April 4, 1939. G. McKNIGHT 2,152,767

SPRAY GUN

Filed Sept. 8, 1936

Fig. 1.

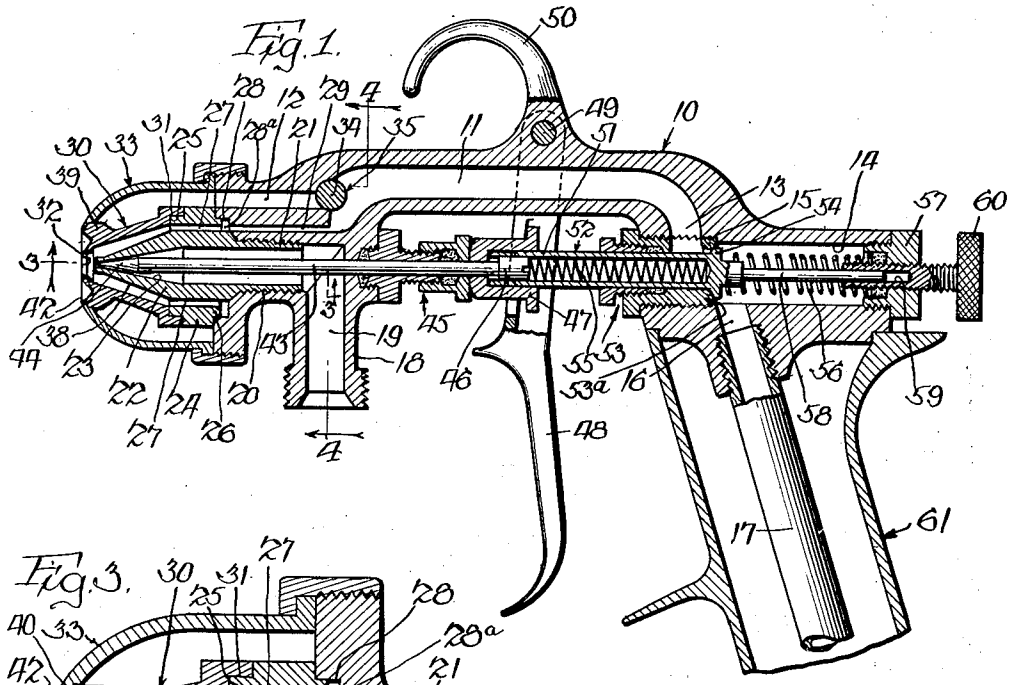


Fig. 3.

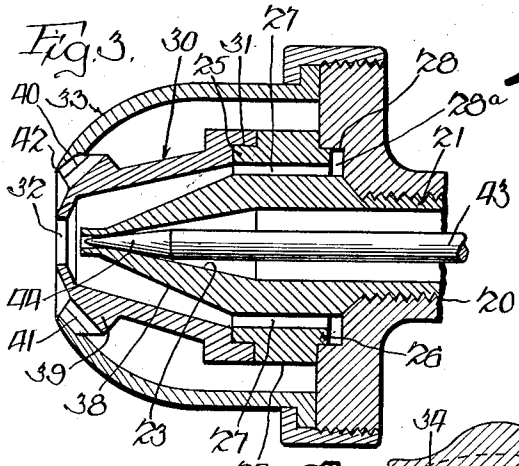


Fig. 2.

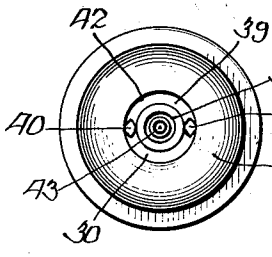


Fig. 6.

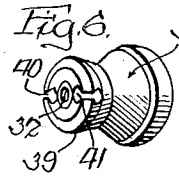


Fig. 4.

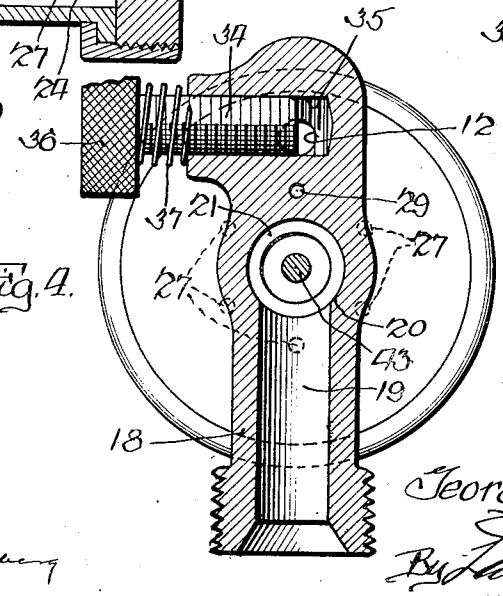
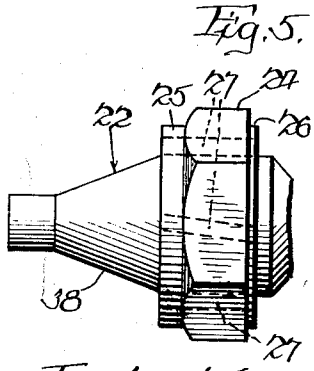


Fig. 5.



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SPRAY GUN

George McKnight, Chicago, Ill.

Application September 8, 1936, Serial No. 99,712

2 Claims. (Cl. 299—140.1)

This invention relates to spray guns in which the material is atomized by means of compressed air and is ejected from a tubular nozzle and thereafter converted into a relatively flat spray.

In spray guns of this class, the material is projected from the tubular tip of the nozzle, around which nozzle air also issues under such pressure that it commingles with the material to form a stream of partly atomized material of circular formation. This stream is then subjected to two opposing jets of air which flatten the stream and completes the atomization. The two air jets cooperate with the air which is issued around the nozzle tip to carry the atomized spray with considerable velocity against an object to be sprayed.

It is an object of this invention to provide a nozzle which has openings arranged therearound that are directed at an angle to the axial center of the nozzle and through which openings, the air is forced in a circulating manner around the nozzle to effect a whirling even flow of air around the material as it is ejected from the nozzle tip.

A further object is to provide adjustable means for regulating the flow of air to the two opposed jets for regulating the pressure of air against the circular formation of material to determine the degree of flatness required of the spray.

Another object is to provide a spray gun having a main air passageway which has a pair of outlets to direct air through a pair of opposed jets and around the nozzle and to provide an adjustable means adapted to extend into one of the outlets for regulating the flow of air therethrough and to the opposed jets while permitting of a predetermined amount of air to constantly flow through the other outlet and around the nozzle.

A still further object is to provide a needle valve to control the amount of material which is to be forced through the nozzle either by suction or pressure whereby the air pressure is admitted to the nozzle prior to the time that the needle valve is opened to any predetermined position.

And a further object is to provide a conical member fixedly positioned over the nozzle of the gun and which member is provided with angularly directed openings which with the shell of the nozzle, serve to form a pair of opposed jets to direct air against the spray to flatten the same, as it leaves the nozzle.

Referring to the drawing:

Figure 1 is a medial longitudinal sectional view of a spray gun embodying my improvements.

Figure 2 is a front view of the nozzle end of the spray gun.

Figure 3 is an enlarged detail cross-sectional view of the nozzle taken substantially on the line 3—3 of Figure 1.

Figure 4 is a detail cross-sectional view taken on the line 4—4 of Figure 1.

Figure 5 is a detail side elevation of the nozzle, illustrating the air passage therethrough; and

Figure 6 is a detail perspective view of the conical member positioned over the nozzle.

The reference numeral 10 designates the body of the gun which is preferably cast of one piece, having a cored opening 11 therein, which communicates with an opening 12 in the forward end of the body. The rearward end 13 of the cored opening 11 is directed downwardly and communicates with an opening 14 that is parallel to the cored opening 11, and which opening is provided with a shoulder 15, and communicates with a downwardly directed opening 16 positioned rearwardly of the shoulder 15 and into which an inlet pipe 17 is threaded, which pipe forms the intake for the air pressure to be applied to the gun.

The body 10 of the gun is also provided at its forward end with a downwardly directed extension 18 which is provided with a bore 19 therein that communicates with a horizontally disposed bore 20 aligned in spaced relation with the opening 14. This horizontally disposed bore 20 serves to receive the threaded end 21 of a nozzle 22 that is provided with a conical bore 23 and which has a hex formation 24 which may be gripped to thread the nozzle in position into the body 10 of the gun. On each side of the hex formation 24, the nozzle 22 is provided with annular portions 25 and 26, respectively, through which a plurality of angularly directed peripheral openings 27 are provided. As the nozzle 22 is threaded into position in the bore 20, the portion 26 of the nozzle fits partially within a counter-bore 28 formed in the bore 20 of the body 10, and provides an annular air chamber 28a that communicates with the angularly directed peripheral openings 27 in the nozzle 22. This counter-bore 28 communicates with the cored opening 11 by means of a drilled opening 29, so that the air which enters into the cored opening 11 is directed through the drilled opening 29 and into the annular air chamber 28a. The other portion 25 of the nozzle 22 is adapted to receive a hollow conical member 30 which has one end provided with an annular groove 31 that is adapted to fit over the portion 25, and this member 30 serves to direct the air from the peripheral openings 27 around the nozzle 22 and out of an opening 32 in the conical member 30. This conical member 30 is retained in position by means of a shell-like an-

nular housing 33 into which the air is directed from the cored opening 11 and through the bore 12. The air that is directed through this bore 12 into the shell-like housing 33 is controlled by means of a set screw 34 which is threaded within a transverse opening 35 that extends across the bore 12, and which set screw is provided with a knurled head 36 for manually adjusting the same to regulate the size of the opening to the bore 12, through which the air passes from the cored opening 11 into this bore. This set screw 34 is yieldingly retained in its adjusted positions by means of a compression spring 37 that engages the knurled head 36 thereof and the body 10 of the gun.

It will be noted that the main air passage through the cored opening 11 is uninterrupted, that is to say, there are no working parts extending through this air passage other than the set screw 34 which regulates the outward flow of air through the bore 12 into the shell-like housing 33, while the air may freely pass from the cored opening 11 through the drilled opening 29 into the air chamber 28a and through the angularly directed peripheral openings 27 around the conical end 38 of the nozzle 22, and out of the opening 32 of the conical member 30. This passage of air around the conical end 38 of the nozzle 22 creates a suction around the nozzle for effecting a suction therethrough and through the downwardly directed opening 19 in the body 10 to effect a suction and the drawing up of the material to be used for spraying purposes.

The conical member 30 is provided at its free end with an annular flange 39, which has angularly and oppositely disposed milled openings 40 and 41, respectively, (Fig. 6), that are arranged to converge to a point outwardly of the nozzle 22. When the conical member 30 is retained in position on the body 10 of the gun by the shell-like housing 33, the annular flange 39 thereof extends flush with an annular opening 42 in the shell 33. This annular opening 42 and shell 33 serve with the milled openings 40—41 to form jets which direct the air from within the shell to engage the spray of material outwardly of the nozzle 22.

This type of gun may be used either for the suction type or pressure type of spraying guns and the above description illustrates the manner of operation when a suction type of spraying is employed. The pressure type, as is commonly known in the art, is where an air pressure is applied to the material and the flow of the material is not solely dependent upon the suction created by the passage of air around the nozzle. However, the type of gun illustrated is applicable for use with either the suction or pressure type of material container.

To regulate the outward flow of the material through the nozzle 22, I provide a needle valve 43 which has conical end 44 that fits within the conical end 38 of the nozzle 22. This needle valve 43 extends through a packing bushing designated as a whole as 45 and has a headed portion 46 that is fixed to the end of the needle valve and is retained in and normally spaced with a cup-shaped member 47 which is operatively connected to a swingable member 48 which forms a trigger for manually adjusting the positioning of the needle valve 43 as the gun is operated. The trigger 48 is pivotally carried on a pin 49 that is secured into a hook-like extension 50 that is an integral part of the body portion 10 of the gun. This extension 50 serves to suspend the gun when not in use. The cup-shaped member 47 also serves to support and engage the free end 51 of a sleeve 52 that is slidably carried in a packing bushing 53 fixed into the body 10 of the gun adjacent the cored opening 13. This sleeve 52 is provided with a valve flange 54 at its other end that coacts with a valve seat 53a in the packing bushing 53 and serves to close the air passage between the inlet pipe 17 and the cored openings 13—11. The sleeve 52 carries a compression spring 55 therein that engages the inner end thereof and the headed portion 46 of the needle valve 43, and this spring 55 serves to retain the conical end 44 of the needle valve 43 into the conical bore 23 of the nozzle 22 to normally close the same. The sleeve 52 is bodily urged with the flange 54 thereof against the valve seat 53a by means of a compression spring 56 positioned in the opening 14 and which spring has one end engaging the sleeve 52 and its other end engaging a lock nut 57 that is threaded into the opening 14 of the body 10. This sleeve 52 also carries a reduced extending portion 58 which extends through the spring 55 into an opening 59 in a set screw 60, that is threaded into the lock nut 57. This set screw 60 serves to limit the rearward movement of the sleeve 52, as the trigger 48 is pulled rearwardly to operate the gun, and this set screw also serves to limit the distance that the needle valve 43 may move to regulate the amount of material to be sprayed through the nozzle 22. A hollow handle 61 is secured to the body 10, and is arranged to extend over the inlet pipe 17, and this handle 61 serves with the trigger 48 as a hand-grip for manipulating the gun.

As thus far described, it will be seen that when the gun is to be operated, the material container (not shown) is attached to the extension 18 and the air pressure is applied to the inlet pipe 17; then the set screw 34 is adjusted to regulate the amount of air desired through the two jets 40 and 41 in the conical member 30, and the set screw 60 is adjusted for the amount of material desired through the nozzle 22. As the operator grips the trigger 48, a sliding movement of the cup-shaped member 47 will be had, which will exert a direct pull upon the sleeve 52 to draw the flange 54 away from the seat 53a of the bushing 53, and upon a further movement of the trigger 48, the cup-shaped member 47 will engage the headed portion 46 of the needle valve 43 and carry the same with the sleeve 52 against the tension of the spring 56, and the valve flange 54 of the sleeve will be carried from the valve seat 53a to permit the passage of air from the inlet pipe 17 into the cored openings 13—11, and through the opening 29 and the peripheral openings 27 in the nozzle. This passage of air through the angularly directed peripheral openings 27 of the nozzle 22 creates a circulating motion around the nozzle before the air exhausts through the annular opening 32 of the conical member 30, and as the material is being drawn through the nozzle, this circulating motion of the air will tend to reduce the material into a relatively cylindrical shape. During this time, the air is also passing through the bore 12 and around the conical member 30, so that a volume of air is contained within the shell 33 and is exhausted through the angularly disposed jets 40 and 41 to again strike the material at a distance outwardly of the opening 32 of the conical member 30. As these jets 40 and 41 are arranged in opposed relation, they will engage opposite sides of the cylindrical material ejected from the noz-

zle 22 and cause the material to be flattened in proportion to the volume of air permitted to be exhausted through the jets by regulating the amount of air through the opening 12 under the control of the set screw 34, the degree of flatness of the spray being determined by the volume of air exhausted through the jets.

With the construction of spray gun above disclosed, and a nozzle arrangement coacting therewith, it will be noted that the nozzle is constructed in a smooth, semi-circular manner wherein the two jets 40 and 41 are retained within the nozzle without protruding parts, and wherein the volume of air necessary for effecting the breaking down or flattening of the material stream after it is compressed upon leaving the nozzle may be varied with respect to the types of objects to be sprayed.

It will be noted that the openings 40 and 41 forming jets in the member 30 are milled diamond-shaped and by this particular shaped opening, the air is directed against the stream of material in a fan-like manner and prevents the clogging and piling up of material on the face of the nozzle.

I claim:

1. A spray gun comprising a body having an air passage and a material passage therein, a flanged material nozzle fixedly secured to the body and communicating with the material passage, the flange of said material nozzle having openings transversely of the flange communicating with the air passage for directing air around said nozzle, a valve within said nozzle, a hollow open-ended conical member having a conical bore terminating into a reduced opening and fitted to the flange of said nozzle and in spaced relation therewith forming means for directing air therearound, a cup-shaped shell having an opening therein and engaging said conical member and releasably secured to the gun body, said shell forming means for directing air from the air passage around said conical member, said conical member having diametrically opposed angularly directed milled openings serving with the shell to direct opposed streams of air to a common center on the axis of the material flow outwardly of the nozzle.

2. A spray gun as per claim 1, in which the gun body is provided with an annular groove serving with the nozzle flange to accumulate and direct air from the air passage through the opening in the nozzle flange.

GEORGE McKNIGHT.