

- [54] **SHIPPING AND CLEANING BOX**
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- [52] U.S. Cl. .... **206/65 A, 206/65 R, 206/72,**  
**220/20**
- [51] Int. Cl. .... **B65d 1/36, B65d 71/00**
- [58] Field of Search ..... **206/17.5, 43, 65 R,**  
**206/65 A, 72; 220/20, 22, 23, 23.83, 97 C, 97**  
**F, 4 B**

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*Assistant Examiner*—Steven E. Lipman  
*Attorney*—Joseph Gray Jackson et al.

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[57] **ABSTRACT**

A plastic box preferably of transparent dielectric material for shipping and cleaning collapsible tubes with or without caps. Between the bottom and the top of the box, which telescopes together, a plastic separator is located which forms separator walls and compartments for the individual tubes side by side and in vertical position. The bottom of the box on its bottom wall preferably has recesses.

**1 Claim, 13 Drawing Figures**

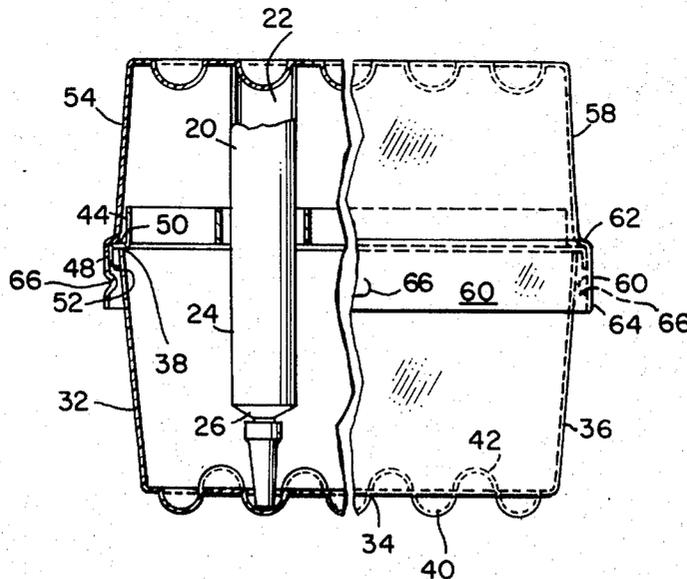


FIG. 2

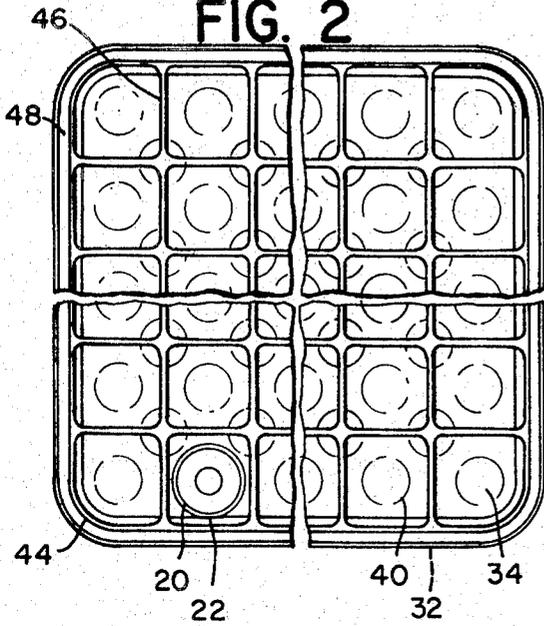


FIG. 1

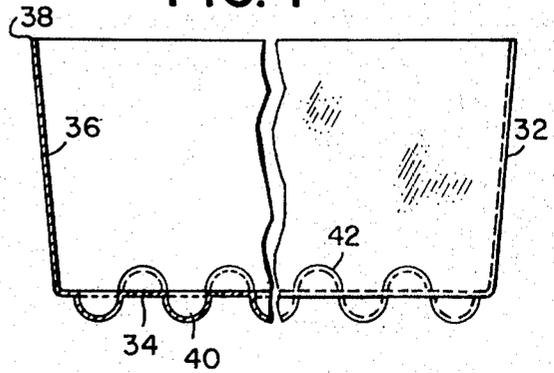


FIG. 3

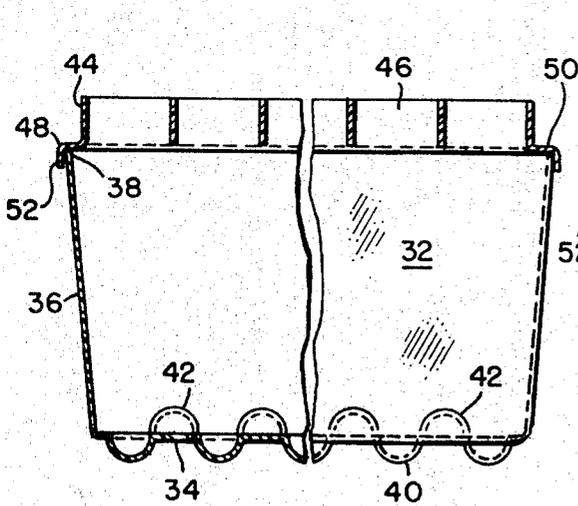
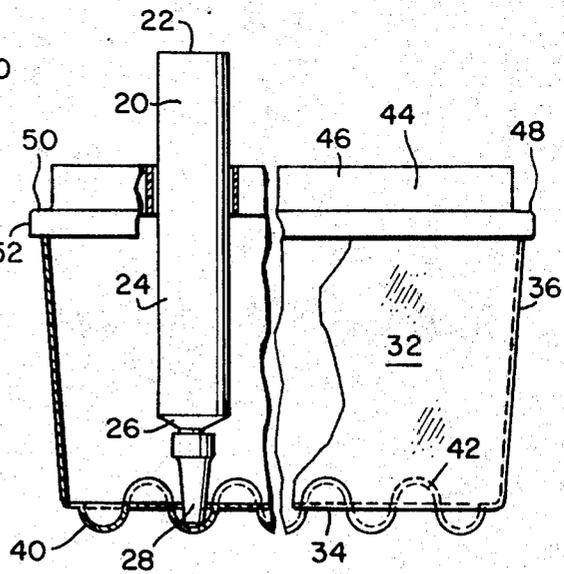


FIG. 4



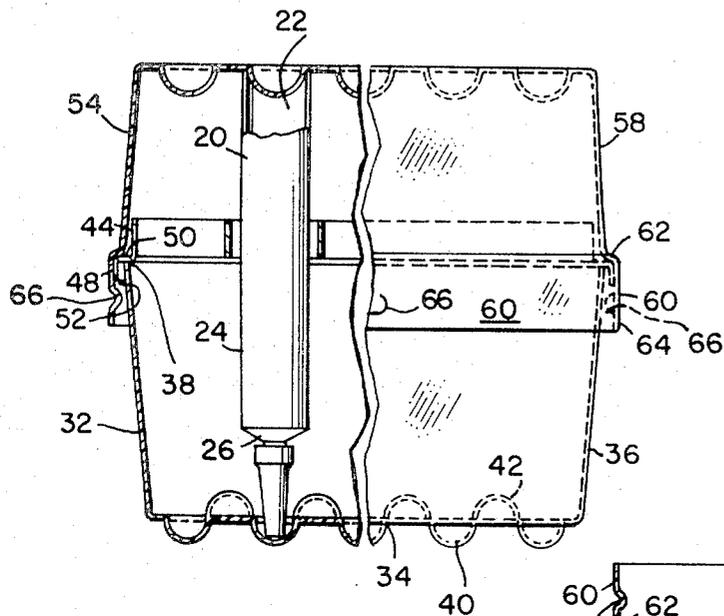


FIG. 5

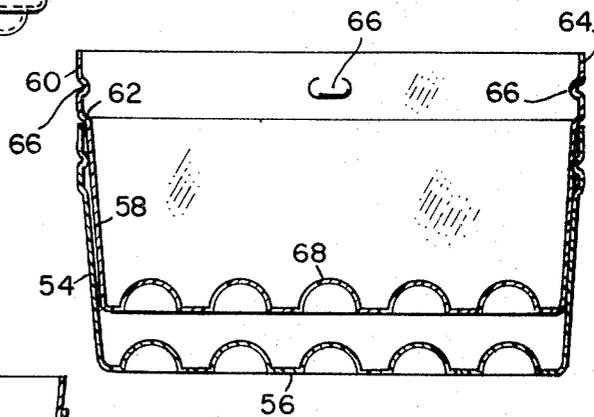


FIG. 10

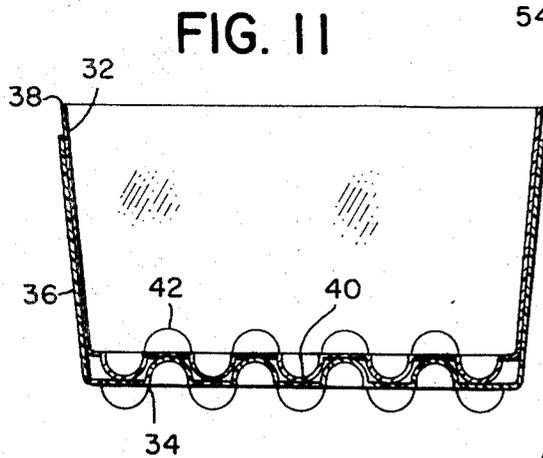


FIG. 11

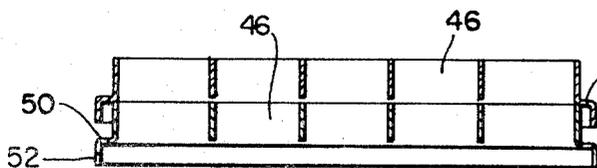


FIG. 12

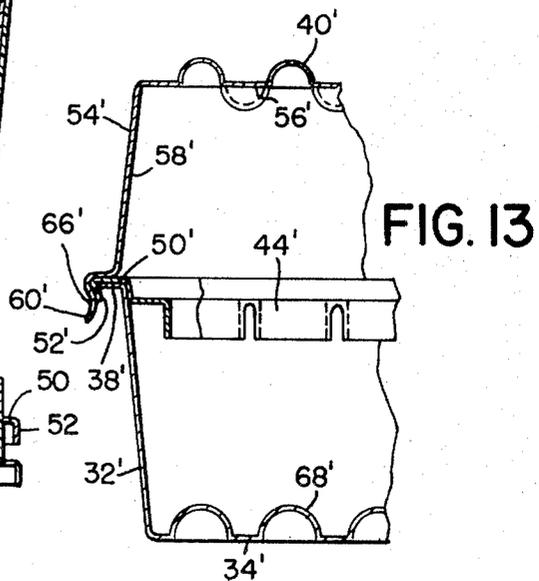


FIG. 13

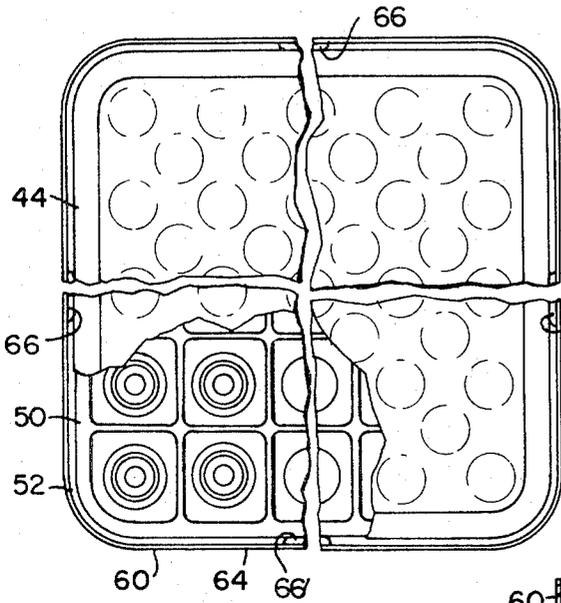


FIG. 6

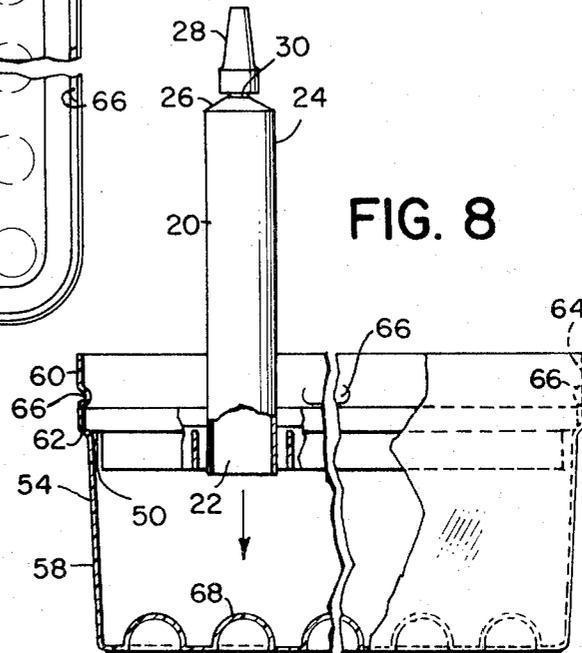


FIG. 8

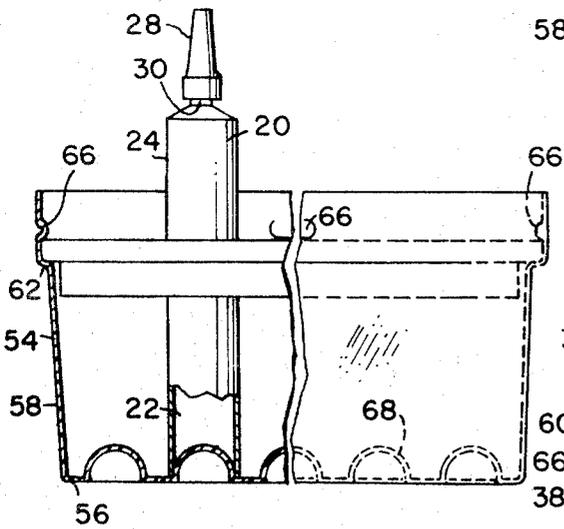


FIG. 7

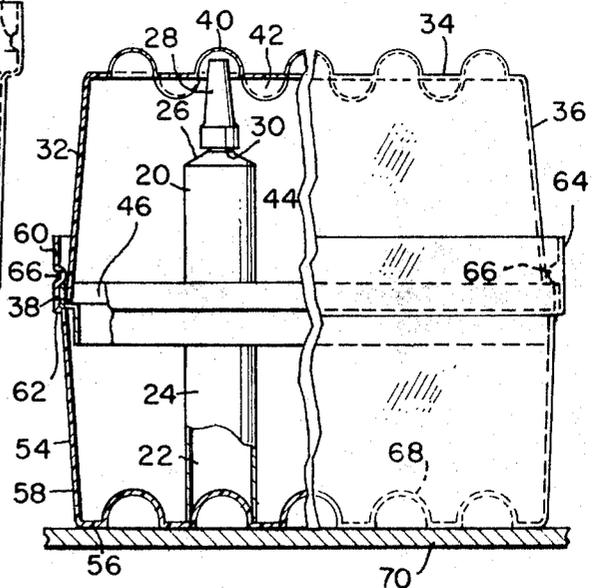


FIG. 9

## SHIPPING AND CLEANING BOX

## DISCLOSURE OF INVENTION

The invention relates to plastic boxes for shipping and cleaning collapsible tubes preferably fitted with caps on their tips and to processes of shipping and cleaning collapsible tubes.

While the objects contained within the box are described herein as collapsible tubes, it will be understood that any equivalent container may be shipped within the box.

A purpose of the invention is to imprison a separator having compartments for individual collapsible tubes between a bottom and a top of a plastic box in which the bottom and the top are in telescopic relation, so that depending on whether the bottom is in its normal lower position or is located uppermost, or the top is in its normal uppermost position or is located under the bottom, in either case the uppermost portion, the top or the bottom, can be removed and the tubes can be taken out and inserted with their open ends up or their caps up as desired.

A further purpose is to place recesses in the bottom wall of the bottom to receive the tips and domes in the top wall of the top to receive the open bottoms of the tubes and thus guide both ends of the tubes.

A further purpose is to guide the tips into the recesses by domes located in the bottom wall of the bottom.

A further purpose is to extend a flange on the separator around the rim at the top of the side wall of the bottom of the box and to extend a flange on the side wall of the top of the box over the rim so that the separator is restrained vertically by the rim on the bottom of the box and a step portion of flange on the top of the box.

A further purpose is to restrain the flange of the separator against leaving the top by detents on the inner part of the flange of the top of the box.

A further purpose is to apply an electrostatic charge to a dielectric plastic making up the wall of the box to divert particles of dust to the box wall when the collapsible tubes are cleaned.

Further purposes appear in the specification and in the claims.

In the drawings we have chosen to illustrate one embodiment of our invention which is preferred, and which illustrates the invention most simply, and effectively.

FIG. 1 is a central vertical section, partly broken away and partly in elevation, of the box bottom of the invention.

FIG. 2 is a fragmentary top plan view of the box bottom and separator, with a tube in place.

FIG. 3 is a central vertical section, partially broken and partly in elevation of the box bottom and separator.

FIG. 4 is a side elevation, partially in section, and partially broken away, of the box bottom and separator with a collapsible tube and cap in place.

FIG. 5 is a side elevation partially in central vertical section and partially broken away of the complete box of the invention including the box top, showing a collapsible tube and cap in place.

FIG. 6 is a fragmentary top plan view of the complete box of the invention partially in horizontal middle section.

FIG. 7 is a side elevation partially in central vertical section and partially broken away of the inverted box

top having a collapsible tube in place and about to be withdrawn for cleaning.

FIG. 8 is a view similar to FIG. 7 showing the insertion of a collapsible tube after cleaning, the tube being partially broken away.

FIG. 9 is a side elevation partially in central vertical section and partially broken away showing the complete box inverted.

FIG. 10 is a central vertical section showing the nesting of the box tops.

FIG. 11 is a central vertical section showing the nesting of the box bottoms.

FIG. 12 is a central vertical section showing the nesting of the separators.

FIG. 13 is a fragmentary vertical section of an assembled box showing a variation in the form shown in other embodiments.

In the prior art, collapsible tubes are normally produced having a threaded tip, to which a cap is applied, and having an open end through which in many cases the tubes will later be filled. At one time it was the almost universal practice to ship the empty collapsible tubes in cardboard boxes. More recently, there has been a demand for removal of particles of foreign matter from collapsible tubes of many different types. Originally, this arose in collapsible tubes which were to be filled with ophthalmic preparations. It was established that fine particles of the tube metal such as aluminum, tin or lead and particles of dust which were abrasive were a possible cause in eye irritation when administering ophthalmic preparations from collapsible tubes.

A process was developed for cleaning the interiors of collapsible tubes which would expel metal particles and dust particles from them, Henry S. Dzedzej, U.S. Pat. No. 3,442,707, granted May 6, 1969 for Apparatus and Process for Cleaning Collapsible Tubes.

More recently, it has been discovered that fibrous particles are another type of contamination in ophthalmic preparations and many other products sold in collapsible tubes, particularly products in the pharmaceutical field. The present invention is designed particularly to make possible the substantial elimination of particulate matter derived from boxes in which collapsible tubes are shipped or are contained while cleaning.

The invention also makes possible the elimination of a tube or tubes not intended for the particular shipment, for example, one which would use a different label from that of the others in the shipment by having a clear plastic lid to make the intermix visible.

The invention lends itself well to receiving collapsible tubes and also cleaning them, since the box which forms the subject matter of the invention can be used with top up or bottom up as desired, and it is capable of functioning in either position. In the invention the box is made from plastic which does not contain fibrous material, preferably crystalline thermoplastic, of which examples are polystyrene, polyvinyl chloride, polyethylene, polypropylene, XT polymer and the like, which are not sources of particulate material and are not likely to form particles.

The box of the invention is in three parts. One part is the bottom half which has a bottom wall and suitably relatively deep side walls and a top rim. The bottom wall preferably has depressions to receive caps and domes to guide the caps into the depressions.

The box has a top which has a top wall and side walls. In the top wall of the top there are preferably domes

which extend within the open ends of the tubes to retain them in alignment.

The box also has a separator and one of the important features of the invention is that the separator is imprisoned between the top and the bottom when the box is closed, but either the top or the bottom can be removed when it is uppermost without disturbing the separator. It will be evident that the separator in some embodiments can be one with the bottom or the top, preferably the top. The separator has a flange which rests on the rim of the bottom and extends around the rim. The top of the box has a flange which contacts the flange of the separator and also in one form extends down around the bottom of the box. The flange of the top also has detents extending inwardly and avoiding unintentional removal of the top of the box, but permitting intentional removal of the top of the box.

The separator preferably has relatively deep separator walls which extend around each tube and which provide depth of section for the separator which strengthens it.

In filling the box originally, with the separator in position on the bottom of the box, tubes are inserted in the separator compartments with the tip end down and the tubes vertical and beside one another. Then the top of the box is applied over the separator and telescoping around the bottom and the box may if desired be additionally held closed as by adhesive tape or the like.

Since the top and the bottom of the box may be transparent and each tube can be seen either from the side or the end, an inspection operation can be performed of the tubes in the box to be sure that they are all of the same size and that they all have the same label and do not contain any odd or mixed-up tubes.

The tubes can then be transported in the box to the cleaning station. At that point the box is inverted since it is desired to insert the tubes into the cleaning station with their open ends down. The bottom of the box then is removed, and it slips out readily from within the flange on the separator having the separator in contact with the top. Tubes are inserted into the cleaning operation, already referred to, and then are restored to the box or to another box, with their open ends down. The separator is designed to facilitate insertion of tubes in the inverted position mentioned above by means of the radiused guide holes as shown.

A desirable aspect in some cases, especially where the air contains discreet particles of matter which may go into the box, is to charge the wall of the box, which in this case will be dielectric as already explained, with an electrostatic charge, which is opposite from the prevailing charge on the dust particles. If the prevailing charge on the airborne dust is negative, the walls of the box will be charged positively and if the prevailing charge of the airborne dust is positive, the walls of the box will be charged negatively. This assures that the airborne dust does not get into the box in a position where it would be likely to enter the inside of one of the collapsible tubes but instead adheres to the wall of the box.

It will be evident when the clean tubes are put in the box, with their open ends around the dome projections on the top wall of the box top (now inverted) there is a slight draining of cleaning solution or the like into the top half of the box.

The detents on the flange of the top half of the box serve two purposes. They effectively hold the separator

to the box top. Also, when the top half of the box is removed and no effort is made to leave the separator on the bottom half, the separator remains with the top and effectively frees the tubes resting in the bottom of the box so that they can be more easily removed to the filling machine.

It will accordingly be evident that particulate matter and especially fibrous matter is eliminated by the present invention, and at the same time inspection can be facilitated as one aspect of this in that the caps may be color coded.

When the tubes have been removed, all of the lids can be nested, all of the box bottoms can be nested and all of the separators can be nested for return shipment with minimum space requirement. This nesting will preclude the return of a tube which was previously shipped.

By the present invention almost half of the tube is exposed by removal either of the top or bottom of the box.

It will be evident that the box bottom can be always the same with a different separator and a different box top depending on whether the tube is longer or shorter or of larger or smaller diameter.

In some cases where it is desired to sterilize the contents of the box against bacterial contamination, this can be done as by ethylene oxide and a sterility indicator can be inserted and read through the transparent wall of the box to be sure that the contents are still sterile.

It will be understood that the separator can be combined with the box top or the box bottom, preferably the box top, as desired.

In the prior art it will be evident that plastic boxes have been used as shipping containers, for example for vials (PLAXALL Inc.) and test tubes but they have not been suitable for collapsible tubes and have not had the features which characterize the present invention and make it distinctive.

The collapsible tubes 20 have open ends 22, side walls 24, shoulders 26 and caps 28 (if capped tubes are shipped) on tips 30 optionally threaded or frictionally engaged on the outside. A box bottom 32 has a bottom wall 34, side walls 36 which are relatively deep and adapted to surround about one-half of the tube, and a rim 38 at the top. The bottom wall has distributed over its surface dome-shaped recesses 40 which are adapted to hold and locate the ends of the tips (whether or not caps are applied) and between the recesses dome-shaped projections 42 which are adapted to guide a misdirected tip into the proper position.

On the bottom of the box in one position sits a separator 44 which is divided into a plurality of upstanding separator walls 46 of the right size to contain and position a collapsible tube and restrain its tendency to rotate and abrade. The separator walls in plan view may be endless and square or circular or any other suitable shape to fit the collapsible tubes and the box. The separator walls extend vertically an appreciable distance and make in effect a large number of stiffener units which add depth of section to the design. The separator unit at the outside has a flange 48 which comprises an outwardly extending portion 50 which is adapted to rest on the rim of the bottom of the box, and a downwardly extending portion 52 which is adapted to surround the rim of the bottom of the box, preventing the separator unit from being displaced.

The top of the box 54 is of course of a size to cooperate with the bottom of the box and consists of a top wall 56, relatively deep side walls 58 and a surrounding flange 60 which is of L-shape in section, having an outwardly extending portion 62 which engages the flange of the separator and imprisons the separator between the top and the bottom, and a downwardly extending portion 64 which surrounds the rim of the bottom of the box and the flange of the separator and is preferably elongated to provide inward detents 66 which are below the separator and which tend to keep the separator with the top of the box unless someone deliberately bulges out the side walls in removing the top of the box, when the top can be removed leaving the separator attached to the bottom of the box. Cooperating in location of the tubes are a plurality of downwardly dome-shaped projections 68 from the top of the box which extend inside the open ends of the tubes. Since the box is selected of the right height so that it just engages the caps and the bottoms of the tubes, the tubes are prevented from freedom which could result in damaging them. It will be understood of course that the size of the box is variable, though a convenient size is adapted to contain 200 collapsible tubes in one embodiment.

Starting with the bottom of the box upright as shown in FIG. 1, in one embodiment, the separator is assembled on the bottom of the box with the flange engaging the rim of the bottom of the box as shown in FIGS. 2 and 3, and then tubes are put in the bottom of the box with their tip ends down as shown in FIG. 4. The top of the box is placed over the separator in such a way to engage the detent of the box top over the separator and the box can be closed as shown in FIG. 5 and maintained in closed position as by adhesive tape, string or the like. The box being wholly or partially transparent, permits inspection of the contents.

In order to clean the tubes, the box is inverted, removing any adhesive tape or string, and the bottom is lifted from the box as shown in FIG. 7, leaving the tubes with the tips at the top. The tubes are then lifted out and are convenient to clean according to the Dzedzej patent, above referred to. After cleaning, the tubes are inserted into the separator compartments as shown in FIG. 8 and allowed to drain, desirably allowing the cleaning solution to evaporate. When evaporation of the solvent is complete, the box is closed by applying the bottom as shown in FIG. 9 and securing the parts together as with tape or string. If an electrostatic charge is to be applied to the box, the table or the like on which the box tops rest when the tubes are inserted after the cleaning, is subjected to the suitable pole 70 of electrostatic machine and the electrostatic charge causes the loose particles to take on a charge and adhere to the box rather than the tubes.

The box can then be shipped and the box is opened, desirably with the tips down, in which case the separator remains with the top of the box, facilitating the removal of the tubes for filling.

The separator is later conveniently extracted over the detents by distorting the walls of the top of the box outward and the bottoms of the box can be nested with themselves and the tops of the box can be nested with themselves and the separators can be nested with themselves as shown in FIGS. 10, 11 and 12, economizing on space in return shipment.

It will be evident that in the claims when the tip end of the tube is designed, it may or may not have a cap thereon.

It will be evident that the positions of the recesses which engage the tips of the tubes or the caps on the tubes and the projections which engage within the side wall at the bottom of the tubes can be reversed with respect to the other forms shown as illustrated in FIG. 13. In this figure a box bottom 32' has rim 38' around the top edge, and in its bottom 34' it has dome-shaped projections 68' which are attached to engage within the open ends of the collapsible tubes. A separator 44' has a flange 50' which rests on the rim 38' and a downwardly extending flange portion 52' which not only extends over the rim 38' but by its reverse bent contour locks over it, though it may be removed by spring outwardly.

The box top 54' has a bottom 56' which has recesses 40' formed in it and receiving the caps or the tube dispenser portions. It has a side wall 58' and an outwardly and downwardly extending flange 60' which extends inwardly at 66' over the flange of the separator although it springs outwardly if desired to separate it from the other parts of the box.

Accordingly in the form of FIG. 13 it will be seen that the box top and bottom snap together and force must be used to separate them by outwardly displacing the flange 60' and the separator and the box bottom snap together and force must be used to separate them if desired. In the form of FIG. 13 the separator is less deep than in the other form of the invention but extra stiffness of the separator is imparted by the configuration of the flange 52'.

In view of our invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of our invention without copying the structure and process shown, and we therefore claim all such insofar as they fall within the reasonable spirit and scope of our claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A plastic box for shipping unfilled collapsible tubes, which consists of a first box portion receiving collapsible tubes side by side and having a bottom wall, side walls, and a rim, a separator which rests on the first portion having a flange surrounding the rim of the first portion and having a plurality of separate walls each of which is attached to receive and laterally guide a collapsible tube, a second box portion resting on the separator, having a flange which surrounds the separator flange and the rim on the first box portion, having a top wall and side walls and receiving a portion of each collapsible tube in side by side relation, the separator flange extending over and gripping the rim on the first box portion and locking the separator to the first box portion removably, the second box portion having a flange which extends over and removably locks on the flange of the separator, holding the parts of the box together, the tubes having tips, a plurality of dome-shaped recesses in one of the first or second box portions receiving the tips in the individual collapsible tubes and retaining the tubes in position, a plurality of dome-shaped projections adjoining the dome-shaped recesses, the dome-shaped projections guiding the tips of the collapsible tubes into the recesses, a plurality of dome-shaped projections in one of the first and second box portions which extend into the open ends of the collapsible tubes and lock them, the separator walls around the individual collapsible tubes being elongated vertically to give depth of section to the separator, the first box portion, the second box portion and the separator being of plastic free from fibrous dust.

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