United States Patent [19]

Sterling

[11] **3,882,660**

[45] **May 13, 1975**

[54] **CAPPER WITH ORIENTING ATTACHMENT**

[75] Inventor: **Walter S. Sterling,** Quincy, Mass.

[73] Assignee: **Pneumatic Scale Corporation,** Quincy, Mass.

[22] Filed: **May 9, 1974**

[21] Appl. No.: **468,485**

[52] **U.S. Cl.** **53/308;** 53/367; 198/278

[51] **Int. Cl.**..... **B67b 3/06;** B67b 3/062; B65b 7/28

[58] **Field of Search** 53/308, 367, 313, 306; 198/25, 238, 240, 244, 245, 267, 278

[56] **References Cited**

UNITED STATES PATENTS

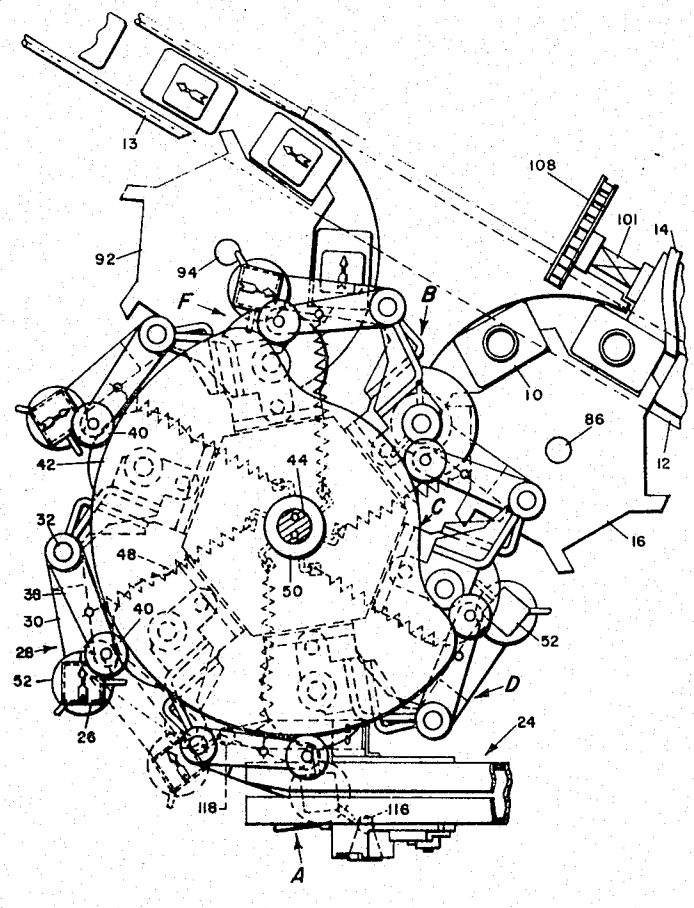
3,054,240	9/1962	Dimond	53/308
3,115,234	12/1963	Eleftherion et al.	198/244
3,309,838	3/1967	Wilhere	53/306 X
3,820,305	6/1974	Van Der Meer	53/308

Primary Examiner—Travis S. McGehee
Assistant Examiner—Horace M. Culver
Attorney, Agent, or Firm—Dike, Bronstein, Roberts, Cushman & Pfund

[57] **ABSTRACT**

Apparatus for applying closures to containers, wherein containers standing upright are moved by a rotor about a vertical axis in a circular path relative to an inclined chute which supplies closures one at a time to a position close to the rotor characterized in that there are pivotally supported transfer arms moving in consonance with the rotor and angularly relative thereto as they pass the chute to take closures from the chute and move them back to the rotor and a rotatable picker at the distal end of each transfer arm which is rotated about a vertical axis as it travels angularly from the chute back to the rotor in a reverse direction by an amount corresponding to the angle the closure becomes displaced by the swinging movement of the transfer arm.

18 Claims, 15 Drawing Figures



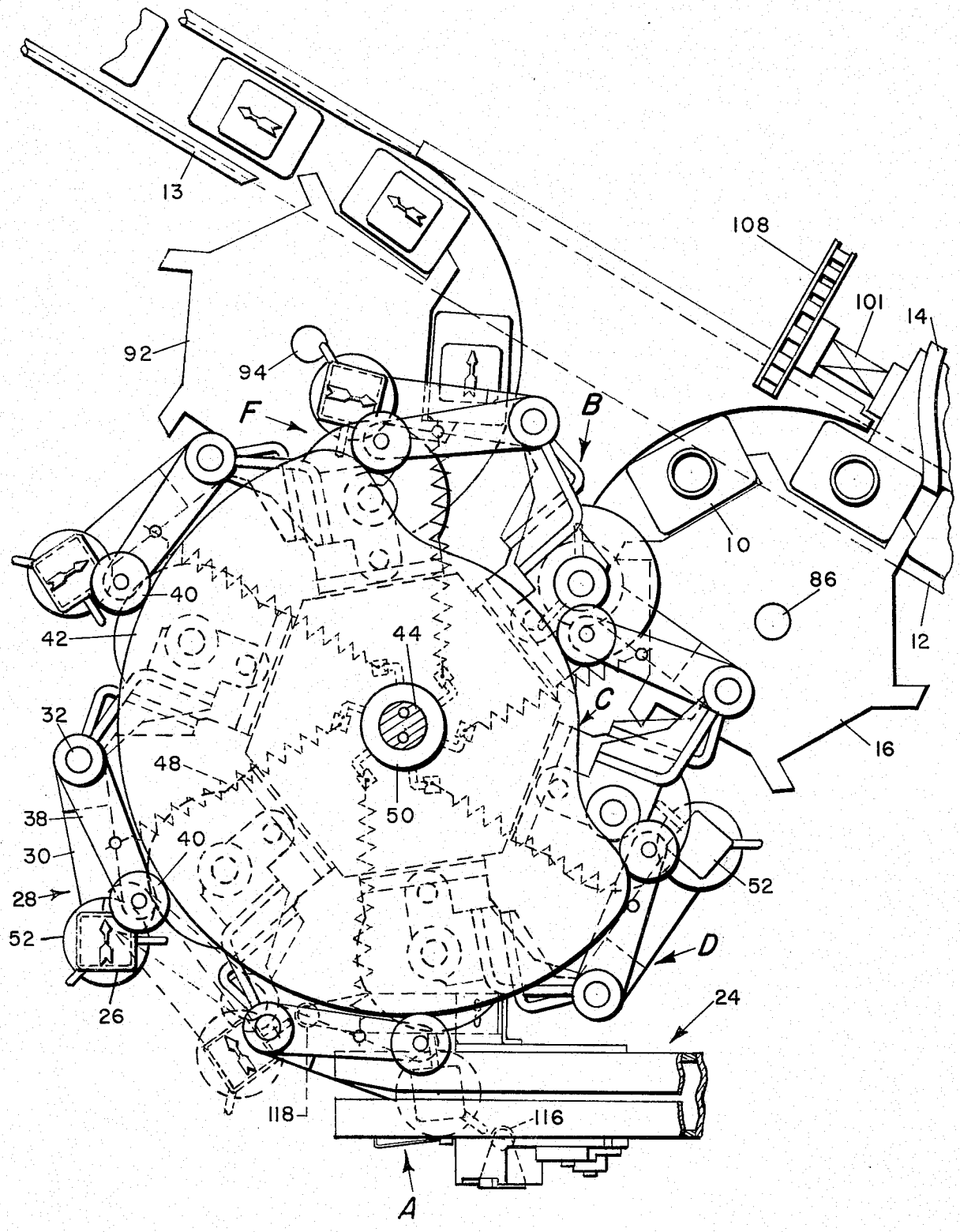

13
108
101
14
92
94
F
B
10
86
12
40
42
44
C
32
16
48
50
38
40
30
28
52
52
D
26
24
118
116
A

Fig. 1

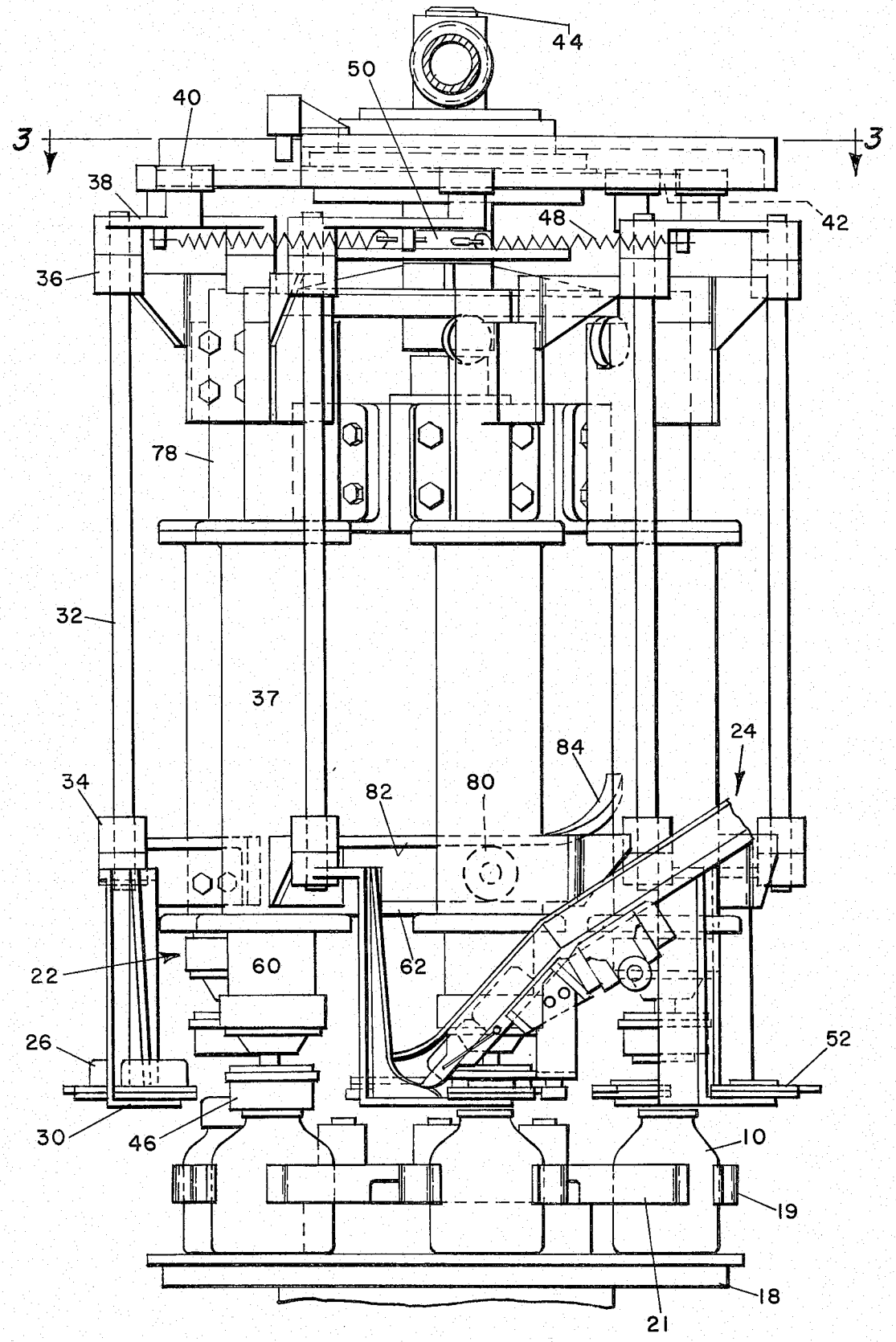

44
50
40
3
3
38
42
48
36
78
32
37
24
84
34
82
80
22
60
62
26
52
30
46
10
19
18
21

Fig. 2

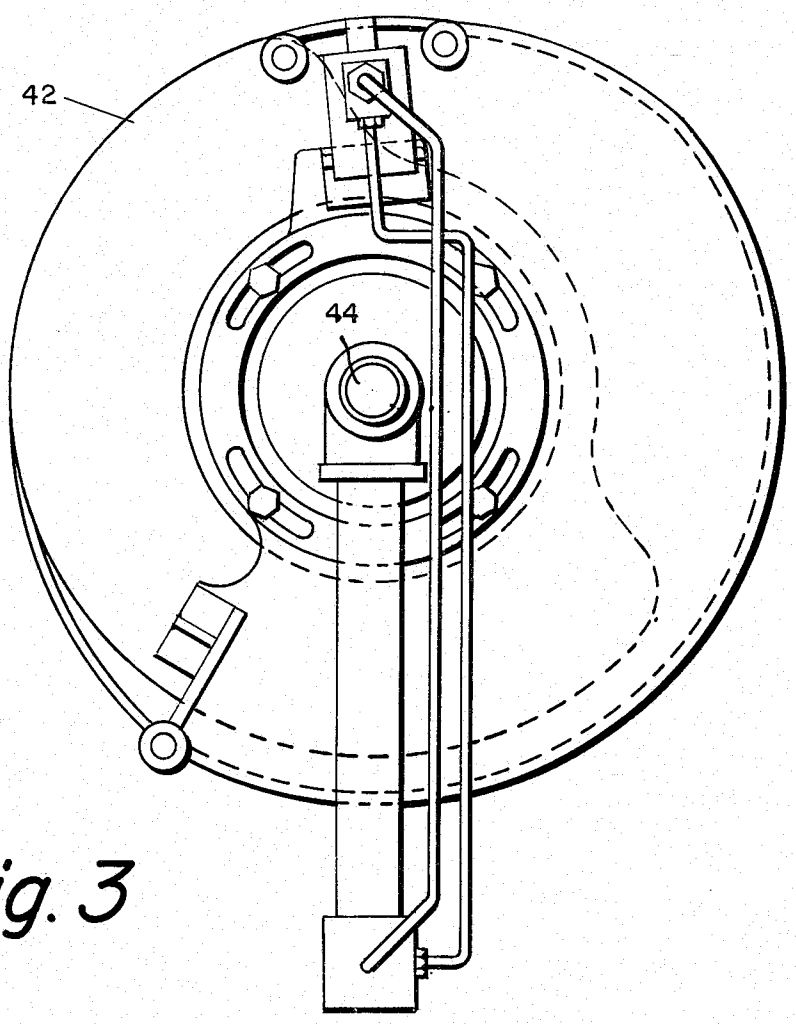


Fig. 3

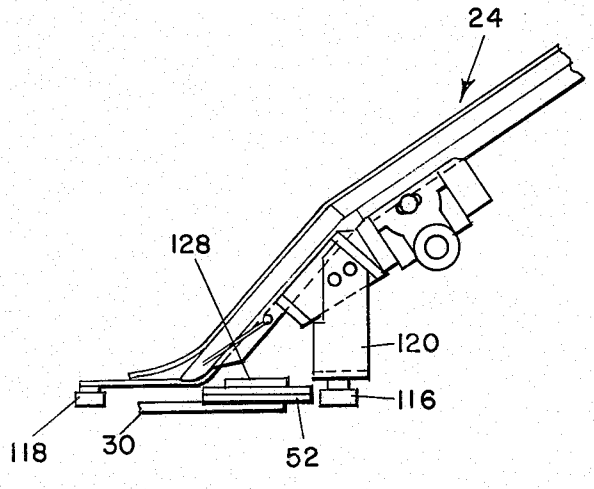


Fig. 4

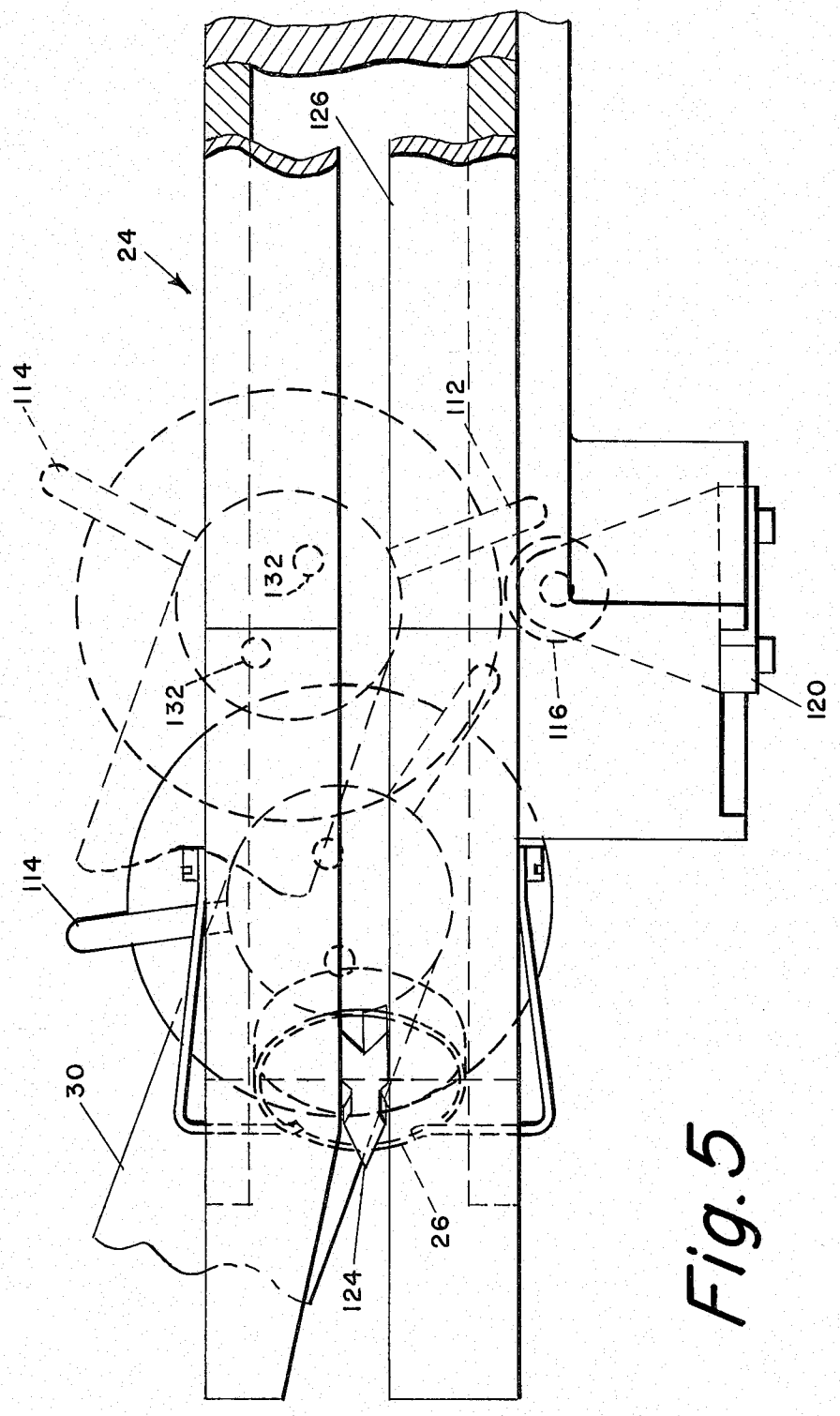


Fig. 5

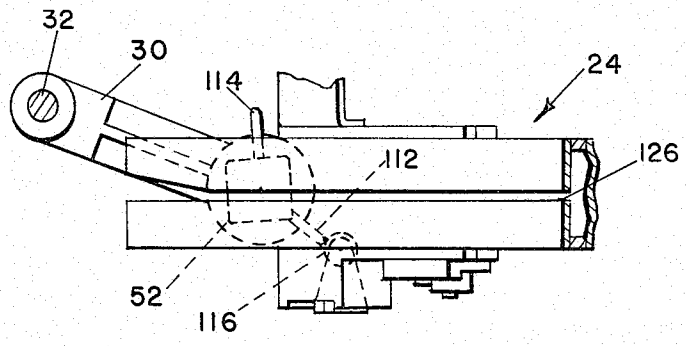


Fig. 6-A

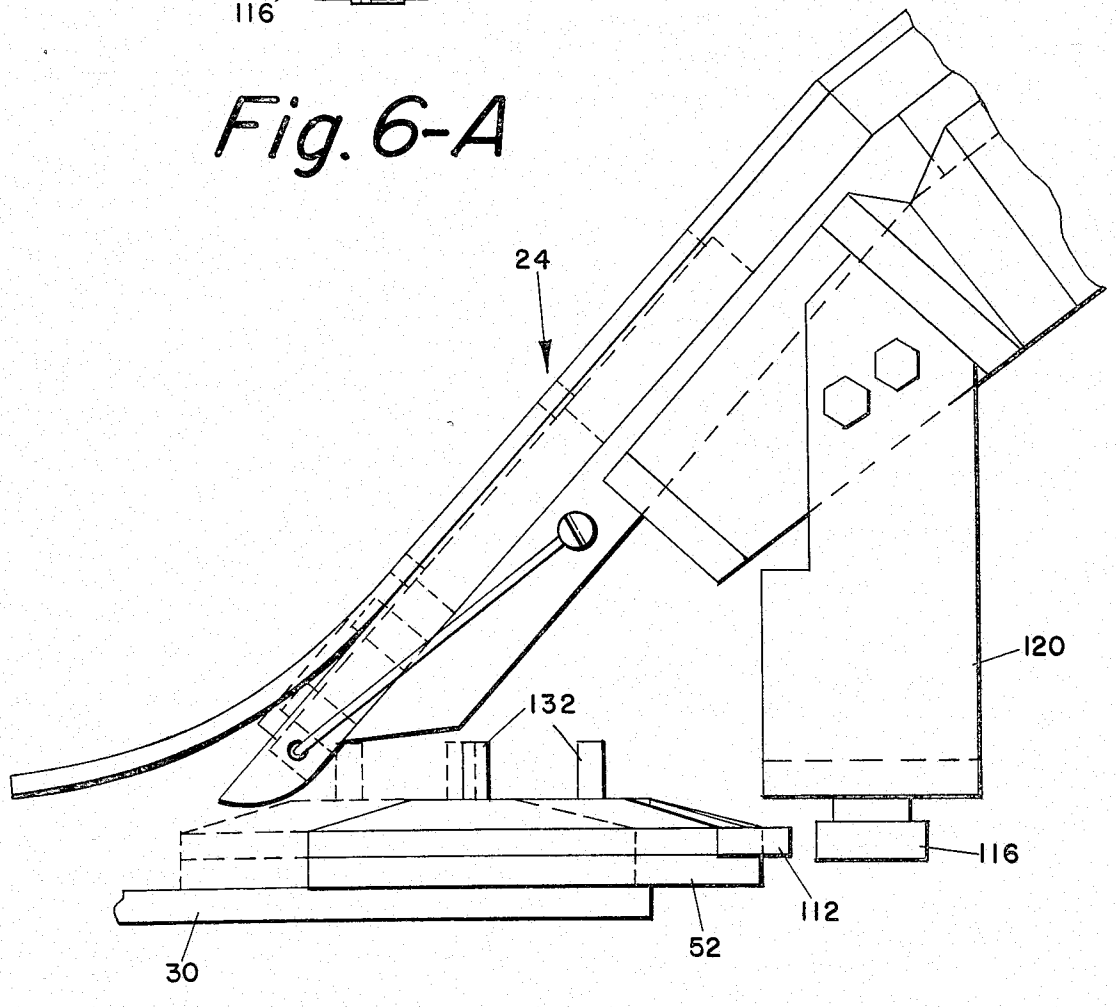


Fig. 6

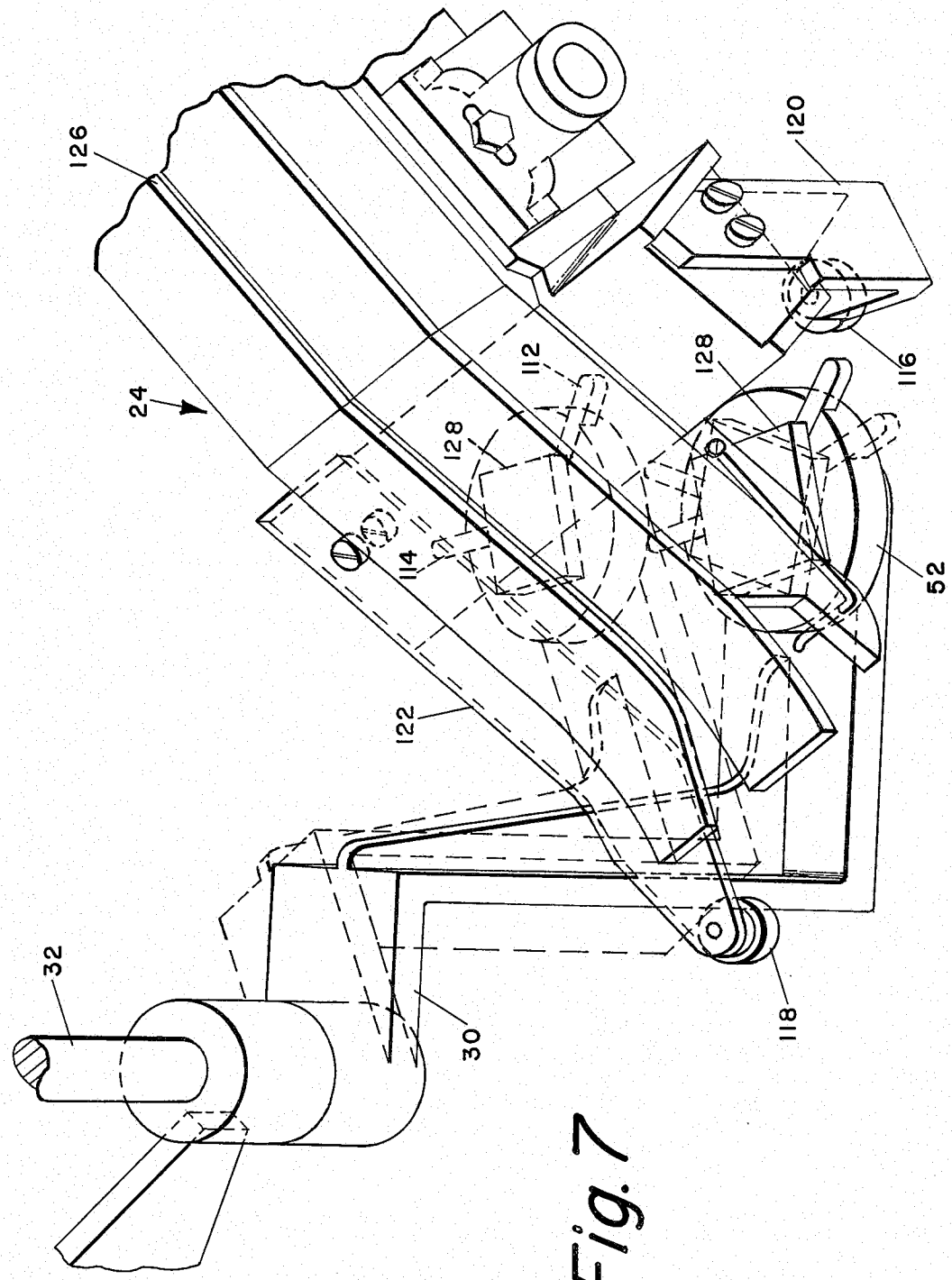


Fig. 7

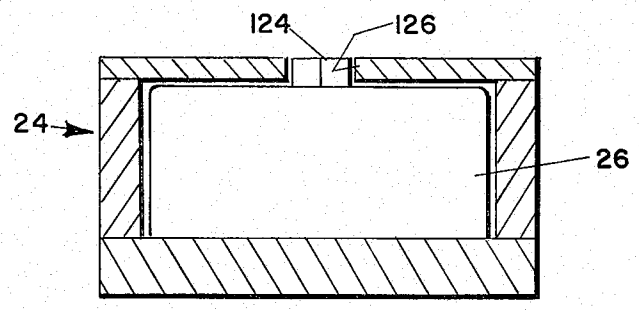


Fig. 8

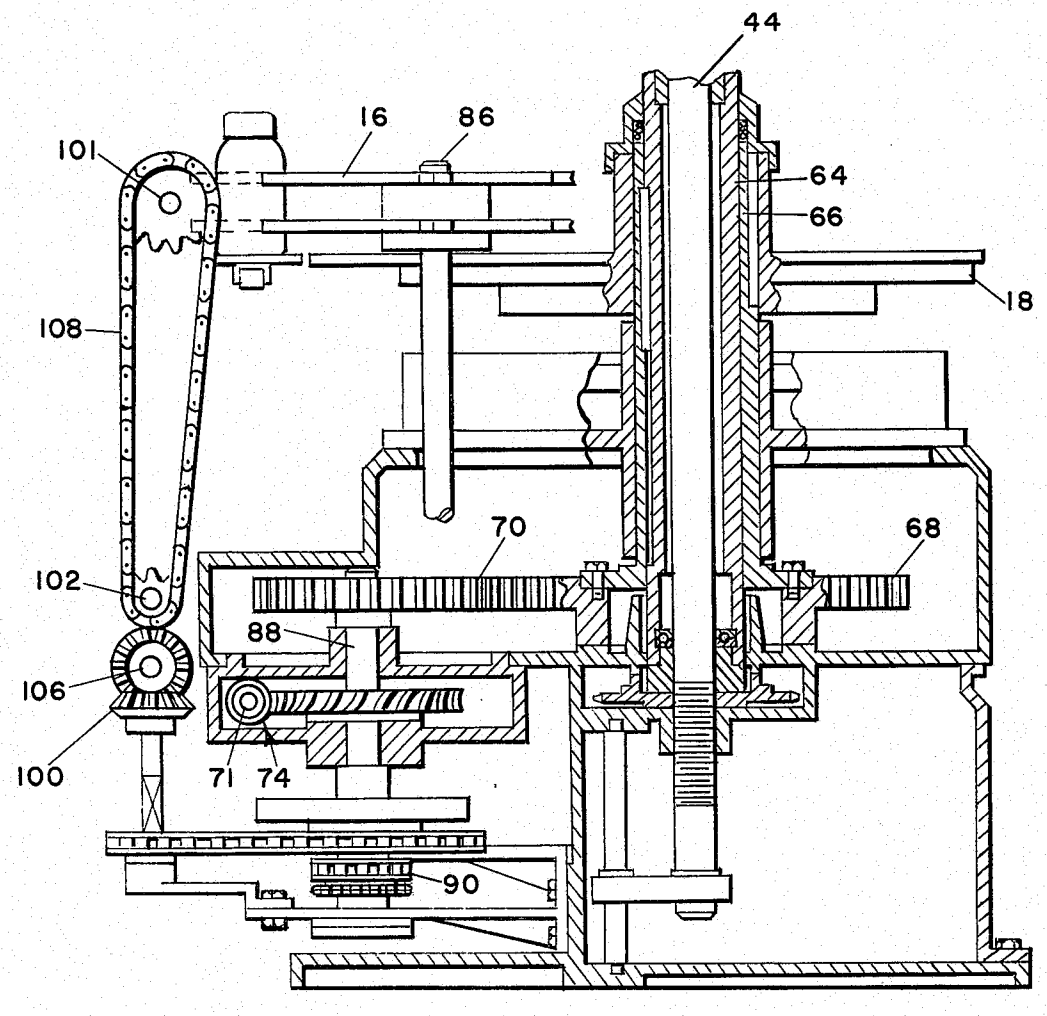


Fig. 13

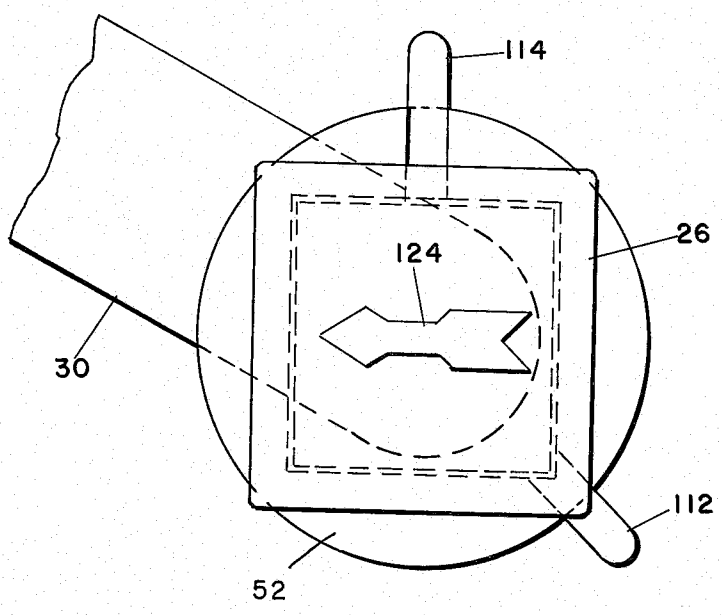


Fig. 9

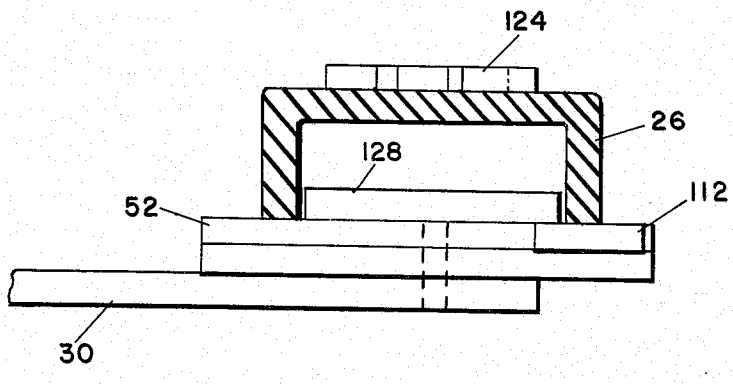


Fig. 10

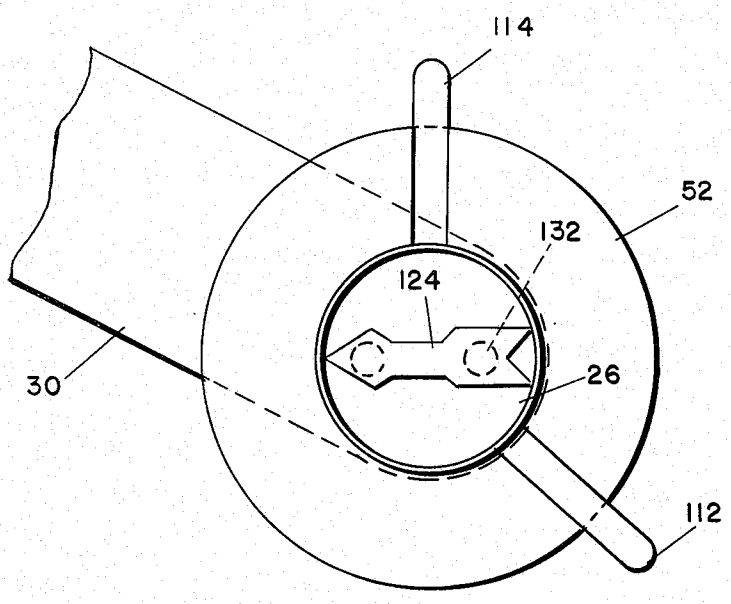


Fig. 11

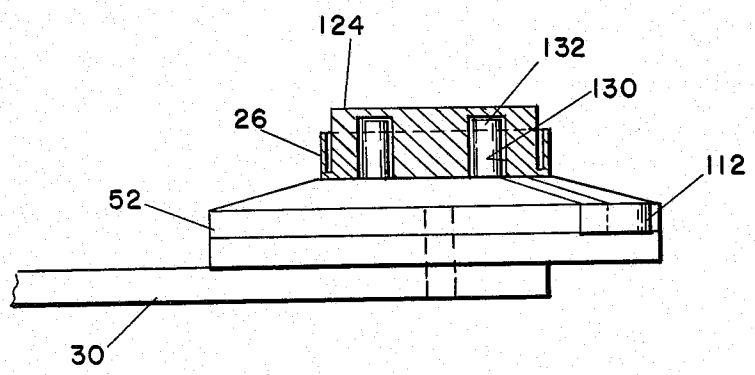


Fig. 12

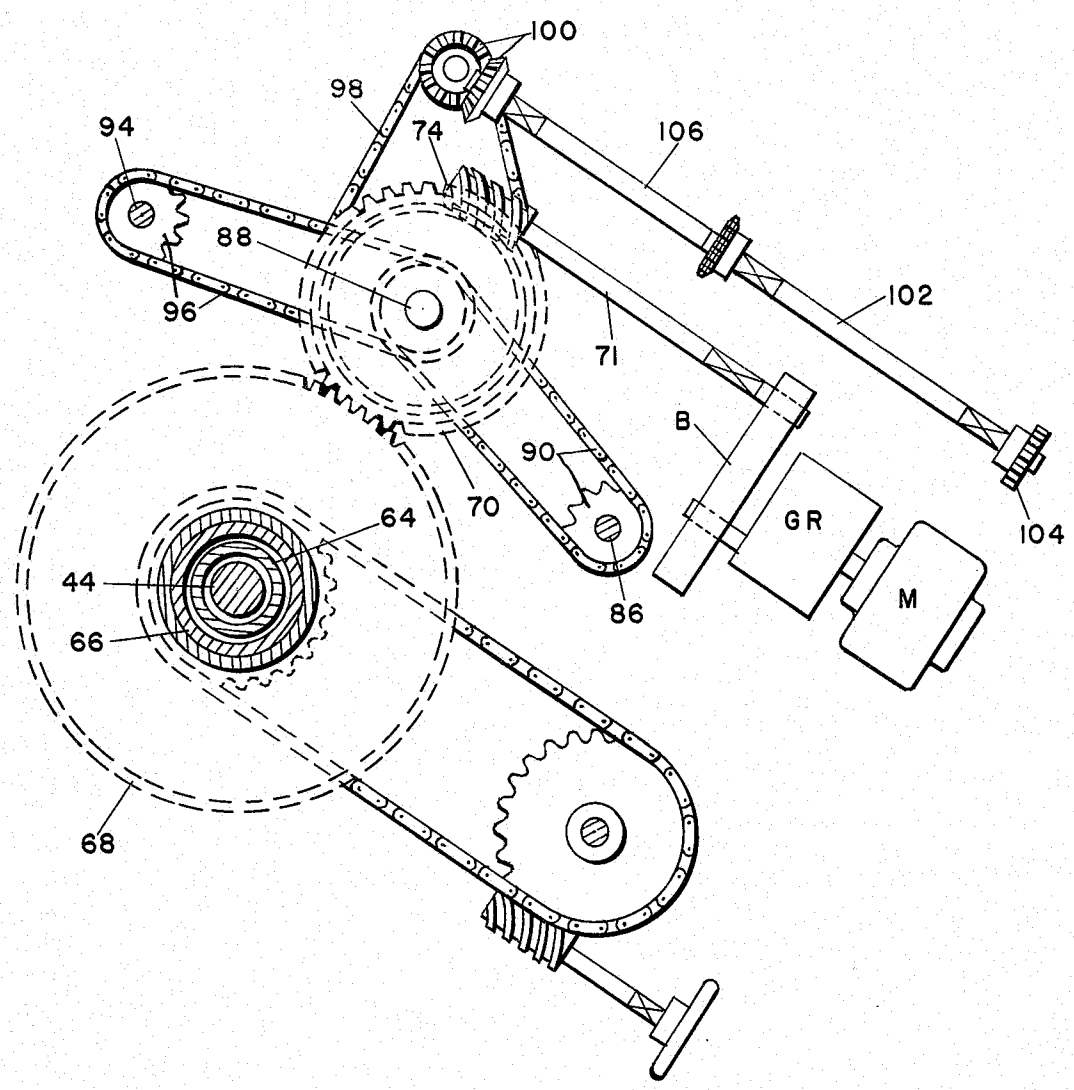


Fig. 14

CAPPER WITH ORIENTING ATTACHMENT

BACKGROUND OF INVENTION

Apparatus for applying closures to containers of the kind with which this invention is concerned are disclosed in U.S. Pat. Nos. 2,744,363, 2,082,048 and 3,054,240. In each of these patents a rotor moves containers standing upright along a circular path and there are transfer arms mounted on the rotor which are moveable thereby to take closures from a stationary support adjacent to rotor and move them to positions above the rotor for application to containers on the rotor. The apparatus shown in U.S. Pat. No. 3,054,240 is designed to orient the closures after they are transferred to the rotor to apply them to the containers in a determined position of orientation. The apparatus of this invention is designed to effect orientation of the closures prior to positioning above a container on the rotor thereby to speed up the operation and to simplify the construction and operation of the closure applying means.

SUMMARY OF INVENTION

Apparatus for applying closures to containers wherein the containers are supported standing upright in a predetermined position of orientation for movement along a predetermined path and closures are delivered one at a time to a position close to the path in a predetermined position of orientation relative to the containers, comprising a transfer arm supported for angular movement about a vertical axis from said path to said position and back to said path to take a closure from the support and position it above the path of movement of the containers for application to a container and means for rotating the closure about a vertical axis as the transfer arm moves it from said support to said path to compensate for angular displacement of the closure relative to said path produced by said angular movement of said transfer arm. The containers are moved along a circular path by a rotor which rotates about a vertical axis to which they are delivered standing upright, and the transfer arms are mounted on the rotor for rotation about vertical axes. The closures are delivered to a position close to the rotor by an inclined chute and there is means for rotating the rotor relative to the chute to move the transfer arms successively by the chute and means for rotating the transfer arms as they travel by the chute about vertical axes to pick a closure from the chute and move it to a position on the rotor. Each transfer arm has at its distal end an adaptor rotatable about a vertical axis designed to pick a closure from the chute and there are interengageable means on the adaptor and stationary parts of the machine for effecting rotation of the adaptor as the transfer arm swings outwardly and back to position the adaptor for taking the closure from the chute and for re-orienting the closure as it is moved to said position above the rotor by the amount of the angular displacement caused by angular movement of the transfer arm.

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

FIG. 1 is a plan view of the apparatus of this invention;

FIG. 2 is a side elevation;

FIG. 3 is a section taken on the line 3—3 of FIG. 2;

FIG. 4 is an elevation of the feed chute;

FIG. 5 is a fragmentary plan view of the lowered end of the feed chute;

FIG. 6 is a fragmentary elevation of the lowered end of the feed chute;

FIG. 6A is a fragmentary elevation to smaller scale at the lower end of the feed chute showing the transfer arm;

FIG. 7 is a prospective view of the transfer arm showing it in dotted lines before it reaches the discharge chute and in full lines at its position of pick-off;

FIG. 8 is a transverse section of the feed chute;

FIG. 9 is a plan view of a rectangular closure resting on the picker;

FIG. 10 shows the closure as captured by the picker;

FIG. 11 is a plan view of a circular closure resting on the picker;

FIG. 12 shows the circular closure as captured by the picker;

FIG. 13 is a side elevation partly in section showing the drive means; and

FIG. 14 shows a plan view of a portion of the drive means.

Capping apparatus of the kind with which this invention is concerned is shown and described in the U.S. patents to Everett Nos. 2,082,048, 2,744,368 and 3,054,240 and so for the purpose of describing the novel features of this invention only such of the construction of the aforesaid apparatus will be described herein as is essential to a clear understanding of the nature of this invention. Referring to FIG. 1 the containers **10** which are to be capped are delivered to the apparatus by suitable conveyor mechanism including a conveyor **12** along one side of which there is a guide rail **13** and along the other side of which is a spirally grooved rotatable cylinder **14** adapted to engage and arrange the containers in spaced relation on the conveyor and to advance the containers in timed relation to successive openings in a transfer disc **16.** The transfer disc **16** is arranged to feed the containers onto a rotary table **18,** FIG. **2,** where they are engaged by clamping means **19, 21** such as employed in U.S. Pat. No. 2,082,048 which support them in upright positions in alignment with closure applying means indicated generally at **22.**

There are a plurality of closure applying means **22** mounted to revolve about a circular stationary shaft **44,** each closure applying means including a housing **60** provided at its lower end with a gripping element **46** mounted for vertical reciprocation in a cylindrical casing **37.** The lower end of each casing **37** is secured to a supporting ring **62** which is in turn secured to an elongated inner sleeve **64** supported for rotation about the central shaft **44.** The inner sleeve **64** is keyed to an outer sleeve **66** secured at its lower end to a gear **68** which meshes with a drive gear **70** fastened to a vertical shaft **88.** The shaft **88** is rotated through a worm gear drive, **74,** the worm being fast on a shaft **71** driven by a motor M through a gear reduction unit GR and a drive belt B. The upper end of each casing **37** is attached to an upper supporting bracket **78** also mounted to rotate about the central supporting shaft **44.** Provision is made for reciprocating the gripper housing **60** vertically to cause the gripper element **46** to first pick up a closure from a transfer arm **30** and then to apply the closure to the container during the revolving movement of the housing and to this end, each housing is provided with a cam roll **80** arranged to cooperate with

a cam track 82 formed in a stationary cam 84 fast on the stationary shaft 44. As previously related, a transfer disc 16 delivers the containers supplied by the conveyor 12 to the table and is mounted on a vertical shaft 86 arranged to be rotated from a shaft 88 by way of a chain and sprocket drive 90. A discharge disc 92 is mounted on the upper end of a vertical shaft 94 arranged to be similarly rotated through a chain and sprocket drive 96. The drive for the spiral groove cylinder 14 is provided for by a chain and sprocket drive 98 from the shaft 88, bevel gears 100 and a horizontal shaft 102 connected by spur gears 104 to a shaft 106. The shaft 102 is connected by a chain and sprocket drive 108 to the shaft 101 upon which the grooved cylinder 14 is mounted.

The closures are supplied by an inclined chute 24 from a hopper as shown in U.S. Pat. No. 2,082,048, wherein provision is made for feeding the closures 26 right side up to the inclined chute 24. The lower or discharge end of the chute is located close to the table at a level above the tops of the containers as shown in FIG. 2.

The closures are transferred from the lower end of the chute 24 to a position for application to the containers by transfer means 28 which move the closures to a position to be engaged by the closure applying means 22 while the latter are revolving. As herein shown each closure applying means 22 is provided with a transfer means 28 comprising an oscillatory transfer arm 30, mounted to the lower end of a vertical rocker shaft 32 supported in lower and upper brackets 34 and 36 respectively, secured to the supporting casing 37 of the closure applying means 22. The upper end of each rocker shaft 32 is provided with an arm 38 having a roller 40 arranged to cooperate with a stationary cam 42 fast on the central shaft 44 for rocking of the transfer arm from a position in alignment with the lower end of closure supply chute 24 to withdraw a closure therefrom as indicated at A in FIG. 1 to a position in vertical alignment with the closure gripping element 46 of the associated closure applying means 22 as indicated at B in FIG. 1 during the continuous rotation of the apparatus. Springs 48 secured at one end to a collar 50 rotatably mounted on the central stationary shaft 44 are connected to the respective arms 38 to hold the rollers 40 against the cam 42. As herein shown each transfer arm 30 is provided at its outer end with a picker 52 which is caused to pass under and engage the end most closure extending from the lower end of the inclined supply chute 24 to withdraw the closure from the chute. The form of the picker 52 will depend upon the kind of closure to be applied.

In the normal operation of the machine the containers 10 are delivered by the table 18 into operative relation to successive closure applying means 22, at station B where the closures are applied and are discharged from the machine at station F by the disc 92. Each closure transfer arm 30 is actuated by the cam 42 to take a closure from the supply chute at station A as shown in FIG. 1 and to present the closure to the gripping element 46 at station B whereupon the housing 60 is elevated to cause the gripping element to pick up the closure whereupon the transfer arm 30 is moved outwardly by the cam 42 to position it for picking a succeeding closure from the chute at station A. As also indicated, in FIG. 1, a container 10 is delivered into operative relation to the closure applying means at station C and the gripping element 46 is moved downwardly at this station to apply the closure to its container. It is to be observed that in operation the closure is applied to the container during the movement of the container along that portion of the path of rotation of the container generally indicated between the stations B and D. The capped container moves from the station B all the way around to the station F where it is discharged by the disc 92 on to the conveyor 12.

In many instances it is desirable to apply closures to the tops of containers in a predetermined position of orientation, for example, square or rectangular closures are desirably applied with their straight sides parallel to the corresponding straight sides of the containers, oval closures are desirably applied with their major axes coinciding with the major axes of the containers, closures with indicia thereon such as arrows or ornamentation are desirably applied with such indicia bearing a predetermined relation to the configuration and/or indicia on the container. Sometimes a closure may have ports or spouts which desirably should be oriented with respect to the exterior or interior configuration of the container. As previously pointed out the closures in whatever form are delivered by the chute 24 in a predetermined position of orientation relative to the path of movement of the closure applying means on the table by the chute 24 at the station A. The delivery end of the chute is located at a radial distance from the center of rotation about which the containers and closure applying means travel which is greater than the radial distance of the containers and closure means from their center of rotation and so as each transfer arm approaches the lower end of the chute at Station A, it is moved outwardly about its pivot 32 to intercept and pick a closure from the lower end of the chute. Following picking the transfer arm continues to move while in this outwardly displaced position all the way around to station B where it is swung inwardly to dispose the closure beneath a gripper element 46 for application to the top of a container. The pivotal movement of the transfer arm as it is moved from the lower end of the chute back to the locus of the line of center of the tops of the containers and closure applying means displaces the angular orientation of the closure from that which it had at the lower end of the chute and hence in relation to the path of movement of the containers and closure applying means so it is necessary to rotate the closures on the transfer arms as the latter are moved toward the closure applying means to restore them to the same position of orientation that they had at the lower end of the chute. Optionally the closures may be rotated to a different position of orientation if this is found to be desirable. It is therefore the purpose of this invention to reorient the closures as they travel from the lower end of the chute to the closure applying means so that at the place of application they will have the same orientation as when taken from the chute or if not the same position of orientation to a predetermined position of orientation such as would be consistent with their application to the containers.

As herein illustrated this is achieved as is shown in FIGS. 5, 6 and 7 by mounting the picker 52 on the transfer arm 30 for rotation about a perpendicular axis and by providing means for rotating the picker about its axis on the transfer arm to compensate for the angular displacement produced by the angular movement of the transfer arm. Various means may be employed to

effect this rotation and as herein illustrated is provided for by two pins, **112, 114** fixed to the picker so as to project radially therefrom and a pair of abutments **116,** 118 mounted by means of brackets **120, 122** at the lower part of the chute so that as the transfer arm approaches the lower end of the chute the pin **112** is intercepted by the abutment **116** to rotate the picker in a counterclockwise direction to a position for picking off a closure from the lower end of the chute and as it continues beyond the lower end of the chute after having picked off a closure the pin **114** is intercepted by the abutment **118** so as to rotate it in a reverse that is clockwise direction by the same amount that it was rotated in a counterclockwise direction thereby disposing the closure when the arm moves inwardly to position the closure below the gripping element **46** in the same relative position it had thereto at the lower end of the chute.

FIG. **9** shows a closure **26** of rectangular configuration with a raised arrow **124** on its upper side which is desirably applied to the container with the arrow parallel to the long side of the container whether it is of rectangular or oval configuration. The raised arrow conveniently provides means for guiding the closure down the chute **24** in a predetermined position by engagement with a slot **126** at the top of the chute. Since the underside of the closure is hollow and of rectangular configuration a rectangular button **128** is provided on the picker **52** for engagement with the open lower side of the closure to pick it from the chute. A circular closure is shown in FIG. **11** which also has a raised arrow on the top side which guides it down the chute in a predetermined position of orientation. The circular closure is a plug type element and so is provided with diametrically spaced openings or holes **130—130** at its underside and the picker **52** with correspondingly spaced buttoms or pins **132—132** for entering the holes to pick the closure from the chute. In the absence of some means such as an arrow at the top a rectangular closure may be guided solely by engagement of its sides with the sides of the chute and in the event that the closure is in the form of a circular cap a pair of downwardly extending diametrically disposed lugs fixed to the inside for engagement with a guide at the bottom of the chute may be employed. A closure with a spout may be guided by the spout or a closure with interior projection by a guide projecting upwardly from the bottom of the track. The form of the picker will depend upon the configuration of the closure and the orientation of the picker will depend upon the angular travel of the transfer arm and/or the desired orientation of the closure relative to the container.

As herein illustrated the adapter is rotated to reorient the closure substantially as soon as it leaves the lower end of the chute, however, it is within the scope of the invention to effect the rotation at any place along the path of movement of the picker between stations A and B and it is also within the scope of the invention to rotate the closure through an angle to compensate for the displacement produced by the angular movement of the transfer arm and/or a lesser or greater angle.

I claim:

1. Apparatus for applying closures to containers wherein the containers are supported standing up in a predetermined position of orientation for movement along a predetermined path and closures are delivered one at a time to a position close to said path in a predetermined position of orientation relative to the containers, comprising a transfer arm supported for angular movement about a vertical axis from said path to said position and back to said path, said transfer arm being adapted to support a closure at said path for application to a container and means for rotating the closure about a vertical axis as the transfer arm moves from said position to said path to re-orient the position of the closure by the amount it became displaced by such angular movement of the transfer arm.

2. Apparatus for applying closures to the tops of containers comprising carrier means for receiving and moving containers in spaced relation for movement along a predetermined path, a stationary support adjacent to the path of movement of the container to which closures are delivered one at a time, transfer means supported for angular movement from a position above the carrier means to said support to pick a closure from the support and back to said position above the carrier means for application to a container received by the carrier and means for effecting rotation of the closure relative to the transfer means as the latter moves back to said position above the carrier means to re-orient the position of the closure by the amount it became displaced by such angular movement of the transfer means.

3. Apparatus for applying closures to the tops of containers, comprising a rotor supported for rotation about a vertical axis said rotor having a horizontal supporting surface for receiving containers standing upright for application of closures to their tops, a plurality of transfer arms mounted on the rotor above the supporting surface for supporting closures at a level to be applied to the tops of the containers received by the supporting surface said transfer arms being rotatable about vertical axes, a closure support close to the rotor to which closures are supplied one by one, means for rotating the rotor to move the transfer arms successively by the closure support, means for moving the transfer arms from the rotor outwardly to pick a closure from the closure support as they travel by and back to the rotor and means on each transfer arm rotatable about a vertical axis as the arm travels back to the rotor to turn the closure in a reverse direction by the amount of its angular displacement by such angular movement of the transfer arm.

4. Apparatus for applying closures to the tops of containers comprising means for moving containers along a predetermined path, a support adjacent the path of movement of the containers, means for delivering closures one at a time to said support, a transfer arm supported for movement from a position above the path of movement of the containers to a lateral position to take a closure from said support and back to said position above the path of movement of the containers to position the closure above the top of a container traveling along said path and means for turning the closure as it travels from said support to said position above said path to position the closure for application to the container in a predetermined position of orientation relative to the container.

5. Apparatus for applying closures to the tops of containers wherein it is desirable to apply the closures to the tops of containers in a predetermined position of orientation with respect to the configuration of the containers, comprising conveyor means for moving the containers in regularly spaced relation along a prede-

termined path, means for supplying closures for application to the tops of the containers traveling along said path, said means including a delivery chute for supplying closures one at a time to a position close to said path, transfer means traveling with the conveyor means along said path for supporting the closures in a position to be applied to the containers traveling along said path, said transfer means being movable laterally from said path as they approach the delivery chute to take a closure from the chute and move it back to said position above the conveyor and means for rotating the closure on the transfer means as it travels from the delivery chute to said position above the conveyor to orient the closure to said predetermined position with respect to the container.

6. Apparatus according to claim 5 wherein there is means movable with the conveyor and associated with each transfer means operable following orientation of the closure above the container to apply the closure to the top of the container.

7. Apparatus for applying closures to the tops of containers in predetermined oriented positions, comprising a rotary conveyor for receiving and moving containers along a predetermined circular path, a support adjacent said path for supplying closures in a predetermined position of orientation relative to the container traveling along said circular path, a transfer arm mounted on the conveyor to swing angularly from a position above such path to a lateral position to take a closure from the support and back to said position above said path and means for orienting the closure on the transfer arm as it travels from the support to said path about its center through an angle such as to dispose the closure in a position to be applied to a container traveling along said path which corresponds to that which it had relative to said path at the time it was picked from the support.

8. Apparatus for applying closures to the tops of containers comprising a rotor rotatable about a vertical axis said rotor being provided with means for receiving containers standing upright for movement along a predetermined circular path, a chute having an end close to said circular path to which closures are delivered in a predetermined position of orientation relative to the circular path, a transfer arm on the conveyor above each receiving means, said transfer arm being angularly movable about a vertical axis laterally from said position above its associated receiver to a position to take a closure from the chute as it travels by and then back to said position above its associated receiver and means movable with the transfer arm as it returns to said position above its receiver to rotate the closure about a vertical axis through an angle to dispose it in a position relative to said path corresponding to that which it had when taken from the chute.

9. Apparatus for applying closures to the tops of containers in a predetermined position of orientation comprising a rotor rotatable about a vertical axis for moving containers standing upright thereon along a circular path, a closure supply supported adjacent the path of movement of the containers for supplying closures in a predetermined position of orientation relative to the conveyor for application to containers traveling along said circular path, a plurality of pivotally mounted transfer arms supported on the conveyor in spaced relation for angular movement about vertical axes from a predetermined position above the conveyor to a lateral position to take closures from the supply as they travel by the closure supply and back to said predetermined position above the conveyor and means on each transfer arm for rotating the closure thereon about a vertical axis as it travels from the closure supply to said predetermined position above the conveyor through an angle to dispose the closure above the conveyor in the same angular position relative thereto that it had when taken from the closure supply.

10. Apparatus according to claim 6 comprising a rotary adaptor at the distal end of each transfer means and means for rotating the adaptor on each transfer means as each transfer means travels from said predetermined position above the rotor to the closure supply and back to said predetermined position above the conveyor.

11. Apparatus according to claim 6 comprising a rotary adaptor at the distal end of each transfer means and means operable by angular movement of each transfer means toward the conveyor to rotate the adaptor in one direction and by angular movement of each transfer means toward the closure supply to rotate the adaptor in the other direction and wherein said closure supply is provided with a chute for delivering closures one at a time in a predetermined oriented position such as to correspond with the position of the adaptor at the place of taking.

12. Apparatus according to claim 6 comprising a rotary adaptor at the distal end of each transfer means, pins fixed to the adaptor in positions such that as each transfer means approaches the closure supply one of the pins is intercepted by a stationary part to cause the adaptor to be rotated to a predetermined position of orientation for taking a closure from the closure supply and the other pin is intercepted by a stationary part as each transfer means moves back to said predetermined position above the conveyor to rotate the adaptor to an angle to dispose the closure at said predetermined position of orientation relative to the container.

13. Apparatus for applying closures to the tops of containers in a predetermined position of orientation comprising a rotor, transfer arms mounted on the rotor at regularly spaced intervals for movement in a circular path said transfer arms being pivotally mounted for angular movement from a predetermined position above the conveyor to a lateral position radially outward of the center of rotation of the rotor, a source of closure situated at said lateral position supplying closures one at a time to the transfer arms as they are moved to said lateral position, means for moving each transfer arm successively to said lateral position and back to said predetermined position above the conveyor, an adaptor at the distal end of each transfer arm designed to take a closure disposed in a predetermined oriented position from the source and means for rotating the adaptor as the transfer arm returns to said predetermined position above the conveyor to position the closure for application to a container on the conveyor in said predetermined position of orientation.

14. Apparatus according to claim 12 wherein the closure is of a predetermined configuration and is oriented by rotation of the adaptor to dispose the closure in a predetermined orientation in relation to the container.

15. Apparatus according to claim 9, wherein the container has a predetermined top formation and the closure a mating formation and there is means on the transfer arm for taking a closure from the closure sup-

ply and positioning it above the container with the mating portions of the container and closure in registration.

16. Apparatus according to claim **6,** wherein there is a closure applying means associated with each transfer means operable to take a closure from the transfer means and apply it to a container.

17. Apparatus for applying closures to containers wherein the containers are supported standing upright for movement along a predetermined path, closure supply means for supplying closures to a position closely adjacent said path, a transfer arm angularly movable relative to the path to take a closure from said closure supply means and move it to a position above a container traveling along said path for application to a container moving along said path and means for rotating the closure on the transfer arm before it is applied to the closure to reorient the position of the closure on the arm by the amount it became displaced by angular movement of said transfer arm.

18. Apparatus for applying closures to the tops of containers, comprising a rotor for receiving containers and moving them along a predetermined path standing upright, closure supply means for supplying closures to said path, transfer arms mounted on the rotor for movement therewith and angularly movable thereon relative to the closure supply means as they travel by the closure supply means to pick closures from the closure supply means, and move them to positions above containers traveling along said path for application thereto and means for rotating said closures on the transfer arms before they are applied to the containers about vertical axes to dispose them at predetermined positions of orientation relative to the containers.

* * * * *