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POWDER APPLYING AND FUSING TORCH APPARATUS

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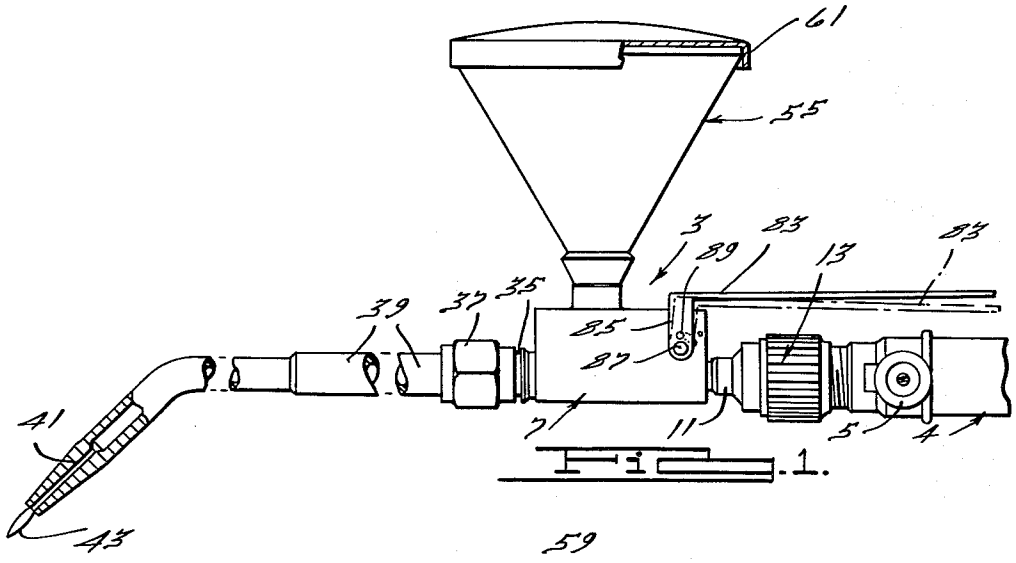


Fig. 1.

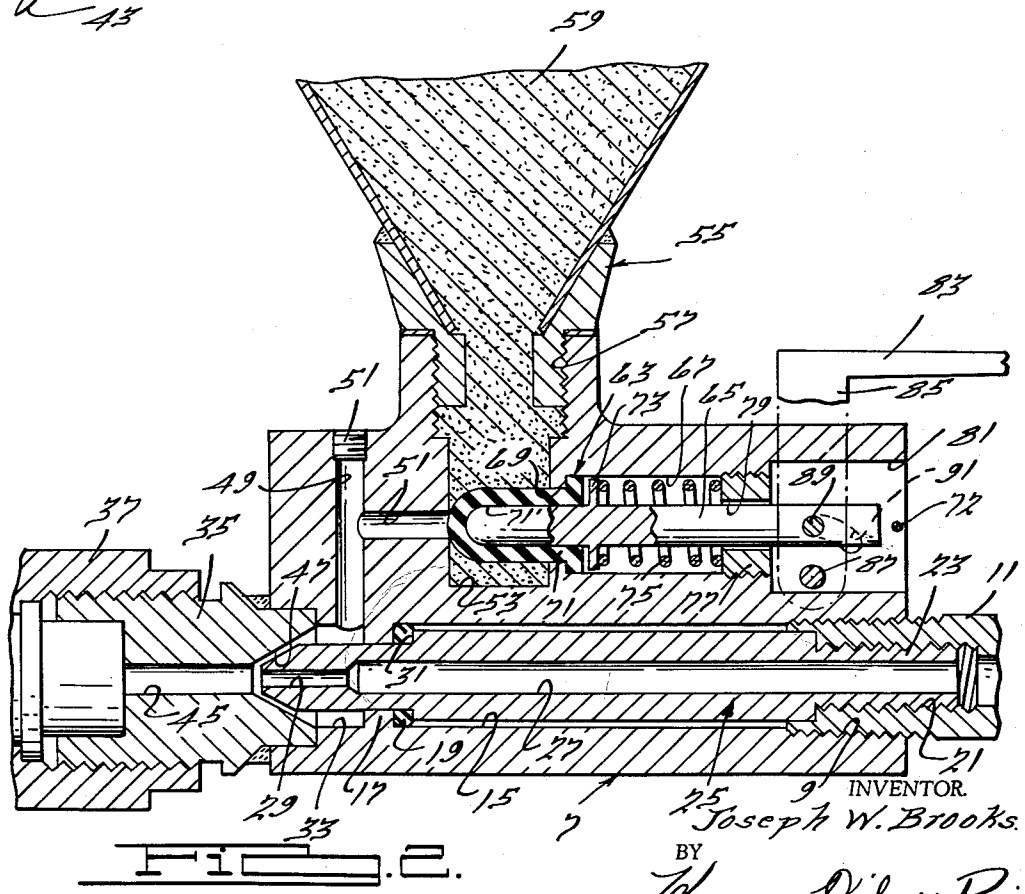


Fig. 2.

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POWDER APPLYING AND FUSING TORCH APPARATUS

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This invention relates to a torch device for applying and fusing metal in powder form onto a metallic surface and more particularly to such a torch device having improved characteristics over those heretofore known.

While many torch devices have been developed and marketed for spraying and fusing metal powder onto a metallic surface such devices have had drawbacks with regard to maintenance, operation, and/or interchangeability of parts. Torch devices of this type are usually connected with a mixing valve of a pressurized fuel system such as an oxy-acetylene unit and the high pressure fuel flows through an orifice in the torch device and because of a "venturi" or aspirating effect, draws metal powder particles into the fuel stream. The particles are mixed with the fuel and when the latter is ignited at the tip of the torch, the particles are melted and fused on a desired surface.

It is an object of this invention to provide a torch device of the aforementioned type in which the capacity can be easily changed or modified merely by changing certain components such as the tip and the fuel nozzle, thereby requiring the use of only one main body member for a multi-capacity unit.

It is a further object of this invention to provide a torch device of the aforementioned type having an improved feeding and control arrangement for the metallic powder which is fed into the fuel stream.

It is a still further object of this invention to provide a torch device of the aforementioned type which is compact, may be easily maintained, is positive in operation, may be manufactured in a relatively inexpensive manner and is safer to use than those heretofore known.

It is a still further object of the invention to provide a torch device which can be handled and controlled by one hand of the user and which will operate with metal particles of different shapes.

These and other objects of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a fragmentary side elevational view of the torch device connected with a mixing chamber of a high pressure oxy-acetylene fuel source, and

FIG. 2 is an enlarged longitudinal sectional view of a portion of the structure illustrated in FIG. 1.

Referring now to the drawings it will be seen that the torch device is indicated generally at 3 and is adapted to be connected through a torch butt 4 with a suitable pressurized fuel system such as an oxy-acetylene fuel system. Valve knobs 5 are provided on the butt 4 for adjusting and controlling the flow of oxygen and acetylene through the butt into a mixer 11. A body member 7 has a threaded aperture 9 adjacent the rear thereof into which the front end of the mixer 11 is threadably connected. A coupling 13 removably connects the mixer 11 with the torch butt 4. Body member 7 has an elongated aperture 15 extending forwardly from the threaded aperture 9 and an annular shoulder 17 projects into the aperture 15 adjacent the forward end thereof to provide a shoulder against the rear face of which an O-ring seal 19 is positioned. The mixer 11 is provided with an internally threaded aperture 21 which receives the threaded rear end portion 23 of a nozzle 25. The nozzle 25 has a longitudinal aperture 27 extending therethrough which terminates adjacent its front end in an orifice 29. The nozzle is provided with a shoulder 31 which engages the O-ring seal 19 and the front end of the nozzle projects into a recess 33 in the front of the body member 7 adjacent the aperture 15.

A coupling member 35 is fixedly connected to the front of the body member 7 such as by being welded in place and the coupling member 35 has its forward end threaded to receive a coupling nut 37 which detachably connects a torch tip member 39 with the coupling member 35. The forward end of the tip member 39 has a reduced orifice 41 through which the gas flows and is adapted to be ignited to produce a flame 43 projecting from the front end of the tip member. The coupling member 35 has an aperture 45 which communicates at its front end with the tip member 39 and at its rear end with a frustro-conical shaped recess 47. The forward end of the nozzle 25 is complementarily tapered with respect to the wall of the recess 47 so that there is a space between the front position of the nozzle 25 and the wall of the coupling recess 47 which communicates with the recess 33 in the front of the body member 7 and with the aperture 45 in the coupling member 35.

A vertically extending passage 49 is provided in the body member 7 which communicates at its lower end with the recess 33 and the upper end of which may be closed by a plug 51. The vertical passage 49 communicates intermediate its ends with the forward end of a horizontal passage 51, the back end of which is adapted to communicate with a vertically arranged cavity 53 in the body member 7 above the nozzle 25. The upper end of the cavity 53 communicates with the lower end of a powder container 55 threaded into a recess 57 directly above the cavity 53. The container 55 is adapted to be filled with powder 59 composed of metallic particles of any suitable shape and/or size, and a removable lid 61 is provided for closing the top of the container 55. Therefore, when the container 55 is filled with metallic powder the powder flows downwardly by gravity to fill the cavity 53.

A valve 63 is provided for closing communication between the powder cavity 53 and the horizontal passage 51. The valve 63 includes a plunger 65 which is disposed in a generally horizontal position and is reciprocable in a horizontal bore 67 provided in the body member 7 above the nozzle 25. The body member 7 is provided with an annular shoulder 69 adjacent the cavity 53 against which the flanged back end of a plunger seal 71 is in constant engagement so as to prevent powder from flowing into bore 67. The seal 71 is formed of rubber or other suitable resilient material and has a central recess 71' into which the front end of plunger 65 extends. The plunger is provided with an annular flange or shoulder 73 intermediate its length against which the front end of a coil spring 75 abuts. The rear end of the coil spring 75 abuts a plug 77 threaded into the rear end of the plunger bore 67 so that the plunger is spring urged in a forward direction. The free length of the rubber seal 71 is less than that shown in FIG. 2 so that when the plunger is moved to its forward position by spring 75 the seal 71 will be stretched until it engages the front wall of cavity 53 and closes communication between the cavity and horizontal passage 51 as illustrated. When the plunger is retracted, as will be hereinafter described, to open communication between the cavity 53 and passage 51, its rearward movement is limited by a stop 72 and the rubber seal will still be slightly stretched or under tension thus positively retaining its flange in sealing engagement with the body shoulder 69. The plunger seal 71 insures a positive shut off between the powder cavity 53 and passage 51 and tests have shown that it has long life and will not be damaged or wear out prematurely.

The plunger 65 extends rearwardly through an aperture

79 in the plug 77 into a recess 81 in the rear of the body member 7. An L-shaped valve actuating lever 83 is provided adjacent the rear of the body member which includes a pair of depending vertical legs 85 which straddle the body member and are pivotally connected therewith by horizontal pivot pin 87. The vertical lever legs 85 are connected to the plunger 65 adjacent the back end thereof by a pin 89 and the walls of the body member are slotted as shown at 91 so that when the horizontal portion of the lever 83 is depressed by the user of the torch the plunger 65 will be moved rearwardly against the action of the coil spring 75 to communicate with passage 51 with the cavity 53. The lever 83 is arranged and located so that it can be operated by the same hand the operator uses to hold the torch.

When the valve has been actuated to communicate the powder cavity 53 with the horizontal passage 51 and the vertical passage 49 and the body member recess 33, and gas under pressure is flowing from the torch butt 4 through the nozzle aperture 27 and the nozzle orifice 29, the flow of gas will draw the powder through the space between the forward end of the nozzle and the back end of the coupling 35 so that the powder will mix with the gas as it flows through the tip 39. Therefore, when the mixture of the fuel and metal powder reaches the forward end of the tip 39 the metal powder will be melted in the flame 43 and can be applied to and fused on a metallic surface. No separate aspiration is required for feeding the powder into the gas stream and because the powder is not gravity fed into the gas stream, but must flow through the horizontal passage 51 and the vertical passage 49, greater safety from blow back of ignited gases is provided. Because of the aforesaid passage arrangement powder will not be blown out of the cavity if any backfiring of the gases occurs. Still further, because the passage 49 extends above passage 51, additional space for blow back will not flow through passage 51 into the powder cavity.

When it is desired to vary the capacity of the torch this can be done by simply unscrewing the coupling nut 37 and connecting a different sized tip 39 with the coupling member 35. When the change in the tip 39 requires a change in the nozzle 25, in order to provide maximum efficiency and change the torch capacity, the nozzle can be changed by simply disconnecting the mixer 11 from the butt 4 through the disconnect coupling 13 and then unscrewing the mixer from the body member 7. When this is done the mixer 11 and the nozzle 25 can be withdrawn from the body member and the nozzle can then be disconnected from the mixer by simply unscrewing one relative to another. A nozzle having a different orifice size can then be threadably connected to the mixer 11, the mixer 11 reinserted into the body member 7 and threadably connected therewith and then connected to the butt 4 through the coupling 13.

It will thus be seen that the nozzle and tip can be quickly changed to permit the torch to be used for a wide variety of applications and it will furthermore be appreciated that a durable and positive valve mechanism is provided for controlling communication of the metal powder into the gas stream and that when the valve is closed the passages communicating the powder cavity 53 with the tip will be quickly cleared out by gas flowing through the torch and thereafter when the gas is shot off the torch will be cleaned and will not tend to be clogged or plugged. In addition if the gas is shut off and the valve opened the torch will not become overloaded or clogged with powder. The torch device of this invention thus has many advantages and improvements over torch devices heretofore known.

While it will be apparent that the preferred embodiment of the invention disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A torch device for applying and fusing metal powder to a workpiece comprising, a body member having a first passage therein, a nozzle having an orifice therein disposed in said first passage and forming an aspirating venturi with said body member, means for connecting said nozzle to a source of combustible fuel under pressure, a tip member having a passage therein supported by said body member and in fluid communication with both said venturi and said first passage, a powder receiving cavity formed in said body member and disposed above said first passage for feeding powder to said venturi, a second passage in said body member having one end thereof in fluid communication with said cavity, a third passage in said body member having one end thereof communicating said venturi and the other end thereof being closed, said third passage communicating the other end of said second passage intermediate the ends of said third passage for providing a flow path for powder from said cavity to said venturi, said third passage forming a substantial expansion chamber above said communication between said third passage and said second passage for providing additional space for expanding gases in the event of blow-back, and valve means supported in said body member having a portion thereof disposed in said cavity for engaging said other end of said second passage and actuable to open and close communication between said cavity and said second passage, so that fuel flowing under pressure through said nozzle orifice and said tip member will draw powder from said cavity through said passages and into the fuel stream when said valve means has been actuated to communicate said cavity with said second passage.

2. A torch device for applying and fusing metal powder to a workpiece comprising, a body member having a first passage therein, a nozzle having an orifice therein disposed in said first passage and forming an annular aspirating venturi with said body member, means for connecting said nozzle to a source of combustible fuel under pressure, a tip member having a passage therein supported by said body member and in fluid communication with both said venturi and said first passage, a powder receiving cavity formed in said body member and disposed above said first passage for feeding powder to said venturi, a horizontal passage in said body member having one end thereof in communication with said cavity above the bottom thereof, a vertical passage in said body member having one end thereof communicating said venturi and the other end thereof being closed, said vertical passage communicating the other end of said horizontal passage intermediate the ends of said vertical passage for providing a flow path for powder from said cavity to said venturi, said vertical passage forming a substantial expansion chamber above said communication between said vertical passage and said horizontal passage for providing additional space for expanding gases in the event of blow-back, and linearly reciprocably operable valve means supported in said body member having a portion thereof disposed in said cavity for engaging said other end of said horizontal passage actuable to open and close communication between said cavity and said horizontal passage, so that fuel flowing under pressure through said nozzle orifice and said tip member will draw powder from said cavity through said horizontal and vertical passages and into the fuel stream when said valve means has been actuated to communicate said cavity with said horizontal passage.

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