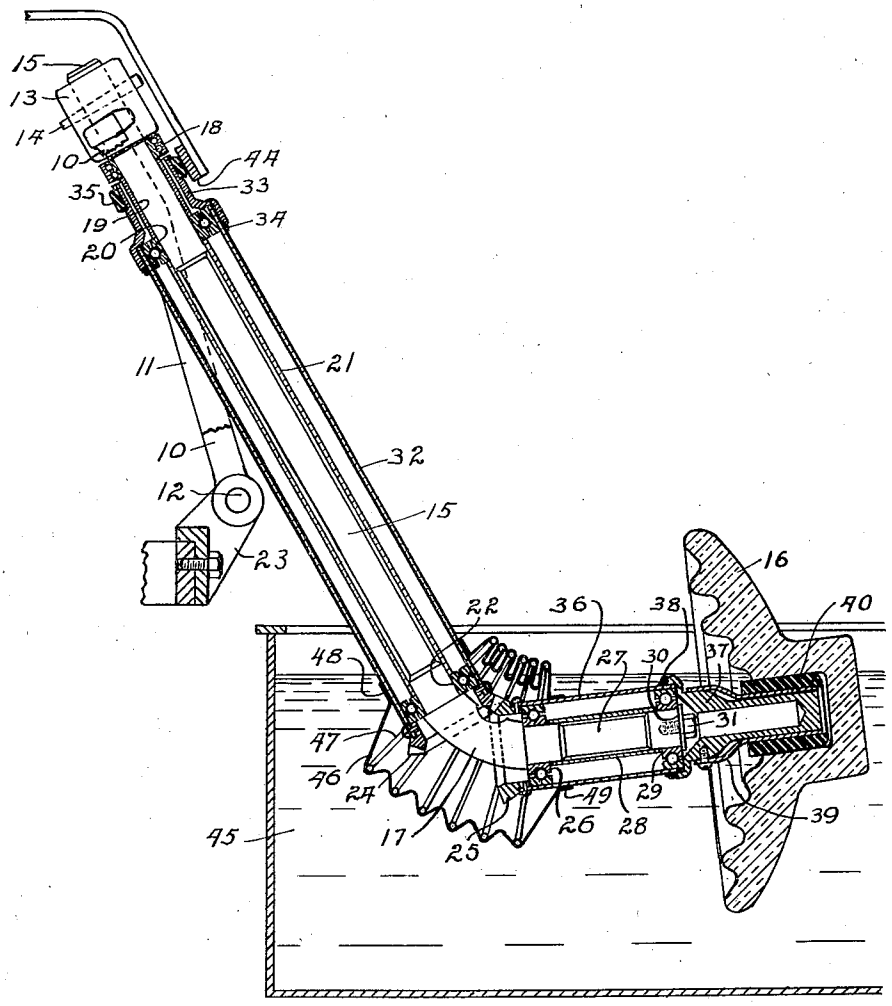
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WORK SUPPORTING SPINDLE

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WORK SUPPORTING SPINDLE

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This invention relates to dipping spindles for coating machines and has for its principal object the provision of supporting spindles for articles to be coated which will rotate the articles in a coating bath and will exclude the material of the bath from the bearings and other operating parts of the spindles.

A further object of the invention is to provide a device of the class named which shall be of improved construction and operation.

Other objects and advantages will appear from the following description.

The invention is exemplified by the combination and arrangement of parts shown in the accompanying drawing and described in the following specification and it is more particularly pointed out in the appended claims.

In the drawing the figure is a vertical sectional view of a spindle illustrating one embodiment of the present invention.

In my prior Patent 2,209,006, issued July 23, 1940, I have described a coating machine for electric insulators having spindles for partially immersing the insulators in a glazing bath and rotating the insulators while in the bath to distribute the glaze uniformly over the surface of the greater portion of the insulators. In the machine shown in the patent the insulators are only partially immersed in the bath so that the bearings for the spindle are not exposed to the coating liquid. In some cases, however, it is desirable to submerge the work pieces to a greater depth in the bath and where this is the case a spindle like that shown in the patent would have its bearings exposed to the glazing material, subjecting the moving parts to the glazing material which in time would impair their operation, and it is found desirable to provide a spindle which would not be so affected. This is not only true of glazing materials but of many other coating baths in which it is desirable to submerge and rotate an article to be coated. In order to support the article in a horizontal or approximately horizontal position in the bath, it is necessary to have the different parts of the spindle disposed at an angle to each other as will be understood from my prior patent. This greatly adds to the difficulty of providing a driving shaft having all of its operating parts protected from the coating bath. The form of the invention shown in the drawing has, however, overcome this difficulty in a satisfactory manner.

In the drawing the numeral 23 designates a supporting bracket and the numeral 44 designates a guide track; the reference characters being the same as those employed in my prior patent for designating similar parts; the operation of these parts being fully described in that patent. In the present invention the operating spindle instead of being mounted directly on the bracket 23, as in the prior patent, is carried by a yoke having spaced arms 10 and 11, the lower ends of which are pivoted at 12 on the bracket 23 and the upper ends of which are rigidly fixed to a sleeve 13. In the drawing the arm 10 is partially broken away to disclose the structure of the spindle itself which is shown in section. Extending through the sleeve 13 and rigidly fixed thereto by a pin 14 is a supporting shaft 15. This shaft 15 extends continuously to a point adjacent the supporting head for the insulator 16 and it is provided with an elbow section 17 which imparts the desired angle to the spindle. A freely rotating roller 18 is journaled on the shaft 15 adjacent the sleeve 13 to travel on the portion of the guide track for holding the spindle in position when rotation thereof is not desired, as explained in the patent. Spaced from the sleeve 13 by a spacer tube 19 and the inner ball race for the roller 18 is a ball bearing 20 and engaging the bearing 20 to hold it in place is a second spacer tube 21. A ball bearing 22 engages the other end of the spacer tube 21 and the bearing 22 is held in place by a shoulder formed by the elbow 17. A ball bearing 26 is mounted on the short arm 27 of the shaft 15 and bears against a shoulder on the other end of the elbow 17. A third spacer tube 28 engages the bearing 26 and a fourth bearing 29 engages the opposite end of the spacer tube 28. The bearing 29 is held in place by a washer 30 and a cap screw 31. A combined housing and driving tube 32 is supported by the outer portions of the bearings 29 and 22 and the upper end of the tube 32 carries a driving sleeve 33 which is rigidly fixed to the tube 32 by welding or solder 34 and which has fixed to its upper end a bearing roller 35 of rubber or other suitable frictional driving material which bears on the track 44, as explained in my prior patent. The lower end of the tube 32 is rigidly fixed to a gear 24 which meshes with a gear 25 secured to the end of a short housing tube 36 which carries an operating head 37 on which the insulator 16 is mounted. As the roller 35 is driven by contact with track 44, it will drive the gear 24 through the tube 32 and consequently will drive the meshing gear 25, the housing tube 36 and the operating head 37. The head 37 is welded or soldered to the tube 36 at 38. A supporting thimble 39 is secured to the head 37 and

the thimble 39 carries a sleeve 40 of rubber or other suitable material for engaging the opening in the insulator 16. The thimble 39 and sleeve 40 may be readily changed to accommodate work pieces having different openings. As the spindle is moved along the track 44 the insulator 16 will be rotated in the coating bath 45 by the driving chain including the roller 35, the sleeve 33, the tube 32, the gears 24 and 25, the tube 36, the head 37 and the supporting sleeve 40. The head 37 and tubes 32 and 36 are sufficient to exclude the coating bath from the roller bearings, except at the exposed ends of the tubes 32 and 36 which carry the gears 24 and 25. In order to exclude the material of the bath from this elbow portion of the spindle, the elbow is enclosed in a flexible, accordion plaited hood 46 which may be made of heavy rubber or other suitable flexible material. The hood is held in an extended position by a series of supporting rings 47 which engage the outer angles of the accordion folds. The ends of the hood are attached to the tubes 32 and 36 respectively at 48 and 49, the material of the hood being extended in tubular bands which fits tightly about the tubes to exclude all coating material from entrance into the interior of the hood. As the tubes 32 and 36 rotate, the hood will expand on the outer periphery of the curve and be compressed on the inner periphery so as to form a continuous protection for the driving gears within the space enclosed by the hood. By mounting the driving members on the outside of the supporting shaft and by connecting the end of the driving chain to a closed supporting head, the bearings for the driving member and the connecting gearing may all be enclosed so that none of the relatively movable operating parts are exposed to the material of the bath.

I claim:

1. A spindle for supporting a work piece in a treating bath, said spindle comprising an inner cantilever shaft having straight portions connected by a rigid elbow or bend, tubular housing members journaled on said straight portions respectively, a driving connection between said housing members at their adjacent ends and a flexible impervious hood connecting the adjacent ends of said housing members and enclosing said driving connection.

2. A spindle for supporting a work piece in a treating bath, said spindle comprising an inner, rigid, cantilever bent shaft, an impervious housing surrounding said shaft and journaled thereon, said housing having a flexible portion at the bend in said shaft to maintain the continuity of said housing about said bend, means at one end of said spindle for rotating said housing and a work supporting head forming a closure for said housing at the other end of said spindle and driven by said housing to rotate a work piece thereon.

3. A driving spindle comprising an inner cantilever shaft bent between its ends to provide relatively angularly disposed straight portions, tubular housing members journaled on said straight portions respectively, beveled gears connecting said housing members at their adjacent ends and a flexible impervious hood connecting said housing members and enclosing said gears.

4. A driving spindle comprising two cantilever supported arms disposed at an angle to each other and rigidly connected at their adjacent ends, tubular housing members journaled on said arms respectively, driving connection between adjacent ends of said housing members, and a flexible, accordion plaited hood connecting said housing members and enclosing said driving connection.

5. A spindle comprising a rigid, bent cantilever shaft, tubular housing members journaled on different portions of said shaft, driving connection between said housing members, an accordion plaited hood connecting adjacent the ends of said housing members and enclosing said driving connection and spacer rings disposed, one in each of the outer folds of said hood to prevent collapse of said hood.

6. A driving spindle comprising a rigid, supporting, inner cantilever shaft, a driving sleeve and housing journaled on said shaft, a carrying arm rigidly secured to said shaft at one end thereof and extending to a point adjacent an intermediate point of said spindle and a pivotal support for said carrying arm providing a supporting fulcrum for said spindle between the ends thereof.

7. A spindle for rotating a work piece in a treating bath comprising an inner rigid cantilever shaft having relatively angularly disposed straight portions connected by a rigid bend or elbow, driving tubes journaled on said straight portions respectively, beveled gears connecting adjacent ends of said tubes at the bend in said shaft, a work support carried by one of said tubes at one end of said spindle and forming a closure for said tube, a roller secured to the other tube at the other end of said spindle for rotating said tubes and work support, and an accordion plaited, flexible, impervious hood connecting the adjacent ends of said tubes and enclosing said beveled gears.

8. A spindle for rotating a work piece in a treating bath comprising an inner, rigid cantilever shaft, bent between its ends to provide two relatively angularly disposed straight arms connected by a rigid elbow, combined driving and housing tubes journaled on said arms respectively, beveled gears connecting said tubes at the adjacent ends thereof, an accordion plaited, impervious hood connecting said tubes and enclosing said gears, spacer rings disposed in the outer folds of said hood to prevent collapse of said hood, a work supporting head carried by one of said tubes at one end of said spindle and forming a closure for said tube, a driving roller carried by the other tube adjacent the other end of said spindle, and a supporting yoke rigidly secured to said shaft at the end of said spindle opposite said work support and extending to a point intermediate the ends of said spindle to provide a fulcrum support for said spindle between the ends thereof.

9. In a cantilever type work dipping and rotating device; a supporting rod concentrically disposed of said device, said rod having an elbow therein such that one portion thereof is disposed at an angle to the other portion; a hollow drive shaft concentrically disposed of said rod, said hollow shaft having one portion disposed at an angle to the other; a work spindle rotatably connected to one of said hollow shafts; bevel gearing rotatably supported on said elbow to transmit motion from one part of said hollow shaft to the other; and means to drive said hollow shafts and a flexible sleeve means connecting said two portions of said hollow shaft and adapted to rotate therewith.

10. In a cantilever style work dipping and rotating device; a supporting tube, said tube having two portions disposed at an angle to each

other; an elbow device connecting said two tube portions; gearing rotatably supported on said elbow; a work spindle rotatably supported on one portion of said tube; shaft means concentric with said last mentioned portion adapted to connect said gearing and said work spindle; driving means rotatably supported on the opposite end of said supporting tube; and a hollow shaft concentric with said last mentioned shaft adapted to connect said driving means and said gearing; and a flexible sleeve device connecting said shafts and disposed about the bend in said supporting tubes and said hollow shaft.

11. In a cantilever type work holding and dipping device; a supporting element having an elbow therein such that one portion of said element is angularly disposed relative to the other; a drive means rotatably supported in one end of said element; a work rotating spindle rotatably supported on the other end of said element; gearing rotatably supported relative to said elbow; a power transmitting means connecting said driving means and said gearing and a power transmitting means connecting said gearing and said work spindle; and a flexible sleeve element connecting said power transmitting means and enclosing said gearing.

12. In a cantilever type submersible work rotating and holding element; a supporting element having two portions angularly disposed to each other and elbow connected; a driving element rotatably disposed on one end of said shaft; a work rotating element rotatably disposed on the other end of said element; bevel gearing rotatably associated with said elbow; power transmitting means connecting said bevel gearing and said driving and work rotating elements; and means enclosing said bevel gearing and closely fitting said power transmitting means.

13. In a cantilever type work holder for rotating a work piece in a treating bath; a supporting element having two portions angularly disposed; an elbow connecting said portions; a work holder rotatably mounted on an end of said shaft element; a driving element mounted on the other end of said element; means to transmit power from said driving element to said work holder which includes, a pair of bevel gears rotatably associated with said elbow and shafting connecting said gears and said work holder and said driving means; and means on said shafting surrounding said gearing to protect same from said treating bath.

WILLIAM A. SMITH.