

July 28, 1959

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2,897,252

SHIELD AND PACKAGE FOR ELECTRON DISCHARGE DEVICE

Filed March 11, 1955

2 Sheets-Sheet 1

Fig. 1

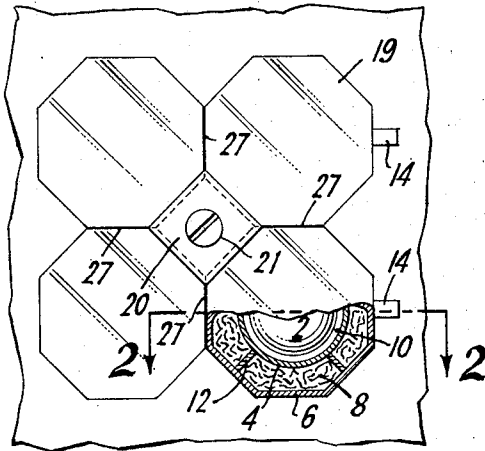


Fig. 2

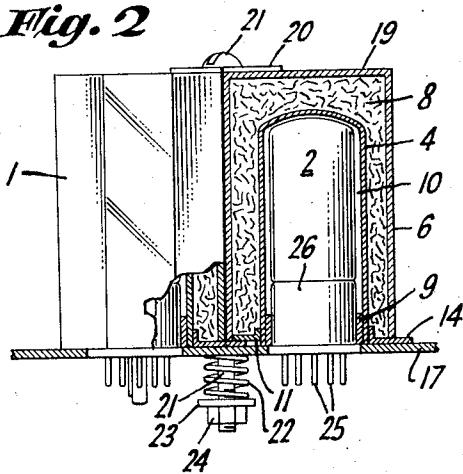


Fig. 3

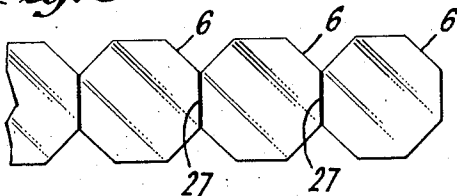


Fig. 4

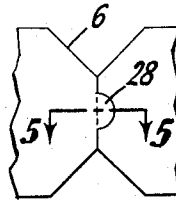


Fig. 5

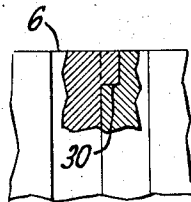


Fig. 6

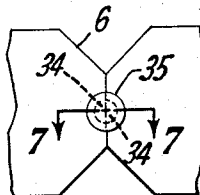
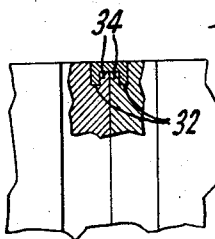


Fig. 7



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2 Sheets-Sheet 2

Fig. 8

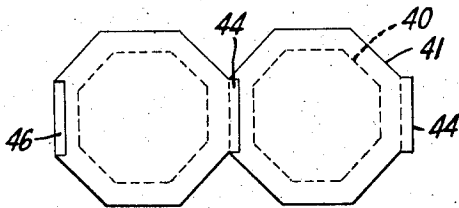


Fig. 9

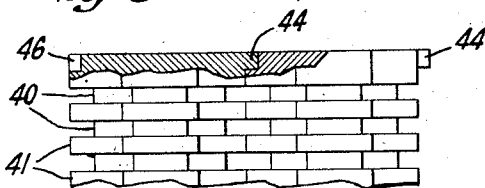


Fig. 10

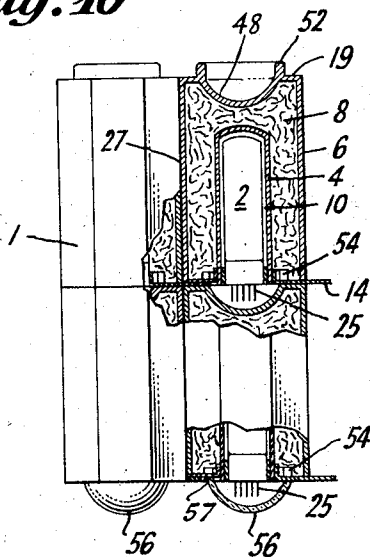


Fig. 11

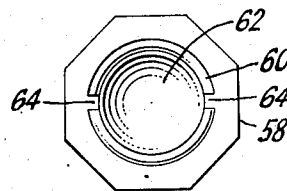
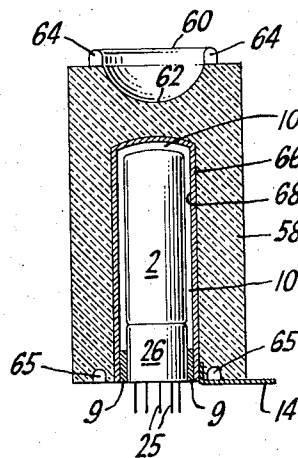


Fig. 12



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SHIELD AND PACKAGE FOR ELECTRON DISCHARGE DEVICE

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8 Claims. (Cl. 174—35)

The present invention relates to an encapsulating carton for packaging a fragile electrical device, which carton is intended to be utilized both for transporting and for mounting the electrical device, either singly or in groups of two or more such devices. More particularly the invention relates to an encapsulating carton having electrically shielding, shock protecting, and cooling means associated therewith.

Although in the forthcoming description of the invention reference is made to a space discharge device, characterized as a radio tube, it should be understood that such reference is intended for purposes of illustration only, and is not intended to limit the applicability of the encapsulating carton disclosed herein.

It has previously been the practice to transport radio tubes in disposable paper cartons, which offered little protection to the tube. Such practice resulted in considerable waste of the cardboard, packing, and the like, utilized therefor and in breakage of radio tubes transported in this manner; and necessitated extensive handling during storage, inventory, and shipment of radio tubes, in extracting such tubes from their cartons, and in plugging the same into sockets during the manufacture of radio equipment. Further handling and expense was encountered in providing those tubes particularly sensitive to microphonism with vibration damping devices, for example, resiliently mounted sockets or felt-lined shield cans. Although such shock absorbing devices are satisfactory, their use has been confined, because of the cost involved, to those applications of radio tubes requiring a relatively superior degree of performance and sensitivity. In less stringent applications, for an example inexpensive amplitude modulated radio receivers utilized in the home, vibration damping devices are usually omitted although performance of the receiver would be improved thereby. Likewise electrical shielding means are not usually provided for tubes utilized in inexpensive circuitry, although it is desirable to shield particularly those tubes utilized in the radio and intermediate frequency stages of a radio receiver, where low interelectrode capacity is essential.

Accordingly it is an object of the present invention to eliminate the necessity of removing a radio tube from its carton prior to mounting such tube on the radio chassis.

Another object is the provision of means for electrically shielding the tube without removing the tube from its carton.

A further object is the provision of means associated with an encapsulating carton for absorbing shock energy imparted to the tube during transportation and utilization of the radio tube.

A still further object is to facilitate the formation of a relatively large group of contiguously bound encapsulated tube packages, which group may be sub-divided either singly or into smaller groups thereof.

A still further object is the provision of means for mounting a group of contiguously and detachably bound

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encapsulated tube packages in predetermined spatial relationship on a radio chassis.

Still another object is to provide, in an encapsulated tube package, means for joining the package to like tube packages during the transportation thereof in relatively large groups or in a prearranged order for easy subsequent mounting upon a radio chassis.

In accordance with the present invention there is provided an encapsulating carton comprising a shell into the interior of which a radio tube or other fragile electrical device can be sealed not only during the transportation thereof but also during the utilization of the tube. The shell is provided with means for detachably joining the encapsulating carton to a number of like cartons in order to form relatively large or small groups of cartons as desired. It is contemplated that the encapsulated tube package can be provided with shock absorbing means that will protect the tube during distribution thereof to various sales outlets and also during subsequent utilization of the tube, since the tube will not be removed from the encapsulating carton. Such means can be so fabricated that efficacious cooling and electrical shielding of the encapsulated radio tube is likewise provided. Other means for protecting, electrically shielding, and cooling can be utilized as hereinafter described for illustrative purposes only and not as limitations thereof.

The aforementioned and other objects of the invention will be better understood from the following detailed description viewed in conjunction with the accompanying drawings, in which:

Fig. 1 is a top plan view partly in section of an encapsulated tube package mounted in accordance with one illustrative application of the present invention.

Fig. 2 is a front elevation, partly in section along line 2—2 of Fig. 1.

Fig. 3 is a top plan view illustrating one embodiment of the means for joining contiguous encapsulated tube packages of the invention for mounting the packages on a chassis having aligned sockets.

Fig. 4 is a top plan view illustrating another embodiment of the joining means.

Fig. 5 is a fragmentary front elevation of Fig. 4, partly in section along line 5—5 of Fig. 4.

Fig. 6 is a top plan view illustrating another embodiment of the joining means.

Fig. 7 is a fragmentary front elevation of Fig. 6, partly in section along line 7—7 of Fig. 6.

Fig. 8 is a top plan view illustrating a means for joining contiguous encapsulated tube packages having one form of cooling means.

Fig. 9 is a fragmentary front elevation of Fig. 8.

Fig. 10 is a front elevation partly in section illustrating an application of the invention to the combining into and transportation of large groups of the novel encapsulated tube packages.

Fig. 11 is a vertical section of another embodiment of a novel encapsulated tube package.

Fig. 12 is a top plan view of Fig. 11.

Referring now to Figs. 1 and 2, the illustrative embodiment of the invention depicted therein comprises a radio tube 2 and an encapsulating shell 1 having an inner wall 4 of generally cylindrical configuration and an outer wall 6 of preferably octagonal conformation for reasons hereinafter apparent. The inner wall 4 can be made in varying sizes and shapes in order to conform generally, within the limits of the outer wall 6, to the more common shapes and sizes of radio tubes. On the other hand, the outer wall 6 can be provided with standardized dimensions in order to facilitate handling and mounting of the encapsulated tube packages.

Into the space 8 enclosed by the inner and outer walls,

may be placed a protective filler such as sponge rubber, metallic wool, or plastic material. It will be appreciated that for higher wattage tube types heat dissipation may be effected through the use of metallic wool as a filler or by impregnating the sponge rubber or plastic material when so used with a sufficient number of metallic particles to provide adequate heat conductivity. Electrical shielding may be provided in the same manner since the tube 2 will not be removed from the encapsulating carton during subsequent operation of the tube. Space 10 is then sealed by the sealing composition 9, disposed between the tube base 26 and the inner wall 4 and serving to hold the radio tube 2 in place within the encapsulating carton. The inwardly extending flange 11 of the outer wall 6 can be provided with suitable vents (not shown) communicating with space 8 in order to facilitate the addition of filler material thereto. Pins or connectors 25 protrude sufficiently to engage with a tube socket, or other electrically connecting means, mounted on a radio chassis. During the transportation of the encapsulated tube package the pins are enclosed by a cap detachably affixed to the encapsulating carton as presently to be described.

As an alternative to providing an electrically conductive filler in spaces 8 or 10 for shielding purposes, at least a part of one or both of the walls 4 and 6 may be fabricated from or coated with an electrically conductive material. If only one such coating is used it is preferably disposed on the inner surface of wall 4 for more efficacious shielding of the tube 2. The grounding tab 14 is electrically connected to the inner wall 4 or to the coating thereon, and compressional contact with chassis 17 is effected by the lower wall portion of the outer wall 6. If an electrically conductive filler is utilized as hereinbefore pointed out, contact may be made therewith by extending tab 14 a short distance into said filler.

In conjunction with the use of heat conductive filler in spaces 8 or 10 or as an alternative thereto a number of cooling fins 12 disposed between walls 4 and 6, respectively, may be utilized.

Figs. 1 and 2 additionally illustrate one method of mounting a cluster of encapsulated tube packages upon a radio chassis in a manner that will admit of facile removal of one or more such tubes without disturbing the remaining tubes. After joining the encapsulated tube packages, for an example with joining means 27, described presently in reference to Fig. 3, the tubes are plugged into tube sockets (not shown) suitably disposed on chassis 17. A mounting plate 20, having such dimensions that said plate overlies relatively small portions of the tops 19 of the encapsulating cartons, is placed thereover. Through an aperture (not shown) in plate 20 and a similar, aligned aperture (not shown) in chassis 17, a mounting bolt 21 extends and has sufficient length to receive tensioning spring 22 and washer 23. The clamping pressure imparted to the tops 19 of the encapsulating carton, is, of course, regulable by adjusting nut 24. It will be appreciated that the tube 2 will be suitably oriented respective to the outer wall 6 that pins 25 will engage the pin receiving means so provided and that grounding tab 14 will be compressed into positive electrical contact with chassis 17 by the lower portion of outer wall 6 of a contiguous package.

The removal of one or more encapsulated tube packages from the mounted cluster is accomplished by displacing mounting plate 20 and bolt 21 in a direction away from the package to be withdrawn, which displacement is permitted by tensioning spring 22, removing the binding means described herebelow, and withdrawing the package from its socket.

It will be noted that although various sizes of tubes may be included in the cluster of encapsulated tube packages so mounted, the center-to-center distances between adjacent tube sockets will be constant as a result of the standardized outer dimensions of the encapsulating shell

1. Therefore in die stamping a number of similar chassis designs only the punches need be interchanged to provide the differing sizes of socket apertures required.

One embodiment of the means for joining a number of contiguous encapsulated tube packages, either for mounting a group of the packages upon the radio chassis or for the facile handling during distribution channels, is illustrated in Figs. 1 and 3. Strips of tape 27, coated on both sides with adhesive are placed on appropriate faces of the outer wall 6 in order to form joints with contiguous tube packages. It will be readily understood that such adhesive strips are selected in size and adhesive strength to permit one or more cartons to be easily pulled away from the larger group as desired. Alternatively, adhesive coatings may be applied directly to the appropriate faces of outer wall 6, thus eliminating the use of the tape. It will be apparent that one advantage of contiguously binding together a number of encapsulated tube packages in the manner described herein is the vibration damping or shock absorbing effect of the relatively large mass afforded by such grouping or cluster.

Figs. 4 and 5 illustrate another embodiment of the joining means of the invention, wherein projection 28 of one encapsulating carton is engaged in recess 30 of the shell 1 of a contiguous like carton, in order to prevent relative lateral movement of the packages.

Another embodiment of the joining means is illustrated in Figs. 6 and 7. Recess 32 having an upwardly projecting central portion 34 is formed upon bringing the semi-annular recesses and semicylindrical projections of like encapsulating cartons in contiguous relationship. A cap 35 is placed within recess 32 to bind together the semicylindrical projections of portion 34.

Figs. 8 and 9 illustrate a means for joining contiguous encapsulated tube packages, the outer walls 40 of which are provided with cooling fins 41. Laterally elongated projection 44 is adapted to engage recess 46 of a contiguous like package, in order to prevent relative lateral movement of the packages. Although cooling means are shown only in Figs. 2, 8 and 9, it is obvious that any of the exemplary embodiments of the invention illustrated herein, may be so provided. It is contemplated that the adhesive coatings or adhesively coated tape described hereinbefore may be utilized in conjunction with the joining means illustrated in Figs. 4 to 9, inclusive.

Referring to Fig. 10, there is shown another illustrative embodiment of the invention, in which the encapsulating carton is provided with means for joining such cartons sidewise and endwise to a number of like cartons to form relatively large groups of encapsulated tube packages suitable for the transportation and distribution thereof. The pins or connectors 25 protruding from an encapsulated tube package in one layer of the group are enclosed within a hemispherical depression 48 in the top 19 of a like encapsulating carton positioned immediately below and joined endwise thereto. In the portion of the top 19 surrounding the depression 48 there is provided an annular projection 52 adapted to detachably engage an annular recess 54 in the opposite end of the shell 1 of a like encapsulating carton. Openings 64 (Fig. 12) are provided in the annular projection 52 at diametrically opposite positions for the purpose of accommodating grounding tabs 14. The pins 25 of each of the encapsulated tube packages comprising the bottom layer are enclosed by hemispherical caps 56 having a rim portion 57 which is adapted to engage detachably the annular recesses 54. The contiguous encapsulated tube packages comprising each of the several layers can be joined sidewise in a manner heretofore described.

Although only four such encapsulated tube packages are illustrated in Fig. 10, it is obvious that radio tubes of a given type, encapsulated in accordance with the present invention, may be joined into groups as large as manufacturers' lots if so desired. In the course of distribution thereof such groups can be easily divided into

wholesalers lots which in turn can be sub-divided into smaller groups required by retail outlets. Such division may take place, for an example, along sidewise joints 27 joined by adhesive material. Since the outward dimensions of shell 1 can be made uniform for the more common radio tube types, the tube packages required for a particular radio circuit may be individually separated from their respective groups of joined packages and rejoined for mounting upon a radio chassis as illustrated by way of examples in Figs. 1 and 2 or in Fig. 3.

Alternatively to grouping the encapsulated tube packages into lots of identical tube type, the various types required for a particular radio circuit can be grouped into the required spatial prearrangement as determined by the circuit design. Such groups then will be joined into lots of any suitable size to be used, for an example, in assembly line mounting of said groups onto radio chassis or the like.

Figs. 11 and 12 depict another illustrative embodiment of the invention in which the encapsulating carton comprises a molded plastic shell 58 having an annular projection 60, a hemispherical depression 62 in the portion of shell 58 enclosed by the annular projection 60, and a central cavity 66 adapted to receive tube 2.

It is obvious that a given shell can be provided with a cavity 66 having a relatively larger or smaller diameter as governed by the type of tube, the method of mounting the same therein, and the outer periphery of the molded plastic shell 58. The annular projection 60 is provided with diametrically spaced indentations 64, adapted to accommodate the tabs 14, when the annular projection 60 is inserted into the annular recess 65 of an adjoining carton as described with reference to Fig. 10.

The radio tube encapsulated in accordance with Figs. 11 and 12 can be electrically shielded by applying an electrically conductive coating 68 to the walls of the central cavity 66. Such coating is grounded by means of tab 14 electrically associated therewith. To absorb shock energy during transportation or operation of the encapsulated tube assembly, the space 10 may be filled with a resilient material such as sponge rubber, or if it is desirable to eliminate the use of coating 68, steel wool or rubber impregnated with metal particles may be utilized both for shock energy absorption and for electrical shielding.

The radio tube 2 is then sealed within the molded shell 58, as described with reference to Figs. 1 and 2, by utilizing the sealing compound 9 disposed between tube base 26 and the inner periphery of the cavity 66.

In place of separately molding the plastic shell 58 and then sealing the same to a radio tube, the encapsulating shell 58 can be molded about the radio tube 2 thus eliminating space 10 and the necessity of utilizing sealing compound 9. Electrical shielding of tubes having dielectric envelopes can be effected by providing part or all of the tube envelope with a conductive coating prior to molding the encapsulating carton, having a grounded tab embedded therein, about the radio tube 2. Cooling and electrically shielding the radio tube 2 may be aided by molding the shell 58 from a heat and electrically conductive material, for an example molded plastic impregnated with metal particles.

It will be apparent that brand, tube type number, and the like, must necessarily be placed on the exterior of the non-disposable encapsulating cartons described herein, except those illustrated in Figs. 11 and 12. In the latter embodiments since it is contemplated that the encapsulating carton may be utilized without the shielding, cooling, or shock absorbing means described herein, the shell 58 can be molded of transparent plastic, for an example, Lucite, through which indicia provided on the exterior of the tube will be visible.

Although the encapsulating carton of the invention has been described with reference to a particular application thereof, it is readily apparent that the carton is not

limited to this one application, viz., transporting and mounting radio tubes, but can be utilized within the scope of the present invention for the mounting and transportation of other fragile electrical devices, for an example, I.F. transformers.

The present invention is not to be understood as restricted to the details herein set forth, since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

What is claimed as new is:

1. A carton adapted for use in transporting and mounting an electrical device having external electrical connectors, said carton comprising an elongated shell having an inner wall and an outer wall; said inner wall defining a cavity having an opening at one end of said shell and adapted to receive said electrical device, through which opening said connectors protrude; said outer wall defining an inwardly extending depression at the opposite end of said shell, said depression adapted to enclose the connectors protruding from a like carton detachably joined to said carton; an annular recess in the portion of said shell surrounding the opening of said cavity; an annular projection on the portion of said outer wall surrounding said inwardly extending depression, said projection adapted to engage detachably, during the transportation of said device, the annular recess in the shell of a like carton; and a joining means disposed on the outer sides of said shell for joining said carton sidewise to at least one other like carton during the transportation and utilization of said electrical device.

2. A carton adapted for use in the transporting and mounting an electrical device having external electrical connectors, said carton comprising an elongated shell having an inner wall and an elongated octagonally shaped outer wall having faces lying in planes substantially parallel to the longer axis of said shell, said inner wall defining a cavity having an opening at one end of said shell and adapted to receive said electrical device, through which openings said connectors protrude; said outer wall defining an inwardly extending depression at the opposite end of said shell, said depression adapted to enclose the connectors protruding from a like carton detachably joined to said carton; an annular recess in the portion of said shell surrounding the opening of said cavity; an annular projection on the portion of said outer wall surrounding said inwardly extending depression, said projection adapted to engage detachably, during the transportation of said device, the annular recess in the shell of a like carton; and a joining means disposed on the outer sides of said shell for joining said carton sidewise to at least one other like carton during the transportation and utilization of said electrical device, said joining means comprising a plurality of adhesive coatings applied to alternate faces of said octagonal outer wall.

3. A carton adapted for use in transporting and mounting an electrical device having external electrical connectors, said carton comprising an elongated shell having an inner wall and an elongated octagonally shaped outer wall having faces lying in planes substantially parallel to the longer axis of said shell, said inner wall defining a cavity having an opening at one end of said shell and adapted to receive said electrical device, through which opening said connectors protrude; said outer wall defining an inwardly extending depression at the opposite end of said shell, said depression adapted to enclose the connectors protruding from a like encapsulating carton detachably joined to said carton; an annular recess in the portion of said shell surrounding the opening of said cavity; an annular projection on the portion of said outer wall surrounding said inwardly extending depression, said projection adapted to engage detachably, during the transportation of said device, the annular recess in the shell of a like encapsulating carton; and a joining means disposed on the outer sides of said shell for joining said carton sidewise to at least one other like carton during the

transportation and utilization of said electrical device, said joining means comprising a plurality of semiannular grooves each defining a semicylindrical projection and disposed in an end portion of said shell, said semiannular grooves abutting alternate faces of said octagonally shaped outer wall and adapted to cooperate with like grooves similarly disposed on like cartons, and a cap adapted to fit into said semiannular grooves in order to bind together the semicylindrical projections of those cartons brought into contiguous relationship.

4. A mounting assembly including a plurality of encapsulated electrical devices, each encapsulated device comprising a carton and an electrical device housed therein, said cartons being clustered together to provide an opening in the cluster, said opening having sufficient extent to permit lateral movement of a mounting bolt extending therethrough; a base having a plurality of connecting means for making electrical contact, respectively, with said electrical devices; a joining means disposed on the outer surface of each carton for detachably joining said carton to at least one other like carton in said cluster; an apertured mounting plate overlying a portion of each of said cartons so clustered together; a mounting bolt extending through a suitably disposed aperture in said mounting plate and through said cluster opening; and means for resiliently fastening said mounting bolt to said base, whereby said bolt and said mounting plate are capable of lateral movement so that at least one of said encapsulated devices can be removed from said cluster without disturbing those encapsulated devices remaining in said cluster.

5. A carton adapted for use both in transporting and in mounting an electrical device, said carton comprising an elongated shell having a cavity adapted to receive said device, an annular recess formed in one end of said shell, and an annular projection formed on the opposite end of said shell, said projection being arranged to engage detachably, as during the transportation of said device, a similarly disposed annular recess of a like carton.

6. A carton adapted for use both in transporting and in mounting an electrical device, said carton comprising an elongated shell having a cavity adapted to receive said device, an annular recess formed in one end of said shell, an annular projection formed on the opposite end of said shell, said projection being arranged to engage detachably, as during the transportation of said device, a similarly disposed annular recess of a like carton, at least one non-linear groove formed on an end of said shell and adjoining the side wall thereof, said groove being arranged to adjoin a similarly disposed groove on

a like carton, and a cap formed to fit into said grooves when so adjoining one another and thereby to bind said carton sidewise to at least one other like carton.

7. A carton adapted for use both in transporting and in mounting an electrical device having external electrical connectors, said carton comprising an elongated shell having a cavity longitudinally arranged therein and adapted to receive said device, said cavity having such depth that said connectors protrude from an end of said shell, an annular recess formed in said end and surrounding said connectors; an annular projection formed on the opposite end of said shell, said projection being arranged to engage detachably, as during the transportation of said device, a similarly disposed annular recess of a like carton; and a connector-receiving depression formed centrally of said projection and adapted to enclose said connectors when said cartons are so engaged.

8. A carton adapted for use both in transporting and in mounting an electrical device having external electrical connectors, said carton comprising an elongated shell having a cavity longitudinally arranged therein and adapted to receive said device, said cavity having such depth that said connectors protrude from said shell, an annular recess formed in said shell and surrounding said connectors; an annular projection formed on said shell and spacedly removed from said recess, said projection being arranged to engage detachably, as during the transportation of said device, a similarly disposed annular recess of a like carton, and a connector-receiving depression formed centrally of said projection and adapted to enclose said connectors when said cartons are so engaged.

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