

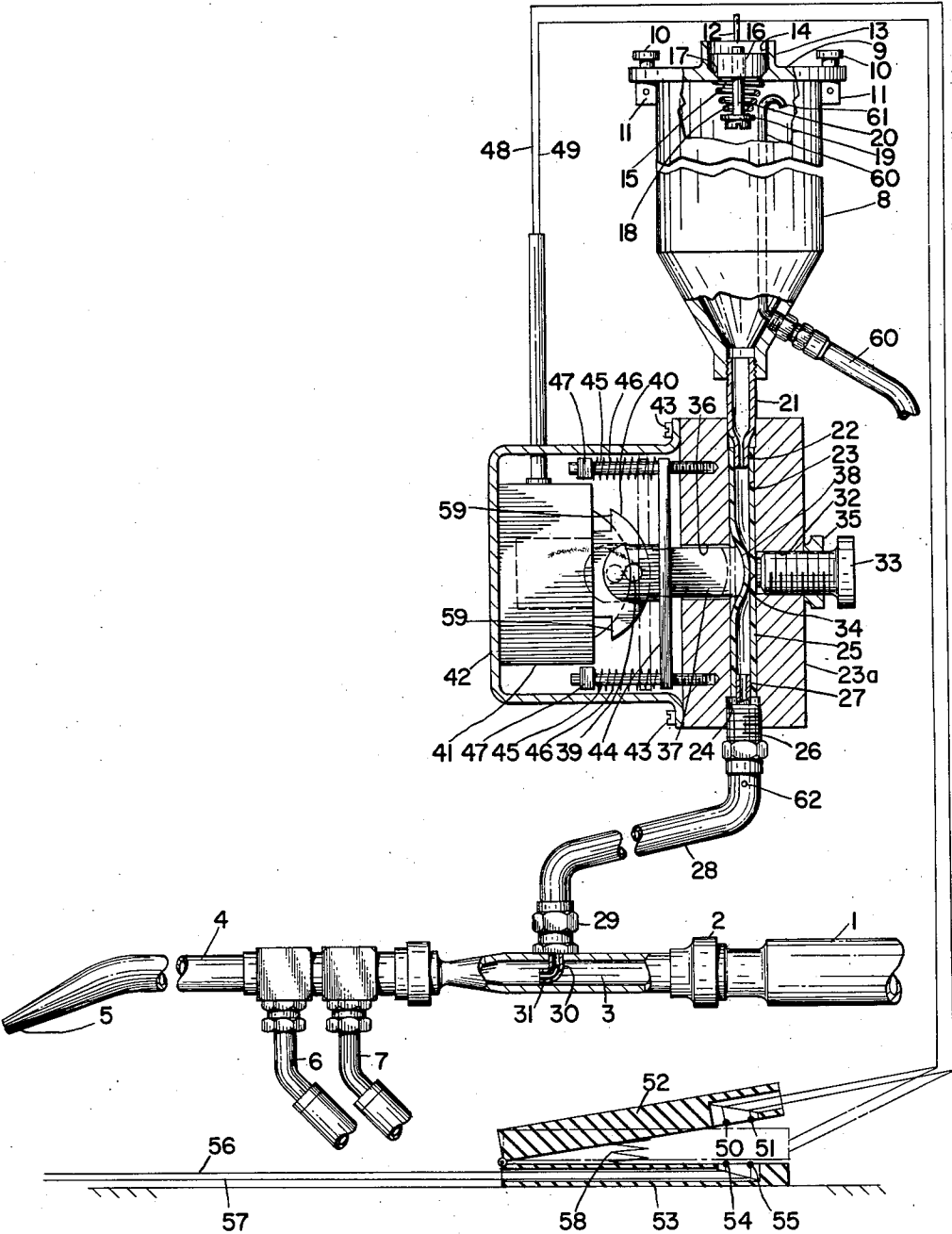
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APPARATUS FOR DEPOSITING POWDERED METALS

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APPARATUS FOR DEPOSITING POWDERED METALS

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This invention relates generally to methods of and apparatus for depositing powdered metals, but has reference more particularly to an apparatus for this purpose which has been designed especially to deliver powders at points which are inaccessible with ordinary spray guns, as for example, the interior surfaces of valves, tubes and the like.

A primary object of the invention is to provide a spray gun of the character described, in which the delivery of the powder is assisted by auxiliary gas pressure, whereby the delivery of the powder to the point or area of application or deposition is assured.

Another object of the invention is to provide a spray gun of the character described, in which electrically controlled means are incorporated for controlling the flow of powder to the gun.

A further object of the invention is to provide a spray gun of the character involved, having desirable safety features incorporated therein.

Other objects and advantages of my invention will be apparent in the course of the following description, taken in connection with the drawing, which forms a part of this specification.

Referring more particularly to the drawing, there is disclosed an oxy-fuel gas blowpipe or torch, comprising a handle or butt 1, a gas mixing chamber 2, in which the oxygen and a fuel gas, such as acetylene, are mixed, to form a combustible mixture, the mixture flowing through a passageway 3, into a nozzle 4 provided with a downturned tip 5. The passageway 3 is thus continuous from the mixing chamber 2 to the end of the tip 5. The nozzle, including the tip, are cooled by means of water, which is supplied and removed by means of water lines or conduits 6 and 7 respectively.

The apparatus further includes a hopper 8 which contains the powdered metal which is to be deposited. This hopper is provided with a cover 9 which is designed to be clamped into sealing engagement with the upper end of the hopper, as by means of screws 10, which are secured to bolts which are pivoted to lugs 11 which extend from the sides of the hopper 8. The hopper is provided with a bail 12, whereby the hopper may be suspended from the ceiling of the room in which the apparatus is used.

The cover 9 of the hopper is provided with a central annular collar or extension 13, which forms an opening 14 which communicates with a smaller opening 15 in the cover. The opening 15 is closed by means of a poppet valve 16, which rests on a conical valve seat 17, and is normally maintained in closed position by means of a compression coil spring 18, which is interposed between the lower face of the cover 9 and the head 19 of a screw 20. The screw 20 is threadedly secured to the valve 16 and the tension of the spring 18 may be adjusted by adjustment of the screw 20 relatively to the valve.

Secured to the lower end of the hopper 8 is a short metallic tube 21 having a constricted lower end 22. The tube 21 extends into the upper end of a bore 23 of a block 23a. Secured to the constricted lower end of the tube 21 and extended through the bore 23 to a counterbore 24 in the block is a length of flexible resilient rubber or plastic tubing 25.

A nipple or coupling 26 is secured in the counterbore 24 and is provided with a short length of copper tubing 27 which is frictionally secured within the lower end of the tubing 25.

Secured to the nipple or coupling 26 is a length of flexible tubing 28, which may be of any desired length, and the lower end of which is connected, as by a coupling 29, to the wall of the torch. The coupling 26 is provided with a short length of copper tubing 30, which extends through the wall of the torch and into the passageway 3, where it is bent to provide a forwardly extending portion 31.

Powder from the hopper 8 may therefore pass from the hopper through the tube 21, tubing 25, tubing 27, coupling 26, tubing 28, coupling 29, and tubing 30—31. The distance from the tubing 30—31, where the powder enters the passageway 3, to the end of the tip 5, may vary. In actual practice, this distance may be as little as 2 or 3 feet, to as much as 20 or 25 feet.

Means have also been provided for controlling the flow of powder through the tubing 25.

For this purpose, the block 23a is provided with a threaded bore 32 which extends transversely to the bore 23 and has threadedly secured therein a powder control adjusting screw 33 having a flat face 34 at its forward end. This screw may be locked in adjusted position by means of a lock nut 35, which is threadedly secured to the screw 33 and is brought to bear against the face of the block 23a when the screw 33 is to be locked in adjusted position.

The block 23a is also provided with an opening 36 which extends transversely to the bore 32 and is coaxial with the latter. Mounted for slidable movement within the opening 36 is a plunger 37 having a convex forward face 38 adapted to engage the tubing 25.

The plunger 37 is connected, as by a pin 39, to the armature 40 of a solenoid 41, which is mounted on a bracket or housing 42, which is secured to the block 23a, as by means of screws 43.

The plunger 37 is normally maintained in the position shown in solid lines in the drawing, in which position, the face 38 thereof bears against the tubing 38 and squeezes the tubing against the face 34 of the screw 33, thereby closing the tubing to the passage of powder there-through. For the purpose of maintaining the plunger 37 in this position, the plunger has secured thereto a plate 44, the ends of which are provided with openings through which pins 45 extend, so that the plate is slidable over these pins. The pins 45 are threadedly secured to the block 23a, and compression coil springs 46 are mounted on the pins, and are interposed between the plate 36 and stops 47 which are secured to the outer ends of the pins.

The springs 46 thus serve to bias the plunger 37 to the position shown in solid lines, except at such times when the solenoid 41 is energized.

For the purpose of energizing the solenoid, an electrical circuit is provided consisting of wires 48 and 49, the terminals 50 and 51 of which are mounted on a movable plate 52 of a floor switch, the stationary plate 53 of which is mounted on the floor. The plate 53 is provided with terminals 54 and 55 of a 110 volt A.C. electrical supply line 56 and 57. The switch is normally maintained in open position by means of a compression coil spring 58 interposed between the plates 52 and 53, but may be closed to energize the solenoid 41, by stepping on the plate 52 to bring it to the position shown in broken lines.

When the solenoid is thus energized, the plunger 37 is retracted to the position shown in broken lines, in which position, powder may flow through the tubing 25, since the resiliency of the tubing is such that the tubing reassumes its original round cross-section upon withdrawal

of the plunger. The armature 40 is provided with faces 59 which about the solenoid 41 so as to prevent retraction of the plunger 37 beyond the position shown in broken lines. Upon opening of the switch, which is accomplished merely by relieving the pressure of the foot on the plate 52, the springs 46 cause the plunger 37 to close the tubing 25.

In order to pressurize the interior of the hopper 8, so as to insure free flow of the powder from the hopper, oxygen may be fed into the hopper during use of the apparatus, through a tube 60 having a downturned upper end 61.

The use or operation of the apparatus will now be briefly described.

The butt or handle 1 of the torch is held by the hand of the operator, flow of the gases is started, while the tube 25 is maintained closed, so that no powder falls through the tube.

The gases form a combustible mixture in the mixing chamber 2, and the mixture flows through the passageway 3 into the nozzle 4 and out of the tip 5, where it is ignited to produce a flame.

The flame heats the metal surface which is to be coated to a temperature approaching its melting point, after which the flow of powder through the tubing 25 is started by the operator depressing the switch plate 52 with his foot. The powder flows freely into the passageway 3 of the torch through the tubing 30—31, where it is carried by the combustible gas mixture to the tip of the torch and into the flame, the flame melting the powder and causing it to become bonded to the heated surface already described.

The hopper 8, which contains the powder is a gas-tight chamber, able to withstand pressures of 40 to 50 pounds per square inch, so that no aspirating effect takes place to assist the flow of powder into the passageway 3. The powder is thus carried to the tip 5 solely by the conjoint carrying effect of the combustible gas mixture in the passageway 3, and the pressure of the oxygen in the hopper 8. The valve 16 is a safety valve which will open in the event that excessive pressures are built up in the hopper 8.

The orifice 62 permits a slight leakage of gas from the passageway 3 into the atmosphere. The small amount of gas which thus leaks out creates a slight back pressure which prevents powder from flowing into the tubing 28 after the tube 25 has been closed. This is particularly advantageous where the distance from the valve 37 to the passageway 3 is great, and a considerable amount of powder would flow after the tube 25 has been closed. Any substantial leakage through the orifice 62, particularly where the apparatus is used in a closed space, might be dangerous, but by having this orifice as well as the valve and hopper, at a substantial level above the gun level, these are maintained at a distance from the coating operations sufficient to greatly minimize this danger.

The pressures within the portions 3, 4 and 5 of the gun may be varied, depending upon the shape of the passageways in these portions and the amount of gas which is flowing. The pressures, however, are always above atmospheric pressure, and this is why the hopper 8 is pressurized.

The use of the gun for spraying and then melting has already been described.

It will be understood, however, that the powder may be sprayed and melted simultaneously.

An oxygen pressure in the hopper of 25 to 30 pounds per square inch is normally used, but lower pressures may be employed.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes may be made in the shape, size and arrangement of parts of my invention, without departing from the spirit of the invention or the scope of the subjoined claims.

This application is a "continuation-in-part" of my co-pending application, Serial No. 708,658, filed January 13, 1958, now abandoned.

Having thus described my invention, I claim:

1. Apparatus of the character described, comprising a powder gun having a handle portion and a nozzle disposed at a substantial distance from said handle portion, said gun having a passageway from said handle portion to said nozzle for passage of a combustible gas under pressure, means for supplying a combustible gas under pressure through said passageway and to said nozzle, a hopper for metal powder disposed above said gun, means for flowing said powder gravitationally from said hopper to said passageway, said means including a tube disposed above the gun and having an orifice in its wall which is open to the atmosphere, said tube communicating through the wall of said passageway with said passageway at a point in said passageway which is adjacent said handle portion and remote from said nozzle, whereby said powder enters said passageway at said point, and means disposed above said orifice for shutting off the flow of said powder, whereby, when the flow of powder is cut off by said last-named means, said combustible gas mixture will enter said tube from said point, pass upwardly through said tube and leak out through said orifice, creating a back pressure in said tube which prevents powder from falling into said tube.

2. Apparatus, as defined in claim 1, including means for supplying oxygen under pressure to the upper part of said hopper, whereby to pressurize the interior of the hopper and assist gravity in removing the powder from said hopper.

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