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METHOD FOR SPRAYING FUSIBLE MATERIAL IN CONTINUOUS LENGTHS

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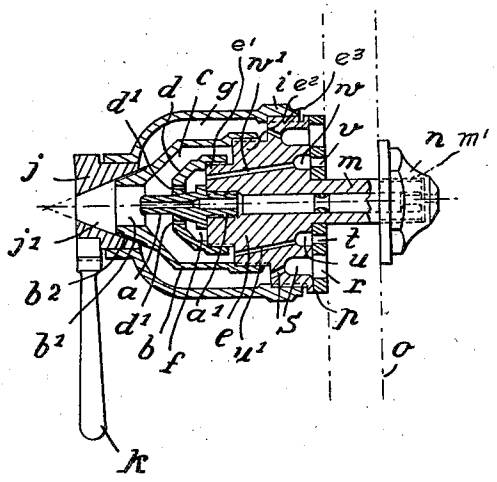

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METHOD FOR SPRAYING FUSIBLE MATERIAL IN CONTINUOUS LENGTHS.

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To all whom it may concern:

Be it known that I, NICOLAUS MEURER, a subject of Germany, and residing at 4 Kaiser-Korso, Berlin-Neu-Tempelhof, Germany, have invented certain new and useful Improvements in and Relating to Methods for Spraying Fusible Material in Continuous Lengths, of which the following is a specification.

Various methods and apparatus have already been proposed, in which elongated materials, e. g. in the form of wires, bands, pipes, strands and the like are fed to a nozzle system, in which the said material is exposed to the action of a combustion gas mixture and is fused by the said mixture being ignited, whereupon the fused material to be sprayed is immediately atomized by a stream of gas under pressure (compressed air), which is also fed to the nozzle system, and is sprayed onto articles placed in front of the nozzle system (cf. for instance: "Das Schoop'sche Metallspritzverfahren" by Hans Günther and M. U. Schoop, published by the Frankhsche Verlagsbuchhandlung, Stuttgart 1917, pages 91 and 92).

In the accompanying drawings the figure illustrates in sectional elevation a nozzle system modified according to the present invention.

One of the known nozzle systems consists substantially of three nozzles placed coaxially one within the other, viz, of an inner nozzle for guiding the wire-shaped material to be sprayed, an intermediate nozzle and an outer nozzle, all three nozzles being fixed to a common nozzle head.

Between the inner nozzle and the intermediate nozzle a fine annular gap is left for the admission of the mixture of fuel and gas. Similarly gas or air under pressure which acts as the atomizing medium, is conveyed through a collecting duct in the nozzle head to an annular gap between the intermediate and the outer nozzle.

According to the present invention the economical working of spraying apparatus is to be increased and, other things being equal, the proportion of oxygen to combustible gas to be considerably reduced or its use completely eliminated by replacing it with compressed air or finally, while using only a small quantity of oxygen, to make it possible to employ a combustible gas of greater calorific value than hydrogen, acetylene or compressed illuminating gas, if the process and the nozzle system for carrying out the process be modified in the following manner:

(1) Provision must be made that the combustible gas mixture for feeding the flame shall emerge in the nozzle system at a point, which is not directly affected by the quantity of compressed gas (compressed air) acting as the atomizing medium, in which the atomizing gas emerges immediately next to the combustible gas mixture.

(2) As much time as possible must be given to the emerging material to be sprayed in passing the hottest part of the flame or bundle of flames fed by the combustible fuel mixture, i. e., without danger of the flame becoming extinguished, the formation of the flame should be caused to take place as far as possible within the nozzle system.

(3) In order to fulfill the requirement stated in (2), the expansion pressure of the atomizing gas (compressed air) emerging in the nozzle system, which counteracts the energy of flow of the combustible gas mixture in the direction towards the nozzle head, must be made less hurtful by the part of the nozzle for conveying the combustible gas mixture having the form of an injector for increasing the velocity of the jet of combustible gas mixture, while the quantity of combustible gas emerging may at the same time be diminished.

(4) Preferably the combustible gas will be mixed with the oxygen, the amount of which is reduced as compared with what was formerly used, or with the compressed air used in its place just before the flame is formed, i. e. in the front part of the nozzle head, instead of as hitherto in the rear part of the nozzle head or even before it.

A constructional form of the nozzle system modified on these lines and shown in longitudinal section in the drawing, has the following features: The inner nozzle a for conveying the material to be sprayed is relatively short and is externally conical above its threaded end a', which is screwed into the nozzle head e, the front end of the cone merging into a cylindrical form. This front end of the inner nozzle extends a short way into the bore b' of a nozzle b, which is screwed externally onto a stepped part e_1 of

the nozzle head *e*. The nozzle *b* surrounds a nozzle *d* which is screwed on to a second stepped part e_2 of the nozzle head *e* with an annular gap *c* being between them, the inner nozzle *a* passing through the bore in the head of the part *d* and forming a tight joint therewith. In the immediate neighborhood of the opening in the nozzle *d*, through which the inner nozzle *a* passes, a number of fine holes *d'* are provided, which connect the annular space *f* between the parts *d* and *a* to the annular space *c*. The nozzle *b* is surrounded by a nozzle consisting in the present case of two parts *i* and *j*, which is screwed on to a third stepped part e_3 of the nozzle head *e*, an annular space *g* being left between the nozzle *b* and the surrounding nozzle and the part *j*, which is provided with a handle *k* being capable of being readily withdrawn from the part *i* by means of the handle. A tight joint between the nozzle head *e*, which is fixed in a known manner by means of a nut *n* screwed onto the thread m_1 of the extension *m* to the front wall *o* of the casing of the spraying apparatus, and the wall of the casing is provided by a packing disk *p*. The latter has openings *r*, which communicate with ducts (not shown) provided in the wall of the casing and leading to pipe unions (not shown). The ducts and openings *r* convey the atomizing gas through holes *s* into the space *g*. Holes *t*, *u*, *u'* in the parts *p*, *e* convey the requisite combustible gas to the space *c* and holes *v*, *w*, *w'* the requisite oxygen or compressed air to the space *f*. The compressed air emerging at a high velocity at *d'* through the small openings or the very small quantity of oxygen emerging at *d'* carries the combustible gas, which is sucked as by an injector, from the space *c* into the bore *j'*, mixing it at the same time, and can be ignited in *j'*. This ignition is facilitated and causes a steady flame to be formed immediately at the point, where the space *c* merges into the bore *b'*, if the nozzle part *j* be momentarily withdrawn by the handle from the part *i* and be returned to its original position after the flame has been formed.

This steadiness of the long flame lying within the bores *b'* and *j'* is in no way interfered with by the atomizing gas (compressed air) emerging at b^2 out of grooves provided in the outer wall of the orifice of the nozzle *b*, as the point of emergence of this gas is considerably advanced relatively to the point, at which the root of the flame is formed, and as the velocity of the stream of combustible gas feeding the flame exceeds that of the atomizing gas already expanding in the space *j'*. The long flame in the spaces *j'* and *b'* enables the wire to be thoroughly fused before, owing to the emergence of the atomizing medium at the outer edge *j'*, a complete sudden expansion and cooling of the atomizing gas has taken place, so that the partial expansion of the gas in *j'* can effect the breaking off and preliminary atomizing of the fused part of the wire.

What I claim is:—

1. A method of spraying fusible material, consisting in feeding the material forward in continuous lengths to a flame produced by the ignition of a combustible gas mixture, fusing the material in the said flame and finally atomizing the fused material by directing a jet of compressed gas into it at a point forward of the point of fusion.

2. A method of spraying fusible material as claimed in claim 1, in which the fusible material to be sprayed passes through the hottest part of the flame fed by the gas mixture, while the flame is shielded from the outer air.

3. A method of spraying fusible material, consisting in feeding the material forward in continuous lengths to a flame produced by igniting a jet of a combustible gas mixture supplied under pressure and moving at a high velocity, fusing the material in the said flame and finally atomizing the fused material by directing a jet of compressed gas into it at a point forward of the point of fusion, the pressure and velocity of the atomizing jet being lower than that of the combustible gas mixture.

4. A method of spraying fusible material, consisting in feeding the material forward in continuous lengths to a flame, effecting the mixture of combustion supporting medium and combustible gas necessary for the production of the flame at a point immediately before that at which the flame is formed, fusing the material in the said flame and finally atomizing the fused material by directing a jet of compressed gas into it at a point forward of the point of fusion.

In testimony whereof I have signed my name to this specification.

NICOLAUS MEURER.