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[54] **TREATMENT OF ELECTRODES**

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[51] **Int. Cl.**..... **B44d 1/20**

[58] **Field of Search**..... 117/228, 111 R; 118/244, 118/258

[56] **References Cited**

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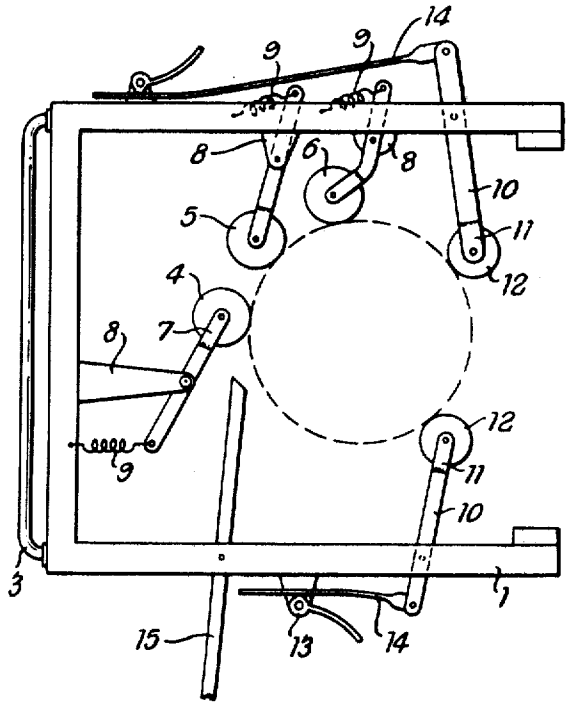
[57] **ABSTRACT**

Apparatus for treating carbon articles comprises a frame, a plurality of rollers mounted on the frame with their axes all parallel, and means associated with the frame for effecting a surface treatment on the article. In use, the article is located in the frame with its axis parallel to the axes of the rollers, and rotated relative to the frame while effecting a protective treatment thereon.

7 Claims, 3 Drawing Figures



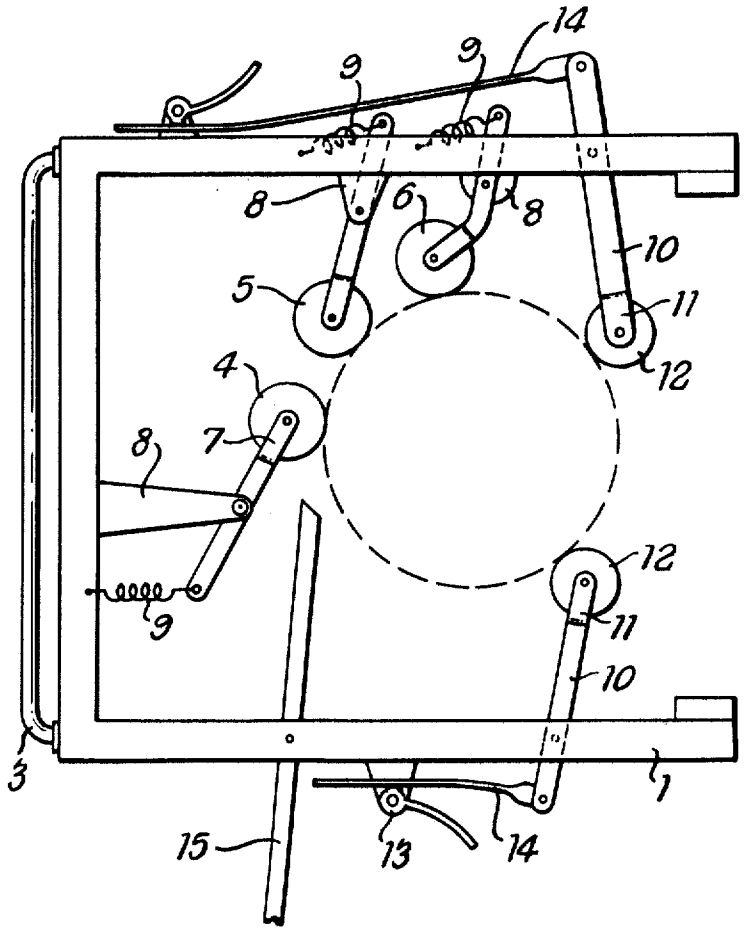


FIG. 1

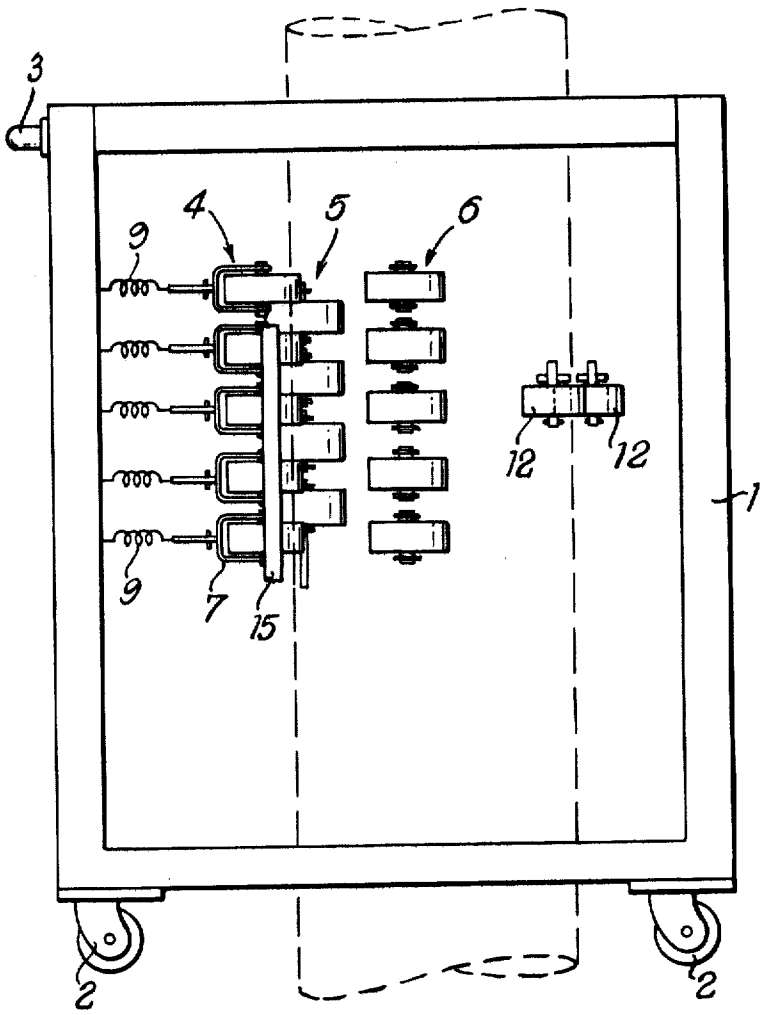


FIG. 2

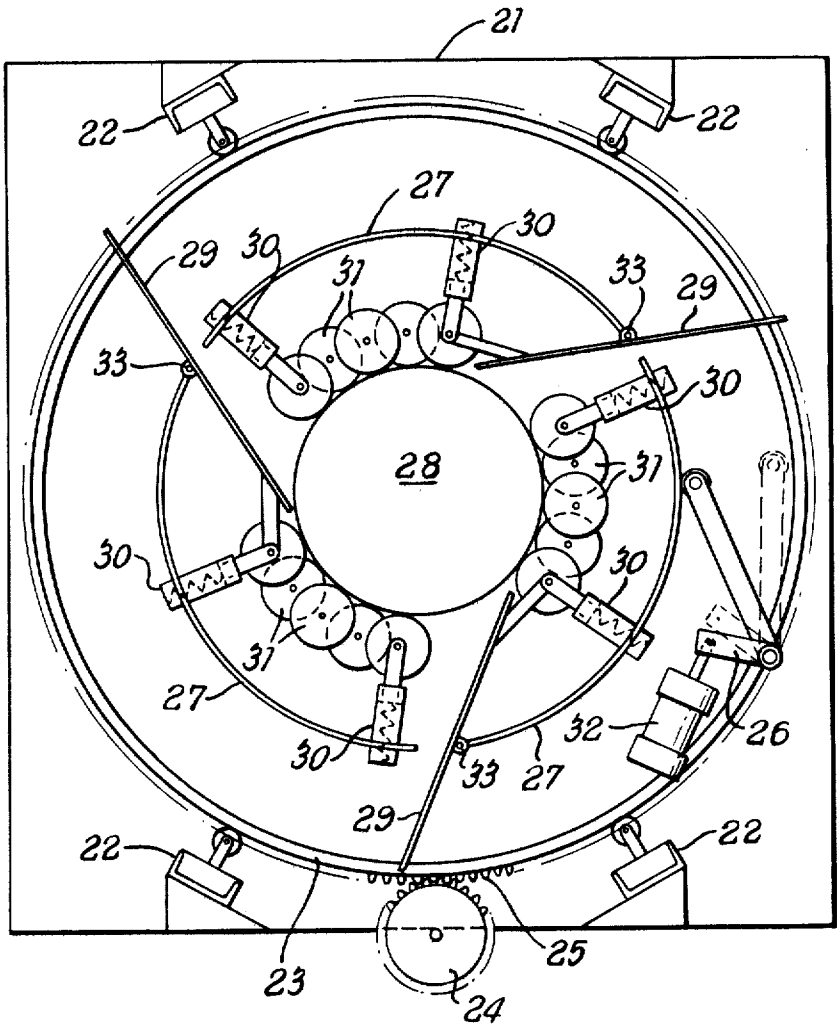

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FIG.3

TREATMENT OF ELECTRODES

This invention relates to the treatment of carbon articles especially graphite electrodes, crucibles and the like and to apparatus for use therein.

In various molten metal treatment plant use is made of massive graphite electrodes to generate heat by means of striking an arc. In order to reduce wastage of electrodes by oxidation of the electrode sides, various suggestions have been made for protecting the electrodes. These include the application of protective coatings to the electrode surface and the adherence of preformed sections of protective material.

According to a first feature of the present invention there is provided apparatus for the treatment of a carbon article which comprises a frame, a plurality of rollers mounted on the frame with their axes all parallel, the rollers being adapted to locate on an article to be treated, and means associated with the frame for effecting a surface treatment on the article. The frame may consist of a single frame, or a main frame and one or a plurality of sub-frames.

The present invention also includes a method of treating a rotationally symmetric carbon article to provide a surface protective treatment which comprises locating the article in a frame as just defined with its axis parallel to the axes of the rollers, and rotating the article relative to the frame while effecting a protective treatment thereon. The relative rotation may be effected by holding the article still and rotating the apparatus, or by holding the apparatus still and rotating the article; The first method must be used if the article is an electrode still held in the electrode clamp. However, the method of the present invention can be used to treat electrodes either while they are held in their clamps or at the electrode nippling stand. The apparatus may be mounted on a suitable mechanical linkage, e.g. a hydraulic arm, to enable this to be effected.

If desired the apparatus may comprise one or more drive rollers adapted to engage with and rotate the article. Rotation may be continuous in one direction or it may be reciprocating. In a particular embodiment, three toothed drive wheels may be spaced about the periphery of the article; they may be mounted on arms which pivot in the frame of the apparatus to bring them into or out of driving contact with the article. The toothed wheels may be driven by any suitable means, e.g. by electric or pneumatic motors.

Alternatively, if the article is to be held stationary, the rollers may be mounted on an arcuate sub-frame at least partially surrounding the article. The sub-frame may be provided with a toothed track or chain drive so that the sub-frame may be rotated or oscillated by means of a driven toothed wheel which engages with the toothed track or the chain drive.

The general shape of the frame may be rectangular or circular in shape, either with an openable section to allow introduction of the article from the side, or the article must be lowered into the space between the rollers. In either case, the position of at least some of the rollers should be adjustable to allow for the insertion of the article roughly into the correct position, followed by adjustment of the roller(s) to bear on the surface of the article.

With this object in mind, one or more individual and independently supported disc rollers or set of rollers (built up from a plurality of individual and independently supported disc rollers) may be provided with means to bias the rollers or set of rollers inwardly, thus ensuring that they act generally as a pressure applying surface and accurately follow the contour of the article surface. This is of particular importance in the case where the article to be treated is an electrode which has already been in service in an arc furnace, since oxidation causes the electrode to taper inwardly towards the end of the electrode from which the arc is generated.

In practice the mounting of the individual rollers or set of rollers may be effected in conjunction with pressure means such as coil springs or a mechanical linkage operated by air or hydraulic cylinders or both which means serves to keep the roller in contact with the article despite any local variations in its shape.

The rollers may be formed of any convenient material. It is preferable to use rollers formed of bonded graphite, since these are unaffected even if the article is red hot, e.g. an electrode directly out of the furnace. They are also self-lubricating and do not tend to stick to the outside of the coating being applied.

The apparatus of the present invention may be adapted to apply a preformed protective lining to an arc furnace electrode or to apply a suitable coating. Methods of doing this are described in our co-pending application Ser. No. 343,217.

In the first case sheets of preformed protective lining may be fed tangentially into contact with the electrode from one or more positions about its circumference, and then rolled down by the rollers, for example, three sheets may be fed onto the electrode from positions 120° apart.

Adherence between the electrode and the protective sheet may be achieved by covering one side of the sheet with adhesive, or by coating the outside of the electrode with adhesive. In either case, if desired, the apparatus may comprise means such as a spray bar for providing the adhesive coating. In order to obtain adherence of certain types of coating, it is necessary to preheat the outside of the electrode and this may be done by means of a gas burner, infra red heater bar or the like mounted on the apparatus. Heating may be applied in this way to the preformed sheet or to the electrode or both.

Normally, in the application of preformed coatings, it is preferred to apply successive sheets of material covering successive cylindrical sections of electrodes. However, if desired, a continuous protective sheet may be applied in spiral form, the electrode moving axially with respect to the apparatus during treatment as well as rotating. In the application of a preformed protective coating the rollers press the coat onto the electrode to give an excellent bond between them and so to protect them as well.

In the case of electrode coatings which are sprayed on, the apparatus of the invention may comprise suitable spray heads, spray bars, reservoirs, pressure valves and the like.

The apparatus can be used to treat electrodes which have already been treated previously, e.g. by the application of a protective layer or coat, or it may be used to treat fresh uncoated electrodes.

The arrangement of the rollers is preferably such that various different standard sizes of electrode may all be accommodated with equal ease.

By way of example, the accompanying drawings show apparatus according to the present invention.

In the drawings,

FIG. 1 is a plan view of one form of apparatus;

FIG. 2 is a side view of the apparatus of FIG. 1, and

FIG. 3 is a plan view of an alternative apparatus.

Referring to FIGS. 1 and 2 the apparatus basically consists of a trolley 1, U-shaped in plan, and provided with four castors 2 and a handrail for moving it 3.

The trolley bears 3 main rollers, 4, 5, 6, each of which is made up of a number of individual coaxial roller sections, each section being separately mounted and independently movable from the others. Each roller section is mounted in its own stirrup 7, pivoted onto a stand 8 on the frame 1, and spring biased by a tension spring 9.

Pivotally mounted in the sides of frame 1 are swing arms 10 each of which carries a stirrup 11 supporting a positioning wheel 12. The position of swing arms 10 may be varied by moving a link 14 on the side of the frame 1 as shown. Link 14 may be held in any desired position by a cam 13.

A guide 15 for preformed protective cladding sections is pivotally mounted on frame 1.

In use, wheels 12 are first swung away from rollers, 4, 5, 6 and the electrode (shown in dashed lines) inserted into position.

Wheels 12 are then swung in to urge the electrode against rollers 4, 5, 6 and then locked into position. It is clear from FIG. 1 that a wide variety of electrode diameters can be received without difficulty. The electrode may then be rotated clockwise seen from above while a protective cladding section is fed along guide 15. This cladding section is fed into the nip between roller 4 and the electrode and is then rolled down firmly by rollers 5 and 6. After the whole of each cladding section has been applied in this way, the electrode is lowered and the next cladding section applied.

Particularly for the application of cladding sections, the individual disc rollers 4, 5, 6 may be circumferentially staggered to minimise the tendency of the leading edge of the cladding sheet to peel away from the electrode.

Further sets of rollers may be provided in excess of those shown in FIGS. 1 and 2, so that substantially the whole of the periphery of the electrode is contacted by rollers.

It will be apparent that, if desired, the groups of rollers may be mounted on sub-frames which sub-frames are mounted on frame 1. To release the electrode, the sub-frames may be swung out of the way, there being no need to move frame 1.

An apparatus of this type is shown diagrammatically in FIG. 3, which is a view similar to FIG. 1, but showing a modified form of apparatus.

Referring to this figure, a rectangular main frame 21 surrounds and supports a rotatable drum 23. Drum 23 is located in position by roller guides 22. The outer main frame 21 may be mounted, e.g. on castors, to enable it to be moved about, but during electrode treatment this main frame is stationary.

During treatment drum 23 may be driven around its axis by means of a drive wheel 24 which engages in a toothed track 25 which extends about the entire periphery of the drum 23. Mounted within drum 23 are three banks of rollers 31. Each bank of rollers is mounted on a sub-frame 27, which is supported in turn by a linkage 26 fixed to drum 23 (only one of these linkages is shown for simplicity). The position of linkage 26, and accordingly of sub-frame 27, is controlled by a hydraulic cylinder 32. The position of linkage 26 when sub-frame 27 is retracted away from an electrode 28 is shown dashed. Each subframe 27 is pivotally mounted at one end 33, and has an associated cladding sheet guide 29. During electrode treatment, cylinder 32 is used to urge the sub-frame 27 and thereby the rollers against electrode 28. In order to allow the rollers to bear evenly towards the electrode, the rollers are mounted on the sub-frames 27 via pressure spring posts 30. While only two such posts 30 are shown, more may be used if desired.

We claim as our invention:

1. In a method of treating the surface of a rotationally symmetric carbon article the steps of: engaging the surface of the article with the surfaces of a plurality of rollers which are disposed with their axes parallel to the axis of the article; effecting relative rotation between the articles and the rollers such that the rollers roll around the circumference of the article; and effecting a protective treatment on the article surface during rotation.

2. A method as in claim 1 wherein the carbon article is a graphite electrode.

3. A method as in claim 1 including the step of biasing the rollers toward the article to thereby follow the contour of the article surface.

4. A method as in claim 2 wherein the electrode is held stationary and wherein said rollers are revolved around the electrode.

5. A method as in claim 2 wherein the electrode is rotated about its axis and wherein the axes of said rollers are stationary.

6. A method as in claim 3 wherein said protective treatment includes the step of applying a protective coating to the surface of the article.

7. A method as in claim 6 wherein the coating is a preformed protective coating, said treatment including feeding the preformed protective coating generally tangentially into contact with the article and pressing the coating onto the surface of the article with the rollers.

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