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2,539,292

PRESSURE BOOSTER

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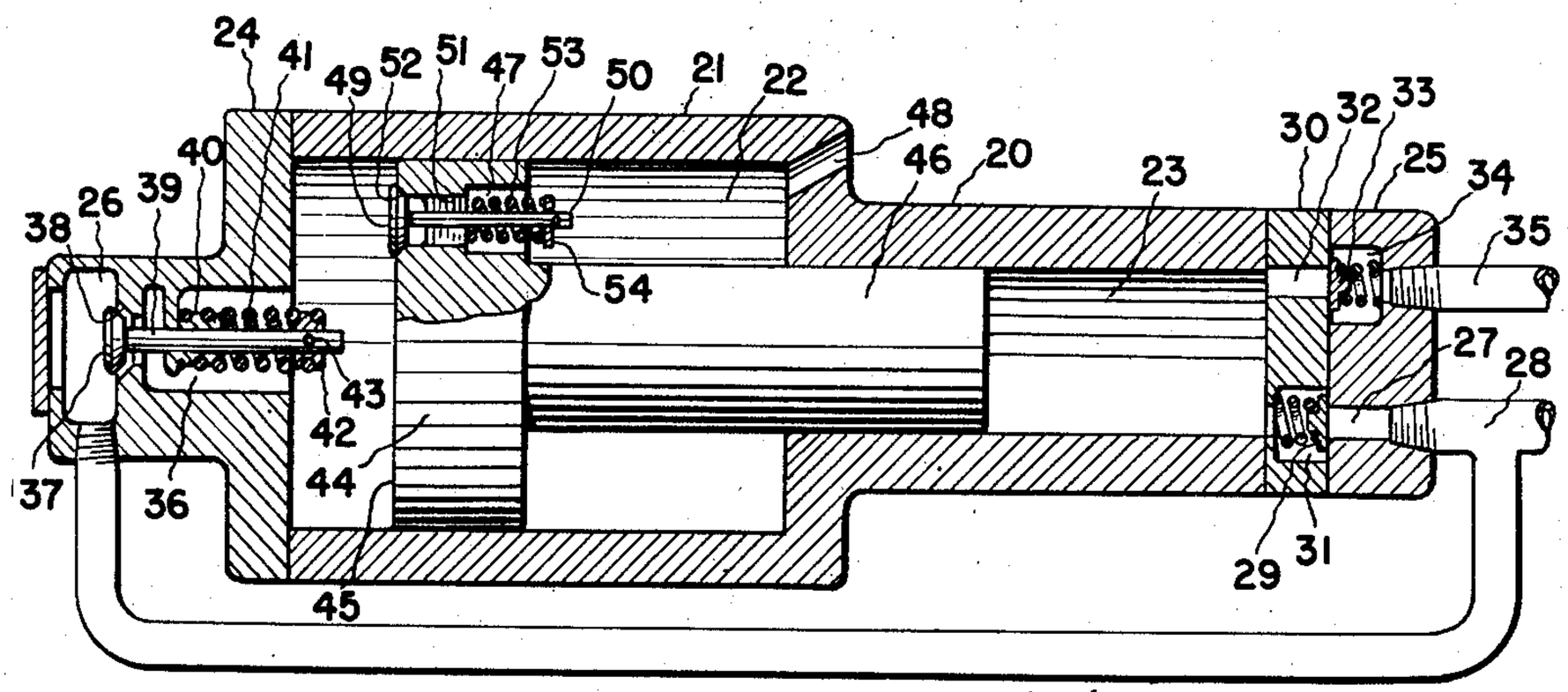

FIG.-1.

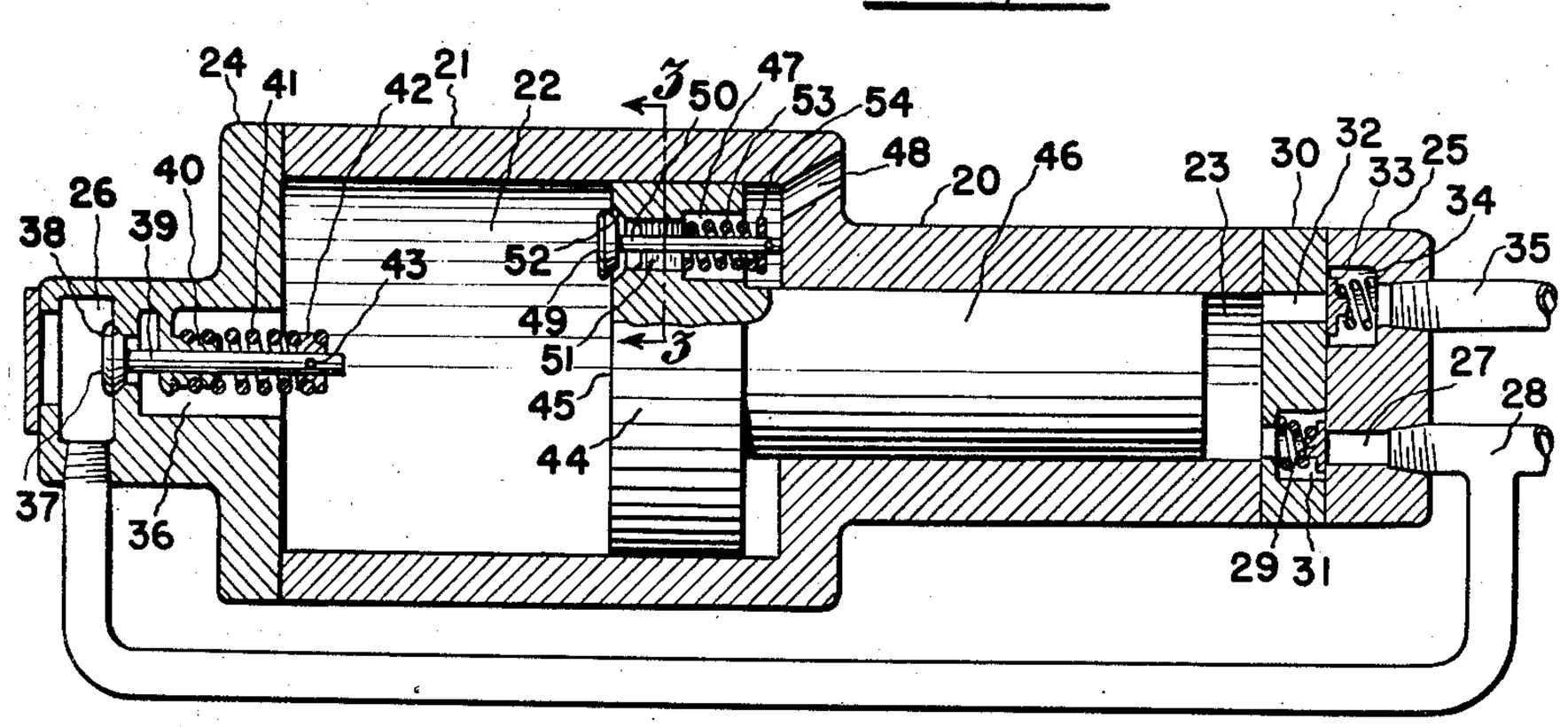

FIG.-2.

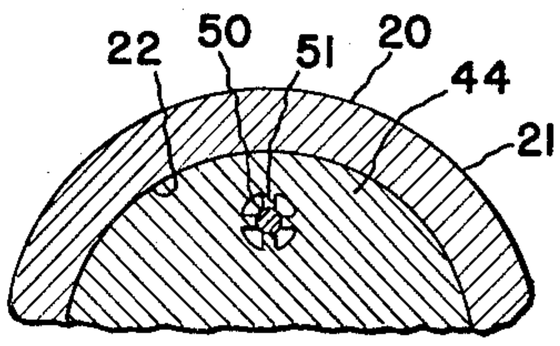

FIG.-3.

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PRESSURE BOOSTER

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4 Claims. (Cl. 230—52)

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This invention relates to fluid compressors, and more particularly to a pressure booster the compressing element of which is actuated by pressure fluid derived from the same source as that intended to be compressed to a higher value.

One object of the invention is to enable the pressure value of a fluid to be conveniently and expeditiously increased.

Another object is to provide a light weight pressure booster of simplified and rugged construction that may be operated and maintained with a minimum of expense.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings accompanying this specification and in which similar reference numerals refer to similar parts,

Figure 1 is a longitudinal elevation, partly broken away, of a pressure booster constructed in accordance with the practice of the invention and showing the parts in position to subject the piston to motive fluid for driving it on its power stroke,

Figure 2 is a similar view showing the piston at the end of its power stroke, and

Figure 3 is a transverse view taken through Figure 2 on the line 3—3.

Referring more particularly to the drawings, the pressure booster constructed in accordance with the practice of the invention and designated 20 comprises a cylinder 21 having a bore consisting of an enlarged portion and a reduced portion that constitute power and compression chambers 22 and 23, respectively.

The outer ends of the power and compression chambers are closed by heads 24 and 25 having admission chambers 26 and 27, respectively, into which fluid is conveyed, from a suitable source of supply (not shown), by a conduit 28. Communication between the chamber 27 and the compression chamber 23 is controlled by a spring-pressed check valve 29 lying in a plate 30 interposed between the head 25 and the end of the cylinder 21, said plate having an aperture 31 to accommodate the valve 29 and to afford communication between the compression chamber 23 and the supply chamber 27.

The plate 30 is further provided with a port 32 for the discharge of the compressed fluid from the chamber 23, and said port is controlled by a spring-pressed valve 33 lying within a recess 34 in the head 25 through which the discharge fluid flows from the port 32 to a discharge conduit 35.

The admission of pressure fluid from the chamber 26 to the power chamber 22 is effected

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through a passage 36 in the head 24 controlled by a valve 37. The valve 37 is shown as being of the poppet type. A seating surface 38 is provided therefor at the juncture of the passage 36 with the chamber 27 and its stem 39 extends slidably through a guide member 40 in the passage 36. The stem has a free running fit in the guide member 40 and, when at rest, the valve stands away from the seating surface 38 to normally maintain an area of communication between the power chamber and the chamber 26. It is held thus by a spring 41 attached at one end to the guide member 40 and at its other end to a collar 42 secured to the free end of the stem 39 by a pin 43.

The free end of the valve stem 39 projects from the recess 36 into the path of a piston 44 reciprocable in the power chamber 22 so that when the piston 44 approaches the end of its suction stroke the end surface 45 thereof will engage the end of the valve stem and move the valve 37 to a wide open position for admitting pressure fluid into the power chamber 22.

Pressure fluid is admitted into only the outer end of the power chamber, and the piston is actuated on its suction stroke by the pressure fluid acting against the end of the stem 46 of the piston lying within the compression chamber 23. The pressure fluid serving to actuate the piston on its power stroke is exhausted through a passage 47 into the inner end of the power chamber 22, and in the adjacent end wall of the power chamber is a free exhaust port 48 for the escape of such fluid to the atmosphere.

The passage 47 is controlled by a valve 49 shown as being of the poppet type. The stem 50 thereof is slidably guided by ribs 51 in the passage 47, and the valve 49 is normally held against its seat 52 by a spring 53 seating at one end against the ribs 51 and at its other end against a collar 54 at the free end of the valve stem 50. The stem 50 projects from the passage 47 to abut the end wall of the power chamber 22 as the piston 44 moves through the end portion of its compression stroke for unseating the valve 49 to communicate the active end of the power chamber with the exhaust port 48.

In the operation of the device, and with the conduit 28 in communication with the source of the pressure fluid intended to be compressed to a higher value, pressure fluid will flow through the aperture 31 into the compression chamber 23 and through the space between the valve 37 and its seat 38 and the passage 36 into the power chamber 22 to drive the piston 44 on its working

stroke. The compressed fluid in the compression chamber 23 will then be compressed to a higher value and discharged through the port 32, the recess 34 and the discharge conduit 35 to a point of storage or utilization.

Near the end of the compression stroke of the piston the valve stem 50 engages the inner end wall of the power chamber 22 and will be held stationary thereby. Thus, as the piston continues on its compression stroke the valve seat 52 will be withdrawn from the valve 49 and the fluid in the power chamber will flow through the passage 47, the inactive end of the power chamber 22 and the exhaust port 48 to the atmosphere.

Simultaneously with the drop in pressure within the power chamber 22 incident to the opening of the valve 49, the pressure fluid in the chamber 26 will shift the valve 37 to its seat and cut-off the further admission of pressure fluid into the power chamber. The pressure fluid flowing thereafter into the compression chamber through the aperture 31 against the small end of the piston stem 46 will then again return the piston. When, during this stroke of the piston, the surface 45 engages the valve stem 39 the valve 37 will be unseated to admit a new charge of pressure fluid into the power chamber for again driving the piston on its working stroke.

In practice, the present invention has been found to be particularly suitable for use in instances where one or more of a number of pressure fluid actuated mechanisms require pressure of a value greater than other mechanisms of a system. In such case, the booster may be quickly connected to the supply line conveying the pressure intended to be boosted to a higher value and to the mechanism requiring such pressure fluid and may be set in operation to perform its boosting function automatically as long as the booster remains in communication with the source of power supply.

I claim:

1. A pressure booster, comprising a casing having a bore to define a power chamber having opposed ends and a compression chamber of smaller diameter than the power chamber, a reciprocatory piston in the chambers, inlet and discharge passages for the compression chamber, check valves to control said passages, supply and exhaust passages for the power chamber at opposed ends thereof, a valve to control the supply passage, a passage in the piston for the escape of exhaust fluid from the power chamber to the exhaust passage, and an exhaust valve in the piston to control the last-mentioned passage having a stem to abut the casing for opening said exhaust valve when the piston approaches the end of the compression stroke.

2. A pressure booster, comprising a casing having a bore to define a power chamber having opposed ends and a compression chamber of smaller diameter than the power chamber, a reciprocatory piston in the chambers, inlet and discharge passages in the casing for the compression chamber, check valves to control said passages, supply and exhaust passages in the casing for the power chamber at the opposed ends thereof, a passage in the piston for the escape of exhaust fluid

from the power chamber to the exhaust port, a valve to control the last-mentioned passage and being unseated by the casing to permit the flow of exhaust fluid through the last-mentioned passage to the exhaust passage, and a valve to control the supply passage having a stem extending into the path of movement of the piston, and a surface on the piston to engage the stem to unseat the last-mentioned valve for admitting pressure fluid into the power chamber.

3. A pressure booster, comprising a casing having a bore to define a power chamber and a compression chamber of smaller diameter than the power chamber, a reciprocatory piston in the chambers, inlet and discharge passages in the casing for the compression chamber, check valves to control said passages, a supply passage in the casing to convey pressure fluid into one end of the power chamber, a free exhaust port in the casing at the other end of the power chamber, a passage in the piston for the escape of exhaust fluid from the power chamber to the exhaust port, a spring-pressed valve to control the last-mentioned passage and being unseated by the casing to permit the flow of exhaust fluid through the last-mentioned passage to the exhaust port, a valve to control the supply passage having a pressure surface subjected to pressure fluid for closing said last-mentioned valve, a surface on the piston to unseat the last-mentioned valve for admitting pressure fluid into the power chamber, and a spring for normally holding the valve in an unseated position.

4. A pressure booster, comprising a casing having a bore to define a power chamber and a compression chamber having a smaller diameter than the power chamber, a reciprocatory piston in the chambers, inlet and discharge passages in the casing for the compression chamber, check valves to control said passages, a supply passage in the casing to convey pressure fluid into one end of the power chamber, a free exhaust port in the casing at the other end of the power chamber, a passage in the piston for the escape of exhaust fluid from the power chamber to the exhaust port, a spring-pressed valve to control the last-mentioned passage and being unseated by the casing to permit the flow of exhaust fluid through the last-mentioned passage to the exhaust port, a valve axially displaced from the last-mentioned valve to control the supply passage having a pressure surface subjected to pressure fluid for closing said last-mentioned valve, a surface on the piston to unseat the last-mentioned valve for admitting pressure fluid into the power chamber, and a spring for normally holding the valve in an unseated position.

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