Dec. 17, 1968 R. H. BEBB 3,416,694

BOTTLE CRATES

Filed Aug. 4, 1967 3 Sheets-Sheet 1

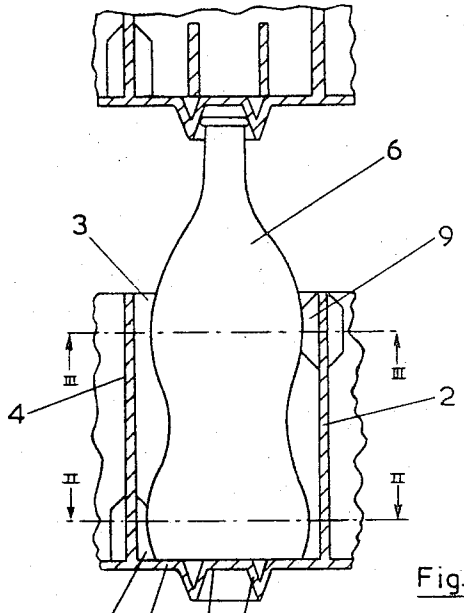



Fig. 1

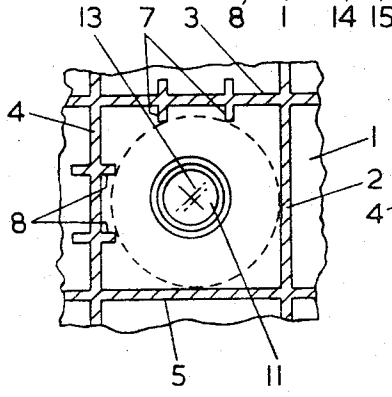



Fig. 2

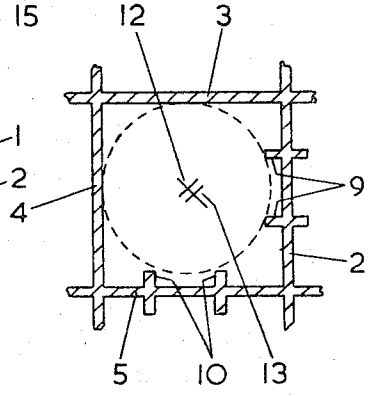



Fig. 3

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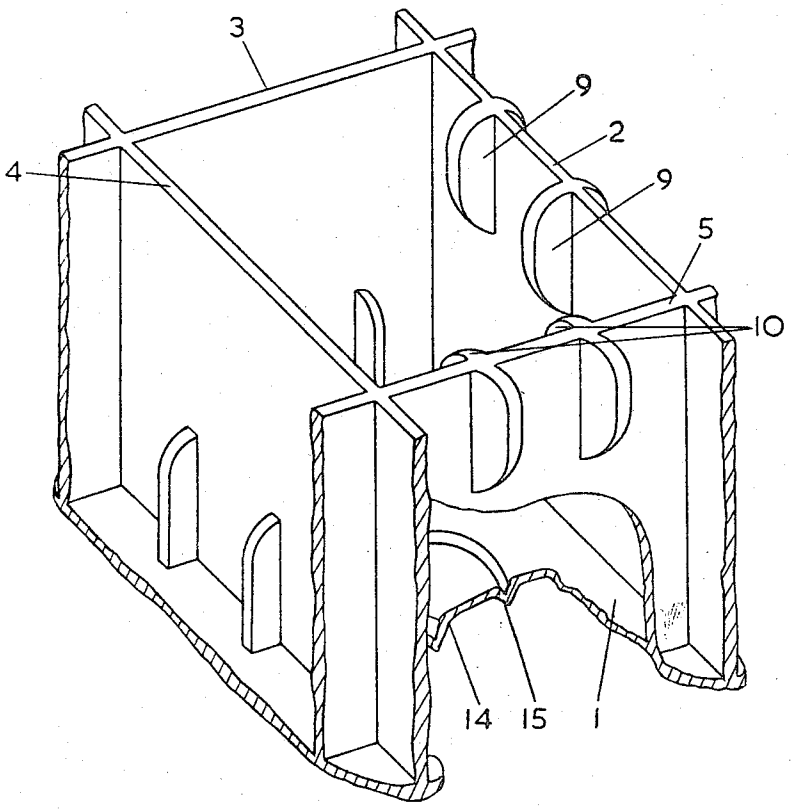



Fig. 4

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BOTTLE CRATES

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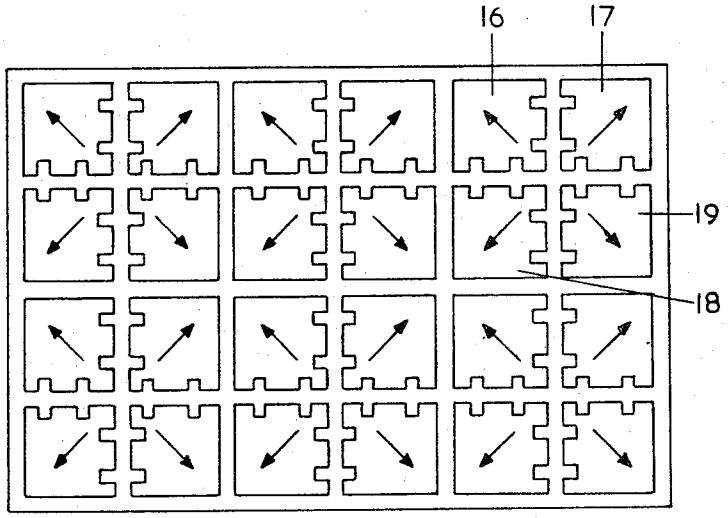



Fig. 5

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3,416,694

# BOTTLE CRATES

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8 Claims. (Cl. 220—21)

## ABSTRACT OF THE DISCLOSURE

"Half-height" bottle crates in which the centres of the spaces provided for receipt of the bottles are off-set at the upper part of the crate relative to the lower part of the crate.

This invention relates to improvements in or relating to bottle crates of the type providing a plurality of longitudinal and transverse rows of cells each adapted to accommodate only part of the height of a bottle, so that when stacked in the loaded condition the base of one crate rests on the bottles in the cells of the crate beneath and not on the crate itself.

The cells aforesaid are loaded with bottles either in successive rows or simultaneously, each bottle being gripped at the crown of the neck and kept substantially upright (with or without the aid of dependent guide fingers or other means) during its descent towards and partly into the associated cell, at which point the gripper means are released.

To facilitate loading and to accommodate the guide means aforesaid, when such are used, each cell of the crate is made oversize for the associated bottle and by an amount substantially greater than the working clearance necessary to provide for the inevitable slight departure of individual bottles from a standard diameter.

The existence of this large radial clearance around them has hitherto allowed the bottles to sway in their respective cells during handling or transport of the crate, and this, in addition to the noise produced, may well result in serious instability of a second crate rested upon the crowns or caps of the bottles.

With a view to stabilising the bottles in their oversize cells when a plurality of loaded crates are stacked one upon another, it is a known practice to provide each crate with underside channels adapted to receive the tops of two adjacent rows of bottles in the crate below, the sides of each such channel being mutually convergent so that said rows are tilted inwards in such manner as to take up the radial clearance around the bottles.

The object of the present invention is to provide an improved construction of crate which, without hindering the insertion of bottles by known mechanical means, will enable such bottles to be effectively stabilised in their respective cells whilst standing substantially upright in the latter.

According to this invention, I provide a bottle crate of the type referred to, in which each cell is so designed that the clearance openings which are provided in the cell for reception of the associated bottle at upper and lower levels of the cell have their effective centres off-set to such an extent that the bottle, when urged towards an upright position by a supported load, will be automatically locked against lateral sway.

Preferably the cellular structure is so arranged that the horizontal components of the side-thrusts acting on the members of any group of symmetrically-placed bottles will be mutually opposed both lengthwise and transversely of such structure, the optimum stability under load occurring when all the cells of the crate can be considered to be arranged in a plurality of such groups, each group consisting of four juxtaposed cells having their centres at the corners of a square. The bases of the cells may have underside recesses adapted to receive the tops of bottles in lower crate, but so shaped as to augment the self-stabilising action of any symmetrical group of bottles.



In its simplest form, the crate may have plain symmetrical cells each providing the necessary working clearance for a bottle and having their axes so inclined to the top and bottom of the crate that each bottle, when fully inserted, will stand substantially perpendicularly to the base of the crate with its periphery engaging the upper and lower portions of the cell wall at points which are diametrically opposite to one another in a plane diagonal to the crate or to any square group of four juxtaposed cells therefor.

However, to reduce the tare weight of the crate and to economise material (for example, when the crate is injection-moulded from a synthetic plastic), it is preferred to make the cells of generally square section and defined by relatively thin longitudinal and transverse walls, a convenient arrangement being four rows of six cells each.

In this form of construction, when the walls of the cells are vertical with respect to the base of the crate, some protuberance or protuberances is necessary on each of the opposite walls of each cell, on each pair of opposite walls, one protuberance or plurality of protuberances on one wall being toward the upper part of the cell and the protuberance or protuberances on the opposite wall being near the bottom of the cell so that the centre of the aperture for receipt of a bottle is off-set at the top of the crate in relation to that at the bottom of the cell.

The protuberance or protuberances may take the form of a single projection on the wall of the cell which may extend vertically with respect to the cell or may be a ridge formed transversely across the wall of the cell.

If a vertical ridge or plurality of ridges are used then these may extend over only a small length of the cell or may be tapered and flared into the wall of the cell so that while extending for substantially the whole height of the cell, the ridge or ridges protrudes further into the cell towards the top of the cell than it does at the bottom of the cell on one wall while the corresponding ridge or ridges on the opposite wall of the cell protrudes further into the cell at the base of the cell than at the top of the cell.

In a particularly preferred arrangement two projections in the form of short vertical laterally spaced ridges are formed on each wall of the cell.

Thus two adjacent walls of each cell are each formed at the top with two laterally-spaced internal lugs or short vertical ribs, the appropriate working clearance for easy entry of the associated bottle being provided between these projections and the other two walls, which are themselves formed with similar projections adjacent the bottom of the cell.

The extent of each projection is such that when a bottle, having necessarily entered the cell at a slight inclination to the vertical, is brought to an upright position by a load (such as a second crate) supported on its crown or cap, it will stand on the cell base with diametrically-opposite parts of its periphery pressed against the upper and lower projections respectively. In other words, the righting action of the supported weight subjects the bottle to a side-thrust in a plane diagonal to the cells' cross-section and effectively prevents the bottle from swaying in that plane.

The projections aforesaid are preferably so arranged in the various cells that alternate cells in each longitudinal and transverse row are mirror images of the others in plan view.

The optimum condition is achieved, in the case of a fully-loaded crate, when the structure provides several complete groups of four juxtaposed cells having their centres at the corners of a square; the convenient 24-cell crate aforesaid having three such groups in its length and two in its width, and when the upper projections of each four cells are arranged adjacent the central junction of their dividing walls, which thus effectively resist the side-thrusts due to the supported load and prevent the group of bottles from swaying either longitudinally or transversely of the crate.

In an alternative arrangement, the upper projections are formed at the outer, instead of the inner, corners of each group of four cells, which reverses the side-thrusts exerted by the bottles, but in this case the exterior walls of the cellular structure may require to be thickened or moulded with reinforcing ribs from top to bottom, the locating lugs being enlargements of such ribs.

Whichever arrangement is used, the self-stabilising action of a load supported on the bottles may be enhanced by forming the underside of the crate, beneath each cell, with a recess adapted to receive the crown or cap of the correspondingly placed bottle in a lower crate, this recess being upwardly convergent so that, when two crates are stacked one upon the other, the walls of the base recesses in the upper crate will resist the respective side-thrusts of the bottles in the lower crate.

When a crate contains only a partial complement of bottles, as may occur when 'empties' are being returned, effective stabilisation of a second crate stacked thereon will be achieved so long as bottles are present in four symmetrically-disposed cells at or adjacent the corners of the lower crate, any other bottles being stabilised diagonally of the cells in one or both directions according to their relative arrangement, which may be quite haphazard.

Since the bottles, although under constant side-thrust, stand coaxial with their respective cells, an empty crate can be stacked inverted upon one wholly or partly filled, and preferably the top and bottom of the crate are designed so that empty crates may be stacked in upright condition.

The invention is illustrated by reference to the accompanying drawings wherein:

FIGURE 1 is a cross-sectional view of part of a crate showing a bottle located in a cell of the crate and part of a crate forming part of the next layer above;

FIGURE 2 is a section along along the line II—II of FIGURE 1 but omitting the bottle while

FIGURE 3 is a section along the line III—III of FIGURE 1 omitting the bottle and the part of the crate forming the next layer above;

FIGURE 4 is a cut-away perspective view of part of a crate of the type shown in FIGURE 1 and

FIGURE 5 is a diagrammatic plan view of a whole crate of the type shown in FIGURE 1.

The crate is injection moulded in one piece from polypropylene and consists of 24 cells each of which can receive a bottle. Each cell is square in plan and has a base **1** and four walls **2**, **3**, **4** and **5**. A bottle **6** is shown located in the cell depicted in FIGURE 1.

A pair of ridges **7**, **8** are formed in the lower part of each of adjacent walls **3**, **4** of the cell, the ridges being perpendicular to the base **1**, and a pair of ridges **9**, **10** are formed in the upper part of each of adjacent walls **2**, **5** of the cell, these ridges **9**, **10** also being perpendicular to the base **1**.

The distance between wall **2** and the ends of ridges **8** and between wall **5** and the ends of ridges **7** is sufficient to accommodate a bottle leaving adequate clearance for easy insertion of the bottle and also to accommodate any variations in bottle diameter from a standard size. Likewise the distances between wall **3** and the ends of ridges **10** and between wall **4** and the ends of ridges **9** is sufficient to accommodate a bottle leaving adequate clearance and to accommodate variations in bottle diameter.



Thus the projections in the upper half of the cell are formed on opposite walls to those on the lower half of the walls of the cell, and so the centre of the space left between the ends of the ridges and the opposing walls in the upper half of the cell is off-set from that of the lower half of the cell. These centres are depicted at **11** and **12** being the centres of the inscribed dotted circles shown while the centre of the cell is depicted at **13** being the point of intersection of the diagonals of the cell (see FIGURES 2 and 3).

Thus when a bottle is inserted in the cell adequate clearance all round the bottle only occurs if it is tilted slightly from the vertical. However, by the effect of gravity, the bottle tends to assume a position as near vertical as its size will allow so that the base of the bottle abuts against ridges **7** and **8** and the upper part of the bottle abuts against ridges **9** and **10**, leaving gaps between the bottle and walls **2** and **5** at the bottom of the cell and between the bottle and walls **3** and **4** at the top of the cell.

When a load, for example another crate, is placed on top of the bottle in the cell, it is forced more firmly towards the vertical position and thus held more firmly against ridges **7** and **8** and ridges **9** and **10**.

In the underside of the base **1** of the cell a recess having a form of a truncated cone **14** is formed as part of the moulding. The tapered sides **15** of this recess engage with the top of the bottle in the cell immediately below and so the upper crate is held more securely in position with regard to the lower crate.

In FIGURE 5 the whole crate is shown diagrammatically in plan view. It is seen that the crate has 4 rows of 6 cells and in FIGURE 5 only the projections in the upper part of the cells are shown. These projections are shown exaggerated in length for sake of clarity. The arrows indicate the direction in which the centre of the upper part of the cell is off-set with regard to the centre of the lower part of the cell so that, considering say the 4 cells **16**, **17**, **18** and **19** forming a square in the upper right-hand corner of the crate, bottles in those cells tend to be inclined from the vertical so that the tops of the bottles tend to be wider apart than the centres of the bottoms of the bottles. In this way a superimposed crate locks the bottles rigidly, minimising any swaying movement between superimposed crates caused by loose fitting bottles.

While this is the preferred disposition of the inclinations of the bottles, alternative arrangements are possible, giving similar results. Thus in FIGURE 5 the second and third lines of 6 cells may be interchanged so that the bottles in both of two adjacent lines of 6 cells tend to be inclined outwardly in one direction while those in the other two adjacent lines of 6 cells tend to be inclined outwardly in the opposite direction. Likewise other arrangements may be used.

I claim:

**1.** A bottle crate of the type providing a plurality of longitudinal and transverse rows of cells, each cell being adapted to accommodate only part of the height of a bottle, in which each cell is defined by at least an upper and a lower locating means for contacting portions of a bottle placed in an upright position within the cell, said upper locating means being positioned to provide an upper clearance opening through which a bottle may be inserted into the cell, and said lower locating means being positioned to provide a lower clearance space into which the lower part of the bottle may be received, the effective centers of said clearance opening and said clearance space being offset from one another to such an extent that a bottle, when urged to an upright position by a supported load, will be automatically locked against lateral sway.

**2.** The bottle crate of claim **1** wherein the cells are arranged in groups of four juxtaposed cells with each cell of a group having its said effective center of its upper clearance opening at a corner of a first imaginary square which connects all effective centers of all cells of a group, and with each cell of a group having its effective center

of its lower clearance space at a corner of a second imaginary square which is of a different size than said first imaginary square and which has its center vertically aligned with the center of the first imaginary square.

3. The bottle crate of claim 1 in which each cell has a generally square cross section and is defined by longitudinal and transverse walls, and wherein at least one projection means is formed on each wall so as to protrude towards the cell interior with one pair of adjacent cell walls having at least one projection means which protrudes further into the cell at an upper part of the wall than at a lower part of the wall, and with an opposite pair of adjacent walls having at least one projection means which protrudes further into the cell at a lower part of the wall than at the upper part of the wall.

4. The bottle crate of claim 3 wherein said projection means are located in substantially central positions along each wall section.

5. A bottle crate as claimed in claim 4 in which each of said at least one projection means comprises a pair of laterally spaced projections.



6. A bottle crate as claimed in claim 1 in which on the underside of the base of the crate underneath each cell, means are provided to engage with the top of a bottle in a cell of a second crate stacked immediately below.

7. A bottle crate as claimed in claim 6 in which said means consists of a recess having tapered sides.

8. A bottle crate as claimed in claim 1 which consists of four longitudinal rows each of six cells' length.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,619,251 | 11/1952 | Schmidt | 220—21 |
| 2,935,222 | 5/1960 | O'Connell | 220—21 |
| 3,151,761 | 10/1964 | Cloyd | 220—21 |
| 3,261,495 | 7/1966 | Beesley | 220—21 |
| 3,341,054 | 9/1967 | Hirota | 220—21 |
| 3,353,704 | 11/1967 | Belcher | 220—21 |


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