United States Patent [19]

Miller

[11] **3,860,145**

[45] **Jan. 14, 1975**

[54] **FULL RECYCLE CAP FEEDER**

[75] Inventor: **Paul Marcus Miller,** Largo, Fla.

[73] Assignee: **Tangen Drives, Inc.,** Clearwater, Fla.

[22] Filed: **Apr. 23, 1973**

[21] Appl. No.: **353,300**

[52] **U.S. Cl.** **221/159,** 198/287

[51] **Int. Cl.** **B65g 47/14**

[58] **Field of Search** 221/158–162; 198/287

[56] **References Cited**

UNITED STATES PATENTS

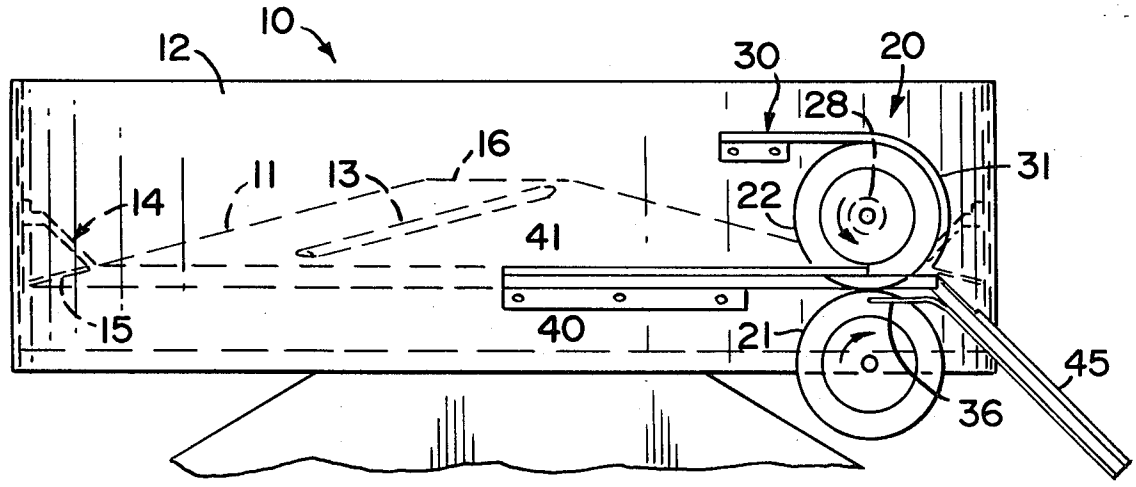
2,665,005	1/1954	Mundy	221/159 X
2,758,434	8/1956	Johnson et al.	221/158 X
2,781,946	2/1957	Wilcox et al.	221/158
3,578,140	5/1971	Myer et al.	198/33 A
3,615,151	10/1971	Sterling	198/33 AA

Primary Examiner—Robert B. Reeves
Assistant Examiner—Francis J. Bartuska
Attorney, Agent, or Firm—Dominik, Knechtel, Godula & Demeur

[57] **ABSTRACT**

A full recycle cap feeder for caps or circular members having a wall or rim in which the diameter of the cap is significantly greater than the depth of the wall is disclosed which utilizes as its principal drive a rotary cone type feeder having a peripheral sidewall. The caps are delivered to a pick up track at a tangential point along the sidewalls, and then delivered to a pair of counter-rotating wheels having resilient edged portions which are rotated along axes parallel to each other and horizontal. Those caps which have the open portion facing downwardly are driven by the lower wheel into a delivery chute. Those caps which are oriented upwardly pass around a recycle shield into a recycle chute which positions the same again, but inverted with the open end downwardly, into a cap trap which is mounted around the lower portion of the wall surrounding the rotary cone. A baffle is provided at a portion of the otherwise open cap trap between the pick up track and the completion of the path of the recycle chute. The method disclosed relates to the sequential steps of diverting the parts, and then refeeding the parts from one path back into the original feed.

5 Claims, 7 Drawing Figures



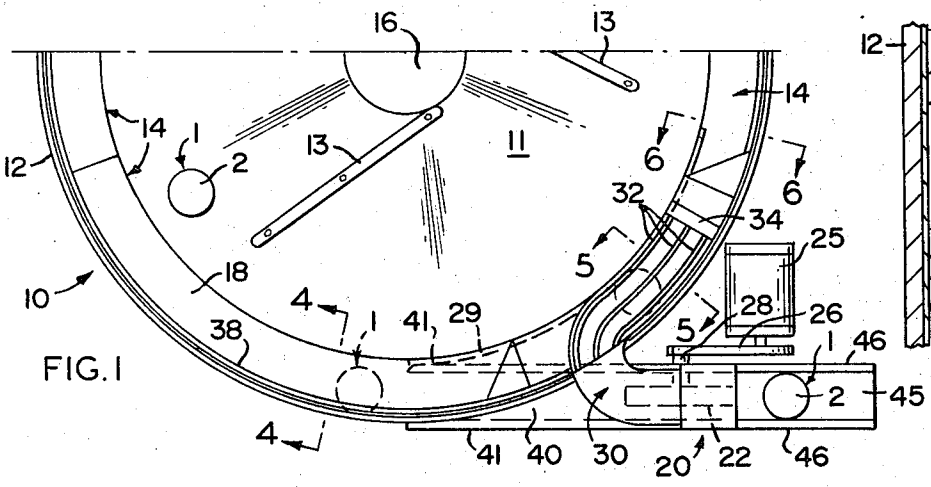


FIG. 1

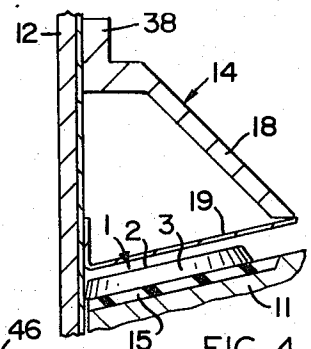
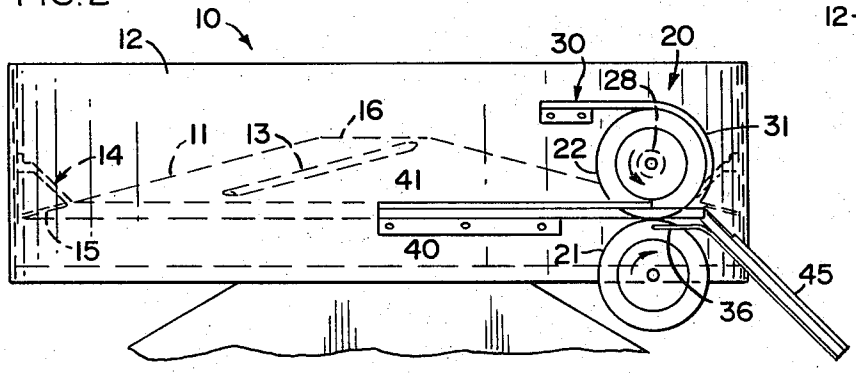


FIG. 4

FIG. 2



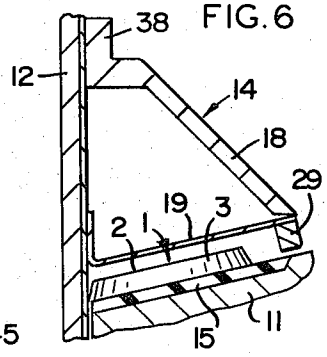


FIG. 6

FIG. 5

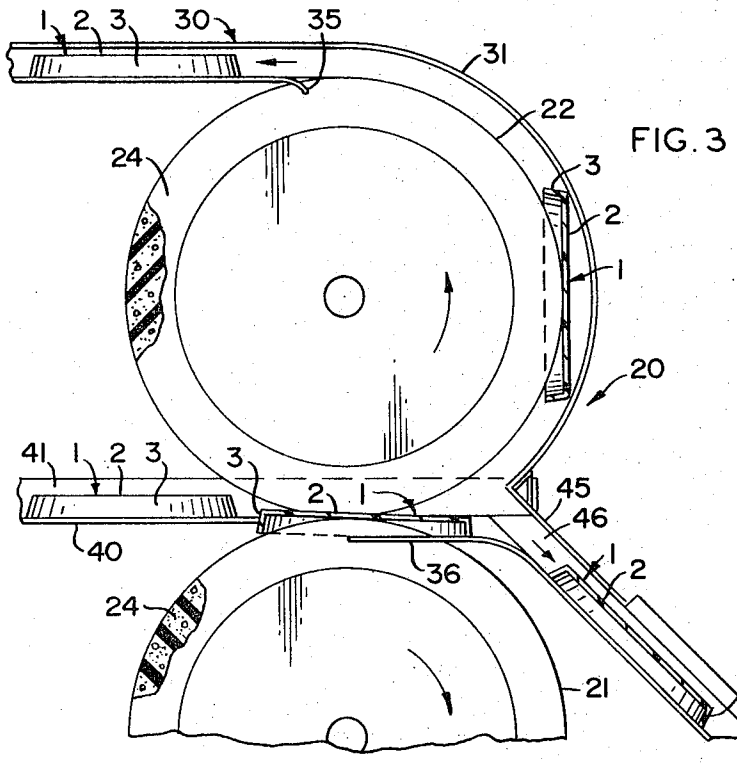
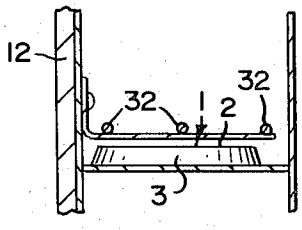


FIG. 3



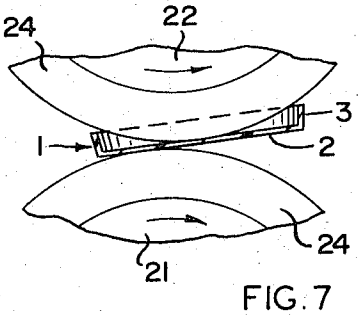


FIG. 7

FULL RECYCLE CAP FEEDER

CROSS REFERENCE TO RELATED APPLICATIONS

The present invention is related to the invention disclosed and described in U.S. Pat. application No. 282,115 filed Aug. 21, 1972, and assigned to the assignee of the present patent application.

BACKGROUND

1. Field of the Invention

The present invention relates to the utilization of rotary cone feeders having a peripheral sidewall of the kind sold under the trademark "CENTRIFEED" by Tangen Drives, Inc. of Clearwater, Florida. Various means for orienting parts which are circulated interiorly of the feeder exist in the art, the present invention, however, being related specifically to the feeding of caps fully oriented at a high rate of speed.

2. Description of Prior Art

Various techniques have been employed in the past for a feeding cup-like parts. An example appears in U.S. Pat. No. 3,710,924. The prior art fails to insure that once a part is in the pick up area which refeeds processing and delivery, that it will be positively processed in less than two rotations of the feed member. Particularly with vibratory feeders of the character exemplified by U.S. Pat. No. 2,609,914, parts may recirculate for a lengthy period of time as they are rejected off of the orientation rails on the bowl. The same is true with many rotary cone type feeders.

SUMMARY

A full recycle cap feeder of the type used to feed at high rates of speed caps having a skirt or sidewall with a depth significantly less than the diameter is disclosed in conjunction with a rotary cone feeder having a peripheral upstanding side wall. A pick up track at a tangential point on the unit receives the caps which have been trapped beneath a cap trap in random fashion, either upwardly or downwardly. The same are fed into a pair of counter-rotating rollers having a resilient or yieldable edged portion, and those caps oriented downwardly pass into a delivery chute which is also oriented downwardly. Those caps oriented upwardly leave the upper or recycle wheel angled slightly upwardly and are conveyed upwardly by means of a recycle shield into a recycle chute in the process of being inverted from their original orientation and then re-enter the cap trap positively and properly oriented for recycling and then engagement by the feed wheel and subsequent feeding into a delivery chute.

The method relates to the sequential steps of diverting the parts, and then refeeding the parts from one path back into the original feed.

One of the principal objects of the present invention is to feed caps at a high rate, fully oriented, and with a maximum of two revolutions of cycle time once the same have been trapped in the cap trap at the lower portion of the peripheral wall of the feeder.

Still another object of the present invention is to provide cap feeders of the character disclosed in which the rate of feed of oriented parts can exceed 1,000 parts per minute.

Still another object of the present invention is to provide a cap feeder in which a minimum of tumbling and abrasion of the parts occurs due to a minimization of tumbling interiorly of the feeder.

Still another object of the present invention is to provide a full recycle cap feeder with the objects set forth above in which the cost is relatively low, the maintenance is relatively low, and the production trouble-free output is maximized.

Yet another object of the present invention is to provice a method for a full recycle cap feeder with the foregoing advantages and objectives achieved, the principles of which will apply to a wide variety of proportions of cap diameters and side wall or skirt dimensions.

DESCRIPTION OF DRAWINGS

Further objects of the present invention will become apparent as the following description of an illustrative embodiment proceeds, taken in conjunction with the accompanying drawings in which:

FIG. **1** is a partially broken plan view of a full recycle cap feeder illustrative of the present invention, the upper portion not being shown being the mirror image of the lower portion without the discharge and delivery elements.

FIG. **2** is a front elevation of the full recycle cap feeder in the same scale as shown in FIG. **1.**

FIG. **3** is an enlarged partially broken front elevation of the separator assembly including the feed wheel and recycle wheel elements and their related delivery and discharge elements.

FIG. **4** is a transverse sectional view and enlarged section of the cap trap taken along Section Line **4—4** of FIG. **1.**

FIG. **5** is a partially broken enlarged transverse sectional view of the recycle grid taken along Section Line **5—5** of FIG. **1.**

FIG. **6** is an enlarged transverse sectional view partially broken showing the cap trap taken along Section Line **6—6** of FIG. **1.**

FIG. **7** is an enlarged partially diagrammatic broken view illustrative of the movement of an inverted cap against the recycle wheel angling and directing the same upwardly for recycling prior to passing again through the separator assembly and delivered downwardly into the delivery chute.

DESCRIPTION OF PREFERRED EMBODIMENT

As pointed out above in the objects of the present invention, the full recycle cap feeder **10** illustrative of the present invention is a modification of a rotary cone feeder of the character sold under the trademark "CENTRIFEED" by applicant's assignee, Tangen Drives, Inc. of Clearwater, Florida. Such a unit includes a rotor **11,** the same being driven at pre-selected rates of rotation, its periphery normally being lined with a friction track **15** and surrounded by a sidewall **12** which contains the various parts which are circulated about in its interior portion. In the present instance, a cap **1** is the part to be fed, the same having a cap top **2,** and a cap wall **3.** In most instances the cap wall **3** will be relatively small compared to the diameter, however, a ratio of 1-to-1 with the cap wall depth to the diameter is approximately the optimum depth of skirt or cap wall which can be readily oriented and fed. In addition, the average part should have a diameter of 2 inches or less, and a sidewall not exceeding 5/8 inches. Obviously certain departures from these limitations may operate depending upon the type of counter-rotating rollers em-

ployed, and the foregoing is not intended to express a limitation of the present invention, but rather to describe the same within terms of parameters of most effective usage in the normal application.

To be noted, particularly in FIG. 1, is the positioning of an agitator 13 interiorly of and on top of the rotor 11, immediately outboard and radially obtuse to the center plate 16 of the rotor 11.

The caps 1, as they are rotated by the rotor 11, are driven centrifugally outwardly and fall beneath the cap trap 14, and are impelled by the friction track 15 (see FIGS. 4 and 6). The cap trap 14 is provided with a shield base 19 (see FIG. 4) and a shield body 18. The shield body 18 terminates in an upper bracket 38 which is secured by conventional fastening means to the sidewall 12 of the full recycle cap feeder 10. Preferably the shield body 18 is formed of a casting, each segment of which is approximately 90° of the full diameter of the rotor 11. The shield base 19 may be formed of sheet metal or other thin sections and positioned with a spacial relationship above the rotor 11 and its friction track 15 to provide the desirable clearance, such as illustrated in FIGS. 4 and 6.

Positioned tangentially, at the 6 o'clock position as shown in FIG. 1, is a pickup track 40 which receives the caps 1 at the terminus of the cap trap 14. The pickup track 40, with its side rails 41, extends (see FIG. 3) to deliver the caps 1 to the point of spaced tangential relationship of the feed wheel 21, and recycle wheel 22 of the separator assembly 20. The caps 1 are then engaged by the wheel rim 24 of both the feed wheeel 21, and the recycle wheel 22. The wheel rim 24 is normally formed of a resilient material into which the sidewalls 3 of the cap 1 will penetrate slightly, the action of which is to deflect the cap 1 in the direction in which the sidewalls 3 are pointed. As illustrated particularly in FIG. 7, if the cap 1 is facing upwardly, the sidewalls 3 engage the wheel rim 24 of the upper recycle wheel 22, and bend upwardly so that, as shown in FIG. 3, the same is directed by the recycle shield 31 into the recycle chute 30.

As will be seen in FIG. 3, the cap 1 shown on the left of the unit is facing downwardly. As it passes off the pickup track 40, it then continues facing downwardly and is engaged by the rim 24 of the feed wheel 21. The same is guided by a pair of wheel flankers 36 and moves forwardly into the delivery chute 45 and then is directed downwardly as shown in the sequence of three caps 1 proceeding from left to right in FIG. 3. The side rails 46 of the delivery chute 45 thereafter guide the cap 1 to its subsequent feeding position. This orientation of the cap 1 is also shown at the 4 o'clock position in FIG. 1.

To be noted in FIG. 1 is the positioning of the motor 25 and the drive belt 26 so that the same engages the drive pulley 28 which is secured only to the recycle wheel 22. The recycle wheel 22 and the feed wheel 21 are sufficiently close together so that each cap 1 which passes therebetween will translate the frictional effort of the recycle wheel 22 on the cap 1, either by means of its top 2, or the diametrically opposed sidewalls 3, to the other wheel. In this fashion, the feed wheel 21 is not necessarily power-driven, but rather sympathetically driven off of the recycle wheel 22 by means of the interaction with the caps 1 which are being fed. As noted in FIG. 3, as the cap 1 proceeds upwardly guided by the recycle shield 31, the same is carried by the pick off element 35, and flanking engagement with the recycle wheel 22 as is the wheel flanker 36 for the feed wheel 21, and thereafter the same is delivered into the recycle chute 30. It will be noted that after the cap 1 has passed the recycle wheel 22 and is in the recycle chute 30, the same is oriented downwardly in such a fashion that it will, upon recycling, pass the feed wheel 21 in a downward orientation and be fed into the delivery chute 45 as illustrated sequentially at the lower portion of FIG. 3.

There is a bend in the recycle chute 30, as shown in FIG. 1, at which point the caps 1 descend downwardly over a three wire recycle grid 32 which is joined at its terminus by a grid drop 34 which serves the two-fold purpose of holding the grid 32 together and permitting the caps 1 to descend into the cap trap 14, unhindered by other recirculating caps because of the baffle 29 provided at the lower portion of the cap trap 14 in the 75° segment shown between the 4:30 and six o'clock positions in FIG. 1. Thereafter, upon recirculation, the cap 1 is already beneath and secured below the cap trap 14, and will proceed for another approximately 270° until the same is positively recycled and again engaged by the pickup track 40, this time properly oriented for feeding over the feed wheel 21, and into the delivery chute 45.

It will be appreciated that a wide variety of materials can be employed for the rim 24 of the feed wheel 21 and the recycle wheel 22. Also, although the same has been shown as having a flat surface, the rim 24 may be provided with a central groove, and an additional pickup positioned for mating but non-contact relationship with the groove to further insure the removal of the part from the rim 24. The speed of the wheels 21, 22 is determined empirically, but normally is at a rate slightly in excess of the peripheral speed of the rotor 11 to accelerate the parts and prevent jamming within the pickup track 40, and elsewhere upstream beneath the cap trap 41.

THE METHOD

In view of the foregoing description of one commercial embodiment, it becomes apparent that the method for feeding the caps disclosed, generally having a diameter larger than the depth of the depending side walls, includes the steps of primarily confining and impelling the parts in random orientation and edge to edge contact. Pneumatic means of feeding or vibratory means of feeding can be employed, although the best known present method is centrifugally impelling the parts to achieve the maximum feed rate. After the parts are in edge to edge contact, they are delivered to opposed resilient stations in which the resilient stations tend to rotate the parts in opposite directions, the same being deflected in the direction of the open end of the cap. Those parts deflected in one elected direction are considered properly oriented, and delivered for further processing. Those parts deflected in the opposite direction are redelivered to the feeding means, and then confined for redelivery into the confining means in the proper orientation. In the preferred method, the parts are inverted for redelivery into the edge to edge step of the method. Also, in the preferred embodiment, the step of utilizing counter-rotating rollers is considered most desirable for deflecting the parts.

Although particular embodiments of the invention have been shown and described in full here, there is no

intention to thereby limit the invention to the details of such embodiments. On the contrary, the intention is to cover all modifications, alternatives, embodiments, usages and equivalents of a full recycle cap feeder and method as fall within the spirit and scope of the invention, specification and the appended claims.

What is claimed is:

1. A full recycle cap feeder comprising, in combination,

a basic feeder unit having a central conical shaped rotor with a peripheral side wall,

a cap trap provided around the periphery of the rotor and the lower portion of the side walls having a space therebeneath to receive caps oriented upwardly and downwardly in random fashion,

a baffle mounted on and beneath said cap trap adjacent to the interior peripheral edge thereof and spaced from said peripheral side wall of said feeder unit thereby to provide a path for the end to end single file orientation of caps therebeneath,

a pickup track positioned at a tangential point along the periphery of the side wall,

a pair of counter-rotating wheels positioned with their axes parallel to each other and horizontal and perpendicular to the axis of rotation of the rotor of the feeder, including an upper recycle wheel and a lower feed wheel,

said pickup track delivering caps to the gap between the counter-rotating wheels,

a resilient rim on each wheel for engaging the caps fed thereto in such fashion that the cap will proceed in that direction in which the side walls of the cap is pointing,

motor drive means for said counter-rotating wheels including coupling means for coupling said motor drive means to said upper recycle wheel in order to drive the same,

said lower wheel being driven sympathetically through the action of said driven upper recycle wheel as caps are engaged between the said upper driven recycle wheel and the said lower feed wheel,

a delivery chute positioned downwardly of the lower feed wheel for receiving those caps having the side walls positioned downwardly,

a recycle chute surrounding the upper recycle wheel for delivering those caps having the side walls thereof pointed upwardly around to the top of the recycle wheel at which time the side wall of the cap is positioned downwardly,

means for re-orienting and thereafter delivering the recycled caps into the cap trap at the periphery of the rotary member interior of the baffle thereby to present to the re-oriented caps into the pickup track and to feed the same to the delivery chute whereupon the recycled caps will feed fully oriented to the counter-rotating wheels,

whereby caps initially delivered to the pickup track in randomly oriented configuration permits caps properly oriented to be delivered to the delivery chute for further processing while caps delivered to the delivery chute in upstanding orientation are re-oriented by said upper recycle wheel and delivered to the pickup track and hence to the cap trap for presentation to the delivery chute in properly oriented position.

2. The cap feeder as set forth in claim **1** above wherein said baffle mounted on and beneath said cap trap extends for substantially 75 ° of the full circle of the rotor.

3. The cap feeder as set forth in claim **1** above, wherein said recycle chute comprises a recycle grid which in turn comprises a plurality of wire-like members extending from the recycle chute and substantially the side wall proportion of the feeder,

said grid members bending downwardly and terminating immediately above the peripheral portion of the rotor and an opening to the cap trap downstream of the terminus of the cap trap baffle,

whereby the properly oriented caps are recycled into the cap trap directly properly oriented for passing approximately 270° around the periphery of the rotor and then re-processed fully oriented to the feed wheel and into the delivery chute.

4. The cap feeder as set forth in claim **1** above, which further includes a pair of flange members adjacent to the rim of the feed wheel and flanking the same, and beneath the periphery thereof to receive the outer portions of a cap delivered thereto and guide the same into the delivery chute.

5. The cap feeder as set forth in claim **1** above, wherein there is further provided a friction track provided at the periphery of the rotor and exceeding in its radial dimension the diameter of the caps to be fed therein.

* * * * *