Jan. 8, 1963 F. J. REILLY 3,072,281

COLLAPSIBLE CRATE

Filed March 9, 1960 2 Sheets-Sheet 1

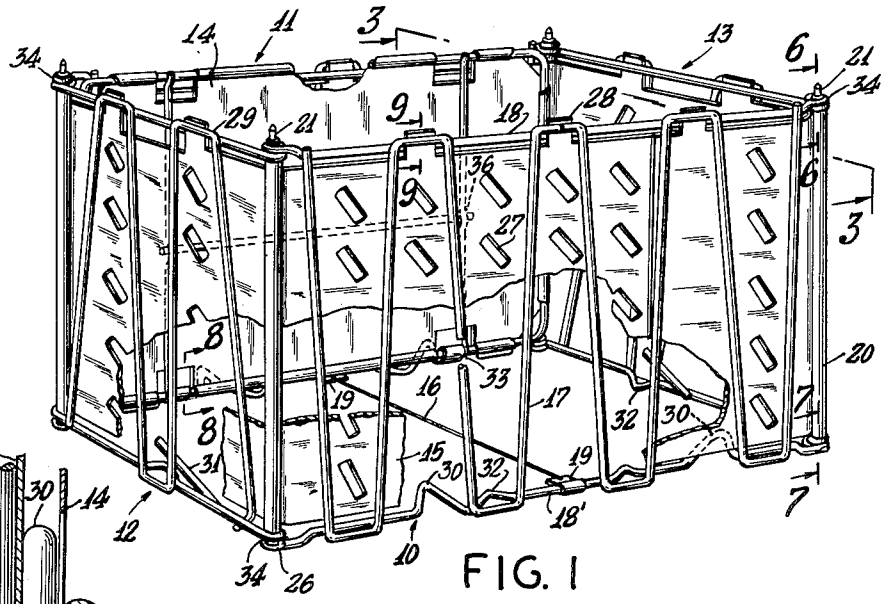


FIG. 1

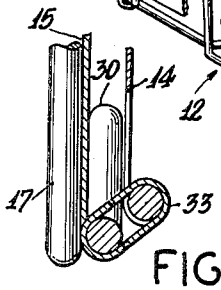
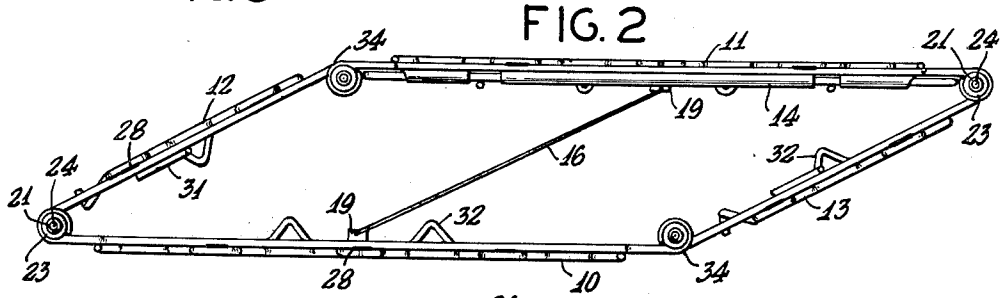


FIG. 8

FIG. 2



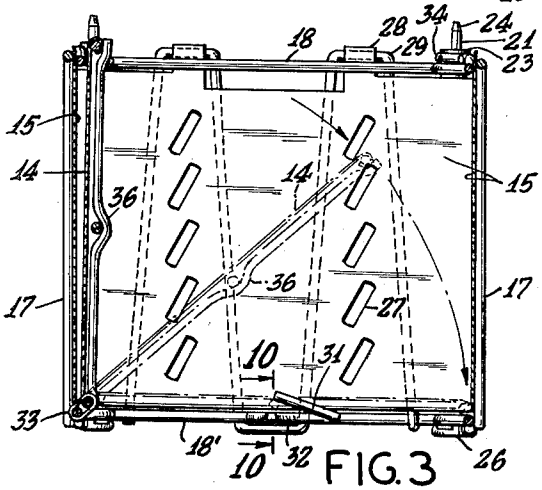


FIG. 3

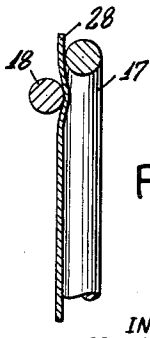


FIG. 9

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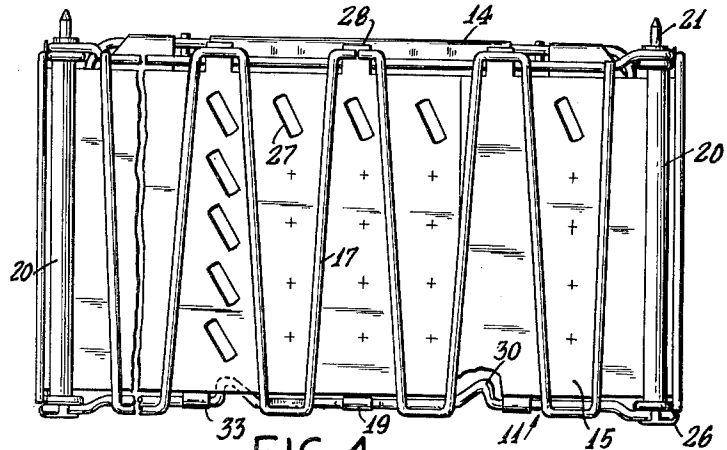


FIG. 4

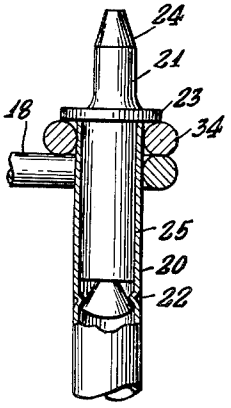


FIG. 6

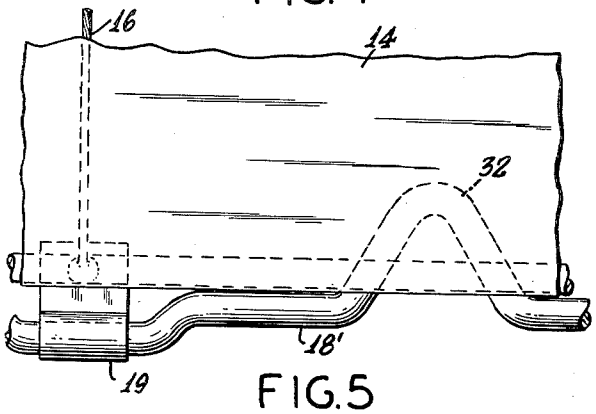


FIG. 5

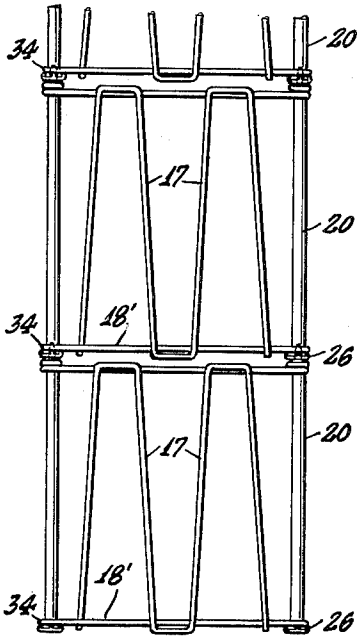


FIG. 11

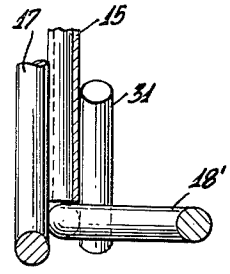


FIG. 10

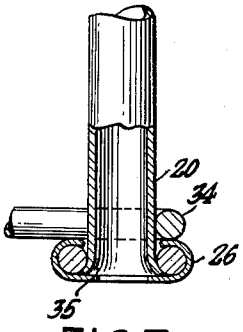


FIG. 7

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COLLAPSIBLE CRATE

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5 Claims. (Cl. 220—6)

This invention relates to crates and particularly to an improved collapsible crate especially useful for packing perishable commodities, such as oranges and tomatoes.

When shipping or storing oranges, for example, it is common practice to refrigerate them to reduce spoilage. The crates heretofore used for packing oranges are of wood or other fibrous material. They are poorly adapted for the refrigerating operation, particularly when it involves circulating cold air through a freight car containing the crated oranges to cool them prior to shipping, as is frequently the case. The walls of such crates have a high ratio of impervious to perforate areas, resulting in poor circulation of the cooling air through the contents.

The prior fibrous crates are also objectionable because they are not sufficiently rigid to protect their contents against damage due to stacking of the crates. The lower crates in the stack are distorted by the weight of the upper crates, so that the contents of the lower crates are subjected to undue pressure resulting in spoilage. The prior crates in most instances cannot be re-used economically after their initial shipment, because their bulk makes it too costly to return them to the point of origin for re-packing. In addition, the fibrous material is subject to fungus rot or other types of bacteria infestation.

The principal object of the present invention is to provide a crate which overcomes these disadvantages.

A crate made according to the invention comprises vertical sections and a bottom section. The vertical sections are constructed of substantially rigid metal bars. Pivot means connect each vertical section to two adjoining sections forming an endless collapsible enclosure. An edge portion of the bottom section is connected by hinges to the lower edge portion of one of the vertical sections permitting upward swinging of the bottom into substantial parallelism with this one section, so that the enclosure can be collapsed. Normally, however, the bottom is in a lowered position in the enclosure, preventing such collapse. The crate has a disposable liner, preferably of treated paper.

In the preferred form of the new crate, the vertical sections consist of horizontal and vertical metal bars. The side edges of each vertical section are pivotally connected by vertical tubes. The crates interlock preventing substantial relative movement of the crates when stacked. For interlocking the top of each vertical edge tube has a protruding tip and its bottom portion has a cavity.

For a better understanding of the invention, reference may be had to the accompanying drawings, in which

FIG. 1 is a perspective partially cut-away view of a preferred form of the new crate;

FIG. 2 is a top view of the crate in its semifolded position;

FIG. 3 is a side view of the crate, showing the bottom section in its closed and (in dotted outline) open positions, taken along section 3—3 of FIG. 1;

FIG. 4 is a back view of the crate;

FIG. 5 is a partial plan view of the bottom of the crate with its bottom section in the closed position;

FIG. 6 is a sectional partial view of a top corner of the crate, showing its protruding tip, taken along section 6—6 of FIG. 1;

FIG. 7 is a partial sectional view of a bottom corner of the crate, showing a closed foot portion, taken along section 7—7 of FIG. 1;

FIG. 8 is a partial view of the hinge mechanism of the crate taken along section 8—8 of FIG. 1;

FIG. 9 is a partial sectional top view of a flap pocket taken along sections 9—9 of FIG. 1;

FIG. 10 is a partial sectional view, showing a liner holder, taken along section 10—10 of FIG. 3; and

FIG. 11 is a side view of a plurality of crates stacked one on top of the other and forming a master crate.

In the drawings, FIG. 1 illustrates a preferred embodiment of the invention in which a collapsible enclosure is formed by four vertical sections. The vertical sections are front section 10, back section 11, left side section 12 and right side section 13. Bottom section 14 is joined to back section 11 at its lower edge by hinge means 33.

The enclosure formed by the vertical sections in collapsed by swinging bottom 14 (see FIG. 3) from its lowered position near the bottom edge of all the vertical sections to its raised position in parallelism with back section 11. Front section 10 is then moved endwise to cause left section 12 and right sections 13 to approach parallelism with the front section 10 and back section 11. When the crate is completely collapsed, left side section 12 and front section 10 lie substantially flat against each other and bottom 14 (which has been folded against the back section 11) is folded between back section 11, front section 10 and right side section 13. In this manner a number of the collapsed crates can be stacked in a compact space for storage or shipment.

Bottom 14 is stopped by rest portions 32 provided along the lower edges of the vertical walls. Bottom section 14 therefore can fall only sufficiently far so as to form the crate and will not continue its rotation outside the area of the enclosure formed by the vertical walls.

The vertical sections are composed of vertical bars 17, top lateral bars 18 and bottom lateral bars 18'. Preferably these bars are of rigid metal and are joined at their points of connection by welding. In one embodiment the bars are of steel and the vertical sections after assembly are spray-painted with a vinyl base paint to resist corrosion. As shown in FIG. 9 the vertical sections form loops, for flap pockets, rising above the top lateral bar 18 and protruding below the bottom lateral bar 18'. These loops permit insertion of liner flaps 28. Lateral bars 18 and 18' at their ends form circular hook portions 34. These hook portions are positioned about vertical edge tubes 20 forming pivot means for the vertical sections.

Edge tube 20 is of tubular metal and has crimp 22 at its top. Protruding tip 21, at the top of tube 20, consists of tip portion 24, annular flange 23, and inner body portion 25. Inner body portion 25 is adapted to fit within a cavity at the top of a corresponding tube 20 in another similar crate. Tip 21 is prevented from dropping within tube 20 by its flange 23 which rests upon hook portion 34 of lateral bar 18. In order to strengthen the crate against bowing, when loaded, metal wire stay 16 is attached from the center of the bottom edge of front section 10 to the center of the bottom edge of back section 11. Stay 16 is affixed to these edges by stay holders 19.

Hinge means 33 for pivoting bottom section 14 comprises a plurality of metal straps fastened about lateral bar 18' of back section 11 and an edge bar of bottom 14 (see FIG. 8). Bottom section 14 might comprise a screen or other perforated sheet, but preferably comprises a solid sheet of aluminum backed by support rods 36.

Liner 14 provides an inside wall of the crate. It is perforated with openings 27 and constructed of heavy chemically treated paper or flexible chemically treated lightweight cardboard. The chemical treatment of liner 14 should include fungus retarding agents. Liner 14 may be economically produced by continuous die stamping rolls of heavy paper and cutting the paper in lengths equivalent to the inside circumference of the enclosure. Liner flaps 28, which are part of liner 14 and spaced at

regular intervals along its top, may be die cut in the same continuous operation with openings 27. Liner 14 is removably maintained against the inner walls of the enclosure by insertion of liner flaps 28 within the top flap pockets (see FIG. 9). At the bottom of the crate liner 14 is maintained substantially flush against the vertical sections by side liner retainer bars 31 on the sides and by liner retainer bar loops 32 at the front and back.

FIG. 7 illustrates a foot cap for use with crates of this invention. This cap is composed of an annular piece of spring metal having a protruding lip portion to engage lower lateral bar 18' hook portion 34. The lower edge of tube 20 is thereby covered enabling the crate to slide easily along a floor.

A plurality of the crates, stacked one on top of the other, provides a master crate by swinging the bottom of one or more upper crates into its raised position against their corresponding back sections 11, as indicated in FIG. 11. A master crate can be formed in this way having an unrestricted depth equal to the overall height of at least two superimposed crates. In this case each upper crate is positively held against collapsing in spite of the fact that its bottom section 14 has been raised into substantial parallelism with the back section 11. Such collapsing is prevented by the upper tips 21 protruding into tube cavities 35. These interlocking means between the upper and lower crates serve to prevent collapsing of the upper crate, because of lowered bottom section 14 of the bottom crate in the stack.

When the new crate of this invention is filled with perishable commodities, such as oranges, the contents are readily cooled for shipping by circulation of refrigerated air through the crate. The new crate has a high ratio of perforated area to impervious area enabling rapid heat transfer.

Crates made according to the invention are readily stacked in a freight car or other vehicle for transporting the perishable commodities. By interlocking of each crate with a similar crate stacked thereon, as previously described, the crates are held against any substantial shifting of one crate relative to the other during transit. The crates are strong and durable and yet of a light weight and inexpensive construction. Because of their strength and rigidity, the contents of a lower crate in a stack of crates are not damaged due to pressure from the upper or surrounding crates. The new crates thus avoid the inherent disadvantage of the usual prior crates for transporting oranges, and the like, wherein the weight of the entire shipment is supported by the product. The new crate can be readily collapsed after the contents have been unloaded at the point of destination, so that the crates for an entire shipment can be returned at low cost in a compact assembly to the point of origin for re-use.

Modifications may be made in the described embodiment within the scope of the invention and the subjoined claims.

I claim:

1. A collapsible crate for perishable articles which comprises a bottom section, four rigid vertical sections each including upper and lower horizontal bars and generally vertical bars interconnected to said horizontal bars, four vertical corner posts releasably connected to said sections and each pivotally interconnecting two adjoining vertical sections, whereby said vertical sections are disposed in two pairs of opposed vertical sections, the top portions of certain adjacent ones of said vertical bars of at least two opposed vertical sections being integrally connected together by horizontally extending elements which lie in a plane above the plane of the upper horizontal bars of said vertical sections and said elements together with said top portions and said upper horizontal bars defining horizontal slits forming flap pockets, hinge means connecting the bottom section to the lower horizontal bar of one vertical section and permitting the bottom section to swing upward into substantial parallelism with said one vertical section, said posts having at their lower ends a plurality of tip-receiving cavities and at their upper ends a plurality of tips complementary to said cavities to permit interlocking of said crate with similar crates above and below, and a disposable cardboard liner surrounded by said vertical sections and having upper flaps extending into said flap pockets to releasably secure the liner.

2. A crate as defined in claim 1, in which at least two opposed vertical sections include bottom elements releasably retaining adjacent lower portions of the liner against said last sections.

3. A collapsible crate for perishable articles which comprises a bottom section, four rigid vertical sections each including upper and lower horizontal bars and generally vertical bars interconnected to said horizontal bars, each horizontal bar terminating at each end in a post-receiving loop, four vertical pivot posts each extending slidably through the two upper and two lower loops of two adjoining vertical sections, thereby pivotally interconnecting said vertical sections into two pairs of opposing sections, with said posts forming releasable corner posts, hinge means connecting the bottom section to the lower horizontal bar of one vertical section and permitting the bottom section to swing upward into substantial parallelism with said one section, each of said posts having at its lower end a tip-receiving cavity, and means releasably securing the posts in the respective loops including a tip at the upper end of each of at least three of said posts, the top ends of said tips being complementary to said cavities to permit interlocking of the crate with similar crates above and below, each tip having an annular part overlying the upper loop through which the corresponding post extends.

4. A crate as defined in claim 3, in which said securing means also include an annular part on the lower end of each post and underlying the lower loop through which the corresponding post extends, said last annular parts defining the entrances to the respective cavities and forming horizontal bearing surfaces on which the crate is slidable.

5. A crate as defined in claim 3, comprising also a disposable liner surrounded by said vertical sections and having upper flaps, the top portions of certain adjacent ones of said vertical bars of at least two opposed sections being integrally connected by horizontally extending elements which lie in a plane above the plane of the upper horizontal bars of said vertical sections, said elements together with said top portions and said upper horizontal bars defining horizontal slits forming pockets for said flaps.

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