Feb. 22, 1938. F. SCHORI 2,108,998

APPARATUS FOR FUSING AND SPRAYING PULVERIZED SUBSTANCES

Filed March 12, 1935 2 Sheets-Sheet 1

Fig. 1.

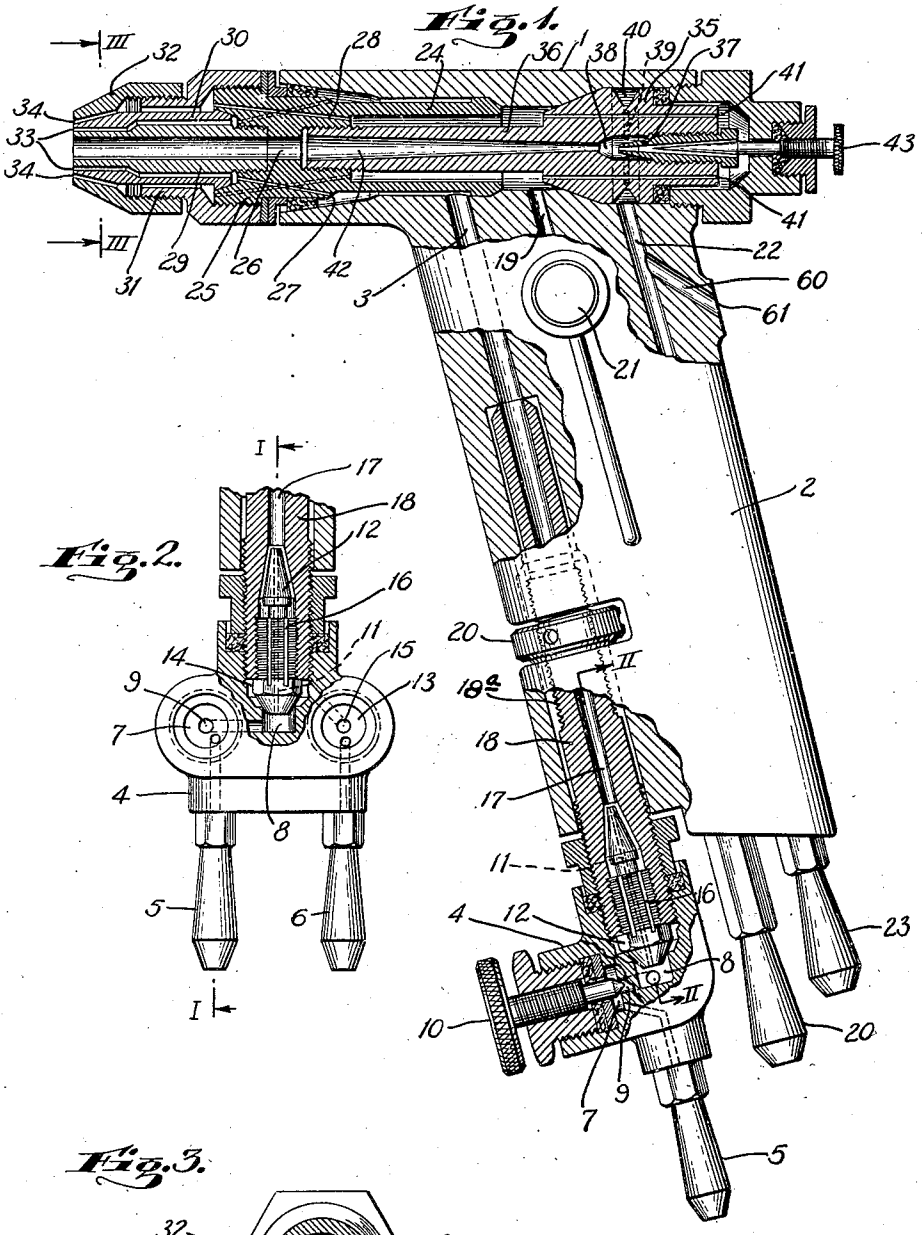
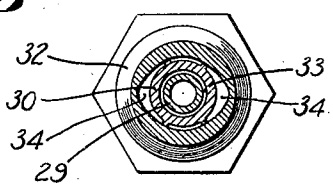


Fig. 2.

Fig. 3.



Fritz Schori
INVENTOR

BY Jeffery Kimball & Eggleston
ATTORNEYS

Feb. 22, 1938. F. SCHORI 2,108,998

APPARATUS FOR FUSING AND SPRAYING PULVERIZED SUBSTANCES

Filed March 12, 1935 2 Sheets-Sheet 2

Fig. 4.

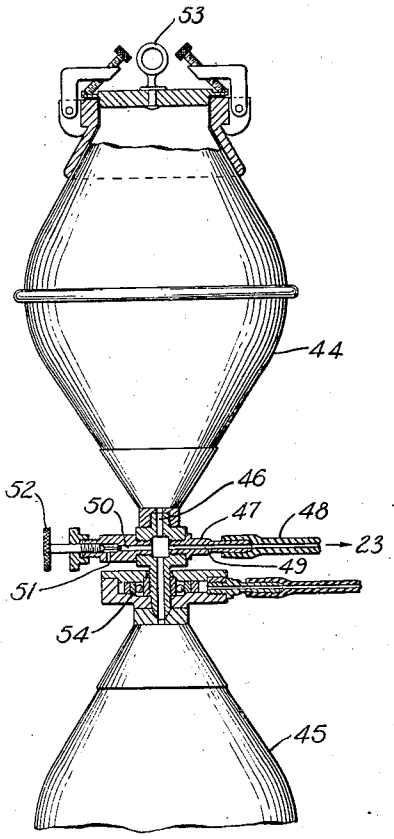
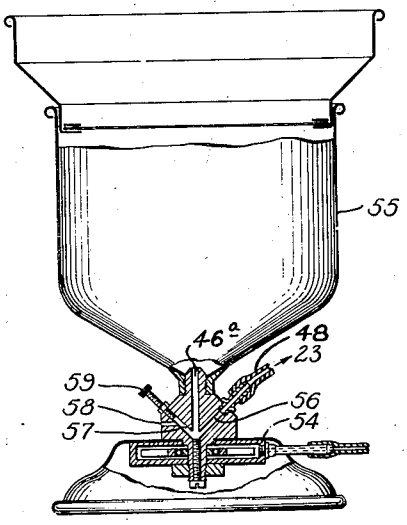


Fig. 5.



Fritz Schori
INVENTOR

BY Jeffrey Kimball & Eggleston
ATTORNEYS

Patented Feb. 22, 1938

2,108,998

UNITED STATES PATENT OFFICE

2,108,998

APPARATUS FOR FUSING AND SPRAYING PULVERIZED SUBSTANCES

Fritz Schori, Wetzikon, Switzerland

Application March 12, 1935, Serial No. 10,725
In Belgium March 12, 1934

12 Claims. (Cl. 91—12.2)

The invention relates to coating apparatus of the kind whereby fusible materials, such as metallic powders, are flame-sprayed on to the surface to be coated, and consists in various improvements which while capable of more general application are particularly concerned with the type of such apparatus as is disclosed in my prior Patent No. 1,781,603 of November 11, 1930, reissued June 22, 1937, No. 20,425, that is to say apparatus consisting generally of a hand sprayer device hose-connected to appropriate sources of supply of the spray components but itself adapted for ready manipulation to meet the exigencies of the work. The present improvements concern especially the organization of the spray device, to the end of providing for better control of the spray and its components, and also the provision of improved means for ensuring an appropriate powder supply for such device, all as more particularly set out in the ensuing description.

In the accompanying drawings Fig. 1 is a part sectional view of a preferred form of spray device embodying the invention; Fig. 2 is a view, part-sectional on the line II—II of Fig. 1; Fig. 3 is a section, somewhat enlarged, on the line III—III of Fig. 1; Fig. 4 illustrates a preferred form of powder receptacle and Fig. 5 a modified form of receptacle.

The hand apparatus illustrated is preferably of pistol form, comprising generally the barrel section 1 and handle 2, the latter containing supply passages for the several spray ingredients and the former organized to distribute and direct such ingredients to the point of discharge.

Passage 3 in the handle supplies the combustion fluid, such as a mixture of oxygen and acetylene, by way of a mixing unit indicated at large by the reference 4. This unit comprises a body portion having nipples 5 and 6 to receive hose connections from gas bottles or appropriate sources of supply of oxygen and acetylene, respectively. As shown in Figs. 1 and 2, the oxygen supplied to nipple 5 enters chamber 7 and passes into chamber 8 by way of port 9, as determined by the setting of valve 10. From chamber 8 it passes through a central bore 11 in plug 12. The acetylene supplied to nipple 6, enters chamber 13 and passes into chamber 14 by way of port 15 under the control of a valve similar to valve 10. From chamber 14 it passes through slots 16 in the outer, threaded surface of plug 12 and discharges around the upper end of the plug, thoroughly mingling with the oxygen discharging through bore 11 and, with it, discharging into an expansion chamber 17 formed in stem 18. By this arrangement the tendency for backfiring to occur in the handle of the piston is reduced to a minimum.

Stem 18 is threaded throughout a portion of its length, as at 18a, and by means of nut 20 is drawn up tight in the pistol handle, which construction also permits of the removal of the mixing unit bodily, as for cleaning or inspection, without disturbing the adjustment of oxygen valve 10 or its companion valve for the acetylene.

Passage 19 in the handle terminates at its lower end in a nipple 20 for hose connection to another source of fluid under pressure, preferably and hereinafter referred to as compressed air, which is supplied to the pistol, through passage 19 and under the control of a shut-off valve 21, for the purposes below described.

Passage 22 formed in the handle parallel to the passage 19 is connected by its nipple 23 and a hose (48) with the supply of the fusible powder to be sprayed.

In the barrel portion of the pistol is seated a distributing sleeve 24 the head 25 of which has a central bore 26 and two sets of ducts marked 27 and 28, respectively, and at the forward end of head 25 are mounted spaced concentric sleeves 29, 30 and 31, the last-mentioned carrying the nozzle cap 32. As thus organized, the gas supplied by way of passage 3 flows through ducts 27 and emerges at the annular flame orifices 33. Surrrounding the flame orifice is an outer orifice 34 to which compressed air is supplied from passage 19 by way of ducts 28, the air sheath thus formed increasing the projection velocity of the enveloped spray. Furthermore and as shown in Fig. 3, the air sheath orifice is preferably of elliptical form, whereby the advantage is secured that the larger volume of air discharged at the sides of the flame serves to flatten the latter, permitting a brush-like application of the spray and ensuring maximum coverage, with uniformity.

According to my invention a portion of this same air supply is applied to still another purpose, viz. the transportation of the powder to the pistol, as will now be explained.

At the rear of the barrel portion of the pistol is inserted an aspirator unit consisting of a body portion 35 having a forwardly extending stem 36 which is threaded into the head of sleeve 24. An aspirator nozzle 37 projects into a suction chamber 38 which is connected by ducts 39 with an annular groove 40 into which passage 22 discharges. The body portion of the aspirator unit

is also traversed by ducts 41, by which a portion of the compressed air supplied to the pistol by way of passage 19 is conducted to the aspirator, whence it is discharged into and through the central bore 42. A suction flow is thus induced in passage 22, by which the powder to be sprayed is drawn from the source of supply into the suction chamber, whence it is projected, with the aspirator air, through the central bore into the center of the flame.

The air flow through the aspirator nozzle and, accordingly, the suction applied to passage 22, may be adjusted as required by needle valve 43, and this adjustment is accomplished without of itself materially affecting the proportions of the flame and air components of the spray, as will be apparent. In this connection it will be seen that all of the spray components are capable of adjustment into a fixed relationship the one with the other, to produce a desired flame and a continuously uniform flame-spray, dependent, of course upon the admission to it of a correspondingly uniform supply of powder.

In this latter regard the invention contemplates the use of the principle disclosed in my said prior patent, viz. of placing adjacent, but outside of the body or mass of powder a hole or holes by which air is admitted to satisfy the suction created by the pistol and thereby produce a suction-induced air stream for transporting the powder to the flame at a non-fluctuating rate, but according to this invention such powder-bearing air current and also the powder receptacle are organized for better and quicker control of the delivery of powder to the flame without tendency to overfeed the powder upon the resumption of the air current after an interruption.

In the preferred form illustrated in Fig. 4, the powder is contained in a double chamber or hour-glass type of receptacle, formed by the two conical cans 44 and 45 connected by a narrow passage or throat 46 which may be provided with a shut off valve (not shown) and which permits a continuous gravity feed from the upper to the lower can. The throat is provided with a horizontal outlet duct 49 terminating in a nipple fitting 47 by which it is connected by hose 48 to the pistol nipple 23. It is also provided with an air inlet duct 50 to which air is admitted by way of port 51 under the control of valve 52. The air from this entrance passes across the throat and forms the air stream by which the powder is borne to the flame through hose 48. It falls through the throat from the upper can and is picked up by this air stream so long as the stream is allowed to flow and such of it as is not thus picked up continues on through into the lower can. Each end of the receptacle may be provided with a hook 53 by which it may be suspended and by means of which it can be reversed end for end when the upper can becomes exhausted thus to utilize the powder that was not picked up by the air stream. As in my said prior patent an unbalanced air motor may be provided to agitate the container and thereby ensure a uniform flow of powder, and such a device is shown at 54.

In Fig. 5 a single powder receptacle 55 is shown, likewise adapted to be agitated by a motor 54, but in this form the flow of the powder does not continue during the interruptions of the air-stream flow. The receptacle discharges through a narrow throat 46a directly into the V-junction of two angularly related passages 56 and 57. The former of these is connected to the pistol by way of the hose 48 and the other is for the admission of air by way of the vent 58 controlled by the valve-screw 59. Together they constitute part of the path for the conveyor air stream that flows to the pistol and they are of about the same diameter as the throat. Because of their relatively steep angle they do not fill up with powder descending from the receptacle, on the cessation of the air flow, to such an extent as to form an objectionable slug of powder to pass into the pistol on the resumption of the live flow. Thus in both forms of receptacle the powder-carrying air stream can be stopped and started as desired without resulting in an initial overfeed of powder.

The stopping and starting of the powder-carrying air stream, which is normally necessary from time to time in the progress of the work, is controlled in a simple manner and without disturbing the flame characteristics or requiring the repeated adjustment of any of the control valves. This is accomplished by providing an alternative or second air admission passage by which to satisfy the suction that is produced by the aspirator in the pistol, and which takes the form of an air duct 60, constituting a branch of passage 22, and terminating in a port 61 located at the rear of the pistol handle in position to be covered or uncovered at will by the thumb of the operator holding the pistol. When the port is uncovered the aspirator suction is satisfied by air entering direct from atmosphere through duct 60 thereby so reducing the suction effect in the hose 48 as to render it substantially ineffective to convey powder to the pistol. Restoring the thumb on the hole 61 causes resumption of the powder feed to the pistol and in either case substantially the same amount of air will flow to the flame spray.

I claim:

1. Coating apparatus comprising a flame-spraying device for fusible powder having passages therein to conduct and discharge the spray components, including a passage adapted for connection at its entrance end to a supply of air under pressure and having two branches separately leading to the point of flame discharge of the apparatus, fusible powder supply means associated with but one of said branches, and another passage separately leading to the point of flame discharge and adapted for connection to a combustible mixture supply.

2. Coating apparatus comprising a flame-spraying device containing passages for the spray components conducted thereto under pressure and including an aspirator, means for diverting part of the flow of one of said pressure spray components through said aspirator for the operation thereof, and thence to the spray, the remaining part of said component passing direct to the spray, a fusible powder supply passage subject to the suction created by said aspirator and a fusible powder container provided with means for constant rate delivery of the powder into said suction supply passage.

3. Coating apparatus comprising a flame-spraying device having means forming an annular, flame discharge orifice, a central passage and an outer, annular orifice, a passage in the device communicating with said flame orifice and adapted for connection to a combustible medium supply, a second passage in said device adapted for

connection to a compressed air supply, aspirator means adapted to discharge into said central passage, a suction passage subject to the action of the aspirator means, means for feeding powder to the suction passage for delivery therethrough by the aspirator-induced suction, and means whereby a portion of the compressed air supplied to said second passage is discharged through said outer, annular orifice and means for discharging the balance of such air through aspirator means.

4. The combination of a flame-spraying device having aspirator means therein, means forming a passage subject to the suction of said aspirator means, and having an air admission port whereby a stream of air therethrough is induced by said aspirator means, and a receptacle for a supply of fusible powder comprising upper and lower containers having means forming a passage connecting the same to permit gravity flow of powder from one container to the other, such passage and the first mentioned passage intersecting one another, whereby the suction-induced air stream intersects the path of the falling powder and such powder as is not picked up by the air stream falls through into the lower container.

5. The combination of a flame-spraying device having aspirator means therein, means forming a passage subject to the suction of said aspirator means, an air duct including a downwardly inclined portion and an adjacent, upwardly inclined portion, a container for a supply of powder having an outlet arranged to permit gravity discharge of the powder therefrom at the junction of said duct portions, a hose connection from said upwardly inclined portion to said passage, and means for controlling the aspirator-induced suction in such passage.

6. Coating apparatus comprising in combination a flame-spray pistol adapted to discharge fluid ingredients supplied thereto under pressure, aspirator means associated with said pistol and adapted for operation by one of said ingredients, a container for a body of fusible powder to be sprayed, a powder supply passage subject to the suction of said aspirator means, means for conducting the powder from its container into the air stream induced in said passage by said aspirator means, and means for starting and stopping the flow of powder through said passage comprising an air admission port for said passage adapted to be normally closed by the hand holding said pistol and located intermediate the aspirator and the point of discharge of powder into the passage, said port having a capacity adapted to satisfy substantially the whole of the aspirator suction.

7. Coating apparatus comprising in combination a flame-spray pistol adapted to discharge fluid ingredients supplied thereto under pressure, aspirator means associated with said pistol and adapted for operation by one of said ingredients, a container for a body of fusible powder to be sprayed, a powder supply passage subject to the suction of said aspirator means, a port located to admit air to said last mentioned passage other than through the body of powder in said container, means for conducting the powder from its container into the stream of air entering said port and flowing through said passage under the suction induced by said aspirator means and means for starting and stopping the flow of powder through the passage comprising an air admission port for said passage adapted to be normally closed by the hand holding said pistol and located intermediate the aspirator and the point of discharge of powder into the passage, said port having a capacity adapted to satisfy substantially the whole of the aspirator suction.

8. Coating apparatus of the character described including a powder supply device comprising two containers connected by passage means, a spray pistol, feed conduit means for the pistol connected to said passage means, and means for supporting said powder supply device with either container uppermost.

9. Apparatus as in claim 2 having three spray component passages concentrically arranged at the spray orifice, the outermost passage conducting air and being of elliptical form to give a flattened spray.

10. Coating apparatus comprising a flame-spraying pistol containing passages for fuel gas and compressed air and including an aspirator, means for diverting part of the compressed air flow in one of said passages through said aspirator for the operation thereof and thence to the spray, the remainder of such compressed air passing direct to the spray, a powder supply passage subject to the suction created by said aspirator, a container for fusible powder having constant rate delivery means into said suction supply passage, said latter passage having two entrances for atmosphere, one being located beyond the point of connection thereof with said container and the other being on the pistol under the operator's control and adapted when open to satisfy the whole suction demand of said aspirator.

11. Coating apparatus as described comprising a flame-spray device in the form of a pistol containing passages for the several spray components, all having their entrance ends in the handle end of the device and one being a combustible mixture passage, a fuel and air mixing device having hose connections respectively for its supplies of fuel and air and means for removably attaching said mixing device to the pistol handle in communication with said combustible mixture passage.

12. Coating apparatus comprising a flame-spraying device containing passages for pressure spray components and including an aspirator, means for diverting part of the flow of one of said spray components through said aspirator for the operation thereof and thence to the spray, the remaining part of said component passing direct to said spray, and a fusible powder supply passage subject to the suction created by said aspirator, in combination with stopping and starting means comprising an air entrance to said aspirator suited for satisfying the whole suction demand thereof.

FRITZ SCHORI.