Oct. 26, 1943. H. E. GANTZER 2,332,790

SORTING DEVICE

Filed April 27, 1940 3 Sheets-Sheet 1

Fig. 1.

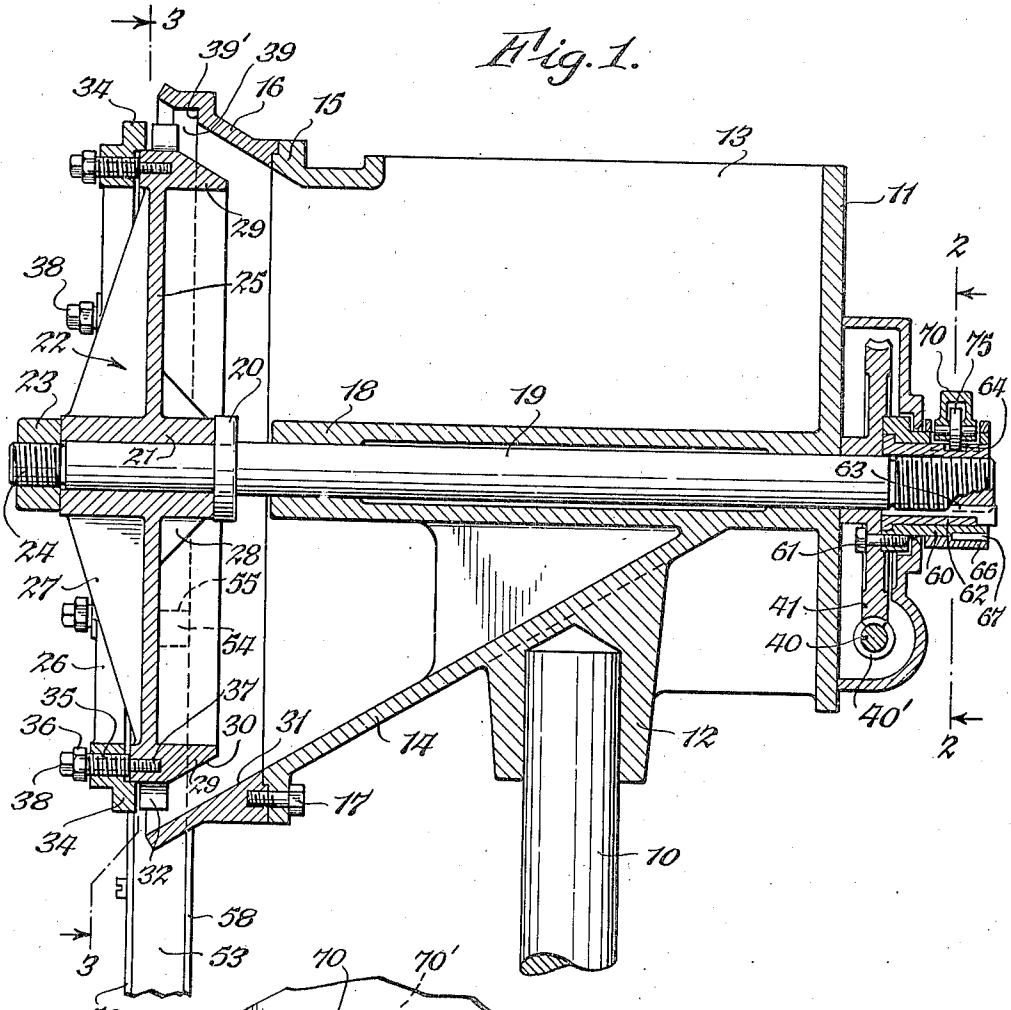
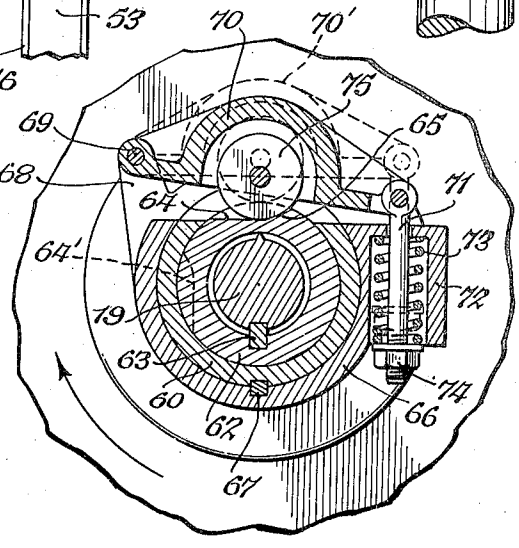


Fig. 2.



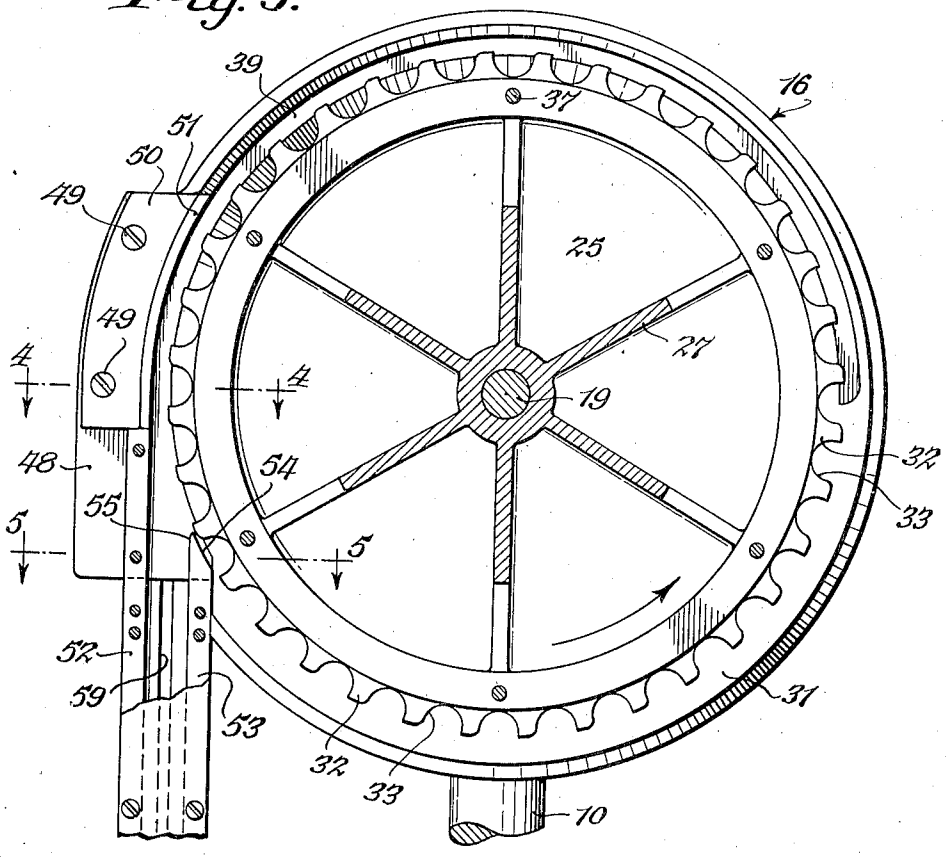
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SORTING DEVICE

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Fig. 3.



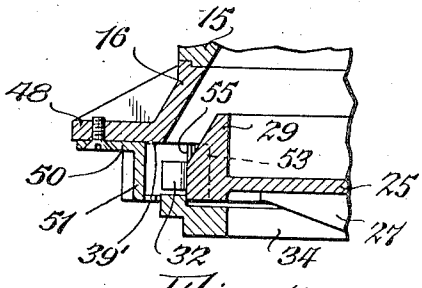


Fig. 4.

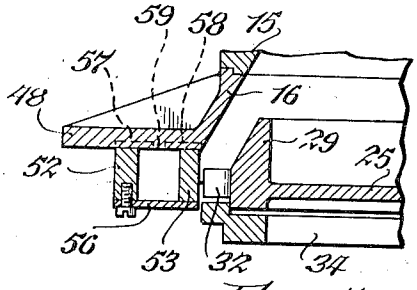


Fig. 5.

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Fig. 6.

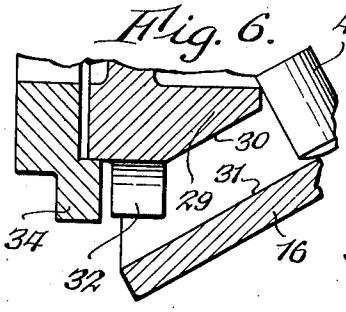


Fig. 7.

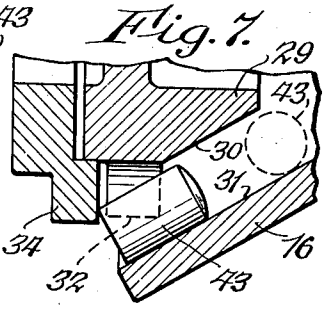


Fig. 8.

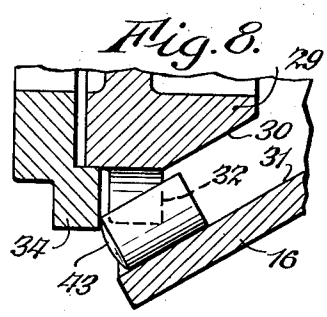


Fig. 9.

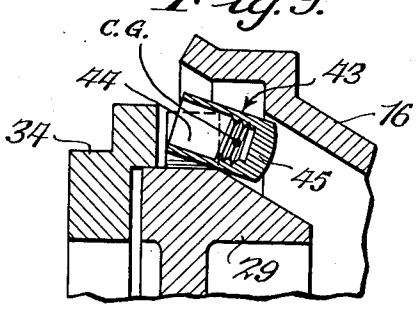


Fig. 10.

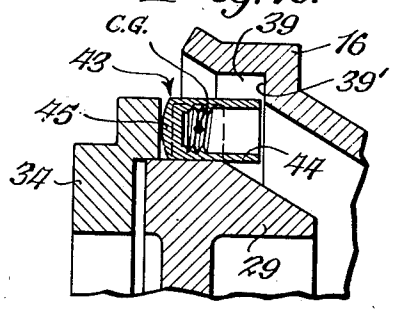


Fig. 11.

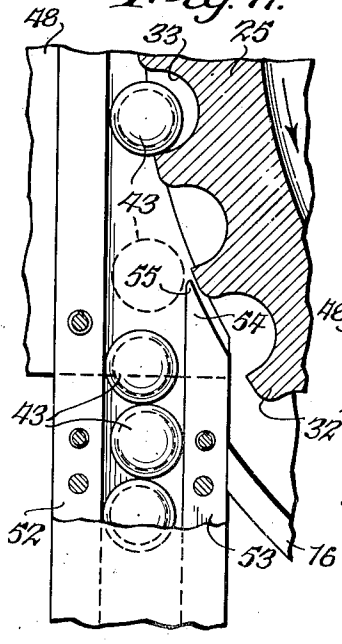


Fig. 12.

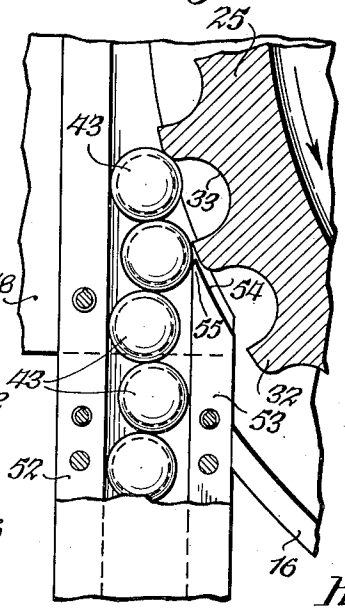
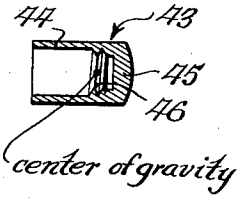


Fig. 13.



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UNITED STATES PATENT OFFICE

2,332,790

SORTING DEVICE

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Application April 27, 1940, Serial No. 331,914

3 Claims. (Cl. 226—88.1)

My present invention relates to a sorter and, more particularly, to a sorter for container caps.

Various devices for the sorting of container caps are in successful use in connection with container caps whose width or diameter is substantially greater than the depth thereof which caps are commonly referred to as "flat caps." A sorter particularly adapted for such caps is disclosed and claimed in my earlier Patent No. 2,073,472, dated March 9, 1937. In sorters of the type described in the aforesaid patent a rotating sorting wheel and a gravity hopper are so designed that passageways are formed through which caps may pass in one position and which will not afford passage for the caps in any other position. As shown in said patent, studs may be arranged upon the sorting wheel in such a manner as to efficiently and rapidly effect the sorting of flat caps.

When the depth of a cap becomes substantially equal to its width or diameter and when the depth actually exceeds the diameter, they are commonly known as "deep caps" and it has been found that sorting devices of the prior art are ineffective to properly sort such caps. Accordingly, it is an object of my invention to provide a sorting device which will operate upon so-called deep caps.

It is a further object of my invention to provide a deep cap sorting device in which the caps are virtually self-sorting as a result of their physical characteristics.

It is a further object of my invention to provide a sorting device for deep caps which includes a receptacle adapted to hold a plurality of unsorted caps, and a rotatable sorting wheel located within said receptacle and having a plurality of pockets formed around the periphery thereof, the pockets being adapted to receive and retain for movement to a discharge station caps presented thereto from the receptacle in an axial direction with the centers of gravity thereof falling within the defined axial limits of the pockets.

It is a further object of my invention to provide a sorting device of the character stated which includes a receptacle adapted to contain a plurality of unsorted caps, a sorting member located adjacent one end of the receptacle, an inclined wall formed in the receptacle along which caps may gravitate into contact with the sorting member and discharge means associated with the sorting member and adapted to receive from the sorting member the caps retained therein.

It is a further object of my invention to provide a sorting device for deep caps which is extremely rapid and reliable in operation and which is mechanically simple and unlikely to need repairs.

Other and further objects of my invention will become more clearly apparent from a consideration of the following description taken in connection with the drawings accompanying and forming a part of this specification. The description and drawings set forth a preferred but not necessarily the only form of my invention.

In the drawings,

Fig. 1 is a general sectional view of a sorter constructed according to my invention;

Fig. 2 is a section along the line 2—2 of Fig. 1 and illustrates details of a give way drive mechanism;

Fig. 3 is a section along the line 3—3 of Fig. 1 and constitutes a general front view of the device;

Figs. 4 and 5 are sections along the lines 4—4 and 5—5 respectively of Fig. 3 and illustrate details of the cap receiving chute;

Figs. 6, 7, 8, 9 and 10 are detailed views illustrating the action of the device in the sorting of deep caps;

Figs. 11 and 12 are detailed views illustrating the discharge of caps from the sorting wheel to the receiving chute; and

Fig. 13 is a sectional view of a deep cap of one type which may be effectively operated upon by the device of the present invention. Similar characters of reference indicate similar parts throughout the several views.

Referring now to the drawings in Fig. 1, there is shown a standard 10 which may be associated in any desired manner with a capping machine or other device with which a cap sorter may ordinarily be used. The standard 10 serves as a support for the cap sorting device of the present invention. The cap sorting device may comprise in general a hopper 11 provided with a suitable socket 12 for supporting engagement with the standard 10. The hopper 11 is formed with an opening 13 through which a quality of unsorted caps may be introduced. The hopper 11 is of generally conical conformation whereby the lower portion 14 thereof is disposed at an angle to the horizontal. This conical conformation is preferred as it tends to cause caps within the hopper 11 to gravitate downwardly and to the left as viewed in Fig. 1.

Attached to the forward rim 15 of the hopper 11 is a flange 16. This flange is preferably a truncated cone forming a continuation of the conical conformation of the hopper 11. The flange 16 is preferably detachably connected to the hopper 11 as by cap screws 17.

The hopper 11 is further provided with a bear-

ing support 18 in which is rotatably mounted a shaft 19 whose axis generally coincides with the axis of the conical body of the hopper 11. The shaft 19 is provided with a collar 20 against which the hub 21 of a sorting wheel indicated generally at 22 may be abutted and held for rotation with the shaft 19 as by a nut 23 threadably received upon a reduced portion 24 of the shaft 19.

The sorting wheel 22 comprises a main wheel portion 25 having an annular ring 26 adjustably secured thereto. The wheel 25 is in general a disk which may have suitable reinforcing ribs 27 and 28 formed thereon to rigidify the same. Adjacent its outer periphery the disk 25 is provided with a rim 29 having an inwardly tapered surface which extends inwardly of the body of the hopper 11. The tapered surface 30 of the rim 29 is generally parallel to the interior surface 31 of the flange 16 and is preferably spaced therefrom a distance slightly greater than the diameter of caps with which the device is to be used. The surfaces 30 and 31 form an inclined circular passageway or chamber into which caps may enter when lying on their sides.

The rim 29 has formed on its outer periphery a ring 32 in which is formed a series of pocekts 33. The pockets 33 are in general semi-circular and are of a radius substantially equal to the radius of caps with which the device is to be used. As will be more fully explained hereinafter, the periphery of the sorting wheel and the inclined surface 30 are located in such a position relative to the surface 31 of flange 16 that caps contained within the hopper 11 will be directed endwise to the pockets 33.

The ring 26 has an annular portion 34 adapted to overlie a portion of the rim 29 and adapted to form a closure for the outer ends of the pockets 33 whereby to limit the extent of entrance of caps into the pockets 33. The ring 26 is mounted for adjustment relative to the wheel 25 for the accommodation of caps of different depths or characteristics. To this end, the ring 26 is drilled and tapped to receive a hollow adjusting screw 35 provided with a suitable head 36. The wheel 25 is drilled and tapped to receive an elongated bolt 37 terminating in a head 38. The bolt 37 passes freely through the bore of the hollow screw 35 and may be drawn down upon the head 36 of the screw 35 to hold the ring 26 rigidly against the wheel 25. Adjustment may be effected by loosening the bolt 37 and moving the screw 36 to change the position of the inner end thereof whereby the spacing between the ring 26 and the wheel 25 may be predetermined. It will be understood that as many of the adjusting screws 35 and bolts 37 may be disposed around the circumference of the ring 26 as may be deemed necessary or desirable.

The flange 16 may have formed in the upper half of its interior surface a groove 39. The dimensions of this groove and its position relative to the pockets 33 and stop ring 34 are such that a cap remaining in a pocket 33 may assume a horizontal position therein when it is carried into the zone of the groove 39 by rotation of the wheel.

The shaft 19 together with the sorting wheel thereon is rotated from a drive shaft 39 connected with a suitable source of power, not shown. The drive shaft 39 has a worm 40 thereon engaging with a worm wheel 41 which, through a give-way mechanism to be later described, imparts rotation to the shaft 19.

Referring now to Fig. 13, there is shown one form of cap for which the present invention is particularly designed. The cap is indicated generally by the reference numeral 43 and includes an elongated cylindrical body terminating at one end in a thin walled skirt portion 44 and terminating at its other end in a closure web 45. A thickened wall portion adjacent the closure web may have screw threads 46 formed therein. It will be readily apparent that a cap of this type will be overweighted toward one end or, stated differently, that the center of gravity of the cap will be offset from the geometrical center thereof. In Fig. 13, the location of the center of gravity has been approximately indicated. While this particular form of cap is described herein and the operation of my device upon such cap is described herein in detail, it will be understood that my device is applicable to caps of a top heavy or unsymmetrical nature no matter how they may be constructed. Thus, the center of gravity may be shifted away from the geometrical center of a cap by the added weight of a closure web, sealing plug or other thickened wall formation for any purpose whatsoever and it is obvious that this condition would exist in caps bearing a fancy head formation.

As shown in the drawings, the ring 32 is of a width considerably less than the depth of the caps with which the device is to be used. The stop ring 34 is adjusted as explained above to such a position that a cap may enter into the pockets 33 to an extent greater than the distance from one end of the cap to the center of gravity thereof but less than the distance from the other end of the cap to the center of gravity. Thus, when a cap is introduced into a pocket 33, heavy end foremost, the center of gravity will be located within the pocket while, if the cap is introduced light end foremost, the center of gravity will lie outside the pocket.

Referring now to Figs. 6, 7 and 8, there is illustrated three different ways in which caps may be presented to the sorting wheel. In Fig. 6, a cap 43 has abutted the inner rim of the inner edge of the rim 29 in a generally upright position. As shown in this figure, the heavy end 45 of the cap is resting upon the surface 31 of the flange 16 although it will be understood that the cap may be inverted and that the light end thereof may be in contact with said surface 31. In either event, the upright cap cannot enter the passageway between surfaces 31 and 30 because the depth of the cap is greater than the distance between said surfaces. As the sorting wheel continues its rotation, a cap, positioned as in Fig. 6, may remain in this position and be prevented from entering the passageway or the cap may be thrown over upon its side as illustrated in dotted lines in Fig. 7 from which latter position it may enter the passageway between surfaces 30 and 31. When the cap enters the passageway, it is then relatively free from pressure caused by the body of unsorted caps within the hopper 11 and continued rotation of the wheel will tend to cause the cap to swing around into a longitudinal position wherein it may enter a pocket 33. This longitudinal position may be as illustrated in full lines in Fig. 7 in which the light end 44 of the cap has first entered the pocket or the position may be that illustrated in full lines in Fig. 8 in which the heavy end has first entered the pocket. It will be understood that a number of caps will be continuously entering the passageway between surfaces 30 and 31 and that of such number cer-

tain of them will follow the procedure just outlined while others may slide directly in a longitudinal direction through the passageway and into a pocket 33. As the wheel continues its rotation, the caps seated in the pockets 33 will, of course, rotate with the wheel and will be carried thereby upwardly along the inner circumference of the flange 16.

As the upward movement of the caps within pockets 33 progresses, those caps whose centers of gravity lie outside the pockets will be dislodged therefrom and will fall back into the hopper 11, while those caps whose centers of gravity lie within the pockets will remain seated therein. In Fig. 9, a cap 43 whose center of gravity lies outside the periphery of wheel 32 is shown as it is about to fall from a pocket. While in this figure the cap is shown at an upper tangential position of the sorting wheel, it will be understood that the caps will normally be dislodged from the pockets by frictional drag upon the surface 31 or by contact with other caps or by the action of gravity almost as soon as they have been removed from the lower portion of the hopper 11.

In Fig. 10, there is illustrated a cap 43 whose center of gravity lies within the periphery of the ring 32. As shown in this figure, the overhanging light end 44 of the cap projects into the groove 39 and is given sufficient clearance within said groove that it may assume a horizontal position within the pocket 33. The vertical wall 39' of the groove 39 will cooperate with the end of the cap to assist in holding the same in position within the pocket.

It will thus be seen that I have provided a sorting wheel which will conduct caps to the groove 39 in a uniform manner with the open ends thereof extending rearwardly.

Referring now to Figs. 3, 4 and 5, there is shown a discharge chute to which the caps carried by the sorting wheel may be conducted. As shown in detail in Figs. 4 and 5, the flange 16 has formed therein an extension 48 having a flat vertical face disposed in a plane rearward of the plane of the sorting wheel and preferably forming a continuation of the plane of the vertical wall 39' of the groove 39. Secured to the extension 48 as by screws 49, there is a plate 50 having a forwardly turned flange 51 which is curved to generally conform with the curvature of the sorting wheel and which is spaced therefrom at such a distance that caps within the pockets 33 will be engaged and guided by the flange 51. There is also secured to the extension 48 a downwardly extending spacer member 52 which may form a vertical continuation of the curved inner surface of flange 51. A second spacer member 53 is provided. As shown in the drawings, the member 53 is bevelled at 54 in order to form a relatively sharp edge 55 extending into close proximity to the outer periphery of the ring 32. A cover plate or guide 56 is secured to the spacer members 52 and 53 on the forward surfaces thereof while a pair of guides 57 and 58 are secured to the rear surfaces of the spacer members 52 and 53 in such a position as to form a substantial continuation of the plane of the extension 48. Preferably, the guides 57 and 58 are individually attached to the respective spacer members 52 and 53 and are spaced from one another to provide a slot 59 through which caps within the passageway may be observed and through which a tool may be inserted for clearing any jams which might possibly occur. The spacer members 52 and 53 together with the front and rear guides 56 and 57, 58 are so proportioned as to form a discharge chute having a passageway into which a cap will fit with just sufficient clearance for the free passage of the cap therethrough. It will be understood that this discharge chute may extend for any distance necessary to convey the selected caps to a capping device or other machine for further operations upon the caps.

It will be apparent that the sorting device just described will deliver sorted caps to the discharge chute in an irregular manner because there may be relatively large variations in the number of caps delivered in successive rotations of the sorting wheel. A container capping machine or similar device with which this sorter may be used will normally place a steady demand upon the discharge chute and it is, therefore, essential that the sorting device shall have a normal or average capacity in excess of the demand placed thereon. Accordingly, it is preferred to drive the sorting wheel 25 at such a speed that an ample supply of sorted caps will be furnished to the discharge chute. It is to be normally expected that driving the sorting wheel at such a speed will occasionally tend to furnish more caps than are necessary to meet the demands upon the discharge chute. In Figs. 11 and 12, I have illustrated two conditions which may exist in the use of my device. In Fig. 11, a cap 43 is shown in a pocket 33 of the sorting wheel 25 and a number of caps 43 are shown in the discharge chute. It will be assumed that the discharge chute is entirely filled with caps to the level of the uppermost cap illustrated therein. When the wheel 25 is rotated in the direction of the arrow, the pocket 33 in which the cap 43 is positioned will move across the mouth of the discharge chute and the cap 43 will gravitate from the pocket into the chute as indicated in broken lines. As long as the level of the uppermost cap within the discharge chute does not rise above that indicated in Fig. 11, caps will continue to gravitate from successively presented pockets 33. However, when the discharge chute becomes filled, as illustrated in Fig. 12, the uppermost cap therein illustrated cannot be gravitated from its associated pocket 33. As illustrated in this figure, the line of caps within the discharge chute will tend to obstruct further rotation of the sorting wheel 25. Accordingly, the give-way mechanism above referred to has been provided.

A preferred form of give-way mechanism is illustrated in Figs. 1 and 2. As shown in these figures, the worm wheel 41 is mounted for free rotation upon the shaft 19. A sleeve 60 is secured to the worm wheel as by cap screws 61. The sleeve 60 is mounted for free rotation upon an inner sleeve 62 which is threaded upon the shaft 19 and keyed thereto as by a key 63. The inner sleeve 62 has formed therein a recess 64 which terminates in an abutment 65. The outer sleeve 60 has a body 66 which is keyed thereto by a key 67. The body 66 has an extension 68 upon which is pivoted, as as 69, one end of an arm 70. The opposite end of the arm 70 has pivoted thereto a rod 71 extending through a socket 72 formed upon the body 66. An expansible spring 73 is seated within the socket 72 and a suitable nut 74 is threaded upon the free end of rod 71 in a position to adjustably bear upon one end of the spring 73.

A roller 75 is mounted intermediate the ends of the arm 70 and is adapted to be seated within the recess 64 in the inner sleeve 62. To this end, the outer sleeve 60 and body 66 are slotted

to permit passage of the roller 75 therethrough. When the worm wheel 41 is rotated in the direction of the arrow in Fig. 2, the sleeve 60 and give-way body 66 will rotate therewith. When the roller 75 is seated within the recess 64, it will be held against the abutment 65 by the action of spring 73 and will serve to transmit rotation of the give-way body to the inner sleeve 62 and shaft 19. This driving relationship will continue until a condition such as that illustrated in Fig. 12 arises. When further rotation of the sorting wheel is thus resisted the roller 75 will be cammed, against the force of spring 73, over the abutment 65 and will thereafter make one idle revolution over the peripheral surface of the inner sleeve 62. During this time no further rotation will be imparted to the sorting wheel 25. An inoperative position of the arm 70 and recess 64 is illustrated in dotted lines at 70' and 64' respectively in Fig. 2. If a cap or a number of caps have been removed from the discharge chute during the idle revolution of the give-way mechanism, rotation of the sorting wheel will be resumed when the roller 75 is rotated to a position to seat within recess 64. If no caps have been removed from the discharge chute, it is obvious that the give-way mechanism may continue its idle rotation for an indefinite period of time.

While the above detailed description has been directed to the use of my invention in sorting objects whose longitudinal dimensions are greater than their transverse dimensions, it may be here observed that the invention is also applicable for use with objects of cylindrical form whose longitudinal or axial dimensions are equal to or even slightly less than their diameters. A cylindrical object presents a circular outline or projection when viewed along its axis and presents a rectangular outline or projection when viewed transversely of its axis. It will be apparent therefore that a cylindrical object will be admitted to the space defined by a semi-circular aperture 33 and the surface 31 of flange 16 if its circular outline is presented to such space. It will be further apparent that the same object will not be admitted or at least will not be admitted to a sufficient extent for engagement if the rectangular outline is presented.

The above disclosure has been made in compliance with the Patent Statutes and is not intended to be taken in a limiting sense. The details are illustrative only and modifications and variations may be resorted to by those skilled in the art.

I claim:

1. A device for sorting objects the endwise projections of which differ from their sidewise projections and having their centers of gravity nearer one end than the other, comprising a sorting member having a plurality of object-receiving pockets, said pockets including object-supporting surfaces having effective axial lengths less than the length of said objects and being adapted to receive the endwise projection of said objects and to exclude the sidewise projection thereof; means limiting the entrance of said objects into said pockets to an extent greater than the least distance from an end to the center of gravity and less than the greatest distance from an end to the center of gravity; and means to move said pockets through positions in which the supporting surfaces of said pockets constitute the only available support for the objects received therein against the action of gravity whereby only those objects whose centers of gravity lie within the vertical projection of the supporting surfaces of said pockets will receive effective support against the action of gravity and will be retained within said pockets.

2. A device for supporting objects the endwise projections of which differ from their sidewise projections and having their centers of gravity nearer one end than the other, comprising a sorting member having a plurality of object-receiving pockets, said pockets including object-supporting surfaces having effective axial lengths less than the length of said objects and being adapted to receive the endwise projection of said objects and to exclude the sidewise projection thereof; means limiting the entrance of said objects into said pockets to an extent greater than the least distance from an end to the center of gravity and less than the greatest distance from an end to the center of gravity; means to move said pockets, said last-named means moving said pockets through positions in which the supporting surfaces of said pockets constitute the only available support for the objects received therein against the action of gravity whereby only those objects whose centers of gravity lie within the vertical projection of the supporting surfaces of said pockets will receive effective support against the action of gravity and will be retained within said pockets; and discharge means to which said pockets are thereafter moved by said pocket-moving means, said discharge means receiving from said pockets the objects retained therein.

3. A device for sorting objects the endwise projections of which differ from their sidewise projections and having their centers of gravity nearer one end than the other, comprising a receptacle adapted to hold a plurality of unsorted objects, said receptacle having an inclined wall; a rotable sorting wheel having a plurality of outwardly radially disposed and radially opening pockets formed around the periphery thereof, said pockets being located with respect to said inclined wall in a position to receive objects gravitating downwardly along said inclined wall, said pockets including cap-supporting surfaces having effective axial lengths less than the length of said caps and being adapted to receive the endwise projection of said objects and to exclude the sidewise projection thereof; a ring formed on said rotable wheel having a surface of frusto-conical form, the slant of said frusto-conical surface being equal to the incline of said inclined wall whereby said surface and said inclined wall define an annular passageway leading to said object-receiving pockets; means limiting the entrance of said objects into said pockets to an extent greater than the least distance from an end to the center of gravity and less than the greatest distance from an end to the center of gravity; means to rotate said wheel, said last named means moving said pockets through positions in which the supporting surfaces of said pockets constitute the only available support for the objects received therein against the action of gravity whereby only those objects whose centers of gravity lie within the vertical projection of the supporting surfaces of the said pockets will receive effective support against the action of gravity and will be retained within said pockets; and discharge means to which said pockets are thereafter moved by said wheel-rotating means, said discharge means receiving from said pockets the objects retained therein.

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