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R. P. MOORE

3,530,974

SPIRAL BOTTOM FEEDER BOWL

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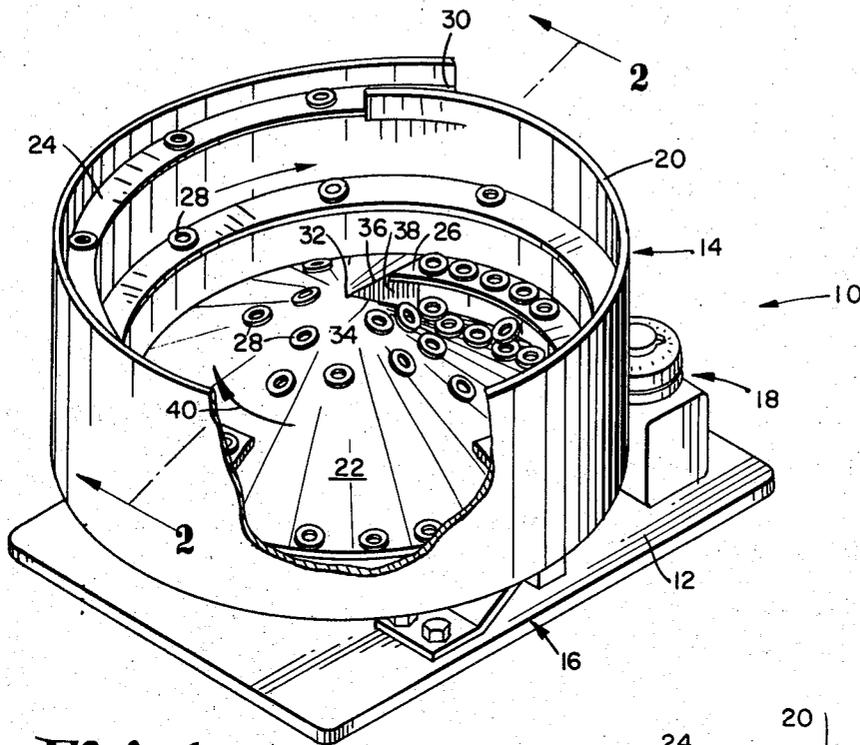


Fig. 1

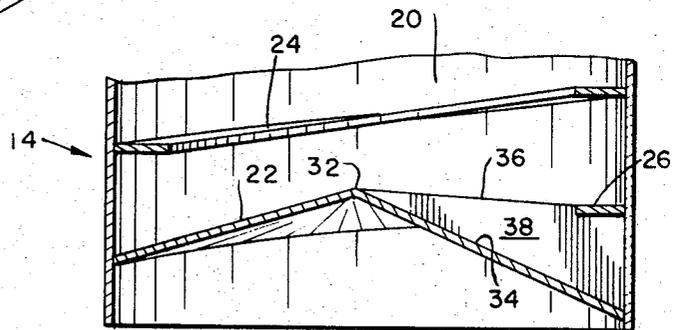


Fig. 2

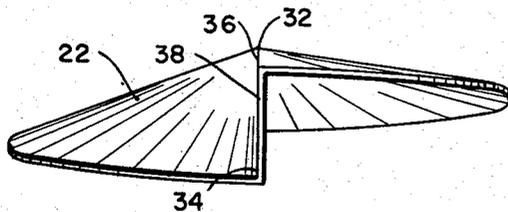


Fig. 3

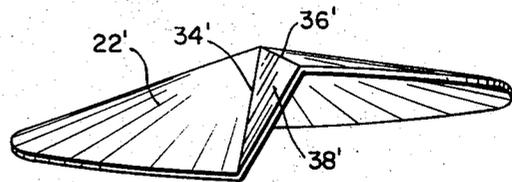


Fig. 4

INVENTOR

ROBERT P. MOORE

BY

Hood, Gust, Trush & Lundy
ATTORNEYS

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SPIRAL BOTTOM FEEDER BOWL

Robert P. Moore, Indianapolis, Ind., assignor to Moor-feed Corporation, Indianapolis, Ind., a corporation of Indiana

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2 Claims

ABSTRACT OF THE DISCLOSURE

A vibratory feeder comprising a hopper bowl having a spirally formed bottom for receiving articles to be fed and oriented, a peripheral side wall, and an article-carrying track spirally inclined about the periphery of the sidewall. The spiral axes of the bottom and the track may coincide and the lower end of the track merges with a portion of the upper delivery edge of the bottom. The upper surface of the bottom is preferably defined by rotating a generally straight line about the coinciding spiral axes with its proximal end coinciding with a fixed point on the axes and its distal end progressively moving axially upwardly at a uniform rate along the inner periphery of the sidewall. Also, preferably, the lower extremity of the bottom, which is defined by the starting position of the line, is approximately 300-360 degrees displaced from the upper delivery edge of the bottom. Also, preferably, such a straight line is always inclined downwardly from its proximal end, even at the upper delivery edge of the bottom, to define a spirally and conically warped bottom.

My invention relates to article handling devices, and more particularly to the provision of a novel hopper bowl for a vibratory feeder of the type which delivers articles up a spirally inclined, shelf-like track to a receiving station with each article being delivered in a predetermined oriented position. The Balsiger et al. Pat. 2,609,914, issued Sept. 9, 1952 is an early patent disclosing the mechanical details of such a known feeder. Thus, reference is made to the Balsiger et al. patent for a description of such details.

Most of the prior art vibratory feeder devices known to me comprise a hopper bowl having a symmetrically domed or symmetrically conically formed bottom as shown in FIG. 6 of the Balsiger et al. patent. That is, the bottom of the bowl is high at the center and inclines downwardly toward the peripheral wall of the bowl so that the force of gravity will cooperate with centrifugal forces in urging articles toward the peripheral wall. A few of the hopper bowls with which I am familiar have a generally flat bottom and a spirally inclined track merging into the upper surface of the bottom. Such a flat bottom bowl is shown in FIG. 2 of the F. E. Smith Pat. 2,901,095 issued Aug. 25, 1959.

I have found that more optimum feeding characteristics can be obtained by providing a hopper bowl having a spirally formed bottom onto which the articles to be fed are deposited, the spiral axes of the bottom coinciding with the central axis about which the bowl is vibrated. The upper surface of the bottom of my bowl is preferably defined by rotating a straight line about the axis of the

bowl with the proximal end of the line coinciding with a fixed point on the axis and the distal end of the line moving progressively axially upwardly along the inner peripheral surface of the side wall of the bowl, the distal end preferably moving upwardly at a uniform rate. Preferably, the lowest extremity of the bottom, which is defined by the starting position of such a line, is approximately 300°-360° displaced from the upper delivery edge of the bottom, which edge is defined by the final position of the line. That is, the upper surface of the bottom is preferably defined by rotating such a straight line through approximately 300°-360°. It will be understood, however, that this angle is not critical and that any angle less than 360° will be suitable for many applications. Also, the axially fixed point about which the proximal end of such a line rotates is preferably slightly higher than the distal end of the line, even at the upper delivery edge of the bottom, to define a spirally and conically warped bottom.

When articles are deposited on the bottom of my preferred hopper bowl, some of the articles will be moved, by the force of gravity and by the centrifugal forces created by vibrating the bowl about its axis, toward the lower extremity of the bottom, from which extremity they will move about the inner periphery of the side wall of the bowl. This is entirely expectable because a substantial portion of the bottom inclines downwardly toward the lower extremity. However, a substantial portion of the articles deposited onto the bottom will tend to move spirally upwardly and outwardly along the spirally inclined bottom toward the point at which the upper delivery edge of the bottom merges with the lower end of the conventional track which extends spirally about the inner periphery of the sidewall of the bowl.

It is an object of my invention, therefore, to provide a hopper bowl having a spirally formed bottom.

Another object of my invention is to provide a hopper bowl, the bottom of which is formed with a conically and spirally warped upper surface for receiving articles to be fed.

One advantage of my spirally-bottom bowl is that it eliminates the requirement for a skirt arranged to direct the articles from the bottom upwardly onto the spiral track. Another advantage of my spirally-bottom bowl is that it eliminates the necessity for the provision of the conventional shield which is used to prevent articles from being caught in the space defined by the spiral track at the point where it merges into the conventional conical or flat floor of a bowl. Of course, the most important advantage of my hopper bowl is that more optimum feeding characteristics are obtained. That is, the bottom of my bowl is spirally and conically formed to increase the rate of flow of articles toward the lower, entrance end of the spiral track.

Other objects and features of my invention will become apparent as this description proceeds.

To the accomplishment of the above and related objects, the present invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however that the drawings are illustrative only, and that change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

In the drawings:

FIG. 1 is a perspective view, partially cut away, showing a feeder device comprising my spiral-bottom hopper bowl;

FIG. 2 is a fragmentary sectional view of the bowl taken generally along the line 2—2 in FIG. 1;

FIG. 3 is an elevation view of the bottom of the bowl; and

FIG. 4 is an elevation view of another form of bottom which I prefer to use with frail articles such as glass articles.

The aforementioned Balsiger et al. Pat. 2,609,914 and Smith Pat. 2,901,095 as well as several other patents, including the Boris Pat. 3,114,448 issued Dec. 17, 1963 and the Austin Pat. 3,147,841 issued Sept. 8, 1964 show vibratory feeder devices comprising hopper bowls. These known feeder devices comprise a base member, a series of resilient members circularly arranged on the base member for supporting a hopper bowl for movement about a central axis and means, such as a solenoid, for vibrating the hopper bowl about such a central axis. In FIG. 1, I have shown a feeder device 10 comprising a base member 12 on which a hopper bowl 14 is mounted for vibratory movement about a generally vertical axis which coincides with the axis of the bowl. Generally indicated by the reference numeral 16 is one of a plurality of resilient members which mount the bowl 14 on the base member 12. Generally indicated by the reference numeral 18 is an electrical control for the driving motor for the bowl 14. Since the means for mounting and vibrating the bowl 14 are so well known in the prior art, it will not be necessary further to describe such means in this description.

My bowl 14 comprises a generally cylindrical sidewall 20, a spirally formed bottom 22 and a track 24 spirally inclined about the inner periphery of the sidewall, the lower end 26 of the track merging with a portion of the bottom so that articles, such as the illustrated washers 28, can move from the bottom onto the track. The upper end 30 of the track 24, usually referred to as the exit end of the track, is disposed at the upper edge of the side wall 20 and emerges from the bowl to deliver articles serially into any other desired piece of equipment (not shown).

My bowl 14 may be fabricated using any number of techniques and using any suitable material. However, I prefer to fabricate the bowl 14 by forming the bottom 22 and the track 24 from sheet metal and then welding them into a metal cylinder defining the side wall 20. Specifically, I prefer to form the bottom 22 so that it has a central point 32 through which the axis of the bowl 14 extends. This point 32 is the uppermost point on the bottom 22 as seen in FIGS. 2, 3 and 4. The bottom 22 is spirally formed about this point 32 and, preferably, the spiral axis of the track 24 extends through the point 32. It will be understood, however, that in some cases, it may be desirable to position this uppermost point 32 so that the spiral axis of the bottom 22 does not coincide with the spiral axis of the track 24, thereby to vary the feeding characteristics of the bottom.

Preferably, the bottom 22 is formed so that it defines a spirally and conically warped upper surface onto which articles to be fed are deposited. This upper surface can be defined by rotating a generally straight line about the bowl axis with the proximal end of the line held at the point 32 and with the distal end of the line moving progressively axially upwardly at a uniform rate along the inner periphery of the sidewall 20. The starting position of such a line would correspond to the lower edge 34 of the bottom 22 and the final position of such a line would correspond to the upper edge 36 of the bottom 22. I refer to these edges 34, 36 as the lower extremity and upper delivery edge, respectively, of the bottom 22. In the embodiment of FIGS. 1, 2 and 3, the edge 36 is approximately 360° displaced from the edge 34 in the di-

rection of movement of such a line. Referring to FIG. 2, it will be seen that such a line, i.e., the edge 36, inclines downwardly at the point where the bottom 22 merges with the lower end 26 of the track 24. Thus, I describe the bottom 22 as being spirally and conically warped since, theoretically, any two consecutive positions of the line defining the upper surface of the bottom are never parallel and since the resulting upper surface is slightly conically domed.

It will be understood that tolerances are difficult to hold in sheet metal fabrication and, therefore, it is extremely difficult to fabricate the bottom 22 so that its upper surface is defined by rotating a perfectly straight line. Thus, in this description and in the appended claims, I have specified that the upper surface of the bottom 22 is defined by rotating a generally straight line about the point 32. Likewise, it will be understood that the drawings accompanying this application are not necessarily drawn to scale and that they are merely illustrative of my spirally and conically warped bottom 22.

In the embodiment of FIGS. 1, 2 and 3 a vertically disposed triangular panel 38 is provided for closing the space between the upper delivery edge 36 and the lower extremity 34. Referring to FIG. 2, it will be seen that the first side of this panel 38 abuts a portion of the inner periphery of the side wall 20, the second side of the panel coincides with the upper delivery edge 36 and the third side of the panel coincides with the lower extremity 34. It will be appreciated that those articles which are moved about the bottom 22 in the direction of the arrow 40 (FIG. 1) and which do not move onto the lower end 26 of the track 24 will fall from the upper delivery edge 36 back onto the lowest portion of the bottom, which portion is adjacent the lower extremity 34. In some cases, it is desirable not so abruptly to drop such articles from the upper delivery edge 36 onto the lower portion of the bottom 22. Thus, I have provided the embodiment of FIG. 4 wherein the panel 38' is inclined at an angle as illustrated so that the articles leaving the upper delivery edge 36' can slide down the panel. It will be obvious that, in the embodiment of FIG. 4, the upper delivery edge 36' is disposed at an angle of less than 360° from the lower extremity 34' in the direction of movement of the line which defines the upper surface of the bottom 22'. In the illustration of FIG. 4, the edge 36' is disposed at an angle of approximately 345° from the lower extremity 34'.

What is claimed is:

1. A vibratory feeder comprising a hopper bowl having a spirally formed bottom providing an upper surface for receiving articles, a peripheral side wall, and an article-carrying track spirally inclined about the periphery of said sidewall, the lower end of said track merging with a portion of the upper delivery edge of said bottom, said upper surface of said bottom being defined by rotating a generally straight line approximately 360° about the spiral axis of said bottom with its proximal end coinciding with a fixed point on said axis and its distal end progressively moving axially upwardly along the inner periphery of said side wall to define a helix, the rotation of said line being such that its distal end progressively moves axially upwardly at a uniform rate along the inner periphery of said side wall to said upper delivery edge, said line being inclined downwardly from said fixed point at said upper delivery edge so that said upper surface nowhere rises above said fixed point.

2. An upright hopper bowl having an article-carrying track spirally inclined about the inner periphery of the side wall of said bowl, the bottom of said bowl defining a conically and spirally warped upper surface for receiving such articles, the lower end of said track merging with a portion of the upper delivery edge of said bottom whereby, as said bowl is vibrated, such articles will move from said bottom onto said track, said upper surface of said bottom being defined by rotating a generally straight line about the spiral axis of said bottom with its proximal

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end coinciding with a fixed point on said axis and its distal end progressively moving axially upwardly along the inner periphery of said side wall, and said upper surface further is smooth and continuous from the helical path of said distal end of said line toward said axis, said line being rotated through approximately 360° from its starting point to said upper delivery edge, said line being inclined downwardly from said fixed point at said upper delivery edge so that said upper surface nowhere rises above said fixed point.

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5 RICHARD E. AEGERTER, Primary Examiner
R. G. GAITHER, Assistant Examiner

U.S. Cl. X.R.

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