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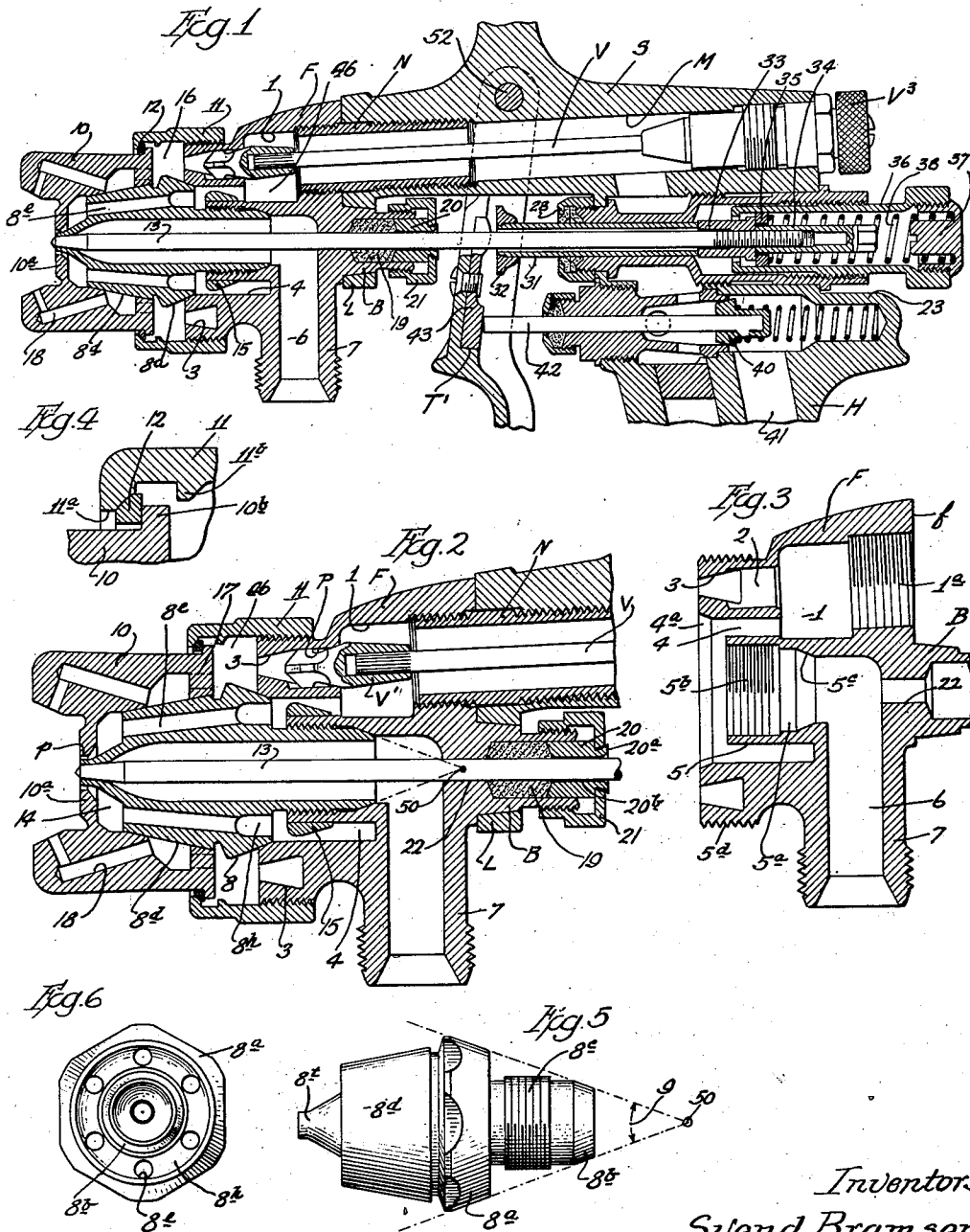
S. BRAMSEN ET AL

2,102,303

SPRAY GUN VALVE

Filed Oct. 31, 1935

2 Sheets-Sheet 1



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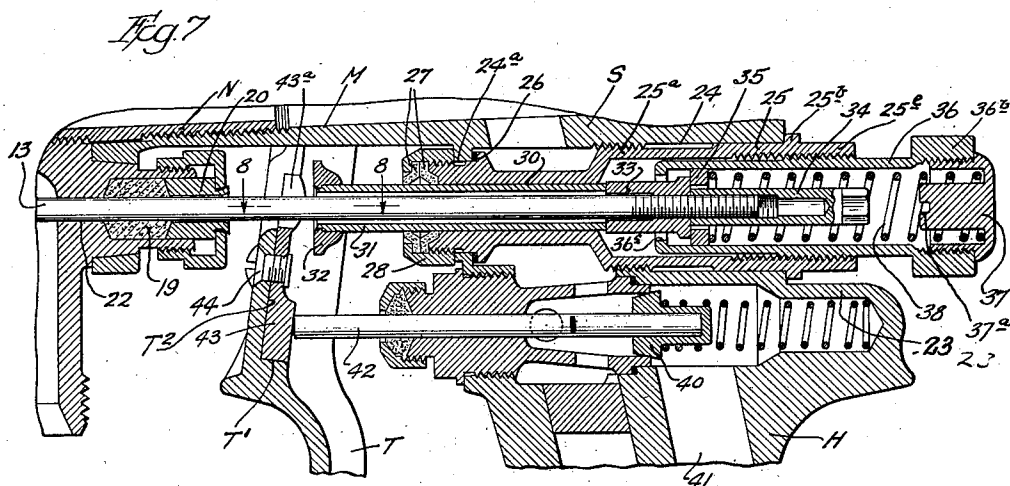
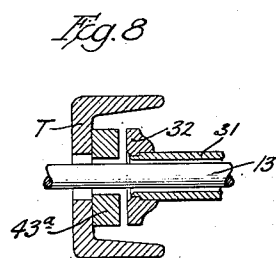
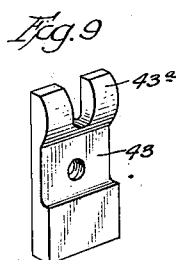
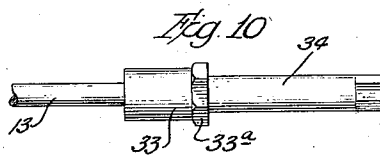
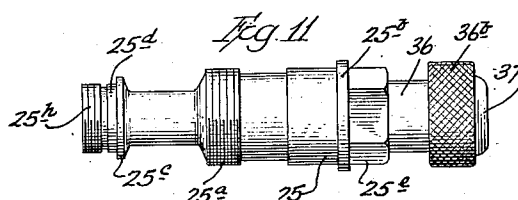
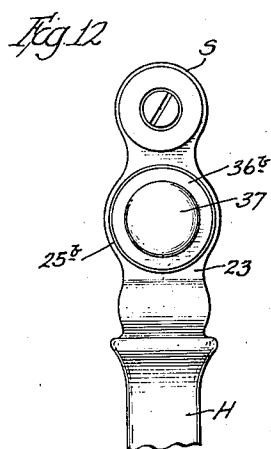
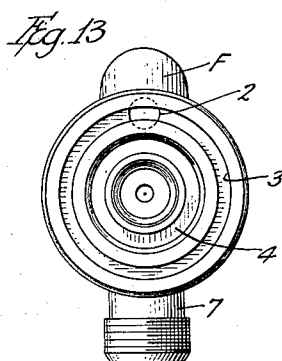
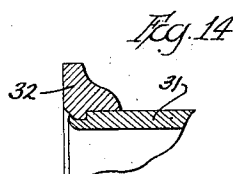
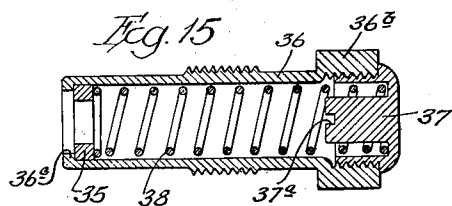
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SPRAY GUN VALVE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,102,303

SPRAY GUN VALVE

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Chicago, Ill., a corporation of Delaware

Application October 31, 1935, Serial No. 47,580

9 Claims. (Cl. 251—134)

Our invention relates to novel structural features of a spray gun valve and in general aims to accomplish the following objects:

(1) Providing improved rearward guide and adjustable pressure provisions for the needle valve which controls the discharge of material from the material nozzle, to prevent this valve from binding if the valve is not exactly straight or if the forward and rearward guides are not in exact axial alignment.

(2) Providing a mounting for the said rearward guide and adjustable pressure provisions associated with the needle valve which will permit the major parts of this assemblage to be attached to, and detached from, the gun body as a unit.

(3) Providing simple and effective means for transmitting digital pressure on the trigger of the gun to the needle valve, and for preventing dust from entering operative portions of this rearward guide.

(4) Providing an effective head and seat for the supplemental air valve which controls the supply of spray-flattening air to the side ports of the air nozzle, and an effective guide for this valve head.

(5) Providing simple, durable and easily replaceable means for reducing wear on the parts of the trigger of the gun which respectively engage the stem of the main air valve and a pressure-transmitting member associated with the needle valve.

Illustrative of the manner in which we accomplish the above recited objects.

Fig. 1 is a central, vertical and longitudinal section through a spray gun embodying our invention, with the usual suspension hook and the major portion of both the handle and the trigger of the gun broken away.

Fig. 2 is an enlargement of the forward portion of Fig. 1.

Fig. 3 is a similar enlargement of the forward part of the gun body alone.

Fig. 4 is a further enlargement of an upper portion of Fig. 1, showing the means which seal the forward end of the attaching ring to the air nozzle while permitting a rocking of the ring with respect to the said nozzle.

Fig. 5 is a side elevation of the material nozzle, and Fig. 6 a rear elevation of the same nozzle.

Fig. 7 is a fragmentary enlargement of a considerable portion of Fig. 1, drawn on the same scale as Fig. 2.

Fig. 8 is a fragmentary and enlarged section

taken along the line 8—8 of Fig. 7 through the trigger and parts adjacent thereto.

Fig. 9 is a similarly enlarged rear perspective view of the presser plate attached to the main part of the trigger.

Fig. 10 is an elevation of the rearward portion of the material-discharge controlling needle valve, the presser member threaded on this valve, and the cap-nut which latches the presser member in its adjusted position, drawn on the same scale as Fig. 7.

Fig. 11 is an elevation of the unitarily detachable assembly of parts of the control unit associated with the needle valve.

Fig. 12 is a rear elevation of the portions of the gun, shown in Fig. 1.

Fig. 13 is a front elevation of the forward gun body part which is separately shown in section in Fig. 3, drawn on the same scale as Fig. 1.

Fig. 14 is an enlarged radial section of a portion of the front end of the slidable thrust sleeve through which pressure on the trigger of the gun is transmitted to the presser member on the needle valve.

Fig. 15 is a central and longitudinal section through the adjusting tube and the parts carried thereby, showing this assemblage when the tube has been detached from the gun body to permit an adjusting of the effective length of the needle valve.

In the illustrated embodiment, the main body part of our gun includes a barrel or stock S having the usual longitudinal main air passage M, a tail portion 23 (Fig. 12) depending from the rearward portion of this stock, and a handle H depending from this tail portion. The companion forward body part F, shown almost completely in section in Fig. 3, has a flat rear face portion *f* bearing against the flat forward end of the stock, and the forward body part also has a rearwardly projecting boss B extending through a longitudinal bore in a lug L depending from the forward end of the said stock.

A doubly threaded nipple N clamps the forward body part tightly against the main body part, after the manner more fully described in our copending application, #43,244, filed October 2, 1935 on a Spray gun.

The forward portion of this nipple is threaded into the rearward portion 1a of an air bore 1 from which a passage 2 leads forwardly to a forwardly open annular channel 3 formed in the radially outward frontal portion of the forward body part, as shown in Figs. 3 and 13. This

forward body part also has a deeper forwardly open channel 4 concentric with and radially inward of the channel 3, into which channel 4 the air bore 1 also opens; and the body portion within the inner wall of the deeper channel 4 has an axial bore 5a forming the forward arm of an elbowed material passage 6, which passage has its inlet in a tubular shank 7 depending from the main portion of the forward body part.

The said axial bore 5a has its forward portion provided with a non-tapering thread 5b and also has a more rearward and rearwardly tapering bore portion 5c, and the portion of the forward body part in which the said axial bore 5a is formed has its forward end spaced rearwardly from the front face of the radially outward portion of this body part in which the outer annular channel 3 is formed. Moreover, the outer wall of the inner channel 4 has a portion 4a tapering forwardly and preferably in the same conical surface with the said tapering portion 5c of the axial bore in the frontal body part.

This alining of two peripheral, longitudinally spaced and coaxial portions of the frontal body part of our gun permits the said portions 4a and 5c to afford zone-like annular seats respectively for a midlength peripheral portion 8a and a rear end peripheral portion 8b of the material nozzle of our gun (shown separately in Figs. 5 and 6) when the said nozzle portions present their peripheries in a conical surface of the same cone angle 9 (Fig. 5) as that in which the tapering portions 4a and 5c were bored. Moreover, the longitudinal spacing between each set of these tapering portions permits a non-taperingly threaded portion 8c of the material nozzle to be screwed into the similarly threaded portion 5b of the frontal body part.

With the previous construction of such spray appliances, the disposition of the axis of the material nozzle with respect to the body part which supports this nozzle, varied according to the extent to which the thread on the nozzle approached an exact alining with the axis of the nozzle, and also on the accuracy with which the corresponding bore in the gun body was threaded. And, since the thread on the nozzle was usually on the extreme rearward portion of the shank of the nozzle, a departure from the intended axial alinement of this nozzle with the corresponding air nozzle of the gun was often magnified to such an extent at the front of these nozzles as to dispose the outlet tip of the material nozzle decidedly eccentric to the central port of the air nozzle, thereby producing a correspondingly distorted pattern of the projected spray.

With our here presented arrangement, the annular tapering seats 4a and 5c in the forward body part can readily be formed in a single operation with a boring tool which has corresponding portions accurately ground to the desired common taper angle, and the annular surfaces 8a and 8b on the material nozzle can both be ground accurately and by a single operation to the same common taper angle. Consequently, the straight-threaded connection between the nozzle shank portion 8c and the body bore portion 5b can be sufficiently loose to permit both of the said nozzle surfaces to seat firmly and to insure an exact positioning of the nozzle. This allows also for manufacturing variations in the non-taperingly threaded interconnected parts, so as to insure an equally proper supporting of material nozzles which have been made at different times.

The companion air nozzle 10 is desirably of a cap type, bored to fit upon a forwardly tapering frustro-conical portion 8d of the material nozzle which is forward of the oppositely tapering portion 8; and the air nozzle has the usual central air port p into which the usual tubular tip 8t of the material nozzle freely extends, as well as the usual peripheral head 10b. This nozzle is clamped rearwardly on the material nozzle by a retaining ring 11 which has its rear end portions screwed upon a peripheral thread 5d on the forward end of the forward body part, the forward end of which ring presents an interior annular flange 11a in front of the head 10b on the air nozzle.

To compensate for manufacturing variations in the fit of the retaining ring on the forward body part, to seal the retaining ring adequately to the air nozzle, we interpose a metal gasket 12 (desirably of bronze) between the interior flange 11a of the retaining ring and the front of the head 10b on the air nozzle. We also preferably form the rearward portion of the bore of this flange so as to flare rearwardly and to present a rearwardly concaved annular face shaped as a zone of a spherical surface which has its center point approximately at the apex 50 (Fig. 2) of the conical surface of which the annular nozzle seats 4a and 5c form a part, and form the gasket 12 of an approximately quarter-circular section presenting a curved section to the said interior flange and presenting a flat rear face to the peripheral flange 10b on the air nozzle.

In addition, we preferably provide a second interior flange 11b on the retaining ring, somewhat rearward of its said end flange 11a, this second flange having its bore diameter intermediate that of the bores of the aforesaid flanges 11a and 10b.

With the parts thus constructed, the gasket can readily be snapped into the forward portion of the retaining ring from the rear of that ring, so as to be held in the latter by the rearward flange 11b when the retaining ring is detached. When this retaining ring and gasket assembly is slipped over the air nozzle (after the latter has been socketed on the material nozzle as in Figs. 1 and 2) the interengaging sphere-zone surfaces of the flange on the retaining ring and of the gasket permit the retaining ring to rock on the air nozzle during the screwing of the retaining ring on the gun body, so as to compensate for any inaccuracy in the threaded connection provided for that purpose, and the gasket thereafter seals the forward end of the retaining ring to the air nozzle.

In the material nozzle, the tip portion 8t extends sufficiently forward beyond the forwardly tapering portion 8d to afford an air space 14 behind and adjacent to the usually flat central forward part (or cap end) 10a of the air nozzle, and the material nozzle has a plurality of circumferentially spaced longitudinal passages 8e leading to this space. In addition, the material nozzle preferably also has an annular groove 8f in its rear end, from which the said passages lead. This groove faces the inner annular channel 4 in the front end of the gun body, to which air is supplied through the air bore 1 in that body, so that this groove co-operates with the said channel in distributing air to the said passages.

To equalize this air distribution we dispose an annular baffle of smaller area (in a plane at right angles to the axis of channel) in the said channel

4 and preferably in the forward portion of this channel, so as to cause the air to flow circumferentially to a considerable extent before reaching the mouth end of the channel.

5 For this purpose we preferably employ a metal baffle ring 15 press-fitted on the tubular body portion which has the interior thread 5b, this ring preferably being considerably wider than its maximum thickness and preferably decreases in thickness rearwardly, from a maximum thickness somewhat less than the width of the annular channel 4 in which the said ring is located.

10 Thus disposed, the baffle ring 15 also serves the important purpose of stiffening the tubular body portion on which it is mounted, to permit that body portion to be accurately bored without danger of cracking it, even when the thickness of the tube wall is rather small so as to reduce the diameter of the head portion of the forward body part.

15 When the air nozzle is to effect a flattening of the spray, the rearwardly tapering portion 8 of the material nozzle preferably is of such length as to extend forwardly for a considerable distance beyond the front end of the gun body, and this tapering portion is spaced from the rear end of the forwardly tapering portion 8d by a peripheral groove disposed adjacent to the rear end of the air nozzle. This permits air admitted from the outer annular body channel 3 to the annular space between the front end of the gun body and the rear end of the air nozzle to flow through longitudinal passages 17 in the rear end part to the air nozzle for reaching the side air passages 18 of that nozzle.

20 The side air for this purpose is supplied (after the manner more fully described in our said co-pending application #43,244) from the main air passage M through the inlet bore 1 and a port P leading forwardly from the latter, this port being controlled by the head V¹ of a side-air control valve V which can be adjusted by a rearward knob V³.

25 Moreover, we preferably construct our material nozzle so that the rear end of the air nozzle will be spaced forwardly from the doubly channeled forward end of the gun body (by a space 46) when the air nozzle seats on the material nozzle, so that this space around the material nozzle will co-operate with the outer channel 3 in equalizing the air distribution to the side air passage 18 of the air nozzle.

30 To control the discharge of material from the material nozzle, we employ a simple rod-like needle valve 13 extending rearward axially through the body boss B, and through an annular packing 19 disposed in a rearwardly open bore in the said boss. This packing is compressed around the needle valve by a plunger or gland 20 which slidably fits the rearward portion of the said bore in the body boss and which gland is fastened to the head of a stuffing box cap 21 threaded on the rear end of the said boss B. To effect this fastening, which permits the gland to be detached along with the stuffing box cap 21 we form the gland with a diametrically rearward extension 20a which extends through and is flared out into a rearwardly flaring axial bore in the head of the said cap, as shown in Fig. 2.

35 Moreover, the axial bore 20b of the gland 20 of the forward gun body part is preferably somewhat larger in diameter than the needle valve, so as to avoid any cramping of this valve. Then we also provide the following novel arrangement in

the more rearward part of our spray gun for guiding the needle valve in such a manner as to avoid any binding or cramping of that valve, while permitting the needed adjustments and also facilitating a disassembling of the control provisions associated with that valve.

4 The pivoted trigger T of the spray gun depends in the usual manner in front of the handle H and of the usual tail portion 23 which connects the stock S to this handle, and the said tail portion 10 has a bore 24 coaxial with the needle-valve-guiding bore 22 in the forward body part and with the material nozzle. Mounted in this bore is a sleeve (Fig. 11) which has a portion 25 fitting the rear end of the said bore, a mid-length portion 15 25a threaded into that bore and a peripheral flange 25b normally bearing against the rear end of the body tail portion 23.

20 The more forward portion of this sleeve presents a peripheral flange 25c behind a contraction 24a of the bore 24, which flange is sealed to the shoulder affording that contraction by a gasket 26 as shown in Fig. 7. In addition, the sleeve has a cylindrical portion 25d fitting into the said bore contraction 24a, and the sleeve extends forwardly 25 through the latter to present its forward end portion 25h in front of the adjacent portion of the tail 23. Threaded on this portion 25h is a retainer ring 28 which bears rearwardly against the said tail portion and which also clamps the 30 radially outer portions of two annular wipers 27 against the front end of forward sleeve portion 25h while permitting the radially inward portions of the wipers to flare away from each other longitudinally of the said sleeve.

35 The part of the said sleeve forward of its mid-length threaded portion 25a has a bore 30 considerably larger in diameter than the needle valve 13, through which bore a presser tube 31 slidably extends. This tube has an annular head 32 40 clinched to it as shown in Fig. 14, and has the wipers 27 fitting against it to prevent dust from entering the sleeve bore 30 to interfere with a free sliding of the presser tube in that bore.

45 The needle valve extends rearwardly through the bore of the tube 31, and thereafter threadedly through a presser head 33 behind that tube and into a long cap nut 34 which normally locks the presser head to the needle valve. Bearing forwardly against this presser head and housing the 50 forward portion of the said cap nut is a ring 35, which freely houses the forward portion of the cap nut 34. This ring is slidable in the bore of an adjusting tube 36 which has a midlength part threaded into the rearward portion of the bore 55 of the sleeve 25. The rear end of the adjusting tube is normally closed by a cap 37, which cap has its rear end portion 36b enlarged and peripherally knurled, and a compression spring 38 interposed between the said cap 37 and the slidable 60 ring 35 continually presses the said ring forwardly.

65 If the bore of the slidable ring 35 were slidably fitted upon the cap nut 34, this interfitting would hold the adjacent part of the needle valve coaxial with the guide sleeve 36. Consequently, any deviation from an exact axial straightness of the needle valve, such as frequently occurs owing to a bending of such valves while they are being hardened, would cause the heretofore frequently encountered cramping (and even sticking) of 70 this valve which interferes with the normal operation of the gun. But with the bore of the ring 35 suitably larger than the diameter of the cap nut portion housed by it, we accomplish the following result:

When the adjusting tube 36 is unscrewed from the sleeve 25, this tube (together with the spring 38, the presser ring 35 and the cap 37) are detached as a unit, as shown in Fig. 15, this being permitted by making the bore 36c in the forward end of that tube larger in diameter than the head 33a of the presser head 33. The needle valve, with this presser head and the locknut 34 still mounted on it, as in Fig. 10, can then be slid manually rearward for adjusting the position of the presser head on this valve.

To insure a substantial axial rearward pressure of the trigger on the frontal head 32 of the presser tube, we provide the trigger proper (T) with a flat rear portion face T² extending in front of both the said tube head and the usual stem 42 on the air valve 40, and also provide the trigger proper with a flat upwardly facing shoulder at the lower end of the said flat rear face portion.

Then we provide a presser plate 43, shaped as in Fig. 9, which is preferably of hardened steel while the trigger may be of aluminum alloy. This presser plate has a lower flat end and has a forked upper portion presenting two fork fingers 43a, spaced by a distance greater than the diameter of the needle valve 13, so that the said valve can extend freely between them. These fingers 43a have their rear faces formed as portions of a common cylindrical surface having a horizontal axis intersecting the axis of the needle valve. When this presser plate is positioned against the said flat face portion of the main trigger portion with the lower end of the plate bearing against the shoulder T¹, a single screw 44, desirably clinched to the trigger proper, suffices for fastening it rigidly to the latter. Then when the trigger is retracted, the rear faces of the plate prongs 43a bear simultaneously against the tube head 32 substantially on a line diametric of that head, so as to effect an axial thrust on the slidable tube 31.

By using the above described features conjointly in a spray gun, we obtain the following advantages over the now commercial guns:

(1) A generally straight path of the air flow through the air inlet 1 of the forward body part and from the latter both through the longitudinal air passages in the material nozzle and to the side air passages of the air nozzle.

(2) A tightly sealed and firm mounting of the material nozzle, regardless of the fit of the threads on the shank of that nozzle.

(3) A circumferential distribution of the air behind and around the material nozzle through channels and chambers of ample size.

(4) A positive aligning of the air nozzle with the material nozzle regardless of a possibly inaccurate fitting of the threaded connection between the retaining ring 11 and the forward end of the body.

(5) A speedy replacing of the packing 19 around the needle valve, effected by having the plunger or gland 19 fastened to the cap 21.

(6) A rearward guiding of the needle valve which automatically adjusts itself to any lack of an exact axial straightness of that valve.

(7) A transmitting of the trigger pressure to a part of the needle valve far behind the trigger, so as to leave that valve free between the presser member 33 and the forward guide bore 22.

(8) Preventing dust from interfering with a free sliding of the presser tube 31, which we accomplish by the wipers 27.

(9) Insuring a non-tilting longitudinal thrust on this presser tube, by providing it with an enlarged forward head engageable by the convexed

finger portions 43a of the presser plate on the trigger.

(10) Guarding against a tampering with the needle valve adjustment. Since the cap 37 of the adjusting tube 36 has a smooth rear head, as shown in Fig. 12, the interior screw-driver receiving slot 37a on this cap is not exposed for tempting an inexperienced gun user to turn this cap.

However, we do not wish to be limited to the conjoint use of the here disclosed features of our invention, or to the heretofore described desirable details of construction and arrangement, since many changes could obviously be made without departing either from the spirit of our invention or from the appended claims.

We claim as our invention:

1. In a spray appliance, a body member, a trigger of light metal depending in front of the said body member, a longitudinally movable needle valve extending freely through the said trigger, a tube coaxial with and freely housing a part of the valve behind the trigger and having a diametrically enlarged frontal head part, the tube being supported by and longitudinally slidable with respect to the said body portion, and a hardened metal presser plate fastened to the rear face of the trigger and having an aperture through which the needle valve freely extends; the presser plate having thickened portions at opposite sides of the said aperture for simultaneously engaging portions of the tube head part at opposite sides of the axis of the latter part, which thickened portions have their rear faces convexed as portions of a common cylindrical surface which has its axis substantially intersecting the axis of the needle valve.

2. In a spray appliance, a body, a longitudinally movable needle valve extending rearwardly and axially into a bore in the said body; a digitally operable trigger depending in front of the said bore, a tubular guide socketed in the said bore, the said guide having the forward portion of its bore of smaller diameter than the rearward portion of that bore; a presser tube extending slidably through the forward bore portion of the said guide, the needle valve extending freely through both the trigger and the bore of the said tube, and the tube having its forward end portion adapted to be engaged by the trigger when the trigger is moved rearwardly from its inoperative position; and means disposed within the said guide rearwardly of the said tube for slidably guiding the rearward portion of the needle valve and for continuously urging the needle valve forwardly.

3. In a spray appliance, an assemblage as per claim 2, including an annular packing member sleeved upon the tube forwardly of the said guide, and means clamping the radially outward part of the packing member against the forward end of the said guide.

4. In a spray appliance, an assemblage as per claim 2, including two annular wipers disposed adjacent to the front end of the said guide, the radially inner portions of the two wipers diverging from each other radially of the said tube and having their bores bearing against the exterior of the tube; and an axially perforated cap threaded upon the said guide and clamping the radially outer portions of the wipers conjointly rearwardly against the guide.

5. In a spray appliance, a body, a longitudinally movable needle valve extending rearwardly and axially into a bore in the said body; a dig-

itally operable trigger depending in front of the said bore, a tubular guide socketed in the said bore; means slidable within a rearward part of the said guide and operatively fastened to the needle valve for supporting a rearward portion of the needle valve; and means for transmitting pressure from the trigger to the aforesaid means, the pressure-transmitting means including a presser tube extending slidably through the forward bore portion of the said guide, the needle valve extending freely through both the trigger and the bore of the said tube, and the tube having its forward end portion adapted to be engaged by the trigger when the trigger is moved rearwardly from its inoperative position.

6. A spray appliance as per claim 5, in which the said bore of the appliance body has its forward portion contracted in diameter to afford a rearwardly facing shoulder; and in which the guide slidably fits the said contracted bore portion and has a peripheral flange clamped against the said shoulder.

7. In a spray gun, a gun body, a horizontally and longitudinally movable needle valve slidably guided by a relatively forward part of the said body, a cylinder coaxial with the needle valve and into which the said valve extends, the said cylinder being supported by a rearward portion of the gun body, a presser head operatively fastened to the needle valve; a ring slidably disposed in the said cylinder and bearing forwardly against the presser head, the ring having a bore of larger diameter than the said valve, through which bore the needle valve extends; and spring means operatively interposed between the cylinder and the said ring for continually pressing the ring forwardly against the presser head so as to press the needle forwardly also; the said larger bore diameter of the ring permitting a radial sliding of the presser head with respect

to the said ring, for automatically adjusting the assemblage when the part of the needle valve carrying the presser head does not align axially with the part of the valve guided by the said forward gun body part.

8. In a spray appliance, an assemblage as per claim 7 in which the presser head is threaded upon the needle valve, and in which the assemblage also includes a locknut threaded on the said valve and normally bearing against the presser head; the locknut being of considerably smaller exterior diameter than the bore of the said ring, to allow for deviations between the positions of the axes of the ring and the locknut.

9. In a spray gun, a gun body, a horizontal cylinder supported by a rearward portion of the said body, a needle valve slidably guided by a forward portion of the said body and extending axially into the said cylinder presser head operatively fastened to the needle valve; a ring slidably disposed in the said cylinder and bearing forwardly against the presser head, the ring having a bore of larger diameter than the said valve, through which bore a part of the needle valve extends; and spring means operatively interposed between the cylinder and the said ring for continually pressing the ring forwardly against the presser head so as to press the needle forwardly also; the cylinder being threaded into the said gun body portion and detachable from the latter, and having an annular forward end; the bore of said end being smaller than the diameter of the said ring, and larger than that of the presser head, so that the cylinder, ring and spring assembly may be detached as a unit from the gun body without detaching the needle valve and presser head assembly.

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