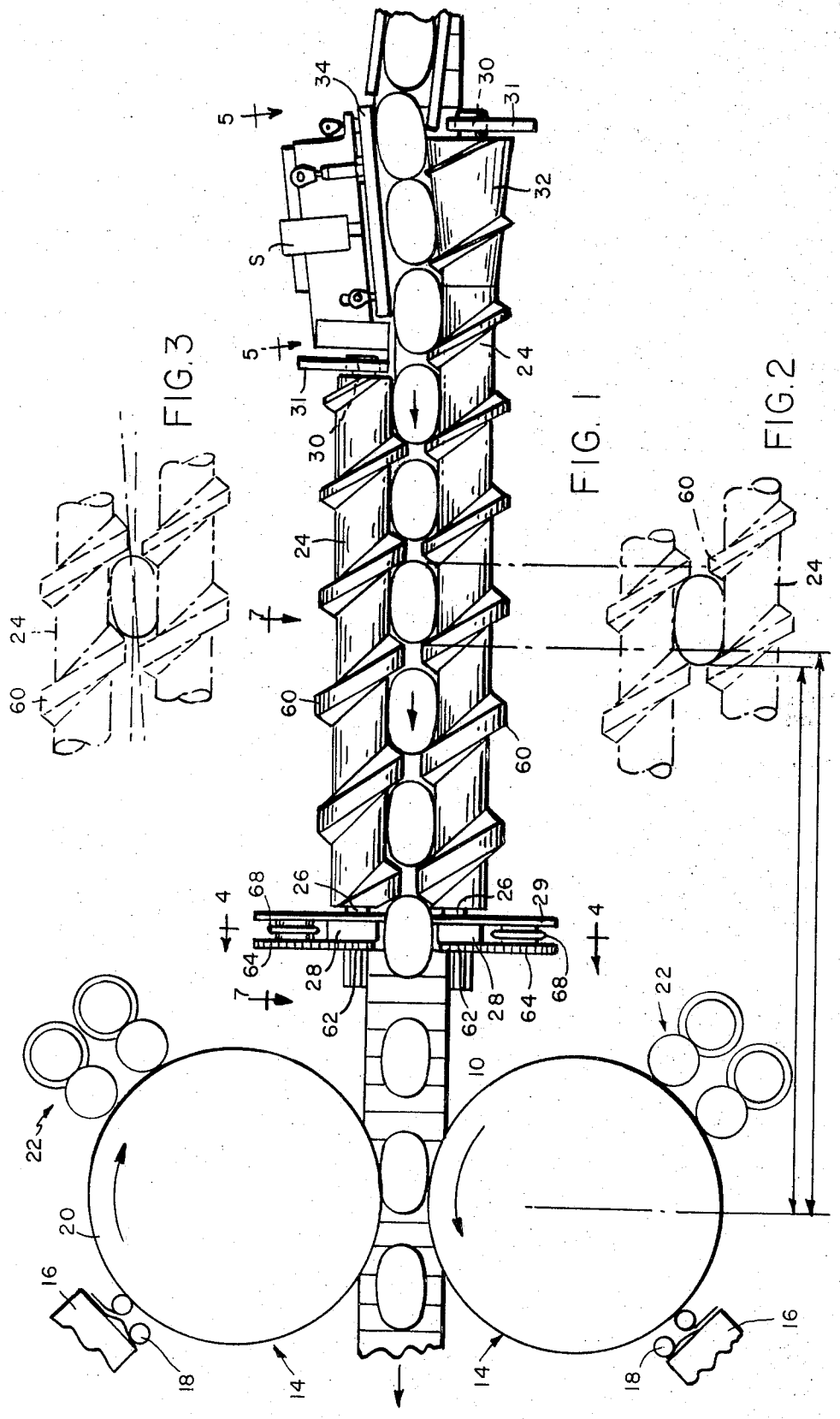
Oct. 15, 1974 S. T. CARTER 3,841,946

HELICAL FEED SCREWS FOR CONTAINER PROCESSING MACHINERY

Filed Dec. 18, 1972

4 Sheets-Sheet 1



HELICAL FEED SCREWS FOR CONTAINER PROCESSING MACHINERY

Filed Dec. 18, 1972

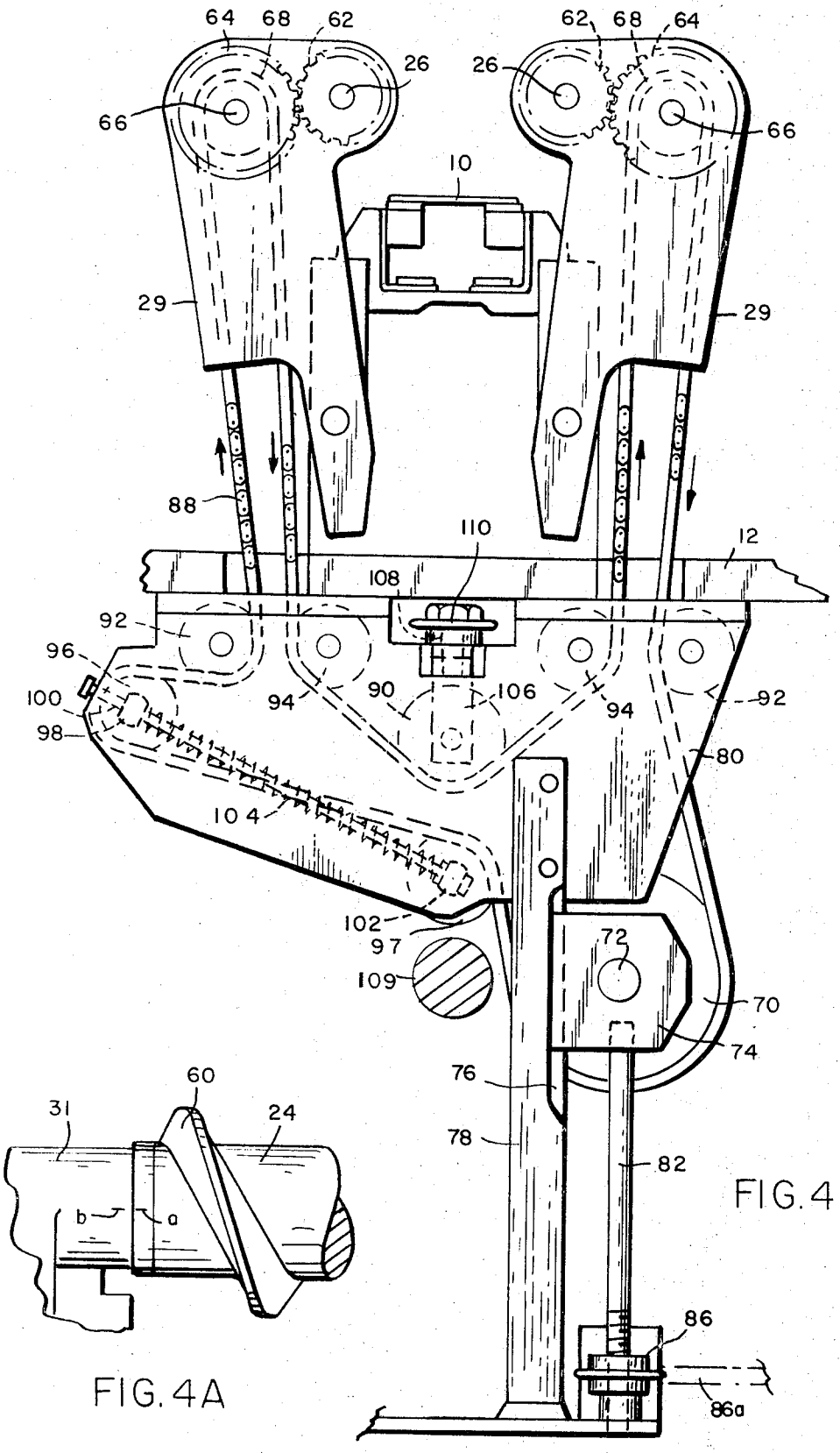


FIG. 4

FIG. 4A

Oct. 15, 1974 S. T. CARTER 3,841,946

HELICAL FEED SCREWS FOR CONTAINER PROCESSING MACHINERY

Filed Dec. 18, 1972 4 Sheets-Sheet 3

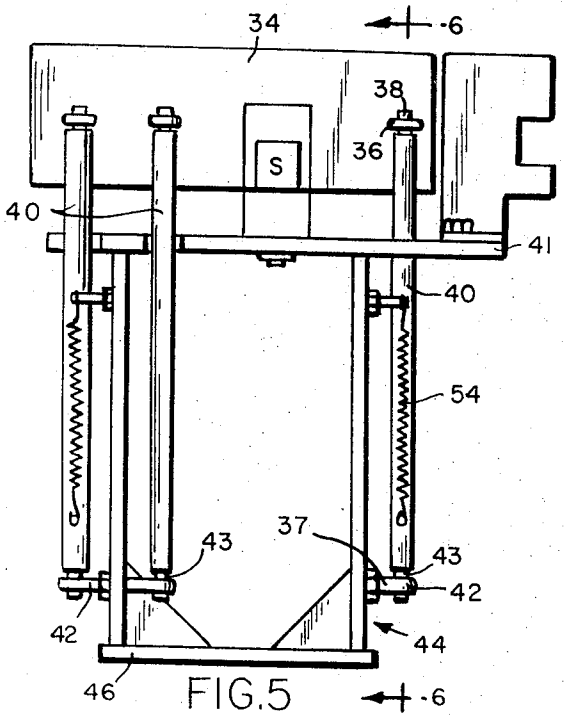


FIG.5

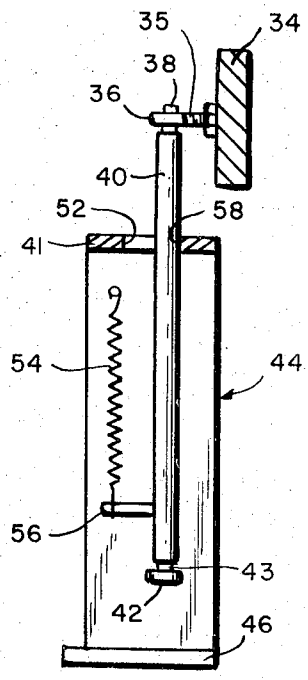


FIG.6

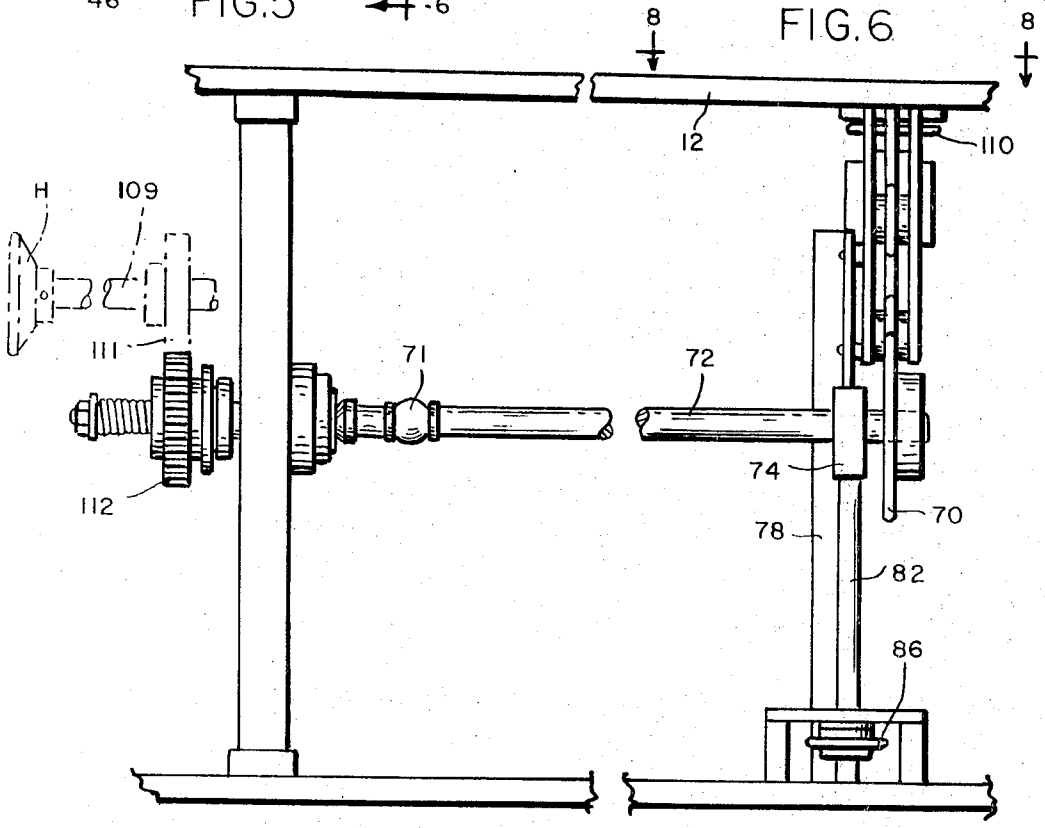


FIG. 7

Oct. 15, 1974 S. T. CARTER 3,841,946

HELICAL FEED SCREWS FOR CONTAINER PROCESSING MACHINERY

Filed Dec. 18, 1972 4 Sheets-Sheet 4

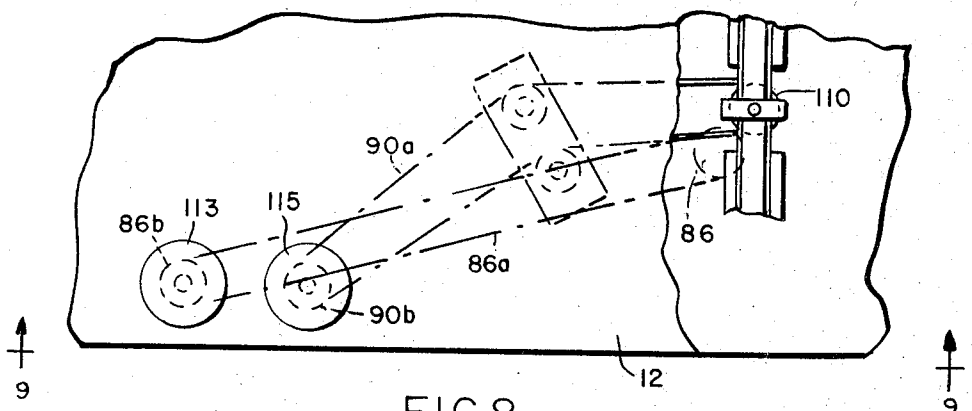


FIG.8

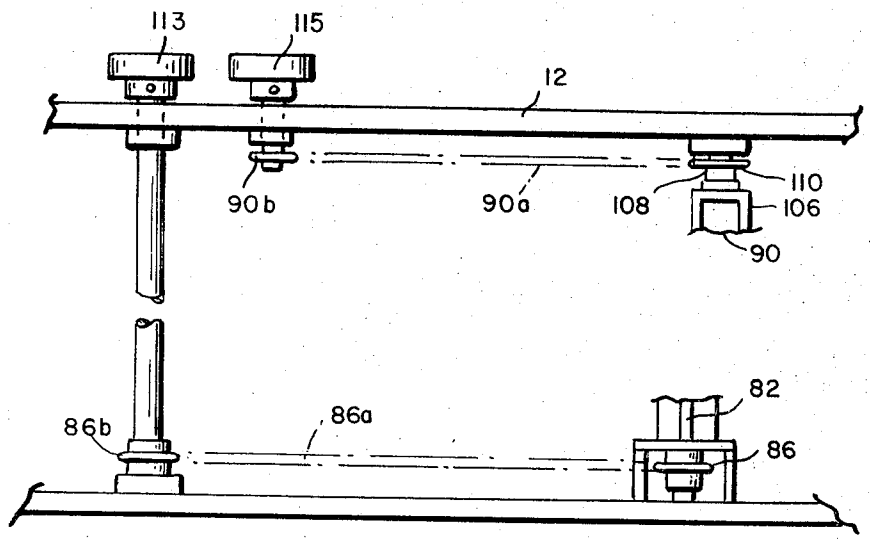


FIG.9

United States Patent Office 3,841,946
Patented Oct. 15, 1974

3,841,946

HELICAL FEED SCREWS FOR CONTAINER PROCESSING MACHINERY

Sidney T. Carter, Shrewsbury, Mass., assignor to A-T-O Inc., Cleveland, Ohio

Filed Dec. 18, 1972, Ser. No. 315,795
Int. Cl. B65c 9/06
U.S. Cl. 156—566 13 Claims

ABSTRACT OF THE DISCLOSURE

The combination with labeling apparatus, of a pair of spaced parallel helical screws mounted in fixed bearings cooperative to arrange containers, moving along on a conveyor to a labeling station whre there are labeling instrumentalities, at a spacing corresponding to the intervals between labeling operations and driving connections connecting the two screws to a source of power for effecting rotation of the screws, said driving connections being adapted, on the one hand, to displace the helices of the screws in consonance relative to the station to advance or retract the line of containers relative to the operating station and, on the other hand, to displace the helix of one screw relative to the other to orient the containers about their vertical axes.

BACKGROUND OF THE INVENTION

The use of helical screws for spacing containers in predetermined spaced relation while travelling along on a conveyor toward an operating station, for example a station for applying labels to bottles or containers, is well-known in the art. Ordinarily such screws are mounted in fixed bearings and when it becomes necessary to change the timing of presentation of the containers to the label-applying instrumentalities, for example, to shift the position of application of labels to the containers, it is necessary to unbolt these bearings and reposition them, an operation which is time consuming and results in down-time in the use of the machine. Additionally, because the containers may not be of symmetrical cross-section it may be necessary to adjust one of the screws relative to the other that is, to advance the helix of one screw relative to the helix of the other to properly accommodate the unsymmetrical shape of the containers to the space between helices and when this is the case there is the added problem of not only detaching the supporting bearings for the screws but also of shifting them relative to each other. The purpose of this invention is to make it possible to move the helices of the two screws relative to the support on which the containers are travelling to advance or retract the line of containers relative to the label-applying station to enable adjusting the arrival of the containers at the label-applying station with the operation of the label-applying instrumentalities at the station without having to dismount the screws and also to enable adjusting one screw relative to the other for containers of different non-symmetrical cross-section.

SUMMARY

As herein illustrated, the invention comprises spaced parallel helical feed screws cooperative to arrange containers moving along a support in single file at a predetermined spacing, means supporting the screws between longitudinally spaced fixed bearings at their ends, drive means connected to the screws for effecting rotation thereof, and means associated with the drive means for effecting longitudinal displacement of the helices of the two screws relative to the support and to each other. The support comprises a conveyor for moving the containers to a station, for example, for the application of labels

thereto wherein the screws are arranged above the support and the means embodied in the drive for moving the helices on the screws relative to the station is for the purpose of adjusting the arrival of the containers at the station in timed relation to the label operation and for movement relative to each other for the purpose of orienting the containers about their vertical axes. The screws are rotated by driven sprockets drivingly connected thereto, a drive sprocket, a chain extending about the sprockets, an idler sprocket yieldably supported between one of the driven sprockets and the drive sprocket over which a loop of the chain passes on its way from the one driven sprocket to the drive sprocket, and means mounting the drive sprocket for vertical movement relative to the driven sprockets. There is an idler sprocket situated intermediate the driven sprockets over which the chain travels from one of the driven sprockets downwardly to the idler sprocket and from which it travels upwardly to the other driven sprocket, and there is means mounting the idler sprocket for vertical movement relative to said driven sprockets.

The invention will now be described in greater detail with reference to the accompanying drawings wherein:

FIG. 1 is a plan view showing the screws in their relation to the label-applying apparatus and a conveyor on which the containers are advanced to the label-applying apparatus for the application of labels;

FIG. 2 is a fragmentary elevation showing displacement of the helices of the screws forwardly relative to the label-applying instrumentalities;

FIG. 3 is a view corresponding to FIG. 2 showing the helix of one screw advanced forwardly relative to the helix of the other screw;

FIG. 4 is a view taken on the line **4—4** of FIG. 1;

FIG. 4*a* is a fragmentary elevation showing the bearing at one end of one of the screws and the aligning marks thereon;

FIG. 5 is a view taken on the line **5—5** of FIG. 1;

FIG. 6 is a section taken on the line **6—6** of FIG. 5;

FIG. 7 is an elevation taken on the line **7—7** of FIG. 1;

FIG. 8 is a fragmentary plan view taken on the line **8—8** of FIG. 7; and

FIG. 9 is an elevation taken on the line **9—9** of FIG. 8.

Referring to FIGS. 1 and 4, there is shown the upper run **10** of a conveyor supported above a table **12** for movement toward labeling instrumentalities **14—14** mounted on the table at opposite sides of the conveyor for applying labels to containers, advanced thereto by the conveyor **10**. The label-applying instrumentalities include magazines **16—16** from which labels are picked by picking means **18—18** which pick the labels from the magazine and supply them to turrets **20—20** which carry the successive labels past adhesive-applying rollers **22—22** for application of adhesive to their surfaces and then into engagement with the containers on the conveyor. The label-applying instrumentalities **14—14** are positioned at both sides of the conveyor so as to apply labels to both sides at the same time.

In order to present the containers to the label-applying instrumentalities in predetermined spaced relation a pair of helical screws **24—24** are mounted above the conveyor **10** on spaced parallel, longitudinally extending shafts **26—26**. The shafts **26—26** are journaled at their opposite ends in fixed bearing members **28—28** and **30—30**. The bearing members **28—28** are mounted above the table at the upper ends of plates **29—29** and the bearings members **30—30** are mounted at the upper ends of plates **31—31**.

One of the screws **24** (FIG. 1) is shorter than the other to provide for leading the containers into the space between the screws. The longer screw has at its receiving

end a conical portion **32**. Opposite the conical portion **32**, at the receiving end of the shorter screw and confronting the conical portion **32**, there is a yieldably mounted guide plate **34** which provides means for conducting the containers from the preceding operation into positions between the successive helices on the longer screw before they are moved into engagement with the helices on the shorter screw. The guide plate **34**, as shown in FIGS. 5 and 6, has studs **35** fixed to its rear side provided with eyes **36** by means of which the guide plate **34** is mounted on pins **38** fixed to the upper ends of posts **40**. The posts **40** extend downwardly through a plate **41** at the top of a rigid frame **44** mounted on the table and are pivotally supported at their lower ends in studs **37** fixed to the frame which have eyes **42**, in which the lower ends of the posts are pivotally supported by means of pins **43** at the lower ends of the posts. A base plate **46** at the lower end of the frame **44** provides means for fastening the frame to the table. The plate **41** contains openings **52** through which the posts project. Springs **54** connected at their lower ends to pins **56** fastened to the posts and at their upper ends to the frame **44** bias the posts in a clockwise direction as shown in FIG. 6 toward the conical portion of the screw so as to hold the guide surface at a predetermined distance from the screw which will lead the containers into the helix of the screw and which will yield in the event that any container becomes jammed. The spacing is determined by engagement of the posts with the ends **58** of the openings **52**.

The screws **24—24** (FIG. 1) have helical threads **60** and these threads as the screws are rotated in the same direction serve to space the containers at a predetermined uniform spacing.

The screws **24—24** are driven by meshing gears (FIG. 4) comprising gears **62—62** fixed to the shafts **26—26**, gears **64—64** fixed to the shafts **66—66** mounted in the bearing members **28—28**, driven sprockets **68—68** fixed to the gears **64—64** and a common drive sprocket **70** which is driven by a shaft **72** (FIG. 7) mounted in a bearing block **74**, the latter being mounted for vertical movement in a vertically extending track **76** provided at one side of a post **78** fixed at its lower end to the base of the machine and at its upper end to a bearing plate **80** fastened to and extending downwardly from the underside of the table **12**. The shaft **72** contains a flexible coupling **71** (FIG. 7) which permits the bearing block **74** and hence the sprocket to be moved up and down the required amount without interruption of the drive. The bearing block **74** is adapted to be moved vertically by means of a screw **82**, the upper end of which is threaded into the bearing block **74** and the lower end of which has fastened to it a sprocket **86** (FIGS. 4 and 7) about which one end of a chain **86***a* (FIGS. 8 and 9) is entrained. Rotation of the driven sprockets **68—68** is effected by a chain **88** entrained about these sprockets, the drive sprocket **70** and a number of idler sprockets, the latter comprising an idler sprocket **90** (FIG. 4) mounted at the underside of the table midway between the sprockets **68—68** and two pairs of idler sprockets **92—92** and **94—94** also mounted at the underside of the table **12** at opposite sides of the idler sprocket **90** and symmetrically with respect thereto. The portions of the chain **88** entrained about the sprockets **68—68** travel downwardly through suitable openings in the table between the sprockets **92**, **94** of the pairs of sprockets, the inner runs comprising a continuous loop which extends about the outer sides of the sprockets **94—94** and the sprocket **90**. The outer runs extend from the sprocket **68** at the right-hand side of the machine, as shown in FIG. 4, directly downwardly about the inner side of the sprocket **92** and around the drive sprocket **70**. The outer run of the chain at the left-hand side also extends downwardly about the inner side of the sprocket **92** but in contrast to that at the right-hand side travels about a yieldably mounted sprocket **96** and a fixed sprocket **97** on its way to the drive sprocket **70** so as to form a loop in the chain between the sprocket **92** and the sprocket **70**. The sprocket **96** is mounted on a block **98** which is slidably mounted at the distal end of a rod **100**. The rod **100** is pivotally mounted at its proximal end on a stub shaft **102** on which there is also mounted the sprocket **97**. A coil spring **104** on the rod holds the sprocket **96** at the distal end thereof.

The idler sprocket **90** (FIGS. 4 and 9) is supported by a block **106**, the upper end of which is connected to the lower end of a screw **108**. The upper end of the screw is threaded into the hub of a sprocket **110** so that by rotation of the sprocket **110** the screw **108** can be moved vertically and thus effect vertical movement of the idler sprocket **90**.

When the drive sprocket **70** is moved vertically the yieldably mounted sprocket **96** which is spring-loaded allows the entire chain to be moved in one direction or the other. Downward movement rotates the sprockets **64—64** in a clockwise direction which advances the helices of the screws **24—24**, as shown in FIG. 4. When the drive sprocket **70** is moved upwardly the sprockets **64—64** are rotated in a counterclockwise direction and this retracts the helices of the feed screws. The displacement of the helices forwardly advances the entire line of containers forwardly relative to the label-applying station and displacement of the helices rearwardly retracts the entire line of containers relative to the label-applying station.

When the idler sprocket **90** is moved up and down only the sprocket **64** at the left side is rotated. Upward movement rotates the sprocket counterclockwise thus retracting the helix of the screw at that side and downward movement rotates the sprocket clockwise thus advancing the helix of the screw at the spring takeup side as shown in FIG. 3. The relative displacement of the helices of the screws rotates or twists the containers about their vertical axes in one direction or the other to accommodate the containers to the space between the helices.

Adjustment of the screws while the machine is moving is effected by control knobs **113**, **115** (FIGS. 8 and 9) on the table connected to the respective sprockets **86** and **110** by means of chains **86***a*, **90***a* and sprockets **86***b*, **90***b*.

When installing the screws at the infeed position on the machine it is advantageous that both sprockets **70** and **90** be in the midposition. This allows adjustment in either direction. Usually a mark *a* on each feed screw is lined up with a stationary mark *b* on one of the bearings (FIG. 4*a*). A hand wheel H (FIG. 7) is provided on the main shaft **109** (FIGS. 4 and 7) which is graduated in degrees for a specific set of screws. The shaft **109** is drivingly connected to the shaft **72** by gearing **111**, **112** so that by turning the shaft **72** the screws may be turned to align the marks *a* thereon with the bearing marks *b* (FIG. 4*a*). Since it is not possible to always be exact in marking these adjustments final adjustments are made by advancing or retracting the screws by means of the aforesaid control knobs **113**, **115**.

As illustrated in FIG. 2 containers or bottles being advanced in random to the labeling apparatus will not always match the lead thread of the screw and if a container should ride onto the middle of a thread it will displace the yieldable plate **34** which actuates a switch S to stop the machine.

While the adjustment of the screws has been described for use in combination with a label-applying machine it is within the scope of the invention to use it in combination with any machine requiring that containers be delivered thereto at a predetermined spacing and at a predetermined timing.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents falling within the scope of the appended claims.

I claim:

1. Apparatus comprising in combination with a station at which there are instrumentalities for applying labels to containers, a conveyor for moving the containers to the station and a pair of spaced parallel side-by-side helical screws supported above the conveyor for rotation about horizontal axes in longitudinally spaced fixed bearings, the helices of said screws cooperating to arrange the containers on the conveyor at a predetermined spacing as they travel along with the conveyor, drive means common to both screws for effecting rotation thereof in the same direction, first manually operable means connected with said common drive means operable to rotatably adjust the helices of the screws in consonance about their axes relative to said station and second manually operable means connected with said common drive means operable to rotatably adjust the helices of one of the screws relative to the other.

2. Apparatus according to claim 1, wherein said means for effecting rotation of the screws comprises first gears fixed to the screws, second gears meshing with the first gears, driven sprockets fixed to the second gears, a drive sprocket, a chain extending about the sprockets, an idler sprocket yieldably supported between one of the driven sprockets and the drive sprocket over which a loop of a chain passes on its way from said one driven sprocket to the drive sprocket and means mounting the drive sprocket for movement relative to the driven sprocket and wherein the first manually operable means operates to effect movement of the drive sprocket relative to the driven sprocket.

3. Apparatus according to claim 1, wherein said means for effecting rotation of the screws comprises driven wheels, rotation of which effects rotation of the screws, a drive wheel, a continuous elongate flexible member entrained about said wheels, rotation of the drive wheel being operable by way of said flexible member and driven wheels to impart rotation to said screws in the same direction, a yieldably mounted idler wheel situated between one of the driven wheels and the drive wheel about which a loop of the endless member is entrained and means supporting the drive wheel for movement relative to the driven wheels and wherein said first manually operable means operates to effect movement of the drive wheel relative to the driven wheels.

4. Apparatus according to claim 1, wherein the means for effecting rotation of the screws comprise gears, rotation of which effect rotation of the screws in the same direction, sprockets for effecting rotation of the gears, a drive sprocket, a chain entrained about said sprockets, a yieldably supported idler sprocket situated between one of said sprockets and the drive sprocket over which a loop of the chain passes and means for supporting the driven sprocket for movement relative to said one sprocket and wherein the first manually operable means operates to move the drive sprocket relative to said one sprocket.

5. Apparatus according to claim 1, wherein said means for effecting rotation of the screws comprise pairs of meshing gears, one gear of each pair being fixed to one of the screws, a driven sprocket fixed to the other gear of each of the pair of gears and a drive sprocket, a chain entrained about the sprockets, an idler situated between the sprockets about which a portion of the chain travels such that equal lengths of the chain run downwardly from one driven sprocket about the idler and upwardly from the idler to the other driven sprocket, a yieldably mounted idler sprocket situated between one of the driven sprockets and the drive sprocket about which a loop of the chain is entrained, and means for moving the drive sprocket relative to the driven sprockets, said means comprising said first manually operable means.

6. Apparatus according to claim 1, wherein said means for effecting rotation of the screws comprise pairs of meshing gears, one gear of each pair being fixed to one of the screws, a driven sprocket fixed to the other gear of each pair, a drive sprocket, idler sprockets supported between the first sprockets in symmetrical relation thereto such that equal lengths of chain extend from one of the driven sprockets to the idler sprocket and from the idler sprocket to the other of the driven sprockets, a yieldably mounted idler sprocket situated between one of the driven sprockets and the drive sprocket about which a loop of the chain passes, and means for effecting movement of the drive sprocket relative to the driven sprockets comprising said first manually operable means.

7. Apparatus according to claim 1, wherein the means for effecting rotation of the screws comprise pairs of meshing gears, one gear of each pair being fixed to one of the screws, first sprockets fixed to the other gears of each pair, a drive sprocket, second sprockets situated between the first sprockets about which the chain travels from one of the first sprockets to the other of the first sprockets, said second sprocket being so arranged that equal portions of the chain travel from one of the first sprockets to the second sprockets and from the second sprockets to the first sprockets, third sprockets situated between the first sprockets and the drive sprocket over which portions of the chain extend from the first sprockets to the drive sprocket, a yieldably mounted idler sprocket situated between one of the latter sprockets and the drive sprocket about which a loop of the chain travels, and means for effecting movement of the drive sprocket relative to the first sprockets, said means comprising said first manually operable means.

8. Apparatus according to claim 2, wherein said means for effecting rotation of the screws comprises a driven sprocket connected to each of said screws such that rotation of a driven sprockets effects rotation of the screws, a drive sprocket, a chain entrained about said sprockets, such that rotation of the drive sprocket effects rotation of the driven sprockets in the same direction, a first idler sprocket situated between the driven sprockets about which the chain passes from one to the other, a yieldably mounted second idler sprocket situated between one of the driven sprockets and the drive sprocket over which a loop of the chain passes and means for effecting movement of the first idler sprocket relative to the driven sprockets, said means comprising said second manually operable means.

9. Apparatus according to claim 8, wherein there is means mounting the first idler sprocket for movement relative to the driven sprockets and said second manually operable means effects movement of said mounting means.

10. Appaartus according to claim 2, wherein said means for effecting rotation of the screws comprises a driven sprocket connected to each of said screws such that rotation of the driven sprockets effects rotation of the screws, a drive sprocket, an endless chain entrained about the sprockets such that rotation of the drive sprocket imparts rotation to the driven sprockets to rotate the screws in the same direction, a first idler sprocket situated between the driven sprockets, about which a length of chain passes, so located that equal lengths of the chain extend from one driven sprocket to the idler and from the idler to the other driven sprocket, a yieldably mounted second idler sprocket situated between one of the driven sprockets and the drive sprocket about which a loop of the chain passes from the one driven sprocket to the drive sprocket and means for mounting the first idler sprocket for movement relative to the driven sprockets and wherein the second manually operable means is operable to effect movement of said mounting means.

11. Apparatus according to claim 1, wherein said first manually operable means effects movement of the drive sprocket relative to the driven sprocket.

12. Apparatus according to claim 3, wherein a rod supports the yieldably mounted idler sprockets, said yieldably mounted idler sprocket being slidable along the rod to-

ward the drive sprocket and a spring yieldably holds the idler sprocket at the distal end of the rod.

13. Apparatus comprising in combination a conveyor for moving containers along a predetermined path and a pair of spaced parallel feed screws supported above the conveyor and parallel thereto for receiving and leading containers moving along the conveyor in single file at a predetermined spacing, drive means connected to the screws for effecting rotation thereof in the same direction, first manually operable means operable to rotatably adjust the helices of the screws in consonance about their axes to effect longitudinal displacement of the helices relative to the conveyor and second manually operable means operable to rotatably adjust the helix of one of the screws relative to that of the other.

References Cited

UNITED STATES PATENTS

3,129,851	4/1964	Seymour et al.	222—412
3,377,000	4/1968	Mason, Jr.	222—412
2,571,036	10/1951	Heyne et al.	198—104
3,652,369	3/1972	Della Vite	156—566
3,323,635	6/1967	Atkinson	198—104

CHARLES E. VAN HORN, Primary Examiner

J. W. MASSIE, Assistant Examiner

U.S. Cl. X.R.

198—34, 89, 104