

June 29, 1965

T. S. JACKSON
CONTAINER

3,191,791

Filed May 22, 1961

2 Sheets-Sheet 1

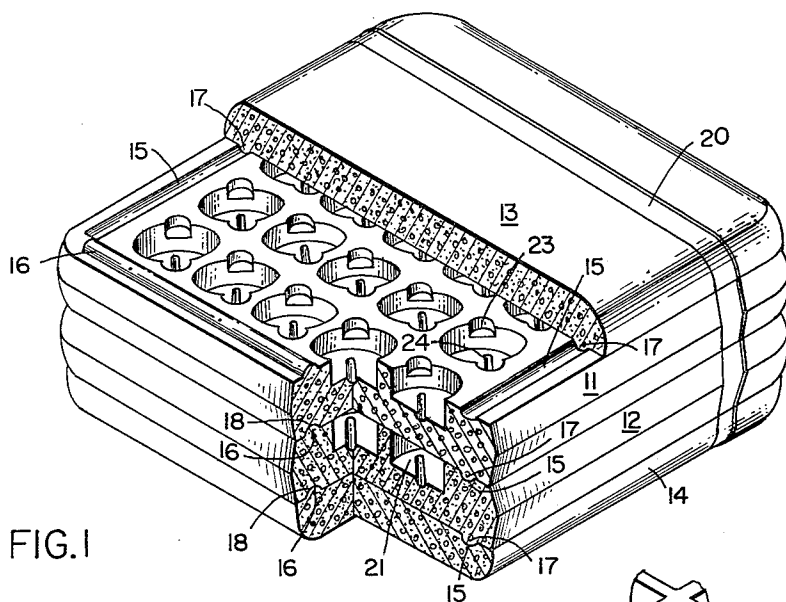


FIG. 1

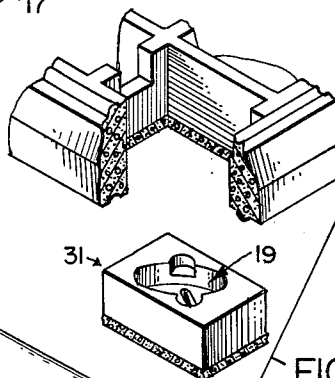


FIG. 5

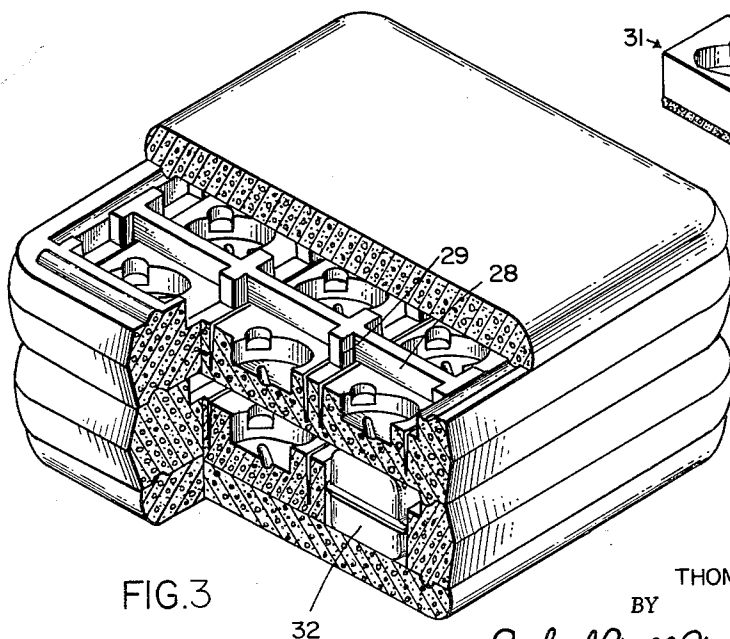


FIG. 3

INVENTOR.

THOMAS S. JACKSON

BY

Ezekiel Wolf, Wolf & Greenfield
ATTORNEYS

June 29, 1965

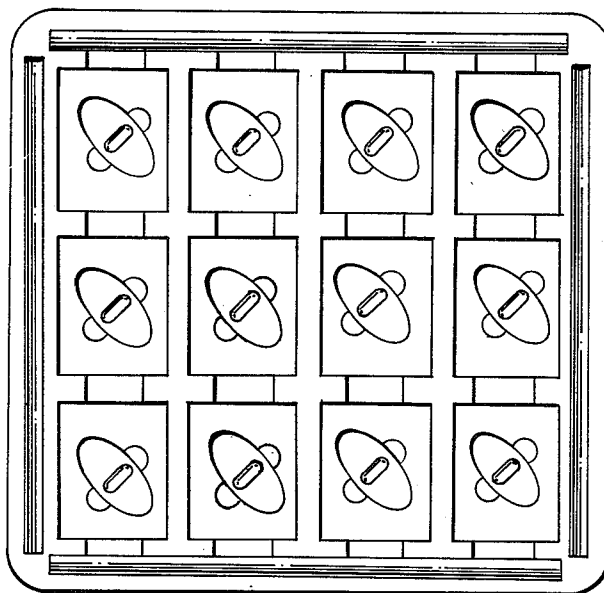
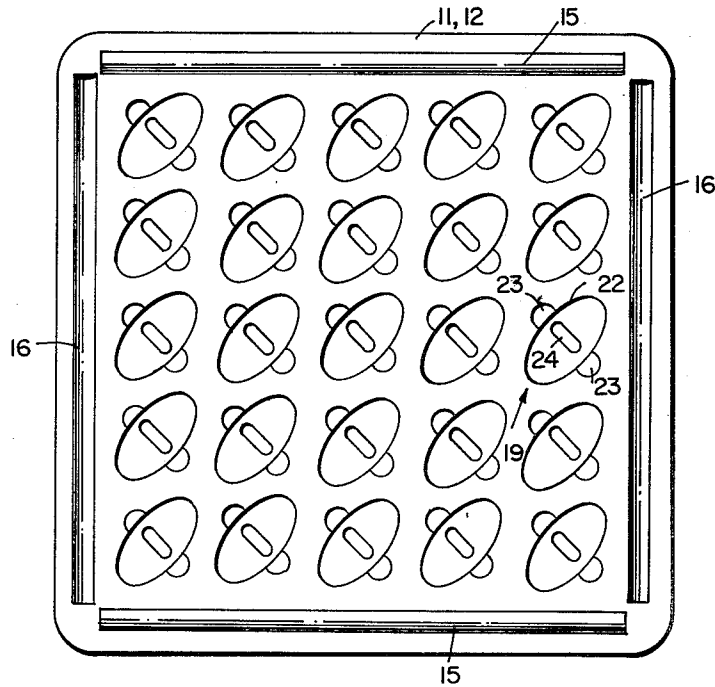
T. S. JACKSON

3,191,791

CONTAINER

Filed May 22, 1961

2 Sheets-Sheet 2



INVENTOR.

THOMAS S. JACKSON

BY

Ezekiel Wolf, Wolf & Greenfield

ATTORNEYS

1

3,191,791
CONTAINER

Thomas S. Jackson, Hopkinton, Mass., assignor, by mesne assignments, to Expandolite, Inc., Plainfield, Conn., a corporation of Delaware

Filed May 22, 1961, Ser. No. 111,664
6 Claims. (Cl. 217-25.5)

The present invention relates in general to containers and more particularly concerns a novel protective shipping container for safely transporting any number of precision elements, such as semi-conductor devices, while minimizing weight, volume and container cost.

It is an important object of the invention to provide a light-weight protective container for transporting and storing precision elements adaptable for accommodating increased quantities of the elements contained, with but a slight increase in the weight and volume of the container, and without sacrificing the protection afforded to the elements by the container.

It is another object of the invention to provide a transistor container in accordance with the preceding objects capable of accommodating different types of semiconductor devices in essentially the same amount of container volume.

It is another object of the invention to achieve the preceding objects while facilitating the accommodation of additional separate containers which themselves may contain virtually any type of semiconductor device.

According to the invention, the novel container comprises a tray formed with alternating grooves and ridges along its top and bottom surfaces adjacent to and generally parallel to the circumferential edge surface of the tray. The grooves and ridges on the top surface are above corresponding ridges and grooves, respectively, on the bottom surface. The tray is formed with a number of recesses for accommodating the elements for transportation so that another like tray may rest upon the tray with the bottom surface ridges and grooves of the said like tray in mating relationship with the grooves and ridges, respectively, of the top surface of the first mentioned tray when the elements reside in the recesses. The novel container preferably includes at least one of these trays and has a top cover with an underside like the said bottom surface of a tray in mating relationship with the top surface of the uppermost of the trays. The container also has a bottom cover having an upper side like the said top surface of the tray in mating relationship with the bottom surface of the lowermost of the trays. Thus, any number of trays may be stacked together in cooperation with the top cover and the bottom cover to form a container capable of accommodating nearly any number of elements while minimizing the weight and bulk of the container.

Each tray and the covers are preferably square with each of the grooves and ridges extending for nearly the entire length of a square side. In a preferred form of the invention for containing different types of semiconductor devices, each recess comprises a first generally oval recess extending into the tray for a first depth and having its lengthwise dimension extending along a first direction together with a second generally oval recess extending into the tray for a second depth less than the first depth and having its lengthwise dimension aligned generally along and being greater than the width dimension of the first

2

generally oval recess so that the central portion of the second generally oval recess is coextensive with a portion of said first generally oval recess. These lengthwise dimensions are generally parallel to a diagonal of the square.

Another feature of the invention resides in bounding each of the said recesses by ridges defining the perimeter of a rectangle having sides generally parallel to the sides of the square together with grooves inside of and generally parallel to at least some of the latter ridges to permit that portion of a tray within a said rectangle to be easily punched out. A separate smaller container may then be supported in the punched out section by the latter ridges.

Numerous other objects, features and advantages of the invention will become apparent from the following specification when read in connection with the accompanying drawing in which:

FIG. 1 shows one form of the container according to the invention;

FIG. 2 is a top view of a tray in the embodiment of FIG. 1;

FIG. 3 is a cut away view of a second embodiment of the invention having the feature of the ridges surrounding each recess as described above; and

FIG. 4 is a top view of a typical tray included in the embodiment of FIG. 3; and

FIG. 5 shows how an individual recess may be knocked out from a tray of the type shown in FIG. 4, to accommodate a separate small container which may in turn accommodate an element.

With reference now to the drawing and more particularly FIG. 1 thereof, there is shown a cutaway view of a container according to the invention. The illustrated container comprises two like trays 11 and 12 sandwiched between a top cover 13 and a bottom cover 14.

The top surface of each tray includes a pair of top surface grooves 15 closely adjacent to and generally parallel to opposite edge faces of each tray. There are a pair of top ridges 16 closely adjacent and generally parallel to the remaining two edge faces of a tray. A bottom surface ridge 17 is below each top surface groove 15 of each of the trays and a bottom surface groove 18 is below each top ridge 16. Thus, the bottom surface ridges 17 and bottom surface grooves 18 of upper tray 11 are in mating relationship with the top surface grooves 15 and top surface ridges 16, respectively, of the lower tray 12.

The cover 13 is formed with a bottom surface like those of the trays having bottom surface ridges 17 and bottom surface grooves 18 (not shown) so that the bottom surface ridges 17 and grooves 18 of cover 13 rest in mating relationship with the top surface grooves 15 and top surface ridges 16, respectively, of the upper tray 11.

The bottom cover 14 is formed with a top surface having top surface grooves 15 and top surface ridges 16 which fit in mating relationship with bottom surface ridges 17 and bottom surface grooves 18, respectively, of the lower tray 12. Thus, the trays and covers coact to form a number of individually protected recesses like cell 21 for accommodating and protecting an element, such as a semiconductor device, during storage and shipment.

Each individual container may comprise as many trays as necessary to accommodate the number of elements to be shipped together with a top cover 13 and bottom cover 14. The assembly thus formed may be securely held together by suitable means such as pressure sensitive tape

3

20. This fastening means is preferred because the container is held together securely during shipment, yet the container may be rapidly disassembled to facilitate removing the elements after shipment.

Referring to FIG. 2, there is shown a top view of either of trays 11 and 12. Note that each recess 19 for accommodating an element is formed with a generally oval recess 22 whose lengthwise dimension is generally parallel to a diagonal of the square tray and extends to a first depth. Recess 19 also includes a generally oval shaped recess 23 extending to a depth less than that of recess 22. The length of recess 23 is generally along and greater than the width of recess 22. The central portion of recess 23 is coextensive with a portion of recess 23. A bottom recess 24 extends deeper into the tray than either of recesses 22 and 23 and accommodates the leads from the transistor. A feature of a recess having the configuration of recess 19 is that a high power semiconductor device of one size fits snugly in recess 22 while a lower power device of smaller size fits snugly within recess 23, the leads of either transistor being accommodated in the bottom recess 24.

Referring to FIG. 3, there is shown a cutaway view of another embodiment according to the invention which includes an additional feature of the ridges such as 28 and 29 surrounding each recess 19. As best seen in FIG. 5, the entire block 31 containing recess 19 may be knocked out and a box 32 (FIG. 3), containing one or more semiconductor devices, substituted for the removed block 31.

A top view of the modified trays 11' and 12' is shown in FIG. 4. Since other features of the embodiment of FIGS. 3 and 4 are identified by the same reference numerals which identify corresponding elements in FIGS. 1 and 2, the description of that embodiment above applies to the embodiment shown in FIGS. 3 and 4.

The preferred material for containers according to the invention is expandable polystyrene. However, it is to be understood that other types of materials may be employed within the principles of the invention.

In accordance with a variation of the invention, both the top and the bottom covers are identical and formed with recesses 18 along each side of its inside face. Thus, the same cover mates with either the top surface ridges 16 or the bottom surface ridges 15. These covers are also preferably formed with grooves on their outside surfaces for accommodating the pressure sensitive tape strips which hold the container together.

There has been described a novel container especially suitable for transporting semiconductor devices but also adaptable for accommodating other types of elements. It is evident that those skilled in the art may now make numerous modifications of and departures from the specific embodiments described herein without departing from the inventive concepts. Consequently, the invention is to be construed as limited only by the spirit and scope of the appended claims.

What is claimed is:

1. A container for elements comprising, at least one tray, each tray comprising means defining a plurality of recesses, each of said recesses surrounded by wall surfaces generally perpendicular to the tray bottom surface plane and the tray top surface plane which are parallel to each other, the wall surfaces of adjacent recesses being joined by means defining top surfaces in said tray top surface plane, an outside wall extending between said tray bottom surface plane and said tray top surface plane completely surrounding all said recesses and having means defining a top surface in said tray top surface plane and a bottom surface in said tray bottom surface plane so that each of the latter top and bottom surfaces forms a closed loop in its respective plane,

4

means defining alternating grooves impressed within and ridges extending outside both said outside wall top surface and said outside wall bottom surface with the depth of each groove corresponding to the height of each ridge and being less than the distance between said tray top and bottom surface planes, almost the entire bottom surface of the tray coinciding with said tray bottom surface plane, whereby, with one of said trays resting on the other the outside wall bottom surface grooves and ridges of said one tray mate with the outside wall top surface ridges and grooves of said other tray with said other tray top surface in contact with said one tray bottom surface.

2. A container in accordance with claim 1 and further comprising a pair of covers,

each of said covers having an outside wall extending from a cover surface plane and completely surrounding an area surrounded by said tray outside wall, an area in said cover surface plane congruent to that surrounded by said tray outside walls in said tray top and bottom surface planes,

each cover outside wall having at least means defining grooves with depth substantially the same as said tray groove depth,

one of the top and bottom surfaces of each cover being almost entirely in said cover surface plane,

one of said covers having at least some of its grooves mating with the ridges in the outside wall top surface of the uppermost tray with said top surfaces of said uppermost tray in contact with said cover surface plane of said one cover,

the other of said covers having at least some of its grooves mating with the ridges in the outside wall bottom surface of the lowermost tray with said bottom surface of said lowermost tray in contact with said cover surface plane of said other cover.

3. A container for elements comprising,

a tray formed with alternating grooves and ridges along its top and bottom surfaces adjacent to and generally parallel to the circumferential edge surface of said tray,

said grooves and ridges on said top surface being above corresponding ridges and grooves respectively on said bottom surfaces,

said tray being formed with means defining a plurality of spaced recesses enclosed on all but one side so that another like tray may rest upon said tray with the bottom surface ridges and grooves of said like tray in mating relationship with the grooves and ridges respectively of the top surface of said first-mentioned tray and cover said one side of all said plurality of recesses,

said tray being rectangular and each of said grooves and ridges extending for nearly the entire length of a side of said tray,

each of said recesses comprising a first generally oval recess extending into said tray for a first depth and having its lengthwise dimension extending along a first direction,

a second generally oval recess extending into said tray for a second depth less than said first depth and having its lengthwise dimension aligned along and greater than the width dimension of said first generally oval recess,

the central portion of said second generally oval recess being coextensive with a portion of said first generally oval recess.

4. A container in accordance with claim 3 wherein said lengthwise dimensions are generally parallel to a diagonal of said rectangle.

5. A container in accordance with claim 4 wherein each of said recesses is bounded by ridges defining the perimeter of a rectangle having sides generally parallel to the sides of said rectangular tray and grooves inside of and

generally parallel to at least some of the last-mentioned ridges to permit that portion of a tray within a said rectangle to be easily removed.

6. A container tray comprising, means defining a first generally oval recess extending into said tray for a first depth and having its lengthwise dimension extending along a first direction, a second generally oval recess extending into said tray for a second depth less than said first depth and having its lengthwise dimension aligned along and greater than the width dimension of said first generally oval recess, the central portion of said second generally oval recess being coextensive with a portion of said first generally oval recess, whereby the portion of said con-

tainer embracing said first and second recesses may snugly accommodate either of two devices of different size.

References Cited by the Examiner

UNITED STATES PATENTS

2,138,241	11/38	Koch et al.	206—56
2,840,256	6/58	Cobb	217—13
2,895,599	7/59	Moyer et al.	217—13

10 GEORGE O. RALSTON, *Primary Examiner*.

EARLE J. DRUMMOND, *Examiner*.