

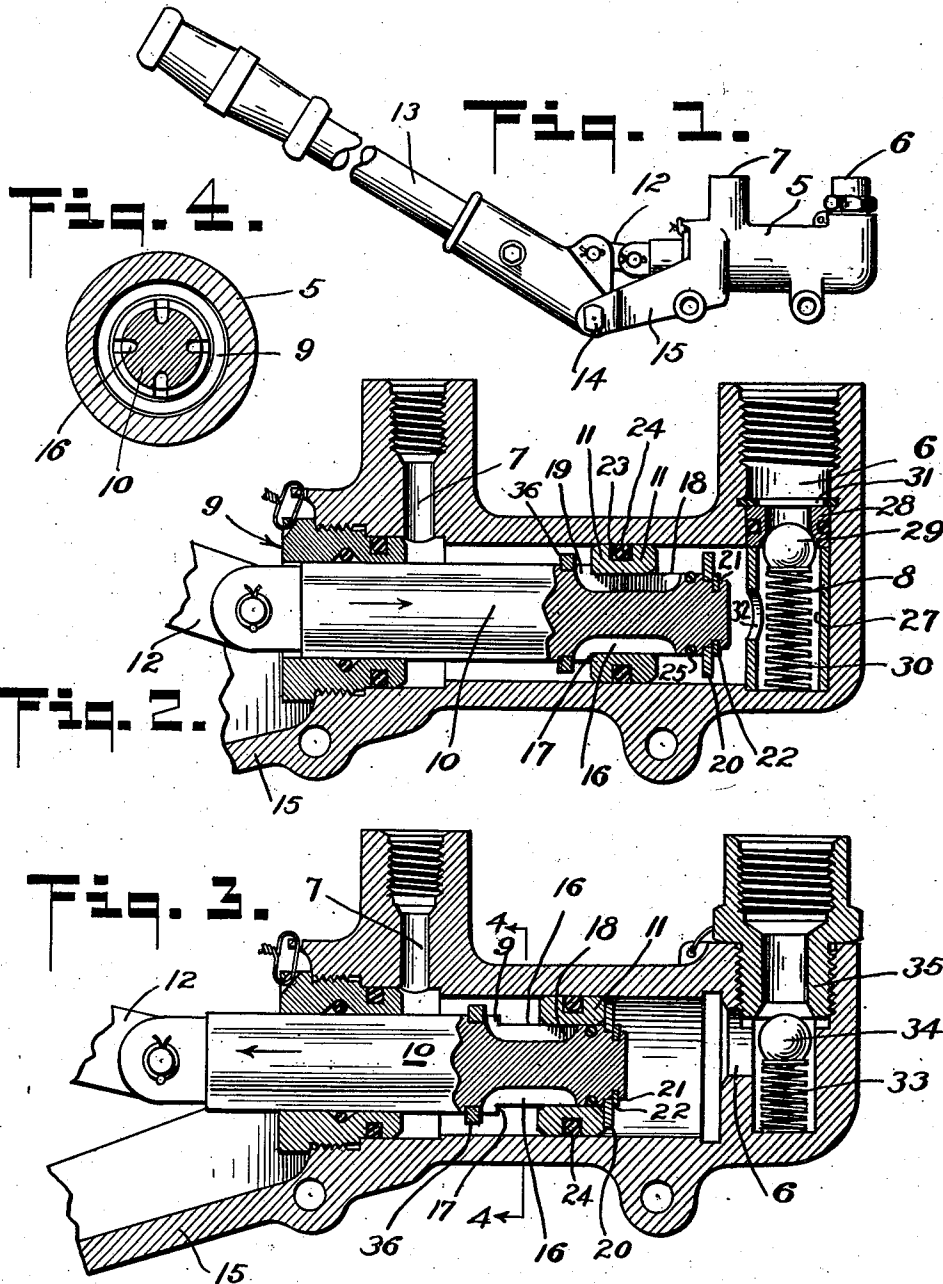
March 19, 1946.

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2,396,878

HAND PUMP

Filed March 6, 1945



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2,396,878

HAND PUMP

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Application March 6, 1945, Serial No. 581,208

4 Claims. (Cl. 103—178)

This invention relates to hand pumps of the type used as emergency pumps for hydraulic systems, especially in aircraft.

More particularly the present invention relates to the construction of the piston of such pumps and has for its primary object the provision of a piston assembly which is constructed and arranged to serve as a valve and makes it unnecessary to employ the separate check valve assembly usually provided on or in the pistons of pumps of the character described, as well as reduces the number of parts, the manufacturing costs and the weight of the pump, compared to pumps as heretofore made.

Another object of my invention is to provide a hand pump such as described in which the piston is slidable on the piston rod and the rod is provided with passages such that the piston will act as a most efficient pump valve controlling the flow through said passages, without the use of springs or parts other than the rod and piston themselves, thus increasing the efficiency of the pump compared to pumps requiring separate check valve assemblies including valve members, valve seat members and valve seating springs.

With the foregoing objects in view, together with such other objects and advantages as may subsequently appear, the invention resides in the parts and in the combination, construction and arrangement of parts hereinafter described and claimed, and illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is a fragmentary side elevation of a hand pump in which the present invention is embodied;

Fig. 2 is an enlarged fragmentary longitudinal sectional view of the pump hereof showing the position and valve action of the piston during the discharge stroke thereof;

Fig. 3 is a sectional view corresponding to Fig. 2 showing the position and valve action of the piston on the intake stroke thereof, there being shown a conventional form of intake check valve instead of the check valve shown in Fig. 2;

Fig. 4 is a cross sectional view taken on the line 4—4 of Fig. 3.

As shown in the accompanying drawing one embodiment of my improved pump includes a cylinder 5 having an intake port 6 at one end, a discharge port 7 at its other end and an intake check valve assembly 8 associated with said intake port.

Slidable through a stuffing box 9 is a piston rod 10 carrying a piston head 11 of special construction and arrangement. This rod is connected by means of a link 12 with a lever 13 fulcrumed as at

14 on a bracket 15 carried by the cylinder 5 so that upon manipulation of the lever the rod and piston will reciprocate in the cylinder.

In accordance with my invention the piston assembly is constructed and arranged to serve as a check valve responsive to reciprocation of the piston assembly. As here shown this assembly is provided with a circular series of by-pass grooves or passages 16 extending axially of and in one end portion of the rod, and the piston head is slidable relative to the rod so as to control the flow of fluid through said passages or grooves. This grooved end portion of the piston rod is reduced and provides a shoulder 17 to limit the travel of the piston head in one direction as shown in Fig. 2. When the piston head abuts the shoulder 17 as on the stroke of the piston in one direction (see arrows in Fig. 2), the intake ends 18 and the discharge ends 19 of the grooves or passages 16 remain open for the free flow of fluid through the passages, between the piston head and piston rod as shown in Fig. 2. In this connection it is seen that the passages 16 are of greater length than the piston and that the discharge ends 19 extend through the shoulder 17 so as to remain open when the piston head abuts said shoulder.

On the stroke of the piston head in the other direction (toward the discharge port as per the arrow in Fig. 3), said head slides into abutting relation to a washer-like stop ring 20 held on the reduced extremity 21 of said rod by a snap ring 22, as shown in Fig. 3. In this position the piston head closes the intake ends 18 of the grooves or passages 16 thus preventing flow of fluid past the piston head, whereupon the check assembly 8 opens for intaking of fluid.

As here shown the piston 11 is in the form of a one-piece annulus having its axial diameter less than its diameter and has a sliding fit on the rod 10 and against the wall of the cylinder 5, there being a ring groove 23 in the piston containing an elastic sealing ring 24 which prevents leakage between the cylinder wall and the piston. A similar sealing ring 25 is carried on the rod 10 between the intake ends 18 of the passages 16 and the stop ring 20, so as to form a seal between the piston and rod when the piston is in position to close the intake ends 18 of the grooves 16 thus preventing leakage between the piston and rod when the latter are moved in the direction of the arrow shown in Fig. 3.

It is now apparent that by the simple expedient of slidably mounting the piston 11 on the rod 10 and forming the simple grooves 16 in the rod, a

most efficient pump valve is provided to control the pump action without necessitating the use of parts separate from the rod and piston, thereby greatly simplifying the construction of the pump and materially reducing its weight as well as its production cost.

As shown in Fig. 2 the check valve assembly 8 includes a sleeve 27 socketed in one end of the cylinder 5 with its upper end registering with the intake port 6 and supporting a valve seat member 28 for an inwardly opening ball valve 29 urged outwardly against its seat by a spring 30 mounted in said sleeve. This assembly is held in place by a snap ring 31. The sleeve has a port 32 opening into the bore of cylinder 5. This check valve assembly requires but little machining for its adaptation to the pump and may be more desirable in some instances than the conventional type of check valve assembly shown in Fig. 3 wherein the cylinder is formed to retain the spring 33 and ball check 34 which latter seats outwardly against the inner end of a screwed in fitting 35.

The intake valve assembly as shown in Fig. 2 and the wall structure of the intake end of the cylinder as shown in Fig. 3 act as stop to limit the stroke of the piston assembly in one direction whereas a stop ring 36 on the piston rod strikes the stuffing box 9 to limit the stroke in the other direction.

While the piston-valve unit hereof is here shown as embodied in a pump it is to be understood that such a unit may be used in any other mechanism or device where the valve action as herein provided is desired in connection with a piston-like member and a piston rod member.

While I have shown and described specific embodiments of my invention, I do not limit myself to the exact details of construction set forth, and the invention embraces such changes, modifications and equivalents of the parts and their formation and arrangement as come within the purview of the appended claims.

I claim:

1. In a hand pump, a cylinder having an intake port and a discharge port, an inwardly opening check valve controlling said intake port, a piston assembly in said cylinder having a passage for establishing communication between said ports and including a piston rod and an annular piston head slidable around said rod into and out of positions for opening and closing said passage, operating means for reciprocating said piston assembly, and a sealing means on said rod to prevent leakage between the rod and the inner periphery of the piston head when the piston closes said passage.

2. In a hand pump, a cylinder having an intake port and a discharge port, a check valve controlling said intake port, a piston rod in said cylinder having a plurality of groove passages in the periphery thereof extending axially of the

rod and affording the passage of fluid there-through from the intake port to the discharge port, means for reciprocating said rod, an annular piston head surrounding said rod and slidable therealong, said piston head being of less length than said passages and its axial dimension being less than its diameter, a stop shoulder on said rod for limiting the sliding of the head to a position in which the head closes said passages to prevent flow of fluid there-through, and a sealing ring mounted on said rod to form a fluid-tight seal between said rod and the surface of the inner periphery of the head when the latter is in position for closing said passages.

3. In a piston-valve unit, a piston rod having a fluid by-pass passage extending axially thereof and opening at its ends on the periphery of said rod, an annular piston head mounted on said rod for sliding movement relative thereto into and out of positions in which the piston head opens and closes said passage to flow of fluid therethrough, a stop means for limiting the relative movement of the piston head in one direction to a position in which the passage is closed at one end by the piston head to prevent flow of fluid therethrough, and other stop means for limiting the relative movement of the piston in the opposite direction to a position in which the piston head uncovers the other ends of said passage whereby fluid may flow therethrough, and a sealing ring surrounding said piston and positioned to be engaged by the inner periphery of said annular piston head when the latter is in engagement with the first recited stop means.

4. In a piston valve unit, a piston rod having a grooved portion which provides a plurality of axially extending groove passages in its periphery, said grooved portion throughout the greater part of its axial extent occupying a diametrically reduced end portion of the piston, the piston having a smooth or un-grooved periphery adjacent the extremity of said end portion, a stop ring surrounding said smooth piston portion, a small part of the extremity of the piston having a further diametrical reduction, said stop ring fitting around the latter piston part and abutting against the annular shoulder resulting therefrom, a snap ring occupying a groove in said piston rod and positioned to prevent said stop ring from moving away from said shoulder, and an annular piston head of less axial extent than said grooved piston rod portion fitted slidably therearound and slidable against and away from said stop ring to open and close fluid flow through said passages, there being in the inner part of the grooved portion of the piston rod stop shoulders produced by its diametrical reduced portion to limit the inward movement of said piston head.

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