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 [33] **Germany**
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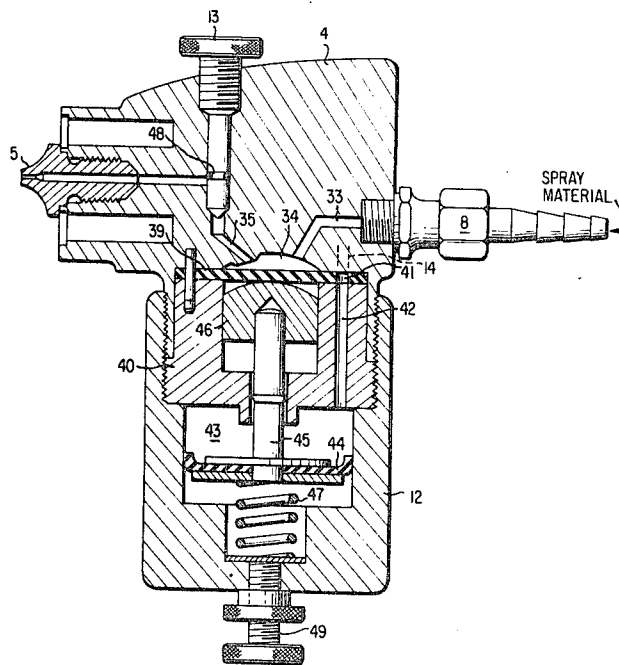
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[54] **SPRAYING DEVICE FOR PASTELIKE MATERIAL WITH SHUTOFF VALVE MEANS FOR THE MATERIAL**
8 Claims, 4 Drawing Figs.

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 239/296, 239/411, 239/412, 251/62
 [51] Int. Cl. B05b 7/32
 [50] Field of Search 239/337,
 407, 410, 411, 412, 413, 296; 251/61.1, 62, 331

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ABSTRACT: A spray device or gun utilizing compressed air as the carrier for the material to be sprayed, comprising a body having an air passage system connecting the air supply to the air nozzle, and a material passage system connecting the supply of the material to the material nozzle. A pressure-reducing valve is interposed in the air passage system to reduce the spraying air pressure. A shutoff valve is located in the material passage system to stop or permit flow of material. The shutoff valve is provided with pressure-responsive actuating means, the means being connected to the air passage system whereby when air pressure is present the shutoff valve is kept in its open position. The passages of the material passage system are so arranged that the shutoff valve first closes the passage leading from to the material nozzle means, and thereafter closes the passages leading from the material supply. This closure arrangement maintains the material nozzle and its passage clear from drippings upon air shut off.



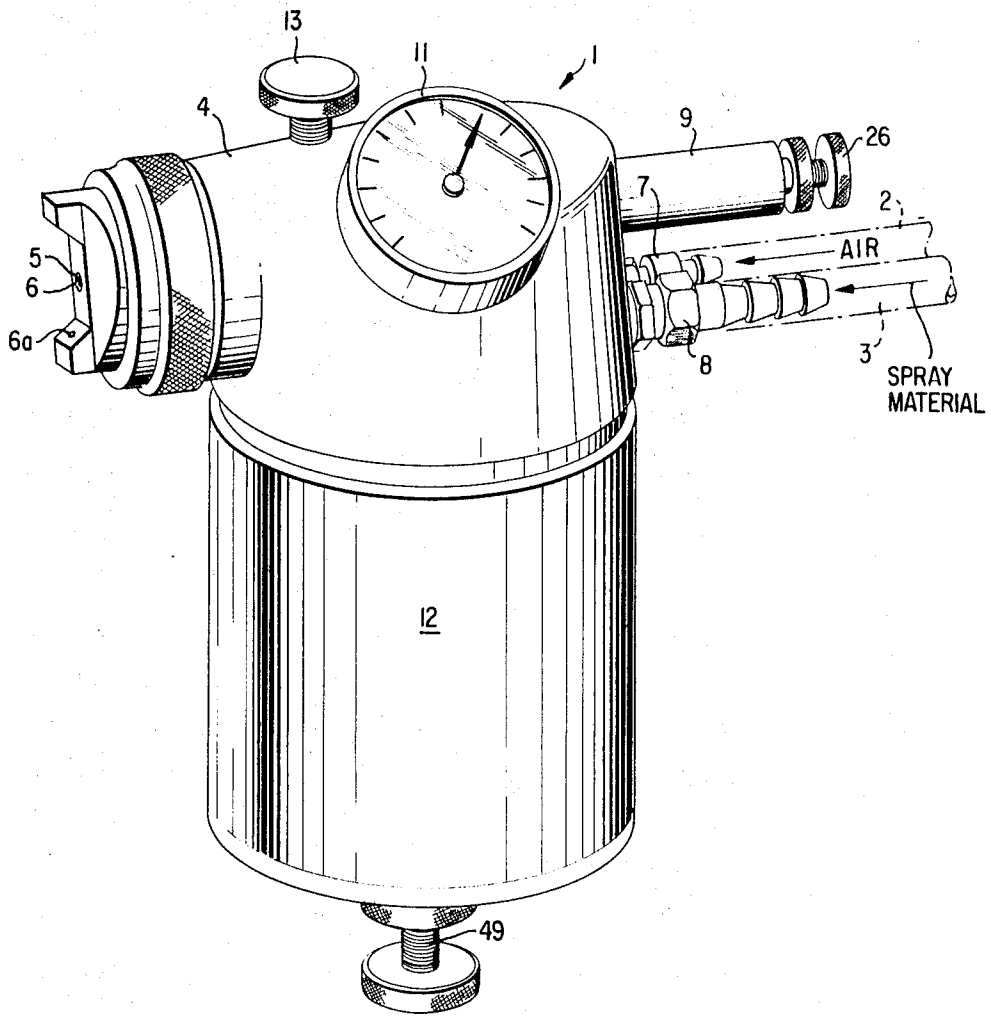


FIG. 1

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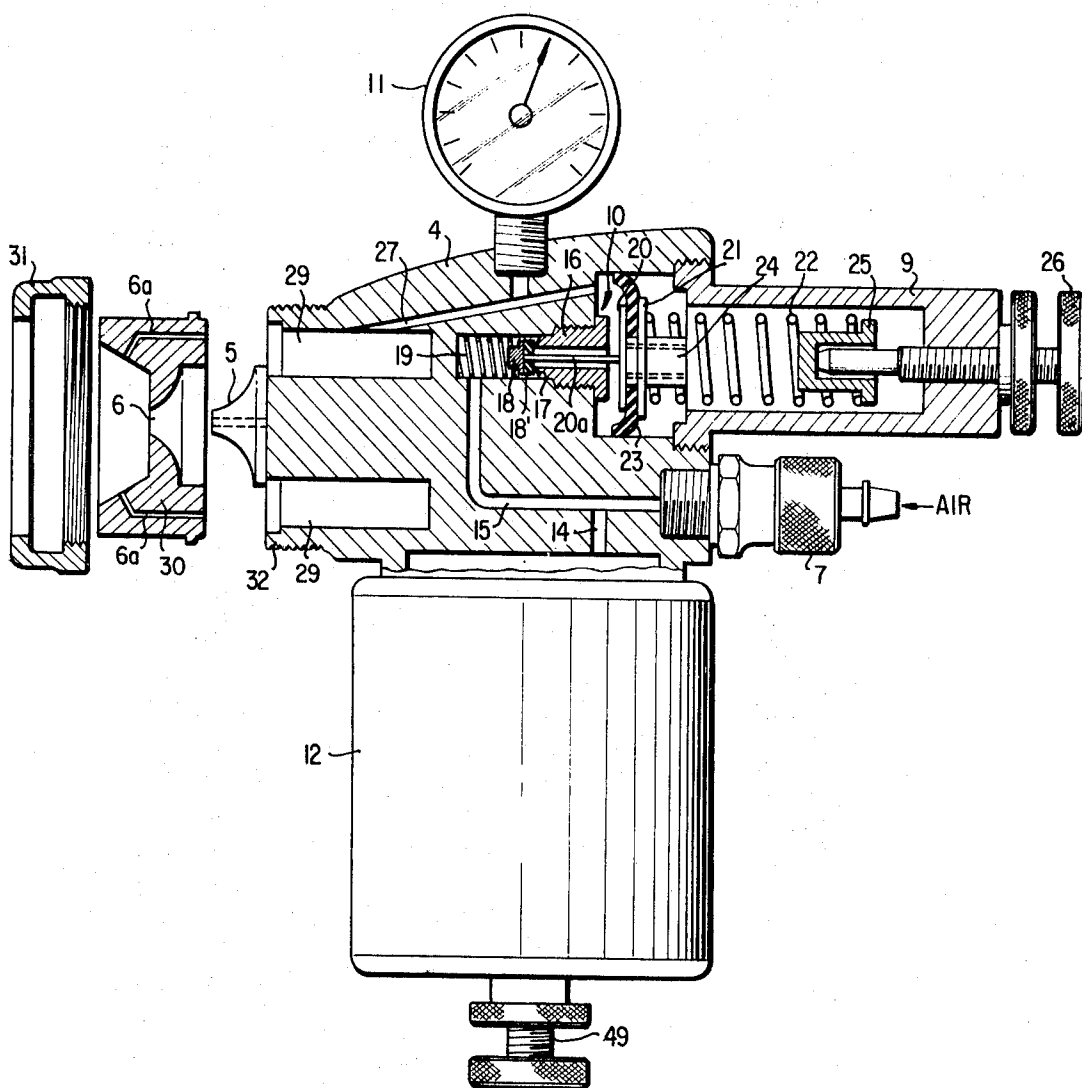


FIG. 2

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FIG. 3

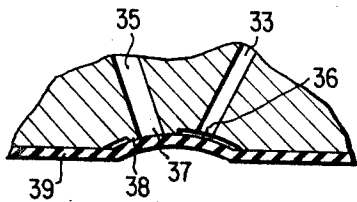
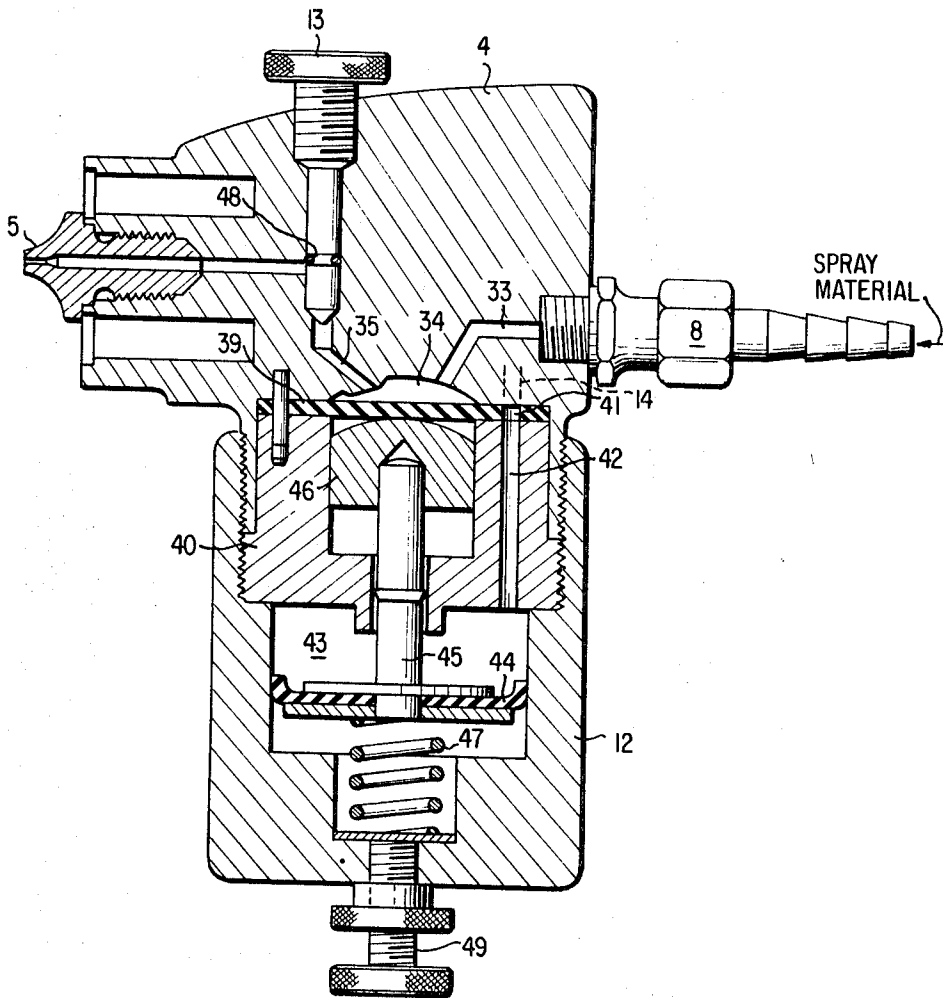


FIG. 4

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SPRAYING DEVICE FOR PASTELIKE MATERIAL WITH SHUTOFF VALVE MEANS FOR THE MATERIAL

This invention relates to sprayer devices wherein compressed air is used as a carrier for paste or slurry type material to be sprayed.

Prior art spray devices are usually equipped with three hoses, one for the compressed-air line, a second for the material to be sprayed, and a third for carrying air to the material shutoff valve. In addition, to the numerous hoses, there is a possibility that upon a bursting or shutoff of the spray air hose, the spray material would still continue to be squeezed out of the spray device as a spray or a dripping.

Another disadvantage of the prior art spray devices is that the air pressure reducing valve is located remotely from the spray head and is not very accessible for adjustment.

An object of this invention is to provide a spray device provided with a spray material shutoff valve in the body of the device and responsive to the pressure in the spray air passage system in the body, thereby eliminating one of the above-mentioned three hoses.

Another object is to provide a pressure-reducing valve located in the air passage system in the body of the device, with easily accessible pressure-adjusting means on the body.

A further object is to provide a sequence of passage closings by the shutoff valve so that all trapped spray material is expelled upon feed air shutoff or failure, whereby the nozzle means is kept free of material dripping.

A further object is to provide an air passage system having a large space capacity whereby a residual supply of air is stored after the flow of feed air is terminated. The air nozzle means is connected to the space whereby sufficient carrier air is supplied for the material remaining in the nozzle and its adjacent passage after the shutoff valve cuts off the flow of material.

Further objects and advantages will be apparent from the following description and accompanying drawings wherein:

FIG. 1 is a front perspective view of the spraying device;

FIG. 2 is a sectional and partly diagrammatic view of the air passage system;

FIG. 3 is a sectional and partly diagrammatic view of the spray material supply system; and

FIG. 4 is a detailed view of the shutoff valve in its closed position.

The spraying device or gun 1 has the usual compressed-air feedline 2 and the material to be sprayed feedline 3. While it is obvious that any material may be sprayed with the disclosed device, such as powdered material, paint, liquid plastic, etc., the device is especially adaptable to spray a material in the form of a paste, slurry or the like. One of the purposes of the device is to spray a pastelike material for grinding or lapping purposes in grinding machines. The term "spray material" will be used in the following specification and claims to cover any sprayable material.

Device 1 comprises a body 4 to which feed lines 2 and 3 are attached at one end, and to which the outlet nozzle means are attached at the opposite end. The nozzle means consists of a spray material nozzle 5, a spray air nozzle 6 having its orifice concentric with that of nozzle 5 and further having two additional air orifices 6a, laterally located with respect to the concentric orifices. Air feedline 2 and material feedline 3 are connected by conventional threaded fittings 7 and 8, respectively, to the passage systems within body 4. An adjusting means 9 for pressure-reducing valve 10 (FIG. 2) extends from one end of body 4. A pressure gauge 11 to indicate the reduced spray air pressure is mounted on body 4 in a position where it can be visually observed while, turning pressure-adjusting means 9. A casing depends from body 4 for housing a shutoff valve mechanism designated by character 12. A spray material flow regulating valve 13, in the form of a needle valve, has a knurled manipulating portion extending from top of body 4.

FIG. 2 is a sectional view, somewhat diagrammatic of body 4 to illustrate the air feed passage system and the pressure-reducing valve 10 incorporated therein. The compressed air is delivered to passage 15. A passage 14 leads from passage 15 to

passage means 41-42 (FIG. 4) to act upon the pressure-responsive means of shutoff valve means 12 to keep the valve in open position as long as air flows to the spraying device. Pressure-reducing valve 10 comprises a valve seat body 16 having a seat 17 which cooperates with movable valve head 18 seating thereon. Valve 18 has a clearance space '8' within the bore in which it slides, or some other communicating means may be provided whereby air may flow from passage 15 through the interior of valve seat 17, when valve head 18 is moved away from the seat. Valve head 18 is biased by light spring 19 towards seat 17. Valve 18 is biased away from the seat by adjustable spring 22 which acts on rod 20a through plates 20 and 21 and adapter piece 24. A diaphragm 23 is clamped between plates 20 and 21. The compressive force of spring 22 is adjustable by threaded means 25-26.

In operation, air flowing past open valve means 17-18 acts on diaphragm 23 to move it to the right. When the pressure of the air attains the desired reduced valve set by adjusting means 26, diaphragm 23 moves sufficiently to the right to throttle the flow of air through valve seat 17 to attain the desired pressure drop. The final position of valve head 18 is such that it throttles the airflow to reduce the pressure to the desired degree, which reduced pressure is indicated by pressure gauge 11.

The feed air under reduced pressure flows through passage 27 into an annular chamber or space 29. Chamber 29 is closed off by air nozzle 6 which is formed in a body 30 which fits into the end chamber 19. FIG. 2 shows the nozzle means in an exploded position. Nozzle 6 is held upon body 4 by a threaded ring 31 which engages threads 32 formed on body 4 around the open end of chamber 29.

The material to be sprayed, which may be in the form of a paste or the like, is fed into the material passage system by hose 3 connected to body 4 by fitting 8 which enter a passage 33 of the system. A formation 34 within body 4 connects passage 33 to material feed-in passage 35. As shown in greater detail in FIG. 4, passage 33 terminates at formation 34 in a grooved outlet part 36. The inlet port 37 of feed-in passage 35 has an annular raised lip surrounding it: the result is that parts 36 and 37 are not in the same plane, but port 37 extends farther into formation 34 than port 36.

Shutoff valve means 12 comprises a seal and closure diaphragm 39 and a plug member 40 whereby the casing containing valve means 12 is secured to body 4. The feed air reaches valve means 12 through passage 14 connected to feed passage 15 (FIG. 2) and passage means 41 and 42 connected to passage 14. Diaphragm 39 functions as the shutoff valve. It is actuated to its open position of FIG. 3, that is, the position wherein passages 33 and 35 are in communication, by air from passage 42 flowing into chamber 43 and acting on pressure-responsive means comprising cup piston 44 sealing the open end of the chamber 43. Piston 44 is connected to rod 45 which is in abutting relation with a domed member 46. Member 46 engages diaphragm 39. The air pressure on piston 44 permits diaphragm 39 to assume its unstressed position to thereby open communication between passages 33 and 35.

Upon a failure of feed air or a certain reduction thereof, a spring 47 which may be adjusted by means 49 urges piston 44, rod 45, and member 46 upwardly to thereby force diaphragm 39 into the position of FIG. 4 wherein ports 36 and 37 are closed. It should be noted that in its upward shutoff movement, diaphragm 39 first engages annular lip 38 thereby closing material feed-in port 37 before port 36. This sequence of port closing permits diaphragm 39 to immediately cut off port 37 and thereafter force any spray material in formation 34 into still open material supply passage 33. Although the air feed supply is cut off or vented from fitting 7 and passage 15, there is sufficient residual air in the passages and in space or chamber 29 to atomize and spray the residual material left within passage 35 and nozzle 5 after shutoff diaphragm closed port 37. Thus, the arrangement of nozzle means 5, 6 and 6a will cause the discharge of all the residual material, which operation results in clear and empty passage means and nozzle

orifices. This arrangement eliminates the usual drippings and leftover material in the nozzle and passage means of the prior art spraying devices.

The passage means 35 to nozzle 5 runs in straight lines, with no blind bores or angles wherein air cushions could form, which would exert pressure in the spray material to move it and cause dripping thereof at nozzle 5, when the feed air is cut off.

To regulate the flow of spray material, adjustable needle valve 13 is inserted in the passage means 35 (FIG. 3). A seal means, such as an O-ring 48, is provided on the stem of the needle to prevent leakage of air and material.

Spring 47 is adjusted by means of screw means 49 to vary the opening width or flow area adjacent port 37. By varying the extent of the shutoff stroke of diaphragm 39, the flow area can be varied to accomodate the consistency of the spray material. In case of highly fluid material, narrow opening width would be in order, that is, the distance between diaphragm 39 and lip 38 would be slight.

Although a certain preferred embodiment of the invention has been discovered for purposes of illustration, it will be evident that various changes and modifications may be made therein without departing from the scope and spirit of the invention.

What is claimed is:

1. A spraying device comprising a body, an air fitting secured to said body and adapted to be connected to a compressed air supply, a spray material fitting secured to said body and adapted to be connected to a spray material supply, an air discharge nozzle means, a spray material discharge nozzle means cooperating therewith first passage system interconnecting said air fitting and said air nozzle means, a pressure-reducing valve in said first passage system to reduce the pressure of the air flowing from the fitting to the air nozzle, a second passage system interconnecting said spray material fitting and the material nozzle, said second passage system comprising a formation into which a first material feed passage means enters and from which a second passage means

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leads to the spray material nozzle, the ports of said passage means entering said formation in different planes, a shutoff valve means in said second passage system movable to a closed position to prevent flow of material therethrough or to an open position, said shutoff valve having a closure member entering said formation to first close off the port of said second passage means and thereafter closing off the port of said first passage means, pressure-responsive means to actuate said shutoff valve means, and passage means connecting said first passage system to said pressure-responsive means to move said valve to said open position.

2. The spraying device as claimed in claim 1 wherein said closure member is a flexible diaphragm capable of assuming the shape of the formation.

3. The spraying device as claimed in claim 2 wherein the ports of the second passage means has a projecting lip encircling it, thereby causing the diaphragm to contact it before contacting the port of said first passage means.

4. The spraying device as claimed in claim 1 wherein said first passage system includes a relatively large space downstream of the pressure-reducing valve to which space the air nozzle means is connected.

5. The spraying device as claimed in claim 4 wherein said air nozzle means comprises a central air orifice concentric with and encompassing the orifice of the spray material nozzle, and additional air orifices lateral to said central orifice.

6. The spraying device as claimed in claim 1 wherein a flow-regulating valve is inserted in said second passage means before the material nozzle means.

7. The spraying device as claimed in claim 1 wherein said pressure-responsive means comprises adjustable spring means to bias the force of the feed air, and means connecting said spring means and said closure member to adjust the closing stroke of the closure member and thereby the flow area for the spray material.

8. The spraying device as claimed in claim 1 wherein the second passage means is formed by a series of straight passages with no blind bores therebetween.

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