Feb. 27, 1951 O. J. BROWN, JR 2,543,657

SCRUBBING DEVICE WITH REMOVABLE BRUSH ASSEMBLY

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FIG. 1

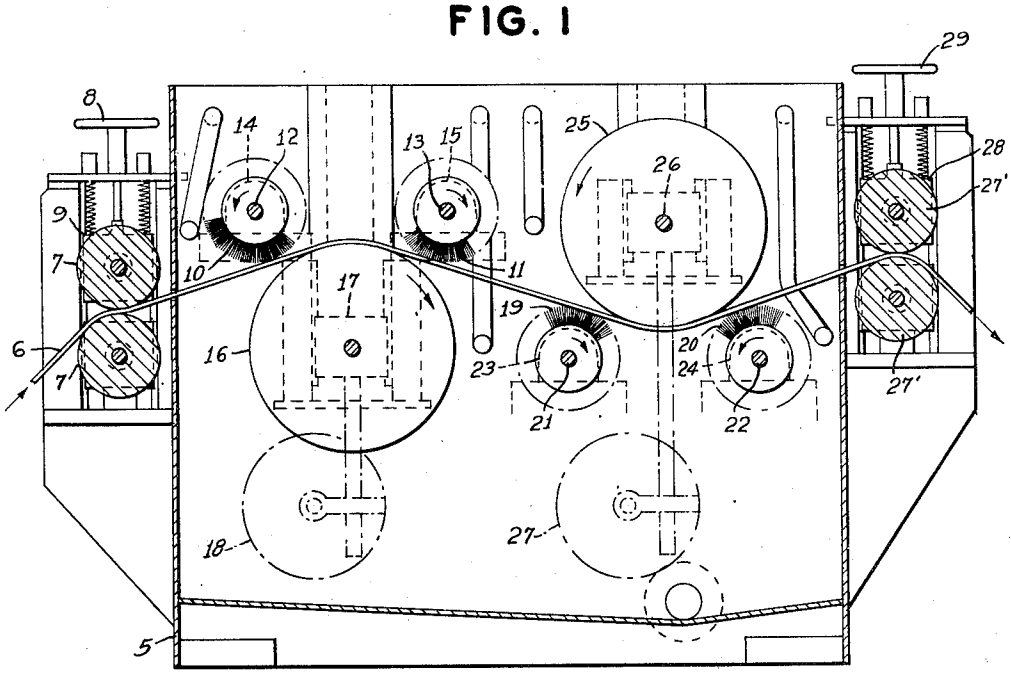
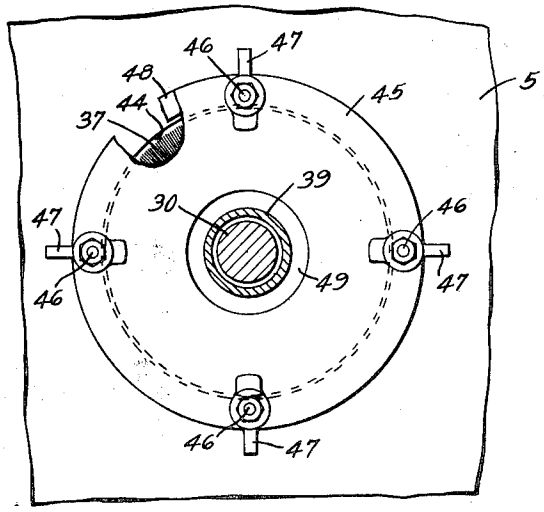


FIG. 4



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FIG. 2

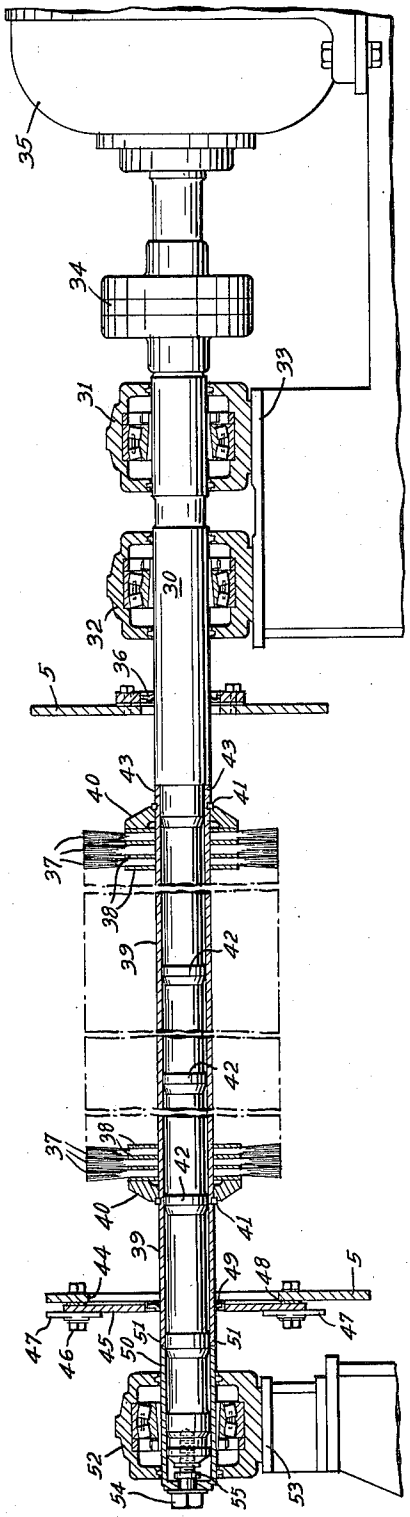
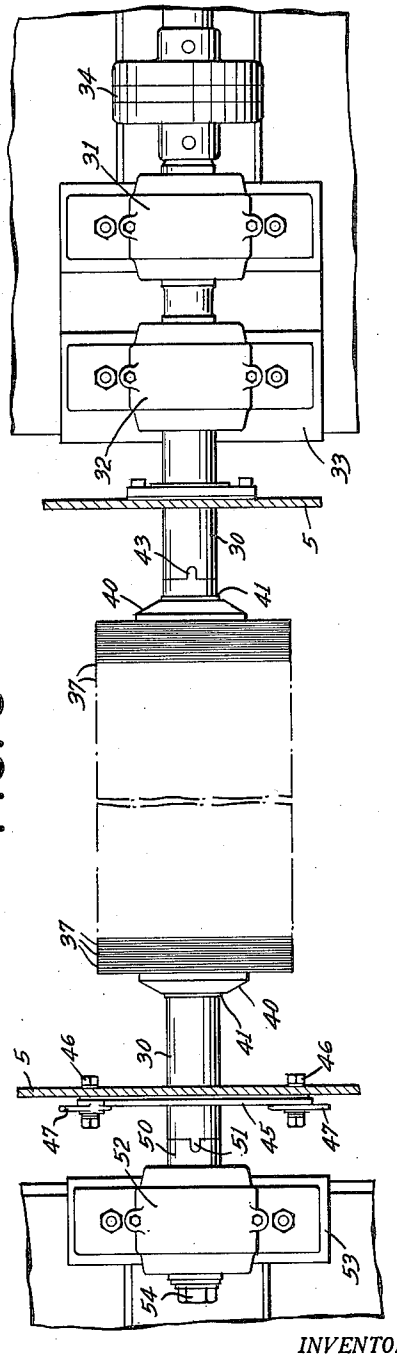


FIG. 3



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SCRUBBING DEVICE WITH REMOVABLE BRUSH ASSEMBLY

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4 Claims. (Cl. 15—77)

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This invention relates to scrubbing devices and more particularly to improvements in apparatus for scrubbing surfaces, for example of metals in strip form, in which the brushes may be removed very readily for repair and replacement.

In the manufacture of metal strip, it is necessary to subject the strip, after it is formed, to various surface cleaning operations in which the metal surface is treated with liquids such as acid or caustic solutions and simultaneously brushed with rotating brushes. In such apparatus the brushes are mounted on driven shafts. When the brushes become worn, they must be replaced. With the structures heretofore known, replacements of the brushes entails substantial dismantling of a part of the machine, with resulting extended delays during which the machine cannot be operated. This is a serious problem in relation to strip mills which operate continuously, since the output of the mill cannot be handled and shutting down the mill adds to the cost of the product.

It is the object of the present invention to provide a structure in a scrubbing apparatus which facilitates the withdrawal and replacement of the revolving brushes, thereby cutting the time required for replacement to a minimum and assuring substantially continuous operation.

Other objects and advantages of the invention will be apparent as it is better understood by reference to the following specification and the accompanying drawing, in which

Fig. 1 is a diagrammatic sectional view illustrating the scrubbing tank and showing the relation of the parts;

Fig. 2 is a longitudinal section through one of the revolving brushes and its supporting and driving mechanism;

Fig. 3 is a top plan view of the structure shown in Fig. 2; and

Fig. 4 is a side elevation of the closure in the wall of the tank through which the brush is withdrawn.

Referring to the drawing, 5 indicates a tank of suitable construction and material adapted to withstand the action of the liquid employed therein for the purpose of treating metal in strip form. The strip 6 enters the tank through a pair of squeeze rolls 7, the pressure of which is adjustable by means of a hand wheel 8 which regulates the position of movable bearings 9 at the ends of the upper sqeeze roll. The purpose is to remove liquid from the strip as it is withdrawn from a preceding operation, so that such a liquid will not contaminate the liquid employed in the tank 5.

Brushes or cleaning elements 10 and 11 are supported on shafts 12 and 13 mounted in suitable bearings 14 and 15. These brushes are rotated in the directions indicated by the arrows and engage the upper surface of the strip as it passes over a roller 16 mounted in adjustable bearings 17. The bearings 17 may be adjusted by a hand wheel 18 to regulate the degree of pressure applied by the brushes 10 and 11 to the upper surface of the strip. Thence the strip passes over brushes 19 and 20, mounted on shafts 21 and 22, in bearings 23 and 24. These brushes engage the under side of the strip, which is directed under a roller 25 mounted in adjustable bearings 26. The bearings 26 may be adjusted by means of a hand wheel 27 to regulate the pressure exerted on the under side of the strip by the brushes 23 and 24. Thence the strip passes through squeeze rolls 27' to remove surplus liquid. The upper squeeze roll 27' is mounted in a movable bearing 28, and the pressure exerted thereby may be regulated by means of a hand wheel 29. The foregoing is a description merely of the typical tank for the purpose of the present invention, which relates to the details hereinafter described. The form and arrangement of the tank and of the various rollers and brushes therein may be modified within the spirit and purpose of the present invention.

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Referring to Figs. 2 and 3 of the drawing, a shaft 30 is mounted in spaced roller bearings 31 and 32 on a suitable supporting frame 33. The spaced bearings 31 and 32 maintain the alignment of the shaft 30 which is driven, preferably through a flexible coupling 34, directly by a motor 35. The shaft 30 extends through one wall of the tank 5, a suitable stuffing box 36 being provided to prevent leakage of fluid from the tank.

A brush assembly, consisting of a plurality of brushes 37 of fiber or metal wire, is mounted between spacers 38 on a sleeve 39 and is held thereon by end rings 40 and split rings 41. The brushes 37 are preferably assembled on the sleeve 39 under hydraulic pressure, so that the split rings 41 will maintain the brushes in the brush assembly firmly and prevent relative movement thereof. Thus, a continuous cylindrical brushing surface is presented to the strip as it passes through the machine.

The sleeve 39 is tightly mounted with a friction fit on the shaft 30, which is provided with a plurality of flanges 42 to support the sleeve throughout its length. The sleeve has a driving lug 43 engaging a suitable recess in the shaft 30 to afford a driving connection so that the sleeve rotates with the shaft.

At the wall of the tank opposite the driving end of the shaft, an opening 44, of a diameter equal to that of the brush assembly, is provided. This is normally closed by a cover 45 held by bolts 46 and lugs 47. A gasket 48 maintains a tight seal, and a stuffing box 49 surrounds the sleeve 39 to prevent the escape of liquid from the tank.

An extension 50 of the sleeve 39 is connected thereto by an interlocking lug and recess 51 affording a driving connection. The extension 50 is supported in a roller bearing 52 mounted on a support 53.

At the end of the sleeve extension 50, a bolt 54 extends inwardly and threadedly engages the end of the shaft 30. It carries a flange 55 so that when the bolt is turned in the counterclockwise direction it exerts pressure internally on the end of the sleeve extension 50 to effect separation of the driving connection 51, that is to say, the extension 50 is moved away from the sleeve 39 and the bearing 52 with the sleeve extension 50 may be removed from the shaft 30. Thereupon, the cover 45 can be removed by turning the lugs 47 on the bolts 36, leaving the opening 44 through which the sleeve 39 and the brush assembly may be withdrawn longitudinally and bodily from the tank. A similar replacement sleeve 39, with the brush assembly thereon, may be immediately pressed onto the shaft 30, whereupon the cover 45 is replaced and the bearing 52 and sleeve extension 50 are likewise replaced. Since the shaft is held in alignment by the bearings 31 and 32, no special alignment of the bearing 52 is necessary, and the machine is ready for operation. The bearings 31, 32 and 52 are of standard construction and require no special description. Any other suitable type of roller bearing or other anti-friction bearing may be employed.

The apparatus as described avoids the necessity for dismantling the machine which, as is apparent by reference to Fig. 1 of the drawing, is a considerable task. Each of the brushes 10, 11, 19 and 20, as shown in Fig. 1, may be constructed in the manner hereinbefore described, with convenient openings in the side wall of the tank so that each of these brushes may be withdrawn endwise and bodily therefrom and as easily replaced. This greatly facilitates the maintenance of the apparaus, since removal and replacement of the brush assemblies requires only a brief time which does not interfere materially with the continued operation of the apparatus.

Various changes may be made in the form and arrangement of the apparatus and its parts without departing from the invention or sacrificing the advantages thereof.

I claim:

1. In a mechanical scrubbing apparatus including walls defining a tank, one of which has an opening therethrough, a removable closure for said opening, driving means positioned outside said tank adjacent the wall opposite said closure, a shaft rotated by said driving means and extending therefrom through the tank and said closure and beyond the tank, a sleeve supported on said shaft extending from within said tank through said closure and having a releasable driving connection with said shaft, a brush assembly mounted on said sleeve within said tank for rotation with said sleeve, and a removable bearing supporting said sleeve and said shaft externally of said tank adjacent said closure, said brush assembly being of a size such that said sleeve and the brush assembly can be removed from the tank through said opening without removal of the shaft after said bearing and said closure are removed and said driving connection is released.

2. The apparatus defined in claim 1 having a pair of spaced bearings for supporting said shaft in fixed alignment positioned between said driving means and said opposite wall.

3. In a mechanical scrubbing apparatus including walls defining a tank, one of which has an opening therethrough, a removable closure for said opening, driving means positioned outside said tank adjacent the wall opposite said closure, a shaft rotated by said driving means and extending therefrom through the tank and said closure and beyond the tank, a first sleeve section supported on said shaft within said tank and extending through said closure, said first sleeve section having a releasable driving connection with said shaft, a brush assembly mounted on said first sleeve section within said tank for rotation with said first sleeve section, a second sleeve section supported on said shaft outside of said tank adjacent said closure and having a releasable driving connection with said first sleeve section, releasable means connecting said second sleeve section to said shaft, and a removable bearing supporting said second sleeve section and said shaft externally of the tank adjacent the closure, said brush assembly being of a size such that said first sleeve section and the brush assembly can be removed from the tank through said opening without removal of the shaft after said connecting means between said shaft and said second sleeve section is released, said second sleeve section is released from said first sleeve section, said bearing, said second sleeve section and said closure are removed and said driving connection between the shaft and the first sleeve section is released.

4. In a cleaning apparatus including walls defining a tank, one of which has an opening therethrough, a removable closure for said opening, driving means positioned outside said tank adjacent the wall opposite said closure, a shaft rotated by said driving means and extending therefrom through the tank and said closure and beyond the tank, a sleeve supported on said shaft extending from within said tank through said closure and having a releasable driving connection with said shaft, a cleaning element mounted on said sleeve within said tank for rotation with said sleeve, and a removable bearing supporting said sleeve and said shaft externally of said tank adjacent said closure, said cleaning element being of such size that, after removal of said bearing and said closure and release of said driving connection, said sleeve and the cleaning element may be slid along the shaft and removed from the tank through said opening without removal of the shaft.

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