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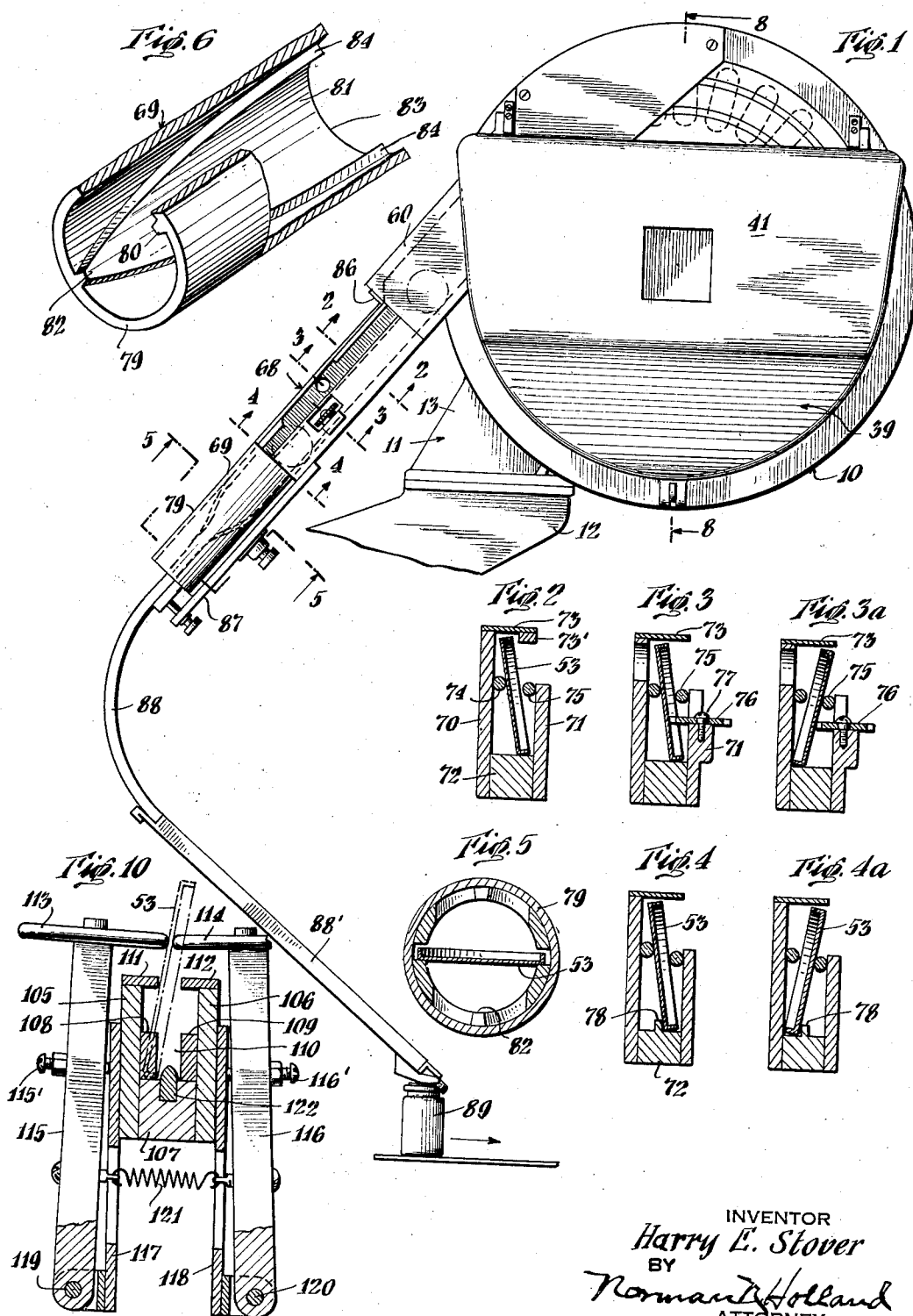
H. E. STOVER

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DEVICE FOR FEEDING CLOSURE CAPS

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2 Sheets-Sheet 1



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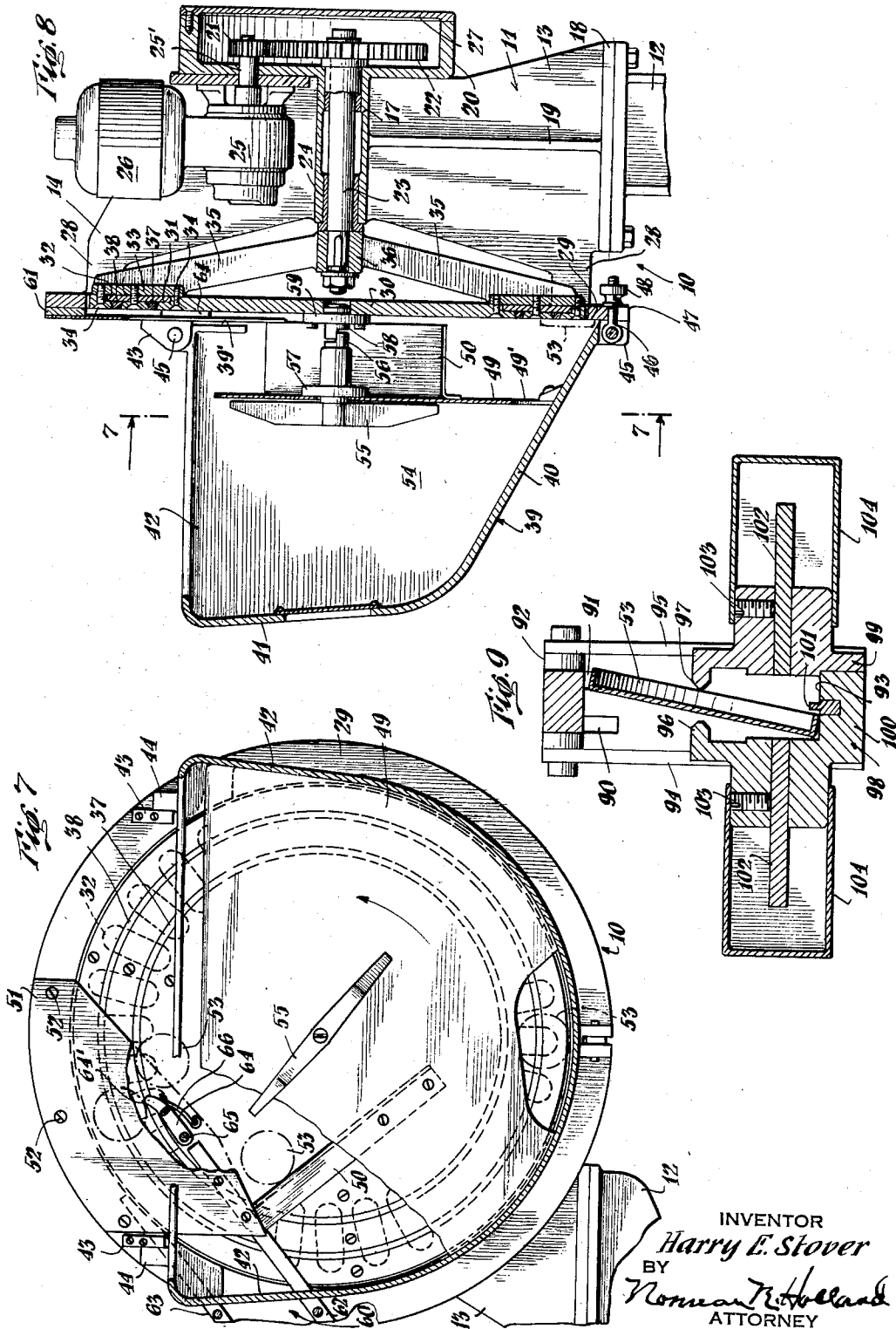
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DEVICE FOR FEEDING CLOSURE CAPS

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2 Claims. (Cl. 221-212)

This invention pertains to cap feeding and aligning devices useful in connection with automatic container sealing machines and for other purposes wherein a requirement exists for the arrangement of caps or closures in a predetermined order.

While cap feeding and arranging devices have been developed for various purposes in the form of hoppers, such prior devices have been complex, noisy, and subjected the closures to scraping and scatching which marred the laquer coating and decoration on them. These difficulties occasion complaints on the part of packers and are quite objectionable. In addition, these hoppers do not provide effective means for delivering caps to a guideway without jamming or with the smoothness that is necessary for efficient feeding.

The present invention aims to provide an improved cap feeding and arranging means having simplicity, low cost, and positive and dependable operation.

Another object of the invention resides in the provision of an improved hopper and associated cap discharge chute that will feed caps into said chute at a predetermined rate or at a rate automatically determined by the rapidity with which they can be accepted by a sealing machine and without the danger of damaging or otherwise deforming caps in the hopper even when the chute is full and can no longer receive caps.

A further object of the invention is a new and improved cap aligning and arranging device that will retard the caps little, if any, as they are turned in one direction or the other in order to arrange them in a uniform manner within a chute. This is attained through the utilization of means reacting on each cap to tilt it in one direction or the other depending upon its position upon arrival at the arranging means. In this way positive cap orientation is secured without interrupting their free movement through the aligning process.

Still another object of the invention resides in the provision of improved means for arranging caps or closures within a chute wherein each closure is tilted relative to a vertical plane to direct it through one of two paths in order to place it within a chute with the tops of all caps facing in one direction.

A still further object of the invention resides in a new and improved cap feeding and aligning device.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

Fig. 1 is a side elevation of a closure cap hopper and arranging device in accordance with the invention;

Figs. 2, 3, and 4 are cross sectional views of Fig. 1

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taken along the lines 2-2, 3-3, and 4-4, respectively, showing certain steps in the orientation of the closures;

Figs. 3a and 4a are similar to Figs. 3 and 4 but show the tilting action when the caps or closures are in a reversed position;

Fig. 5 is a cross sectional view along the line 5-5 of Fig. 1 and illustrates the completion of the cap orientation;

Fig. 6 is a perspective view of the cap rotating means having a portion broken away to illustrate the contour of the guideways;

Fig. 7 is a cross sectional view of the hopper taken along the line 7-7 of Fig. 8;

Fig. 8 is a cross sectional view of the hopper taken along the line 8-8 of Fig. 1;

Fig. 9 is a cross sectional view of a modified closure tilting means forming part of the arranging means; and

Fig. 10 is still another embodiment of a closure tilting device.

In automatically sealing containers such as glass jars and the like, means must be employed for supplying caps at a rate determined by the capping machine. The attainment of this end requires that the apparatus for supplying caps be capable of performance rates exceeding that of the sealing machine and at the same time provide caps only as fast as they are used. The difficulties heretofore encountered in meeting these requirements have been overcome by this invention by the utilization of magnetic and gravitational forces, which not only provides a simpler, more effective device, but also prevents mechanical damage to the caps.

Referring to drawings and specifically to Figs. 1, 7, and 8, the hopper for feeding caps singly into a narrow chute is broadly denoted by the numeral 10 and includes a frame member 11 supported by a suitable bracket 12. The frame member 11 is formed of two plates 13 and 14 spaced about a central tubular member 17 formed integrally therewith or otherwise suitably fastened thereto. The lower end of the downwardly extending plate 13 is coupled by a base plate 18 and a transverse rib 19 for added rigidity.

The right side of the frame 11 as viewed in Fig. 8 carries a housing 20 enclosing a pair of meshed gears 21 and 22. The gear 22 is mounted on and carried by a shaft 23 rotatably supported by a bearing 24 disposed within the tubular member 17. The second gear 21 is carried by the output shaft 25' of a speed reducer 25 driven by a suitable motor 26. The motor and speed reducer are preferably carried by the housing 20, and the housing is closed by a cover plate 27.

The mechanism for holding the caps or closures and aligning them is carried in part by the outwardly extending finger-like parts 28 of the plates 13 and 14 through the medium of an outer surrounding ring 29 secured to the fingers 28. Within this outer stationary ring 29 is a disc 30 of a non-magnetic material such as brass, aluminum, magnesium, or the like. The peripheral edge of this disc is recessed as illustrated at 31 to a depth sufficient to receive a plurality of radially disposed magnets 32 positioned with like poles aligned in the same direction. These magnets are held in position by a back plate 33 secured to the disc 30 by screws 34 and the disc is carried by a plurality of arms 35 angularly spaced one from the other about a central hub 36. The hub 36 is in turn mounted on the shaft 23 and thus provides a rotary support for the disc 30. In the left-hand face of the disc 30 as viewed in Fig. 8 are a pair of spaced magnetic rings 37 and 38 which are positioned in circular recesses formed in the disc in contact with the magnets 32 and in effect form two concentric circular magnetic poles.

With the arrangement thus far described, the motor 26 functions through the speed reducer 24 and gears 21

and 22 to rotate the shaft 23. This in turn rotates the hub 36 which is keyed to the shaft 23 and this rotation is transmitted by means of the arms 35 to the disc 30.

Forwardly of the disc 30 is a container or hopper 39 of relatively thin gauge metal for holding a plurality of caps or closures to be individually fed into the discharge or delivery chute. The hopper 39 is preferably formed of a non-magnetic material and has a sloping bottom wall 40 and substantially vertical front and side walls 41 and 42. The end of the hopper 39 adjacent the disc 30 is generally of circular configuration and has a radius roughly corresponding to the inside diameter of the stationary ring 29 and is secured to the stationary ring 29 by means of cooperating bracket members 43 and 44. These bracket members are interconnected by a pair of pins 45 axially aligned one with the other so that the entire hopper can be swung upwardly to uncover the lower portion of the disc 30. The lower side of the hopper 39 is provided with a bifurcated bracket 45 having an eye bolt 46 pivotally attached thereto. This bolt is arranged to engage a slot 47 in the lower edge of the stationary ring 29 and is provided with a suitable nut 48 so that the bracket 45 can be pulled tight against the front surface of the ring 29.

In front of the disk 30 carrying the magnets 32 and magnetic rings 37 and 38, is a stationary disc 49 of a relatively thin non-magnetic material. This disc conforms generally with the configuration of the hopper 39 and may be suitably secured to the walls 40 and 42 thereof. It is provided with a bottom opening 49' to permit caps or closures 53 to be fed from the chamber to the left of the plate 49 as viewed in Fig. 8 into the lower side of the chamber to the right of the plate in order to be picked up by the magnetic rings 37 and 38. In order to prevent the caps in the chamber 54 to the left of the plate 49 from becoming jammed or blocked, agitating means in the form of a blade 55 is provided. This blade is carried by a shaft 56 journaled in the collar 57 disposed in line with the axis of rotation of the disc 30. The disc 30 includes a short shaft 58, journaled in a collar 59, which is adapted to positively engage the shaft 56 when the hopper is in a down or operable position. Thus the blades 55 are positively driven from the disc 30 and constantly move the closures or caps so that they will feed through the opening 49' in the disc or partition 49.

As the caps are picked up by the magnetic rings 37 and 38, they are carried in a counter clockwise direction as viewed in Fig. 7 and discharged, in a vertical plane, through a narrow chute generally denoted by the numeral 60. This chute is formed between the disc 30 and an overlying plate 51 secured to the stationary ring 29 by means of screws 52 and spaced outwardly from the disc a distance slightly greater than the thickness of a closure 53 by means of a spacer member 61 (Fig. 8). The upper and lower edges of this chute are defined by a pair of tangentially disposed metal strips 62 and 63 which are positioned between the plate 51 and the stationary ring 29, as may be observed more clearly in Fig. 7. It will be noted that the inner end of the lower strip 62 is spaced inwardly of the innermost magnetic ring 37 and of course is inclined to permit the caps to move through the chute 60 under the force of gravity. The upper chute member 63 is substantially parallel to the lower member 62 and terminates approximately at the left-hand edge of the plate 51, as viewed in Fig. 7.

Just to the right and substantially in line with the lower chute member 62 is an arm 64 pivoted to the plate 51 by means of a short shaft or stud 65 and urged upwardly to a position substantially parallel to the chute member 62 by means of a spring 66. The outer end 64' of the pivoted member 64 is bent upwardly to insure proper positioning of each cover 53 before release into the chute 60 and to discharge closures that have been improperly engaged by the magnetic rings 37 and 38 and cause them to be returned to the bottom of the hopper.

When a closure 53 properly engages both magnetic rings 37 and 38, it will be forced upwardly by the finger 64 and engage the lower member 62 of the chute 60 which will slide it from the magnetic rings and allow it to roll down the chute. Should a cover be attracted only by the innermost ring 37, the finger 64 will dislodge it and return it to the hopper. In order to prevent the dislodged covers from piling up about the sides of the hopper, a baffle 50 extends from the underside of the chute 60 downwardly to a point spaced from the center line of the hopper so that each of the dislodged closures upon reaching the end of the baffle 50 will fall to the bottom of the hopper and in the normal case will be again attracted to the magnetic rings 37 and 38 for delivery to the chute 60.

From the foregoing it is apparent that the closures 53 may be attracted to the rings 37 and 38 either with the rim of the cover in contact with the magnetic rings or with the closed side of the cover in contact therewith, and the chute 60 will accept them in either orientation. Since a device of this character is primarily intended for use in combination with sealing apparatus for containers of glass, metal, and the like, it is essential that all of the closures before application to the containers have their covers facing in the same direction. For this purpose cover tilting and twisting means 68 and 69, respectively, are provided and have been illustrated in Fig. 1 as being carried by the chute 60 and axially aligned therewith.

More specifically, and with reference to Figs. 1 through 4a, the cap engaging or tilting apparatus 68 is intended to tilt each cover 53 in one direction or the other from a vertical plane depending on the position of the cover as it rides down the chute 60. This portion of the apparatus has a rectangular channel aligned with the chute 60 and formed by side walls 70 and 71, a bottom wall or spacer 72, and an overlying top wall 73. When the cap first enters the cap tilting apparatus 68, it is engaged by a pair of side rails 74 and 75 carried by the side walls 70 and 71, respectively, as may be observed in Fig. 2, and an upper guide 73' secured to the top wall 73. This upper guide together with the side rails pre-tilts the caps 53, as illustrated in Fig. 2. As the cap rolls downwardly on the bottom wall 72 it approaches a star wheel 76 pivoted by means of a screw 77 to the side wall 71. Since the cover side of the cap 53 in Fig. 2 is to the left, the periphery of the star wheel 76 will merely enter the hollow portion and will not disturb its inclination as illustrated in Fig. 3. Immediately after passing the star wheel the lower end of the cap engages the right-hand side of a central rail or divider 78 which is positioned centrally of the lower wall or spacer 72. This guide rail 78, as will be described, causes the cap 53 to engage one set of curved grooves that will function to twist the cap in a counterclockwise direction as reviewed in Fig. 3 and discharge it into chutes 88 and 88' for delivery to containers 89 being conveyed through a sealing machine.

In the event a cap 53 approaches the cap tilting mechanism 68 with the cover to the right as viewed in Figs. 3a and 4a, it will nevertheless approach the star wheel in a tilted position corresponding to that shown in Fig. 2. Upon arrival at the star wheel 76 the periphery of the star wheel will engage the cover of the cap forcing it to tilt to the right as shown in Fig. 3a. As the cap then proceeds past the star wheel 76, the bottom thereof engages the left-hand side of the center rail or divider 78 which causes it to engage another set of twisting grooves, and be rotated through a clockwise angle for delivery to the chute 88.

The cap twisting mechanism for rotating the caps in one direction or the other is shown in Figs. 1, 5, and 6 and consists generally of a tubular member 79 having upper and lower cams 80 and 81. The lower cam may be observed in Fig. 6 and has a narrowed end portion 82 which butts against and co-operates with the guide rail or separator 78 as viewed in Figs. 4 and 4a. Fig. 6

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has been reversed to facilitate the perspective. The angular span of this cam increases substantially uniformly with distance, so that the terminal end 83 thereof at the exit of the twister has an arcuate span slightly less than 180°. This angle is adjusted, so that the terminal ends of the side walls 84 of the upper and lower cams 80 and 81 are spaced apart a distance slightly greater than the thickness of a cap 53. With this arrangement it is apparent that, if a cap or closure 53 is tilted in one direction upon entering the twister 69, the cams 81 and 82 will engage opposing edges thereof and cause it to be rotated in one direction while a reversely positioned cap with a tilt in the opposite direction will be caused to rotate through a reverse angle. In this way all caps are rotated in the proper direction to effect their discharge from the twister 69 with the covers of all the caps facing in the same direction.

While the cap tilting apparatus 68 and twister 69 may be supported in any suitable manner, in the present embodiment of the invention the tilting apparatus 68 is secured to the end of the chute 60 by means of a bracket 86 while the twister 69 is secured to the tilting apparatus 68 by means of an underlying bracket 87 secured at one end to the tilting mechanism 68 and at the other end to the twister. The chute 88 for receiving the aligned caps may be coupled with the twister 69 in any suitable manner and directs them into a discharge chute 88' for application to the jars 89.

In the previously described embodiment of the invention, the cap engaging and tilting apparatus included three guide rails and a co-operating star wheel in order to accomplish the desired ends. An alternative embodiment of the invention for the attainment of these ends is shown in Fig. 9 and includes a similar rectangular guide way having top and bottom walls 92 and 93 and side walls 94 and 95 for the receipt of the caps 53. The caps are guided with their diameters lying in a substantially vertical plane by means of a pair of guides 90 and 91 depending from a top member 92. At a point spaced beyond the terminal ends of the depending members 90 and 91, the forward edge of each cap engages a pair of inwardly extending fingers 96 and 97 which may be formed integrally with a pair of co-operating magnet supporting members 98 and 99. The member 98 has a bottom portion 100 aligned with the bottom surface 93 of the cap chute and includes a guide rail 101 for engagement of the bottom edge of the cover as in the case of the guide rail 78 as shown in Figs. 4 and 4a. The members 98 and 99 each include a generally horizontally disposed magnet 102 that is held in place by a suitable set screw 103. The magnets are adjustable inwardly and attract the bottom of each cap in one direction or the other depending on the position of the back of the cap relative to the magnets. The outer ends of each magnet are preferably covered by suitable shells or guards 104 to prevent them from being jarred or damaged in any way.

As a cap approaches this tilting mechanism, it usually occupies a position with the diameters thereof in a substantially vertical plane. In this position the top of the cover will necessarily be closer to one of the magnets 102 than to the other, and the closest magnet will cause the cover to move in that direction. In addition, positive tilting is insured since the finger 96 or 97 disposed above the particular magnet 102 which exerts the greatest pull on the bottom end of a cap will limit the movement of the middle of the cap and cause the upper part to move toward one side wall, 94 or 95 as the case may be.

With the above embodiment of the invention as well as that disclosed in Figs. 2 through 4a for tilting caps or closures, it will be observed that little or no drag is placed on the caps and they will feed freely through the chute 60, the tilting and twisting mechanisms, and into the chute 88 and 88'.

Under conditions where the containers or jars 89, pass-

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ing through a suitable sealing machine, actually pull the leading closures 53 from the chute 88', the rate at which the closures are fed to the container engaging point will be completely under control of the sealing machine.

With the present feed, when the chute 60 is filled, the caps or closures picked up by the magnetic rings on the hopper cannot enter the chute 60 and will slide on the magnets or drop back into the bottom of the hopper as previously described. Thus, the caps are not scratched or marred and the entire hopper mechanism will feed aligned covers at the rate required by the sealing machine.

A still further embodiment of the cap engaging and tilting apparatus is shown in Fig. 10. In this form of the invention each cap enters an elongated downwardly inclined guideway formed by a pair of side walls 105 and 106 that are held in spaced relationship by a bottom member or spacer 107. Within the side walls are a pair of longitudinal spacer members 108 and 109 that provide a narrow gap 110 therebetween for receipt of the caps with their diameters in the vertical plane. On the upper ends of the side walls 105 and 106 are a pair of inwardly extending plates 111 and 112 which insure the alignment of each cap in the substantially vertical position. While at least a portion of the cap 53 is in engagement with the fingers 111 and 112 and the guide rails 108 and 109, it enters between a pair of rollers 113 and 114 of relatively large diameter. These rollers are supported by a pair of vertically disposed rods 115 and 116 carried by a pair of side members 117 and 118 which are secured to and extend downwardly from the side walls 105 and 106. The rod 115 is pivoted to the member 117 by a suitable pin 119 while the rod 116 is pivoted to the lower end of the member 118 by a pin 120. A spring 121 is suitably connected between the rods 115 and 116 and tends to urge them against the plates 111 and 112, their inner positions being determined by set screws 115' and 116'.

The rollers 113 and 114 are proportioned in size so that the rods 115 and 116 will tilt inwardly. The degree of tilt and the minimum spacing between the rollers may be adjusted by suitable adjusting screws 115' and 116' threadably retained by the associated rod and bearing against the outer surface of the side walls 117 and 118. The spring 121 is a relatively weak spring so that the skirt of a cap such as cap 53 rolling down the guideway between walls 105 and 106 forces the rollers 113 and 114 apart to allow the cap to pass therethrough as will be more fully described below. In the preferred adjustment of positions of the rollers a slight gap is provided as shown to minimize retardation of the closures in passing between the rollers.

The guide rails 108 and 109 terminate at the rollers 113 and 114 so that as each cover 53 enters between the rollers 113 and 114, it maintains engagement with the fingers 111 and 112 but moves out of engagement with the guide rails 108 and 109. In so doing, the cover will tilt in one direction or the other depending upon the position of the cover relative to the rollers 113 and 114. This tilting results from the fact that the rollers 113 and 114, being biased inwardly by a single spring, tend to apply equal force to the cap 53. The equal forces center the cap cover with respect to the fingers 111 and 112. Since the cap cover is at one edge of the cap, the cap is necessarily tilted to permit the centering of the cap cover by the rollers 113 and 114. In the illustrated embodiment, the cover part of the cap is to the left and it is therefore tilted to the right. As the cover proceeds in this inclined position through the rollers 113 and 114, the bottom edge of the cap is engaged by a central rail 122 that guides the cap into one or another guideway in the twisting means for rotating it in either a clockwise or counter clockwise direction in the same manner as discussed in connection with Figs. 2 to 4a. Through the utilization of the relatively large rollers 113 and 114, as shown in Fig. 10, very little effort is required to move

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each cap or closure between the rollers and effect the desired tilt in one direction or the other with the result that little or no drag and no interruptions occur in the rate at which the covers are being supplied.

In operation, referring first to the hopper part shown in Figs. 1, 7, and 8, closure caps are delivered in bulk to the receptacle part 39 of the hopper where they pass through the opening 49' to engage the rotating disc 30 and particularly the magnetized rings 37 and 38 adjacent to the periphery of it. By reason of the magnets 32 back of these rings, the rings serve as a north and south pole of a continuous magnet extending about the discs. The closures are held by these rings flat against the disc, and as the disc rotates the closures are fed one at a time to chute 60. Closures which are high enough on the disc, that is, when they span the two rings, will pass into the chute. Those not high enough will be forced off the rings by the finger or cam 64'. When the chute is filled, the caps slide back on the magnetized rings and drop down into the hopper for engagement with the magnetized rings and delivery a second time to the chute. Thus, closures are continuously fed at the rate they are taken from the chute.

The rotating disc 30 is mounted upon the arms 35 keyed to shaft 23 which is driven by gears 22, 21, reduction gear 25, and motor 26.

An agitator 55 mounted on a stub shaft 56 in engagement with the member 58 on this rotating disc agitates the closures in the hopper to prevent their clogging prior to entry through the opening 49' at the bottom of the receptacle.

Referring to the twister or orienting mechanism shown in Figs. 1 to 6, the closures pass along the chute 60 until they reach the portion shown in Fig. 2 where the middle of the closure is supported between the guides 74 and 75, so that the closure may tilt. As the closure continues past the star wheel 76 of Figs. 3 and 3a, the bottom edge of the closure is pushed to one side or the other depending upon whether the cover of the closure is adjacent to the star wheel as shown in Fig. 3a or remote from the star wheel as shown in Fig. 3. The closure thus tilted passes on one side or the other of the rib 78 in the bottom of the channel. This rib guides the closure against one or the other of the cam surfaces 84 as shown in Fig. 6. Thus, each closure is turned 90° so that the cover faces downwardly as shown in Fig. 5. As the closure passes around the bend in the chute 88, it is inverted and when it is in position to be engaged by the container 89 the cover part faces upwardly. In this manner the closures, without substantially retarding action, are oriented so that each closure is in proper position to be placed on a container regardless of how it faces when it enters the chute 60.

In Fig. 9 a pair of magnets 102 are utilized for tilting the closure. The magnet adjacent to the cover of the cap will be effective upon the closure to tilt it as shown in Fig. 9.

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In Fig. 10 a pair of rollers 113 and 114 engage the upper part of the closure for the purpose of tilting it. These rollers are resiliently retained in position by the spring 121 and tilt the closure depending upon which roller it faces, as shown in Fig. 10.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. In a magnetic cap feed mechanism for continuously feeding metal caps into a cap chute, the combination of a rotatably mounted nonmagnetic disc, drive means for continuously rotating said disc, a pair of spaced rings of magnetic material positioned concentrically of and embedded in one face of said disc, a plurality of permanent magnets mounted on said disc, one of said spaced rings contacting the north pole of each magnet and the other of said spaced rings contacting the south pole of each magnet whereby continuous magnetic fields are created concentrically of said disc, a cap hopper at least partially enclosing said one face of said disc outwardly of said rings whereby caps in said hopper engage said spaced rings as said disc is rotated by said drive means, a cap chute having a narrow cap conveying channel therein adjacent to said one face of said disc and aligned substantially tangentially with said spaced rings whereby caps magnetically attracted to said rings and lying flat against said one face of said disc are fed into said chute by the rotation of said disc.

2. Apparatus according to claim 1 including a partition within said hopper and in spaced parallel relationship to said disc, said partition having an opening therein for the passage of caps from one side thereof to the other side and into contact with said disc, and agitating means on said one side of the partition operatively connected to said disc for movement therewith to produce free movement of the caps through said opening.

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