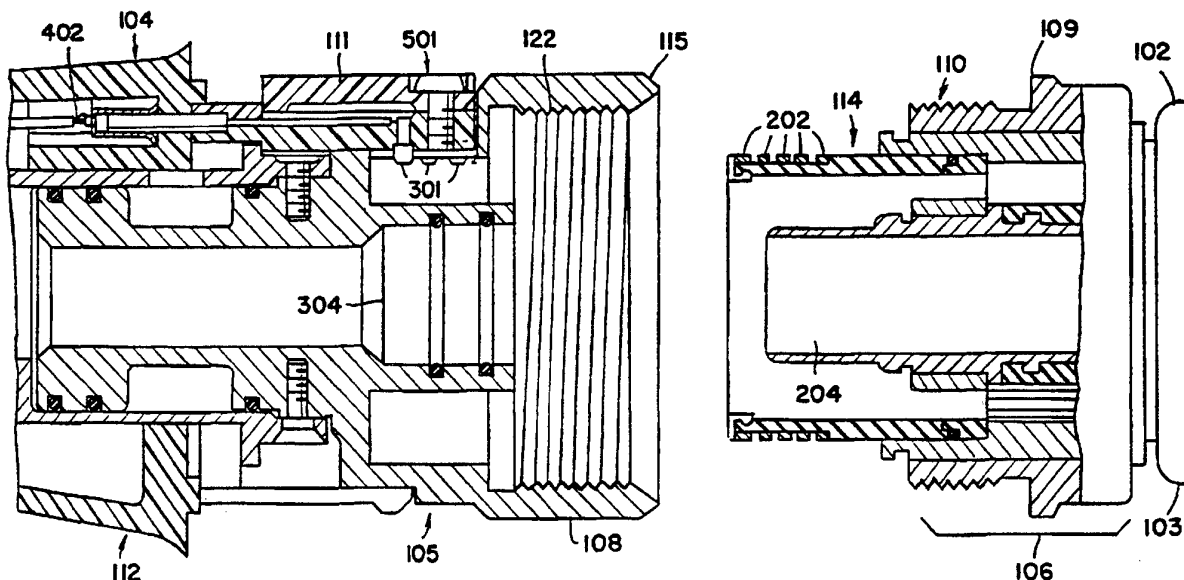




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US93/11746 (22) International Filing Date: 2 December 1993 (02.12.93) (30) Priority Data: 986,095 4 December 1992 (04.12.92) US (60) Parent Application or Grant (63) Related by Continuation US 986,095 (CIP) Filed on 4 December 1992 (04.12.92) (71) Applicant (for all designated States except US): SABER EQUIPMENT CORPORATION [US/US]; 111 Research Drive, Stratford, CT 06497 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): SIMPSON, W., Dwain [US/US]; 124 Catalpa Road, Wilton, CT 06897 (US). PYLE, James, H. [US/US]; 29 Bradley Road, Weston, CT 06883 (US). WILCOX, Geoffrey, F. [US/US]; 195 Painter Hill Road, Roxbury, CT 06783 (US). (74) Agent: KADEN, Jeffrey, M.; Gottlieb, Rackman &amp; Reisman, 1430 Broadway, New York, NY 10018-3308 (US).</p>		<p>(81) Designated States: AT, AU, BB, BG, BR, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  Published With international search report.</p>

(54) Title: ELECTRICAL CONNECTOR AND FUEL DISPENSING HOSE



(57) Abstract

A fuel dispensing hose having conductive elements for transmitting electric signals from a fuel dispenser to a fuel dispensing nozzle. A plurality of conductive bands are installed around a portion of the hose, and a plurality of conductive plungers (301) in the fuel nozzle make contact with the conductive bands. As the hose is twisted, the conductive bands remain in contact with the plungers (301), thereby providing uninterrupted electric signals to the nozzle.

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## Electrical Connector and Fuel Dispensing Hose

This application is a Continuation-In-Part Application of  
5 Application Serial No. 07/986,095 filed December 4, 1992,  
presently pending.

### Background Of The Invention

The present invention relates to an electrical  
connector and improved dual channel fuel dispensing hose for  
10 a fuel dispensing system, and more particularly to an  
improved hose that carries electrical power and fuel to a  
fuel dispensing nozzle from the fuel dispenser and carries  
fuel vapor away from a fuel dispensing nozzle.

In the past several years, workers in the art of fuel  
15 dispensing nozzles have attempted to provide electronics,  
led displays, and basic computer capabilities within the  
nozzle itself. These attempts have been hampered by the  
inability to transport the electrical power and signals from  
the fuel pump to the nozzle.

20 U.S. Patent No. 4,005,412, issued to Leander, on June  
25, 1977, is an example of a prior art system. In the  
Leander arrangement, a display is placed atop a nozzle. The  
display is capable of displaying the amount of fuel  
dispensed, or other user information. The nozzle is powered  
25 by a battery installed therein.

Another example of such a nozzle is described in U.S.  
Patent No. 4,140,013, issued to Hunger. In the Hunger  
patent, the nozzle has an electronic flowmeter, in addition  
to a display system for displaying data to be read by the  
30 user. This patent speaks only generally of power  
requirements, and suggests using a battery.

Numerous other attempts have been made in the prior art  
to provide electronics and computer capabilities to a  
dispensing nozzle. The problem in the prior art is that no  
35 safe and efficient way to provide power to the fuel

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dispensing nozzle exists. Because of the high volatility of fuel being dispensed, it has always been unsafe to provide power supplies in the nozzle, or to run electrical wires to the nozzle. As a result, although numerous patents and  
5 prior art publications showing electronics installed into fuel dispensing nozzles exist, none of these have met with commercial success. Regulatory bodies responsible for safety, such as Underwriters Laboratories (UL), have been reluctant to grant approval to fuel dispensing nozzles with  
10 unsafe power supplies built in.

Another problem with powering fuel dispensing nozzles is that if the power supply is not built into the nozzle, it must be remotely located and wires run from the remote location, down the fuel dispensing hose, to the nozzle. The  
15 problem with this is that the nozzle is often twisted and turned by the user relative to the fuel dispensing hose. Such use presents the danger that the wires will bend too often and eventually fray or electrically short to one another. Due to the volatility of the fuel being dispensed,  
20 the situation can become dangerous and explosions may occur.

In view of the desirability of providing user friendly electronics, data input capabilities, and other user friendly items which require electric power in a fuel dispensing nozzle, it can be appreciated from the above  
25 discussion that it would be desirable to provide a safe, efficient, and easy to manufacture technique for providing electric power to a fuel dispensing nozzle.

#### Summary Of The Invention

The above and other problems of the prior art are  
30 overcome in accordance with the present invention which relates to an improved technique for providing power to a fuel dispensing nozzle. In accordance with the invention, a fuel dispensing hose includes a first closed pathway for carrying fuel in a first direction and a second closed  
35 pathway for carrying vapor in a second opposite direction.

Wires or fiber optic material are also provided within the hose for carrying the electric signal between the fuel dispenser and the dispensing nozzle assembly. A connecting collar screws onto the nozzle and connects the nozzle and  
5 hose. The electric power is transferred from the hose to the nozzle by a cylindrical member which contains a plurality of conductive bands therearound.

The dispensing hose is connected at one end to the fuel dispenser. At this end, electrical power is transferred  
10 from the dispenser to the hose by a male electrical contact on the hose which engages a female electrical contact provided in the input output port of the dispenser. Two stabilizing rods are provided on the hose to lock the hose to the dispenser in stationary engagement. Wires run down  
15 the fuel dispensing nozzle from the male contact on the hose to the conductive bands of the cylindrical member on the other end thereof. This transports electrical signals from one end of the hose to the other.

When the cylindrical member is connected to the fuel  
20 dispensing nozzle, the conductive bands are placed in contact with conductive plungers on the inside of the fuel dispensing nozzle.

The conductive plungers are resilient and tend to expand out and away from the fuel dispensing nozzle. Due to  
25 the resiliency of the conductive plungers, the conductive plungers and conductive bands remain in contact with each other despite variations in the surface of the conductive bands and cylindrical member.

Importantly, the fuel dispensing nozzle can rotate  
30 freely without effecting the connection between the conductive bands and the conductive plungers. Thus, the problem with the wires twisting is eliminated.

The conductive plungers are connected through the valve of the fuel dispensing nozzle, to the display system,  
35 computer electronics, or other electrical device in the fuel dispensing nozzle. Importantly, the risk of tangled and

twisted wires is eliminated as is the need for a power supply in the fuel dispensing nozzle itself. Both of these advantages result in a much safer system which can be exploited commercially, unlike all prior art systems.

5

#### Brief Description Of The Drawings

FIG. 1 is a perspective view of a fuel dispensing nozzle with a fuel dispensing hose connected thereto;

FIG. 2 is an end plan view of the receiving end of a  
10 fuel dispensing hose in accordance with the preferred embodiment of the invention;

FIG. 3 is a side elevational view of a fuel dispensing hose in partial cross section along lines 3-3 of FIG. 2;

FIG. 4 is an end plan view of the input output port  
15 opening of a fuel dispenser;

FIG. 5 is an enlarged view of the fuel dispensing hose and nozzle of FIG. 1, showing the portion of the fuel dispensing hose which connects to the fuel dispensing nozzle;

FIG. 6 is a top exploded view of the fuel dispensing  
20 nozzle and hose;

FIG. 7 is a rear view of the fuel dispensing nozzle;

FIG. 8 is an enlarged view of the electrical connector shown in FIG. 7;

FIG. 9 is a cross-sectional exploded view of the nozzle  
25 connected to the hose;

FIG. 10 is an enlarged view of the conductive plunger shown in FIG. 8; and

FIG. 11 shows an alternative embodiment of the  
30 conductive plunger.

#### Detailed Description Of The Preferred Embodiment

FIG. 1 is a perspective view showing a fuel dispensing hose 102 partially connected to fuel dispensing nozzle 104. The nozzle includes a fuel dispensing valve 105 installed  
35 therein. Valve 105 is generally cylindrical and is

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contained within nozzle body 112. The valve is preferably designed to be slidably disengageable from nozzle 104 and is preferably held within nozzle 104 by a breakaway ring 107 as described in the previous application Serial Nos. 07/931,696  
5 and 08/105,375 assigned to the same assignee as the present application.

The nozzle body 112 includes optional electronics 113 mounted therein. The electrical connector 111 carries electrical power and/or data signals from valve 105 to  
10 nozzle 104 as described hereafter. A valve connector portion 108 of valve 105 mates with a connecting collar 106 of hose 102 to connect dispensing hose 102 to nozzle 104. The fuel dispensing hose 102 includes a plastic hose guard 103 at the point where connecting collar 106 meets with  
15 valve connector portion 108. The trigger, spout, and other conventional elements of the nozzle 104 are also shown.

Particular reference is next made to FIGS. 2 - 4, which illustrate the preferred embodiment of the dual channel hose 102 of the present invention. Hose 102 is connected at a  
20 first end 102a to an input output port 12 of a fuel dispenser and vapor recovery tank. Hose 102 is connected at a second end 102b to fuel dispensing nozzle 104.

Hose 102 is formed of a first annular outer tube 14 preferably formed of a rubber or plastic type material that  
25 is flexible and impermeable to vapor. A second inner tube 16 is also preferably formed of a flexible material that is of a fluid and vapor impermeable substance.

Inner tube 16 includes a continuous inner wall 17 that forms a first pathway 18 to allow fuel to flow from the fuel  
30 dispenser to fuel dispensing nozzle 104 in the direction of arrow A. In particular, during engagement with input output port 12 of the dispenser, annular metallic element 50 which is coupled to inner tube 16 engages annular element 52 of input output port 12. In the preferred embodiment, annular  
35 element 52 includes at least one gasket therein to create a seal with annular metallic element 50.

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A second annular pathway 11 is formed by inner tube 16 and the inner wall 13 of outer tube 14. Second annular pathway 11 carries vapor in a direction opposite to arrow A. In other words, vapor travels from fuel dispensing nozzle 5 104 to the fuel dispenser. A plurality of conductors 206, such as wires or fiber optic material, are disposed within second annular pathway 11 and electrically couple the fuel dispenser and fuel dispensing nozzle 104.

At first end 102a, hose 102 connects to the input 10 output port 12 of the fuel dispenser. Two stabilization bars 22 and 23 are provided to engage slots 24 and 25 of input output port 12. Furthermore, stabilization bars 22 and 23 and slots 24 and 25 help to position male electrical connector 28 within female electrical connector 30. Male 15 electrical connector 28 is formed of a substrate with a plurality of conductive land areas disposed thereon. Each conductive land area is coupled to one of conductors 206. Female electrical connector 30 is formed with a slot 31 to receive male electrical connector 28 therein. Female 20 electrical connector 28 also includes a plurality of leaf spring contacts aligned to bear against the conductive land areas of male connector 28. This relationship allows the electric signals of the fuel dispenser to be coupled with conductors 206 of hose 102.

25 It is important to note that when stabilization bars 22 and 23 engage slots 24 and 25, the hose 102 cannot rotate relative to input output port 12 of the fuel dispenser. Therefore, when external threads 42 of the rotatable connecting collar 40 engage the internal threads 44 of input 30 output port 12 of the fuel dispenser, male connector 28 is forced to move linearly into engagement with the female electrical connector 30. If torque is applied to hose 102 relative to input output port 12 of the fuel dispenser, no lateral pressure will be exerted on male and female 35 electrical connectors 28 and 30 because of the engagement of the stabilization bars 22 and 23 engaging slots 24 and 25.

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If hose 102 is pulled or pressure is exerted thereon in the axial direction relative to the input output port 12 of the fuel dispenser, the pressure or tension is absorbed by rotatable collar 106.

5 Particular reference is next made to FIGS. 3 and 5 in connection with the coupling of hose 102 at second end 102b with fuel dispensing nozzle 104. The figures show nozzle 104 and hose 102 slightly disconnected from each other. Connecting collar 106 includes a threaded portion 110 which,  
10 in actual operation, is fully secured to valve connector portion 108 so that flange 109 butts directly up against valve end 115. Mating threads 122 on the inside of valve connector portion 108 connect directly to threaded portion 110.

15 Electrical connector 111, more fully described later herein, couples electrical conductors from valve 105 to nozzle body 112. Further electrical conductors 120 may be utilized to run electrical power from the electrical connector 111, through nozzle 104, to electronics 113 which  
20 may comprise a display, a data input keypad, or other such device. Additionally, valve control, sensors, and any other electronic or electromechanical devices present in the nozzle may be powered via these electrical conductors. The electronics may, of course, be located anywhere on the  
25 nozzle which is convenient or desirable.

The dispensing hose 102 preferably comprises two concentric channels, with inner channel 204 mating with valve channel 304 when the hose and nozzle are connected.

Importantly, connecting collar 106, including threaded  
30 portion 110, is free to rotate independent of rotation of dispensing hose 102, hose guard 103, or cylindrical member 114, and is axially constrained by means of a snap ring or other means well known in the art. The hose can be viewed as comprising a rotatable and a stationary part. The  
35 rotatable part is connecting collar 106, and the stationary part comprises cylindrical member 114, hose 102 and hose

guard 103.

If one were to rotate connecting collar 106, and simultaneously grasp fuel dispensing hose 102, such action would cause hose guard 103 and cylindrical member 114 to be stationary and connecting collar 106 would rotate relative thereto. Furthermore, when collar 106 is assembled and connected to fuel dispensing nozzle 104, fuel dispensing nozzle 104 and collar 106 rotate relative to hose 102. This construction keeps the connecting collar 106 from unscrewing as the hose 102 twists and turns. This is opposite to the top portion of the hose 102a of FIG. 3 which is designed not to rotate due to the locking engagement of stabilization bars 22 and 23 relative to slots 24 and 25.

FIG. 6 shows a top view of the hose and nozzle disconnected from one another as in FIG. 5. FIGS. 5 and 6 show that cylindrical member 114 also includes a plurality of conductive bands 202 preferably made from copper. The conductive bands run circumferentially around the outside of cylindrical member 114. It is understood that while in this exemplary embodiment conductive bands 202 span the entire outer perimeter of cylindrical member 114, this need not be the case. For example, if rotation of the nozzle 104 relative to hose 102 is limited to less than 360°, then there will be portions of the cylindrical member 114 to which the conductive bands need not be affixed. This is simply a matter of design choice. For example, one way of preventing rotation is to change cylindrical member 114 so that it is not completely cylindrical.

The conductive bands 202 are parallel to one another and each is capable of conducting electricity of sufficient quantity to exchange signals and power with the desired electronics installed in the fuel dispensing nozzle.

Shown in dotted outline in FIG. 6 are conductors 206. Conductors 206 run down the length of fuel dispensing hose 102 from a power supply installed in a remote location. The plurality of conductors 206 are preferably color coded and

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each terminates inside cylindrical member 114. The power supply should be of an intrinsically safe design and approved for use in a fuel dispensing environment. Techniques for designing such supplies and/or adopting  
5 conventional supplies for intrinsic safety are well known in the art.

Each of the conductors 206 is connected to a different one of conductive bands 202 as depicted in FIG. 6. The conductors 206 terminate inside the cylindrical member 114  
10 and a separate small bore 306 is drilled through cylindrical member 114 to connect each conductor 206 from the inside of cylindrical member 114 to its associated conductive band on the outside of cylindrical member 114. The connection is preferably made by including a small conductive stub on the  
15 inside of each conductive band 202 which protrudes through the small bore on cylindrical member 114 into the inside of cylindrical member 114.

FIG. 7 depicts a rear view of valve 105 looking into the valve with dispensing hose 102 fully removed.  
20 Electrical connector 111 is also shown in FIG. 7. Inner valve channel 304 mates with channel 204 from dispensing hose 102. Cylindrical member 114, with its previously described conductive bands 202, would lie between valve channel 304 and the outer surface 305 of valve connector  
25 portion 108.

A plurality of conductive plungers 301 emanate from electrical connector 111 as best seen in FIGS. 5 and 6. The particulars of these conductive plungers will be described later herein. The conductive plungers are arranged so that  
30 each of them contacts a different one of the conductive bands 202 when the dispensing hose is mated with the fuel dispensing nozzle. The conductive plungers are arranged along electrical connector 111 around screw 501 as best seen in FIG. 6.

35 It can be seen from FIGS. 6 and 9 that when the dispensing hose 102 is fully inserted into valve connector

portion 108, the electricity and/or electrical signals will be supplied from conductors 206 through conductive bands 202, to conductive plungers 301, and through electrical connector 111 to the dispensing nozzle. The signals may then  
5 be transmitted through the dispensing nozzle to the appropriate electronics by a set of conductors 120 installed within the dispensing nozzle.

In the preferred embodiment, electrical connector 111 includes a plurality of stubs 402 which mate with a  
10 plurality of sockets 403 in a different connector in dispensing nozzle 104 as shown in FIG. 6. However, it should be noted that once the appropriate power and electrical signals are supplied through electrical connector 111 to dispensing nozzle 104, any appropriate technique can  
15 be utilized to run the power and signals to and from the appropriate electronics in the dispensing nozzle 104.

An exploded view of electrical connector 111 is shown in FIG. 8. One of stubs 402 is shown as extruding from the connector. As described with reference to the previous  
20 figures, these stubs would mate with a socket for supplying power and/or signals to the dispensing nozzle. Stubs 402 are connected to conductive plungers 301 through the connector by means of conductors 502.

The connector 111 is preferably manufactured in two  
25 parts with a small screw 501 holding the parts together. This allows the conductive plungers 301, one of which is shown by means of a cutaway in FIG. 8, to be placed in the bottom portion 503 and connected to their respective conductors 502 before the top portion 504 is connected  
30 thereto.

The conductive plungers 301 are slightly compressible in length so that as cylindrical member 114 rotates, small variations in the width of conductive bands 202 or cylindrical member 114 itself are compensated for.  
35 Moreover, the plungers 301 are spring loaded and thus resiliently tend to expand to their full length. Therefore,

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contact with conductive bands 202, as shown in FIG. 9, is maintained despite variations in the thickness of the conductive bands, the shape of cylindrical member 114, etc.

An exploded view of a conductive plunger 301 is shown in FIG. 10. An exemplary conductor 502 provides the signal to an upper member 601 which is slidably engaged into a lower member 602. A spring 701 tends to expand the plunger. When the conductive plunger is installed in electrical connector 111, the lower member 602 cannot fit completely out the bottom portion of lower portion 503 of electrical connector 111. Upper member 601 cannot move upward at all since upper portion 504 of electrical connector 111 prevents such movement. Therefore, when the conductive plunger 301 of FIG. 10 is installed properly into an electrical connector 111, it tends to expand, but it cannot fully separate. As cylindrical member 114 rotates, conductive bands 202 press up against conductive plunger 301 and conductive plunger 301 constantly remains in contact with the conductive bands 202. Thus, there is no interruption of power or signals.

FIG. 11 shows an alternative implementation of conductive plunger 301. In the embodiment of FIG. 11, only a single member 601 is utilized, and a spring 701 is utilized in order to force the member outward. The spring pushes against the electrical connector 111 and tends to bias the member 601 and keep it in contact with the conductive bands. The embodiment of FIG. 11 is presently believed to be easier to manufacture.

Returning to FIG. 5, in operation, the dispensing hose 102 is connected to the dispensing nozzle 104 by turning connecting collar 106 clockwise, thereby screwing threaded portion 110 into valve connector portion 108. The inside of valve connector 108 includes the appropriate mating threads 122. When the connecting collar 106 is fully tightened, the arrangement appears as in FIG. 9, with flange 109 touching valve end 115 and each of conductive bands 202 in contact

with its associated conductive plunger 301 for purposes of clarity, only one conductive plunger 301 is shown in FIG. 9.

During use, either the dispensing hose 102 or the nozzle 104 will be twisted and turned relative to the other  
5 of the dispensing hose 102 and nozzle 104 by service station attendants or self service users. Such turning will cause cylindrical member 114 or plungers 301 to turn. This motion is always relative motion. In other words, the hose 102 moves relative to the nozzle 104 and collar 106, such that  
10 the collar 106 will not be unscrewed from nozzle 104. However, as cylindrical member 114 turns the electrical connection between conductive bands 202 and conductive plungers 301 will not be interrupted nor will any wires be twisted because conductive bands 202 span the circumference  
15 of cylindrical member of 114 therefore, the conductive bands 202 will remain in contact with their respective conductive plungers 301 as cylindrical member 114 turns.

The above describes the preferred embodiments of the present invention. However, it will be understood that  
20 various modifications and/or additions will be apparent to those of ordinary skill in the field. For example, the particular types of electrical connectors or conductors used, and particular channels utilized in order to dispense the fuel, are not critical to the present invention. Nor is  
25 the particular nozzle. The conductive plungers may be placed on the inside or outside of the valve connecting portion, or may even be placed elsewhere on the dispensing nozzle if convenient.

Other types of valves and dispensing arrangements may  
30 be utilized without the departing from the spirit and scope of the present invention.

Claims

WHAT IS CLAIMED IS:

1. A fuel dispensing hose for communication between a fuel dispenser and an electronic fuel dispensing nozzle assembly comprising:
  - 5 a first closed passageway for carrying fuel in a first direction;
  - a second closed passageway for carrying fuel vapor in a second opposite direction; and
  - 10 means for carrying a safety approved electrical signal in a fuel dispensing environment between said fuel dispenser and said electronic fuel dispensing nozzle assembly and disposed within one of said first and second passageways.
- 15 2. The fuel dispensing hose of Claim 1, wherein said carrying means includes at least one conductive wire.
3. The fuel dispensing hose of Claim 1, wherein said carrying means includes at least one optical fiber.
4. The fuel dispensing hose of Claim 1, wherein  
20 said fuel dispensing hose includes a coupling member for engagement with said fuel dispenser.
5. The fuel dispensing hose of Claim 4, wherein said coupling member rotates independently of said hose.
6. The fuel dispensing hose of Claim 1, wherein  
25 said hose includes guide means for facilitating engagement with said fuel dispenser.
7. The fuel dispensing hose of Claim 4, wherein said coupling member is threaded to facilitate engagement with said fuel dispenser.
- 30 8. The fuel dispensing hose of Claim 1, wherein said dispensing hose includes an electrical connector for connecting said electrical signal carrying means to the fuel dispensing hose.
9. The fuel dispensing hose of Claim 8, wherein  
35 said electrical connector for connecting said electrical signal carrying means to the fuel dispensing hose is formed

of a substrate having a plurality of conductive elements disposed thereon.

10. The fuel dispensing hose of Claim 1, wherein said first closed pathway is a cylindrical inner pathway.

5 11. The fuel dispensing hose of Claim 1, wherein said second closed passageway is an annular passageway concentric about said first closed passageway.

12. The fuel dispensing hose of Claim 11, wherein said electrical signal carrying means is located within said  
10 annular passageway.

13. An electronic fuel dispensing system comprising:

a fuel dispensing hose with first and second ends having a first pathway for carrying fuel, a second pathway  
15 for carrying recovered fuel vapor and means for carrying an electrical signal;

a fuel dispensing and vapor recovery tank having an input output port with an electrical connector;

20 means for connecting said hose first end to said port such that said electrical signal carrying means is in electrical contact with said electrical connector.

14. The fuel dispensing hose of Claim 13, wherein said connecting means comprises means for guiding said hose first end into said input output port.

25 15. The fuel dispensing hose of Claim 14, wherein said guiding means comprises at least one stabilization bar extending from said hose first end, and at least one slot located on the input output port for selectively receiving said at least one stabilization bar.

30 16. The fuel dispensing hose of Claim 13, wherein said connecting means comprises means for rotatably coupling said hose first end into said input output port.

35 17. The fuel dispensing hose of Claim 16, wherein said coupling means comprises a rotatable male member on said hose first end selectively engageable in a female member of said input output port.

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18. The fuel dispensing hose of Claim 17, wherein said male member rotates independently with respect to said electrical connector.

5 19. A fuel dispensing apparatus comprising:  
a nozzle, said nozzle including:

a valve having a valve coupling portion for connecting to a fuel dispensing hose;

10 at least one conductive plunger disposed on the valve coupling portion and resiliently tending to expand away from said valve coupling portion such that it remains in contact with a conductive band placed against said conductive plunger despite variations in the surface of said conductive band.

15 20. A fuel dispensing apparatus comprising a nozzle according to Claim 19, said apparatus further comprising:

a fuel dispensing hose, said fuel dispensing hose comprising:

a member for mating with said valve coupling portion;

20 at least one conductive band, each of said conductive bands being affixed to the outer perimeter of said member; and

25 a connecting collar attaching the fuel dispensing hose to the valve coupling portion, thereby placing said conductive bands in contact with said at least one conductive plunger.

21. The fuel dispensing apparatus of Claim 20, wherein said conductive bands span the entire outer perimeter of said member.

30 22. The fuel dispensing apparatus of Claim 21, wherein said member is cylindrical.

23. The fuel dispensing apparatus of Claim 22, further comprising an electrical connector for mounting said conductive plungers, said electrical connector further comprising a separate conductor connected to each of said  
35 conductive plungers and routing an electrical signal from

said conductive plunger, through said connector and into said fuel dispensing nozzle.

24. The fuel dispensing apparatus of Claim 22, wherein said fuel dispensing hose comprises an inner channel  
5 and an outer channel.

25. The fuel dispensing apparatus of Claim 22, wherein said fuel dispensing nozzle comprises:

an electronic display for displaying data.

26. The fuel dispensing arrangement according to  
10 Claim 25 further comprising data input means attached to said fuel dispensing nozzle for allowing a user to enter digital data.

27. The fuel dispensing apparatus of Claim 25 further comprising data display means mounted on said  
15 nozzle.

28. The fuel dispensing nozzle of Claim 22, wherein said at least one conductive plunger comprises a lower member;

an upper member slidably engaged within said lower  
20 member; and

means for biasing said upper and lower members away from one another such that said conductive plunger tends to expand to its maximum length.

29. The fuel dispensing nozzle of Claim 23 wherein  
25 said electrical connector comprises a plurality of stubs thereon for connecting to conductors within the fuel dispensing nozzle.

30. A fuel dispensing apparatus comprising:  
a cylindrical dispensing hose, said hose including a  
30 plurality of conductive bands therearound;

a dispensing nozzle, said nozzle including a valve connecting portion for coupling to said dispensing hose;

a plurality of conductive plungers inside said valve connecting portion and disposed such that when said  
35 dispensing hose is fully connected to said dispensing nozzle, said conductive plungers are in contact with said

conductive bands.

31. The fuel dispensing apparatus of Claim 30 wherein said fuel dispensing hose includes a connecting collar, said connecting collar including a plurality of  
5 threads thereon and being freely rotatable about the longitudinal axis of said dispensing hose.

32. Apparatus of Claim 31 wherein said fuel dispensing hose and said nozzle each comprise an inner and outer channel.

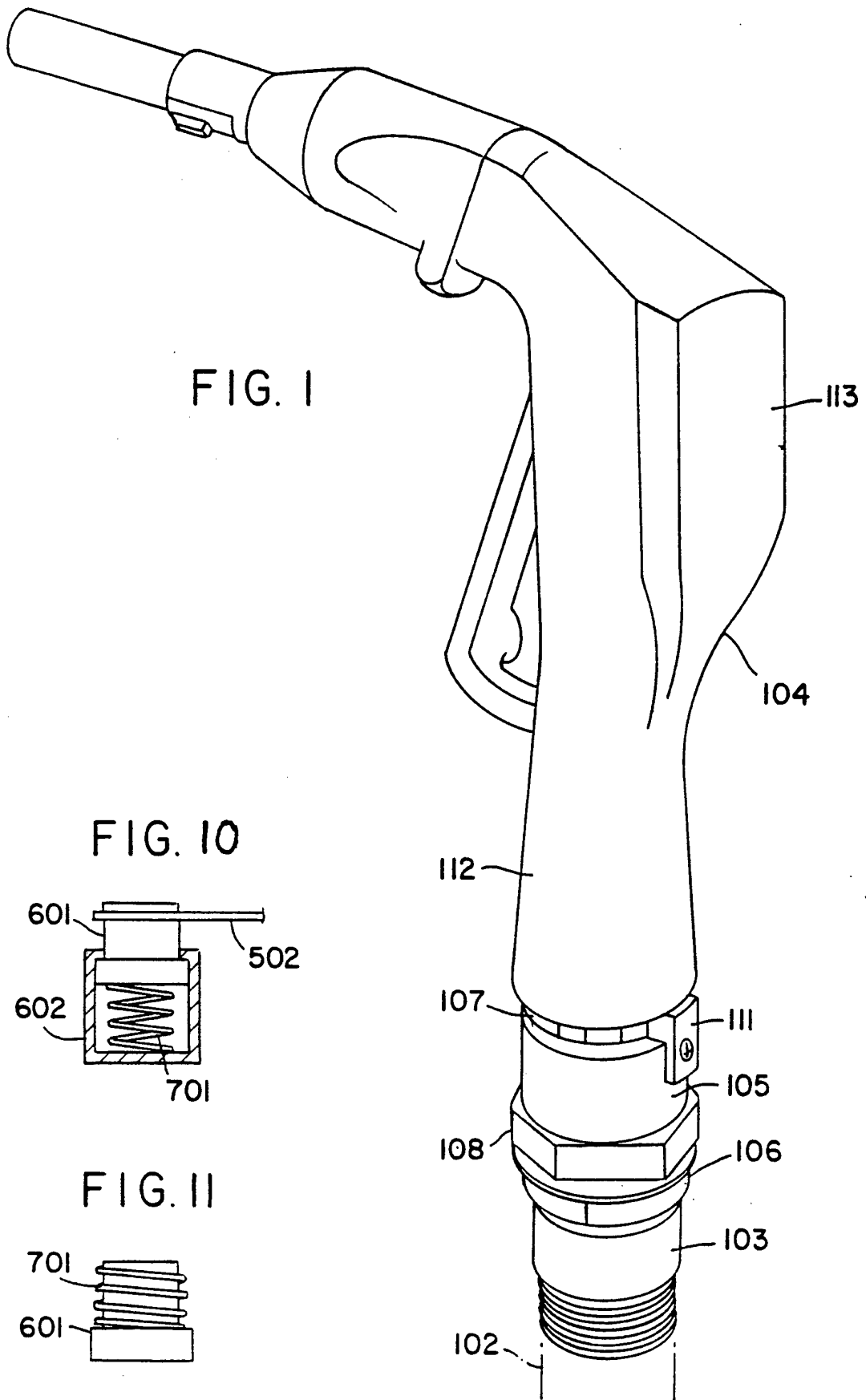


FIG. I

FIG. 10

FIG. II

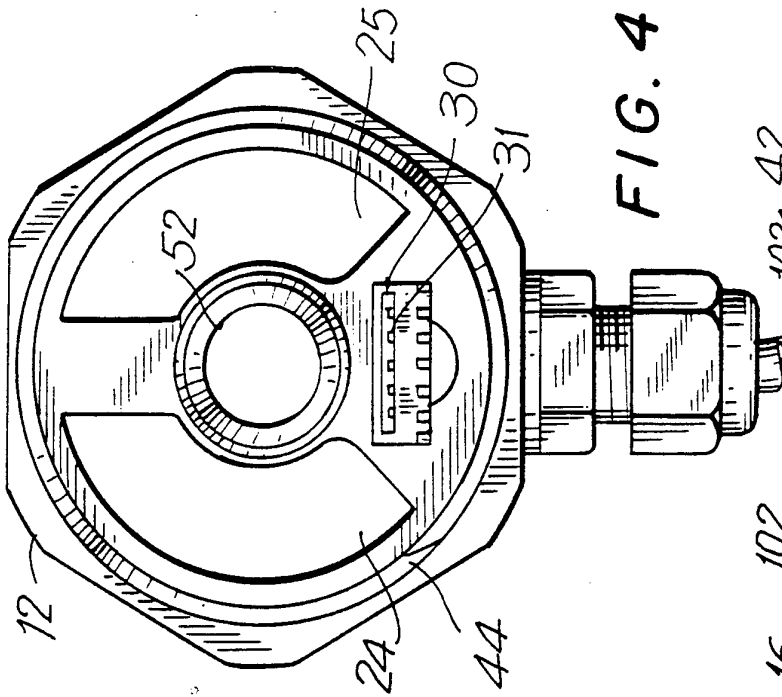
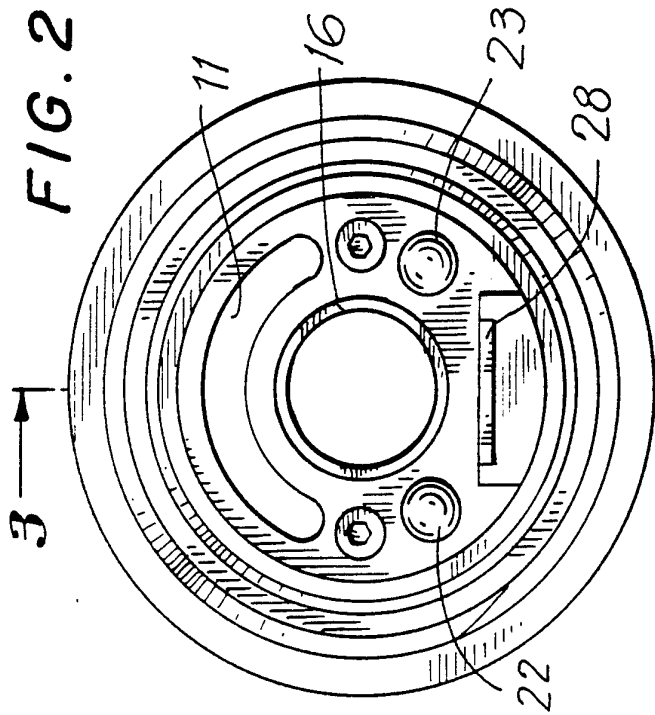


FIG. 4

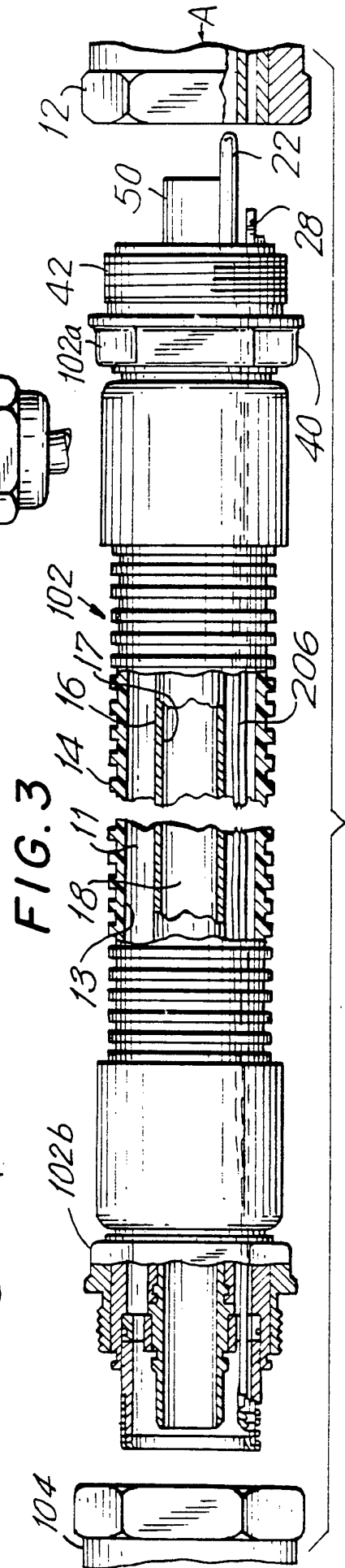


FIG. 3

FIG. 5

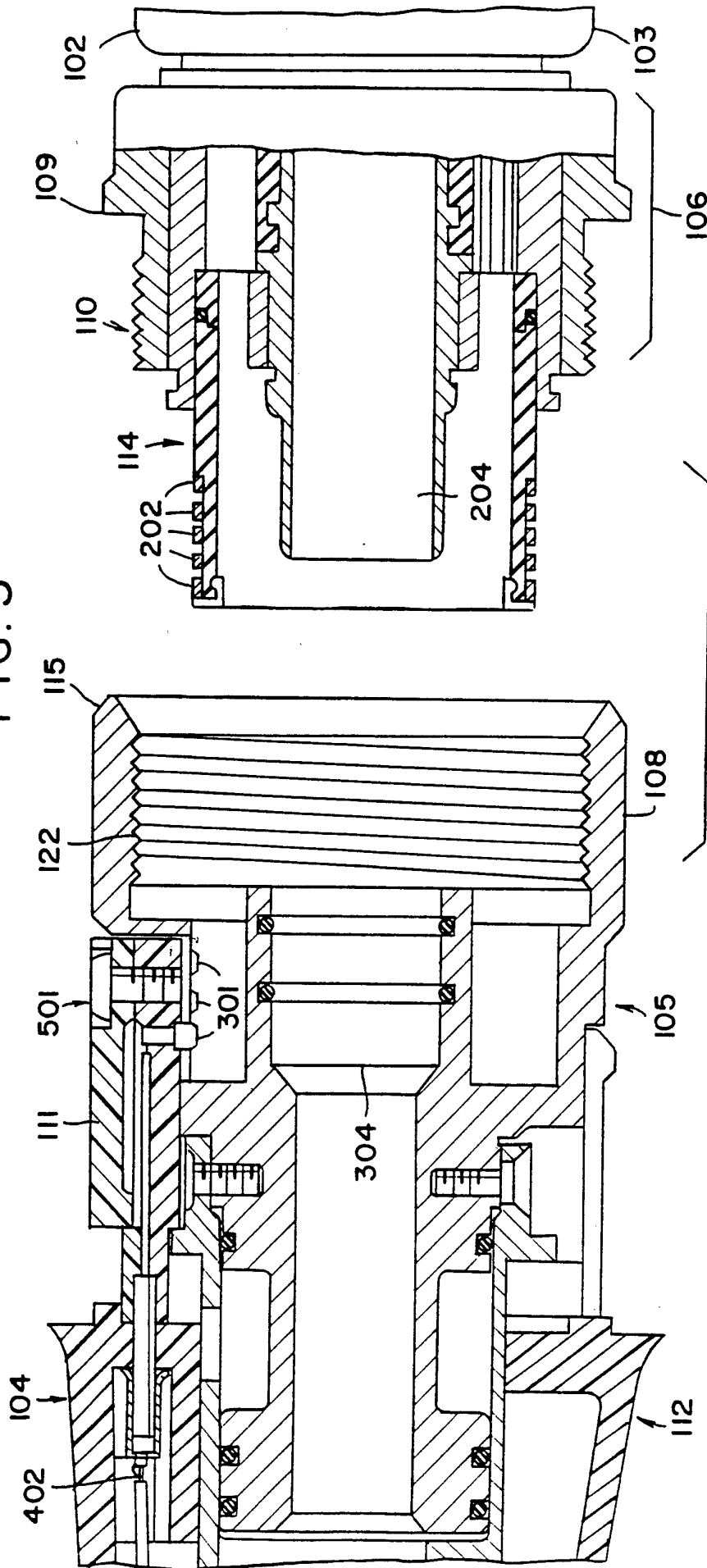
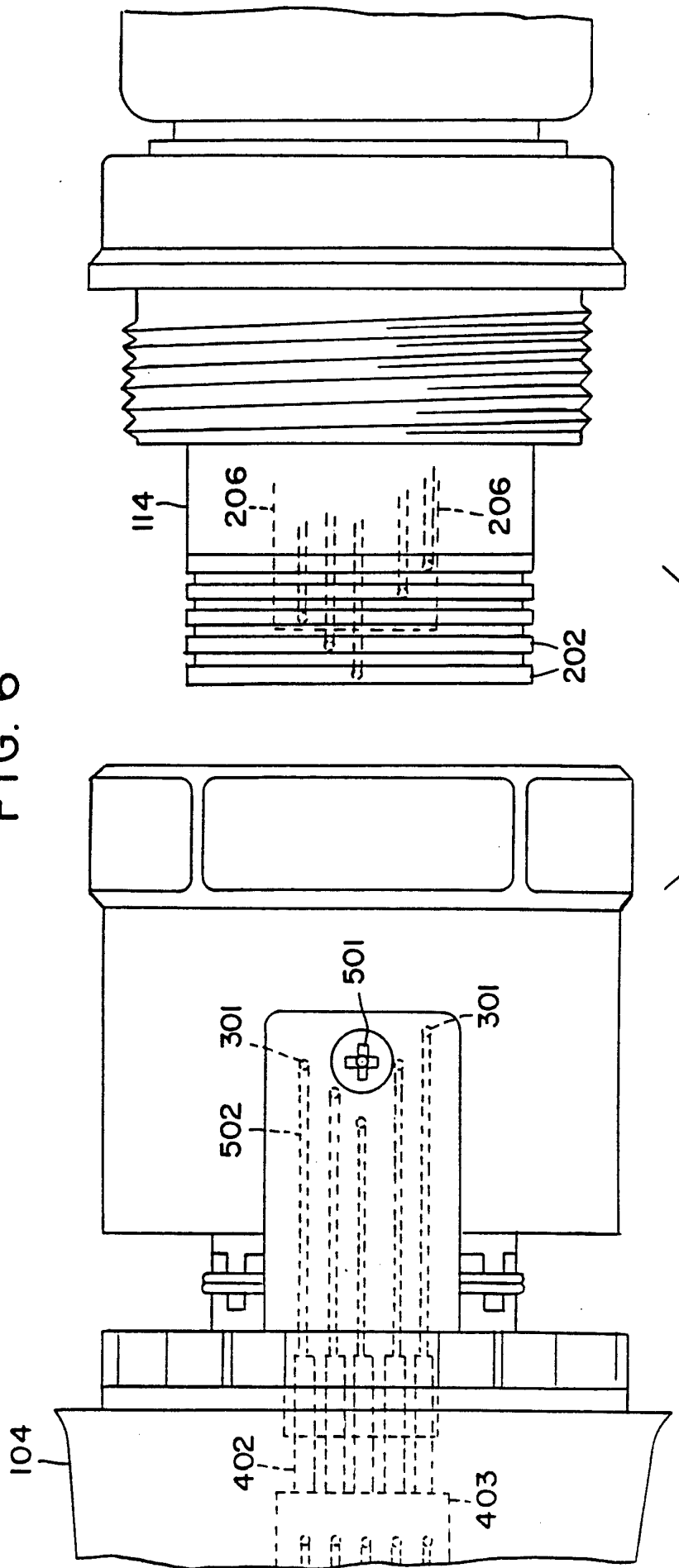


FIG. 6



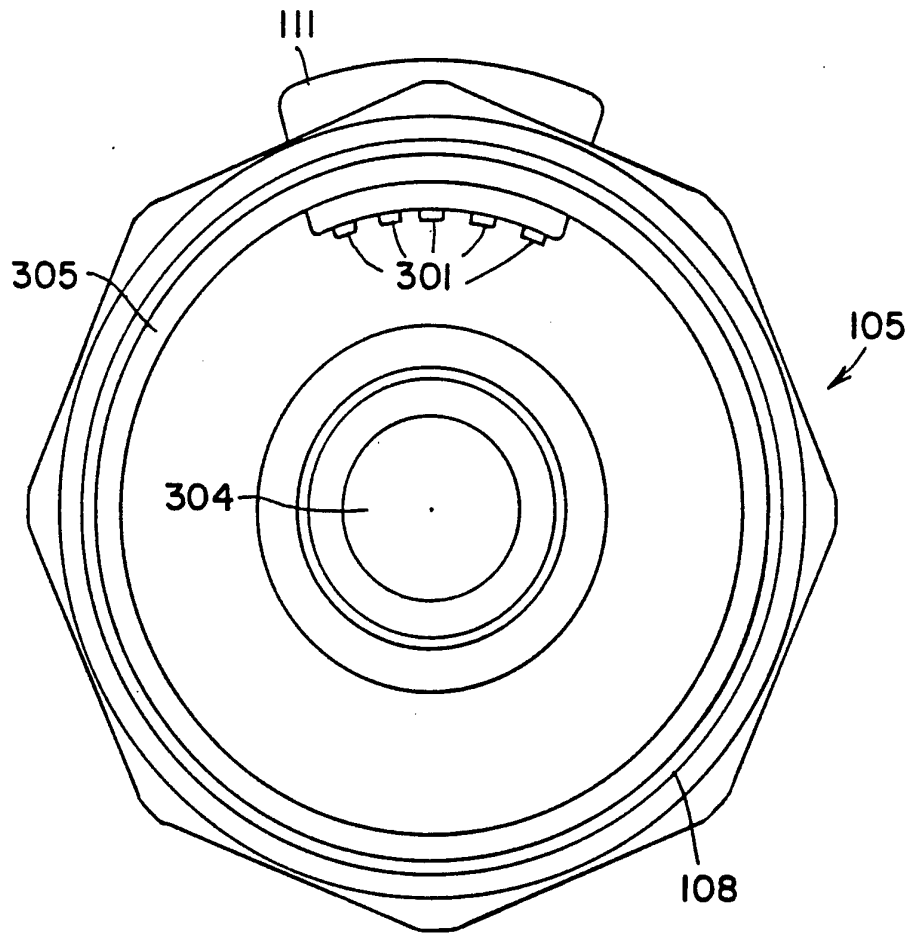


FIG. 7

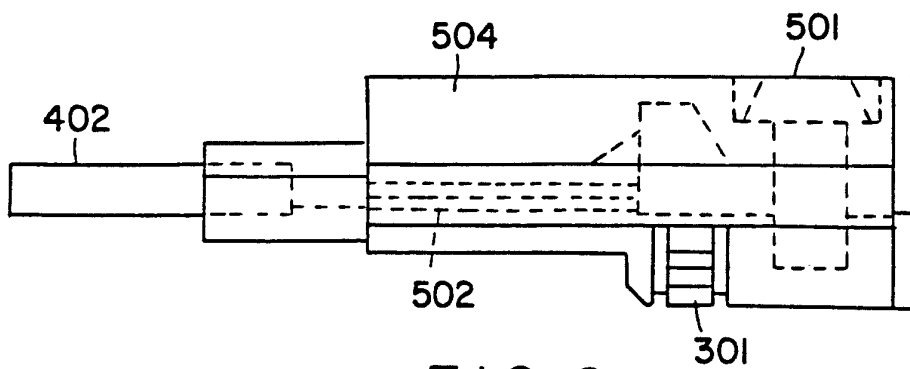
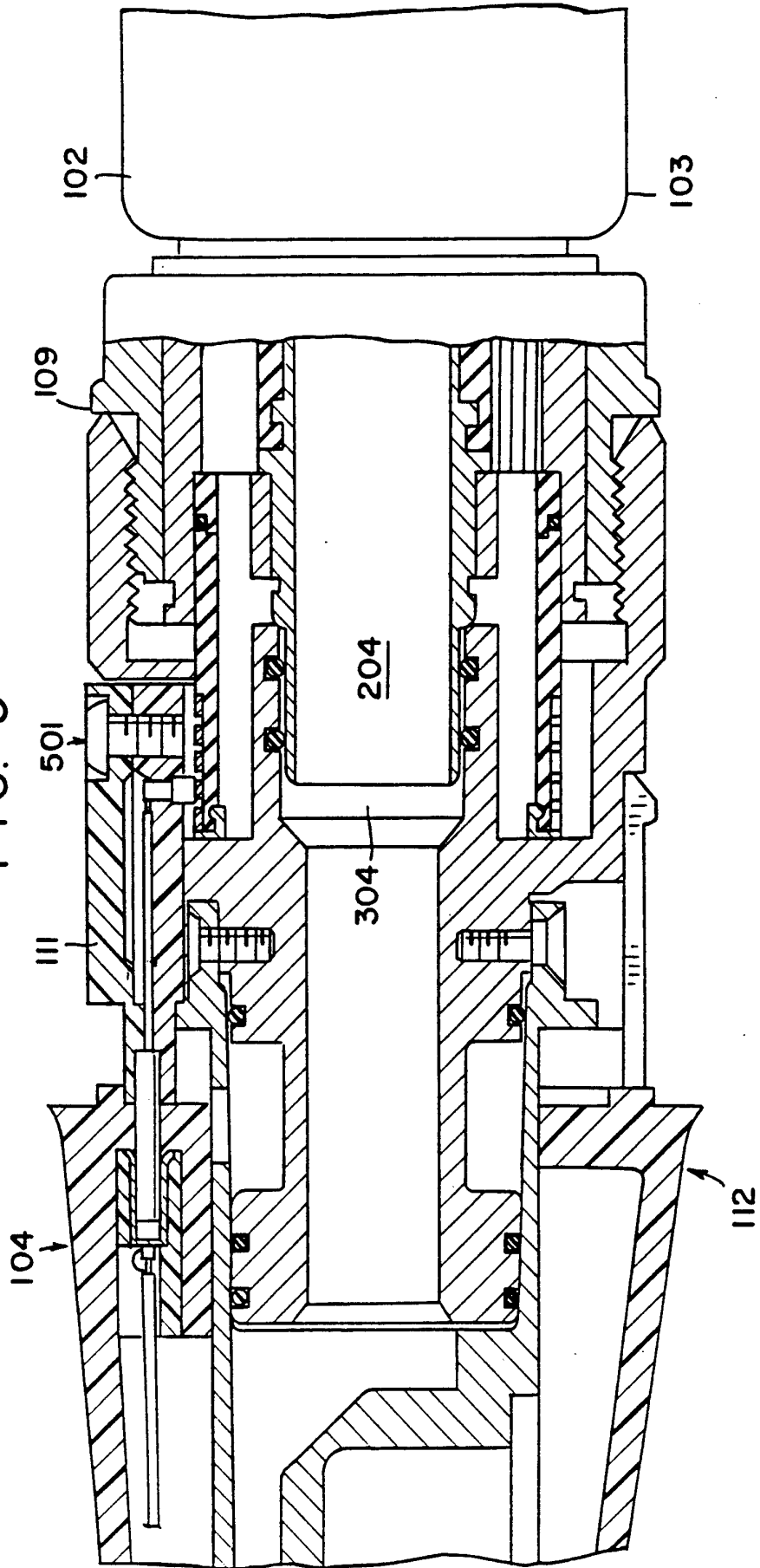


FIG. 8

FIG. 9



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US93/11746**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(5) :B65B 1/04,3/00; B67C 3/00

US CL :141/387,392; 364/509

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. : Please See Extra Sheet.

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)

APS

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,P	US, A, 5,184,309 (Simpson et al) 02 February 1993.	1-32
A	US, A, 3,980,112 (Basham) 14 September 1976.	1-32
A	US, A, 3,771,110 (Reed) 06 November 1973.	1-32
A	US, A, 3,470,521 (Downey) 30 September 1969.	1-32

 Further documents are listed in the continuation of Box C.
  See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be part of particular relevance	"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
"E" earlier document published on or after the international filing date	"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
"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)	"G" document member of the same patent family
"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	

Date of the actual completion of the international search

19 January 1994

Date of mailing of the international search report

15 FEB 1994

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
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INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US93/11746

B. FIELDS SEARCHED

Minimum documentation searched

Classification System: U.S.

141/387,392,98,198,206-212; 364/509,510; 222/71,74; 439/284,251,840,191,192,194,289;  
128/201.19,202.13,202.23,202.27,908,912