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HYDRAULIC CONTROL MECHANISM

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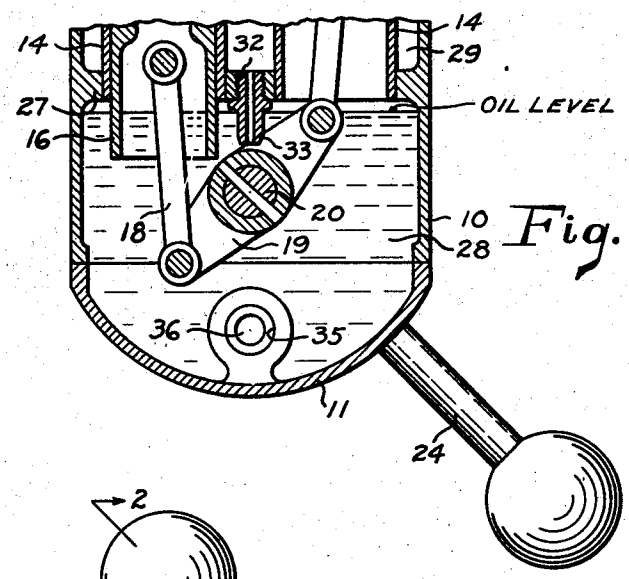


Fig. 3

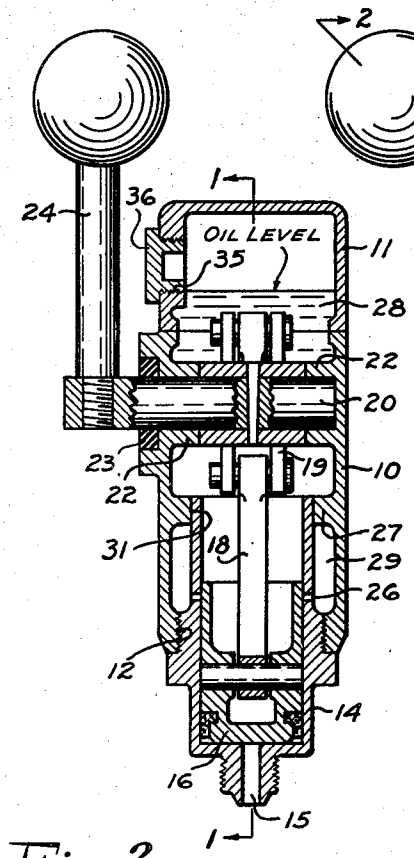


Fig. 2

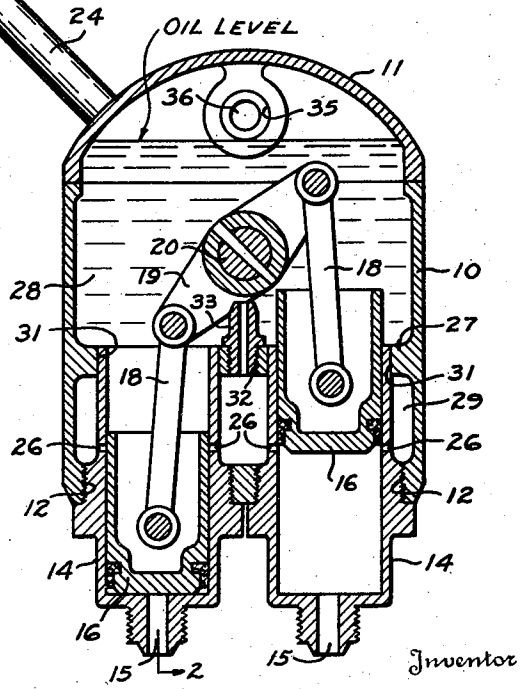


Fig. 1

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HYDRAULIC CONTROL MECHANISM

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5 Claims. (Cl. 60—54.6)

This invention relates to hydraulic control mechanism, and more particularly to the construction of a sender or compressor unit adapted to actuate a receiver or motor unit through the medium of a hydraulic fluid.

In a power transmission apparatus of this type it is of great importance to prevent air from entering the hydraulic system, since air is highly compressible, whereas successful operation of the system requires the use of a substantially incompressible fluid, such as oil. It has been proposed heretofore to provide the compressor unit with ports through which air could be eliminated from the system and replaced with oil, and such a compressor unit will operate satisfactorily so long as it remains substantially in its normal position. However, when the apparatus is installed on aircraft, which assume many different attitudes during flight, these prior compressor units will admit appreciable quantities of air to the system.

It is accordingly the main object of the invention to provide a compressor unit which will prevent air from entering an associated hydraulic system regardless of the position which the unit may assume.

It is a further object of the invention to provide a compressor unit particularly adapted for installation on aircraft and capable of preventing air admission to an associated hydraulic system even when the aircraft is flying in an inverted position.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawing illustrating one embodiment of the invention, and in which like reference numerals indicate like parts,

Fig. 1 is a vertical section through a compressor unit for a hydraulic control system, the section being taken on the line 1—1 of Fig. 2;

Fig. 2 is a section taken substantially on the line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary view similar to Fig. 1, but showing the unit in an inverted position.

The embodiment illustrated comprises a hollow body 10 with a cover plate 11 suitably secured thereto to form a hollow liquid-tight casing. The bottom of the body 10 is provided with two screw-threaded openings 12 to receive a pair of vertical cylinders 14 which are open at their upper ends, the upper portions of the cylinders extending into the casing. The lower ends of the cylinders are provided with openings 15 adapted to be connected by conduits (not shown) to a receiver or motor unit of suitable construction. Within each cylinder there is mounted a slidable piston 16, these pistons being joined by connecting rods 18 to the opposite ends of a rocker arm 19 secured to a horizontal shaft 20. This shaft is supported in two spaced bearings 22 in the body 10. One end of the shaft extends outside of the casing through a suitable annular seal 23, and on this end there is mounted an upwardly extending handle 24 which can be swung back and forth to oscillate the shaft and thereby actuate the pistons 16. Each of the cylinders 14 is provided with one or more ports 26 in the wall thereof so located that they will be closed by the corresponding piston except when the latter is raised or retracted to its uppermost position. These ports open into the interior of the casing, and they make it possible for air to escape from the cylinders and for oil to enter the same.

Means is provided to prevent air from entering the cylinders through the ports 26, no matter what position the apparatus may assume. This may be brought about by ensuring that the ports will at all times remain submerged in oil. For this purpose the body 10 is provided with a transverse horizontal wall or partition 27 which divides the interior of the casing into an upper chamber 28 and a lower chamber 29. This partition is provided with two openings 31 within which the upper portions of the cylinders 14 fit closely. The partition 27 is also provided with a screw-threaded opening 32 which is spaced inwardly from the side walls of the casing and preferably located between the two openings 31. Within this opening 32 there is mounted a nozzle 33 which projects upwardly into the chamber 28 and provides the sole connecting passage between the chambers 28 and 29. The cover plate 11 is provided in one side with a screw-threaded opening 35 which is normally closed by a removable plug 36. This opening 35 is so located that if the casing is filled with oil to the level of the bottom of the opening when the unit is in its normal upright position, as shown in Figs. 1 and 2, the tip of the nozzle 33 will remain submerged in the oil regardless of the position of the unit and even though it be completely inverted, as shown in Fig. 3.

It will now be understood that in the operation of the invention the chamber 28 forms a reservoir for oil. Air can be completely eliminated from the cylinders 14, with the unit in its upright position, by swinging the handle 24 back and forth through several full strokes. This will cause the

air to escape through the ports 26 into the chamber 29, as the corresponding pistons are alternately raised, and thence upwardly through the nozzle 32 into the chamber 28. Thus the cylinders 14 and the lower chamber 29 will become completely filled with oil. Oil will then be added to the reservoir, if necessary, to bring the level to the bottom of the opening 35. Thereafter no air can enter the chamber 29 and the ports 26 through the nozzle 33, even though the unit be completely inverted as shown in Fig. 3, since the nozzle tip will be submerged in the oil, and the barometric pressure will prevent the oil from escaping from the chamber 29 downwardly through the nozzle under the influence of gravity. The apparatus is therefore particularly adapted for installation on aircraft.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A compressor unit for a hydraulic control system comprising a hollow casing, a partition dividing the interior of the casing into an upper chamber and a lower chamber, two upright cylinders with their upper ends opening directly into the upper chamber, a slidable piston mounted in each cylinder, and means to slide the pistons simultaneously in opposite directions, each cylinder having a port therein communicating with the lower chamber and arranged to be closed by the corresponding piston except when the latter is in its raised position, the partition having a passage therethrough located between the two cylinders and connecting the two chambers, the various parts being so constructed and arranged that if the upper chamber is filled with liquid to at least a predetermined level with the unit in its normal position, the said passage through the partition will remain submerged in the liquid regardless of the position which the unit may assume, thereby preventing air from entering the lower chamber through said passage.

2. A compressor unit for a hydraulic control system comprising a hollow casing, a partition dividing the interior of the casing into an upper chamber and a lower chamber, an upright cylinder with its upper end opening directly into the upper chamber, a slidable piston mounted in the cylinder, means to slide the piston in the cylinder, the cylinder having a port therein communicating with the lower chamber and arranged to be closed by the piston except when the latter is in its raised position, and a nozzle on the partition and extending into the upper chamber to provide a passage between the two chambers, the various parts being so constructed and arranged that if the upper chamber is filled with liquid to at least a predetermined level with the unit in its normal position, the tip of the nozzle will remain submerged in the liquid regardless of the position which the unit may assume, thereby preventing air from entering the lower chamber through the nozzle.

3. A compressor unit for a hydraulic control system comprising a hollow casing, a partition dividing the interior of the casing into an upper chamber and a lower chamber, two upright cylinders with their upper ends opening directly into the upper chamber, a slidable piston mounted in each cylinder, means to slide the pistons simultaneously in opposite directions, each cylinder having a port therein communicating with the lower chamber and arranged to be closed by the corresponding piston except when the latter is in its raised position, and a nozzle on the partition and extending into the upper chamber to provide a passage between the two chambers, the various parts being so constructed and arranged that if the upper chamber is filled with liquid to at least a predetermined level with the unit in its normal position, the tip of the nozzle will remain submerged in the liquid regardless of the position which the unit may assume, thereby preventing air from entering the lower chamber through the nozzle.

4. A compressor unit for a hydraulic control system comprising a hollow casing, a partition dividing the interior of the casing into an upper chamber and a lower chamber, two upright cylinders with their upper ends opening directly into the upper chamber, a slidable piston mounted in each cylinder, means to slide the pistons simultaneously in opposite directions, each cylinder having a port therein communicating with the lower chamber and arranged to be closed by the corresponding piston except when the latter is in its raised position, and a nozzle on the partition between the two cylinders and extending into the upper chamber to provide a passage between the two chambers, the various parts being so constructed and arranged that if the upper chamber is filled with liquid to at least a predetermined level with the unit in its normal position, the tip of the nozzle will remain submerged in the liquid regardless of the position which the unit may assume, thereby preventing air from entering the lower chamber through the nozzle.

5. A compressor unit for a hydraulic control system comprising a hollow casing having two openings in the bottom thereof, a vertical cylinder mounted in each opening, the upper portions of the cylinders extending upwardly into the casing, a slidable piston mounted in each cylinder, a horizontal partition dividing the interior of the casing into an upper chamber and a lower chamber, the partition having two openings within which the upper portions of the cylinders fit closely, a nozzle on the partition between the last-mentioned openings, the nozzle extending into the upper chamber and providing a passage between the two chambers, each cylinder having a port therein communicating with the lower chamber and arranged to be closed by the corresponding piston except when the latter is in its raised position, means to slide the pistons simultaneously in opposite directions, the various parts being so constructed and arranged that if the upper chamber is filled with liquid to at least a predetermined level with the unit in its normal position, the tip of the nozzle will remain submerged in the liquid regardless of the position which the unit may assume, thereby preventing air from entering the lower chamber through the nozzle.

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