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H. E. HEIGIS

2,780,296

FLUID DISPENSING SYSTEM

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2 Sheets-Sheet 1

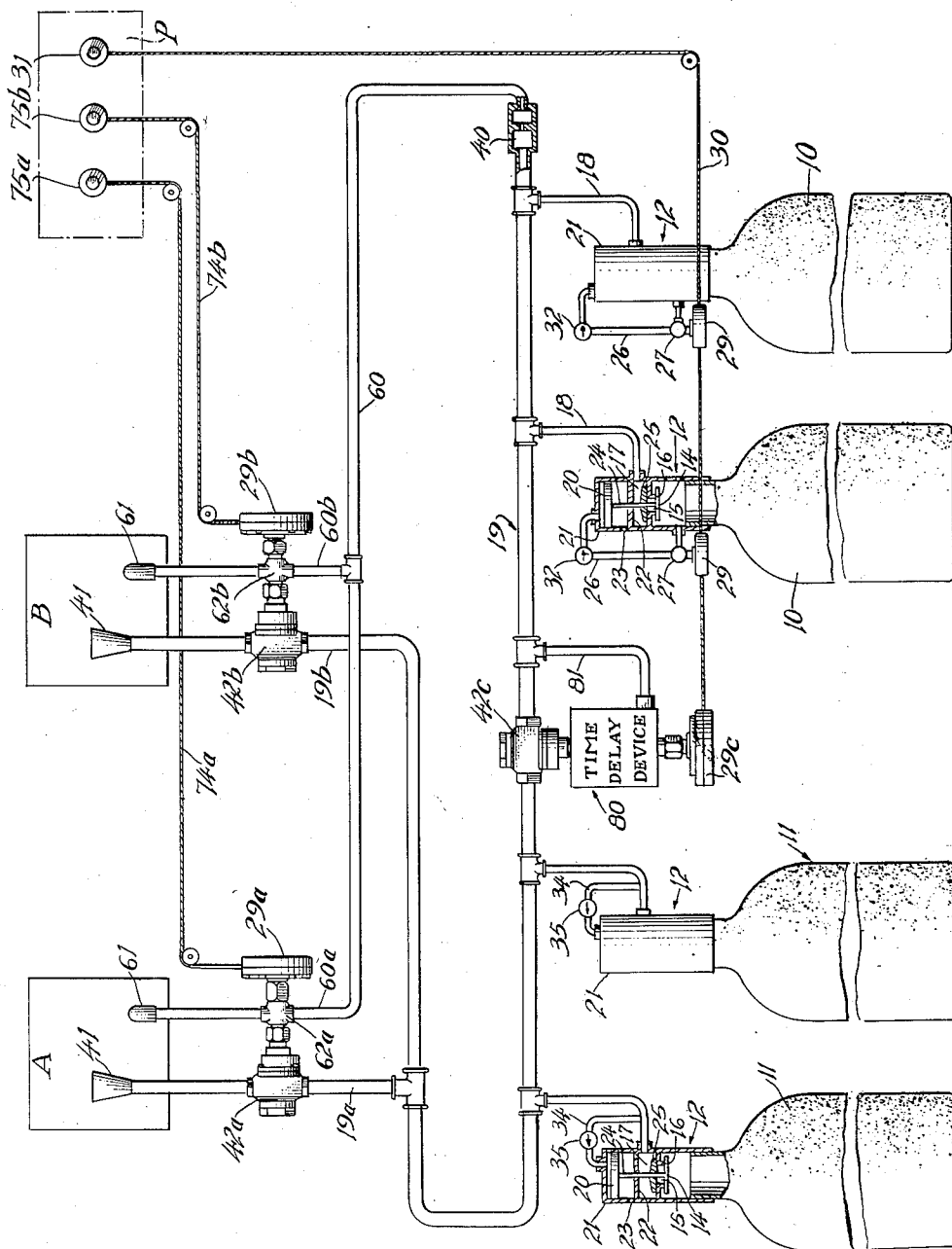


Fig. 1.

INVENTOR.
Henry E. Heigis
 BY
J. William Carson
 ATTORNEY

Feb. 5, 1957

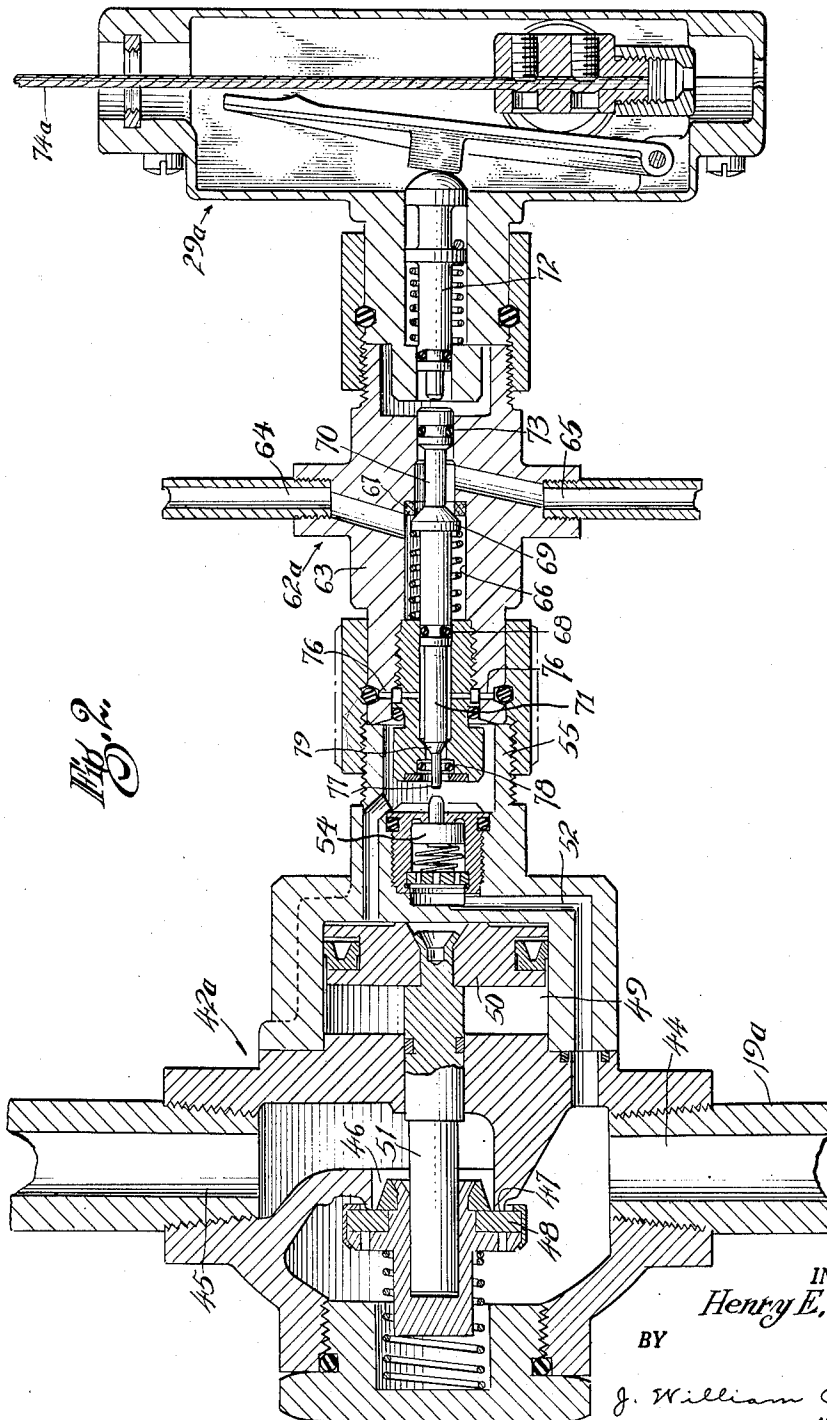
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FLUID DISPENSING SYSTEM

Henry E. Heigis, Nutley, N. J., assignor to Specialties Development Corporation, Belleville, N. J., a corporation of New Jersey

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4 Claims. (Cl. 169—11)

This application is a continuation-in-part of my prior application for Letters Patent of the United States, Serial No. 186,142, filed September 22, 1950, now Patent No. 2,630,867.

The present invention relates to high pressure fluid medium dispensing systems of the type wherein gaseous and/or liquefied carbon dioxide is stored and is released and distributed to primarily utilize the same as a fire extinguishing medium and to accomplish an auxiliary operation.

Such systems generally comprise a source of fluid medium under pressure, a main discharge conduit connected to the source and extending to one or more zones wherein a fire may occur, a normally closed valve in the main conduit or branches thereof, an auxiliary conduit in fluid flow communication with the source or another source, and a normally closed valve in the auxiliary conduit. The main valve usually includes a cylinder, a piston in the cylinder for opening the valve and a normally closed pilot valve for controlling the admission of the fluid medium from the main conduit to the cylinder. In the operation of the system, the pilot valve of a main valve, which controls the admission of the fluid medium to a selected space, is unseated to condition the main valve for opening thereof, and the auxiliary valve of an auxiliary conduit associated with the selected space is unseated.

The present invention is primarily concerned with providing such a system wherein the pilot valve and the auxiliary valve are arranged to be opened simultaneously under the control of a single mechanism.

Accordingly, an object of the present invention is to provide a system of the foregoing character wherein the pilot valve and the auxiliary valve are mechanically interconnected and the pilot valve housing or chamber and the auxiliary valve chamber are isolated to prevent fluid flow intercommunication between the main and auxiliary conduits.

Another object is to provide such a system wherein the pilot valve chamber can be vented to the atmosphere.

Another object is to provide such a system wherein the foregoing is accomplished in a simple, practical and economical manner.

A further object is to provide a combined main valve, auxiliary valve and interconnector arrangement which is extremely compact and is of a minimum weight.

A still further object is to provide such an arrangement which is reliable in operation and is adapted for use in a wide variety of systems of the aforementioned type.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

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Fig. 1 is a diagrammatic view of a system embodying the present invention.

Fig. 2 is a longitudinal sectional view illustrating the improvements in accordance with the invention.

Referring to the drawings in detail and more particularly to Fig. 1 thereof, there is shown a fire extinguishing system of the one pipe type for protecting a plurality of spaces, herein designated as A and B by way of example. Generally described, the system comprises a bank of one or more primary or master receptacles or containers 10, and one or more secondary or controlled receptacles or containers 11, the receptacles illustrated herein being cylinders of the type for storing fluid medium under pressure such as liquefied carbon dioxide or the like and being connected for directing the medium to the spaces A and B as described hereinafter. While two receptacles 10 and two receptacles 11 are shown by way of example, it will be understood that a system in accordance with the present invention may comprise any number of receptacles 10 and 11, and, preferably, a greater number of secondary receptacles 11 than primary receptacles 10.

Each of the receptacles 10 and 11 has connected thereto a fluid medium actuated release control means 12 comprising retaining means, such as a main valve member 14, which controls the discharge of the fluid medium from the receptacle by way of an opening or main valve port 15 surrounded by a valve seat 16, a chamber 17, and a conduit 18 connected to a common main discharge conduit or fluid medium delivery means 19.

Each fluid medium actuated release control means 12 further comprises main valve operating means, such as a piston 20, movable in a cylinder 21 which is separated from the chamber 17 by a partition 22. The lower portion of the cylinder 21 has a vent 23 for preventing the entrapment of air, and the piston 20 and the main valve member 14 are operatively connected by a piston rod 24 which passes through a gland (not shown) in an opening in the wall 22. A check valve member, such as an apertured disc 25, is located in the chamber 17 with the rod 24 extending therethrough, and is adapted to seal the valve port 15 from the side opposite the seat 16, whereby the escape of fluid medium in the conduit 19 is prevented should a container be detached or be pierced as a result of gun fire or the like.

The fluid medium release control means 12 of the primary receptacles 10 are each provided with a fluid flow connection 26 between the receptacle and the cylinder 21 at the upper side of the piston 20 for effecting operation of the piston to unseat the main valve members upon release of a portion of the fluid medium in the receptacle. Release of the medium for this purpose is controlled by a pilot valve 27 in the connection 26 under the control of a valve unseating device or head 29.

The devices 29 shown herein are of the pull cable actuated type (Fig. 2) which are operated in tandem by a cable 30 extending to a control panel P and provided with manually operable means 31 on the panel. However, it will be understood that remotely operable control devices of the pneumatic, hydraulic or electro-magnetic type could be utilized.

The connection 26 is further provided with check valve means 32 constructed and arranged to permit the flow of medium through the connection from the receptacle 10 to the cylinder 21 and to prevent the flow of medium from the cylinder to the receptacle, whereby fluid medium admitted into the cylinder is trapped therein in back of the piston.

In order to effect simultaneous operation of all of the secondary receptacle release control means by fluid medium in the conduit 19, a connection 34 is provided between the conduit 18 and the upper end of the cylinder

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21. The connection 34 is provided with check valve means 35 constructed and arranged to permit the flow of medium into the cylinder and to prevent the flow of medium from the cylinder whereby the fluid medium admitted into the cylinder is trapped therein in back of the piston.

As illustrated herein, one end of the conduit 19 (at the right as viewed) has fluid flow restricting means, such as an orifice 40, connected thereto and the other end of the conduit is in communication with a pair of main discharge branch conduits 19a and 19b leading to the spaces A and B, respectively. Each of these branches is provided with a discharge outlet means 41 located in the respective spaces, and a normally closed valve 42a and 42b, respectively, located upstream of the outlet means.

As shown in Fig. 2, the valves 42a and 42b are of the fluid medium operated, pilot valve controlled type, and generally comprise an inlet 44, an outlet 45, a port 46 between the inlet and the outlet surrounded by a valve seat 47, a spring urged main valve member 48 for the seat, a cylinder 49, a piston 50 in the cylinder having a rod 51 for unseating the main valve member, a fluid medium flow connection 52 between the inlet and the cylinder, a pilot valve 54 in the connection 52 for controlling the flow of medium to effect operation of the piston to unseat the valve member, and a nipple portion 55 which provides a housing for the pilot valve as indicated hereinafter.

An auxiliary conduit 60 is connected to the downstream end of the flow restricting means 40 and is in communication with a pair of branches 60a and 60b leading to the spaces A and B, respectively. Each of these branches is provided with a fluid medium operated warning means, such as a siren or whistle 61 located in the respective spaces and a normally closed valve 62a and 62b, respectively upstream of the warning means (Fig. 1).

As shown in Fig. 2, the valves 62a and 62b are of the mechanically operated type, and generally comprise a valve body 63, a side inlet 65, a side outlet 64, and a vertical through bore 66 formed with a valve seat between the inlet and the outlet; a spring urged valve member 69 for the seat for controlling the flow of medium to effect operation of the warning device 61, and upper and lower stem portions 70 and 71 at the respective sides of the valve member 69 slidably mounted in the bore 66.

The valve body 63 of the valves 62a and 62b is coupled to the nipple 55 of the valves 42a and 42b in a manner to house the pilot valve and to provide for fluid flow in the connection 52 when the pilot valve member is unseated. The lower end of the stem portion 71 is arranged to engage the pilot valve member 54 and effect unseating thereof. Movement of the valve member 69 and its stem portions is effected by a plunger 72 of the control device for engaging the upper end of the stem portions 70. In this manner a mechanical interconnection between the pilot valve and the auxiliary conduit is established.

In order to isolate the pilot valve chamber provided by the nipple 55 in communication with the bore 66 from the auxiliary conduit also in communication with the bore 66, the lower stem 71 has an O-ring 68 thereon for forming a seal between the stem and the bore. Leakage of fluid medium from the pilot valve to the auxiliary conduit or vice versa is thus prevented. This is important because the rate of flow of the medium through these devices and the pressure of the medium usually differ and are of a predetermined value, whereby intercommunication between these devices would result in a condition other than is contemplated which may cause malfunctioning of the system. Leakage through the upper end of the bore is prevented by an O-ring 73 on the stem 70.

Preferably, provision is made for venting the pilot valve chamber to release fluid medium under pressure in back of the piston 50 to enable the main valve to reclose under the influence of its spring. This is accomplished by providing the bore 66 with vent openings 76 below the O-ring 68 and providing the lower end of the stem with a section 77 of reduced diameter. When the pilot valve is opened,

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the loss of fluid medium through the vent openings is prevented by an O-ring 78 adjacent the lower end of the bore, and a shoulder portion 79 on the stem 71 which engages the O-ring 78.

As shown herein, the control devices 29a and 29b are of pull cable actuated type, and are adapted to be selectively operated by pull cables 74a and 74b, respectively, which extend to the control panel P (Fig. 1) where manually operable means 75a and 75b are provided. The control devices 29 for the pilot valves of the primary receptacles, as illustrated herein, are identical to the control devices 29a and 29b, although it will be understood that the devices 29a and 29b, as well as the devices 29, could be of the pneumatically, hydraulically or electromagnetically operated types.

In view of the fact that the illustrative system provides for delaying the discharge of the secondary receptacles for an interval of time after the release of the medium of the primary receptacles into the conduit or pipe 19, this pipe is further provided with a normally closed valve 42c positioned between the points at which the conduits 18 of the primary receptacles 10 are connected to the pipe and points at which the conduits 18 of the secondary receptacles are connected to the pipe so that fluid medium discharged into the pipe from the receptacles 10 will not effect operation of the release means of the secondary receptacles unless the valve 42c is opened.

The valve 42c is identical to the valves 42a and 42b and has its inlet (which is provided with the pilot valve controlled fluid medium flow connection) at the side of the pipe 19 in which the primary receptacles are connected, the pilot valve being adapted to be unseated by an element of a time delay device 80.

The time delay device is not illustrated in detail because it may be of any well known type wherein clockwork or fluid medium operated means effect delaying the actuation of the element for unseating the pilot valve of the valve 42c until a predetermined interval of time has expired. Such time delay device may be put in operation mechanically by a control device 29c actuated in tandem with the devices 29 by the pull cable 30, or may be put in operation responsive to the pressure of fluid medium in the conduit or pipe 19 by a conduit 81 connecting the pipe and the time delay device.

In operation, should a fire occur in space A, the cables 30 and 74a are pulled whereby the fluid medium in the primary receptacles 10 is released and discharged into the pipe 19, the time delay device is put into operation, and the valve member 69 of the valve 62a and the pilot valve member 54 of the valve 42a are unseated.

The fluid medium in the pipe, by reason of the valve 42c being closed, can only flow through the flow restricting means, into the conduit 60 and the branch 60a thereof, through the valve 62a and to the warning device 61 or other mechanism to be pressure operated.

When the time delay period expires, the valve 42c is opened, and fluid medium enters the section of the pipe in which the secondary receptacles are connected and effects release of the fluid medium therefrom. The medium flowing through the valve 42c and the medium released from the secondary receptacles is conducted to the branch 19a, and, by reason of the pilot valve 54 of the valve 42a being unseated, effect pressure operation of the piston 50 to unseat the main valve member 48. The fluid medium then flows through the valve 42a to discharge outlet means 41 located in the space A whereby the medium floods this space to extinguish the fire therein.

From the foregoing description, it will be seen that the present invention provides an improved system for selectively discharging fire extinguishing medium into one of a plurality of spaces wherein a pilot valve of a main valve and an auxiliary valve are operated simultaneously by a single mechanism. The system is simple and practical, and utilizes a minimum number of valves, control

devices and fluid flow connections which are constructed and arranged in a manner to simplify the operation and assembly of the system.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. In a fluid distributing system, a main discharge conduit; a normally closed valve in said conduit having an inlet and an outlet directly connected to said conduit, and including a cylinder, a piston in said cylinder for opening the valve, and a normally closed pilot valve, provided with a housing, for controlling the admission of fluid under pressure from said main conduit to said cylinder; an auxiliary conduit; a valve body having a through bore provided with a valve seat and having an inlet and an outlet communicating respectively with said bore at opposite sides of said seat and directly connected to said auxiliary conduit, said valve body having one end detachably connected to said pilot valve housing; a valve member in said bore for said valve seat normally preventing fluid flow communication between said valve body inlet and outlet; a stem at one side of said valve member extending outwardly of said bore and having its free end adjacent said pilot valve for effecting opening thereof; means providing a seal between said stem and said bore; a second stem at the opposite side of said valve member extending outwardly of said bore; and a control head detachably connected to the other end of said valve body having an element structurally independent of said second stem for engaging said second stem to actuate the same, whereby said valve member is unseated to establish communication between said inlet and outlet of said valve body and said first stem effects opening of said pilot valve.

2. In a fluid distributing system, a source of fluid under pressure; a main discharge conduit connected to said source; a normally closed valve in said conduit having an inlet and an outlet directly connected to said conduit, and including a cylinder, a piston in said cylinder for opening the valve, and a normally closed pilot valve, provided with a housing, for controlling the admission of fluid under pressure from said main conduit to said cylinder; a fluid pressure operated warning device; an auxiliary conduit having one end in fluid flow communication with said source and having its other end in communication with said warning device; a valve body having a through bore provided with a valve seat and having an inlet and an outlet communicating respectively with said bore at opposite sides of said seat and directly connected to said auxiliary conduit, said valve body having one end detachably connected to said pilot valve housing; a valve member in said bore for said valve seat normally preventing fluid flow communication between said valve body inlet and outlet; a stem at one side of said valve member extending outwardly of said bore and having its free end adjacent said pilot valve for effecting opening thereof; means providing a seal between said stem and said bore; a second stem at the opposite side of said valve member extending outwardly of said bore; and a control head detachably connected to the other end of said valve body having an element structurally independent of said second stem for engaging said second stem to actuate the same, whereby said valve member is unseated to establish communication between said inlet and outlet of said valve body and said first stem effects opening of said pilot valve to establish communication between said main conduit and said cylinder.

3. In a fluid distributing system, a main discharge conduit; a normally closed valve in said conduit having an inlet and an outlet directly connected to said conduit,

and including a cylinder, a piston in said cylinder for opening the valve, and a normally closed pilot valve, provided with a housing for controlling the admission of fluid under pressure from said main conduit to said cylinder; an auxiliary conduit adjacent said main conduit; a valve body having a vertical through bore provided with a downwardly facing valve seat and having a side inlet and a side outlet communicating respectively with said bore at opposite sides of said seat and directly connected to said auxiliary conduit, said valve body having its lower end detachably connected to said pilot valve housing; a valve member in said bore for said valve seat normally preventing fluid flow communication between said valve body inlet and outlet; a stem at the lower side of said valve member extending outwardly of said bore having its lower end adjacent said pilot valve for effecting opening thereof; means providing a seal between said stem and said bore; a second stem at the upper side of said valve member extending outwardly of said bore; means providing a seal for the upper end of said bore; and a control head detachably connected to the upper end of said valve body having an element structurally independent of said second stem for engaging said second stem to move the same downwardly, whereby said valve member is unseated to establish communication between said inlet and outlet of said valve body and said first stem effects opening of said pilot valve.

4. In a fluid distributing system, a main discharge conduit; a normally closed valve in said conduit having an inlet and an outlet directly connected to said conduit, and including a cylinder, a piston in said cylinder for opening the valve, and a normally closed pilot valve provided with a housing for controlling the admission of fluid under pressure from said main conduit to said cylinder; an auxiliary conduit; a valve body having a through bore provided with a valve seat and having an inlet and an outlet communicating respectively with said bore at opposite sides of said seat and directly connected to said auxiliary conduit, said valve body having its lower end detachably connected to said pilot valve housing; a valve member in said bore for said valve seat normally preventing fluid flow communication between said valve body inlet and outlet; a stem at the lower side of said valve member having a reduced lower end portion extending outwardly of said bore and being adjacent said pilot valve for effecting opening thereof and having a shoulder above said portion; means providing a seal between said stem and said bore; said bore having a vent between its lower end and said seal and having a sealing surface adjacent its lower end adapted to be engaged by said shoulder; a second stem at the upper side of said valve member extending outwardly of said bore; means providing a seal for the upper end of said bore; and a control head detachably connected to the upper end of said valve body having an element structurally independent of said second stem for engaging said second stem to move the same downwardly, whereby said valve member is unseated to establish communication between said inlet and outlet of said valve body and said first stem effects opening of said pilot valve and said surface and shoulder cooperate to prevent communication between said pilot valve housing and said vent.

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