United States Patent

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[54] **PACKAGING MEANS FOR CATHODE RAY TUBE STRUCTURES**
12 Claims, 5 Drawing Figs.

[52] U.S. Cl. 206/65, 217/26.5, 220/97, 229/2.5
[51] Int. Cl. B65d 71/00, B65d 85/62
[50] Field of Search ..... 206/65, 46, 43; 217/26.5; 229/2.5, 14 C; 220/97, 4 E, 23.6

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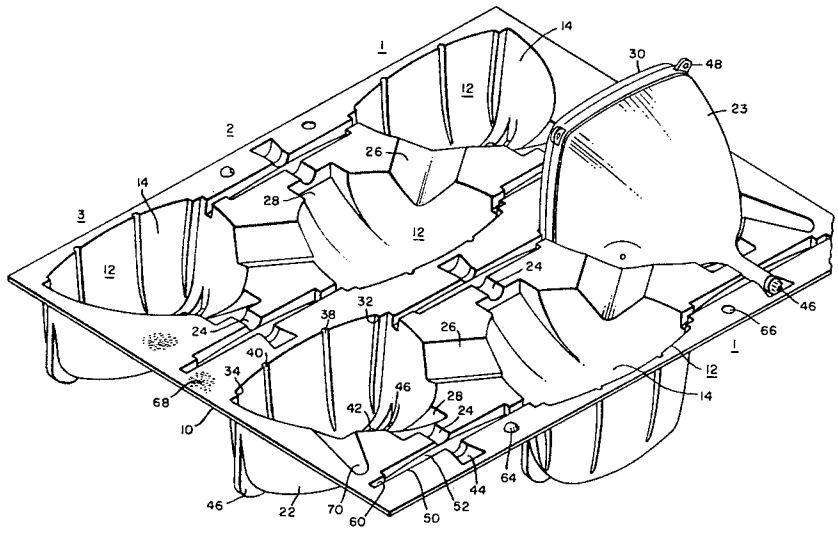
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ABSTRACT: The invention is packaging means utilizing a pair of integrally formed packaging sections as a multipack enclosure to provide compact, shockproof horizontal packaging of a plurality of cathode-ray tubes, and permit vertical stacking of a plurality of the multipack enclosures.



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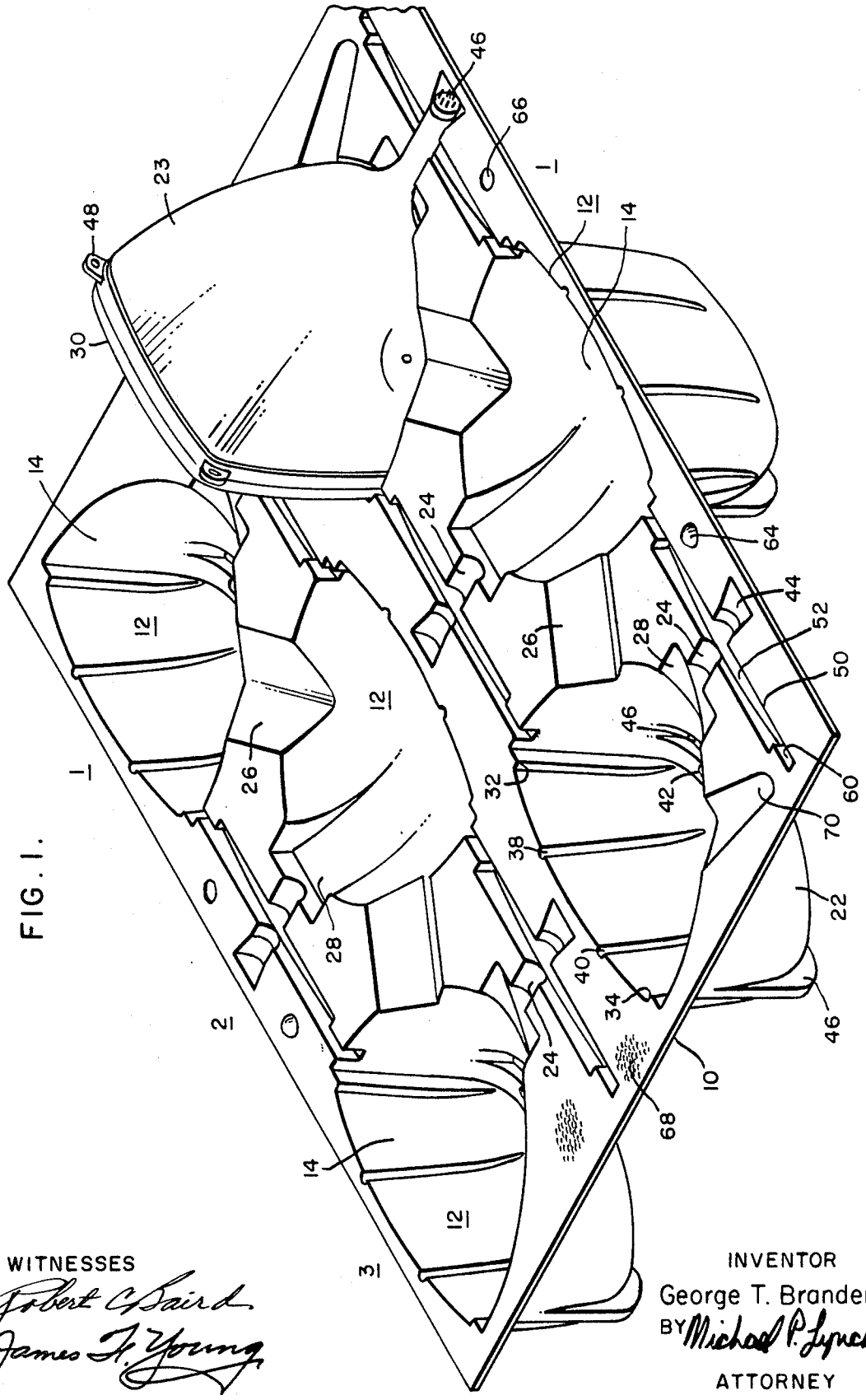


FIG. 1.

WITNESSES

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FIG. 2.

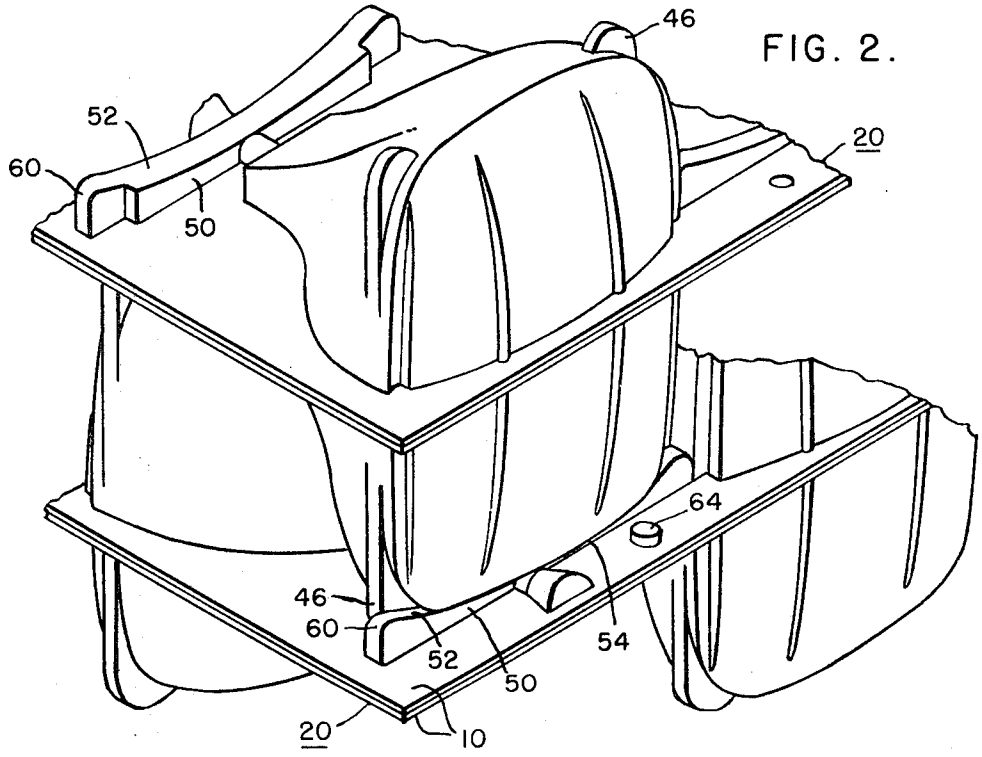


FIG. 5.

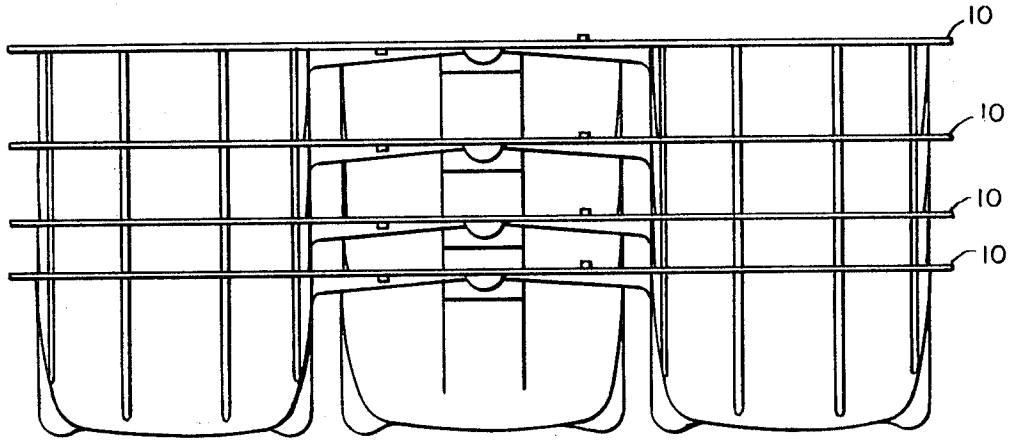
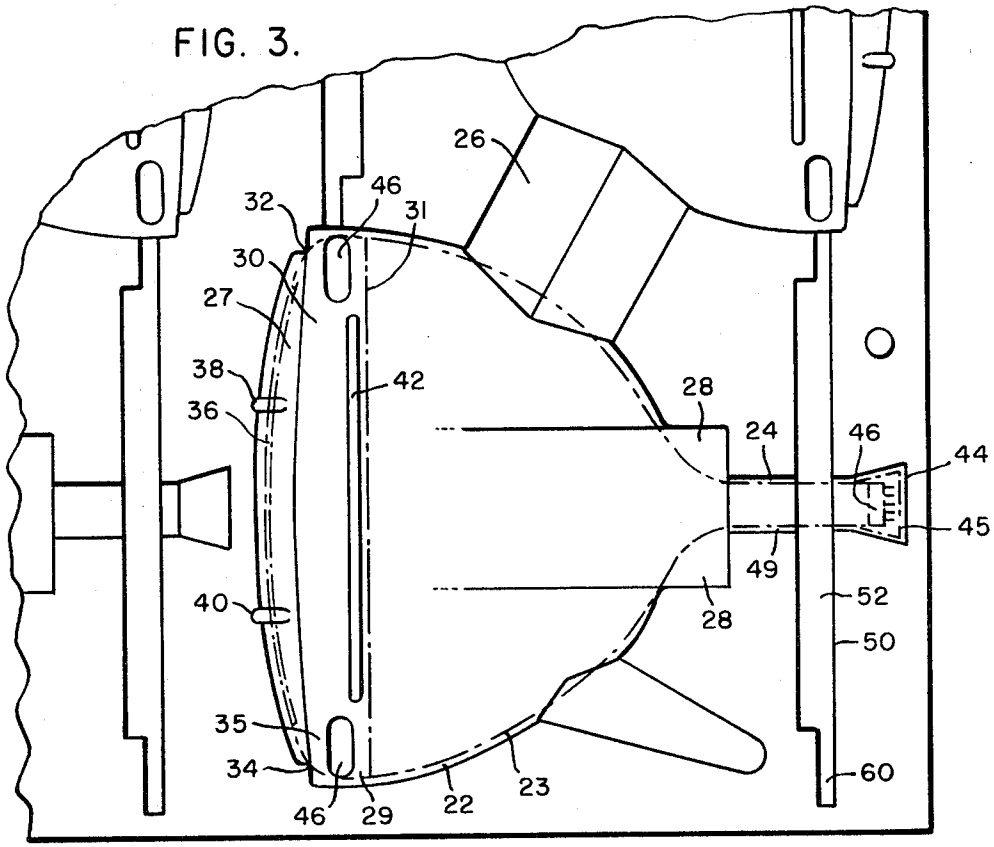


FIG. 3.


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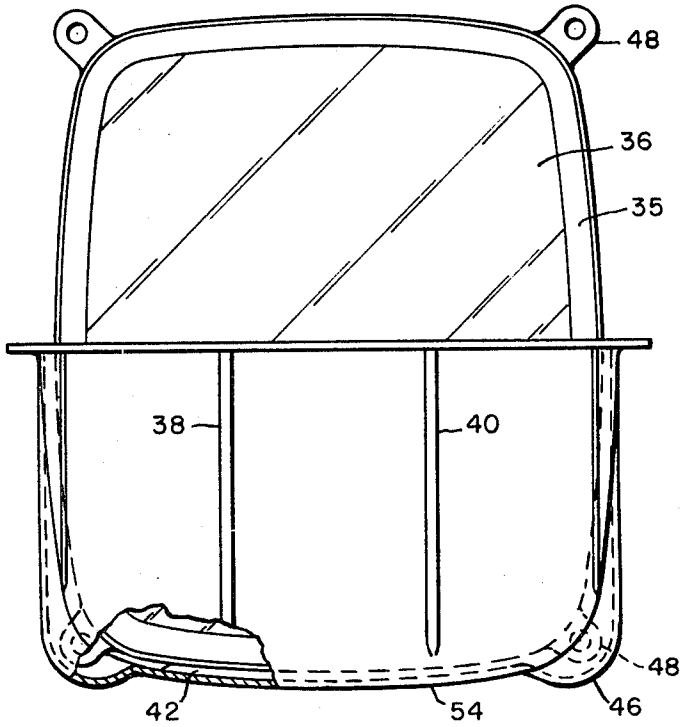

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FIG. 4.

PACKAGING MEANS FOR CATHODE RAY TUBE STRUCTURES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to packaging means for tube structures such as glass funnels for use in fabricating cathode-ray tubes and for finished cathode-ray tubes such as television picture tubes.

2. Description of the Prior Art

The fragility of tube units such as glass funnel structures and finished cathode-ray tubes has resulted in the expenditure of considerable funds and time by manufacturers to develop optimum packaging and handling techniques. While efforts to date have produced packaging methods which solve some of the problems encountered in handling cathode-ray tubes, there remains numerous disadvantageous in these methods, especially in the handling of color television picture tubes.

The present methods are complex due to the many individual pieces required to complete the packaging of a relatively few tube units. Furthermore, while present packaging methods permit compact multipackaging of tube units, funnel sections and finished tubes, in the horizontal plane, there are no provisions for efficiently stacking the horizontal sections in the vertical plane.

In many packaging containers a tube unit is placed totally within one portion of the container having a cover section, thus requiring the handler to reach over the walls of the container and into the container causing considerable difficulty in removing the rather heavy tube from the container.

The disadvantage of current packaging methods do not cease with the removal of the tube unit. The problem of storing and transporting the empty tube containers is also a considerable concern inasmuch as the conventional tube containers occupy the same space when emptied as they did with tube units contained within.

While present packaging methods provide overall protection of the tube unit from breakage there are few provisions for protecting detailed structure and operational features of the tube unit. This is especially apparent in the handling of color television tubes in which protection of the tube face panel must be provided as well as protection of the corona area surrounding the external anode button and the fragile neck portion of the tube unit.

Generally the weight of the current tube container, which accounts for considerable expense in shipping, is excessive due to the fact that the corrugated packaging material generally utilized must be reinforced to provide the required tube protection from damage resulting from crushing of the tube container. Utilization of corrugated material renders the containers susceptible to damage from moisture.

SUMMARY OF THE INVENTION

The invention is an integral packaging section formed with tapered cavities from a plastic-type material such as high impact styrene, polyethylene, or ABS (acetate-buterate-styrene) to accept a plurality of tube units. The one piece packaging section provides horizontal packaging of the individual tube units and encloses approximately a 50 percent of each unit. The horizontal plane corresponds to the longitudinal axis of the tube neck. An identically formed section is positioned in an oppositely disposed registering relationship with the first section forming a multipack enclosure which completely encloses the tube units. The arrangement of the tube units in the packaging sections permits compact vertical stacking of the enclosed tube units such that adjacent multipack enclosures efficiently utilize allotted packaging volume. The identical construction of the packaging sections and the tapered form of the cavities therein permit nesting of superimposed sections and thereby provides high density storage of the sections while not in use.

The integral packaging section provides inherent protection for the face panel, corona area and neck portion of the tube.

The exposure of approximately half of the tube unit with the removal of one of the two packaging sections facilitates removal of the tube unit.

The integral packaging section is designed to accommodate glass funnel sections and finished tubes with or without implosion systems thus providing optimum utilization of the packaging section.

DESCRIPTION OF THE DRAWING

FIG. 1 is a pictorial view of a typical integral packaging section illustrating the horizontal packaging arrangement for tube units;

FIG. 2 illustrates the vertical stacking capability of multipack enclosures comprised of a pair of integral packaging sections;

FIG. 3 is a partial top view of the packaging section of FIG. 1 illustrating the details of the individual cells which accommodate the tube units;

FIG. 4 illustrates a typical application of the invention; and

FIG. 5 illustrates the vertical nesting capability provided by the packaging means illustrated in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 there is illustrated a packaging means 1 in accordance with a preferred embodiment of my invention which comprises an integral packaging section 10 fabricated from a suitable material such as styrene or polyethylene by one of several techniques including vacuum forming to produce multiple tapered cell elements 12. Each cell element 12 is constructed to accommodate a tube unit such as a glass funnel section or a finished cathode ray tube.

The cell arrangement efficiently utilizes the available area of section 10 by reversing the packaging direction of alternate rows (1, 2, 3) of cell elements 12 and staggering the cell element from adjacent rows to efficiently accommodate the cell cavities 14 of the respective cell elements.

The integral packaging section 10 which is more accurately defined as a half section in that it provides containment for approximately half of each tube unit, as illustrated in FIG. 4, positioned within the cell elements 12. Complete containment of the tube units positioned in section 10 is provided by inverting an identical half section and positioning it over the exposed portion of the tube unit to form a multipack enclosure 20 as illustrated in FIG. 2. The tapered lines of the cell cavities 14 apparent in FIG. 2, permit compact vertical stacking of the multipack enclosures of FIG. 2 by rotating adjacent multipack enclosures 180° horizontally. A further advantage derived from utilizing identical half sections with tapered cavities is the nesting capability of superimposed sections as illustrated in FIG. 5 to provide high densities storage for unused packaging sections. It is apparent that the mating package sections need not accommodate equal portions of the tube unit.

The discussion thus far has been directed to the formation of the integrally formed packaging section 10 and the combination of pairs of the sections to form multipack enclosures 20 which provide packaging means for efficient horizontal packaging of multiple tube units within each multipack enclosure and compacted vertical stacking of the multipack enclosures.

In addition to providing efficient storage of tube units the integral packaging sections provide inherent protection for the tube units.

The contour of the cell cavities 14 as illustrated in FIG. 1 conform generally to the external lines of a cathode-ray tube such that the combination of two packaging sections as a multipack enclosure 20 of FIG. 2 form enclosed volumes corresponding in shape and size to the volume defined by a cathode-ray tube.

The structural details of each cell element as illustrated in FIGS. 1 and 3 are the result of a fabrication of the packaging sections 10 which, when produced by vacuum forming, are incorporated into a mold and the plastic material drawn into the mold under controlled temperature and pressure conditions.

The cell cavity 14 comprises generally a funnel-shaped cavity 22 and cylindrical relief areas 24 and 26. The cavity 22 accepts the funnel section 23 and face panel portion 30 of a cathode-ray tube while the cylindrical relief area 24 accommodates the neck portion of the tube. The face panel portion 30 consists of the screen area or end plate 27 and the rim portion 29. The relief area 26 coincides with the corona area of a television picture tube and the anode electrode button located therein and provides clearance for this area to prevent damage resulting from contact with the package section 10.

In the fabrication of a finished television picture tube the funnel section 23 including the neck portion is joined to the face panel 30 by means of a sealant commonly referred to as a solder glass frit seal 31. The frit seal 31 is applied at the juncture between the funnel section 23 and the peripheral edge of the rim portion 29 of the face panel 30.

A transition relief area 28 is provided between the cavity 22 and the neck relief area 24 to permit insertion of a handler's hand between the packaging section and the cathode-ray tube funnel section 23. The relief area 28 discourages removal of the tube by the fragile neck portion of the tube and permits removal of the tube by placing one hand in the relief area to grasp the tube while cooperatively lifting the tube with the second hand placed against the face panel end plate 27.

Face panel end plate protection is provided by inwardly extending vertical projections 32 and 34 of FIGS. 1, 3 and 4 which contact inactive edges 35 of the face panel and maintain adequate clearance, approximately ¼ inch, between the active area 36 of the face panel 30, which in the instance of color television picture tubes is extremely sensitive to contact damage, and the packaging section 10. Additional face panel end plate protection is provided by outwardly extending vertical rib members 38 and 40 of FIG. 3 and 4 which prevent warping of the relatively thin packaging wall adjacent to the face panel end plate 27 which could result in contact between the packaging structure and the face panel end plate resulting in possible damage to the end plate.

An inwardly extending horizontal support projection 42 illustrated in FIGS. 1 and 3 as extending parallel to the frit seal 31 has a two-fold purpose. In an event the finished tube is placed in the cell cavity 14, the horizontal support projection 42, which is formed to the contour of the face panel rim 29 with which it contacts, supports the tube in the area of the face panel rim and so doing maintains the frit seal 31 free of damaging contact by the package section 10.

In the event a funnel section 23 alone is to be packaged, the horizontal support projection 42 functions as a retaining member to minimize horizontal movement of the funnel section by permitting the leading edge of the funnel section, which corresponds to the frit seal 31, to abut against the horizontal projection 42. The packaging of the funnel section 23 prior to incorporation in a finished tube requires a funnel shaped relief area 44 to accept the funnel shape neck base (shown in dotted lines) which is later modified to accept the pin connector 46 of a finished tube. The cell element described thus far is capable therefore of accepting either a funnel section or a finished tube.

Furthermore as illustrated in FIGS. 1 and 4 the cell cavity in the area of the face panel provides additional recesses 46 in the corners of the packaging section 10 to accommodate mounting ears 48 which may or may not be affixed to the face panel section 30 as part of a metal band extending around the circumference of the face panel 30. The corner recesses 46 also function to interlock vertical stack multipack enclosures as will be described hereafter.

The assembled multipack enclosures 20 of FIG. 2 illustrated in a vertical nesting configuration employed for transporting large quantities of tube units provide protection for the individual tube units as well as providing mutual support and interlock capability between adjacent enclosures 20.

The depth of the cylindrical relief area 24 provided for the neck portion of a tube unit is sufficient to provide an annular clearance 49 about the neck portion when a pair of packaging sections are mated to form a multipack enclosure 20. The annular clearance buffers the fragile neck portion of the tube from the forces exerted from the multipack enclosure in a vertical stack configuration.

A support member 50 outwardly extending from the neck relief area 24 provides a contoured support surface 52 which conforms to a shoulder portion 54 of the package section which as illustrated FIGS. 1 and 4 extends outwardly from the face panel area of the package section 10. The contoured support member 50 terminates at either end in interlock ears 60 of FIGS. 1 and 3 which during the vertical stacking of multipack enclosures interlock with the corner recesses 46 as illustrated in FIG. 2 to restrict the horizontal movement of the vertically stacked individual multipack enclosures 20.

Package section interconnect members comprised of male and female elements 64 and 66 respectively provide accurate mating of package sections forming a multipack enclosures.

Overall package section strength and rigidity is improved by utilizing a steppled surface effect 68 in the contacting areas of the respective package sections of a multipack enclosure.

Additional package section rigidity is provided by the outwardly projecting reinforcing grooves 70.

Various modifications may be made within the scope of this invention.

I claim:

1. A stacking and nesting packaging means comprising a pair of integrally formed individual package sections, each of said package sections having an open surface and a closed surface and at least one cell unit comprised of recesses including a tapered cavity element having an enlarged open end and a reduced open end for receiving in a horizontal position a relatively fragile glass cathode ray tube envelope, said envelope having a neck section, an outwardly extending portion extending from the reduced open end of said tapered cavity element to accommodate said neck section, orientation of said open surfaces of said pair of package sections in an oppositely disposed mating relationship completely enclosing said cathode-ray tube envelope, the opening formed by the mating of the enlarged open ends of said tapered cavity elements being substantially rectangular, ear-type members projecting outwardly from the corners of the rectangular opening of said mated tapered cavity elements, a face panel section corresponding substantially to the glass face panel of said cathode-ray tube envelope extending from said rectangular opening of said mated tapered cavity elements thereby providing a surface for enclosing the rectangular opening of said mated tapered cavity element and forming a peripheral rim about said rectangular opening of mated said tapered cavity elements, said rim extending between said rectangular opening of said mated tapered cavity elements and said surface, an outwardly projecting ridge disposed substantially perpendicular to said neck cavity element and terminating at each end in a configuration suitable for mating in an interlocking relationship with said ear-type members, the surface of said ridge being contoured to mate in an abutting relationship with said peripheral rim such that the vertical stacking of alternate mated pairs of package sections in a reverse, end for end relationship establishes a vertical supporting and interlocking relationship between the neck portion of one pair of mated package sections and the face panel portion of the adjacent pair of mated package sections.

2. A stacking and nesting packaging means as claimed in claim 1 wherein the recesses of one of said package sections correspond in size and shape to recesses of the opposed mating package section.

3. A stacking and nesting packaging means as claimed in claim 1 wherein the mating of said pairs of package sections positions said cathode-ray tube envelope such that the neck section is secured without making contact with said packaging means and the outwardly extending neck portions of said mated package sections cooperate to buffer said neck section of the cathode-ray tube envelope from damaging shock and stress.

4. A stacking and nesting packaging means as claimed in claim 1 wherein the recesses of said packaged sections are tapered to permit nesting of superimposed package sections.

5. A stacking and nesting packaging means as claimed in claim 1 wherein said package section comprises a plurality of cell units arranged unidirectionally in rows, and alternate rows of cell units arranged in reverse end for end and slightly overlapping relationship.

6. A stacking and nesting packaging means as claimed in claim 1 wherein each package section includes lateral interlock means, the interlock means of mated package sections engaging to restrict lateral movement of the individual package sections relative to one another.

7. A stacking and nesting packaging means as claimed in claim 1 wherein said cathode-ray tube envelope is a television picture tube of the type having an envelope comprised of a glass face panel section with an extended rim portion having a continuous peripheral edge, a funnel-shaped body section sealed at its enlarged end to said face panel rim portion, and a neck section extending from the opposite end of said funnel-shaped body section, said packaging means including a first inwardly projecting support member extending substantially parallel to but displaced from the seal between said funnel-shaped body section and said face panel rim portion to displace said seal from damaging contact with said packaging means.

8. Packaging means as claimed in claim 7, further including a relief area outwardly extending from the tapered portion of said package section cavity to accommodate the corona area of the television picture tube to prevent contact between the corona area and the package section.

9. Packaging means as claimed in claim 7 further including a second inwardly projecting support member in the package section area corresponding to the end portion of said face panel section to contact said end portion and maintain clearance between said end portion and said package section.

10. Packaging means as claimed in claim 7, further including a relief area at the juncture of said tapered cavity portion and said neck portion to provide access for removal of said television picture tube from said package section.

11. A stacking and nesting packaging means as claimed in claim 1 wherein said package sections are made of a plastic material with the wall thickness of the supporting portions of said package sections being greater than the wall thickness of the remaining portions of said package sections.

12. A stacking and nesting packaging means as claimed in claim 7 wherein said television picture tube includes mounting ears extending from the corners thereof, said ear-type members providing packaging recesses therefor.