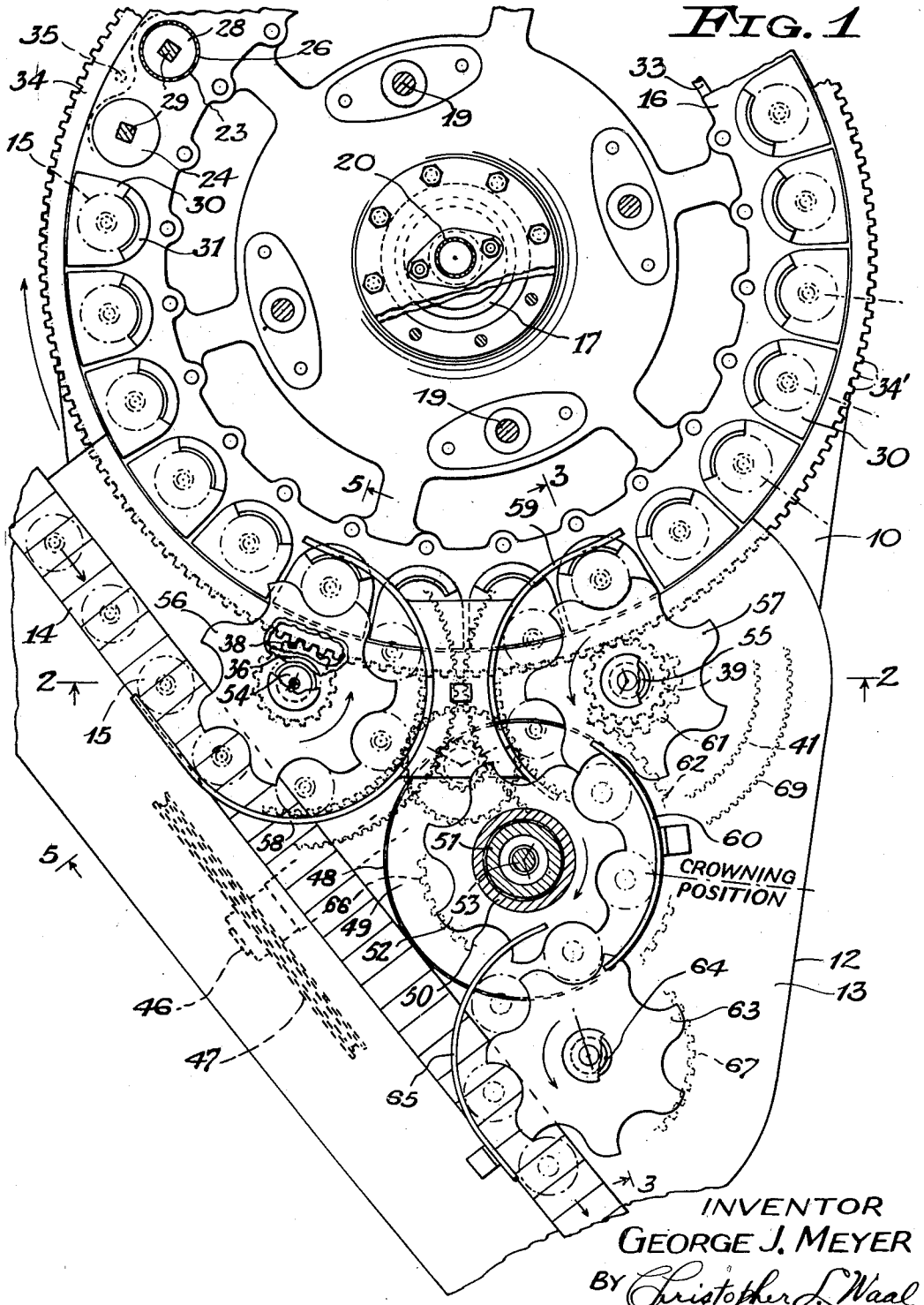
March 14, 1950 G. J. MEYER 2,500,465

FILLING MACHINE DRIVE

Filed Aug. 27, 1945 4 Sheets-Sheet 1

FIG. 1



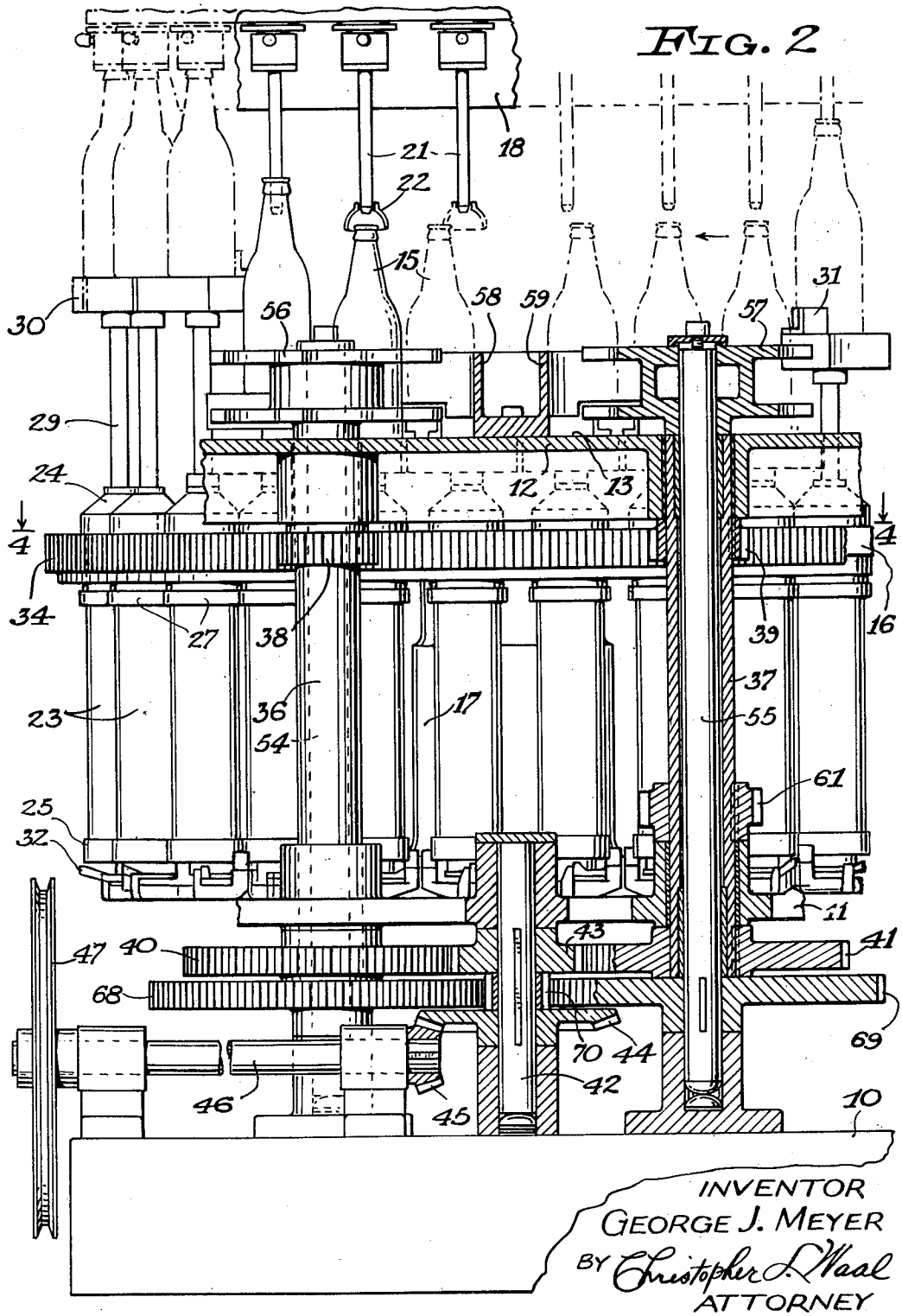
INVENTOR
GEORGE J. MEYER
BY Christopher L. Waal
ATTORNEY

March 14, 1950 G. J. MEYER 2,500,465

FILLING MACHINE DRIVE

Filed Aug. 27, 1945 4 Sheets-Sheet 2

FIG. 2



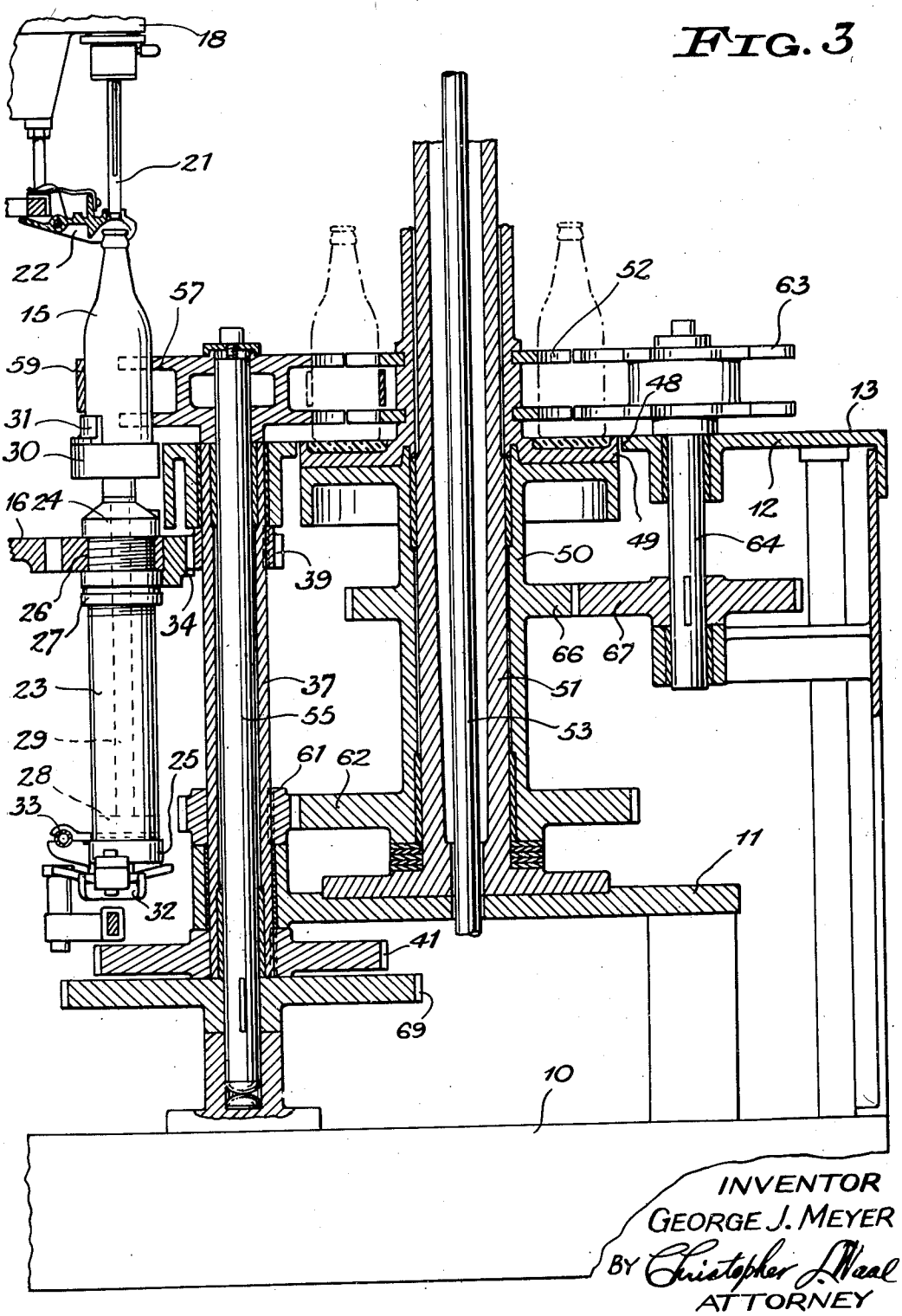
INVENTOR
GEORGE J. MEYER
BY Christopher L. Waal
ATTORNEY

March 14, 1950 G. J. MEYER 2,500,465

FILLING MACHINE DRIVE

Filed Aug. 27, 1945 4 Sheets-Sheet 3

FIG. 3



INVENTOR
GEORGE J. MEYER
BY Christopher L. Neal
ATTORNEY

March 14, 1950 G. J. MEYER 2,500,465

FILLING MACHINE DRIVE

Filed Aug. 27, 1945 4 Sheets-Sheet 4

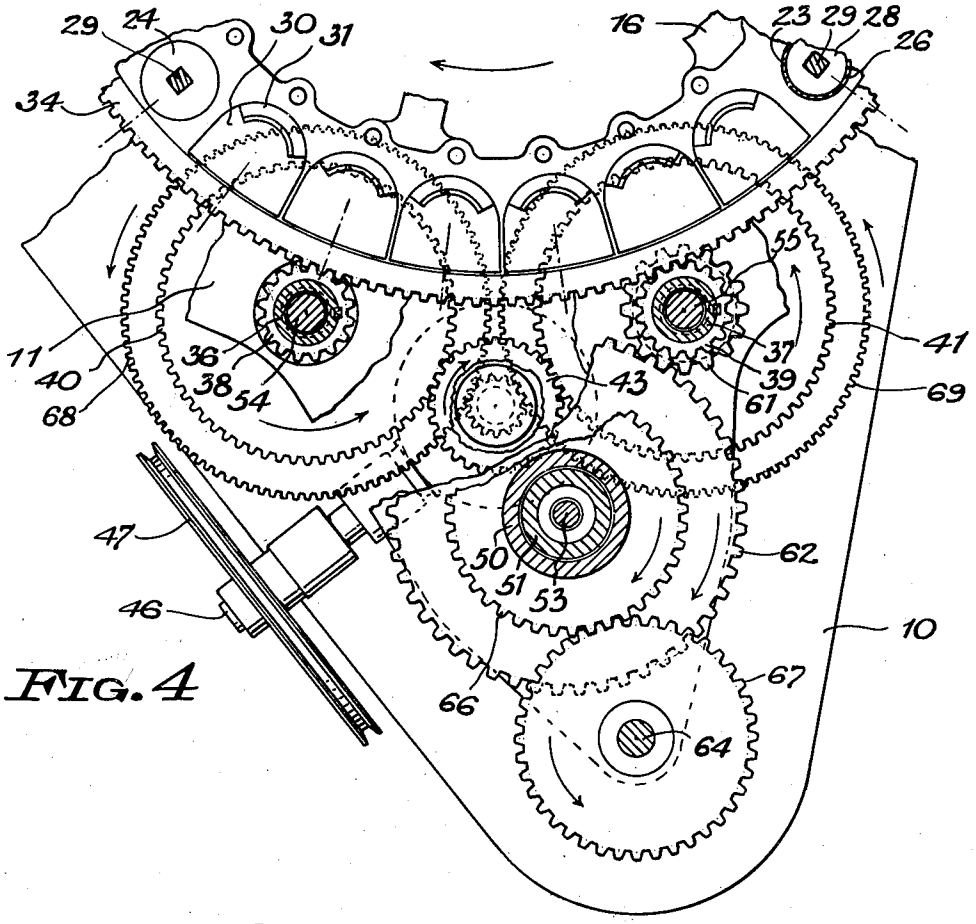
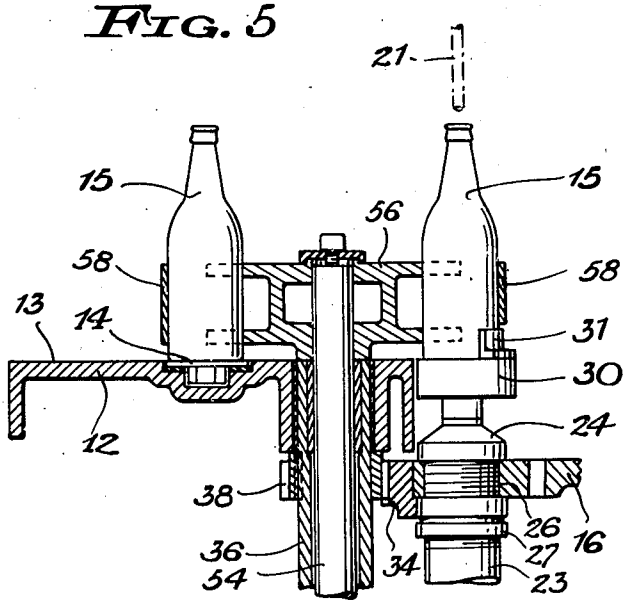


FIG. 4

FIG. 5



INVENTOR
GEORGE J. MEYER
BY Christopher L. Waal
ATTORNEY

Patented Mar. 14, 1950 2,500,465

UNITED STATES PATENT OFFICE

2,500,465

FILLING MACHINE DRIVE

George J. Meyer, Milwaukee, Wis., assignor to Geo. J. Meyer Manufacturing Co., Cudahy, Wis., a corporation of Wisconsin

Application August 27, 1945, Serial No. 612,909

6 Claims. (Cl. 198—22)

1

The present invention relates to container handling machines, and more particularly to filling machines of the type having a rotary filling table and means for transferring bottles or other containers with respect to the table.

An object of the invention is to provide a filling machine having improved means for driving the rotary filling table and bottle transferring means of the machine whereby to permit smooth high-speed operation and to minimize wear.

Another object is to provide a filling machine having a novel form of gearing for driving bottle-moving star wheels in properly timed relation to the rotary filling table.

A further object is to provide a filling machine drive which is accurate and reliable in operation and which is capable of simple manufacture.

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

In the accompanying drawings,

Fig. 1 is a fragmentary plan view of a filling machine constructed in accordance with the invention, the upper portions of the machine being removed and parts being shown in section;

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. 1;

Fig. 4 is a sectional view taken generally along the line 4—4 of Fig. 2, and

Fig. 5 is a sectional elevation taken generally along the line 5—5 of Fig. 1.

In these drawings, 10 designates a filling machine base on which is rigidly secured a frame 11. A stationary table 12 is rigidly mounted on the base and has a flat top 13. A conveyor 14 is provided for conducting containers, such as bottles 15, to and from the stationary table, the conveyor being in the form of a flat-topped chain the upper run of which is flush with the table top.

A circular filling table or carrier 16 is rotatably mounted on a tubular pillar or column 17 secured to the machine base, and the usual tank or bowl 18 is supported above the table to rotate therewith, as by the usual adjustable posts 19, Fig. 1. The tank is adapted to contain and distribute the liquid to be bottled, such as beer or carbonated beverage. The liquid is conducted to the tank through the usual pipe 20, Fig. 1, extending concentrically through the tubular column 17. The tank is provided with the usual circular series of equally spaced downwardly projecting filling nozzles 21, and in some instances is further provided with pivoted bottle-centering guides 22 at the respective filling nozzles.

Below and in line with the filling nozzles 21, vertical air cylinders 23 are rigidly secured near their upper ends on the apertured rim portion of the rotary table 16, so as to turn with the table

2

and tank, the cylinders being arranged in a circular series and being equally spaced, as usual. Each cylinder proper is commonly made of a length of thin-walled metal tubing secured to upper and lower heads 24 and 25, the cylinder passing through an opening 26 in the table and being clamped to the table by the upper head 24 engaging the top surface of the table and by a nut 27 engaging the bottom surface of the table.

Pistons 28 are movable in the respective cylinders and are attached to piston rods 29 which pass through the upper heads 24 and are provided with respective supports or platforms 30 on which the bottles are adapted to rest approximately in vertical alignment with the cylinders and piston rods, the supports having respective back rests 31 for the bottles. In their lowermost positions the platforms 30 have their upper faces at the same level as the top of the stationary table 12. Suitable valve means 32 are provided at the lower cylinder heads to control the flow of air to and from the cylinders, compressed air being supplied to the cylinders through an annular header pipe 33. The air cylinders may be of the general type shown in my United States Patent No. 2,320,370 for Air cylinder apparatus for bottle filling machines, dated June 1, 1943.

A gear 34 is rigidly secured to the periphery of the rotary filling table and is here shown to be a separate ring gear fastened to the table by bolts 35, Fig. 1, although in some instances the gear may be formed integral with the table. The teeth 34' of the ring gear are a multiple of the number of bottle supports 30, and preferably there is a tooth at the radial line of each support. A pair of laterally spaced vertical tubular shafts 36 and 37 of identical construction are journalled in the frame 11 and in the stationary table 12. Identical pinions 38 and 39 are secured to the respective tubular shafts 36 and 37 and mesh with the filling table ring gear 34 for driving the filling table in the direction indicated by the arrow in Figs. 1 and 4. Respective identical gears 40 and 41 are secured to the lower ends of the tubular shafts 36 and 37 and have portions underlying the path of the lifting cylinders. A vertical transmission shaft 42 is rotatably mounted on the base 10 and frame 11 and extends in a plane midway between the tubular shafts. A pinion 43 on the shaft 42 is disposed between the gears 40 and 41 and meshes with these gears to drive them. A bevel gear 44 on the shaft 42 meshes with a bevel pinion 45 on a horizontal drive shaft 46 journalled on the base 10. The drive shaft has a pulley 47 which is belt-driven by a suitable source of power, such as an electric motor, not shown. By the gearing above described the rotary filling table 13 is driven at a suitable rate of speed.

A circular opening 48 is formed in the sta-

tionary table 12 between the conveyor chain and the rotary filling table and receives therein a rotary capping or crowning table 49 which is flush with the top of the stationary table. The crowning table is carried on a tubular vertical shaft 50 which is rotatably mounted on a stationary hollow column 51 secured to the frame 11. The upper section of the tubular shaft 50 carries a star wheel 52 for positioning the bottles on the crowning table. The crowning mechanism may be of any well-known type and includes an operating rod 53 extending in the hollow column 51.

A pair of vertical shafts 54 and 55, driven as hereinafter described, are coaxially journalled in the tubular shafts 33 and 34, respectively, and each projects above the plane of the table surface 13. At their upper ends the shafts 54 and 55 have detachably secured thereon against relative rotation respective infeed and outfeed star wheels 56 and 57, the bottle circles of which are substantially tangent to the bottle circle of the filling table. The infeed star wheel 56 transfers bottles from the conveyor 14 to the filling table platforms 30, the bottles in the star wheel being confined in their arcuate path of travel by a curved guide member 58. The outfeed star wheel 57 transfers filled bottles from the filling table to the rotary crowning table 49, the bottles in this star wheel being confined in their arcuate path of travel by a curved guide member 59. The bottles on the crowning table are guided by a curved guide member 60 and are crowned during their travel. The tubular shaft 37 has a pinion 61, Figs. 3 and 4, which meshes with a gear 62 on the tubular shaft 50 of the crowning table for driving the latter table. The capped or crowned bottles are transferred from the crowning table to the outgoing portion of the conveyor 14 by a star wheel 63 carried on the upper end of a vertical shaft 64 journalled in the stationary table 12, the bottles in the star wheel being confined in their arcuate path of travel by a curved guide member 65. A gear 66 on the crowning table shaft meshes with a gear 67 on the star wheel shaft 64 to drive the star wheel 63 at the proper speed. The bottle circle of the crowning table is tangent to the bottle circles of the star wheels 57 and 63, and all three bottle circles have the same linear speed.

The star wheel shafts 54 and 55 carry respective gears 68 and 69 at their lower ends arranged below the gears 40 and 41 and meshing with a pinion 70 on the transmission shaft 42, the pinion 70 being smaller than the pinion 43 so that these star wheel shafts rotate at a slower speed than the tubular shafts 36 and 37, but in the same direction, the gear ratios being such that the bottle circles of the star wheels have the same linear speed as the bottle circle of the rotary filling table. In the typical machine illustrated the rotary filling table has 24 filling nozzles and the same number of bottle-lifting cylinders and therefore rotates $1/24$ revolution per bottle. The infeed and outfeed star wheels each have 7 bottle pockets and each rotates $1/7$ revolution per bottle. The pitch circle of the filling table ring gear 31 is larger than the bottle circle of the filling table and therefore has a greater linear speed. Assuming that the ring gear has 168 teeth (7 teeth per bottle support) and that the driving pinions 38 and 39 have 16 teeth each, then the tubular shafts 36 and 37 carrying these pinions each rotate at $\frac{7}{168}$ revolution per bottle, and the gear ratios between the transmission

shaft 42 and the shafts 36, 37, 54, and 55 are selected accordingly. The transmission shaft 42 preferably rotates one revolution per bottle. The several star wheels are of sufficiently large diameter to avoid abrupt changes in the direction of bottle travel. In the present instance, each of the four star wheels rotates at $1/7$ revolution per bottle. In the typical machine above described a gear ratio of $16/49$ between the tubular shaft 37 and the rotary crowning table shaft 50 will provide the correct speed for the crowning table.

In operation the rotary filling table 16 is driven at a suitable rate of speed by the pinions 38 and 39 meshing with the table ring gear 34. The incoming bottles 15 are smoothly transferred from the conveyor 14 to the vertically movable supports or platforms 30 of the filling table by the star wheel 56 which is accurately timed with respect to the filling table. As the supports 30 revolve, the bottles thereon are lifted by the air cylinders into filling position, and after filling the bottles are lowered just before they reach the outfeed star wheel 57. The bottle on each reciprocatory platform is approximately in vertical alignment with the associated cylinder and piston rod, thus avoiding bending and inaccurate travel of the rod and also avoiding binding or cramping of the lifting mechanism. The filled bottles are moved by the star wheel 57 onto the rotary crowning table 49 where they are crowned, and the crowned bottles are then transferred to the outgoing portion of the conveyor 14 by the star wheel 63.

The driving pinions 38 and 39 on the tubular shafts 36 and 37 engage peripherally spaced points of the filling table ring gear 34, thus reducing wear, minimizing back lash, and providing a smooth drive. The infeed and outfeed star wheels 56 and 57 are driven by the shafts 54 and 55 rotatable in the tubular shafts, thus providing a compact drive while permitting the star wheel shafts to run at the proper speed to insure smooth transfer of the bottles to and from the rotary filling table. The transmission shaft 42 and its pinions 43 and 70 are subject to relatively little wear because of the location of this shaft between the pairs of gears which mesh with these pinions. The drive arrangement is such as to permit smooth, reliable, high-speed operation of the machine.

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

1. In a filling machine, a rotary filling table adapted to carry containers thereon and having a gear adjacent to its periphery, a pair of laterally spaced tubular vertical shafts having respective pinions meshing with said table gear to drive said table, a pair of star wheel shafts extending in said respective tubular shafts, an infeed star wheel on one of said last-named shafts for transferring containers to the filling table, an outfeed star wheel on the other of said last-named shafts for transferring filled containers from the filling table, gears on said tubular shafts, gears of larger diameter on said star wheel shafts, a vertical transmission shaft between the gears of said star wheel shafts and having a pinion meshing with said star wheel shaft gears and a second pinion of larger diameter meshing with said tubular shaft gears, and means for driving said transmission shaft.

2. In a filling machine, a rotary filling table adapted to carry a series of containers thereon in a circle concentric therewith and having a

concentric gear adjacent to its periphery, said gear having a pitch diameter larger than the diameter of the container circle, a tubular vertical shaft having a pinion meshing with said table gear to drive said table, a gear on said tubular shaft, a star wheel shaft in said tubular shaft, a star wheel on said last-named shaft for transferring containers with respect to said table, a gear on said star wheel shaft larger than the gear on said tubular shaft, a transmission shaft having pinion means meshing with said star wheel shaft gear and tubular shaft gear to rotate said star wheel shaft and tubular shaft in the same direction but at a fixed speed ratio with said star wheel shaft rotating at the slower speed, and means for driving said transmission shaft.

3. In a filling machine, a rotary filling table adapted to carry a series of containers thereon in a circle concentric therewith and having a concentric gear adjacent to its periphery, said gear having a pitch diameter larger than the diameter of the container circle, a star wheel for transferring containers with respect to said table, a vertical shaft for said star wheel, a tubular shaft concentric with said star wheel shaft and having a pinion meshing with said table gear for driving the filling table, a transmission shaft having a pair of pinions of different pitch diameters, gears on said first-named shafts meshing with said pinions, the gear on said star wheel shaft meshing with the smaller transmission pinion to rotate said star wheel shaft at a speed lower than the speed of said tubular shaft, and means for driving said transmission shaft.

4. In a filling machine, a rotary filling table adapted to carry a series of containers thereon in a circle concentric therewith and having a concentric gear adjacent to its periphery, said gear having a pitch diameter larger than the diameter of the container circle, a star wheel for moving containers with respect to said table, a vertical shaft for said star wheel, a tubular shaft concentric with said star wheel shaft and relatively rotatable with respect thereto, a pinion on said tubular shaft meshing with said table gear for driving said table, and means for driving said shafts in the same direction but at different speeds of fixed ratio, the speed of said star wheel shaft being lower than the speed of said tubular shaft.

5. In a filling machine, a rotary filling table adapted to carry a series of containers thereon in a circle concentric therewith and having a concentric gear adjacent to its periphery, said gear having a pitch diameter larger than the diameter of the container circle, a stationary container-supporting table, a tubular vertical shaft journalled in said stationary table and having a pinion meshing with said table gear to drive said table, a star wheel shaft journalled in said tubular shaft, a star wheel on said star wheel shaft for transferring containers between said tables, and means for driving said shafts in the same direction but at different speeds of fixed ratio, the speed of said star wheel shaft being lower than the speed of said tubular shaft.

6. In a filling machine, a rotary filling table adapted to carry a series of containers thereon in a circle concentric therewith, said table having a concentric peripheral gear with a pitch diameter greater than the diameter of the container circle, a tubular vertical shaft having a pinion meshing with said gear for driving said table, a star wheel shaft extending coaxially in said tubular shaft and relatively rotatable with respect to said tubular shaft, a star wheel on said star wheel shaft for transferring containers with respect to said table and having a container circle substantially tangent to the container circle of the filling table, and means for rotating said shafts in the same direction but at different speeds of fixed ratio, the linear speed of the star wheel container circle being the same as the linear speed of the filling table container circle.

GEORGE J. MEYER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,028,652	Wurzburg	June 4, 1912
2,202,033	Stewart et al.	May 28, 1940
2,239,120	Stewart et al.	Apr. 22, 1941
2,329,954	Stewart et al.	Sept. 21, 1943
2,353,523	Stewart et al.	July 11, 1944