

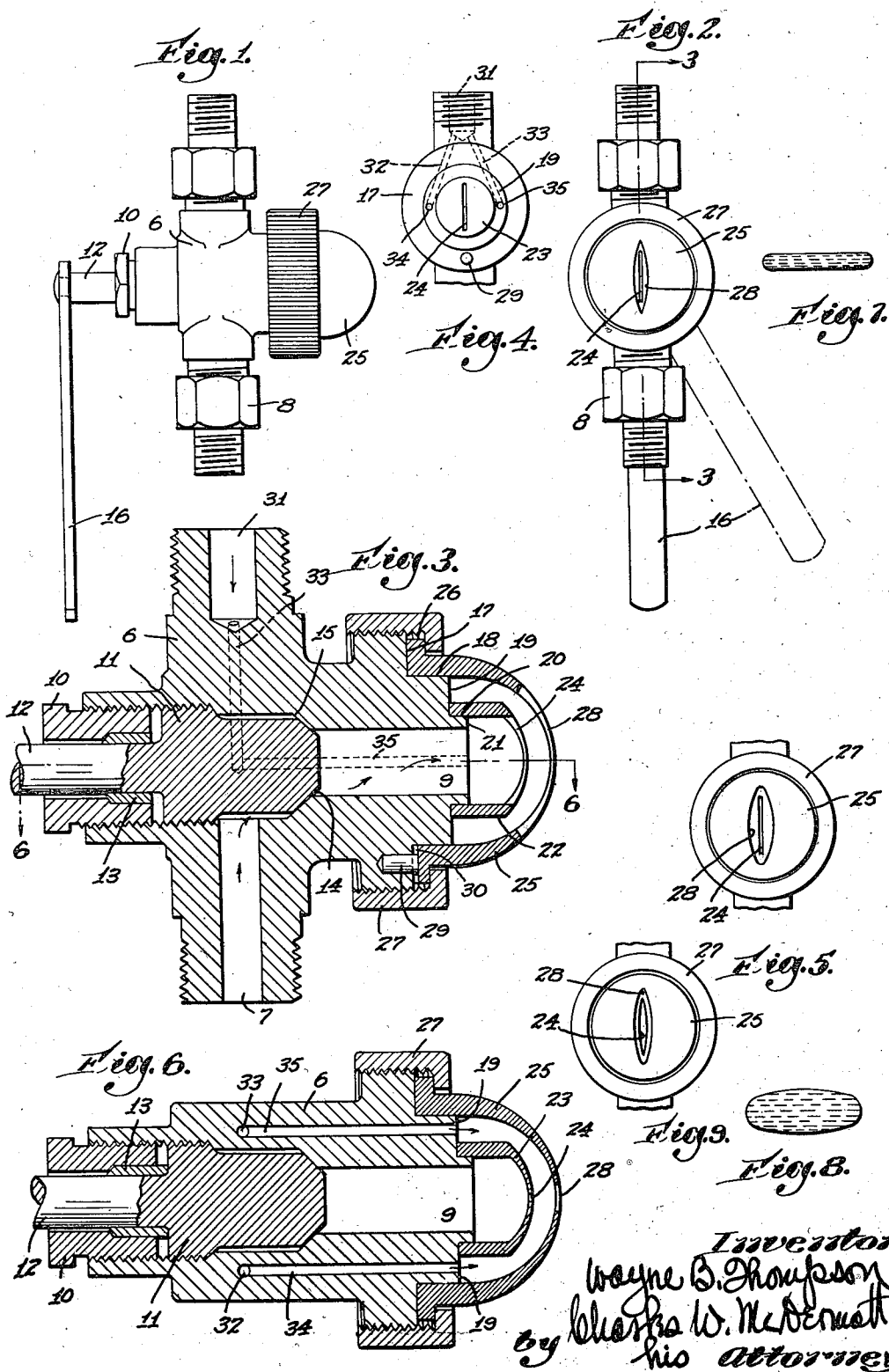
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TOOL FOR APPLYING COATING

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TOOL FOR APPLYING COATING

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The present invention relates to a tool for applying coating.

The principal object of the present invention is to provide a tool by which an elongated target substantially uniform in spray density and width throughout its length may be produced.

To the accomplishment of this object, and such others as may appear hereinafter, the various features of the present invention relate to certain devices, combinations and arrangements of parts hereinafter described and then set forth broadly and in detail in the appended claims which possess advantages which will be apparent to those skilled in the art.

The various features of the present invention will be readily understood from an inspection of the accompanying drawing illustrating the best forms of the invention at present devised, in which,

Figure 1 is a view in elevation of the apparatus or tool for applying coating material to a traveling web;

Fig. 2 is a view in front elevation;

Fig. 3 is an enlarged view in sectional elevation on the line 3-3 of Fig. 2;

Fig. 4 is a detail view in front elevation, the outer nozzle and the locking collar therefor being removed;

Fig. 5 is a detail view in front elevation showing a modified form of slot in the outer nozzle;

Fig. 6 is an enlarged view in sectional plan on the line 6-6 of Fig. 3;

Fig. 7 is a detail view in plan of the target formed by the tool illustrated in Figs. 1, 2, 3, 4, and 6;

Fig. 8 is a detail view in plan of the target formed when the tool is provided with the outer nozzle illustrated in Fig. 5, and

Fig. 9 is a detail view in front elevation similar to Fig. 5, but showing a modified form of slot in the inner nozzle.

Referring to the drawing, the apparatus or tool for applying coating comprises a metallic body 6 into which the motive agent, such as air under pressure, is introduced through an air passage 7 (Fig. 3) which is connected to an air hose coupling 8 (Fig. 1) fitted to the body portion 6 around the lower end of the passage 7. At its upper end the air passage 7 communicates with a horizontal passage 9 extending completely through the central portion of the body 6. The passage 9 is interiorly threaded to receive a plug 10 (Fig. 3) and a valve 11 provided with a spindle 12 which passes loosely through the plug 10. Interposed between the plug 10 and the spindle 12 is a packing 13.

The front end of the valve 11 is provided with a frusto-conical face 14 which cooperates with a frusto-conical seat 15 formed in the wall of the body 6 surrounding the entrance to the front

end of the passage 9. The outside end of the spindle 12 is provided with an arm 16, rotation of which causes the threaded valve 11 to rotate on the internal threads on the body engaged thereby and thus move the face 14 into and out of engagement with the seat 15. The cooperating threads on the body 6 and valve 11 are pitched so that the valve may be opened and closed by less than a complete rotation of the arm 16.

The front end face of the body 6 may be terraced to provide a vertical annular shoulder 17, a cylindrical seat 18, a second vertical annular shoulder 19, a second cylindrical seat 20, and a vertical annular wall 21 separating the passage 9 from the seat 20. Mounted tightly upon the seat 20 is an inner nozzle 22. One end of the inner nozzle is closed by a surface 23 resembling substantially a spherical zone of one base except for a slot 24 formed by cutting through the surface 23 in the direction of the length of the nozzle. The other end of the nozzle 22 is open so that the annular end face thereof may engage the shoulder 19. The long sides and the short ends of the slot may be parallel, respectively, (Fig. 4).

Mounted on the seat 18 is a dome-shaped outer nozzle 25 provided with an out-turned flange 26 one face of which engages the shoulder 17 so as to leave a narrow space between the outer nozzle 25 and the inner nozzle 22. The outer nozzle 25 is held in place on the seat 18 and against the shoulder 17 by a suitable locking means shown as an internally threaded collar or nut 27 engaged with threads on the body 6 and provided with an inturned flange to engage the out-turned flange 26. The outer nozzle 25 is provided with a slot 28 formed by cutting through the spherical surface formed by the dome in the direction of the length of the nozzle. The long sides of the slot 28 are, however, cut away so that they bow outwardly from each other. The major axis of the slot 28 is arranged to lie in the same plane as the major axis of the slot 24. To insure this alignment the body 6 carries a laterally projecting pin 29 which engages a short vertical groove 30 formed in the rear face of the flange 26.

The coating material may flow into the body 6 through a passage 31, either under pressure or under the influence of gravity. Preferably, however, the compressed air discharged through the slot 24 is relied upon to create a condition of unbalanced pressure so that the coating material is forced by the pressure of the atmospheric air from a suitable source of supply into the passage 31. The bottom of the passage 31 and the body 6 are drilled to form two diverging passages 32 and 33 (Figs. 4 and 6) which conduct the coating material, respectively, into two horizontal passages 34 and 35 which terminate on the shoulder 19 in a plane normal to the major axis of the

slot 24 (Fig. 4). The passages 34 and 35 thus conduct the coating material into the space between the inner and outer nozzles.

For general humidifying purposes the long sides of the slot 28 could be made parallel to each other and to the long sides of the slot 24 thus to discharge water into the atmosphere in an elongated atomized cloud.

Experience has demonstrated that when this parallel arrangement of the long sides of the slots 24 and 28 is used in a tool employed to discharge a coating material upon one face of a travelling web, the target formed is dumb-bell shaped, that is, it has two heavy ends connected by a thin shank. In coating one face of a travelling web a battery of tools is used so that it is difficult with a plurality of dumb-bell shaped targets to obtain uniform coverage.

Bowing outwardly the long sides of the slot 28 tends to thicken the shank of the target to the width of the ends thereof. Stated in another way the tool illustrated in Figs. 1, 2, 3, 4, and 6 discharges the coating material in an elongated spray of uniform density, the middle of which is as wide as the widest portion of the ends thereof, (Fig. 7).

While bowing outwardly the long sides of the slot 28 is effective, a better result is obtained by directing a large volume of water, collected in the space between the nozzles, towards the central portion of the slot 28 adjacent its minor axis, and the best result is obtained by increasing the velocity of the air which passes through the central portion of the slot 24 in order that it may meet and discharge effectively the large volume of water through the central portion of the slot 28.

These beneficial results may be obtained readily through the construction of the domes of the nozzles 22 and 25. As shown in Fig. 3, each dome is thickest at its base portion, and becomes thinner as the apex is approached, the wall of the dome at that point being very thin as compared with the base. This construction may be obtained by having the center of curvature of the inner wall of each dome on the same longitudinal axis as the center of curvature of the outer wall of each dome, respectively, but lying nearer the surface of the outer wall than does the center of curvature of the outer wall. Stated in another way, the curvatures of the outer walls of the domes are not concentric with the curvatures of the inner walls of the domes, respectively. Moreover, the outer surface of the inner nozzle and the inner surface of the outer nozzle are spaced apart farthest along the longitudinal axis in which their centers of curvature lie.

The purpose of this construction is to provide, in the case of the space between the two nozzles, a maximum amount of coating material in the area adjacent the minor axis of the slot 28 and, in the case of the inner nozzle, to increase the velocity of the air as it approaches the center of the slot 24. Thus, air emits with a maximum velocity from the central portion of the slot 24, and there meets a maximum quantity of coating material to discharge through the central portion of the slot 28.

As shown also in Fig. 3 the internal diameter of the inner nozzle 22 is greater than the internal diameter of the entrance to the passage 9. This construction permits the major axis of the slot 24 to be almost as long as the major axis of the slot 28 measured on the inner face of the outer nozzle. It is important, however, in order

to insure a smooth flow of the coating material to the slot 28 that the air escaping from the inner nozzle 22 does not cause a back pressure against the coating material in the narrow space between the two nozzles. To this end the slot 24, as shown in Figs. 2, 3, and 5, is enough shorter than the slot 28 so that air emitting from the slot 24 will not strike against the inner spherical surface of the outer nozzle, but must pass directly through the slot 28.

Undoubtedly the space between the inner and outer nozzles is filled with the coating material during the operation of the tool, there being a tendency for the coating material to leak out through the slot 28. But this coating material, as fast as it reaches the ends and sides of the slot 28, is discharged therethrough by the compressed air from the slot 24. Escape of the air from the ends of the slot 24 at points closely adjacent the ends of the slot 28 causes the coating material to be discharged from the tool in an extremely elongated manner.

Sometimes, however, it is desirable to produce elongated targets which are thicker in the middle than at the ends, (Fig. 8). Such targets may be produced by imparting to the outwardly bowed sides of the slot 28 a greater curvature, (Fig. 5). This variation in the shape of the long sides of the slot 28 may be correlated with variations in the shapes of the curved surfaces of the inner and outer nozzles in order that an increased volume of coating material may be delivered to the enlarged portion of the slot 28 and an increased velocity may be imparted to the air emitting from the central portion of the slot 24.

The necessary air for handling the differential amounts of coating material flowing through the slot 28 throughout its length may be obtained by bowing outwardly the long sides of the slot 24 as shown in Fig. 9.

It will be clear to those skilled in the art, with the general object of the present invention in view, that changes may be made in the details of structure, the described and illustrated embodiments thereof being intended as an exploitation of their underlying essentials, the features whereof are definitely stated in their true scope in the claims herewith.

What is claimed as new, is:

1. A spray nozzle comprising a body having an inner nozzle provided with a slot at least the exterior long side edges of which are parallel, and an outer nozzle provided with a slot at least the exterior long side edges of which are non-parallel.

2. A spray nozzle comprising a body having an inner nozzle provided with a slot at least the exterior long side edges of which are parallel, an outer nozzle provided with a slot at least the exterior long side edges of which are non-parallel, and means for maintaining the major axes of the slots in the same plane.

3. A spray nozzle comprising a body having an inner nozzle provided with a slot the long sides of which are parallel, and an outer nozzle provided with a slot the long sides of which are spaced apart longitudinally farther at their middles than at their ends.

4. A spray nozzle comprising a body having an inner nozzle provided with a slot the long sides of which are parallel, an outer nozzle provided with a slot the long sides of which are spaced apart longitudinally farther at their middles than at their ends, and means for maintaining the major axes of the slots in the same plane.

5. A spray nozzle comprising a body having two cylindrical seats of different diameters formed on the front end face thereof, an inner nozzle provided with a slot the long sides of which are parallel, said nozzle being mounted on the seat having the smaller diameter, and an outer nozzle provided with a slot the long sides of which are non-parallel, said nozzle being mounted on the seat having the larger diameter, the rear end faces of the nozzles being seated flatwise against annular shoulders coterminous with the seats, respectively and means engaging the body and the outer nozzle for securing said nozzle in position.

6. A spray nozzle comprising a body having spaced slotted surfaces which are curved and are in juxtaposition in inner and outer relationship, the long sides of the slot in the inner surface being parallel and the long sides of the slot in the outer surface being bowed outwardly to cause the slot to be convex, and means to supply coating material between said surfaces and to supply a motive agent through said slots thereby effecting the discharge of the coating material.

7. A spray nozzle comprising a body having spaced slotted surfaces which are curved and are in juxtaposition in inner and outer relationship, the long sides of the slot in the inner surface being parallel and the long sides of the slot in the outer surface being bowed outwardly to cause the slot to be convex, and means to supply coating material between said surfaces and to supply a motive agent through said slots thereby effecting the discharge of the coating material, and means for maintaining the major axes of the slots in the same plane.

8. A spray nozzle comprising a body having spaced slotted inner and outer surfaces in juxtaposition, the long sides of the slot in the outer surface being bowed outwardly to cause the slot to be convex, means to supply coating material between said surfaces and to direct the largest volume thereof towards the minor axis of the outwardly bowed slot, and means to supply a motive agent through said slots, thereby effecting the discharge of the coating material.

9. A spray nozzle comprising a body having inner and outer nozzles provided at their discharge ends with slotted, dome-shaped surfaces having their centers of curvature lying in the same longitudinal axis, the outer surface of the inner nozzle and the inner surface of the outer nozzle being spaced apart farthest along said axis.

10. A spray nozzle comprising a body having an inner dome-shaped nozzle which is slotted and an outer dome-shaped nozzle which is slotted, the slot in the inner nozzle being narrower than the slot in the outer nozzle and the slot in the outer nozzle being bowed outwardly to cause the slot to be convex, means for supply material between the nozzles, and means for supplying a motive agent to the inner nozzle comprising a passage aligned with the inner nozzle and having the internal diameter of at least its entrance into the inner nozzle smaller than the internal diameter of the inner nozzle.

11. A spray nozzle comprising a body having an inner nozzle and an outer nozzle spaced therefrom, each nozzle being provided at its discharge end with a slot and curved surfaces, means for supplying material between the nozzles, and means for supplying a motive agent to the inner nozzle, the curvature of the inner surface of the

inner nozzle being non-concentric with the curvature of the outer surface of the inner nozzle to increase the velocity of the motive agent as it emits from the central portion of the slot in the inner nozzle.

12. A spray nozzle comprising a body having an inner nozzle and an outer nozzle, said nozzles terminating at their discharge ends in surfaces resembling substantially spherical zones of one base and each of said surfaces being provided with a slot, means for supplying material between the nozzles, means for supplying a motive agent to the inner nozzle, and means for increasing the velocity of the motive agent as it emits from the central portion of the slot in the inner nozzle.

13. A spray nozzle comprising a body having an inner nozzle and an outer nozzle spaced therefrom, said nozzles terminating at their discharge ends in surfaces resembling substantially spherical zones of one base and each of said surfaces being provided with a slot, means for supplying material between the nozzles, means for supplying a motive agent to the inner nozzle, means for preventing back pressure by the motive agent in the space between the nozzles, and means for increasing the velocity of the motive agent as it emits from the central portion of the slot in the inner nozzle.

14. A spray nozzle comprising a body provided with a slotted inner nozzle and a slotted outer nozzle spaced therefrom each of which has curved surfaces, each resembling substantially a spherical zone of one base, the curvature of the outer surface of the inner nozzle being non-concentric with and less than the curvature of the inner surface of the outer nozzle to cause the nozzles to be spaced apart farthest between the central portions of the slots.

15. A spray nozzle comprising a body having an inner nozzle provided with curved surfaces and a slot, the long sides of the slot being parallel and the outer curved surface being non-concentric with the inner curved surface, and an outer nozzle entirely spaced from said inner nozzle and provided with curved surfaces and a slot, the long sides of the slot being non-parallel and the inner curved surface being non-concentric with the outer curved surface of the inner nozzle.

16. A spray nozzle comprising a body having inner and outer spaced nozzles, each nozzle being provided with curved surfaces each resembling substantially a spherical zone of one base, the outer surface of each nozzle being non-concentric with the inner surface, and also provided with a slot, the long sides of the slot of the inner nozzle being parallel and the long sides of the slot of the outer nozzle being non-parallel, and means for maintaining the major axes of the slots in the same plane.

17. A spray nozzle comprising a body provided with an inner slotted and dome-shaped nozzle and an outer slotted and dome-shaped nozzle spaced therefrom, the surfaces of said nozzles each resembling substantially a spherical zone of one base, the centers of the slots coinciding with the centers of the nozzles, respectively, the curvature of the outer surface of each nozzle being non-concentric with the curvature of the inner surface of each nozzle, respectively, and the curvature of the inner surface of the outer nozzle differing from the curvature of the outer surface of the inner nozzle to cause the nozzles to be spaced apart farthest between the central portions of the slots.

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