June 3, 1958 C. L. DAY ET AL 2,836,947

CAP FEEDING AND APPLYING MECHANISM

Original Filed June 23, 1952 8 Sheets-Sheet 1

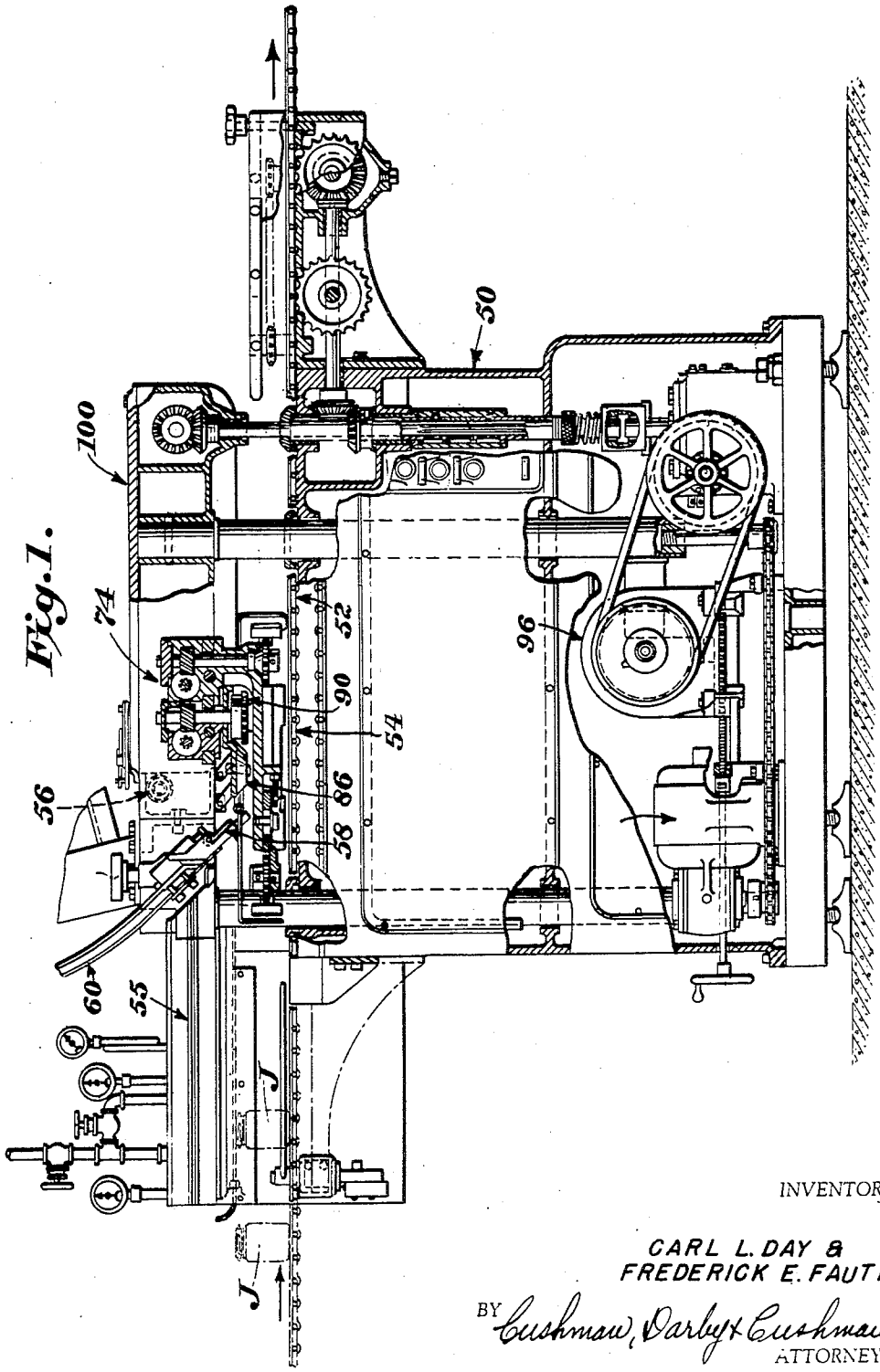


Fig. 1.

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CAP FEEDING AND APPLYING MECHANISM

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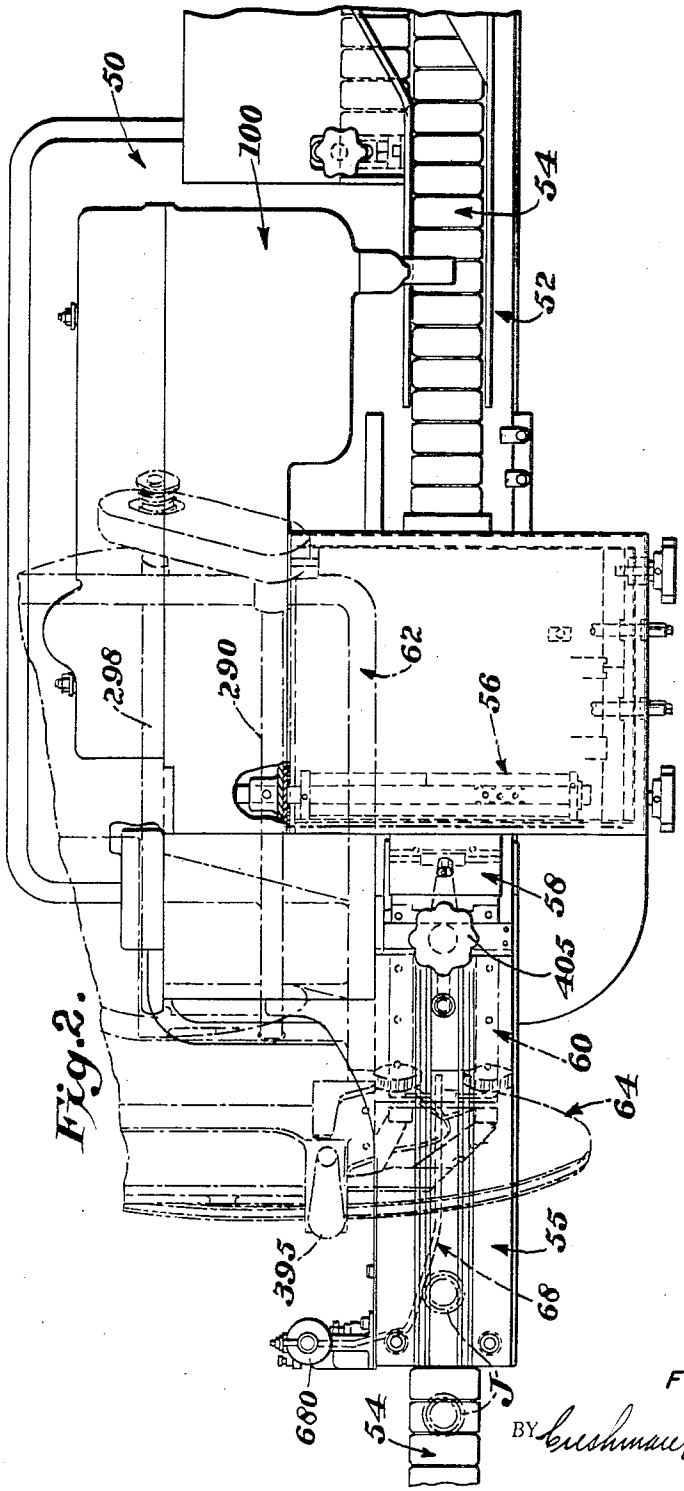


Fig. 2.

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CAP FEEDING AND APPLYING MECHANISM

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Fig. 3.

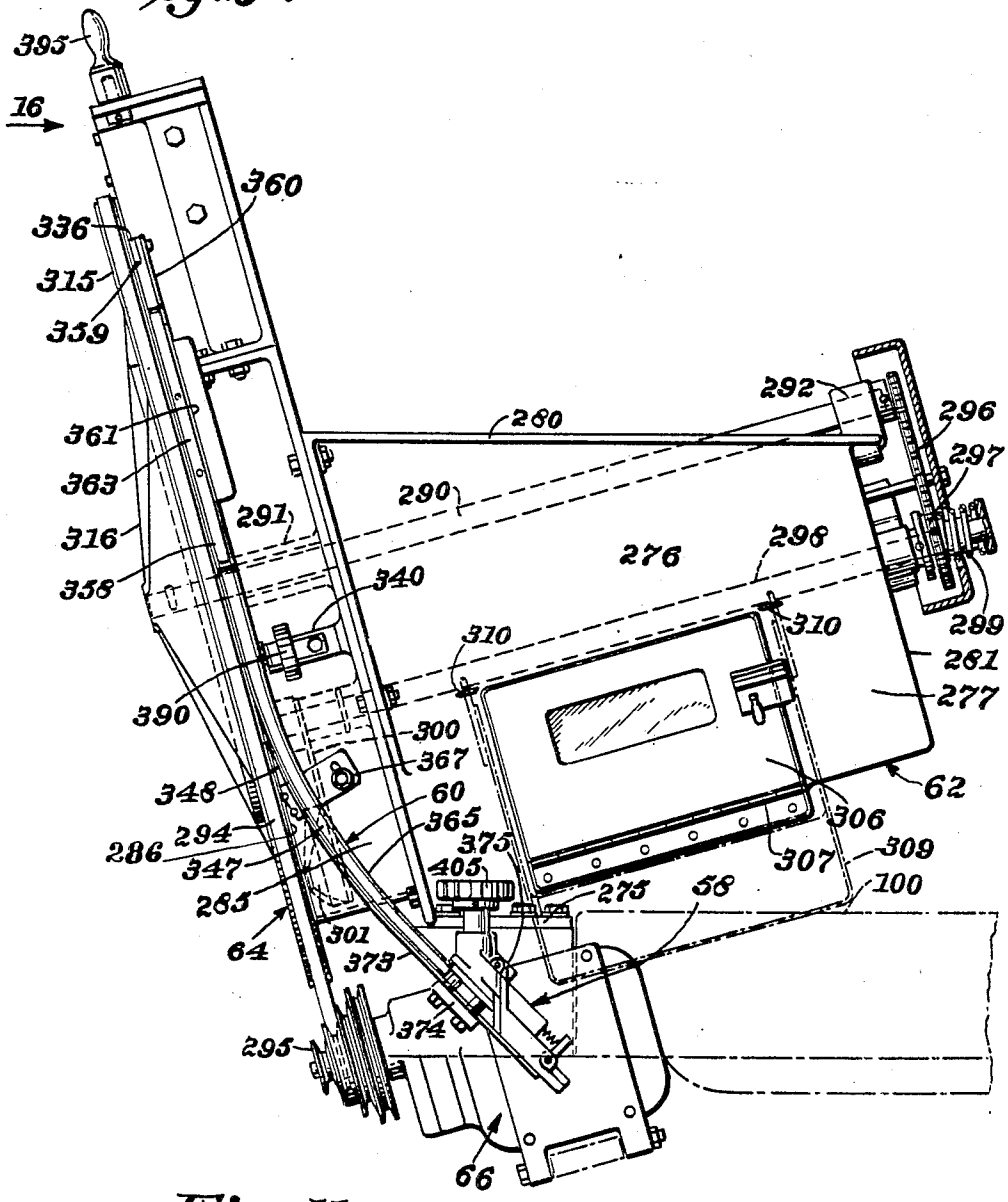
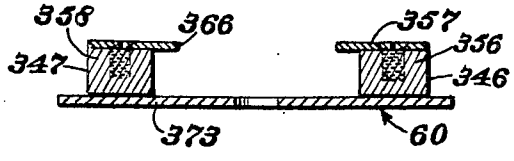


Fig. 11.



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CAP FEEDING AND APPLYING MECHANISM

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Fig. 4.

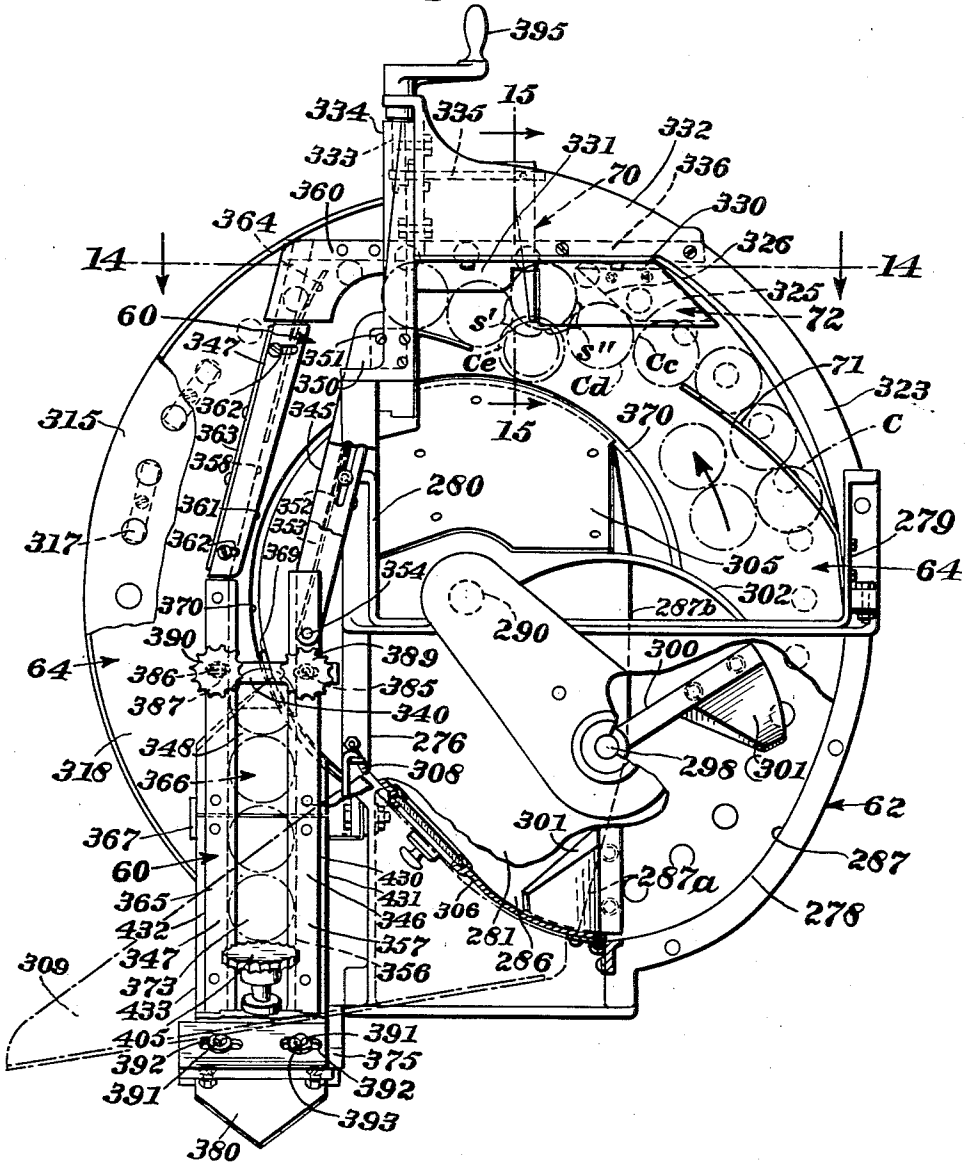
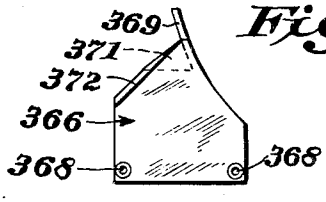


Fig. 5.



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CAP FEEDING AND APPLYING MECHANISM

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Fig. 6.

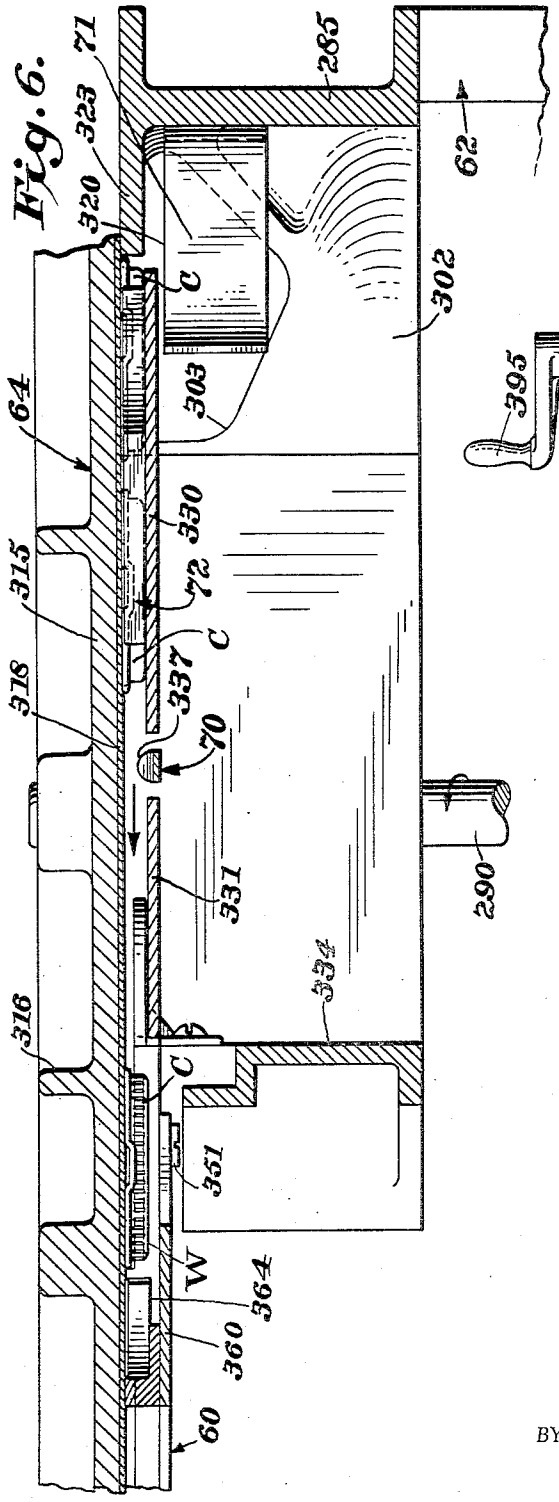


Fig. 8.

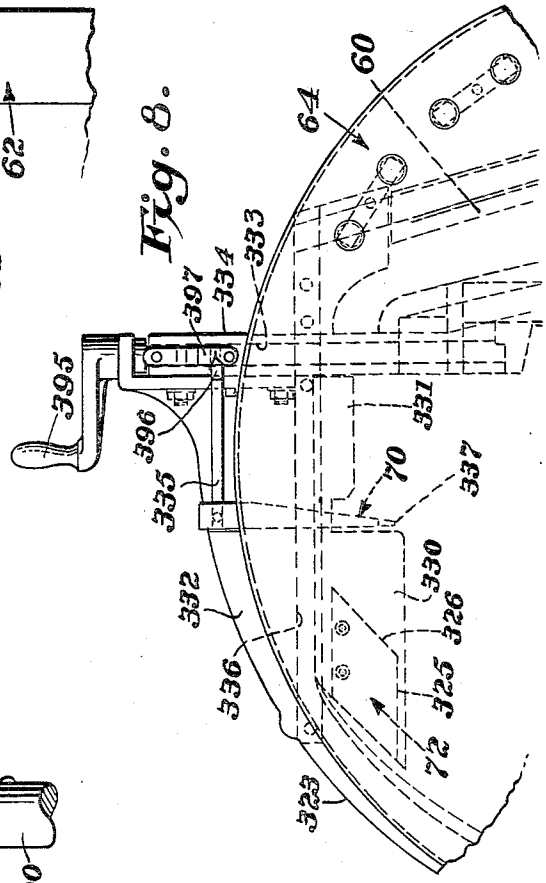
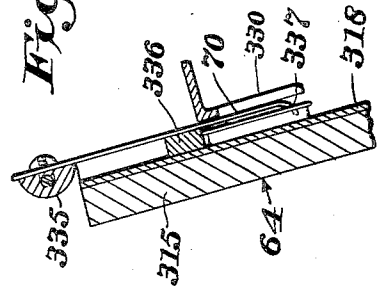


Fig. 7.



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CAP FEEDING AND APPLYING MECHANISM

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Fig. 9.

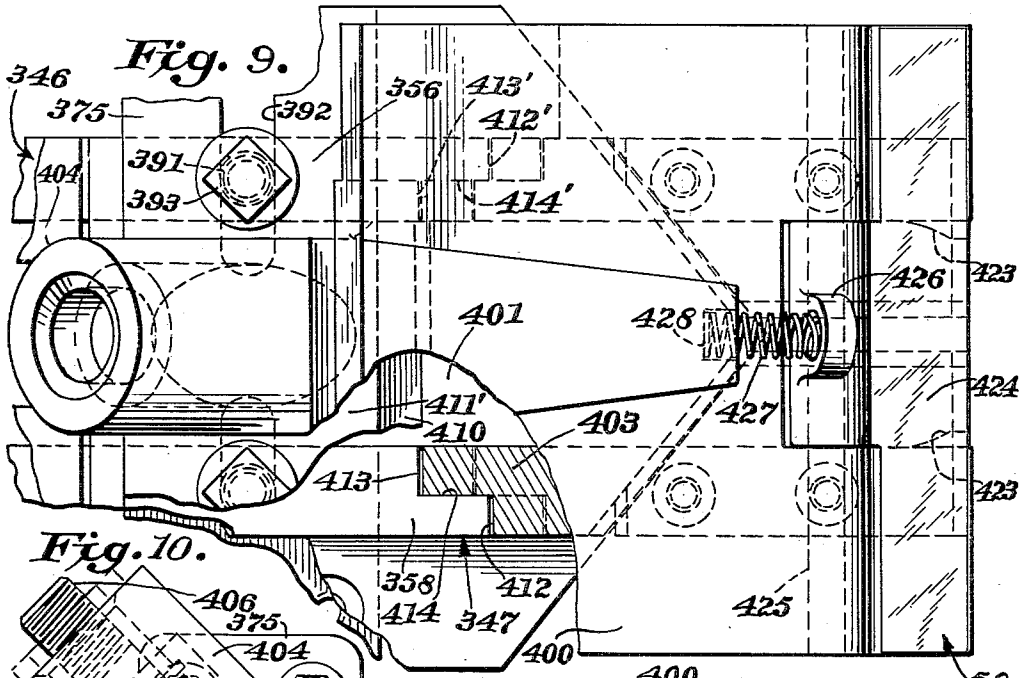


Fig. 10.

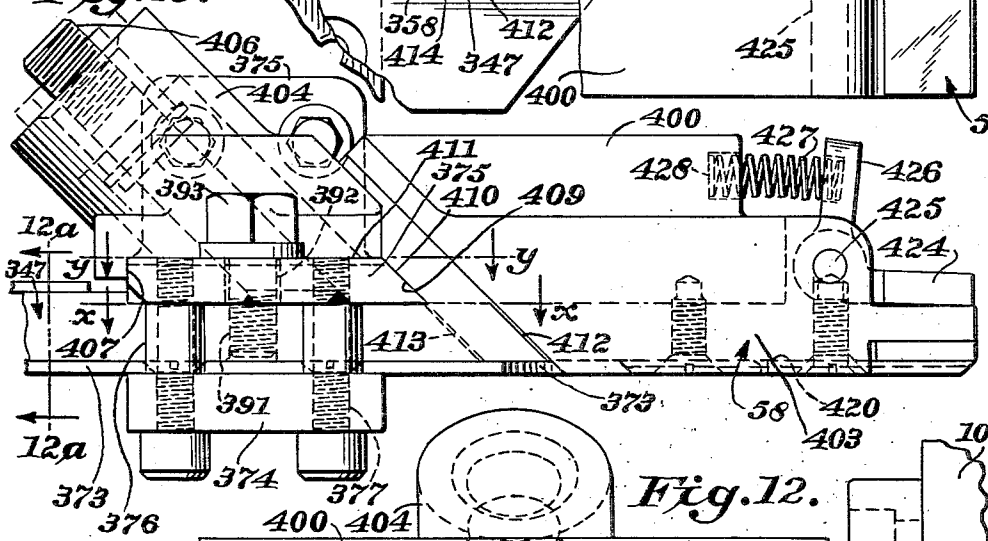
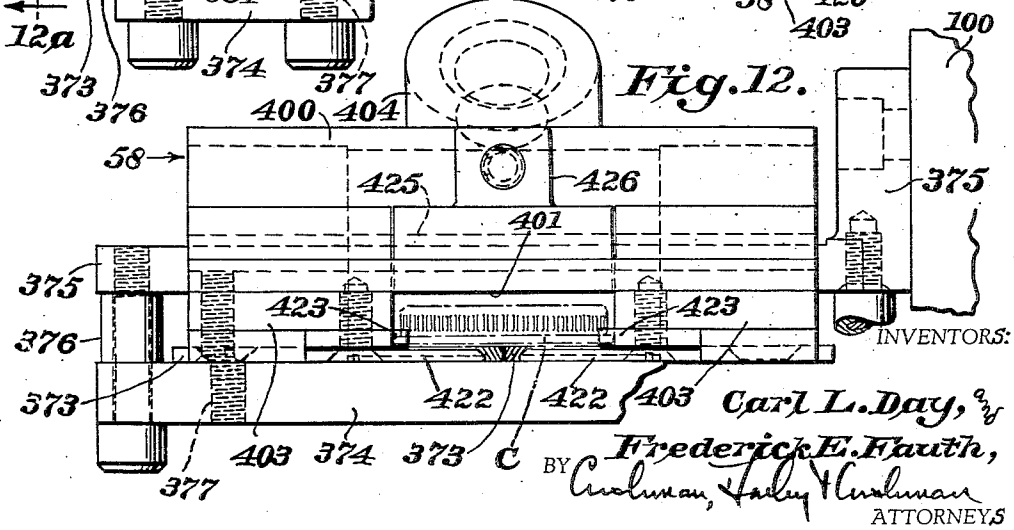


Fig. 12.



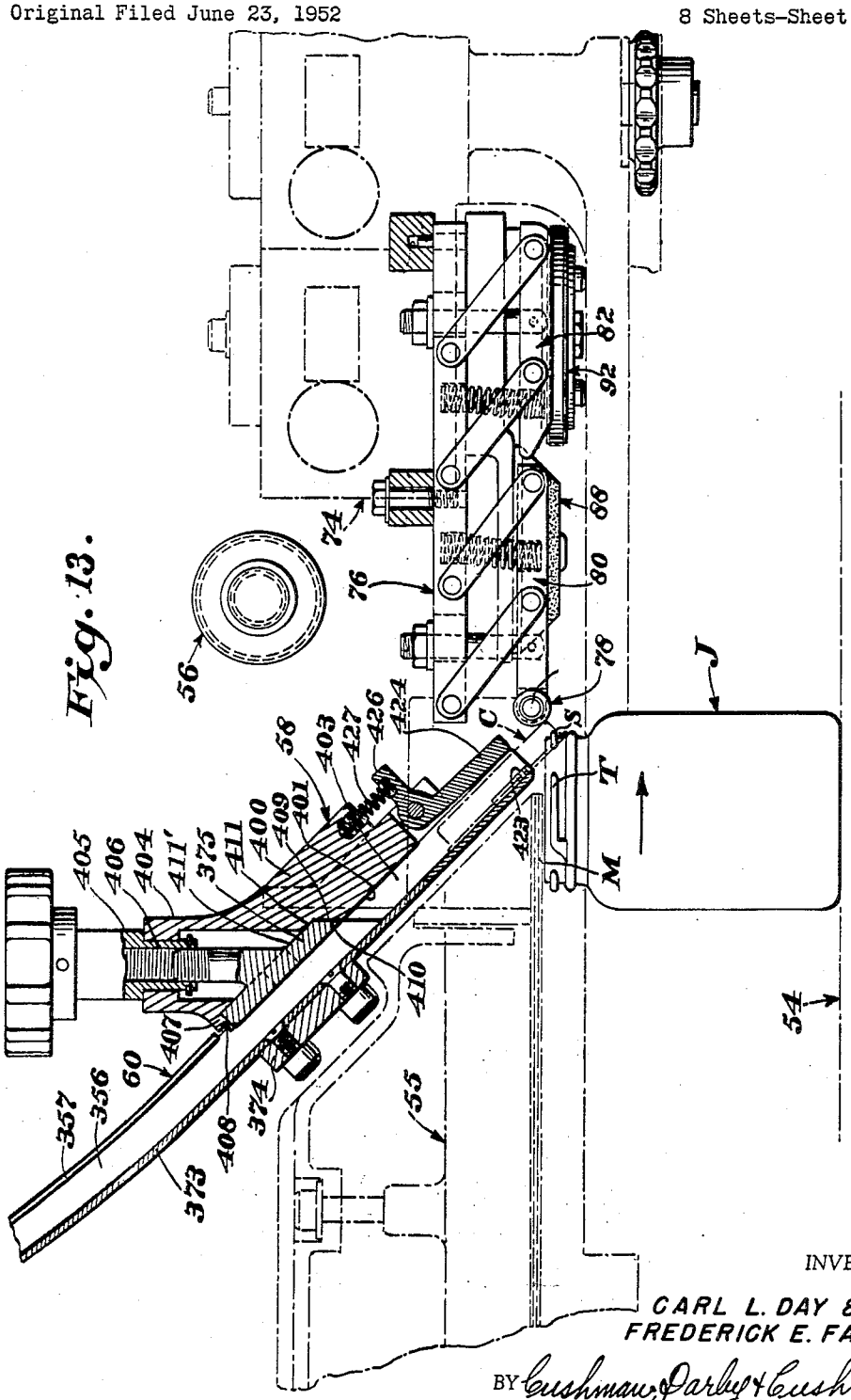
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CAP FEEDING AND APPLYING MECHANISM

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Fig. 13.



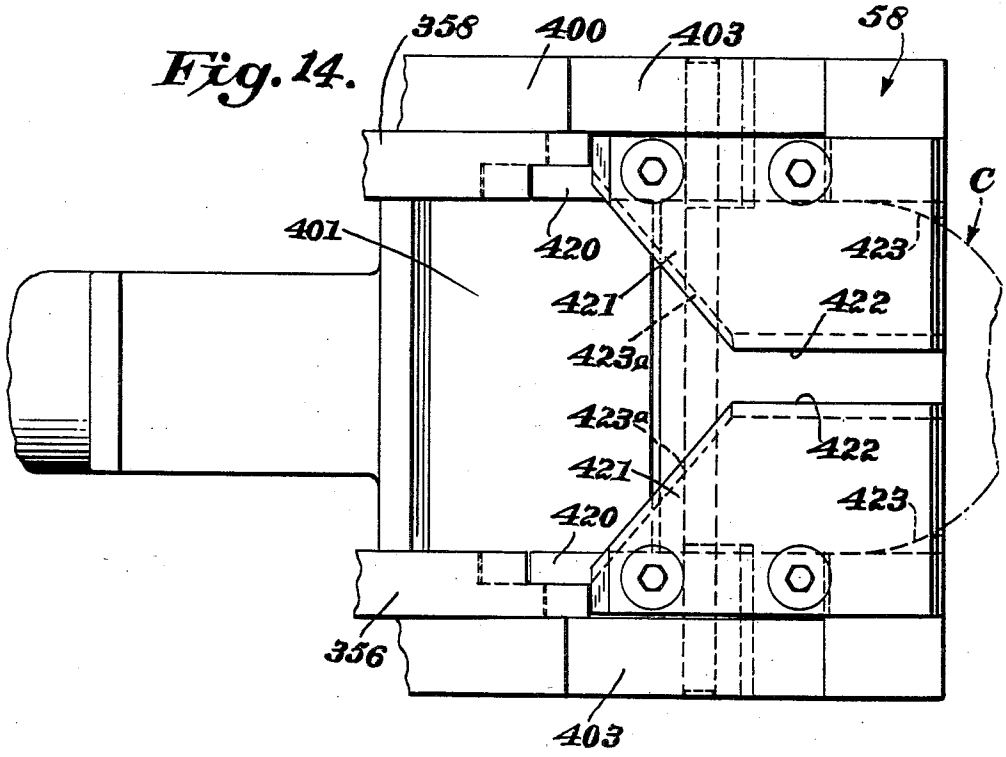
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CAP FEEDING AND APPLYING MECHANISM

Original Filed June 23, 1952 8 Sheets-Sheet 8

Fig. 14.



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United States Patent Office

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Patented June 3, 1958

2,836,947

CAP FEEDING AND APPLYING MECHANISM

Carl L. Day and Frederick E. Fauth, Baltimore, Md., assignors to Crown Cork & Seal Company, Inc., Baltimore, Md., a corporation of New York

Original application June 23, 1952, Serial No. 295,024, now Patent No. 2,734,672, dated February 14, 1956. Divided and this application January 29, 1954, Serial No. 405,195

27 Claims. (Cl. 53—314)

The present invention relates to a cap feeding and applying mechanism and, more particularly, to an apparatus for feeding and applying threaded type caps to containers travelling in line on a conveyor after which the caps are secured to the containers by any suitable cap securing mechanism.

This application is a division of application Serial No. 295,024, filed June 23, 1952, now Patent No. 2,734,672, which discloses a cap securing apparatus particularly adapted for use with the present invention. However, it is within the scope of the present invention that the cap feeding and applying mechanism disclosed in this application may be used to feed caps of the non-threaded type to any type of cap securing mechanism.

Numerous cap feeding and applying mechanisms heretofore have been proposed, but such prior apparatus have not been of optimum efficiency in feeding and applying caps to the tops of containers moving at high speeds.

Therefore, an object of the present invention is the provision of an apparatus which will feed caps properly faced at high speeds to containers moving at high speeds.

Another object of the present invention is to provide a cap supply means of such design that an adequate supply of properly facing caps will be available for an associated capping means.

Still another object of the present invention, and ancillary to the preceding object, is to provide container actuated means for controlling the supply of caps to a capping chute.

It is well-known practice to supply caps to a chute from a hopper by means of a rotary feeding element. However, in order to compensate for caps facing in the wrong direction, which are returned to the hopper, it is necessary that the feeding element supply caps to the chute at a rate which sometimes may exceed the rate at which caps are removed from the chute outlet. This may result in the feeding element supplying so many caps to the chute that caps will be forced from the outlet or cap applying end of the chute.

Another object of the invention is to provide a means of novel design to prevent caps facing in the wrong direction from reaching the cap supply chute.

A further object of the invention is to provide a cap chute of such design that it readily can be adjusted for various sizes of caps.

Still another object of the invention is to provide a cap chute and a means to eliminate caps facing in the wrong direction and both of which are simultaneously adjustable for caps of various sizes.

Most packing plants find it necessary at frequent intervals to change the size of caps when different size containers are being handled. It heretofore has been proposed to make the cap chutes and the cap applying means adjustable for various sizes of caps. However, such adjustments have been difficult to make, particularly where the plant operates according to seasonal requirements and much of the labor employed is relatively unskilled.

We have found that the most satisfactory manner of

adjusting a capping and applying mechanism for various sizes of caps is to include with the apparatus a number of cap applying mechanisms of like type, each one being designed to handle a different size cap but all of which readily can be mounted upon the machine frame for cooperation with the adjustable capping chute.

Another object of the invention is to provide a cap chute and cap applying mechanism which are so related that the cap applying mechanism readily can be replaced by a similar device and the chute adjusted when caps of another size are to be handled.

Another object of the invention is to provide a cap feeding means including a magnetic disc to move the caps from a hopper to a chute, with the chute and disc so arranged with relation to each other that the caps readily will be removed from the disc and delivered to the chute.

Other objects and advantages of the invention will be apparent from the following specification and accompanying drawings.

Figure 1 is a view partly in front elevation and partly in vertical section of a machine associated with the cap feeding and applying mechanism of the present invention. The views omits the upper portion of the hopper and chute of the cap feeding and applying mechanism.

Figure 2 is a plan view of the structure shown in Figure 1, the view including dot-and-dash line showings of portions of the cap feeding and applying mechanism omitted from Figure 1.

Figure 3 is a front elevation of the cap hopper and cap feeding means indicated in dotted lines in Figure 2.

Figure 4 is a view of the cap hopper and feeding means looking toward Figure 3 from the right. Portions of the end wall of the hopper are broken away.

Figure 5 is a detail elevation of a cap stripping plate included in the cap chute illustrated in Figure 4.

Figure 6 is a horizontal section on the line **14—14** of Figure 4.

Figure 7 is a fragmentary view on the line **15—15** of Figure 4.

Figure 8 is a detail of the upper portion of the structure shown in Figure 3, the view looking toward Figure 3 in the direction of the arrow **16** of Figure 3.

Figure 9 is a top plan view of a cap applying device included in the invention, portions of the device being broken away on the lines *x—x* and *y—y* of Figure 10 to show how the device is mounted with respect to the lower ends of the cap chute guide rails.

Figure 10 is a side view of the structure shown in Figure 9, that is, the cap applying element and the lower portion of the cap chute.

Figure 11 is a transverse section on the line **12***a***—12***a* of Figure 10.

Figure 12 is an elevation of the outfeed end of the cap applying element, that is, a view looking toward Figures 9 and 10 from the left.

Figure 13 is a vertical sectional view through the cap applying mechanism.

Figure 14 is a bottom elevation of the cap applying elements of Figures 9, 10 and 12. The view omits the chute bottom wall but shows the chute guide rails.

GENERAL DESCRIPTION

The construction and operation of the apparatus illustrated in this application as embodying the invention generally may be described as follows:

Referring to Figures 1 and 2, the container sealing apparatus includes a base casing or housing **50** including an upper surface or work table **52** across which the top run of a straight line conveyor **54** moves filled jars J or other containers from the left to the right in Figures 1

and 2. The containers J first will move through a steam tunnel generally indicated **55** so that at least a substantial portion of air within the headspace of the container will be displaced by steam. Steam is also supplied through a diffuser **56** positioned adjacent the tunnel exit, cap applying means and cap securing mechanism **74**. The apparatus and method thus far described for closing a container under vacuum or the like is the same as described in our copending application Serial No. 405,194, now U. S. Patent No. 2,768,487, filed herewith, which is also a division of the previously mentioned application Serial No. 295,024, filed June 23, 1952.

As is generally indicated in Figures 1 and 13, immediately after a container J leaves the steam tunnel **55**, a cap C provided with thread engaging lugs L will be loosely applied to the container by a cap applying element **58** positioned above conveyor **54** and at the lower end of a cap chute **60**.

The caps to be applied to the containers are delivered to the chute **60** from a cap hopper **62** supported above the remainder of the machine as generally indicated in Figures 2 and 3. Hopper **62** is provided at one end with a cap feeding disc **64** including magnetic inserts which cause caps to adhere to the planar face of the disc. Disc **64** is rotatable about a substantially horizontal axis to move caps upwardly in a counter-clockwise direction as viewed in Figure 4 and toward the upper end or inlet of chute **60**. Disc **64** is driven by a motor **66** (Figure 3) which is so controlled by a container-actuated switch operating arm **68** within steam tunnel **55** (Figure 1) that cap feeding disc **64** only will be driven when containers are moving through the tunnel.

Referring to Figure 4, the cap feeding disc **64** has a discriminator or detector device **70** associated therewith to remove from the disc caps which are facing in the wrong direction, such caps being caused to drop back into the hopper. In addition, a spring stripper arm **71** secured to the hopper wall prevents upward movement of superimposed caps and a cam or block **72** rigid with the hopper and overlying an edge of the rotary path of disc **64** insures that the circular line of caps on the disc will not become so long as to exert too much pressure upon the line of caps in chute **60**.

The cap chute **60** (Figures 3 and 4) is readily adjustable to handle runs of caps of different sizes and the cap applying element **58** (Figures 9 to 13) is of such design that it readily can be removed from the lower end of chute **60** and a similar element attached to the chute for handling caps of a different size.

After the cap C is loosely positioned on the container J, the container and cap will be conveyed to the cap securing mechanism generally indicated by the numeral **74**. The cap securing mechanism **74** includes a cap presser **76** provided with a horizontally and transversely disposed roller **78** at its infeed end and two horizontal and tandem arranged spring-loaded bars **80** and **82**. Roller **78** so cooperates with the cap C as to cause bar **80** to smartly tap or impact the cap to press it downwardly with respect to the container. During movement of container J beneath the cap applying element **58** as well as during its travel through the securing mechanism **74**, the body of the container J will be engaged and held against rotation by horizontally arranged and opposed endless belts (not shown).

The cap securing mechanism **74** also includes a pair of unthreading members **86** and a pair of threading rolls **92**. The cap securing mechanism thus far described will be found in more detail in application Serial No. 295,024, filed June 23, 1952. As will be evident to one skilled in the art, a cap securing mechanism other than the cap securing mechanism **74** may be used in combination with the cap feeding and applying means of the present invention.

Cap feeding hopper and agitator assembly

The cap feeding hopper **62** including the disc **64** is illustrated in Figures 2 to 8. Referring to Figure 3, hopper **62** is of trough-like shape and is so formed and mounted on the superstructures **100** by a flange **275** that its bottom is downwardly inclined toward the disc **64**. Referring to Figure 4, which shows the hopper **62** as viewed from the right of Figure 3 along the axis of the disc **64**, the hopper includes a vertical front wall **276**, an inwardly inclined lower wall **277** and, rearwardly thereof, a curved wall **278** extending upwardly to the rear top edge 279 of the hopper. The rear top edge **279** and the forward top edge **280** (Figure 3) normally lie in a horizontal plane. The right-hand end (Figure 3) of the hopper is closed by a wall **281** shown partly broken away in Figure 4. At its left-hand end in Figure 3, hopper **62** includes an agitator housing generally designated **285** which generally conforms to the transverse section of the hopper **62** but includes a vertical wall **286** which covers the dial **64** from left to right in Figure 4 to edges designated **287***a* and **287***b* extending from top to bottom of the hopper just rearwardly of the hopper center-line. Hence, a vertically arranged dial contact opening **287** in housing **285** is provided at the right-hand side (Figure 4) of the hopper **62**. The caps deposited within the hopper **62** may gravitate into housing **285**.

Disc **64** is fixed to a shaft **290** which extends through a journal **291** in agitator housing **285** and has its opposite end journalled in a boss **292** formed at the upper edge of the hopper end wall **281**. Disc **64** is provided with a shallow peripheral groove in which a belt **294** is fitted, the belt being driven by a pulley device **295** fixed to the shaft of the motor **66**. The pulley device **295** may be adjustably mounted for axial movement upon the motor shaft and provided with pulleys of different sizes to thereby permit the speed of rotation of disc **64** to be varied.

Beyond boss 292, shaft **290** carries a sprocket wheel which drives a sprocket chain **296** which also engages a sprocket wheel **297** mounted on a second shaft **298** which, as shown in Figure 3, extends parallel to shaft **290**. Sprocket wheel **297** is drivingly connected to shaft **298** by an overload release clutch **299**. At its end adjacent disc **64**, shaft **298** has a hub fixed thereto provided with a plurality of radially projecting arms **300**. The arms **300** are provided at their outer ends with sweeps or blades **301** rotated in a counterclockwise direction as viewed in Figure 4. The blades preferably are formed of resilient but relatively rigid material so as not to mar caps and they serve to direct caps which move into agitator housing **285** past edge **287***a* against disc **64**.

As has been indicated above, the container operated switch arm **68** illustrated in Figure 2 as extending along tunnel **55**, controls the operation of motor **66** which drives hopper impeller blades **301** and disc **64**. It will be observed from Figure 2 that arm **68** is pivoted in a housing **680** secured to the work table **52**, and the arm is of such length that a single container will hold it outwardly during the time that the container is moving a substantial distance within tunnel **55**. Therefore, so long as containers are moving toward cap applying device **58** reasonably spaced apart, arm **68** will be held outwardly and motor **66** will drive the cap feeding elements. However, if no container engages arm **68**, it will swing inwardly by spring pressure to the position shown in Figure 2, and motor **66** will cease operation. Guide bars, not shown, will hold containers upright while they engage switch arm **68**.

The provision of the container controlled switch **68** for motor **66** will avoid over-feeding of caps to chute **60** and the undue stirring of caps in hopper **62** which otherwise would occur during delays in the feeding of containers.

As is indicated in Figure 3, motor **66** may be pivoted

to the superstructure **100** in such manner that its weight will properly tension the belt **294** by means of which it drives the cap supply mechanism.

Referring to Figure 6, which is a horizontal section showing the upper wall **302** of the agitator housing **285**, it will be observed that this wall of the housing is cut away to provide an opening **303** through which caps may move upwardly from agitator housing **285** with the disc **64**. The upper left-hand portion of the agitator housing as viewed in Figure 4 partially may be covered by a curved plate **305** extending from the disc **64** to the opposite end wall of the agitator housing. In order to permit caps to be removed from the hopper when it is desired to operate with caps of a different size, the hopper includes a door **306** pivoted at its lower edge **307** to the wall **277** of the hopper. Figures 3 and 4 show a chute **309** in phantom outline with its hooks **308** engaged in eyelets **310** fixed to hopper wall **277**. By thus securing the chute **309** and then swinging door **306** downwardly, caps readily can be removed from the hopper **62** into chute **309**.

Disc **64** includes a body plate **315** which is of substantial thickness and is ribbed on its rearward face as indicated at **316** for bracing purposes. Adjacent its circumference, plate **315** is provided with a circumferentially spaced series of magnetic inserts **317**, the spacing between the inserts being sufficiently close that a substantially continuous stream of caps will be carried upwardly to the discriminator **70** and the entrance of cap chute **60**. As is indicated in Figure 4, a thin sheet of highly polished non-magnetic material **318** covers the inner face of plate **315** and the caps contact with this sheet.

As is indicated in Figure 4, hopper **62** generally covers only the lower right-hand portion of disc **64** so that rotation of disc **64** in the direction of the arrow of that figure, and with the magnetic inserts **317** arranged near the disc periphery, will cause caps which adhere to the disc to be moved upwardly above the hopper and laterally toward the infeed mouth of cap chute **60**. Because the infeed mouth of chute **60** is adjacent the vertical diameter of the disc and the chute then diverges downwardly from the path followed by the magnetic inserts, the inserts will not affect caps which have moved into the chute.

Other constructional features of the hopper **62** and disc involved in the present invention are described below in connection with the operation of the hopper.

With the disc **64** and the agitator blades **301** rotating in a counterclockwise direction as viewed in Figure 4 and in a clockwise direction as viewed in Figure 8, as the caps slide downwardly in the hopper **62** toward disc **64**, the caps will be stirred by the blades **301** to assist in causing them to reach a parallel relationship with the disc **64**. Therefore, as a magnetic insert **317** moves upwardly through the lower right-hand quadrant (Figure 4) of the travel of the disc **64**, caps which become parallel to the disc will adhere to the sheet **318** by the action of the magnetic inserts. Obviously, a cap may adhere in parallel relationship to the disc either with the edge of its skirt against the disc, which is the desired position, or with the skirt facing away from the disc. The action of the magnets may cause a cap lying directly against the disc to pick up a second cap so that the second cap will be superposed upon the first. Superposed caps will be stripped from the cap which is immediately adjacent the disc **64** by the spring stripper arm **71** shown in Figures 4 and 6. As is clear from Figure 6, the edge **320** of stripper arm **71** is positioned sufficiently close to the adjacent surface of disc **64** that only one cap may move with disc **64** past stripper **71**, any superposed cap falling back into the hopper.

As is best shown in Figures 4 and 6, a rim piece **323** extends upwardly from the agitator housing **285** and lies immediately adjacent the forward surface of disc **64**. As is indicated in Figures 4 and 6, a pair of plates **330** and **331** lie parallel with the inner face of disc **64**, the faces of the plates adjacent disc **64** being spaced from the disc surface by a distance corresponding to the height of the caps. These plates thereby insure that the caps on the upper portion of disc **64** and in readiness for movement to the chute **60** cannot become nested by reason of an accumulation of caps in that area. The plates **330** and **331** are supported by a cowling **332** which overlies the upper portion of disc **64**, cowling **332** being fixed to the rim piece **323** and to a standard **334** supported upon the agitator housing **285**.

As shown in Figures 4, 6 and 8, a cam block **72** is fixed to plate **330** so as to lie adjacent the forward surface of the disc, block **72** thereby projecting into the line of travel of the magnetic inserts **317**. Therefore, as a cap C moves upwardly with disc **64** by adherence to the magnetic inserts, the cap will engage the lower surface **325** of block **72** as indicated by the cap *Cc* in Figure 4 and so that the cap will be forced toward the axis of the disc by edge **325**. However, the far edge **326** of block **72** recedes from edge **325** at an acute angle so that when a cap reaches edge **326** (as indicated by the cap *Cd* of Figure 4) the cap will be free to move closer to the magnetic inserts and the edge of the disc. It will be understood that caps at *Cc* and *Cd* still will be under the influence of the magnetic inserts and hence will move along in a counterclockwise direction with the disc while in contact with the edges **325** and **326** of the block. In normal operation, caps will accumulate adjacent the inlet of chute **60** and to the left of block **72** as indicated in the upper portion of Figure 4. That is, some caps will lie in an upper arc directly against the path of the magnetic inserts and other caps may adhere thereto in a lower row or arc. Even though the above caps may be stationary for a few moments, depending upon the rate of removal of caps from chute **60**, nevertheless, the rotation of disc **64** beneath such caps will exert pressure upon them so that they all tend to push to the left in Figure 4. It will be observed from Figure 4 that the only caps in a position to exert pressure on caps in the chute **60** are those to the left of the block **72**. In other words, the caps which have not yet reached block **72** cannot press against the caps in the chute because block **72** diverts their pressure. This arrangement is desirable because if all of the caps being lifted by disc **64** were in an arcuate line leading directly to the mouth of the chute **60**, a sufficient pressure could be built up in the chute to force caps from its lower end.

In order that caps which are facing in the wrong direction will be returned to the lower portion of the agitator housing **285**, the disc **64** has the selector or discriminator **70** associated therewith. As is best illustrated in Figures 4, 6 and 8, the discriminator **70** is an arm or strip of metal depending from a horizontal rod **335** mounted on a slide **333** vertically adjustable in the standard **334** as hereinafter described. As shown in Figure 6, the discriminator lies substantially in the plane of the plates **330** and **331** and outwardly of a horizontal guide bar **336** fixed to cowling **332**. Bar **336** is a top guide bar in that it limits the upward movement of the caps. Throughout most of its length, arm **70** is substantially parallel with disc **64**. However, as illustrated in Figure 7, the lower end of tip **337** of discriminator **70** is bent toward the disc **64** and normally lies at a distance from the disc less than the height of a cap skirt. The discriminator arm **70** is formed of spring metal so that its lower portion may bend away from disc **64**.

The operation of discriminator **70** is as follows: When a cap having its skirt edge bearing against the disc **64** moves beneath discriminator **70**, the discriminator **70** will bend outwardly from the disc and its tip **337** will ride upon the wall W of the cap. This action is assisted by the fact that the lower end of the discriminator is spaced below the top guide bar **336** by a distance less than the diameter of a cap C. Hence, a cap moving along in contact with top guide bar **336** first will have the lower

portion S' (Figure 4) of its rounded periphery come into engagement with the discriminator tip 337 so that the tip of arm 70 is, in effect, cammed outwardly by the cap periphery. Therefore, the cap simply will move to the left, with the tip 337 of arm 70 bearing on the top wall of the cap and finally dropping off the trailing portion of the cap top wall.

In the event that a cap moving with disc 64 and along top guide bar 336 has the edge of its skirt facing away from the disc 64, the tip 337 of the discriminator will be cammed outwardly by the rounded edge of the skirt to climb over that edge. However, the continued movement of the cap to the left in Figure 4 will bring the inner wall of the skirt portion designated S'' in Figure 4 against the side edge of discriminator tip 337. Because this surface is substantially parallel to the facing edge of tip 337, the movement of the cap to the left with disc 64 will be retarded. This retardation of the cap will be sufficient to release it from the magnetic insert 317 to which it has been adhering, so the result will be that the cap will fall downwardly toward the bottom of the agitator housing 285. A cap having its skirt facing away from disc 64 sometimes may hang on the discriminator tip for a few moments as indicated by the cap Ce of Figure 4, and until the tip is moved outwardly again by a succeeding cap but, in any event, such a cap cannot again be picked up by the magnetic inserts.

Because discriminator 70 is vertically movable with the slide 333 and with respect to top guide bar 336, the position of the tip 337 of discriminator 70 with respect to guide bar 336 can be varied in accordance with the diameter of the caps being handled. It will be noted that tip 337 always must be spaced below top guide bar 336 by a distance slightly less than the diameter of the caps being handled.

Cap chute and cap applying element

Figure 3 illustrates the cap chute 60 as viewed from the front of the machine. It will be observed from this view that the upper portion of the chute, that is, the portion above the adjusting bracket 340, lies closely adjacent the forward surface of the disc 64. Below bracket 340, chute 60 is curved upwardly so that its lower end and the cap applying element 58 will lie at the proper angle to enable the cap applying elements to position caps upon containers as indicated in Figure 13.

Figure 4 shows the cap chute 60 as viewed from the right or outlet end of the machine. That is, Figure 4 views Figure 3 from the right, but Figure 4 omits the cap applying element 58. As is illustrated in Figure 4, the cap chute 60 generally may be described as comprising an inner upper guide 345, an inner lower guide 346, and an outer guide 347. As is hereinafter described, the upper portion of chute 60 lies parallel and closely adjacent disc 64 so that the disc there forms the bottom wall of the chute. Because the lower portion of chute 60 curves away from disc 64 as shown in Figure 3, a plate structure generally designated 348 forms the bottom wall of the this portion of the chute.

The inner upper guide 345 includes a plate 350 which is pivoted at its upper end to the slide 333 by means of a pin or screw 351. On its undersurface, plate 350 has a channel member 352 welded thereto with the channel open toward disc 64. Channel member terminates about midway of the length of plate 350. A bar member 353 lies beneath the lower portion of plate 350 and is enclosed by at least the lower portion of the length of channel member 352. Member 353 is pivoted at 354 to the lower inner guide 346. Plate 350 extends inwardly of the channel member 352 and bar 353 to thereby overlie caps which have their skirts bearing against the channel members.

The lower inner guide 346 includes a bar 356 and a plate 357, the bar being adapted to be engaged by the cap skirts while the plate portion 357, like the plate portion 350, overlies the caps to retain them in the chute. As will be clear from a consideration of Figures 3 and 4, upper inner guide 345 lies flat and close against disc 64 but lower inner guide 346 curves outwardly from disc 64.

The outer guide 347 includes a bar 358 which has its upper end notched as indicated at 359 in Figure 3 to slidably engage a complemental notch at the outer end of the top or horizontally extending guide bar 336 fixed to cowling 332. Bar 358 extends the entire distance from top guide bar 336 to the cap applying element 58. Its upper portion lies close to disc 64 but its lower portion curves outwardly as shown in Figure 3.

At its upper end, guide bar 358 extends beneath a plate 360 depending from and secured to top guide bar 336, plate 360 thereby retaining caps in this portion of the chute. A plate 361 is positioned upon the bar 358 below plate 360, the connection between plate 361 and bar 358 including headed screws in the bar and horizontal slots 362 in the plate. A flat spring 363 secured to the edge of bar 358 normally holds plate 361 in the position extending beyond bar 358 indicated in Figure 4 to thereby retain caps in the chute. If it is desired to remove caps from this portion of the chute, plate 361 may be moved to the left as viewed in Figure 4 against the action of spring 363. Bar 358 also has a bowed spring 364 fixed to its inner and upper portion to deflect caps downwardly. A plate 365 is fixed to and overlies the lower portion of bar 358 to cooperate with plate 357 in retaining caps in the lower portion of the chute.

As will be apparent from Figures 3 and 4, and particularly Figure 4, the disc 64 forms the bottom wall of the upper portion of chute 60 in that caps moving through that portion of the chute will have their skirt edges bearing on the disc. Generally speaking, the caps are stripped from the magnetic inserts by the bowed spring 364 at the upper end of the chute. Because chute 60 extends downwardly along a line inwardly of the path of travel of the magnetic inserts 317, the caps will move downwardly in the chute and upon the disc entirely free of the magnetic action of the inserts. It will be noted from Figure 4 that the upper portion of chute 60 angles outwardly from the vertical plane in which the disc axis lies, but that the lower portion of the chute extends parallel to the plane of the disc axis but inwardly of the line of travel of the magnetic inserts. The curvature of the lower end of the chute away from the lower portion of the path of travel of disc 64 carries the caps well away from the effect of the inserts.

With the lower portion of the chute curved away from disc 64 slightly below the upper end of the lower inner guide member 346, it is desirable to provide a stripper plate 366 at the upper portion of the chute bottom wall 348. As illustrated in Figure 4, plate 366 is secured to a bracket 367 fixed to the agitator housing 285, plate 366 being held to bracket 367 by machine screws extending through apertures 368 (Figure 5) at the lowermost corners of plate 366. As also is shown in Figure 5, stripper plate 366 includes an upwardly projecting and curved tongue 369 which, as shown in Figure 4, lies in a circumferential groove 370 formed on the front face of disc 64. Plate 366 and its tongue 369 are slightly concaved on its side facing away from disc 64 with the result that tongue 369 may lie in groove 370. In addition, the upper portion of plate 366 is beveled on its rearward surface as indicated at 371 and tongue 369 has its free end thinned toward its point. Also, the outer face of the upper edge of plate 366 is beveled as indicated at 372 and extends angularly downwardly from tongue 369. By this arrangement, caps moving downwardly through the upper portion of chute 60 on disc 64 will be stripped from the disc by riding up on the tongue 369 lying in groove 370, the beveled edge 372 permitting the caps to slide readily upon the upper surface of plate 366.

The remainder of the bottom wall 348 of the chute

includes a curved plate 373 secured at its uppermost edge to the bracket 367. The lower portion of plate 373 is secured to a bar 374 (Figures 10 and 12) which, in turn, is secured below a bracket 375 also shown in the lower portion of Figures 3 and 4 as bolted to superstructure 100. It will be noted from Figure 12 that bar 374 is spaced below bracket 375 by collars 376 which surround the screws which hold bar 374 to bracket 375. Screws 377 hold plate 373 to the upper surface of bar 374 and the collars 376 provide space between plate 373 and the undersurface of bracket 375 for the guides 346 and 347. As is best indicated in Figures 4 and 10, the lower end 380 of plate 373 is cut to V form in plan. Plate 373 is flat adjacent bracket 375 and the cap applying mechanism 58, but lies at an angle of about 45° to the vertical.

Lower inner guide 346 and outer guide 347 are provided with tapped holes to receive studs 385 and 386, respectively, which project through slots 387 extending crosswise of bracket 340. Hand wheels designated 389 and 390, respectively, are provided with studs 385 and 386 to thereby clamp the guides in adjusted position with respect to each other and brackets 340.

As is best shown in Figure 10, the lower ends of the lower inner cap guide 346 and the outer cap guide 347 each are provided with a threaded aperture 391, and these apertures respectively are aligned with slots 392 in bracket 375. As also shown in Figure 10, bolts 393 are threaded in the apertures 391 and the bolts are headed at their upper ends. The bolts ordinarily are not tightened and, therefore, the two guides in question can be moved toward and away from each other upon loosening of the hand wheels 389 and 390.

In order to adjust the upper inner guide bar 345 for various sizes of caps, the slide 333 in standard 334 is moved vertically by rotation of handle 395 in the proper direction. Handle 395 is threadedly connected to slide 333 in such manner that rotation of the handle will move the slide vertically. As has been stated above, the horizontal rod 335 which supports discriminator finger 70 also is secured to the slide. Slide 333 includes a pointer 396 movable along a scale 397 fixed to the rear face of standard 334. Scale 397 carries graduated markings corresponding to various cap sizes. Therefore, with pointer 396 aligned with a particular scale marking, both discriminator 70 and the plate 350 and upper channel 352 of the upper inner guide 345 will be at the proper height with respect to the top guide bar 336 to accommodate caps of a given size. Because the two channel members 352 and 353 of upper guide 345 are telescopically connected and the lower member 353 is pivoted at 354 to lower inner guide 356, the vertical movement of slide 333 will slightly change the angle of the upper inner guide 345 with respect to the lower inner guide 346. This movement is possible because of the pivot connections 351 and 354.

The cap applying device 58 is illustrated in detail in Figures 9 to 13 and 14. The device of Figure 14 is adapted to handle caps of a larger size than the device of Figures 9 to 13 but bears like reference numerals. As best shown in Figure 13, it generally may be described as including an upper body portion 400 which may be a casting of generally U-shaped form in transverse section to thereby provide a cap passage 401 defined by the undersurface of body 400 and the depending side walls or legs 403 of the casting. The body 400 is provided at its upper end with a boss 404 which is apertured to carry the shank of a hand wheel 405, the threaded bore of the hand wheel shank being adapted to engage a threaded stud 406 which extends vertically upwardly from the chute supporting bracket 375. As shown in Figure 13, the underside of the upper end of body 400 is so cut away that a depending shoulder 407 on the body will engage against the upper edge 408 of bracket 375 and a lower shoulder 409 on body 400 will bear upon the vertical and lower face 410 on bracket 375. The surface 411 of body 400 between shoulders 407 and 409 will lie flat upon the upper surface 411' of bracket 375.

As is evident from Figures 9 and 10, the lower end of the bar 358 of the outer cap guide 347 is stepped as viewed from above to include two end surfaces 412 and 413 and both of these surfaces are inclined to the length of the bar to thereby lie in a vertical plane or at least a plane parallel to the axis of the stud 406. The surface 412 is the outermost and lowermost surface of bar 358 and an inwardly facing shoulder 414 is thereby provided on bar 358 between the surfaces 412 and 413. The bar 356 of the inner and lower cap guide 346 also has its lowermost end provided with corresponding surfaces 412', 413', and 414', the surface 412' being outermost and lowermost so that the surface 414' faces toward the center line of the chute.

As also appears in Figures 9 and 10, the ends of the side walls 403 of body 400 which lie opposite the inclined and shouldered ends of the bars 356 and 358 are shouldered and inclined to complement the bar surfaces. Hence, when cap applying element 58 is moved vertically downwardly upon the stud 406 to the position illustrated in Figure 13, and the bars 356 and 358 are properly adjusted, the opposed surfaces of the body 400 and the bars 356 and 358 will snugly engage each other.

As is best shown in Figure 14, which is a bottom plane of a cap applying element 58, the bottom surface 420 of each side wall 403 has a plate 421 secured thereto, the two plates thereby forming the bottom wall of the lower portion of the cap applying means. The opposed edges 422 of the two plates preferably are spaced apart but their edges 423*a* lie at such an angle with respect to each other as to define a V. As is best shown in Figure 12, each of the plates 421 is provided with an upstanding shoulder 423 against which the lowermost cap in the chute will rest, it being necessary to lift the lowermost cap in the chute over the shoulders 423 to remove it from the chute. As indicated in Figures 9 and 10, a retainer plate 424 pivoted on a pin 425 extending horizontally across body 400 normally holds the lowermost cap downwardly against the plates 421 and in contact with the stop shoulders 423. However, plate 424 includes an upstanding ear 426 against which a spring 427 bears, the opposite end of the spring being mounted in a pocket 428 in body 400. Hence, when a container mouth engages the lowermost cap C as indicated in Figure 13, retainer plate 424 may swing upwardly against the action of spring 427 to thereby permit the cap to be lifted over the shoulders 423.

As has been stated above, and as is illustrated in Figure 4, the lowermost end of the bottom wall plate 373 is cut in plan to form a V including a centrally projecting apex. The fact that the edges 423*a* of the plates 421 secured to body 400 are similarly formed will permit the edges 423*a* of the plates 421 to snugly engage the ends of the chute bottom plate. The opposed edges of the chute bottom plate and the plates 421 lie in vertical planes when the cap applying element is mounted upon the chute because the opposed surfaces are bevelled. Because the adjoining edges are of V form in plan and hence do not extend directly crosswise of the line of movement of the caps, caps cannot abut against the edge surfaces.

A capping apparatus of the present invention ordinarily would be provided with a number of cap applying elements 58 of the type illustrated in Figures 9 and 13 and 14, but each element 58 would be so formed as to provide a cap passage 401 of a different width and to accommodate a standard size skirted cap. For example, it will be observed that the side walls 403 of the element 58 illustrated in Figure 14 have their inner surfaces spaced further apart than the cap applying element illustrated in Figures 9 to 13. However, the overall dimensions of all of the cap applying elements 58 supplied would be substantially identical. By this arrangement, when the

machine has been operating to handle caps of one standard size, for example, a relatively large size, such as the 70 mm. size, and it is then desired to use the machine to apply a smaller size cap, for example, 38 mm. caps, the following operation will accomplish the adjustment: The operator will disengage the threaded hand wheel 405 from the stud 406 on the bracket 375 so that the large sized cap applying element 58 can be lifted directly from the end of the chute 69 by straight line vertical movement. Then the operator will position a cap applying element 58 for 38 mm. caps upon the end of the chute and in the position illustrated in Figure 13, the handle 405 of the new element 58 being engaged with the stud 406 and the surfaces 407, 409, and 411 of the cap applying element being fitted against the corresponding surfaces of the bracket 375.

Then the operator would loosen the hand or clamping wheels 389 and 390 so that the inner guide elements 345 and 346 and the outer guide element 347 will be free for movement toward each other. The crank 395 shown at the top of Figure 4 may be rotated to bring the pointer 396 (Figure 8) opposite the 38 mm. indicia on the gauge plate 397, thereby positioning the detector or discriminator finger 70 at the proper height for 38 mm. caps and simultaneously positioning the inner guide rail 345 at the proper position with respect to top guide 336 to handle 38 mm. caps. When the operator then slides the inner lower guide 346 inwardly so that its lower end shoulder 414' is in engagement with the opposed surface on the cap applying element and with the outer edge 430 of the guide 346 parallel to the inner edge 431 of the bottom wall of the chute as shown in Figure 4, the inner guide elements of the chute may be locked in position by threading the hand wheel 389 to clamping position. When the outer guide rail 347 is moved inwardly to bring its bottom end surface 414 (Figure 9) against the opposed surface of the cap applying element and when the outer edge 432 of this guide is parallel to the outer edge 433 of chute bottom wall 372, the outer hand wheel 390 may be tightened to clamp the outer guide 347 in the proper position.

As indicated in Figure 4, the bottom wall elements 366 and 373 are of a width to support the guides 346 and 347 when the latter are spread to accommodate caps of maximum size.

It will be observed from the foregoing that the matter of changing the chute and cap applying means, as well as the detector or discriminator finger 70, to handle different sizes of caps, quickly can be performed and with a minimum of operations.

The terminology used in this specification is for the purpose of description and not for limitation as the scope of the invention is defined in the claims.

We claim:

1. In a cap applying mechanism, a cap chute comprising a bottom wall and side guide members movable with respect to each other on said bottom wall, a supporting bracket for said bottom wall and adapted to be fixed to a machine frame to extend horizontally, the cap outfeeding ends of said side guide members and said bottom wall being positioned adjacent the outfeed side of said bracket, a cap applying element to receive caps from the outfeed end of said chute and position them upon containers moving below said element on the machine frame, said cap applying element including a body provided with side walls and a bottom wall to thereby provide a cap passage through the lower portion of said body, said body being provided at its cap receiving end with recesses including outwardly facing shoulders to receive and space apart the outfeed ends of said guide members, said bottom wall being positioned in the plane of the bottom wall of said chute, and means to secure said guide members in adjusted position.

2. A mechanism of the character described in claim 1 wherein the shouldered recesses of said cap applying element body open laterally outwardly.

3. A mechanism of the character described in claim 1 wherein the shouldered recesses of said cap applying element body open downwardly so that the element may be positioned upon said guide members by downward vertical movement.

4. A mechanism of the character described in claim 1 wherein the shouldered recesses of said cap applying element body open downwardly so that the element may be positioned upon said guide members by downward vertical movement, said bracket includes an upwardly projecting stud, and said cap applying element includes an aperture to fit upon said stud.

5. A mechanism of the character defined in claim 4 wherein said stud extends at an acute angle to said chute bottom wall, and said guide members and recesses include opposed transverse surfaces extending parallel to said stud.

6. A mechanism of the character described in claim 1 wherein the cap outfeeding end of the chute bottom wall is V-shaped in plan to provide a centrally projecting apex.

7. A mechanism of the character described in claim 1 wherein the cap outfeeding end of the chute bottom wall is V-shaped in plan to provide a centrally projecting apex and the bottom wall of the cap applying element is formed of two plates, each provided with an edge complementary to the adjoining edge of said bottom wall.

8. A mechanism of the character described in claim 1 wherein said chute guide members lie entirely above the chute bottom wall.

9. In a capping apparatus, a cap hopper, means to feed caps in a horizontal stream from said hopper and in edgewise relation, a chute to receive the horizontally moving caps and feed them downwardly, said chute including a pair of cap guiding members, one positioned directly in the path of horizontal outfeeding movement of the caps with said means so as to divert the caps downwardly, the second guide member having its upper end below the horizontal path of the caps with said means, and means to adjust said second guide member with respect to the horizontal path of the caps with said cap feeding means.

10. A capping apparatus of the character described in claim 9 wherein said guide members are movable toward and away from each other, and means to secure said members in adjusted position.

11. A capping apparatus of the character described in claim 9 wherein said guide members are movable toward and away from each other, said second guide member is longitudinally telescopic, and means to secure said members in adjusted position.

12. In a capping apparatus for skirted caps, a cap hopper, a disc at one end of said hopper rotatable in a vertical plane, said disc having its planar face opening to said hopper provided with magnetic inserts to which caps will adhere and arranged in a circumferential series of such radius as to be movable upwardly in a path above the caps in said hopper, a guide bar fixed with respect to said hopper at the upper portion of said path and adapted to be engaged by cap skirts to maintain caps moving with said disc at a predetermined distance from the disc axis, and a spring detent urged toward the planar face of said disc, said spring detent being spaced from said bar and toward the disc axis by a distance less than a cap diameter, and said detent normally being spaced from the disc planar face by a distance less than the height of a cap skirt.

13. In a capping apparatus for skirted caps, a cap hopper, a disc at one end of said hopper rotatable in a vertical plane, said disc having its planar face opening to said hopper provided with magnetic inserts to which caps will adhere and arranged in a circumferential series of such radius as to be movable upwardly in a path above the caps in said hopper, a guide bar fixed with respect

to said hopper at the upper portion of said path and adapted to be engaged by cap skirts to maintain caps moving with said disc at a predetermined distance from the disc axis, and a spring arm supported on said hopper inwardly of said disc to extend from said bar toward the disc axis, said arm having its free end bent toward said planar face of said disc to engage the interior of a cap moving along said guide bar with its skirt facing away from said disc.

14. A capping apparatus of the character described in claim 13 wherein the free end of said spring arm is spaced from said guide bar by a distance substantially greater than the radius of the caps but less than the cap diameter.

15. A capping apparatus of the character described in claim 13 wherein the free end of said spring arm is spaced from said guide bar by a distance substantially greater than the radius of the caps but less than the cap diameter, and said guide bar has its cap engaging surface lying immediately adjacent the path of travel of said magnetic inserts.

16. A capping apparatus of the character described in claim 13 including means to support said spring arm for adjusting movement toward and from the axis of said disc.

17. A capping apparatus of the character described in claim 13 including a cap chute formed of spaced cap skirt engaging guide rails, said chute having its cap receiving inlet positioned beyond said arm and immediately below said guide bar so that said guide bar forms the outer cap guide rail of the chute.

18. A capping apparatus of the character described in claim 13 including a cap chute formed of spaced cap skirt engaging guide rails having its cap receiving inlet positioned beyond said arm and immediately below said guide bar so that said guide bar forms the outer cap guiding rail of the chute, including means to support the inner cap guiding rail of said chute and said spring arm for adjusting movement with respect to the axis of said disc.

19. In a capping apparatus for skirted caps, a cap hopper, a disc at one end of said hopper rotatable in a vertical plane, said disc having its planar face opening to said hopper provided with magnetic inserts to which caps will adhere and arranged in a circumferential series of such radius as to be movable upwardly in a path above the caps in said hopper, a cap receiving chute including spaced cap skirt engaging guide rails including a portion lying in a plane adjacent said planar face of said disc and extending along lines substantially tangential to the circular path of travel of the magnetic inserts and above the caps in said hopper, and a cap skirt engaging flange fixed above said hopper and projecting over said disc planar face in advance of the chute inlet to hold caps moving with said disc and adjacent said flange in a path closer to said disc axis than said chute.

20. In a capping apparatus for skirted caps, a cap hopper, a disc at one end of said hopper rotatable in a vertical plane, said disc having its planar face opening to said hopper provided with magnetic inserts to which caps will adhere and arranged in a circumferential series of such radius as to be movable upwardly in a path above the caps in said hopper, a cap receiving chute including spaced cap skirt engaging guide rails including a portion lying in a plane adjacent said planar face of said disc and extending along lines substantially tangential to the circular path of travel of the magnetic inserts and above the caps in said hopper, to thereby remove caps from the magnetic inserts, said chute including a second and lower portion lying adjacent said disc but positioned out of the path of travel of the magnet inserts, a third portion inclined away from the plane of said disc, and means positioned forward of the inlet of said chute to move caps momentarily out of alignment therewith whereby pressure on caps in said chute from caps in the path of said hopper is at a minimum.

21. In a capping apparatus for skirted caps, a cap hopper, a disc at one end of said hopper rotatable in a vertical plane, said disc having its planar face opening to said hopper provided with magnetic inserts to which caps will adhere and arranged in a circumferential series of such radius as to be movable upwardly in a path above the caps in said hopper, and a spring stripper arm fixed with respect to said hopper and above the caps in the hopper, said arm including an edge parallel to and spaced from the planar face of said disc by a distance greater than the height of a single cap but less than the height of two caps.

22. In a capping apparatus for skirted caps, a cap hopper, a cap conveyor movable through said hopper, said conveyor having its face opening to said hopper provided with spaced magnetic inserts to which caps will adhere, and a spring arm supported adjacent said conveyor, said arm having its free end bent toward said face of said conveyor to engage the interior of a cap moving along said conveyor with its skirt facing away from the conveyor to cam the cap off of the magnetic inserts.

23. In a capping apparatus for skirted caps, a cap hopper, a cap conveyor movable through said hopper, said conveyor being provided with magnetic inserts spaced lengthwise thereof on a given line, a cap receiving chute including spaced cap skirt engaging guide rails in contact with said conveyor and extending in alignment with the path of travel of the magnetic inserts, and a cap skirt engaging block projecting over said conveyor in advance of the chute inlet to hold caps moving with the conveyor in a path out of alignment with said chute.

24. In capping apparatus, a cap hopper, a disc mounted for rotation through the caps in said hopper, said disc being provided on one planar face with a circular series of magnetic inserts to which caps in the hopper will adhere, said planar face being provided with a circular groove adjacent the series of inserts, a fixed chute to receive caps from the planar face of said disc and including an inlet mouth aligned with the circular series of inserts, said chute including a stripper blade positioned in the planar face groove.

25. A capping apparatus of the character described in claim 24 wherein the planar face groove is of less diameter than the circular series of inserts and the stripper blade is mounted in the chute at a point spaced from the chute inlet mouth.

26. In a capping apparatus, a cap hopper, a disc mounted for rotation through the caps in said hopper, said disc being provided on one planar face with a circular series of magnetic inserts to which caps in the hopper will adhere, a fixed chute to receive caps from the disc and including an inlet mouth aligned with the circular series of inserts, and a fixed member overlying the planar face of the disc at a point spaced in advance of the chute inlet mouth, said member extending sufficiently into the path of caps with said inserts to deflect caps out of alignment with said chute inlet mouth but without entirely removing the caps from the inserts.

27. In a capping apparatus, a cap supply hopper, means movable in said hopper to feed caps therefrom, a chute to receive caps from said cap feeding means, a container supporting conveyor movable beneath said chute, means on said chute and above said conveyor to apply caps to containers supported on said conveyor, means to drive said conveyor, means to drive said cap feeding means, means responsive to the presence of containers on said conveyor to control said last-mentioned driving means and rotatable means to secure to the containers caps applied by said applying means, said securing means being driven by said conveyor driving means.

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