

Aug. 12, 1969

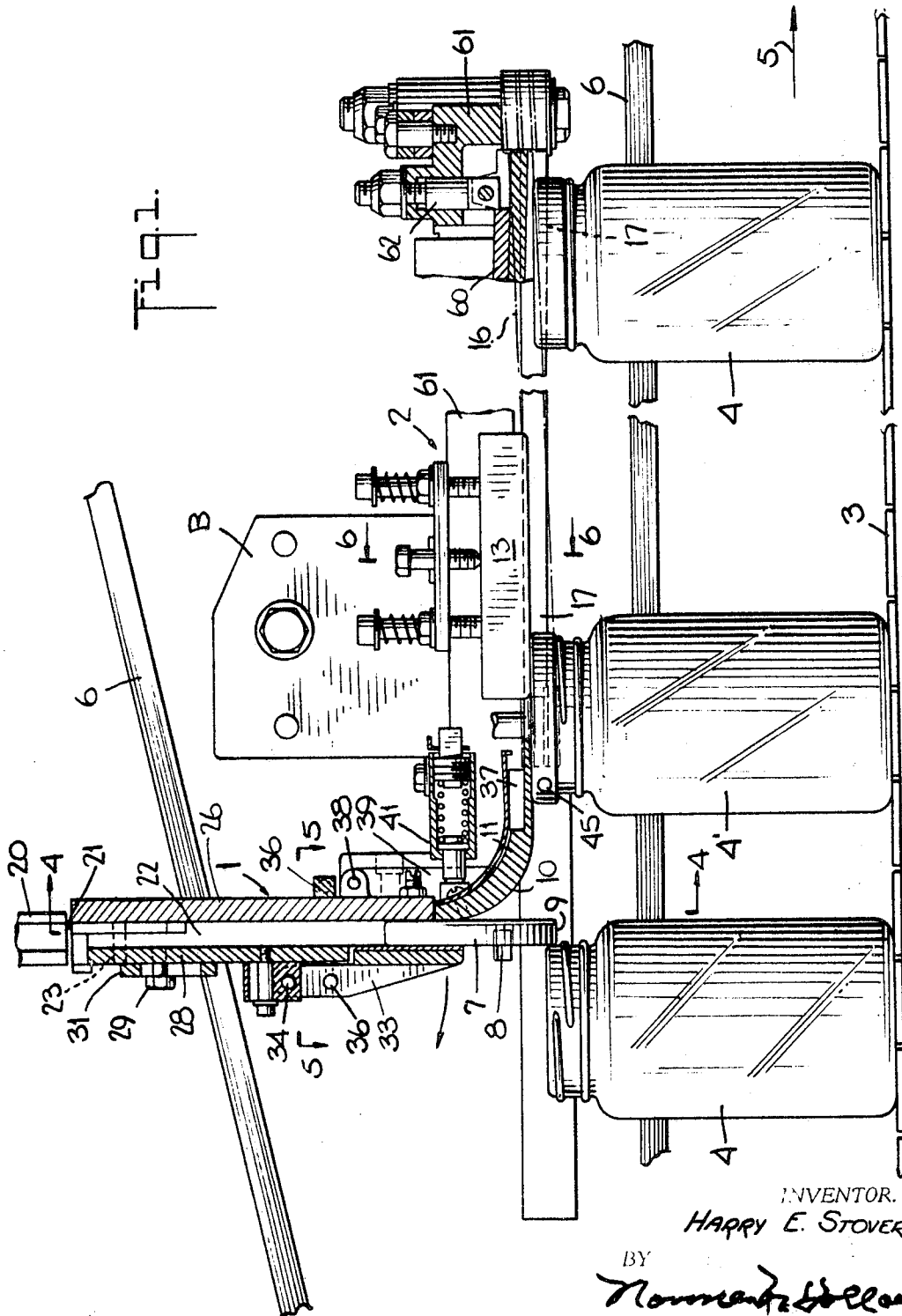
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CLOSURE CAP FEEDING MEANS

Filed Oct. 6, 1966

3 Sheets-Sheet 1



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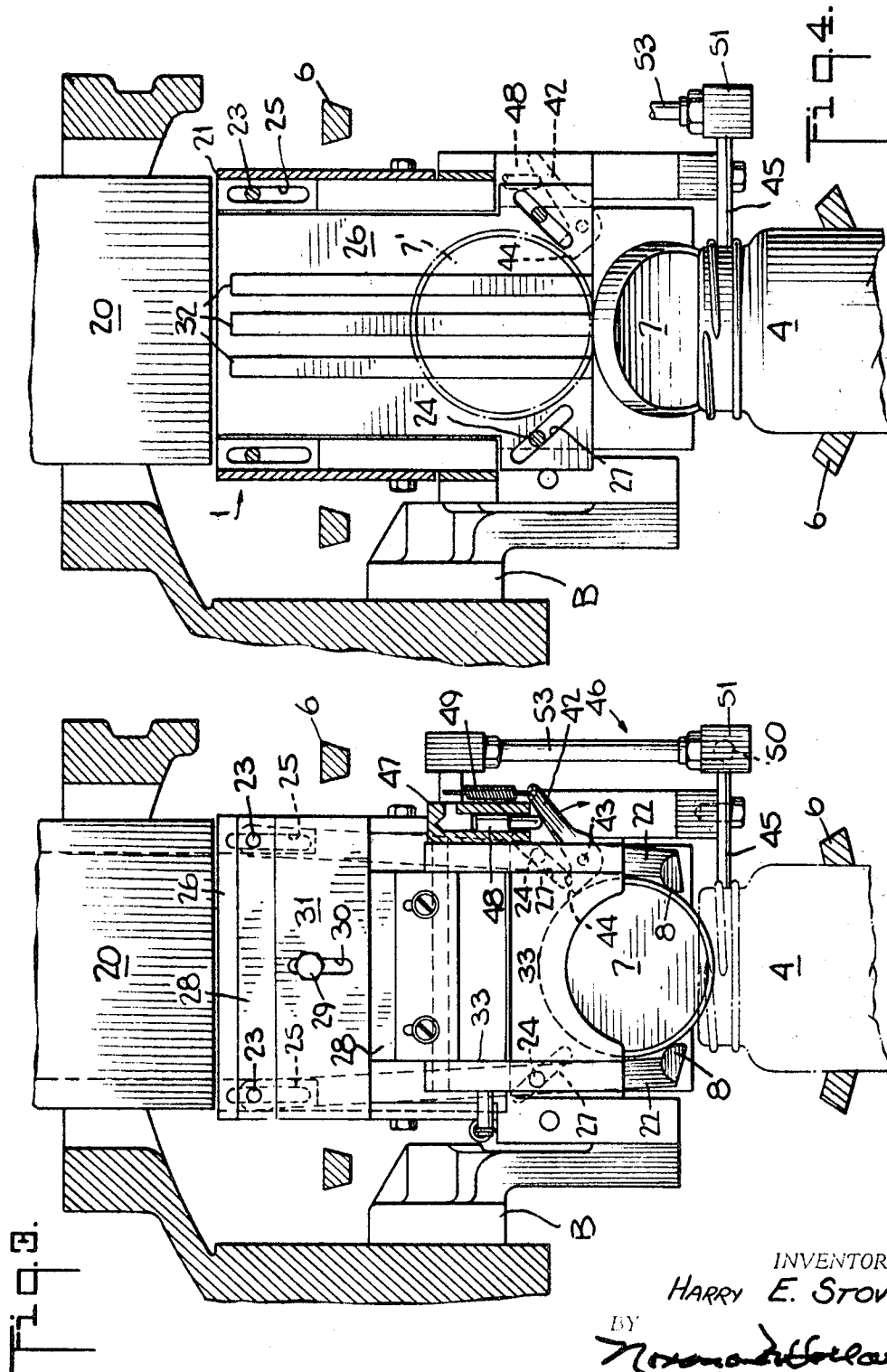
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3 Sheets-Sheet 3



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CLOSURE CAP FEEDING MEANS

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15 Claims

The present application relates to the container sealing art and more particularly to a closure feeding device for feeding closure caps to the tops of containers in a sealing machine preparatory to the final sealing of the closures onto the containers.

Automatic sealing machines are in common use which receive filled but unsealed containers at their input and which carry these containers first beneath a cap feeding means and a cap applicator which lightly applies closure caps to the container mouths and which thereafter move the lightly capped containers to a final container sealing mechanism. The present invention is particularly directed to the cap feeding portion of such sealing machines and provides an improved means for feeding the caps from a hopper or other cap supply and for lightly placing the closure caps on the tops of the containers. Prior cap feeds of this type are now in use which include an inclined chute for directing a row of caps downwardly towards the tops of moving containers so that each container withdraws a cap from the chute. Such inclined chutes are satisfactory for lower speed sealing machines and particularly for machines of the type wherein there is a significant space between successive containers and where each container is isolated an appreciable distance from the adjacent containers as it draws a closure cap from the cap feed chute. These conventional and presently used cap feeds have been retained although the speeds of the sealing machines have been constantly increased to meet the increasing requirements of modern day high speed packaging and particularly the needs of modern high speed food packaging where the economics of the packing situation require containers to be sealed over long periods and at a high speed.

The present chutes, however, are proving unsatisfactory at these higher speeds for a variety of reasons. One serious drawback results from the requirement for high cap feed pressures in the inclined chutes to permit the caps to be fed at the same speed as the containers. These high pressures result in an unintentional discharge of caps out of the chute ends in advance of the containers as the high feed pressure forces caps past the cap holding detents even when no container is present. In addition, the necessity of providing a large spacing between successive containers is made more difficult at higher speeds and a need has developed for a cap feed which will be operative with containers fed substantially in engagement with one another in the line or with only a slight spacing between the containers.

Additionally, high speed operations and the rapid passage of containers beneath the lower ends of the cap chutes has made the chute positioning and cap positioning more and more critical and a definite need has developed for a cap feed less sensitive to container size variations and container position and which will operate independently of minor variations in the position of the lowermost cap as presented to the rapidly advancing containers.

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As will be more fully described below, the improved cap feed overcomes all of above problems and in addition provides additional advantages in its greater ability to force protruding products down into the jars during the cap application and as the generally vertical design of the improved cap feed permits a significant decrease in the overall sealing machine size.

Accordingly, an object of the present invention is to provide an improved cap feed for sealing machines.

Another object of the present invention is to provide an improved cap feed particularly adapted for high speed operation.

Another object of the present invention is to provide an improved and more compact cap feed permitting a reduction in the size of the related sealing machines.

Another object of the present invention is to provide a non-critical cap feed relatively insensitive to variations in jar height and position and in cap position.

Another object of the present invention is to provide an improved cap feed readily adjusted for a wide variety of cap sizes and container heights.

Another object of the present invention is to provide a cap feed capable of applying caps to containers in a row having little or no spacing between successive containers.

Another object of the present invention is to provide an improved cap feed and cooperating cap applicator.

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 front elevational view partially in section illustrating a preferred embodiment of a cap feed and a cooperating cap applicator in accordance with the present invention;

FIG. 2 is a top plan view partially in section of the cap feed and applicator of FIG. 1;

FIG. 3 is a side elevational view of the entrance side of the cap feed in accordance with the present invention;

FIG. 4 is a modified vertical sectional view taken along line 4—4 on FIG. 1;

FIG. 5 is a horizontal sectional view taken along line 5—5 on FIG. 1; and

FIG. 6 is a vertical sectional view taken along line 6—6 on FIG. 1.

FIG. 1 illustrates the cap feed 1 and the cooperating cap applicator 2 in accordance with the present invention mounted on bracket B in position above a container conveyor 3 of a typical container sealing machine. The containers 4 are illustrated being advanced by the conveyor 3 in the direction of the arrow 5 between container gripping side belts 6. The conveyor 3 and the side belts 6 cooperate to move each container 4 of the row of containers initially into contact with the lowermost cap 7 resting on spaced stop members 8 at the lower end of the cap feed 1. The containers 4 strike the cap skirt 9 thereby sliding the cap forwardly and clear of the sta-

tionary stop members 8. The moving containers 4 then draw the caps 7 forwardly and around lower curved cap engaging surface 10 of the spring-loaded and magnetic pressure plate 11. When the containers 4 reach the position illustrated at 4', the cap 7 will have been drawn into telescoping relation with the container top and the cap 7 will be supported with its threads or lugs slightly above the corresponding threads or lugs on the container 4 by a magnetized cap support and leveling plate 13. Thereafter the continually advancing jars 4 draw the opposite sides of the cap skirt 9 into engagement with the inner runs 14 and 15 of the counterrotating cap applying belts 16 and 17 as best illustrated in FIG. 2. The belts 16 and 17 now rotate the cap and turn it downwardly into light engagement with the container threads as will be more fully described below.

It will be seen that other types of cap supporting and leveling means may be used such as one using a vacuum principle and that other cap applying belt systems using one stationary belt and one moving belt or one slow and one fast moving belt might also be used in this application.

The cap feed 1 will now be described in detail. Caps 7 are fed into the cap feed 1 of the present invention from a regular cap hooper including a cap selector (not illustrated) which cooperate with one another to provide a continuous stream of closure caps 7 having their covers oriented in the same direction and being fed under pressure towards the sealing machine through a cap guiding chute. The lower end of such a downwardly curving cap chute is illustrated at 20 in FIG. 1 in position to direct the stream of caps 7 into the top 21 of the cap feed 1.

The particular width of the cap chute 20 is not critical and it is made wide enough to accept the largest cap fed and small enough to keep the caps 7 in line without two caps jamming side by side in the chute. The upper end 21 of the cap feed 1 has a corresponding width, however, the width of the lower portion of the cap feed 1 is made adjustable for the particular cap size being fed so that the lowermost cap in the line of caps 7 rests firmly on the spaced cap stop members 8 as illustrated in FIG. 3.

This adjustment is provided by forming the stop members 8 at the lower ends of two spaced guide rails 22. These guide rails are mounted at their upper ends on guide pins 23 on the back plate 28 and have another set of guide pins 24 on their lower portion. The upper guide pins 23 operate in generally vertical slots 25 on the face plate 26 and the lower guide pins engage inwardly angled slots 27 in the face plate 26. The angle of the slots 27 is so arranged that the stops 8 will position all size caps with the lower edge of the skirt 9 the same distance above the conveyor. The guide pins are adjustable in the slots thereby permitting the spacing of the stop members 8 and the attached rails 22 to be adjusted through the simultaneous raising or lowering of the two guide rails 22 under the control of the rail adjusting plate 28 whose position is adjustably set by the bolt 29 positioned in the vertical adjustment slot 30 in the fixed plate 31. As seen in FIG. 4 the face plate 26 also includes a plurality of raised slide rails 32 which engage the tops of caps 7 to facilitate their sliding movement downwardly through the cap feed 1. As already indicated, the lowermost cap 7 of the line of caps from the cap feed chute 20 rests on the stationary stop members 8 in position to be picked off by the moving containers 4. In order to facilitate the movement of this lowermost cap 7 off of the stop members 8 and into the telescoping engagement with a container top, the lowermost portion of the cap feed back plate 28 comprises a pivotally mounted exit plate 33 which swings back under the force of the moving cap 7 on its hinge pin 34 and against the force of a pair of coil springs 35 extending between the pin members 36 (FIG. 5).

Referring again to FIG. 1 a curved magnetic pressure plate 11 including a magnet 37 is mounted opposite the

exit plate 33 in position to slidably engage and magnetically support the top of each cap 7 as it moves out of the cap feed 1. This pressure plate 11 is pivotally mounted at 38 on arms 39 to permit it to accommodate its position to the telescoping action of the caps 7 as the caps swing downwardly onto the container top. The pressure plate 11 is resiliently urged toward its initial position by the spring loaded plunger 41.

It is clear that the above described cap feed design including the fixed stop members 8 and the spring-loaded exit plate 33 and the pressure plate 11 provide a cap feed pressure resistant positioning means for the lowermost cap 7. For this reason, an extremely high cap feed pressure may be used of sufficient magnitude to assure a continuous supply of caps at extremely high speeds. The lowermost cap 7 being firmly held by rigid stop members 8 cannot be forced out of the cap feed 1 until a moving container 4 engages the cap 7 and swings it forwardly against the pressure plate 11 with the cap skirt 9 clear of the stop members 8 in the manner described above.

It is also clear that the above described cap removal action is not critical as the lower edge of the cap 7 need strike no particular portion of the jar top. The cap removal and application are assured as long as the cap 7 engages the container rim at any position between its uppermost portion and a position well down on the container top even below the container threads as the rapid removal of the cap 7 from the stop members 8 and around the curved pressure plate 11 causes the cap 7 to slide forwardly and clear of the container threads thereby insuring that the cap 7 is lifted against the magnetic pressure plate 13 and is held in loosely telescoping relation at the time that the cap is thereafter moved into engagement with the cap rotating belts 16 and 17.

For certain sealing operations, packers find it necessary to make relatively frequent halts in the filling and sealing operations so that the sealing machines themselves are intermittently stopped and started. Where such stops and starts are made in an extremely high-speed packing operation, it has been found desirable to employ an additional jar activated cap trip system in the cap feed of the present invention to provide for the complete control of the caps in the cap feed 1 and to prevent the accidental feeding of more than one cap as may result where an abrupt halt of the sealing operation may cause a cap partially engaged by a container top to slide forwardly on that container.

A cap trip which is effective during these stop and start periods will be described below. If desired this trip may be held in its open or inoperative position at all times, except when the container conveyor is slowing down or speeding up, by a suitable lock out device. As illustrated in FIG. 3, the cap trip includes a trip arm 42 pivotally mounted at 43 on a cap chute side rail 22. The inner edge 44 of this trip protrudes into the cap feeding channel to arrest the downward movement of the next cap in the chute above the cap 7 already in container engaging position on stop members 8. This action is illustrated in FIG. 4 where the lowermost cap 7 is being drawn from the chute and where the next cap 7' has dropped downwardly in the chute and into engagement with the trip arm 42. This next cap 7' will remain in this position until the moving jar 4 engages a pivotally mounted trip lever 45 which swings the trip arm 42 clear of the cap 7 by a coupling system such as the hydraulic coupling 46 as further described below. By the time that the trip lever has been actuated by the container 4, the lower end of the cap chute 1 will be cleared so that the released cap 7' will then fall into proper position against the stop members 8 and will be ready for the arrival of the next container 4.

The hydraulic coupling 46 includes a suitable hydraulic cylinder 47 and piston 48 positioned to swing the trip arm 42 to its open position against the force of

the spring 49. This piston 48 is actuated by a hydraulic drive piston 50 shown in FIG. 2 mounted in the lower hydraulic cylinder 51 and having its outer end 52 in engagement with the jar actuated trip lever 45 so that movement of the trip lever 45 by the container depresses the piston 48 which is coupled to the piston 50 by the hydraulic line 53. As already indicated, a suitable mechanical latch or other means may be used to inactivate this trip system where the sealing operation speed or its continuous nature makes the use of the trip arm unnecessary. An automatic device operated by the sealing machine controls on the conveyor belt speed may be used to activate the trip arm system only during stop and start periods where its protective action is of the greatest use.

The cap feed as described above and including the curved and magnetized cap pressure plate 11 will operate with a variety of cap applicators as, for example, the cap applicator described in United States Patent No. 3,071,909 owned by the assignee of the present invention. A belt type cap applicator used in combination with the cap feed 1 has been found particularly advantageous for the high speed application of certain types of caps and particularly for the application of continuous thread caps. These caps have elongated threads formed in their skirts and they require rotation through substantially one or more complete revolutions for their application to containers.

A preferred embodiment of such a cooperating belt type coxer or cap applicator 2 is illustrated in FIGS. 1, 2, and 6. This coxer 2 includes a resiliently mounted magnetic plate 13 positioned just beyond the exit edge of the curved pressure plate 11. This magnetic plate 13 operates to hold each closure cap 7 in telescoping relationship with the moving container 4 but with the cap threads or lugs positioned above the container threads. The plate 13 is made sufficiently long so that the caps 7 are carried by the containers 4 in this telescoping relationship until the cap skirts 9 are firmly engaged by the opposed inner runs 14 and 15 of the cap applying belts 16 and 17. Since the caps 7 are applied by a screwing or combined rotary and downward movement, the belts 16 and 17 are inclined and oppositely rotated to provide such a simultaneous movement. Best results are obtained where the inner run 14 of the forward belt 16 slants upwardly in the direction of container movement and where the inner run 15 of the rear or back belt 17 slopes downwardly in the direction of container movement. These slopes on the belts are desirable since the cap must move downwardly on both belts 16 and 17 while the front belt 16 has a speed slower than or in the opposite direction to that of the moving container 4 and while the rear belt 17 has a speed faster than and in the same direction as the moving container 4.

In order to insure the full application of a typical continuous thread cap regardless of the particular relative positions of the cap 7 and container 4 at the beginning of the cap application, it is desirable that the cap be given a minimum of about three revolutions. This is necessary since such caps commence their threading operation at only one position on the containers and almost a completely full turn may be used before the cap and container threads engage each other to commence the required sealing turns.

Where typical lug caps are being applied, it is only necessary to turn the cap about a half turn as only a quarter turn is required for full sealing and as the maximum lost rotation before the lugs are engaged as a quarter turn or less. A full cap application is thus obtained without slippage in about a one half revolution of the cap by the pair of cap rotating belts.

The above described cap rotating belts 16 and 17, for example, may be driven with their inner runs 14 and 15 moving in opposite directions by a suitable drive coupling between either the front or rear pulleys and the sealing

machine conveyor 3 drive or a drive synchronized with the conveyor drive to move the belt 16 at one half the conveyor 3 speed and the belt 17 at two and one half times the conveyor 3 speed.

While the caps 7 are normally held firmly by the cap rotating belts 16 and 17 as they leave the leveling plate 13, a hold down plate 60 shown in FIGS. 1 and 2 mounted on the coxer frame 61 on slidable supports 62 is preferably positioned between the leveling plate 13 and the end of the coxer 2 to insure the engagement of the caps 7 with the belts 16 and 17.

It will be seen that an improved cap feed has been provided which not only reduces the required sealing machine size but which also permits higher sealing speeds to be employed without an increase in sealing machine conveyor speed as it reduces the spacing required between successive containers in the row of containers being sealed.

The cap feed is particularly useful in high speed sealing as it provides a positive feed wherein high cap feed pressure may be used without accidental release of the caps and where a cap cannot be fed until a container moves into engagement with the lowermost cap in the feed system. In addition an uncritical and easily adjusted cap feed and cooperating cap applicator are provided where relatively great variations in container size and cap feed positioning may be tolerated and have no adverse effect upon the positive operation of the cap feed.

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. A sealing machine cap feed for feeding closure caps to the tops of moving containers comprising the combination of a cap chute having a generally vertical cap feeding channel therethrough, stop members mounted in spaced cap engaging positions on opposite sides of the lower end of said channel for engaging the lowermost cap in said chute and for presenting the lower portion of said cap to the top of a moving container, a cap guiding plate yieldably mounted on the cap exit side of said cap chute having a curved cap guiding surface for directing said cap from a generally vertical position on said stop members to a generally horizontal position on said moving container, means for holding said cap against said plate, and a cap exit plate yieldably mounted on the container entrance side of said chute for permitting the upper portion of the lowermost cap in said chute to swing backwardly over the moving container as the cap is drawn from the chute and along said cap guiding plate by moving containers.

2. A sealing machine cap feed for feeding closure caps to the tops of moving containers comprising the combination of a cap chute having a generally vertical cap feeding channel therethrough, a pair of stop members mounted in spaced cap engaging positions on opposite sides of the lower end of said channel for engaging the lowermost cap in said chute and for presenting the lower portion of the cap to the top of a moving container, means for adjusting the position of said stop members, a magnetic pressure plate yieldably mounted on the cap exit side of said cap chute having a cap engaging surface curving from a generally vertical to a generally horizontal direction, a magnet positioned for holding said cap against said pressure plate, and a cap exit plate yieldably mounted on the container entrance side of said chute for permitting the upper portion of the lowermost cap in said chute to swing backwardly over the moving container as the cap is drawn from the chute and along said pressure plate by moving containers.

3. The cap feed as claimed in claim 2 in which opposite side walls of the channel comprise adjustably positioned guide rails, mounting means for the lower portions of said guide rails for moving the lower portions laterally of the channel, and said stop members being mounted on said lower portions of said guide rails for movement therewith.

4. The cap feed as claimed in claim 2 which further comprises a cap trip means including a trip arm movably mounted in said channel for engaging and releasably supporting the next cap above said lowermost cap, means for moving said trip arm clear of said next cap including an activating member mounted in the path of the moving containers for movement thereby and beyond the lower end of said channel in the direction of the container movement.

5. A sealing machine cap feed for feeding closure caps to the tops of moving containers comprising the combination of a cap chute having a generally vertical cap feeding channel therethrough, a pair of stationary stop members adjustably mounted in spaced cap engaging positions on opposite sides of the lower end of said channel for engaging the lowermost cap in said chute and for presenting the lower portion of the cap to the top of a moving container, a pressure plate pivotally mounted on the cap exit side of said cap chute having a cap engaging surface curving from a generally vertical to a generally horizontal direction, a magnet positioned for holding caps against said pressure plate, and a cap exit plate yieldably mounted on the container entrance side of said chute for permitting the upper portion of the lowermost cap in said chute to swing backwardly over the moving container as the cap is drawn from the chute and along said pressure plate by moving containers.

6. The cap feed as claimed in claim 5 in which opposite side walls of the channel comprise adjustably positioned guide rails, mounting means for the lower portion of said guide rails for moving said lower portion laterally of the channel, and said members being mounted on said lower portion of said guide rails.

7. The cap feed as claimed in claim 5 which further comprises a cap trip means including a trip arm movably mounted in said channel for engaging and releasably supporting the next cap above said lowermost cap, means for moving said trip arm clear of said next cap including an activating member mounted in the path of the moving containers for movement thereby and beyond the lower end of said channel in the direction of the container movement.

8. In combination in a container sealing machine a cap chute having a generally vertical cap feeding channel therethrough, a pair of stationary stop members mounted in spaced cap engaging positions on opposite sides of the lower end of the channel for engaging the lowermost cap in said chute and for presenting the lower portion of the cap to the top of a moving container, a cap guide plate yieldably mounted on the cap exit side of said cap chute having a cap engaging surface for directing said cap from a generally vertical position on said stop members to a generally horizontal position at a container top, means for holding said cap against said pressure plate, a cap exit plate yieldably mounted on the container entrance side of said chute for permitting the upper portion of the lowermost cap in said chute to swing backwardly over the moving container as the cap is drawn from the chute and along said cap guide plate by moving containers, a pair of belts having their inner runs positioned for engagement with the sides of the cap on the top of the moving container, and means for moving said inner runs for turning the cap onto the container.

9. The cap feed as claimed in claim 8 in which said one inner run is angled upwardly from the conveyor and said other inner run is angled downwardly from the conveyor whereby said inner runs turn the cap downwardly onto the container top.

10. The cap feed as claimed in claim 8 which further comprises a cap trip means including a trip arm movably mounted in said channel for engaging and releasably supporting the next cap above said lowermost cap, means for moving said trip arm clear of said next cap including an activating member mounted in the path of the moving containers for movement thereby and beyond the lower end of said channel in the direction of the container movement.

11. The cap feed as claimed in claim 8 in which opposite side walls of the channel comprise adjustably positioned guide rails, mounting means for the lower portions of said guide rails for moving the lower portions laterally of the channel, and said stop members being mounted on said lower portions of said guide rails for movement therewith.

12. In combination in a container sealing machine a cap chute having a generally vertical cap feeding channel therethrough, a pair of stationary stop members mounted in spaced cap engaging positions on opposite sides of the lower end of the channel for engaging the lowermost cap in said chute and for presenting the lower portion of the cap to the top of a moving container, a cap guide plate yieldably mounted on the cap exit side of said cap chute having a cap engaging surface for directing said cap from a generally vertical position on said stop members to a generally horizontal position at a container top, a magnet positioned for holding said cap against said guide plate, a cap exit plate yieldably mounted on the container entrance side of said chute for permitting the upper portion of the lowermost cap in said chute to swing backwardly over the moving container as the cap is drawn from the chute and along said cap guide plate by moving containers, a pair of belts having their inner runs positioned for engagement with the sides of the cap on the top of the moving container, means for moving one of said inner runs faster than said container and the other of said runs in an opposite direction relative to said one inner run for turning the cap onto the container, and a yieldably mounted magnetic cap leveling plate positioned beyond said cap guide plate and having a generally flat bottom surface for engaging the cap top as the cap sides are engaged by said inner belt runs.

13. The cap feed as claimed in claim 12 in which opposite side walls of the channel comprise adjustably positioned guide rails, mounting means for the lower portions of said guide rails for moving the lower portions laterally of the channel, and said stop members being mounted on said lower portions of said guide rails for movement therewith.

14. The cap feed as claimed in claim 12 in which said one inner run is angled upwardly from the conveyor and said other inner run is angled downwardly from the conveyor whereby said inner runs turn the cap downwardly onto the container top.

15. In combination in a container sealing machine a cap feed, a pair of stop members mounted in spaced cap engaging positions on opposite sides of the lower end of said cap feed for engaging the lowermost cap in said cap feed for presenting the lower portion of the cap to the top of a moving container, a cap guide means yieldably mounted on the cap exit side of said cap feed having a cap engaging surface for directing said cap to a generally horizontal position at a container top, a cap exit plate yieldably mounted on the container entrance side of said cap feed for permitting the upper portion of the lowermost cap in said cap feed to swing backwardly over the moving container as the cap is drawn from the cap feed and along said cap guide means by moving containers, a pair of belts having their inner runs positioned for engagement with the sides of the cap on the top of the moving container, and means for moving one of said inner runs faster than said container and the other of said runs in an opposite direction relative to said one inner run, said one inner run sloping upwardly from

said conveyor, said other inner run sloping downwardly from said conveyor, for turning the cap onto the container.

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