July 26, 1938. W. B. THOMPSON 2,125,251

POWDER BLOWER

Filed Feb. 24, 1934

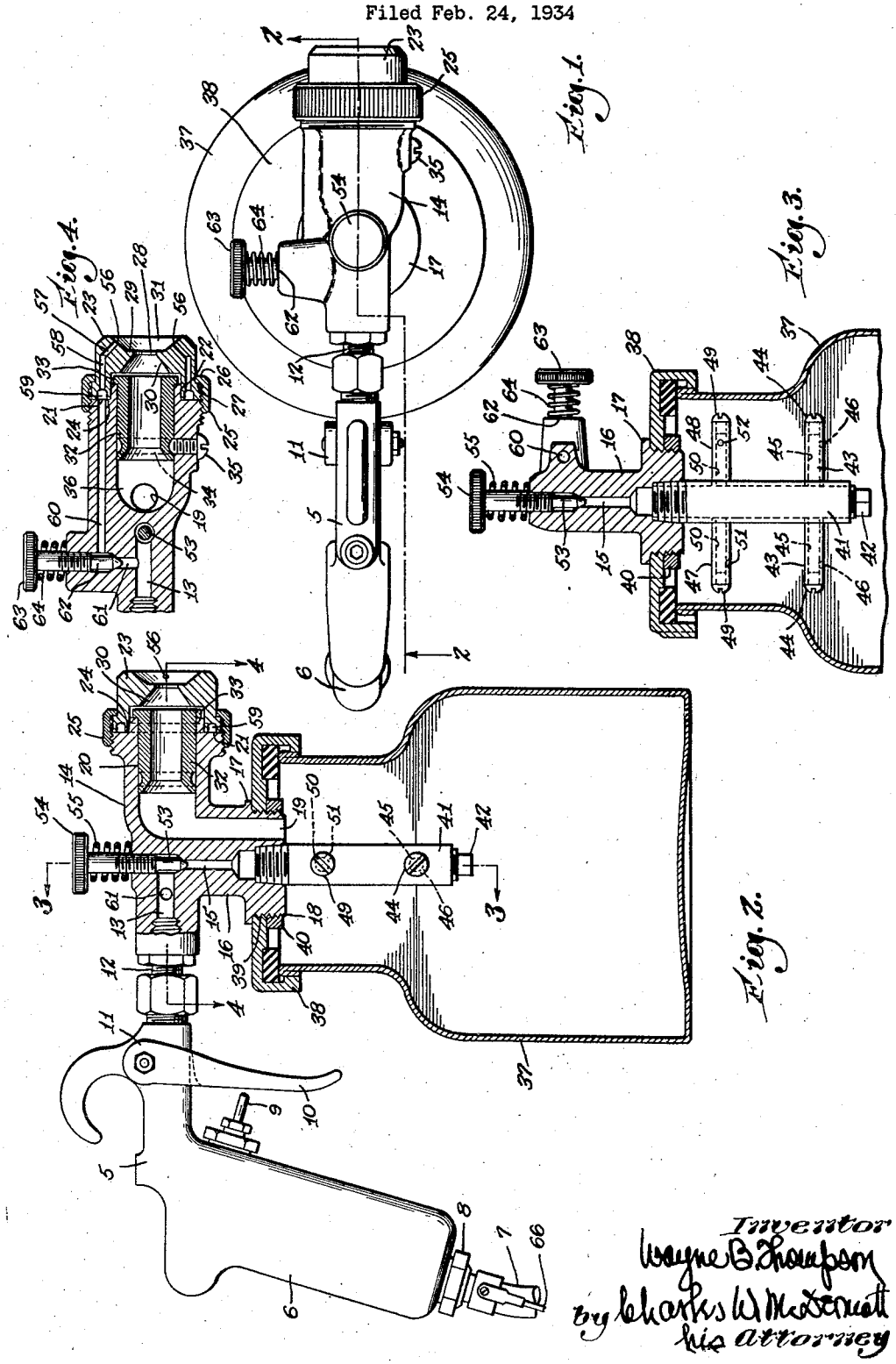


Fig. 1.

Fig. 3.

Fig. 4.

Fig. 2.

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Patented July 26, 1938 2,125,251

UNITED STATES PATENT OFFICE

2,125,251

POWDER BLOWER

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Application February 24, 1934, Serial No. 712,721

8 Claims. (Cl. 91—8)

The present invention relates to tools or apparatus for applying material such as powder or flock.

It has been proposed heretofore to discharge material such as powder or flock from a tool or apparatus in such a manner as to form a circular target on the surface to which the material is applied.

The principal object of the present invention is to produce a tool or apparatus for applying material such as powder or flock whereby a circular, an elliptical, or any target shape intermediate therebetween, may be formed by the material on the surface to which it is applied.

To the accomplishment of this object, and such others as may appear hereinafter, the features of the present invention relate to certain devices, combinations and arrangement of parts hereinafter described and then set forth in the appended claims.

The various features of the present invention will be understood readily from an inspection of the accompanying drawing, in which,

Figure 1 is a view in plan;

Fig. 2 is a view in sectional elevation on the line 2—2, Fig. 1;

Fig. 3 is a detail view in sectional elevation on the line 3—3, Fig. 2, and

Fig. 4 is a detail view in sectional elevation on the line 4—4, Fig. 2.

Referring to the drawing, the apparatus or tool for applying powder or flock is preferably provided with a metallic body 5 (Figs. 1 and 2) which has integral therewith a handle or grip 6. The motive agent, which may be air under pressure, is preferably introduced into the body portion 5 through the grip 6 which is connected to an air hose 7 through a hose coupling 8. The passage of the air through the body portion 5 is controlled by a normally closed main air valve (not shown) the stem 9 of which is arranged to be engaged by a trigger 10, at the will of the operative, to depress the stem 9 and thus open the main air valve. The upper end of the trigger 10 is provided with a yoke 11 which embraces the body portion 5 to which the yoke is secured in a pivotal manner.

The front end of the body portion 5 is coupled to one end of a short piece of pipe 12 the other end of which is fitted into an axial passage 13 formed in a distributor 14. The axial passage 13 communicates with a passage 15 formed vertically through the body portion of the distributor and a neck-like extension 16 thereof. Adjacent its lower end the neck 16 is provided with a peripheral flange 17. Below the flange the neck 16 is cylindrical, its surface being provided with external threads 18.

The lower end of the passage 15, which is enlarged, terminates centrally of the bottom of the neck 16. Adjacent the passage 15, the neck 16 is provided with a vertical passage 19 which extends from the bottom of the neck 16 to a central blind opening 20, formed in the body portion of the distributor 14 and terminating on its front face.

The front face of the distributor is provided with a transverse annular seat 21 (Figs. 2 and 4) and a forwardly extending cylindrical seat 22. Rotatably positioned on the cylindrical seat 22 is a nozzle 23 the rear end face 24 of which engages the transverse seat 21 flatwise. The nozzle 23 is coupled to the distributor 14 by an internally threaded ring 25 threaded on the distributor and provided with an inturned flange 26 arranged to engage a peripheral shoulder 27 formed on the nozzle 23.

The nozzle 23 is provided with a central discharge orifice 28 formed in the common base 29 of an internal frusto-conical passage 30 and an external frusto-conical recess 31. The frusto-conical internal passage 30 and the frusto-conical external recess 31 are reversely arranged so that the common base 29 is the smaller base of each of the frusto-conical surfaces.

The front end portion of the opening 20 is lined with a hollow tube 32 one end of which is provided with a flange 33 engaged with the front end face of the cylindrical seat 22. The tube 32 is provided with a peripheral groove 34 which is engaged by the rounded end of a screw 35 serving to hold the tube in place but rendering it readily removable. The entrance to the reduced cylindrical interior of the tube 32 is frusto-conical, the larger base being adjacent a mixing chamber 36 comprising the space in the opening 20 not lined with the tube 32, and the smaller base merging with the rear end of the cylindrical interior of the tube.

In the illustrated embodiment of the invention the powder or flock is placed in a container 37 which may be detachably connected to a closure 38 by the same means disclosed in the patent granted to Preble and Thompson, No. 1,819,117, August 18, 1931. The closure 38 is provided with a central, internally threaded opening 39 which receives the threads 18 on the neck 16. The closure 38 is clamped in engagement with the flange 17 by a brass nut 40 threaded on the neck 16 and engaged with the under surface of the

closure. Into the enlarged lower end of the passage 15 is threaded the frusto-conical upper end of a hollow pipe 41 depending into the container 37. The lower end of the pipe 41 is closed by a plug 42.

In order to discharge air under pressure into the container to stir or disperse the mass of powder or flock therein, to separate a portion of the moving mass into floating particles and cause them to enter the passage 19 by the entraining action of the air seeking an outlet from the container through the passage 19, the pipe 41, above the surface of the powder or flock in the container, is provided with two diametrically opposite tubes 43 (Figs. 2 and 3) radiating laterally therefrom. The outer end of each tube 43 is closed by a screw 44 (best shown in Fig. 3) thus forming a blind passage 45 into which air from the pipe 41 flows. The air in each passage 45 discharges against the surface of the powder or flock through an orifice 46 formed in each tube to the left (Fig. 2) and downwardly on an angle of 45 degrees relative to the vertical plane passing through the common center line of the tubes 43. The orifices 46 are formed in the tubes 43 on the sides thereof which face away from the entrance to the passage 19.

Some of the powder or flock swirls into the upper part of the container 37 adjacent the entrance to the passage 19 at which point the swirling material encounters the material laden air seeking an outlet therethrough. The material thus concentrated at the entrance to the passage 19 tends to felter and form a mat with the result that the material remains in the container and air only escapes therefrom. In order to agitate the mass of material concentrated at the entrance to the passage 19 to prevent its feltering, to break it up into floating particles, and to add air to the entrained material so that in addition to its being thoroughly broken up and intensified there will be sufficient velocity to carry the material to the point of use, the pipe 41 is provided with two upper diametrically opposite tubes 47 and 48 (Fig. 3) radiating laterally therefrom. The outer end of each of the upper tubes is closed by a screw 49 thus forming a blind passage 50 into which air from the pipe 41 flows. The air which enters the blind passage 50 of the tube 47 discharges into the container 37 through an orifice 51. The air which enters the blind passage 50 of the tube 48 discharges into the container 37 through an orifice 52. The orifices 51 and 52 are formed in the tubes 47 and 48, respectively, on the sides thereof which face the entrance to the passage 19. The orifice 51 is arranged to discharge the air laterally and downward on an angle of 45 degrees relative to the vertical plane passing through the common center line of the tubes 47 and 48, while the orifice 52 is arranged to discharge the air horizontally on the opposite side of the pipe 41.

The air discharged from the orifices 51 and 52 acts on the mass of swirling material adjacent the entrance to the passage 19 in a direction opposed to that of the initial material motivating air discharged through the orifices 46. With this construction and mode of operation the mass of material, concentrated at the entrance to the passage 19, and which had been previously agitated by the air discharged into the container through the orifices 46, is re-agitated by the air discharged into the container through the orifices 51 and 52. This re-agitation of the mass of material prevents it from forming a mat of feltered material at the entrance to the passage 19, and separates it into particles which commingle with the re-agitating air. The commingled particles are discharged from the container by the entraining action of the re-agitating air escaping from the container through the passage 19. The orifices 51 and 52 constitute an intensifier to intensify the density of the material laden air escaping from the container and impart velocity thereto.

The material which enters the passage 19 by the entraining action of the air current exhausting from the container 37 is delivered into the mixing chamber 36 where the material and the air have an opportunity to expand and then form into an axial line of flow through the frusto-conical entrance into the reduced cylindrical passage in the tube 32. When this material laden air leaves the tube 32 it is again directed axially by the internal frusto-conical passage 30 of the nozzle 23 to the discharge orifice 26. This construction provides for the discharge of the material centrally of the discharge orifice 26.

The tube 32 is made as a separate piece in order to enable the length of the mixing chamber 36 to be varied, to obtain a smooth frusto-conical surface between the mixing chamber and the cylindrical passage in the tube 32, and to enable the diameter of the cylindrical passage in the tube 32 to be varied, all of which may be accomplished to meet varying conditions of use by substituting different tubes for the particular tube 32 shown.

The volume of air discharged through the orifices 46, 51 and 52 is controlled by a spindle 53 (Figs. 2 and 3) the point of which has a valve seat engagement with the wall of the vertical passage 15 just below its point of junction with the passage 13. The spindle 53 is threaded into the enlarged upper end of the passage 15 and is provided with a milled head 54 to facilitate its adjustment. Coiled about the spindle 53 and interposed between the distributor 14 and the head 54 is a coiled spring 55 acting to hold the spindle 53 in any desired position of adjustment.

In order that the material discharged axially of the discharge orifice 26 may be flattened, the walls of the frusto-conical recess 31 are provided with a pair of diametrically opposite jet orifices 56 through which air is discharged supplementally upon the main discharge. Each orifice 56 (Fig. 4) is formed in the front end of a passage 57 which communicates through a passage 58 with an annular groove 59 formed in the rear end face of the nozzle 23. Communicating with the groove 59 is a supplemental motive agent passage 60 (Figs. 3 and 4) formed in the distributor 14. The passage 60 communicates with the axial passage 13 through a lateral passage 61 (Figs. 2 and 4).

The volume of air discharged through the orifices 56 is controlled by a spindle 62 (Figs. 3 and 4) the point of which has a valve seat engagement with the wall of the lateral passage 61 in advance of its point of junction with the passage 60. The spindle 62 is threaded into the distributor 14 and is provided with a milled head 63 to facilitate its adjustment. Coiled about the spindle 62 and interposed between the distributor and the head 63 is a spring 64 acting to hold the spindle 63 in any desired position of adjustment.

In the operation, the volume of the material discharged and the velocity of the entraining air are controlled by the spindle 53. The shape of the discharged material is controlled by the spindle 62. When the spindle 62 is engaged with its valve seat the target formed by the discharged material is circular. By manipulating the spindle

62 the shape of the target formed by the discharged material may be varied from a circle to an ellipse. As shown in Fig. 4 the orifices 56 are arranged horizontally, thus providing for the flattening of the discharged material into a vertically arranged fan. By loosening the ring 25 the nozzle 23 may be angularly adjusted to obtain the fan in any desired plane.

By providing for the discharge of the material centrally of the orifice 28 the formation of a uniform, rather than a lopsided, fan is insured when the central discharge is hit by the air issuing from the orifices 56. The supplemental air jets discharged through the orifices 56, in addition to producing a fan shape in the discharged material, provide additional air for breaking up the discharged material and help to control the velocity at which the discharged material is driven upon a coated surface.

In the event the orifices 46, 51 and 52 become clogged they may be readily cleaned by removing the screws 44 and 49 and pulling the trigger 10.

In order to prevent the accumulation of static electricity in the container tending to retard the proper breaking up of the material therein and its atomization, the apparatus may be grounded by a wire 66, (Fig. 2).

What is claimed as new, is:

1. A tool or apparatus for applying material such as powder or flock having, in combination, a container for the material, a closure for the container having an inlet and an outlet therein, a nozzle connected to the outlet, means for introducing air under pressure into the container including a vertical pipe connected to the inlet and provided with a closed end, a plurality of lower arms adjacent thereto, and a plurality of upper arms interposed between the inlet and the lower arms, each lower arm having an orifice, formed in the side thereof which faces away from the outlet, for discharging air into the body of the material in a lateral and downward direction, each upper arm having an orifice formed in the side thereof which faces the outlet, one of said upper arm orifices discharging air horizontally and another one of said upper arm orifices discharging air laterally and downwardly.

2. In a tool or apparatus for applying material such as powder or flock, the combination with a body portion having an opening therein provided with a rear wall, and a nozzle secured to the body portion having an internal frusto-conical passage, an external frusto-conical recess, said passage and said recess having a common base, and a central discharge orifice in the common base, said opening and said orifice having a common axis, of a lining removably mounted within a portion of said opening so as to be spaced from the rear wall thereof, said lining having a central cylindrical passage extending partially therethrough and a frusto-conical passage, the smaller base of which merges with the rear end of the cylindrical passage, interposed between the portion of the opening unfilled by the lining and the central cylindrical passage therein, the cylindrical and frusto-conical passages of the lining being in communication with the discharge orifice and the unfilled portion of the opening, respectively, and the diameter of the cylindrical passage at least at its discharge end being greater than that of the discharge orifice, said cylindrical passage by reason of said diametric difference providing a deliveryway for at least a portion of the material into impingement with the nozzle adjacent its discharge orifice.

3. A tool or apparatus for applying material such as powder or flock having, in combination, a body having a positioning means upon its front end face, and having a material entraining air passage and an independent air passage, a nozzle, having a central main discharge orifice in communication with the material entraining air passage, engaged directly with said positioning means, means for supplementally discharging air upon the main discharge to flatten or spread the same including a supplemental jet delivery means on the nozzle and angularly adjustable with said nozzle throughout a full circle in a single plane upon said positioning means and having passages remaining in communication with the independent air passage in any desired position of adjustment, and means independent of said positioning means for holding the nozzle engaged therewith.

4. A tool or apparatus for applying material such as powder or flock having, in combination, a container for the flock, a main compressed air line, a body secured to the container and provided with a branch compressed air line for delivering air under pressure from the main air line into the container, a nozzle secured to the body and provided with an internal frusto-conical passage and an external frusto-conical recess, said passage and said recess having a common base and there being a discharge orifice in the common base, a passage, formed in the body, one end of which communicates with the interior of the container and the other end of which forms a mixing chamber communicating with the internal frusto-conical passage of the nozzle, said body passage permitting the escape from the container by way of the nozzle of at least a portion of the air introduced into the container and the withdrawal of the material from the container and its discharge through the nozzle by the entraining action of the escaping air, a second branch air line formed in the body and connected to the main air line, and means connected to the second branch air line for discharging air therefrom under pressure upon the material discharged from the nozzle.

5. A tool or apparatus for applying material such as powder or flock having, in combination, a container for the flock, a main compressed air line, a body secured to the container and provided with a branch compressed air line for delivering air under pressure from the main air line into the container, a nozzle secured to the body and provided with an internal frusto-conical passage and an external frusto-conical recess, said passage and said recess having a common base and there being a discharge orifice in the common base, a passage, formed in the body, one end of which communicates with the interior of the container and the other end of which forms a mixing chamber communicating with the internal frusto-conical passage of the nozzle, said body passage permitting the escape from the container by way of the nozzle of at least a portion of the air introduced into the container and the withdrawal of the material from the container and its discharge through the nozzle by the entraining action of the escaping air, a second branch air line formed in the body and connected to the main air line, and outlets for the second branch air line disposed on the frusto-conical recess of the nozzle for discharging air under pressure upon the material discharged from the nozzle.

6. A tool or apparatus for applying material such as powder or flock having, in combination,

a container for the flock, a main compressed air line, a body secured to the container and provided with a branch compressed air line for delivering air under pressure from the main air line into the container, a nozzle secured to the body and provided with an internal frusto-conical passage and an external frusto-conical recess, said passage and said recess having a common base and there being a discharge orifice in the common base, a passage, formed in the body, one end of which communicates with the interior of the container and the other end of which forms a mixing chamber communicating with the internal frusto-conical passage of the nozzle, said body passage permitting the escape from the container by way of the nozzle of at least a portion of the air introduced into the container and the withdrawal of the material from the container and its discharge through the nozzle by the entraining action of the escaping air, a second branch air line formed in the body and connected to the main air line, and means connected to the second branch air line for discharging air therefrom under pressure upon the material discharged from the nozzle, the main and each branch air line having an independent valve.

7. In a tool or apparatus for applying material such as powder or flock, the combination with a body portion having an opening therein provided with a rear wall, and a nozzle secured to the body portion having an internal frusto-conical passage, an external frusto-conical recess, said passage and said recess having a common base, and a central discharge orifice in the common base, said opening and said orifice having a common axis, of a lining removably mounted within a portion of said opening so as to be spaced from the rear wall thereof, said lining having a central cylindrical passage extending partially therethrough and a frusto-conical passage, the smaller base of which merges with the rear end of the cylindrical passage, interposed between the portion of the opening unfilled by the lining and the central cylindrical passage therein, the cylindrical and frusto-conical passages of the lining being in communication with the discharge orifice and the unfilled portion of the opening, respectively.

8. In a tool or apparatus for applying material such as powder or flock, the combination with a body portion having an opening therein provided with a rear wall, and a nozzle secured to the body portion having an internal frusto-conical passage the smaller base of which extends away from the rear wall and is provided with a discharge orifice, said opening and said discharge orifice having a common axis, of a lining removably mounted within a portion of said opening so as to be spaced from the rear wall thereof, said lining having a cylindrical passage extending partially therethrough and a frusto-conical passage, the smaller base of which merges with the rear end of the cylindrical passage, interposed between the portion of the opening unfilled by the lining and the cylindrical passage therein, the cylindrical and frusto-conical passages of the lining being in communication with the discharge orifice and the unfilled portion of the opening, respectively.

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