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PITCH CARTRIDGE FOR ELECTRODE JOINT

Original Filed Oct. 12, 1954

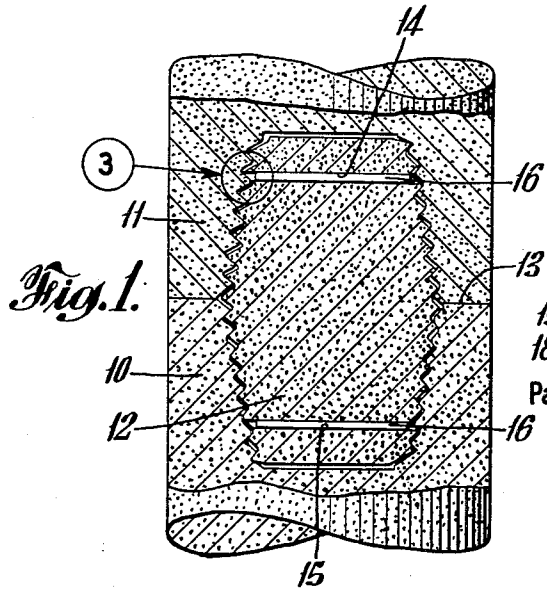

Fig. 1.

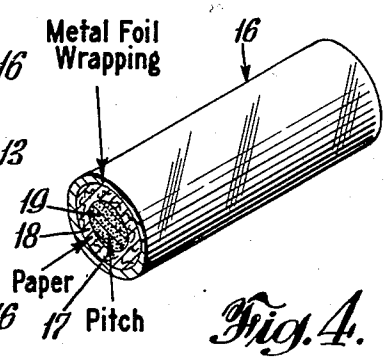

Fig. 4.

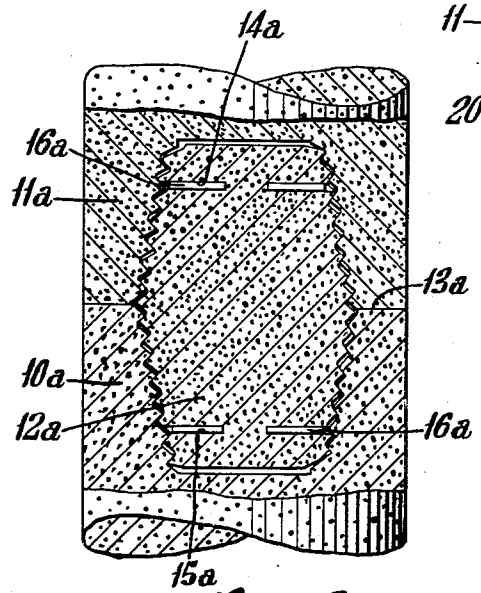

Fig. 2.

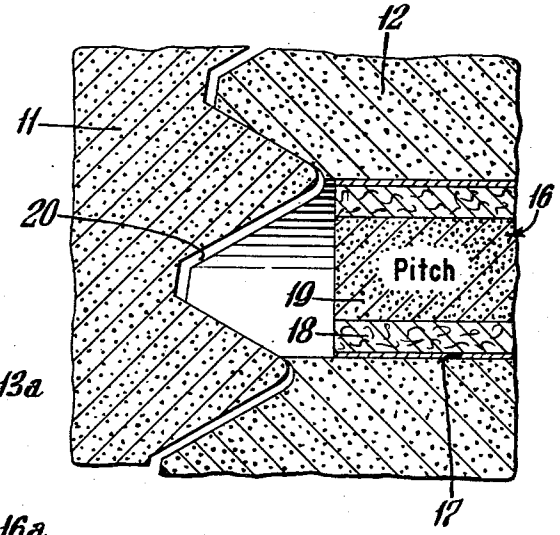

Fig. 3.

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PITCH CARTRIDGE FOR ELECTRODE JOINT

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Original application October 12, 1954, Serial No. 461,714, now Patent No. 2,735,705, dated February 21, 1956. Divided and this application November 16, 1955, Serial No. 547,237

1 Claim. (Cl. 206—84)

This invention relates to a pitch cartridge for a joint between sections of an electric furnace electrode and has for an object to provide a cartridge for an improved joint of this class which is easier to make and assemble and has less danger of the pitch melting prematurely.

After the invention of Patent No. 2,510,230, it was discovered that a joint less in danger of nipple rupture could be provided by the provision of a pitch reservoir opening onto the end face of an electrode section so that when the pitch melted, it flowed into the pores and crevices and bonded the contacting end faces, thus transmitting much of the flexural stresses between the electrode sections directly without having to have them pass largely through the nipple. The clearance spaces around the nipple threads were substantially free of any pitch thereby enabling the nipple to slide or tilt slightly with respect to the electrode sections under flexure. A later improvement sought the same freedom from flexure in the nipple with satisfactory electrical conductivity in the end face contact by eliminating the pitch reservoir in the end face and transferring it to each end of the nipple with only about 10% to 25% of the thread clearance space volume being filled with pitch.

According to this invention, by the use of a pitch cartridge to be described, a satisfactory electrode joint has been developed which possesses the advantages of a nipple that does not have to transmit a major portion of flexural stresses between electrode sections, has satisfactory electrical conductivity, adequate tightness to prevent an electrode section coming unscrewed with respect to the nipple, foolproofness whereby it is immaterial which end of a section and nipple is at the top or bottom, requires less pitch or other thermal setting bonding material, is one in which it is simpler and easier to form the pitch reservoir and install the pitch therein, and this joint is constructed to reduce the danger of the pitch flowing out of the reservoir prematurely and before the joint has been fully formed.

Specifically the nipple is provided adjacent each end with a diametral or radial recess into which the pitch or other thermal setting binder is inserted. The pitch is preshaped into the form of a stick of a size to be easily inserted in the recesses adjacent each end of the nipple, and the pitch is surrounded by a thermal insulating wrapper which delays the time required for the pitch to melt to an amount such that when the pitch cartridge is inserted in a nipple heated to a temperature above the melting point of the pitch, there will be ample time for the joint to be fully assembled after the last stick of pitch has been inserted. Upon heating, the pitch melts and flows into only about 10% of the thread clearance volume and adjacent each end of the nipple.

Referring to the drawing:

Fig. 1 is a longitudinal section through an electrode joint embodying this invention;

Fig. 2 is a longitudinal section of a modified construction;

Fig. 3 is an enlarged detail of the area shown within the circle designated 3 in Fig. 1; and

Fig. 4 is a perspective showing the pitch cartridge.

The furnace electrode joint in Fig. 1 comprises the lower electrode section 10, the upper electrode section 11 and the nipple 12 in threaded engagement with each section holding their end faces in mechanical and electrical contact as shown at 13. A diametral recess 14 is bored into the upper portion of the nipple 12 and a similar recess 15 adjacent the lower end of the nipple is also cut. Within each reservoir or recess is a preformed cartridge 16 of pitch having a melting temperature between about 75° C. and 200° C. As is well known in the art, the pitch in this cartridge melts on heating. It flows out of its diametral recess into the clearance spaces indicated in Fig. 3, where on further heating, it carbonizes and bonds the nipple to the electrode section against the sections coming unscrewed in use. In the present instance the quantity of pitch, however, is insufficient to fill all such clearance spaces and only about 10% to 20% of the volume of such clearance spaces is supplied with this pitch and the pitch is located adjacent the ends of the nipple after it has become set. In this way the joint is not so stiff but permits a slight tilting or sliding of the nipple with respect to each section in order that flexural stresses may not in large measure have to be borne by the nipple because the joint is usually of less strength to withstand such stresses than are the electrode sections.

The preformed cartridge of pitch has a wrapper of thermal insulating material around it as shown in Figs. 3 and 4. Around the outside of the cartridge is a layer of aluminum foil 17 to reflect radiant heat from the nipple from penetrating the cartridge and melting the pitch prematurely. Between the pitch 19 and the foil 17 is a layer of fibrous insulating material 18 to delay conduction of heat from the nipple to the pitch. In this case the fibrous material 18 is constituted by about 14 layers of kraft paper in a cartridge for a 20 inch diameter electrode. The effect of this wrapping is to delay the melting of the pitch 19 as much as one to six minutes before it flows into the helical clearance spaces 20.

In Fig. 2, wherein is represented a furnace electrode joint comprising a lower electrode section 10*a*, an upper electrode section 11*a*, and a connecting nipple 12*a* in threaded engagement therewith, holding the sections in electric and mechanical contact as shown at 13*a*, the pitch recesses 14*a* and 15*a* are radial and the pitch cartridge 16*a* is of shorter length than is the cartridge in Fig. 1 for the same size electrode and nipple. No large number of radial cartridges will be needed because the clearance space to be filled is small.

Instead of a conductive cementitious binding material like pitch, it has been found that a non-conductive cementitious binder may also be used in place of the pitch, but preferably such a binder should be thermal setting. Examples of non-conductive binders include water glass and Saureisen cement.

The cartridge recesses in the nipple are drilled adjacent the top and bottom without having to invert or change the position of the nipple.

In locations where the electrode sections must be connected close to the top of the furnace due to the absence of headroom or because a long electrode slip cannot be tolerated within the furnace, it has been found that the thermally insulated pitch cartridge of this invention is especially needed. In those installations where large headroom above the furnace is available, the electrode section may be connected far enough away from the furnace roof for the thermally insulated pitch cartridge to be unnecessary. Where the headroom is not large, a cartridge is placed into one end of the nipple before the

nipple is threaded into the heated lower section. The nipple is then screwed into that lower section for half its length. Hours later a pitch cartridge is placed into the upper recess **14** of the nipple just before the upper electrode section is to be secured in place. The threading of each electrode section onto its nipple should take not over a minute and the delay occasioned by the thermal insulation around the pitch is adequate to prevent the pitch from melting prematurely and preventing carbon to carbon contact. Another way in which the joint is made is to have the nipple with one cartridge inserted into a cold electrode section with the section arranged horizontally, then when a section is moved to a vertical position a pitch cartridge is placed in the lower end of the nipple just before that nipple is threaded into the hot lower electrode section.

Among the advantages of this invention may be mentioned the fact that a suitable electrode joint has been provided which is simple and less costly than have been the prior art joints. A delay of one to six minutes affords protection against premature melting of the pitch before the parts of the joints are fully assembled. The nipple and the electrode sections are both capable of being attached with either end upward, thus providing a foolproof joint, that is one in which the workman need not be required to be sure that one end of the nipple or of an electrode section is intended to be at the bottom of the joint. As compared with the joint of prior patent construction 2,510,230, the present joint is free of the disadvantage of having considerable nipple breakage due to the joint being too stiff. As compared with the electrode joint in the prior application of H. V. Johnson, Serial No. 300,243, filed July 22, 1952, now abandoned, the joint of the present invention is more nearly foolproof since either end of either the nipple or the electrode section may be placed uppermost or lowermost, but it makes no difference which. As compared to that same prior construction, the joint of this invention is slightly more conductive for an electrode of the same size due to the fact that no portion of a meeting of end faces of either electrode section in this invention is prevented from having any good contact with the other or contiguous meeting end face. In that prior mentioned application, Serial No. 300,243, a minor portion of the meeting end faces of one or both electrode sections was eliminated

from affording good contact by the fact that a pitch reservoir was formed within that end face. As compared with the joint in the prior application of Johnson, et al. Serial No. 379,566, filed September 11, 1953 for Furnace Electrode Joint, the construction of the present invention requires less pitch because not so much pitch has to remain in the pitch reservoir as is the case in that last mentioned application if it is to be considered capable of comparable foolproofness. In that prior construction the pitch reservoirs were axially disposed and almost half of the pitch in that reservoir was not usable. The drilling of the holes for the pitch in said aforementioned application was more difficult because the nipple had to be turned over after having one pitch reservoir drilled, in order for the reservoir at the opposite end of the nipple to be formed.

With a nipple 10.75 by 14 inches, the pitch reservoirs **16** and **16***a* were placed about one and a half inches from each end. The quantity of pitch found desirable is in the range of .02 to .11 of a pound for this foregoing nipple size.

This application is a division of application Serial No. 461,714, filed October 12, 1954, now Patent No. 2,735,705, granted February 21, 1956.

What is claimed is:

A generally elongated, substantially cylindrical cartridge of pitch adapted to be inserted into a nipple of a furnace electrode joint wherein temperatures well above the melting point of said pitch are encountered, said pitch having a melting temperature between about 75° C. and 200° C., said cartridge being provided with a fibrous, thermally insulating jacket to defer the time of melting said pitch for over a minute, despite the fact that said nipple is at a temperature above the melting point of said pitch, said jacket being consumable at a temperature well above that at which said pitch melts and having an outer wrapping of heat-reflective foil.

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