United States Patent

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[72] Inventor **Robert W. Curry, III**
Louisville, Ky.

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[73] Assignee **General Electric Company**

[54] **COMBINATION STORAGE RECEPTACLE AND DISPENSER**
6 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **222/240,** 198/64
[51] **Int. Cl.** **G01f 11/20**
[50] **Field of Search** 222/240, 241; 198/64

[56] **References Cited**

UNITED STATES PATENTS

3,348,656	10/1967	Hall et al.	198/64
3,422,994	1/1969	Alvarez	222/240
3,437,244	4/1969	Alvarez et al.	222/240

Primary Examiner—Stanley H. Tollberg
Attorneys—Walter E. Rule, Harry F. Manbeck, Jr., Joseph B. Forman, Oscar B. Waddell and Frank L. Neuhauser

ABSTRACT: An ice piece dispenser comprising a relatively wide and shallow receptacle having a generally concave bottom wall and a dispensing outlet in the front thereof contains an auger-type dispensing means horizontally supported in the receptacle in spaced relationship with the sidewalls of the receptacle. The dispensing means includes a feed section for dispensing ice pieces through the outlet and a conveying section spaced from the feed section for conveying ice pieces to the feed section at a rate in excess of that at which ice pieces are dispensed by the feed section so that the excess ice pieces move tangentially into adjacent portions of the receptacle and are recirculated to thereby agitate the contents of receptacle and break up any ice clumps or clusters. A single longitudinally extending step or shoulder in the bottom wall of the receptacle below the conveying section and adjacent the inlet end of the feed section is provided to deflect ice pieces moving in a tangential direction into the feed section without materially interferring with the recirculation pattern of the stored ice pieces.

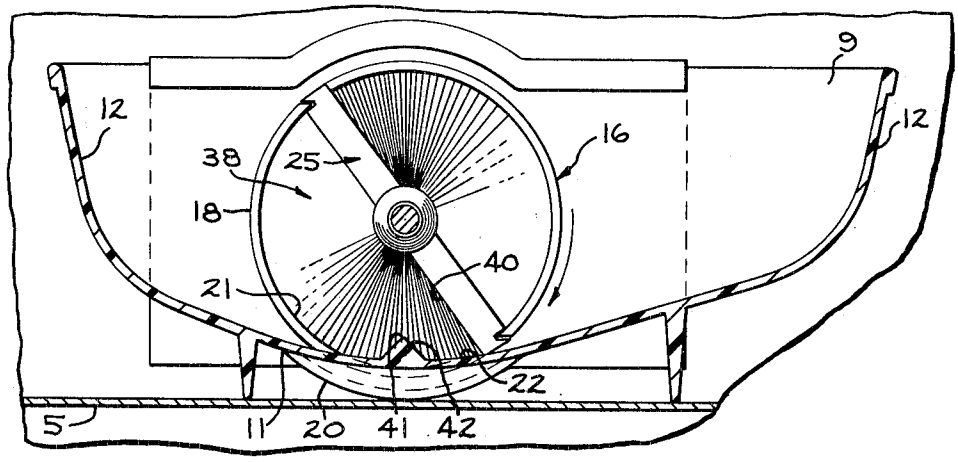
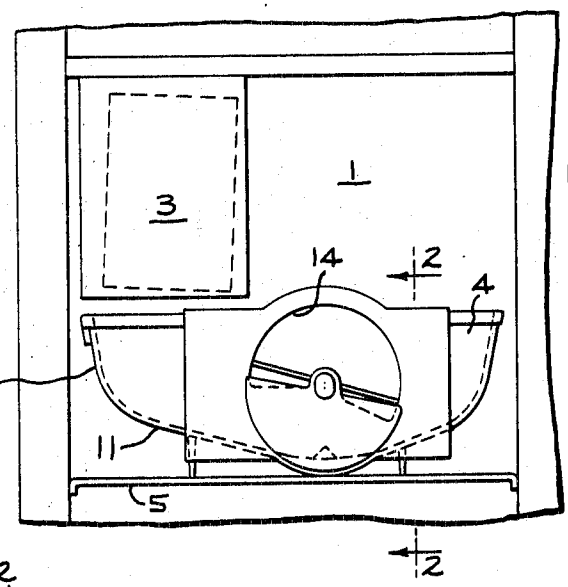


FIG. 1



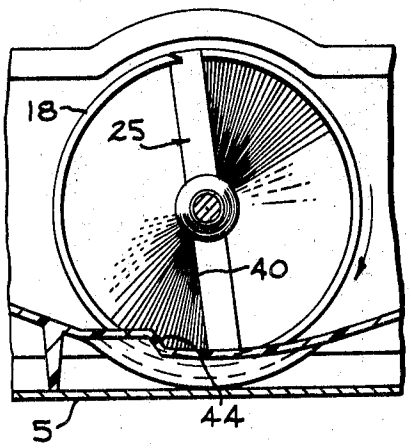


FIG. 4

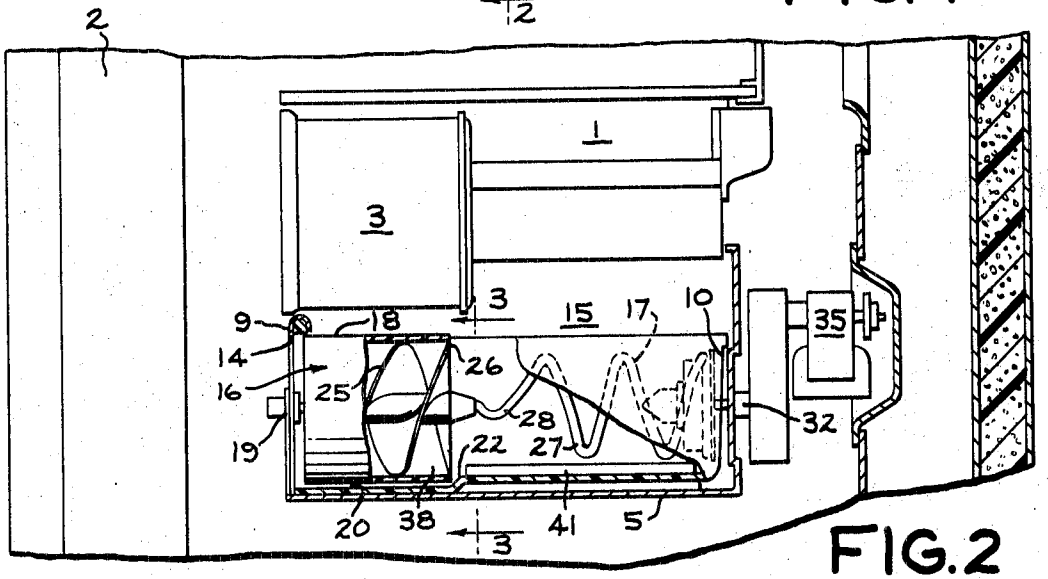


FIG. 2

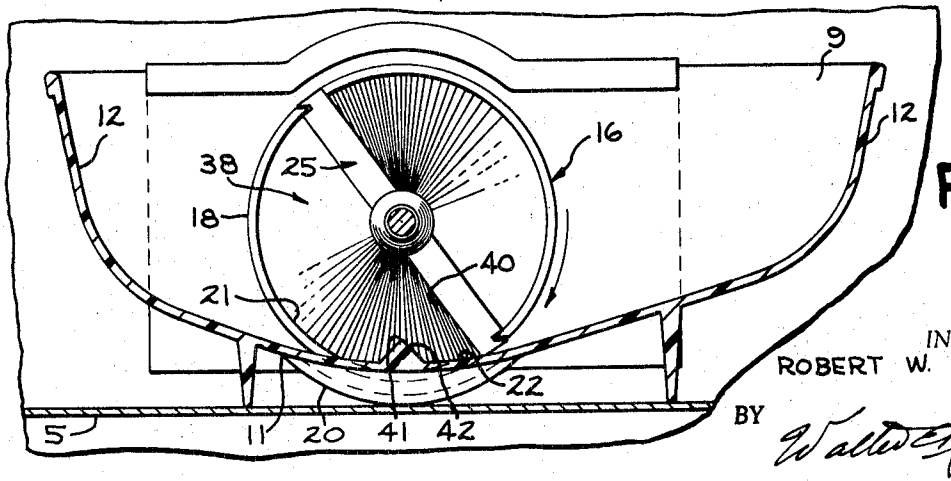


FIG. 3

INVENTOR.
ROBERT W. CURRY III

BY

HIS ATTORNEY

COMBINATION STORAGE RECEPTACLE AND DISPENSER

BACKGROUND OF THE INVENTION

The present invention relates to an ice piece dispenser for a conventional household refrigerator and more specifically to an ice dispenser of the type disclosed and claimed in U.S. Pat. No. 3,422,994 Alvarez issued Jan. 21, 1969 and U.S. Pat. No. 3,437,244 Alvarez et al. issued Apr. 8, 1969. Briefly described such a dispenser comprises a receptacle for receiving and collecting ice pieces from an automatic ice maker and dispensing means rotatably supported in a horizontal position within the receptacle so that, upon operation thereof, ice pieces will be automatically dispensed through a discharge opening in the receptacle. The dispensing means generally comprises a feed section for feeding ice pieces to the discharge opening and a conveying section connected to the feed section and rotatable therewith. The feed section comprises a collar containing a conveyor screw or auger rotatable with the collar. The conveyor section is designed to both convey ice pieces from more remote portions of the receptacle to the inlet end of the feed section and circulate and agitate the stored ice pieces so as to break up clusters or clumps thereof. To this end, the bottom wall of the receptacle slants away from the dispensing means whereby excess ice pieces conveyed to the feed section by the conveying section move tangentially from the portion of the dispensing means ahead of the feed section and into the adjacent portions of the receptacle to the side of the dispensing means. For maximum recirculation of the ice pieces and agitation of substantially all of the ice pieces stored in the receptacle, the receptacle is preferably of a width from two to three times the diameter of the dispensing means and has a height about equal to the height of the dispensing means. These optimum dimensional relationships and a smooth arcuate shape of the bottom wall of the receptacle provide the maximum free circulation and agitation of ice pieces throughout the receptacle.

In the actual operation of a dispenser of this type, it has been found that even though ice pieces are delivered by the conveying section to the feed section at a rate greater than the feed section can take these ice pieces, the ice pieces occasionally fail to enter the feed section at the anticipated rate. In some cases it has been found that this has been due to the fact that two interconnected ice pieces, which may be called a webbed double, become caught on the inlet edge of the auger blade so that this double rotates with the feed section thereby blocking entrance of other ice pieces into the feed section. In other cases, a plurality or group of unconnected ice pieces become aligned or arranged in such a pattern that as a group or unit they move tangentially along the bottom wall of the receptacle in the direction of rotation of the dispensing means with insufficient movement relative to one another to permit or cause one or more of the ice pieces to enter the feed section.

SUMMARY OF THE INVENTION

The present invention is directed to and has as it primary object the provision of an improvement in an ice dispenser of the aforementioned type adapted to assure a more continuous and positive introduction of ice pieces into the dispensing means feed section without significantly interferring with the circulation and agitation of the stored ice pieces by the dispensing means.

In accordance with the illustrated embodiments of the invention, the ice piece dispenser comprises a receptacle for receiving and collecting the ice pieces formed by an automatic ice maker. The receptacle includes a discharge opening in the front wall thereof through which ice pieces are discharged as required by the user by operation of a dispensing means supported substantially horizontally and rotatably in the receptacle. The dispensing means comprising a feed section adapted to discharge ice pieces through the opening and a conveying section adapted to convey ice pieces from the more remote portions of the receptacle to the feed section. The feed section comprises a cylindrical collar having an outlet at the front end thereof communicating with the opening and an inlet at the rear end thereof. Means, such as a screw auger, is contained within the collar for advancing ice pieces from the inlet to the outlet end of the collar upon rotation of the dispensing means. The conveying section for conveying ice pieces to the inlet end of the feed section includes helical means in the form of a heavy wire or rod bent to form a helix of one or more turns spaced from one another. The conveyor section and feed section are spaced from one another and so arranged within the receptacle that ice pieces which do not enter the feed section are recirculated and agitated within the receptacle thereby preventing the formation of ice clusters and breaking up clusters of ice pieces which may be present within the receptacle. To prevent the formation of groups of ice pieces or clusters of interconnected ice pieces from interferring with the continuous entrance of ice pieces into the feed section, the otherwise continuous and gently curving bottom wall of the receptacle below the dispensing means and at the inlet end of the feed section is provided with a shoulder or ridge. This shoulder or ridge is in the path of ice pieces moving tangentially at the inlet end of the feed section so that it disperses or breaks up the groups or clusters which may otherwise block the entrance to the feed section.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing:

FIG. 1 is a front elevational view of the ice dispensing means of the present invention incorporated in the freezer compartment of a household refrigerator;

FIG. 2 is a sectional view taken generally along line 2–2 of FIG. 1;

FIG. 3 is an enlarged sectional view taken generally along line 3–3 of FIG. 2; and

FIG. 4 is a view similar to FIG. 3 illustrating another embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIGS. 1 and 2 of the drawing, there is illustrated a household refrigerator comprising a freezer compartment 1 having an access opening at the front thereof closed by a door 2. Within the upper portion of the freezer compartment 1, there is mounted an automatic ice maker 3 which may be any of the well-known types presently provided in household refrigerators for the automatic production of ice pieces, generally referred to as ice cubes regardless of their particular shapes. These ice pieces are discharged into a storage bin or receptacle 4 which serves not only to store the manufactured ice pieces at subfreezing temperatures but also forms part of an ice dispenser designed to automatically dispense the stored ice pieces as required by the user.

The receptacle 4, which is removably supported on a supporting shelf 5 below the ice maker 3, is relatively wide and relatively shallow and includes vertical front and rear walls 9 and 10 and an arcuate or concave bottom wall 11 merging with sidewalls 12. The front wall 9 of the receptacle 4 is provided with a dispensing opening 14 above and spaced from the lowest portion of the bottom wall 11.

For the purpose of conveying ice pieces stored in the receptacle 4 to the discharge opening 14, there is provided within the receptacle 4 a dispensing means generally indicated by the numeral 15. It extends lengthwise of the receptacle 4 adjacent the lowermost portion of the arcuate bottom wall 11 and in alignment with the discharge opening 14 and is pivotally supported in a horizontal position on the front and rear walls 9 and 10 of the receptacle 4 for rotational movement about its horizontal axis. It essentially comprises a feed section 16 at the front end thereof and a conveyor section 17 connected to the feed section and forming the rear portion of the dispensing means.

The feed section 16, as is more fully shown in FIGS. 2 and 3 of the drawing, comprises an open ended cylindrical sleeve or collar 18 of a diameter such that with the front end of the dispensing means pivotally supported by a bearing member 19 adjacent the discharge opening 14, the bottom of the sleeve 18 is positioned in a shallow arcuate depression 20 in the bottom wall 11 of the receptacle 4. The depression 20 is of a depth such that the inner surface 21 of the collar 18 is in substantially the same plane or slightly below, the adjacent surface portion 22 of the receptacle bottom wall to facilitate entrance of ice pieces into the collar 18.

The collar 18 contains a conveyor screw, in the form of a double auger 25 rotatable with the collar 18, for picking up ice pieces at the inlet end 26 of the feed section and advancing these ice pieces in single file arrangement to the discharge opening 14 during rotation of the dispensing means. The feed section is of a construction such that during normal operation of the ice dispenser, a plurality of ice pieces are stored within the feed section in a manner such that a controllable number of ice pieces are discharged through the discharge opening 14 upon each half revolution of the dispensing means.

The conveyor section 17 comprises an open coil of wire or rod designed to advance ice pieces towards the feed section and also agitate and circulate the ice pieces stored within the receptacle 4. It includes, as shown particularly in FIG. 2 of the drawing, a conveyor portion 27 comprising one or more open, helical coils designed upon rotation of the dispensing means to transport ice pieces from the rear of the bucket to the inlet end 26 of the feed section and a second volute or tapered portion 28 connecting the first portion 27 to the center shaft or axis of the feed member.

The portion 28 spaces the main portion 27 from the inlet end of the feed section a distance sufficient so that ice pieces conveyed to the feed section but not entering that section can move in a radial or transverse direction out of the dispensing means and be recirculated in a manner to be more fully described hereinafter.

The rear end of the conveyor section 17 is connected to a shaft 32 forming part of the motor and speed reduction drive means 35 mounted on the rear portion of shelf 5 and adapted to rotate the dispensing means in a clockwise direction as viewed in FIG. 3 of the drawing. The dispensing means is preferably spaced from the bottom wall of the receptacle 4 a distance less than the smallest dimension of the ice pieces stored in the receptacle 4 and preferably about one-half of that dimension.

As is taught in the aforementioned U.S. Pat. No. 3,422,994 Alvarez, the receptacle has an effective storage width of at least twice, preferably about three times, the diameter of the dispensing means and a height about equal to the diameter of the dispensing means. These optimum dimensional relationships and the smooth arcuate shape of the bottom wall substantially prevent jamming of the ice pieces at various points along the dispensing means and provide a relatively free circulation and agitation of ice pieces through the receptacle.

During rotation of the dispensing means 8, the ice piece circulation follows a definite pattern. Ice pieces picked up by the conveyor section 17 are advanced towards the feed section where some of the ice pieces enter the feed section for ultimate discharge through the discharge opening 14. The conveyor section is designed to supply ice pieces to the feed section at a rate in excess of the rate at which ice pieces can enter the feed section. The excess ice pieces travel transversely or laterally into the areas on one side or the other of the feed section 16. Then under the pressure of following ice pieces, they move along the sidewalls to the rear of the receptacle where they are again in a position to be picked up by the conveyor section.

Some of the clumps or clusters of ice pieces consisting of a plurality of ice pieces joined together at isolated points which are too large to enter the feed section are broken up while in the area ahead of the feed section either by the rotating feed section entrance or by the rotating tapered portion 28. Those which exit through the open section between the main conveyor section coils 27 and the feed section 16 may be broken up by agitation thereof with other ice pieces during the recirculation of the ice pieces within the receptacle. The rotation of collar 18 helps turn such clumps or clusters of ice pieces which cannot enter the feed section away from the feed section entrance.

While all of the above design details as taught in the aforementioned Alvarez patent have been found to aid in preventing stalling of the motor, in breaking up of ice piece clusters and in supplying ice pieces to the feed section at a rate greater than the feed section dispenses ice pieces, there are occasional periods during which ice pieces are not picked up by the feed section at the anticipated and required rate. It has been found that this has generally been caused by the fact that a webbed double, that is two interconnected ice pieces, has entered one of the feed section flutes 38 to the point where one of the ice pieces is within the flute while the other is still outside so that the double is straddling the inlet edge of an auger blade. This double riding on the inlet edge 40 of an auger blade will then rotate for several revolutions of the feed section blocking the entrance to the flute during this period. In other cases, a lower entrance rate has been found to be due to the fact that groups of unconnected ice pieces sliding tangentially along the smooth bottom wall 11 of the receptacle in the direction of rotation of the dispensing means appear to move together and as a unit with no substantial rearrangement of the group so that even those ice pieces immediately adjacent the inlet end of the feed section move along with the group rather than entering the feed section.

In accordance with the present invention, means are provided for both dislodging the webbed double from the inlet end of the feed section and for breaking up of any group arrangement of disconnected ice pieces without materially affecting the desired circulation of ice pieces throughout the receptacle.

To this end the otherwise smooth and continuous dish-shaped or concave bottom wall of the receptacle is interrupted by a slanting shoulder or step portion adjacent the feed section inlet and below the dispensing means.

This means, as illustrated in FIG. 3 of the drawing, comprises a ridge 41 of generally triangular cross section extending longitudinally of the bottom wall of the receptacle and particularly in the area between the conveying section and the feed section. The height of this ridge is less than the smallest dimension of the stored ice pieces so that it will only impede rather than stop the lateral or tangential movement of ice pieces in this area and therefore will not stall or increase the load on the drive motor. A webbed double which has partly entered the feed section as described hereinbefore and which would otherwise rotate with the feed section for two or three revolutions thereof will, upon engagement with the ridge 41, be dislodged from its position straddling the inlet edge 40 of a blade and will either be completely delivered into a flute or will be shoved away from the mouth of the flute for recirculation through the receptacle. Under some conditions, the ridge 41 and the pressure of other ice pieces in this area of the receptacle may cause the web to become broken so that the double is separated into two individual ice pieces.

Such a ridge also serves to disrupt the aforementioned group movement of unconnected or individual ice pieces. As the ice pieces of such a group contact the ridge they are individually elevated as they pass over the ridge thereby effecting enough of a rearrangement of the pieces to disrupt the group pattern with the result that some of the ice pieces adjacent the inlet to the feed section will be pushed by the other ice pieces in this area into the feed section.

Preferably at least the one wall 42 of the ridge facing the ice pieces moving tangentially in this area in the direction of rotation of the dispensing means is slanted or sloping in order to minimize breaking or chipping of the ice pieces. Also to aid in the forward advancement of ice pieces by the conveyor section, the ridge preferably extends rearwardly beneath the con-

veyor section where a slight interference with the tangential movement of ice pieces in conveyor area will encourage the forward movement of ice pieces toward the feed section.

FIG. 4 illustrates what is presently considered to be a preferred commercial embodiment of the invention. In that embodiment, the otherwise smooth continuous bottom wall of the receptacle is interrupted by a slanting shoulder or step 44 positioned below the dispensing means but slightly offset from the axis thereof. More specifically, this step or shoulder 44 is offset in the direction of rotation of the dispensing means but is within the surface portion 22 of the receptacle bottom wall adjacent the shallow arcuate depression 20 below the feed section. This step or shoulder, like the slanting portion 42 of the ridge 41 affects the desired uniformity in the rate of which the ice pieces are fed to the feed section without substantially interferring with the recirculation of the stored ice pieces.

While there has been sown and described specific embodiments of the invention, it will be understood that it is not limited thereto and it is intended by the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

I claim:

1. An ice piece dispenser comprising:

a receptacle for receiving and collecting ice pieces, said receptacle having a discharge opening at the front end thereof;

dispensing means horizontally and rotatably supported in said receptacle and comprising a feed section adjacent said opening and a conveying section rearwardly of said feed section;

said feed section comprising a cylindrical collar having an outlet for discharging ice pieces to said discharge opening and an inlet at the rear end thereof, said collar containing conveyor means for advancing ice pieces entering said feed section inlet through said collar upon rotation of said dispensing means;

said conveying section comprising a helically coiled member for moving ice pieces in said receptacle towards said feed section during rotation of said dispensing means at a greater rate than ice pieces can enter said feed sections;

the bottom wall portions of said receptacle on opposite sides of said feed section inlet extending away from said dispensing means to form recirculation areas whereby ice pieces which do not enter said feed section can move transversely into said areas; and

means for facilitating entrance of ice pieces moving transversely along the bottom wall adjacent said feed section inlet into said inlet comprising a projection on said bottom wall adjacent said feed section inlet and below said dispensing means.

2. The dispenser of claim 1 in which said projection also extends longitudinally of said receptacle beneath said conveyor section.

3. The dispenser of claim 1 in which the inner surface of the bottom portion of said feed section collar at the inlet end thereof is below the adjacent portion of said receptacle bottom wall and said projection is within said adjacent portion of said bottom wall.

4. An ice piece dispenser comprising:

a receptacle having a discharge opening at the front end thereof;

dispensing means horizontally and rotatably supported in said receptacle and comprising a feed section adjacent said opening and a conveying section rearwardly of said feed section;

said feed section comprising a cylindrical collar having an outlet for discharging ice pieces to said discharge opening and an inlet at the rear end thereof, said collar containing a conveyor means within and substantially coextensive with said collar for advancing ice pieces through said collar upon rotation of said dispensing means;

said conveying section comprising a helically coiled wire component for moving ice pieces in said receptacle towards said feed section during rotation of said dispensing means, said conveying section being spaced from said feed section inlet;

the bottom wall portions of said receptacle on opposite sides of said feed section inlet slanting away from said dispensing means to form recirculation areas whereby ice pieces which do not enter said feed section move transversely into said areas; and

means for facilitating entrance of ice pieces moving transversely along the bottom wall adjacent said feed section inlet into said inlet comprising a shoulder in said bottom wall adjacent said feed section inlet and below said dispensing means.

5. The dispenser of claim 4 in which said shoulder also extends below said conveyor section.

6. The dispenser of claim 5 in which the lower portion of said feed section is positioned in a shallow arcuate depression in said receptacle so that the lower portion of said collar is slightly below the portion of said receptacle bottom wall rearwardly adjacent said feed section.