United States Patent

[11] 3,557,933

[72] Inventor **Clifford D. Sopher**
Peoria, Ill.

[21] Appl. No. **744,581**
[22] Filed **July 12, 1968**
[45] Patented **Jan. 26, 1971**

[73] Assignees **General Methods Corporation**
a corporation of Illinois;
Fleming-Potter Company, Inc.
a corporation of Illinois

[54] **ARTICLE SPOTTING DEVICE**
29 Claims, 13 Drawing Figs.

[52] **U.S. Cl.** **198/33,** 198/171
[51] **Int. Cl.** **B65g 19/02,** B65g 47/24
[50] **Field of Search** ..... 198/33(R2), 171, 34

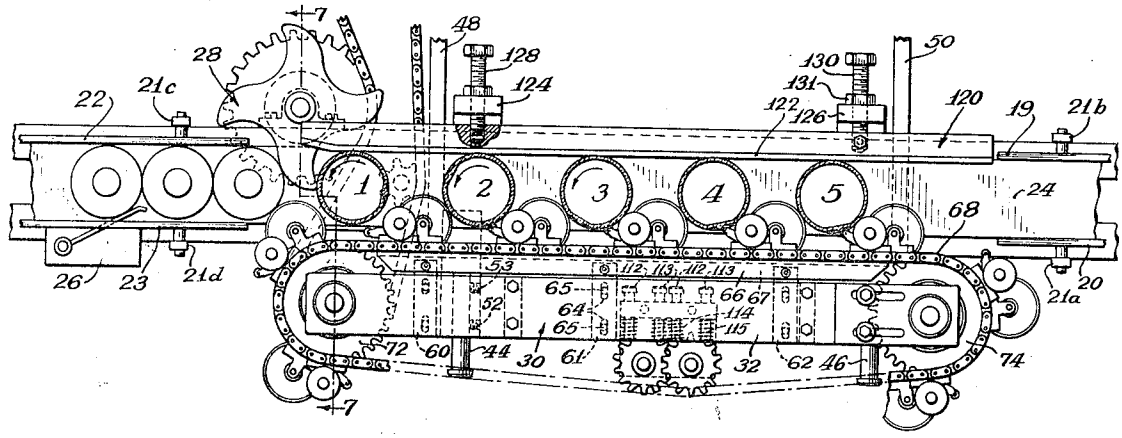
[56] **References Cited**

UNITED STATES PATENTS

2,843,252	7/1958	Eddison	198/33(R2)
2,880,845	4/1959	Carter	198/33(R2)
2,911,089	11/1959	Carter	198/33(R2)
3,119,482	1/1964	Ganz	198/33(R2)

Primary Examiner—Edward A. Sroka
Attorney—Molinare, Allegretti, Newitt & Witcoff

ABSTRACT: A bottle-spotting device which rotates a bottle about its vertical longitudinal axis as it is conveyed along a conveyor path and engages a spot on the bottle to precisely orient that bottle. Friction rails on one side of the conveyor path cooperate with pusher elements mounted on a pair of endless chains on the opposite side of the conveyor path to impart rotation to the bottle. A bottle-spotting lug is mounted on one of the endless chains and is adapted to engage the spot on the bottle and stop rotation once the bottle has rotated to the desired position. A star wheel is used to feed the bottles into the spotting device at a metered rate. A switching circuit is provided for starting the spotting operation only when a predetermined number of bottles are ready for a spotting operation.



PATENTED JAN 26 1971

3,557,933

SHEET 1 OF 5

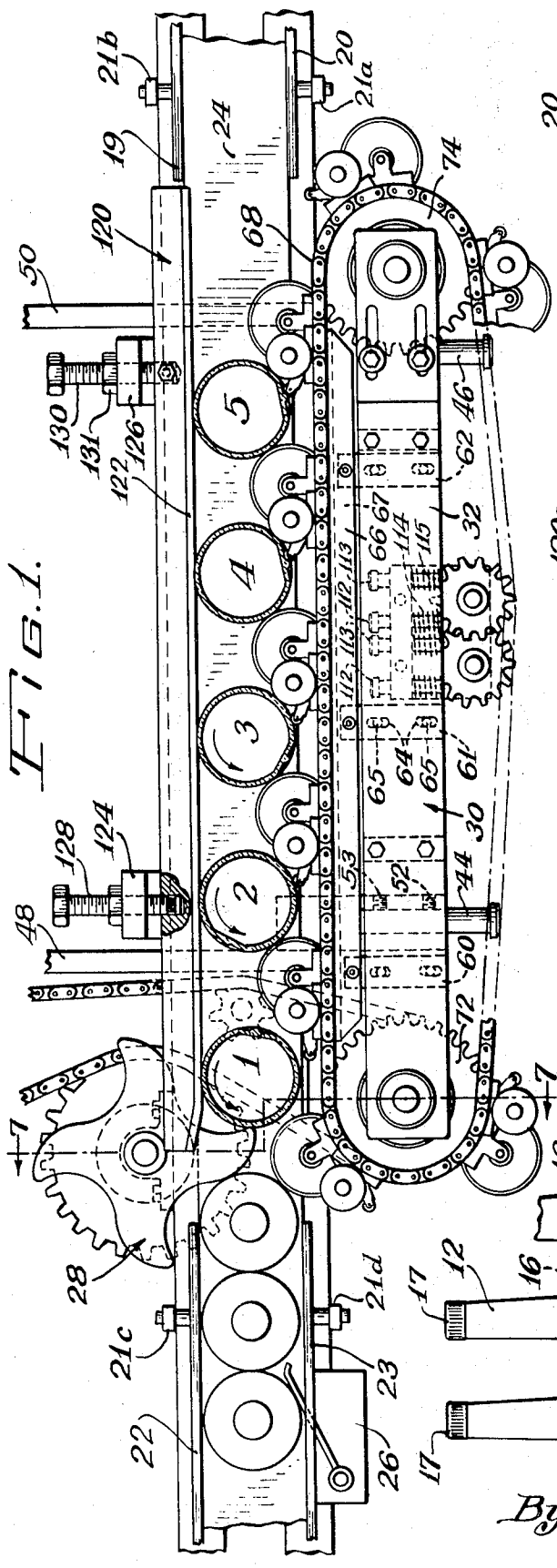


FIG. 1.

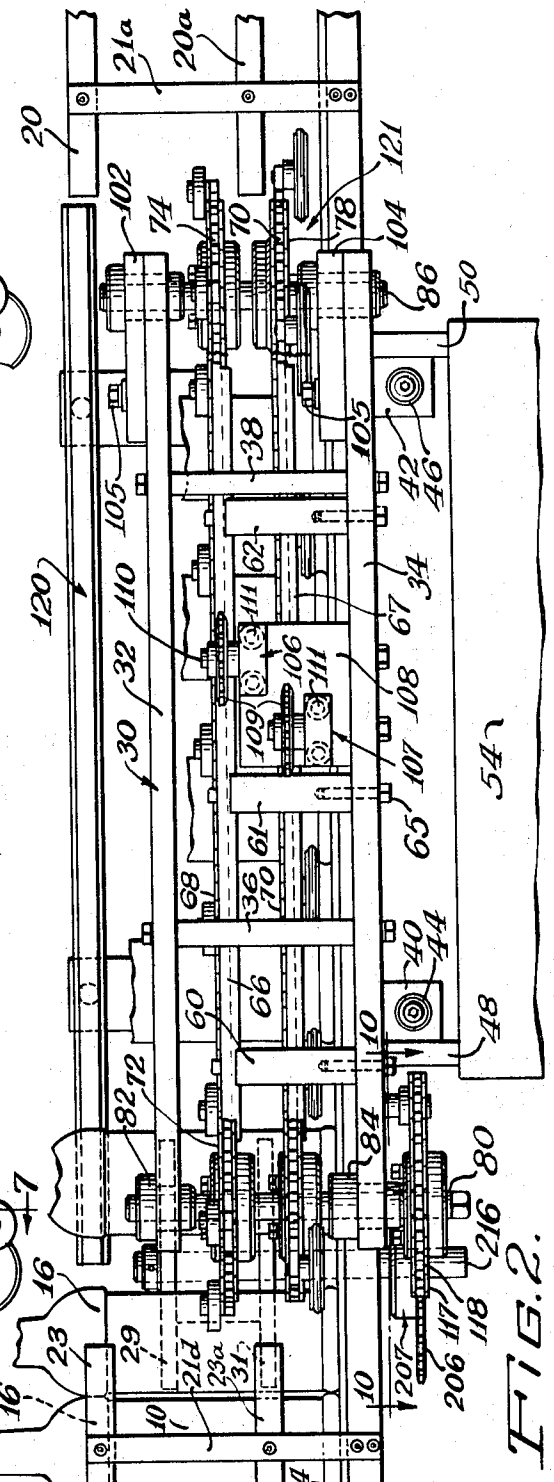


FIG. 2.

Inventor:
Clifford D. Sopher
By Bair, Freeman & Molinare
Attys.

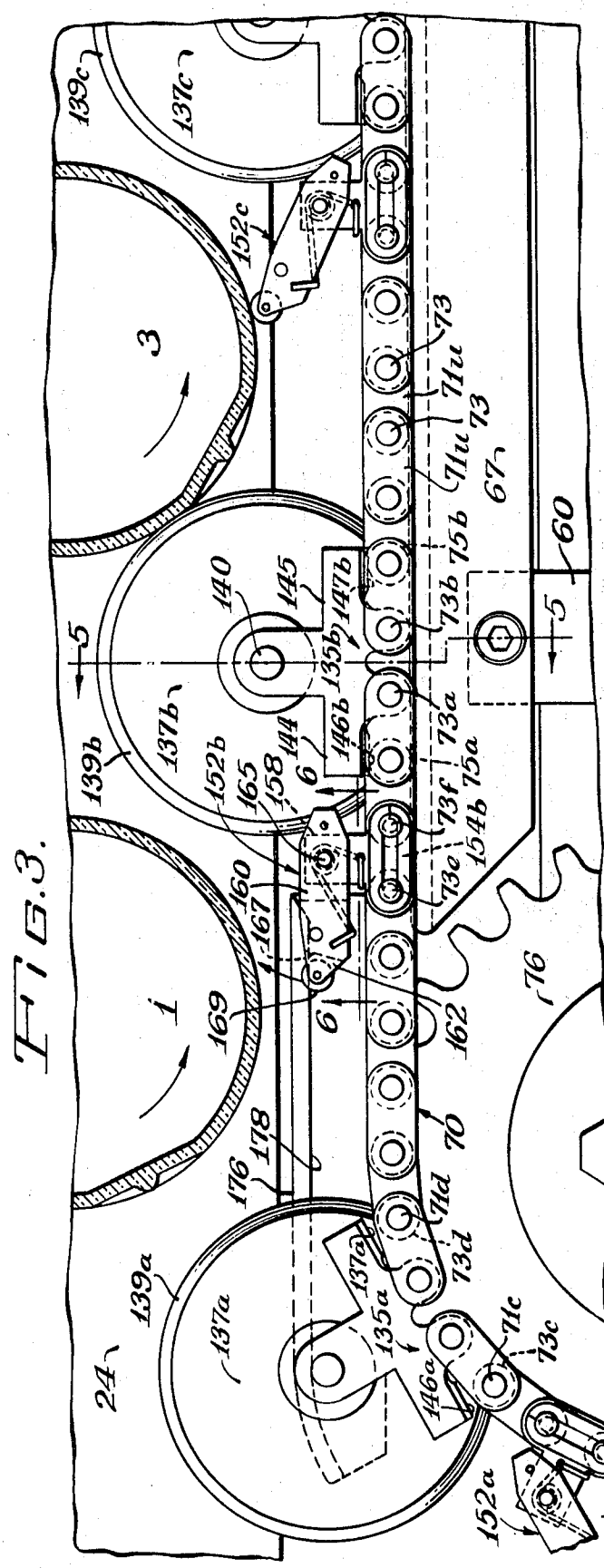


FIG. 3.

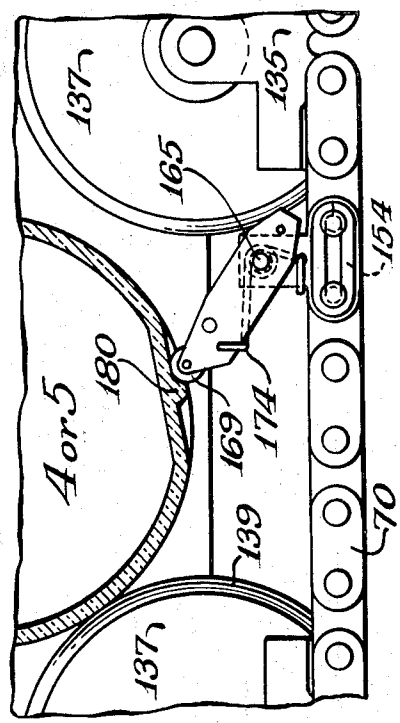


FIG. 4.

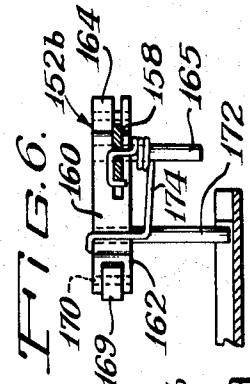


FIG. 6.

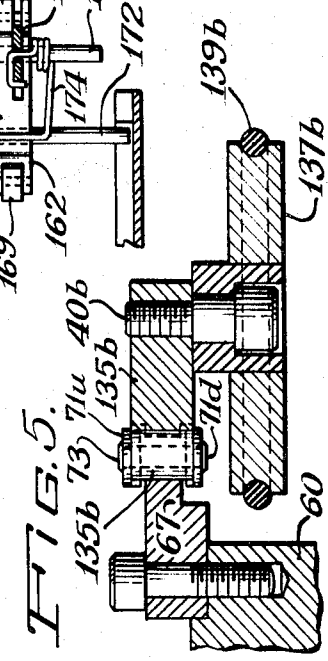


FIG. 5.

Inventor:
Clifford D. Sopher
By Bair, Freeman & Molinare
Attys.

FIG. 7.

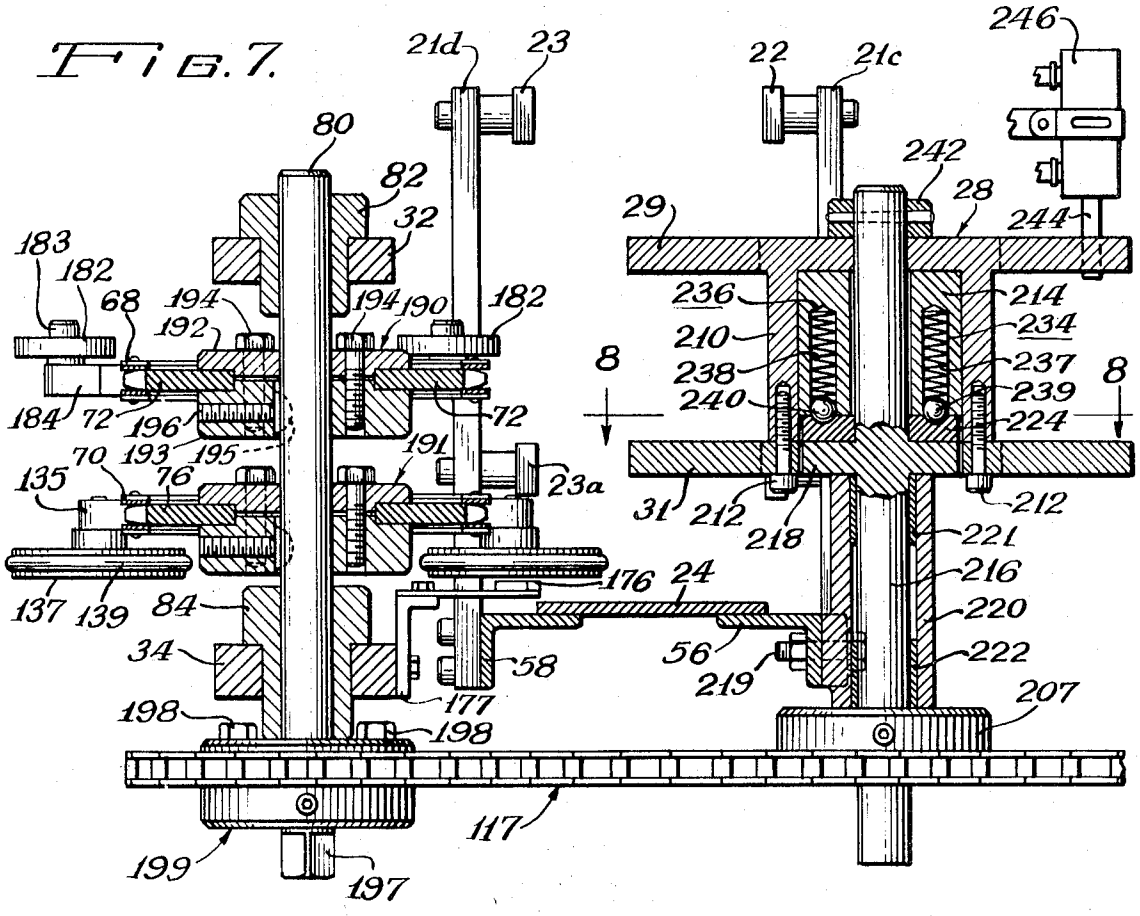


FIG. 8.

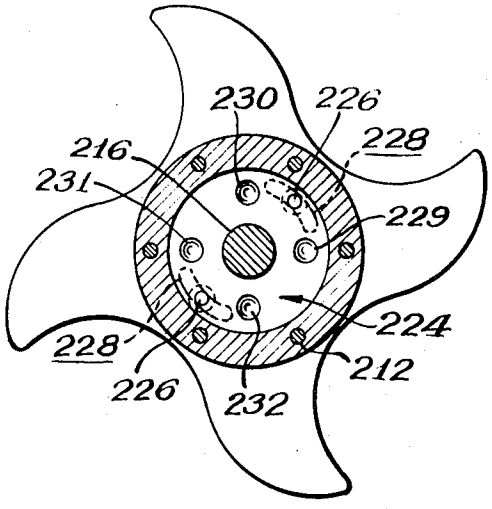
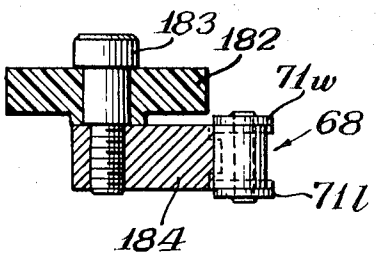


FIG. 9.



Inventor:
Clifford D. Sopher
By Bair, Freeman & Molinare
Attys.

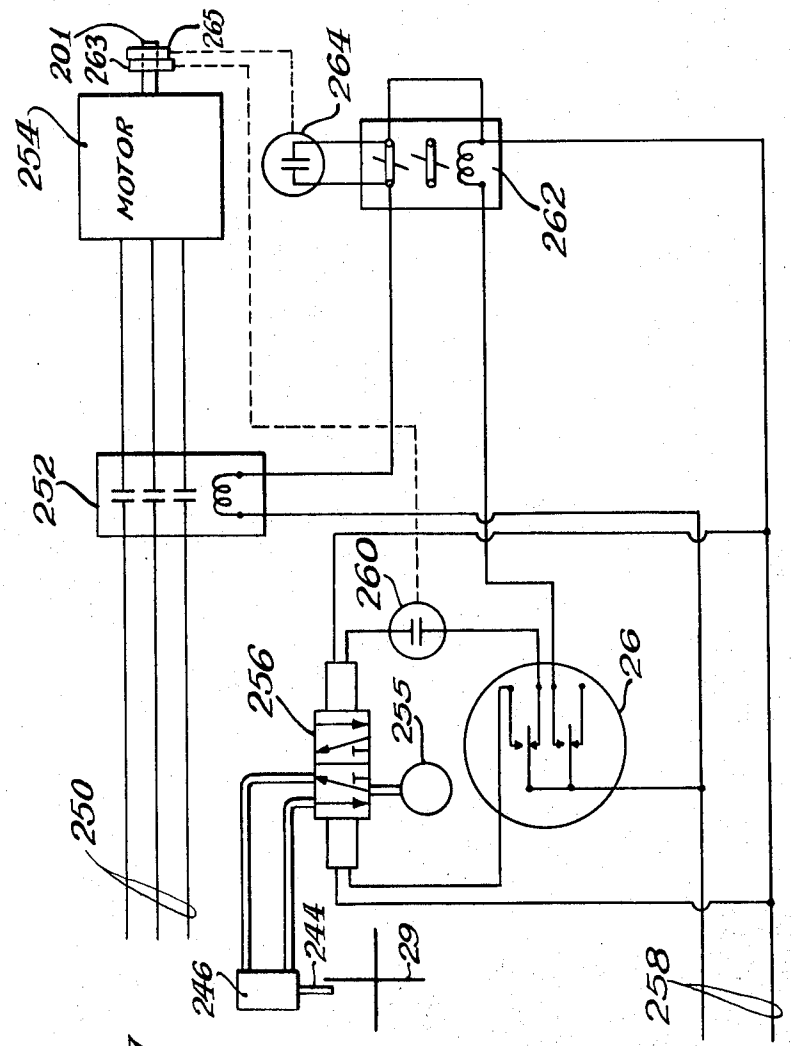


FIG. 11.

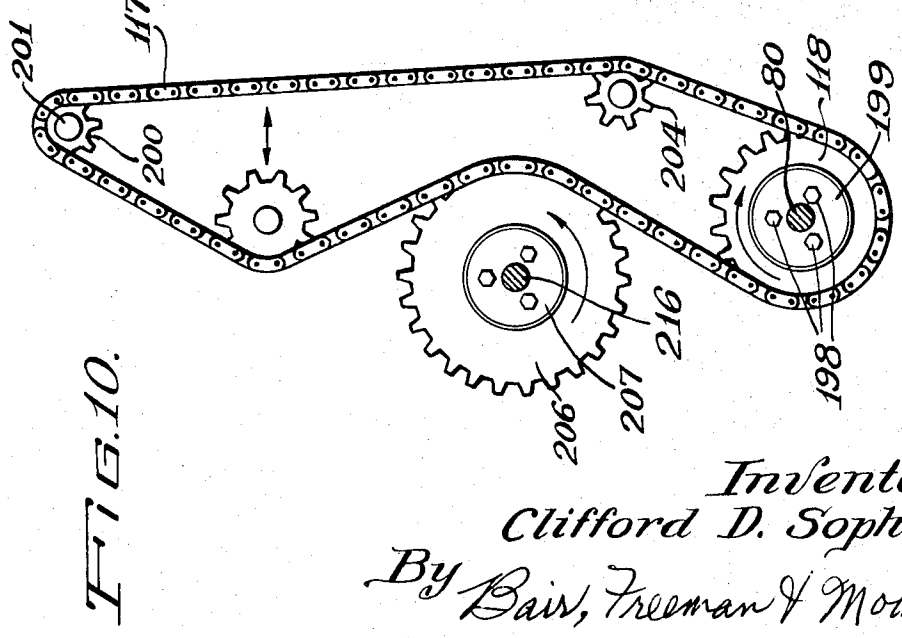


FIG. 10.

Inventor:
Clifford D. Sopher
By Bair, Freeman & Molinare
Attys.

FIG. 12.

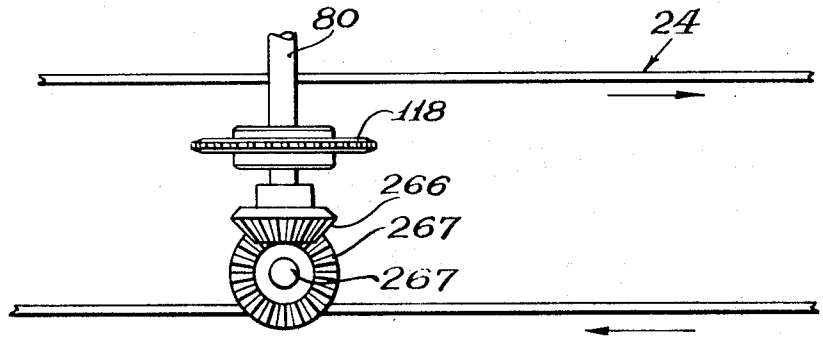
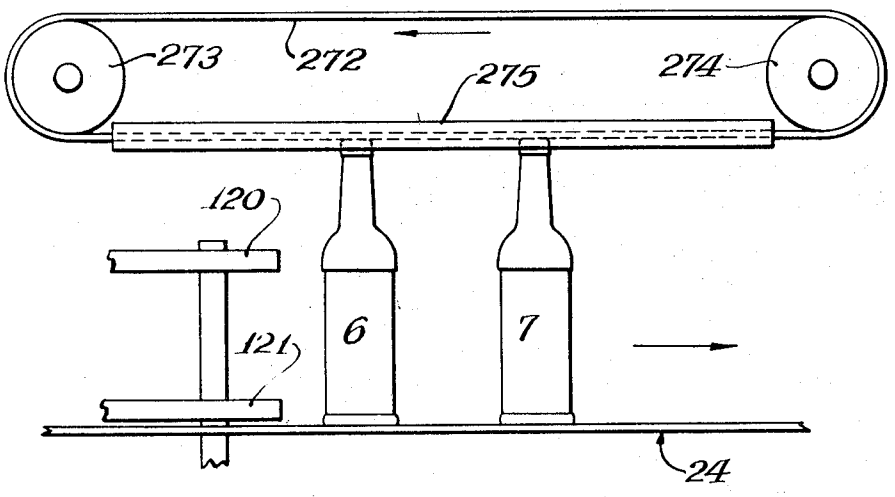


FIG. 13.



Inventor:
Clifford D. Sopher
By Bair, Freeman & Molinare
Attys.

ARTICLE SPOTTING DEVICE

BACKGROUND OF THE INVENTION

This invention relates to an improved article-spotting device and more particularly to a bottle-spotting device wherein bottle drive means and spot-sensing and engaging means are included on the same side of the conveyor path.

Mechanisms for rotating and orienting a bottle or similar article having a spot thereon are widely used, for example, in the wine and liquor industry. Such devices, more commonly called spotters, are preferably adapted to align a bottle or article in a precise manner by engaging a spot on the bottle or article with a lug. The spot is merely a protrusion or indentation, for example, molded in a glass bottle. The lug is thus adapted to engage the spot whenever the bottle is rotated to a position where the spot and the lug can engage.

Preferably spotters perform their orientation operation on an article, such as a bottle, as the article is being transported in a rectilinear path by a conveyor. A continuous in-line operation is preferable because assembly line methods are used to fill and label articles at rates of more then 300 per minute. An intermittent operation would slow the rate of production of an entire line.

There have been developed various spotters or spotting mechanisms which space articles and orient them so that, for example, a labeling operation can be performed uniformly on all of the articles. Thus, a labeled secondary capsule closure, which fits over the sealed top end of a bottle, may need to be oriented in relation to the bottle so that the written material on the label faces in a desired direction on the bottle. In other words, the written matter of labels on the body of the bottle and the capsule closure often must be properly aligned. Another example of an operation requiring orientation of the bottles is the application of tax stamps. These stamps should be applied over the bottle cap and neck so that they will not interfere with or cover up the writing on a capsule closure.

Several devices have heretofore been developed for the purpose of spotting articles such as bottles so that oriented labeling or other operations may be performed on them. For example Carter U.S. Pat. No. 2,911,089 shows a spotter in which a worm or helical screw is positioned at one side of a conveyor path to drive the bottles along the conveyor path and simultaneously cause the bottles to rotate about their longitudinal axis. A moving lug chain runs along the conveyor path opposite the worm. As the bottles spin, a spot on the bottle engages the lug chain and holds the bottle in a nonrotatable position. Capstack U.S. Pat. No. 2,706,031 discloses another type of bottle-spotting device wherein the bottle-driving means and the spotting lug are also placed on opposite sides of the moving conveyor and cooperate to spot the bottle.

Carter U.S. Pat. No. 2,825,442 shows still another orienting arrangement utilizing two endless belts positioned on opposite sides of a conveyor run. Magnusson U.S. Pat. No. 2,293,553 shows one further orienting arrangement wherein the bottle spotting lug is positioned on one side of the conveyor and bottle-rotating drive means are located on the opposite side of the conveyor. In the Magnusson device the bottle must stop for the spotting operation since the spotter is an intermittently operative device.

Of these devices, of course, the one of Magnusson is the least useful for modern day assembly line methods since it is an intermittent device. The remaining spotting devices, while being in-line devices which operate on moving bottles, are rather bulky and do not have mobility for movement from one operating station to another. Moreover, it is inherent in the construction of the remaining devices that labels may be torn off, scuffed or marked by the driving means which moves the bottles along the conveyor path. This is especially true when the labels are fresh and the label glue is still wet. The spotter of the present invention successfully overcomes these disadvantages.

SUMMARY OF THE INVENTION

In the principle aspect the present invention comprises an article-spotting device for continuously transporting articles in a forward direction along the conveyor path and means for sensing and engaging the spot on each of the articles. Both the means for driving and the means for sensing and engaging the article are positioned on the same side of the conveyor path. In addition, means for providing torque to each of the articles about their longitudinal axes is also provided. In this manner the article will be carried along a path and spin until the spot is sensed and engaged and a labeling operation or the like is performed on the article.

It is thus an object of the present invention to provide an improved article-spotting device.

It is a further object of the present invention to provide an article-spotting device wherein the article drive means and the spot-sensing and engaging means are positioned on the same side of the conveyor.

One further object of the present invention is to provide an article-spotting device which will not mar or tear labels already affixed to an article passing through the device.

Still another object of the present invention is to provide an article-spotting device which is compact, economical to manufacture, and may be easily incorporated with existing conveyor lines and apparatus along said conveyor lines.

These and other objects, advantages and features of the present invention will be more fully set forth in the detailed description which follows:

BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description which follows reference will be made to the drawings comprised of the following FIGS.:

FIG. 1 is a plan view of the complete article-spotting device of the invention illustrating how articles, especially bottles, are transported along the conveyor path, fed into the spotting device, and properly oriented and spotted;

FIG. 2 is a front view of the spotting device of FIG. 1 with portions of the drive mechanism cut away so as to better illustrate the device;

FIG. 3 is an enlarged plan view of the lower drive sprocket and chain;

FIG. 4 is an enlarged plan view of the spot engaging lug attached to the lower drive chain and engaging a spot on a bottle;

FIG. 5 is a cross-sectional view of the lower drive roller taken substantially along the line 5–5 of FIG. 3;

FIG. 6 is a front view of the spot engaging lug taken substantially along the line 6–6 in FIG. 3;

FIG. 7 is a side cross-sectional view of the drive sprocket and star wheel taken substantially along the line 7–7 in FIG. 1;

FIG. 8 is a plan cross-sectional view of the clutch arrangement of the star wheel taken substantially along the line 8–8 in FIG. 7;

FIG. 9 is a cross-sectional view of the upper chain drive roller;

FIG. 10 is a plan cross-sectional view of the drive chain arrangement taken substantially along the line 10–10 in FIG. 2;

FIG. 11 is a circuit diagram of the article feed and timing mechanism of the device;

FIG. 12 is a partial side view showing an arrangement for driving the spotter and conveyor simultaneously; and

FIG. 13 is a partial view showing the spotter in combination with a device for holding the bottles in a spotted position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The following description is directed to the spotting of cylindrically-shaped glass bottles. However, the invention is not limited to a device which spots only such bottles but it is anticipated should include apparatus for spotting any type of container having a spot thereon.

The bottles that the following detailed description contemplates are of the type having a main body portion as at 10 in FIG. 2, a narrowed neck 12, a lower scruff rail 14, an upper scruff rail 16 and a top or cap 17. The scruff rails 14 and 16 serve to keep the main body portion 10 spaced from the sides of conveyor rails as at 19, 20, 22 and 23 in FIG. 1 and from friction rails 120 and 121 as will be described below. The conveyor side rails 19, 20, 20*a*, 22, 23 and 23*a* are supported by vertical rail support rods as at 21*a*, 21*b*, 21*c* and 21*d* which are attached to conveyor frame members 56 and 58. The side rails 19, 20, 20*a*, 22, 23 and 23*a* serve to keep the bottles positioned vertically on a moving conveyor belt 24. Each bottle, as at 1, 2, 3, 4 and 5, also has a spot 180 which will be described in further detail below.

The bottles move along a conveyor belt 24, activate a limit switch 26 and are fed into the spotting device at a metered rate by a star wheel assembly 28. Although a star wheel assembly 28 is shown as the preferred method for feeding bottles at a metered rate to the spotting device, it is contemplated that any means for metering the rate of bottle feed into the device may be utilized. For example, an escapement mechanism or a worm drive mechanism may be utilized to feed the bottles at spaced intervals into the spotting device. In the preferred embodiment described, the star wheel assembly 28 is incorporated as an integral part of the spotting device and therefore is synchronized to operate in sequence with the spotter mechanism as will be described in greater detail below.

The bottle-driving mechanism of the spotting device is mounted on a frame 30 having an upper frame member 32, a lower frame member 34 and a pair of vertical interconnecting frame members 36 and 38 which rigidly interconnect and space the upper and lower frame members 32 and 34. Attached at spaced intervals to the bottom side of the lower frame member 34 are left and right frame mounting blocks 40 and 42 respectively. Left and right cylindrical mounting rods 44 and 46 respectively are inserted through corresponding openings in mounting blocks 40 and 42 respectively. The mounting rods 44 and 46 are rigidly attached to a support frame member as at 48 and 50 respectively. Since the mounting blocks 40 and 42 are freely slidable on the mounting rods 44 and 46, the position of the frame 30 and thus the position of the spotting device may be adjusted in relation to the conveyor belt 24. Locking screws, as at 52 and 53 inserted through mounting block 40, are adjusted to hold the mounting block 40 in a fixed relation with mounting rod 44. A similar arrangement (not shown) is provided for mounting block 42 and rod 46.

Support frame members 48 and 50 may be part of the frame supporting the conveyor belt 24 or they may be part of a portable housing and support unit of the bottle-spotting device. For example, if frame members 48 and 50 are permanently attached and part of the frame supporting the conveyor belt 24 then the frame members 48 and 50 are immovable in relation to the bottle-spotting device and merely serve as members for attachment of the bottle device to the conveyor frame. On the other hand if frame members 48 and 50 are part of the bottle-spotting unit, the unit may be positioned in relation to the conveyor belt and its supporting frame. The unit may then be locked or bolted in a fixed position in relation to the frame of the conveyor belt 24. Finally the frame 30 may be adjusted on the mounting rods 44 and 46 to provide a fine adjustment of the spotter in relation to the conveyor belt 24. In FIG. 2 the latter described arrangement is shown wherein the spotter unit is mounted on a housing 54. Frame members 48 and 50 are fixed to the housing 54 and also rigidly, though temporarily, attached to parallel longitudinal frame members 56 and 58 of the frame assembly supporting conveyor belt 24.

Also, attached to lower frame member 34 are three spaced and adjustable chain support brackets 60, 61 and 62. The chain support brackets are bolted to the lower frame member 34 and are adjustable in a direction perpendicular to the run of the conveyor belt 24. As illustrated in FIG. 1 for center chain support bracket 61, adjustment is provided by cooperation of elongated openings 63 and 64 in lower frame member 34 and bolts 65. Thus, bolts 65 may be loosened, center chain support bracket 61 moved to the desired position and bolts 65 again tightened. The remaining support brackets 60 and 62 are constructed in the same manner.

Attached to the chain support brackets 60, 61 and 62 are an upper chain support 66 and a lower chain support 67. The upper and lower chain supports 66 and 67 are arranged substantially parallel to the conveyor belt 24 and serve to keep an upper and lower bottle drive chain 68 and 70, respectively on a straight line course, parallel to the conveyor belt 24 as will be described in greater detail below.

Again referring to FIGS. 1 and 2, there is shown mounted on pairs of sprockets 72 and 74, 76 and 78 attached at opposite ends of the frame 30, the upper drive chain 68 and the lower drive chain 70. The upper drive chain 68 is mounted on drive sprocket 72 and idler sprocket 74. In a similar manner the lower drive chain 70 is mounted on drive sprocket 76 and idler sprocket 78. The drive sprockets 72 and 76 are mounted on a vertical drive shaft 80 which is journaled in bearing blocks 82 and 84 attached respectively to the upper frame member 32 and the lower frame member 34. In a similar manner idler sprockets 74 and 78 are mounted on a shaft 86. The shaft 86 is journaled in idler bearing blocks 92 and 94 respectively. The idler bearing blocks 92 and 94 are in turn mounted in adjustable upper and lower frame bearing block holders 102 and 104 respectively in the manner illustrated in FIG. 2. Thus, by loosening block holder bolts 105 and sliding block holders 102 and 104 to the desired position, the tension and length of run of the upper and lower chains 68 and 70 may be adjusted.

In order to insure that the upper and lower drive chains 68 and 70 are maintained at a sufficient tension there is also provided upper and lower spring idler sprocket assemblies 106 and 107 respectively. The assemblies 106 and 107 are mounted on a block 108 attached to lower frame member 34. The upper and lower assemblies are substantially identical in construction. Both include an idler sprocket 109 rotatably mounted on a shaft 110. The shaft 110 in turn is fixed to a shaft mounting block 111. Left and right guide rods 112 and 113 extend from the shaft mounting block 111 through the assembly mounting block 108. Left and right biasing springs 114 and 115 are positioned on guide rods 112 and 113 respectively between the shaft mounting block 111 and the assembly mounting block 108. These springs 114 and 115 act to bias the sprocket assembly 106 and 107 into engagement with the upper or lower drive chain 68 or 70 as the case may be. In this manner the upper and lower drive chains 68 and 70 are assured proper tension.

Attached to the upper drive chain 68 are bottle engaging and driving means which are more fully described below. Likewise, lower drive chain 70 includes bottle engaging and driving means and spot sensing and engaging means which are also more fully described below. The drive sprockets 72 and 76 which drive the drive chains 68 and 70 derive their power through main drive chain 117 situated beneath the conveyor belt 24 and passing around spotter drive sprocket 118. This construction is also described more fully below by reference to the other FIGS. of the drawing.

Still referring to FIGS. 1 and 2, however, there is also shown parallel to the conveyor belt 24 on the side opposite the drive chain, an upper friction rail 120 and a lower friction rail 121. These rails 120 and 121 are substantially similar in construction and each is fabricated from a metal bar such as aluminum with a facing material 122 attached to the inside surface for engagement with the scruff rails 14 and 16 of the bottles. The facing material 122 is preferably leather since testing has indicated this is the best material known for operation of the device. It has also been determined that rubber is not a desirable material for use as a facing material.

As illustrated in FIG. 2 the upper friction rail 120 is adapted to coincide with the scruff rail 16 of the bottles whereas the

lower friction rail 121 is adapted to engage or coincide with the lower scruff rail 14. Thus, the friction rails 120 and 121 are designed not to interfere or engage any label placed on the body 10 of a bottle. Moreover, the friction rails 120 and 121 are separated by a distance approximately equal to the height of the body of the bottle. The area having as one dimension the space between the friction rails 120 and 121 and as the other dimension the distance approximately equal to the run of the spotting device provides an ideal position for sensing devices and/or other bottling machinery. Such additional machinery is thus positioned on the same side of the spotting device and in the same position as the friction rails 120 and 121. This area provides ample room for operations to be performed on the body 10 of the bottle once the bottle has been spotted. The fact that the bottle may be sensed and operated upon by machinery along one side of the conveyor while the bottle is simultaneously being spotted or is spotted by means on the opposite side of the conveyor belt 24 is only one important advantage and feature of the present invention.

The upper and lower friction rails 120 and 121 are also adjustable so that various sizes of bottles may be accommodated by the spotting apparatus. Provided at opposite ends of the bottle spotting device on the right and left respectively are vertical rail support members 124 and 126. These vertical support members 124 and 126 are attached either to the longitudinal frame member 56 or to the housing 54. In other words, the vertical support members 124 and 126 are fixed relative to the conveyor belt 24. An adjusting screw 125 fits through a threaded opening in vertical support member 124 and is threaded into upper friction rail 120. A nut 129 may be tightened against vertical support member 124 to lock adjusting screw 128 in position once proper alignment of the left end of rail 120 has been achieved. In a similar manner an adjusting screw 130 and nut 131 cooperate with vertical support member 126 at the opposite end of upper friction rail 120 to adjust and set the position the right-hand end of upper friction rail 120. Lower friction rail 121 has similar adjusting means.

Referring now to FIG. 3, there is shown in an enlarged plan view a portion of the lower drive chain 70 and the drive chain sprocket 76 along with the spot sensing means and bottle drive means attached to the lower chain 70.

Chain 70 is comprised of interconnecting links generally denoted by 71 and pins generally denoted by 73 with spacers generally denoted by 75. Thus, as illustrated in FIGS. 3 and 5 lower chain 70 includes upper links generally denoted by *71u* and lower links generally denoted by *71d* connected by pin 73 and spaced by spacer 75 so that teeth of a drive sprocket may properly engage the chain 70.

Attached to the chain 70 at spaced intervals around the circumference of the chain 70 and in place of an upper and lower link *71u* and *71d* and a pair of spacers 75 are roller carriers generally denoted by 135 and more specifically, as at *135a*—*135c* which are carriers for bottle drive rollers generally denoted by 137 and more specifically, as at *137a*–*137c*.

A description of the roller carrier *135b* and roller *137b* will serve as a description for the remaining roller carriers 135 and rollers 137 on lower chain 70. The roller carrier *135b* interconnects adjacent pins as at *73a* and *73b* in FIG. 3 of chain 70. Projecting from the opposite sides of the roller carrier *135b* in a direction parallel to the conveyor run are bearing surface projections *144b* and *145b*. These surface projections *144b* and *145b* have bearing surfaces *146b* and *147b* respectively which rest against chain spacers *75a* and *75b* respectively. In this manner the axis of the roller *137b* is held in a substantially vibrationless position as it is translated down the path of the conveyor parallel to the belt 24. As will be observed in FIG. 3, when the roller carrier as at *135a* passes over the sprocket 76, the bearing surfaces *146a*, *147a* are lifted away from spacers *73c*, *73d* and pins *71c*, *71d* and do not interfere with the travel of the chain 70 over the sprocket 76. The combination of the lower chain support 67 with roller carriers 135 insures that the rollers 137 are translated along the conveyor path without wobble or vibration.

As illustrated in FIG. 5, the bottle drive rollers generally denoted by 137 are cylindrical in shape and have a rubber gasket or O-ring generally denoted by 139 around the circumference to prevent abrasion and tearing of any labels on a bottle. Each roller 137 is rotatably attached to a roller carrier 135 by means of a support bolt 140 threaded into a roller carrier 135.

Also attached to lower chain 70 are lug assemblies generally denoted by 152 and more specifically as at *152a*–*152c* for spotting successive bottles. FIGS. 3, 4 and 6 illustrate in greater detail bottle spotting lug assembly *152b*. A description of assembly *152b* therefore serves as a description for all the spotting lug assemblies 152.

The bottle-spotting lug assembly *152b* includes a pin link *154b* which connects, respectively, the bottom ends of second and third drive chain pins *73e* and *73f* positioned in the direction opposite from the direction of movement of the drive chain 70. This is the minimal spacing allowable between pin link *154b* and roller carrier *135b* since the bearing surface 146 must rest against at least the next adjacent spacer *75a* in the direction opposite the rotational direction of the drive chain 70. Thus, it is contemplated that the lug assembly *152b* may be positioned any desired number of chain links 71 behind the roller carrier *135b* depending upon the diameter of the bottles and the rate at which the bottles are to be fed into the spotting device, for example.

Pin link *154b* has an outward extending member 158 to which is attached a spotter lug 160. Lug 160 has a spot engaging end 162 and an opposite end 164. The opposite end 164 is pivotally attached to a shaft 165 fixed in member 158. Positioned in a slot 167 in the spot-engaging end 162 is a spotter roller 169. The roller 169 is free to rotate about a fixed pin 170 extending between the sides of the slot 167. A cam shaft pin 172 extends downwardly from the spot engaging end 162. A spring 174 wraps around shaft 165 and is rigidly fixed to both the spot-engaging end 162 and the member 158. Spring 174 biases lug 160 in a clockwise direction about shaft 165 as indicated by the arrow in FIG. 3. It should be noted that pin link *154b* replaces a lower link *71d* of the chain 70. Thus, the outward member 158, as shown in FIG. 6, lies in the same plane as the bottom link *71d* of the chain 70 as shown in FIG. 5.

A camway member 176, as shown in FIGS. 6 and 7, is mounted by means of a bracket member 177 to the lower frame member 34. The camway member 176 has a cam guide surface 178 which coacts with the lower end of cam shaft pin 172 to depress the lug assembly *152b* in a counterclockwise direction against the biasing force of spring 174. The cam guide surface 178 terminates shortly after the beginning of the run along the conveyor belt 24 of the bottle-spotting device. The lug assembly 152 is depressed by means of the cam surface 178 to prevent engagement of the roller 169 with a bottle spot 180 prior to engagement of a bottle by a drive roller 137. If the lug assembly 152 does engage a spot 180 prematurely, the drive roller 137 would improperly engage a bottle probably resulting in breakage of the bottle.

Advantageously, a camway member (not shown) may be included at the output end of the bottle spotter. Such a camway member would be similar in construction to camway member 176 and would act to depress lug assembly 152 as bottles are discharged to insure that the lug assembly would not "kick" the discharging bottles. Since the lug assembly 152 accelerates when rounding upper idler sprocket 74, it may otherwise hit the discharging bottles if not depressed.

Distinct advantages arise from this lug assembly construction. First, since there is a roller 169, the spotting device may be used with a freshly affixed label still having a wet backing wherein the glue is not yet dry. The roller 169 will merely roll along the surface of the bottle and label until it engages a spot 180. The cam drive surface 178 and cam shaft pin 172 coaction also prevent premature contact between the roller 169 and a bottle thereby also preventing ripping or tearing of a label.

As can be observed by reference to FIGS. 1 and 3, the lug assembly **152** is transported by the lower drive chain **70** as the chain is rotated in a clockwise direction. The lug **160** is depressed by the cam surface **178** until the appropriate time when the lug is biased outwardly into a path in which it will intersect the spot **180** on a bottle. The sequence of steps in a spotting operation is illustrated by the bottles designated by positions 1—5 in FIG. 1. It should be noted that bottle positions 1 and 3 are also designated in FIG. 3 and bottle position 4 or 5 is designated in FIG. 4. The bottles rotate in a counterclockwise direction as indicated by the arrows in the various FIGS. until the roller **169** engages the spot **180** as illustrated in FIG. 4. The bottles are then transported without further rotation by conveyor belt **24** and the spotter bottle drive rollers **137**.

The upper drive chain **68** and its associated parts facilitate bottle transfer along conveyor belt **124** and are illustrated in a cross-sectional view in FIGS. **5**, **7** and **9**. The upper chain **68** is substantially the same as the lower drive chain **70**. In a prototype model two No. 40 chains are used advantageously for the bottle spotter device of the present type which has been used for spotting one-fifth gallon, whiskey-type bottles having a 3-inch diameter.

As illustrated by FIGS. **1** and **9**, a bottle support roller **182** is pivotably mounted by means of a bolt **183** on a roller carrier **184** attached to upper chain **68**. The construction of the roller carrier **184** is substantially the same as the construction of the previously described roller carrier **135**. Roller **182**, however, is preferably a polyethylene or plastic material which will not abrade a label.

Referring again to cross-sectional view FIG. **7**, there is shown the arrangement for the connection of the drive shaft **80** and the drive sprockets **72** and **76**. The drive sprockets **72** and **76** each include a center hub assembly **190** and **191** respectively. The hub assemblies **190** and **191** are each constructed in the same manner thus a description of one will suffice for both. The top hub assembly **190** includes an upper hub member **192** and a lower hub member **193** which are clamped together by hexagonal head cap screws **194**. The upper and lower hub members **192** and **193** may be tightened to clamp the sprocket **72** in a fixed position therebetween. The hub assembly **190** is keyed to the shaft **80** by key **195** and locking key screw **196**. Thus, the upper spotter chain can be adjusted by loosening the three hex head cap screws **194** on the upper hub assembly **190** and advancing or retarding the chain manually. Since the lower hub assembly **191** is constructed in the same manner, the lower chain **70** may be manually adjusted in the same manner.

In addition to adjustment of the separate upper and lower chains **68** and **70**, the entire spotting unit can be adjusted by loosening hex head cap screws **198** which are attached to hub assembly **199**. Hub assembly **199** is constructed in the same manner as hub assemblies **190** and **191**. Thus by loosening cap screws **198** and turning the drive shaft in a clockwise direction with a wrench on the lower end **197** of the spotter drive shaft **80**, the unit can be adjusted. Turning the drive shaft **80** in a clockwise direction advances the bottles. Turning it in a counterclockwise direction retards the bottles.

Referring now to FIG. **10**, there is shown the drive chain arrangement for driving the star wheel metering assembly **28** and the drive chains **68** and **70** of the bottle spotter in a synchronized fashion. Power is provided to drive chain **117** in a clockwise direction by drive sprocket **200** which is connected to drive shaft **201**. The drive chain **117** passes over idler sprocket **204** and around the spotter drive sprocket **118** imparting a clockwise motion to the drive sprocket **118** and thus, to the upper and lower drive chains **68** and **70**. Drive chain **117** continues in its circuitous path and engages a star wheel sprocket **206** imparting a counterclockwise motion to the star wheel sprocket **206** and adjustable star wheel sprocket assembly **207**. Thus a counterclockwise motion is imparted to the star wheel assembly **28** illustrated in FIGS. **1** and **7**. Finally, drive chain **117** passes over an adjustable tension idler sprocket **208**. In a prototype model of the invention, the spotter drive sprocket **118** is a 30 tooth sprocket which, of course, is driven on the inside of drive chain **117** to obtain the clockwise motion, and the star wheel sprocket **206** is a 40 tooth sprocket and is driven on the outside of the chain **117** to obtain the counterclockwise rotation.

Referring now particularly to FIGS. **1**, **7** and **8** there is shown the construction of the star wheel metering assembly **28** which feeds bottles into the spotter at a fixed rate. The star wheel assembly **28** includes an upper star wheel **29** and a lower star wheel **31**. While two star wheels **29** and **31** are shown, one star wheel is sufficient for operation of the device. The star wheels **29** and **31** themselves are replaceable, depending upon the shape and size of the bottle being spotted. The configuration pictured in the cross-sectional view of FIG. **8** is particularly adapted for feeding cylindrical one-fifth of a gallon bottles into the spotter device. However, star wheels are available and known in the art for feeding square-shaped bottles, etc.

Upper star wheel **29** has a cylindrical flange **210** depending downward therefrom and is connected with lower star wheel **31** by means of screws **212**. Upper star wheel **29** in turn is rigidly mounted to a star wheel hub **214**. Star wheels **29** and **31** and hub **214** include a central cylindrical opening and slidably fit over a star wheel shaft **216**. The shaft **216** is rigidly connected to the adjustable star wheel sprocket assembly **207**.

Shaft **216** includes a circular plate section **218**. The lower surface of plate section **218** bears against a shaft bracket **220**. Shaft bracket **220** in turn is mounted on frame member **56** by means of mounting bolts **219**. Bearings **221** and **222** are provided in shaft bracket **220** for shaft **216**.

A hub plate **224** is bolted to shaft plate **218** by countersunk cap screws **226** in the manner illustrated in FIGS. **7** and **8**. Hub plate **224** includes arcuate slots **228** through which the cap-screws **226** are fitted and which permit the hub plate **224** to be rotationally positioned in relation to the shaft plate **218**. Such positioning is necessary to provide proper synchronization between the star wheel assembly **28** and the remainder of the device. Hub plate **224** also includes four semihemispherical indentations **229**, **230**, **231** and **232** spaced at 90° intervals and at equal radial distances from the center of the hub plate **224**. Hub **214** includes four cylindrical vertical shafts as at **234** and **236** in FIG. **7** which are positioned directed over indentations as at **229** and **231**. Springs as at **237** and **238** are positioned in shafts **234** and **236**, respectively, to bias ball bearing locking members **239** and **240** into their corresponding indentations **229** and **231**. A locking nut **242** is provided on the top end of the shaft **216** to prevent the ball bearings as at **239** and **240** from riding out of an indentation as the shaft **216** is turned.

Thus, when shaft **216** is being driven by drive chain **117** the star wheels **29** and **31** are provided with torque through the clutch mechanism described above. When, however, it is desirable to prevent the star wheels **29** and **31** from turning even though drive chain **117** is imparting power to sprocket **206**, a brake rod **244** engages star wheel **29** to prevent rotation. Brake rod **244** is actuated by an air cylinder **246** which is part of a star wheel assembly control circuit which will be described below.

FIG. **11** schematically represents the control circuit for the star wheel assembly **28** and a brake motor **254** providing power to shaft **201**. Three phase 220 volt lines **250** provide power through a starter relay **252** to the main drive motor **254**. As also depicted in FIG. **11**, a double-acting air cylinder **246** with brake rod **244** is positioned where it may impinge on star wheel **29**. A two position, four way pilot operated solenoid valve **256** receiving air from a line source **255** is activated either by a single-pole double-throw switch **260** or a double-pole, double-throw limit switch **26**. Input control power lines **258** provide control circuit power. Limit switch **26**, which is also depicted in FIGS. **1** and **2**, is the limit switch which activates the control circuits and starts the bottle-spotting device.

Bottles moving on the conveyor belt 24 activate the limit switch 26 which supplies control voltage to a time delay relay 262. When the time delay relay is activated, its normally opened contacts close and remain closed after the limit switch 26 is opened, and for the period of time the timer is set. This period of time is preferably equivalent to the period of time that it takes a bottle to pass on a complete run through the spotting device. This time is approximately 3.5 seconds when the bottle-spotting device is being used for processing bottles at a normal operating rate of approximately 100 bottles per minute for 3 inch diameter cylindrical bottles. When the normally opened contacts of the time delay relay 262 close, control voltage is supplied to the starter relay 252, which in turn supplies line voltage to the motor 254. After the motor 254 starts, a preset cam 263 that runs at a 1:1 ratio with the spotter device, causes limit switch 260 to close. This supplies control voltage to solenoid valve 256. When solenoid valve 256 opens, it supplies air from the air supply 255 to air cylinder 246, which closes, withdrawing rod 244 and allows the star wheel 29 to feed bottles through the spotter. The cam 265 is adjusted to insure that bottles feed into the spotter device between sets of rollers. This is to prevent the bottles from fouling the spotter mechanisms or from being crushed.

When limit switch 26 closes, solenoid valve 256 is reversed, which causes air cylinder 246 to open, rod 244 to extend and stop the star wheel. The motor 254 will continue to run until the time delay relay 262 runs out. When the time delay relay 262, runs out, the normally opened contacts return to their normally opened position.

A limit switch 264 is also activated by the cam 265 that runs at a 1:1 ratio with the bottle spotter. When the switch 264 is closed by the cam 265, the motor continues to run until the spotter device stops at a desirable position. A desirable position is one in which the spotter rollers are aligned to receive bottles from the star wheel 29 without crushing them. When the normally opened contacts on the time delay relay 262 are returned to open, the motor 254 will stop unless limit switch 264 is closed. Otherwise, the motor will continue to run until limit switch 264 drops off the cam 265 and returns the switch 264 to its opened position.

The control circuit of FIG. 11 can operate in any one of three separate ways to effect spotting of bottles:

OPERATION PROCEDURE NO. 1

As shown in FIG. 1, for example, the star wheel 29 will hold back a predetermined number of bottles. When one bottle activates the limit switch 26, one bottle is fed into the spotter device. Preferably switch 26 is placed at an integral number of bottle positions prior to assembly 28. For example, in FIG. 1 the limit switch 26 is positioned two bottle diameters prior to the star assembly 28.

After a bottle comes along the conveyor belt 24 and activates limit switch 26, the spotter device will continue to run until that bottle has passed completely through the machine. This results because the time delay relay 262 keeps the device operating for a preselected period of time. When several bottles enter the spotter device, the limit switch 26 is held closed by the bottles. Consequently the air cylinder 246 will open lifting rod 244 as described above and will remain open until the last bottle closes the limit switch 26. The spotter device will continue to run until the last bottle discharged by the star wheel 29 has passed completely through the spotter device.

OPERATION PROCEDURE No. 2

A single-pole, single-throw off–on switch is substituted in place of the limit switch 264. The time delay relay 262 is omitted. The limit switch 26 may be a single-pole double-throw switch and is used only to activate the air valve 256. The switch 264 is used to turn the bottle conveying part of the spotter device off and on. This part of the spotter device will run continuously once turned on. Meanwhile, the star wheel 29 will hold back a predetermined number of bottles depending upon the position of limit switch 26. When one bottle activates the limit switch 26, the star wheel 29 feeds one bottle into the bottle conveying part of the spotter device. Even after the bottle leaves the bottle conveying part of the spotter device, it will continue to run. When several bottles enter the spotter device, the limit switch 26 remains held closed by the bottles. The air cylinder 246 will open and remain open until the last bottle opens the limit switch 26 and causes cylinder 246 to close which, in turn, stops star wheel 29.

Thus, the star wheel clutch mechanism described above is caused to function. Rod 244 prevents rotation of the assembly 28 while the spotter chains continue to drive the spotter rollers, etc. The ball bearings in the assembly 28, as at 239 and 240, ride up out of their hemispherical indentations 229—232 against the biasing force of the springs, as at 237 and 238, as the star wheel 29 and thus the star wheel assembly 28 is held in a fixed position. The shaft 216 continues to rotate but the star wheel assembly 28 itself does not.

For example, if switch 26 is placed two bottle lengths from the assembly 28 and if there are only one or two bottles which are waiting to be spotted and no others appear on the conveyor, the cylinder 246 and rod 244 will act to prevent passage of the bottles through the spotting machine. Appearance of a bottle on the line-actuating limit switch 26 will activate the assembly 28 permitting passage of one bottle into the spotter. The limit switch 26 may be moved forward or back of the position shown in FIG. 1 to provide for activation of the spotter to spot one or more than two bottles respectively.

OPERATION PROCEDURE No. 3

The time delay relay 262 is turned to its minimum time approximately one-tenth second. The limit switch 260, the air valve 256, and the air cylinder 246 are eliminated. The limit switch 26 may be a single-pole, single-throw limit switch since it is only necessary to activate the time delay relay 262. When one bottle activates the limit switch 26, the spotter device will run for one cycle or until that bottle passes the limit switch and thereby opens the limit switch 26. When a series of bottles activate the limit switch 26, the spotter device will continue to run until the last bottle opens the limit switch 26. With this method of operation the spotter device will always remain full of bottles and one bottle will leave the discharge end of spotter device for every bottle that activates the limit switch 26. In order to "clear" the machine at the end of a run, the limit switch 26 may be manually held closed until the last bottle leaves the discharge end of the spotter device.

The operation of the spotting device once bottles have been fed into it by means of the star wheel assembly 28 is perhaps best understood by again referring to FIG. 1. First the spotting device must be adjusted so that the particular bottle being spotted spotted will be carried substantially along the center of the conveyor belt 24 during the spotting operation. This is accomplished by first adjusting the friction rails 120 and 121 in the manner described above. After the friction rails 120 and 121 are adjusted, then the portion of the spotting device on the opposite side of the conveyor is adjusted along the rods 44 and 46. Proper orientation is accomplished when the spotting roller 169 of the spotting lug 162 seats against the spot 180 of the bottle and holds the spot 180 at approximately a 90° angle to the direction of conveyor belt 24 motion. Pin links 135 and/or 184 may be moved to position the rollers 137 and 182, respectively, on the top and bottom chain 68 and 70. Likewise pin link 154 of spotting lug assembly 152 on the bottom chain 70 may be positioned to accommodate variously sized bottles. In addition the length of the run can also be adjusted to accommodate peculiarities encountered in various bottling operations.

As the bottles are fed by the star wheel assembly 28 along the conveyor the rollers 137 and 182 engage the outer cylindrical surface of the bottles. The bottom bottles 137 act to push the bottle along the conveyor belt 24. The upper rollers 182 act tp guide the bottles as they are being pushed by the

lower rollers 137. As may be observed by reference to FIG. 1 the bottom rollers 137 and the top rollers 132 both are tangent to a circle coincident with the circumference of the bottle being spotted. The upper rollers 132 engage the forward side of the bottle whereas the lower rollers 137 engage the trailing side of the bottles.

The bottles are caused to rotate about their vertical longitudinal axes by rolling against the friction rails 120 and 121 until the spotting lug roller 169 engages the spot 180 as described previously. Labeling operations or the like are performed on the bottles after are positioned or spotted. For example, bottles 4 and 5 at FIG. 1 may have labeling or other operations performed on them.

Once bottles have completed their spotting operation, the roller 169 disengages the bottle. Likewise rollers 137 and 132 disengage the bottle. A bottle is then carried away from the spotter by conveyor belt 24.

Referring now to FIG. 12 there is shown, in a partial side view, an alternative arrangement for driving bottles in the spotter. In this arrangement, the conveyor belt 24 is driven at the same speed that the bottle-spotting device, previously described, moves bottles on the conveyor belt 24. Thus, the bottle-spotting device and the conveyor belt 24 both serve to simultaneously transport a bottle.

As shown in FIG. 12, the shaft 80 is connected to a bevel gear 266. The bevel gear 266, in turn, meshes with a second bevel gear 267. Gear 267 is fastened to a rotatable shaft 269 which serves to drive the conveyor belt 24 at the same speed as the bottles transported by the bottle-spotting device. This particularly described embodiment is, of course, merely illustrative of many possible ways in which the speed of the conveyor belt 24 and speed of the spotting device can be synchronized. In fact, the conveyor and spotter may be driven by separate power sources, although the described embodiment is preferable because problems of synchronization are eliminated. One advantage of such synchronization is smoother operation of the entire device.

In FIG. 13, there is shown a device or means for holding bottles that have been spotted by the bottle spotter. The bottles, such as those identified by the numbers 6 and 7 in FIG. 13, have been spotted. They are then transported along the friction rails 120 and 121 by the spotter and the conveyor belt 24. The holding means comprises an endless belt 272 which engages the tops of the bottles 6 and 7. The belt 272 fits around an idler pulley 273 and a drive pulley 274. The belt 272 is driven, in the direction indicated by the arrows, at the same speed as the bottles 6 and 7 passing along the conveyor belt 24. The belt 272 intersects the bottles, as at 6 and 7, prior to discharge from the spotter to insure retention of bottle orientation.

This arrangement works best when the speed of the conveyor belt 24, the speed of the bottle-spotting device, and the speed of the upper belt 272 are all equal. Thus, as bottles are discharged from the bottle-spotting device to be carried by the conveyor belt 24, no torque forces act on the bottles because of the upper belt 272 moving at a different speed and tending to cause the bottles to tip or sway. As the bottles are transported along on the conveyor belt 24 and held in position by the upper belt 272, a guide rail 275 also insures that the belt 272 will remain fairly rigid and will not deviate from a straight line path over the conveyor belt 24.

The holding means just described permits placement of labels or the like on the side surfaces of bottles, as at 6 and 7, while the bottles are held in a spotted position. The use of the upper belt 272 to hold the bottles in an oriented position provides more available working space on the side surface of the bottles to attach a label or the like.

The timing mechanism for feeding bottles to the spotter, previously described, can be adjusted to provide power to drive the spotter device, the conveyor belt and the holding device for a period of time sufficiently long enough to allow a bottle to pass completely through the spotter and the holding device.

Finally, holding means similar to that described above and shown in FIG. 13 may be positioned on opposite sides of the conveyor belt 24. Such a construction would be quite similar to that shown for FIG. 13 except that endless belts would be positioned on opposite sides of the conveyor belt 24. The belts would be synchronized with each other and with the conveyor belt 24 to hold the bottles, as at 6 and 7, in a spotted position on the belt 24.

I claim:

1. An article-spotting device for transporting articles in a forward direction along an article path and for orienting said articles by coacting with a spot on each of said articles, said device comprising, in combination:

a. means for driving said articles in the forward direction along said path, said means being positioned at one side of said path, said means comprising an endless chain having a run parallel with said article path and including a plurality of spaced article-engaging means, each of said spaced article-engaging means cooperable with an article to push said article along said path;

b. means for providing torque to each of said articles about an axis substantially perpendicular to the article path such that said articles rotate about said axis prior to being spotted; and

c. means for sensing and engaging said spot on each of said articles, said means for sensing and engaging being attached to and moving simultaneously with said means for driving said articles, said means for driving and said means for sensing and engaging being positioned on the same side of said path.

2. The device of claim 1 including means for metering the spacing of articles along said path prior to engagement of articles by said means for driving.

3. The device of claim 2 wherein said means for metering include a star wheel assembly for spacing and feeding articles to said spotting device.

4. The device of claim 2 wherein said metering means and said means for driving are driven in synchronization from a common power source.

5. The device of claim 2 wherein said metering means includes clutch means and brake means adapted to prevent said metering means from feeding articles to said spotting device.

6. The device of claim 5 wherein said brake means comprises a brake for engaging said metering means and said clutch means includes a first plate connected with said metering means, a second plate fixed to said power source and spring-biased locking elements in one of said plates engaging receptacles in the other of said plates whenever said brake is released.

7. The device of claim 1 including control means for starting said device whenever at least one article is positioned in said article path and for stopping said device whenever at least one article is not positioned in said path.

8. The device of claim 7 wherein said control means include switching means actuated by passage of a bottle along said path prior to engagement of the article by said means for driving.

9. The device of claim 7 including metering means for spacing said articles prior to engagement of articles by means for driving.

10. The device of claim 9 wherein said control means provides power to said means for driving and for a predetermined period to time, said period of time being substantially equal to the time required for an article to pass through said spotting device along said path, said period of time being initiated by sensing of an article passing along said path by said control means.

11. The device of claim 10 wherein said control means activates said metering means for a shorter period of time than said means for driving.

12. The device of claim 1 wherein said means for driving comprises an endless upper chain and an endless lower chain, each chain having runs parallel to the path, said runs being

substantially vertically disposed one above the other, and spaced articlelengaging means attached to each chain to cooperatively engage and move articles along said path.

13. The device of claim 1 including a chain support parallel to said path for guiding and supporting each of said chains in a substantially straight run parallel to said article path.

14. The device of claim 1 wherein said means for providing torque include at least one friction rail parallel with said path and on the side opposite said means for sensing and engaging.

15. The device of claim 14 including first and second friction rails which are movable to engage scruff rails of an article moving along said path.

16. The device of claim 1 including means for adjusting and tensioning said chains.

17. The device of claim 1 including means for holding said articles in a spotted position upon spotting of said articles and upon discharge from said device forward forward of said device.

18. The device of claim 17 wherein said means for holding said articles in a spotted position comprise an endless belt adapted to engage the tops of said articles and move in the forward direction at the same speed as said articles move along said article path.

19. The device of claim 1 wherein said means for driving said articles in a forward direction include conveyor means, said conveyor means having a speed equal to the speed equal of said means for driving said articles in a forward direction.

20. An article-spotting device for transporting articles in a forward direction along an article path and for orienting said articles by coacting with a spot on each of said articles, said device comprising, in combination:

a. means for driving said articles in the forward direction along said path, said means being positioned at one side of said path;

b. means for providing torque to each of said articles about an axis substantially perpendicular to the article path such that said articles rotate about said axis prior to being spotted; and

c. means for sensing and engaging said spot on each of said articles, said means for sensing and engaging being attached to and moving simultaneously with said means for driving said articles, said means for driving and said means for sensing and engaging being positioned on the said same side of said path, said means for sensing and engaging including lug means attached to said means for driving said articles, said lug means being biased to engage said spot whenever said means for driving positions said lug adjacent said path.

21. The device of claim 20 including means for metering the spacing of articles along said path prior to engagement of articles by said means for driving.

22. The device of claim 20 including control means for starting said device whenever at least one article is positioned in said article path and for stopping said device whenever at least one article is not positioned in said path.

23. The device of claim 20 wherein said means for providing torque include at least one friction rail parallel with said path and on the side opposite said means for sensing and engaging.

24. The device of claim 20 including means for holding said articles in a spotted position upon spotting of said article and upon discharge from said device forward of said device.

25. The device of claim 20 wherein said means for driving include at least one endless chain and said lug means are attached to one of said endless chains, such that said lugs are positioned to engage said spot.

26. The device of claim 20 wherein said lug means comprises a biased lug member having a spot engaging end and an opposite end, said opposite end being attached to said means for driving, said lug being biased about said opposite end for engagement with said spot.

27. The device of claim 26 including a roller attached to said spot engaging end of said lug, said roller adapted to roll freely on the surface of an article and engage said spot.

28. The device of claim 26 including a lug guide mounted substantially parallel to said path, and wherein said lug includes means for engaging said guide, said guide being adapted to bias said lug out of engagement with said spot.

29. The device of claim 28 wherein said guide is positioned to restrain engagement of said lug and spot at the rearward end of said path.