

[72]	Inventor	Josef Wagner 7991 Friedrichshafen-Fischbach, Germany
[21]	Appl. No	14,359
[22]	Filed	Feb. 26, 1970
[45]	Patented	Nov. 30, 1971
[32]	Priority	Feb. 28, 1969
[33]		Germany
[31]		P 19 10 093.7

{ 56 }

References Cited

UNITED STATES PATENTS

2,687,739	8/1954	Shelburne et al.	239/332 X
2,704,690	3/1955	Eichenauer	239/127
3,147,767	9/1964	Goss	239/127 X
3,317,141	5/1967	Mann	239/127
3,388,866	6/1968	Levey	239/127

Primary Examiner—M. Henson Wood, Jr.

Assistant Examiner—John J. Love

Attorneys—William Frederick Werner, Eric P. Schellin and Martin P. Hoffman

[54] FEED ARRANGEMENT FOR SPRAY PAINTING
6 Claims, 2 Drawing Figs.

[52] U.S. Cl..... 239/127,
239/332

[51] Int. Cl. 239/332
B05b 9/00

[50] **Field of Search**..... 239/127,

329-334, 360; 222/318

ABSTRACT: A unitary spray device having a paint-containing reservoir, a diaphragm pump and a feed line communicating from said pump to a spray gun. An air vent relief valve is positioned in the unitary device intermediate the pump and the spray gun. The air vent valve has a conduit terminating proximate the paint intake means of the reservoir.

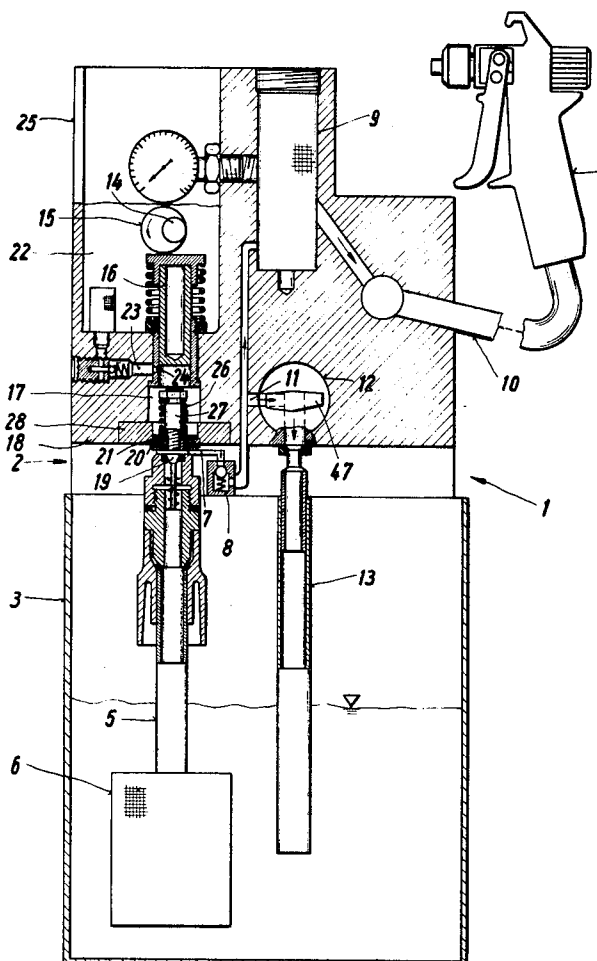
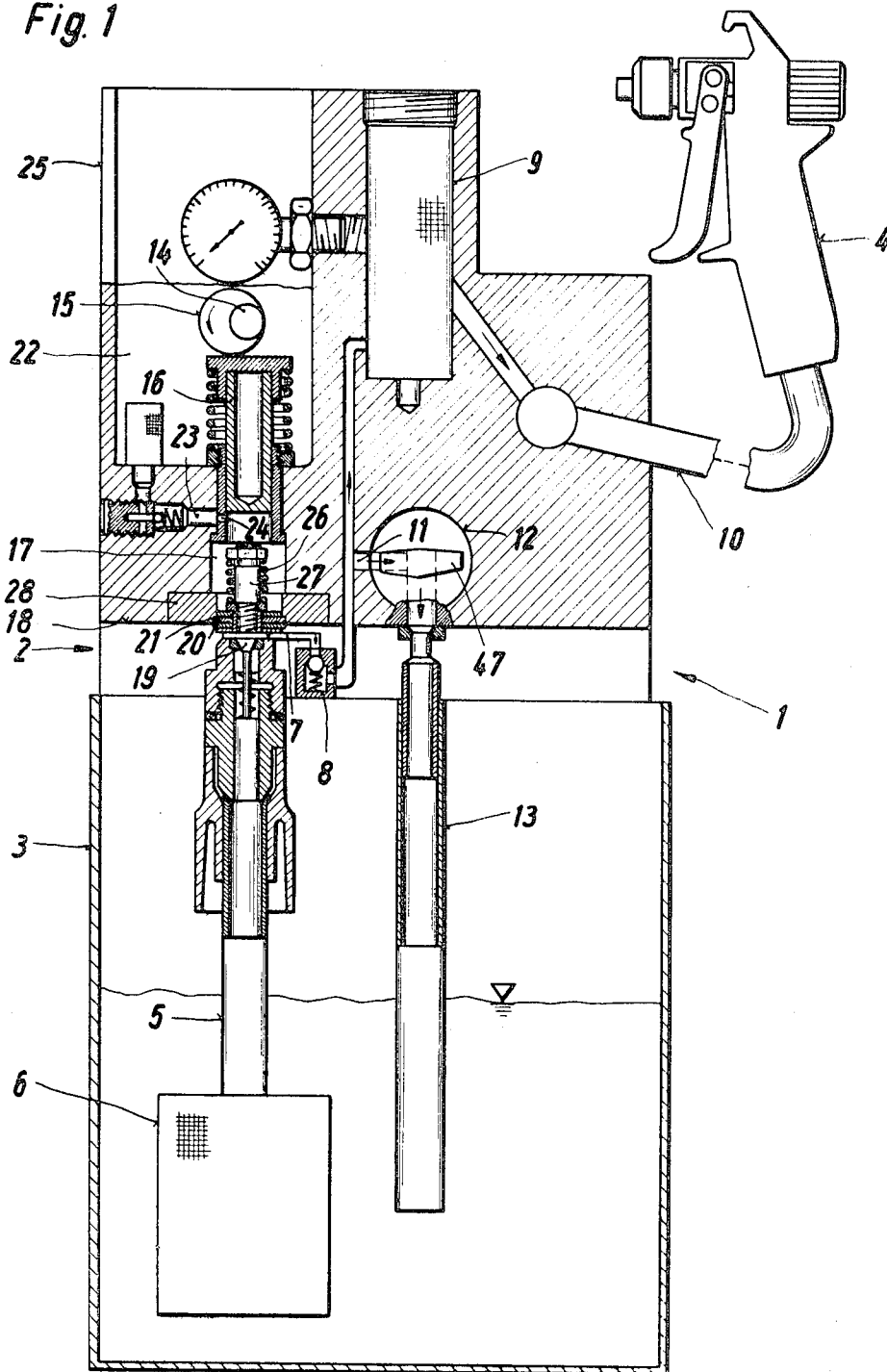


Fig. 1



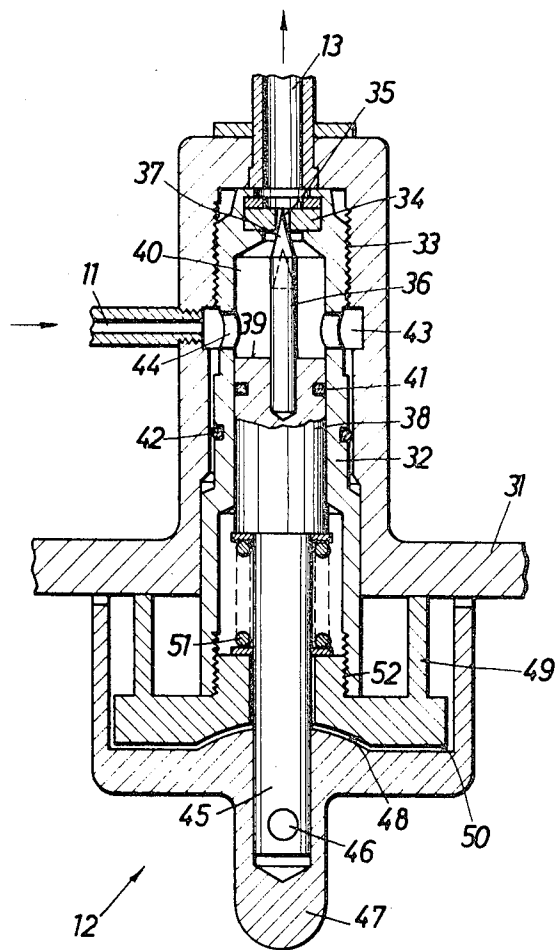
Inventor:

JOSEF WAGNER

ATTORNEY:

William Frederick Werner

Fig. 2



Inventor:

JOSEF WAGNER

ATTORNEY:

William Frederick Kerner.

FEED ARRANGEMENT FOR SPRAY PAINTING

BACKGROUND OF THE INVENTION

As stated, the invention relates to a spray painting apparatus having a diaphragm pump as the pressurizing device. The paint which is to be sprayed is pumped from a reservoir, through connecting lines, to one or more filters of a spray gun.

It is known that when a diaphragm pump is put into operation, it is necessary to expunge any gas-and-air mixture usually present in the pump chamber and the feed lines as fast as possible. Without such removal, the spray device does not deliver a smooth flow but results in a sputtering output. This is due to the gas present in the pump chamber being compressed in such a way that the valves open only imperfectly, so that a constant paint-feeding flow, as required for good spraying action, is available only after the apparatus has been in operation for some time.

Therefore, in spray painting units, a conventional procedure consists in starting the pump operation some time before the start of the spraying, in order to expel the enclosed air by means of the spraying material, or to remove the air by special devices from the pump chamber of the diaphragm pump. This is not only very expensive and time-consuming on account of the length of the feed lines, but also results at every start in the loss of a substantial amount of spraying material.

The invention therefore aims at a spray painting apparatus of the initially mentioned type in which the disadvantages of known comparable structures are avoided by simple means and without great expenditure, so that immediately after the starting of the operation faultless functioning is assured.

BRIEF SUMMARY OF THE INVENTION

According to the invention an immediate smooth flow of the spraying material is achieved by providing the diaphragm pump with a preferably manually adjustable air vent valve, connected to the feed line of the pump.

In this structure it is advantageous, in order to return the paint to the paint reservoir, to connect the air vent valve, via a line connected with the air vent aperture of said valve, with the paint reservoir. The said line ends in the reservoir, preferably in the area of the suction filter.

Furthermore it is preferable to insert in the feed line, in the direction of conveyance, behind the branch-off point of the air vent valve, one or more filters. Additionally, a check valve is positioned in the feed line between the branch-off point of the air vent valve and the diaphragm pump.

The air vent valve consists of a stationary diaphragm and a movable valve element engaging it, in which structure the valve element, in the area of the element that engages the diaphragm aperture, is shaped as a cone and preferably as a needle.

For moving the valve element, a lever is provided rotatable in the direction of the valve element and equipped with a cam that cooperates with a stationary countersurface. As an alternative, the valve element is provided with a switch with which the valve element is connected, directly or via intermediate elements consisting of a piston inserted in a casing supporting the diaphragm and impinged upon by the pressure agent. Besides, the valve member or the piston connected therewith may rest, via one or more springs, on a stationary structural element or an intermediate element inserted therein.

It is particularly advantageous to combine in a single structural unit the diaphragm pump, the reservoir, the air vent valve and the filter inserted in the paint-feeding line, in a common casing.

A spray painting apparatus constructed according to the invention excels not only by the simplicity of structure but particularly by high operating safety and readiness for use. This results from the fact that the diaphragm pump is provided with an air vent valve which makes it possible to ventilate at any time, but especially when the spray painting apparatus is being put into operation, the pump chamber as well as the feed lines, so that compression of the enclosed air is largely avoided and

a reliable suction of the pump is assured. The pump is, therefore, immediately after the air vent is reclosed, ready for operation and its delivery of spraying agent is constant.

Furthermore, the paint in the reservoir is churned by the returning paint and the gas mixture when the air vent valve opens, since the return line thereof ends in the paint reservoir. Thus clod formation, especially when the apparatus has been out of operation for some time, is obviated so that the suction is further improved. It is also possible to flush, by sudden opening of the suitably constructed air vent valve the filter inserted in the feed line since the latter can be abruptly emptied via the valve and the drained-off feeding flow of the pump acts also as an ejector. The spray painting apparatus constructed according to the invention is thus very simple in structure, and by the insertion of the pump, of the reservoir, of the air vent valve and of the filters in a common casing a compact unit is produced which is extremely safe in operation and nevertheless, especially at the start, assures immediately an unobjectionable operation.

DETAILED DESCRIPTION OF THE INVENTION

Further details of the spray painting apparatus of the invention are illustrated in the embodiment shown in the drawing.

In FIG. 1, the apparatus, consisting of a diaphragm pump, a paint reservoir, a spray gun, and several valves and filters;

In FIG. 2, the air vent valve with which the diaphragm pump is provided, in cross section.

The spray painting apparatus shown in FIG. 1 and indicated by reference numeral 1 consists essentially of a paint-feeding pump, constructed as a diaphragm pump 2, a reservoir 3 for the paint to be sprayed, and a spray gun 4. Diaphragm pump 2 aspirates the paint through a line 5 provided with a filter 6, from reservoir 3 and conveys it, via pressure line 7 in which a check valve 8 is inserted, to another filter 9, wherefrom the paint is fed through a flexible line 10, adjustable to prevailing needs, to spray gun 4.

In order to ventilate feed lines 7 and 10 at the start of spray painting apparatus 1, pump 2 is provided with a manually controllable air vent valve 12 which through a branch line 11 can be connected with a feed line 7. A return line 13 of air vent valve 12 ends in reservoir 3 so that, when valve 12 is open, the conveyed paint is directly returned and therefore the paint in reservoir 3 is churned.

Diaphragm pump 2 whose diaphragm 18 is clamped in a casing 25 is driven by an eccentric disc 15 mounted on the driving shaft 14 of a driving motor not shown, which eccentric disc acts upon a displaceable piston 16. At each rotation of shaft 14, piston 16 is therefore moved in a strokelike manner, so that diaphragm 18 is bent via the oil present in a pressure chamber 17 and paint is aspirated through valve 19, which opens at the suction stroke, from reservoir 3 and pressed, through valve 8, into paint feeding line 7.

For guiding diaphragm 18 two holding plates 20 and 21 are used between which diaphragm 18 is inserted and which are rigidly connected with a bolt 27. Bolt 27 in turn rests, via a spring 26 provided for its return, on a disc 28 inserted rigidly in casing 25. Pressure chamber 17 is connected via a line 23 and an aperture 24, covered or freed at a stroke of cylinder 16, with an oil tank 22, in order to compensate for possible leakage losses.

Air vent valve 12, shown in FIG. 2 in cross section, is inserted in a separate casing 31 between branch-off line 11 and a return line 13 and consists essentially of a diaphragm 34 provided with an aperture 35 and an axially movable valve element 36, a section 37 of which is cone-shaped like a needle and engages diaphragm aperture 35. Diaphragm 34 is fastened in a casing 32 screwed in turn in casing 31 by means of a thread 33.

For moving valve element 36 axially a rotatable switch 47 is used which is rigidly connected by a pin 46 with the rod 45 of a piston 38 impinged upon by the paint, in which piston valve element 36 is inserted. Switch 47 is provided with a cam 48

which cooperates with a countersurface 50 provided on a casing 49. Casing 49 is rigidly connected, by a thread 52, with casing 32 which guides valve piston 38. Besides, a pressure spring 51 is inserted between casing 49 and valve piston 38, so that the latter is held, together with valve element 37, in the upper terminal position by the force of spring 51.

In the position of operation shown, needle 37 of valve element 36 closes aperture 35 of diaphragm 34, so that no pressure medium can flow from line 11 via annular chamber 43 sealed by packings 42, via openings 44 provided in casing 32, and via pressure chamber 40 sealed by packings 41, into return line 13. When, however, the force exerted by the paint upon piston surface 39 exceeds the force of spring 51, piston 38 is moved downward and at least a portion of diaphragm aperture 35 is freed by needle 37. Thus paint can be discharged and the excess pressure is reduced. As soon as the balance between the compressive force produced by the paint and the force of spring 51 is reestablished, or the force of spring 51 is greater than the said compressive force, aperture 35 is closed. Air vent valve 12 acts therefore as relief valve jet.

When, however, switch 47 is turned, cam 48 thereof runs up on the countersurface 50 of casing 49, and needle 37 frees diaphragm aperture 35 according to the position indicated in dot-and-dash lines, since valve element 36, together with piston 38 and piston rod 45, is pulled downward. From the level of cam 48 the adjusting path of valve element 36 and, dependent thereon, the freed passage cross section of diaphragm aperture 35 can be determined so that a stepless cross section modification is possible under given circumstances. In this operating condition, spring 51 acts in the manner already described so that, with diaphragm aperture 35 only partially closed, the air vent valve 12 is also effective as relief valve jet.

When spray painting apparatus of FIG. 1 is put into operation and a paint mixture is in feed line 7, so that the enclosed air would possibly be compressed by pump 2 and therefore a faultless operation of apparatus 1 would not be assured, air vent valve 12 must be opened by turning switch 47. Thus the paint and air mixture can be discharged via line 13 into reservoir 3, and paint can be sucked off by pump 2 without difficulties. As soon as a constant feed flow is produced, valve 12 must be closed. By the conveyed paint the air present in filter 9 and line 10 is then expelled so that after a short time a faultless operation of the apparatus is assured.

When the air vent valve 12 is opened during the operation

of apparatus 1, the paint flows from lines 10 and filter 9 very rapidly via line 13 back into paint reservoir 3, in which process also an ejecting effect occurs. Filter 9 is flushed and in paint reservoir 3 the paint is churned so as to avoid clod formation. The provision of air vent valve 12 thus assures not only a rapid start of apparatus 1 but the operation thereof is further improved.

While there has been shown and described a particular embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and, therefore, it is aimed to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

1. In a spray coating apparatus where pressurization is accomplished by a diaphragm pump having its suction end in communication with a reservoir containing coating material, and a feed line connects the pressurized side of said pump with a spray gun, the improvement comprising an air vent valve in said feed line, said air vent valve including a pressure chamber, an apertured diaphragm at one end of said pressure chamber, a valve element axially movable in said pressure chamber and adapted to seat in said diaphragm aperture, a valve piston for actuating said valve element, means urging said valve piston and said valve element towards said diaphragm, and a branch-off line connecting said feed line with said pressure chamber at a point between said diaphragm and the face of said valve piston.

2. The apparatus of claim 1 wherein the air vent valve has a conduit terminating in said reservoir.

3. The apparatus of claim 1 wherein the air vent valve includes a stationary annular member and the axially movable valve element is cone shaped in the area which seats within the annular member.

4. The apparatus of claim 1 wherein a check valve is positioned between said diaphragm pump and said air vent valve.

5. The apparatus of claim 1 wherein means is provided to move said valve element including a lever, said lever is provided with a cam, said cam cooperates with a fixed surface and is rotatably mounted to operate means which thereby operates to adjust the valve element.

6. The apparatus of claim 5 wherein the piston is urged normally towards said annular member by resilient means.

* * * * *

50

55

60

65

70

75