Sept. 4, 1934. S. A. WISDOM 1,972,849

SAFETY DEVICE FOR ELECTRODES

Filed July 20, 1932 2 Sheets-Sheet 1

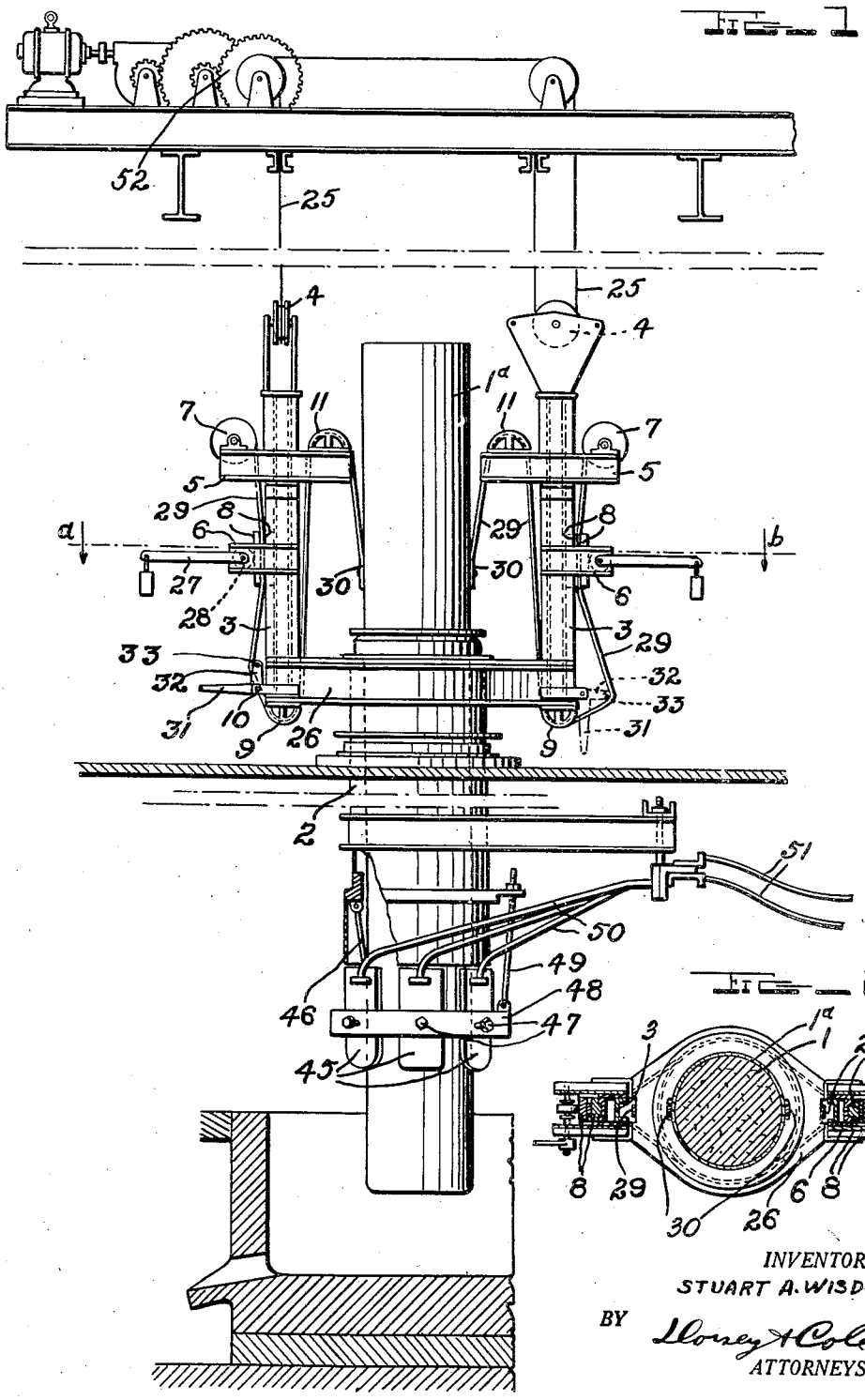


FIG. 2

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FIG. 3.

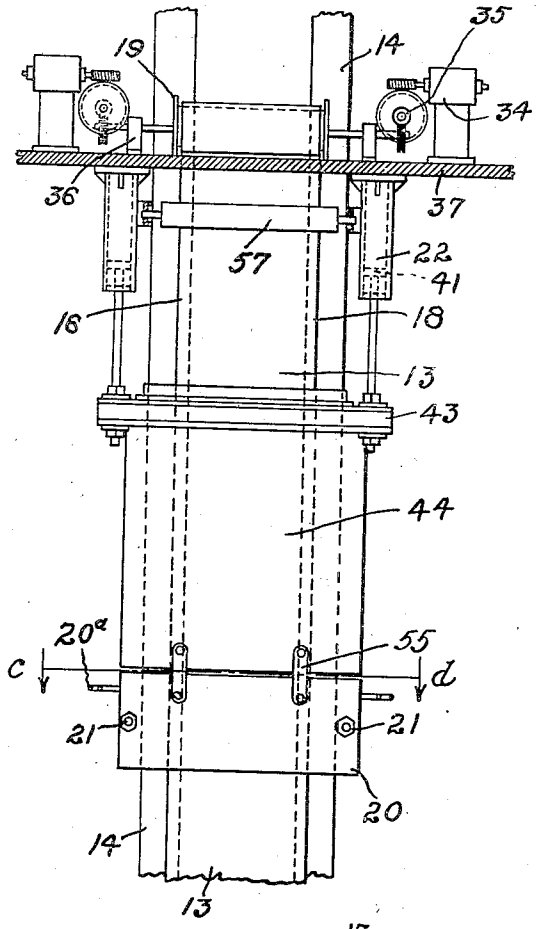
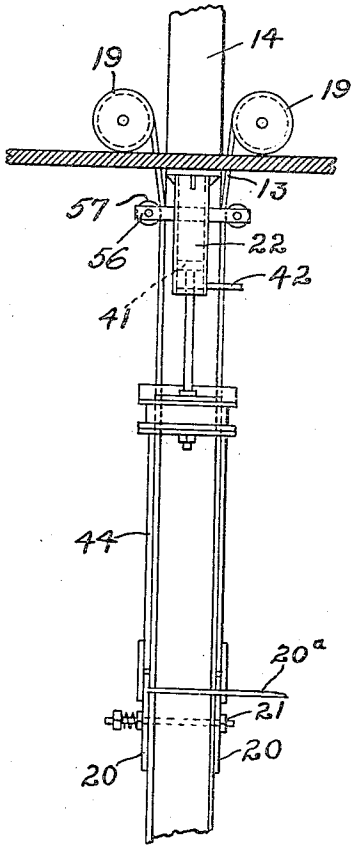


FIG. 4.



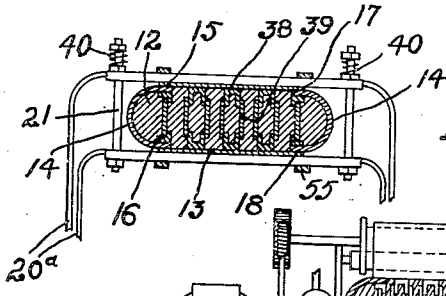


FIG. 5.

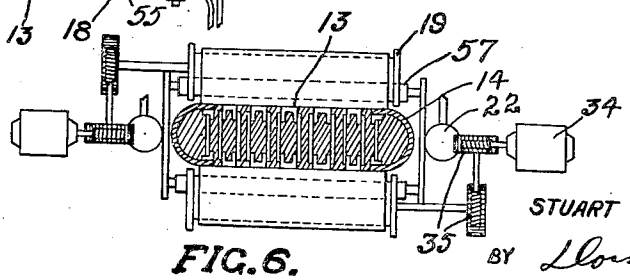


FIG. 6.

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Patented Sept. 4, 1934 1,972,849

UNITED STATES PATENT OFFICE

1,972,849

SAFETY DEVICE FOR ELECTRODES

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Application July 20, 1932, Serial No. 623,586
In Norway September 11, 1929

11 Claims. (Cl. 13—14)

This application is filed as a continuation in part of my application Serial No. 480,767.

This invention relates to electrodes for electric furnaces, and more particularly to a device for allowing the electrode to move through the holder without the risk of slipping too far.

My invention is of particular importance in connection with modern electric furnace installations where very heavy electrodes are so frequently used, and where an accidental or undesired slippage of the electrode may cause great damage or disaster.

The invention may be employed with many different types of electrodes and electrode holders, but one of its most important fields is in connection with heavy electrodes, particularly those which are baked in the furnace in which they are used. Such electrodes often are of a diameter of a meter and more, and their weight is considerable.

One of the principal objects of the invention is to provide a safety device comprising a metal band attached to the electrode, and means for a controlled movement of the band allowing the pulling out of a definite length of the band through a system of friction clamps without raising the electrode.

Another object of the invention is to provide such a safety device in combination with the casing from which the electrode is suspended and the suspending means for the casing.

A further object of the invention is the provision of a safety device in the nature of a flexible band which is interposed between and interconnects the electrode to which it is attached at one end and the suspending device comprising the holder through which the electrode is fed into the furnace, to thereby provide for the control of the feeding of the electrode through the holder as the band is played out.

Another object is to provide a safety device comprising a flexible metal band which is permanently attached to the electrode or to the metallic reinforcements of the same.

A further object of the invention is to provide in a safety device for electrodes of the nature heretofore discussed for the automatic feeding of the electrode through its holder under control of the safety device.

Another object is to provide a safety device comprising a flexible metal band in which the band forms a part of the mantle of the electrode.

Further objects of the invention will appear as the description proceeds.

In the drawings, in which I have illustrated the invention as applied to a round self-baking electrode, and also to an oblong electrode of the self-baking type,—

Figure 1 illustrates an elevational view of an electrode installation with the safety device applied thereto.

Figure 2 represents a horizontal sectional view on the line *a—b*, of Figure 1.

Figure 3 represents an elevational view partly diagrammatic of another form of installation applied to an oblong electrode.

Figure 4 represents an elevational view taken at right angles to Figure 3, the motors and gearing being left out.

Figure 5 represents a horizontal sectional view through Figure 3 on the line *c—d*.

Figure 6 represents a diagrammatic plan view of Figure 3.

Referring more particularly to the form of invention illustrated in Figures 1 and 2, the electrode 1 may be of the type which is baked in the furnace in which it is used, being provided with metallic reinforcements, illustrated as a mantle 1^a which surrounds the electrode mass, and the electrode is suspended within the casing 2 which latter in its lower end carries the holder, and which at its upper end is suspended from the cables 25. The holder includes the clamps 45 suspended from the casing 2 by the links 46, and the clamps may be tightened or loosened through the medium of the adjusting bolts or screws 47 carried in a ring 48, also suspended as at 49, from the casing. Current may be introduced to the holder clamps 45 and thence to the electrode through the leads 50 which connect with the cables 51. The suspending means for the casing includes the collar 26 formed of channel iron and plates, or otherwise if desired, which collar is provided on diametrically opposed sides of the electrode and casing with the columns 3, which may be formed of channel iron. The pulleys 4 are mounted in shields at the upper ends of these columns, and the suspending cables 25 run over these pulleys. The cables are under control of mechanism indicated generally and diametrically at 52 for raising and lowering the suspending means, including the holder, as a whole, and with it, of course, the electrode.

Adjacent their upper ends the columns are provided with the pairs of cross bars 5, and below these, with pairs of cross bars 6, forming brackets. The cross bars 5 at their outer ends serve as supporting means for the drums 7, and at their inner ends are provided with the friction brakes 11. The lower ends of the columns are provided with the friction brakes 9. The brackets formed by the

cross bars 6 are provided with the brake clamps 8, actuated through the weighted levers 27 and eccentric followers 28, to release the brake clamps when the levers are raised, and to apply the brake clamps when the levers are lowered. The weighted levers normally maintain the brake clamps applied, and release them only when raised.

On the drum 7 are coiled the iron or steel bands 29, and such bands extend from the drums down between the members of the brake clamps 8, over the lower friction brakes 9, thence upwardly and over the upper friction brakes 11, thence downwardly to the electrode. The ends of the bands are applied to the electrode, or the mantle 1ª thereof, as at 30, in suitable manner, for instance, by welding. Disposed between the brake clamps 8 and the lower friction brakes 9, are arranged devices 10 for pulling out from the drums predetermined lengths or portions of the bands as the electrode is to be lowered from time to time. These devices include levers 31, on the arms 32 of which pins 33 are mounted which underlie the bands 29. When one of the levers 31 is lowered, as indicated on the right hand side of Figure 1, the pin carried by its arm 32 will force the band outwardly, as indicated, to draw off a length of the band from its drum, it being understood that the brake clamp 8, through which the band extends, will have been released.

In the operation of the device, when the electrode is to be lowered through its holder, the levers 31 are moved downwardly, and simultaneously the brake clamps 8 are released sufficiently to allow of the pulling from the drum of the bands under the influence of the levers 31. Then the brake clamps 8 are again applied and the levers 31 brought back to normal position, thus providing a slack in the bands corresponding to the lengths that have been pulled from the drums. When the electrode holder clamps 45 are released sufficiently the electrode will slide slowly through the holder until the slack in the bands has been taken up and the bands become tightened, whereupon the sliding movement of the electrode will cease, and further sliding be prevented. The holder clamps are then retightened. The operation may be repeated as often as required as the electrode is consumed and is lowered from time to time, and the length of the bands pulled out each time may be varied as desired by controlling the throw of the levers 31.

The friction between the band and the brakes 8, 9 and 11 is so adjusted that the pulling out of the portion of the band through the clamps 8 will not cause any raising of the electrode. The operation of the devices 10 will therefore cause only new portions of the band to be pulled from the drum 7 through the clamps 8, without otherwise displacing the bands.

If desired, the clamps of the electrode holder may be so adjusted that the electrode will slide continuously slowly downwardly as it burns away and as the baking proceeds upwardly in the electrode, and the bands will still serve as a safety device and will always stop the electrode when the slack provided in the bands by the operation of the levers 31, has been taken up.

The end of the band connected to the electrode moves with the same as the latter slips through its holder. It is not necessary to weld or otherwise attach the whole length of the band to the electrode or its mantle, it being sufficient to attach it at certain points.

In the form of the invention shown in Figures 3 to 6, inclusive, the electrode is illustrated as the type which is baked in the furnace in which it is used and having an oblong cross section with rounded ends and the safety bands are used to themselves form part of the mantle of the electrode.

The bands 13 are considerably wider than in the form of the invention previously described, and form the sides of the electrode mantle, the ends of the mandle being formed of the semi-circular pieces 14. The bands are carried on the drums 19, the latter being under the control of the motors 34 which may be mounted on the floor 37 of the tamping house. The drums are operated through the instrumentality of intervening worms and worm gearing, indicated generally and diagrammatically at 35, the shafts of the drums being carried in suitable bearings 36, which may also be supported on the floor of the tamping house. In forming the electrode mantle, the bands are played out from the drums as the latter are rotated from time to time. As the end pieces 14 are inserted, sufficient overlap between the bands and end pieces is provided so that the bands may be welded to the end pieces along the lines 15, 16, 17 and 18 of the overlapping portions of the bands and end pieces, or at suitable intervals along such lines. The ribs 38 or other projections of the mantle are suitably welded or otherwise attached to the inner sides of the bands and end sections, and these ribs may, for example, be U-shaped to afford good contact with the casing. The ribs may be connected at intervals by cross pieces as at 39, to maintain the sides of the mantle against deformation or bulging under the pressure of the electrode paste. The sections 14 of the electrode mantle are made sufficiently strong to withstand the pressure from the electrode paste, without the use of any external electrode holder or contact around the end portions of the electrode.

I may, for example, utilize a simple construction of electrode holder or contact arrangement, as shown in Figures 3, 4 and 5. In such arrangement, contacts 20 are placed on each side of the electrode and joined together by means of bolts 21, current being introduced to the contacts as at 20ª, the pressure against the electrode being adjusted by tightening the bolts, and the tightening nuts may bear against springs 40 to afford a flexible contact against the electrode. The pressure of the springs may be so adjusted as not to be sufficient for carrying the total weight of the electrode. The latter will then slip through the contact as new sections of the bands 13 are unrolled from the drums 19.

It will be understood that the drums may act as winches and serve to lower or raise the electrode.

In connection with the embodiment illustrated in Figures 3–6, I have illustrated a hydraulic suspension means for the electrode, including the cylinders 22 having the pistons 41 operating therein, fluid being introduced to the cylinders as at 42. The piston rods are connected to the ring 43 of a casing 44, and from the latter the contacts 20 may be suspended by links 55 which are sufficiently flexible, or sufficiently loosely connected, to allow of the desired adjustment of the contacts 20 with respect to the electrode. The suspending means may include the cross bars 56 having the rollers 57 thereon over which the bands 13 may run, to properly position them with reference to the end pieces 14 in forming the electrode mantle.

From the foregoing description of the embodi-

ments of the invention illustrated, it will be understood that my safety bands may themselves serve as the suspending means for the electrode, and raise or lower the electrode as the mechanism for operating the bands is actuated, or they may be used in connection with electrode holders of the ordinary types. Such holders are generally composed of several individually adjustable clamps pressing against the electrode. When the holders are used and the electrode is to be lowered, one or more of these clamps may be released until the electrode slips slowly downwardly, and when my present invention is utilized in connection with the holders, the electrode will, of course, slip only so far as the safety bands will permit.

The number of bands used, and the shape of the electrode may of course be varied to suit each particular case, and the safety bands may be used to form the whole or only a part of the electrode mantle, the shape and number of the bands being chosen so as to form a mantle of the desired shape when welded together, or the bands may be connected with the electrode mantle and used merely as safety suspending means for the electrode.

The foregoing detailed description has been given for purposes of illustration and understanding of the invention, and no undue limitation should be deduced therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

Having thus described my invention what I claim as new, and desire to secure by U. S. Letters Patent is:—

1. The combination with an electrode and means for suspending the electrode including a holder adapted to be adjusted for allowing the electrode to slide through the holder, of a band permanently attached at one end to the electrode and means acting on said band for regulating the feeding of the electrode through the holder.

2. The combination with an electrode baked in the furnace in which it is used and including metallic reinforcements, of a movable suspending structure therefor, comprising a band permanently attached to the metal reinforcements of the electrode, and means acting on the band for regulating the feeding of the electrode.

3. A safety device for a continuous electrode which is baked in the furnace in which it is used, comprising a metallic band adapted to be permanently attached to the continuous electrode, and means to control movement of the band to allow controlled lowering of the electrode relative to the electrode holder.

4. The combination with an electrode, of a flexible band attached thereto, a drum from which the band is adapted to be unrolled, friction clamps through which the band is adapted to move, and means for pulling out predetermined lengths of the band from the drum.

5. The combination with an electrode, of a flexible band attached thereto, a drum from which the band is adapted to be unrolled, a series of friction brakes over which the band extends, a brake clamp between the friction brakes and drum, and means between the brake clamp and friction brakes for drawing sections of the band from the drum when the brake clamp is released.

6. The combination with an electrode having a metallic casing, of a flexible metallic band permanently attached at one end to the casing and adapted to move with the casing as the electrode is lowered into its furnace, a drum on which said band is coiled, and means for regulating the uncoiling of the band from the drum.

7. A safety device for an electrode which is baked in the furnace in which it is used, comprising a metal band, said band forming a part of the electrode mantle, and sections connected to the band and also forming part of the mantle, and means for raising and lowering the band and therewith the electrode.

8. In an electrode baked in the furnace in which it is used, a set of drums, metal bands carried by the drums, mantle sections to which the bands are adapted to be connected for forming the mantle of the electrode, and means for actuating the drums.

9. In an electrode baked in the furnace in which it is used, a continuous metal band adapted to form a part of the electrode mantle, and a plurality of end sections adapted to be connected to said continuous band for forming the mantle.

10. In an electrode baked in the furnace in which it is used, a flexible metal band, said band forming a part of the electrode mantle, and means for raising or lowering the band and therewith the electrode.

11. The combination with an electrode and suspending means therefor including a holder with reference to which the electrode is adapted to be fed into a furnace, of a flexible band permanently attached to the electrode and adapted to move with the electrode as the latter moves through the holder, and means, mounted on the said suspending means and engaged by the band, to regulate the feeding of the band and thereby the slipping of the electrode relatively to the holder.

STUART A. WISDOM.