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Courier Press, Leamington Spa, England.

Description

The present invention relates to apparatus for dispensing fluid from containers in which pressurized fluid is stored, the apparatus including a coupling assembly which does not require retaining means for holding the coupling apparatus to a pressurized fluid-containing cylinder when the pressurized fluid is released therefrom to the coupling apparatus.

Various coupling devices are known for connection to a container housing fluid under pressure and in which the container or the coupling device includes a valve for releasing the fluid from the container into the coupling device. Each of these known coupling devices requires some retaining structure to maintain the coupling device and the container in secure operative association with each other when the pressurized fluid escapes the container and flows into the coupling device. As can be readily appreciated, the force of a highly pressurized gas exiting the container into a coupling device joined to the container can easily separate the container and coupling device. Typically, such retaining structure used in prior art coupling devices includes threads for interconnecting with threads formed in the container. Alternatively, the retaining structure includes a clamp or strap for maintaining a secure connection between a coupling device and the container or a valve.

It has been found desirable to eliminate the use of such retaining structures in order to simplify the connection between a container or valve and the coupling device and to minimize the amount of space taken by the container, valve, and coupling device. As a result of simplifying these connections, the assembly and disassembly of the container is facilitated and enhanced. More specifically, it has been found advantageous to invert a pressurized fluid containing cylinder and provide a coupler adaptor for passing pressurized fluid into a pressure regulator without the use of retaining structure for holding the pressure regulator and cylinder together. In this regard the present invention includes a coupler adaptor which remains in operative association with the cylinder and pressure regulator when relatively high pressurized fluid is released from the container through a valve to the coupler adaptor and to the pressure regulator. The coupler adaptor remains joined to the container and pressure regulator because of a pressure balancing arrangement.

U.S.—A—3,319,829 to Sentry discloses a pressure regulator which is connected to a housing by means of threads. The housing includes an opening for receiving a cylinder which houses gas under relatively high pressure. The gas is released into the pressure regulator in a direction parallel to its escape from the cylinder. An O-ring seal is provided adjacent the connection of the pressure regulator to the housing in order to prevent leakage of the gas.

U.S.—A—2,524,052 to Grant, Jr. describes a valve assembly which is held by threads to a container. A valve operating member is joined to and movable relative to the valve assembly by means of a threaded coupling nut. An O-ring seal prevents leakage of gas between the coupling nut and the valve operating member.

U.S.—A—1,910,283 provides a valve arrangement including a casing threadedly connected to a cylinder housing pressurized fluid. A thrust screw is used to permit the opening of a check valve and the escape of pressurized fluid.

Apparatus according to the pre-characterising portion of claim 1 is known from U.S.—A—3771762, which is primarily concerned with a system for filling a tank with pressurized fluid fuel. With the known apparatus, the first and second body portions can only be coupled when the coupling assembly is disconnected from the source of pressurized fluid so that a separate valve is required somewhere upstream of the coupling assembly. This separate valve must be closed before the assembly is coupled and then re-opened after coupling, this being a rather time-consuming operation. A further problem of the known apparatus is that if the first body portion is not fully inserted in the recess then one of the sealing members can fail to make sealing contact with the recess with the result that pressurized fluid can escape to atmosphere. This situation can arise, for a short period at least, if the first body portion is removed from the recess without first closing the separate upstream valve.

According to the invention, there is provided apparatus for dispensing fluid from a container (12) in which pressurized fluid is stored to a fluid utilization device, including a coupling assembly (14) for coupling said container and said device for fluid communication, the coupling assembly comprising first (32; 144) and second (66; 120) body portions each having a fluid flow passage (52, 104; 150, 140), the first body portion being adapted to be coupled with said second body portion by engaging in a recess (68) thereof, and a pair of sealing members (58, 60; 158, 160) each arranged to form a seal between the first body portion and the recess during coupling, the sealing members being spaced apart so as to define therebetween a space via which said fluid flow passages are communicated whereby the forces exerted by the gas under pressure are balanced, said coupling assembly (14) further including flow control means (36; 128) arranged normally to close one of said flow passages and to open the passage when said first body portion is received in said recess, thereby enabling fluid to be dispensed from the container to the fluid utilization device via the coupling assembly, characterized in that said flow control means (36; 128) is arranged so that it is opened only when said sealing members (58, 60; 158, 160) are sealingly received in the recess (68) on each side of said space via which the fluid flow passages (52, 104; 150, 140) are communicated.

By providing the coupling assembly with flow control means as defined above, fluid flow is

permitted only when the first body portion is sealingly received in the recess, thereby avoiding problems associated with the prior art.

In one embodiment of the invention, the first body portion or coupler adaptor comprises a generally cylindrical body having said flow control means in the form of a check valve extending therethrough. The cylindrical body is integrally joined to a housing which is threadably connected to the container for housing the pressurized fluid. The cylindrical body includes two grooves. An O-ring is seated in each groove and an interface passage is formed between the two O-rings. The pressurized fluid moves past the check valve and through the interface passage to a pressure regulator.

In another embodiment of the present invention, the second body portion is connected to the container and houses the flow control means in the form of a check valve. The first body portion or coupler adaptor is threadably attached to a pressure regulator or other coupling device for receiving the pressurized fluid from the container. The pressurized fluid is released from the container when the check valve is engaged. The pressurized fluid escapes from the container into the pressure regulator through the pressure balanced space or interface passage formed in the coupler adapter. A pair of O-rings is also included, as in the first embodiment, adjacent the interface passage. In both embodiments, the O-rings on both sides of the interface passage prevent leakage of the pressurized fluid when it is released from the container assembly and, most significantly, provide a substantial pressure balance so that the coupling device and container assembly remain in operative association during the release of the pressurized fluid.

Some embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view showing a first embodiment of the present invention with an inverted cylinder;

Figure 2 is a perspective view of a second embodiment of the present invention with the container in an upright position;

Figure 3 is a perspective view of the inverted cylinder showing the pressure regulator separated from the coupler adaptor;

Figure 4 is a fragmentary, enlarged, longitudinal section, taken along line 4—4 of Figure 3, showing details of the coupler adaptor;

Figure 5 is an enlarged, longitudinal section, taken along line 5—5 of Figure 3, showing details of the pressure regulator;

Figure 6 is an enlarged, fragmentary, longitudinal section, taken along line 6—6 of Figure 1, showing details of a first embodiment in which the coupler adaptor is fixedly connected to the container;

Figure 7 is an enlarged, fragmentary, longitudinal section showing details of the second embodiment in which the coupler adaptor is fixedly connected to the pressure regulator.

Referring to the drawings, a container assembly 10 including a cylinder 12 is depicted in Figure 1 having a coupling assembly 14 attached to the cylinder 12 at its neck 16. The cylinder 12 is typically used to contain carbon dioxide under high pressure such that a portion of the contents of the cylinder 12 is liquid carbon dioxide while the remaining portions of the contents of the cylinder 12 are gaseous carbon dioxide. The gaseous carbon dioxide is, preferably, used to carbonate beverages, such as soft drinks. Accordingly, the present invention is primarily adapted for connection to another container which houses the beverage to be carbonated. When desired, the gaseous carbon dioxide is permitted to escape the cylinder 12 and coupling assembly 14 through the outlet tube 18 into the container which houses the beverage to be pressurized or carbonated.

The coupling assembly 14 includes a coupler adaptor. In a first embodiment, the coupler adaptor is threadedly connected to the cylinder 12. In the second embodiment, the coupler adaptor is threadedly connected to a coupling body such as a pressure regulator. The coupling body or pressure regulator is also an element or part of the coupling assembly 14. In the first embodiment, the coupler adaptor remains in operative association with the pressure regulator when pressurized gas is permitted to escape from the cylinder 12. Similarly, in the second embodiment, the coupler adaptor remains in operative association with the container assembly 10 and cylinder 12 when pressurized gas is permitted to escape from the cylinder 12. This operative association in both embodiments does not necessitate the use of retaining structure, such as clamps, yokes, threaded attachments, and the like, unlike previously devised coupling structures wherein such retaining mechanisms were required.

A preferred configuration involves the inverted or upside down positioning of the cylinder 12, as illustrated in Figures 1, 3, 4, 5 and 6. However, it is understood, as illustrated in Figures 2 and 7, that the apparatus also properly functions when the cylinder 12 is positioned right side up. That is to say, the container assembly 10 and the coupling assembly 14 remain operatively connected without the use of retaining structure when the cylinder 12 is positioned upright and gas escapes from the cylinder 12 into the coupling assembly 14.

In this regard, the notable functional difference between the use of an inverted cylinder and an upright cylinder is that, in the inverted cylinder embodiment, the weight of the cylinder and the carbon dioxide contained therein act to overcome the force of the pressurized gas in the cylinder acting on a check valve stem for releasing the pressurized gas from the cylinder. This force tends to separate the container assembly and coupler assembly. With respect to the inverted cylinder embodiment, the coupler assembly is normally fastened to and supported by a horizontal support surface while the inverted cylinder is vertically positioned above the coupler assembly while joined thereto. Consequently, the force resulting

from the pressurized gas against the check valve stem, tending to separate the coupler assembly from the container assembly, is fully or at least partially overcome by the downward acting force of the weighted cylinder.

With respect to the upright cylinder embodiment in which the coupler assembly is again fastened to a horizontally extending supporting surface, the force resulting from the pressurized gas against the check valve stem tends to separate the cylinder from the coupler assembly. However, since the magnitude of the force against the check valve stem depends upon the magnitude of the pressure of the gas contained in the cylinder, this force is normally overcome by friction forces which resist the normal fluid force present in the cylinder. Additionally, the force against the check valve stem in an upright cylinder embodiment is minimized considerably through the use of a relatively small lateral or cross-sectional area. Also, this force can be negated by using a valve stem which is secured against movement in a direction towards the coupler assembly so that the force of the pressurized gas does not act to move the check valve.

Although not shown in Figures 1 and 2, it is understood that standard support mechanisms are usually provided to rigidly maintain the combination container assembly 10 and coupler assembly 14 in either the upright or inverted configuration. Conventional supporting assemblies can be connected to either the container assembly 10 or the coupler assembly 14 in order to prevent the overturning or tipping of the container assembly 10 and coupler assembly 14 from their substantially vertical positions. Nevertheless, it is once again emphasized that such support structure is not used to interconnect the coupler adaptor and pressure regulator with respect to the aforementioned first embodiment or, alternatively, the coupler adaptor and container assembly with respect to the aforementioned second embodiment. It is also desirable, in selecting workable support structure, that ready access to the cylinder 12 be provided so that it can be easily replaced whenever the carbon dioxide contained therein has been expended.

The embodiments of the present invention are shown in the two different structural arrangements identified here as the first and second embodiments. Although Figure 6 depicts details of the apparatus with an inverted cylinder 12, while Figure 7 illustrates details of the apparatus with an upright cylinder 12, it is readily appreciated that both embodiments of Figures 6 and 7 can be used with either an inverted or upright cylinder 12.

With reference now to the first embodiment in which the coupler adaptor is threadably connected to the container assembly 10, Figure 1 shows that the container assembly 10 also includes a gas escape tube 20 which extends longitudinally through the cylinder 12. The gas escape tube 20 includes an inlet 22 located above the liquid carbon dioxide contained in the cylinder 12 to provide an exit for only the gaseous carbon dioxide and not the liquid carbon dioxide. Whenever the cylinder 12 is used in the inverted configuration, the escape tube 20 is utilized. Conversely, no gas escape tube 20 is included when the cylinder 12 is positioned in an upright state, as illustrated in Figure 2, since the gaseous carbon dioxide is in the upper portions of the cylinder 12 immediately adjacent the coupling assembly 14 for release from the cylinder 12.

Referring to Figure 6, as well as Figures 3, 4 and 5, the gas escape tube 20 is integrally joined to a housing 24 of the valve assembly 26. The housing 24 is threaded for secure attachment to the neck 16 of the cylinder 12. An O-ring seal member 28 is positioned adjacent the top surface of the neck 16 to prevent leakage of the pressurized gas from the cylinder 12 through the threaded junction of the housing 26 and cylinder neck 16.

A bore 30 is formed through the center of the housing 26 for communication with the previously discussed coupler adaptor 32. The coupler adaptor 32 is fixedly joined to the housing 24 by means of interconnecting threads while an O-ring seal member 34 prevents leakage of gas through this threaded connection.

In the embodiment of Figures 3, 4, 5 and 6 the check valve 36 of the valve assembly 26 is operatively positioned within a coupler passageway 38 of the coupler adaptor 32. The check valve 36 includes the check valve stem 40, previously discussed in connection with the forces acting thereon, a valve plunger 42, and a valve spring 44. The valve stem 40 is integrally joined to the valve plunger 42 while the valve spring 44 is in operative engagement with the valve plunger 42. When the check valve 36 is closed, as seen in Figure 4, the valve seat 46 acts to prevent the escape of gas from the cylinder 12. An O-ring seal 48 is located in the coupler passageway 38 around portions of the valve stem 40 to prevent escape of gas from the coupler adaptor 32 along the outer wall of the valve stem 40 whenever the check valve 36 is in its opened position.

The coupler adaptor 32 includes a generally cylindrical body 50 and an interface passage 52 which is formed perpendicular, or substantially perpendicular, to the coupler passageway 38 for providing a transverse flow of pressurized gas. A first circular groove 54 is formed in the coupler adaptor 32 at a first side of the interface passage 52 or located vertically above the interface passage 52 when the cylinder 12 is inverted. A second circular groove 56 is formed in the coupler adaptor 32 at a second side of the interface passage 52 or located vertically below the interface passage 52 when the cylinder 12 is inverted. A first O-ring seal member 58 is seated in the first groove 54 while a second O-ring seal member 60 is seated in the second groove 56.

The first and second O-ring seal members 58, 60 provide two functions critical to the proper operation of the present apparatus. In particular, whenever a coupling device of the coupling

assembly 14 is joined to or is in operative association with the coupler adaptor 32 and engages the check valve 36 for releasing the pressurized gas from the cylinder 12, the first and second O-ring seal members 58, 60 function to balance the pressure present at the interface or area along which the pressurized gas escapes the coupler adaptor 32. As a result, the joined coupling device remains attached to the coupler adaptor 32. The balanced pressure results because the force of the escaping gas against the first O-ring seal member 58, acting to separate the coupler adaptor 32 and the coupling device, is balanced or offset by an equal force applied by the escaping gas in the opposite direction against the second O-ring seal member 60. In addition to the providing of balanced pressure along the exit interface of the coupler adaptor 32, the two O-ring seal members 58, 60 also function to prevent leakage of the gas so that the gas released from the cylinder 12 will properly pass to the operatively connected coupling device. The O-ring seal members 58, 60 also provide friction force to help keep the coupler adaptor 32 joined with a mating recess, as will now be discussed.

To provide a safety vent for pressurized fluid contained in the cylinder 12, a burst disc assembly 108 is connected to the housing 24. The burst disc assembly 108 includes a vent plug 110, a rupture disc 112 and a seal 114. The vent plug 110 is threadably fastened to the housing 24 in a recess formed in the housing 24. The seal 114 prevents leakage of the pressurized gas around the rupture disc 112 or through the threaded joint. The rupture disc 112 will rupture and permit the escape of the gas if an excessively high pressure is present within the cylinder 12. This is a required safety device and is desirable to prevent overpressurization of the cylinder 12.

In the preferred embodiment of the present invention, the coupling device referred to above is a pressure regulator assembly 62. Basically, the pressure regulator assembly 62 regulates or controls the pressure of the gas received from the cylinder 12 through the coupler adaptor 32. The pressure regulator assembly 62 includes an outlet port 64 formed in a regulator body 66. The outlet port 64 is connected to the outlet tube 18. The outlet tube 18 carries the pressure regulated carbon dioxide gas to the container which houses the liquid. As best seen in Figure 5, the regulator body 66 also has a recess 68 formed therein. A cylindrical valve lifting pin 70 is integral with the regulator body 66 and extends into the recess 68. A vent passage 72 is also formed in the regulator body 66. The coupler adaptor 32 is slidably fitted or plugged into the recess 68 in order to couple the coupler adaptor 32 to the pressure regulator assembly 62. The force necessary to plug the coupler adaptor 32 into the recess 68 must be of a magnitude to overcome the pressurized gas force acting on the check valve 36. This force can readily and manually be overcome by simply inserting the coupler adaptor 32 into the recess 68 and then pressing downwardly (in those instances in which the cylinder 12 is in its inverted position). The vent passage 72 permits the escape of air from between the surface of the coupler adaptor 32 and the recess 68 when the coupler adaptor 32 is inserted into the recess 68.

The pressure regulator assembly 62 further includes a regulator spring housing 74. A diaphragm 76 is located at the interface of the regulator spring housing 74 and the regulator body 66. A diaphragm back up plate 78 engages one side of the diaphragm 76 while a diaphragm rivet 80 contacts the other or pressure side of the diaphragm 76. The head of diaphragm rivet 80 is positioned within a valve chamber 82 of the regulator body 66. A forward plate 84 is threadably fastened to an end of the regulator spring housing 74 and a regulator spring 86 is operatively positioned between the diaphragm back up plate 78 and the forward plate 84.

Positioned within a cavity 88 formed in the regulator body 66 is a valve mechanism 90 which includes a bushing 92, a valve arm 94, a valve seat 96 and a helical spring 98. The valve arm 94 moves laterally in a valve passageway 100 formed in the bushing 92. The valve arm 94 is in operative engagement with the helical spring 98 at one end of the helical spring 98. The opposite end of the helical spring 98 is joined to a rigid filter disc 102 at the opposite end of the valve passageway 100. The filter disc 102 is typically made of a porous material such as sintered bronze and which is fitted into a recess formed in the end of the bushing 92. The opposite side of the filter disc 102 communicates with a regulator passage 104. The regulator passage 104, in turn, communicates with the interface passage 52. An O-ring seal 106 is positioned adjacent the bushing 92 and filter disc 102 to prevent the leakage of gas through the outer wall of the bushing 92.

Finally, a safety shroud 116 is fixedly attached between the outer surface of the neck 16 and the housing 24. The safety shroud 116 is generally bowl-shaped, as seen in Figure 1, having a wall 118 which surrounds the coupler assembly 14 and valve assembly 26. The safety shroud 116 is preferably made of a material having a melting point at a desired temperature. If the safety shroud 116 shows signs of excess temperature, it is an indication that the temperature of the environment about the safety shroud 116 and cylinder 12 has been at an undesirable level. Thus, the distortion of the safety shroud 116 is a warning that the temperature of the cylinder 12 may have been high enough to have annealed and weakened the metal cylinder 12 to produce an unsafe operating condition. Additionally, the safety shroud 116 acts to protect the coupling assembly 14 and valve assembly 26 should the container assembly 10 and coupler adaptor 32 be inadvertently dropped during transport or during the interconnection of the coupler adaptor 32 and pressure regulator assembly 62.

In operation of the embodiment of Figures 1, 3, 4, 5, and 6, the housing 24 is threadably joined to the cylinder 12 and the coupler adaptor 32 is also

threadably joined to the housing 24. The cylinder 12 then receives carbon dioxide under pressure through the coupler adaptor 32. When it is desired to use the gaseous carbon dioxide for carbonation purposes, for example, the cylinder 12 is inverted and the pressure regulator assembly 62 is joined to the coupler adaptor 32 by inserting or slidably fitting or plugging the coupler adaptor 32 into the recess 68 formed in the pressure regulator assembly 62. In so doing, the valve stem 40 contacts the cylindrical valve lifting pin 70 which extends into the recess 68. The force exerted by the valve lifting pin 70 against the valve stem 40 moves the valve plunger 42 away from the valve seat 46 against the force of the valve spring 44 and the pressure force acting on the check valve 42. As a result, the pressurized carbon dioxide gas is able to pass from the valve passageway 38 through the opening created at the valve seat 46 into the interface passage 52. The gas is unable to escape around the valve stem 40 because of the O-ring seal 48.

As previously discussed, balanced forces are provided at the juncture of the coupler adaptor 32 and the pressure regulator assembly 62 by means of and the location of the first and second O-ring seal members 58, 60. The gas escaping the interface passage 52 and entering the pressure regulator assembly 62 exerts equal and opposite forces against the first and second O-ring seal members 58, 60. That is, the force tending to separate the pressure regulator assembly 62 from the coupler adaptor 32 in an upward direction is balanced by the force tending to separate the pressure regulator assembly 62 from the coupler adaptor 32 in a downward direction. As a consequence, the pressurized gas exiting the interface passage 52 and entering the regulator passage 104 does not tend to separate the coupler adaptor 32 from the pressure regulator assembly 62.

Upon entering the regulator passage 104, the gas moves through the filter disc 102 into the valve passageway 100. The gas passes by the valve seat 96 into the valve chamber 82 where it exerts pressure against the side of the diaphragm 76 and escapes the pressure regulator assembly 62 through the outlet port 64. The pressure of the gas entering the pressure regulator assembly 62 is controlled by the operation of the valve mechanism 90 and the diaphragm 76. The force of the gas against the diaphragm 76 causes the diaphragm 76 to move towards the left (as viewed with respect to Figure 3) against the force of the regulator spring 86. At a predetermined gas pressure in the valve chamber 82 acting against the diaphragm 76, the diaphragm 76, as well as the diaphragm rivet 80, move laterally to the left a sufficient distance such that the valve arm 94 contacts the valve seat 96 to thereby cut off the flow of the gas from the valve passageway 100. When the pressure is reduced below the predetermined pressure, the force of the regulator spring 86 moves the diaphragm 76 laterally towards the right, as viewed with respect to Figure 6, to permit the flow of gas past the valve seat 92 and into the valve chamber 82 so that it can pass through the outlet port 64 and then to the container which houses the beverage to be pressurized or carbonated.

Referring now to the embodiment illustrated in Figure 7, a connector body 120 is threadably fastened to the neck 16 of the cylinder 12, while the O-ring seal member 28 is positioned at the interface of the neck 16 and the connector body 120 to prevent the escape of gas through this threaded joint. A valve housing 122 is threadably fastened to the connector body 120 in a recess formed therein. A first O-ring seal 124 is positioned at one end of the threaded connection between the connector body 120 and the valve housing 122 and a second O-ring seal 126 is positioned at the opposite end of the threaded connection between the connector body 120 and the valve housing 122 to prevent escape of the gas through the ends of this threaded joint.

A check valve 128 is provided in a recess formed in the valve housing 122. The check valve 128, like the check valve 36, includes a valve stem 130, a valve plunger 132 and a valve spring 134. A valve passageway 136 receives pressurized gas from the cylinder 12 and carries it to a first transverse passage 138 when the check valve 128 is in its open position. A second transverse passage 140 is also formed in the valve housing 122 and communicates with the first transverse passage 138 through the slot 142.

In this embodiment, a coupler adaptor 144 is fixedly joined to a coupling device or, in the preferred embodiment, a pressure regulator assembly 146, unlike the embodiment illustrated in Figures 3, 4, and 6 in which the coupler adaptor 32 is threadably attached to the housing 24 of the valve assembly 26. Like the coupler adaptor 32, the coupler adaptor 144 includes a generally cylindrical body 148 and a transversely formed interface passage 150 for receiving the pressurized carbon dioxide gas whenever the valve plunger 132 is displaced away from a valve seat 152. Correspondingly also, the coupler adaptor 144 includes the first and second grooves 154, 156, respectively, into which first O-ring seal member 158 and second O-ring seal member 160 are, respectively, seated. The first and second O-ring seal members 158, 160 provide balanced fluid forces adjacent the coupler adaptor 144 and valve housing 122 interface when the carbon dioxide gas exits the valve housing 122 and enters the coupler adaptor 144. As a result, the coupler adaptor 144 and valve housing 122 remain in operative association when the check valve 128 is engaged and the carbon dioxide gas escapes the cylinder 12 past the valve plunger 132 of the check valve 128. The coupler adaptor 144 further includes a coupler passageway 162, which is in communication with the interface passage 150. The carbon dioxide gas, therefore, exits the interface passage 150 and enters the coupler passageway 162. From the coupler passageway 162, the gas flows to the pressure regulator assembly 146.

In joining the coupler adaptor 144 to the valve

housing 122, the coupler adaptor 144 is inserted or slidably fitted into a recess formed in the valve housing 122 so that the top surface 164 of the coupler adaptor 144 engages the valve stem 130 of the check valve 128 in order to permit the flow of the gas into the first transverse passage 138. A vent passage 166 formed in the coupler adaptor 144 is provided to permit the escape of air between the interface of the top surface 164 of the coupler adaptor 144 and the valve housing 122 when the coupler adaptor 144 is inserted into the valve housing recess.

Like the embodiment of Figure 6, the gas passes from the coupler passageway 162 to a regulator passage 168 formed in the pressure regulator assembly 146. The remaining elements of the pressure regulator assembly 146 are identical in structure and function to the previously described pressure regulator assembly elements so that the previous description with respect to the pressure regulator assembly 62 also applies to the pressure regulator assembly 146.

In view of the foregoing description, numerous advantages of the present apparatus are readily discerned. A coupler adaptor is provided for use with a valve to permit the release of a pressurized gas from a cylinder without the necessity of any additional retaining structure. The pressurized gas is released through the valve and the forces tending to separate the coupler adaptor from a body joined thereto are balanced. In this regard, the coupler adaptor is easily plugged into a recess formed in a valve housing or a pressure regulator assembly in order to open the valve and release the gas. The present apparatus is particularly advantageous in a beverage dispensing system in which it is desirable to quickly and efficiently replace a carbon dioxide-containing cylinder when the carbon dioxide has been expended from the cylinder. Additionally, it is equally important that the present apparatus provides an effective carbonation system with minimal parts in order to reduce the complexity of the system as well as to minimize the space needed for an operable carbonation system.

Apparatus according to the present invention is particularly useful in a pressurisation system, such as a carbonation system, wherein a container houses carbon dioxide under high pressure. The carbon dioxide gas in the container is permitted to controllably escape through the check valve and the coupler adaptor into a pressure regulator. The pressure regulator regulates the pressure of the gas which leaves an outlet port formed in the pressure regulator. Typically, the pressure regulated gas is used to pressurize a liquid, such as a soft drink.

It will thus be seen that the invention, at least in its preferred embodiments, provides an efficient, yet simple, coupler adaptor which is quickly plugged into or slidably fitted to a pressure regulator in one embodiment or a valve body in another embodiment for connection to a container. As a result, connection and removal of the container and coupler adaptor from the pressure regulator or the connection and removal of the container from the coupler adaptor and pressure regulator is quickly and easily accomplished even when the container contents are highly pressurized. Importantly, the coupler adaptor remains coupled to or in operative association with the pressure regulator or valve body without retaining structure for securing them together, even though escaping gas from the container provides a considerable force at the interface of the coupler adaptor and the pressure regulator or valve body. Coupler parts are thereby minimized and the space required for the container, coupler adaptor, and pressure regulator is reduced.

Claims

1. Apparatus for dispensing fluid from a container in which pressurised fluid is stored to a fluid utilization device, including a coupling assembly for coupling said container and said device for fluid communication, the coupling assembly comprising first and second body portions each having a fluid flow passage, the first body portion being adapted to be coupled with said second body portion by engaging in a recess thereof, and a pair of sealing members each arranged to form a seal between the first body portion and the recess during coupling, the sealing members being spaced apart so as to define therebetween a space via which said fluid flow passages are communicated whereby the forces exerted by the gas under pressure are balanced, said coupling assembly further including flow control means arranged normally to close one of said flow passages and to open the passage when said first body portion is received in said recess, thereby enabling fluid to be dispensed from the container to the fluid utilization device via the coupling assembly, characterised in that said flow control means is arranged so that it is opened only when said sealing members are sealingly received in the recess on each side of said space via which the fluid flow passages are communicated.

2. Apparatus as claimed in claim 1, wherein said flow control means comprises a valve spring biased to its closed position, the valve including a member arranged to urge the valve open during engagement of the first body portion in the recess.

3. Apparatus as claimed in claim 1 or 2, wherein the flow control means is disposed in said first body portion.

4. Apparatus as claimed in claim 1 or 2, wherein the flow control means is disposed in the second body portion.

5. Apparatus as claimed in any preceding claim, wherein each of said sealing members comprises an O-ring seated in a retaining groove on the exterior surface of said first body portion.

6. Apparatus as claimed in any preceding claim, wherein the first or second body portion includes a vent passage arranged to vent the base of the recess to atmosphere during engagement of the first body portion in the recess.

7. Apparatus as claimed in any preceding claim,

including a pressure regulator arranged downstream of the coupling assembly.

Patentansprüche

1. Vorrichtung zur Abgabe einer Flüssigkeit aus einem Behälter, in dem unter Druck stehende Flüssigkeit gespeichert ist, an eine Flüssigkeitsverwertungsvorrichtung, mit einer Kupplungsvorrichtung zur Verbindung des Behälters und der Flüssigkeitsverwertungsvorrichtung, wobei die Kupplungsvorrichtung einen ersten und einen zweiten Teil mit je einer Flüssigkeitsdurchflußbohrung aufweist, wobei der erste Teil zur Verbindung mit dem zweiten Teil durch Einsetzen in eine im zweiten Teil befindliche Ausnehmung ausgebildet ist und zwei Dichtungen, von denen jede während des Verbindungsvorganges eine Abdichtung zwischen dem ersten Teil und der Ausnehmung bildet, und derart in gegenseitigem Abstand angeordnet sind, daß zwischen ihnen ein Raum gebildet ist, durch den die Flüssigkeitsdurchflußbohrungen miteinander in Verbindung stehen, wodurch die von dem unter Druck stehenden Gas ausgeübten Kräfte ausgeglichen werden, wobei weiters die Kupplungsvorrichtung eine Durchflußsteuervorrichtung aufweist, die normalerweise eine der Durchflußbohrungen verschließt und nach dem Einsetzen des ersten Teiles in die Ausnehmung öffnet und dadurch die Abgabe der Flüssigkeit aus dem Behälter durch die Kupplungsvorrichtung an die Flüssigkeitsverwertungsvorrichtung ermöglicht, dadurch gekennzeichnet, daß die Durchflußsteuervorrichtung derart ausgebildet ist, daß sie nur geöffnet ist, wenn die Dichtungen in der Ausnehmung an beiden Seiten des Raumes, durch den die Flüssigkeitsdurchflußbohrungen miteinander in Verbindung stehen, dicht eingesetzt sind.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Durchflußsteuervorrichtung ein ein in seine Schließstellung mittels einer Feder vorgespanntes Ventil aufweist und daß das Ventil ein Glied aufweist, das zum Öffnen des Ventiles während des Einsetzens des ersten Teiles in die Ausnehmung ausgebildet ist.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Durchflußsteuervorrichtung im ersten Teil angeordnet ist.

4. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Durchflußsteuervorrichtung im zweiten Teil angeordnet ist.

5. Vorrichtung nach den Ansprüchen 1 bis 4, dadurch gekennzeichnet, daß jede Dichtung aus einem O-Ring besteht, der in einer an der Außenfläche des ersten Teiles ausgebildeten Halterille sitzt.

6. Vorrichtung nach den Ansprüchen 1 bis 5, dadurch gekennzeichnet, daß der erste oder der zweite Teil eine Entlüftungsbohrung aufweist, die zur Entlüftung der Basis der Ausnehmung zur Außenluft während des Einsetzens des ersten Teiles in die Ausnehmung dient.

7. Vorrichtung nach den Ansprüchen 1 bis 6, dadurch gekennzeichnet, daß ein Druckregler stromabwärts der Kupplungsvorrichtung angeordnet ist.

Revendications

1. Appareil pour distribuer un fluide, à partir d'un récipient dans lequel un fluide sous pression est stocké, à un dispositif d'utilisation de fluide, comprenant un ensemble de raccordement pour mettre en communication fluidique ledit récipient avec ledit dispositif, l'ensemble de raccordement comprenant une première et une seconde partie de corps comportant chacune un passage d'écoulement de fluide, la première partie de corps étant adaptée pour être raccordée à ladite seconde partie de corps par engagement dans un évidement de celle-ci, et deux éléments d'étanchéité agencés chacun de façon à former un joint d'étanchéité entre la première partie de corps et l'évidement pendant le raccordement, les éléments d'étanchéité étant espacés l'un de l'autre de façon à définir entre eux un espace par l'intermédiaire duquel lesdits passages d'écoulement de fluide sont mis en communication de telle sorte que les forces exercées par le gaz sous pression soient équilibrées, ledit ensemble de raccordement comprenant en outre un moyen de commande d'écoulement agencé normalement pour fermer un desdits passages d'écoulement et pour ouvrir le passage quand ladite première partie du corps est reçue dans ledit évidement, en permettant ainsi une distribution de fluide du récipient au dispositif d'utilisation de fluide par l'intermédiaire de l'ensemble de raccordement, caractérisé en ce que ledit moyen de commande d'écoulement est agencé de telle sorte qu'il soit ouvert seulement quand lesdits éléments d'étanchéité sont reçus de façon étanche dans ledit évidement de chaque côté dudit espace par l'intermédiaire duquel les passages d'écoulement de fluide sont en communication.

2. Appareil tel que revendiqué dans la revendication 1, caractérisé en ce que ledit moyen de commande d'écoulement comprend un ressort de valve poussé dans sa position de fermeture, la valve comportant un élément agencé de manière à pousser la valve en condition d'ouverture pendant un engagement de la première partie de corps dans l'évidement.

3. Appareil tel que revendiqué dans une des revendications 1 ou 2, caractérisé en ce que le moyen de commande d'écoulement est disposé dans ladite première partie de corps.

4. Appareil tel que revendiqué dans la revendication 1 ou 2, caractérisé en ce que le moyen de commande d'écoulement est disposé dans la seconde partie de corps.

5. Appareil tel que revendiqué dans une quelconque des revendications précédentes, caractérisé en ce que chacun desdits éléments d'étanchéité comprend une bague torique logée dans une rainure de retenue prévue sur la surface extérieure de ladite première partie de corps.

6. Appareil tel que revendiqué dans une quelconque des revendications précédentes, carac-

térisé en ce que la première ou la seconde partie de corps comprend un passage d'évent agencé pour assurer l'évent de la base de l'évidement vers l'atmosphère pendant l'engagement de la première partie de corps dans l'évidement.

7. Appareil tel que revendiqué dans une quelconque des revendications précédentes, caractérisé en ce qu'il comprend un régulateur de pression placé en aval de l'ensemble de raccordement.

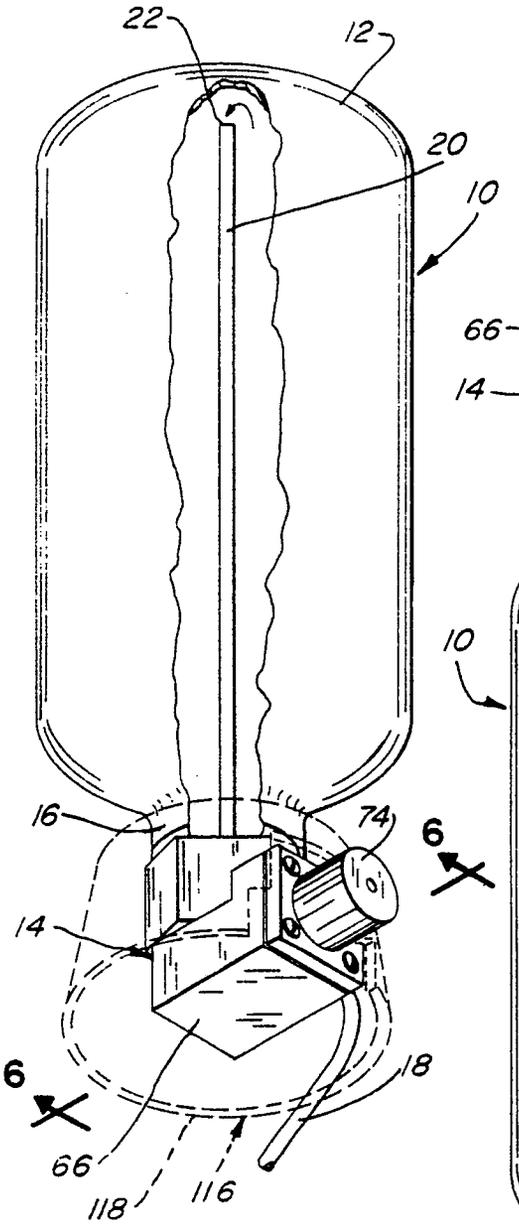


Fig.-1

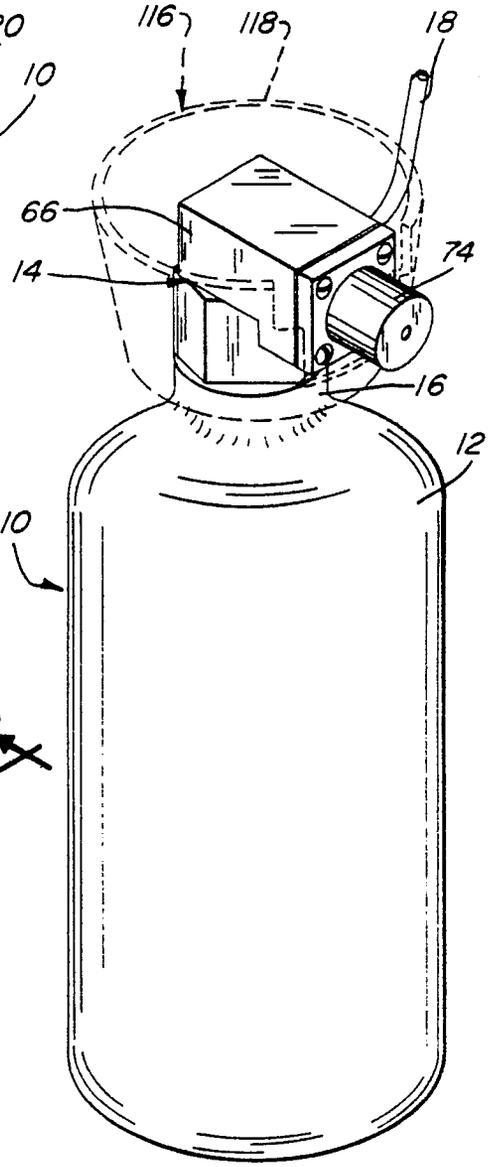
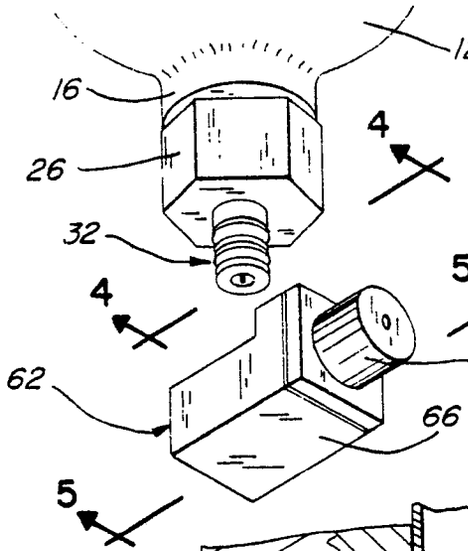


Fig.-2



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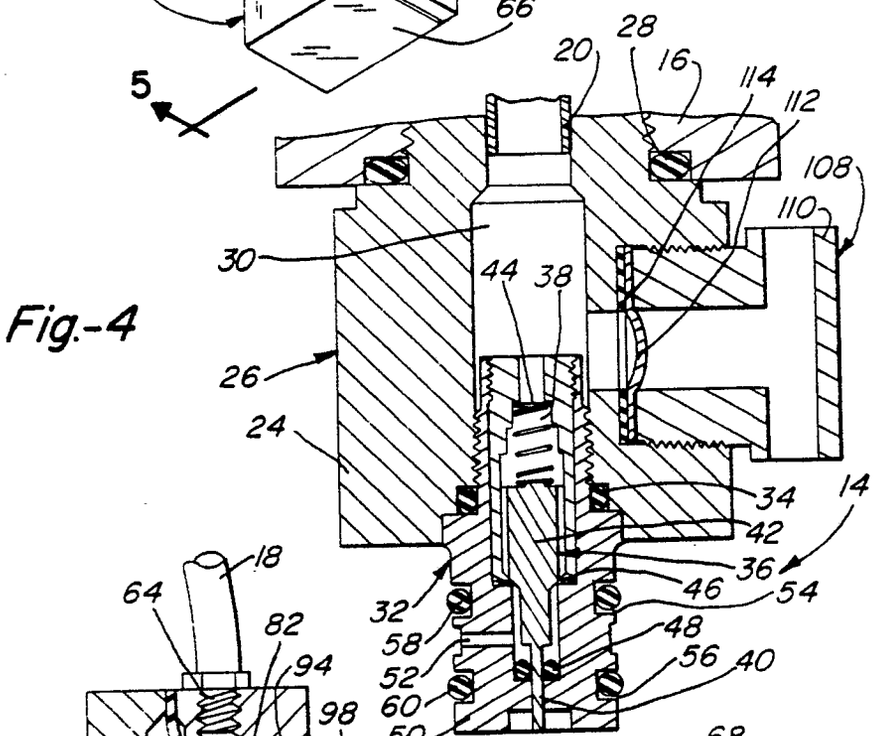

Fig.-4

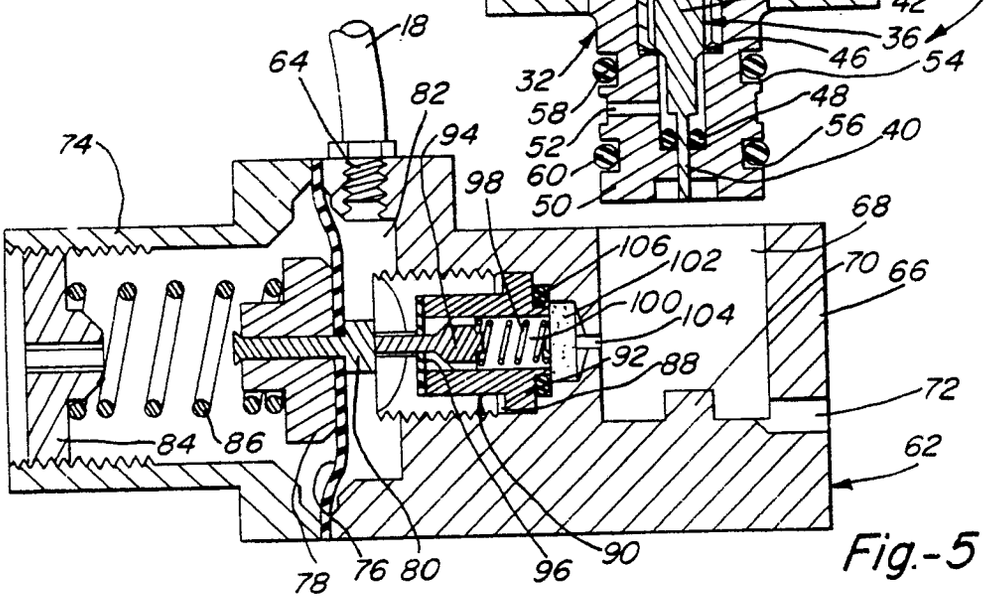

Fig.-5

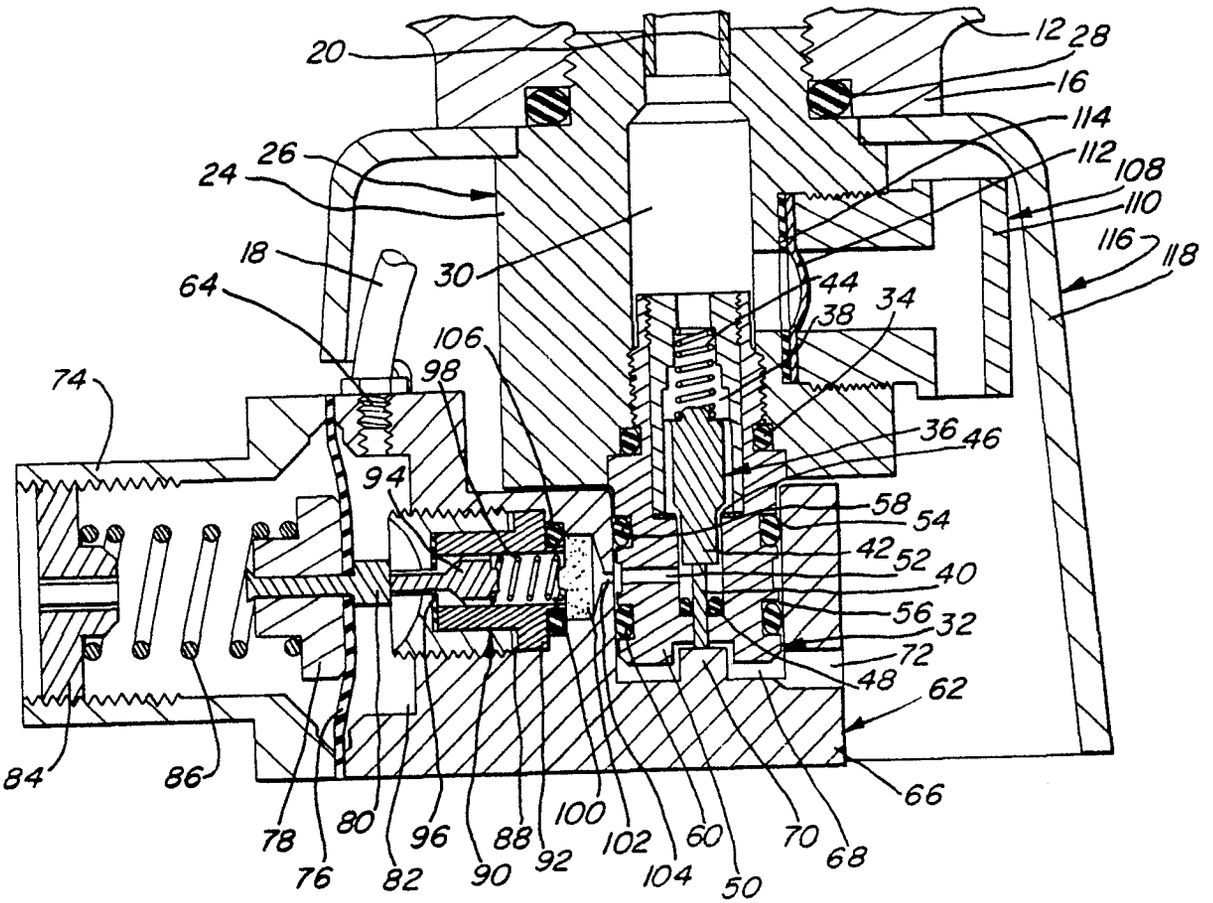
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Fig.-6

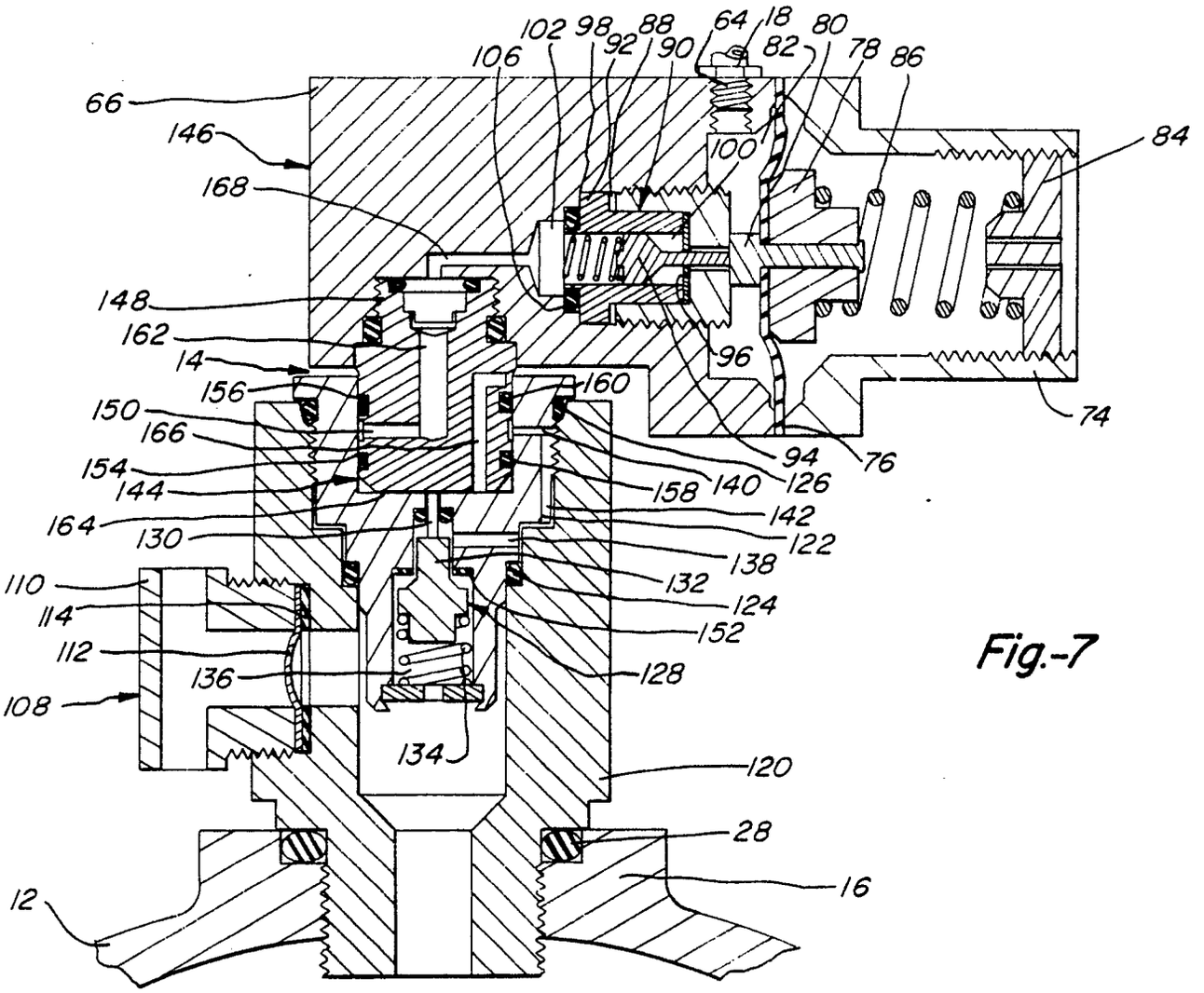
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Fig.-7