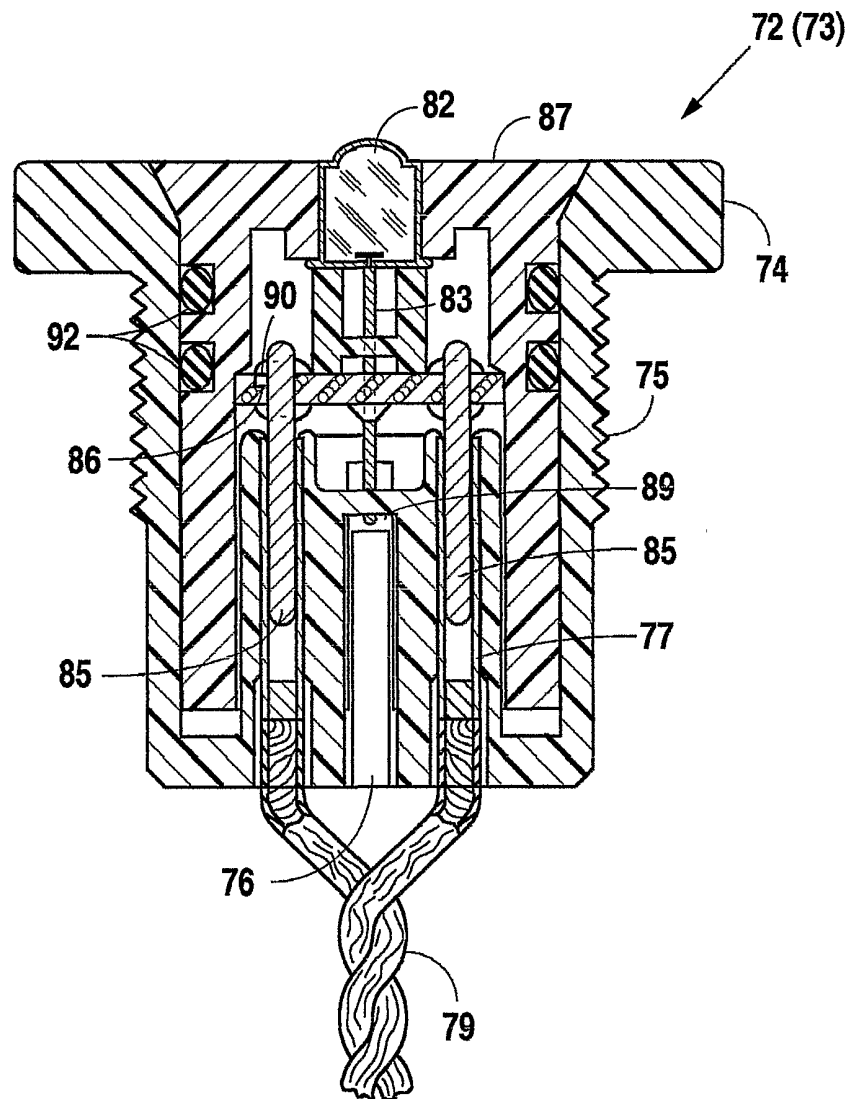


Fig. 9

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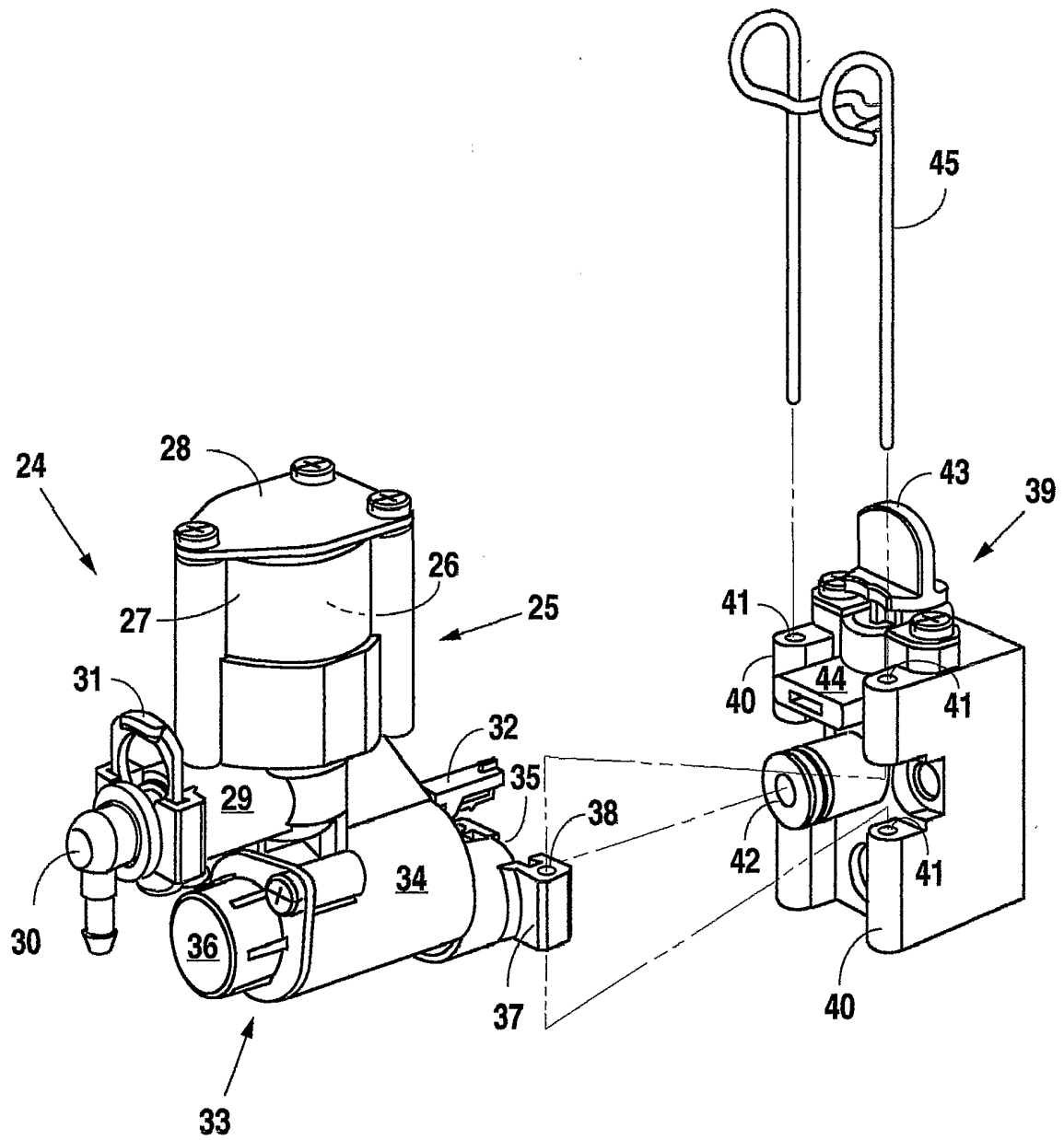


Fig. 11

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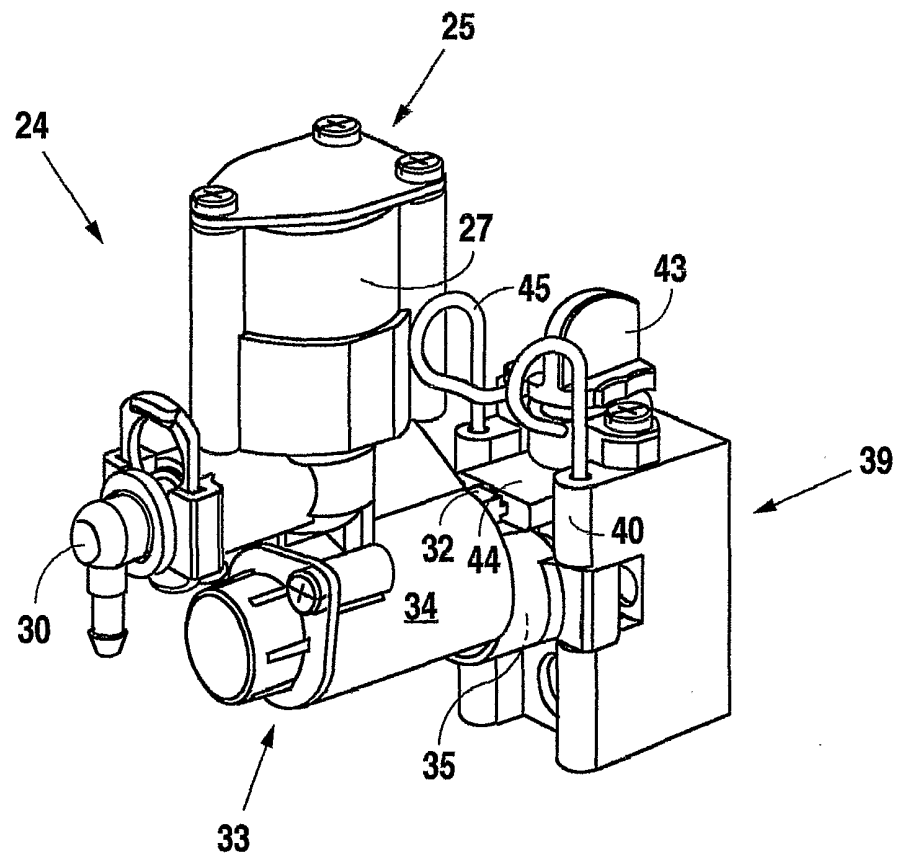


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/41539

A. CLASSIFICATION OF SUBJECT MATTER		
IPC(7) : F25C 5/18		
US CL : 222/065, 129.1, 146.6, 239, 413		
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)		
U.S. : 222/064, 065, 129.1, 129.2, 129.3, 146.6, 238, 239, 405, 413		
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 practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,211,338 A (WEIL et al.) 12 October 1965 (12.10.1965), col. 2, line 3 to col. 7, line 18.	1-3, 20
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Y		21
X	US 4,732,301 A (TOBIAS et al.) 22 March 1988 (22.03.1988), col. 2, line 45 to col. 6, line 47.	1-3, 20
Y	US 5,542,573 A (FRANTZ) 06 August 1996 (06.08.1996), col. 2, line 1 to col. 3, line 37.	21
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier application or patent published on or after the international filing date	"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
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	
Date of the actual completion of the international search		Date of mailing of the international search report
18 September 2001 (18.09.2001)		17 OCT 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230		Authorized officer <i>J. Husley for</i> Kenneth Bomberg Telephone No. 703-308-0861