

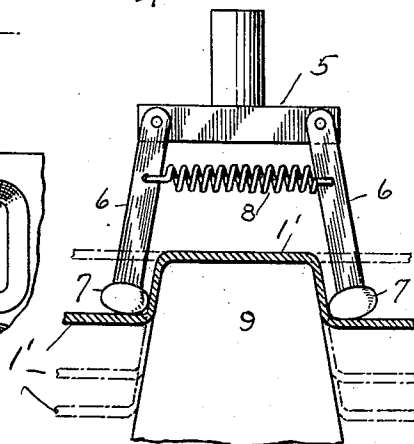
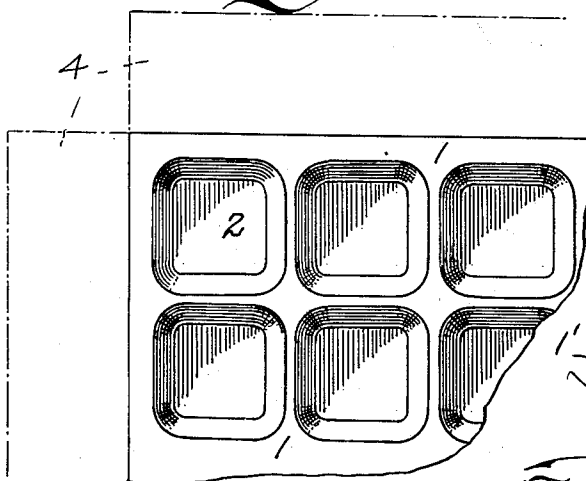
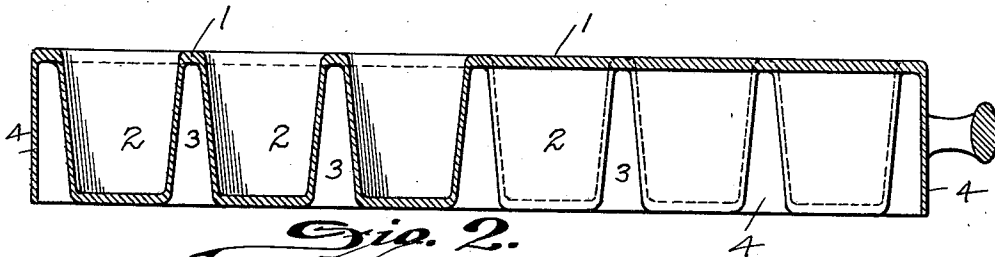
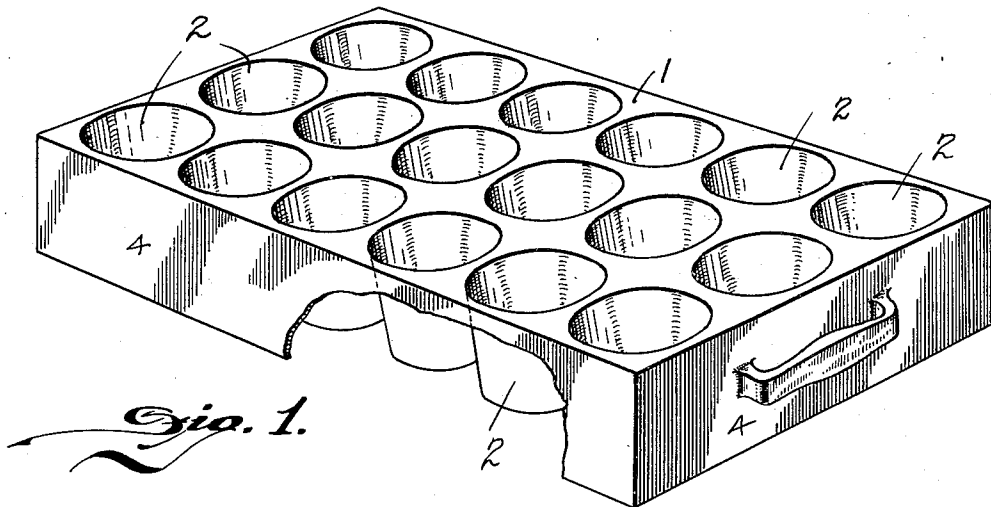
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T. M. HIESTER

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MULTICOMPARTMENT TRAY AND METHOD OF MAKING THE SAME

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Inventor
Theodore M. Heister
By *R. L. Walker*
Attorney

UNITED STATES PATENT OFFICE

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MULTICOMPARTMENT TRAY AND METHOD OF MAKING THE SAME

Theodore M. Hiester, Dayton, Ohio, assignor to
United Aircraft Products Inc., Dayton, Ohio, a
Corporation of Ohio

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This invention relates to the manufacture of multi-compartment or cellular receptacles for use as ice trays or freezing pans in domestic types of electrical refrigerators, pans, storage trays and the like but which may be utilized in suitable sizes and proportions for sundry other purposes.

The invention pertains more particularly to multi-compartment trays formed from a single sheet of material by forming therefrom integral cells or compartments projecting in spaced relation with each other, the walls of which are preferably though not necessarily of less thickness than that of the intermediate and surrounding top areas of the original stock sheet.

The object of the invention is to simplify the construction of such multi-compartment pans or trays and the method of producing the same, whereby they will not only be cheapened in construction, but will be more efficient in use, of increased durability, and unlikely to become broken or out of repair.

A further object of the invention is to provide an integral compartment tray formed from a single sheet of metal.

A further object of the invention is to provide a compartmental tray, the compartments or cells of which are spaced apart to permit free circulation of air therebetween and thereby facilitate heat transference whereby ice may be more quickly frozen therein.

A further object of the invention is to provide such integral multi-compartment trays wherein the side walls of the spaced compartments will be of less thickness than the connecting portions of the trays.

A further object of the invention is to provide a multi-compartment unit by extruding from a flat sheet of material a plurality of relatively spaced hollow protuberances while maintaining the intermediate and surrounding portions of the material in a common plane and of original thickness.

A further object of the invention is to provide a tray having non-intercommunicating compartments, and to facilitate the removal of solidified contents thereof singly.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

In the accompanying drawing wherein are

shown the preferred but obviously not the only forms of the embodiment of the invention, Fig. 1 is a perspective view of an ice tray or other multi-compartment pan embodying the present invention. Fig. 2 is a longitudinal sectional view thereof. Fig. 3 is a top plan view of a modification. Fig. 4 illustrates the method of production.

Like parts are indicated by similar characters of reference throughout the several views.

While the present tray is herein described and referred to as an ice tray, it is to be understood that it is not limited to such use but when produced in suitable sizes and proportions it may be used as a baking pan for baking muffins, cup cakes and the like, wherein the side walls of reduced thickness will be equally as effective in transference of heat as when used for freezing purposes. Likewise the tray may be utilized for segregating small articles for display purposes and the like.

The present popular type of freezing tray for domestic refrigerators consists of a pan having therein transverse removable partitions dividing the interior of the pan into compartments having common division walls. These compartments communicate to greater or less extent with each other beneath the partition walls and hence do not completely segregate the liquid contents of one compartment from that of another. Moreover the compartments, although divided by partitions, form in effect a single unitary body wherein the contents of each compartment are protected by the contents of adjacent compartments and hence heat transference and freezing of the contents is delayed. When frozen, the contents of one compartment cannot be conveniently removed without affecting the contents of adjacent compartments. The present construction overcomes such difficulties by providing spaces intermediate the receptacles for the circulation of cold air which is thus brought equally into intimate contact with the walls of each compartment insuring uniformity of freezing action as well as materially increasing the rapidity thereof. The compartments or receptacles are entirely non-communicating which enables different liquids to be frozen in different compartments of the same tray without becoming intermixed. This is of material advantage when making frozen desserts and the like or when it is desired to utilize less than the entire tray for such purpose. Furthermore, the separate spaced relation of the receptacles or compartments enables the contents to be removed from any one of the series by warming the walls of such compartment

only without materially affecting the contents or walls of any other compartment.

The tray consists of a top plate 1 portions of which are projected downward out of the plane of the plate to form a plurality of relatively spaced cup shaped receptacles or compartments 2—2 integral with the top plate 1. In Fig. 1 these compartments or receptacles are shown as circular, and slightly conical to facilitate the removal of the contents when solidified. However the compartments may be of other shapes, as for example, of rectangular form preferably with the corners rounded as in Fig. 3. The space 3 intermediate the receptacles permits free circulation of cold air in direct contact with the entire wall surface of each compartment. The top plate is preferably, though not necessarily, of sufficient size to permit marginal portions thereof to be bent downwardly at right angles to form integral side walls 4.

The preferred method of producing the tray is by a process of extruding from a flat sheet the hollow protuberances which form the receptacles or compartments, as distinguished from drawing, stamping, or spinning. In the forging process the material forming the projecting protuberance is formed into shape by a rotary forging operation without "taking" material from the sheet beyond the outline of the compartment. The operation is a modified spinning process wherein the material is preferably held stationary in relation with a form or mandrel and a tool is rotated under pressure about the form or mandrel and against the sheet of material. The tool following the outline of the mandrel or form shapes the material into conformity therewith. The stock sheet is not distorted or bent out of its flat formation as in spinning but maintains its original plane formation and original thickness, while the side walls of the receptacles or protuberances extruded therefrom are of less thickness than the stock sheet, the extension of the projection being compensated by a resulting reduction in thickness. While the method of extruding metal from sheet formation is not broadly new nor original, so far as known the production of a plurality of integrally united, relatively closely spaced hollow protuberances from a single flat sheet has never before been attempted, and the application of this method to the production of multi-compartment trays affords a new and meritorious article of manufacture. The resulting decrease of thickness of the side walls of the compartments is advantageous in effecting more rapid heat transference and greatly facilitates the freezing operation.

If the cups or compartments of the tray are drawn on a punch press or stamped, material is necessarily drawn from the stock sheet beyond the outline of the receptacle. As a result the compartments must be spaced apart much farther than when the present rotary forging process is employed in order to provide for sufficient "take" of material without interfering with or distorting an adjacent compartment or cup. Although stamping may be employed, the extrusion process is preferred as it permits the compartments to be closely spaced without interference.

In the rotary forging operation employed a piece of metal of given thickness is held against the small face of a frustro-conical anvil and while so held a plurality of tools are caused to rotate upon the metal and at the same time move toward

the broader base of the frustro-conical anvil with sufficient pressure to forge the metal and stretch it upon the anvil, thinning only that area of the metal contained in the ring which is bounded inside by the area of the small face of the frustro-conical anvil and outside by the outline of the larger base of said anvil, thus spreading this limited annular area of the metal blank over the inclined side wall of the anvil at the expense of the thickness of the metal, but leaving the metal along the remaining area untouched resulting in a frustro-conical shell with a thin wall.

While the invention has been described in its relation to ice trays for refrigerating purposes, it is to be understood that it is not so limited, but in different sizes and proportions it may be applied to various other purposes wherein a multi-compartment pan or tray is desired. The apparatus for forming the trays by extrusion and method of extruding multiple closely spaced projections from a single sheet, will form the subject matter of separate applications for Letters Patents.

However to illustrate the method of production by the extrusion process, there is illustrated in Fig. 4 the type of apparatus employed. Referring to Fig. 4 a rotary head 5 is provided with radially swinging arms 6 carrying at their ends presser tools 7 which are yieldingly urged inwardly, as by the tension spring 8. The sheet of material 1' is placed over a stationary mandrel or form 9 and the head 5 and presser tools are rotated thereon with a descending pressure. The material beyond the form or mandrel is displaced downwardly by stretching the material along the sides of the form as it descends. Successive positions and degrees of extrusion of the material are illustrated by dot and dash lines.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A multi-compartment tray comprising a top plate and a plurality of relatively deep cup shaped receptacles formed by a rotary forging operation from the material of the top plate and integral therewith, having side walls of less thickness than the top plate.

2. A multi-compartment tray including a sheet of metal retaining its original flat plane formation and original thickness and a plurality of integral cup shaped protuberances projected therefrom by a rotary forging operation in relatively closely spaced relation.

3. The herein described method of producing multi-compartment trays consisting in projecting by a rotary forging operation from a flat sheet of

material a plurality of relatively spaced hollow protuberances while maintaining the intermediate and surrounding portions of the sheet in an undistorted flat plane and of its original thickness.

5 4. A multi-compartment tray comprising a top plate and a plurality of dependent cup shaped receptacles projected therefrom in relatively spaced relation, said cup shaped receptacles being projected by a rotary forging operation, the side walls of the receptacles being of less thickness than the top plate.

10 5. A multi-compartment tray comprising a flat top plate and integral side walls, and a plurality of integral cup shaped receptacles formed by a rotary forging operation from material depressed from the top plate intermediate the side walls.

15 6. The herein described method of producing multi-compartment trays including projecting by a rotary forging operation from a flat sheet of material a plurality of integral relatively spaced cup shaped receptacles.

20 7. A multi-compartment tray comprising a top plate and a plurality of integral dependent cup shaped receptacles formed by a rotary forging operation from the material of said plate projecting therefrom in relatively spaced relation.

25 8. A multi-compartment tray comprising a top plate and a plurality of integral dependent cup shaped receptacles formed by a rotary forging operation from the material of the plate in relatively spaced relation, the side walls of the receptacles being of less thickness than the top plate from which they were extruded.

30 9. A multi-compartment tray comprising a sheet of material and a plurality of integral hollow compartments projected therefrom by a rotary forging operation in relatively spaced relation.

35 10. A multi-compartment tray comprising a single sheet of material and a plurality of dependent cup shaped compartments formed therefrom and spaced apart a distance less than one-fourth their depth.

40 11. In a multi-compartment tray, a sheet of material and a plurality of integral closely spaced compartments formed by rotary forging integral portions of the original sheet into projections from the original plane thereof, the intermediate and surrounding portions of the stock sheet remaining in their original positions in said sheet.

12. In a multi-compartment tray a single sheet of material having a plurality of closely spaced cup shaped cavities formed therein, the entire side walls and bottoms of said cavities being rotary forged from those portions of the sheet of material originally included within the border lines of the respective cavities.

13. The method of forming a multi-compartment tray from a single sheet of material including the step of forming by a rotary forging operation a plurality of dependent cup shaped compartments from said sheet, said cups being spaced apart a distance less than one-fourth their depth.

14. The method of forming a multi-compartment tray from a sheet of material including the projection by a rotary forging operation of closely spaced compartments from the original sheet without distorting the intermediate and the surrounding portions of the stock sheet.

15. The method of forming a multi-compartment tray from a single sheet of material, including the step of forming from said sheet of material a plurality of closely spaced cup shaped cavities, including the formation of the walls of said cavities from the portion of sheet material located intermediate the surrounding portions and the bottom of the cup shaped cavities by a rotary forging operation.

16. The method of forming a multi-compartment tray from a single sheet of material including the step of extruding the compartments from the sheet by a rotary forging operation beginning at the bottom of the compartments and ending at the top thereof.

17. The method of forming a multi-compartment tray including the step of progressively forming the metal from the bottom of the compartment to the top thereof by a rotary forging operation.

18. The method of forming a multi-compartment tray from sheet material including the step of progressively rotary forging the material within the edges of each compartment so as to form the walls of the compartments of decreased thickness.

THEODORE M. HIESTER.