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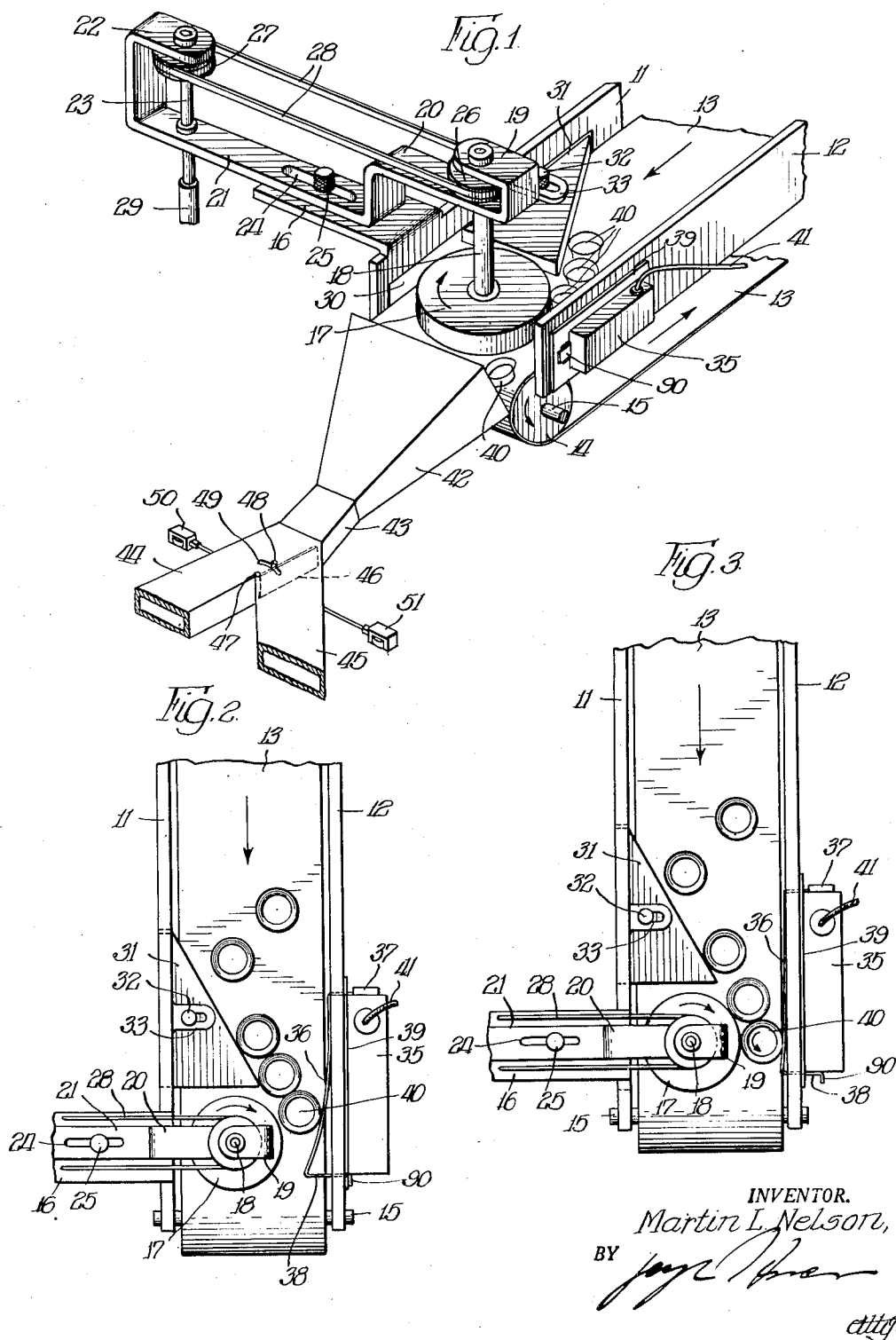
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2,493,464

CONTROL APPARATUS AND SWITCH THEREFOR

Filed Oct. 16, 1945

2 Sheets-Sheet 1



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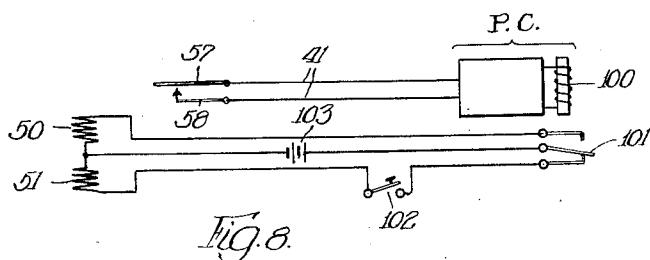
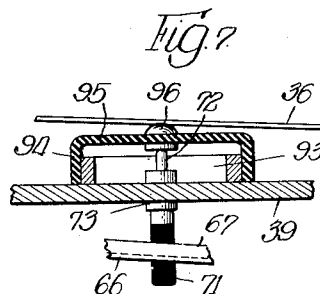
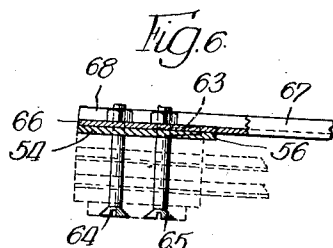
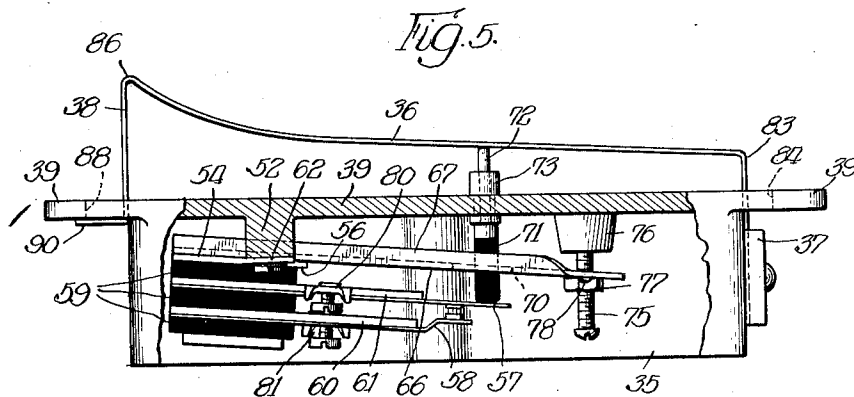
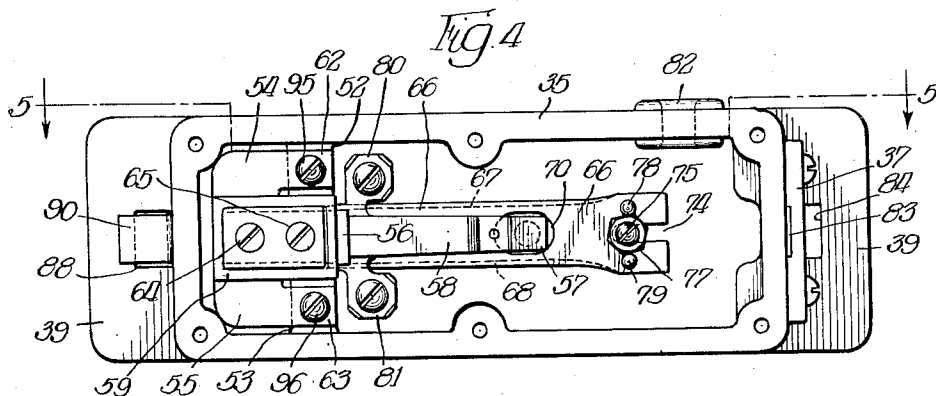
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CONTROL APPARATUS AND SWITCH THEREFOR

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,493,464

CONTROL APPARATUS AND SWITCH
THEREFOR

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Application October 16, 1945, Serial No. 622,561

8 Claims. (Cl. 198—40)

1

This invention relates to control apparatus, and is particularly concerned with apparatus for automatically feeding past a given point articles to be counted for the purpose of actuating a novel switch which produces electrical impulses for the actuation of a counting device, and for automatically distributing such articles for packaging in lots of predetermined numbers of pieces through the medium of control means governed by the counting device.

The various objects and features of the invention will appear from the detailed description which is rendered below with reference to the accompanying drawings. In these drawings,

Fig. 1 is a diagrammatic perspective view of an embodiment of the new control apparatus as applied to the counting and packaging of bottle caps;

Fig. 2 illustrates a diagrammatic partial top plan view of the apparatus with a bottle cap and actuating parts shown in position just prior to the operation of the novel switch;

Fig. 3 represents a view similar to the one shown in Fig. 2, but shows a bottle cap and actuating parts of the apparatus in counting position;

Fig. 4 is an enlarged elevational top plan view of the novel switch with the cover removed to expose its operating parts;

Fig. 5 shows the operating parts of the novel switch as seen along sectional lines 5—5 in Fig. 4;

Fig. 6 illustrates a mounting detail;

Fig. 7 represents an embodiment of a moisture-proof closure for use in connection with the contact-actuating member of the switch shown in Figs. 4 and 5; and

Fig. 8 is a simplified circuit diagram showing the interconnection of the apparatus with a counting device.

The drawings are not to scale, diagrammatic throughout, and are intended merely for illustrative and descriptive purposes. Known details and elements will be described only to the extent required for conveying an understanding of what is believed to be new. Like parts are indicated by like reference numerals throughout the drawings.

Referring now to the drawings, and particularly to Figs. 1, 2 and 3, the control apparatus shown in these figures comprises side walls 11 and 12 defining a trough-like channel which encloses a conveyer belt 13. The belt 13 is mounted at each end on a rotatable drum such as the drum 14, the shaft of which is indicated at 15. The drum 14 rotates in the direction of the arrow shown in Fig. 1. Accordingly, the belt 13 moves

2

in the direction indicated by the arrows. The objects or articles to be counted, for example, bottle caps, are deposited more or less haphazardly on the moving belt 13, at an intermediate point, and move with the belt to the forward or discharge end at the left. The side walls 11 and 12 of the feed channel are shown separate from the rotatable drum 14 and shaft 15 only for the sake of convenience. It will be understood that these side walls may be extended in longitudinal and in downward directions at either end of the structure, and that they may include the bearings for journalling the shaft of the drum 14 as well as the shaft of the drum at the rear end.

The side wall 11 of the feed channel is provided with an extension 16 which projects laterally therefrom for adjustably attaching the mounting strip 21 carrying the feed member or wheel 17 and the drive therefor. The member 17 is attached to a shaft 18 which is rotatably journaled in the arms 19 and 20 extending from the mounting strip 21, the rear end of which is bent upwardly and inwardly to form the extension 22 for journalling the drive shaft 23. The mounting strip 21 is provided with a slot 24, and its attachment on the lateral extension 16 is obtained by suitable means, for example, a screw 25. The mounting strip 21, and therewith the disk-like wheel or member 17, can thus be moved laterally and angularly with respect to the forward end of the feed channel and with respect to the conveyer belt 13. The wheel or member 17 constitutes a part or element of a discharge gate or passageway for controlling the discharge of articles from the feed channel. This structure and its function will be presently described in detail. The shaft 18 of the member 17 is provided with a pulley 26, and the shaft 23 may be provided with a similar pulley 27. These pulleys are interconnected by a drive belt 28. A different drive, for example, a chain and sprocket drive, may be substituted. The shaft 23 may be operated in any desirable and suitable manner, for example, by a flexible shaft drive 29. The side wall 11 of the feed channel is also provided with a cutout 30 for accommodating the wheel 17 in any of its retracted angularly and laterally adjusted positions. The wheel or member 17 may be in the position shown in Figs. 1, 2 and 3, for the handling of relatively small articles, such as small bottle caps. Its position may be changed by releasing the screw 25 and moving the mounting strip 21 angularly and laterally as desired, and again tightening the screw 25.

A generally triangular deflector plate 31 may also be provided and may be adjustably attached by means of a screw 32 which engages a slot in an ear or extension 33 projecting from the side wall 11 laterally inwardly of the feed channel. The deflector plate 31 is thus likewise adjustable angularly and laterally with respect to the moving belt and within the channel space between the side walls 11 and 12, and may be moved into its forward position in which it is shown, or may be angularly tilted and laterally retracted as desired. The slot 39 in the side wall 11 accommodates the deflector plate 31 in laterally retracted position. The deflector plate constitutes a means for directing the objects or articles on the moving belt tangentially in the direction of the discharge gate or passageway formed by the wheel 17.

On the side wall 12, near the forward or discharge end of the structure, is mounted a contact switch, the housing of which is indicated in Figs. 1, 2 and 3 by numeral 35. This switch is particularly shown in Figs. 4-7, inclusive, and will presently be described in detail. It will be sufficient at this point to state that the switch is provided with a spring 36 which is adjustably anchored at one end of the switch housing by a plate 37 and the forward end 38 of which is hooked on the mounting plate 39 of the switch housing by an angular extension 90 and is laterally movable with respect to the housing. The spring 36 extends inwardly of the feed channel through a slot in the side wall 12. In Fig. 2, the spring is shown in normal position, and in Fig. 3, it is shown in its actuated position. The spring 36 forms with the feed or wheel member 17 the previously mentioned gate or restricted passageway within the feed channel near or at the forward or discharge end thereof. This passageway normally prevents or inhibits the passage of the articles for discharge from the feed channel.

Assuming now that the belt 13 moves in the direction indicated by the arrows in Figs. 1, 2 and 3, the bottle caps deposited thereon will be carried forwardly toward the discharge end of the structure, and will be deflected by the plate 31 to flow along the gradually narrowing feed channel formed by the deflector plate, and thence in the direction of the restricted passageway or gate formed by the wheel 17 and the spring 36. Further motion of the bottle caps is normally impeded by this gate or passageway. Assuming, however, that the wheel 17 is rotated, it will take hold of the bottle cap, for example, the one indicated in Fig. 2 by numeral 40, which has reached the discharge gate or passageway, and will spin the bottle cap 40 around its own axis and force it at the same time forwardly against the elastic pressure of the spring 36, thereby depressing the spring. The parts are shown in Fig. 3 in this actuated position. The bottle cap 40 is then discharged and the spring 36 moves into its normal position shown in Fig. 2, in which the next cap is spun axially and driven forwardly for discharge as described. The operation is repeated with each bottle cap. The depression of the spring 36, caused by the passage of each bottle cap through the restricted passageway, produces an electrical impulse which is transmitted over conductors in a suitable cable 41 to the counting device. The latter may be a predetermined counter, indicated in Fig. 8 by the letters P. C.

The bottle caps are in the above described manner individually discharged, one by one, and

roll off of the belt 13 into the chute 42 which is provided with the neck 43 and chute branches 44-45. Each of these chute branches may deliver bottle caps into a separate container. A vane 46 indicated in Fig. 1 in dotted lines is for this purpose provided at the juncture of the two chute branches 44-45 and is rotatably mounted at 47. The vane may be provided with guide pins, the one on top indicated in Fig. 1 at 48 and a similar pin at the bottom, which pins extend through arcuate slots such as the one indicated at 49. The vane 46 can thus be tilted into the position shown in Fig. 1, in which position bottle caps will be fed into the branch chute 44, or into its alternate position for directing bottle caps into branch chute 45.

The control of the vane 46 may be by means of solenoids 50-51. It is assumed in Fig. 1 that the solenoid 51 is in energized position and that it has pulled the vane into the dotted line position in which it is shown. Therefore, bottle caps rolling off the forward end of the belt 13 are directed into the branch chute 44 for deposit in a packaging container disposed at the discharge end of such branch chute.

The structural details of the new contact switch will now be described with reference to Figs. 4-7, inclusive.

The switch comprises the housing 35 which is mounted on the side wall 12 of the feed channel (Figs. 1, 2, 3) by means of extensions 39 referred to previously as the mounting plate of the switch. The housing 35 is provided with a suitable cover which has been removed in order to show the interior operating parts as illustrated in Figs. 4 and 5. From the mounting or bottom plate 39 extend the posts or bosses 52-53. Mounted on these two posts are the extensions 54-55 of an elastic generally W-shaped plate which also carries a central extension 56. This central extension underlies the contact pile including the contact springs 57-58, insulating washers 59, and the terminal strips 60-61, the first of which is in engagement with the spring 58 and the second of which is in engagement with the spring 57. The strip 60 carries the laterally projecting terminal 81, and the strip 61 carries a similar terminal 80. The forward mounting end 62 of the extension 54 of the elastic plate is bent with respect to the forwardly projecting central extension 56, and the forward end 63 of the extension 55 is bent likewise. These extensions are attached to the bosses or posts 52, e. g., by means of the screws 95, 96, respectively, and it will therefore be clear that the entire contact assembly is disposed at an angle to the plane of the bottom of the housing, as shown in Figs. 5 and 6. The contact pile, including the contact springs 57-58, the insulating washers 59 and the terminal strips 60-61, is secured by means of the screws 64-65 which project through the straight central extension 56 of the elastic mounting member and through the top 66 of a shallow, generally U-shaped strong control or adjusting spring having the side walls 67-68. This spring 66 thus extends forwardly in parallel with the contact springs 57-58 and is disposed at the same angle with respect to the plane of the bottom of the switch housing. The spring 66 is provided with a cut-out 70 through which projects the insulating portion 71 at the inward end of an actuating pin, the rear end 72 of which projects to the outside through a bushing 73. This actuating pin projects into the housing at an angle per-

5

pendicular to the bottom thereof. The contact springs 57—58 are tilted and therefore form an acute angle with the actuating pin 71—72.

The free end of the contact or adjusting spring 66 is provided with a slot 74 and through this slot extends, in the mounted position shown in Figs. 4 and 5, a screw 75 which is attached to a post 76 projecting from the bottom of the switch housing. The screw 75 is provided with a nut 77 which may be displaced axially of the screw for the purpose of determining and setting the desired angular position of the adjusting spring 66 and therefore of the contact spring 57 with respect to the contact actuating pin 71—72. The nipples or projections 78—79 are punched out from the material of the spring 66 at its forward end, where it forms the slot 74, and on a line with the center of the nut 77, for the purpose of providing peripherally effective frictional stop means which prevents inadvertent angular displacement of the nut 77 incident, for example, to jarring of the mechanism.

An insulating bushing 82 is provided in the housing wall, as shown in Fig. 4, for carrying to the outside the cable 41 (Figs. 1, 2, 3) which contains the conductors connected to the terminals 80—81 of the two strip members 60—61 which are in engagement with the contact springs 57—58, respectively.

It will be seen from the above description of the new switch that the contact spring 57 may be adjusted in its desired and proper position with respect to the insulating portion 71 of the contact actuating pin, simply by operating the nut 77 along the screw 75, to tilt the spring 66 and therewith the entire spring assembly in desired clockwise or in counter-clockwise direction until the proper and desired co-acting position is obtained between the contact spring 57 and the actuating pin. The gap between the contact points on the springs 57—58, and therewith the contact opening and contact pressure as well as the extent of axial displacement of the contact actuating pin, can likewise be adjusted by operating the nut 77. In other words, once the position of spring 66, and therewith of the contact assembly, is obtained so that the spring 57 just touches the tip of the insulating part 71 of the contact actuating pin, any further (counter-clockwise) tilting of the spring assembly by the operation of the nut 77 will be against the tip of the insulating part 71 of the contact actuating pin and will tend to narrow the gap between the contact points on the springs 57—58. Pressure is thus put on the contact actuating pin 71—72, and the gap between the contact points on the springs 57—58 is adjusted as desired. The pressure exerted on the actuating pin corresponds to the pressure which will be required to operate the contact spring 57 with respect to spring 58, and the gap between the contact points on these springs corresponds to the minimum displacement of the actuating pin. Any further displacement will add the pressure of spring 58 to the pressure of spring 57 on the tip of the contact actuating pin.

The switch operating spring 36 is mounted on the switch, as is particularly shown in Figs. 4 and 5. The rear end of the spring 36 is bent at an angle to its body, forming the mounting portion 83 which extends through an aperture 84 in the housing extension 39 and is clamped on the rear wall of the housing by means of the plate 37. Inasmuch as the spring 36 is in engagement with the outwardly protruding portion

6

72 of the contact actuating pin, it is thus possible to determine the position of this actuating pin and of the tip of its insulating portion 71 with respect to the contact spring 57. The mounting of the spring 36 furnishes in this manner, in conjunction with the adjustment that may be obtained by the nut 77, additional adjustment possibilities. In other words, the rearward motion of the contact actuating pin may be elastically limited by the spring 36, thereby defining the normal position of the tip of its insulating portion 71 with respect to the contact spring 57. The pressure of the contact springs and the gap between the contact points are then adjusted by means of the nut 77.

The curved forward end 38 of the contact spring 36 is likewise bent at an angle and extends through an aperture 88 in the housing flange or extension 39 at the left of the switch structure, as shown in Figs. 4 and 5. The free end of the spring extension 38 is bent to form a hook 90 for overlapping engagement with the face of the mounting flange 39. The spring 36 is thus elastically and adjustably mounted for angular motion with respect to the outwardly protruding end 72 of the contact actuating pin.

The apparatus has been described so far for use in the counting and packaging of bottle caps. It is understood, of course, that the apparatus may be used for counting and for packaging other objects such as cans, jars, bottles and the like, either incident to the manufacture thereof, or incident to their use in canneries, breweries, dairies, etc., etc.

Assuming, for example, that the apparatus is used for counting milk bottles in a dairy establishment, it is important that the switch is made water- and moisture-proof. The outwardly protruding portion 72 of the contact actuating pin therefore must be protected. Such an arrangement is shown in Fig. 7, the numerals in this figure indicating identical parts as shown in Fig. 5. Accordingly, 39 is the bottom wall of the switch housing; 66 indicates the control or adjusting spring having the side wall 57. Through the adjusting spring projects the insulating portion 71 of the contact actuating pin, the portion 72 of which protrudes to the outside through the bushing 73. In order to prevent moisture from entering the interior of the housing, there is provided a ring 93 which is firmly attached to the housing wall 39 outside thereof. The attachment may be made by soldering, welding, or in any other desirable and suitable manner. An elastic cap 94, which may be made, for example, of rubber, is placed over the ring 93 forming a diaphragm portion 95 which stretches across the ring 93. This diaphragm portion is provided with a plate or nipple 96 for engagement with the operating spring 36. The pressure and displacement of the spring 36 are thus effective to the nipple 96 and are elastically transmitted through the diaphragm 95 to the actuating pin portion 72, and thus to the insulating portion 71 thereof which is in operative engagement with the contact spring.

The far-reaching adjustment provisions of the contact switch furnish an important improvement which will be appreciated when it is considered that the switch, which is a delicate mechanism and requires expert care, may be used in surroundings such as dairies, breweries, etc., which do not have expert facilities. Adjustments, if any are required, do not need expert attention in the present case. All that is

necessary to obtain proper contact adjustment is the use of a screw-driver and a wrench or pliers for manipulating the nut 77 and the plate 37. And yet, most delicate adjustment can be obtained by these simple means.

The operation of the control apparatus and of the contact switch mechanism will be apparent from the foregoing description, but may be briefly summarized as follows, assuming again that the objects or articles to be counted and packaged are small bottle caps.

The position of the feed wheel 17 is first adjusted within the feed channel above the moving belt 13 so as to provide the proper width of the restricted passageway or discharge gate formed by the wheel and the switch actuating spring 36. The adjustment is, of course, in accordance with the size of the bottle caps or other objects that have to be handled. The deflector plate 31 may or may not be used so as to provide the gradually narrowing or tapering portion of the feed channel directly ahead of the restricted passageway. The belt is then started by a suitable drive and motor. The rotation of the feed wheel is started by the operation of the drive 29. The revolutions of the wheel 17 are adjusted so that it rotates fast enough to discharge the bottle caps faster than they are fed by the belt. The articles to be counted and delivered for packaging are then placed on the belt at a point away from the discharge end of the feed channel. The articles—in the illustrated case, the bottle caps—are deposited on the belt relatively indiscriminately or haphazardly, avoiding, of course, overcrowding or piling up, and are moved by the belt toward the restricted discharge passageway. One after the other of the bottle caps moves through this passageway, spinning and moving through it as previously explained, successively taking the positions indicated in Figs. 2 and 3, thereby depressing the spring 35 from the position shown in Figs. 2 and 5 into that shown in Fig. 3. The contact actuating pin 72—71 is thus likewise successively depressed and produces a series of impulses, one for each bottle cap, by the closure of the contact points on the contact spring 57—58. The impulses are transmitted over the conductors 41 which terminate in the predetermined counter P. C. shown in Fig. 8.

This counter may be of the general type shown in U. S. Patents Nos. 2,295,968 and 2,346,869; that is, it may be a predetermined counter which may be set to the counting of predetermined numbers or sets of impulses. The counter may include a relay 100, indicated in Fig. 8, for the operation of a contact spring 101. In normal position of this contact spring, and assuming that the switch 102 is closed, there is a circuit extending from one terminal of the battery 103 over the solenoid 51 which controls the distributor gate 46 shown in Fig. 1 in the receiving chute 43, and back over the switch 102 to the other terminal of the battery 103. This position is maintained for a predetermined number of impulses produced by the passage of a corresponding number of bottle caps, that is, for a predetermined number of caps moving through the restricted passageway by the operation of the feed wheel 17 in coaction with spring 36. When this predetermined number of impulses is reached, in other words, when the predetermined number of bottle caps has been counted and delivered to the chute 44 for deposit to a packaging container at the discharge end of this chute, the relay 100 energizes and moves the contact spring 101 into

alternate position. Accordingly, the solenoid 51 deenergizes and the solenoid 50 energizes and moves the gate 46 in the feed chute into its alternate position, blocking the branch chute 44 and opening the chute 45. The next lot of bottle caps will then be delivered into another container disposed at the discharge end of the branch chute 45.

Changes may be made within the scope and spirit of the following claims which define what is believed new and desired to have protected by Letters Patent of the United States.

I claim:

1. Apparatus for counting bottle caps or like articles comprising a conveyor belt and means for moving such belt, means forming side walls for said belt and forming an open relatively wide channel therewith for receiving bottle caps in bulk and for conveying such bottle caps toward one end of said channel which is the discharge end thereof, a yieldable control member mounted at one of said side walls and partially extending into said channel from the corresponding side wall thereof, a drive wheel disposed in said channel above said conveyor belt, the axis of said drive wheel extending perpendicular to the plane of said conveyor belt and the rim of said drive wheel forming with said yieldable control member a laterally restricted passageway for the passage of said bottle caps one by one for discharge from said channel, means for rotating said drive wheel to engage the rims of bottle caps as they are successively delivered to said restricted passageway by said conveyor belt so as to force said bottle caps successively one by one against and past said yieldable control member to pass through said restricted passageway for discharge from said channel, and means automatically actuated by said yieldable control member for counting each bottle cap as it passes through said passageway.

2. The structure and combination defined in claim 1, together with means for variably adjusting the position of the axis of said drive wheel laterally of said channel to determine the width of said restricted passageway, the other side wall forming a slot for accommodating the portion of said drive wheel disposed away from said passageway.

3. The structure and combination defined in claim 1, together with an angular deflector plate disposed in said channel, said deflector plate forming an inclined edge in said channel which extends from one side wall thereof laterally angularly inwardly and forwardly for directing said bottle caps toward said restricted passageway tangentially of said drive wheel, means for adjusting the position of the axis of said drive wheel laterally of said channel, and means for adjusting said deflector plate to position the inclined edge thereof so as to conform to the adjusted position of said drive wheel.

4. Apparatus for controlling the counting and packaging of articles comprising means forming a conveyor belt and side walls therefor forming with the conveyor belt a relatively wide trough-like channel for receiving said articles which are continuously delivered thereto in bulk and relatively haphazardly deposited on said conveyor belt at one end of said channel and are moved by said conveyor belt for discharge and subsequent packaging at the other end thereof, a disk-like rotatable drive member disposed near the discharge end of said channel above said conveyor belt near one side wall thereof, a spring

member disposed near the discharge end of said channel and mounted on the opposite side wall thereof, said spring member extending into said channel and forming with the rim of said disklike drive member a restricted passageway which normally inhibits the discharge of said articles from said channel, means for rotating said disklike drive member to engage said articles frictionally one by one to force them one by one against said spring member and through said passageway against the resilient pressure exerted by said spring member, thereby successively depressing said spring member, a contact switch mounted on the corresponding side wall of said channel, said contact switch being controlled by said spring member to produce a series of electrical impulses corresponding to the number of articles which pass through and from said restricted passageway, and a counting device for receiving and counting such impulses to record the number of articles passing through and from said passageway.

5. The structure and combination defined in claim 4, together with means for laterally and angularly variably adjusting the position of the axis of said disklike rotatable member with respect to said spring member for the purpose of varying the normal width of said restricted passageway in accordance with the diameter of the articles to be counted for packaging.

6. The structure and combination defined in claim 4, together with angularly and laterally adjustable deflector means disposed on one side wall and extending laterally into said channel above said conveyor belt ahead of the passageway formed by said disklike member and said spring member to form a variably adjustable gradually narrowing path for directing said articles toward such passageway tangentially of said disklike member.

7. In combination, a movable conveyor belt, side walls forming with said belt a relatively wide troughlike channel for receiving generally circular articles which are continuously delivered thereto and haphazardly deposited on said belt at one end of said channel, said belt moving such articles for discharge at the other end thereof, control means disposed near the discharge end of said channel forming a restricted passageway which normally inhibits the discharge of said articles, said control means comprising a rotatable shaft extending downwardly into said channel and carrying a drive wheel at its end

above said conveyor belt axially perpendicular thereto, spring means extending from one of said side walls laterally into said channel for coaction with the rim of said drive wheel to form said restricted passageway, and means for rotating said drive wheel to engage said articles peripherally one by one pressing such articles against and past said spring means and imparting to each individual article a force which spins such article around its own axis and simultaneously moves such article in the general direction of said conveyor to effect discharge thereof from said conveyor.

8. Apparatus for conveying and counting generally circular articles comprising a movable conveyor belt and means forming side walls therefor to form a relatively wide troughlike channel for receiving said articles in bulk at one end thereof and for moving such articles toward the other end for discharge thereat, a switching device mounted on one of said side walls near the discharge end of said channel, a resilient control spring extending from said switching device laterally into said channel above said conveyor belt, a rotatable drive wheel disposed in said channel above said conveyor belt and forming with said control spring a restricted passageway for the discharge of said articles one by one, a pair of contact springs in said switching device extending generally in parallel with said control spring, common mounting means for said contact springs and said control spring, actuating means for operating said contact springs, means for angularly adjusting the position of said control spring to adjust the position of said contact springs relative to said actuating means, and counting means actuated by said actuating means.

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