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Hesselmann

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[54] **SCREW NIPPLE CONNECTION FOR CARBON AND GRAPHITE ELECTRODES**

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[52] **U.S. Cl.**.....**313/357,** 13/18

[51] **Int. Cl.**.....**H01j 1/00,** H05b 7/14

[58] **Field of Search** 313/357; 13/18

[56] **References Cited**

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[57] **ABSTRACT**

An arrangement for securing a threaded nipple to a carbon or graphite electrode against turning, according to which that end face of the threaded nipple which is to be connected to the electrode is provided with an axial recess into which is introduced a cement adapted to swell under the influence of heat and a fitting member provided with teeth which in response to a swelling of said cement are brought into locking engagement with teeth provided in a recess in the end face of the electrode to which said nipple is to be connected.

5 Claims, 3 Drawing Figures

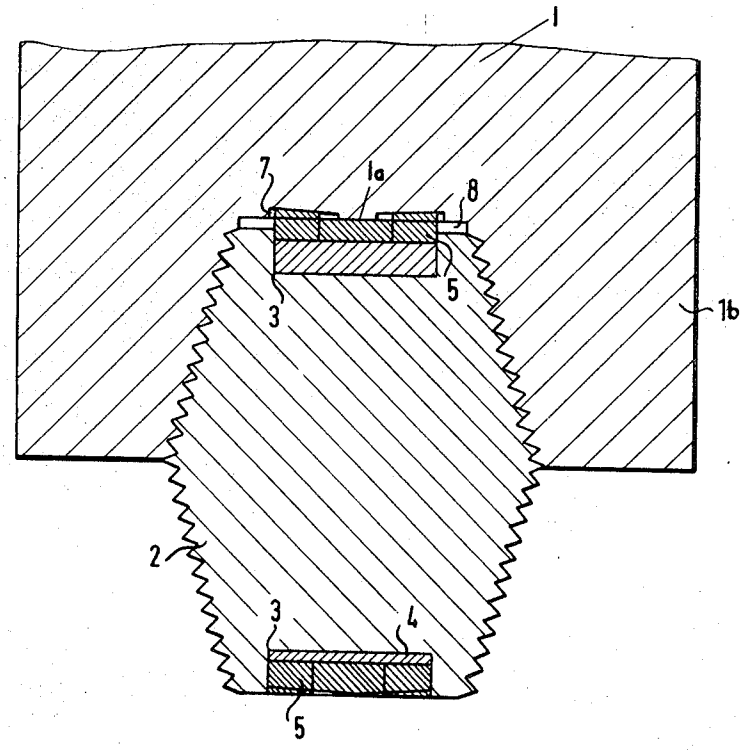
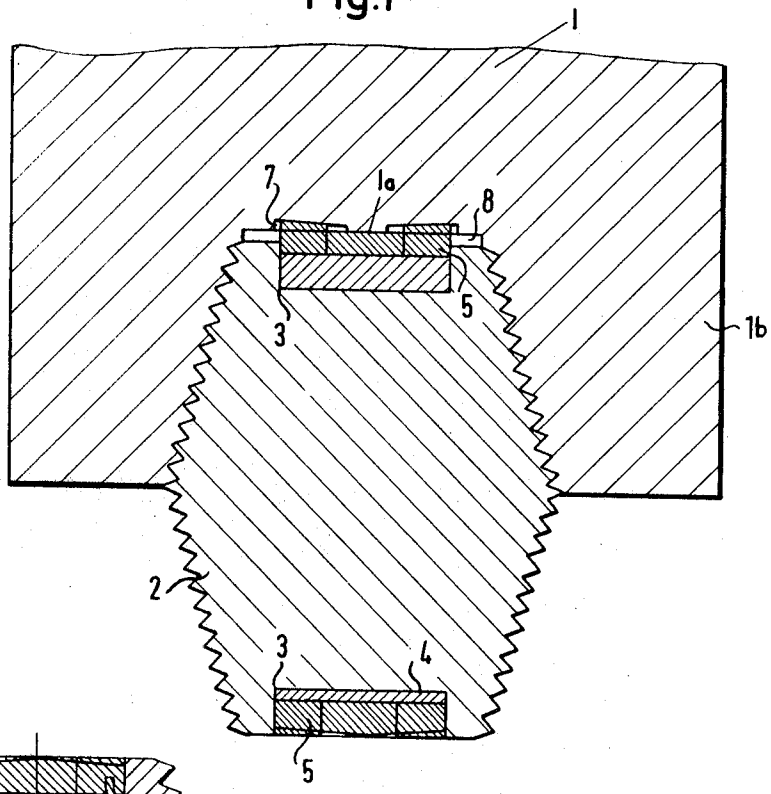


Fig.1



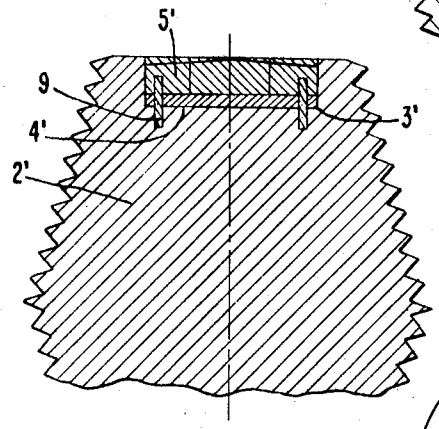
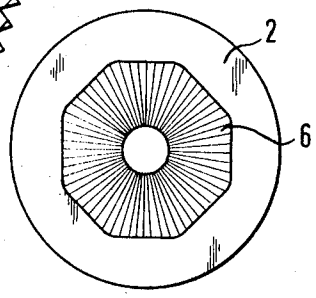


Fig.2

Fig. 3



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SCREW NIPPLE CONNECTION FOR CARBON AND GRAPHITE ELECTRODES

The present invention relates to a screw nipple connection for carbon and graphite electrodes especially in electric furnaces and, more specifically, is directed to means for securing such screw nipple connection.

Carbon and graphite electrodes are screwed onto each other by cylindrical or double cone threaded nipples of carbon or graphite, in order to make the electrode material follow up in a continuous manner. By improperly inserting the threaded nipple or by shocks and vibrations of the furnace, a loosening of the threaded connection may occur which in its turn may cause considerable disorders in operation. In spite of numerous suggestions for effectively securing the nipple connection involved, no satisfactory solution has been found heretofore.

It is known in connection with carbon or graphite electrodes to insert plastic cement adapted to coke at higher temperatures, between the recessed bottom surface of the end portion of the electrode also called the box bottom on one hand, and the end face region of the nipple on the other hand, in order in this way to secure the nipple connection against loosening. When being heated up and if desired through the intervention of a leavening agent, the cement will intimately engage the connecting surfaces of nipple and electrode box so as to fill in all hollow spaces and gaps. Aside from the fact that in view of the close tolerances, a uniform distribution of the cement causes considerable difficulties, the slightest shrinking of the inserted cement layer during the hardening and coking process brings about a reduction of the arresting effect and might even completely undo the desired arresting or locking effect. The loosened nipple will then, in view of the considerable weight of the electrode strand, be pulled downwardly while the end faces of the electrode move away from each other so that the total current passes through the nipple. As a result thereof, a strong overheating of the nipple occurs which may cause breakage.

According to another suggestion, it is intended to secure the nipple connection by means of graphite pins which are driven at the abutting surfaces of the electrodes or at a certain distance therefrom laterally through a bore in the wall of the electrode box and into the nipple. This type of securing the electrode-nipple connection has, similar to the lateral insertion of wedges, the drawback that in addition to the additional work necessary, the wall of said box is weakened while the bores in view of occurring high pull and bending stresses and the notch effect thereof will tear.

It is furthermore known to provide the end faces of the threaded nipple and the bottoms of the electrode boxes with a plurality of depressions distributed over the surface into which depressions the cement enters so that the securing material forms a disc with studs preventing the rotation of the nipple. However, also in this instance the cement is pressed through lateral bores in the electrode box whereby the wall of the box is dangerously weakened.

It has also been suggested in connection with securing nipple connections of electrodes to provide between the end faces of the nipple and the bottom of the electrode box at least one safety element in the form of metallic discs or rings of strongly resilient material with stamped-in, upwardly bent tips or with fan-shaped bends. These metallic securing elements, however, have the drawback that with increasing temperature the spring effect intended for securing the nipples against rotation decreases at a high rate, and not infrequently, even the melting point of the respective metal is reached.

It is, therefore, an object of the present invention to provide means which will establish a safe connection of the threaded nipple with the carbon or graphite electrode, especially in electric furnaces, against accidental rotation.

These objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawing, in which:

FIG. 1 is a longitudinal section through an embodiment of the threaded nipple according to the invention.

FIG. 2 shows a nipple end face with inserted fitting member.

FIG. 3 is a view similar to that of FIG. 1 and showing modification according to the invention.

The nipple-electrode connection according to the present invention is characterized primarily in that each of the end faces of the threaded nipple has an axial recess into which above the inserted cement layer there is provided a fitting member of carbon or another suitable material, and is furthermore characterized in that said fitting member on that side thereof which faces the electrode is provided with teeth having a radial component. This component, depending on the axial displacement of the fitting member by the driving force of the heated-up cement, engages corresponding teeth in the bottom of the electrode box. In this way, over heretofore known solutions, it will be possible in a simple manner and firmly to secure the nipple connection even at high temperatures of operation.

In order to make sure that the nipple cannot be rotated relative to the fitting member, the recess means in the end faces of the nipple and the fitting members to be inserted therein advantageously have a polygonal contour. It is, of course, also possible to make the fitting member and the recess means cylindrical. In this instance, however, it is necessary to connect the fitting members by means of graphite pins or similar pins at the bottom of the recess means with the nipples. The turning of the nipples and of the fitting member relative to the electrode is prevented by the teeth which are provided on that side of the fitting member which faces the electrode and by teeth in the bottom of the electrode box. The teeth will in this instance have a radial component. Preferably, the tooth flanks extend in a radial direction. In order to assure a safe engagement of the teeth of fitting member and electrode box, the nipple and the electrode box may each be provided with a marking the location of which will depend on the pitch of the nipple thread and the pitch of the teeth.

Referring now to the drawing in detail, FIG. 1 shows an electrode section 1 with a double cone threaded nipple 2. Recess means 3 are provided in the end faces of the nipple, and first a certain predetermined quantity of cement 4 is worked into the recess means 3 whereupon fitting members 5 are inserted in conformity with the recess means. The fitting members 5 have that side thereof which faces the electrode provided with teeth 6. Similar teeth 7 are provided in the bottom 1*a* of the

electrode box 1*b*. The nipple may by means of screw-in markings be screwed into the electrode box so that one tooth each of the fitting member teeth is located opposite a tooth space in the box bottom. Under the influence of oven heat, the cement expands under the effect of the leavening addition, presses the fitting member into the teeth at the bottom of the box and then cokes so that the fitting member can no longer be moved. This position is occupied by the upper fitting member of FIG. 1. For receiving possibly excessive cements, there is provided a remaining intermediate space 8 between the nipple end face and the box bottom.

It is, of course, to be understood that the present invention is, by no means, limited to the particular construction shown in the drawing but also comprises any modifications within the scope of the appended claims. It is also to be understood that the term "carbon material" as it appears in the claims also covers electrodes of carbon in the form of graphite. FIG. 3 shows structure accordingly with graphite pin means 9 engaging first and second locking means complementary thereto so as to prevent the same from rotating relative to each other. Remaining ref-erence numerals in FIG. 3 have primes added thereto for des-ignating features similar to those of FIGS. 1 and 2.

What I claim is:

1. In combination: an electrode of carbon material having an end face provided with an axial bore, said bore being provided with a thread and having a bottom with first locking means, a threaded nipple threaded into said threaded bore and having that end face thereof which faces said bottom provided with a recess having a bottom, second locking means arranged in said recess and in locking engagement with said first locking means, and leavening swelled cement arranged in said recess means and interposed directly between said second locking means and said recess bottom of said nipple while holding said second locking means in firm engagement with said first locking means.

2. The combination according to claim 1, in which said first and second locking means are formed by substantially radially extending interengaging teeth.

3. The combination according to claim 1, in which said recess means and said second locking means respectively have an inner and outer circumferential polygonal contour complementary so as to interengage each other and locking each other against relative rotative movement.

4. The combination according to claim 1, which includes graphite pin means engaging said first and second locking means complementary thereto so as to prevent the same from rotating relative to each other.

5. The combination according to claim 1, in which said nipple has the contour of a truncated symmetrical double cone and has a cylindrical recess axially symmetrial in each end face.

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