HOPPER FEED APPARATUS

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The present invention relates to hopper feed apparatus; particularly to hopper feed apparatus for the automatic feeding, in uniformly oriented relation, of articles having one and portion of lesser thickness or diameter than other portions of its length, such as bottles, screw driver blades, bottle stoppers or plugs or other articles having enlarged heads, or the like.

It is an object of the present invention to provide apparatus of the character described that may automatically feed articles of the character described in uniformly oriented relation, with their thicker portion foremost.

It is also an object of the present invention to provide apparatus of the character described that is capable of feeding the articles at relatively high speed.

It is another object of the present invention to provide apparatus of the character described which may be adapted for the feeding of articles having main body portions of various sizes and different shapes.

It is still another object of the present invention to provide apparatus of the character described that is certain and constant in its operation and will not readily clog or jam or otherwise get out of order.

It is a further object of the present invention to provide apparatus of the character described that is neat and compact.

It is a still further object of the present invention to provide apparatus of the character described that is of relatively simple construction, relatively easy and convenient to operate and economical to maintain.

The foregoing and other objects and advantages of the hopper feed apparatus of the present invention will become more readily apparent to those skilled in the art from the several embodiments thereof shown in the accompanying drawings and from the description following.

It is to be understood, however, that such embodiments are shown by way of illustration only, to make the principles and practice of the invention more readily comprehensible and without any intent of limiting the invention to the specific details therein shown.

In the drawings:

FIG. 1 is a vertical, sectional and partly elevational view through one embodiment of the apparatus of the invention;

FIG. 2 is a section taken along the plane of line 2—2 of FIG. 1; showing the apparatus with a properly oriented article in feeding position;

FIG. 3 is a fragmentary view, similar to that of FIG. 2; shown with a mis-oriented article at the feeding position;

FIG. 4 is a fragmentary sectional view taken on line 4—4 of FIG. 2;

FIG. 5 is a fragmentary sectional view taken on line 5—5 of FIG. 3;

FIG. 6 is a fragmentary sectional view taken on line 6—6 of FIG. 3.

Generally stated, the apparatus of the invention follows, in broader detail, the type of hopper feeder that has been known and used for the feeding of articles that do not require orientation, such as headless pins, rods, or the like. Such apparatus includes a rotary peripheral, flat-surfaced ring on the hopper bottom which is provided with spaced radial grooves, open at the inner end. These grooves pick up the articles at the bottom of the hopper and carry them upwardly for discharge at the top of the hopper into a suitable chute or ramp; the open inner ends of the grooves being blocked along the ascending side of the ring by a suitable guard wall, to prevent the dropping of the articles out of the grooves as they near the top of the ascents.

The present invention contemplates, first, to provide the foregoing, broadly described apparatus with grooves means in the ring that will pick up and hold and carry upwardly articles having an end portion of reduced thickness or diameter, whether the remainder thereof is uniform or varying thickness, and, secondly, with means inhibiting the discharge from the grooves, at the top of the hopper, those articles that are mis-oriented, or, more specifically, those articles that are oriented with the portion of reduced thickness directed toward the center of the hopper. In the form of the invention illustrated in the drawings, the inhibiting means are provided at the very top of the hopper, at the article discharge position, to stop the gravitational movement of the misoriented article.

More specifically stated, and with particular reference to the accompanying drawings illustrating the invention, the hopper feed apparatus of the invention generally designated as 10, includes a bottom wall comprising a central disc 12, a rotary flat-surfaced, peripheral ring 14, of substantial thickness fitted closely around the central disc 10 and projecting thereabobe, and a cylindrical wall 16, extending forwardly and upwardly from the hopper bottom and preferably formed with an inwardly offset flange 18, at its outer edge. The hopper 10 may be supported with its bottom at a conventional angle to the horizontal, by the center of the disc 12, as on the canted platform 20, supported on the stand 22, which may be of any conventional construction, all in the conventional manner, well known in the art.

In the instant embodiment of the invention the disc 12 is shown as fixedly secured on the platform 20 and the ring 14 as fixedly associated with the wall 16 to rotate therewith. The rotating means for the ring and wall is shown, for the purpose of simplicity of illustration, as comprising a pulley ring 24, secured on the exterior of the wall 16 which is operatively connected to a driving motor (not shown) by the driving belt 26. It will be clear, however, that, if desired, another conventional arrangement may be provided, wherein the center disc is rotatably supported on the platform 20 and the ring 14 is associated with the center disc for rotation therewith, with the wall 16 being fixed in position and with other suitable means provided for driving the disc and ring.

The ring 14 is provided with spaced, radially extending grooves 28, in its upper surface, whose bottoms clear the edge of the center disc 12, particularly at the top or uppermost point thereof and along the descending
side of the ring, in the manner conventional with the general type of hopper feeder to which the apparatus of the present invention is applicable.

A chute, or ramp 30, is fixedly supported on the hopper 10 along the vertically extending diameter of its bottom, with its upper end disposed closely adjacent to the inner face of the projecting portion of the ring 14, in position to receive thereon or therein articles dropping or sliding gravitationally from passing grooves 28, and with its lower end extending to the exterior of the hopper, as is conventional. The chute 30 is shown as supported, at least at one point, by a bracket 32 mounted on disc 12. However, it may be stated, that it may be supported from any other stationary part of the apparatus of the ring or of the wall 10, when the latter, opposite, or from a projection of the platform 20, in a manner that will be readily understood by those skilled in the art.

The guard means for blocking the inner ends of the grooves 28, along the upper portion of their ascent, as the ring ascending on the ring 14, as by an upwardly carried in the grooves, where the center disc is stationary, may be built up from the disc 12 especially at the upper quarter of the disc along the ascending side of the ring, as illustrated at 34 (FIG. 1), or may comprise a curved guard wall overlapping the projection portion of the ascending edge of the ring 14, which wall may be suspended from a fixed point on the inner edge of the ring to the chute 30. The apparatus may be provided with a top guard 38, at its upper end that overhangs the inner portion of passing grooves 28, to prevent the bouncing out of the articles carried by them, as they approach the point of discharge, directly above the chute 30. Also, to prevent the bouncing about of the articles in the chute, after they are discharged, and thereby possibly become disoriented, the chute 30 may be tubular instead of V-shaped, as shown.

The grooves 28 may be of a shape, width and depth that may vary with the size and shape of the articles to be fed. In the embodiment of the invention illustrated the article being fed, generally designated as 40, is shown to comprise a relatively thick cylindrical body section 42, and a relatively thin neck or stem section 44, at its other end, and the grooves 28 are shown to be of a width and depth to receive and hold the article section 42 during their upward movement, but not deep enough to completely enclose the same, so that a portion of the thickness of the article section 42 projects above the surface of the ring 14.

The article orienting means is shown to comprise a preferably flat leaf spring 46, supported over the surface of the ring 14, with the latter, opposite the chute 30, transversely of any groove 28 disposed along the vertical diameter of the hopper bottom. The leaf spring is of a length to overlap the edges of such groove and not less than the width of the chute opening. The spring 46 may be supported by its end nearest the ring ascending to prevent the ring 14, from sliding gravitationally from passing grooves formed in its upper surface, said grooves each opening into the inner edge of said ring, a chute arranged to receive the article section 42 nearer the inner edge of the ring 14, and others, 40b, will have their thinner sections 44 facing the inner edge of the ring and their thicker sections 42 facing away from the inner edge, in misoriented position. As the loaded grooves of the ring 14 ascend, all articles in the grooves will be held therein by the guard wall 36 or other groove-blocking means. As each groove 28 passes the guard wall, its innermost article if in position 40a, that is, it is properly oriented, will pass freely under leaf spring 46, which overlies its thin section 44 and the article will be permitted to slide out of its groove, by gravity, onto the chute 30. All articles in position 40b, with their thin ends innermost and, therefore, misoriented, will have their thicker sections 43 resiliently and frictionally gripped by the orienting spring 46 and inhibited from dropping or sliding out of their groove, until such groove has passed beyond the spring 46 and thereby also beyond the opening of the chute 30, and will then drop back into the hopper interior.

It may here be stated that the apparatus of the present invention may be adapted for the automatic feeding of numerous articles of leaf-like or flat shape, with the articles being flat or curved in either a plane substantially parallel to the plane of said ring and transversely of a groove disposed in alignment with said chute, said leaf spring being spaced from the surface of said ring a distance less than the thickness of the
thicker end portion of an article, the inner edge of said spring being disposed at a distance from the inner edge of said ring greater than the length of the thicker portion of an article but less than its entire length, said leaf spring thereby resiliently engaging the circumferential periphery of the thicker end portion of an article disposed at the innermost end of a groove with its thin end portion facing the inner edge of said ring, whereby the gravitational discharge of an article so positioned in said groove is prevented when said groove is in the discharge position above said chute.

2. The hopper feed apparatus of claim 1 in which said leaf spring is L-shaped and supported at the end of its uprightly disposed leg.

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