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ELECTRIC ARC TORCH

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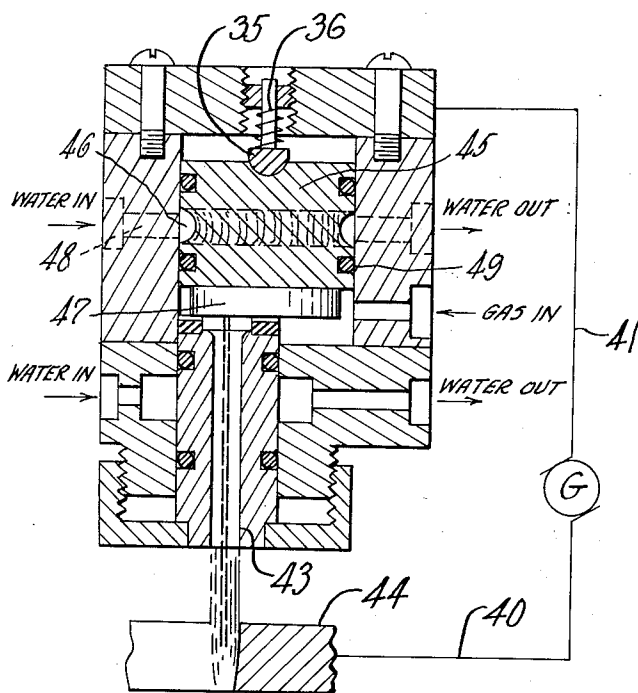


Fig. 1.

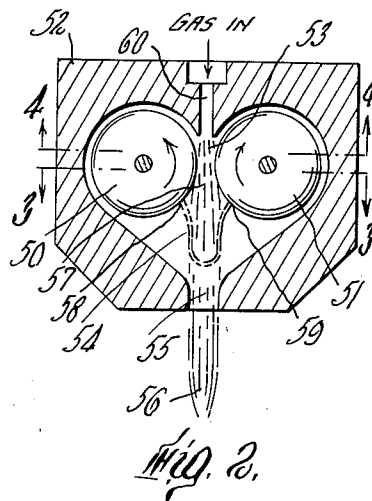


Fig. 2.

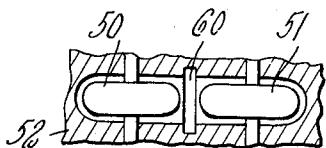


Fig. 4.

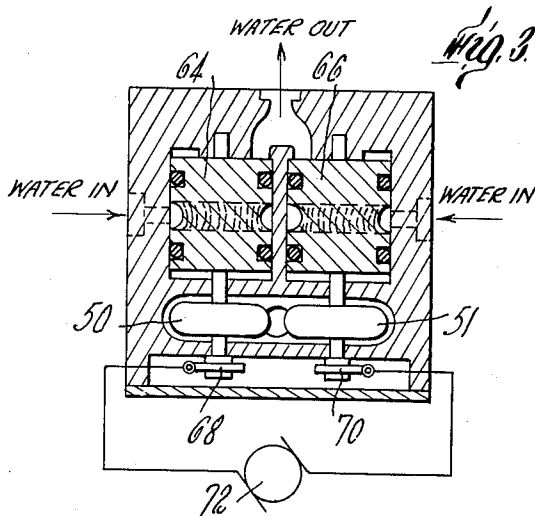


Fig. 3.

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ELECTRIC ARC TORCH

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4 Claims. (Cl. 219-75)

My invention relates to electric arc torches and relates more particularly to means whereby the life of arc torch electrodes may be significantly extended. In present arc torch devices, after normal erosion through use, electrodes must be replaced. In some cases the eroded electrode may be restored by cutting away eroded areas and reshaping to original configurations by known machining processes. In either case costly interruptions of operation are caused. Also expensive electrode material may be wasted.

The essence of this invention is to make better use of electrode material. Such materials include refractory metals such as thoriated tungsten. These materials are expensive and, in periods of national emergency, may present a critical shortage. In accordance with the invention, power driven rotary electrodes are employed to provide a continuous change of the active electrode areas. Thus what I accomplish is the extension of the period of uninterrupted usage before electrode renewal becomes necessary.

This application is a continuation-in-part of application Serial No. 114,578, filed on March 23, 1961, by James A. Browning and George A. Klasson. Torches of the general type of which my invention is applicable are shown and described in U.S. Patents No. 2,960,594, issued to Merle L. Thorpe.

It is a principal object of my invention to provide a torch having electrodes with greatly extended service lives.

It is a further object of my invention to utilize power sources already available in conventional devices to accomplish the foregoing principal object.

Other objects and advantages of my invention will be readily apparent from the following description and drawing, in which,

FIGURE 1 is a view, in cross section, of a torch device employing my invention;

FIGURE 2 is a view, partly in cross section, of another embodiment of the invention using two rotating electrodes;

FIGURE 3 is a view on the section line 3-3 of FIGURE 2;

FIGURE 4 is a view on the section line 4-4 of FIGURE 2.

Referring now more particularly to FIGURE 1, an arc torch of the general type to which the invention is applicable is shown. The torch is operating in the transferred mode; that is, one active electrode 47 is in the torch body while a work piece 44 serves as the second electrode. The circuit from a source of power G is completed through leads 40 and 41.

I provide a rotor 45 having turbine vanes 46 formed on its periphery. Brazed to the rotor 45 is the cylindrical electrode 47, the axis of which is offset in the manner shown from the axis of an arc passageway 43. Water under pressure is introduced at an aperture 48 and performs the dual function of cooling and driving the rotor 45. Seals as at 49 keep the water from entering other chambers of the torch. As the rotor 45 turns, the erosional wear on the emitting surface of electrode 47 is continuously distributed, thus making possible long periods of operation with no interruptions whatever.

The electrical connection to the rotor 45 may be made

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through a hemispherical element 35 which is seated firmly but rotatably in a recess in the rotor 45. A spring 36 may be used to supply the desired contact pressure. The remaining elements of the torch of FIGURE 1 form no part of this invention as such and perform substantially the same functions as described in said application Ser. No. 114,578, filed on March 23, 1961.

The torch construction shown in FIGURE 2 employs two rotating electrodes. Here the torch is operating in what is known as the non-transferred mode; that is, the arc is wholly contained within the torch, the affluent 56 being a plasma stream emerging from an aperture 55. The arc per se is shown at 54 and it runs from electrode 50 to electrode 51. It should be pointed out at this point that either electrode may act as the cathode, while its counterpart acts as the anode. Or, alternatively, an A.C. arc may be established between the electrodes, such operation, of course, requiring an appropriate power supply. The torch of FIGURE 1 may also be operated in the A.C. or also in the non-transferred mode as heretofore pointed out.

A plasma forming gas is introduced under suitable pressure through a slot 60, which is shown in FIGURE 4 in relation to the electrodes 50 and 51. The gas flowing through the slot 60 and between the electrodes at 57 blows the arc 54 into an elongated path, best shown in FIGURE 2. The heated stream then passes out of the torch body to be applied as desired.

I provide two water turbines 64 and 66 journaled in the body member 52. They may be driven, as in FIGURE 1, by cooling water supplied to the torch under pressure. The active arc-impinging areas 58 and 59 of the electrodes 50 and 51 are normally subject to a high rate of attrition which in conventional devices seriously limits electrode life. With the electrodes continuously rotated the entire periphery of the surface is used and wear is thus effectively distributed.

The net gain in electrode life afforded by my invention is spectacular in either embodiment shown herein. Life is extended not merely in proportion to the additional active electrode surface presented, but by a significant further increase over that factor. This is achieved due to the fact that a given region on the electrode is permitted to "recover" before becoming a part of the arc circuit again. Thus the instantaneous active electrode surface runs much cooler than is the case where the arc continues to emerge from or impinge upon a localized spot. Accumulative effects of normal attrition are therefore avoided.

In FIGURE 3, a method of energizing the torch is shown. This comprises a power supply 72 connected by leads to two brush-slip units 68 and 70. The method is merely illustrative, and any suitable expedients in the commutator-slip ring brush art may be applied to accomplish the purpose.

Having described my invention taking two possible forms, it is understood that modification and variations within the spirit and scope of the following claims may occur to those skilled in this art.

I claim:

1. In an electric arc torch, at least one rotatable electrode, an arc passageway extending from said electrode and having its axis parallel to and offset from the axis of rotation of said electrode, means for supplying cooling fluid under pressure to said torch, and means adapted to be driven by said fluid to rotate said electrode.

2. An electric arc torch comprising a body, two rotatable electrodes mounted in said body in spaced relation, means for establishing an arc between said electrodes, means for gas stabilizing said arc in a substantially constant path with respect to the axes of said electrodes, and

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means for rotating said electrodes to present successive areas on said electrodes in operative relationship to said arc.

3. An electric arc torch according to claim 2 in which the means to rotate said electrodes are operative continuously while said torch is in operation.

4. An electric arc torch comprising a body, two rotatable electrodes mounted in said body in spaced relation, means for establishing an arc between said electrodes and stabilizing said arc in a substantially constant path, means

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for supplying cooling fluid under pressure to said torch, and rotor means attached to said electrodes and adapted to be turned by said fluid, whereby successive areas on said electrodes are presented in operative relationship to said arc.

References Cited in the file of this patent

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