

Croley

[15] **3,704,824**

[45] **Dec. 5, 1972**

[54] FIBERBOARD FLAT WITH JOINED STRENGTHENED CORNERS FOR SETTING UP INTO AN ANGULAR TRAY AND THE SET-UP TRAY

1,102,877	7/1914	Clark.....	229/DIG. 4
1,673,109	6/1928	Fenstermacher.....	229/DIG. 4
686,808	11/1901	Hirsch.....	229/41 R
1,563,907	12/1925	Koff.....	229/32 X

[72] Inventor: **Thomas E. Croley**, Worthington,
Ohio

[73] Assignee: **Corco, Inc.**, Columbus, Ohio

[22] Filed: **March 5, 1971**

[21] Appl. No.: 121,279

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 107,335, Jan. 18, 1971, abandoned.

[52] U.S. Cl.....229/32, 229/41

[51] Int. Cl. B65d 5/36

[58] **Field of Search**.....229/32, 33, 36, 41, DIG. 4

[56] **References Cited**

UNITED STATES PATENTS

1,485,584	3/1924	Bergstein.....	229/32
1,656,307	1/1928	Walter.....	229/32 X

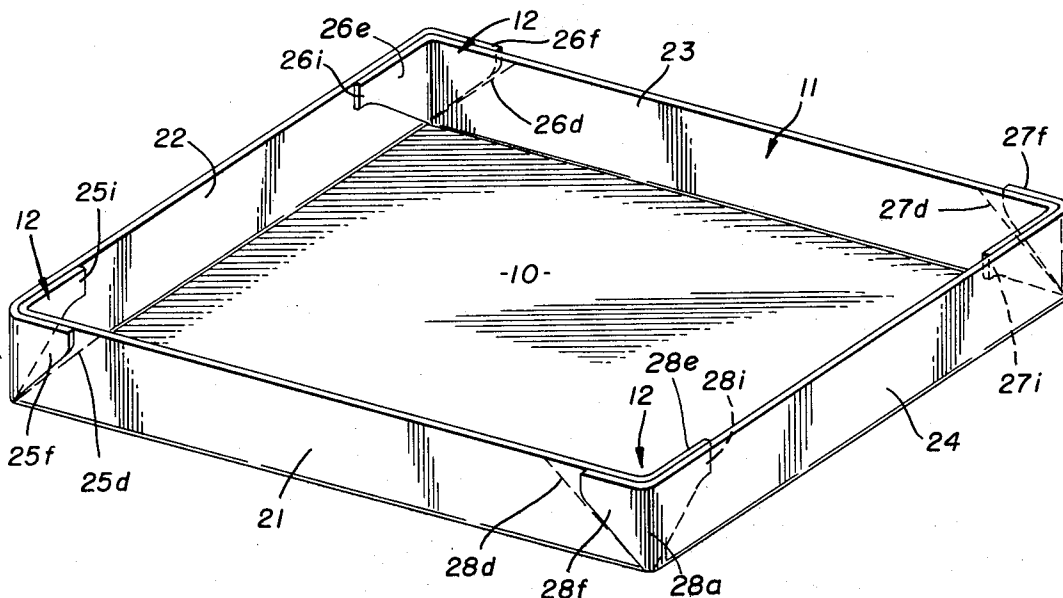
Primary Examiner—Davis T. Moorhead

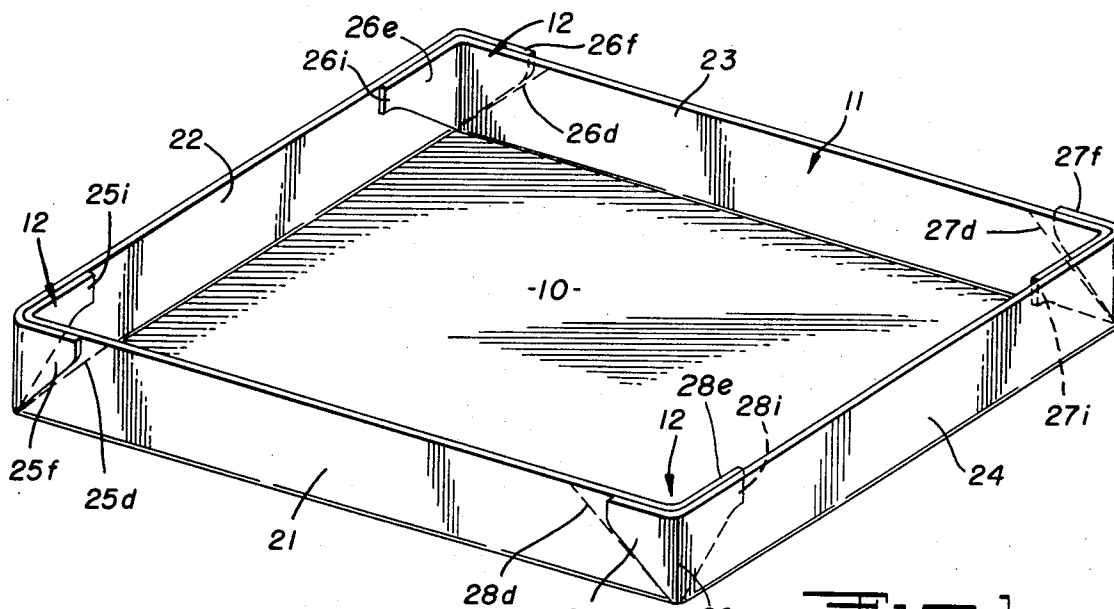
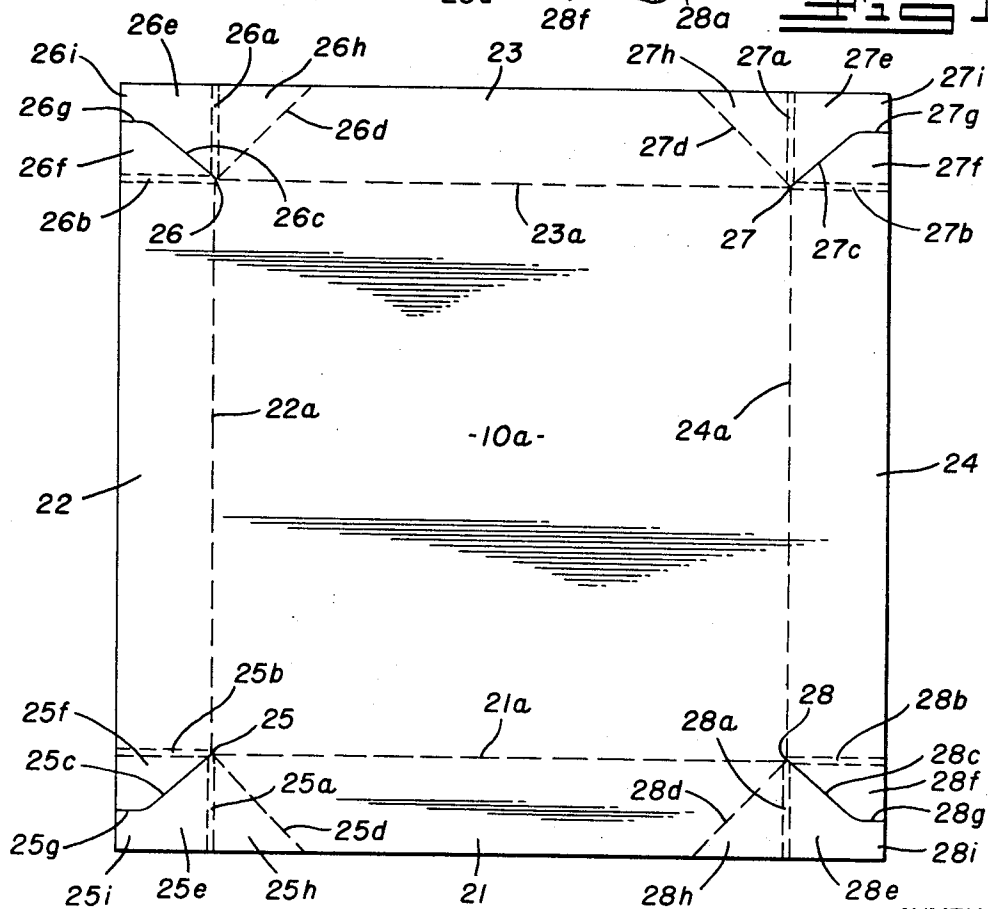
Attorney—William V. Miller, Eugene J. Mahoney and Robert E. Stebens

[57] **ABSTRACT**

A flat of fiberboard or similar material which can be set-up to provide an angular tray with a main flat wall and a peripheral flange at a right angle to the plane thereof, the flange consisting of flaps hinged to the main wall and joined together at the angles of the tray. Each angular joint of the set-up tray is of such a structure that it has increased strength. The flat is manufactured in collapsed or flat condition with all corners joined ready to be expanded into set-up condition to provide the final tray. It is provided with improved corner-connecting joints which will ensure that in setting it up, bending will occur only at certain scored fold lines.

7 Claims, 6 Drawing Figures





INVENTOR.

THOMAS E. CROLEY

BY
MAHONEY, MILLER & STEBENS

BY *Wm. V. Miller*
ATTORNEYS

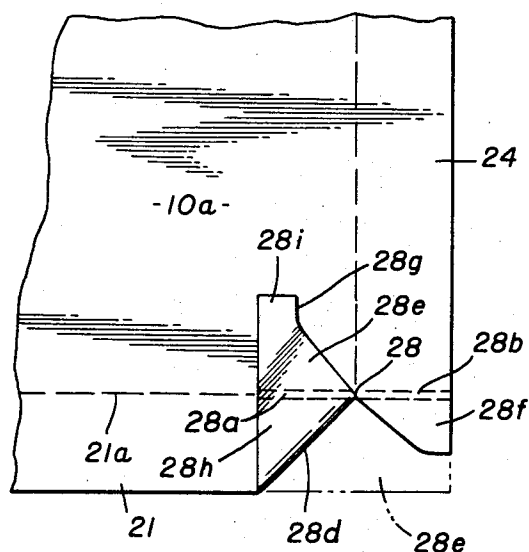


Fig. 3

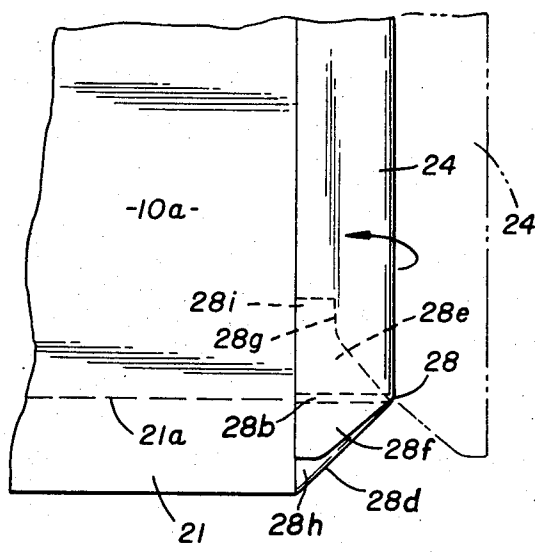


Fig. 4

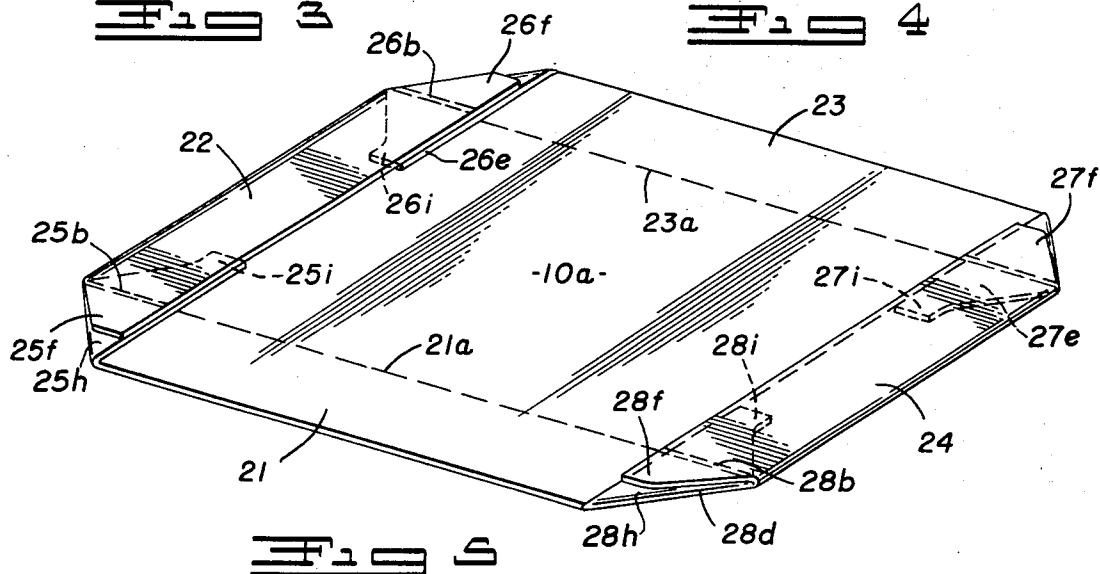


Fig. 5

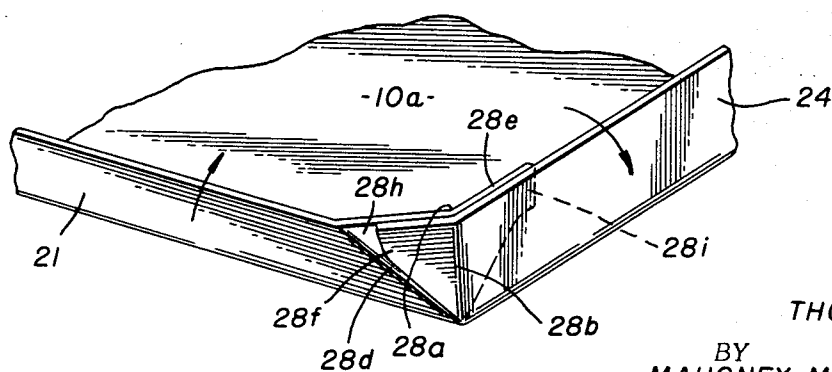


Fig. 6

INVENTOR.
THOMAS E. CROLEY

BY
MAHONEY, MILLER & STEBENS
BY *Wm. V. Miller*
ATTORNEYS

FIBERBOARD FLAT WITH JOINED STRENGTHENED CORNERS FOR SETTING UP INTO AN ANGULAR TRAY AND THE SET-UP TRAY

This application is a continuation-in-part of my co-pending application, Ser. No. 107,335, filed Jan. 18, 1971, now abandoned.

This invention relates generally to what are usually referred to in the art as trays, which term will be used hereinafter, but are actually shallow box-like structures which consist of a main flat wall and a peripheral flange at a right angle to the plane thereof. Although they are referred to as trays, they are used for various purposes including their use as trays, and additional uses such as closures for either end of box-like containers over which they telescope, or as upper and lower sections of a fully telescoping box. They have been manufactured in the past in knocked-down form which form may be termed a flat and this term will be so used in the following description. Obviously, it is desirable to supply these trays in knocked-down form to save space in shipping and storing.

One type of prior art tray manufactured, has consisted of a scored and slit blank which provides a flat with corner tabs adapted to interlock when the flaps are folded up to form the peripheral flange or edge wall. Obviously, such an interlocking corner joint would tend to become disconnected in use and even if it remained connected would have inherent weaknesses. Another type of prior art tray manufactured is produced from a suitable scored and slit blank, is set up and the corners are joined by corner-connecting tabs and then is folded down under pressure into flat form. Obviously, the operations of so setting-up and then knocking-down the tray, is time-consuming and costly. Also, folding the edge walls down under pressure often produces weaknesses in the structure especially at the corners. Furthermore, this type of prior art structure inherently has weak corners, even after the corners are permanently joined together, since the corner joints provide only one thickness of the blank material at the corner folds. It is common knowledge that at this single thickness corner fold, failure of the tray usually occurs.

This invention will be described with reference to a quadrangular tray but it is to be understood that it is applicable to trays of different numbers of sides where there are side walls disposed angularly relatively which must be provided with strong connecting angular joints therebetween.

In the example disclosed herein of my present invention, a quadrangular sheet of suitable material is scored and slit to provide a flat blank with the main flat wall and outwardly extending hinged flaps at each edge thereof, the flaps being separated from each other at specially formed slits running outwardly from the corners of said wall. These slits and special adjacent score lines provide, on opposite ends of each flap, oppositely-extending corner connecting tabs of special form. Two of the opposed flaps of a first pair are folded inwardly and the other two of the second pair remain flat and extend outwardly so that the corner-connecting tabs are arranged in superimposed relationship and these tabs are maintained in such relationship, preferably, by adhesive or other means to produce a composite laminated corner structure. The quadrangular tray can

be set-up readily from the flat by merely folding outwardly the first pair of flaps which automatically folds inwardly the second pair of flaps so that they will be up-standing relative to the main wall. At the corner joints so produced by the connected tabs, there will be two thicknesses of material with the tabs extending inwardly from the corner fold lines in opposite directions at right angles and overlapping the adjacent angularly disposed flaps which provide the side walls or flanges of the tray. The inner tabs are of special form with reinforcing extensions to prevent bending of the overlapping flaps at the adjacent tab edges when setting up the flat. Also, the corner fold lines are of special scoring to facilitate folding at such corner fold lines in setting up the flat. The resulting set-up tray will have corner joints of very high strength and will be free of any breaks in material other than the desired pre-scored breaks.

The best mode contemplated in carrying out this invention is illustrated in the attached drawings in which:

FIG. 1 is a perspective view of the expanded and set-up tray resulting from my invention.

FIG. 2 is a diagrammatic plan view illustrating the blank from which the tray is made according to my present invention.

FIG. 3 is a schematic plan view illustrating one step in forming the flat for the tray according to my invention.

FIG. 4 is a similar view illustrating a subsequent step in forming the flat.

FIG. 5 is a perspective view illustrating the flat in collapsed condition with all the corners connected, in the form in which it is manufactured and supplied to the user according to my invention.

FIG. 6 is a perspective view illustrating the operation of expanding and setting up the flat into a tray of the type shown in FIG. 1 ready for use.

With reference to FIG. 1 of the drawings, the completed set-up quadrangular tray ready for use according to my present invention is indicated as comprising a flat main wall 10 with a peripheral edge wall or flange 11 at a right angle to the plane thereof. In this illustration, the tray is square, the wall 10 is the bottom and the edge wall 11 is upstanding. In this upright position, the tray is suitable for use as a receptacle tray, as the bottom telescoping closure of a box or as the lower section of a fully telescoping box. In a position inverted from that shown, it is suitable for use as a top telescoping closure of a box or as the upper section of a fully telescoping box. At each of the four corners of the tray, a special improved corner connecting joint 12 is provided which results in a double laminated thickness adjacent the corner and especially at the vertically disposed corner fold line. However, as previously indicated, this invention is not necessarily limited to a four-sided tray.

The flat for the tray is produced according to this invention, from the flat blank illustrated in FIG. 2. This blank may be formed from suitable sheets of material, such as corrugated fiber board, solid fiber board, paper board, or other sheet material capable of being slit, scored and folded. In this example, the blank is shown of square outline and as being provided with the main score lines 21a, 22a, 23a and 24a parallel to the respective outer edges of the blank and producing the respec-

and exhibits the requisite kinetics of water vapor adsorption.

7. An enclosure for providing a moisture-free environment comprising a container for said environment, having at least some portion of its inner surface coated with a film of the desiccant composition of claim 1.

8. A hemetically sealable container for providing a moisture free environment for enclosing moisture sensitive equipment having at least some portion of its inner surface coated with a film of the dehumidifying composition of claim 1.

* * * * *

10

15

20

50

12

10

a film of the desiccant composition of claim 1, having at least some portion of its inner surface coated with a film of the dehumidifying composition of claim 1, for providing a moisture-free environment for enclosing moisture sensitive equipment having at least some portion of its inner surface coated with a film of the dehumidifying composition of claim 1.

* * * * *

respective flaps 22 and 24 and are adhered to the inner surfaces thereof, in combination with the outer corner connecting tabs 25f, 26f, 27f and 28f, which overlap the respective flaps 21 and 23 and are adhered to the outer surfaces thereof, will provide a composite double laminated corner connecting structure. Since the overlapping layers, including the oppositely extending inner and outer corner-connecting tabs, which are disposed relatively at right angles, are adhered to adjacent surfaces of the side flaps, they serve to provide a composite laminated structure having a strength in combination greater than the sum total of the strength of each of the layers.

Since the flat is manufactured and supplied in the knocked-down condition illustrated in FIG. 5, storage and shipping will be facilitated as it will occupy a minimum of space. In the example shown, the flat can easily be set-up for use merely by outward folding of the one pair of flaps which will automatically produce inward folding of the other pair, due to the previously joined corner structures. When set-up, the corners will be of increased strength because of the adhered laminations providing double thickness of material at the corner fold lines. After some uses, the tray could again be knocked-down for storage.

As previously indicated, this invention is applicable to angular trays of other than four sides, where there are angularly related side walls and it is desirable to provide connecting joints of increased strength at the angles between said side walls.

Having thus described this invention, what is claimed is:

1. A flat for use in setting up a tray-like article which has a substantially flat wall with side walls at its periphery that are angularly disposed relative to each other and are connected at the angular joints therebetween said flat comprising:
 - a substantially flat wall portion of angular peripheral outline having scored fold lines adjacent all its edges;
 - side-wall producing flaps attached to said flat wall portion around its periphery at the respective scored fold lines and having opposed ends;
 - said flaps comprising first and second flaps alternating around the periphery of said flat wall portion with the first flaps extending outwardly from their respective scored fold lines in a substantially common plane with said flat wall portion and with the second flaps turned inwardly about their respective scored fold lines into overlapping relationship with said flat wall portion; and
 - joint structures for connecting together adjacent ends of said first and second flaps and comprising:
 - an outwardly extending tab on the end of the second flap;
 - an inwardly folded connecting section on the adjacent end of the first flap carrying an inwardly extending tab which is in superimposed relationship and in flat contact with said second flap and being secured thereto;
 - said outwardly extending tab extending outwardly in superimposed relationship and in flat contact with the said connecting section and being secured thereto;

said outwardly extending tab being connected to said second flap at a scored joint fold line and said inwardly extending tab being connected to said connecting section at a scored joint fold line, the two scored joint fold lines being superimposed to provide a common joint fold line;

said common joint fold line being in alignment with the fold line of said first flap which is a scored line; said connecting section being folded inwardly about a scored fold line at an angle relative to said common joint fold line;

said inwardly extending tab extending beneath the second flap, being provided with an inner edge extending angularly from said corner fold line and being provided with an inward extension beyond the angular edge;

said common joint scored fold lines being more pronounced than the other said scored fold lines;

said flat wall portion being of quadrangular outline and the flaps being provided as opposed pairs of the first and second flaps with the flaps of the first pair extending outwardly in opposite directions and the flaps of the second pair extending inwardly towards each other, said angular scored fold line being at an angle of 45° relative to said corner joint fold line, said outwardly extending tab having an outer edge disposed at an angle less than 45° relative to said common joint fold line so that said edge will be recessed inwardly of said angular scored fold line of said connecting section, said angular inner edge of said inner tab also being disposed at an angle of 45° relative to said corner fold line.

2. A tray like article set-up from the flat of claim 1 by folding the second flaps outwardly about their respective fold lines and simultaneously folding the first flaps inwardly about their respective fold lines.

3. A flat for use in setting up a tray-like article which has a substantially flat wall with side walls at its periphery that are angularly disposed relative to each other and are connected at the angular joints therebetween, said flat comprising:

- a substantially flat wall portion of angular peripheral outline having scored fold lines adjacent all its edges;

- side-wall producing flaps attached to said flat wall portion around its periphery at the respective scored fold lines and having opposed ends;

- said flaps comprising first and second flaps alternating around the periphery of said flat wall portion with the first flaps extending outwardly from their respective scored fold lines in a substantially common plane with said flat wall portion and with the second flaps turned inwardly about their respective scored fold lines into overlapping relationship with said flat wall portion; and

- joint structures for connecting together adjacent ends of said first and second flaps and comprising:
 - an outwardly extending tab on the end of the second flap;

- an inwardly folded connecting section on the adjacent end of the first flap carrying an inwardly extending tab which is in superimposed relationship and in flat contact with said second flap and being secured thereto;

The dehumidifier film or coat is strongly bonded to the material of a container being dehydrated, so that no additional means or operations are required for securing said dehumidifier composition in said container.

The method of obtaining the present dehumidifying composition in the form of a film or coat comprises applying onto the inner surface of containers a suspension containing 100 parts by weight of zeolite having a humidity of 20–23 wt. percent, 45–280 parts by weight of a thermosetting resin, 120 parts by weight of an organic solvent intended for dissolving said resin, 0–45 parts by weight of a suitable plasticizer, and 0–85 parts by weight of a curing agent.

The suspension applied onto the inner surface of a container is maintained in the air at a temperature of from 5° to 80° C in order to remove the bulk of volatile components, followed by subjecting said suspension to heat treatment in vacuo at a residual pressure of not greater than 10^{-1} mm Hg and at a temperature of from 150° to 180° C. Said heat treatment removes the last traces of volatile components, brings about binder polymerization and results in the formation of film or coat (layer) depending upon the amount of the suspension used, said film (coat) being characterized by a highly extended porous structure which is adhesively bonded to the coated surface and provides for the requisite kinetics of water vapor adsorption. The porous structure of a dehumidifying composition film is defined by the volume of primary pores in zeolite crystals and by the volume of secondary pores. The volume of secondary pores depends primarily on the dispersity of zeolite crystals and binder (resin) particles, as well as on the nature of the binder used, and the type and density of zeolite crystal and binder particle packing.

The volume of secondary pores in the range of equivalent radii of from 291,000 to 31 Å equals 0.044 cm³/cm³, a significant portion of said volume (0.020 cm³/cm³) being due to the pores in the equivalent radius range of from 98 to 31 Å.

An essential feature of the present dehumidifying composition is that it provides the possibility of controlling the kinetics of adsorption by varying the proportion of components of stock suspensions, so that the present dehumidifying composition can be used in devices and instruments of various types and sizes, the desired kinetics of moisture adsorption inside a given device (instrument being attained by selecting an appropriate ratio of suspension components. As compared to the known dehumidifying agents in the form of tablets or thickened silicone oil-based mixtures, the present dehumidifying composition in the form of a film or coat occupies a very small volume inside casings and has an insignificant weight. Said beneficial characteristics of the present dehumidifying composition make it eminently suited for use in conjunction with microminiaturized electronic instruments. The dehumidifying composition contained in an instrument casing (bulb) can be repeatedly regenerated, thereby making it practicable to have a requisite stock of dehumidifier-coated casings, a further advantage of the present dehumidifier being the absence of oil on the surfaces to be welded and, hence, the ease of sealing hermetically the devices or instruments.

The present dehumidifying composition is employed without resorting to mechanical means for securing said composition in instrument (device) casings or to special-type equipment for introducing said composition into instrument (device) casings and is suitable for being introduced into casings (bulbs) of any shape or size at one and the same production section, the latter feature being highly advantageous for the simultaneous production of diverse types of semiconductor instruments. It is expedient to use the present dehumidifying composition irrespective of the scale or automation degree of production processes or when the manufacture of instrument casings and the assembly of finished semiconductor devices are carried out at different plants.

It follows from the foregoing that the present dehumidifying composition used in the form of a film or coat is commercially superior to the known dehumidifiers.

The following examples are illustrative of the manner of carrying out the invention but are not intended to limit the scope thereof.

EXAMPLE 1.

One hundred parts by weight of Type Na zeolite A (moisture content, 25 percent by weight; particle diameter, 4 mc maximum) is mixed with 100 parts by weight of epoxide resin (molecular weight, 370–450; epoxy group content, 18 percent) dissolved in 127 parts by weight of an organic solvent having the following composition, percent by weight: butyl acetate, 10; cellosolve ($C_2H_5-OCH_2CH_2OH$), 8; acetone, 7; butanol, 15; ethanol, 10, and toluene, 50. Dibutyl phthalate (plasticizer) is added to the stirred mixture in an amount of 5 parts by weight, followed by introducing 10 parts by weight of polyethylene polyamine (curing agent). The resulting mixture is thoroughly mixed to obtain a homogeneous suspension. The dehumidifying composition thus prepared is ready for use.

Use is made of a buret, an atomizer or a syringe to apply the composition on the inner surface of instrument metal casings (bulbs) having a volume of 0.25 cm³. From 10 to 12 mg of said composition is introduced in each bulb, followed by maintaining the bulbs with said composition applied thereonto for a period of 10–20 hours in the air at ambient temperature in order to remove the bulk of volatile components. Next the bulbs are placed in a vacuum drying cabinet, subjected to gradual heating to a temperature of 180° C at a residual pressure of 0.1 mm Hg, and maintained at this temperature for a period of 3 hours. It is pertinent to gradually heat the composition in order to provide in the resultant film an access of zeolite micropores to the ambient atmosphere and to attain good adhesion of the film to the bulb surface. The resultant film displays heat stability up to a temperature of 200°C in the air. The thus-treated bulbs are ready for use as sealing components of instruments or circuits.

Mechanical tests of the film under the conditions prescribed for testing transistors enclosed in bulbs are indicative of the absence of crumbling, dusting or cracking phenomena.

The film obtained by the procedure described herein before is capable of maintaining in the hermetically sealed volume of the bulb a low relative humidity in the temperature range of from –60° to +150°C.