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J. DECKER ET AL  
CONTAINER CAPPER

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3 Sheets-Sheet 1

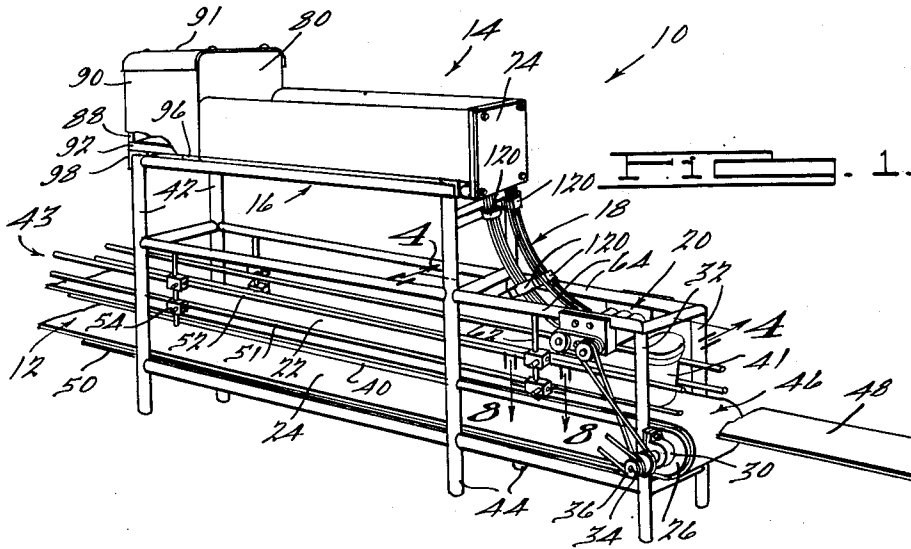


FIG. 1.

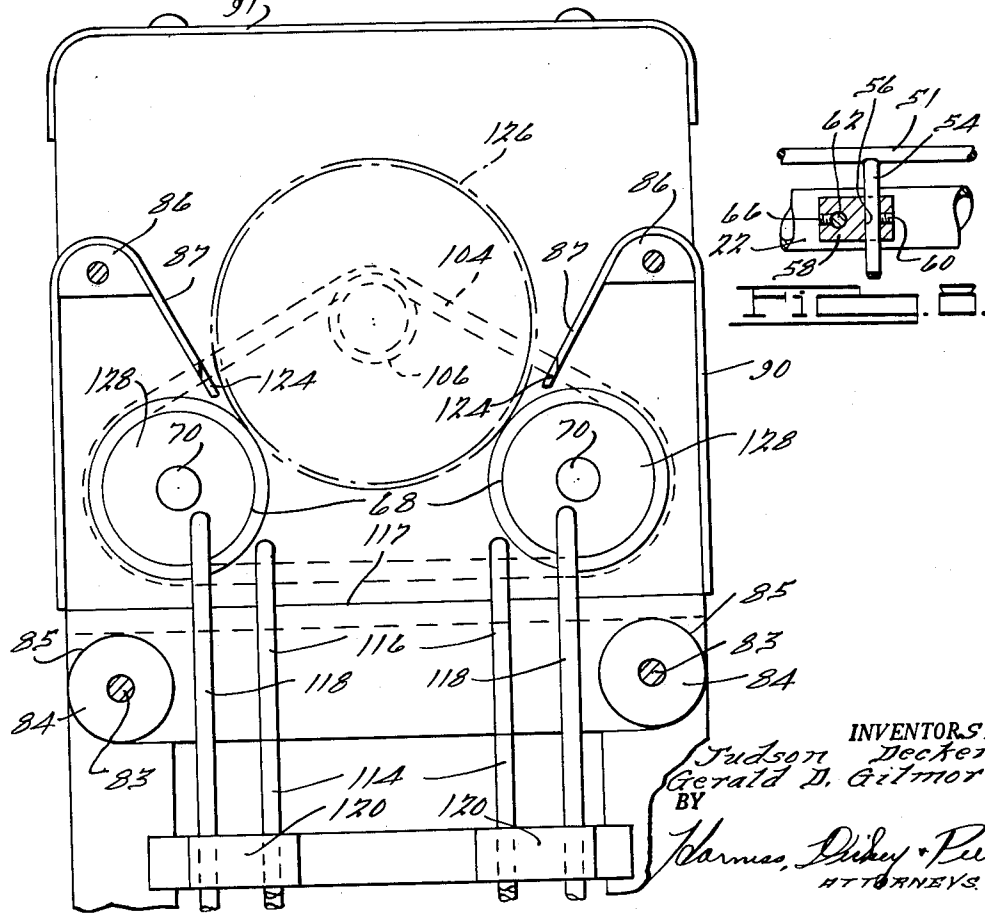


FIG. 2.

INVENTORS:  
Judson Decker  
Gerald D. Gilmore.  
BY  
Harnes, Dickey & Perin.  
ATTORNEYS

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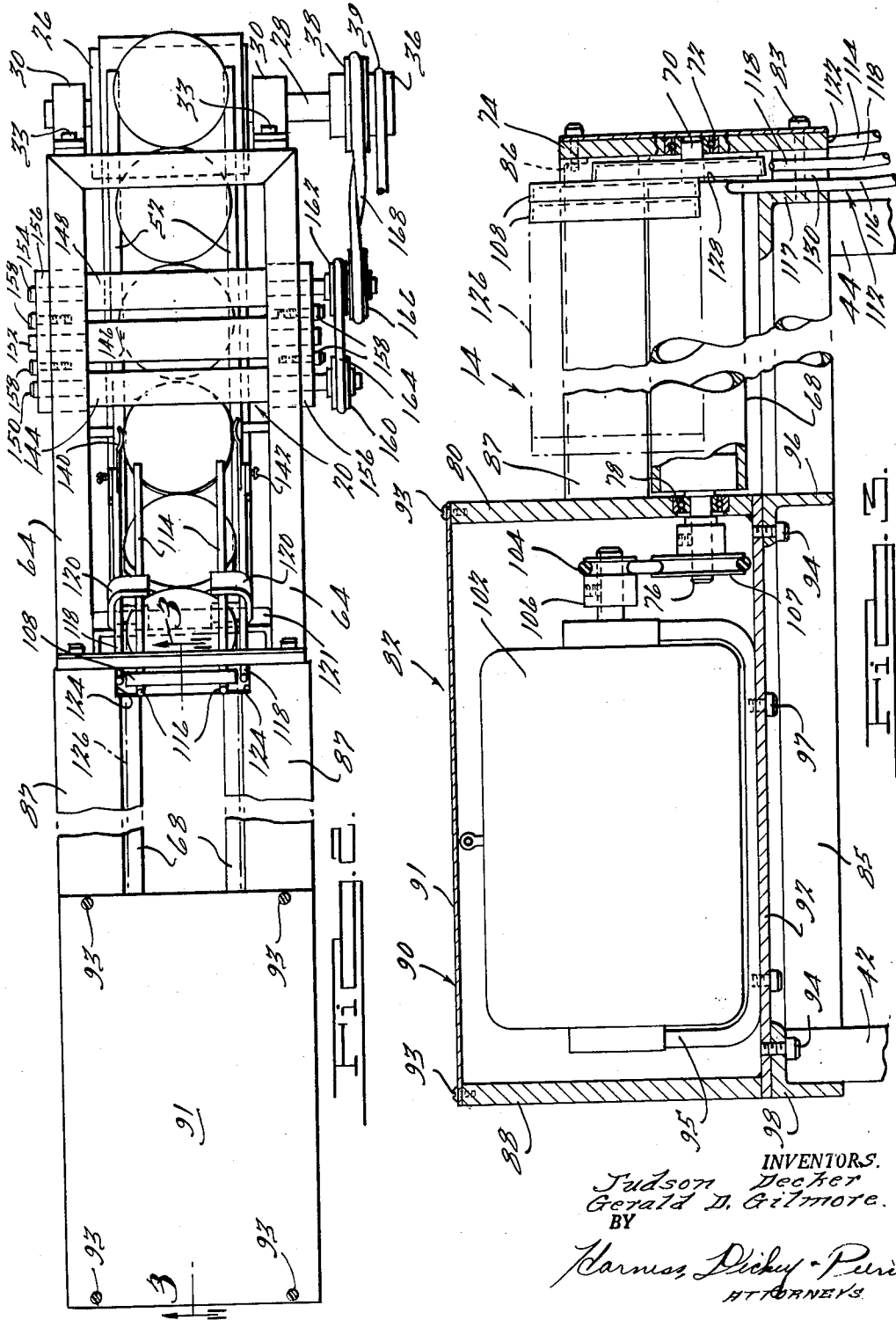
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INVENTORS:  
Judson Decker  
Gerald D. Gilmore.

BY  
Harnes, Dickey & Peris.  
ATTORNEYS.



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**CONTAINER CAPPER**

Judson Decker, Birmingham, and Gerald D. Gilmore, Rochester, Mich., assignors to Bopp-Decker Plastics, Inc., Birmingham, Mich., a corporation of Michigan  
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 16 Claims. (Cl. 53—316)

This invention relates to improvements in container capping machines and in particular concerns improvements in the cap dispensing system and in the cap applying means which cooperate to locate and place caps firmly on containers. The improved dispensing system and applying means are particularly adapted for use with automatic container filling and conveying apparatus which operate at relatively high speeds, and may be used for containers and caps of any material including plastic and metal.

In using automatic capping machines for the rapid automatic assembly of caps onto containers, the problem necessarily arises of feeding caps one at a time to the cap dispensing device which locates the caps properly on the container tops for their subsequent forcible and final assembly on the containers. The difficulty in so feeding the caps one at a time arises from the fact that the caps generally are provided with flanges which form recesses on one side of the caps into which an adjacent cap will nest and frequently become frictionally held. This nesting is particularly prominent when the flanges are outwardly tapered. One method of separating these caps from frictional attachment to each other is of course manually which would defeat to a large extent the utility and effectiveness of the automatic capping machine with its automatic feeding and dispensing means. It is noted that it is generally the practice to supply these container caps to the assembler of the container and cap in the form of stacks wherein the caps are frequently arranged in a nested manner as mentioned above.

In view of the foregoing, it is a principal object of applicants' invention to provide in a high speed cap dispensing and applying system, a cap separating and feeding means which is adapted to receive the entire stack of nested caps, effectively separate these caps from frictional attachment to each other, feed these caps in a continuous manner to the individual cap dispensing means, locate the cap properly with respect to the top of the container, and then forcibly and frictionally secure the caps to the container tops.

This principal object is generally accomplished by applicants by the provision of a set of cap separating and feeding rolls which have their longitudinal axes substantially in a horizontal plane or possibly slightly inclined toward the cap dispensing means or chute. These rolls are adapted to receive the entire stack of nested caps lying on their sides just as they are received from the cap manufacturer, and to rotate this stack of caps so as to impart rotative, jiggling, and longitudinal motion to the caps to effectively separate each from the other in their movement toward the individual cap dispensing means or chute. Sometimes the caps are provided with a peripheral flange which tapers radially outwardly as it extends axially from the cap top, and when using these types of caps the feeding rolls may be maintained horizontal since the slope of the flanges tend to automatically feed the stack longitudinally of the rolls toward the dispensing chute. If the cap flanges do not taper, a slight inclination of the rolls will facilitate their feeding toward the dispensing chute.

The dispensing chute is a very low friction rod type which terminates in resilient retaining means for frictionally holding back the caps as they attempt to emerge

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from the chute. The frictional force of the retaining means is overcome by the action of the containers as they move along the conveyor and engage the caps to pull them one by one from the chute.

As the caps are being pulled from the chute, applicants' improved cap applying roller mechanism effectively positions and forces the caps onto the containers. The details of the roller mechanism shall be explained below with reference to the overall operation of the dispensing and conveying systems for purposes of clarity. It suffices to say here that the leading roller assist the containers in dragging the cap from the chute while simultaneously starting the cap toward its downward position on the container, that a latter roller is provided for properly positioning displaced caps on the container tops, and that a trailing roller completes the downward motion of the cap on the container while imparting the proper linear speed to the container with respect to the conveying system to prevent tipping of the container.

It is, therefore, a specific object of this invention to provide a novel type of cap separating and feeding device for use with automatic capping machines and similar apparatus which must automatically separate and feed caps which may have become frictionally attached to each other by nesting of each within the flanges of the adjacent ones.

Another specific object is to provide an improved type of cap dispensing chute and cooperating cap retaining means for use with the aforesaid improved cap separating and feeding mechanism.

A further specific object is to provide an improved roller type of cap applying means for use and cooperation with the aforesaid improved chute retaining means, and cap feeding device.

Further objects and advantages of the present invention will become apparent from the following description and drawings in which:

FIGURE 1 represents an isometric elevational view of applicants' capping machine;

FIGURE 2 represents a top plan view of the machine of FIGURE 1;

FIGURE 3 represents a partial cross sectional view of the cap separating and feeding device taken along the line 3—3 of FIGURE 2 with portions thereof broken away;

FIGURE 4 represents a partial longitudinal cross sectional view of the cap dispensing and applying means and a conveyor system taken along the line corresponding to 4—4 of FIGURE 1 in the direction of the arrows;

FIGURE 5 represents an end view of the cap separating and feeding device of FIGURE 1 with the end bearing plate removed showing a portion of the dispensing chute;

FIGURE 6 represents a cross sectional view of the chute taken along the line corresponding to 6—6 of FIGURE 4 in the direction of the arrows;

FIGURE 7 represents a partial cross sectional view of the cap retaining means of FIGURE 4 taken along the line 7—7 thereof in the direction of the arrows; and

FIGURE 8 represents a partial cross sectional view of the guide rail supporting and adjusting structure of FIGURE 1 taken along the line corresponding to 8—8 thereof in the direction of the arrows.

Referring to the drawings, applicants' automatic capping machine is generally designated 10 and essentially comprises a continuous conveyor system generally designated 12, cap separating and feeding means generally designated 14 supported on a frame generally designated 16, cap dispensing means or chute 18, and a cap applying means or roller mechanism generally designated 20. The combined cap separating and feeding means, and the cap

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dispensing means or chute may conveniently be called the cap dispensing system.

The conveyor system 12 comprises a continuous flexible belt having an upper portion 22 and a lower portion 24 supported by and stretched between a pair of roller-type pulleys, only one of which is shown at 26 in FIGURES 1, 2, and 4. Pulley 26 is shown to be the drive pulley for the belt although the other pulley could be, and is provided with a shaft 28 mounted in bearings or pillow blocks 30 secured to the front of the frame 16 on the end posts or legs 32 by suitable means such as bolts 33. One end 34 of shaft 28 is provided with a driven pulley 36 and a driving pulley 38. Pulley 36 is connected by means of a belt 39 to a suitable driving means such as an electric motor, the speed of which is regulated by any of the conventional pulley arrangements or gear reduction units so that the conveyor belt is moved along at the desired speed. The companion roller pulley of pulley 26 which supports the belt at the inlet end of the capping machine is not shown but may be of identical structure to pulley 26 with the exception that it is not driven and is therefore an idler pulley.

Top portion 22 of the conveyor belt is supported upon a flat plate 40 of any sturdy material secured between the leg pairs 32, 42 and 44 of the frame 16. Plate 40 provides stability to the containers 41 as they move along the conveyor belt from the inlet end 43 to the outlet end 46 of the capping machine. Adjacent the outlet end 46 of the machine another conveyor or a downwardly sloping take-away slide or any other means 48 may be provided to remove the filled and capped containers 41 from the machine. A second support plate 50 may be provided underneath the bottom portion 24 of the conveyor belt to prevent it from excessive sag and stretching, particularly if the conveyor belt is of considerable length and weight.

In order to maintain the containers 41 in a designated path through the capping machine, any number of side rails such as 51 and 52 may be provided on either side of the conveyor to guide the containers. Referring to FIGURE 8, these rails are adjustable in and out with respect to the containers and conveyor belt by means of studs 54 which project through apertures 56 in blocks 58 provided with set screws 60 which may be tightened against studs 54 when the rails are properly positioned with respect to the sides of the containers. Blocks 58 further slidably receive and are supported by support rods 62 welded or otherwise secured to the longitudinal frame supports 64, and are further provided with set screws 66 which may be tightened against the rods 62 when the rails are properly positioned lengthwise of the containers.

The cap separating and feeding means 14 comprises a pair of rolls 68 each having a supporting shaft 70 integral with a plug secured in the forward end of each of said rolls, said shafts being journaled in bearings 72 supported in bearing plate 74. These rolls are further provided with supporting shafts 76 integral with a plug secured in the rear end of each said roll and supported in bearings 78 mounted in section 80 of a motor container generally designated 82. As shown in FIGURES 3 and 5, bearing plate 74 is secured by bolts or other suitable means 83 to the plugged or covered ends 84 of the frame members 85 and to the upper portions 86 of flanges 87 which are described below. The motor container 82 comprises the forward housing portion 89, the rearward housing portion 88, a covering shroud 90, a removable cover 91, and a base plate 92 removably secured by bolts 94 to the frame cross bars 96 and 98 welded or otherwise secured to the longitudinal top frame supports 85. Cover 91 is secured in place by screws 93 and the motor support 95 is removably secured to plate 92 by bolts 97.

Rolls 68, as shown in FIGURES 3 and 5, are spaced apart and driven by the motor 102 through the drive belt 104 driven by the motor driveshaft pulley 106. Belt 104 is received by the pulleys 107 secured to the shaft

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76 of each of the rolls. As shown in FIGURE 5, the pulleys are in a triangular arrangement so that the rolls 68 will rotate in the same direction to impart rotative motion to the container caps 108 supported on their edges between rolls 68. A pair of flanges 87 which may conveniently be formed from an extension of the metal shroud 90 are turned inwardly and downwardly toward the rolls 68 as shown in FIGURE 5 so that sideways loading of the stack 126 of container caps onto the rolls 68 can readily be accomplished. These flanges also prevent excessive motion of the caps 108 in a lateral direction.

The cap dispensing means or chute 18 comprises a pair of top rods 114, a pair of bottom rods 116 and a pair of edge rods 118. These rods are spaced apart sufficiently so that only one cap at a time can possibly slide through the chute and are preferably welded in place within one or more bands 120 longitudinally spaced along the chute and secured to frame 16 by means such as bracket 121. Rods 114 extend to the bottom edge 122 of the front support plate 74 and may be welded thereto to support the chute 18. The bottom rods 116 extend upwardly through the space between the frame cross bar 117 and the end plate 74 to a point underlying the inner periphery of the rolls 68 and may be welded to the bar 117 which is welded to the longitudinal frame members 85 passing through bar 117 as shown in FIGURE 5. The edge rods 118 likewise extend through the opening between the cross bar 117 and the end plate 74 to a point just beneath the forward shafts 70 of the rolls 68. The forward end portions of the flanges 87 are notched at 124 to allow the caps 108, as shown in FIGURES 2, 3, and 6 to fall down into the chute 18 between the rods 114, 116, and 118 as the rolls 68 feed the stack of caps 126 toward the forward end 128 of the rolls. It is noted that these forward ends 128 of the rolls are smooth and form in cooperation with the rods 116, 118, and end plate 74 a smooth frictionless opening 130 in the bottom of the separating and feeding means 14 for allowing only one cap at a time to drop off of the ends of the rolls 68 into the dispensing chute 18.

Chute 18 extends downwardly on an arc of sufficient radius so as not to bind the caps 108 therein, to a position overlying the tops 113 of the containers 41 and is supported by band 120 and bracket 121 to the members 64 on either side of the frame 16. The top rods 114 extend downwardly further than the bottom rods 116 so that the leading edges 132 of the containers will not be able to brush by the bottom edges 134 of the cap flanges 138 as the containers move underneath the caps, but, will be forced to engage the inside surface 136 of the flanges and pull the caps out of the chute 18.

As shown in FIGURE 7, the resilient cap retaining means comprises a pair of spring arms 140 flush mounted in slots in the inner surfaces of the edge rods 118 and may be conveniently secured thereto by spot welds. Adjusting screws 142 may be threadedly received into strengthening pieces 143 and rods 118 and engageable with the springs 140 to urge them further toward the caps 108 should more frictional resistance to pulling of the cap out of the chute 18 be required.

The cap applying means generally designated 20 comprises a series of three rollers 144, 146, and 148. As shown in FIGURE 2, these rollers are provided with shafts 150, 152, and 154 respectively, and are journaled at each end in bearing plates 156 secured to frame members 64 by welding or bolt means 158. Should it be desired, the bolts 158 may be received in slots in the bearing plates 156 so that the cap applying means 20 may be adjusted as a unit either vertically or longitudinally with respect to the containers 41. The shafts 150 and 154 of rollers 144 and 148 respectively, are provided at one end with pulleys 160 and 162 respectively, which are drivingly connected by a belt 164. A second pulley 166 on shaft 154 is drivingly connected by a twisted belt 168 to pulley 38

mounted on shaft 28 of roller pulley 26 to drive rollers 144 and 148 in a counterclockwise direction so that these rollers can cooperate with conveyor 22 in moving the caps and containers simultaneously along the conveyor 22. The leading roller 144 may be of slightly less diameter than trailing roller 148 so that it will only relatively lightly engage the caps 108 and tend to assist the container in pulling the cap out of the chute 18 while urging the cap downwardly over the leading edge 132 of the container. It frequently happens, however, that cap 108 slides or is pulled beyond the edge 132 of the container as it is forcibly pulled from the chute. For the purpose of properly seating these caps which are improperly positioned on the containers, an undriven idler roller 146 is provided which will exert drag forces on the caps tending to retard their forward motion under the influence of driven roller 144 so that the leading edges 132 of the containers will catch up with the inner surfaces 136 of the cap flange 138. It is noted that roller 146 extends slightly below roller 144 but slightly above roller 148 and as the partially capped container passes under roller 148 the caps will be urged to their finally seated position on the containers.

What is claimed is:

1. A cap dispensing system for an automatic container capping machine comprising means for imparting rotative motion at the radial edges of a plurality of caps which are disposed in substantially stacked relationship relative to a substantially common axis to separate the same from frictional attachment to each other, and means for receiving each one of said separated caps and dispensing it to a container.

2. A cap dispensing system for an automatic container capping machine comprising roller means for supporting and imparting rotative motion to a plurality of caps which are disposed in substantially stacked relationship to separate the same from frictional attachment to each other, said roller means being constructed for supporting said caps edgewise with the axis of the stack in a substantially horizontal plane, and means for receiving each one of said separated caps and dispensing it to a container.

3. A cap dispensing system for an automatic container capping machine comprising means for imparting rotative and jiggling motion at the radial edges to a plurality of caps which are disposed in substantially stacked relationship along a substantially common axis to separate the same from frictional attachment to each other, means for receiving each one of said separated caps and dispensing it to a container, said first means being further adapted for moving said plurality of caps simultaneously toward said latter means.

4. An automatic container capping machine comprising conveyor means for supporting and moving containers in an upright position, cap dispensing means positioned over said conveyor means for positioning caps one at a time for engagement by said containers as they move on said conveyor means, cap feeding means for supporting a plurality of caps stacked with their axes substantially along one line and in a substantially horizontal position and for rotating and jiggling the same to separate the caps from frictional attachment to each other, said feeding means communicating with the inlet end of said dispensing means and being adapted to move said stack theretoward, and cap applying means positioned over said conveyor means near the outlet end of said dispensing means for engaging the tops of said caps and forcing them onto the containers.

5. An automatic container capping machine comprising conveyor means for supporting and moving containers in an upright position, cap dispensing means positioned over said conveyor means for positioning caps one at a time for engagement by said containers as they move on said conveyor means, cap feeding means for supporting a stack of caps in a substantially horizontal position and for rotating and jiggling the same to separate the caps from frictional attachment to each other, said feeding means communicating with the inlet end of said dispensing means

and being adapted to move said stack theretoward, and cap applying means positioned over said conveyor means near the outlet end of said dispensing means for engaging the tops of said caps and forcing them onto the containers, said cap applying means comprising a series of rollers the leading one of which is positioned slightly further from said conveyor than the other rollers of said applying means.

6. An automatic container capping machine comprising conveyor means for supporting and moving containers in an upright position, cap dispensing means positioned over said conveyor means for positioning caps one at a time for engagement by said containers as they move on said conveyor means, cap feeding means for supporting a stack of caps in a substantially horizontal position and for rotating and jiggling the same to separate the caps from frictional attachment to each other, said feeding means communicating with the inlet end of said dispensing means and being adapted to move said stack theretoward, and cap applying means positioned over said conveyor means near the outlet end of said dispensing means for engaging the tops of said caps and forcing them onto the containers, said cap applying means comprising a series of rollers the leading one of which is positioned slightly further from said conveyor than the other rollers of said applying means, and one of said rollers of said applying means being positioned closer to said conveyor means than said leading roller for exerting a drag on the caps while forcing them onto the containers.

7. An automatic container capping machine comprising conveyor means for supporting and moving containers in an upright position, cap dispensing means positioned over said conveyor means for positioning caps one at a time for engagement by said containers as they move on said conveyor means, cap feeding means for supporting a stack of caps in a substantially horizontal position and for rotating and jiggling the same to separate the caps from frictional attachment to each other, said feeding means communicating with the inlet end of said dispensing means and being adapted to move said stack theretoward, and cap applying means positioned over said conveyor means near the outlet end of said dispensing means for engaging the tops of said caps and forcing them onto the containers, said cap applying means comprising a series of rollers the leading one of which is driven and positioned slightly further from said conveyor than the other rollers of said applying means, and one of said rollers of said applying means being an idler roller positioned closer to said conveyor means than said leading roller for exerting a drag on the caps while forcing them onto the containers.

8. A cap dispensing system for an automatic container capping machine comprising roller means for supporting and imparting rotative motion to a plurality of caps which are disposed in substantially stacked relationship to separate the same from frictional attachment to each other, said roller means including a pair of substantially horizontal, longitudinally extending, spaced, rotatably mounted rollers, and means for receiving each one of said separated caps and dispensing it to a container.

9. A cap dispensing system for an automatic container capping machine comprising roller means for supporting and imparting rotative motion to a plurality of caps which are disposed in substantially stacked relationship to separate the same from frictional attachment to each other, said roller means including a pair of longitudinally extending, rotatably mounted rollers having substantially continuous and uniform peripheral surfaces and with said surfaces being spaced from each other a linear distance less than the outside diameter of the caps, means for rotating said rollers in the same direction, and means for receiving each one of said separated caps and dispensing it to a container.

10. The dispensing system of claim 9 further including

a pair of longitudinally extending flanges disposed upwardly from and proximate to said pair of rollers.

11. An automatic container capping machine comprising conveyor means for supporting and moving containers in an upright position; cap dispensing means positioned over said conveyor means for positioning caps one at a time for engagement by said containers as they move on said conveyor means, cap feeding means for supporting a stack of caps edgewise and for rotating the same to separate the caps from frictional attachment to each other, said feeding means communicating with the inlet end of said dispensing means and being adapted to move the stack of caps theretoward, and cap applying means positioned over said conveyor means near the outlet end of said dispensing means for engaging the tops of said caps and forcing them onto the container, said cap applying means comprising a series of rollers with a leading one of said rollers being positioned slightly further from said conveyor means than the others of said rollers and with a second one of said rollers being an idler roller positioned closer to said conveyor means than said leading roller for exerting a drag on the caps and with a third one of said rollers positioned after said second roller and closer to said conveyor means than said idler roller for forcing the caps onto the containers, and means for rotating said first and said third rollers.

12. An automatic container capping machine comprising conveyor means for supporting and moving containers in an upright position and cap applying means positioned over said conveyor means for forcing caps onto the containers, said cap applying means comprising a series of rollers with a leading one of said rollers being positioned slightly further from said conveyor means than the others of said rollers and with a second one of said rollers being an idler roller positioned closer to said conveyor means than said leading roller for exerting a drag on the caps and with a third one of said rollers positioned after said second roller and closer to said conveyor means than said idler roller for forcing the caps onto the containers, and means for rotating said first and said third rollers.

13. An automatic container capping machine comprising conveyor means for supporting and moving containers in an upright position, cap dispensing means positioned over said conveyor means for positioning caps

at an outlet end one at a time for engagement by said containers as they move on said conveyor means, and cap applying means positioned over said conveyor means and proximate to said outlet end of said cap dispensing means for forcing caps onto the container, said cap applying means comprising a series of rollers with a leading one of said rollers being positioned slightly further from said conveyor means than the others of said rollers for engaging that one of the caps held at said outlet end of said cap dispensing means and with a second one of said rollers being an idler roller positioned closer to said conveyor means than said leading roller for exerting a drag on the caps and with a third one of said rollers positioned after said second roller and closer to said conveyor means than said idler roller for forcing the caps onto the containers, and means for rotating said first and said third rollers.

14. The capping machine of claim 13 with said leading one of said rollers being of a smaller diameter than said third one of said rollers and with said means for rotating said first and said third rollers being common to both said first and said third rollers.

15. A cap dispensing system comprising means for imparting rotative motion at the radial edges of a plurality of caps which are disposed in substantially stacked relationship relative to a substantially common axis to separate the same from frictional attachment to each other, and means for receiving each one of said separated caps and dispensing it.

16. A cap dispensing system comprising roller means for supporting and imparting rotative motion to a plurality of caps which are disposed in substantially stacked relationship to separate the same from frictional attachment to each other, said roller means being constructed for supporting said caps edgewise with the axis of the stack in a substantially horizontal plane, and means for receiving each one of said separated caps and dispensing it.

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