

Aug. 9, 1966

K. S. OMER

3,265,200

PACKAGING DEVICE

Filed Oct. 22, 1964

2 Sheets-Sheet 1

FIG. 1.

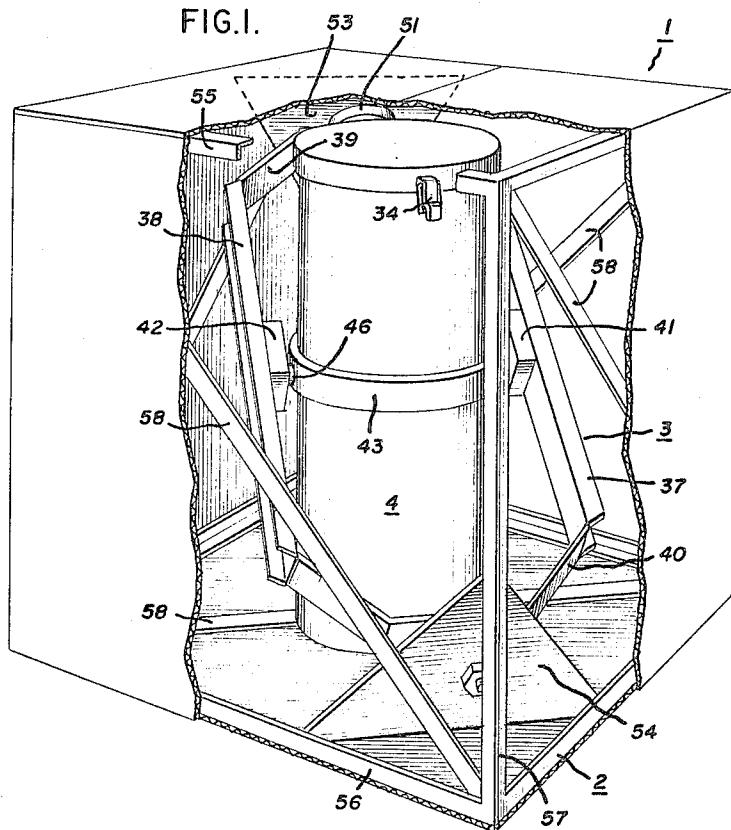
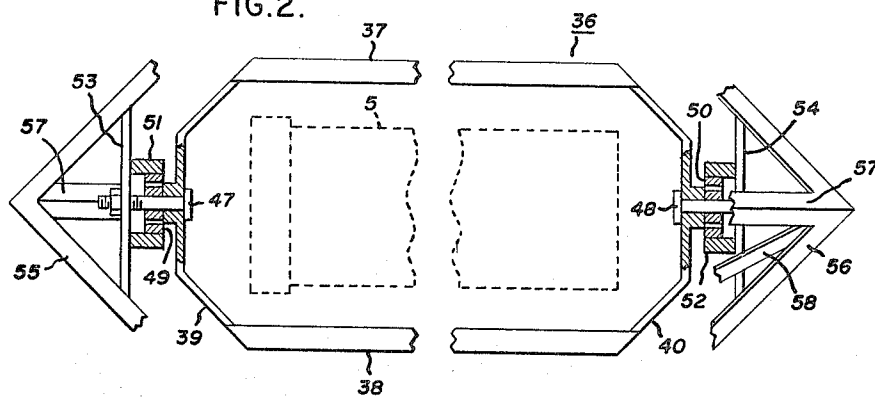


FIG. 2.



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FIG.3.

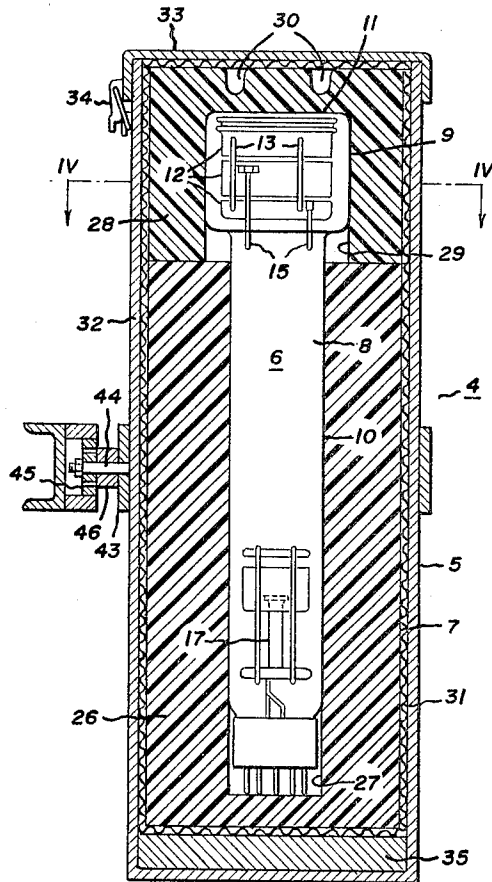
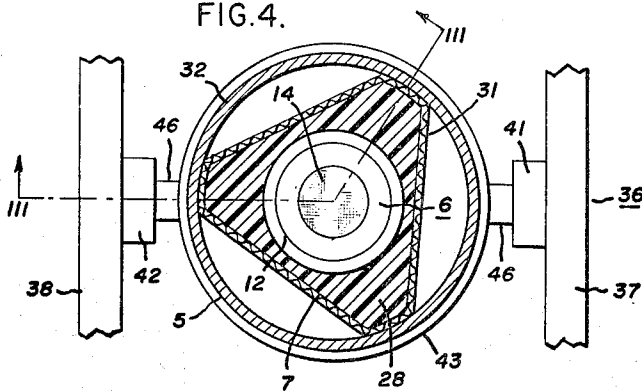


FIG.4.



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3,265,200

PACKAGING DEVICE

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Filed Oct. 22, 1964, Ser. No. 405,789
17 Claims. (Cl. 206-46)

This invention relates to a package for the handling, shipping and storage of orientation-sensitive products and materials and more particularly to the handling, shipping and storage of orientation-sensitive television camera tubes such as image orthicon or vidicon tubes or the like.

Some types of electronic equipment, such as the above-mentioned image orthicon tubes are of relatively high unit cost value and are formed with extremely sensitive parts, as for example, the electron beam receptor called a target which is highly susceptible to damage should a particle of material contained within its vacuum envelope accidentally touch upon its electron-receiving surface. The surface in use and in the preferred method of handling should always be oriented so that the likelihood of a particle touching upon the surface of the target is eliminated. In the present day handling, shipping and storage of these tubes, there has not been available a means to prevent the persons or equipment handling these tubes in transit from tipping them sufficiently to destroy the usefulness of the tube, even when these tubes are shipped air freight, special handling and are personally delivered to the airplane and personally received by the consumer or manufacturer's representative. Even with the special precautions taken with these tubes, a very large percentage of the tubes have been rendered inoperative because of tipping of the tubes by the persons handling the same. Thus, the cost of such tubes has been greatly increased.

It is an object of this invention to provide a package for such orientation-sensitive products or materials which will render the special handling previously required unnecessary and reduce substantially the number of products damaged in transit even where the special handling was previously used.

It is a further object of this invention to provide a special package for the handling, shipment and storage of orientation-sensitive vacuum tubes. It is a further object of this invention to provide a new and improved package for a vacuum tube which would be rendered inoperative by excessive tipping.

In accordance with these objects, there is provided a package comprising means for rotatably supporting an orientation sensitive product within the device, whereby the product will be maintained in the desired orientation irrespective of the orientation of the device as a whole.

Further objects and advantages of this invention will be apparent from the following complete description and from the drawings wherein:

FIGURE 1 is a perspective view of the preferred embodiment of the packaging device in accordance with the invention with a portion thereof broken away to disclose the interior;

FIGURES 2 and 3 are partial section views of portions of the packaging device showing in further detail the specific embodiment of the invention; and

FIGURE 4 is a section view taken on line 4-4 of FIGURE 3.

The shipping package in accordance with the invention, as shown in FIGURE 1, includes a parallelepiped enclosure 1 which may be a corrugated, or other material of suitable strength, carton having an openable top. A rigid framework 2 is enclosed or closely contained within said enclosure 1 and supports a gimbal mount means 3 to be fully described below, in diagonally opposite corners of the framework 2. Means may be pro-

vided to positively secure the framework to the enclosure but for most purposes an approximate force-fit will suffice. Supported at the center of the gimbal 3, and centrally of the enclosure 1, is a support means or container 4 which, because of its mounting, will be maintained in a vertical position in the central portion of the enclosure, irrespective of the orientation of the enclosure. Although the enclosure 1 as is shown as completely enclosing the device, since the cannister is completely protective in and of itself, the enclosure may be opened or virtually eliminated permitting the rigid framework itself to define an enclosure sufficient for shipping the device.

The support or container means 4 is shown in further detail in FIGURE 3 and comprises a cannister 5 which may be of metal or other suitable material. A television camera pickup tube such as an image orthicon tube 6 is shown within the vibration absorbing container 7, inserted in the cannister 5.

The tube 6 comprises an insulative and preferably glass envelope 8 having an enlarged head portion 9 and an elongated neck portion 10. Since the head portion houses the image section of the device which includes the target while the neck portion houses the multiplier and beam forming section, the portions 9 and 10 will be sometimes referred to hereinafter as the target portion and the gun portion, respectively.

The head or target portion 9 of the envelope includes a suitable photocathode 11 and a plurality of cylindrical grid electrodes 12. The grid electrodes are mounted together coaxially by being each suitably secured to a plurality of circumferentially spaced insulative rods or stalks 13. A target electrode assembly 14 is mounted coaxially within the plurality of electrodes 12, the various electrodes providing for control of the velocity of electrons moving away from the photocathode and toward the target electrode 14 and also for controlling the impinging force of electrons striking the target from an electron beam source located in the neck portion of the envelope. Extending through the back portion of the head 9 and sealed therein are a plurality of conductive leads 15 which make electrical connections to the various electrodes included in the target portion 9 of the tube. The neck portion of the envelope houses an electron gun-dynode assembly, which includes an electron beam source in the form of an electron gun 17 and various electrodes which are fully shown and described, for example, in U.S. Patent 3,038,094.

The operation of the tube is fully disclosed therein, but it should be noted that the gun 17 of the tube directs a thin beam of electrons toward the target electrode producing a spot on the target electrode 14 which is of the order of 1 to 2 mils in size.

During the manufacture and testing of the tube prior to shipment it is possible that the envelope and the electrodes contained therein will yield small contaminant particles within the tube. For this reason, during manufacture and testing the tube is maintained insofar as possible with the target portion held in the position shown in the drawing so that any contaminant particles will be confined in the neck or gun portion of the tube. The importance of this will be realized when, as pointed out above, the spot to be scanned on the target electrode is of a size of 1 to 2 mils so that even an extremely small particle can have a large effect upon the operation of the tube such as to render the same unusable. For this same reason, it is necessary that the image orthicon tube be shipped in this same upright position to prevent the contaminant particles within the tube from coming in contact with the target electrode. It will be further noted that the direction of the electron beam from the gun is largely controlled by the placement of the electrodes within the tube and, therefore, it is further required that, insofar as possible, the tube be kept free from vibration shock. To this

end the tube 6 is enclosed within the vibration absorbing container 7.

The vibration absorbing container 7 comprises a bottom portion 26 having an internal aperture or shape 27 which generally conforms and is of a length to accommodate the neck or gun portion of the tube 6 in close confinement. A top portion 28 has an aperture 29 which has an internal shape and length generally conforming to the target portion 9 of the electron tube 6. The vibration absorbing container, thus described, is preferably formed from a foamed organic polymer such as a foamed polyurethane, polyethylene, or polystyrene. To enable removal of the top portion 28 of the container 7 there may be provided finger apertures 30 in the top portion thereof. The external shape of the container 7 may conform generally to the internal shape of the cannister means 5, but, as shown in FIGURE 4, it is preferable that the container be of a polygonal shape with spaces between the sides thereof and the cannister 5 to permit easy removal of the container from the cannister. Since it is contemplated that the main shipping package will be reusable, it is preferred to enclose the foamed polymer top and bottom portions of the container in a suitably conforming shaped cardboard box portion 31. While only one tube is shown, it will be appreciated that the container 7 may also be of suitable size and configuration to contain a plurality of tubes.

The vibration absorbing container 7 is supported within the support or containing means by the cannister 5, said cannister 5 including a main cylindrical body portion 32 and a top cover portion 33. The cover portion and the body of the cannister 32 may be secured together by suitable latch means 34. For reasons to be described hereinafter, the cannister further includes a balancing weight 35 located within the bottom of the cannister. It will be appreciated that the cannister need not take the form of a complete cylindrical body, as such, but for the fulfillment of the invention it is only necessary to provide a framework structure which will hold the vibration absorbing container and the balancing weight, if such is desired.

The cannister 5 is rotatably supported by the gimbal mount means 3. The gimbal mount means 3 comprises a bridle or yoke 36, said bridle 36 including a pair of side members 37 and 38, preferably of a channel shape connected at its ends by members 39 and 40 (FIGURE 2). The side members 37 and 38 are slightly longer than the height of cannister 5, so that the central opening in the bridle is larger than the vertical cross-sectional area of the cannister. Secured to the inner surfaces of side members 37 and 38 centrally thereof is a pair of cylindrical bearing blocks 41 and 42 (FIGURE 4). The bearing blocks 41 and 42 may be secured to side members 37 and 38, respectively, by any suitable means, for example, by welding. A support band 43 is secured to the cannister 5 and is rotatably mounted within the bearing blocks 41, 42, upon spud shafts 44 which are rotatable on bearings 45 (FIGURE 3), the spud shafts 44 defining an axis hereinafter referred to as the minor axis. Spacing washers 46 may be provided between the support band 43 and the bearings 45. Thus, it will be seen that the balancing weight 35, which is a part of the cannister 5, will maintain the tube 6 contained within the container in the position shown irrespective of any rotation of side members 37 and 38 about the minor axis and, hence, the tube will be maintained vertical irrespective of any rotation of the enclosure 1 about this axis.

The gimbal mounting means is completed by providing spud shafts 47 and 48 (FIGURE 2) secured in end members 39 and 40 of the bridle, respectively, the shafts 47 and 48 being rotatable within bearings 49 and 50. The bearings 49 and 50 are mounted within bearing blocks 51 and 52 which are in turn suitably secured to bearing support plates 53 and 54. Thus, the minor axis is free to rotate about the major axis defined by shafts 47 and 48.

The combined action of the rotation about the major axis and the minor axis results in the axis of the cannister being free to maintain vertical orientation with respect to the point of intersection of the two axes. The central opening of the bridle being sufficiently large, the bridle and hence the framework may rotate a full 360° about the cannister.

While it is necessary that the enclosure be capable of rotating a full 360° about with respect to the cannister, it is still desirable to minimize the size of the enclosure 1 insofar as is possible. To this end, the bearing support plates 53 and 54 take the form of a triangular shape shown in dotted lines in FIGURE 1, said plates being mounted in diagonally opposite corners of the framework 2 and perpendicular to the diagonal of the enclosure so that the stub shafts 47 and 48 and hence the major axis will be aligned on this diagonal. This permits the opening defined by side members 37, 38, and end members 39, of the bridle 36 to be of a dimension permitting such free rotation, while minimizing the horizontal length of the side members of the framework 2. The dimensions of the enclosure 1 is further held to a minimum by mounting the cannister 5 on support band centrally thereof. Since the support band is secured to the cannister 5 at the center of the cannister, the balancing weight 35 is provided to maintain the cannister in the upright position desired.

To provide a stable mounting for the gimbal 3, the rigid framework 2 includes top and bottom frame members 55 and 56 interconnected by corner posts 57. This rigid framework not only provides a stable mounting for the gimbal, but also insures that the enclosure 1 does not collapse at its sides and disrupt the rotating of the cannister in the desired manner. To further carry out this desirable feature diagonal braces 58 are provided in all of the six sides of the framework to prevent the center sections of the enclosure 1 from collapsing inwardly. Thus, it will be seen that there is provided a package and shipping device for orientation sensitive products and materials such as an image orthicon tube which will maintain the product in its desired orientation irrespective of the manner in which the enclosure in which it is contained is handled. It further provides against inadvertent vibration damage; the term vibration, as used herein, being intended to include shock or other stresses or strains which might be placed on the product.

While the invention has been disclosed by way of the preferred embodiment thereof, it will be understood that many modifications and changes may be made therein without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A package for an orientation sensitive product, comprising an enclosure and means for containing the product rigidly supported at its center within said enclosure and rotatable about the center of said enclosure including a balancing weight whereby the weight maintains said means in a vertical position irrespective of the orientation of the enclosure member.

2. A package for an orientation sensitive product comprising an enclosure, a rigid framework contained within that said enclosure and means for containing the product rigidly supported at its center by said framework and rotatable about the center of the enclosure including a balancing weight whereby the weight maintains said means in a vertical position irrespective of the orientation of the enclosure member.

3. A package for an orientation sensitive product comprising an enclosure, a rigid framework within said enclosure and a product cannister rigidly supported at its center by said framework and rotatable about the center of the enclosure having a balancing weight in one end thereof whereby the weight maintains the cannister in a vertical position irrespective of the orientation of the enclosure member.

4. A package for an orientation sensitive product comprising a parallelepiped enclosure, a rigid framework conformable with and disposed within said enclosure, a gimbal, and means for supporting said gimbal located at diagonally opposite corners of said framework.

5. A package for an orientation sensitive product comprising a parallelepiped enclosure, a rigid framework conformable with and confined within said enclosure, means for supporting the product in a vertical position centrally of the enclosure including a gimbal, and means securing the ends of said support means at diagonally opposite corners of said framework.

6. A package for an orientation sensitive product comprising a parallelepiped enclosure, a rigid framework conformable with and contained within said enclosure, a gimbal secured at its ends in diagonally opposite corners of said framework, and a product cannister containing a balancing weight rigidly supported within said gimbal whereby the weight maintains the cannister in a vertical position irrespective of the orientation of the enclosure member.

7. A package for an orientation sensitive product comprising a parallelepiped enclosure, a rigid framework conformable with and contained within said enclosure and means for supporting a product held rotatably in the center of said enclosure by a gimbal, said gimbal secured at its ends in diagonally opposite corners of said framework and including a pair of members defining an opening which is larger than the dimensions of said product supporting means, whereby said last mentioned means is free to rotate a full 360° within said opening.

8. A package for an orientation sensitive product comprising an enclosure; a rigid framework contained within said enclosure including a top and a bottom frame, corner posts securing said top and bottom frames together and diagonal braces across the top and bottom frame and the sides delineated by the top and bottom frame and corner posts for rigidly supporting against inward movement, the top, bottom and sides of said cardboard enclosure; and means for containing the product supported within said framework for rotation 360° within the center of said enclosure.

9. A package for an orientation sensitive product comprising an enclosure; a rigid framework contained within said enclosure including a top and a bottom frame, corner posts securing said top and bottom frames together and diagonal braces across the top and bottom frame and the sides delineated by the top and bottom frame and corner posts for rigidly supporting against inward movement, the top, bottom and sides of said cardboard enclosure; a cannister rotatably supported at its center within said framework including a main body portion and a top cover portion, latching means for securing said top cover portion to the main body portion of said cannister and a weighting means for maintaining said cannister in a vertical position contained within said cannister; and a vibration absorbing container within said cannister.

10. A package for an orientation sensitive product comprising an enclosure; a rigid framework contained within said enclosure including a top and a bottom frame, corner posts securing said top and bottom frames together and diagonal braces across the top and bottom frame and the sides delineated by the top and bottom frame and corner posts, for rigidly supporting against inward movement, the top, bottom and sides of said enclosure; a gimbal mount supported from diagonally opposite corners of said rigid framework including bearing support plates secured to said rigid framework, a bridle rotatively supported by said bearing support plates, a support band supported between the side members of said bridle, bearing means between the bridle and the support band for rotatively supporting said support band; a cannister supported by said support band including a weighting means contained within said cannister for maintaining said cannister in a vertical position within said gimbal mount;

and a vibration absorbing container within said cannister.

11. A package for an orientation sensitive product comprising an enclosure; a rigid framework contained within said enclosure including a top and a bottom frame, corner posts securing said top and bottom frames together and diagonal braces across the top and bottom frame and the sides delineated by the top and bottom frame and corner posts for rigidly supporting against inward movement, the top, bottom and sides of said enclosure; a gimbal supported from diagonally opposite corners of said rigid framework including bearing support plates secured to said rigid framework, a bridle rotatively supported by said bearing support plates, a support band supported between the side members of said bridle and bearing means between the bridle and the support band for rotatively supporting said support band; a cannister supported by said support band, including a main body portion and a top cover portion, latching means for securing said top cover portion to the main body portion of said cannister and a weighting means contained within said cannister for maintaining said cannister in a vertical position within said gimbal mount; and a vibration absorbing container within said cannister.

12. A package for an electron tube which includes a target portion and a gun portion comprising an enclosure, and a vibration absorbing container supported for rotation within said enclosure and including a bottom portion having an internal shape for conforming to the envelope of the gun portion of said tube and a top portion for conforming to the envelope of the target portion of said tube.

13. A package for an electron tube which includes an envelope defining a target portion and a gun portion comprising a parallelepiped enclosure, a vibration absorbing container supported for rotation by diagonally opposite corners of said enclosure including a bottom portion having an internal shape for conforming to the envelope of the gun portion of said tube and a top portion for conforming to the envelope of the target portion of said tube.

14. A package for an electron tube which includes an envelope defining a target portion and a gun portion comprising an enclosure, a rigid framework contained within said enclosure, and a vibration absorbing container supported for rotation by said framework, said vibration absorbing container including a bottom portion having an internal shape for conforming to the envelope of the gun portion of said tube and a top portion for conforming to the envelope of the target portion of said tube.

15. A package for an electron tube which includes an envelope defining a target portion and a gun portion comprising an enclosure, a rigid framework contained within said enclosure, a gimbal mount rigidly and rotatably secured to said framework and a vibration absorbing container supported for rotation by said gimbal mount, said vibration absorbing container including a bottom portion having an internal shape for conforming to the envelope of the gun portion of said tube and a top portion for conforming to the envelope of the target portion of said tube.

16. A package for an electron tube which includes an envelope defining a target portion and a gun portion comprising a parallelepiped enclosure, a rigid framework conformable with and contained within said enclosure, a gimbal mount rigidly but rotatively secured across diagonally opposite corners of said framework and a vibration absorbing container supported for rotation about 360° by said gimbal mount, said vibration absorbing container including a bottom portion having an internal shape for conforming to the envelope of the gun portion of said tube and a top portion for conforming to the envelope of the target portion of said tube.

17. A package for an image orthicon tube which includes an envelope defining a target portion and a gun portion comprising an enclosure; a rigid framework contained within said enclosure including a top and a bottom frame, corner posts securing said top and bottom frames together and diagonal braces extending across the top and

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bottom frame and the sides delineated by the top and bottom frame and corner posts for rigidly supporting against inward movement, the top, bottom and sides of said cardboard enclosure; gimbal mount means supported from diagonally opposite corners of said rigid framework including bearing support plates secured to said rigid framework, a bridle including a pair of side members defining an open portion rotatably supported by said bearing support plates, a support band rotatably secured between the side members of said bridle, bearing means 10 between the bridle and the support band for rotatively supporting said support band; a cannister including a main body portion and a top cover portion supported by said support band, latching means for securing said top cover portion to the main body portion of said cannister, a 15 weighting means contained within said cannister for maintaining said cannister in a vertical position within said

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gimbal mount; and a vibration absorbing container within said cannister including a bottom portion having an internal shape for conforming to the envelope of the gun portion of an image orthicon tube and a top portion having an internal shape for conforming to the envelope of the target portion of an image orthicon.

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