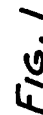


3,202,006

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2 Sheets-Sheet 1



INVENTOR.
WENDELL G. LEWELLEN

BY

Barnes, Kisselle, ^{Dr} Kirsch & Choate

ATTORNEYS

Aug. 24, 1965

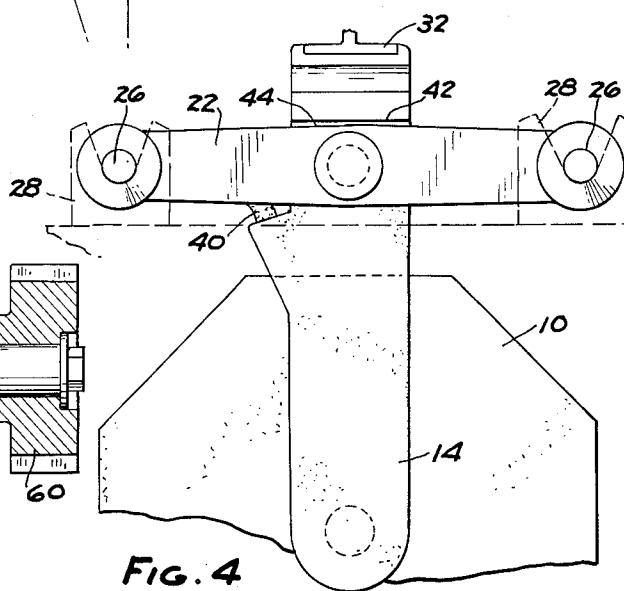
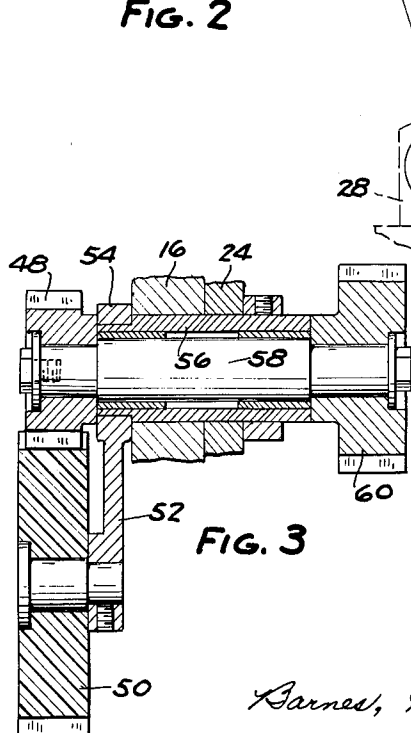
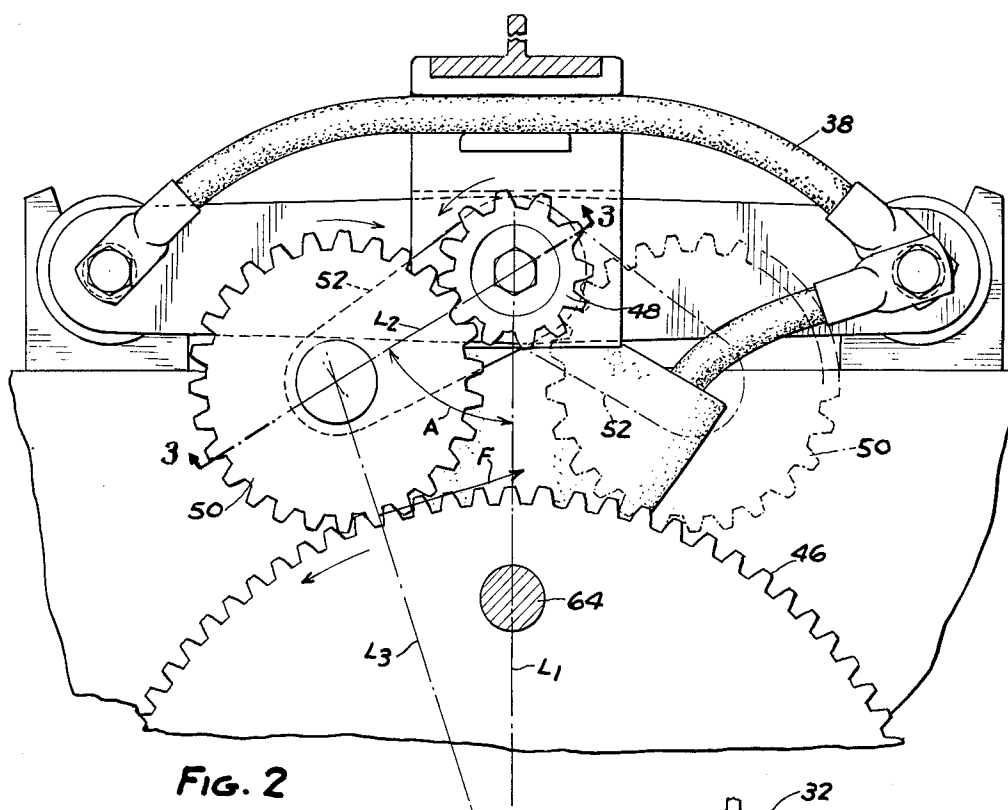
W. G. LEWELLEN, JR

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ROTATING MECHANISM FOR PLATING BARREL OR THE LIKE

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2 Sheets-Sheet 2



INVENTOR.
WENDELL G. LEWELLEN

BY
Barnes, Kisselle, Rainick & Choate
ATTORNEYS

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ROTATING MECHANISM FOR PLATING BARREL OR THE LIKE

Wendell G. Lewellen, Jr., Wayne, Mich., assignor to Imperial Industries, Inc., Wayne, Mich., a corporation of Michigan

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14 Claims. (Cl. 74-406)

This invention relates generally to plating barrels of the type which are immersed and rotated at a relatively slow rate in plating baths during the process of plating articles contained within the barrels. More specifically, the invention involves mechanism for rotating the barrels.

It is conventional to rotate a plating barrel by means of gearing formed of plastic or metal which is impervious to the effects of fluids used in plating baths. During the course of use, wear occurs at the bearings which support such a plating barrel, and this results in an increase in the distance between the centers of the plastic gears. This, in turn, causes the gears to mesh improperly and to wear at an increasing rate. Eventually, the resulting slack between the gears becomes so great that the gear teeth strike each other upon changes of loading on the gears, thereby breaking the teeth of one or more of the gears and requiring gear replacement. Moreover, conventional gearing cannot be conveniently disengaged to facilitate manual rotation of the plating barrel for convenient loading and unloading thereof.

The primary object of the present invention is to provide a simple, inexpensive gear drive for a plating barrel improved so that it compensates automatically for wear at the bearings which support the plating barrel and for wear of the gear teeth themselves. Another object is to provide a gearing arrangement which facilitates convenient manual rotation of the plating barrel and which can be engaged with a gear on the barrel selectively at different locations to meet the requirements of different specific installations.

The invention generally contemplates the use of an idler gear between a drive gear and the driven gear on the barrel, the idler gear being mounted in such a way that it can move freely toward and away from drive transmitting relation between the drive and driven gears. The idler gear is held in mesh with the drive and driven gears by the forces which the latter two gears themselves exert on the idler gear. As wear occurs, the idler gear shifts automatically under these forces to take up the slack which would otherwise occur. One form of the invention is shown in the accompanying drawings:

FIG. 1 is a generally elevational view of a plating barrel utilizing a drive mechanism according to this invention, parts being broken away and shown in section to illustrate structural details.

FIG. 2 is an enlarged fragmentary generally sectional view on line 2-2 of FIG. 1.

FIG. 3 is a slightly enlarged fragmentary sectional view on line 3-3 of FIG. 2.

FIG. 4 is a fragmentary partly diagrammatic end view of the plating barrel and related parts.

Shown in the drawings is a plating barrel 10 rotatably supported within a plating tank 12 by means of two hangers 14 and 16 having bearing connections to the ends of the barrel as at 18 and 20. Hangers 14 and 16 are rockably attached respectively to horizontal supporting arms 22 and 24, each of which carries adjacent its ends an electrode horn 26 supportedly engaged within recess blocks 28 anchored to top lip portions 30 of the plating tank. Barrel 10 is both supported and furnished electrical current through the electrode horns. A crosshead 32 is secured to the upper ends of hangers 14, 16 to facilitate

raising and lowering of the barrel assembly relative to plating tank 12.

Barrel 10 has a removable top 34 through which workpieces are put into and removed from the barrel. The barrel has holes 36 in its sides through which the plating bath fluids enter to contact the workpieces. Electrical current is conducted into the barrel from horns 26 by cables 38 and 40, cables 40 extending downwardly through recesses in hangers 14, 16 and into the barrel through hollow hubs at the ends of the barrel. Rocking of support arms 22, 24 relative to the hangers facilitates leveling of the plating barrel despite incidental differences of vertical placement of blocks 28. Relative rocking of the support arms and hangers is limited by a lip 42 on each hanger spaced slightly above the top 44 of each support arm.

The drive for the plating barrel includes a large gear 46 non-rotatably fastened to one end of the plating barrel concentric with bearing connection 20. This gear is driven by a drive gear 48 through an idler gear 50. Gear 50 is mounted so that it can move freely toward and away from the interaxial line L_1 between gears 46 and 48. In the form of the invention illustrated, the mounting for gear 50 is an arm 52 provided with a collar 54 rockably surrounding a bushing 56 through which the drive shaft 58 for gear 48 passes. Arm 52 swings freely about the axis of drive gear 48. Hanger 16 and cross arm 24 are also secured to bushing 56 (FIG. 3) and a gear 60 is provided at the outer end of shaft 58. When the plating barrel assembly is in operative position on plating tank 12, gear 60 engages and is driven by another gear 62 rotated by suitable drive mechanism (not shown) which conventionally is permanently positioned adjacent the plating tank.

In a typical assembly, barrel 10, gear 46, and gear 50 are made of a plastic material, gear 46 being bolted to the barrel as represented at 64 (FIG. 2). The gear train is relatively inexpensive even though gear 46 is relatively large.

The axis of gear 50 is vertically intermediate the axes of gears 46 and 50 and arm 52 extends at an oblique angle to the horizontal and vertical so that gear 50 tends by the force of gravity to remain engaged with gear 46. The interaxial line L_1 between gears 46 and 48 and the interaxial line L_2 between gears 48 and 50 define an included angle A; and this angle, measuring from the axis of gear 46 to the axis of gear 48 and then to the axis of gear 50, is opposite in direction to the direction of rotation of gear 48. Thus, in FIG. 2, assuming that gear 48 is rotating counterclockwise, angle A, measured in the direction indicated, is clockwise. Stated in another way, the axis of gear 50 is displaced laterally from the interaxial line between gears 46 and 48 in a direction opposite to the direction of rotation of gear 48.

Gears 46, 48, and 50 are dimensioned and oriented so that the interaxial line L_3 between gears 46 and 50 is angled at preferably less than 45° to line L_1 as shown in FIG. 2 for reasons given below.

In operation, it may again be assumed that gear 48 is rotating counterclockwise. Gear 46 resists rotation because of inherent frictional forces and inertia of the load carried by barrel 10. Gear 50 in turn resists rotation by gear 48. This results in the application of force by gear 48 tending to swing gear 50 in a counterclockwise direction as FIG. 2 is viewed. Moreover, the resistance of gear 46 to rotation results in a reactive force on gear 50 which is tangential to gears 46 and 50 where they interengage and whose direction is upwardly and to the right as represented by arrow F in FIG. 2. Since the angle between lines L_1 and L_3 is less than 45°, the horizontal component of the latter force exceeds the vertical component and urges gear 50 counterclockwise.

Thus, the force of gravity and the component forces in the gear train itself maintain idler gear 50 in engagement with gear 46. These forces are of sufficient magnitude to eliminate the necessity of springs or other extraneous mechanism for securing gears 50 and 46 in inter-engagement.

When wear occurs at bearings 18, 20 through which barrel 10 is supported and rotated, the center of gear 46 shifts downwardly. However, the forces acting on gear 50 during use cause it to swing counterclockwise to compensate for this shifting and maintain proper engagement with gears 46 and 48. The same is true when wear occurs at the gear teeth themselves. Thus, the gearing at all times remains properly engaged despite these wear factors. Moreover, gear 50 is free to shift as required to compensate for any relative shifting of gears 46 and 48 caused by such other factors as thermal expansion and contraction.

Barrel 10 can be manually rotated in a counterclockwise direction as FIG. 2 is viewed to position its removable top 34 wherever desired to facilitate loading and unloading to the barrel. During this rotation of the barrel, idler gear 50 merely bobs up and down in a ratchet-like action caused by the teeth on gear 46 pushing the teeth on the idler gear out of the way. Subsequently, when the barrel is driven by gear 48, idler gear 50 shifts counterclockwise as described to take up any slack. Alternatively, idler gear 50 can be completely disengaged from gear 46 by swinging it upwardly; and this enables the barrel to be manually rotated in either direction. To re-engage the drive, gear 50 is merely swing down into engagement with gear 46. In the form of the invention illustrated, gear 50 remains engaged with gear 48 during these swinging movements.

If the angle between lines L_1 and L_3 were 45° , the horizontal and vertical components of the tangential force F on gear 50 would be equal. Gravity and the counterclockwise force exerted on gear 50 by gear 48 would probably keep gear 50 engaged with gear 46. The same might be true for angles somewhat greater than 45° between L_1 and L_3 . However, it is believed that best results will be obtained where this angle is less than 45° .

In a particular installation, it may be advantageous or necessary to mount idler gear 50 in a position to the right of line L_1 (dotted lines, FIG. 2) rather than to the left as shown in solid lines. This is accomplished during erection of the plating barrel assembly merely by swinging arm 52 to the desired position. The only other requirement is that the direction of drive gear 48 be reversed. The force of gravity and the component forces in the gear system will hold gear 50 in engagement with gear 46 in the manner described with the various directions being reversed.

I claim:

1. For plating and the like, a rotating barrel assembly having means which rotatably supports the barrel and having mechanism operable to rotate the barrel, said mechanism comprising,
 - a driving gear and means operable to rotate said driving gear in one direction,
 - a driven gear carried by said barrel and having a driving relation thereto,
 - an idler gear and means mounting it for relatively free movement toward and away from drive-transmitting relation between said driving and driven gears,
 - said mounting means being constructed and arranged so that said idler gear is biased toward said drive-transmitting relation,
 - the interaxial line between said driving gear and idler gear in said drive-transmitting relation being disposed at an angle to the interaxial line between said driving gear and driven gear,
 - said angle, measured from the driven gear axis to the driving gear axis and then to said idler gear axis, being opposite in direction to said one direction, so

that the force exerted on said idler gear by said driving gear, responsive to inherent resistance to rotation by said barrel and driven gear, tends to supplement said bias,

the interaxial line between said idler and driven gears being disposed at an angle to that between said driving and driven gears,

said angles being so related that the radially outward component of force exerted by said driven gear on said idler gear responsive to said resistance is insufficient to overcome the combined effects of said bias and force supplementing said bias,

whereby said mount and idler gear tend to shift toward said drive-transmitting relation responsive to rotation of said driving gear.

2. The combination defined in claim 1 wherein said bias is gravitational.

3. The combination defined in claim 2 wherein the latter-said angle is no greater than 45° from the vertical.

4. The combination defined in claim 2 wherein the latter-said angle is less than 45° from the vertical.

5. The combination defined in claim 1 wherein said mounting means includes an arm supporting said idler gear in the general plane of said driving and driven gears, said arm being mounted for swinging movement to facilitate said relatively free movement of said idler gear toward and away from drive transmitting relation between said driving and driven gears.

6. The combination defined in claim 5 wherein said arm is swingable selectively to angular positions on the opposite sides of the interaxial line between said driving and driven gears for selectively engaging said idler gear with said driven gear at said angular position, whereby to facilitate utilization of said force on said idler gear in either direction of rotation of said driving gear.

7. The combination defined in claim 5 wherein said arm is mounted for swinging movement substantially about the axis of said driving gear.

8. The combination defined in claim 7 wherein said arm maintains said driving gear and idler gear continually in engagement.

9. For plating and the like, a rotating barrel assembly having means which rotatably supports the barrel and having mechanism operable to rotate the barrel, said mechanism comprising,

a driving gear and means operable to rotate said driving gear in one direction,

a driven gear carried by said barrel and having a driving relation thereto,

an idler gear supported by an arm mounted for relatively free swinging movement substantially about the axis of said driving gear, said idler gear being engaged with said driving gear and, responsive to swinging movement of said arm, being movable toward and away from drive-transmitting engagement with said driven gear,

the axis of said idler gear being disposed above the axis of said driven gear and below the axis of said driving gear, and said arm and idler gear being gravity biased toward engagement by said idler gear with said driven gear,

the interaxial line between said driving gear and idler gear in said drive-transmitting engagement being disposed at an angle to the interaxial line between said driving gear and driven gear,

said angle, measured from the driven gear axis to the driving gear axis and then to said idler gear axis, being opposite in direction to said one direction so that the force exerted on said idler gear by said driving gear responsive to inherent resistance to rotation by said barrel and driven gear supplements said gravity bias,

the interaxial line between said idler and driven gears being disposed at an angle of less than 45° to the

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vertical so that the horizontal component of force exerted by said driven gear on said idler gear responsive to said resistance exceeds the vertical component thereof,

whereby said horizontal component supplements said force and gravity bias.

10. The combination defined in claim 9 wherein said idler gear is substantially free of forces tending to urge said idler gear into engagement with said driven gear other than said gravity bias and said forces exerted thereon by said driving and driven gears.

11. For plating and the like, a rotating barrel assembly having means which rotatably supports the barrel and having mechanism operable to rotate the barrel, said mechanism comprising,

a driving gear and means operable to rotate said driving gear in a predetermined direction,

a driven gear carried by said barrel and having a driving relation thereto,

an idler gear and means mounting it for relatively free movement toward and away from drive-transmitting relation between said driving and driven gears, said mounting means being shiftable to engage said idler gear in said drive-transmitting relation selectively at two positions which are on opposite sides of the interaxial line between said driving and driven gears,

the direction of displacement of said idler gear from said interaxial line in each of said positions being

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opposite to said predetermined direction of rotation of said driving gear.

12. The combination defined in claim 11 wherein the axis of said idler gear in each of said positions is vertically intermediate the axes of said driving and driven gears and said idler gear is gravity biased toward said drive-transmitting relation, the interaxial line between said idler and driven gears being disposed at an angle to said interaxial line between said driving and driven gears within which the vertical component of force exerted by said driven gear on said idler gear responsive to inherent resistance of said driven gear to rotation is less than the horizontal component thereof so that said horizontal component supplements said gravity bias.

13. The combination defined in claim 11 wherein said mounting means comprises an arm mounted for swinging movement substantially about the axis of said driving gear, said idler gear being carried by said arm.

14. The combination defined in claim 13 wherein said means operable to rotate said driving gear includes a shaft on the support means for said barrel, said arm having a pivotal attachment around said shaft.

References Cited by the Examiner

UNITED STATES PATENTS

829,068	8/06	Fox	74-354
879,616	2/08	Eynon.	
2,397,777	8/46	Colman	74-409

DON A. WAITE, *Primary Examiner*.