

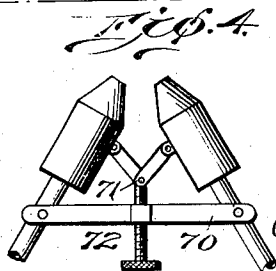
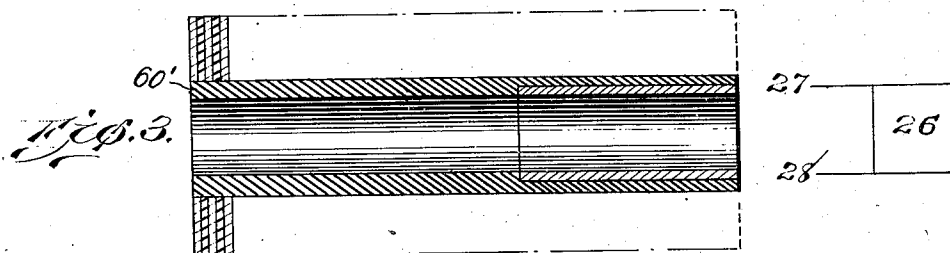
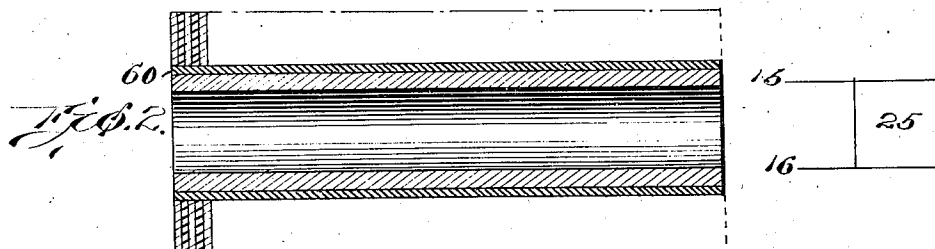
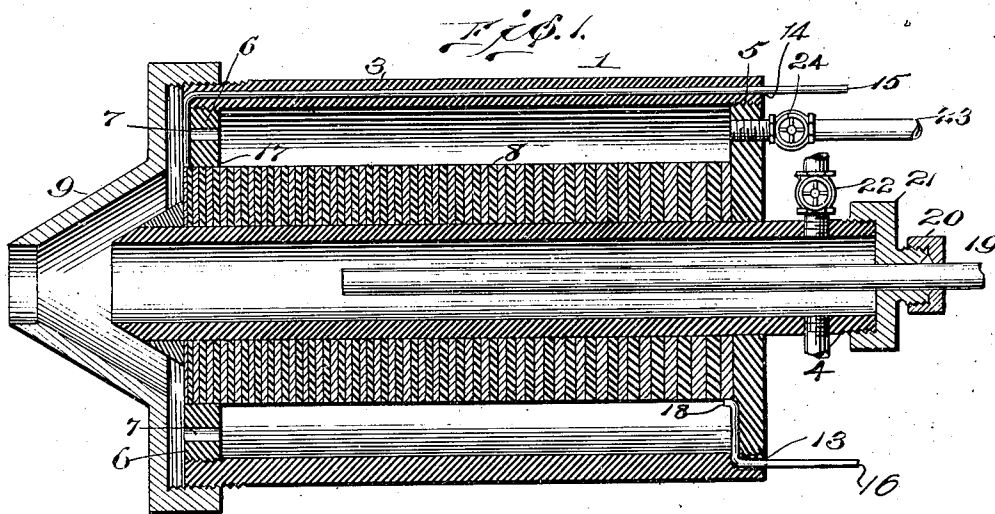
July 16, 1929.

C. M. SAEGER, JR  
METAL SPRAYING DEVICE

1,721,092

Filed May 8, 1925

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

*Fig. 5.*

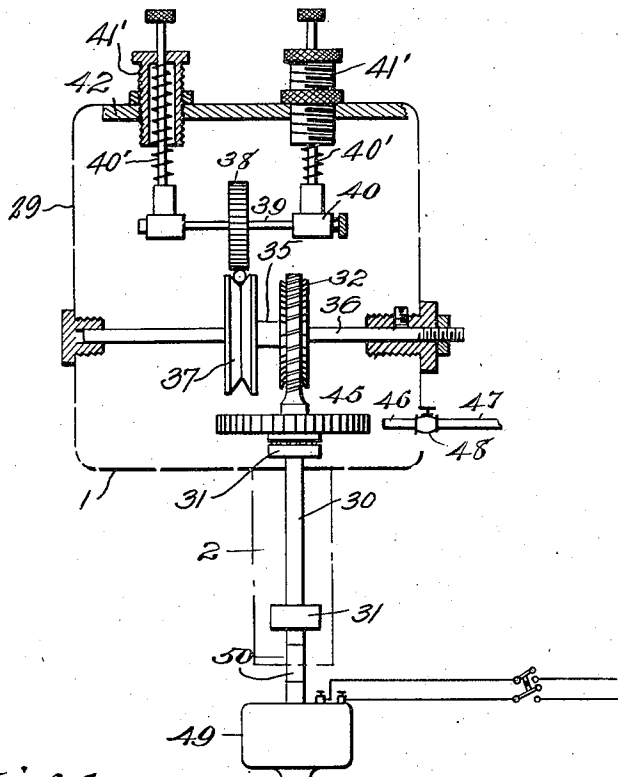


*Fig. 6.*

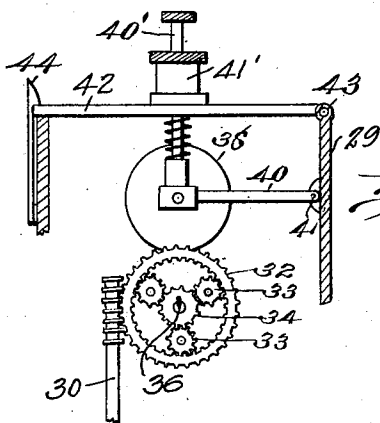


*Fig. 7.*

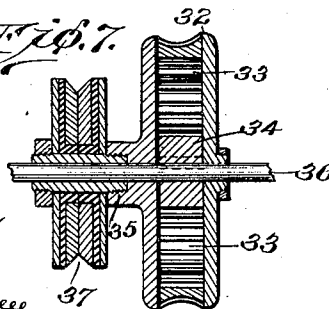
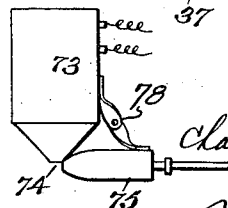


*Fig. 8.*



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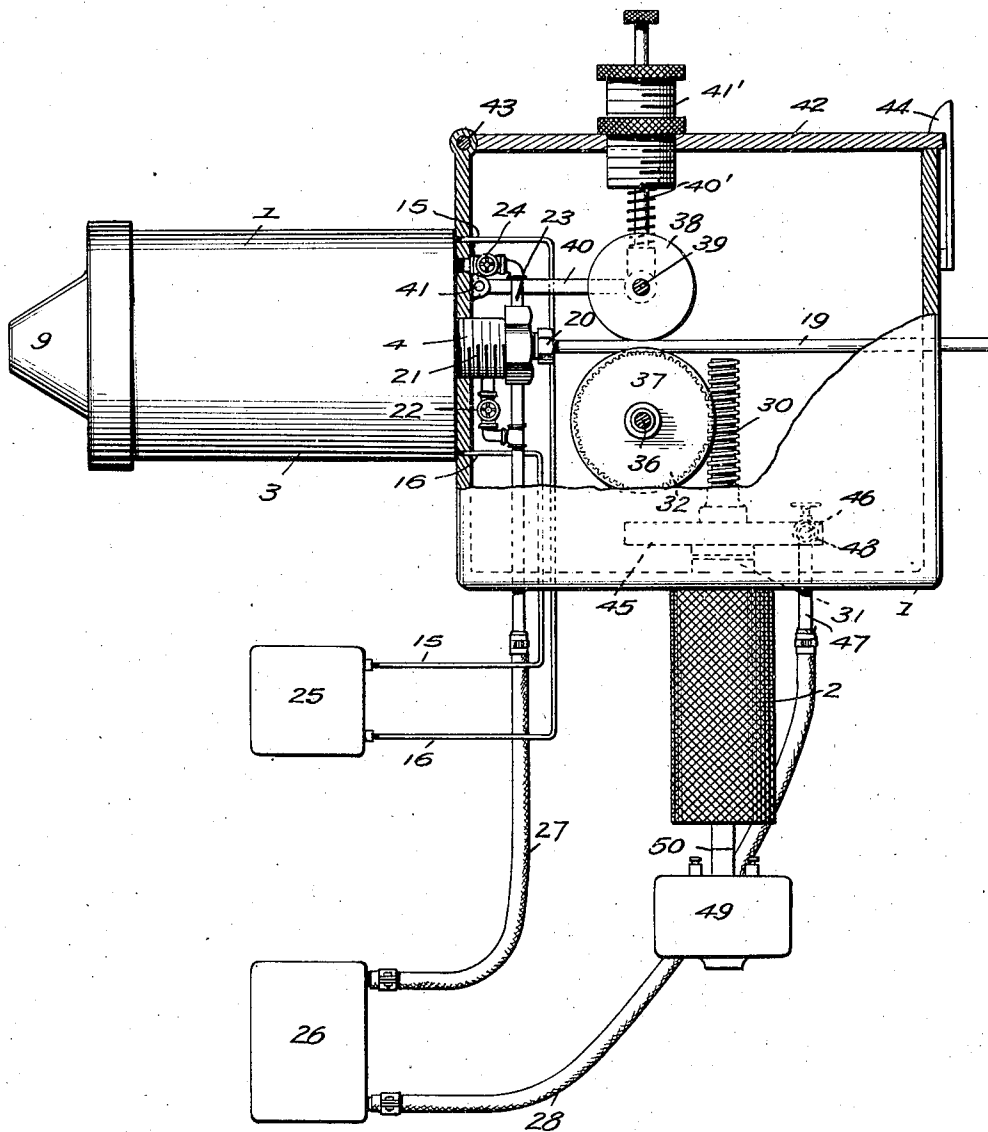
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*Fig. 9.*



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# UNITED STATES PATENT OFFICE.

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## METAL-SPRAYING DEVICE.

Application filed May 8, 1925. Serial No. 28,925.

This invention relates in general to the metal spraying devices and more particularly to a metal spray device in which the metal to be sprayed is melted by electric induction.

5 It is the prime object of my invention to provide a metal spray device in which the metal to be sprayed is melted by induction, using high frequency current, this method giving an almost unlimited degree of temperature control for the purpose of melting a great variety of metals while the temperature of the outside of the device is not raised materially.

15 It is a further object of my invention to provide a metal spray device of light structure which can be conveniently operated at a distance from the source of electrical energy.

An object of my invention is to provide a means for feeding the metal to be fused.

20 Another object of my invention is to provide novel and improved cooling means for my device.

25 A further object of my invention is to provide means for controlling the temperature, velocity and application of the spraying blast of air or gas.

30 Other objects of my invention will appear in the accompanying specification and claims and will be disclosed in the accompanying drawings in which:—

Fig. 1 is a longitudinal section of my melting furnace and blast nozzle.

Fig. 2 is a detail view in section illustrating a modification of the inner tube.

35 Fig. 3 is a similar view of still another modification of the tube.

Fig. 4 illustrates two of my devices adjustably mounted on a single frame.

40 Fig. 5 is a view of the metal feeding device used in connection herewith.

Fig. 6 is a detail view of the driving mechanism for the knurled roll.

Fig. 7 is a detail sectional view of the knurled roll and adjacent parts and

45 Fig. 8 is a side elevation showing a furnace and a blast nozzle constructed separately.

Fig. 9 is a side elevation, partly diagrammatical, showing my assembled device.

50 Referring now with greater particularity to the drawings it will be seen that my device is comprised as follows:

55 The metal spray device includes a casing 1 in which the operating parts are housed, the casing having a pistol grip or other suitable handle 2 for the manipulation of the device.

The furnace or melting apparatus is en-

closed in the casing 1 and consists of an outer casing 3 of heat and electric insulating material. A hollow tube 4 of electro-insulating material is mounted centrally of the casing 3 and spaced therefrom by glands 5 and 6 which are perforated at 7 to permit of the passage of the blast gases as will hereinafter be disclosed. Mounted on the tube 4 is a coil 8 of copper or other electro-conductive material wound spirally with an increasingly great number of turns to each unit of length as it approaches the nozzle 9 of the device. The material of the coil 8 is bandular in structure the bands being wound edgewise upon the tube 4. The forward end of the tube 4 is coniform in shape to conform to the nozzle 9. The nozzle 9 is adjustably screw threadedly secured to the casing 3.

The casing 3 is provided with passages 13 and 14 to permit of the passage of the high frequency leads 15 and 16 which are secured to the ends of the coil at 17 and 18. The metal to be sprayed is fed in the form of a rod or wire 19 into the hollow tube 4 through a loosely fitting packing 20 in the rearward end of an extension 21 of end of the tube 4. A valve 22 is mounted in the extension 21 and may be opened at will to permit the passage of blast gas along the passage of tube 4. A tube 23 is provided with valve 24 to control the passage of gas along the annular space between the tube 4 and the casing 3.

The high frequency current is secured from a standard light weight high frequency apparatus 25 and is conducted to the furnace by leads 15 and 16.

The gas or air to cool the furnace and to furnish the blast for spraying is obtained from any suitable source 26 and is fed to the furnace through flexible tubes 27 and 28. In Figures 5 and 6 the wire feeding apparatus is disclosed diagrammatically at 29 though it is preferably inclosed in the casing to the rear of the furnace as later disclosed.

Having reference now especially to Figures 5, 6 and 7, my wire feeding device will be disclosed.

In this structure the drive shaft 30 mounted in suitable bearings 31 passes up through the pistol grip 2 into the casing 1. The upper end of the shaft 30 is formed to provide a worm for driving a worm gear 32 for rotating through the medium of reducing or planetary gears 33, a gear 34 fixedly mounted on a collar 35 rotatable on shaft 36. A knurled roll 37 is carried by and fixed to

said collar 35. A second knurled roll 38 is mounted on a shaft 39 which is held in a yoke 40 pivotally secured to a shaft 41. The roll 38 is pressed toward the roll 37 by spring-pressed plungers 40' held in sleeves 41' adjustably screw-threadedly secured in the cover 42 of the casing 1. The casing cover 42 is pivoted to the body of the casing at 43 and is held in closed position by a spring latch 44.

The driving shaft has mounted thereon a turbine wheel 45 which is adapted to be rotated by high pressure gas issuing from a nozzle 46 on lead 47. The gas flow may be controlled by a valve 48.

When the wire to be melted is of heavy stock or when other conditions render the use of an electric drive preferable to a turbine drive the wire may be fed by an electric motor 49 driving the shaft through a flexible shaft 50.

Figure 8 shows a modification of my device in which the induction furnace for melting the metal is formed separately from the device for atomizing the molten metal. At 73 I have shown a furnace of the Northrup type 73 with a gas blast nozzle 75 positioned at an angle thereto and adjustable in angular relation thereto by means of a link 78, to control the degree of fineness of the coating sprayed.

The operation of my device will be understood to be as follows: The gas blast is first put into operation by the opening of the valve leading to the passages and the nozzle is adjusted to give the desired cone of dispersion. The high frequency current is then put into operation and the wire feeding apparatus started. As the wire enters the rear of the furnace induction or eddy currents are set up in it causing it to rise in temperature. As the wire progresses toward the nozzle it is subjected to the continued action of the coils which, as the wire approaches the nozzle, are of an increasingly great number of turns, until the metal is melted. The blast of gases through the passageways 7 and the bore of the tube 4 force the fused metal out of the nozzle and deposit the same on the material to be coated.

The gases passing through the annular passageway between the coil and the casing 3 and through the bore of tube 4 tends to cool the apparatus. The ease of control of the high frequency apparatus makes the control of the temperature of the furnace governable to the extent that metals of a wide range of points can be sprayed by this apparatus. The wire to be fused may be fed by either of the drive sources, the rotation of the driving shaft resulting in the rotation of the knurled feed rolls to feed the wire. The adjustably held spring pressed plungers permit adjustment of the rolls to accommodate various sizes of stock, the spring holding the upper roll tightly in engagement with the stock.

The gas blast may be used through either

the annular passageway or the bore of the tube 4, or both, depending upon the nature of the material and characteristics of the coating desired. The gas to be fed through the bore of the tube 4 may be heated if desired and it may be either an inert gas or an oxidizing one depending upon the nature of the coating desired.

In the modification shown in Figure 2 I have provided a lining 60 of electro-conducted material within and throughout the length of the core 4. In this type of furnace the lining 60 will be heated to a high degree by induction and will melt the metal by radiation. In the structure shown in Figure 3 I have shown a lining 60' of conductive material extending for a portion of the length of said core and at the rearward portion thereof. This lining serves to heat the metal to a certain extent by radiation and also serves as a means for heating gas blasts which may be passed through the core of the tube 4.

I claim:

1. In a metal spraying device, a casing, a high frequency induction furnace within said casing, means for continuously feeding the metal to be sprayed into said furnace, and means for spraying the molten metal.
2. In a metal spraying device, a casing, a high frequency induction furnace within said casing and spaced therefrom to provide passages, means for continuously feeding the metal to be sprayed into said furnace, and means for causing a blast of gas to pass through said passages for the purpose described.
3. In a metal spraying device, a casing, a high frequency furnace within said casing, said high frequency induction furnace comprising an insulating core wound with an increasing number of turns of conducting material per linear unit from rear to front, means for continuously feeding the metal to be sprayed into said core, and means for spraying said metal when molten.
4. In a metal spraying device, a casing, a blast nozzle adjustably secured to said casing, a high frequency induction furnace within said casing and spaced therefrom to provide cooling passages, said high frequency furnace comprising an insulating core wound with an increasing number of turns of conductive material per linear unit from rear to front, means for continuously feeding the metal to be sprayed into said core, and means for causing a blast of gas to pass through said passages for the purposes described.
5. In a metal spraying device, a casing, a blast nozzle adjustably secured to said casing, a high frequency induction furnace within said casing and spaced therefrom to provide cooling passages, said high frequency furnace comprising an insulating core wound with an increasing number of turns of conductive material per linear unit from rear to front,

means for continuously feeding the metal to be sprayed into said core, and means for causing a blast of gas to pass through said passages and said core for the purposes described.

5 6. In a metal spraying device, a casing, an electric induction furnace within said casing, means for continuously feeding the metal to be sprayed into said furnace, and means for spraying molten metal.

7. In a metal spraying device, a casing, a 10 high frequency induction furnace within said casing, means for continuously feeding the metal to be sprayed into said furnace, means for spraying the molten metal, and means for 15 cooling said furnace.

In testimony whereof I affix my signature.

CHARLES MARSHALL SAEGER, Jr.,