

[54] **TRAY OR BOX**

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[22] Filed: **Feb. 2, 1970**

[21] Appl. No.: **7,640**

[30] **Foreign Application Priority Data**

Jan. 31, 1969 Great Britain.....5,489/69

[52] **U.S. Cl.**.....229/34 R, 229/31 FS

[51] **Int. Cl.**.....B65d 5/26

[58] **Field of Search** ...229/30, 31 R, 31 FS, 32, 34 B,
229/34 R, 35, DIG. 11

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Primary Examiner—Evon C. Blunk

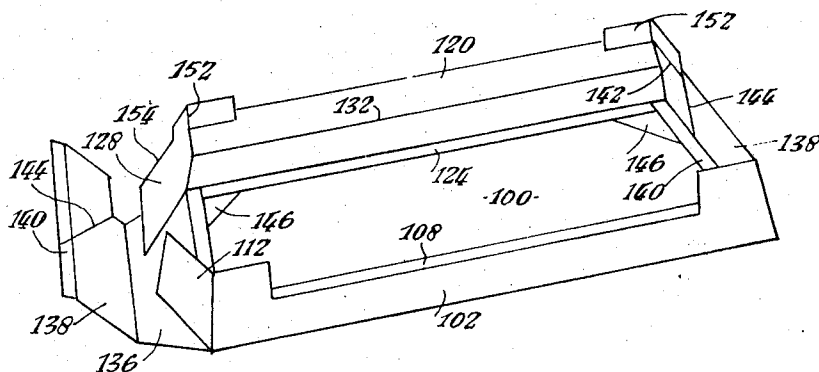
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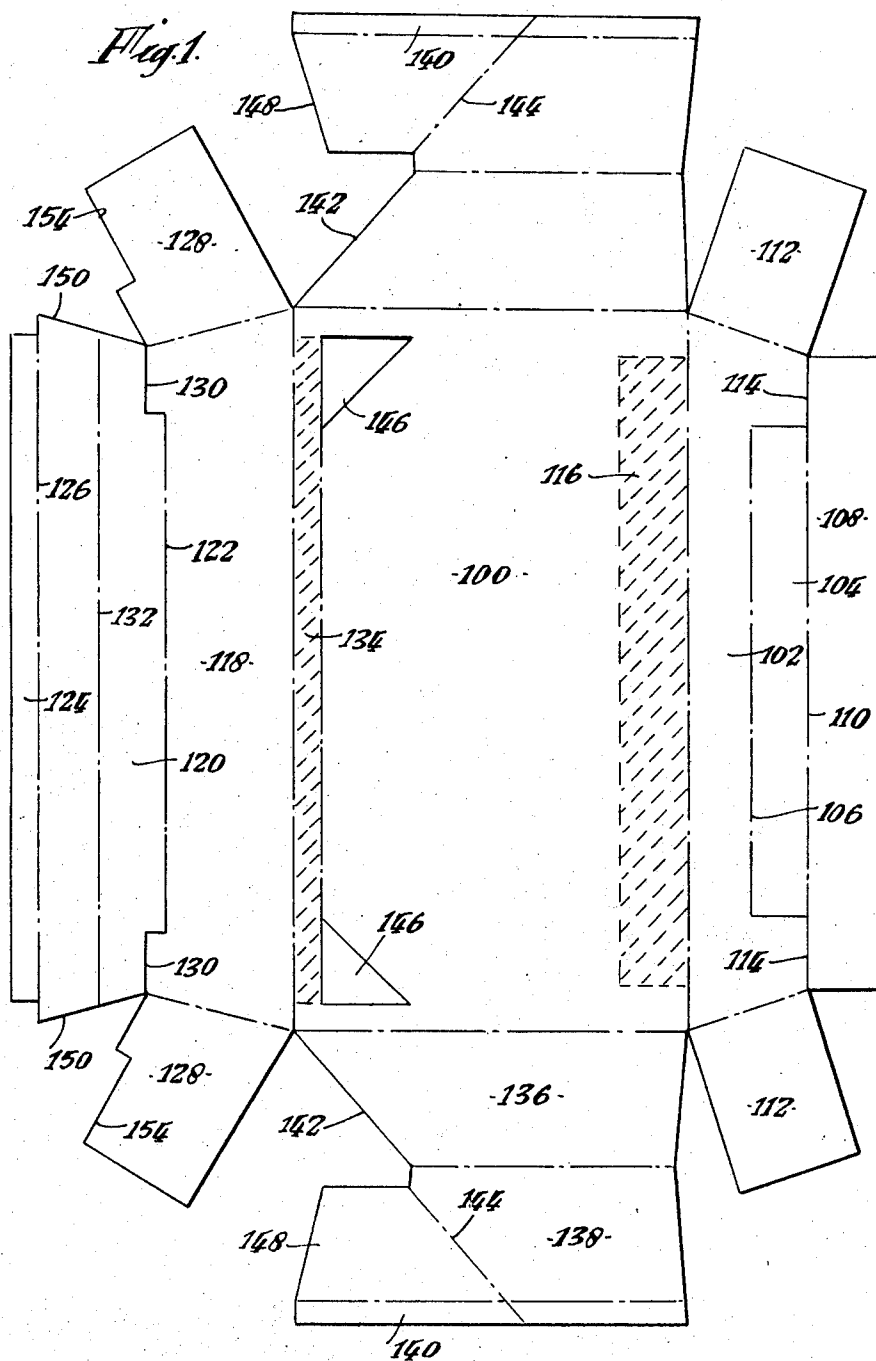
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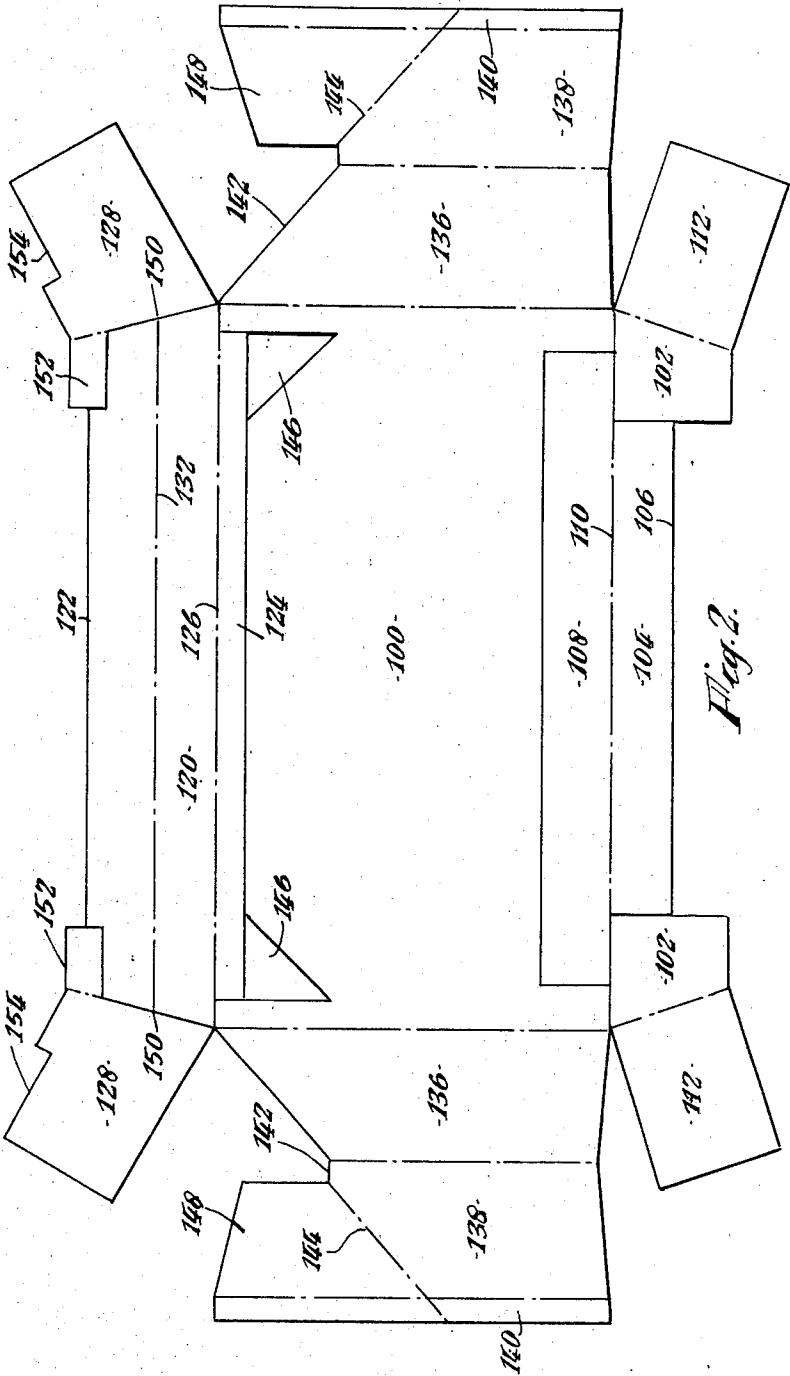
[57] **ABSTRACT**

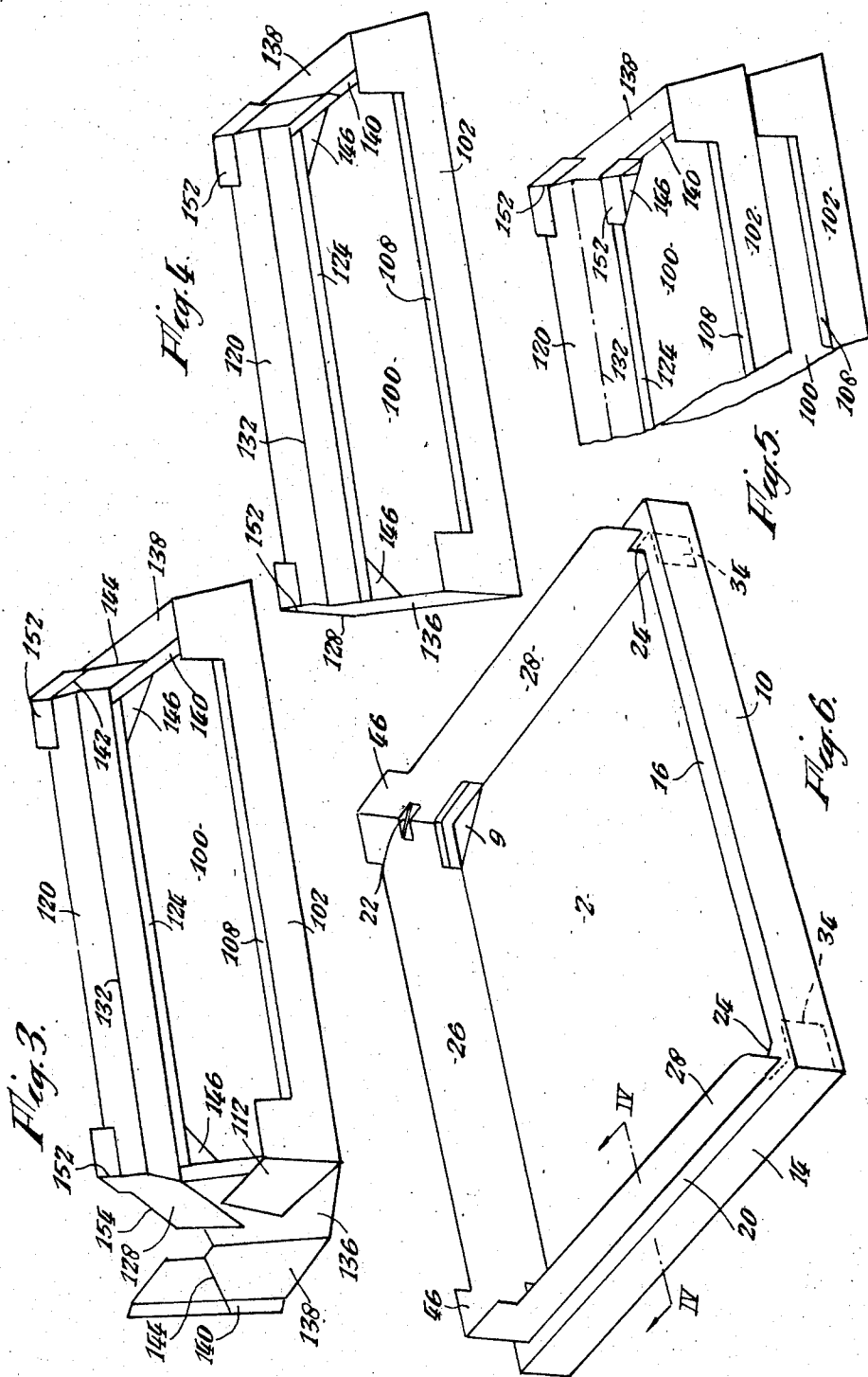
A stackable tray having upstanding projections on its walls and apertures in its bottom, so that a stack of the trays can be stabilized by inter-engagement of the projections and apertures. The projections are provided in at least two corners, and each projection extends laterally around the corner. The angled form of the projection, particularly when made from foldable sheet material, strengthens it against lateral deformation in a stack of filled trays. When used for containing meals or refreshments at least a part of one wall of each tray may be lower than the other walls.

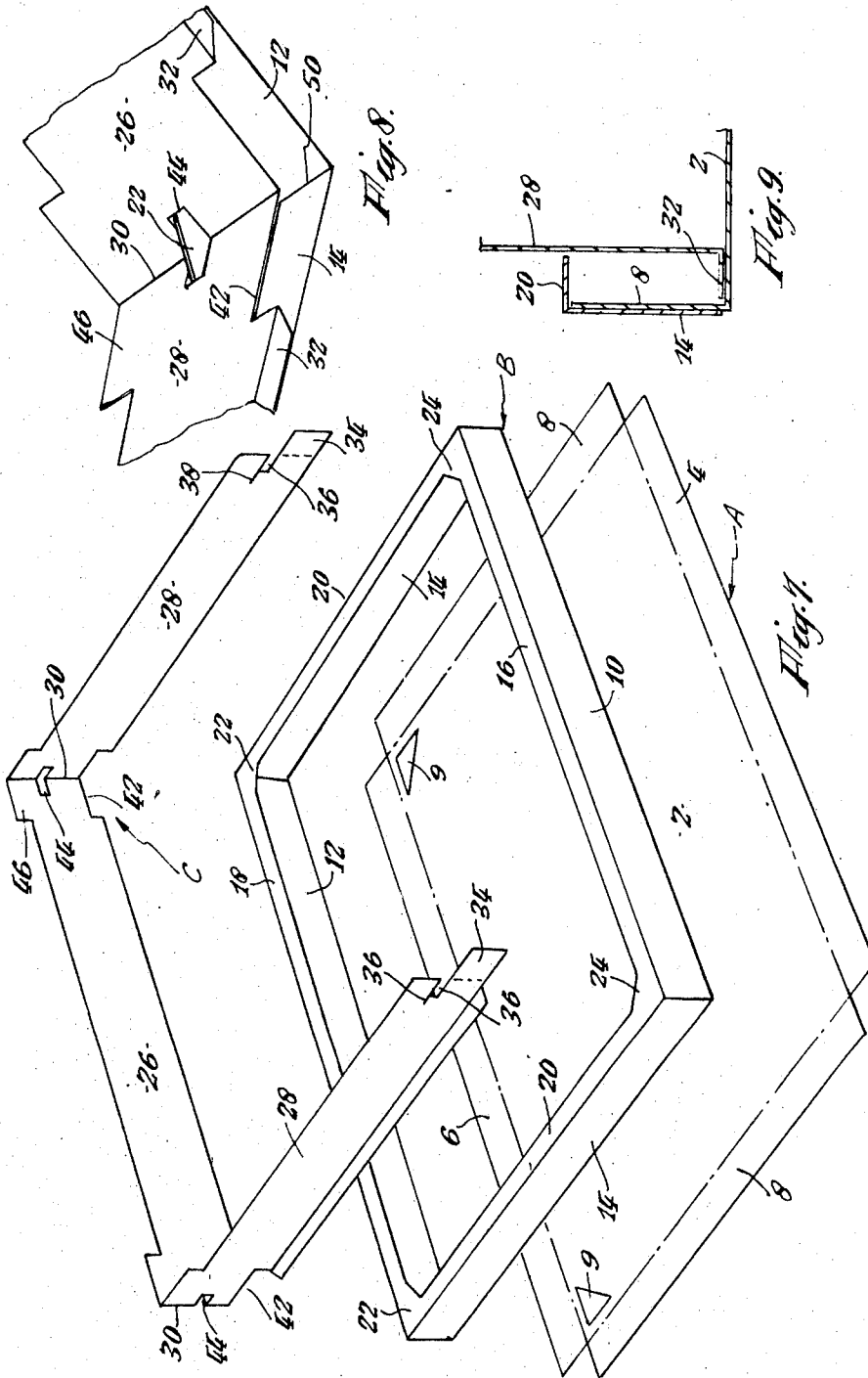
13 Claims, 12 Drawing Figures











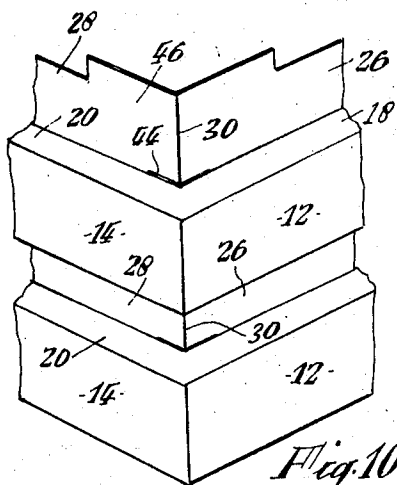


Fig. 10.

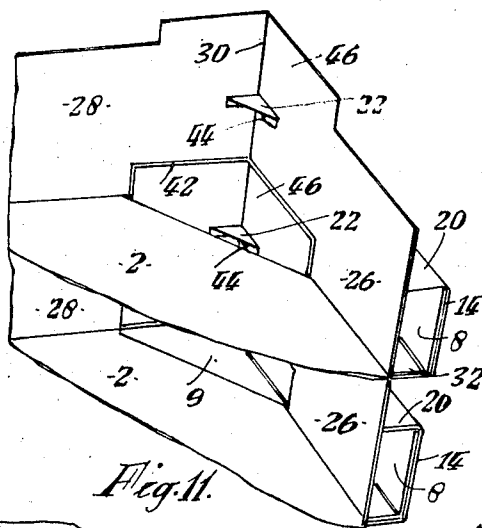


Fig. 11.

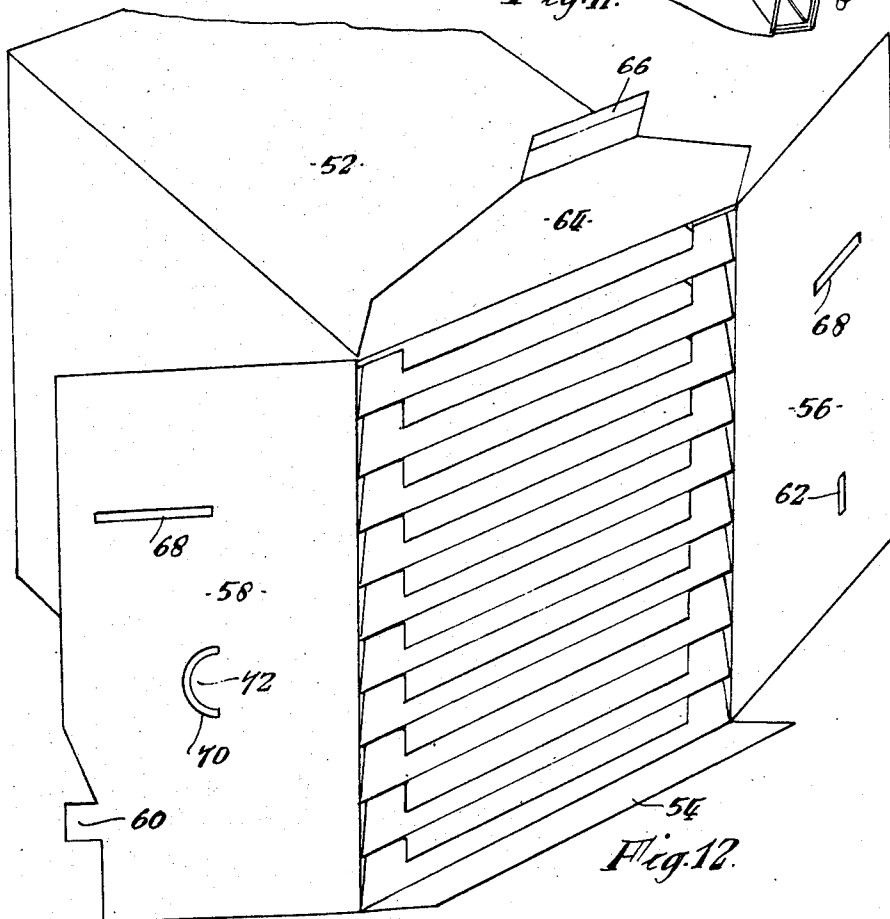


Fig. 12.

TRAY OR BOX

This invention relates to trays and boxes (hereinafter referred to generally as "trays"). More particularly it relates to stackable trays. It is especially applicable to trays for carrying meals or refreshments, where the trays must for convenience and saving of space be stacked ready for distribution, and if necessary re-stacked after use. One problem involved in this is that of making the stack stable against collapse from minor disturbances, particularly when being handled. Inter-engagement between adjacent trays would be a suitable method of achieving this but it must be such that the trays can be readily located relative to each other, readily removed from the stack, and yet the engagement being strong enough to resist deformation under the often considerable weight and inertia of the filled and stacked trays. This problem is particularly acute in trays made from foldable sheet material since the sheet is normally easily deformed.

The inventor has found that suitable engagement can be attained between projections on one tray with apertures in an adjacent tray when the projections are of angled form; the increased strength being derived from the angular nature of the projections.

Accordingly the present invention provides a stackable tray comprising a bottom having an aperture in each of at least two corner regions, walls extending upwardly from the bottom and including in each of at least two corner regions a pair of corner forming panels extending one along each of the adjacent sides of the tray and having a single integral projection extending upwardly above the height of the adjacent walls and laterally around the corner.

The tray is preferably made from foldable sheet material such as cardboard. It may be of permanent construction or it may be collapsible.

One form of tray made from foldable sheet material such as cardboard has hinged to the bottom a pair of opposite side walls and a third side wall extending between them, said third wall having lateral flaps hinged thereto, and each wall of said pair comprising a first panel hinged to the bottom and a second panel hinged to the first panel and folded into the tray to trap the adjacent lateral flaps between the panels and thereby maintain the walls in the erect condition, the projections being provided at the corners between and integral with said third wall and its lateral flaps. The part of each projection which extends upwardly from a lateral flap may pass through a cut-away portion of the adjacent wall of said pair.

Preferably said third wall comprises a first panel hinged to the bottom, a second panel hinged to the outer end of the first panel and folded back on the first panel and secured in that condition, the lateral flaps being hinged to one of the panels, and each projection being provided in part by an L-shaped cut at the end of the hinge line between the two panels and extending from the hinge line into the panel not carrying the lateral flaps. The securing may be effected by a flange hinged to the second panel and adhered to the bottom, or else the first and second panels may be adhered together. Preferably the second panels of said pair of walls are folded inwardly to trap the lateral flaps, and the second panel of each wall of the tray has hinged to it a flange which lies on the bottom and faces inwardly

from the wall, the length of the flange of said third wall being such that at its ends it abuts the edges of the flanges of said pair of walls and maintains the second panels of said pair in the folded in condition. Preferably the outer of the two panels of said third wall is provided with the lateral flaps and the inner of the two is arranged to flex inwardly relative to the box so that the adjacent ends of the second panels of said pair of walls are trapped between the lateral flaps and the ends of the inwardly flexed panel.

In another form of the invention the wall of the tray includes an outer wall forming part, an inner wall forming part fitting inside the outer part and comprising a strip of panels hinged one to the next, and means for retaining the strip within the tray, the upper edge of the strip being shaped in the region of the hinges to provide the projections.

The retaining means preferably comprises horizontal webs of material extending diagonally across the corners between adjacent outer wall panels engaging in corresponding horizontal slots provided in the strip in the region of its hinges and extending into the adjacent panels. The outer wall panels of the tray are preferably provided with an intumed peripheral flange providing spacing means between the outer wall panels and the strip.

The strip may alternatively be secured within the tray by stitching, stapling, or adhering to the inside surfaces of the outer wall panels.

The invention includes a blank of foldable sheet material for erection into a tray as hereinbefore described.

The invention further includes a stack of the trays described housed in a container and withdrawable horizontally therefrom.

Two forms of tray made according to this invention and the method forming a stack from such trays is illustrated in the accompanying drawings wherein:

FIG. 1 shows a blank for making one form of tray.

FIG. 2 shows the blank in a partially folded condition.

FIG. 3 shows a perspective view of the partially erected tray.

FIG. 4 shows a perspective view of the fully erected tray.

FIG. 5 shows a perspective fragmentary view of two trays stacked together.

FIG. 6 shows a perspective view of a second form of tray.

FIG. 7 is an exploded perspective view of the tray shown in FIG. 6 showing the various integers which make up the tray.

FIG. 8 is a perspective underneath view of a corner of the tray with the bottom removed.

FIG. 9 is a section taken on line IV—IV of FIG. 1.

FIG. 10 is a perspective view of a portion of two trays showing how they can be stacked together.

FIG. 11 is a perspective view of the same portions of tray as shown in FIG. 5 and viewed from the inside, and

FIG. 12 is a perspective view of a stack of trays in use.

Referring to the drawings, and firstly to FIGS. 1 to 5, the first embodiment of tray is erected from the blank shown in FIG. 1. This blank comprises a rectangular bottom forming panel 100 and hinged thereto two pairs

of opposite side wall forming portions, one pair along the longer sides of the bottom and the other pair along the shorter sides of the bottom.

One of the longer walls is made up from a first panel 102 hinged to the bottom and a second panel 104 hinged at 106 to the free end of the first panel. A flange 108 is hinged at 110 to the free end of the second panel 104, and a pair of lateral flaps 112 are hinged to the first panel 102. In addition, a pair of L-shaped cuts 114 increase the height of the panel 102 at its end portions and decrease the overall length of the second panel 104. The panels 102, 104 are the same height each side of the hinge line 106, so that the panel 104 can be folded back on the panel 102 and the panel 108 adhered to the bottom over the corresponding area 116.

The other long wall likewise comprises a first panel 118 hinged to the bottom, a second panel 120 hinged at 122 to the free end of the panel 118, and a flange 124 hinged at 126 to the free end of the second panel. Lateral flaps 128 are hinged to the first panel 118, and L-shaped cuts 130 increase the height of the first panel 118 at its end portions and decrease the overall length of the second panel 120 in the region of its hinge 122. In addition, a medial line of weakening 132 is provided in the second panel 120. The panels 118, 120 are of equal height each side of the hinge line 122 so that the panel 120 can be folded back on the panel 118 and the flange 124 adhered to the bottom over the corresponding region 134.

The walls at the two shorter sides are of identical construction. Each comprises a first panel 136 hinged to the bottom, a second panel 138 hinged to the free end of the first panel, and a flange 140 hinged to the free end of the second panel. The panels 136, 138 are of equal height each side of the hinge line joining them so that the panel 138 can be folded over the panel 136 with the flange 140 abutting the bottom 100. In addition, the first and second panels have cut-away regions 142 at their ends adjacent the lateral flaps 128, and diagonal lines of weakening 144 extend across the panels 138 and flanges 140.

Triangular apertures 146 are provided in the bottom 100 near the corners between the panel 118 and the panels 136, but spaced from the edges of the bottom 100 by amounts equal to the widths of the flanges 140 and 124.

The first stage in erecting the tray consists in folding over the panels 104 and 120 and adhering the flanges 108 and 124 to the areas 116 and 134 respectively of the bottom. At this stage the blank will still be in a flat condition, so that if the manufacturer wishes to supply blanks for erection by the customer, they may be supplied either in the form shown in FIG. 1 or the partially folded form shown in FIG. 2. If supplied in the form shown in FIG. 1, a pressure-sensitive or other adhesive may be applied to the areas 116, 134 and if necessary also to the flanges 108, 124 before sending out the blanks.

To erect the box from the blank, the two longer walls are brought into the upright condition and the lateral flaps 112, 128 turned inwardly so as to lie along the hinge lines between the panels 136 and bottom 100. As will be seen from the drawings, the panels 102 and 118 have upwardly tapering sides so that when the lateral flaps 112, 128 are brought into contact with the bottom

100 the walls are inclined upwardly inwardly relative to the tray.

Next, each panel 136 is erected so that it lies against the adjacent lateral flaps 112, 128, and is thus also inclined upwardly inwardly relative to the box. The panels 138 are then turned over into the box so as to trap the lateral flaps between panels 138 and 136, and the flanges 140 are turned inwardly relative to the box and rest on the bottom 100. The edges of the flanges 140 also abut the end edges of the flanges 124 and 108 which assists in maintaining the panels 138 in the folded in condition.

Because of the upwardly convergent attitude of the two longer walls, the maximum lengths of the panels 138 is greater than the distance between the upper edges of the longer walls. Thus, the diagonal line of weakening 144 is provided in the panels 138 to allow them to flex and facilitate their entry into the tray. Furthermore, the medial line of weakening 132 in the panel 120 allows this panel to flex inwardly relative to the box when the wall is brought into the upright condition. Thus the adjacent ends 148 of the panels 138 can be trapped between the lateral flaps 128 and the edges 150 of the panel 120. This retains the panels 138 in the correct position, and prevents the apertures 146 from being partially covered by the flanges 140.

The upper edge of each lateral flap 128 is stepped at 154 so as to provide, together with the adjacent L-shaped cut 130, an upstanding projection 152 in the corner of the tray. In the erected condition of the tray, each projection 152 emerges in part through the cut away region 142 of the shorter wall, thus projecting upwardly above the height of the adjacent walls, and laterally around the corner.

The upward taper at the sides of the panels 102, 118 is designed so that the resulting overhang of the side walls will bring the projections 152 into register with (that is vertically above) the apertures 146. Thus, as shown in FIG. 5, two similar trays can be stacked one on top of the other with the projections of the lower tray extending into the apertures 146 of the upper tray, the upper edges of the side walls between the projections providing a seating for the bottom of the tray above. Any number of trays can be stacked one above the other in this way.

Referring now to the second embodiment shown in FIGS. 6 to 11 of the drawings; each tray comprises three parts, a bottom part A, and two wall forming parts B and C. The bottom part A comprises a rectangular bottom forming area 2 with hinged side panels, comprising a front panel 4, a rear panel 6 and end panels 8 joined to the bottom forming area 2 through fold lines. The bottom area is provided with a pair of triangular apertures 9 in the corner regions adjacent the rear panel 6.

The wall forming part B is of rigid construction and comprises a front wall panel 10, a rear wall panel 12 and end wall panels 14 joined together to form a frame with a peripheral intumed continuous and horizontal flange comprising a front portion 16, a rear portion 18 and end portions 20. Each corner between the portions 16 and 20 is formed as a horizontal web 22. Each corner between the portions 18 and portion 20 is also formed as a horizontal web 24, the edge of the webs 24 being inclined relative to the wall panels 14 at a slightly different angle than are the edges of the webs 22.

The wall forming part C comprises a strip of three panels hinged one to the next; a back panel 26 and two end panels 28 joined to the panel 26 through fold lines 30. The panels 26 and 28 are provided each with a flange 32 joined to the lower edges of the panels through score lines. The panels 28 are provided at their free ends with tabs 34 and cut out slots 36 from each of which leads a slit 38. The part C is further provided with a pair of recesses 42 extending from the bottom of the blank across the fold lines 30 so as to be partly in the panel 26 and partly in the panels 28. A slot 44 extends across each fold line 30 above the recess 42 and the upper edge of the blank is shaped to provide a pair of projections 46 each of which also extends across a fold line 30, the remainder of the upper edge forming a shoulder for supporting a similar tray stacked on top.

The tray is assembled by applying the panels 4, 6 and 8 to the inner faces of the panels 10, 12 and 14 respectively by means of adhesive or other means. The part C is applied to the inner edge of the wall portion B by bringing the ends of the panels 28 close together and making the slots 44 to engage the webs 22. The free ends of the panels 28 are then brought outwards so that the slots 36 engage the webs 24 and the sides of the slits 38 grip the two surfaces of the webs 24. In this position the tabs 34 lie on the inside of the wall 10. The flanges 32 already folded horizontally outwards span the gap between the lower edges of the walls of the tray and the lower edges of the panels 26 and 28 of the strip except for the area in the vicinity of the fold lines 30. In these areas L-shaped cavities 50 are formed by the walls 12 and 14 of the tray, the horizontal flange portions 18 and 20 and the panels 26 and 28 best seen in FIG. 8. The cavities 50 coincide with the triangular apertures 9.

The trays are stacked by superimposing one tray upon another; the bottom 2 of each tray resting on the shoulder provided by the upper edge of the strip C of the tray below, the angled projections of the tray below engaging the apertures 9 in the bottom 2 of the tray above.

One or more stacks of trays of either embodiment can conveniently be housed in a cardboard or like outer container, provided with an opening for easy withdrawal of a stack or part of a stack. Referring to FIG. 12 an outer container 52 has an end opening which is closable by means of flaps hinged around its periphery. The lower flap 54 is first turned up. Then the side flaps 56, 58 are folded in, the flap 56 first, and a tab 60 on the flap 58 engaging in a slot 62 in the flap 56. Then the top flap 64 is folded down and its end tab 66 inserted through superimposed slots 68 in the side flaps. The tab 66 is held in the near vertical position by being trapped between the side flap 56 and the stack of containers. A C-shaped slot 70 in the side flap 58 provides a tongue 72 by which the container can be pulled from a stack of similar containers.

When the trays are for containing food, the container is preferably made of cardboard with an external coating of aluminum foil or other impermeable film so that externally produced odors are not absorbed by the cardboard and transmitted to the food. The container illustrated is particularly suitable where it may be exposed to rain, since the flap 64 greatly reduces the chance of rain getting into the container.

As has already been observed in respect of the first embodiment, the blank as provided by the manufacturer may be in the unfolded or partially folded but still flat condition. The term "blank" is intended to include any such flat condition from which the tray can be erected. It may for example be in a form where the adhered side walls are folded in flat on the bottom instead of lying flat adjacent the bottom as shown. In this case the second panel may have to be slightly less high than the first in order to enable the walls to be erected without damage. A difference of about 2mm. has been found satisfactory in many cases.

The trays described are made of cardboard or like material but other embodiments can be made in plastics material, in which case they could be integrally moulded into the required shape if desired. The trays may have walls on only three sides if desired.

The trays described are particularly suitable for fragile articles, and one particular use is in the catering trade where it is desired to pre-pack meals, for example for consumption on an aircraft passenger flight. In this case the food and the implements required for consuming it, may be placed in the trays which are stacked one above the other in the manner described, and the stack is then slid into the outer container 52 which is then closed. An appropriate number of filled containers are taken on board the aircraft and, when it is desired to partake of the meal, the hostess withdraws all or part of the stack from the container and delivers a filled tray to each passenger starting at the top of the stack. When the meal is finished, the trays together with any unconsumed food are restacked and again placed in the outer container, which is disposed of together with the contents at the end of the journey.

The tray and its method of use is a great advantage over the existing system where trays are housed in a relatively heavy aluminum container fitted with runners and withdrawn singly. Only three or four trays can be distributed at one time. Such trays and containers also need to be washed for re-use. The present trays and containers are cheaper, lighter, can be carried in greater numbers, and can be discarded after use.

Other uses for the tray made according to this invention are to be found for example on sports grounds, at garden parties and like functions, and in schools and hospitals. The trays can also be used for the transport of fragile articles.

One useful feature which is shown in both of the embodiments described is that of having at least a part of one wall lower than the other three. This is particularly important in trays for food where the food is to be eaten with utensils straight from the tray. It is inconvenient for the diner to have to operate over a high wall on the tray, yet having a low wall all round would unduly restrict the size of article which could be contained in the tray when stacked. A similar advantage could be obtained with trays of the present invention if two opposite walls have lower portions. Where projections are provided only on two corners, the opposite wall, instead of being merely lower, could be absent altogether.

What I claim and desire to secure by Letters Patent is:

1. A stackable tray comprising a bottom having an aperture in each of at least two corner regions, walls ex-

tending upwardly and inwardly from the bottom and including in each of at least two corner regions a pair of corner forming panels extending one along each of the adjacent sides of the tray and having a single integral projection lying in the plane of the panel to which it is integral and extending upwardly above the height of the adjacent walls and laterally around the corner, the projections and apertures in the tray being arranged so that two similar trays can be stacked one on the other with the projections of the lower tray engaging in the apertures of the upper tray and the projections are reinforced by their engagement with the apertures.

2. A stackable tray made from foldable sheet material, comprising a bottom, hinged to the bottom a pair of opposite side walls and a third side wall extending between them, said third wall having lateral flaps hinged thereto, and each wall of said pair comprising a first panel hinged to the bottom and a second panel hinged to the first panel and folded to trap the adjacent lateral flaps between the panels and thereby maintain the walls in the erect condition, said third wall and its lateral flaps being shaped to provide at each corner between them an integral projection extending upwardly above the height of the adjacent walls and laterally around the corner, the bottom being provided with apertures arranged so that two similar trays can be stacked one on the other with the projections of the lower tray engaging in the apertures of the upper tray.

3. A tray according to claim 2 having a fourth side wall opposite said third wall, and lateral flaps hinged to the fourth wall and trapped between the first and second panels of said pair of opposite walls, the fourth wall comprising a first panel hinged to the bottom, and a second panel defined at least in part by a pair of cuts extending into the first panel from its upper edge and a hinge line extending parallel to said other edge between the lower ends of the cut, the second panel being folded about the hinge line to provide in the fourth wall a relatively lower portion.

4. A tray according to claim 2 wherein the part of each projection which extends from a lateral flap passes upwardly through a cut-away portion of the adjacent wall of said pair.

5. A tray according to claim 2 wherein said third wall comprises a first panel hinged to the bottom, a second panel hinged to the outer end of the first panel and folded back on the first panel and secured in that condition, the lateral flaps being hinged to one of the panels, and each projection being provided in part by an L-shaped cut at the end of the hinge line between the two panels and extending from the hinge line into the panel not carrying the lateral flaps.

6. A stackable tray comprising a bottom having an aperture in each of at least two corner regions, walls extending upwardly from the bottom and including in each of at least two corner regions a pair of corner forming panels extending one along each of the adjacent sides of the tray and having a single integral projection extending upwardly above the height of the adjacent walls and laterally around the corner, the projections and apertures in the tray being arranged so that two similar trays can be stacked one on the other with the projections of the lower tray engaging in the apertures of the upper tray, the wall of the tray including an outer wall forming part, an inner wall forming part

fitting inside the outer part and comprising a strip of panels hinged one to the next, and means for retaining the strip within the tray, the upper edge of the strip being shaped in the region of the hinges to provide the projections.

7. A tray according to claim 6 wherein the retaining means comprises horizontal webs of material extending diagonally across the corners between adjacent outer wall panels engaging in corresponding horizontal slots provided in the strip in the region of its hinges and extending into the adjacent panels.

8. A tray according to claim 6 wherein the outer wall panels of the tray are provided with an intumed peripheral flange providing spacing means between the outer wall panels and the strip.

9. A blank of foldable sheet material for erecting into a stackable tray comprising a bottom and side walls extending upwardly therefrom, the blank comprising a bottom forming panel and hinged to the bottom forming panel a pair of opposite side wall forming portions and a third side wall forming portion extending between them said third side wall forming portion having hinged lateral flaps, each wall forming portion of said pair comprising a first panel hinged to the bottom forming panel and a second panel hinged to the free end of the first panel, the lateral flaps and said third side wall forming portion being shaped in the region of their common hinges to provide in the erect condition of the tray an integral projection extending laterally around the corner at each hinge and upwardly above the height of the adjacent walls, the second panels of the wall forming portions of the pair being foldable to trap the lateral flaps between the first and second panels and maintain the tray in the erect condition, the bottom forming panel being provided with apertures located so that when similar trays are stacked the projections of one tray may engage in the apertures of the tray next above.

10. A blank according to claim 9 wherein said third wall forming portion comprises a first panel hinged to the bottom and a second panel hinged to the free end of the first panel, the second panel of each wall forming portion having hinged to its free end a flange, the flanges being adapted so that in the erect condition of the tray they can lie on the bottom and extend inwardly from their respective walls with the end edges of the flange of said third wall abutting the free edges of the flanges of said pair of walls.

11. A stackable tray made from foldable sheet material, comprising a bottom, hinged to the bottom a pair of opposite side walls and a third side wall extending between them, said third wall having lateral flaps hinged thereto, and each wall of said pair comprising a first panel hinged to the bottom and a second panel hinged to the first panel and folded to trap the adjacent lateral flaps between the panels and thereby maintain the walls in the erect condition, said third wall and its lateral flaps being shaped to provide at each corner between them an integral projection extending upwardly above the height of the adjacent walls and laterally around the corner, the bottom being provided with apertures arranged so that two similar trays can be stacked one on the other with the projections of the lower tray engaging in the apertures of the upper tray, said second panels of said pair of walls being folded in-

wardly to trap the lateral flaps, and the second panel of each wall having hinged to it a flange which lies on the bottom and faces inwardly from the wall, the length of the flange of said third wall being such that its ends it abuts the edges of the flanges of said pair of walls and maintains the second panels of said pair in the folded in condition.

12. A stackable tray made from foldable sheet material, comprising a bottom, hinged to the bottom a pair of opposite side walls and a third side wall extending between them, said third wall having lateral flaps hinged thereto, and each wall of said pair comprising a first panel hinged to the bottom and a second panel hinged to the first panel and folded to trap the adjacent lateral flaps between the panels and thereby maintain the walls in the erect condition, said third wall and its lateral flaps being shaped to provide at each corner between them an integral projection extending upwardly above the height of the adjacent walls and laterally around the corner, the bottom being provided with apertures arranged so that two similar trays can be stacked one on the other with the projections of the lower tray engaging in the apertures of the upper tray a fourth side wall opposite said third wall, and lateral flaps hinged to the fourth wall and trapped between the first and second panels of said pair of opposite walls, the fourth wall comprising a first panel hinged to the bottom, and a second panel defined at least in part by a pair of cuts extending into the first panel from its upper edge and a hinge line extending parallel to said other edge between the lower ends of the cut, the second panel being folded about the hinge line to provide in

the fourth wall a relatively lower portion, said second panels of said pair of walls being folded inwardly to trap the lateral flaps, and the second panel of each wall having hinged to it a flange which lies on the bottom and faces inwardly from the wall, the length of the flanges of the third and fourth walls being such that at their ends they abut the edges of the flanges of said pair of walls and maintain the second panels of said pair in the folded in condition.

13. A stackable tray made from foldable sheet material, comprising a bottom, hinged to the bottom a pair of opposite side walls and a third side wall extending between them, said third wall having lateral flaps hinged thereto, and each wall of said pair comprising a first panel hinged to the bottom and a second panel hinged to the first panel and folded to trap the adjacent lateral flaps between the panels and thereby maintain the walls in the erect condition, said third wall and its lateral flaps being shaped to provide at each corner between them an integral projection extending upwardly above the height of the adjacent walls and laterally around the corner, the bottom being provided with apertures arranged so that two similar trays can be stacked one on the other with the projections of the lower tray engaging in the apertures of the upper tray, the outer of the two panels of said third wall being provided with the lateral flaps and the inner of the two being arranged to flex inwardly relative to the tray so that the adjacent ends of the second panels of said pair of walls are trapped between the lateral flaps and the ends of the inwardly flexed panel.

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