

Nov. 24, 1942.

E. G. WEEKS

2,303,152

BUFFERED BLOWER VALVE

Filed Oct. 25, 1940

3 Sheets-Sheet 1

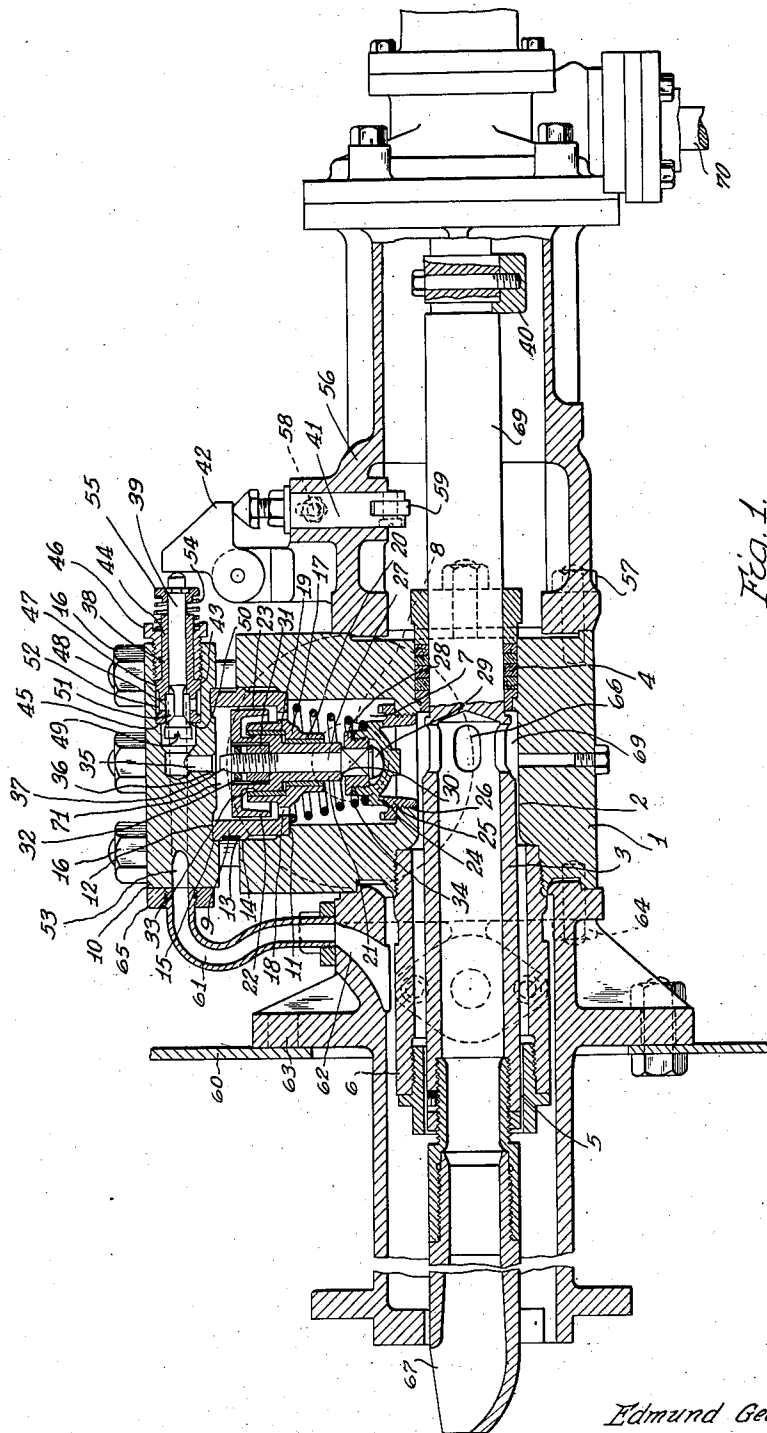


Fig. 1.

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3 Sheets-Sheet 2

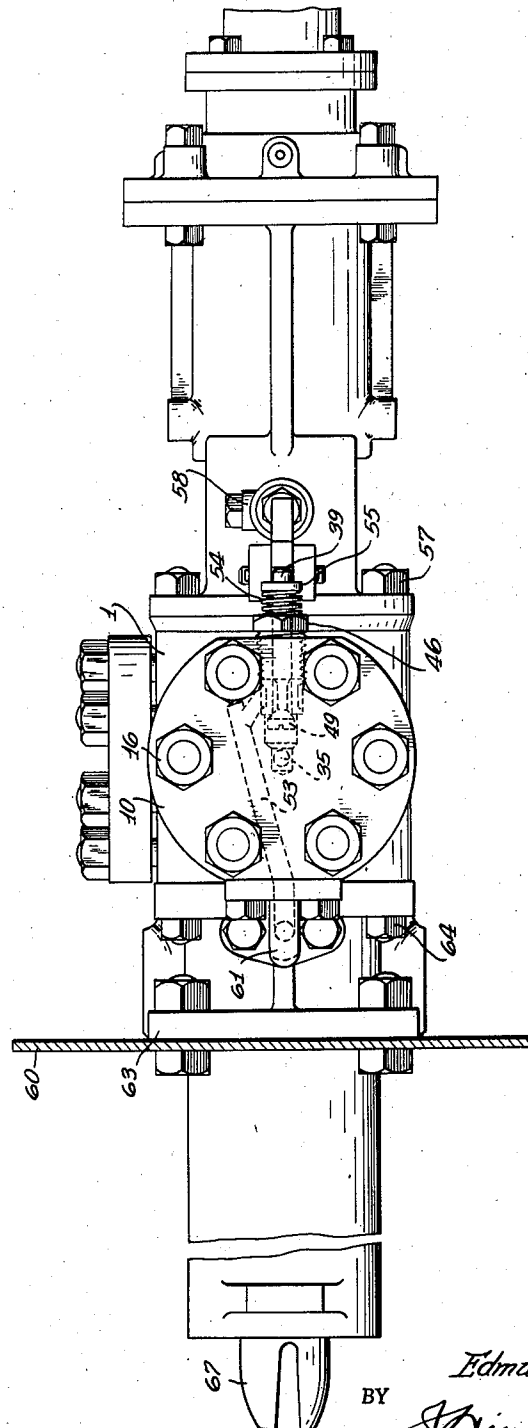


Fig. 2.

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3 Sheets-Sheet 3

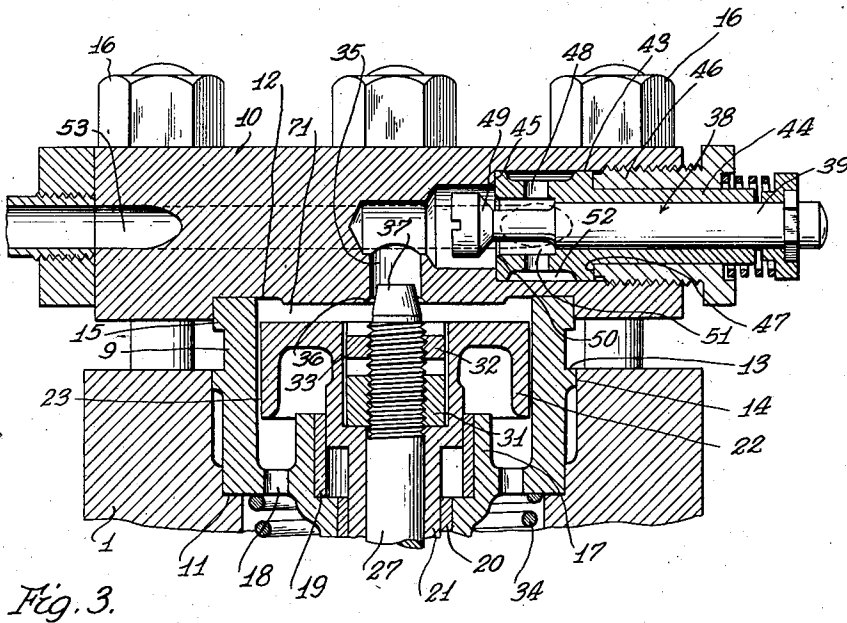


Fig. 3.

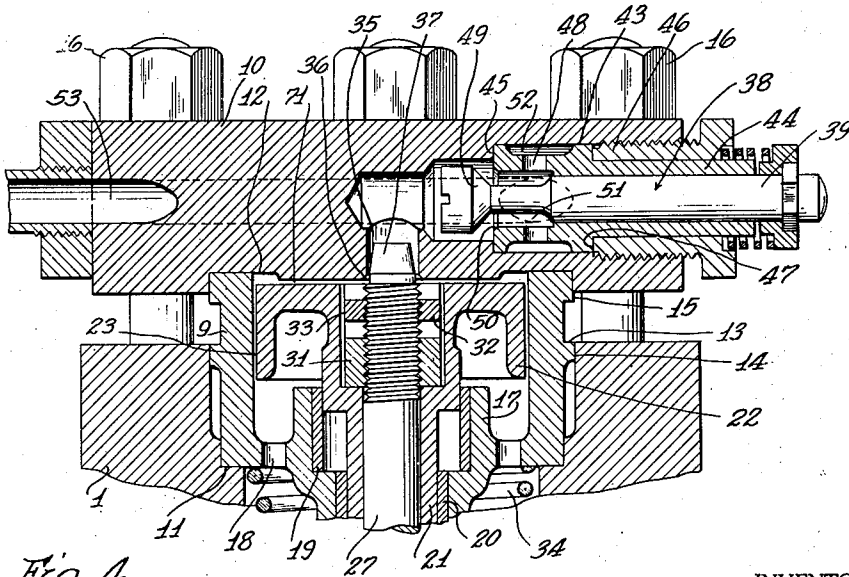


Fig. 4.

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UNITED STATES PATENT OFFICE

2,303,152

BUFFERED BLOWER VALVE

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Application October 25, 1940, Serial No. 362,785
In Great Britain October 25, 1939

2 Claims. (Cl. 137-139)

This invention relates to fluid heater cleaners of the kind comprising a blower tube and a normally closed control valve for controlling the flow of cleaning fluid to the blower tube, the valve being operable by a piston arranged during service to move the control valve from the open to the closed position when the pressure on one side of the piston is raised to a sufficient degree through the leakage of cleaning fluid to that side of the piston while an auxiliary valve for controlling the escape of fluid from the one side of the piston is closed, together with means arranged automatically to open the auxiliary valve when the blower tube is in a predetermined position in order to release the pressure on the one side of the piston and whereby to effect opening of the control valve and admission of cleaning fluid to the blower tube. In a fluid heater cleaner of this kind a definite and rapid opening of the valve is obtainable. Whilst the rapid opening is advantageous it introduces the difficulty that the piston is brought to rest with considerable shock which may cause damage to the parts affected. An object of the invention, therefore, is the provision of simple but effective means for overcoming this difficulty.

In a fluid heater cleaner of the kind specified in accordance with the present invention means are provided for effecting cushioning of the piston by preventing or limiting escape of fluid from the one side of the piston during the latter part of the opening movement of the control valve.

Thus in one form of cleaner or soot blower in accordance with the invention movement of the piston to open the control valve effects prevention or limitation of the escape of fluid from the one side of the piston.

The cleaner may, for example, be of the kind in which the blower tube simply rotates and is provided with a number of nozzles for the escape of cleaning fluid or it may be of the type in which the blower tube carries at its end a nozzle which together with the blower tube is retractable to a normal position.

The invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 shows a longitudinal cross section of a fluid heater cleaner according to the invention, with parts of the driving gear broken away;

Figure 2 is a plan view of Figure 1, also with parts of the driving gear broken away; and

Figures 3 and 4 are sectional side views of the cover plate and upper part of the casing and associated members to a larger scale than Fig-

ure 1, respectively showing the upper end of the piston with the plunger half-way and fully home within the port in the cover plate.

The cleaner illustrated is constructed substantially in the manner described in the complete specification of co-pending British patent application No. 21,696/39 and includes a casing or pressure part 1 in which is an aperture 2 through which the blower element including the blower tube 3 extends and in which the element is able to move to and fro, the element being arranged to slide through joints 4 and 5 and provided respectively in the pressure part 1 and a tubular extension 6 to the pressure part. The pressure part 1 is also formed with a valve chamber 7 the longitudinal axis of which is transverse to that of the blower tube 3. Cleaning fluid such as steam may be admitted to the valve chamber 7 through a side opening 8 and the chamber is closed by a sleeve or cylinder 9 and a cover plate 10, the lower end of the cylinder seating upon an annular shoulder 11 of the pressure part 1 and the upper end of the cylinder engaging the surface of an annular recess 12 in the cover plate. The cylinder 9 extends above the top of the pressure part 1 and is formed with an annular projection 13 which by engaging the surface 14 of the pressure part ensures that the longitudinal axes of the valve chamber 7 and cylinder 9 shall coincide. The cover plate 10 is located relatively to the cylinder 9 by engagement between the annular projection 15 on the cylinder and the radially outer side of the annular recess 12. The cylinder 9 is clamped between the pressure part 1 and cover plate 10 by studs and nuts 16. The lower end of cylinder 9 supports a spider which includes a hub 17 and is formed with ducts 18 for the flow therethrough of fluid. The hub 17 is provided with bushings 19 and 20 through which a piston rod 21 slides. As shown the bushings 19 and 20 and the co-operating parts of the piston rod are of substantial diameter so that adequate bearing surfaces are provided for accurately locating the longitudinal axis of the piston in coincidence with that of the cylinder. The piston rod 21 is formed in one with a piston 22 which moves within the cylinder 9, there being a small clearance 23 between the piston and cylinder for the leakage of cleaning fluid. It will be appreciated that upon removal of the cover plate 10 the cylinder 9 together with piston 22 and valve lid 24 may be removed as a unit. A fixed valve seat 25 is screwed into an opening 26 between the valve chamber 7 and the aperture 2 and the co-operating valve lid 24 is carried by

the piston, the valve lid being held to a bolt 27 by a sleeve 28 encircling the bolt, screwed into the valve lid and engaging the head 29 of the bolt. The bolt 27 passes through the hollow piston rod 21 and the shoulder 30 on the bolt is clamped against the end of the piston rod by a nut 31 locked by nut 32, the nuts being accommodated in the recess 33 in the piston and piston rod. The valve lid 24 is biased to the closed position by gravity and by a compression spring 34 acting between the valve lid and the lower end of cylinder 9 or the associated spider.

The upper surface of the piston 22 and the opposing surface of the cover plate 10 surrounded by the annular recess 12 are substantially flat and the cover plate 10 is formed with a port 35, countersunk at 36, coaxial with the piston rod 21 and bolt 27. The upper end of the bolt 27 extends above the upper surface of the piston 22 and is bevelled to form a plunger 37 arranged to enter the port 35, the arrangement being such that as the plunger 37 moves further into the port 35 the clearance between the plunger and port is progressively reduced, as will be clear from Figures 3 and 4. By making the part of the plunger 37 of greatest diameter of suitable size, the plunger may, if desired, be adapted substantially to prevent escape of fluid through the port 35.

A relay valve 38 includes a spindle 39 the axis of which is disposed in a plane parallel to the axis of the blower tube and a cam 40 on the blower element is arranged to transmit movement to the spindle 39 through a tappet 41 transverse to the blower tube and a lever 42 intermediate the spindle and tappet. In the arrangement shown the spindle 39 is parallel to the axis of the blower tube, the relay valve 38 being arranged as a removable unit secured in a recess 43 in the cover plate 10, which recess is in communication with the cylinder 9 through the port 35.

The spindle 39 of the relay valve slides through a sleeve 44, the inner end of which is clamped against a shoulder 45 in the recess 43 by a threaded ferrule 46 screwed into the recess and bearing against the annular shoulder 47 on the sleeve. The inner portion of the sleeve 44 is formed with ports 48 and the adjacent portion of the spindle 39 is of reduced diameter so that when the movable valve face 49 formed near the inner end of the spindle is moved from the valve seat 50 on the sleeve, fluid is able to pass into the annular space 51, and through the ports 48 into the annular space 52 and thence to a duct 53 in the cover plate. The spindle 39 is biased to the closed position by a spring 54 which acts between seatings on the ferrule 46 and a collar 55 secured to the spindle and the lever 42 operates the relay valve by pressing against the outer end of the spindle 39. The lever 42 is pivoted to, and the tappet 41 is arranged to slide in a bracket 56 secured to the pressure part 4 by studs and nuts 57 and the length of the tappet 41 is adjustable, whilst a pin and slot arrangement 58 prevents rotation of the tappet 41 and thus maintains proper orientation of a roller 59 at the lower end of the tappet 41 in relation to the cam 40.

The relay valve 38 is arranged to exhaust pressure fluid acting on the upper side of piston 22 to the inner side of a wall 60 of the fluid heater. Thus a tube 61 is arranged to conduct the fluid from the duct 53 in cover plate 10 to a duct 62 leading to the interior of a wall box 63 clamped by screws 64 to the front side of the pressure

part 1, the tube being readily disconnectable from the cover plate 10 by means of the joint 65.

The blower tube 3 is provided with ports 66 and carries a nozzle 67 and is formed in one with a spindle 68. The ports 66 lie always between the joints 4 and 5 in the annular space 69 between the blower element and aperture 2 and tubular extension 6 so that when the valve lid 24 is lifted cleaning fluid is able to flow from the valve chamber 7 through opening 26 into annular space 69 and through ports 66 blower tube 3 and nozzle 67. The spindle 68 carries the cam 40 for operating the tappet 41 when the nozzle 67 has been projected from the retracted position and forms part of suitable operating means including a driving shaft 70 for moving the blower tube 3 and nozzle 67 axially and effecting the requisite rotation of the latter.

When pressure fluid is admitted to the valve chamber 7 with the blower tube 3 in its normal or retracted position and the relay valve 38 closed, pressure fluid leaks past the piston 22 through clearance 23 and raises the pressure in the space 71 between the piston 22 and cover plate 10 so that, notwithstanding the pressure exerted by the cleaning fluid on the underside of the piston, the force of gravity and the biasing spring 34 are effective in pressing the valve lid 24 against its fixed seating 25. If, however, the blower tube 3 is advanced, the associated cam 40, when the nozzle 67 reaches an operative position, through operation of tappet 41 and lever 42 effects opening of the relay valve 38 and thereby vents fluid from space 71 through port 35, duct 53 and tube 61. The cleaning fluid below the piston, therefore, moves the latter rapidly upward and quickly lifts the valve lid 24 thereby admitting cleaning fluid to the aperture 2 in the pressure part 1 and thence by way of ports 66 to the blower tube. As the piston 22 moves towards its uppermost position the plunger 37 on the bolt 27 by entering the port 35 for the escape of fluid exerts a throttling effect which increases as the movement proceeds, so that the escape of fluid is restricted. The fluid thus retained in the space 71 is compressed and serves as a cushion for the piston. Notwithstanding the rapid opening of the valve, therefore, the piston and valve are brought to rest gradually and without shock.

When the cam 40 allows the relay valve 38 to reclose, cleaning fluid leaking through the clearance 23, by raising the pressure in space 71, effects movement of the valve lid 24 to the closed position.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A fluid control comprising a spring pressed valve having a valve seat guarding a main fluid entry, said valve having an enlarged end at a distance from said valve seat, a cylinder surrounding said enlarged end and having slight normal clearance therewith whereby fluid inletted between said valve seat and said enlarged end may leak past said end, a head for said cylinder and a relief valve operable by outside influence to vent the pressure between said cylinder head and said enlarged end whereby said valve is opened to permit the passage of fluid into said main fluid entry, said cylinder head having a passageway leading to said relief valve, said enlarged end having a conical valve atop thereof for seating in the entry to said passageway, said conical valve

having a smaller diameter than that of said passageway whereby a restricted flow through said passageway is permitted.

2. A fluid control comprising a main valve spring pressed against its seat, said valve having an enlarged end portion subjected to equal pressures on opposite sides thereof, a relief valve for bleeding the pressure from the side of said valve in support of the pressure of said spring, a

passageway leading to said relief valve and terminating at its inlet end in a valve seat, said enlarged end portion having a conical extension thereon arranged for seating in said valve seat upon opening of said relief valve, said conical valve having a smaller diameter than that of said passageway whereby a restricted flow through said passageway is permitted.

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