Nov. 18, 1941. J. T. REILLY ET AL 2,262,964

DEVICE FOR SPRAYING METAL

Filed Nov. 1, 1937

Fig. 2

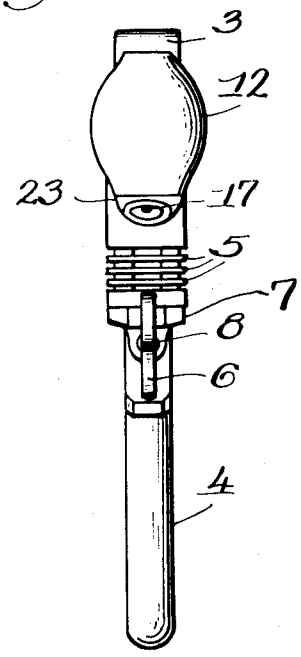



Fig. 1

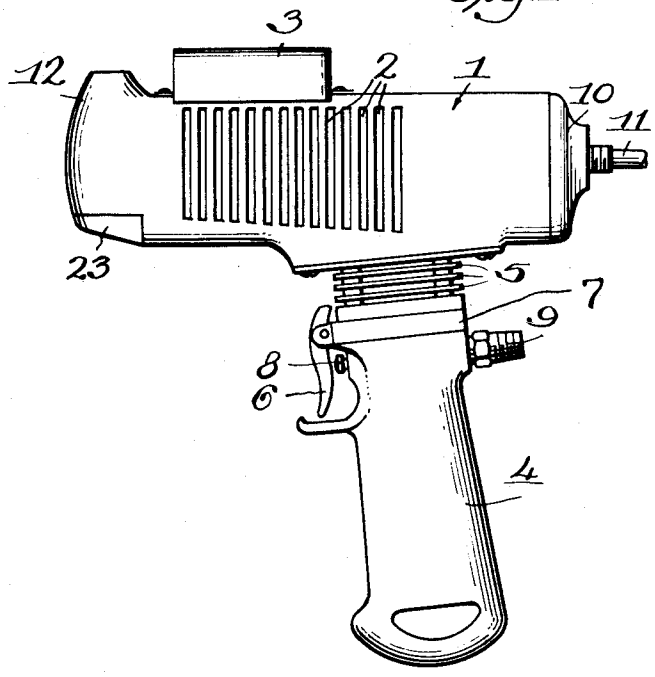



Fig. 3

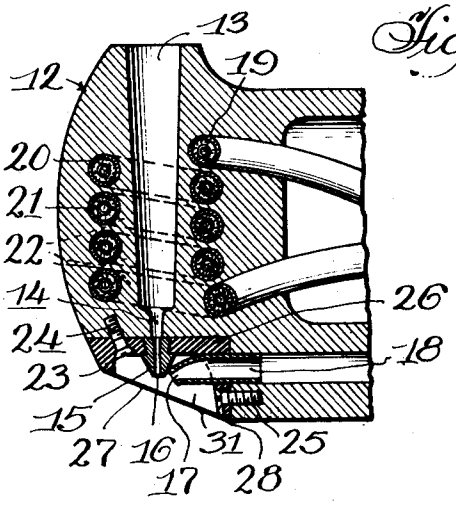
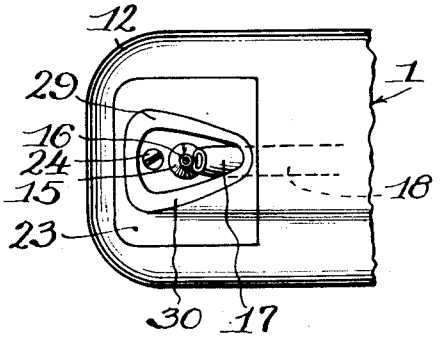



Fig. 4




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# UNITED STATES PATENT OFFICE

2,262,964

## DEVICE FOR SPRAYING METAL

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Application November 1, 1937, Serial No. 172,074

8 Claims. (Cl. 91—12.2)

The present invention relates to what is usually termed spray guns of the type for spraying metal, such as molten solder, and has reference more particularly to the retort or crucible part of the gun in which the solder is melted and from which the melted solder is discharged and is sprayed.

Heretofore, crucibles in this type of device have been heated by resistance coils located loosely or freely between refractory sleeves surrounding a removable cup or crucible in which the metal, such as solder, was melted. Only a small portion of the heat available at the resistance coil is effective in causing the metal to melt or fuse, the heat transmitted being mostly heat of convection.

Among the objects of the present invention is to provide a novel crucible and heating means whereby practically all of the available heat in the heating element will be transmitted directly by conduction through a high heat conducting metal to the contents of the crucible, the crucible and the heating element being integral, and the heating element being coiled closely around the fusing chamber of the crucible. In the illustrated embodiment the heating element is cast in the metal constituting the body of the crucible in the form of a helical coil surrounding the walls of the fusing chamber and with but a small thickness of crucible body metal between such coil and the fusing chamber, yet with sufficient metal to hold the heat and to conduct it at a regular rate to the fusing chamber.

The invention also comprehends a novel crucible provided with a hard metal (as steel) discharge orifice tip the discharge opening of which is so located with relation to the air blast nozzle as to provide for an efficient aspirating spraying of the discharging molten metal under atmospheric pressure.

Another object of the invention is the provision of novel means to guard against damage occurring to the tip and the air nozzle from any knock or impact the device may receive by reason of rough usage or from accidental or improper handling.

A further object is to provide a novel means which may be so closed, such as by placing and holding the mouth of the guard means against a surface, that an air blast may be effected in the guard means and blown backwards through the crucible chamber to scavenge and blow out dross and other foreign matter that may have accumulated in the chamber and may adhere to the walls of the chamber.

Other objects, advantages, capabilities, features or the like are comprehended by the invention as will later appear and as are inherently possessed by the invention.

Referring to the drawing:

Fig. 1 is a side view in elevation of a solder gun embodying the invention;

Fig. 2 is a front end view of the same;

Fig. 3 is a fragmentary sectional view, on an enlarged scale, taken in a vertical plane, of the retort or crucible portion of the device; and,

Fig. 4 is a bottom plan view of the same.

Referring more in detail to the drawing the embodiment chosen to illustrate the invention is shown in a solder gun comprising a hollow body 1 of metal having ventilating slots 2, an electrical thermostat 3 surmounting the body 1, and a depending handle 4 carrying heat radiating fins 5, and a finger trigger 6 pivotally carried by a strap 7 surrounding the handle 4. The trigger 6 is adapted to operate a valve within the handle by way of a valve stem 8 for controlling the passage of air under pressure from a suitable hose connected to the fitting 9. At the rear end of the body 1 is connected a cap 10 carrying the electrical terminals 11 for the heating element for the retort or crucible later described.

At the forward end of the body 1 is provided a retort or crucible 12 of metal, such as cast aluminum, and provided with an upright bore 13 in which bars, rods or ribbons of solder are placed to be melted. The bore 13 tapers slightly downwardly and has a passage or throat 14 for the passage therethrough of the melted solder. At the lower end of the throat is located a steel discharge orifice tip 15 having an orifice 16 through which the melted solder flows to be sprayed by a jet or blast of air issuing from a nozzle 17 of an air pipe 18. The air pipe 18 extends rearwardly in the body 1 and communicates with the fitting 9, the passage of air being controlled by the valve operated by the trigger 6.

The heating element is of the electrical type and is formed from what is known as a "Calrod" comprising a metal tubular sheathing 19 filled with a compacted powder 20 which is electrically non-conducting but heat conducting and in which is centrally located and imbedded a helical resistance wire 21 extending throughout the length of the tube and connected at its ends to the terminals 11.

The heating element comprises a helical portion 22 surrounding the chamber 13 of the retort or crucible 12, with such portion 22 preferably cast in the metal of the retort or crucible

body so as to form an integral part of it. In this way the heat is directly and efficiently conducted through the metal to the walls of the retort chamber, and the degree of heat may be easily regulated, as by the use of a thermostat 3 suitably connected to the circuit of the heating element. The invention comprehends the idea of locating the heating element as closely to the object to be heated or melted as is possible and practicable, as also having the heating element extend along the retort chamber for the major portion of its height or depth for efficient and effective heat transference. These objects and advantages are obtained by coiling the heating element around the fusing chamber of the retort so that the coil will, in the finished product, be disposed around the retort chamber and sufficiently close to its walls as to transmit the heat thereto and the contents of the chamber, there being sufficient thickness of metal between the coil and the chamber walls as to hold heat and to steadily conduct heat to the chamber walls. It is preferred to cast the metal of the retort about the coil of the heating element.

Another advantage of this arrangement of the heating element with respect to the melting chamber is that the said melting chamber and the heating element are both located at one end of the hollow body 1, and by arranging the heater coil and the melting chamber in upright planes it is possible to materially shorten the body length of solder guns of the type now in common use. At the same time it is possible to obtain a maximum heating efficiency by reason of their direct conduction of heat for minimum distances from the heating element, through a heat-retaining wall to the melting chamber. A further advantage of arranging the melting chamber and the heating element in vertical planes, with the heating element surrounding the chamber is that it is possible to use fewer convolutions of the heater coil than is required where the heating element is arranged at an angle with respect to the melting chamber, thereby not only increasing the efficiency of the device, but also resulting in a definite reduction in the cost of manufacture and the expenses of operation.

At the lower forward end portion of the gun is secured a guard member 23 (which may be of bronze) as by screws 24 and 25 threaded into a lower portion of the retort or crucible 12 and the forward end portion of the body 1 respectively, as clearly shown in Fig. 3. This guard member comprises a base 26 seated against the bottom of the retort portion of the gun, front and rear walls 27 and 28, and inclined side walls 29 and 30 thus defining therein a recess 31 within which are located the tip 16 and the nozzle 17 well above the plane of the edges of the walls 27, 28, 29 and 30 to be protected and guarded by these walls against any impact with any object with which the gun may contact. The inclined plane of the edges of the walls referred to serves as a seat against any flat or substantially flat surface when the gun is held with these edges pressed against such surface and when it is desired to clean the chamber of the crucible of dross or other foreign matter. In the melting of solder which usually has flux material with it in the fusing chamber of the crucible foreign material such as dross, etc. is formed and will adhere to the walls of the chamber. Heretofore, it was customary to scrape these walls with a rod or the like inserted into the chamber by turning or moving it about to dislodge the foreign matter, and then to turn the gun upside down to shake out the foreign matter by tapping or striking the gun against any object. In the present invention the mouth of the guard, that is at the edges of the walls 27, 28, 29 and 30, is pressed against any suitable surface as against the sole of the shoe of the operator, so as to close off the chamber or recess 31, and then the trigger 6 is operated to blow a blast of air into the chamber 31 and thence upwardly through the retort chamber 13, this blast of air scavenging and blowing out the foreign matter. This affords a very efficient and quick way of cleaning the retort or crucible, and avoids the necessity of the use of a scraper or the like.

While we have herein described and upon the drawing shown an illustrative embodiment of the invention it is to be understood that the invention is not limited thereto but comprehends other constructions, details and arrangements of parts, features, and the like, without departing from the spirit of the invention.

Having thus disclosed the invention, we claim:

1. A metal spray gun comprising a metal body provided at its forward end with an integral metal crucible having a fusing chamber therein in which the metal to be sprayed is fused, a discharge orifice means at the lower end of the crucible chamber for discharging molten metal for spraying by an air blast, an air discharge nozzle so located adjacent to said discharge orifice means as to spray the fused metal discharging from said means, and a guard surrounding said discharge orifice means and said nozzle and extending beyond the tip ends of said orifice means and said nozzle to protect the same from damage in use, said guard having a rim defining a mouth with the rim so disposed in a plane as to be closed by pressing the rim to a substantially plane surface to define a chamber about said nozzle and said orifice means for blowing a blast of air therethrough and through said chamber.

2. A metal spray gun comprising a metal body provided at its forward end with an integral metal crucible having a fusing chamber therein in which the metal to be sprayed is fused, a discharge orifice means at the lower end of the crucible chamber for discharging molten metal for spraying by an air blast, an air discharge nozzle so located adjacent to said discharge orifice means as to spray the fused metal discharging from said means, and a guard surrounding said discharge orifice means and said nozzle and extending beyond the tip ends of said orifice means and said nozzle to protect the same from damage in use by contact with exterior objects.

3. In a metal-spray-gun, a hollow body of metal having its forward end provided with an integral metal crucible member constituting an end wall of the hollow body, said crucible portion having an upright melting chamber therein for the molten metal to be sprayed, said chamber being tapered downwardly and having a downwardly directed discharge orifice at its lower end, and an electric heating element located within the metal portion of the crucible member and having portions encircling said melting chamber and arranged longitudinally of the latter, an integral heat-holding and heat-conducting portion of said crucible member being interposed between the melting chamber and the encircling portion of the heater element, the lower portion of said hollow body having an air

conduit therein disposed at an angle to the axis of the melting chamber and provided with a discharge orifice positioned adjacent to the bottom of said crucible portion and arranged at such an angle with respect to the discharge orifice of the melting chamber as to project a blast of air across the line of travel of a stream of molten metal as the latter is discharged from the melting chamber.

4. In a metal-spray-gun, a hollow body of metal having its forward end provided with an integral metal crucible member constituting an end wall of the hollow body, said crucible portion having an upright melting chamber therein for the molten metal to be sprayed, said chamber being tapered downwardly and having a downwardly directed discharge orifice at its lower end, the bottom wall of said chamber being integral with said end wall and having an air conduit therein, an electric heating element including a helical portion embedded within said crucible member at a position adjacent to and surrounding the melting chamber, the convolutions of said helical portion being arranged longitudinally of the melting chamber but radially spaced from the latter in such manner as to provide an interposed integral heat-holding and heat-conducting portion of the crucible member between said coils and said melting chamber, said air conduit having a discharge orifice positioned adjacent to and below the discharge orifice of the melting chamber and at such an angle with respect thereto as to project a blast of air across the line of travel of a stream of molten metal as it is discharged from the melting chamber.

5. In a metal spraying apparatus, the combination of a body member having a head portion provided with a socket therein open at the top for the reception of metal to be fused, means for heating the metal to be fused in said socket comprising an electrical resistance heating unit imbedded in the metal of said head about said socket, a channel member removably secured in inverted position below said socket, a nipple secured in said channel member in communication with said socket for controlling the escape of fused metal from the socket, and means independent of the heating means and including a duct in the wall of the body member for blowing a stream of fluid under pressure across the outlet opening of said nipple and comprising a nozzle open at one side of said nipple, the arrangement being such that the open face of the channel member is capable of being readily closed for causing the fluid under pressure delivered to the channel member to be forced upwardly through the nipple and the socket for cleaning and cooling the apparatus after a period of use.

6. In a metal spraying apparatus, the combination of a body member having a head portion provided with a socket therein open at the top for the reception of metal to be fused, means for heating the metal to be fused in said socket comprising an electrical resistance heating unit imbedded in the metal of said head about said socket, a trough-shaped member removably secured in inverted position below said socket, a nipple removably secured in an opening through the wall of said trough-shaped member in communication with said socket for controlling the escape of fused metal from the socket, and means independent of the heating means and including a duct in the wall of the body member for blowing a stream of fluid under pressure across the outlet opening of said nipple and comprising a nozzle removably mounted in the end wall of said trough-shaped member and opening at one side of the nipple through the medium of a substantially crescent-shaped outlet orifice curved downwardly about the opening of the nipple so that the stream of fluid therefrom avoids contact with the nipple.

7. In a metal spraying apparatus, the combination of a body member having a head portion in the form of a metal casting with a socket extending through the head portion and opening at the top for the reception of metal to be fused, means for heating the metal to be fused in said socket comprising an electrical resistance heating unit imbedded in the metal of said head about said socket, a channel member removably secured in inverted position below said socket longitudinally of the body member and having a wall portion extending transversely of the member at its inner end, a nipple removably secured in an opening through the horizontal wall portion of said channel member in communication with said socket for controlling the escape of fused metal from the socket, and means independent of the heating unit and including a duct in the wall of the body member for blowing a stream of fluid under pressure across the outlet opening of said nipple and comprising a nozzle removably mounted in said end wall of said channel member and extending at its inner end a short distance into a fluid duct in said body member and opening at one side of said nipple through the medium of a substantially crescent-shaped outlet orifice curved downwardly about the opening of the nipple so that the stream of fluid therefrom avoids contact with the nipple.

8. In a metal spraying apparatus, the combination of a body member having a head portion provided with a socket therein open at the top for the reception of metal to be fused, means for heating the metal to be fused in said socket comprising an electrical resistance heating unit imbedded in the metal of said head about said socket, a channel member removably secured in inverted position below said socket and having a wall portion extending transversely of the member at its inner end, a nipple secured in said channel member in communication with said socket for controlling the escape of fused metal from the socket, and means independent of the heating means and including a duct in the wall of the body member for blowing a stream of fluid under pressure across the outlet opening of said nipple and comprising a nozzle also carried by said channel member and open at one side of the nipple, the side wall portions of the channel member being so arranged in triangular form and so disposed with respect to the transverse wall portion that the open face of the channel is capable of being readily closed by engagement with a plane surface so as to cause the fluid under pressure delivered into the channel member to be forced upwardly through the nipple and the socket for cleaning and cooling the apparatus after a period of use.

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