June 18, 1968 S. M. DE CORSO 3,389,209

ELECTRODE FUSE PROTECTOR

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FIG. 1

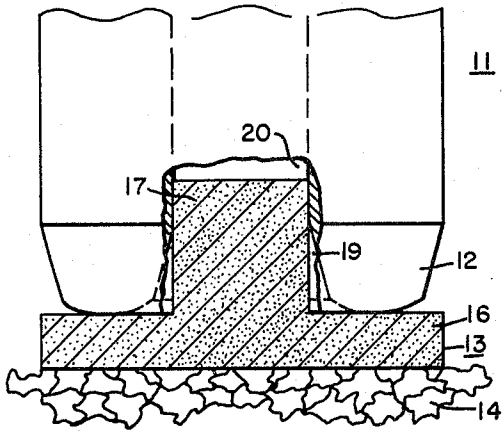
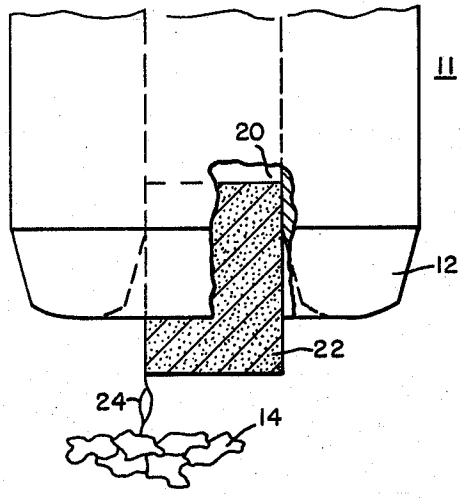


FIG. 2



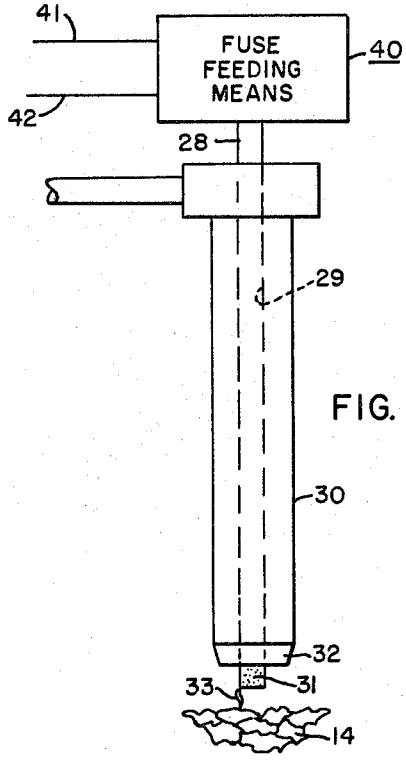
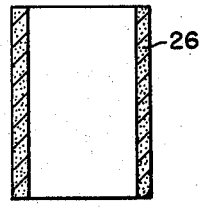


FIG. 3

FIG. 4



WITNESSES

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ELECTRODE FUSE PROTECTOR

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13 Claims. (Cl. 13—18)

ABSTRACT OF THE DISCLOSURE

A fuse for an electrode used in an arc furnace is composed of a material such as carbon, graphite, or a carbon-graphite mixture, is mounted in or on the electrode tip or other arcing surface, or extends through a central axial aperture through the electrode and beyond the electrode tip. When the arc first starts to the melt of the furnace, the arc takes place between the fuse and the melt. The fuse is rapidly consumed and the arc thereafter transfers to the electrode tip and takes place between the tip and the melt.

Background of the invention

This invention relates to improvements in fuses, and more particularly to a fuse for protecting an electrode used in an arc furnace.

In the operation of non-consumable electrodes in an arc furnace, the term "non-consumable" as employed herein signifying an electrode having a fluid-cooled arcing tip with a passageway for cooling fluid near the arcing surface and a field coil in the tip for setting up a magnetic field to rotate the arc, one of the most severe operating conditions occurs during the short interval when the electrode is starting an arc on a cold scrap charge. Standard furnace regulation is such that until a second electrode approaches within arcing distance of the scrap no arcing action occurs at the first electrode. Therefore, the travel of the first electrode is regulated by voltage indication between the electrode and the scrap or bath until arcing commences. This means that the first electrode will be very close to sizeable scrap pieces and may be in actual direct contact with the scrap.

Summary of the invention

In summary, the fuse of my invention provides a physical barrier of diamagnetic material between the electrode tip or arcing surface, and the scrap. My invention includes several modifications including one in which the fuse is positioned by hand, and a second one in which the fuse is fed or moved into position down a centrally located axial aperture in the electrode.

Accordingly, an object of the invention is to provide a new and improved electrode fuse.

A further object is to provide a new and improved electrode fuse composed of diamagnetic material.

A still further object is to provide a new and improved electrode fuse which may be inserted through the central aperture of the electrode.

Brief description of the drawings

In the drawings, FIG. 1 shows a fuse according to one embodiment of my invention;

FIG. 2 shows a fuse according to a second embodiment of my invention;

FIG. 3 shows a fuse according to a third embodiment of my invention; and

FIG. 4 shows a fuse according to a fourth embodiment of my invention.

Description of the preferred embodiments

In FIG. 1, the electrode is generally designated **11** having an electrode face member or electrode tip shown at

12 and forming an arcing surface. The fuse generally designated **13** is seen to be interposed between the electrode tip **12** and the scrap charge indicated at **14**. The fuse is generally seen to include a flange portion **16** of a diameter sufficiently great to insure that no portion of the electrode tip comes in direct contact with scrap, and a hub or cylindrical portion **17** which extends up into the central aperture **19** of the annular arcing tip member **12**. This hub or cylindrical portion **17** of the fuse may be sufficiently long if desired to extend into the central passageway **20** of the electrode.

As previously stated the fuse generally designated **13** may be composed of diamagnetic material. Suitable materials are carbon, or graphite, or a carbon-graphite mixture. The fuse in FIG. 1 is inserted by hand into the end of the electrode before the electrode is lowered into the furnace and is maintained in place by pressure contact at the cylindrical portion **17** with the adjacent wall of the tip **12** and/or the adjacent wall of the central aperture **20** through the electrode.

If desired, suitable clips extending from the tip and projecting over the flange portion may be added to additionally secure the fuse in place, these not being shown for convenience of illustration.

In operation current coduction is first from the electrode face or tip member through the fuse to the scrap until the fuse is expended at which time arcing occurs from the electrode tip **12** to the scrap **14**.

In FIG. 2 a further embodiment of the fuse is shown generally designated **22** and generally being of a solid cylindrical construction. The fuse **22** is inserted by hand into the end of the electrode and is held in position by interference fit, and an arc **24** is shown taking place from fuse **22** to scrap **14**. The fuse **22** is rapidly expended on consumed and after a short time interval the arc takes place directly from the electrode tip **12** to the scrap **14**.

Particular reference is now made to FIG. 4 which shows another embodiment, or modification, of a fuse similar to that of fuse **22** except that the fuse element **26** of FIG. 4 is hollow and is cylindrical in shape, the operation being similar to that of the fuse in FIG. 2.

Particular reference is made now to FIG. 3. An elongated fuse **28** extends the entire length of the central aperture **29** of electrode **30**, and the end portion **31** of the fuse extends beyond the arcing surface **32** of the electrode. Arc **33** is seen taking place from the end **31** of the fuse to the scrap **14**, and it will be understood that the extended end portion of the fuse is rapidly consumed by the action of the arc, and after a short period of operation the arc transfers to the arcing surface **32** of the electrode and that the arc thereafter takes place from the electrode to the scrap.

The invention includes a feeding device having leads **41** and **42** located at the top of the electrode in FIG. 3 to automatically feed fuse upon a dead short indication of electrode to scrap.

The automatic fuse feeding means **40** may be dispensed with, if desired.

The foregoing written description and drawings it will be understood are illustrative only and are not to be interpreted in a limiting sense.

I claim as my invention:

1. A fuse for an electrode to be used in an arc furnace, the fuse being composed of diamagnetic material, the fuse extending beyond the arcing surface of the electrode and being interposed between the electrode and the scrap of the furnace whereby when a current path is first provided through the electrode, an arc first takes place from the fuse to the scrap, the arc rapidly consuming the material of the fuse, the arc after a short time interval being

transferred to the electrode and taking place between the electrode and the scrap.

2. A fuse according to claim 1 including a flange portion having an outer diameter at least as great as the outer diameter of the arcing surface of the electrode and a cylindrical portion adapted to be inserted into the central aperture of the electrode and to be held in frictional engagement therein.

3. A fuse according to claim 2 in which the cylindrical portion is additionally described as being sufficiently long to extend into the central aperture of the electrode.

4. A fuse according to claim 1 in which the fuse is additionally characterized as being composed of carbon.

5. A fuse according to claim 1 additionally characterized as being composed of graphite.

6. The fuse according to claim 1 additionally characterized as being composed of a carbon-graphite mixture.

7. A fuse according to claim 1 additionally characterized as being cylindrical in shape.

8. A fuse according to claim 7 additionally characterized as being hollow and as having a cylindrical wall portion.

9. A fuse for use with an electrode in an arc furnace, the electrode having a central aperture extending through the electrode in an axial direction, the fuse being of sufficient length in accordance with the total length of the

electrode that the end of the fuse adjacent the arcing surface of the electrode extends beyond the arcing surface, an arc first taking place from the fuse to the scrap when the arc is started, the material of which the fuse is composed being rapidly consumed until the arc transfers to the electrode and takes place between the electrode and the scrap.

10. A fuse according to claim 9 composed of carbon.

11. A fuse according to claim 9 composed of graphite.

12. A fuse according to claim 9 composed of a carbon-graphite mixture.

13. A fuse according to claim 9 including in addition fuse feeding means located at the top of the electrode to automatically feed the fuse upon a dead short indication of electrode to scrap.

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