Jan. 23, 1951

H. HERMANNY

2,539,134

HYDRAULIC SYSTEM

Original Filed March 12, 1943

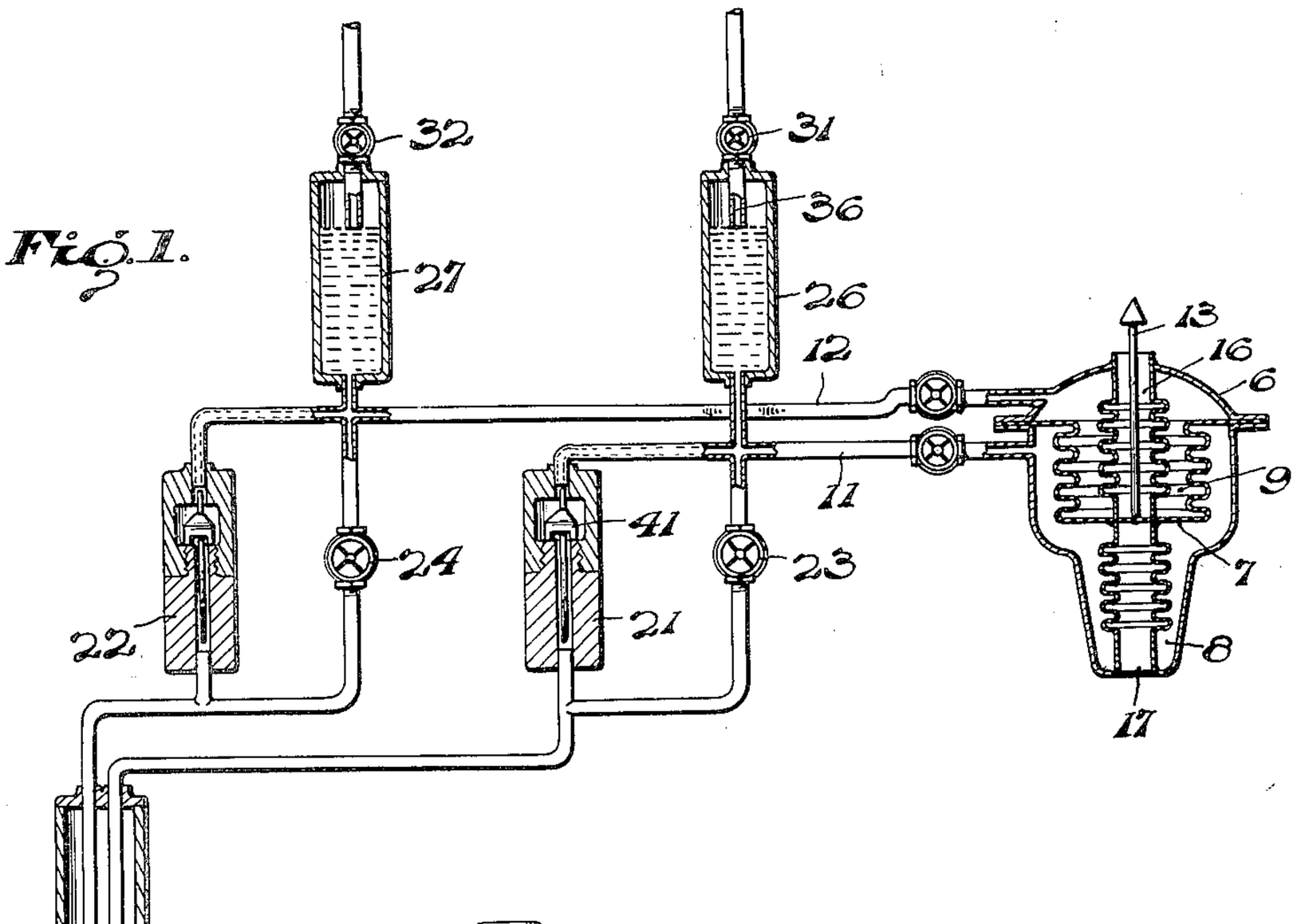

Fig. 1.

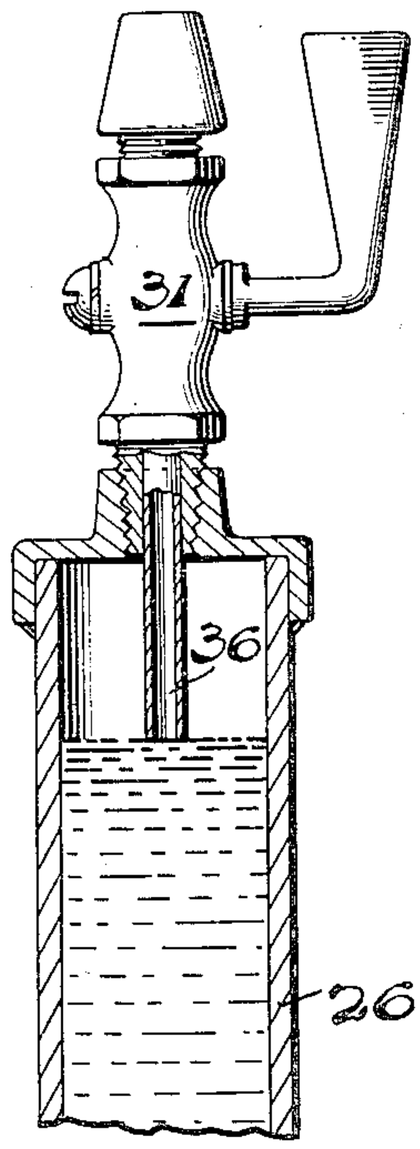

Fig. 2.

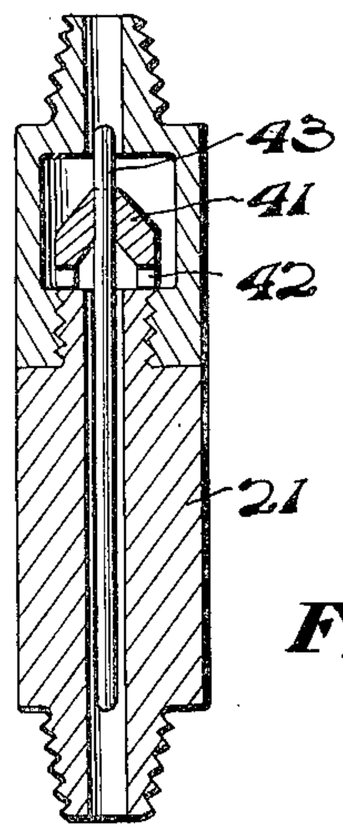

Fig. 3.

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HYDRAULIC SYSTEM

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Original application March 12, 1943, Serial No. 478,989, now Patent No. 2,396,653, dated March 19, 1946. Divided and this application March 1, 1946, Serial No. 651,137

2 Claims. (Cl. 138—26)

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This invention relates to hydraulic systems, and particularly to the control of pressure surges to prevent damage to parts of such a system.

An object of the invention is to provide a novel method and means of absorbing a suddenly applied pressure impulse of abnormally great magnitude, such as might result from an explosion under the surface of a body of water in which is located a vessel such as a ship or submarine carrying susceptible parts of a hydraulic system.

The invention is herein illustrated as applied to the protection of a hydraulic circuit which includes a bellows assembly of a character employed in marine measuring apparatus; but it is to be understood that the invention has broader application and that its scope is defined by the appended claims rather than by the illustrated exemplification thereof.

In the drawings:

Figure 1 shows the invention applied to the protection of a bellows assembly, as above noted;

Figure 2 is a more detailed showing of one of the control units of Figure 1; and

Figure 3 is a more detailed showing of another of the control units of Figure 1.

As shown, the illustrated embodiment is applied to a bellows assembly 6, divided (by a diaphragm 7) into two chambers, 8 and 9, the former receiving the "pressure" (Pitot) conduit 11 and the latter receiving the "static" conduit 12; the index actuating rod 13 being attached to the diaphragm 7 for operation of any associated measuring or other apparatus (as in Rydberg Patent No. 1,968,539, for example). The inner spaces 16 and 17 are exposed to the pressure of the atmosphere surrounding the unit 6, as is customary.

Numeral 18 designates a "rodmeter," as it is termed in the art, having terminal openings 19 and 20 for the conduits 11 and 12, respectively; the said rodmeter 18 being attached to the hull of the vessel, so that openings 19 and 20 are exposed to the open sea, as are openings 3 and 5 in Figure 1 of the Rydberg patent, above identified. Numerals 21 and 22 designate automatic valve assemblies, and valves 23 and 24 are provided to permit temporary by-passing of the valves 21 and 22, respectively, during conditioning and servicing.

Air collectors 26 and 27 are provided in the lines 11 and 12, respectively; each air collector including a tube (as at 36) projecting externally and adapted to be vented to atmosphere, when desired, by opening of vent valve 31 or 32, as the case may be, and projecting internally

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sufficiently to insure the trapping of a quantity of air at all times. These air collectors are claimed herein, per se, whereas the system as a whole is claimed in my parent application No. 478,989, filed March 12, 1943, and issued March 19, 1946, as Patent 2,396,653 of which this application is a division.

Operation

If the pressure increases suddenly due to the explosion of a depth charge, the entrapped air in collectors 26 and 27 is compressed by the inrush of water through the "snubber" valves 21 and 22. The piston 41 of each valve rises and closes off its upper orifice, thus blocking the further passage of water before the pressure applied has increased sufficiently to injure the bellows assembly 6. As soon as the pressure subsides, the pistons will drop due to gravity and the system will again be safe for normal operation.

Also, as the pressure subsides, the trapped air in the collectors expands to re-occupy all the space between the top of the collectors and the bases of the tubes 36, thus restoring the air cushions to their normal volumes, the said normal volume being determined by fixing the tubes 36 with their ends at a predetermined distance below the tops of the respective collectors. This distance is pre-set, that is, an initial adjustment is made, depending upon the amount of liquid which is to be permitted to flow through the "snubber" valves 41 for a given pressure difference. Likewise an initial adjustment is made of the distance between each snubber orifice and its valve to predetermine the time required to effectively block the passage. These values can be determined experimentally and the adjustments made accordingly. Once made, they remain fixed and constant during the ensuing period of operation of the system.

During rough weather air bubbles will infiltrate through the rod meter and accumulate in the air collectors 26 and 27. The air cushions will therefore increase in volume and must be corrected from time to time by opening the valves 31 and 32 to blow off the excess. It is common practice to open the valves 31 and 32, and the bypass valves 23 and 24 once every four hours.

What is claimed is:

1. Hydraulic cushioning mechanism comprising a vessel adapted to contain a predetermined level of liquid therein and to contain a predetermined volume of air above said level, and having an opening below said level to receive liquid

containing air, air vent means adjacent the top of said vessel and including a passage communicating with the interior of said vessel at said predetermined level, said passage limiting the air venting action and thus insuring retention of an air-cushion of said predetermined volume at the end of a venting operation.

2. Apparatus according to claim 10 in which said air vent means includes a valve for selectively shutting off fluid flow through said passage.

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