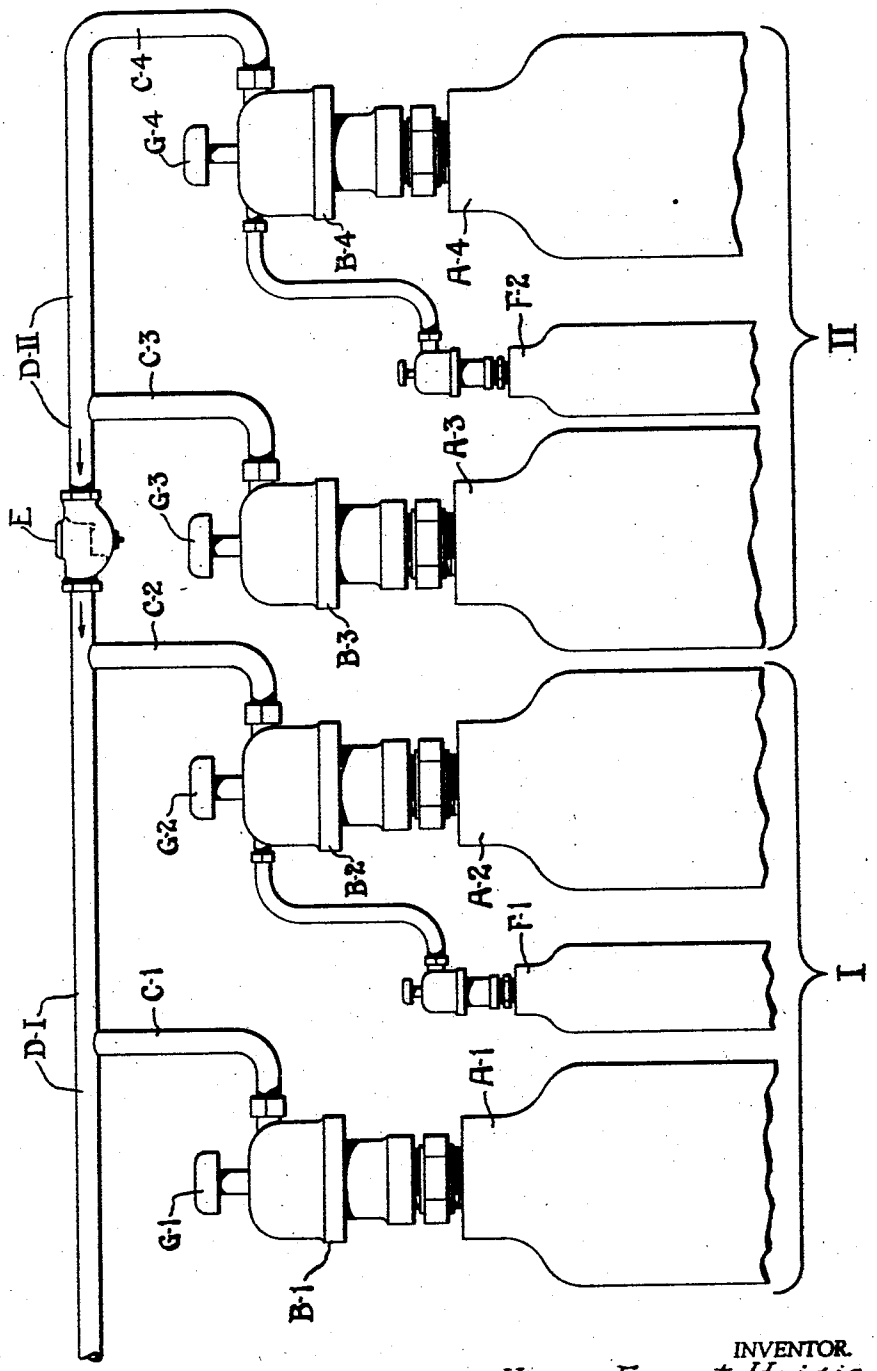
Oct. 28, 1941. H. E. HEIGIS 2,261,026

DISTRIBUTING SYSTEM FOR HIGH PRESSURE FLUID MEDIA

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Fig. 1



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Fig. 2

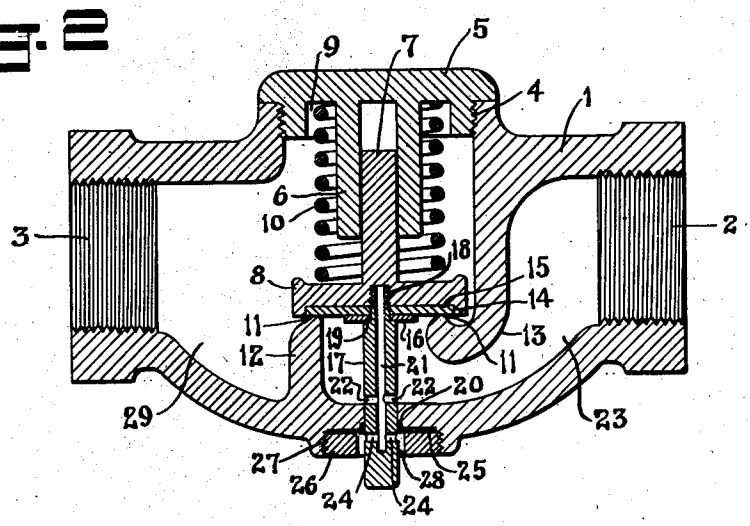


Fig. 3

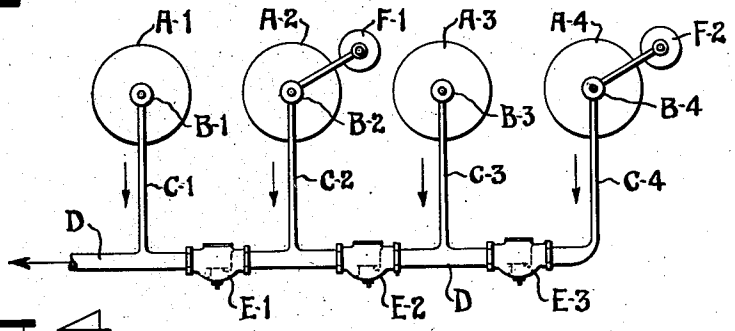
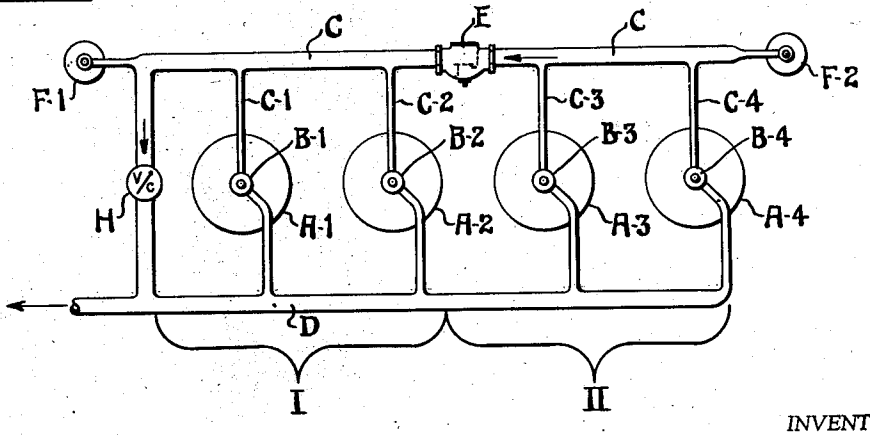


Fig. 4



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UNITED STATES PATENT OFFICE

2,261,026

DISTRIBUTING SYSTEM FOR HIGH PRESSURE FLUID MEDIA

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Application June 11, 1938, Serial No. 213,227

4 Claims. (Cl. 169—11)

This invention relates to distributing systems for high pressure fluid media of the general type comprising a battery of high pressure fluid medium containers, each provided with a fluid pressure operable fluid release valve, fluid medium conduits, and a separate source of stored fluid medium under pressure adapted, when released to operate the fluid pressure operable valves to release the main body of fluid medium, to be delivered to the points of desired application.

More particularly, the present invention relates to a system of the type referred to, which will permit a flow of the fluid medium, initiated by fluid pressure operated means, from a desired portion of the system and which will, at the same time, make impossible the release of the fluid medium from another portion of the system due to undesired action of the released pressure medium via the interconnecting conduits on the unoperated portions of the system.

There is a great variety of arrangements under which such systems operate, depending upon the particular application. It is with the thought of effectively sectionalizing a high pressure fluid medium distribution system such as encountered in modern carbon dioxide fire extinguishing practice, that this invention is primarily concerned.

The elements that go to make up such systems have been mainly arranged in the past along two lines, which differ from each other only in the particular, that in one case the valves or releasing mechanisms are arranged, for one and the same conduit to serve, at once, as the operating fluid line and the main discharge line; while in the other case the pressure operated container releasing devices are separately manifolded on the one side for pressure operation and on the other side for discharge of the fluid medium, no provision being made for conducting the operating fluid through the same conduit through which the main body of fluid medium is discharged. The latter arrangement has evolved out of considerations to conserve the fluid medium, to accomplish a desired type of operation, and to save on installation expense, as this arrangement involves a minimum of piping. There are, of course, other modifications which, however, are mere variations of the above described general types; but all of these systems are dependent for operation upon some means for initiating the flow of a pressure medium.

In the case of a multiple cylinder arrangement, a very widely accepted means for operation makes use of pressure driven piston cutters, which open frangible closures sealing said cylinders from their respective outlets. While, either so-called developed pressure or stored pressure may be used to operate these cutters, in the systems hereinafter described, stored pressure is employed, which is obtained from a separate container or containers holding a medium under pressure, which may be used only for control purposes, or which may be combined with the main body of fluid medium.

Whatever general type of system be employed, it is often desired to discharge only a portion of the cylinders in a battery at a given time, leaving other portions of the battery in reserve; and it therefore becomes necessary and desirable to provide means to sectionalize the system, that is, to prevent the pressure medium released in one part of the system from operating the pressure operable fluid release valves of that portion of the cylinders which is not to be operated at that time, whether they are connected to separate operating and discharge conduits or to a combined operating and discharge conduit. At the same time, such sectioning means shall permit the flow of fluid medium from that portion of the cylinder battery it separates, when that flow is desired. A solution to such a problem might appear obvious, but presents, due to the peculiarity of the operating conditions, further complications which have led to the present invention. Ordinary check valves have been used in the past for such a purpose, but these, however well constructed, will permit leakage, if only very slight, to gradually build up a pressure on the pressure operated controls of the fluid release valves of the non-operated cylinders, and thus result in their operation at a time when such operation is not desired. Furthermore, with such construction, the unintentionally released medium is discharged to the same point as the intentionally released medium, which may not only be undesirable, but quite dangerous, because of its unexpected character. Provision, therefore, had to be made to eliminate such leakage-created pressure, and at the same time not to interfere with the flow of the medium under desired conditions.

It is therefore an object of this invention to provide a high pressure fluid medium distributing system comprising means for sectionalizing such a system and for preventing undesired operation of a specified section of the system otherwise operatively interconnected with other sections of the system.

Another object is to provide such a distributing system that will permit of a flow in a desired direction only.

A further object of the invention is to provide a

high pressure fluid medium distributing system in which any pressure, undesirably leaking from the operating to a non-operating portion of the system, is eliminated without any accompanying impairment of flow of the fluid medium from the latter portion of the system when desired.

These and other objects of the invention not defined above will be readily apparent as the invention is further described and interpreted in conjunction with the accompanying drawings wherein:

Fig. 1 is a view in elevation showing the layout and connections of a battery of high pressure fluid medium containers forming a high pressure fluid medium distributing system of the type having a single conduit serving both for operation and distribution, the upper ends only of the containers being shown.

Fig. 2 is a longitudinal vertical section of the body of a valve in accordance with this invention, showing all the features of construction.

Fig. 3 shows diagrammatically another form the system of Fig. 1 may take; while Fig. 4 is a diagrammatic layout of a system of the second named general type having separate operating and distributing conduits.

Referring to Fig. 1, a high pressure fluid medium distributing system is shown divided into a plurality of sections or groups I and II, and comprising a plurality of containers or cylinders A—1 to A—4, used for storing the medium under pressure; said cylinders having fluid pressure operated frangible disc cutter valves B—1 to B—4, which may be, for example in the case of the release devices designated by B—1 and B—3, like those shown in Figure 1 in Letters Patent of the United States No. 2,000,708, for opening the closures of these cylinders and similarly for the case of the devices indicated by B—2 and B—4, with the modification of an additional fluid medium connection as indicated in the drawings, the operation of which may also be accomplished manually by means of strike-knobs G—1 to G—4. Branch conduits C—1 to C—4 are provided for conducting the medium stored in these cylinders to the manifold D—I, D—II, whence it is conducted to its destination, such as a space to be covered against the spread of fire in case of a fire extinguishing system. E indicates a special valve constituting means for effective separation of the two cylinder groups I and II; that is, it will keep group II inactive in case group I is operating, when it is so desired; or, it will provide an outlet for the fluid medium of group II into the common manifold D—I, D—II, whence it will cause the operation of cylinders B—2 and B—1, unless they have already been released. F—1 and F—2 indicate separate controls for groups I and II, each comprising a small cylinder containing a fluid medium under pressure and designed, upon either manual or automatic initiation, to operate the pressure operated controls B—2, B—4 ot the main cylinders A—2, A—4. This method of control and the parallel arrangement of the containers as shown in Fig. 1 are the preferred method and arrangement, but this invention is not restricted to this particular form, as a number of other controls and container arrangements, e. g., a tandem-operation arrangement, will serve the same purpose.

In Fig. 2, the body 1 of the valve E is shown having a threaded inlet 2 and a threaded outlet 3, permitting connection of the valve into the piping of the system of which it is a part, as shown in Fig. 1. An opening is formed in the upper part of the valve body, centrally located between inlet 2 and outlet 3, and threaded at 4 to receive a plug 5, which is adapted to removably close said opening. Said plug 5 has a tubular depending projection 6, centrally recessed to serve as a guide for the stem 7 of the valve head 8, and having an annular recess 9, which receives a compression spring 10. Said spring bears against the upper face of valve head 8, tending to hold it normally against valve seat 11, which is formed interiorly by a portion of the valve body 1, and shown sectionally at 12 and 13. The lower side of the valve head is provided with an annular recess 14 to receive a compressible packing washer 15, usually made of leather. This packing washer is held in place by a metal washer 16, through which passes the cylindrical ported stem 17, the upper and smaller end of which is screwed within a threaded opening 18 in the valve head. A shoulder 19, formed on the ported stem, bears against the metal washer 16 and presses it in place. The ported stem 17, which extends outside the valve body through the body opening 20, is provided with a central axial bore 21, radial ports 22 communicating with the inlet chamber 23, and radial ports 24 leading to the atmosphere. Opening 20 on its lower side is enlarged to receive a centrally cupped packing washer 25, which is held in place by gland 26, threaded at 27 into the enlargement of opening 20. Gland 26 in turn has an annular central recess 28 to permit free communication of the ports 24 with the atmosphere. The numeral 29 indicates the outlet chamber of the valve.

Ordinarily, the spring 10 presses the valve head 8 against the valve seat 11, thus tightly separating inlet chamber 23 from outlet chamber 29. If, as per Fig. 1, upon initiation by control cylinder F—1, the pressure operated control B—2 releases the fluid medium under pressure from cylinder A—2, which will flow through branch conduit C—2 into the manifold section D—I to its ultimate outlet, the pressure thus set up in D—I will, through branch conduit C—1, operate the piston operated control B—1 of cylinder A—1 to release its contents to combine with that of cylinder A—2. A pressure will therefore be seen to be set up in the outlet chamber 29 of the valve E, as shown in Fig. 2. As the pressure is considerable, a gradual leakage will occur past the seat 11, which, if allowed to build up, will create a pressure of sufficient magnitude to cause the operation of the pressure operated controls B—3 and B—4 and, thus, release cylinders A—3 and A—4 of group II. To anticipate and remedy such fault, the vents 22 are provided, which through the bore 21 and vents 24 allow any pressure to dissipate into the atmosphere, thus preventing undesired release of the fluid medium from cylinders A—3 and A—4. However, when the flow is in the desired direction, that is, when the contents of cylinders A—3 and A—4 are released through manifold D—II, either manually or by operation of control cylinder F—2, the valve head 8 is raised from valve seat 11 by virtue of the suddenly applied pressure of the released fluid medium, and the vent ports 24 are withdrawn into the valve, establishing free communication from D—II to D—I and stopping any further escape to the atmosphere. In this case, unless group I has been released prior to group II, the operation of group II will also release group I.

Fig. 3 shows in diagrammatic form another arrangement of such a distributing system, employing four containers A—1 to A—4 and three

sectionalizing valves E—1, E—2, E—3, which latter make it possible to release one, two, three or four containers or sections of containers in a given sequence; e. g., A—1, A—2, A—3, A—4 may be released singly in that order; or A—2 and A—1, and A—4 and A—3, in that sequence; or A—3, A—2, A—1 simultaneously; or A—4, A—3, A—2, A—1 simultaneously; or in other possible combinations. This manner of operation, of course, is possible only as long as each container is operable manually by some means such as the strike-knobs G—1 to G—4 of Fig. 1. The release devices used in this arrangement are similar to those shown in the system of Figure 1 of the drawings.

The diagrammatic layout of Fig. 4 represents, as already mentioned, the other general type of system. Here the cylinder controls B—1 to B—4 are of such a type as to completely separate the operating fluid conduit C from distribution conduit D, in contrast to the controls used in the systems previously referred to. The details of their construction will not be gone into, since, except for the arbitrary addition of hand strikes, they are shown in principle in Figure 3 of Letters Patent of the United States No. 2,088,850 and Figure 3 of Letters Patent of the United States No. 2,073,688, and do not form a part of the invention. A release, in this case, of the operating fluid from the control cylinder F—1 will operate containers A—2 and A—1. The operating fluid, due to the construction of controls B—1 to B—4 and of sectionalizing valve E becomes static within the confines of conduit C and branch conduits C—1 and C—2, except for very slow leakage past the valve seat and through the ports 24 of valve E. This condition, however, may be relieved by providing a special by-pass check valve H designed to operate above a given pressure after operation of controls B—2 and B—1 to permit discharge of the control fluid into the main discharge conduit D. Release of control fluid from control cylinder F—2, on the other hand, will operate to release containers A—4 and A—3 and, if not already operated, also containers A—2 and A—1 through valve E. The operating fluid will then discharge as before into the main discharge line D through check valve H. A great variety of release combinations and groupings may thus be obtained through suitable placement of sectionalizing valves E.

It will be seen, therefore, that in high pressure fluid medium distributing systems as described, the combination of a plurality of sources of fluid pressure operatively interconnected, and comprising means which render them capable of selective sectional operation, and their various sections proof against undesired release due to conditions incidental to the operation of other sections, represents a new and decided improvement in the art.

It is readily apparent that this system may be given many functions not specifically enumerated above, which may require modifications as to arrangement and type of control and interconnections; and it will therefore be understood that the present invention, while described with respect to specific embodiments and a particular application, is not to be limited thereto, except as covered by the following claims.

I claim::

1. A high pressure fluid medium supply system comprising a plurality of high pressure fluid medium containing units, fluid pressure operable fluid medium releasing means for each unit, a fluid medium discharge conduit in operative connection with all said fluid medium containing units, an operating fluid conveying conduit separate from said discharge conduit in operative connection with all of said fluid pressure operable fluid medium releasing means, pressure responsive unidirectionally acting fluid flow control means in said operating fluid medium conveying conduit adapted to divide said operating fluid conduit into consecutively adjacent sections each associated with a group of fluid medium containing units, said pressure responsive unidirectionally acting means being adapted to prevent flow of the operating fluid medium from any subsequent section to the preceding sections to operate the medium releasing devices associated therewith and to permit flow of the operating fluid medium from any preceding section to the subsequent sections, selective means for initially introducing operating fluid medium into any one of the aforesaid sections to release the fluid content of the respective units associated therewith, pressure relief means in the operating fluid conveying conduit associated with each preceding group relative to a subsequent group and operatively associated with said pressure responsive control means adapted to prevent undesired operation of a preceding group due to leakage pressure from an operated subsequent group to a preceding group not to be operated and adapted to become inoperative when said fluid flow control means become inoperative.

2. In a high pressure fluid medium distributing system, the combination of a fluid medium conduit, two sources of fluid medium under pressure adapted to be released by fluid pressure and operatively connected to said conduit, pressure responsive unidirectionally acting fluid flow control means in said conduit connected in said conduit between the connections of the two fluid sources and adapted to separate said conduit into consecutively adjacent sections each associated with one of said sources of fluid medium, said control means being adapted to prevent the flow of fluid medium from the subsequent section to the preceding section to operate the source associated therewith and to permit flow of fluid medium from the preceding section to the subsequent section to operate it, venting means operatively connected to said control means to relieve the conduit adjacent the pressure responsive side of said control means of pressure due to leakage from the other side of the control means to prevent operation by fluid pressure of the fluid medium source adjacent said pressure responsive side when the other source has been operated, said venting means adapted to become inoperative upon actuation of the control means when the fluid pressure is in the direction from the preceding to the subsequent section, and means to initially cause introduction of fluid medium into either section of the fluid conduit to result in the release of a desired amount of the fluid medium available.

3. A high pressure fluid medium supply system comprising a plurality of high pressure fluid medium containing units, fluid pressure operable fluid medium releasing means for each unit, an operating fluid conveying conduit in operative connection with all of said fluid pressure operable fluid medium releasing means, fluid medium discharge means separate from said operating fluid conduit common to and in operative connection with all the fluid medium units, pressure responsive unidirectionally acting fluid flow con-

trol means in said operating fluid medium conveying conduit adapted to divide said operating fluid conduit into consecutively adjacent sections each associated with a group of fluid medium containing units, said pressure responsive unidirectionally acting means being adapted to prevent flow of the operating fluid medium from any subsequent section to the preceding sections to operate the medium releasing devices associated therewith and to permit a continuous flow of the operating fluid medium from any preceding section to the subsequent sections, and selective means for initially introducing operating fluid medium into any one of the aforesaid sections to release the fluid content of the respective units associated therewith.

4. In a high pressure fluid medium distributing system, the combination of a fluid medium conduit, a plurality of sources of fluid medium under pressure adapted to be released by fluid pressure and operatively connected to said conduit, pressure responsive unidirectionally acting fluid flow control units of a number one less than that of the fluid sources in said conduit connected in said conduit intermediate the connections of said fluid sources and adapted to separate said conduit into consecutively adjacent sections each associated with one of said sources of fluid medium, said control units being adapted to prevent the flow of fluid medium from a subsequent section to the preceding section to operate the source associated therewith and to permit flow of fluid medium from any preceding section to the subsequent section to operate it, venting means operatively connected with each of said control units to relieve the conduit adjacent the pressure responsive side of each of said control units of pressure due to leakage from the other side of the control unit to prevent operation by fluid pressure of the fluid medium source adjacent said pressure responsive side when the subsequent source has been operated, said venting named means adapted to become inoperative when the fluid pressure is in the direction from the preceding to the subsequent section, and means to initially cause introduction of fluid medium into any section of the fluid conduit to result in the release of a desired amount of the fluid medium available.

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