Spray Metal Gun of the Gas Blast Type

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This invention relates to new and useful improvements in spray metal guns of the gas blast type.

In spray metal guns of the gas blast type, a metal wire is usually fed continuously into a heating zone in which the tip of the wire is melted and from which metal particles in a finely subdivided state are propelled by a blast of gas to the object to be sprayed. In guns of this type, it has been common practice to bleed air into the passage leading the wire to the heating zone. The bleeding of air or other blast gas is accomplished by means of a single aperture opening into the wire passage. Spray metal guns of the gas blast type, and conventionally including a gas blast bleeding aperture, are characterized by the fact that the tip of the wire, at the point of its melting, fluctuates considerably and appears to move in and out longitudinally during the spraying operation. This requires that the wire speed be reduced sufficiently so that the tip of the wire where it melts off in its outermost position does not extend far enough to cause a rough or spattery type of spray. Such reduction in wire speed is conducive of economical operation of the gun. In addition to the necessity for reducing speed, another disadvantage which results from this construction is that occasionally the wire sticks in the tip of the nozzle.

The construction in accordance with the instant invention satisfactorily overcomes the aforementioned disadvantages and drawbacks present in the conventionally construed spray metal guns of this type. The invention will be more fully understood and these as well as other objects will become evident from the foregoing description read in conjunction with the drawing in which

Fig. 1 is a cross-section through part of a spray metal gun construction embodying my invention in the line 1—1 of Fig. 2 in the direction of the arrow;

Fig. 2 is a vertical section through part of a spray metal gun construction embodying my invention; and

Fig. 3 is a vertical section through the construction illustrated in Fig. 1 in the plane III—III thereof.

Referring to the drawing, Fig. 1 indicates the inlet for oxygen or other combustion supporting gas, 2 the inlet for acetylene or other combustible gas, and 3 the inlet for air or other gas for atomization of the metal, projection of the metal spray and driving of the turbine. When plug 4 of valve 9 is in the position shown, each of the inlets registers with a corresponding hole in the plug, these holes being indicated by numerals 5, 6 and 7 respectively. In this position, oxygen flows through duct 10 into duct 11. The combustible gas flows through duct 12 to mix with the oxygen in duct 11 and the air flows through duct 15 into chamber 18 and also flows through the side surrounding burner tip 34 and manifold 19. Openings 5, 6 and 7 in plug 4 are so arranged that as handle 8 is turned from the off position, which is at a right angle to the showing in Fig. 2, first some combustible gas passes into duct 11 and thence to the burner outlet to enable the burner to be lighted. Some air passes simultaneously into manifold 19 to enable the turbine to come up to speed. Alternatively, all the valve passages may be opened but at such rates of flow as to establish favorable lighting conditions which are different from the conditions obtaining when the gun is in operation. This position of the valve is called the lighting position. After the burner has been lighted, movement of handle 8 causes oxygen to flow through duct 10 which establishes a melting flame with the ignited gas and the final movement of handle 8 to the position shown in Fig. 2 permits air to flow into duct 16 and thence into chamber 18 to project the sprayed metal upon the surface to be covered.

The construction of that part of the gun by which the rod or wire is melted and projected will be explained by reference to Fig. 1. The wire 37 moves forward to guide 31 and through duct 32 to the interior 33 of the burner tip 34. The mixture of gas and oxygen move forward through the duct 11, which is immediately behind duct 32 and into the annular space 35. From this annular space 35 the combustible mixture moves forward through a number of holes to be discharged through convergent orifices 36 against the wire. This forms a zone of gases undergoing combustion, whereby the wire 37 melts as rapidly as it is progressively advanced into the zone, for which reason this zone is referred to as a melting zone. The air from chamber 18 advances through the annular space 40 surrounding burner tip 34 is projected by air nozzle 41 in such a way as to sub-divide and propel the molten metal. The air tip 41 is threaded to the outer shell 42 of the burner so that the orifice 43 defined by conical interior of air tip 41 and conical exterior of burner tip 34 may be adjusted with corresponding variations in the characteristics of the air blast. When a satisfactory adjustment has been made, the tip 41 is locked in position by the lock nut 44. It will be noted that the air in passing forward from
the chamber 16 goes through the constricted annular space 45 which exerts a definite control over the volume of air passing. As a result of this construction and the orifice effect thereby created, the adjustment of air tip 41 modifies the characteristics of the air blast without so great a modification of the volume of air passing thereto as would otherwise result, which is decidedly advantageous in the adjustment and operation of the gun. The wire 31 is fed through the passage or duct 32 to the melting zone by means of suitable wire feeding means (not illustrated) such as driven burs or the like mechanism known in the art.

Bleeder gas ducts 50 lead, in combination with blast gas chamber 16, from the annular neck or groove 51 into the wire duct or passage 32.

The bleeder holes in accordance with our invention are preferably so arranged that they are substantially evenly spaced with respect to each other inside the wire passage or duct. Instead of individual bleeder ducts it is possible to provide for one or more common or intercommunicating ducts from which the requisite number of bleeder holes issue into the wire passage. Though as a rule two bleeder holes accomplish the desired result, three bleeder holes are preferred. In general, unless special circumstances or considerations of construction prevail rendering the use of more than three bleeder holes desirable, a number of bleeder holes in excess of three will normally not confer any material advantage over the use of three such holes.

The dimensions of the bleeder holes should be such that their aggregate cross-sectional area permit the blast gas or compressed air supply to bleed into the wire passage at a pressure sufficient to overcome the back pressure obtaining at the burner nozzle tip and insufficient to interfere with the temperature requirements of the melting zone.

My invention is not limited to the construction of a spray gun illustrated in the foregoing examples and may be used in connection with any other suitable gun construction of the blast wire feed type, including those having other heating or melting means for the wire, such as an arc or the like and further including those constructions of this type in which multiple wires are fed to the heating zone.

The foregoing description is by way of illustration and not of limitation, and it is, therefore, my intention that the invention be limited only by the appended claims or their equivalent, in which I have endeavored to claim broadly all inherent novelty.

1. claim:
1. In a metal spray gun of the wire feed gas blast type, having a gas blast duct and a wire feed duct for feeding a metal wire to the melting zone of said gun, the improvement comprising a multiple number of holes around the wire feed duct of said gun, and a multiple number of bleeder gas passages converging on said wire feed duct in the direction of wire feed therein, said passages terminating in said holes and connecting said holes with said gas blast duct, said holes and said passages being positioned, and dimensioned to bleed blast gas into said duct sufficient to overcome pressure at the nozzle tip of said gun, said blast bleeder holes being spaced apart a considerable distance from each other to substantially reduce wire tip fluctuation in said melting zone.

2. In a metal spray gun of the wire feed gas blast type, the improvement in accordance with claim 1 in which said holes and said passages are each three in number.

3. In a metal spray gun of the wire feed gas blast type having a gas blast duct and a wire feed duct for feeding a metal wire to the melting zone of such gun, the improvement comprising in communication with said gas blast duct a multiple number of bleeder holes around the wire feed duct of said gun, said gas blast bleeder holes being spaced apart a considerable distance from each other to substantially reduce wire tip fluctuation in said melting zone.

4. In a metal spray gun of the wire feed gas blast type having a gas blast duct and a wire feed duct for feeding a metal wire to the melting zone of such gun, the improvement comprising a multiple number of holes around the wire feed duct of said gun, and a multiple number of bleeder gas passages at least one for each of said holes and connecting said holes with said gas blast duct, said holes and said passages being positioned, and dimensioned to bleed blast gas into said wire feed duct sufficient to overcome back pressure at the nozzle tip of said gun, said gas blast bleeder holes being spaced apart a considerable distance from each other to substantially reduce wire tip fluctuation in said melting zone.

5. In a metal spray gun of the wire feed gas blast type having a gas blast duct and a wire feed duct for feeding a metal wire to the melting zone of such gun, the improvement comprising a multiple number of evenly spaced holes in substantially radial arrangement in said wire feed duct of said gun, and a multiple number of bleeder gas passages at least one for each of said holes and connecting said holes with said gas blast duct, said holes and said passages being positioned, and dimensioned to bleed blast gas into said wire feed duct sufficient to overcome back pressure at the nozzle tip of said gun.

6. In a metal spray gun of the wire feed gas blast type, the improvement in accordance with claim 5 in which said holes are three in number.

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