Sept. 14, 1943. G. J. MEYER 2,329,407

BOTTLE LIFTER SPINDLE MECHANISM

Filed July 18, 1940

FIG. 1

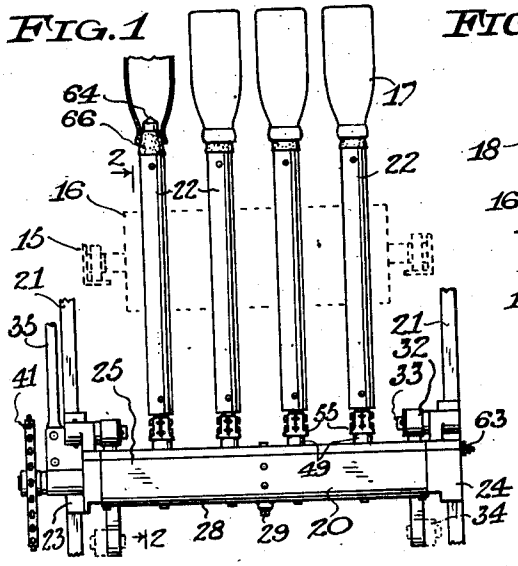


FIG. 2

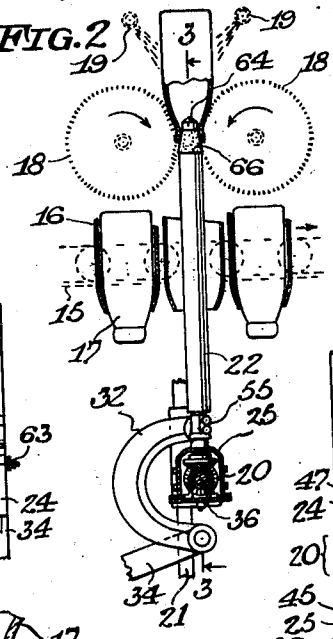


FIG. 5

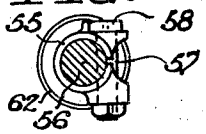


FIG. 4

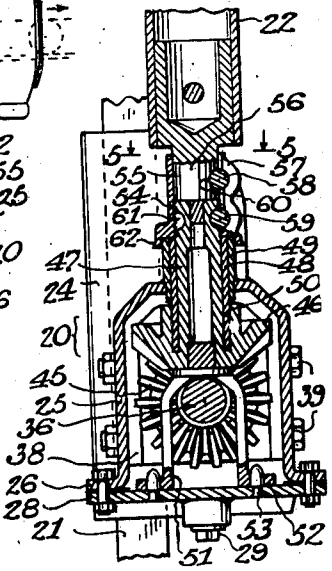


FIG. 6

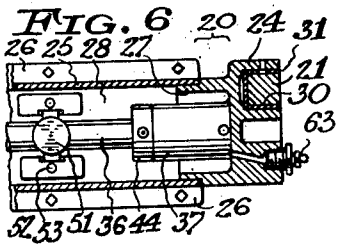


FIG. 3

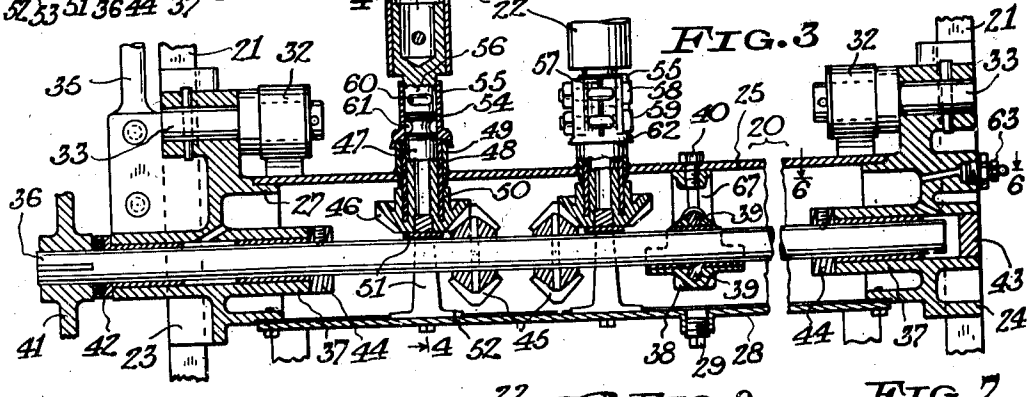


FIG. 8

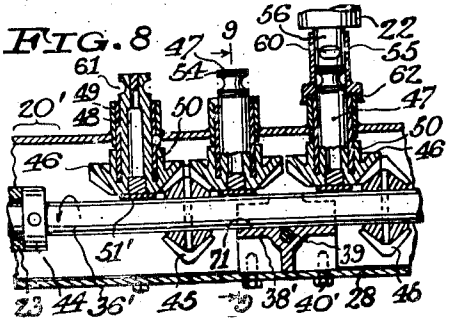


FIG. 9

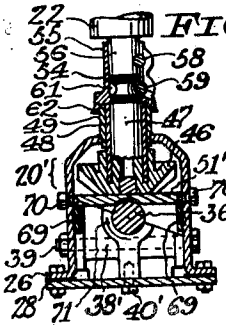


FIG. 10

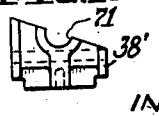
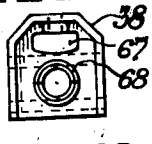


FIG. 7



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BOTTLE LIFTER SPINDLE MECHANISM

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5 Claims. (Cl. 74—389)

The present invention relates to bottle cleaning machines and more particularly to mechanism for lifting and rotating bottles to cooperate with cleaning apparatus.

In a usual type of bottle cleaning machine, such as that shown in Patent No. 1,429,960 to George J. Meyer, dated September 26, 1922, bottles are carried in a conveyer and while inverted are subjected to various cleaning operations including an outside brushing operation wherein the bottles are lifted and rotated between rotary brushes by reciprocating lifter spindle mechanism. This general type of machine is also shown in Patent No. 1,817,014, dated August 4, 1931, and in Patent No. 1,830,068, dated November 3, 1931.

It is an object of the invention to provide an improved lifter spindle mechanism which will insure adequate lubrication of the parts, which requires only infrequent attention to replenish lubricant, which is efficient in operation, which will have a long service life, which is of simple and relatively light-weight construction, and which can be economically manufactured.

Another object of the invention is to provide a lifter spindle mechanism in which the spindles have a relatively large bearing area in a limited space and have firm but detachable connections with the driving parts.

The invention further consists in the several features hereinafter described and claimed.

In the accompanying drawing, illustrating certain embodiments of the invention,

Fig. 1 is a transverse elevation of a bottle lifter spindle mechanism constructed in accordance with the invention;

Fig. 2 is a sectional elevation taken generally along the line 2—2 of Fig. 1;

Fig. 3 is a sectional elevation taken generally along the line 3—3 of Fig. 2;

Fig. 4 is a detail sectional elevation taken generally along the line 4—4 of Fig. 3;

Fig. 5 is a detail sectional view taken along the line 5—5 of Fig. 4;

Fig. 6 is a sectional view taken generally along the line 6—6 of Fig. 3;

Fig. 7 is a detail elevation of a shaft bearing member;

Fig. 8 is a sectional elevation of a modified form of spindle mechanism;

Fig. 9 is a sectional elevation taken generally along the line 9—9 of Fig. 8, and

Fig. 10 is a detail elevation of another form of shaft bearing member.

In the drawing, 15 designates the main frame of a bottle cleaning machine which may be such as that shown in the above-identified patents, and 16 designates the rows of bottle holders of the bottle conveyer thereof by the movement of which the rows of inverted bottles 17 or other containers are successively brought into position to be lifted and rotated between rotary cleaning brushes 18 and into the zone of action of spray pipes 19.

The means for lifting and rotating the bottles comprises a reciprocatory support or cross-head in the form of a gear-box 20 which is slidably guided at opposite ends on vertical guide bars 21, the gear-box carrying thereon a row of upright bottle-engaging spindles 22 mounted and driven as hereinafter more fully described. By way of example, a row of four spindles is shown, but in some instances a larger number of spindles may be provided, for example, twenty-eight or more.

The gear-box 20 comprises cast end or head members 23 and 24 to which the opposite ends of an elongated housing or casing member 25 are rigidly secured, as by brazing or welding. The housing member is formed by a metal plate bent to inverted U-shape and having out-turned bottom flanges 26. The secured ends of the housing member overlap inwardly flanged shouldered portions 27 of the end members 23 and 24. A bottom plate 28 is detachably bolted to the bottom flanges 26 of the housing member and to the end members and forms with these members a lubricant chamber. The bottom plate is suitably gasketed around its edges and is provided with a drain plug 29.

Each end member of the gear-box 20 is provided with a vertical guide channel 30, Fig. 6, to receive therein the corresponding guide bar 21, the guide channel preferably including a renewable liner 31. The gear-box 20 is reciprocated on the guide bars 21 by any usual means, such as that shown in the above mentioned patents. The actuating means is here shown to include C-shaped links 32 pivotally mounted at their upper ends on horizontal pins 33 secured to the respective end members of the gear-box, each link being connected at its lower end to a rockable lever 34. One of the gear-box end members also carries a brush-controlling rod 35 such as that shown in the above-mentioned Patent 1,830,068.

A horizontal drive shaft 36 extends longitudinally within the gear-box 20 and is journalled at opposite ends in bushed tubular bearing portions 37 of the end members 23 and 24, and also in a bushed intermediate bearing member 38

which fits between the parallel side walls of the housing member 25 and abuts against the bottom of the top wall of the housing member. The bearing member 38 is secured to the housing member side walls by horizontal through bolts 39 arranged above and below the drive shaft, and is secured to the top wall by a screw 40. This bearing member also provides additional bracing for the housing member. In the case of a long shaft, two or more intermediate bearing members may be provided. One end of the drive shaft 36 projects through the end member 23 and carries a suitably driven sprocket wheel 41, and an oil seal 42 for the shaft is provided at the outer end of this end member. The bearing portion 37 of the end member 24 is closed at its outer end by a plug 43. The drive shaft 36 carries thrust collars 44 which are adapted to bear against the inner ends of the tubular bearing portions 37 of the gear-box end members and serve to axially position the shaft.

In the form of the invention shown in Fig. 3, the drive shaft 36 has pinned thereon a plurality of double bevel pinions or gears 45 which mesh with respective bevel gears 46 secured as hereinafter described to the lower ends of the spindles 22, the axes of the spindles intersecting at right angles the axis of the shaft 36. Each bevel gear 46 has integrally formed thereon an upwardly projecting hollow shaft 47 plugged at opposite ends and journalled in a bearing sleeve 48. The sleeve is firmly mounted in a bushing 49 rigidly secured, as by welding, to the top wall of the housing member 25, the sleeve and bushing extending above and below the plane of this top wall. The lower end portion of the bearing sleeve 48 rotatably fits in a deep annular channel 50 formed in the bevel gear 46, the inner cylindrical wall of the channel forming a part of the shaft bearing surface and the outer cylindrical wall of the channel forming a bearing surface engageable with the outer wall of the sleeve, thus providing an extended bearing surface for the spindle gear within a limited axial space. The teeth of the spindle gear surround the lower end portion of the bearing sleeve. The tubular construction of the spindle gear shaft 47 facilitates the production of sound castings, conserves material, and reduces weight. The lower end of the bearing sleeve 48 is closer to the axis of the shaft 36 than the radius of the bevel pinion or gear 45. The lower end of the bevel gear 46 has an axial thrust engagement with the disk-like upper end of an inverted U-shaped thrust bearing member 51 straddling the shaft 36. The bearing member 51 is provided with enlarged apertured lower ends or feet 52 which bear on the bottom plate 28 of the gear-box and are retained in position by upstanding dowels 53 on the bottom plate. The bevel pinions or gears 45 for each pair of adjacent spindles are arranged in opposed thrust relation, as by placing them between the spindle gears, thus balancing out end thrust on the shaft 36. In assembling the double bevel gears on the shaft they may be mounted either end first. The spindle gear shafts 47 are inserted into the gear-box through the open bottom thereof before the insertion of the drive shaft. During the insertion of the latter shaft the pinions 45 and thrust bearings 51 are introduced in their proper order. When the bottom plate 28 is applied to the gear-box, the dowels 53 on the plate are entered into the openings in the feet of the thrust bearings 51 to laterally confine these bearings.

The upper end of each bevel gear shaft 47 is exteriorly screw-threaded at 54 to engage the lower end portion of a coupling collar 55, the upper end portion of this collar receiving therein the reduced lower end 56 of the lifter spindle 22. The coupling collar is longitudinally split at 57 and is detachably clamped to the spindle end 56 and shaft 47 by bolts 58 and 59, the bolt 58 engaging the walls of a lateral notch 60 in the spindle end and the bolt 59 engaging the walls of an annular groove 61 formed about the upper end portion of the shaft. The lower end of the coupling collar has an enlarged continuous skirt 62 which encloses the upper ends of the bearing sleeve 48 and bushing 49 and prevents the entrance of water and other foreign matter into the shaft bearing and lubricant chamber of the gear-box. The annular groove 61 in the shaft 47 permits the coupling collar to be turned on the shaft to take up any looseness, the bolts 58 and 59 being temporarily loosened to a slight degree when this adjustment is effected. The reduced lower end 56 of the spindle is in engagement with the upper end of the shaft 47.

The lubricant chamber formed in the gear-box is filled with a fluid grease the level of which extends above the spindle gears 46, thus adequately lubricating all of the various bearings and gears. The lubricant is admitted through a fitting 63 secured to the end member 24 of the gear-box, and after the first filling it is only necessary to add grease at infrequent intervals. A large part of the bearing area of each spindle gear is below the grease level, thus insuring positive lubrication. The upper end of each bearing sleeve 48 projects a short distance above the housing top wall and is adequately lubricated without danger of leakage. The end thrust bearings for the spindles are within the gear-box where they will be freely lubricated.

The lifter spindles 22 are preferably of tubular construction and are provided at their upper ends with suitable means for engaging the bottles or other containers. In the present instance, each spindle is shown to include a pointed headed top stem 64 the reduced shank of which is knurled at 65 and which carries thereon an upwardly converging resilient rubber sleeve 66 adapted to enter the mouth of the inverted bottle and to drivingly engage the bottle. In some instances the spindles may be arranged to drivingly engage the bottoms of the inverted containers, as in the case of wide-mouthed jars or cans.

In operation, the lifter spindles 22 are rotated by the shaft 36 through the bevel gearing connections, and the gear-box 20 is raised periodically on the guide bars 21 to lift the successive rows of bottles 17 from the conveyer pockets 16 to positions between the rotating brushes 18 and in the zone of action of the spray pipes 19, the lifted bottles being rotated by the spindles. The brushes rotate in a direction opposing the lifting movement of the bottles. After each lifting operation the gear-box descends to release the spindles from the bottles and to allow the succeeding row of bottles to move into position. In some instances, each row of bottles may be lifted two or more times between the brushes during each cycle. As is well understood in this art, the conveyer may be moved either intermittently or continuously. In the case of an inter-

mittently moving conveyer, the lifting and brushing mechanisms operate on the bottles while the conveyer is stationary; while in the case of a continuously moving conveyer, the lifting and brushing mechanisms reciprocate horizontally as a unit to follow the bottles.

The gear-box end members **23** and **24** and the bushings **49** are shown to be separate members rigidly attached to the housing member **25**, but it will be understood that in some instances these parts may be formed integrally on one casting.

In the modified form of gear-box **20'** shown in Figs. 8 and 9, each double bevel pinion or gear **45** drives the gears **46** of two adjacent lifter spindles **22**, the end thrust on the drive shaft **36'** being balanced out or neutralized. This construction permits the lifter spindles **22** to be brought relatively close together, as in a bottle cleaning machine for handling bottles of small size. An intermediate bearing member **38'** for the drive shaft **36'** presents an upwardly opening half-bearing **71**, Figs. 9 and 10, engageable with the lower surface of the drive shaft, one side of the half-bearing being higher than the other side so as to better resist the side thrust on the drive shaft during the rotation of the shaft, the direction of rotation being indicated by arrows in Figs. 8 and 9. The half-bearing may also be described as having its central plane at an angle to the vertical plane of the spindles. The bearing member **38'** fits between the side walls of the gear-box and is secured thereto by a through bolt **39** extending below the drive shaft. This bearing member also rests on the bottom plate **28** and is secured thereto by screws **40'**. The bearing member is readily mounted in place and avoids interference with the closely spaced spindle gears **46**. The downward end thrust on each spindle gear is resisted by a plate-like thrust bearing member **51'** which rests at opposite ends on ledge members **69** secured, as by welding, to the opposite inner side walls of the gear-box, the opposite ends of the thrust member being retained in position by cone-pointed screws **70**. The construction and operation of the device of Figs. 7 and 8 is otherwise the same as that of Figs. 1 to 6.

It will be obvious that the shaft bearing member **38'** of Figs. 8 to 10 may be used in the gear-box of Figs. 3 and 4, and that the thrust bearing members **51** of Figs. 3 and 4 may be used in the gear-box of Figs. 8 and 9. In order to permit the use of the shaft bearing member **38** in a gear-box with closely spaced spindle gears, the upper portion of this bearing member is cut away at **68** and has an opening **67** above the drive shaft, Figs. 3 and 7, thus providing clearance for the gears and thrust bearings.

In each form of the invention, the spindles and other rotating parts run easily and with a relatively low power consumption, and wear on the mechanism is minimized. The free upper ends of the spindles are maintained in accurately spaced relation without requiring additional guiding means.

What I claim as new and desire to secure by Letters Patent is:

1. In a spindle mechanism for a bottle cleaning machine, a gear-box having a lubricant chamber, a drive shaft rotatably carried by said gear-box, spindle shafts rotatably carried by said gear-box and extending transversely of said drive shaft, gearing connections for driving said spindle shafts from said drive shaft and disposed in said lubricant chamber, and thrust bearings carried by said gear-box and interposed between said drive shaft and the inner ends of said spindle shafts to resist inward axial thrust on said spindle shafts.

2. In a spindle mechanism for a bottle cleaning machine, a gear-box having top and bottom walls, a drive shaft rotatably carried by said gear-box, spindle shafts rotatably carried by said gear-box and extending upwardly therefrom transversely of said drive shaft, gearing connections for driving said spindle shafts from said drive shaft, and thrust bearings carried by said bottom wall and having portions interposed between said drive shaft and the lower ends of said spindle shafts for resisting downward axial thrust on said spindle shafts.

3. In a spindle mechanism for a bottle cleaning machine, a gear-box having top and bottom walls, a drive shaft rotatably carried by said gear-box, spindle shafts rotatably carried by said gear-box and extending upwardly therefrom transversely of said drive shaft, gearing connections for driving said spindle shafts from said drive shaft, and thrust bearings carried by said bottom wall and having portions interposed between said drive shaft and the lower ends of said spindle shafts for resisting downward axial thrust on said spindle shafts, said thrust bearings being of inverted U-shape and straddling said drive shaft.

4. In a spindle-mechanism for a bottle cleaning machine, a gear-box having a top wall and opposite side walls, a drive shaft rotatably carried by said gear-box, spindle shafts rotatably carried by said gear-box and extending upwardly therefrom transversely of said drive shaft, gearing connections for driving said spindle shafts from said drive shaft, and thrust bearings carried by said side walls and having portions interposed between said drive shaft and the lower ends of said spindle shafts for resisting downward axial thrust on said spindle shafts.

5. In a spindle mechanism for a bottle cleaning machine, a support having a bearing sleeve, a bevel gear at an end portion of said sleeve and having a spindle shaft journalled in said sleeve, said gear further having a bearing surface engageable with the outer periphery of said sleeve, a drive shaft extending transversely of said spindle shaft and having a bevel gear meshing with said first-named bevel gear, the radius of said drive shaft gear being greater than the distance from the drive shaft axis to the adjacent end of said sleeve.

GEORGE J. MEYER.