June 1, 1937. A. F. JENKINS 2,082,061

SPRAY GUN

Filed Jan. 12, 1935 2 Sheets-Sheet 1

FIG. 1.

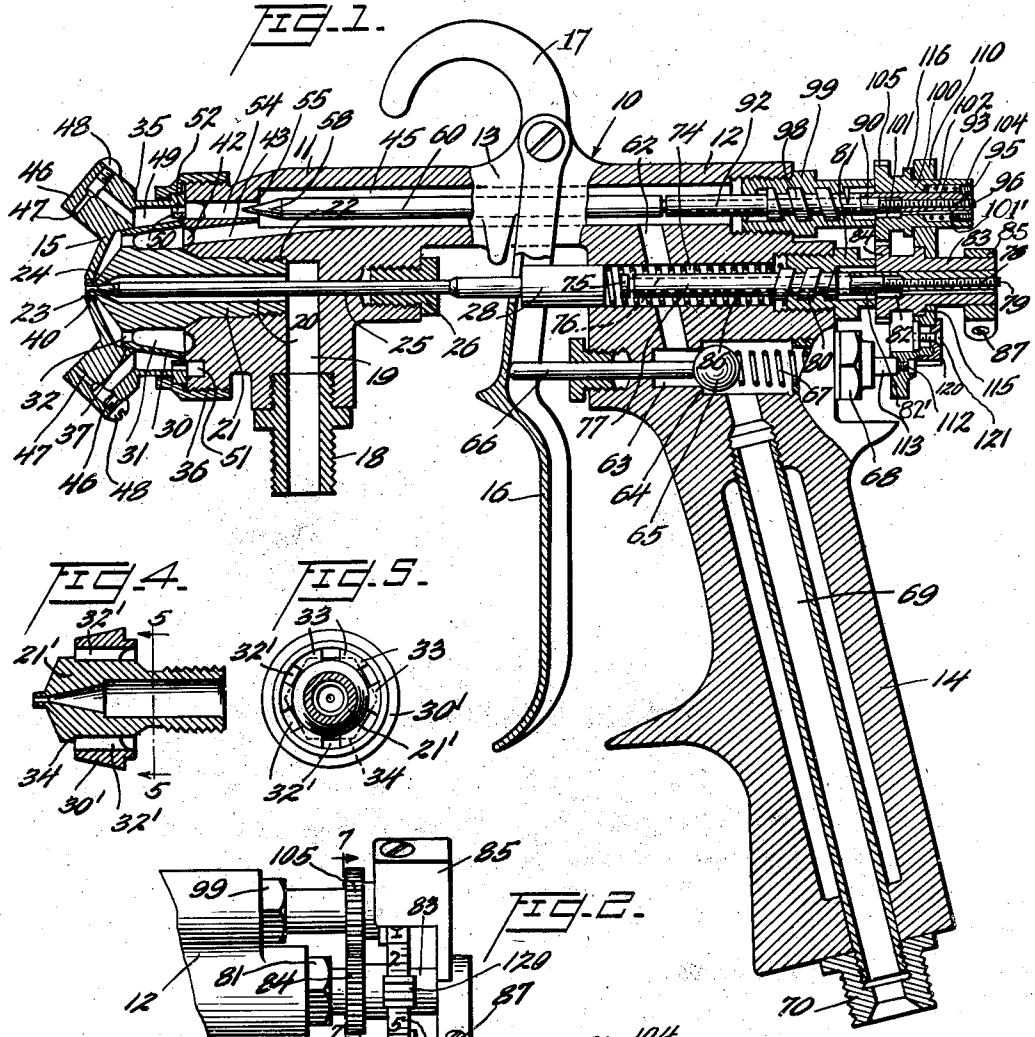


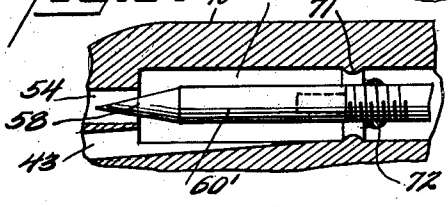
FIG. 4.

FIG. 5.

FIG. 2.

FIG. 3.

FIG. 6.



Inventor

A. F. Jenkins

By Watson, Coit, Grosz & Grindle.

Attys.

June 1, 1937. A. F. JENKINS 2,082,061

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Filed Jan. 12, 1935 2 Sheets-Sheet 2

FIG. 7.

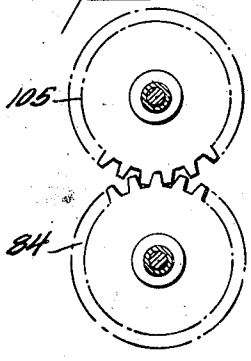

FIG. 8.

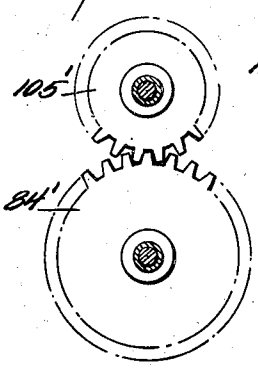

FIG. 9.

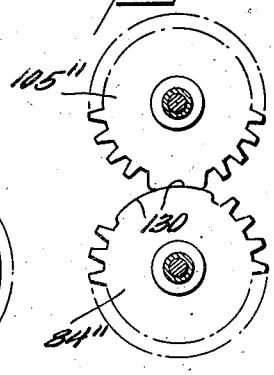

FIG. 10.

FIG. 11.

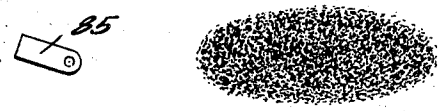

FIG. 12.

FIG. 13.

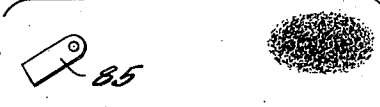

FIG. 14.

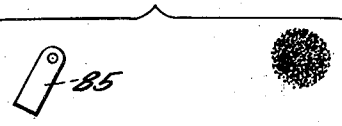

FIG. 15.

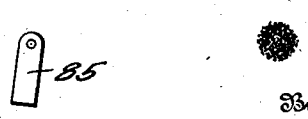

FIG. 16.

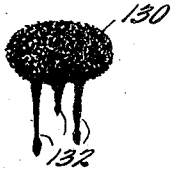

FIG. 17.

Inventor

A. F. Jenkins.

Watson, Coit, Grosz & Grindle

By

Attorney

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2,082,061

SPRAY GUN

Alexander F. Jenkins, Baltimore, Md.

Application January 12, 1935, Serial No. 1,554

10 Claims. (Cl. 299—140.1)

This invention relates to spray guns and the like and more particularly to devices of this character by means of which paint or similar liquid coating material may be sprayed by means of compressed air; such, for instance, as is disclosed in my copending application Ser. No. 714,766, filed March 9, 1934.

The general object of the present invention is to provide a novel and improved mechanism of the type described.

More specifically it is an object of the invention to provide novel valve setting or adjusting means for simultaneously controlling the rate of flow or volume of both the coating fluid and the compressed air supplied to the nozzle.

Another object of the invention is to provide novel means in conjunction with such synchronous or simultaneously operated valve adjusting or controlling means for independently and differentially altering the setting of the valve assemblies controlling respectively the coating fluid and air, so as to permit the delivery of these fluids in various predetermined proportions.

Other objects include the provision of means whereby the simultaneous adjustment of the valve assemblies or flow control mechanism may be effected in different ratios and also means for intermittently adjusting one of the valves during the continuous adjustment movement of the other by the common adjusting means.

The provision of novel and exceedingly convenient adjustable stop means for readily retaining the synchronous valve setting mechanism in any of a plurality of selected positions, constitutes another important feature of the invention.

Further objects and features of novelty will be apparent from the following specification when read in connection with the accompanying drawings in which certain embodiments of my invention are illustrated by way of example.

In the drawings:

Figure 1 is a substantially full size vertical longitudinal sectional view of a spray gun embodying the principles of my invention;

Figure 2 is a fragmentary view in side elevation of the rear end of the gun showing the valve adjusting mechanism;

Figure 3 is an end view of the same portion of the gun;

Figures 4 and 5 are views in vertical section and elevation respectively of a modified form of nozzle;

Figure 6 is a fragmentary view in vertical longitudinal section of a portion of the spray gun illustrating a modification in the air controlling means;

Figure 7 is a fragmentary view in transverse section illustrating the adjusting gearing and taken on line 7—7 of Figure 2;

Figures 8 and 9 are similar views illustrating modifications in the gearing;

Figures 10–15 inclusive are diagrams showing the relative shape and size of the area covered by a blast from the spray gun when the valve adjusting lever occupies the positions indicated; and also illustrating the effect of the proper proportioning of the coating material and air by means of my invention;

Figure 16 shows graphically the effect of a disproportionate regulation of the fluids in which there is an excess of coating material in the spray; and

Figure 17 illustrates the effect of an excess of air with relation to the coating material.

The spray gun indicated generally by the numeral 10 in the drawings comprises a body having a forward portion 11 and a rearward portion 12 connected by a narrow intermediate part 13. The gun is provided with the handle or grip 14, the spray nozzle indicated generally at 15 and a hook 17 for supporting the gun when not being used. During operation, the supplies of coating material and compressed air are turned on and off by means of the trigger 16 disposed conveniently with respect to the grip 14 and operatively associated with the supply valves later to be described. This trigger and its associated connections will be referred to in general as the actuating means for the gun in contradistinction to the controlling, regulating, or setting means employed in predetermining the flow of air and liquid which will presently be described.

Suitable connections are made with the nipple 18 for the introduction of the coating fluid to the forward portion 11 of the gun. From the nipple 18 the fluid passes through the vertical passageway 19 and then enters the horizontal passageway 20 drilled in the inner nozzle member 21 which is threaded as at 22 into the forward body portion 11. The front end of the nozzle portion 21 converges and forms a narrow opening 23 which is controlled by the needle valve 24 at the forward end of the elongated valve stem 25. Rearwardly the valve stem passes through the stuffing box 26 and carries upon its end the preferably cylindrical abutment member 28 which is adapted to be engaged by the trigger 16 in opening the coating fluid controlling needle valve. The member 28 is guided within a bore

located in the rear body portion and is resiliently urged forwardly toward valve closing position by spring means which will be later described.

The inner nozzle member 21 is surrounded by a skirt portion 30 which may be integrally formed therewith or comprised in a separate element. This portion encloses the air chamber 31 from which the air flows forwardly through the openings 32.

In Figures 4 and 5 there is illustrated an alternative nozzle structure in which separate members 30' are fitted to the outer periphery of the central nozzle member 21'. The grooves 32' take the place of the openings 32 in the prior embodiment, and the inner surfaces of the lands 33 fit snugly against the outer cylindrical wall of the member 21' and against the shoulder 34 of the hexagonal head of the member 21'.

A nozzle cap or head 35 is secured to the forward body portion 11 of the gun by means of the threaded collar 36. This cap is provided with shoulders which fit snugly against the tapering outer surface of the portion 30 as at 37. The front wall of the cap is provided with an opening which surrounds the projecting tip of the inner nozzle member 21 to provide the annular orifice 40 which provides a jet of propelling air for cooperating with the paint jet from the central opening 23. The propelling air enters the chamber 31 in the inner nozzle member from the annular groove 42 in the forward body portion 11 which is in communication with the source of supply by means of the inclined passageway 43 communicating with the longitudinal main air passage 45 leading from the rear body portion 12 of the gun. The nozzle cap 35 is provided with two diametrically oppositely disposed projections 46 which are drilled to provide the passageways 47 for the spray modifying air jets. The bores 47 are closed at their rearward ends by means of the screw plugs 48 and communicate with the chamber 49 provided between the cap 35 and the inner frusto-conical nozzle member 30. An inwardly directed flange 50 is seated against the forward face of the body member of the gun, covers the annular groove 51, and is provided with the air openings 52. The groove 51 receives the air from the passageway 54 which communicates with the main air passage 45 beyond the valve seat 55. This passage is controlled by the needle valve 58 carried at the forward end of the elongated valve stem 60.

The rear body portion 12 is provided with the passageway 62 which connects the common air passage 45 with the longitudinal bore 63. This bore is provided with a valve seat 64 with which the ball valve 65 cooperates. The valve 65 is carried on the rear end of the stem 66, the forward end of which is abutted by the trigger 16 in operating the gun. The ball valve is urged against its seat by means of the coil spring 67 which is seated rearwardly against the plug 68 which is threaded into the rear end of the gun. Rearwardly of the valve 65 the bore 63 is connected, through the conduit 69 which passes through the handle 14, with the nipple 70 which provides means for connecting the gun with an air hose leading from a suitable source of compressed air supply.

Thus far, it will be perceived that the needle valve 58 and the ball valve 65 together constitute an air flow controlling means for the gun, the needle valve 58 regulating the rate of flow to the spray modifying jets by adjusting the size of the opening at the valve seat 55, and the ball valve 65 having but a slight regulatory effect on the air flow, being employed primarily to start and stop the flow of air through the gun. The connection between the trigger 16 and the paint valve controlling abutment member 28 has already been described and it will now be seen that when the trigger is moved rearwardly this air control and the paint control will be simultaneously actuated.

In order to provide a finer regulation or adjustment of the total air flow, including both the so-called propelling air supply through the annular orifice 40 in the nozzle and the spray modifying or flattening air through the supplemental jets, an arrangement such as is illustrated in Figure 6 of the drawings may be employed. In this embodiment, the common passageway 45 is constricted as at 71 and there is threaded, or otherwise adjustably secured, upon the needle valve stem 60', the annular sleeve or enlargement 72. It will be readily seen that movement of the enlarged portion 72 past the constriction 71 will vary the opening through the passageway and thus control the total air flow to the nozzle.

It will also be understood that by the provision of appropriate adjustment or regulating means for the air modifying needle valve 58 and the paint needle valve 24, it will be possible to secure sprays of coating material of various shapes and sizes. Furthermore, by suitable means, individual relative adjustments or settings of the valve assemblies may be attained for materials of different viscosities and for various other purposes. With the relative individual control adjustments made, a simultaneous adjustment can be effected to obtain various cross-sectional shapes of sprays and different volumes of sprayed material. The mechanism provided for these purposes in connection with the present invention will now be described.

In the case of the exemplary embodiment illustrated herein, in order to control the extent of rearward movement of the paint controlling needle valve stem 25 and thus the rate or volume of flow, there is positioned within the bore 74, within which the abutment 28 is guided, a follower or stop head 75 carried by a stem 76 which is received within and guided by the sleeve 77. The rear end of the stem 76 is provided with an attenuated portion 78 which is threaded within the narrowed rear portion of the sleeve 77. It will thus be seen that there is provided, in effect, a telescoping or extensible follower or stop member which may be shortened or lengthened by relative rotation which may be effected by the application of a suitable tool to the end 79 of the stem 78. With a given position of the sleeve 77 the shortening or lengthening of the element by the projection or retraction of the head 75 will afford an individual setting of the control means for the paint valve stem 25. The outer sleeve member 77 of the adjustable stop is provided with the threads 80 of relatively great lead or pitch, whereby it engages corresponding threads in the plug 81 which is screwed into the rear end of the bore 74. The plug 81 also serves as the rear seat for the coil spring 86 which bears against the abutment member 28. A key 82 is rigidly secured in a bushing 83 and the rearward portion of the sleeve 77 is provided with an elongated key-way 82' for the reception of the key 82, whereby the members 77 and 83 may have relative longitudinal motion but must rotate at the same time. The bushing 82 is provided with

the gear portion 84 and the manipulating handle 85, the handle being bifurcated and clamped to the extreme end of the bushing 83 as by means of the screw 87.

The adjusting mechanism for the modifying air needle valve 58 associated with the stem 60 or 60' for controlling the air flow is very similar to that just described in connection with the paint valve. The rearward portion 90 of the stem 60 is narrowed and is received within the elongated sleeve 92, which is provided with an internally threaded portion 93 adapted to receive the attenuated threaded end 95 of the valve stem. This construction provides an individual adjustment of the air valve 58 which may be effected by applying a tool at the end 96 of the valve stem. The sleeve member 92 is provided with the quick acting threads 98 which cooperate with the internally threaded plug member 99 secured within the rear end of the air conduit 45. It will be noted here that the threads 98 are of opposite hand to the corresponding threads 80 of the paint valve control assembly. A bushing 100 is keyed to the sleeve member 92 by means of the key 101 which is guided in the key-way 101' formed in the sleeve member 92. The bushing 100 is urged forwardly upon the member 92 so as to abut the extended rear end of the plug 99, by means of the coil spring 102 which is seated against the nut 104 threaded upon the rear end of the sleeve 92. The bushing 100 carries the gear 105 which may be formed integrally therewith and which meshes with the gear 84 carried by the sleeve 83 of the paint valve adjusting mechanism. It will thus be seen that rotation of the paint control bushing 83 with its gear 84 will cause a corresponding rotation of the air control bushing 100 but in the opposite direction and the respective threaded sleeves 77 and 92 will be moved forwardly or rearwardly together with their air and paint modifying portions, these portions being individually adjustable as already described.

Novel adjustable stop and gauging means are provided whereby the degree of adjustment of the valve controlling members may be readily indicated and settings frequently employed may be readily and accurately remade after intervening adjustments have been effected.

For these purposes, and also to provide a supporting or enclosing means for certain of the controlling members, a bracket 110 is applied to the projecting ends of the bushings 83 and 100 and secured in position as by means of the set screw 112 which is threaded into the post 113 carried by the lowermost plug 68. Flanges 115 and 116 formed respectively on the bushings 83 and 100 serve to maintain the relative positions of the bracket 110 and the controlling elements. The larger circular portion of the bracket 110 shown best at 118 in Figure 3, is provided with the graduations 119 which indicate the setting of the handle member 85. Adjustable stop members 120 may be positioned at various points along the graduated portion 119 as by means of the bolt and nut connections 121 which pass through the arcuate opening 122 in the member 118. These stop members are provided with notches 123 adapted for the reception of the resiliently projected pawl 124 carried within the handle member 85. It will be readily seen that upon rotation of the handle 85 the pawl 124 will snap into and out of the notches 123 of the stop members 120, and thus the desired settings may be accurately secured at these points merely by the sense of touch, and frequently recurring settings will be repeatedly attained with great accuracy. The lowermost stop or retaining member 120 may be provided with a projecting lug 125 which will positively prevent further movement of the handle 85 beyond this setting.

In Figure 7, the gearing 84 and 105 are shown just as illustrated in the previously described figures. However, this gearing may be modified to secure certain desired results. In Figure 8 the gears 84' and 105' are of a different diameter and thus a differential adjustment of the paint valve and the spray modifying valve assemblies may be obtained by the single manipulative means. In Figure 9 the gears 84'' and 105'' are provided with toothless portion 130 whereby an intermittent operation of one with respect to the other may be attained. By this means both flow regulating means may be adjusted through a certain portion of the movement of the handle 85 and one only through other portions of its movement.

Figures 10–15 inclusive illustrate the nature of the spray obtained by various adjustments of the handle 85 when gears 84 and 105 of the same diameter are employed. When the handle is in its uppermost position as shown in Figure 10 a very broad evenly distributed spray is obtained which covers considerable area. Successive downward adjustments of the handle 85 produce correspondingly narrowed spray forms until a point may be reached at which the modifying spray is entirely cut off and a small circular spray is attained. Of course, the shape and size of the successive spray patterns obtained by rotating the handle 85 may be modified by the individual adjustments of the paint and air valves by altering the extensibility of the stem and follower members described. This is necessary, for example, when a change is made from a coating liquid of one viscosity to one of another viscosity.

A graphic illustration of the results of the faulty regulation of the relative quantities of coating liquid and air supplied to the nozzle is found in Figures 16 and 17. In the case of the sprayed area 130 shown in the former figure, the flow of coating material is too great with respect to the flow of air and the excess paint forms a thick coating which spreads, drips, or runs as indicated at 132. In spraying the area 133 of Figure 17, there was a deficiency of paint or an excess of air and as a result the coating fluid was practically blown away and only a faint thin coating was applied. Such difficulties as these are common faults attendant upon the hit-or-miss individual adjustments common to the spray guns in general use today.

Various changes and modifications may be made in the embodiments illustrated and described herein without departing from the scope of the invention as defined in the following claims. Also, the device described may be employed for the spraying of various liquids, the term "paint" being used in an exemplary sense only.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A spraying device of the class described comprising, in combination, a body portion provided with a nozzle and liquid and air passageways leading thereto, means for regulating the rate of flow through each of said passageways, means for controlling the starting and stopping

of flow through said passageways, actuating means for said last named means; said regulating means comprising a longitudinally movable needle valve in said air passageway, a member connected with said valve and threaded within said body portion, a longitudinally movable valve in said liquid passageway and a movable abutment member for limiting the extent of opening of said liquid valve, said movable abutment member also being threaded within said body portion, said abutment member and said movable air valve connected member being geared together for simultaneous rotation, and a common manipulative means connected with the gearing for effecting a synchronized adjustment of both valve mechanisms.

2. A spraying device of the class described comprising, in combination, a body portion provided with a nozzle and liquid and air passageways leading thereto, means for regulating the rate of flow through each of said passageways, means for controlling the starting and stopping of flow through said passageways, actuating means for said last named means; said regulating means comprising a longitudinally movable needle valve in said air passageway, a member connected with said valve and threaded within said body portion, a longitudinally movable valve in said liquid passageway and a movable abutment member for limiting the extent of opening of said liquid valve, said movable abutment member also being threaded within said body portion, said abutment member and said movable air valve connected member being geared together for simultaneous rotation, a common manipulative means connected with the gearing for effecting a synchronized adjustment of both valve mechanisms, said abutment and said air valve controlling member each being longitudinally extensible, and separate means respectively embodied in said members for extending and contracting them whereby individual settings of said valve mechanisms may be effected.

3. A spraying device of the class described comprising, in combination, a body portion provided with a nozzle and liquid and air passageways leading thereto, a valve in the air passageway, a needle valve in the liquid passageway, a trigger operatively connected with each of said valves for actuation to start and stop the flow of fluid through said passageways, means for regulating the rate of flow through each of said passageways, the regulating means for the air comprising a third valve disposed in said air passageway and a member longitudinally movable with respect to the body portion of the device for setting said valve at adjusted degrees of opening, the regulating means for the liquid including an abutment member movable with respect to said body portion so as to be disposed at adjusted limiting positions in the path of movement of said needle valve, common means for simultaneously moving said first named member and said abutment member to effect synchronous setting of both of said regulating means for predetermined rates of flow to be effective upon operation of said actuating means to start flow through said passageway.

4. A spray gun for the application of coating material or the like to surfaces, in which the density of spray and shape of the spray pattern may be varied in accordance with the work to be done, comprising in combination a body portion provided with a nozzle and liquid and air passageways leading thereto, means for regulating the rate of flow through each of said passageways in order to determine the density of the spray and the shape of the spray pattern in accordance with the nature of the coating to be applied, means for effecting the starting and stopping of flow through said passageways, a trigger member for actuating said last named means, and a common means independent of said trigger member operating directly upon both of said flow regulating means to set them for predetermined rates of flow to be effective upon operation of said actuating trigger member to start flow through said passageways.

5. A spray gun for the application of coating material or the like to surfaces, in which the density of spray and shape of the spray pattern may be varied in accordance with the work to be done, comprising in combination a body portion provided with a nozzle and liquid and air passageways leading thereto, means for regulating the rate of flow through each of said passageways in order to determine the density of the spray and the shape of the spray pattern in accordance with the nature of the coating to be applied, means for effecting the starting and stopping of flow through said passageways, a common actuating member for said last named means, and a common means operating directly upon both of said flow regulating means to set them for predetermined rates of flow to be effective upon operation of said actuating means to start flow through said passageways, each of said flow regulating means including means for individually setting them independently of said common setting means.

6. A spray gun for the application of coating material or the like to surfaces, in which the density of spray and shape of the spray pattern may be varied in accordance with the work to be done, comprising in combination a body portion provided with a nozzle and liquid and air passageways leading thereto, means for regulating the rate of flow through each of said passageways in order to determine the density of the spray and the shape of the spray pattern in accordance with the nature of the coating to be applied, means for effecting the starting and stopping of flow through said passageways, a common actuating member for said last named means, the regulating means for each passageway including a rigid, extensible and contractible member one end of which is movable to effect said regulation and also including means for extending and contracting said member for effecting an individual setting of said regulating means, and a common means operating directly upon said extensible and contractible members for simultaneously moving both of them bodily for attaining a synchronous setting for both of said flow regulating means for predetermined rates of flow to be effective upon operation of said actuating means to start flow through said passageways.

7. A spray gun for the application of coating material or the like to surfaces, in which the density of spray and shape of the spray pattern may be varied in accordance with the work to be done, comprising in combination a body portion provided with a nozzle and liquid and air passageways leading thereto, means for regulating the rate of flow through each of said passageways in order to determine the density of the spray and the shape of the spray pattern in accordance with the nature of the coating to be applied, means for effecting the starting and

stopping of flow through said passageways, a common actuating member for said last named means, the regulating means for each passageway including a rigid extensible and contractible member one end of which is movable to effect said regulation, each of said members comprising telescoping elements one threaded within the other, each of said members also including means for rotating one of its elements with respect to the other thus independently extending or contracting said members whereby individual adjustments of the rate of flow of the paint and air respectively may be obtained, each of said members being threaded into said body portion, a common manipulating means for simultaneously rotating both of said members with respect to said body portion, whereby by means of said threaded connection both of said members are bodily advanced or retracted for attaining a synchronous setting for both of said regulating means for predetermined rates of flow to be effective upon operation of said actuating means to start flow through said passageways, and means for preventing rotation of said members with respect to said body portion during such individual adjustment.

8. A spray gun for the application of coating material or the like to surfaces, in which the density of spray and shape of the spray pattern may be varied in accordance with the work to be done, comprising in combination a body portion provided with a nozzle and liquid and air passageways leading thereto, means for regulating the rate of flow through each of said passageways in order to determine the density of the spray and the shape of the spray pattern in accordance with the nature of the coating to be applied, means for effecting the starting and stopping of flow through said passageways, a common actuating member for said last named means, the regulating means for each passageway including a rigid, extensible and contractible member one end of which is movable to effect said regulation, each of said members comprising telescoping elements one threaded within the other, each of said members also including means for rotating one of its elements with respect to the other thus independently extending or contracting said members whereby individual adjustments of the rate of flow of the paint and air respectively may be obtained, each of said members being threaded into said body portion, gears mounted on each of said members and directly meshing with each other, said gears thus connecting said members together for simultaneous rotation with respect to the body portion, and manually operable means connected with one of said members for effecting said rotation, whereby by means of said threaded connection both of said members are bodily advanced or retracted for attaining a synchronous setting of both of said flow regulating means for predetermined rates of flow to be effective upon operation of said actuating means to start flow through said passageways.

9. A spray device as set forth in claim 8 in which said gears are of the mutilated type whereby intermittent operation of one of said members may be effected during operation of the other of said members.

10. A spray gun for the application of coating material or the like to surfaces with a predetermined density of spray and shape of the spray pattern, comprising in combination a body portion provided with a nozzle and liquid and air passageways leading thereto, means for regulating the rate of flow through each of said passageways in order to control the density of the spray and the shape of the spray pattern in accordance with the nature of the coating to be applied, means for effecting the starting and stopping of flow through said passageways, a common actuating member for said last named means, the regulating means for each passageway including a rigid, extensible and contractible member one end of which is movable to effect said regulation each of said members comprising telescoping elements one threaded within the other, each of said members also including means for rotating one of its elements with respect to the other thus independently extending or contracting said members, whereby individual adjustments of the rate of flow of the paint and air respectively may be obtained, each of said members being threaded into said body portion, a common manipulating means for simultaneously rotating both of said members with respect to said body portion, whereby by means of said threaded connection both of said members are bodily advanced or retracted for attaining a synchronous setting for both of said regulating means for predetermined rates of flow to be effective upon operation of said actuating means to start flow through said passageways, adjustable detent means carried by said body portion with which said manually operable means may be engaged for setting the latter in positions of frequent use and also for holding the common regulating means stationary during manual setting of the individual adjustments.

ALEXANDER F. JENKINS.