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APPARATUS FOR ORIENTING BOTTLE CAPS AND THE LIKE

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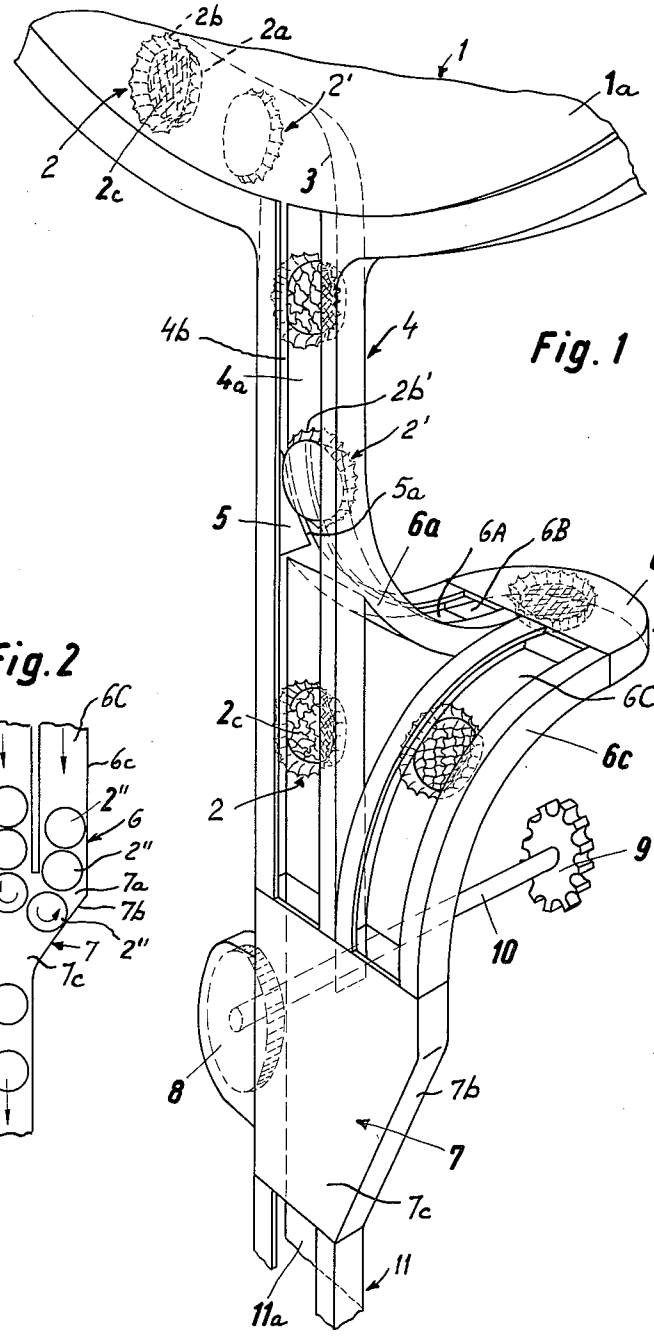


Fig. 1

Fig. 2

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APPARATUS FOR ORIENTING BOTTLE CAPS AND THE LIKE

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The present invention relates to an apparatus for arraying bottle caps and the like, and more particularly to an apparatus which is especially suited for inverting improperly positioned crown caps during delivery of such caps to bottle capping machines.

In a bottle capping machine, the chucks in capping heads which apply caps to the tops of bottles must receive caps in a predetermined position so that each cap is properly held during transfer and during application to the top of a bottle. On the other hand, the hopper which contains a supply of caps is normally constructed to feed such caps at random, i.e., the open sides of adjoining caps in a file of consecutive caps will often face in opposite directions. Therefore, the bottle capping machine must be provided with an apparatus which is capable of ejecting and/or inverting all improperly positioned caps so that the capping heads will receive caps in requisite position in order to avoid jamming with resultant loss in output and eventual damage to sensitive parts of the machine. All presently utilized inverting apparatus of which I have knowledge at this time are rather complicated and/or unreliable because the deflected caps are likely to jam, because the deflected caps must be returned to the hopper for renewed delivery toward the capping station, and/or because the deflecting and inverting devices are likely to deface the caps by removing some of the finish from their surfaces.

Accordingly, it is an important object of the present invention to provide a very simple, reliable, inexpensive and compact apparatus which is capable of automatically ejecting from the path of crown caps all such caps which are not in proper position for delivery to a further processing station, and to construct the apparatus in such a way that an improperly positioned crown cap is automatically inverted and may return into the pathway of properly positioned caps without returning to the hopper or to another source from which the caps are being fed at random.

Another object of the invention is to provide an apparatus of the just outlined characteristics wherein the deflection, inversion and subsequent advance of crown caps may be inspected and influenced at all times, wherein the inversion of improperly positioned caps requires little room, wherein such deflection and inversion may be carried out without damage to the finish or to descriptive matter on the caps, and wherein the rate at which the caps are being fed to a bottle capping or other processing machine may be the same as if the caps were to be fed without inversion.

An additional object of the instant invention is to provide an apparatus for inverting improperly positioned crown caps wherein the deflection, inversion and further advance of such caps may be effected by gravity feed alone, and wherein all improperly positioned caps are inverted regardless of the percentage of such caps in the total number which is being discharged from a hopper or from another suitable source.

Still another object of the invention is to provide the improved inverting apparatus with means for insuring that inverted crown caps have precedence over non-inverted caps so that the apparatus cannot be clogged even if the percentage of improperly positioned caps exceeds the percentage of properly positioned caps.

A further object of the present invention is to provide a novel inverting track which may be used with advantage in an apparatus of the above outlined characteristics.

Another object of the invention is to provide a novel siding which may be combined with the improved inverting track and which enables the apparatus to discharge inverted caps alternatively with non-inverted caps so that all channels in which the caps travel are protected from clogging.

A concomitant object of the invention is to provide an apparatus of the above outlined characteristics which may be constructed in any desired size or shape and which may be readily installed in all or nearly all presently known bottle capping machines, cork pad inserting machines and other automatic machinery which must receive one or more rows of properly arrayed crown caps.

With the above objects in view, one feature of my invention resides in the provision of an apparatus for inverting improperly positioned crown caps for bottles and the like. The apparatus comprises chute means defining channel means for conveying crown caps and including a first portion arranged to receive and convey randomly distributed caps and a second portion arranged to receive from the first portion only such caps which are properly positioned for further processing, deflecting means in the form of one or two wedges provided in the first portion of the chute means for engaging the crowns of improperly positioned caps and for ejecting such caps from the first portion, and inverting means comprising a substantially V-shaped inverting track having a first and a second section each of which defines an arcuate bypass channel. The two sections have first end portions which respectively merge into the first and second portions of the chute means and second end portions which make substantially right angles with the first end portions and communicate with each other. The first end portion of the first section is arranged to receive improperly positioned caps which are ejected from the first portion of the chute means whereby such caps are automatically inverted on their way through the arcuate channels of the two sections and may enter the second portion of the chute means.

The chute means preferably defines a vertical or nearly vertical composite channel so that the caps may descend by gravity. In such inverting apparatus, the first end portion of each track section is substantially vertical and the second end portion of each track section is substantially horizontal. In order to facilitate transfer of partially inverted caps from the second end portion of the first section into the second end portion of the second section, the track preferably comprises a third section which defines an arcuate channel located in the planes of the second end portions and serving to connect the two bypass channels so that each improperly positioned cap will travel first in an arcuate bypass channel and is turned through 90 degrees, thereupon in an arcuate path to reverse the direction of its advance, and finally again in an arcuate path through another angle of 90 degrees so that its inversion is completed before it is readmitted into the channel.

I further prefer to provide a siding which may be disposed between the first end portion of the second track section and the lower portion of the chute and which is provided with a driven wheel or the like to insure that inverted caps and non-inverted caps alternate on their way to the chuck in the capping head of a bottle capping machine.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved inverting apparatus itself, however, both as to its construction and its mode

of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of a specific embodiment with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic perspective view of an inverting apparatus which embodies my invention; and

FIG. 2 is a diagrammatic vertical section through the lower portion of the apparatus shown in FIG. 1.

Referring to the drawings, and first to FIG. 1, the inverting or arraying apparatus cooperates with a feed mechanism including a stirrer or agitator **1** having a housing **1***a* provided at its lower end with an arcuate outlet **3** so as to discharge a single file or row of crown caps. The outlet **3** receives a single file of crown caps in response to rotation of one or more stirring disks (not shown) which cover the housing **1***a* and which insure that a steady stream of randomly distributed caps is discharged from the agitator. Each cap is of known construction and comprises a metallic or plastic shell **2***a* having a corrugated annular edge portion or crown **2***b* and accommodating a cork pad **2***c* which overlies the top of a bottle when the cap is applied thereto. The outlet **3** is dimensioned in such a way that it can discharge crown caps at random, i.e., the crowns **2***b* on properly positioned caps **2** will face in one direction and the crowns on the remaining (improperly positioned) caps **2'** will face in the opposite direction. However, since a bottle capping machine must receive caps in such a way that all of the crowns **2***b* face in the same direction, the apparatus comprises means for deflecting improperly positioned caps **2'** from the channel which leads to the capping heads of a bottle capping machine and for thereupon inverting and returning such caps into the channel so that the thus inverted caps **2''** may be applied to bottles.

The inverting apparatus comprises a vertical or nearly vertical upper chute **4** which defines a flat guide channel **4***a* and is provided with spaced grooves **4***b* in communication with the channel **4***a*. The grooves **4***b* accommodate diametrically opposed portions of crowns **2***b* on properly positioned caps **2** so that such caps are automatically compelled to descend in the channel **4***a* on their way to the bottle capping machine, not shown. Each improperly positioned cap **2'** is deflected by one or two wedge-like deflecting members **5** which are provided in the channel **4***a* adjacent to the grooves **4***b* and have arcuate cam faces **5***a* along which the crown **2***b'* of an improperly positioned cap **2'** slides to be ejected into an arcuate bypass channel **6A** defined by one section or leg **6***a* of a substantially V-shaped inverting track **6**. This track comprises a second section or leg **6***c* which is connected with the leg **6***a* by a horizontal intermediate section or web **6***b*. The arcuate median channel **6B** defined by the web **6***b* extends through an angle of 180 degrees and its ends are in communication with the bypass channels **6A**, **6C** respectively defined by the legs **6***a*, **6***c*. The end portions of the legs **6***a*, **6***c* which are connected with the web **6***b* are located in a common horizontal plane, i.e., at right angles to the channel **4***a*. The bypass channels **6A**, **6C** of the legs **6***a*, **6***c* extend through angles of about 90 degrees whereby the vertical upper end portion of the upper channel **6A** merges into the guide channel **4***a* and the vertical lower end portion of the lower channel **6C** merges into a siding **7** which is adjacent to the lower end of the upper chute **4**. The siding **7** may be considered to constitute the lower end portion of the leg **6***c*. While travelling through the channels **6A**, **6B**, **6C**, and improperly positioned crown cap **2'** is automatically inverted in a manner illustrated in FIG. 1 so that it is ready to be delivered to the head of a bottle capping machine as soon as it enters the internal chamber **7***a* of the siding **7**. This chamber is configurated in a novel way, see FIG. 2, so that the inverted caps **2'** will have precedence and may enter a lower chute **11** of the improved inverting apparatus prior to entry of properly positioned caps **2** which descend through the upper chute **4** and bypass the deflecting member **5**. The reason for such precedence is that improperly positioned caps **2'** will not accumulate in and cannot clog the inverting track **6** and/or the chamber **7***a*.

The means for controlling the advance of caps **2** from the channel **4***a* and the advance of inverted caps **2''** from the arcuate channel **6C** into the lower chute **11** comprises a toothed or knurled roller or wheel **8** which is mounted in such a way that it extends into the path of caps **2** descending through the upper chute **4** and causes such caps to enter the chamber **7***a* in order to advance into the channel **11***a* of the lower chute **11**. The wheel **8** is driven by a shaft **10** which carries a driver gear **9**, and the direction in which the wheel **8** rotates is such that it tends to return the lowermost cap **2** into the guide channel **4***a*. In FIG. 2, the wheel **8** rotates in a counterclockwise direction to rotate the lowermost cap **2** in a clockwise direction. However, when an inverted cap **2''** enters the chamber **7***a*, it strikes against the lowermost cap **2** and is thereby caused to rotate in a counterclockwise direction, i.e., in the same direction as the wheel **8**. Such rotation contributes to rapid advance of the inverted cap **2''** into the channel **11***a* and on to the chuck of the head in a bottle capping machine. The distance between the inclined side wall **7***b* of the siding **7** and the periphery of the wheel **8** exceeds somewhat the diameter of a cap **2** or **2''** but is less than the combined diameters of caps **2**, **2''** so that only one cap at a time may pass through a funnel **7***c* which is formed by the lower part of the siding **7**. The gear **9** may be rotated by the main drive of the bottle capping machine or from the drive of the agitator **1** which feeds caps **2**, **2'** at random through the outlet **3** and into the upper end of the channel **4***a*.

The track **6** and the chute **11** may but need not be provided with grooves corresponding to the grooves **4***b* in the upper part of the main chute **4**. The provision of such grooves in the track **6** and chute **11** is not absolutely necessary because the width of the channels **6A–6C** and **11***a* is preferably such that a cap **2**, **2'** or **2''** can advance in one way only, namely, in a way as required for proper delivery to the capping station. Also, and as shown, at least one side of each of the chutes **4**, **11** and of the track **6** may remain open so that the operator may observe the progress of caps and may eliminate any "traffic jams" caused by stalled caps if such disturbances should take place. On the other hand, it is also possible to make the chutes **4**, **11** and the track **6** with transparent or translucent walls and to provide each thereof with a readily detachable panel so that, while the channels normally remain sealed to prevent entry of dust or other foreign matter, each thereof will be readily accessible if a cap happens to be stuck or if a foreign body enters the apparatus and prevents smooth gravitational descent of caps to the bottle capping machine.

Of course, the grooves **4***b* may also be omitted from that portion of the upper chute **4** which extends from the deflecting member **5** to the wheel **8** because, in this portion of the upper chute, there is no possibility that a properly positioned crown cap could be guided in any other but the required way.

Owing to the provision of the web **6***b*, the arcuate legs **6***a*, **6***c* of the track **6** are laterally offset with reference to each other so that an improperly positioned cap **2'** travels in a composite path including a downwardly sloping concave portion in the bypass channel **6A**, thereupon a semicircular portion in a horizontal plane (channel **6B**), and finally a downwardly sloping convex portion in the bypass channel **6C**.

The inverting or arraying apparatus of my invention operates as follows:

When the agitator **1** feeds properly aligned crown caps **2**, such caps pass through the outlet **3** and drop by gravity through the channel **4***a* and onto the toothed periphery of the wheel **8** to be deflected into the chamber **7***a* and to advance through the funnel **7***c* into the channel **11***a* on their

way to the head of a bottle capping machine. The crown 2*b'* of each improperly positioned cap 2' is automatically engaged by the deflecting member 5 and the corresponding cap 2' is then caused to enter the bypass channel 6A to thereupon advance through the channels 6B, 6C and into the chamber 7*a*, and to bypass the wheel 8 while moving through the funnel 7*c* and into the channel 11*a* of the lower chute 11. Thus, an improperly positioned cap 2' is inverted or turned through 180 degrees in a fully automatic way and need not even touch the periphery of the wheel 8. Should an inverted cap 2'' reach the funnel 7*c* simultaneously with a properly positioned cap 2 which has descended through the channel 4*a* and was deflected by the wheel 8, the cap 2'' has precedence for the reasons explained above and enters the channel 11*a* ahead of the cap 2. The next-following inverted cap 2'' will have precedence before the next-following properly positioned cap 2, and so on, to make sure that the channels 6A–6C are not overfilled and that all improperly positioned caps 2' which descend through the outlet 3 are free to enter the bypass channel 6A on their way to the funnel 7*c* and channel 11*a*. The wheel 8 and the lowermost caps 2, 2'' shown in FIG. 2 cooperate in the same way as the gears or a gear train whereby the wheel 8 performs the function of a driver gear and the lowermost cap 2 acts not unlike an intermediate gear to rotate the lowermost inverted cap 2'' in the direction in which the wheel 8 rotates.

The exact construction of the agitator 1 and of the bottle capping machine which may receive properly positioned crown caps from the improved inverting apparatus forms no part of the present invention. It is to be noted however, that the inverting apparatus is equally useful in machines which serve to insert cork pads 2*c* into shells 2*a* of crown caps because, in such machines, the shells 2*a* must be fed in a predetermined position in order that each thereof may receive a cork pad.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. An apparatus for inverting improperly positioned crown caps for bottles and the like, comprising chute means defining channel means for conveying the caps, said chute means including a first portion arranged to convey randomly distributed caps and a second portion arranged to receive properly positioned caps from said first portion; deflecting means provided in the first portion of said chute means for engaging the crowns of improperly positioned caps and for ejecting such caps from said first portion; and inverting means comprising a substantially V-shaped inverting track having a first and a second section each defining an arcuate bypass channel, said first and second sections having first end portions respectively merging into the first and second portions of said chute means and second end portions making substantially right angles with said first end portions and communicating with each other, the first end portion of said first section being arranged to receive caps ejected by said deflecting means so that such caps are automatically inverted during passage through said bypass channels and enter the second portion of said chute means.

2. An apparatus for inverting improperly positioned crown caps for bottles and the like, comprising a pair of substantially vertical chutes including an upper chute and a lower chute, said chutes defining a pair of communicating vertically aligned channels and said upper chute being provided with means for guiding properly positioned caps into the channel of said lower chute; a deflecting member provided in the channel of said upper chute and arranged to engage the crowns of improperly positioned caps to eject such caps from said upper chute; means for feeding randomly distributed crown caps into the channel of said upper chute; and a substantially V-shaped inverting track having a pair of sections each defining a bypass channel extending through an angle of about 90 degrees, one of said sections having a substantially vertical upper end portion merging into said upper chute to receive caps which are ejected by said deflecting member and a substantially horizontal lower end portion, the other section having a substantially horizontal upper end portion communicating with the lower end portion of said one section and a substantially vertical lower end portion arranged to deliver caps into the channel of said lower chute, the caps entering said track being automatically inverted on their way through said bypass channels.

3. An apparatus for inverting improperly positioned crown caps for bottles and the like, comprising a pair of substantially vertical chutes including an upper chute and a lower chute, said chutes defining a pair of communicating vertically aligned channels and said upper chute being provided with means for guiding properly positioned caps into the channel of said lower chute; a deflecting member provided in the channel of said upper chute and arranged to engage the crowns of improperly positioned caps to eject such caps from said upper chute; means for feeding randomly distributed crown caps into the channel of said upper chute; and a substantially V-shaped inverting track comprising a pair of legs each defining a bypass channel extending through an angle of about 90 degrees, one of said legs having a substantially vertical upper end portion merging into said upper chute to receive caps ejected by said deflecting member and a substantially horizontal lower end portion, the other leg having a substantially horizontal upper end portion located in the general plane of said lower end portion and a substantially vertical lower end portion communicating with said lower chute, said track further comprising a web connecting the lower end portion of said one leg with the upper end portion of said other leg and having a horizontal channel extending through an angle of about 180 degrees to connect said bypass channels so that caps descending in the bypass channel of said one leg travel through said horizontal channel on their way into the bypass channel of said other leg and are inverted at the time they enter the channel of said lower chute.

4. An apparatus for inverting improperly positioned crown caps for bottles and the like, comprising a first chute defining a first channel arranged to receive randomly distributed crown caps from a source of supply; a second chute defining a second channel arranged to receive properly positioned caps from said first channel; a deflecting member provided in said first channel and arranged to eject improperly positioned caps from said first chute; and a V-shaped inverting track comprising a first and a second section each defining an arcuate bypass channel extending through an angle of about 90 degrees, said first section having a first end portion merging into said upper chute so that the corresponding bypass channel may receive caps ejected by said deflecting member and a second end portion which is substantially perpendicular to said first end portion, said second section having a first end portion adjacent to said lower chute and a second end portion arranged to receive caps from the bypass channel of said first section whereby such caps are inverted at the time they reach the first end portion of said second section, said track further comprising a siding defining a chamber connecting the first end portion of said second section with said second chute so that inverted caps may enter said second channel, said siding comprising control means for directing properly positioned caps from said first channel into said siding so that an inverted cap received in said siding has precedence over a properly positioned cap.

5. An apparatus as set forth in claim 4, wherein said control means comprises a rotary wheel extending into the path of properly positioned caps in said first channel at a point past said deflecting member, and means for driving said wheel to rotate the properly positioned caps which impinge against said wheel.

6. An apparatus as set forth in claim 5, wherein the periphery of said wheel is provided with teeth and wherein the extent to which said wheel extends into said siding is such that only one cap at a time can bypass the wheel on its way into said second channel.

7. An apparatus as set forth in claim 4, wherein said chutes are substantially vertical and wherein the second end portions of said sections are substantially horizontal, said track further comprising a horizontal section defining an arcuate channel extending through an angle of substantially 180 degrees and connecting said bypass channels.

8. A V-shaped inverting track for crown caps and the like, comprising a pair of sections defining a pair of arcuate bypass channels each extending through an angle of about 90 degrees, each channel having a substantially vertical first end portion spaced from the first end portion of the other channel and a substantially horizontal second end portion in communication with the second end portion of the other channel so that a crown cap entering the first end portion of one of said channels is automatically inverted on its way to the first end portion of the other channel.

9. An inverting track as set forth in claim 8, further comprising an intermediate section defining a horizontal third channel extending through an angle of about 180 degrees and connecting the second end portions of said bypass channels.

10. In a bottle capping machine, in combination, an apparatus for inverting improperly positioned crown caps for bottles and the like, comprising chute means defining channel means for conveying the caps, said chute means including a first portion arranged to convey randomly distributed caps and a second portion arranged to receive properly positioned caps from said first portion, deflecting means provided in the first portion of said chute means for engaging the crowns of improperly positioned caps and for ejecting such caps from said first portion, and inverting means comprising a substantially V-shaped inverting track having a first and a second section each defining an arcuate bypass channel, said first and second sections having first end portions respectively merging into the first and second portions of said chute means and second end portions making substantially right angles with said first end portions and communicating with each other, the first end portion of said first section being arranged to receive caps ejected by said deflecting means so that such caps are automatically inverted during passage through said bypass channels and enter the second portion of said chute means; and agitator means comprising an outlet arranged to deliver randomly distributed crown caps to the first portion of said chute means.

11. An apparatus for inverting improperly positioned crown caps for bottles and the like, comprising a pair of substantially vertical open-sided chutes including an upper chute and a lower chute, said chutes defining a pair of communicating vertically aligned channels and said upper chute being provided with means for guiding properly positioned caps into the channel of said lower chute; a deflecting member provided in the channel of said upper chute and arranged to engage the crowns of improperly positioned caps to eject such caps from said upper chute; means for feeding randomly distributed crown caps into the channel of said upper chute; and a substantially V-shaped inverting track having a pair of open-sided sections each defining a bypass channel extending through an angle of about 90 degrees, one of said sections having a substantially vertical upper end portion merging into said upper chute to receive caps which are ejected by said deflecting member and a substantially horizontal lower end portion, the other section having a substantially horizontal upper end portion communicating with the lower end portion of said one section and a substantially vertical lower end portion arranged to deliver caps into the channel of said lower chute, the caps entering said track being automatically inverted on their way through said bypass channels.

12. An apparatus for inverting improperly positioned crown caps for bottles and the like, comprising a pair of substantially vertical chutes including an upper chute and a lower chute, said chutes defining a pair of communicating vertically aligned channels and said upper chute being provided with means for guiding properly positioned caps into the channel of said lower chute; a substantially wedge-like deflecting member provided in the channel of said upper chute and having a cam face arranged to engage the crowns of improperly positioned caps to eject such caps from said upper chute; means for feeding randomly distributed crown caps into the channel of said upper chute; and a substantially V-shaped inverting track having a pair of sections each defining a bypass channel extending through an angle of about 90 degrees, one of said sections having a substantially vertical upper end portion merging into said upper chute to receive caps which are ejected by said deflecting member and a substantially horizontal lower end portion, the other section having a substantially horizontal upper end portion communicating with the lower end portion of said one section and a substantially vertical lower end portion arranged to deliver caps into the channel of said lower chute, the caps entering said track being automatically inverted on their way through said bypass channels.

13. An apparatus as set forth in claim 12, wherein the means for guiding properly positioned caps into the channel of said lower chute comprises a pair of lateral grooves provided in said upper chute to communicate with the respective channel and arranged to receive diametrically opposed portions of crowns on properly positioned caps.

14. An apparatus as set forth in claim 12, further comprising a siding arranged to connect the first end portion of said second section with said lower chute so that caps inverted in said track pass through said siding on their way into the channel of said lower chute.

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