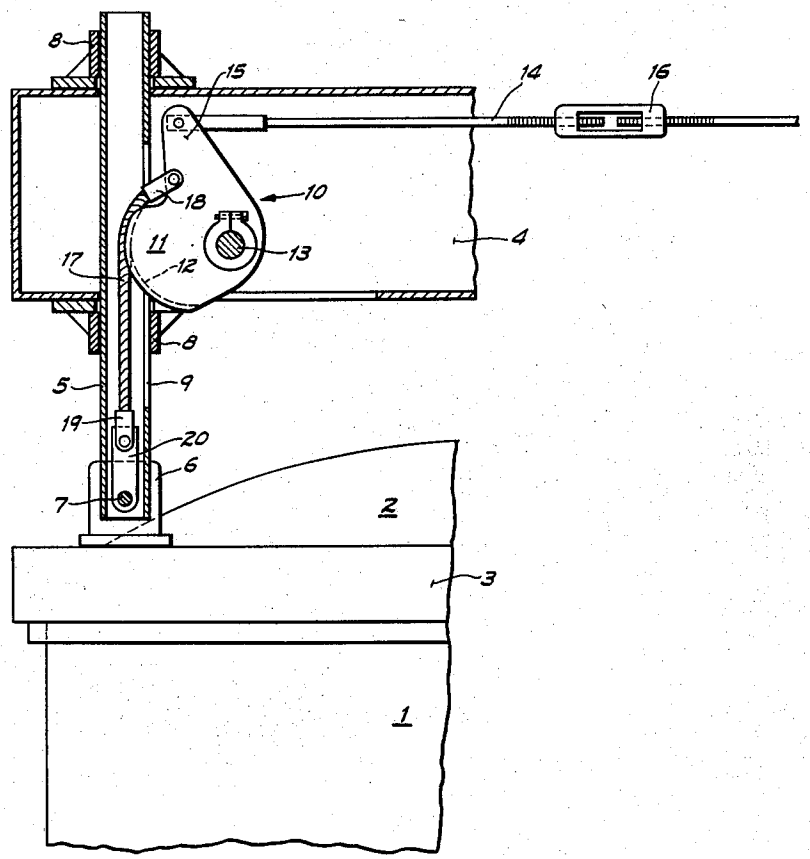
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COVER LIFTING DEVICE FOR AN ELECTRIC FURNACE

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Fig. 1



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COVER LIFTING DEVICE FOR AN ELECTRIC FURNACE

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This invention relates generally to electric furnaces, and more particularly, to apparatus for controlling the cover of an electric furnace.

Electric furnaces having a fixed tank and a cover that is adapted to be lifted before being swung or slid away from the tank for the purpose of charging the furnace are well known. For raising or lowering the cover, flexible chains or cables are normally attached at three or four points to the cover and carried to a power driven hoisting mechanism over guide rollers, pulleys, or the like, which are fixedly located on a swinging arm that extends over the furnace. Suspension of the cover on flexible chains or wire ropes, has the disadvantage that during sliding or swinging out, the cover oscillates or pendulates out of control, making relocating of the cover on the furnace body more difficult. Furthermore, when the heavy cover is suspended on long chains or wire ropes, these elements may be unequally stretched, causing the cover to approach the tank at an inclination.

Accordingly, it is an object of this invention to provide cover lifting apparatus that guides and stabilizes the cover when it is being lifted and removed from a furnace tank and which provides for the use of relatively short flexible hoisting means so as to eliminate the problem of the cover failing to properly register with the furnace.

A further object is to provide cover lifting apparatus that is distinguished by its compactness and which allows guiding of the cover along perfectly true vertical lines and which at the same time is so designed that it conceals and offers protection to the cable means upon which the cover is suspended.

It is a general object of this invention to provide a simple and inexpensive furnace cover lifting apparatus, and more specific objects will appear from time to time throughout the course of the following specification.

In general terms, a preferred embodiment of the invention is characterized by a furnace cover over which extends a rigid arm by means of which the cover can be lifted and swung or slid away from the tank. Attached to the cover is a hollow tubular member which extends through the arm in which it is guided by suitable bearings. In its preferred form, the tubular member has a slot through its sidewall for the admission of the grooved and curved periphery of a pivotally mounted sector. A short piece of wire rope is attached to the sector and extends along the groove from which it departs tangentially down the center of the tube. The lower end of the wire rope is attached to the cover, and when the sector is rocked by means of a pull rod or the like, the wire rope partially wraps onto the sector and hoists the cover upwardly while it is being guided by several tubular members.

A more detailed description of the invention will now be set forth in connection with the drawing in which:

Fig. 1 is an elevational view, partly in section and with parts broken away, of an electric furnace embodying the invention.

Referring to the drawing it will be seen that the apparatus comprises a conventional refractory lined stationary furnace shell 1 upon which rests a convex refractory cover 2 through which electrodes, not shown, ordinarily pass. The cover 2 is conventional in construction and includes a metal ring 3 in which the refractory material is set.

The invention contemplates lifting and swinging the cover away from and back in registry with tank 1. For this purpose there is provided a suitable structure from which cover 2 can be suspended, such as a rigid beam 4 which extends over the cover and which is adapted to slide or swing in a plane parallel with that of the cover 2, subject to control of the furnace operator.

In order that cover 2 will be prevented from pendulating while moving horizontally, there is provided a long rigid tubular member 5 which is fixedly anchored at its lower end to the metal ring 3 of cover 2 through the agency of a pair of confronting clip angles 6 or any other suitable socket means. Tubular member 5 may be attached to clip angles 6 by means of a bolt or pin 7. Tubular member 5 acts as a vertical guide for the cover 2 by virtue of the member extending upwardly and through a pair of spaced guide bearings 8 which are carried on arm 4. The guide bearings may be of the sleeve type as illustrated or other suitable means may be employed, such as roller bearings embracing the member 5 on opposite sides (not shown). Tubular member 5 is provided with an opening or slot 9 through its wall for a purpose which will shortly appear. It is preferred that member 5 be of square cross section to avoid being weakened too much by the slot 9. The construction is not confined to the use of a tubular member because for the latter a channel-shaped member may be substituted provided it has a side opening corresponding with slot 9.

From the construction thus far described it should be evident that cover 2 will be guided in a vertical direction when lifted by reason of the presence of tubular members 5 and it should be understood that ordinarily using three or four such members 5 and associated elements is recommended so that the cover 2 may be suspended at several points from a pair of arms like that designated 4.

For imparting a lifting force to cover 2 there is provided a rocking sector plate, generally designated by the reference numeral 10, a part of whose periphery 11 is arcuate and grooved edgewise at 12. Sector 10 is mounted for rotation through a limited angle on a shaft 13 which may be journalled on arm 4 by any suitable bearing means. Rocking force is imparted to sector 10 by means of a pull rod 14 terminating in a clevis pivotally attached to an extension arm 15 on the sector 10. The remotely opposite end of rod 14 may be attached to a similar sector 10, not shown, on a diametrically opposite side of cover 2 and synchronized movement of sectors may be achieved with a turnbuckle 16. Power means for imparting a lifting force to the cover 2 through pull rod 14 are not shown.

A short length of flexible chain or wire rope 17 is connected to sector 10 at its upper end by an appropriate wire rope socket 18. The lower end of the wire rope is attached by means of a socket 19 to an intermediate link 20 which is also connected to the cover 2 by the same pin 7 that serves to anchor guide tube 5. It will be observed that wire rope 17 extends vertically down through the center of tubular member 5 and lies in the groove 12 along the arcuate periphery of the sector which in turn extends laterally nearly to the center of the tube 5, and that since the wire rope 17 lies tangent to groove 12 during all of its angular positions, the wire rope will remain centered in tubular member 5, regardless of the elevation of cover 2.

From the construction described it should be evident that cover 2 cannot seriously depart from a true horizon-

tal position when lifted from tank 1 because of the former being guided vertically by means of several tubular members 5 and because changes in the length of the wire rope or flexible hoisting element 17 as a result of stretching are reduced to insignificance due to their shortness. Stretching and the likelihood of the apparatus getting out of adjustment is further reduced by controlling rocking sectors 10 by means of a rigid, unyielding pull rod.

The apparatus operates as follows: An axial force is exerted toward the right on pull rod 14 so that sector 10 rotates clockwise for lifting cover 2. Upon this event, the short wire rope 17 wraps partially on the arcuate groove 12, thus lifting the cover while tubular guide member 5 slides upwardly in its guide bearings 8. Cover 2 is then ready for being swung away from furnace tank 1 along with arm 4, and the furnace is ready for charging or gaining access to its interior. When arm 4 is swung back over furnace tank 1, cover 2 is not able to pendulate by reason of the stability imparted to it by the tubular guide members 5. Likewise, when arm 4 is properly positioned, cover 2 will be at rest and prepared for being lowered into perfect registry with the furnace tank 1 by forcing sector 10 counterclockwise until the cover bears on the tank.

Having disclosed a preferred embodiment of the invention, many obvious modifications will now appear to those skilled in the art. Therefore, it is to be understood that the specific details of the construction disclosed herein are for the purpose of illustration, and not limitation, except as made necessary by the scope of the appended claims.

What is claimed is:

1. In a lifting device for lifting and moving an electric furnace cover, the combination with a furnace cover, of arm means extending over the cover, a rigid elongate member fixed at one end to said cover and slidably engaged with said arm means, rocking means pivotally carried on said arm means, flexible hoisting means disposed in substantially parallel force transmitting relation with said elongate member and fixedly attached at its opposite ends to said cover and said rocking means, said rocking means during rocking motion maintaining the application of said force in said parallel direction and means connected with said rocking means for rocking the same to thereby wrap a portion of said flexible means on said rocking means for lifting said cover under guidance of said elongate member.

2. In a lifting device for lifting and moving an electric furnace cover, the combination with a furnace cover, of arm means extending over the cover, an elongate hollow member affixed substantially perpendicular on said cover and extending toward said arm means, guide bearing means mounted on said cover and slidably receiving said hollow member therethrough, rocking means pivotally carried on said arm means, said rocking means including a member having an arcuate portion projecting toward the axis of said hollow member, flexible hoisting means fixedly attached to said rocking means and said cover with a part of said flexible means lying on said arcuate portion and another part projecting axially along the interior of said hollow member, and means connected with said rocking means for rocking the same and thereby maintaining a portion of said flexible means in engagement with said arcuate portion and hoisting said cover under the guidance of said hollow member.

3. The invention set forth in claim 2 wherein said hollow member has a longitudinal opening into which the arcuate portion of said rocking means projects, the axis of said hollow member being in substantially tangential relation to said arcuate portion.

4. An electric furnace cover lifting device comprising in combination, a furnace cover, arm means extending over the cover for suspending it and moving in unison with it in parallel horizontal planes, an elongate hollow member fixed at one end to said cover and slidably engaged with said arm means, said hollow member having a side opening, a sector means pivotally mounted on said arm means and having an arcuate portion projecting into said hollow member through its side opening, flexible hoisting means attached at one end to said cover within said hollow member and extending tangentially onto said sector to a point of attachment thereon, and rod means operatively coupled with said sector for rotating the same through a limited angle to raise and lower said cover under guidance of said elongate member.

5. Hoisting mechanism for an electric furnace cover comprising in combination, a furnace cover, a slidably guided tubular member attached to said cover and having a lateral opening, sector means mounted on a fixed pivot and having a portion projecting through said lateral opening, a flexible hoisting means attached to said cover within said tubular member and extending tangentially onto said sector means, and rod means operatively attached for pivoting said sector means to raise and lower said cover through the agency of said flexible hoisting means.

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