March 9, 1954 K. FOYN 2,671,816

CYLINDRICAL ELECTRODE HOLDER

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Fig. 1

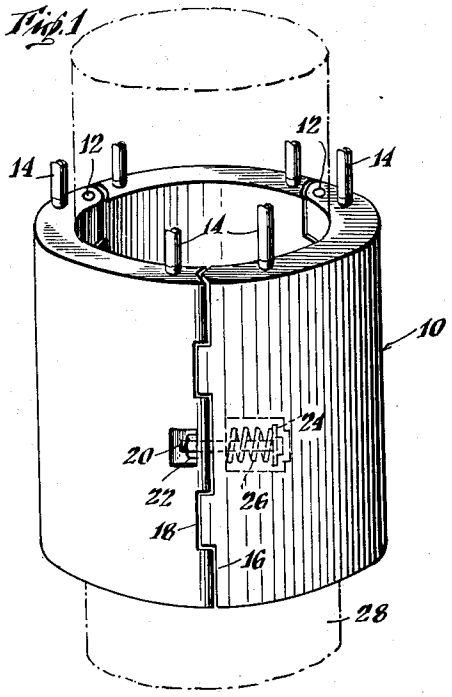


Fig. 2

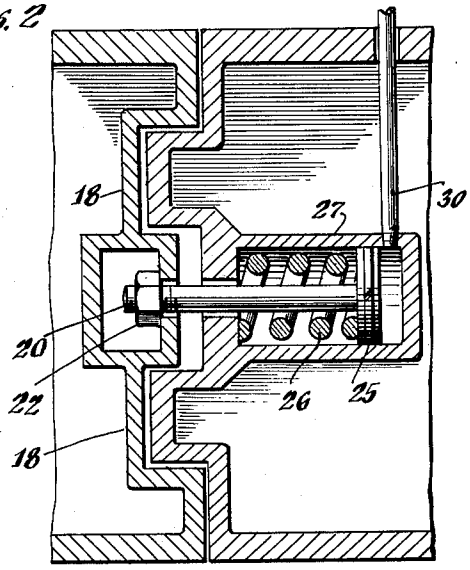


Fig. 4

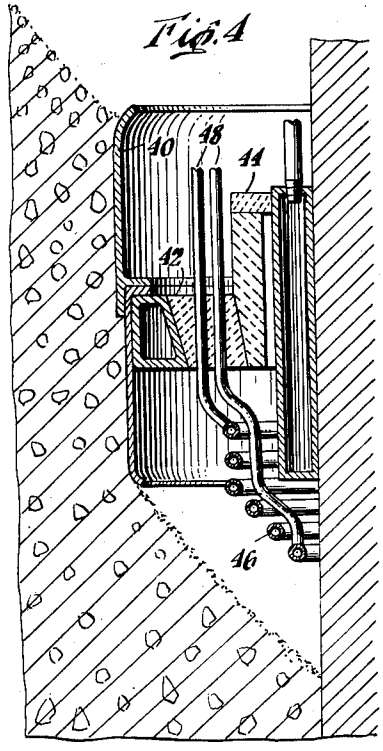


Fig. 3

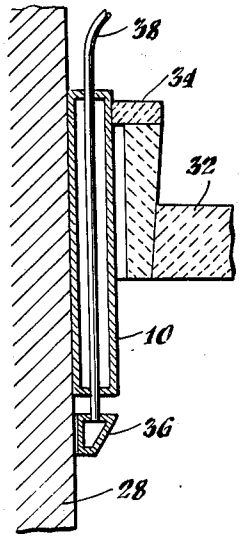
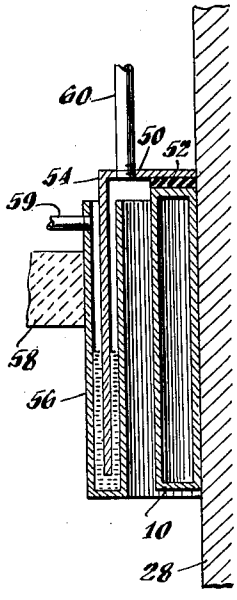


Fig. 5



INVENTOR.
Kjeld Foyn

BY
Eyre, Mann & Burrus
ATTORNEYS

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CYLINDRICAL ELECTRODE HOLDER

Kjeld Foyn, Oslo, Norway, assignor to Elektrokemisk A/S, Oslo, Norway, a corporation of Norway

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Claims priority, application Norway February 15, 1951

4 Claims. (Cl. 13—16)

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This invention relates to an electrode holder for electric furnaces which will be suitable for use in both open and closed furnaces and which is so constructed that it can be made with a substantially smooth exterior surface which will permit it to be lowered through the roof opening in the smelting furnace itself while still making a good physical connection with the roof. When the electrode holder can thus be lowered into the furnace the electrical conditions of the furnace are considerably improved, as the distance from the point where the electrical current is introduced into the electrode to the heating point will be reduced and shortening this distance makes the electrode stronger and safer. All of this is of great importance especially in the construction of large electric furnaces. Actually as conditions are now, it is the electrical conditions and the stability of the electrode during use which limit the capacity and depth of the furnace.

In carrying out this invention I form a water-cooled ring made in two or three sections which are hinged together but adapted to open at one of the joints. The ring itself is made with a substantially smooth exterior and the mechanism for holding the parts of the ring together and clamping them tightly about the electrode is so constructed that it is within the contours of the ring. This maintains the smooth exterior surface and also makes it possible to apply adequate cooling for this mechanism.

I have found it highly advantageous to provide the mechanism for holding the ring closed and for clamping it about the electrode with resilient tighteners. These may be spring-operated or they may be controlled directly by fluid pressure (that is either hydraulic or pneumatic pressure). Preferably the tightening means is spring-controlled so that the ring tends to grip the electrode firmly but fluid mechanism is supplied for loosening the spring clamp. As stated, if preferred, the gripping can be created by the fluid pressure but inasmuch as the gripping is effective for the greater part of the time it is advisable to have this accomplished by the spring and to use the fluid means for loosening it to permit the electrode to slide down through the ring when it is necessary from time to time to readjust the point where the ring grips the electrode. In this application I not only show the electrode itself but also show some of the various arrangements in which it may be employed.

If desired, vertical projections in the nature of tongues and grooves may be formed between

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the ring members so that if gas is collected inside the ring, it will not readily escape.

An illustrative example of the ring and examples of such use are shown in the accompanying drawings in which Fig. 1 is a perspective view of the ring or holder in its simplest embodiment; Fig. 2 is an enlarged view showing the clamping mechanism in section and illustrating a modified form of clamping mechanism from that shown in Fig. 1; Fig. 3 shows a sectional view through the ring and shows its position in a closed furnace; Fig. 4 is a sectional view similar to Fig. 3 showing another arrangement of the ring in a closed furnace and Fig. 5 is another sectional view similar to Fig. 3 showing an arrangement of the ring in conjunction with a liquid seal.

In Fig. 1 the ring 10 is made up of three sections hinged together at 12. It is understood that each of these sections is provided with pipes 14 which serve for the flow of cooling water into the sections and also these pipes are preferably made of copper and serve to conduct the electrical current to the ring member. The ring member is adapted to open along the line indicated at 16 and preferably is made with interlocking projections and recesses as indicated at 18.

In this figure the clamping mechanism consists of a bolt 20 provided on one end with a nut 22 and at the other end with a flange 24 against which spring 26 presses, thereby clamping the parts of the ring together to hold it tightly about the electrode indicated at 28.

Fig. 2 shows an enlarged view of the clamping mechanism but in this case the flange 24 is replaced by a plunger head 25 which operates in a cylinder 27. A pipe 30 runs into the cylinder 27 and is connected to a source of fluid pressure (not shown) so that when this pressure is admitted into the cylinder the spring 26 is compressed thereby permitting the parts of the ring 10 to separate somewhat so that the electrode 28 can slip through the ring.

In Fig. 3 the ring 10 is shown in a closed furnace indicated by the top member 32 and the contact sealing member 34. Since the ring 10 has a substantially smooth cylindrical surface it is a simple matter to keep the member 34 in contact with the surface of the ring 10. In this figure I also show the possibility of employing a supplementary cooling ring 36 suspended below the main ring 10 and designed to protect it from the heat of the furnace. This cooling ring 36 may be supplied with cooling water through pipes such as the one shown at 38 pass-

ing down through the ring 10. While not shown in this figure, it is understood that the ring 10 is supplied with its own cooling pipes such as those shown at 14 in Fig. 1.

In Fig. 4 I show the use of the ring in a furnace construction somewhat similar to that shown in Ingelsrud Patent No. 2,592,517 dated April 8, 1952. In this figure the furnace is provided with a shaft member 40 to which is connected a roof member 42 carrying a seal member 44. In this case auxiliary cooling mechanism is formed of a pipe coil 46 with the pipes 48 extending through the roof member 42.

In Fig. 5 the ring 10 is provided with a flange 50 separated from the ring by insulation 52. Extending down from the outer edge of the flange 50 is an outer ring 54 which enters a pocket 56 connected with roof member 58. The pocket 56 is supplied with liquid through the pipe 59 to form a liquid seal between the roof member 58 and the electrode 28. If desired, the insulation 52 may be eliminated in which case the pocket 56 may be filled with mercury so that the electrical current is conducted to the electrode through this seal. In this case a large amount of the furnace gas will collect between the pocket 56 and the ring 10, and the flange 54 can be supplied with a pipe 60 for withdrawing the gas from this point.

It is to be understood that the nature of the electrode 28 is not critical for this invention and it may, for example, either be a continuous electrode of the Söderberg type or it may be a prebaked graphite electrode.

It may be noted that by arranging the locking mechanism (including the bolt 20 and spring 26) within the lines of the ring 10, the ring is given the desired cylindrical shape and also the spring is protected from the heat of the furnace so that it will maintain its temper.

What I claim is:

1. An electrode holder of the type described comprising a plurality of ring members hinged together to form a cylinder having a substantially smooth exterior surface and an opening at one side between two of the ring members, each of said ring members being formed with an inner wall and an outer wall so that said members may be cooled by water circulated through them, means for drawing the edges of the cylinder together at said opening to compress the holder about the electrode, such means being positioned between the inner and outer walls of the ring member adjacent said opening so that the cylindrical shape of the holder is maintained, and means for transmitting electric current to said ring member so that the same will serve both for supporting the electrode and for transmitting electric current to it.

2. A structure as specified in claim 1 in which the means for drawing the edges of the cylinder together comprises a bolt connected with one of the ring members and extending into a cylinder positioned between the walls of the adjacent ring member, a plunger head on said bolt and means for exerting fluid pressure to control the action of said bolt.

3. A structure as specified in claim 2 which further includes a spring tensioning said bolt to hold the adjacent sides of the ring member together and which includes means whereby fluid pressure is used to counteract the pressure of such spring when it is desired to loosen the electrode.

4. The combination of an electrode holder as specified in claim 1, an electrode held by said holder, an electric furnace having a roof, and a ring-shaped contact member carried by said roof within which the said electrode holder is suspended while contact between it and the said ring-shaped contact member is maintained.

KJELD FOYN.

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