

[54] METHOD OF TRANSFERRING SAMPLE
VIALS TO AND FROM VIAL-CARRYING
TRAYS

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Related U.S. Application Data

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abandoned.

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[58] Field of Search 214/152, 310;
220/20, 21

[56] References Cited

UNITED STATES PATENTS

2,366,886	1/1945	Tuyl	214/310
2,386,076	10/1945	Taylor et al.	214/310
3,517,852	6/1970	Schoeller	220/21
3,055,531	9/1962	Chelbor	220/21

FOREIGN PATENTS OR APPLICATIONS

659,226	10/1951	Great Britain	214/310
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[57] ABSTRACT

A disposable tray for holding sample vials and the like is provided, by means of which sample vials may be easily handled by automatic equipment. Loading of vials into vial holding compartments in the tray is facilitated by the provision of regular V-shaped notches along the upper edges of compartment-defining partitions. These notches cause any slightly misaligned vial, upon its descent into the tray, to be cammed into the appropriate vial-holding compartment. Vial loading is further facilitated by the outer tray sides, which are formed so as to slant slightly toward the tray interior, thereby assisting in camming outer rows and columns of vials into the appropriate compartments. To provide compartments which may be accurately located under the descending vials, the partitions are rigidly secured to each other and to the tray sides. Tray rigidity is enhanced by tabs formed on opposite sides of the tray blank, which tabs are secured, upon tray formation, to the abutting tray sides. Removal of vials from the tray is made possible by the provision of a hole in each compartment bottom, through which may be inserted the tine of a vial-ejecting comb.

1 Claim, 8 Drawing Figures

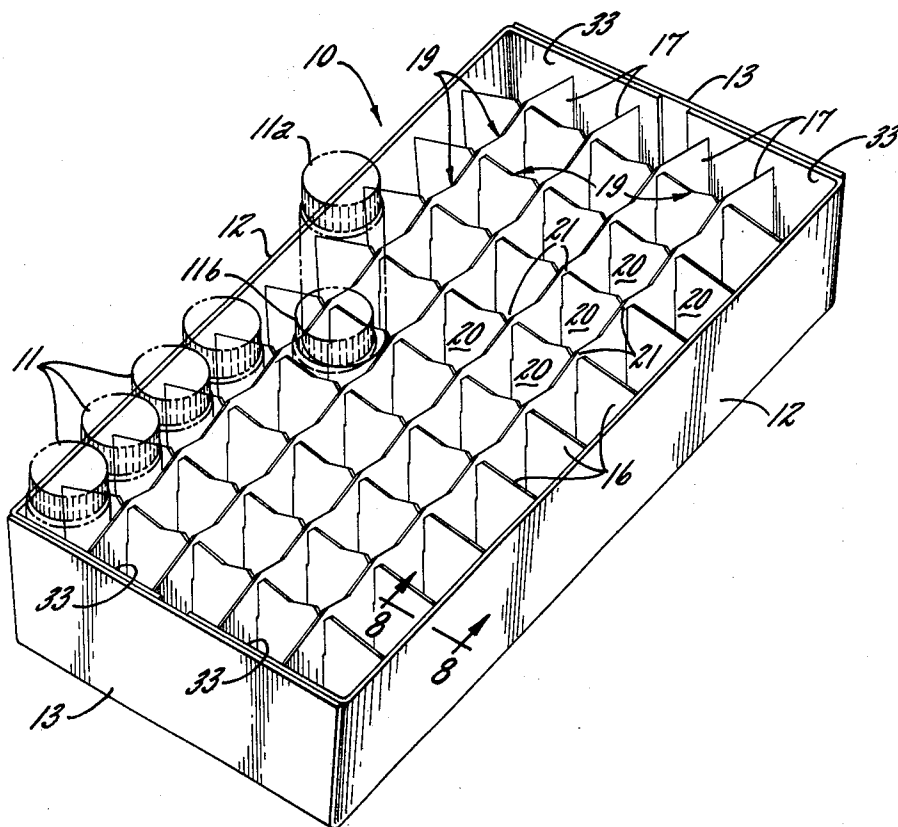


Fig. 1.

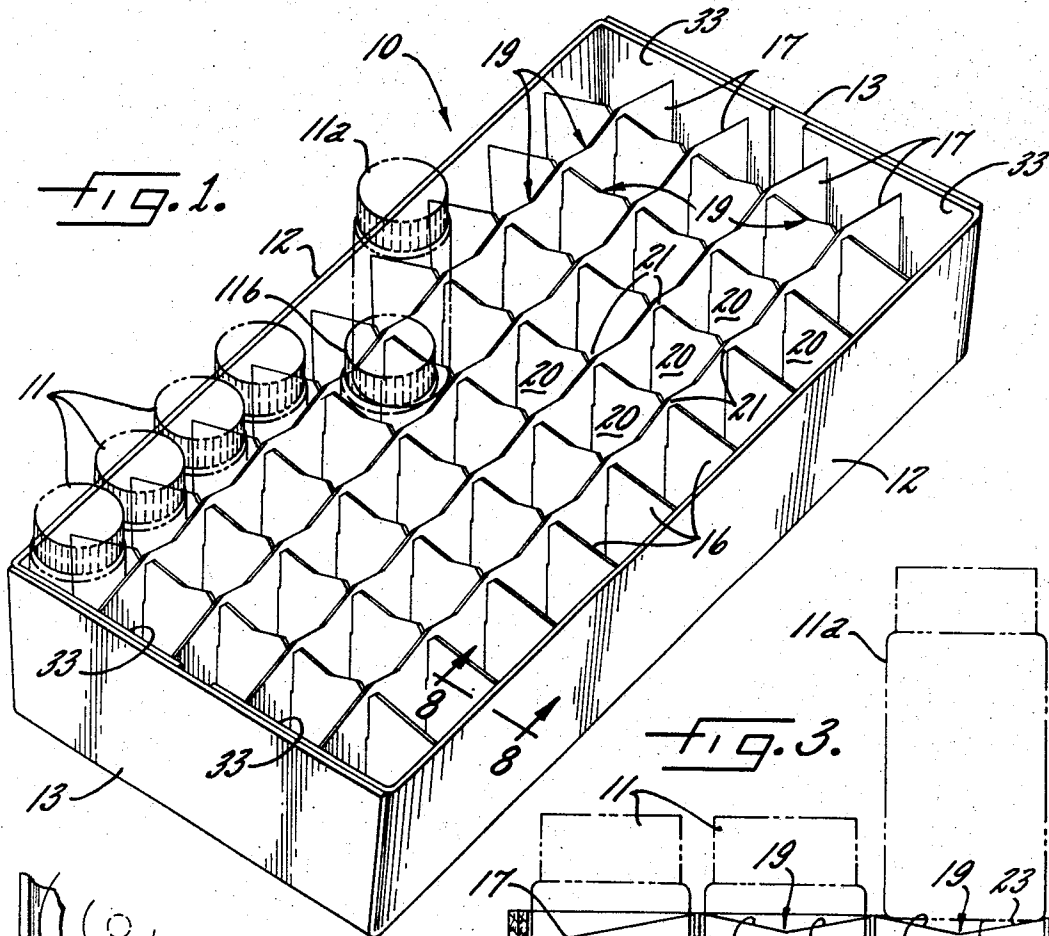


Fig. 3.

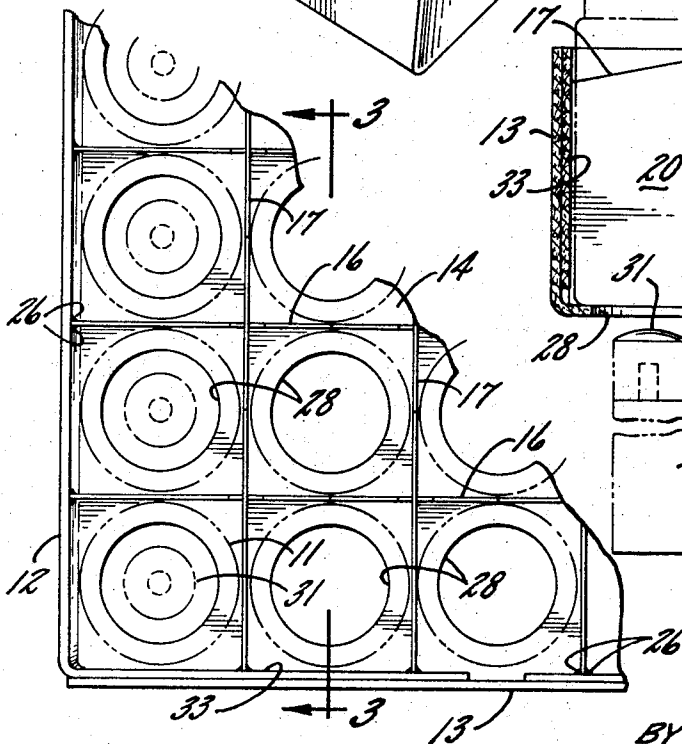
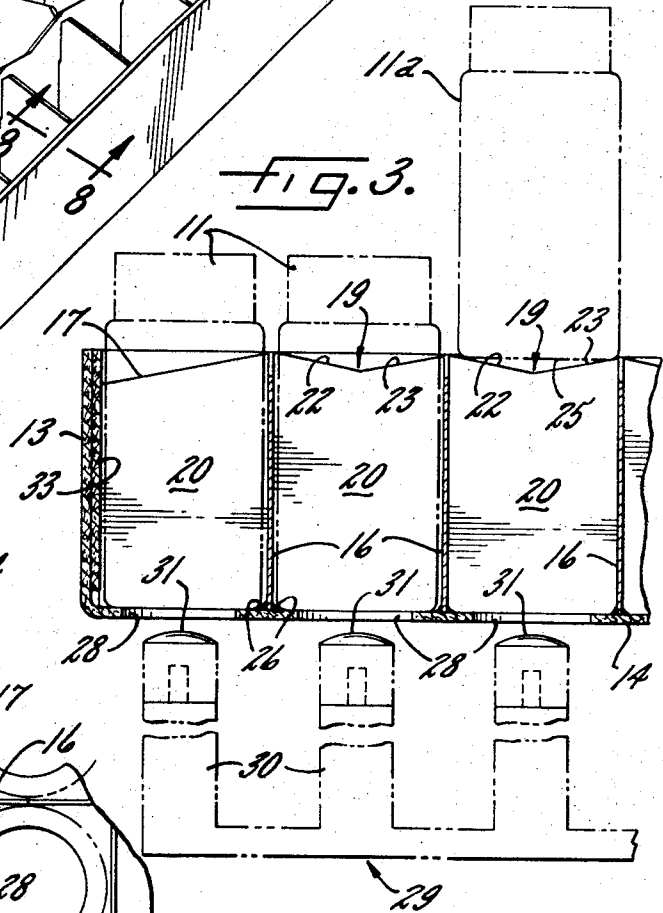
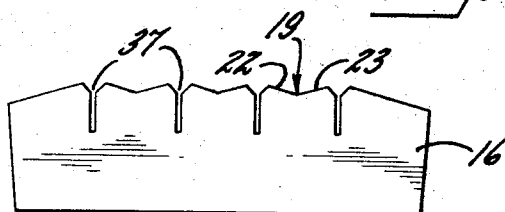
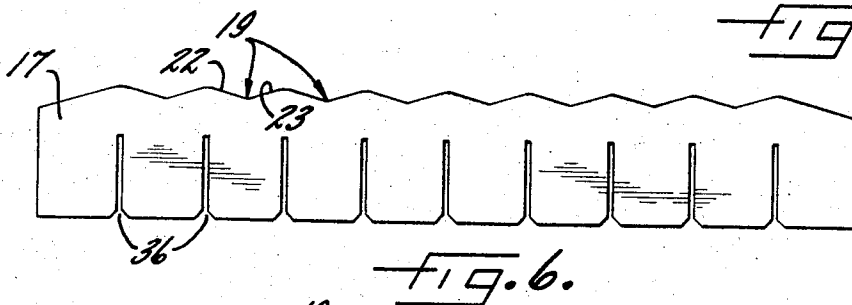
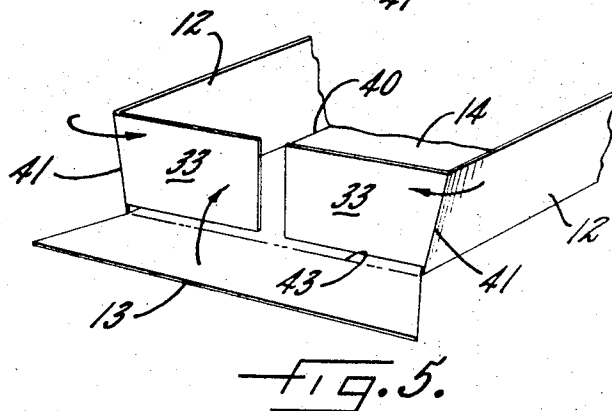
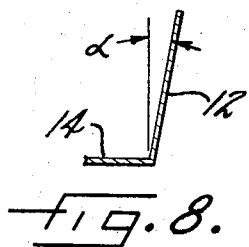
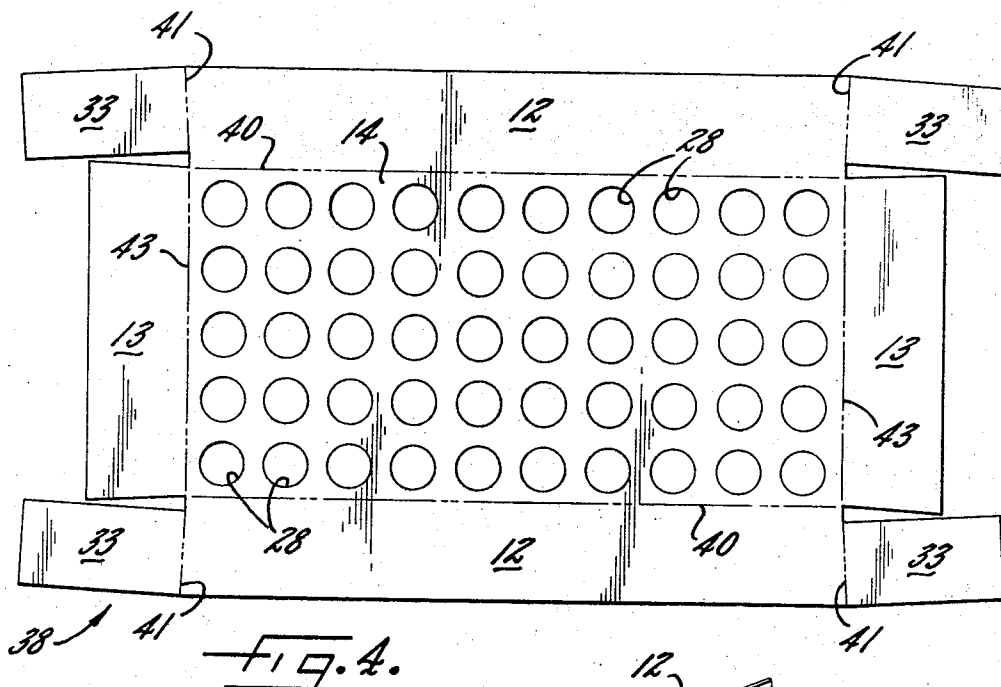


Fig. 2.

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METHOD OF TRANSFERRING SAMPLE VIALS TO AND FROM VIAL-CARRYING TRAYS

This is a division of U.S. Pat. application Ser. No. 27,405 filed Apr. 10, 1970, now abandoned.

RELATED APPLICATIONS

Edmund Frank and Edward F. Polic, U.S. Pat. Ser. No. 27,406, filed Apr. 10, 1970.

Edmund Frank, Serial No. 27,411, filed Apr. 10, 1970.

DESCRIPTION OF THE INVENTION

This invention relates generally to container trays, and more particularly to trays for holding sample vials and the like which are particularly constructed for use with automatic sample vial-handling equipment.

Trays for holding arrays of bottles and like objects in ordered rows and columns have long been known. Such trays usually consist of a box-like structure containing a plurality of intersecting partition members defining individual compartments for the objects and can be adapted to hold special bottles such as sample vials. However, the introduction of automatic vial-handling equipment has rendered known types of vial-holding trays unsatisfactory in several respects. For example, modern vial-handling apparatus lowers sample vials, either sequentially or simultaneously, into the tray compartments. If the tray or the tray partitions erected therein are misaligned with the descending vials, the vials may become lodged upon the top of the tray. Such lodgements, known as hang-ups, require that the handling apparatus be stopped and the difficulty rectified manually and, if not promptly discovered, may result in damage to the equipment. Further, prior forms of trays of the inexpensive disposable type are normally characterized in that they have little, if any, structural strength in the tray sides and partitions. This is acceptable with such prior trays because the trays have a solid bottom which does provide adequate strength for the tray. However, the use of a solid tray bottom, in turn, the use of complex vial grasping members in the vial-handling apparatus in order that the vial-handling apparatus can be appropriately located above the tray top. On the other hand, trays having bottom-located apertures, for the insertion of handling apparatus members therethrough, have been previously fabricated of plastic or other expensive material in order to obtain the requisite tray rigidity.

It is a primary object of the invention to provide an improved method of transferring sample vials to an from a storage tray which permits the vials to be easily and surely loaded into and unloaded from vial-holding compartments within the tray.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIG. 1 is an overall perspective view of the novel sample vial-holding tray, here illustrating, in phantom, several vials fully loaded therein and another identical vial partially loaded therein;

FIG. 2 is an enlarged fragmentary plan view of the tray showing in detail the bottom thereof;

FIG. 3 is an enlarged sectional view taken substantially along line 3—3 in FIG. 2 showing in detail several of the tray compartments together with a portion of a tray-unloading comb device, the latter being depicted in phantom;

FIG. 4 is a plan view of the tray blank as it is formed before having been folded and fabricated into the finished tray;

FIG. 5 is a fragmentary perspective view illustrating the method by which the tray is formed;

FIG. 6 is a plan view of a typical longitudinal partition member of the tray;

FIG. 7 is a plan view of a typical transverse tray partition member; and,

FIG. 8 is a fragmentary sectional view taken substantially along line 8—8 in FIG. 1 showing, in somewhat exaggerated manner, the relationship of the sloping tray sides to the tray base.

While the invention will be described in connection with a preferred embodiment, it will be understood that I do not intend to limit the invention to that embodiment. On the contrary, I intend to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention.

Turning now to the drawings and referring first to FIG. 1, there is shown a typical tray structure 10 for holding sample vials 11 and the like. The outer tray structure comprises two generally longitudinal sides 12, two shorter perpendicular sides 13, and a bottom 14 (FIG. 4), as are more fully described below. Within the tray 10 are located a plurality of planar transverse partition members 16, which may be made of light cardboard or other inexpensive material. As shown, these partition members 16 are disposed in spaced parallel relation to one another, and to the two transverse sides 13 of the tray. To form regular rows and columns of compartments within the tray for receiving the sample vials 11, a plurality of planar longitudinal partition members 17, also formed of cardboard or other inexpensive material, are disposed in perpendicularly intersecting relation to the transverse partitions 16 as shown.

In accordance with the invention, and to facilitate loading the vials 11 into the tray by automatic vial-handling equipment, regular V-shaped notches 19 are formed upon the upper edge of each partition 16 and 17. When the tray 10 and partitions 16 and 17 are assembled as shown, a plurality of preferably square compartments 20 are thus formed, each compartment 20 having a peak or point 21 adjacent at least one of the corners thereof. The V-shaped notches 19 are, in the preferred embodiment, formed with an included angle of about 140°. The straight, inclined sides 22, 23 of the notches 19 formed on the four sides of each compartment co-operate with the bottom edges 25 of the vial to produce what is, in effect, four inclined planes, all directed downwardly and inwardly toward the central axis of each compartment 20. The notches 19 thus have the effect of camming or guiding a vial 11a which is descending in mis-alignment with its compartment toward

the axis of that compartment and down into the proper position 11*b*.

To further facilitate loading the vials 11 into the tray in accordance with this aspect of the invention, the outer tray sides 12 and 13 are formed as described below, so as to slant slightly toward the tray interior, thereby assisting in camming rows and column of vials adjacent there sides into the appropriate compartments. In the illustrated embodiment, shown in FIGS. 2 and 8, the sides 12 are slanted toward the interior at an angle α of substantially 3° from the normal to the tray bottom 14. While not shown in the drawings, it will be understood that the sides 13 may be similarly slanted.

To assist in the requisite the accurate positioning of the tray compartments 20 with respect to the handling apparatus in further accordance with the invention, the intersecting partition members 16 and 17 are secured within the tray structure so as to accurately fix the location of each compartment 20 within the tray structure. In the present embodiment, the partition members 16 and 17 are rigidly secured to one another in a manner hereinafter described, and are also secured to the tray structure. In the present instance, each partition member 16 and 17 is joined to the appropriate tray sides 12 or 13 at its opposite extremities by appropriate drops of glue 26. Preferably, these glue drops 26 are located at the corners whereat the partition members 16 and 17 intersect not only the appropriate tray sides 12 and 13, but also about the bottom of the tray 14, thus providing additional rigidity to the entire structure.

In accordance with a further aspect of the invention, provision is made for the operation of vial-handling apparatus, which may be automatic in operation (such, merely by way of example, as that illustrated and described in the aforesaid copending applications of Edmund Frank and Edward F. Polis, U.S. Pat. Ser. No. 27,406, and Edmund Frank, U.S. Pat. Ser. No. 27,411, both of which are assigned to the assignee of the present invention), from a position below the bottom 14 of the tray. To this end, the tray bottom 14 is formed with holes 28 disposed in regular columns and rows in such manner that a hole is located in the bottom of each compartment 20. In order that the vials 11 may be elevated from the compartments 18, a vial elevating comb 29 is, in the illustrated embodiment, positioned directly below any column or row of compartments in the tray 10. To elevate the vials in such row or column, the comb 29 is moved upward relative to the tray, so that the comb tines 30 are inserted through the holes 28 and vials 11 are forced upwardly relative to and out of the tray. The vial bottles may then be removed from the tine tips 31. The tines 30 are then removed from the tray by withdrawing them through the holes 28. It will be noted that the holes 28 in the tray bottom 14 must be made large enough to allow the free passage of the tines 30; to provide maximum vial guidance, the tine tips 31 must be as large as possible.

Also in accordance with the invention, loading vials into the tray may be easily accomplished. To this end tines 30 are inserted upwardly through the holes 28 of the compartment, and vials 11 are disposed as shown, by automatic equipment or manually, upon the tine tips 31. The comb is then lowered and the tines 30 drawn out through the tray bottom. The vial bottles 11 are thereby lowered into the appropriate compartments 20. Mis-aligned vials 11 are cammed toward the center

of and down into the compartments 20 by the camming surfaces or notches 19, as described above.

In accordance with a further aspect of the invention, the rigidity of the tray construction is further enhanced by the provision of tabs 33 which are formed upon and extend beyond the ends of the opposite longitudinal sides 12. During fabrication of the tray into its final form, the tabs 33 are bent substantially normally to the tray sides 12 upon which they are formed, and are then securely attached to the abutting perpendicular tray sides 13. Preferably, this attachment is made by glue, stapling, or other convenient means, and is made at a point nearer the top of the tray than the bottom of the tray, thus providing maximum stress support.

The preferred embodiment of the tray may be fabricated in a straight-forward manner. The planar partition members 16 and 17 are formed as illustrated in FIGS. 6 and 7. It will be noted that slots 36 are formed in the longitudinal partition members 17 which communicate with the bottom thereof, and that slots 37 are formed in the transverse partition members 16 so as to communicate with the top thereof. The compartment-defining partition member lattice work is then assembled in rectangular relation, as shown in FIG. 1, by slipping the slots 36 of the longitudinal partition member 17 downwardly into and over the slots 37 formed in the transverse partition members 16. The partition members 16 and 17 are thus secured to one another in the requisite rigidly spaced manner. The tray blank 38 is formed as illustrated in FIG. 4, and the longitudinal sides 12 are then folded into their slightly slanted position along fold lines 40. Thereafter, tabs 33 are folded substantially normally to the sides 12 along fold lines 41. Finally, transverse sides 13 are folded up, along fold lines 43 to meet tabs 33 for securing, and are attached to the tabs as described. The assembled partition member lattice work is then inserted into the tray structure and secured therein as described above. There is thus produced a strong and inexpensive tray into which the sample vials 11 may be easily inserted and from which they may be easily removed by automatic vial-handling equipment.

I claim as my invention:

1. A method of transferring sample vials to and from a rectangular array of vials disposed in columns and rows, said method comprising the steps of

a. placing the vials in a tray having a plurality of transverse partition members disposed in spaced parallel relation to one another, a plurality of longitudinal partition members, spaced apart and disposed in perpendicularly intersecting relation to the transverse partition members so as to form regular rows and columns of compartments for receiving the vials, the partition members being rigidly secured to intersecting partition members and to the tray structure so as to fix the location of each compartment within the tray structure, the top edges of said partitions forming camming surfaces adapted to cam a vial engaging said top edges toward the center of one of the compartments formed by said partitions, and a tray bottom forming holes disposed in regular columns and rows so that at least one hole is formed centrally in the bottom of each compartment,

b. aligning said tray with a comb member having a plurality of tines being disposed generally below the tray bottom and spaced to align with the holes

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in the bottoms of at least one row of compartments in the tray, the gap between adjacent tines being less than the width of the vial,
c. inserting the comb tines through the holes formed in the tray bottom, and elevating the comb to force the vials located above the holes out of the tray, 5
d. removing the vials from the tine tips,
e. and subsequently disposing vials on the tine tips while said comb is in its elevated position and withdrawing the tips from the tray through the holes in 10

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the tray bottom to lower those vials aligned with their respective compartments directly into such compartments, and simultaneously lowering misaligned vials into engagement with said camming surfaces on the tray partitions so as to cause said misaligned vials to be cammed downwardly and inwardly toward the centers of their respective compartments.

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