Jan. 30, 1945. H. C. GRANT, JR 2,368,212

PRESSURE OPERATED SYSTEM

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Fig. 1

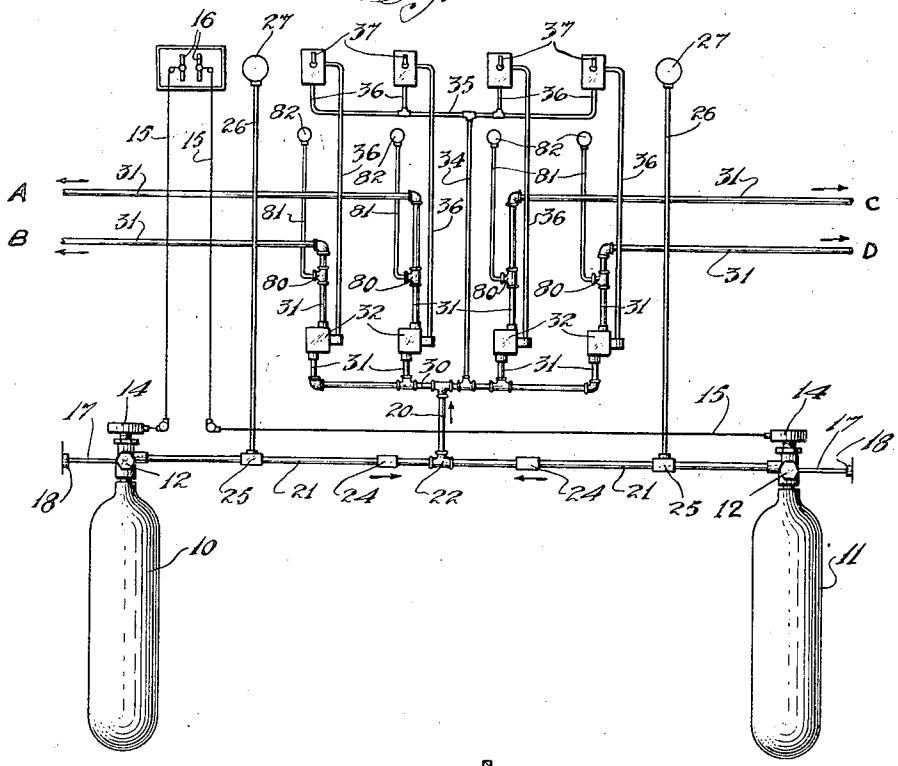


Fig. 2

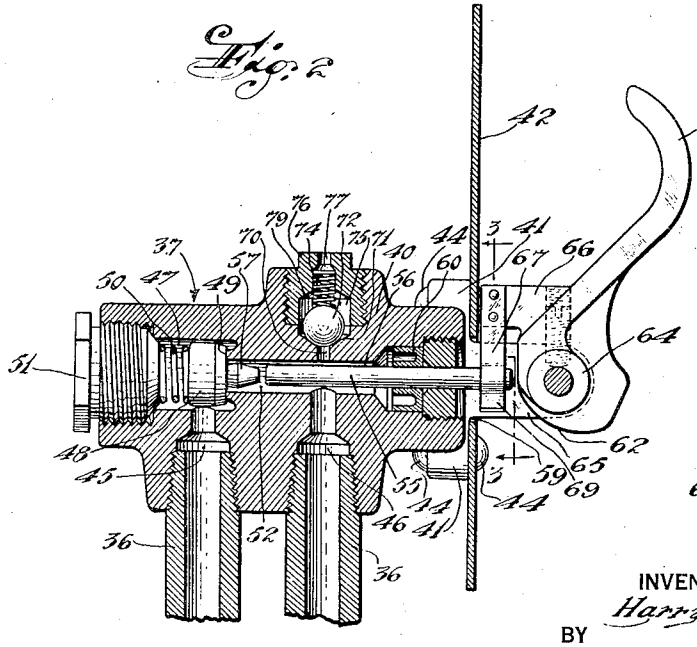
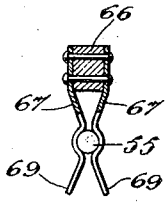


Fig. 3



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PRESSURE OPERATED SYSTEM

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8 Claims. (Cl. 169—11)

The present invention relates to systems for releasing and distributing a fluid pressure medium, and more particularly to a system for selectively directing a fluid pressure medium to one or more desired locations.

The present invention aims to provide a system for directing a fluid pressure medium, such as carbon dioxide, to one or more locations where it may be used for extinguishing a fire, inflating flotation bags or effecting the operation of other pressure operable devices. More particularly, the invention aims to provide a fire extinguishing system adapted for multi-motored aircraft, wherein the fire extinguishing medium may be selectively directed to one or more of the engine nacelles.

An object of the invention is to provide an improved system of the foregoing character.

Another object is to provide a system for selectively directing a pressure medium to a desired location, wherein the pressure medium is prevented from being accidentally directed to an undesired or unselected location.

A further object is to provide a system which is compact and simple, comprises a minimum number of parts, and comprises control or actuating devices which may be centrally located on a control panel or the like.

Other and further objects, not specifically enumerated above, will be apparent when described in greater detail in connection with the accompanying drawing, wherein:

Figure 1 is a diagrammatic view of a system for distributing a pressure medium, illustrating an embodiment of the invention.

Figure 2 is a sectional view of a valve utilized in the system and provided with means for preventing the pressure medium from being improperly distributed.

Figure 3 is a sectional view taken along the line 3—3 on Figure 2, illustrating a detail of the valve.

Referring to the drawing, and more particularly to Figure 1, there is shown a system for distributing a fire extinguishing medium under pressure to a plurality of locations. By way of example, the system illustrated may be installed in a multi-motored airplane having four engine nacelles, each provided with a fire extinguishing medium discharge line.

The system illustrated more or less diagrammatically herein may include a source of fire extinguishing medium comprising, preferably, two or more cylinders for containing carbon dioxide under high pressure. For example, there may be provided a main cylinder 10 and a reserve cylinder 11, each of which has a discharge valve 12 for releasing the pressure medium from the cylinders. The discharge valves 12 each may be operated by a suitable control device 14 adapted to be actuated by a pull cable 15 having a pull handle 16 attached thereto which preferably is located on the instrument board or control panel of the airplane or some other central location. Each of the cylinders 10 and 11 may be provided with a safety device for releasing the pressure medium in the event the pressure within the cylinder rises beyond a pressure when the cylinders can safely hold without danger of bursting. The safety release devices (not shown) each are connected with an outboard discharge conduit 17 having an indicator 18 at the outboard end which may be readily observed from the exterior of the fuselage of the airplane to determine when a cylinder has been discharged due to excessive pressure.

The valves 12 are each operatively connected to a main conduit 20 by a conduit 21 extending from the valve 12 to a T coupling or fitting 22 connected to the main conduit. Each of the conduits 21 may have a check valve 24 positioned intermediate the fitting 22 and the respective valve 12 for preventing the flow of pressure medium from either cylinder into the other in the event one has been emptied. The conduits 21 may further be provided with a fitting 25 and a conduit 26 for directing pressure to an indicator 27 on the control panel which indicates when the cylinders have been discharged into the main conduit.

A suitable distributing header 30, which may be considered to be part of the main conduit, is connected to the main conduit 20, and a plurality of branch conduits 31, for example four in number, are connected to the header 30 for distributing the pressure medium to desired locations A, B, C and D. In order to control the passage of the pressure medium through the branch conduits 31, each conduit 31 is provided with a suitable pressure operable valve 32. These valves 32 may comprise a valve member normally held in a position by a spring to close the conduit, each valve also having a piston movable by fluid pressure to move the valve member into a position to open the conduit. Since valves of this type are well known, a detailed description and illustration are not believed to be necessary.

In order to selectively operate one or more of the pressure operable valves 32, the header 30

or the main conduit 20 is provided with a secondary conduit 34, connected to a distributing conduit or header 35 to which a plurality of branch conduits 36 are connected. Four branch conduits 36 are provided and each is connected to one of the valves 32 to supply pressure medium for moving the valve piston to open the valve. The passage of pressure medium to the valves 32 is selectively controlled by providing a selector valve 37 in each of the conduits 36. The selector valves 37 preferably are mounted on the control panel or other central location adjacent the pull handles 16 and indicators 27.

Referring to Figure 2, one of the selector valves 37 is shown in detail. The valve 37 comprises a body member 40 having ears or lugs 41 at one end thereof for attaching the valve to a control panel 42 by means of suitable screws, bolts, or rivets 44. The valve body 40 has an inlet 45 for connecting the portion of the conduit 36 extending from the header 35 and has an outlet 46 for connecting the portion of the conduit extending to the pressure operable valve 32. Adjacent the inlet 45 a chamber 47 is provided in the valve body for housing a valve member 48 adapted to be urged against a valve seat 49 by a spring 50. To facilitate assembly of the valve 37 the spring 50 is held in position by a plug 51 or other suitable means threaded into the chamber 47 at the end of the body opposite the lugs 41. A passage, bore or conduit 52, in the valve body, extends from the valve seat 49, adjacent the inlet 45, to the outlet for operatively connecting the inlet and outlet when the valve member 48 is unseated.

In order to unseat the valve member a rod 55 or the like extends through a bore 56 in coaxial alignment with the passage 52 and one end of the rod is adapted to engage a stem portion 57 of the valve member extending into the passage 52. The other end of the rod 55 extends through the valve body and outwardly through an aperture 59 in the control panel 42 to be engaged by operating means about to be described. The bore 56 is sealed to prevent the passage of pressure medium from the passage 52 to the atmosphere by a suitable packing gland 60 or the like fitted in the valve body and extending about the rod 55.

The rod 55 is adapted to be moved inwardly towards the valve member 48 to unseat it by a manually operable handle or lever 61 having a cam surface 62 for engaging the outwardly extending end of the rod. The lever may be pivotally mounted in any suitable manner but preferably carries trunnions 64 rotatably supported in bearing or journal members 65 integral with the valve body and extending through the aperture 59 in the control panel 42.

Accidental movement of the handle or lever 61 may be prevented by providing the lever with a projection 66 having a pair of spring clip members 67 or the like attached thereto for engaging the end of the rod 55, as shown in Figure 3. When the handle 61 is swung downwardly to cause the cam surface 62 to move the rod 55 inwardly, the spring clip members 67 are forced out of engagement with the rod. Reengagement of the rod is facilitated by flaring the free ends of the members 67 outwardly from each other as indicated at 69.

It is desirable and an object of the invention to vent any pressure which may be built up in the passage 52, the outlet 46, and the portion of the conduit 36 leading to the pressure operable valve 32. Such pressure may exist in connection with one of the valves 37 and its circuit due to pressure medium leaking past its valve member 48 and valve seat 49 when a cylinder is discharged and is to be directed by another of the valves 37 to open its respective valve 32 and distribute the medium. Also, after operation of a valve 37 to admit pressure medium to a respective valve 32 which opens its distributing conduit 31, it is desirable to relieve the pressure trapped in the respective conduit 36 so that the valve 32 may again be closed by the spring within the valve 32.

The foregoing may be accomplished by providing suitable means for venting any pressure in the passage 52, the outlet 46 or the conduit 36 connecting the outlet to the valve 32 while the valve member 48 is on its seat. Such venting means may comprise a venting aperture 70 formed in the valve body which is in communication with passage 52 intermediate the valve seat 49 and the outlet 46. A valve seat 71 may be provided at the outward end of the aperture 70 for receiving a ball member 72, or other suitable valve member which is pressed lightly against the seat 71 by a spring 74 to normally seal the aperture against the introduction of dirt or foreign substances into the passage 52. One end of the spring 74 engages the ball 72 to urge it downwardly and the other end of the spring is seated in a bore 75 of a cap member 76 having an outlet aperture 77 in communication with the atmosphere. The cap member 76 is threaded to the valve body adjacent the aperture 70 and confines the ball 72 for limited movement to vent the passage 52. The ball 72 may also be utilized to prevent the loss of a material amount of pressure medium through the aperture 77 when the valve member 48 is unseated and pressure medium flows through the passage 52 from the inlet 45 to the outlet 46. This may be accomplished by providing an inverted seat 79 in the cap 76 adjacent the bore 75 against which the ball may be driven in opposition to the spring 74 when a medium under high pressure is conducted through the passage 52. The seat 79, preferably, is imperfect so that the ball does not close off the bore 75 and aperture 77 completely and permits a slight amount of pressure medium to bleed to the atmosphere. Thus when the valve member 48 seats again on the seat 49 to shut off the high pressure medium directed to the valve 32, any pressure trapped in the conduit 36 leading to the valve 32, the outlet 46 and the passage 52 is quickly bled to atmosphere whereby the spring of the valve 32 returns the valve member to close the discharge line 31.

If desired, each of the discharge conduits 31 leading to the space where the pressure medium is to be distributed may be provided with a fitting 80 connected by a conduit 81 to an indicator 82 (similar to indicators 27) mounted on the control panel to indicate to which space pressure medium has been discharged.

In operation of the system, if a fire should occur, the operator at the control panel pulls the handle 16 connected to the cable 15 for causing the control device 14 to effect release of the pressure medium in the main cylinder 10, or bank of cylinders. The pressure medium passes through the conduit 21, the main conduit 20, the header 30, the secondary conduit 34, and the header 35 to supply pressure medium adapted to pass through any or all the valves 32 and 37. In pass-

ing through the fitting 25 in the conduit 21, the indicator 27 is operated to advise the operator that the pressure medium has been released from the cylinder 10.

The operator may now selectively direct the pressure medium to one or more of the locations where a fire may exist. This may be accomplished by pulling downwardly the lever or handle 61 of the valve 37 in the circuit for the space or spaces in which the fire exists. Downward movement of the handle 61 causes the cam surface 62 thereof to move the rod 55 inwardly and unseat the valve member 48, whereby pressure medium passes through the valve 37 to the pressure operable valve 32 which is then opened to permit the passage of pressure medium through the conduit 31 to the seat of the fire. As the pressure medium passes through the fitting 80 the indicator 82 is operated to advise the operator that the medium has been conducted to the space.

When it is desired to stop the flow of pressure medium the handle 61 is moved upwardly to its initial position and the spring 50 in the valve 37 causes the valve member to engage its seat 49 to shut off the flow of pressure medium tending to keep the valve 32 open. The pressure which may be trapped in the portion of the conduit leading from the valve 37 to the valve 32 is quickly vented to the atmosphere by the venting arrangement, whereby the spring in the valve 32 returns the valve member of the valve 32 to close the conduit 31.

During the release of pressure medium any pressure medium which leaks through a valve which is not intended to be operated is vented to the atmosphere and is prevented from unintentionally opening the valve 32 of a circuit which is not distributing pressure medium.

The reserve cylinder 11, or a bank of reserve cylinders, may be released into the system in the event the contents of the main cylinder or cylinders do not extinguish the fire. This may be accomplished by pulling the handle 16 which effects operation of the control device on the cylinder 11. The reserve cylinder or cylinders may likewise be used for a subsequent fire which may occur before the discharged main cylinder or cylinders have been replaced by charged cylinders. The reserve cylinder 11 is then released and distributed in the same manner as described in connection with the main cylinder 10.

While the present invention has been described in connection with a fire extinguishing system for distributing a fire extinguishing medium under pressure to a plurality of locations, it will be understood that the system may be employed where it is desired to selectively direct a pressure medium, or a portion thereof, to effect inflation of a flotation bag or raft, fuel tank purging, operation of emergency devices for lowering landing gear or opening doors or hatches. The system may be used in the foregoing manner in connection with aircraft armored tanks, submarines, boats or any other land or sea vessels.

While my invention resides in certain principles of construction and operation which have been illustrated and described in connection with the accompanying drawing, it will be apparent to those skilled in the art that the invention may be embodied in other forms of construction without departing in any manner from the spirit and scope of the invention, and I therefore do not wish to be strictly limited to the disclosure, but rather to the scope of the appended claims.

I claim:

1. In a system of the class described, the combination of a control location, a plurality of sources of fluid pressure medium, a main conduit operatively connected to each source of pressure medium, release means for releasing the medium solely from any one of said sources to said main conduit and thus preserve any remaining medium for release by said release means, said release means including manually selectively operable devices at said control location for determining the source from which the medium is to be released, a plurality of branch conduits connected to said main conduit for directing the medium to desired locations, a pressure operable valve in each of said branch conduits, each of said valves being independently operable to determine through which of said branch conduits the released medium is directed, a secondary conduit operatively connected to said main conduit, a plurality of branch conduits each connected to said secondary conduit and one of said pressure operable valves for conducting pressure medium to respectively open said valves, a manually operable valve in each of said last branch conduits and at said control location for selectively directing pressure medium to said pressure operable valves, and means associated with said last valves for venting pressure in the portions of said last branch conduits intermediate said last valves and said respective pressure operable valves.

2. In a system of the class described, the combination of a source of fluid pressure medium, means for effecting discharge of said medium, a conduit for directing the medium to a point of discharge, a pressure operable valve in said conduit adapted to be opened to permit the passage of pressure medium through said conduit, a secondary conduit connected to said first conduit at a point intermediate said source and said valve and connected to said valve for admitting pressure medium for opening said valve, a control valve in said secondary conduit, and means for venting pressure in the portion of said secondary conduit connecting said valves, said venting means being ineffective when said control valve is opened to admit pressure medium to said pressure operable valve and being effective to vent pressure when said control valve is in substantially closed position.

3. In a system of the class described, the combination of a source of fluid pressure medium, means for effecting discharge of said medium, a conduit for directing the medium to a point of discharge, a pressure operable valve in said conduit adapted to be opened to permit the passage of pressure medium through said conduit, a secondary conduit connected to said first conduit at a point intermediate said source and said valve and connected to said valve for admitting pressure medium for opening said valve, a control valve in said secondary conduit, and means for venting pressure in the portion of said secondary conduit connecting said valves, said venting means including an aperture leading to the atmosphere, a valve member, a valve seat in said aperture for receiving said valve member to prevent the escape of pressure to the atmosphere when said control valve is opened to admit pressure medium for opening said first valve, and resilient means for maintaining said valve member out of engagement with its seat when less than a predetermined pressure is in said portion of said secondary conduit.

4. In a system of the class described, the combination of a plurality of sources of fluid pres-

sure medium, a main conduit operatively connected to each source of pressure medium, means for releasing the medium from said sources to said main conduit including selectively operable devices for determining the source from which the medium is to be released, a plurality of branch conduits connected to said main conduit for directing the medium to a desired location, a pressure operable valve in each of said branch conduits, each of said valves being independently operable to determine through which of said branch conduits the released medium is directed, a secondary conduit operatively connected to said main conduit, a plurality of branch conduits each connected to said secondary conduit and one of said pressure operable valves for conducting pressure medium to respectively open said valves, a control valve in each of said last branch conduits for selectively conducting pressure medium to said pressure operable valves, and means associated with said last valves for venting pressure in the portions of said last branch conduits intermediate said last valves and said respective pressure operable valves.

5. In a system of the class described, the combination of a plurality of sources of fluid pressure medium, a main conduit, conduit means connecting each source of pressure medium to said main conduit, means for releasing the medium from said sources to said main conduit including manually selectively operable devices for determining the source from which the medium is to be released, a plurality of branch conduits connected to said main conduit for directing the medium to desired locations, a pressure operable valve in each of said branch conduits, each of said valves being independently operable to determine through which of said branch conduits the released medium is directed, a secondary conduit operatively connected to said main conduit, a plurality of branch conduits each connected to said secondary conduit and one of said pressure operable valves for conducting pressure medium to respectively open said valves, and a manually operable valve in each of said last branch conduits for selectively directing pressure medium to said pressure operable valves; each of said venting means including an aperture leading to the atmosphere, a valve member, a valve seat in said aperture for receiving said valve member to prevent the escape of pressure to the atmosphere when said control valve is opened to admit pressure medium for opening said first valve, and resilient means for maintaining said valve member off its seat when less than a predetermined pressure exists in said portion of said secondary conduit.

6. In a system of the class described, the combination of a control location, a plurality of sources of fluid pressure medium, a main conduit, conduit means operatively connecting each source of pressure medium to said main conduit, release means for releasing the medium solely from any one of said sources to said main conduit and thus preserve any remaining medium for release by said release means, said release means including selectively operable devices at said control location for determining the source from which the medium is to be released, a plurality of branch conduits connected to said main conduit for directing the medium to desired locations, a pressure operable valve in each of said branch conduits, each of said valves being independently operable to determine through which of said branch conduits the released medium is directed, a secondary conduit operatively connected to said main conduit, a plurality of secondary branch conduits each connected to said secondary conduit and one of said pressure operable valves for conducting pressure medium to respectively open said valves, a valve in each of said secondary branch conduits and at said control location for selectively directing pressure medium to said pressure operable valves, and means in each of said secondary branch conduits intermediate said valve therein and said pressure operable valve connected therewith for normally venting leakage pressure in said secondary branch conduits to the atmosphere.

7. In a system of the class described, the combination of a source of pressure medium, a conduit operatively connected to said source for directing the fluid pressure medium to a desired location, release means for admitting pressure to said conduit from said source, a pressure operable valve in said conduit, a secondary conduit connected to said valve for conducting pressure to said valve for effecting operation thereof, valve means in said secondary conduit, and means in said secondary conduit intermediate said valve and said valve means for normally venting leakage pressure in said secondary conduit to the atmosphere.

8. In a system of the class described, the combination of a source of pressure medium, a conduit operatively connected to said source for directing the fluid pressure medium to a desired location, release means for admitting pressure to said conduit from said source, a pressure operable valve in said conduit, a secondary conduit connected to said valve for conducting pressure to said valve for effecting operation thereof, valve means in said secondary conduit for admitting pressure to said pressure operable valve, means in said secondary conduit for normally venting leakage pressure from that portion of said secondary conduit between the two valves to the atmosphere, and means associated with said venting means for rendering said venting means ineffective upon opening of said valve means to admit pressure to operate said pressure operable valve.

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