March 8, 1938. J. F. BOYLE 2,110,195

VALVE MECHANISM

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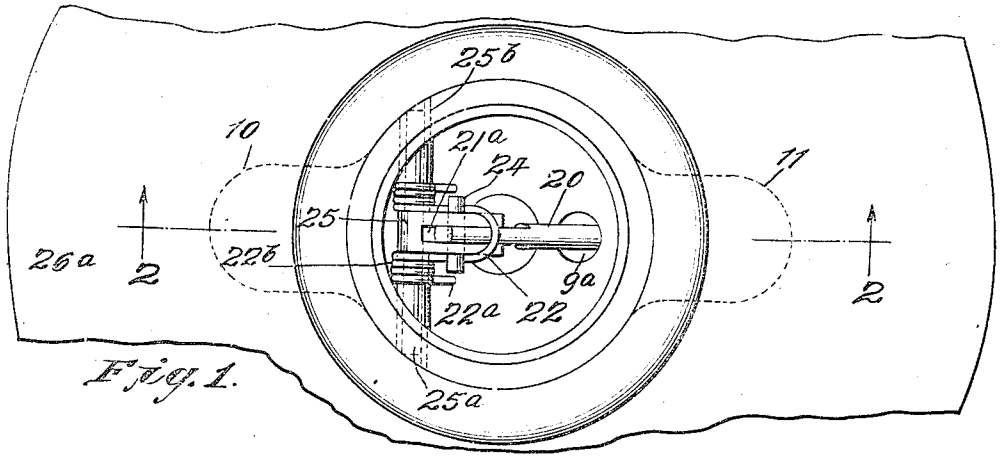


Fig. 1.

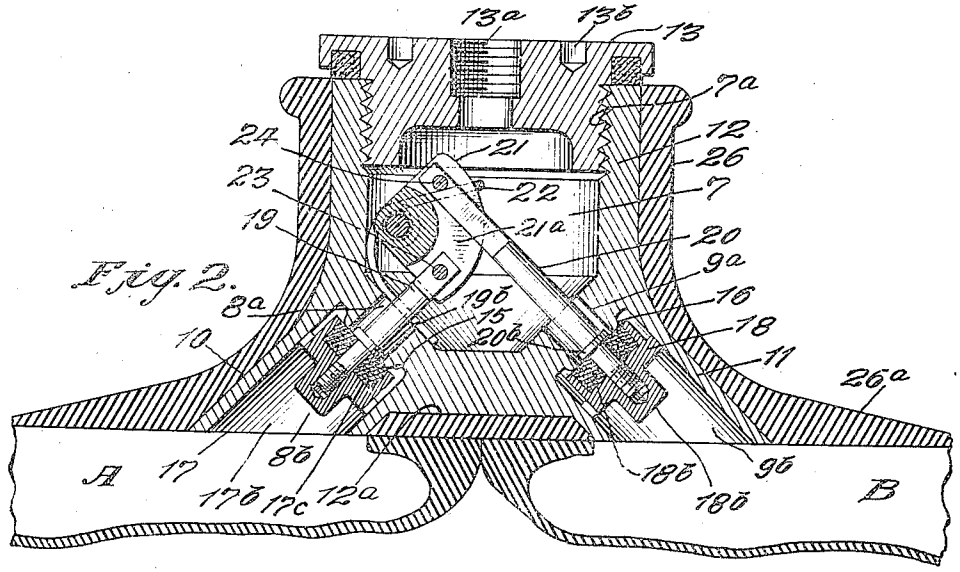


Fig. 2.

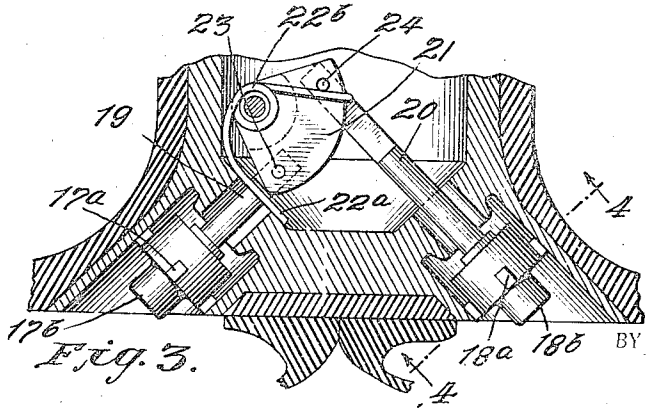


Fig. 3.

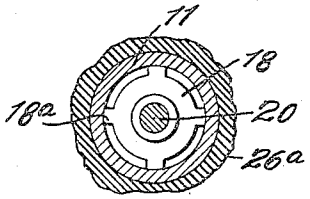


Fig. 4.

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Fig. 5.

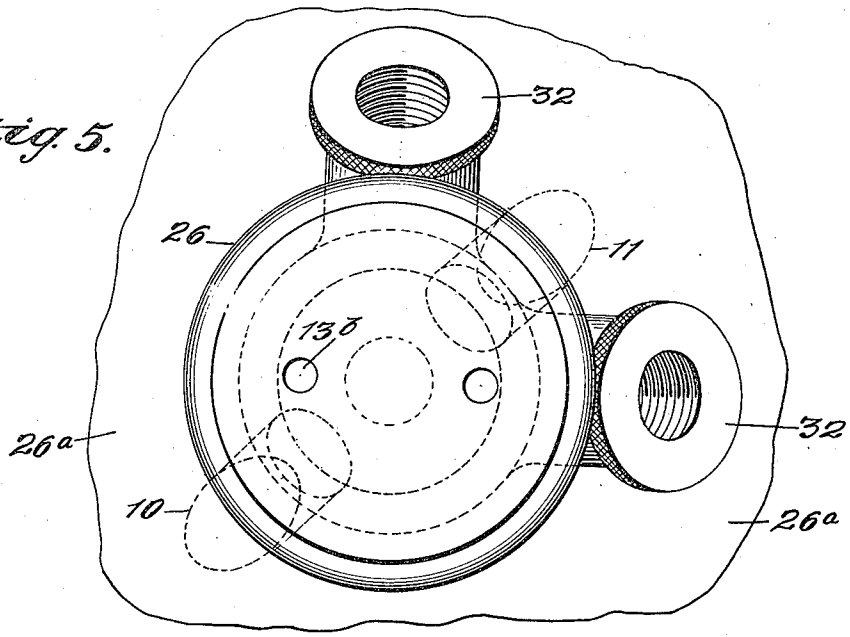
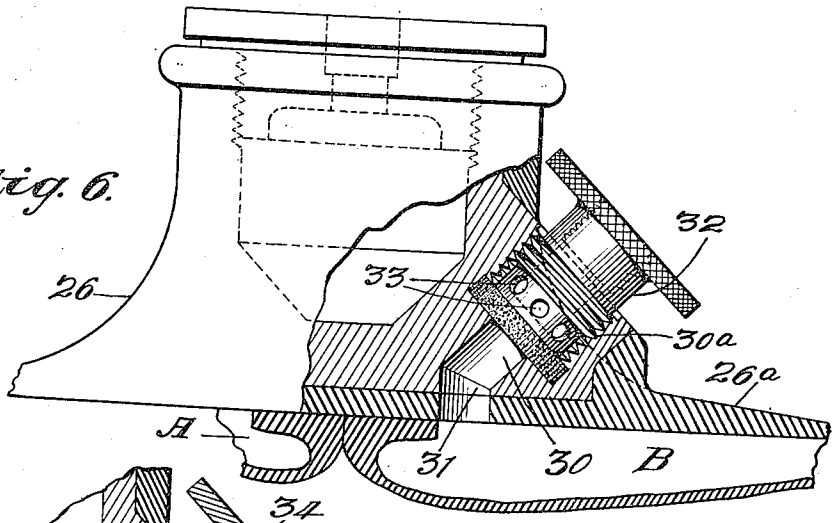


Fig. 6.



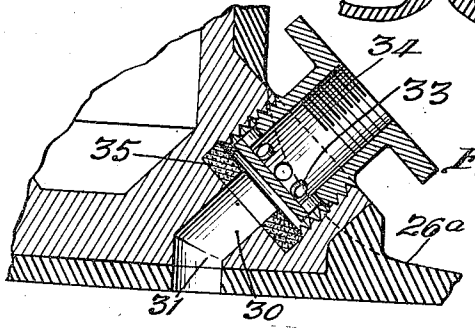


Fig. 7.

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Patented Mar. 8, 1938 2,110,195

UNITED STATES PATENT OFFICE

2,110,195

VALVE MECHANISM

James F. Boyle, Teaneck, N. J.

Application August 13, 1935, Serial No. 35,997

8 Claims. (Cl. 277—20)

This invention relates generally to fluid containers and is more particularly directed to inflatable devices and means for controlling their inflation, whereby an inflating charge may be simultaneously and uniformly introduced to a plurality of such devices in cooperative association.

While my invention, as will be manifest from the description thereof, possesses a wide range of utility in the construction and employment of various types of fluid containers, where the simultaneous filling of a plurality thereof is desirable or necessary, for the purposes of this disclosure, I have elected to treat it as it may be practiced in conjunction with apparatus or components thereof, inflatable under pressure, as air-craft flotation gear, collapsible boats, life rafts and similar devices, especially those coming within the category of emergency equipment, wherein instantaneous inflation is of paramount importance. It will be understood, however, that this is merely illustrative and is not to be construed, in any sense, as limiting the scope of utility of my invention.

In the construction and use of flotation gear and especially life-saving craft, as collapsible boats, for example, it is becoming the standard practice, in the interest of greater efficiency and to increase the factor of safety, to provide more than one reservoir or container for the reception and retention of the inflating charge. These reservoirs or containers, formed by dividing the apparatus into compartments or by inserting therein suitable bladders or bags, communicate with a common inlet for the purpose of admitting the charging fluid thereto from a single charging element. This inlet is provided with an internal valve mechanism designed to function to seal the passages to the containers, but it has been found that while an effective seal may be obtained, uniform inflation of the cooperating containers cannot be effected, one container frequently receiving an excessive charge, while the other is only partially inflated. Obviously, this unequal distribution of the charge may have serious consequences. In the event that the over-inflated container does not rupture and render the piece of equipment non-serviceable, the functioning of the latter will be dangerously impaired. Again, in addition to uniformity of inflation, the charging of the containers, should be capable of approximately instantaneous accomplishment, but in the efforts to insure a more equal distribution of the charge within the containers, the inflation period has been prolonged, so that there is not now available any method or means for controlling the admission of the charging gas or fluid to a plurality of containers, which responds to the demand for their instantaneous and uniform simultaneous inflation, from a single charging source, as the conventional carbon-dioxide bottle or tank.

Therefore, it is the primary object of this invention to provide a means or mechanism for controlling the admission of a fluid to a plurality of containers, cooperatively associated, through a common inlet, which will overcome the disadvantages of existing media of the kind, in a simple and extremely practical manner.

It is also an object of this invention to provide a valve mechanism unit connectible to a plurality of containers to form a common inlet for the admission of fluid to such containers and to permit of its equal and substantially instantaneous distribution thereto, the mechanism being adapted to function as a seal for the respective containers.

Another object of this invention is the provision of a mechanism, as aforesaid, wherein means are embodied for rendering the sealing function of such mechanism ineffective at the option of the user, to accomplish the discharge of the contained fluid externally of the apparatus of which the mechanism is a part.

More specifically, it is the object of my invention to provide a unit of a collapsible boat or other collapsible apparatus, having a plurality of independent gas or fluid chambers or bladders, in the form of a manifold and embodying valve mechanism responsive to fluid pressure to simultaneously admit the fluid to said chambers for effecting their inflation at a uniform rate, whereby the fluid, at the conclusion of the charging operation will be equally distributed between the chambers.

It is also an important object of my invention to provide a method for controlling the actuation of a plurality of valves in response to an impinging fluid to permit of the entrance of such fluid into cooperating valve passages, for effecting the simultaneous and uniform inflation of a plurality of inflatable elements or devices.

My invention also comprehends a manifold unit for use in conjunction with inflatable apparatus generally, embodying a single inlet for connection to a source of fluid supply and passages between the inlet and associated fluid retaining chambers, with valve mechanism for sealing such passages, the valves being simultaneously unseatable to open the passages in response to the pres-

sure of an impinging fluid, liberated into said inlet for the performance of an inflating operation.

Other objects and advantages flowing from the practicing of my invention, will doubtless present themselves, as the description proceeds and I would have it clearly understood that I reserve unto myself all rights to the full range of equivalents, both in structure and in use, to which I may be entitled under my invention, in its broadest aspect.

In the accompanying drawings, I have illustrated a preferred and highly practical embodiment of my invention, that is especially applicable to collapsible emergency equipment, whereby instantaneous and uniform inflation of two bladders or fluid containers, may be effected in response to the pressure of the fluid released into the inlet of the manifold portion of the unit shown. My invention, of course, may take other forms, the structure and mode of assembly of the components being variable, to meet the requirements of different uses and production routines, within the purview of the appended claims.

In the drawings:

Figure 1 is a top plan view of a manifold and associated valve mechanism, conforming to my invention.

Figure 2 is a sectional elevation on the line 2—2 of Figure 1, with the valve chamber closure in place.

Figure 3 is a fragmentary elevational view, similar to the preceding figure, illustrative of the unseating of the valves, in response to the fluid pressure.

Figure 4 is a transverse section on the line 4—4 of Figure 3.

Figure 5 is a top plan view of the structure of the preceding figures, showing an arrangement of the discharge openings or outlets.

Figure 6 is a view in elevation, partly in section, of the structure shown in Figure 5, with the outlet-passage sealing element functioning, and

Figure 7 is a fragmentary sectional elevation, showing the sealing element unseated, to permit the fluid to escape to the external atmosphere.

Referring now to the drawings in detail, in which like characters of reference are employed to designate similar parts in the several views, an appropriately designed fitting which will be termed the manifold, embodies a chamber 7 and branching passages 8 and 9, communicating with the lower part thereof, these passages extending through the diametrically opposite downwardly and outwardly directed extensions 10 and 11, integral with the body-portion 12 of said manifold and terminating in the plane of the base thereof, which may be centrally recessed or undercut, as at 12*a*. The chamber 7 is open at its upper end, the defining wall being threaded, as at 7*a* for the reception of a complementary threaded closure or cap 13, centrally apertured and tapped, as at 13*a*, for establishing a connection between the manifold and a source of fluid supply.

As will be observed, each of the aforesaid passages or bores 8 and 9, is of two diameters, the portions 8*a* and 9*a* of minor diameter being in juxtaposition to the chamber 7 and terminating, at their lower ends, in valve seats 15 and 16, with which the valves 17 and 18, reciprocable within the major diameter portions 8*b* and 9*b* of said passages are adapted to cooperate, as hereinafter described. The valves 17 and 18 may be of any preferred form suitable for attaining the objectives hereinbefore set forth. In the present showing each comprises a cup of a diameter less than that of the bore portion within which it is contained, and is provided with a plurality of equi-distantly spaced peripheral lugs 17*a* and 18*a* which function as guides in bearing engagement with the bore wall. The respective cups embody the integrally formed base bosses 17*b* and 18*b* which are threaded for the reception of the valve stems 19 and 20. Suitable packing material, as indicated at 17*c* and 18*c*, is inserted in each of the cups for retention therein between the cup base and the cooperating collars or flanges 19*b* and 20*b* of the valve stems, it being obvious that the packing, in each instance, forms the seat cooperating part of the valve.

The valve stems 19 and 20, it will be noted, are of different lengths, and pivotally connected to a common segmental fitting or actuator 21, which is supported for arcuate or rotative movement on an axis disposed transversely of the manifold chamber 7, an appropriately shaped spring, as one embodying a U-portion 22 and laterally spaced legs 22*a*, with intermediate coils 22*b*, being associated with said actuator and effective thereupon, when in fixed bearing engagement with a part of the wall of the chamber 7, to urge said actuator upwardly for effecting a simultaneous and corresponding directional movement of both valves into their seated positions, whereby communication between the portions 8*a*, 9*a* and 8*b*, 9*b* of the bore or passages 8 and 9 is closed or cut off, the packing material, preferably of resilient characteristics, cooperating with the valve-seat defining surfaces to provide an hermetic seal. The interconnection of the actuator and the valve stems may be variously accomplished; also the actuator may be mounted for the requisite arcuate movement within the chamber 7 in different ways, with the spring means effective upon the actuator taking other practical forms.

However, in actual practice, I have found it is feasible to produce the actuator with an arcuate slot 21*a*, extending from end to end thereof, within which, in proximity to the lower end thereof, the shorter valve stem 19 is mounted for relative pivotal movement on the cross-pin 23, while the longer stem 20 is connected to the actuator adjacent the upper end of the slot, by the pin 24.

The actuator, which is provided with a suitable bearing inwardly of its bifurcated area, is mounted on a shaft 25 axially alined with openings oppositely located in the wall of the manifold, one end of the shaft being of enlarged diameter, as at 25*a*, for fixation in one of these openings, while the other end thereof is entered in a sleeve 25*b* located in the opposite opening, the enlarged portion 25*a* and the sleeve 25*b* functioning as abutments for centering the actuator on said shaft. The coil sections 22*b* of the spring, as will be noted, straddle the actuator in embracing engagement with the shaft element, the legs 22*a* bearing upon the chamber wall, while the U-shaped head is engaged beneath the cross-pin 24, upon which the valve stem 20 pivots.

Since the distance between the centers of the axis of rotation of the actuator and of the pivot connections of the valve stems thereto is the same, it will be manifest from the construction thus far described, that the movement of the valves 17 and 18 relatively to their seats will be uniform, in both time and extent. Assuming that the manifold, which may be embraced in a protective material 26, as rubber, merging into

a tapering attaching surface **26***a*, is to be employed in conjunction with a two compartment collapsible container, the surface **26***a* is cemented or otherwise united to the external wall of the container, so that the passage **8** will open into the container compartment **A**, while the passage **9** will communicate with the compartment B, the portion of the container between the compartments being united to the manifold inwardly of the passages, in association with the base recess **12***a*. Now, for the performance of an inflation operation, a carbon dioxide gas bottle, for example, may be connected to the inlet **13***a*, the pressure of the gas, as it is liberated within the chamber **7** and impinges upon the valves **17** and **18**, overcoming the resistance of the spring and simultaneously unseating the valves to enter the two container compartments in equal proportions or quantities. As the gas bottle is emptied, the spring reacts to instantly and simultaneously seat both valves and seal the passages leading from the respective compartments, the back pressure of the trapped or contained gas contributing to the maintenance of the seal during the use of the inflated container.

Various methods may be utilized for exhausting the gas from the compartments, when necessary or desired, either through the container wall, or through the manifold. The cap **13**, apertured as at **13***b* for its use, may be removed with a spanner wrench and the actuator depressed to unseat the valves. However, in order to avoid possible dislocation of the valve mechanism, which such manual actuation might entail, I provide for exhausting the gas from the compartments externally of the chamber **7**. For this purpose, the manifold may embody suitably located passages to form a path of communication between each compartment and the external atmosphere. Each of these passages includes an angularly disposed section **30** of two diameters, merging into an offset extension **31** at its lower end, the portion of the passage of larger diameter being internally threaded, as at **30***a*, to receive the plug **32**. This plug is provided with peripheral openings **33** in proximity to its base, which communicate with the central bore **34** thereof, a gasket or other packing material **35** being interposed between the base of the plug and the lower end of the enlarged diameter part of the passage, the plug cooperating with the gasket to seal the passage, and the compartment with which it communicates, when screwed down tightly thereupon, as shown in Figure 6. To permit the gas to escape from the compartment, the plug is unseated, as shown in Figure 7, the gas exhausting past the threads, through the apertures **33** and out of the bore **34**, the rate of discharge being controllable in proportion to the extent of the outward movement of the plug. This arrangement also admits of testing each compartment independently of the other, the plug bore being threaded for the connection of an inflating device, as a pump, thereto, the plug, when a testing operation is to be carried out, being unscrewed, as for the discharge of the compartment contents, to permit the testing fluid to enter the compartment through the openings **33** and past the threads of the passage wall.

While I have described my invention, more or less specifically, with relation to the embodiment shown, it will be entirely clear, as previously pointed out, that it may take other forms and that it has a wide range of utility as a medium for uniformly controlling the admission of fluids to a plurality of containers by valves functioning simultaneously in response to the fluid pressure to permit the fluid to pass thereby and enter the containers in equal or approximately equal proportions or quantities.

I claim:

1. A valve mechanism, including a casing embodying a plurality of bores, a valve seat associated with each bore, a valve slidably mounted within each bore adapted to cooperate with the seat thereof to seal such bore above the valve and rockable means common to all of said valves for controlling their movement longitudinally of said bores, said means including a single spring effective upon all of said valves to urge them into seated position.

2. A valve mechanism including a casing embodying a plurality of bores, each having a valve seat, a valve mounted for reciprocation within each bore and means for rendering said valves simultaneously movable longitudinally of their respective bores in response to fluid pressure, said means including a rockable element and a spring effective thereon to seat all of said valves simultaneously.

3. A valve mechanism including a casing embodying passages, each being formed with a valve seat, a valve associated with each valve seat, a rockably mounted support common to both of said valves, said valves being connected to said support for relative movement and spring means associated with said support and effective thereupon to actuate the same to simultaneously urge said valves into engagement with their respective seats.

4. A valve mechanism including a housing, provided with a chamber, a plurality of passages leading from said chamber, a valve seat formed in each passage, a valve located in each passage for cooperation with the seat therein, a device rockably mounted within said chamber, means connecting said valves to said device for relative movement, and means effective upon said device to urge said device in a direction to actuate said valves into engagement with their respective seats.

5. A valve mechanism including a housing provided with a chamber and passages leading therefrom, said passages embodying valve seats, a valve contained within each passage for cooperation with the seat therein, a device rockably mounted in said chamber, means connected to the respective valves and pivotally connected to said device on centers equi-distantly from the axis of movement of said device, and a spring having a portion in bearing engagement with a fixed surface of said housing and another portion in engagement with said device, said spring being effective on said device to urge it in a direction to simultaneously locate said valves upon their respective seats, in a single continuing movement.

6. A manifold embodying a plurality of passages, each having a valve seat, a valve in each passage formed to cooperate with the seat therein, rockable means common to both of said valves for producing simultaneous movement thereof toward and from their respective seats, spring means for controlling such movement, other passages from the base of said manifold to the external atmosphere and means adjustable within said latter passages to seal the same or open communication therethrough.

7. A manifold for inflatable apparatus embodying a plurality of compartments, whereby both compartments may be coincidentally inflated,

said manifold including a chamber, a plurality of passages leading therefrom, each being adapted to communicate with an inflatable compartment and being provided with a valve seat, a valve contained in each passage to cooperate with the seat therein, means including a single spring common to both of said valves located externally of said passages for producing a simultaneous and uniform movement of said valves toward and from their respective seats and means independent of said valve passages in said manifold for forming a path of communication from each compartment of an apparatus with which said manifold is associated to the external atmosphere.

8. A manifold for inflatable apparatus embodying a pair of compartments, said manifold being connectible to said apparatus whereby both of said compartments may be inflated and deflated therethrough and embodying a chamber, a passage to each compartment leading from said chamber, each passage including a valve seat, a valve in each passage formed to cooperate with the seat therein, a valve stem fixed to each valve, a device rockably mounted in said chamber, said valve stems being pivotally connected thereto, a spring associated with said device and effective thereupon to urge said device in a direction to move said valves into seated position, said valves moving in synchronism, and passages independent of said valve containing passages for establishing communication between the compartments into which said valve-controlled passages open and the external atmosphere.

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