Aug. 24, 1937. H. A. ROSELUND ET AL 2,091,055

FLOCK SPRAYING APPARATUS

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FIG. 1.

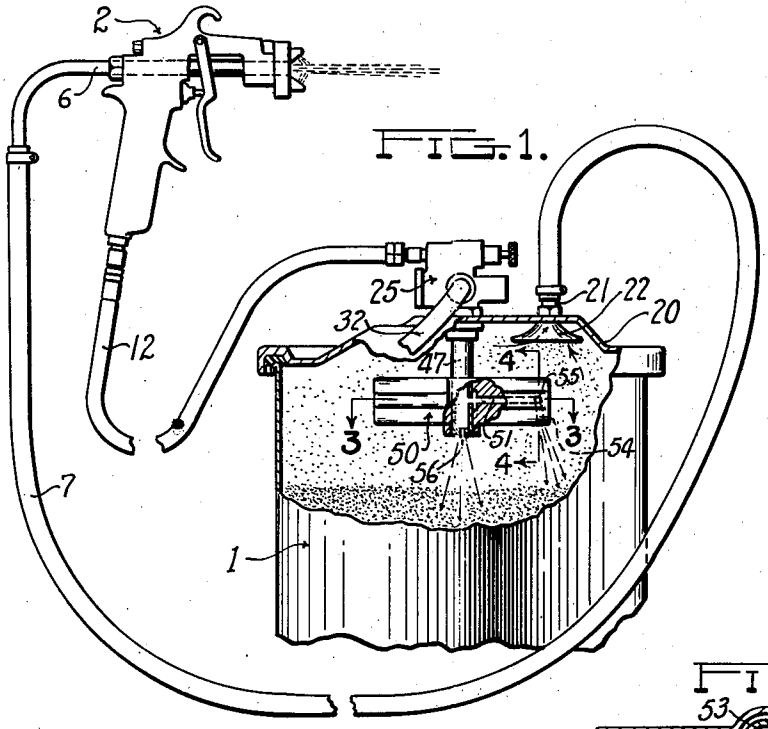


FIG. 4.

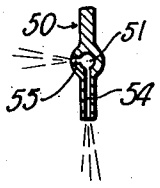


FIG. 3.

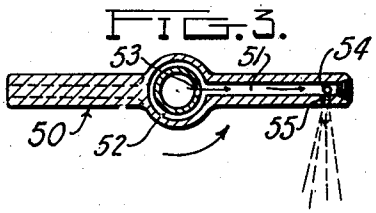
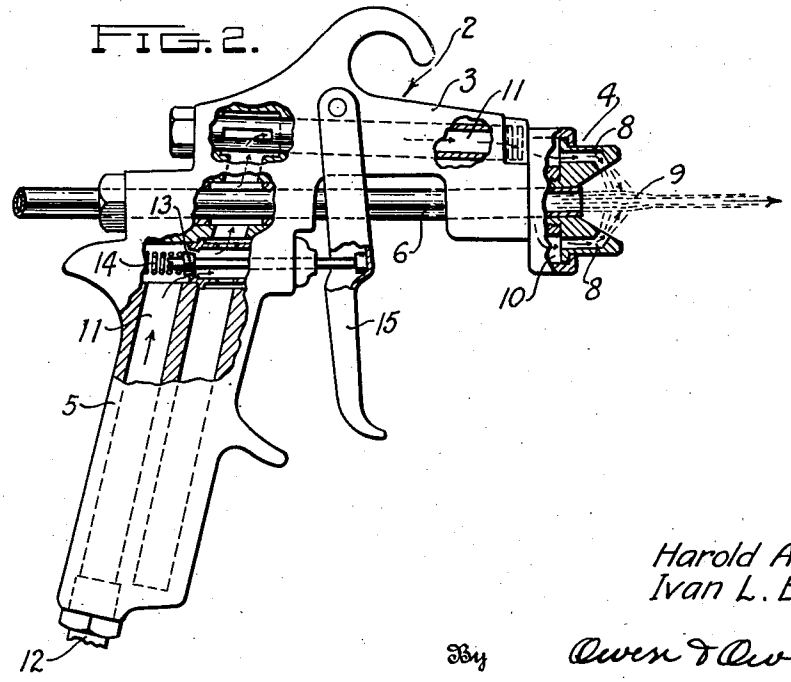


FIG. 2.



Inventors

Harold A. Roselund
Ivan L. Eastman

By Owen & Owen,

Attorneys

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FIG. 5.

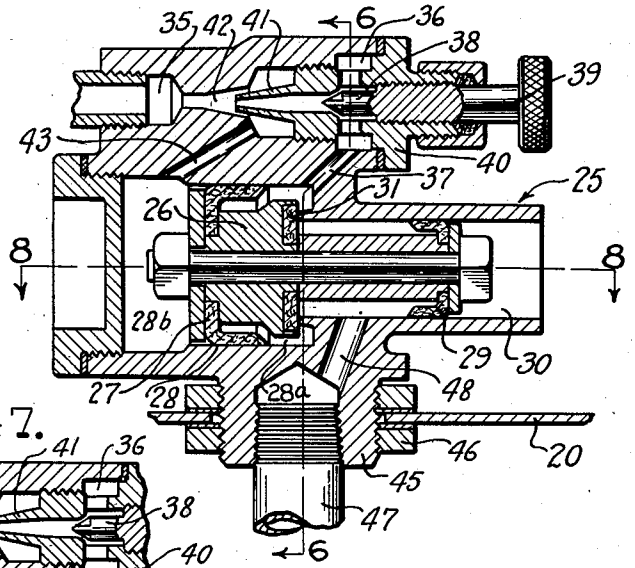


FIG. 7.

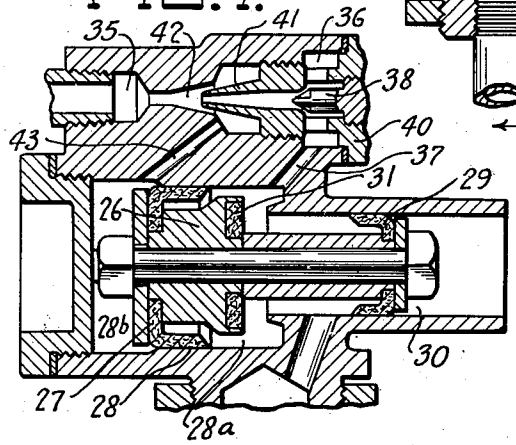


FIG. 6.

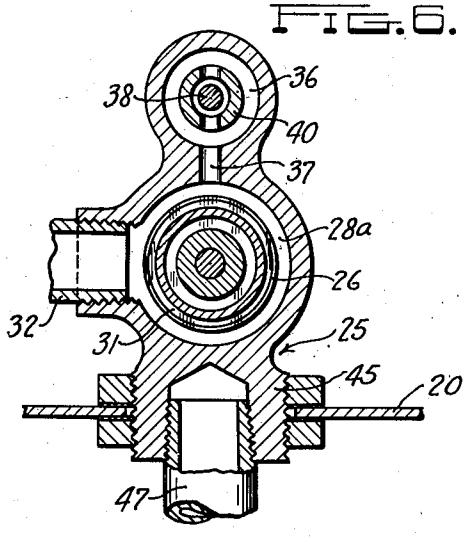
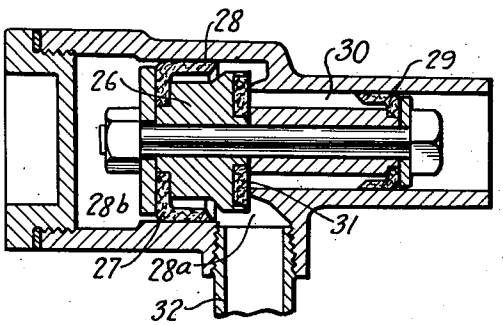


FIG. 8.



Inventors

Harold A. Roselund

Ivan L. Eastman

By Avery & Avery,

Attorneys

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2,091,055

FLOCK SPRAYING APPARATUS

Harold A. Roselund and Ivan L. Eastman, Toledo, Ohio, assignors to The De Vilbiss Company, Toledo, Ohio, a corporation of Ohio

Application February 25, 1936, Serial No. 65,619

10 Claims. (Cl. 91—8)

This invention relates to flock spraying apparatus, and more particularly to control means therefor.

An object of the invention is the provision of an apparatus of the class described, wherein the control valve for the actuating air pressure used in a flock spraying operation is separate from the spray applying gun and is indirectly controlled, in the present instance pneumatically, by the manipulation of a control at the gun.

Another object of the invention is the provision of a flock spraying apparatus in which the passage or line for the delivery of the flock stream is open throughout its length and not impaired by the presence therein of control valves or other obstructions.

Another object of the invention is the provision, in an apparatus of the class described, of simple and efficient means for agitating the body of fibrous material in its container.

Other objects and advantages of the invention will be apparent from the following detailed description, and from the accompanying drawings illustrating one embodiment of the apparatus, in which—

Figure 1 is an assembly view, with parts broken away, of an apparatus embodying the invention; Fig. 2 is an enlarged side elevation of a spray gun used in connection with the apparatus, and with parts broken away; Fig. 3 is an enlarged section on the line 3—3 in Fig. 1; Fig. 4 is a section on the line 4—4 in Fig. 3; Fig. 5 is an enlarged central vertical section of the air control means mounted on the container; Fig. 6 is a cross-section thereof on the line 6—6 in Fig. 5, with the main air valve closed; Fig. 7 is a fragmentary sectional view similar to Fig. 5, with the main air valve open, and Fig. 8 is a section on the line 8—8 in Fig. 5.

Referring to the drawings, 1 designates a closed container for the flock, or other light comminuted fibrous material to be sprayed, and 2 the gun by which the material is sprayed or applied to the receiving surface.

The gun 2, in the present instance, comprises a body or stock part 3 having a spray-head 4 at its forward end and a handle 5 at its rear end. A flock discharge tube 6 extends lengthwise through the body 3 with its discharge end terminating centrally within the spray-head and opening forwardly therefrom. The rear end of the tube 6 is preferably curved downwardly and connected to a flexible discharge tube 7. The only provision in the present instance for the discharge of air from the spray-head is through two diametrically opposed passages 8, which are disposed to direct their streams against opposite sides of the flock stream 9 discharging from the tube 6, so that the flock stream may be flattened to a greater or less extent as desired by the discharging of the air streams thereagainst.

The air passages 8, 8, have communication at their rear ends with a common supply passage 10 disposed annularly in the spray-head around the tube 6, and the passage 10 receives its supply of air under pressure through a longitudinally extending passage 11 in the gun body, which passage extends at its rear end down through the handle 5 where it may connect with a flexible air supply tube 12. The passage 11 in the handle is adapted to be closed by a valve 13 which is normally held seated by a coiled expansion spring 14. The stem of this valve extends forwardly from the handle and is engaged by a trigger member 15 which may be operated by the forefingers of a hand grasping the gun handle, as well understood in the art. It will be noted that the flock tube 6 of the gun and the discharge tube 7 are entirely open throughout their length, and that the passage therethrough is not impaired by the presence of valves, shoulders or irregularities in the tube.

The container 1 is provided, in the present instance, with a top closure or cover member 20, and the end of the tube 7 opposed to the spray-gun is in communication with the interior of the container through a nipple 21 on the cover. The nipple 21 is provided at its inner end with a flaring mouthpiece 22 to facilitate the passage of the light flock material thereto from the container.

Air under pressure is supplied to the interior of the container and to the gun supply tube 12 from a source of supply through a valve head 25 mounted in the present instance on the cover 20 of the container and containing the main air control valve 26.

The valve 26 includes a plunger 27 operating in a cylinder 28 in the valve head, and a plunger 29 of smaller diameter operating in a correspondingly smaller cylinder 30 in the valve head with its outer end open to the atmosphere. The plungers 27 and 29 are preferably of the cup washer type, with their cup portions opening toward each other, as shown in Figs. 5, 7 and 8. The valve 26 is of less diameter than the cylinder 28 and has the end thereof opposed to the plunger 27 formed with a gasket face 31 for seating against the inner end of the cylinder 28 in surrounding relation to the inner end wall

of the cylinder 30, so as to close the communication between the two cylinders when the valve is seated. The plunger 27 divides the cylinder 28 into inner and outer chambers 28a and 28b, respectively, with the inner one serving as a valve chamber.

Air under pressure is supplied to the valve chamber 28a at one side thereof through an air supply tube 32 leading from any suitable source of supply.

The air tube 12 leading to the gun handle has its supply end connected to the valve head 25 and in communication through a passage 35 with a supplemental air supply chamber 36 in the valve head, which chamber in turn has supply communication with the inner end portion of the valve chamber 28a through a passage 37. The communication between the chamber 36 and passage 35 is controlled in the present instance by a needle valve 38. The valve 38 is provided with a flat or bleed passage, so that it will not, when seated, entirely close the communication between the chamber 36 and passage 35. The valve 38, in the present instance, is provided at the inner end of a control stem 39, which is threaded into a plug member 40 and is packed against leakage of air therearound. The plug member 40 is threaded into and closes the outer end of the chamber 36 and forms an injector nozzle 41, which has its discharge through a restricted Venturi-like portion 42 of the passage 35. The passage portion 42 is enlarged at the rear of the discharge end of the nozzle 41, and such enlarged portion is in communication with the chamber 28b of the cylinder 28 at the outer side of the plunger 27 through a passage 43. The outer end portion of the cylinder 28 is preferably enlarged relative to the plunger, as shown. It is thus apparent that when air is being discharged from the injector nozzle 41 through the restricted passage 42, a suction action is set up through the passage 43, which tends to exhaust from the chamber 28b any air pressure which may be present therein.

The valve head 25 is mounted on the container cover 20 in any suitable manner, as for instance by providing the head on its bottom with a stud portion 45 adapted to be threaded into a flanged ring 46 forming an opening in the cover. Threaded into and projecting downwardly from the stud 45 and into the top portion of the container 1 is a tube 47 which has its upper end in communication with the cylinder 30 of the valve head at the inner side of the plunger 29 through a passage 48. In this manner, air under pressure is supplied to the tube from the chamber 28a when the valve 26 is open or unseated.

A cross-arm 50, forming an agitator, is rotatably mounted, in the present instance centrally of its ends, on the tube 47 within the upper portion of the container 1 and has one arm provided with a lengthwise extending passage 51 which is in constant communication with the interior of the tube 47 through an annular chamber 52 in the head portion of the arm and an orifice 53 in a side of the tube, as best shown in Figs. 1 and 3. The outer end of the passage 51 is provided with a restricted downwardly directed orifice 54, as well as a restricted side opening orifice 55. The discharge of air from the orifice 55 is substantially tangential to a circle concentric to the axis of rotation of the cross-arm, so that such discharge tends to impel rotation of the arm, as is apparent. Air discharging from the downwardly directed orifice 54 is directed down into the body of the flock contained in the container 1, thus tending to agitate and blow the light flock material up into the upper portion of the container where such agitation is further augmented and facilitated by the rotary action of the cross-arm 50. The agitating action of the flock within the container is also effected by the downward discharge of air pressure centrally into the flock body from a restricted orifice 56 in the lower end of the tube 47. It is apparent that the air discharged into the container 1 not only effects an agitation of the light flock material within the container, but causes such material to commingle with such air and to pass therewith from the container to the spray gun through the tube 7.

In the operation of the apparatus, it will be understood that air pressure from the main air supply line 32 is continually present in the valve chamber 28a, and from such chamber through the passage 37, supplemental chamber 36, passage 35 and tube 12 to the gun passage 11 leading to the discharge orifices 8, 8, of the spray-head. Also, that in order for there to be any discharge from the spray-head orifices, the valve 13 must be opened by a movement of the trigger 15, and that the volume of discharge of air to the gun, and consequently the pressure of such discharge, is regulated by an adjustment of the needle valve 38. If a round, or substantially round, spray stream of the flock material is desired, the valve 38 is closed, and if a flattened stream is desired, such valve is opened a suitable extent to obtain the desired flattening action of the spray stream by the impingement thereagainst of the opposed air streams from the spray-head orifices 8, 8. In order to effect the proper operation and control of the main air valve from the gun, it is necessary to have a slight flow of air at all times through the tube 8 and gun passage 11 when the control valve 13 is opened, and for this purpose a slight bleeding action of the air past the valve 38 when seated is provided. The discharge of air through the restricted portion 42 of the passage 35 leading to the gun tends to draw from the outer end portion 28b of the valve cylinder 28 any air pressure present therein. The valve chamber 28a is in constant communication with the air pressure supply through the tube 32, and when the control valve 13 in the gun is closed, the air pressure equalizes in the chambers 28a and 28b, at both sides of the plunger 27, due to the communication between such chambers through the passage 37, supplemental chamber 36, nozzle 41 and passage 43. When the control valve 13 is opened, the air discharge through the gun and the passages leading thereto tends to draw the air from the chamber 28b, thus permitting the air pressure on the valve side of the plunger 27 to force the valve 26 to the left from the closed position shown in Fig. 5 to the open position shown in Fig. 7. Upon an opening of the valve 26, air pressure passes to the interior of the container 1 through the inner end portion of the cylinder 30, passage 48 and tube 47, the discharge from the tube into the container being from the orifice 56 at the lower end of the tube and also from the orifices 54 and 55 in the outer end portion of one arm of the cross-arm 50. This discharge causes an agitation of the light flock material in the upper portion of the container, which agitation is facilitated by the rotating action of the cross-arm and of the downwardly directed discharge orifice 54 therein. The flock laden air is discharged from the con-

tainer through the flaring mouthpiece 22, tube 7 and gun tube 6.

It is apparent that the main valve 26 remains open so long as the control valve 13 is held open and that, upon a closing of the valve 13, the air pressure again equalizes on both sides of the plunger 27 within the chambers 28a and 28b, thus permitting the air line pressure against the inner side of the plunger 29 to effect a closing of the main valve. It is thus apparent that the main valve has a floating action within its chamber and that the valve is pneumatically controlled to open and close the communication between the air pressure supply line and the interior of the container in accordance with an opening or closing of the control valve at the gun.

It is also apparent that the air pressure supply line at the supply side of the valve 26 is in constant communication both with the valve controlled outlet passage for the air through the gun and with the chamber 28b of the cylinder 28 at the outer side of the plunger 27.

It is further apparent that the flock stream discharge line from the container and through the gun is open at all times and free of any sharp curves, angles, shoulders or restrictions which might interfere with the free discharge of material from the container and which might have a tendency to cause the material to accumulate in the discharge line and thereby necessitate frequent cleaning out.

We wish it understood that our invention is not limited to any specific form, construction or arrangement of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described our invention, what we claim as new, and desire to secure by United States Letters Patent, is:

1. In an apparatus of the class described, a closed container for the material to be sprayed, a spray gun having a material discharge passage in communication with the upper interior part of the container, means forming an air pressure supply passage having communication with the upper interior part of the container whereby air discharged into the container will agitate the material therein and will pass therefrom with the material through said first passage and also forming a branch from said supply passage with a controlled discharge, a valve operable to open and close said supply passage to the container, and pneumatic means cooperating with the air pressure in said supply passage and branch to control the opening and closing movements of said valve by predetermined changes in the discharge condition of said branch.

2. In an apparatus of the class described, a closed container for fine fibrous material to be sprayed, means forming an air pressure supply passage to the upper interior portion of the container and having a branch outlet, control means for said outlet, a valve operable to open and close said passage, means forming a material and air discharge passage from said container, and pneumatic means cooperating with the air pressure in said supply passage and branch to control the opening and closing movements of said valve by predetermined changes in the discharge condition of said branch outlet.

3. In an apparatus of the class described, a closed container for fine fibrous material to be sprayed, means forming an air pressure supply passage to the upper interior part of the container and having a separate outlet, a valve operable to open and close said passage, means forming an air and material discharge passage from the upper part of the container, and pneumatically operated means for opening and closing said valve, and control means for said last means remote from said valve and associated with said outlet.

4. In an apparatus of the class described, a closed container for a fine material to be sprayed, means forming a discharge passage from the upper part of the container, means forming an air pressure supply passage to the upper interior part of the container and having a branch, a valve floatingly movable to open and close the supply passage, and manually controlled means utilizing a part at least of the air pressure in said branch to impart opening or closing movements to the valve.

5. In an apparatus of the class described, a container for a fine material, said container having an open discharge passage from its top portion, means forming an air pressure supply passage to the upper interior part of the container, and a branch passage from said supply passage, a control valve for opening and closing said branch passage, a main valve in said supply passage operable to open and close the supply passage to the container, and means associated with said main valve and pneumatically operable to move said main valve to open position when said control valve is open and vice versa.

6. In an apparatus of the class described, a container for a flock like material to be sprayed, means forming an open discharge passage for the material from the container, means forming an air supply passage in communication with the upper interior part of the container, a valve chamber in said passage and an outlet branch passage having communication with said main passage and with an end portion of said chamber, a valve movable in said chamber to open and close said main passage to the container, a control valve in said branch passage, and means associated with said main valve and pneumatically operable to move the main valve to open position when said control valve is open and vice versa.

7. In an apparatus of the class described, a container for a flock like material to be sprayed, means forming an open air and material discharge passage from the upper part of the container, means forming an air pressure supply passage to the upper interior part of the container, a stepped valve chamber intersecting said passage, and a branch discharge passage from the supply passage, a control valve in said branch passage, and valve means floatingly movable in said chamber and pneumatically operable by pressure from said branch and supply passage to close said supply passage to the container when said control valve is closed and to open said supply passage to the container when the control valve is open, said valve means having spaced plunger parts operable in different stepped portions of said chamber, both plunger parts being exposed at their inner sides to pressure in said supply passage and one plunger part being exposed at its opposite side to pressure from said branch passage.

8. In an apparatus of the class described, a container for a flock like material to be sprayed, a spray gun having an open material discharge passage in communication with the upper interior part of the container and having an air discharge passage, means forming an air pressure supply passage to the upper interior part of said

container, a valve chamber in intersecting relation to said supply passage and a branch passage leading from said supply passage to the air discharge passage of said gun, a control valve at the gun for opening and closing said air discharge passage, a main valve movable in said chamber to open and close the air supply passage to the container without interrupting the constant supply of air pressure to said branch passage, said branch passage having communication with the valve chamber at the outer side of the valve, and means cooperating with the valve and pneumatically operable by air pressure from said supply and branch passages to close said main valve when the control valve is closed and vice versa.

9. In an apparatus of the class described, a container for a flock like material to be sprayed, a spray gun having an open material discharge passage in communication with the upper interior part of the container and having an air discharge passage, means forming an air pressure supply passage to the upper interior part of said container, a valve chamber in intersecting relation to said supply passage and a branch passage leading from said supply passage to the air discharge passage of said gun, a control valve at the gun for opening and closing said air discharge passage, a main valve movable in said chamber to open and close the air supply passage to the container without interrupting the constant supply of air pressure to said branch passage, said branch passage having communication with the valve chamber at the outer side of the valve, and means cooperating with the valve and pneumatically operable by air pressure from said supply and branch passages to close said main valve when the control valve is closed and vice versa, said branch passage having a valve controlled injector jet therein to withdraw air pressure from the end of the valve chamber with which it communicates when the control valve is open.

10. In an apparatus of the class described, a container for fine material to be sprayed, a spray gun having an air discharge passage and a material discharge passage, the latter in open communication with the upper interior part of the container, means forming an air pressure supply passage in communication with the upper interior part of the container and having a branch in communication with said gun air passage, a main valve in said supply passage to open and close its communication with the container, a control valve in said branch passage, a valve controlled injector jet in said branch, and means cooperating with air pressure in both said supply and branch passages to pneumatically move said main valve to open position when the control valve is open and vice versa.

HAROLD A. ROSELUND.
IVAN L. EASTMAN.