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**INT CL<sup>4</sup> B65G 59/00 59/10**

(54) **Nested container dispensing device**

(57) Containers (10) are dispensed one-at-a-time from a nested stack by a device comprising at least one resiliently deformable support member (18) and pulling means (22). The support member (18) supports the stack by engaging a lip (14) of a lowermost container (10) but is deformable to release the lowermost container when the pulling means (22) is operated to apply sufficient directly downward force to the lowermost container (10). Pulling means (22) may be coated with rubber (24) and are mounted for eccentric motion as shown on gear train (26, 28, 30, 32) so as to approach, grip, and separate as the cup falls.

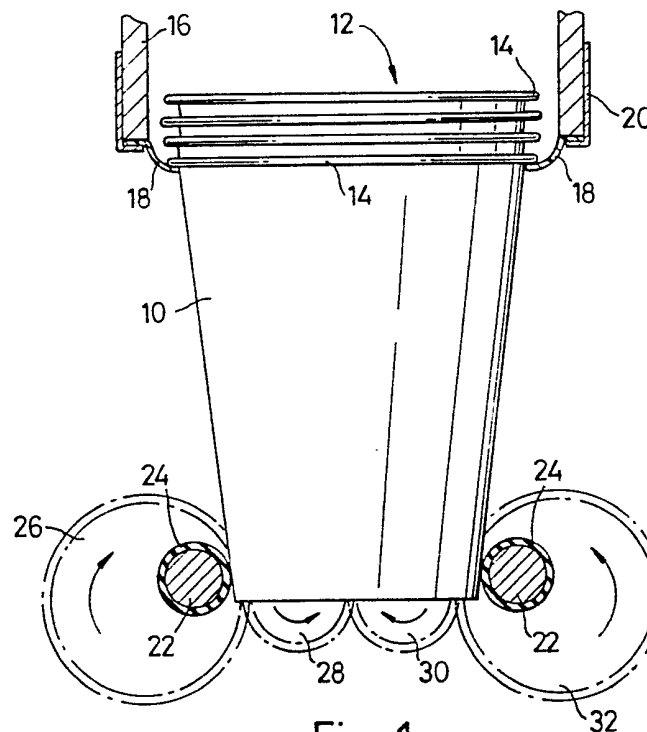


Fig. 1

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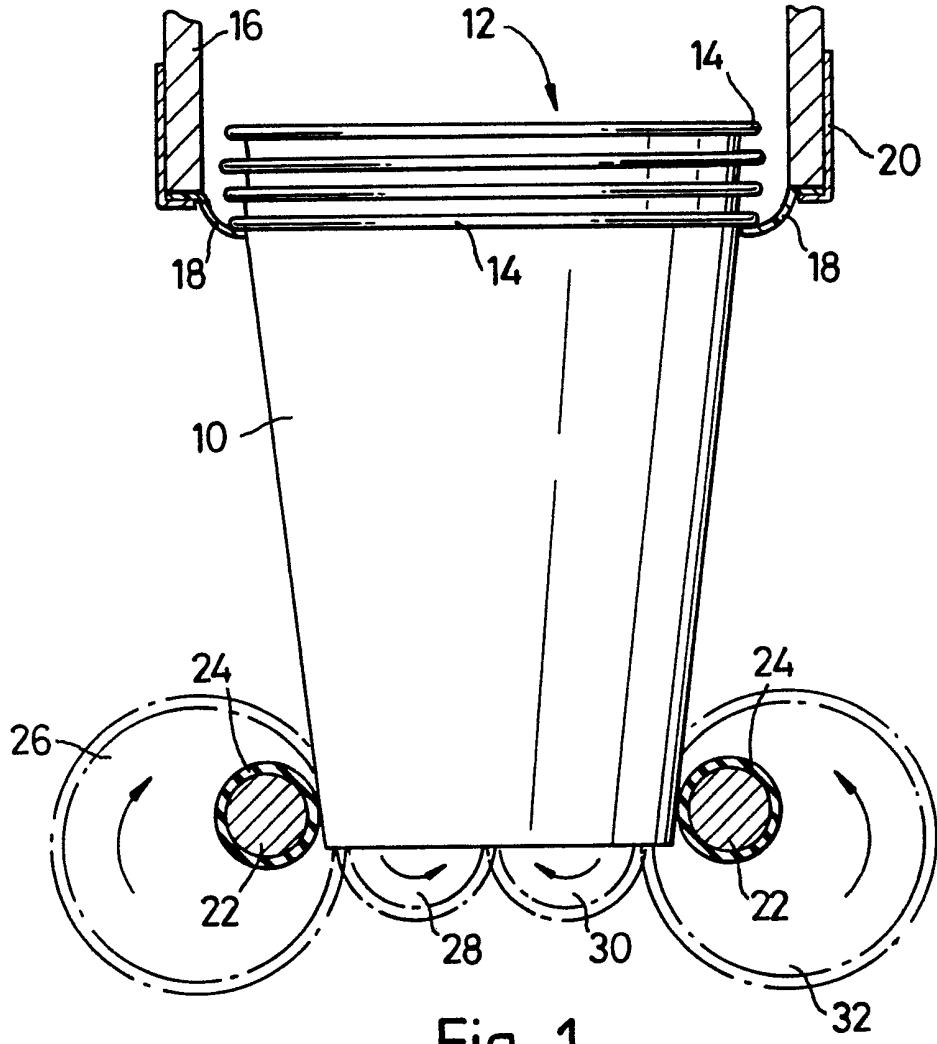


Fig. 1

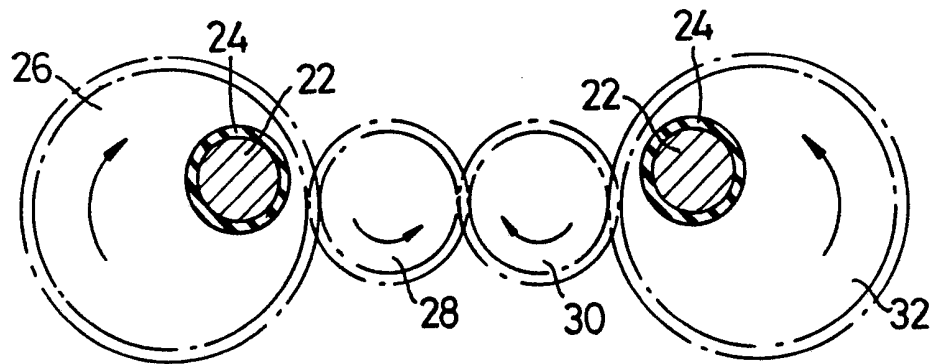


Fig. 2

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## CONTAINER DISPENSING DEVICE

This invention is concerned with a container dispensing device operable to dispense containers one-at-a-time from the bottom of a stack of nested containers each of which has an external  
5 horizontally-extending projection, for example a lip.

In various applications, the requirement exists to be able to dispense containers one-at-a-time from the bottom of a stack of nested containers. For example, in a drinks dispensing machine, containers are stored in the  
10 machine in the compact form of a stack of nested containers and are dispensed one-at-a-time to a filling station to be filled with drink. In one existing container dispensing device, the lip of the lowermost container in a stack is supported on a number of snail  
15 cams distributed around the lip. The cams are all mounted on gears which are turnable about vertical axes and are meshed with an annular gear surrounding the stack so that when the annular gear is turned about the longitudinal axis of the stack, the snail cams all turn  
20 simultaneously. The action of turning the snail cams releases the lip of the lowermost container in the stack so that it falls away from the stack and introduces the snail cams beneath the lip of the lowermost but one container. This known container dispensing device is  
25 complicated in construction.

United States Patent Specification No. 4327843 describes a container dispensing device in which a pair of coacting jaws which conform to the contour of a container are used as pulling means to remove containers  
30 from a stack which is supported by a plurality of

resiliently-biased fingers. The jaws grip the lowermost container and pull it away from the stack in a direction downwardly and to the side of the stack causing the fingers to be displaced. The fingers release the  
5 lowermost container and then return to their position to support the stack by supporting the next container. This device, since it does not pull the lowermost container directly downwardly, tilts the container so that the container dispensing is unreliable.

10 It is an object of the present invention to provide a simple and reliable container dispensing device of the type referred to.

The invention provides a container dispensing device operable to dispense containers one-at-a-time from the  
15 bottom of a stack of nested containers each of which has an external horizontally-extending projection, for example a lip, the device comprising at least one resiliently deformable support member arranged when in a supporting condition thereof to support the stack by  
20 supporting the projection of the lowermost container in the stack, the or each support member being resiliently deformable or displaceable so that, when the lowermost container is pulled downwardly, pressure from the projection of the lowermost container causes the or each  
25 support member to depart from its supporting condition allowing the lowermost container to fall away from the stack whereupon the or each member returns to its supporting condition in which it supports the projection of the next container and hence the stack, the dispensing  
30 device also comprising pulling means operable to pull the lowermost container directly downwardly with respect to the stack.

The container dispensing device described in the last preceding paragraph avoids the complication of the aforementioned known dispensing devices and is reliable in operation.

5            Preferably the device comprises one resiliently deformable member which is annular and within which the lowermost container is received. This arrangement allows the whole of the projection of a circular container to be supported in a simple manner. The  
10 resiliently deformable member or members may suitably be made of neoprene. Alternatively, there may be a plurality of resiliently deformable members distributed around the lowermost container, preferably uniformly distributed.

15            The pulling means may comprise container gripping members mounted for movement into or out of gripping contact with the lowermost container and for downward movement while in gripping contact with the lowermost  
20 container, the gripping members being arranged to move so that throughout their movement, they are symmetrically arranged about said stack.

            The pulling means may comprise two opposed container gripping members arranged symmetrically about the stack and movable to grip the lowermost container on opposite  
25 sides thereof, or in the case of a circular container at diametrically-opposite points thereon, and moving means operable to move the gripping members into or out of gripping contact with the container and, while they are in gripping contact to move the gripping members  
30 downwardly. The container gripping members may be movable simultaneously around paths which are circular about horizontal axes so that they approach the lowermost

container from opposite sides, engage it, carry it downwardly with them, and then release it. Conveniently, the gripping members may be eccentrically mounted on gears arranged to turn about said horizontal axes.

5 Conveniently, the gears may be intermeshed with further gears and a single motor may drive both gripping members. The gripping members preferably have a resilient surface which engages the lowermost container.

10 There now follows a detailed description, to be read with reference to the accompanying drawings of a container dispensing device which is illustrative of the invention. It is to be understood that the illustrative container dispensing device has been selected by way of example and not of limitation of the invention.

15 In the drawings:

Figure 1 is a diagrammatic side view of the illustrative container dispensing device; and

Figure 2 is a diagrammatic side view of a gear train of the illustrative container dispensing device.

20 The illustrative container dispensing device is operable to dispense containers in the form of cups 10 one-at-a-time from the bottom of a stack 12 of nested containers. The cups are of well-known type having a circular horizontal cross-section and tapering downwardly  
25 to a base which is of smaller diameter than an open upper end. Each cup 10 has an external horizontally-extending projection in the form of an annular lip 14 projecting from the upper end of the cup. The device comprises a vertically-extending acrylic tube 16 which provides a  
30 guide for the stack 12. The device also comprises a

neoprene ring 18 which provides a resiliently deformable member which is annular and within which the lowermost container 10 in the stack 12 is received. The neoprene ring 18 is clamped between a stainless steel clamp ring 20 and a bottom surface of the tube 16. The stainless steel clamp ring 20 has a vertically-extending portion which embraces an outer surface of a lower portion of the tube 16 and a horizontally extending portion which extends beneath the ring 18 and clamps it to the bottom of the tube 16. The ring 18 provides a resiliently deformable support member arranged when in a supporting condition thereof (shown in Figure 1) to support the stack 12 by supporting the lip 14 of the lowermost container 10 in the stack.

As shown in Figure 1, the ring 18 is deformed downwardly by the weight of the stack 12 but has sufficient strength to prevent the weight of the stack 12 from deforming it sufficiently to cause the lowermost container 10 to pass through the ring 18. However, the ring 18 is resiliently deformable so that, upon application of sufficient directly downward force to the lowermost container, i.e. when the lowermost container is pulled downwardly, pressure from the lip 14 of the lowermost container causes the ring 18 to depart from its supporting condition by deformation allowing the lowermost container to fall away from the stack 12. After the lowermost container 10 has fallen away from the stack 12, the release of the pressure between the lip 14 and the ring 18 allows the ring to return to its supporting condition in which it supports the lip 14 of the next container and hence the stack 12.

The illustrative dispensing device also comprises pulling means operable to pull the lowermost container 10

directly downwardly with respect to the stack 12 by  
applying the aforementioned downwardly-directed force to  
the lowermost container 10. The pulling means comprises  
two opposed container gripping members in the form of  
5 horizontally-extending shafts 22 which are provided with  
rubber coatings 24 providing a resilient surface which  
engages the lowermost container 10. The shafts 22 are  
mounted for movement into or out of gripping contact with  
the lowermost container and for downward movement while  
10 in gripping contact. The shafts 22 are arranged so that,  
throughout their movement, they are symmetrically  
arranged about the stack 12, i.e. at equal distances from  
a central vertical axis of the stack 12. The shafts 22  
extend parallel to one another on opposite sides of the  
15 lowermost container 10. The shafts 22 are arranged to  
grip the lowermost container 10 at diametrically-opposite  
points thereon by being moved around circular paths which  
bring them into contact with the wall of the container 10  
near the bottom of the container. Continued movement  
20 around the circular paths then pulls the lowermost  
container directly downwards and then causes the  
container to be released.

The pulling means also comprises moving means  
operable to move the shafts 22 into or out of gripping  
25 contact with the lowermost container 10 and, while they  
are in gripping contact, to move the shafts 22  
downwardly. The moving means comprises an electric motor  
(not shown) operable to drive a gear 28 mounted to rotate  
about a horizontal axis. The gear 28 is meshed with and  
30 drives a gear 26 on which one of the shafts 22 is  
eccentrically mounted. The gear 28 is also meshed with  
an idler gear 30 which is in turn meshed with a gear 32  
on which the other shaft 22 is eccentrically mounted.  
Thus, the shafts 22 are both movable simultaneously



around paths which are circular about horizontal axes  
(the axes about which the gears 26 and 32 turn) so that  
the shafts approach the lowermost container 10 from  
opposite sides, engage it, carry it downwardly with them,  
5 and then release it. The container then falls between  
the shafts 22 which, at their greatest separation, are  
separated by more than the maximum diameter of a  
container 10. Figure 1 shows the shafts engaging the  
wall of the container 10 and in continued movement of the  
10 gears 26 and 32 (indicated by the arrows in Figures 1 and  
2) the shafts 22 will compress the wall of the container  
10 before releasing it. Thus, the shafts grip the  
container 10, pull it directly downwardly so that the  
ring 18 releases the lip 14 thereof and release the  
15 container so that it falls away from the stack 12. Thus  
the lowermost container 10 is dispensed and a further  
operation of the motor to turn the gears 26 and 32  
through one complete revolution causes a further  
container to be dispensed.

20 In an alternative arrangement, the gears 28 and 30  
are omitted, the diameter of the gears 26 and 32 is  
increased so that they mesh with one another, and the  
gear 26 or the gear 32 is driven. However, the use of  
the gears 28 and 30 enables the height of the assembly to  
25 be reduced.

## CLAIMS

1. A container dispensing device operable to dispense containers one-at-a-time from the bottom of a stack of nested containers each of which has an external horizontally-extending projection, for example a lip, the device comprising at least one resiliently deformable support member arranged when in a supporting condition thereof to support the stack by supporting the projection of the lowermost container in the stack, the or each support member being resiliently deformable or displaceable so that, when the lowermost container is pulled downwardly, pressure from the projection of the lowermost container causes the or each support member to depart from its supporting condition allowing the lowermost container to fall away from the stack whereupon the or each member returns to its supporting condition in which it supports the projection of the next container and hence the stack, the dispensing device also comprising pulling means operable to pull the lowermost container directly downwardly with respect to the stack.
2. A dispensing device according to Claim 1, wherein the device comprises one resiliently deformable member which is annular and within which the lowermost container is received.
3. A dispensing device according to Claim 2, wherein the resiliently deformable member is made of neoprene.
4. A dispensing device according to Claim 1, wherein there are a plurality of resiliently deformable members distributed around the lowermost container.

5. A dispensing device according to any one of Claims 1 to 4, wherein the pulling means comprises container gripping members mounted for movement into or out of gripping contact with the lowermost container and for downward movement while in gripping contact with the lowermost container, the gripping members being arranged to move so that throughout their movement, they are symmetrically arranged about said stack.

6. A dispensing device according to any one of Claims 1 to 5, wherein the pulling means comprises two opposed container gripping members arranged symmetrically about the stack and movable to grip the lowermost container on opposite sides thereof, or in the case of a circular container at diametrically-opposite points thereon and moving means operable to move the gripping members into or out of gripping contact with the container and, while they are in gripping contact, to move the gripping members downwardly.

7. A dispensing device according to Claim 6, wherein the container gripping members are movable simultaneously around paths which are circular about horizontal axes so that they approach the lowermost container from opposite sides, engage it, carry it downwardly with them, and then release it.

8. A dispensing device according to Claim 7, wherein the gripping members are eccentrically mounted on gears arranged to turn about said horizontal axes.

9. A dispensing device according to Claim 8, wherein the gears are intermeshed with further gears and a single motor drives both gripping members.

10. A dispensing device according to any one of Claims 5 to 9, wherein the gripping members have a resilient surface which engages the lowermost container.

5 11. A container dispensing device substantially as hereinbefore described with reference to and as shown in the accompanying drawings.