

July 15, 1941.

W. H. JACKSON

2,249,609

CONTACT FOR ELECTROPLATING MACHINES

Filed Sept. 7, 1937

2 Sheets-Sheet 1

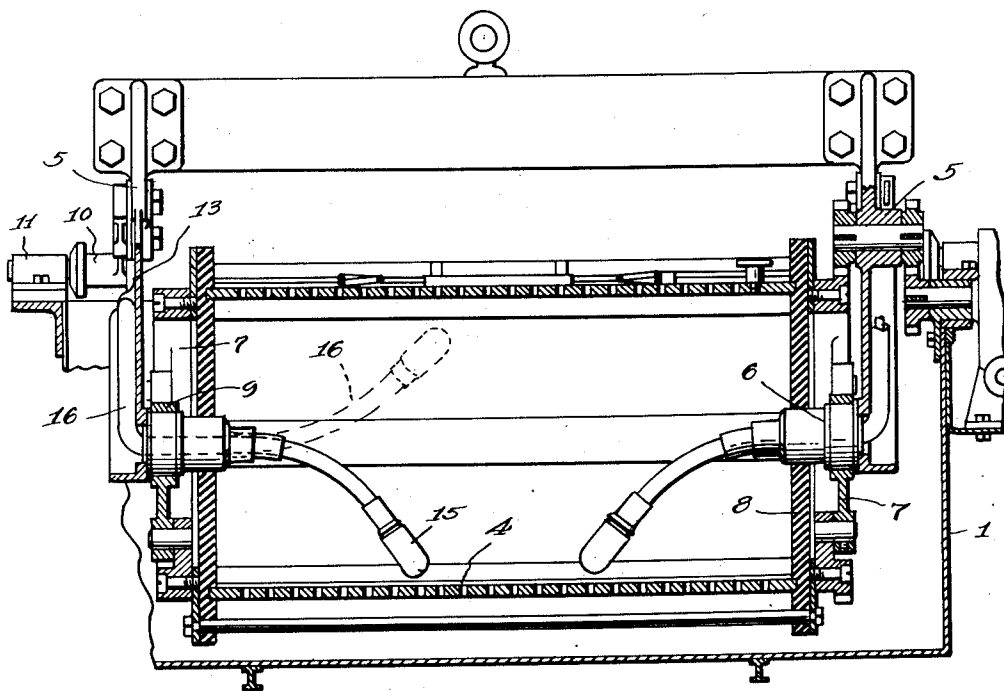


Fig. 1

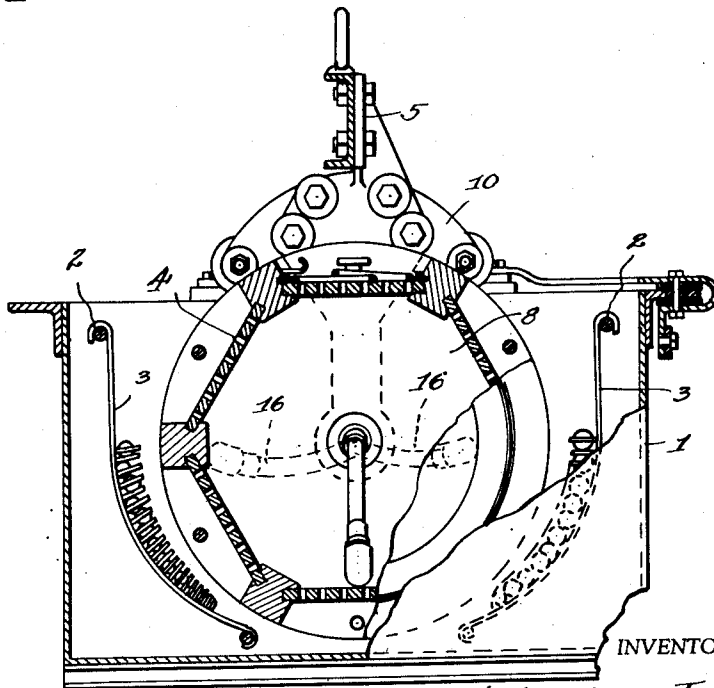


Fig. 2

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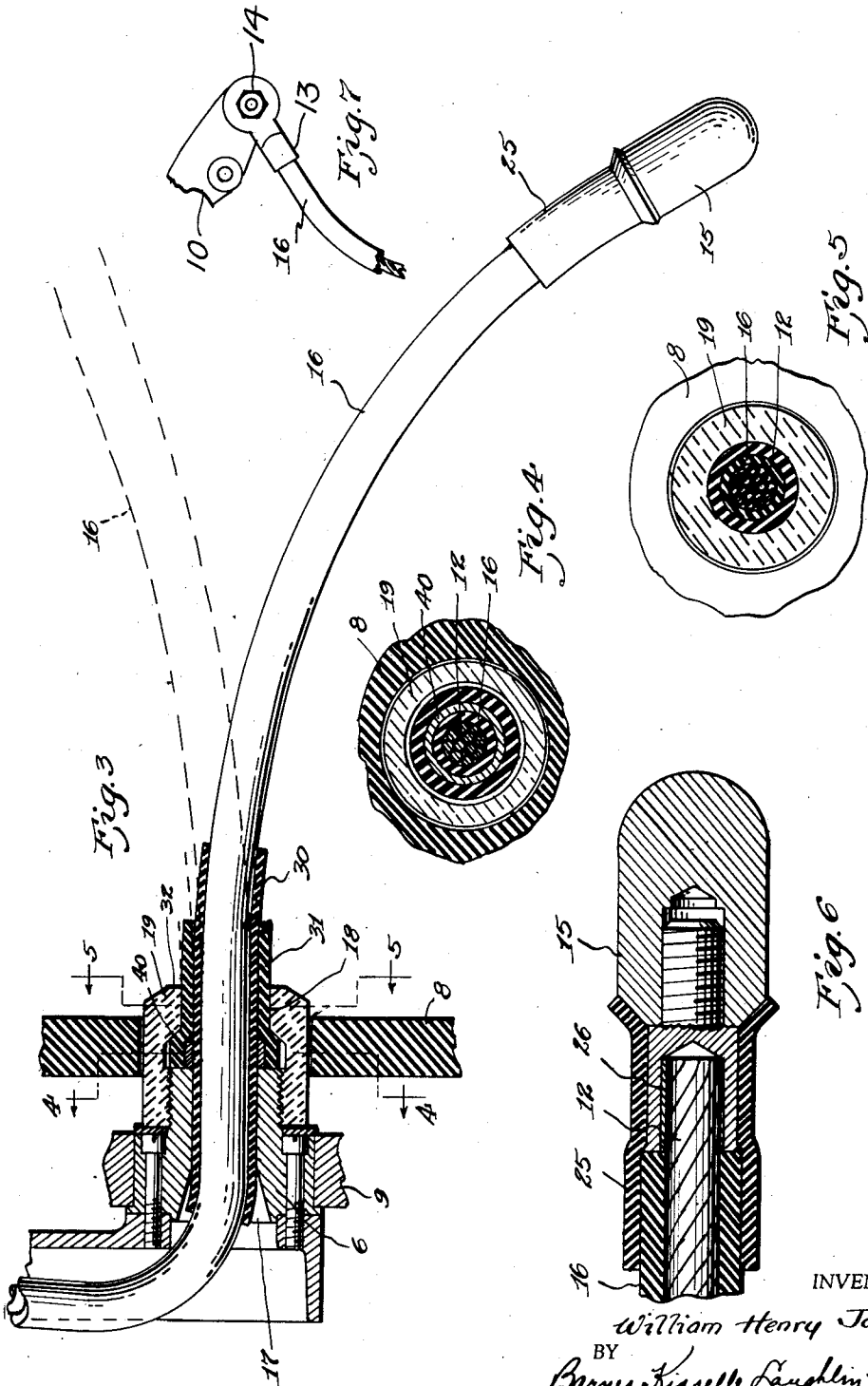
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2,249,609

CONTACT FOR ELECTROPLATING MACHINES

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Application September 7, 1937, Serial No. 162,574

1 Claim. (Cl. 204—213)

This invention relates to an electroplating machine and more particularly to a contact for such a machine.

In copending application of Karl Gustaf Soderberg, Serial No. 162,569, filed September 7, 1937, there is shown, described and claimed a contact comprising a flexible cable and insulating cover which are continuous from a point above the surface of the plating solution where the contact is connected to the cathodic side of the electrical circuit to a point below the solution level where it contacts the work. This invention contemplates a novel mounting for such cathodic contact.

Since the insulated flexible type of contact described in the above-mentioned Soderberg application is continually flexed by contact with the work as the work is agitated and tumbled during the plating operation the contact is subjected to rather severe torsional and bending moments.

It is the object of this invention to mount this type of contact so that its life will be long. This object has been achieved by distributing the torsional moments to which the insulated cable is subjected throughout substantially the entire length of the cable and the bending moments over a substantial portion of its length.

In the drawings:

Fig. 1 is a longitudinal vertical sectional view through a plating machine showing the mounting of the flexible cable cathode contact.

Fig. 2 is a transverse vertical section.

Fig. 3 is a detail sectional view showing the support for the cathode cable where it passes into the work container.

Figs. 4 and 5 are sections along the lines 4—4 and 5—5 of Fig. 3.

Fig. 6 is an enlarged sectional view showing the connection between the wire cable and the steel knob.

Fig. 7 is a detail of the connection between the cathode contact and the yoke supporting the cylinder.

Generally the plating machine comprises a tank 1 for the plating solution, anode support rods 2, anodes 3, a rotating cylinder, generally designated 4, and hangers 5 which support the rotating cylinder in the tank 1. A bearing 6 is bolted to the lower end of each of the hangers 5. A spider 7 is fixed to each end 8 of the cylinder 4. Each spider is provided with a hub 9 which is rotatably mounted upon the bearing 6 to provide a slip joint about which the work cylinder 4 rotates during the operation of the machine.

The yokes 10 which rest upon the saddles 11 are bolted to, but insulated from, the hangers 5. Thus the work hangers 5 which support the rotating cylinder are supported by the yokes 10. As in the above-mentioned patent, the yoke 10 is cathodic whereas the hangers 5 are preferably anodic.

In a plating machine of this general type it is proposed to use a cathode contact comprising a flexible wire cable 12 which has fixed at its upper end a metal connector 13. The connector 13 is secured in electrically conducting relation with the yoke 10 by means of the bolt and nut 14. A steel knob 15, preferably chromium plated for ease of removal of trees, is fixed to the lower end of the cable 12. The entire cable 12 between the connector 13 and knob 15 is completely insulated by the rubber covering 16. It will be noted that the upper end 13 of the cathode contact is positioned adjacent the top of the tank 1 where it is well above the surface of the plating solution. The insulated cable 12 passes down along the hanger 5 and then through a suitable opening 17 provided therefor in the bearing 6 and an opening 18 in the bushing 19 of rubber, Bakelite or other nonmetallic material. The bushing 19 is screwed on to the end of the bearing 6. Thus although the hubs 9 rotate about bearing 6 and the ends 8 of the cylinder rotate about bushings 19 and although the cathode contacts pass from a stationary part of the machine through the rotating hubs and the rotating cylinder ends, nevertheless the cathode contact is continuous and the need for a slip joint in the cathode contact is obviated. Thus there are no joints in the cathode contacts in which trees can grow and wear away.

A piece of rubber hose 25 is mounted over the end of the end of the insulation 16 and cable 12 and protrudes over the end of the knob 15. The hose 25 protects or seals the joint 26 between the end of cable 12 and knob 15 from the plating solution.

Since the amount of work to be plated, which is placed in the cylinder 4, varies from small amounts to amounts almost sufficient to fill the cylinder, it will be appreciated that the work, as it is agitated and tumbled during the rotation of the cylinder 4, will bend the cathode cable 12 in all directions about the openings in which it passes through the bearing 6 and nut 19, thus subjecting the cable to severe bending moments. Further, during the course of its life the cable, due to its operative contact with the work, will be subjected to severe torsional or twisting mo-

ments. If these moments are concentrated at any point along the cable, e. g., if the cable is bent about a sharp corner, the torsion and bending stresses will break the cable at this point and the cable will be short lived. To obviate this defect it is proposed to so mount the cable 12 that the torsional and bending stresses to which it is subjected are distributed throughout a substantial area. This has been accomplished by providing the cable with a cantilever mounting which avoids sharp bending of the same.

This cantilever mounting takes the form of preferably a plurality of soft rubber tubes such as 30 and 31. Tube 31 is mounted over tube 30 which is mounted over the rubber insulation 16 and extends through openings 17 and 18 in the bearings 6 and nut 19 and projects beyond the end of the nut 19. The distance that the flexible or rubber tube 30 projects beyond the end of tube 31 will depend upon the area over which one wishes to distribute the bending moment. This is also true of the extent that the flexible or soft rubber tube 31 extends beyond the end 32 of the nut 19. The further the tubes 30 and 31 extend beyond the end 32 of the nut 19 the greater the area over which the bending stress on the cable 12 is distributed. The rubber tubing 31 projects beyond the end 32 of the nut 19 a lesser distance than the tube 30, preferably about half the distance that the tube 30 projects beyond the end 19 of the tube 32. Thus, the tubes 30 and 31 are in stepped relation. The number of these tubes in stepped relation can be varied within limits to effect a more gradual bending of the cable and a more uniform distribution of the bending moment of load over any given area. Preferably, the soft rubber tube 30 has a slip fit with the insulation 16 on the cable 12. Thus the insulated cable 12, 16 can turn or rotate within the tube 30 and slip longitudinally of the tube 30. This slip joint between the cable 12, 16 and the tube 30, bearing in mind that the upper end of the cable is fixed to the yoke 10 by the nut and bolt connection 14, permits the cable

12 to twist throughout its entire length from knob 15 to the connection 14 and thus the torsional moments or twisting stresses are distributed throughout the entire length of the cable 12. This gives the cable a long life. Further, when the rotating cylinder bends the portion of the cable within the cylinder about its support at the bushing 10, the cantilever mounting, i. e., the hoses 30 and 31, due to their differences in length and diameter, prevent sharp bending of the cable and thus distribute the bending moments over a substantial portion of the cable. This also adds to the life of the cable.

A locking ring 40 of steel or other suitable material is mounted over the tube 30 and within the inner end of the tube 31. This locking ring 40 cooperates with the nut 19 to lock the soft rubber tubing 31 in position upon and against longitudinal movement along the inner soft rubber tubing 30.

I claim:

In an electroplating machine comprising a stationary support, a rotating cylinder rotatably mounted on said stationary support and having an opening in an end wall at the axis of rotation and adapted to receive the work to be plated, and a contact comprising a flexible member fixed at one end to the stationary part of the machine and passing through the said opening and into the said cylinder adapted to contact the work in the cylinder, the combination with said cylinder and contact of a cantilever support for the contact at the said opening comprising a plurality of resilient tubes of different diameters mounted one within the other and over the said flexible contact, each tube of lesser diameter having a greater length and extending within the cylinder beyond the tube of the greater diameter, the contact having a slip fit with the innermost of said tubes whereby the bending stresses to which the flexible contact is subjected during the rotation of the cylinder are distributed along a portion of the said contact.

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