Feb. 29, 1944. E. D. MARTIN 2,342,811

APPARATUS FOR ELECTROPLATING METAL STRIP

Filed Jan. 12, 1940

Fig. 1

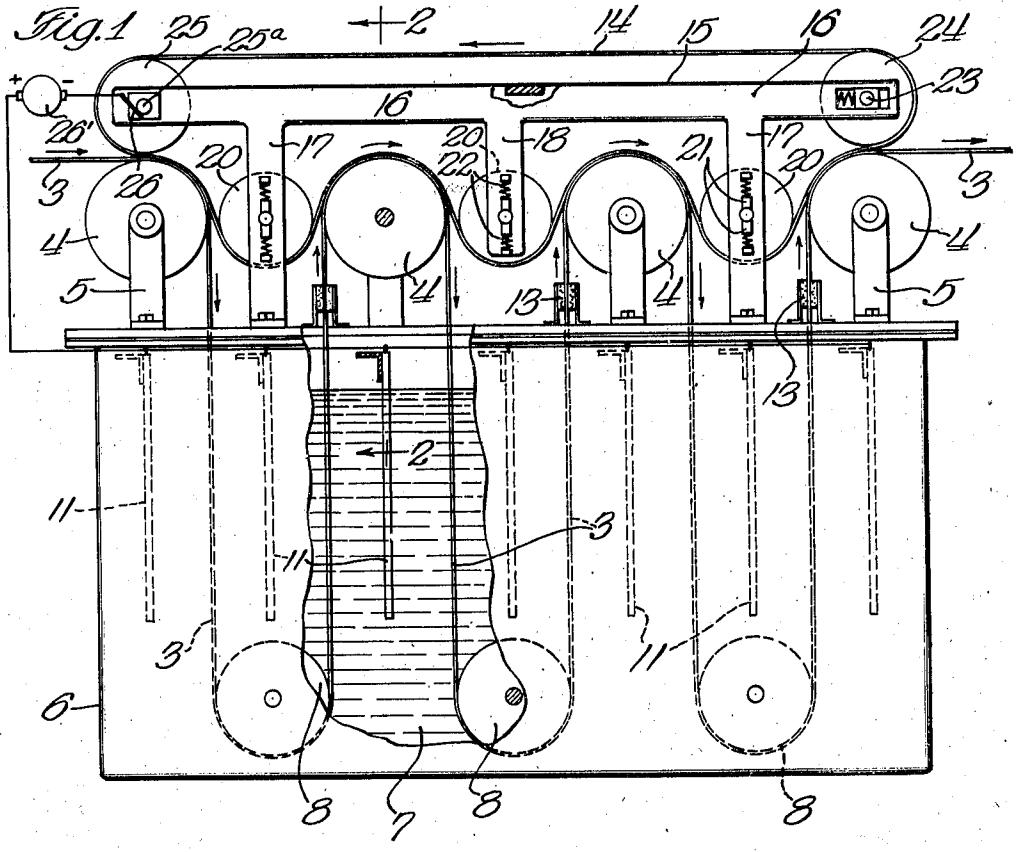
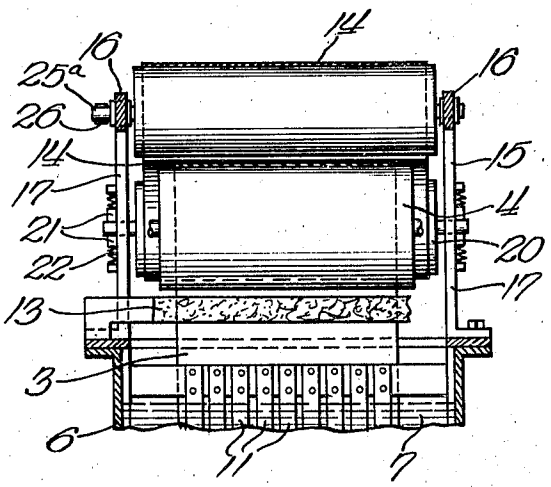


Fig. 2



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APPARATUS FOR ELECTROPLATING METAL STRIP

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4 Claims. (Cl. 204—206)

My invention relates to improvements in apparatus for electroplating metal strip and the like and more particularly to novel means for electrically charging the strip as it passes through the electrolytic bath.

It has been rather common practice heretofore to pass the strip alternately around rolls adjacent the bottom of the plating bath and rolls above the bath and to electrically charge one or more of the upper rolls in order to charge the strip so that it serves as the cathode. With such a construction, difficulties are encountered as an electrolytic action takes place between the surface of each charged roll and the strip and the surface of the roll is plated with a coating of the plating metal. This coating builds up and mars the plated surface of the strip and also causes trouble due to the increase in the diameter of roll.

The principal object of my invention is to provide a simple and efficacious structure and arrangement which overcomes these difficulties. To this end, and generally speaking, I use insulated rolls and employ an electrically charged band which is suitably mounted in contact with the metal strip to charge the strip.

Other objects and advantages will become apparent as this description progresses and by reference to the accompanying drawing wherein:

Fig. 1 is a somewhat diagrammatic side view of an apparatus embodying my invention; and

Fig. 2 is a cross sectional view through the upper part of the apparatus, as on the line 2—2 of Fig. 1.

Referring to the drawing, the metal strip 3, which is to be plated, may be drawn from a coil or reel and then as one step of a continuous operation prepared or cleaned for the plating operation. The strip is formed of the desired base metal, such, for example, as steel or copper, and may be of any desired width and length.

The strip, after being prepared for the plating step, passes over the first of the rolls 4 which are mounted on brackets 5 fixed to the opposite sides of the top of a tank 6 containing the desired electrolytic bath 7, such, for example, as one containing tin.

Suitably journaled near the bottom of the tank are a plurality of rolls 8 in staggered relation with respect to the rolls 4. The rolls 4 and 8 are all insulated rollers, being formed of or covered with a suitable insulating material, such, for example, as rubber or porcelain. The strip 3 alternately passes around the bottom rolls 8 and the middle rolls 4 and then passes over the right hand roll 4 and through any subsequent finishing steps of the process and is finally wound on a reel or cut into sections, as may be desired. The strip may be pulled through the apparatus by the winding reel, or by driving some or all of the rolls, or by other suitable means.

Soluble anodes 11 of the plating metal, such as tin, for example, are suitably suspended in the bath and between the vertical sides of the loops formed in the strip by passing it over the rolls 4 and 8. Squeegee pads or rolls 13, suitably mounted in spaced positions above the tank, serve to remove the excess electrolyte from the strip as it emerges from the bath.

As already mentioned, it has been heretofore one practice to form the upper rolls or their surfaces of conducting material, such as nickel or copper, for example, and to provide such rolls with electrical brushes connected to the negative pole of a source of power in order to electrically charge the metal strip as the cathode. As before stated, this arrangement has serious objections in that an electrolytic action takes place between conducting rolls and the strip with the result that the surface of such roll becomes plated and the strip is marred and the diameter of the roll is increased. I overcome these difficulties by insulating all of the upper rolls or by forming all of the upper rolls or their surfaces of insulating material and providing an electrically charged metal band 14 which is maintained in contact with the strip 3 to be plated, as now will be described.

Mounted on the top of the tank 6 is a frame 15, each side of which comprises a top bar 16, end legs 17 bolted to the top of the tank, and an intermediate arm 18. Insulated rolls 20 are positioned between the rolls 4 and have their shaft extensions mounted in tensioning means in the legs 17 and arm 18. As somewhat diagrammatically shown, these tensioning means may comprise blocks 21 in which the shaft extensions are mounted, and opposing springs 22 on each side of the blocks which are slidable in slots in the legs 17 and arm 18. Mounted in suitable tensioning devices 23 in the right hand ends of the bars 16 of the frame 15, is a similar insulated roll 24. Mounted in the left hand ends of the bars 16 is a conducting roll 25, which has its shaft extensions journaled in insulating blocks carried by the bars. Brushes 26, connected to the negative pole of the source of power shown diagrammatically at 26' engage the shaft extensions 25a of the roll 25. The positive

pole of the source of power is connected to the anodes 11. The endless band 14 of conducting material, such as copper, passes around the rolls 25, 24 and 26, and as the rolls 26 are located between the rolls 4 the band is firmly pressed against the portions of the strip engaging the rolls 4.

It will be apparent that the electrical charge of the band is conducted directly and efficiently to and over large surfaces of the strip 3, as it passes over the rolls 4, and thus the strip is properly charged to act as the cathode during the plating operation. It is also obvious that my invention overcomes the difficulties heretofore encountered. The rolls 4 being electrically insulated, do not become plated so their surfaces remain smooth and their diameters do not increase. There may be a tendency to plate the outer surface of the band but this is not at all serious because of the large area of the band and the ease with which the coating may be removed without interfering with or interrupting the plating operation of the strip. The band 14, being in engagement with the strip as it passes over the rolls 4, also aids in synchronizing and equalizing the feed of the loops of the strip through the electrolyte. The inside of the band 14, which engages the rolls 20, 24 and 25, remains substantially dry so that there is practically no electrolytic action between the band and these rolls.

I have illustrated one form of embodiment of my invention, but it will be understood that changes in detail and arrangement of parts may be resorted to without departing from my invention as defined by the claims that follow. For example, the number of rolls 4 may be varied or the band may be arranged to coact with less than all of the rolls 4. Further, one or more of the rolls carried by the frame 15 may be positively driven, in order that the band 14 may aid in advancing or feeding the strip 3 through the apparatus.

I claim:

1. In an apparatus for electroplating a metal strip by passing the strip through an electrolytic bath, the combination with a plurality of insulated rolls adjacent the bottom of the bath and a plurality of insulated upper rolls above the bath, the strip alternately passing underneath and about the lower rolls and over and about the upper rolls, of a plurality of band-engaging rolls some of which are between said insulated upper rolls and one of which is electrically charged, and a flexible conducting band passing around said band-engaging rolls, the band engaging the strip as it passes over said upper insulated rolls to electrically charge said strip.

2. In an apparatus for electroplating a metal strip by passing the strip through an electrolytic bath, the combination with a plurality of insulated rolls adjacent the bottom of the bath and a plurality of insulated upper rolls above the bath, the strip alternately passing underneath and about the lower rolls and over and about the upper rolls, of a plurality of band-engaging rolls some of which are between said insulated upper rolls and one of which is electrically charged, a flexible conducting band passing around said band-engaging rolls, the band engaging the strip as it passes over said upper insulated rolls to electrically charge said strip, and tensioning means for resiliently maintaining the band against the strip.

3. In an apparatus for electroplating a metal strip by passing the strip through an electrolytic bath, the combination with a plurality of insulated upper rolls, the strip passing over and about the upper rolls above said bath with portions of said strip extending down between said upper rolls and through said bath, of a plurality of band-engaging rolls above said bath at least one of which extends between adjacent upper insulated rolls and at least one of which is conducting and electrically charged, and a flexible conducting band passing around said band-engaging rolls and above said upper insulated rolls, the band engaging the upper surface of said strip as it passes over said upper insulated rolls to electrically charge said strip.

4. In an apparatus for electroplating a metal strip by passing the strip through an electrolytic bath, the combination with a plurality of insulated upper rolls above the bath, the strip passing over and about the upper rolls with portions of said strip extending down between said upper rolls and through said bath, of a plurality of band-engaging rolls above said bath at least some of which are positioned between adjacent upper insulated rolls and at least one of which is conductive and electrically charged, and a flexible conducting band passing around said band-engaging rolls and above said upper insulated rolls, the band engaging the upper surface of said strip as it passes over said upper insulated rolls to electrically charge said strip.

EDWIN D. MARTIN.