US00RE45025E

(19) **United States**

(12) **Reissued Patent**

Evers, Jr. et al.

(10) **Patent Number: US RE45,025 E**

(45) **Date of Reissued Patent: Jul. 22, 2014**

(54) **CONVEYOR ASSEMBLY**

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(21) Appl. No.: **11/010,250**

(22) Filed: **Dec. 10, 2004**

Related U.S. Patent Documents

Reissue of:

(64) Patent No.: **6,491,152**
Issued: **Dec. 10, 2002**
Appl. No.: **09/827,522**
Filed: **Apr. 9, 2001**

(51) **Int. Cl.**
B65G 47/24 (2006.01)

(52) **U.S. Cl.**
USPC **198/397.01**; 198/393

(58) **Field of Classification Search**
USPC 198/393, 396, 397.01, 397.06, 698, 198/397.05; 221/160
See application file for complete search history.

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(57) **ABSTRACT**

A conveying system for lifting and orienting bottle caps comprises a conveyer belt of articulated sections and with guide rollers with an upper lifting section having an essentially vertical path of travel and a lower loading section with an angled path of travel. Sprockets on the guide rollers effect movement of the belt in an upward path of travel through the lower section and then the upper section. Cleats are secured to the exterior surface of the conveyer **[**belts**]** *belt*. Supporting surfaces of the cleats extend at right angles from the exterior surface of the conveyer belt for retaining bottle caps thereon when the **[**upper**]** *top* surface of the bottle cap is in contact with the conveyer belt and the **[**lower edge thereof**]** *generally cylindrical perimeter of the bottle cap is* supported in a trough **[**of**]** *on* the supporting surfaces of the cleats **[**but to effect**]**. *The trough effects* the dropping **[**thereof when the**]** *of* bottle caps *that* are not in the proper orientation.

35 Claims, 7 Drawing Sheets

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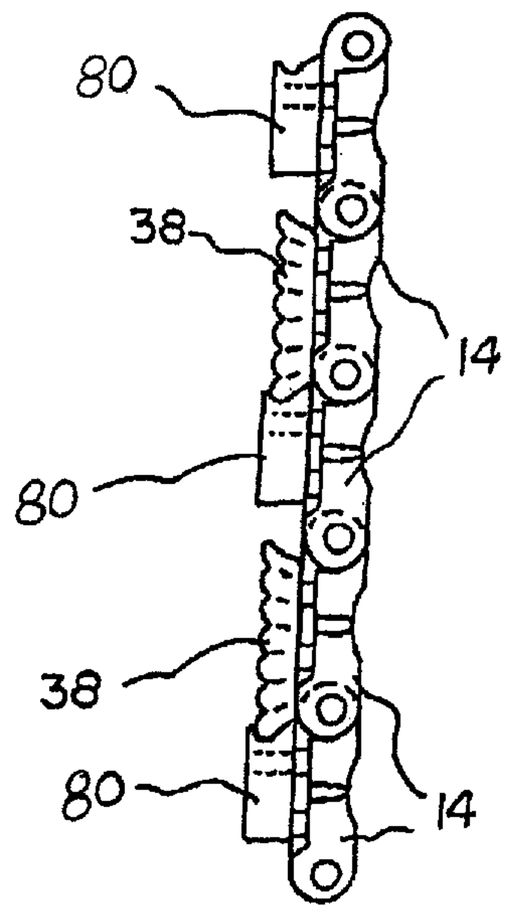

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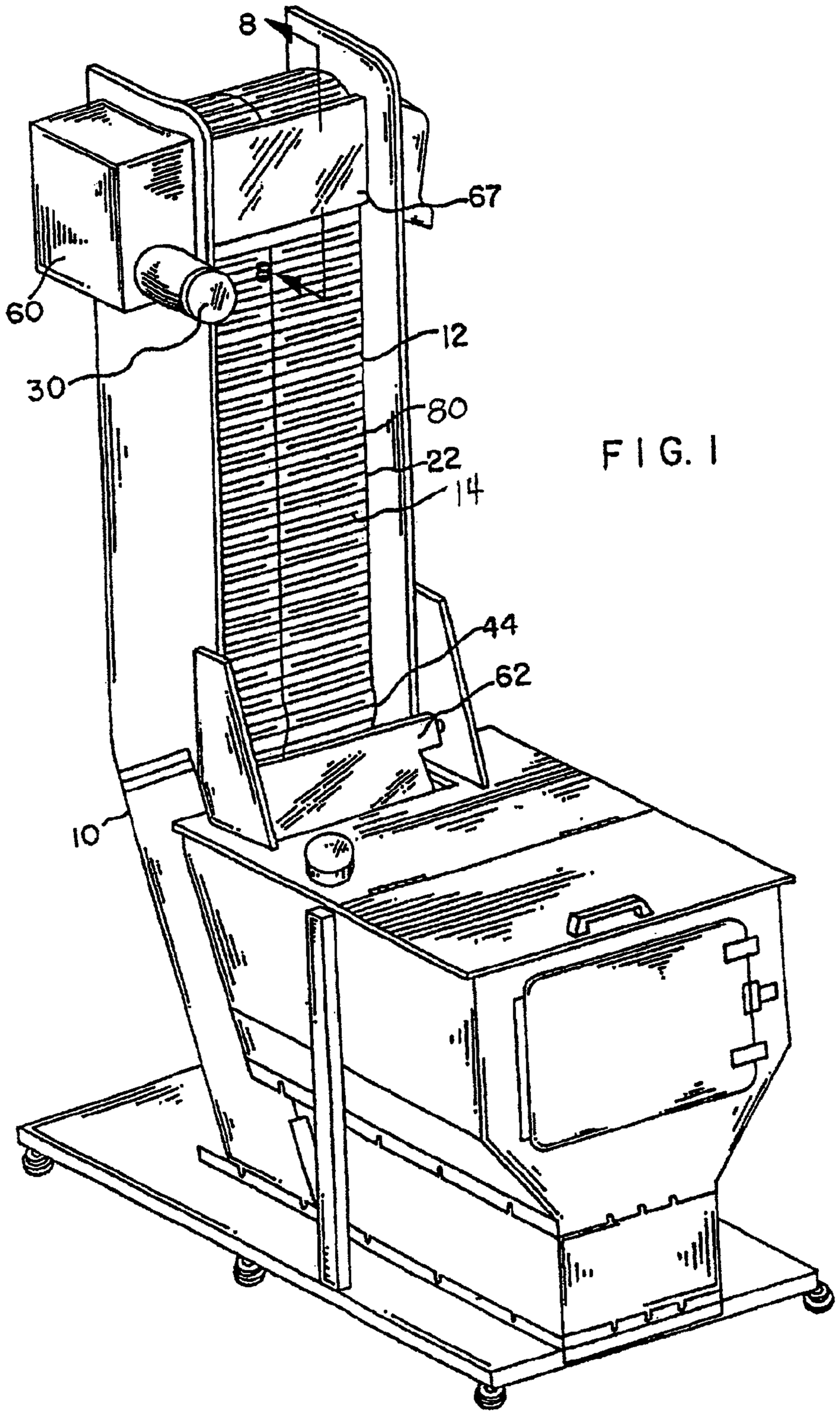

FIG. 1

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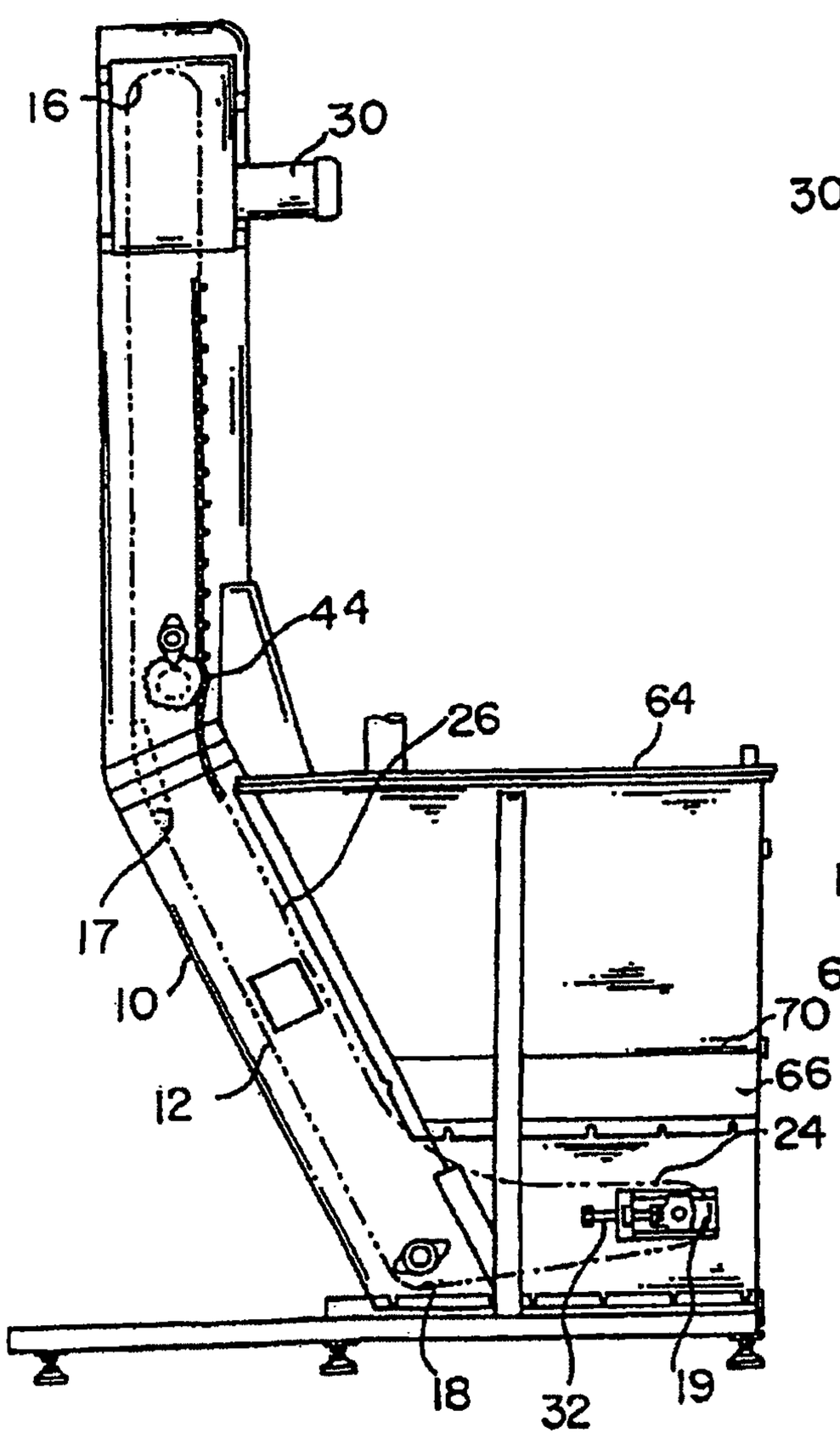

FIG. 2

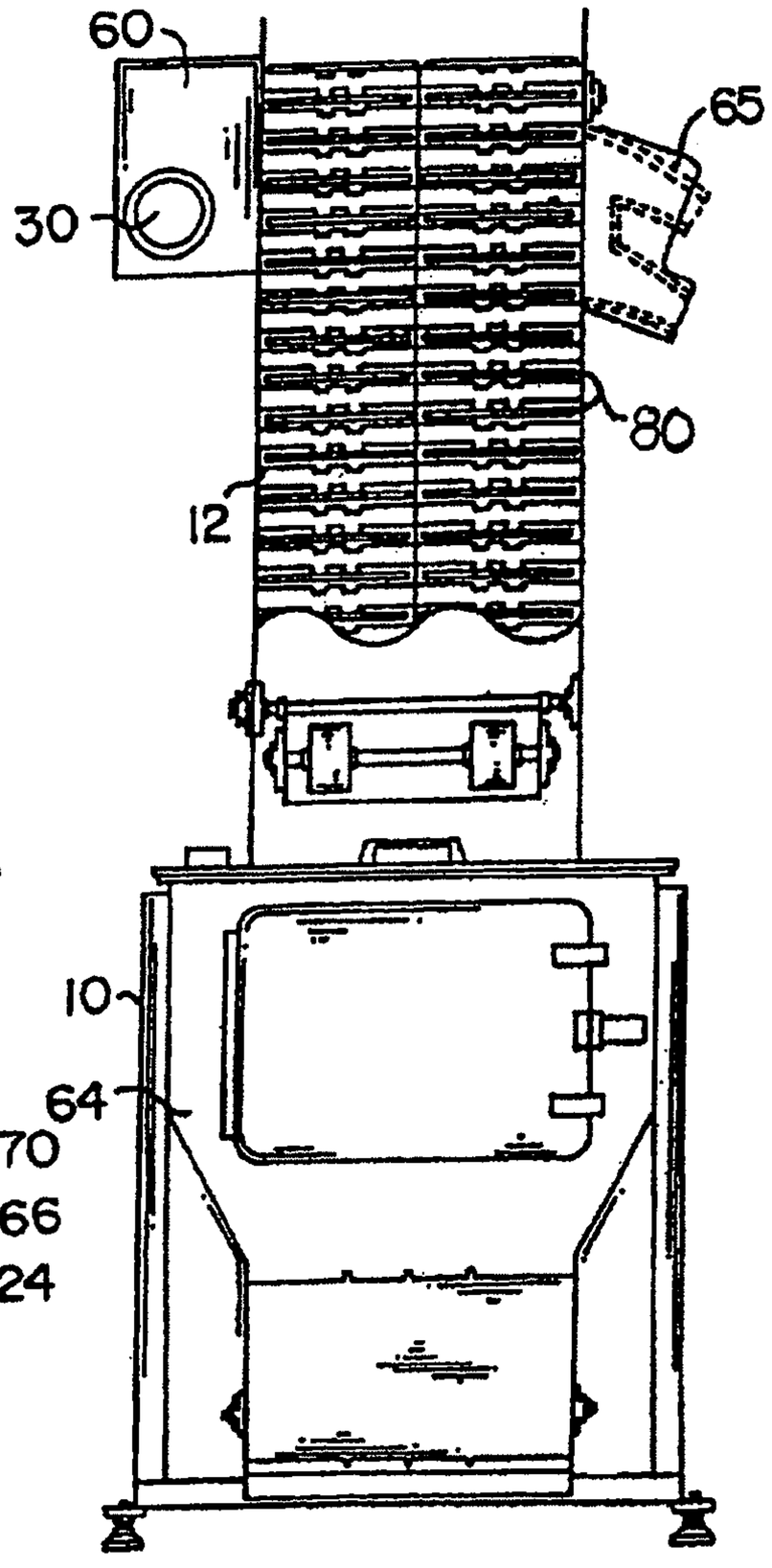

FIG. 3

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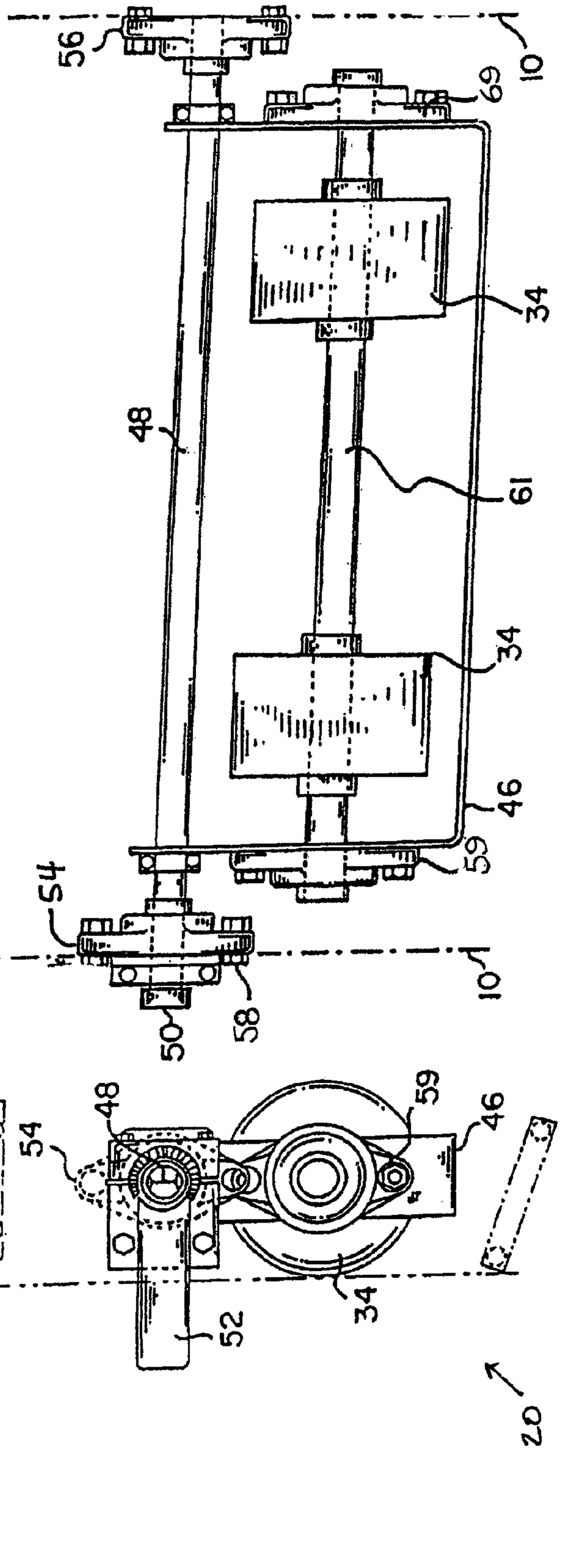

FIG. 5

FIG. 4

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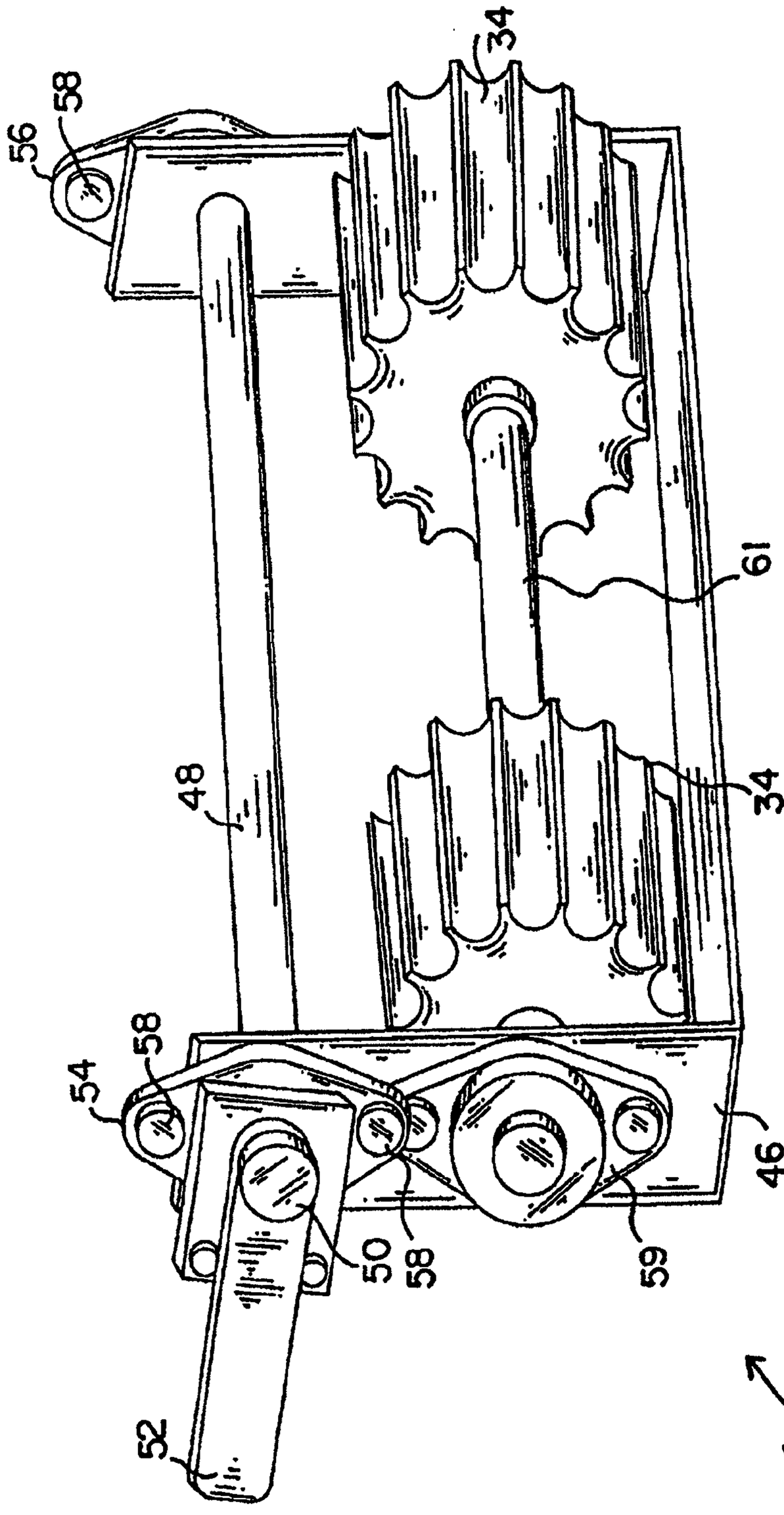

FIG. 6

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FIG 8

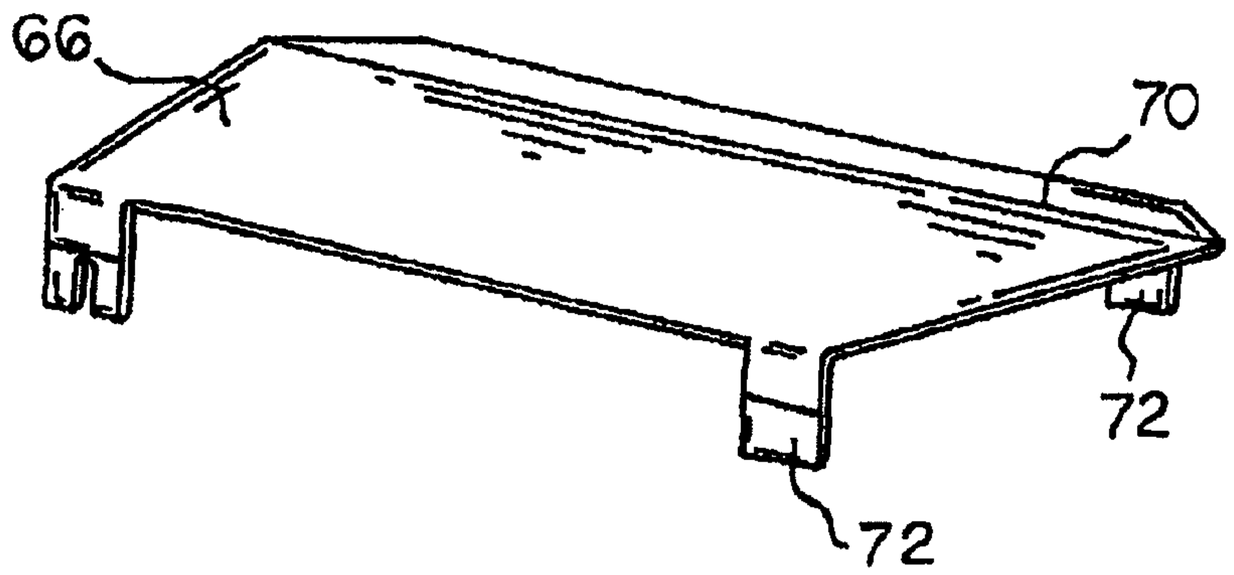
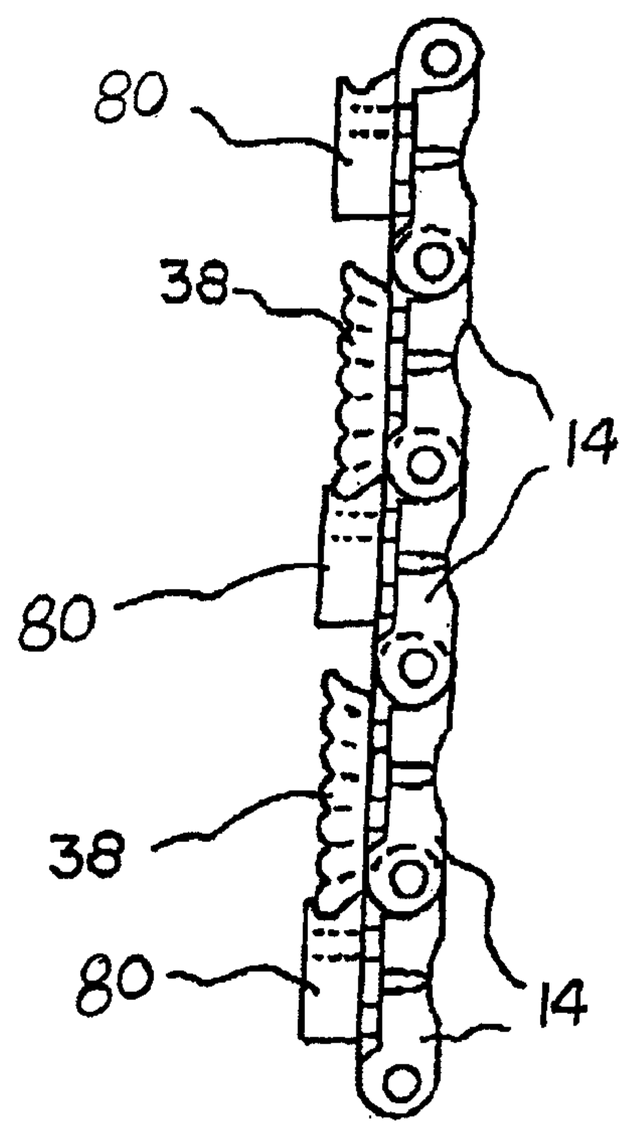


FIG 7



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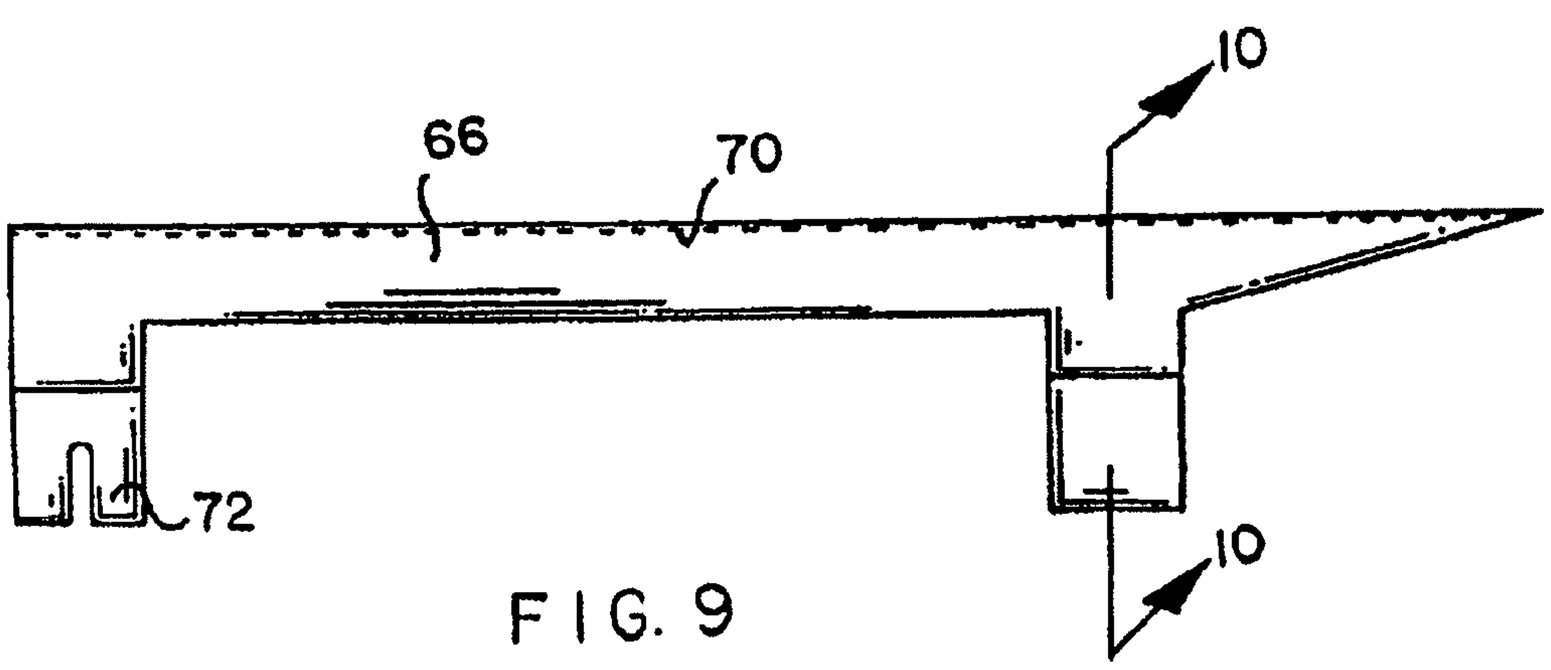

FIG. 9

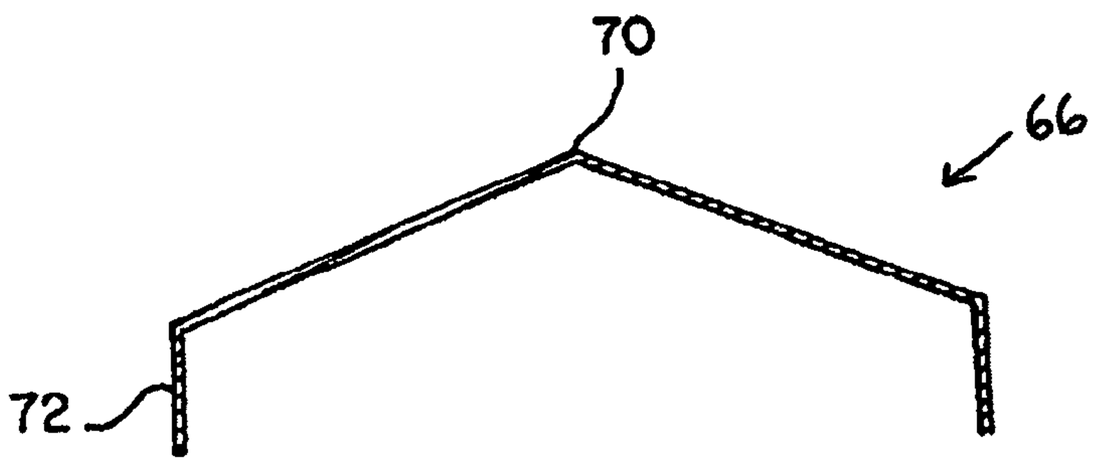

FIG. 10

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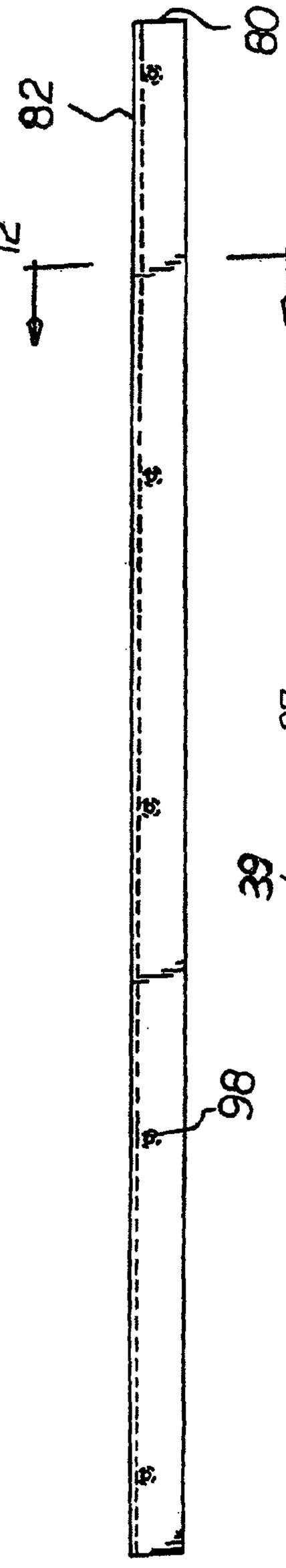

FIG 11

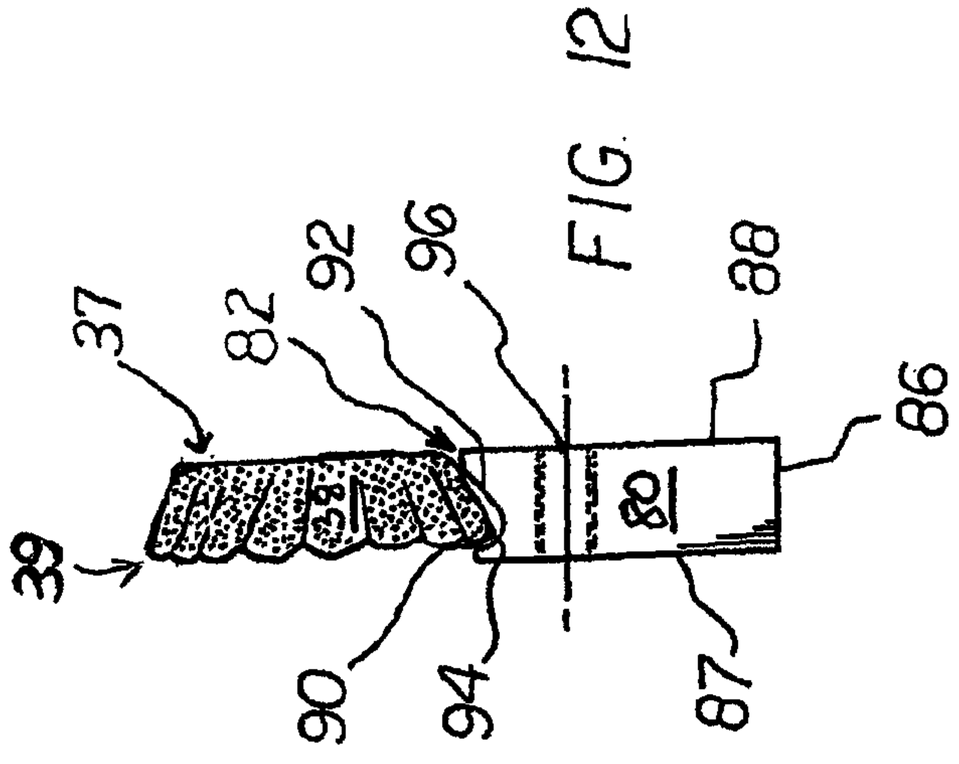

FIG 12

CONVEYOR ASSEMBLY

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a conveyor system for lifting and orienting bottle caps and more particularly, to lifting and orienting bottle caps through a conveyor with a lower loading zone and a vertical lifting zone which is [11] adjustable to the needs of the run.

2. Description of the Background Art

In the past, caps, container closures, and crowns with a diameter greater than height, were oriented during feeding by changing the angle of an inclined, cleated conveyor. This angle change caused incorrectly-oriented caps to fall from the cleat and back into a hopper at a loading zone. Incorrectly-oriented caps are considered to be those with the open side toward the conveyor belt. Correctly oriented caps are considered to be those having the open side away from the conveyor belt.

The standard for many years was to begin with an angle at about 25 [degree] *degrees* from the vertical angle for increased pickup of caps. The angle change was 20 degrees to an angle of 5 degrees from vertical. This method worked fine for large diameter closures. As the diameter of the closures being conveyed decreases, and the height also decreases, the angle change becomes critical [for] *in order to obtain a* consistent orientation. Several procedures were tried in attempts to compensate for this. The present invention is a device for varying the angle on all cleated, conveyor-style cap orientors and feeders. The assembly can be installed on an existing inclined, cleated, conveyor-type orientor *in order* to vary the angle.

It is, therefore, an object of this invention to provide an improvement which overcomes the aforementioned inadequacies of the prior art devices and provides an improvement which is a significant contribution to the advancement of the [oral inflation] art.

Another object of this invention is to provide a new and improved conveying system for lifting and orienting bottle caps comprising a conveyer belt which is formed of articulated sections and with guide rollers to support the belt with an upper lifting section having an essentially vertical path of travel and a lower loading section [with] *having* an angled path of travel. Also included are sprockets on the guide rollers to effect movement of the belt in an upward path of travel through the lower section and then the upper section. Further included is a plurality of cleats secured to the exterior surface of the conveyer belts. The cleats have supporting surfaces which extend at a generally right angles from the exterior surface of the conveyor belt, each cleat being of a generally rectangular cross section with an upper face and a lower face, and [with an interior face therebetween] *a front face and a rear face,* wherein the upper cap supporting surface [having] *has* a trough for retaining bottle caps thereon in a proper orientation when the [upper] *top* surface of the bottle cap is in contact with the conveyer belt and the [lower edge thereof supported on] *generally cylindrical perimeter of the bottle cap is in contact with* the supporting surfaces of the cleats [but to effect]. *The trough effects* the rejecting [thereof when the] *of* bottle caps *that* are not in the proper orientation. Also included is a supplemental sprocket in contact with the interior face of the conveyer belt in the lower extent of the upper section to form an outwardly directed bow in the belt and effect the removal, by gravity, of bottle caps not in the proper orientation. Further included are adjustment means to vary the extent of the bow as a function of the particular bottle cap being conveyed.

It is a further object of the invention to bow the lower end of a vertical conveyor for rejecting improperly oriented caps.

It is a further object of the invention to vary the extent of a conveyor bow as a function of the caps being conveyed.

The foregoing has outlined some of the pertinent objects of the invention. These objects should be construed to merely illustrative of some of the more prominent features and applications of the intended invention. Many other beneficial results can be attained by applying the disclosed invention in a different manner or modifying the invention within the scope of the disclosure. Accordingly, other objects and a fuller understanding of the invention and the detailed description of the preferred embodiment in addition to the scope of the invention defined by the claims taken in conjunction with the accompanying drawings.

SUMMARY OF THE INVENTION

For the purpose of summarizing [this invention], this invention comprises a new and improved conveying system for lifting and orienting bottle caps, container closures, and crowns, comprising a conveyer belt which is formed of articulated sections and with guide rollers to support the belt, with an upper lifting section having an essentially vertical path of travel and a lower loading section with an angled path of travel. Also included are sprockets on the guide rollers to effect movement of the belt in an upward path of travel through the lower section and then the upper section. Further included is a plurality of cleats secured to the exterior surface of the conveyer belts. The cleats have supporting surfaces which extend at a generally right angles from the exterior surface of the conveyer belt, each cleat being of a generally rectangular cross section with an upper face and a lower face, and [with an interior face therebetween] *a front face and a rear face,* wherein the upper cap supporting surface [having] *has* a trough with a sloped interior recess in contact with a lower hemispherical region for retaining bottle caps, container closures, and crowns thereon in a proper orientation when the [upper] *top* surface of the bottle cap is in contact with the conveyer belt and the [lower edge thereof supported on] *generally cylindrical perimeter of the bottle cap is in contact with* the supporting surfaces of the cleats [but to effect]. *The trough effects* the rejecting [thereof when the] *of* bottle caps *that* are not in the proper orientation. The lowermost extent of the hemispherical region being closer to the front face than to the rear face, the cleat also has a plurality of bores extending from the front face to the rear face where they can be coupled to the conveyer belt by means of a screw. Also included is a supplemental sprocket in contact with the interior face of the conveyer belt in the lower extent of the upper section to form an outwardly directed bow in the belt and effect the removal, by gravity, of bottle caps not in the proper orientation. Further included are adjustment means to vary the extent of the bow as a function of the particular bottle cap being conveyed. Further included is a plate positioned in close proximity to the cleats in the region of the conveyer belt beneath the bow whereby bottle caps on the conveyer belt may drop under gravity into the hopper due to the orientation of the bow. Still further included is a source of pressurized air adjacent to the upper extent of the upper section at one lateral

side of the belt to pneumatically urge bottle caps to the opposite lateral side of the belt with a chute to receive the pneumatically conveyed bottle caps while maintaining their proper orientation. A hopper is also included for a quantity of randomly oriented bottle caps adjacent to the lower section of the conveyer belt for the initial positioning of bottle caps on the conveyer belt prior to movement to the bow. Further included is a **[**shield**]** *baffle* which has a raised central extent, parallel with the direction of flow of the conveyor belt and positioned over the lower loading section, whereby bottle caps dropped thereon will limit movement of the caps onto the conveyor except at the leading edge of the plate.

The foregoing has outlined rather broadly the more pertinent and important features of the present invention in order that the detailed description of the invention that follows may be better understood *and* so that the present contribution to the art can be more fully appreciated. Additional features of the invention will be described hereinafter which form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and the specific embodiment disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be **[**had**]** *made* to the following detailed description taken in connection with the accompanying drawings in which:

FIG. **1** is a perspective illustration of the preferred embodiment of the new and improved conveying system for lifting and orienting bottle caps constructed in accordance with the principles of the present invention**[**,**]**.

FIG. **2** is a side elevational view of the device shown in FIG. **1**.

FIG. **3** is a front elevational view of the device shown in FIGS. **1** and **2** but with parts broken away to shown certain internal constructions.

FIG. **4** is an enlarged side elevational view of the mechanisms for adjusting the angle of *the* bow in the conveyor.

FIG. **5** is a front elevational view of the mechanism shown in FIG. **4**.

FIG. **6** is a perspective illustration of the mechanism shown in FIGS. **4** and **5**.

FIG. **7** is a cross sectional view taken along line **8-8** of FIG. **1**.

FIG. **8** is a perspective view of the plate positioned over the lower extent of the conveyor.

FIG. **9** is a side elevational view of the plate shown in FIG. **8**.

FIG. **10** is a cross sectional view taken along line **[**x-x**]** *10-10* of FIG. **9**.

FIG. **11** is side elevational view of the cleat of the present invention.

FIG. **12** is cross sectional view taken along line **12-12** of FIG. **11**.

Similar reference characters refer to similar parts throughout the several views of the drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention, the new and improved conveying system for lifting and orienting bottle caps, is comprised of a plurality of components. In their broadest context, such components include a conveyor belt, sprockets to effect the movement of the belt, a plurality of cleats on the surface of the belt, a supplemental sprocket for creating a bow, adjustment means for varying the extent of the bow, a keeper to maintain the bow at a predetermined configuration, a source of pressurized air at the upper extent of the belt, a guide at the edge of the belt to receive caps, a **[**shield**]** *baffle* to preclude the direct dropping of caps onto the belt, and a plate to preclude falling caps from inadvertently removing properly oriented caps. Such components are specifically configured and correlated with respect to each other to attain the desired objectives.

More specifically, the main component of the system is a housing **10** adapted to support a conveyor belt **12** constrained for movement in a predetermined path of travel. The conveyor belt *12, shown in FIGS. 1, 2, and 3* is formed of articulated sections **14** coupled with respect to each other along lines perpendicular to the path of travel. Rotatable rollers and ultra-high molecular weight guides **[16, 17, 18** and **19]** support the belt in a configuration to constitute an upper lifting section **22** having an essentially vertical path of travel and a lower loading section **24 [**with**]** *having* an angled path of travel slightly offset from the horizontal. An intermediate section **26** is located between the upper and lower sections. The upper guide roller **16** is driven by a motor **30** while the remaining guide rollers and ultra high molecular weight guides are idlers *17, 18, 19* for **[**go**]** movement **[**as**]** caused by the belt *12* being driven by the drive roller *16*.

An adjustment device **32** is secured to the housing **10** and is coupled **[**with regard**]** to the roller *19* beneath the lower section *24, as shown in FIG. 2,* to maintain a proper tension on the belt *12* during operation and use.

A pair of sprockets **[34]** are located on each of the guide rollers *16, 17, 18, 19* to effect movement of the belt *12* in an upward path of travel through the lower section *24*, intermediate section *26,* and then the upper section *22*.

Located on the exterior surface of the conveyor belt *12* are a plurality of cleats *80*. Each cleat *80* extends laterally across essentially the entire width of the belt *12*. **[**They**]** *The cleats 80* are spaced in the direction of the path of travel to receive a bottle cap **38** thereon. Each cleat *80, as shown in FIGS. 11 and 12,* has a supporting surface *82* extending at *a* right **[**angles**]** *angle* from the exterior surface of the conveyor belt *12*. It is this surface *82* which retains bottle caps *38* thereon by gravity in a proper orientation when the **[**upper**]** *top* surface *37* of the bottle cap *38* is in contact with the conveyor belt *12*. In such proper orientation, the *generally* cylindrical **[**edge**]** *perimeter 39* of the cap *38* is in contact with the **[**horizontal**]** *supporting* surface *82* of the cleat **[**with**]** *80 while* the **[**closed flat face**]** *top surface 37* of the cap *38 is* in contact with the belt *12*. When so properly oriented, the caps *38* may be elevated through the upper section *22* of the belt *12* in a vertical orientation. When not properly oriented, the bottle caps *38* will simply fall by gravity from the surface of the belt *12* away from the cleat *80* when entering the upper lifting section *22* of the conveyor.

In order to ensure proper orientation of the bottle caps *38* on the conveyor belt **[**for**]** *12 while* being elevated, supplemental sprockets **34** are provided at the **[**lower most**]** *lowermost* extent of the upper lifting section *22*. Such sprocket *34* is in contact with the interior face of the conveyor belt *12* to form an **[**outwardly**]** *outward* bow **44** in the belt *12*. It is this bow *44* which ensures **[**that there is effected**]** the removal, by gravity, of bottle caps not in the proper orientation. An adjustment assembly *20* is provided to vary the extent of the bow *44* as a function of the particular bottle cap being conveyed.

[Such] *The* adjustment [mechanism] *assembly 20, shown in FIGS. 4, 5, and 6,* is in the form of a U-shaped bracket **46** with parallel vertical walls and a lower horizontal wall therebetween. The bracket *46* is supported for rotational motion about the axis of a supporting rod **48** at the upper extent of the vertical walls. The rod **48** extends through the vertical brackets with one end **50** being provided with an adjustment lever **52** [for manual rotation]. *Rotation* of the lever [and] *52 about* the rod [which] *48* functions to vary the angular position of the sprockets *34* with respect to the housing **10** and, hence, *vary the extent of* the bow *44*.

As can be best seen in FIG. **4**, taken in combination with FIGS. **5** and **6**, the ends of the rod **48** are secured by releasable collars **54** and **56**. The collars *54, 56* are fixed to the housing *10*. Adjustment of a pair of bolts **58** on the collars *54, 56* allows loosening thereof for rotating the rod *48*. The rod *48, after* having been rotated to the proper orientation by the adjustment lever **52**, the bolts *58* are tightened to secure such orientation and sprocket positioning. The collars *54, 56* are secured to the end plates of the housing **10** of the conveyor assembly.

Supplemental collars **59**, *69* are on the exterior surfaces of the vertical plates of the U-shaped [member] *bracket 46*. The [rod] *shaft* **61** for the supplemental sprockets **34** extends therethrough. [It] *The shaft 61* is mounted in bearings for free rotation thereof. A conventional plastic keeper on the vertical side walls of the housing **10** in sliding contact with the exterior face of the belt ensures that the bow *44* will maintain its proper curvature during operation and use.

Located at the upper extent of the upper lifting section *22* is a source **60** of pressurized air. Such source is located at one lateral edge of the conveyor belt *12, as shown in FIGS. 1 and 3,* and tends to pneumatically eject supported bottle caps *38* to the opposed lateral edge of the conveyor. The opposite lateral edge is provided with a guide chute **65** whereby caps *38* moved laterally by the flow of air will enter the guide chute *65* for further movement. Such caps *38* are then in an elevated orientation for rolling along the chute *65*. They are also oriented for proper receipt at the next station of the system for further processing. In association therewith, a plate **67**, preferably a transparent plate, is in close proximity to the bottle caps *38* and flights to ensure the proper movement of the raised and oriented caps from the flights to the chute *65* for further handling.

Located in the path of travel of the conveyor, beyond the hopper *64*, is a plate **62**. Such plate *62, shown in FIG. 1,* is positioned in close proximity to the cleats *80* in the region of the conveyor belt *12* beneath the bow **44**. In this manner, bottle caps *38* on the conveyor belt *12* which are dropped by gravity therefrom at the bow *44* will fall back into the hopper *64* under the influence of gravity. The falling caps, however, will not contact and improperly drive caps from the cleats *80* which are already properly positioned. Such improper contact is precluded by the plate **62**.

Next, located adjacent to the lower loading section *24* of the conveyor is a hopper **64**. The hopper *64* is formed as a part of the housing *10*. The housing *10* functions to allow a quantity of caps *38* to be dumped to a location over the lower loading section *24* of the conveyor so that they may be entrained by the cleats *80* and moved in the upper path of travel. This is prior to movement of the caps *38* vertically in the upper lifting section *22*. Note FIGS. **1**, **2**, **3** and **8**.

The last component of the system is a baffle **66**. The [shield] *baffle 66, as shown in FIGS. 8, 9, and 10,* is a plate in a tent-like configuration. It has a bend **70** at a slight angle along the longitudinal center thereof in the [-]direction of flow of the conveyor belt *12* and bottle caps *38* being conveyed. It then has four corner legs **72** depending downwardly therefrom and secured to the housing *10* on the sides of the conveyor adjacent to the lateral edges of the conveyor. In this manner, a space is created above the conveyor at the lower loading section *24* and beneath the lower surface of the baffle *66*. In this manner, bottle caps *38* dumped in the conveyor remain above the [shield] *baffle 66* and are deposited on the conveyor belt *12* only at the leading edge of the loading section *24* immediately in anticipation of the intermediate section *26*.

In summary then, the bow [adjusting] *adjustment* assembly *20, shown in FIGS. 4, 5, and 6,* consists of sprockets **34** mounted on a shaft *61* which is mounted in bearings. These bearings are mounted to a bracket [43] *46* which is in turn mounted to a [second] rod [or shaft] **48**. This rod *48* is mounted in collars [or bearings **54** and **56**] *54, 56* which are in turn mounted to the sides of the housing **10**. One end *50* of [this second shaft] *the rod 48* extends through the conveyor side. A [shaft] *rod* position clamp mechanism is fixed to the external conveyor side. A lever **52** and dial indicator are attached for ease of use as the [shaft] *rod 48* is turned, the sprockets *34* rotate in an arc about the center of the [shaft] *rod 48*. This allows the sprockets **34** to come in contact with the back of the conveyor belt *12*. This in turn displaces the conveyor belt *12* away from its normal path. The conveyor belt *12* is restrained on the opposite side by low friction guide material or keeper. A machined arc in the guide material at the area of the sprocket *34* causes the conveyor belt *12* to follow the arc of the sprocket *34*. This in turn allows an angle change of greater than [20] *twenty* degrees for a short space on the conveyor. In practice, instead of a final angle of [5] *five* degrees from vertical, it is possible to have an angle past vertical for this short space. This allows the center of the cap to fall from the cleated conveyor while correctly oriented caps remain.

FIGS. **11** and **12** disclose an alternate embodiment of the present invention [inventions wherein the cleat of the present invention would be replaced with an] *invention. The* improved cleat **80** shown in FIG. **11**[. These improved cleats have] *has* a supporting [surfaces] *surface* **82** extending outwardly at a generally right [angles] *angle* from the exterior surface of the conveyer belt *12*. Each cleat *80* is of a generally rectangular cross section with an upper [face **84**] *supporting surface 82* and a lower face **86**, and with a front face **87** and a rear face **88** [therebetween wherein the]. *The* upper cap supporting surface *82* has a trough **90**. This trough [region] *90* has a sloped interior recess **92** in contact with a lower hemispherical region **94** for retaining bottle caps thereon in a proper orientation; *more specifically,* when the [upper] *top* surface *37* of the bottle cap *38* is in contact with the conveyer belt *12* and the [lower edge] *generally cylindrical perimeter 39* thereof [supported on] *is in contact with* the supporting [surfaces] *surface 82* of the [cleats but to effect] *cleat 80. The shape of the trough 90 effects* the dropping [thereof when the] *of* bottle caps *38 that* are not in the proper orientation. The lowermost extent of the hemispherical region *94* is closer to the front face *87* than to the rear face *88*. The cleat *80* also has a plurality of bores **96** extending from the front face *87* to the rear face *88* where [they] *the cleat 80* can be coupled to the conveyer belt *12* by means of a screw **98**.

The present disclosure includes that contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrange-

ment of parts may be resorted to without departing from the spirit and scope of the invention.

What is claimed is:

1. A new and improved conveying system for lifting and orienting bottle caps comprising, in combination:

a conveyer belt formed of articulated sections and with guide rollers to support the belt with an upper lifting section having an essentially vertical path of travel and a lower loading section **[**with**]** *having* an angled path of travel;

sprockets on the guide rollers to effect movement of the belt in an upward path of travel through the lower section and then the upper section;

a plurality of cleats secured to the exterior surface of the conveyer **[**belts**]** *belt*, **[**the cleats**]** *each cleat* having *an upper* supporting **[**surfaces**]** *surface* extending outwardly at a generally right **[**angles**]** *angle* from the exterior surface of the conveyer belt, each cleat being of a generally rectangular cross section with an upper **[**face**]** *supporting surface* and a lower face and with **[**an interior face therebetween**]** *a front face and a rear face* wherein the upper **[**cap**]** supporting surface **[**having**]** *has* a lower curved region and a trough with a sloped interior recess in contact with the lower curved region for retaining bottle caps thereon in a proper orientation when **[**the upper**]** *a top* surface of the bottle cap is in contact with the conveyer belt and the **[**lower edge thereof supported on**]** *generally cylindrical perimeter of the bottle cap is in contact with* the *upper* supporting **[**surfaces**]** *surface* of the **[**cleats but to effect**]** *cleat and wherein the trough effects* the dropping **[**thereof when the**]** *of* bottle caps *that* are not in the proper orientation, the lowermost extent of the *lower* curved region being closer to the front face than to the rear face, **[**the**]** *each* cleat also having a plurality of bores extending from the front face to the rear face where **[**they**]** *the cleat* can be coupled to the conveyer belt by means of a screw;

a supplemental sprocket in contact with the interior face of the conveyer belt in the lower extent of the upper section to form an outwardly directed bow in the belt and effect the removal, by gravity, of bottle caps not in the proper orientation;

adjustment means to vary the extent of the bow as a function of the particular bottle cap being conveyed;

a plate positioned in close proximity to the cleats in the region of the conveyer belt beneath the bow whereby bottle caps on the conveyer belt may drop under gravity into the hopper due to the orientation of the bow;

a source of pressurized air adjacent to the upper extent of the upper section at one lateral side of the belt to pneumatically urge bottle caps to the opposite lateral side of the belt with a chute to receive the pneumatically conveyed bottle caps while maintaining their proper orientation;

a hopper for a quantity of randomly oriented bottle caps adjacent to the lower section of the conveyer belt for the initial positioning of bottle caps on the conveyer belt prior to movement **[**to**]** *toward* the bow; and

a baffle having a raised central extent parallel with the direction of flow of the conveyor belt and positioned over the lower loading section whereby bottle caps dropped thereon will limit movement of the caps onto the conveyor except at the leading edge of the plate.

2. A conveying system for lifting and orienting bottle caps comprising:

a conveyer belt formed of articulated sections and with guide rollers to support the belt with an upper section having an essentially vertical path of travel and a lower section **[**with**]** *having* an angled path of travel;

sprockets on the guide rollers to effect movement of the belt in a path of travel through the lower section and then the upper section;

a plurality of cleats secured to the exterior surface of the conveyer **[**belts**]** *belt*, **[**the cleats**]** *each cleat* having *an upper* supporting **[**surfaces**]** *surface* extending outwardly at a generally right **[**angles**]** *angle* from the exterior surface of the conveyer belt, each cleat being of a generally rectangular cross section with an upper **[**face**]** *supporting surface* and a lower face and with **[**an interior face therebetween**]** *a front face and a rear face* wherein the upper **[**cap**]** supporting surface **[**having**]** *has* a trough for retaining bottle caps thereon in a proper orientation when **[**the upper**]** *a top* surface of the bottle cap is in contact with the conveyer belt and **[**the lower edge thereof supported on**]** *generally cylindrical perimeter of the bottle cap is in contact with* the *upper* supporting **[**surfaces**]** *surface* of the **[**cleats but to effect**]** *cleat and wherein the trough effects* the dropping **[**thereof when the**]** *of* bottle caps *that* are not in the proper orientation, each cleat having a trough with a sloped interior recess in contact with the lower curved region with the lowermost **[**etent**]** *extent* of the curved region being closer to the front face than to the rear face of the cleat; and

a supplemental sprocket in contact with the interior face of the conveyer belt in the lower extent of the upper section to form an outwardly directed bow in the belt and effect the removal, by gravity, of bottle caps not in the proper orientation.

3. A conveying system for lifting and orienting bottle caps comprising:

a conveyer belt driven by sprockets on guide rollers to effect movement of said belt along a generally upward path of travel; and

a plurality of cleats secured to the exterior surface of said belt, each cleat having a generally rectangular cross section, an upper supporting surface and a generally opposing lower face, and a front face and a generally opposing rear face,

wherein said upper supporting surface of extends outwardly at a generally right angle from said exterior surface of said belt,

and wherein said upper supporting surface includes a lower curved region and a trough with a sloped interior recess in contact with said lower curved region for retaining a bottle cap thereon in a proper orientation wherein a top surface of said bottle cap is in contact with the conveyer belt and the generally cylindrical perimeter of said bottle cap is in contact with said upper supporting surface of said cleat, and wherein said trough effects the dropping of bottle caps that are not in the proper orientation, the lowermost extent of said lower curved region being closer to said front face than to said rear face.

4. The conveying system of claim 3, further comprising:

a supplemental sprocket in contact with the interior face of said conveyer belt to form an outwardly directed bow in said belt and thereby effect the removal, by gravity, of bottle caps that are not in the proper orientation.

5. The conveying system of claim 4, further comprising:

adjustment means to vary the extent of the bow as a function of the particular bottle cap being conveyed.

6. The conveying system of claim 4, further comprising:

a plate positioned in close proximity to said plurality of cleats in the region of said belt beneath said bow,

whereby bottle caps on the conveyer belt may drop under gravity into a hopper due to the orientation of said bow.

7. The conveying system of claim 3, further comprising:

a source of pressurized air adjacent to the upper extent at one lateral side of said belt, said source having a pressure sufficient to pneumatically urge said bottle caps to the opposite lateral side of said belt, with a chute to receive said pneumatically conveyed bottle caps while maintaining their proper orientation.

8. The conveying system of claim 4, further comprising:

a hopper for a quantity of randomly oriented bottle caps adjacent to the lower section of said conveyer belt for the initial positioning of bottle caps on said conveyer belt prior to movement toward said bow.

9. The conveying system of claim 6, further comprising:

a baffle having a raised central extent parallel with the direction of flow of said conveyor belt and positioned over a lower loading section whereby bottle caps dropped thereon will limit movement of said caps onto said conveyor except at the leading edge of said plate.

10. A conveying system for lifting and orienting bottle caps comprising:

a conveyer belt driven by sprockets on guide rollers to effect movement of said belt along a generally upward path of travel;

a plurality of cleats secured to the exterior surface of said belt, each cleat having a generally rectangular cross section, an upper supporting surface and a generally opposing lower face, and a front face and a generally opposing rear face,

wherein said upper supporting surface of extends outwardly at a generally right angle from said exterior surface of said belt,

and wherein said upper supporting surface includes a lower curved region and a trough with a sloped interior recess in contact with said lower curved region for retaining a bottle cap thereon in a proper orientation wherein a top surface of said bottle cap is in contact with the conveyer belt and the generally cylindrical perimeter of said bottle cap is in contact with said upper supporting surface of said cleat, and wherein said trough effects the dropping of bottle caps that are not in the proper orientation, the lowermost extent of said lower curved region being closer to said front face than to said rear face; and

a supplemental sprocket in contact with the interior face of said conveyer belt to form an outwardly directed bow in said belt and thereby effect the removal, by gravity, of bottle caps that are not in the proper orientation.

11. The conveying system of claim 10, further comprising:

adjustment means to vary the extent of the bow as a function of the particular bottle cap being conveyed.

12. The conveying system of claim 10, further comprising:

a plate positioned in close proximity to said plurality of cleats in the region of said belt beneath said bow, whereby bottle caps on the conveyer belt may drop under gravity into a hopper due to the orientation of said bow.

13. The conveying system of claim 10, further comprising:

a source of pressurized air adjacent to the upper extent at one lateral side of said belt, said source having a pressure sufficient to pneumatically urge said bottle caps to the opposite lateral side of said belt, with a chute to receive said pneumatically conveyed bottle caps while maintaining their proper orientation.

14. The conveying system of claim 10, further comprising:

a hopper for a quantity of randomly oriented bottle caps adjacent to the lower section of said conveyer belt for the initial positioning of bottle caps on said conveyer belt prior to movement toward said bow.

15. The conveying system of claim 12, further comprising:

a baffle having a raised central extent parallel with the direction of flow of said conveyor belt and positioned over a lower loading section whereby bottle caps dropped thereon will limit movement of said caps onto said conveyor except at the leading edge of said plate.

16. A method of lifting and orienting bottle caps comprising:

conveying said bottle caps along a conveyer belt driven by sprockets on guide rollers to effect movement of said belt along a generally upward path of travel;

retaining said bottle caps on a plurality of cleats secured to the exterior surface of said belt, each cleat having a generally rectangular cross section, an upper supporting surface and a generally opposing lower face, and a front face and a generally opposing rear face, wherein said upper supporting surface of extends outwardly at a generally right angle from said exterior surface of said belt, and wherein said upper supporting surface includes a lower curved region and a trough with a sloped interior recess in contact with said lower curved region for retaining a bottle cap thereon, the lowermost extent of said lower curved region being closer to said front face than to said rear face; and

orienting said bottle caps in a proper orientation on said plurality of cleats, wherein said proper orientation is characterized in that a top surface of each bottle cap is in contact with said conveyer belt and the generally cylindrical perimeter of each bottle cap is in contact with said upper supporting surface of said cleat, such that said trough effects the dropping of bottle caps that are not in the proper orientation.

17. The method of claim 16, further comprising:

forming an outwardly directed bow in said conveyor belt to assist in the removal, by gravity, of bottle caps that are not in the proper orientation.

18. The method of claim 17, wherein said bow is formed by a supplemental sprocket in contact with the interior face of said conveyer belt.

19. The method of claim 16, further comprising:

varying the extent of the bow as a function of the particular bottle cap being conveyed.

20. The method of claim 17, further comprising:

positioning a plate in close proximity to said plurality of cleats in the region of said belt beneath said bow, such that bottle caps dropping off said conveyer belt fall into a hopper.

21. The method of claim 16, further comprising:

pneumatically urging said bottle caps using a source of pressurized air positioned adjacent to the upper extent at one lateral side of said belt, said source having a pressure sufficient to urge said bottle caps to the opposite lateral side of said belt toward a chute positioned to receive said pneumatically conveyed bottle caps while maintaining their proper orientation.

22. The method of claim 17, further comprising:

positioning a hopper adjacent to the lower section of said conveyer belt to hold a quantity of randomly oriented bottle caps for the initial positioning of said bottle caps on said conveyer belt prior to movement toward said bow.

23. The method of claim 20, further comprising:

positioning a baffle over a lower loading section of said belt, said baffle having a raised central extent parallel with the direction of flow of said conveyor belt and

positioned whereby bottle caps dropped thereon will limit movement of said caps onto said conveyor except at the leading edge of said plate.

24. A method of lifting and orienting bottle caps comprising:

conveying said bottle caps along a conveyer belt driven by sprockets on guide rollers to effect movement of said belt along a generally upward path of travel;

retaining said bottle caps on a plurality of cleats secured to the exterior surface of said belt, each cleat having a generally rectangular cross section, an upper supporting surface and a generally opposing lower face, and a front face and a generally opposing rear face, wherein said upper supporting surface extends outwardly at a generally right angle from said exterior surface of said belt, and wherein said upper supporting surface includes a lower curved region and a trough with a sloped interior recess in contact with said lower curved region for retaining a bottle cap thereon, the lowermost extent of said lower curved region being closer to said front face than to said rear face;

orienting said bottle caps in a proper orientation on said plurality of cleats, wherein said proper orientation is characterized in that a top surface of each bottle cap is in contact with said conveyer belt and the generally cylindrical perimeter of each bottle cap is in contact with said upper supporting surface of said cleat, such that said trough effects the dropping of bottle caps that are not in the proper orientation; and

forming an outwardly directed bow in said conveyor belt to assist in the removal, by gravity, of bottle caps that are not in the proper orientation.

25. The method of claim 24, wherein said bow is formed by a supplemental sprocket in contact with the interior face of said conveyer belt.

26. The method of claim 24, further comprising:

varying the extent of the bow as a function of the particular bottle cap being conveyed.

27. The method of claim 24, further comprising:

positioning a plate in close proximity to said plurality of cleats in the region of said belt beneath said bow, such that bottle caps dropping off said conveyer belt fall into a hopper.

28. The method of claim 24, further comprising:

pneumatically urging said bottle caps using a source of pressurized air positioned adjacent to the upper extent at one lateral side of said belt, said source having a pressure sufficient such to urge said bottle to the opposite lateral side of said belt toward a chute positioned to receive said pneumatically conveyed bottle caps while maintaining their proper orientation.

29. The method of claim 24, further comprising:

positioning a hopper adjacent to the lower section of said conveyer belt to hold a quantity of randomly oriented bottle caps for the initial positioning of said bottle caps on said conveyer belt prior to movement toward said bow.

30. The method of claim 27, further comprising:

positioning a baffle over a lower loading section of said belt, said baffle having a raised central extent parallel with the direction of flow of said conveyor belt and positioned whereby bottle caps dropped thereon will limit movement of said caps onto said conveyor except at the leading edge of said plate.

31. A cleat for lifting and orienting a bottle cap along a conveyor, the cleat comprising:

an upper supporting surface and a generally opposing lower face, and a front face and a generally opposing rear face, such that said cleat has a generally rectangular cross section;

wherein said upper supporting surface extends outwardly at a generally right angle from a surface of said conveyor,

and wherein said upper supporting surface includes a lower curved region and a trough with a sloped interior recess in contact with said lower curved region for retaining said bottle cap thereon in a proper orientation, the lowermost extent of said lower curved region being closer to said front face than to said rear face,

wherein said proper orientation is characterized in that a top surface of said bottle cap is in contact with said conveyer and the generally cylindrical perimeter of said bottle cap is in contact with said upper supporting surface of said cleat,

and wherein said upper supporting surface effects the dropping of said bottle cap if it is not in said proper orientation.

32. The cleat of claim 31, wherein said upper supporting surface retains said bottle cap in said proper orientation when said conveyor is moving along a generally vertical path of travel.

33. The cleat of claim 31, wherein said upper supporting surface effects the dropping of said bottle cap if it is not in said proper orientation when said conveyor is moving along a generally vertical path of travel.

34. The cleat of claim 31, wherein said upper supporting surface effects the dropping of said bottle cap if it is not in said proper orientation and if said conveyor is moving along a path of travel that exceeds vertical at least momentarily.

35. The cleat of claim 31, wherein said upper supporting surface effects the dropping of said bottle cap if it is not in said proper orientation, but only if said conveyor is moving along a path of travel that exceeds vertical by a sufficient degree, at least momentarily, wherein said degree is a function of the particular size and shape of the bottle cap being conveyed.

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