Sept. 29, 1959 A. B. TABAKOF ET AL 2,906,445

PACKING CARTON LINER FOR SENSITIVE INSTRUMENTS

Filed Sept. 9, 1957 2 Sheets-Sheet 1

Fig. 1.

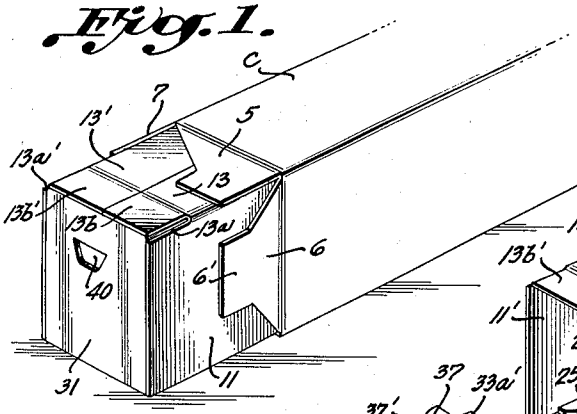
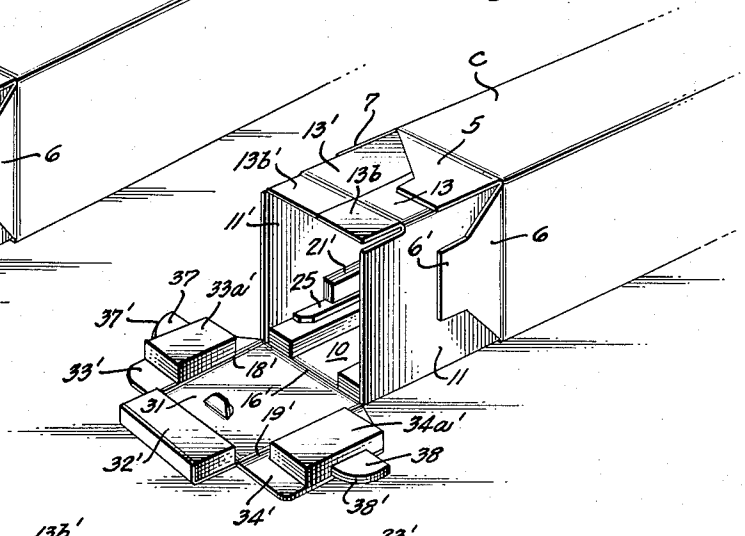


Fig. 2.



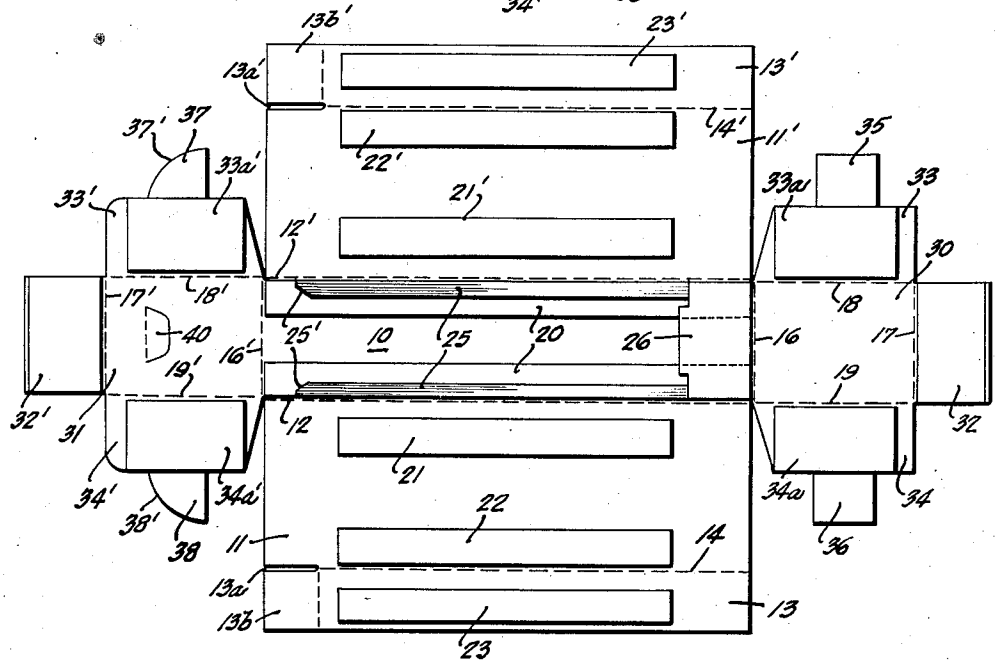


Fig. 3.

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Sept. 29, 1959 A. B. TABAKOF ET AL 2,906,445

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Filed Sept. 9, 1957 2 Sheets-Sheet 2

Fig. 4.

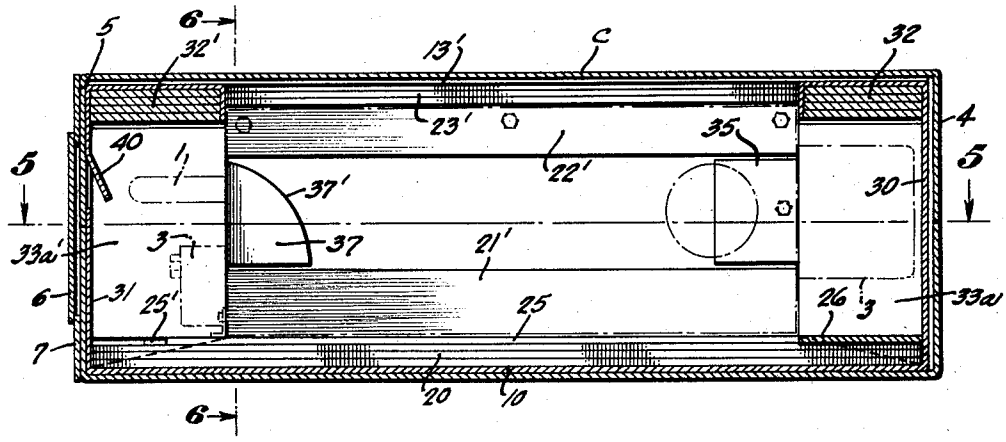


Fig. 5.

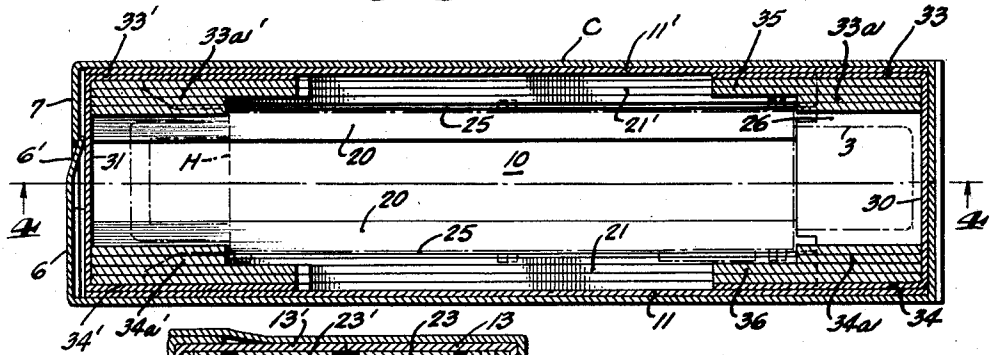
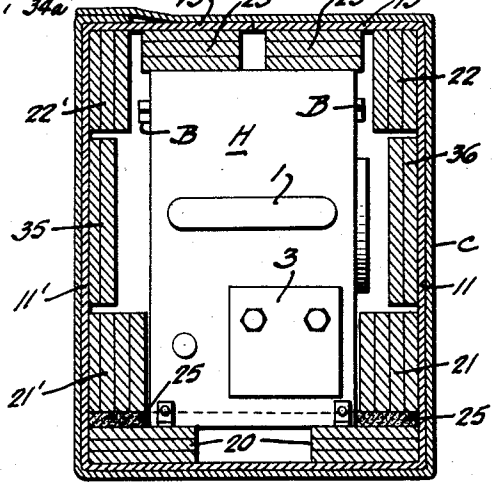


Fig. 6.



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PACKING CARTON LINER FOR SENSITIVE INSTRUMENTS

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7 Claims. (Cl. 229—14)

This invention relates to a reusable carton liner formed of cardboard material for the purpose of cushioning fragile devices or sensitive instruments against shock and vibration in the course of their shipment by air, railway, truck or ship.

It is the object of the present invention to provide a packing carton liner which is rugged and economical in construction, which may be shipped and stored in a flat, knock-down state, and which may be quickly and easily set up as a cushioning liner for sensitive electrical instruments and analogous devices in the course of packing thereof for transit.

It is another object of the invention to provide a carton liner of cardboard material formed as an integral unit of multiple folded parts which are fitted with cooperating internal cushioning members to protectively surround the electrical apparatus therewith. This carton liner in its closed position is in turn adapted to be encased by a surrounding carton or casing of heavy fiberboard material, and the relation between the carton liner and its outer casing is such that the sensitive apparatus may be inserted into and removed from the liner and the casing by only partially withdrawing the carton liner from its enclosing carton.

It is a further object of the invention to provide a carton liner which is adapted to house a basic rectangular prismatic unit of substantially uniform size but which may have appended thereto extensions of different characters from one or both ends thereof. Nevertheless, these extensions are cushioned and shielded effectively against shock and vibration while the liner secures the unit against shifting during transit and shields it against shock and vibration as well.

The invention proceeds upon the principle of providing a unitary packing carton liner of cardboard material such as corrugated board having a plurality of hinged sides and ends, and which may be shipped and stored in flat condition and which may be set up quickly into a rectangular prismatic form for cushioning a similarly shaped body or housing for sensitive instruments. The liner is fitted with a cushioning layer on its bottom to support and shield the housing against shock and vibration. Similar cushioning members are provided on the inner side and top walls of the carton liner. In addition, the end walls are hingedly pivoted to the opposite ends of the bottom wall and the former are provided with pivoted flaps faced with cushioning pads. When these end walls and flaps are swung into closed position, the ends of the pads on the latter serve as stops for the ends of the housing to prevent the shifting thereof during transit. In addition, the chambers formed adjacent the end walls serve to shield any extensions or appendages which may protrude for short distances from one or both ends of the housing.

The body being packed may be set upon the bottom wall of the carton liner and the remaining walls may be folded therearound, followed by the insertion of the closed liner into an encompassing rectangular outer casing of slightly larger cross-sectional dimensions. On the other hand, the carton liner may be pre-assembled with its outer casing preparatory to the sliding of the housing into one end of the carton. In order to render the carton reusable several times, special structural features are embodied in the liner in order to facilitate this sliding movement with least wear or tear on the cushioning elements therof.

Other objects and purposes will appear from the detailed description of the invention following hereinafter, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a perspective view of the carton liner shown in its partially retracted position from its encompassing casing preparatory to the opening thereof for the withdrawal therefrom or insertion thereinto of a fragile body or housing containing sensitive electrical apparatus;

Fig. 2 is a perspective view similar to Fig. 1 showing the carton liner with its front end wall in open position;

Fig. 3 is a plan view of the carton liner in disassembled position illustrating the several component parts which may be folded around the prismatic housing for the electrical apparatus;

Fig. 4 is a vertical sectional view, along line 4—4 of Fig. 5, of the carton liner in its upright assembled position, with the prismatic housing containing electronic apparatus therein shown in dotted lines, all confined within an external cardboard packing container in readiness for shipment;

Fig. 5 is a horizontal sectional view along line 5—5 of Fig. 4; and

Fig. 6 is a vertical transverse sectional view along line 6—6 of Fig. 4.

In the drawings is illustrated a reusable carton liner for shipping fragile or sensitive devices of all types to insure against their damage by blows, shocks or vibrations. The carton liner may be fabricated from cardboard or corrugated board and may be shipped and stored in a flat state, as shown in Fig. 3. The liner may be readily set up for utilization and is retained in its assembled position, as shown in Figs. 4 to 6, by the insertion thereof into the encompassing carton C of double-faced corrugated paper or preferably of heavy fiberboard. The carton may be assembled by means of metallic staples and is provided with a closed wall 4 at one end thereof and an open mouth at the opposite end thereof. The open end may be closed by the provision of companion flaps 5 pivoted from opposite sides of the casing, cooperating with a notched flap 7 to form an opening for the reception of tongue 6′ extending from a fourth flap 6, as generally shown in Figs. 1, 2, 4 and 5. Any other type of closure may be used at the open end of the carton C, for the invention is not concerned with the structural details of the outer confining carton, and the specific closure described above for the open end is merely illustrative.

The particular carton liner in accordance with the present invention is adapted to meet particularly the shipping requirements of sensitive electronic apparatus of the type used in radar systems which may be serviced more economically by the shipments of the units "en toto" by the various users of such equipment, such as airplane companies, to the manufacturer, rather than by the breakdown of such apparatus for repair and adjustment. Therefore, the invention aims to attain a carton liner which effectively cushions a piece of electronic equipment housed in a metallic cabinet of substantially uniform dimensions, but which is provided with external appendages containing different instruments depending upon the different needs served by the equipment, and which generally are fitted within supplemental casings on the front and rear ends of the unit, which are designated "doghouses." These "doghouse" protrusions supplement handle and tube extensions on the front end of the electronic housing. This housing is

also assembled in such manner that bolts and nuts are provided across the top thereof, to which the cushioning members of the liner must be accommodated in order to prevent the tearing of the cushioning members as the electronic units are slid into and out of the carton liner.

As shown in the preferred embodiment of the invention, the carton liner is preferably formed of a unitary laminated or non-laminated foldable sheet of cardboard to which may be affixed the front and rear walls as well as the cushioning members or pads to form an integral assembly. The bottom wall **10** of the liner, which may be formed of single or multiple-ply double-faced corrugated board, has affixed thereto a cushioning layer for the base of the rectangular prismatic housing H for the electronic apparatus. This layer may assume the form of cushioning members **20** extending the full length of the bottom wall **10** adjacent to its sides **12** and **12'**. These cushioning members are formed of several plies of double-faced corrugated board adhesively joined to each other and to the base **10**, as known in the art. Side walls **11** and **11'** are hinged to the base wall **10** along hinge lines **12** and **12'**, respectively, and the top wall of the liner may be formed by top wall sections **13** and **13'** pivoted to the side walls along hinge lines **14** and **14'**, respectively. The front portions of the hinge lines **14** and **14'**, are notched at **13***a* and **13***a'*, respectively, to form freely movable flaps **13***b* and **13***b'* at the front portions of the upper wall for a purpose to be described in detail hereinafter.

In order to facilitate the guiding of the rectangular prismatic housing H, tracks **25** of wear-resistant material, such as binder's board, are adhesively applied to the tops of the cushioning members **20** adjacent the hinge lines **12** and **12'** and these are tapered at the front ends **25'** in order to guide the housings into the liner centrally thereof. Several layers of binder's board may be adhered together to form these guide tracks, as shown in Figs. 2, 3, 4 and 6.

A corrugated panel **26** is affixed to the rear portion of the cushioning members **20** to form a plateau at the rear end of the base, of substantially the same height as the level of the strips **25**.

A rectangular rear wall **30** is hingedly connected to the bottom wall **10** along hinge line **16** and similarly a rectangular wall **31** is provided at the front end of the bottom wall **10** hinged along the line **16'**. Flaps **32**, **33** and **34** are pivoted to the other three edges of the rectangular rear wall **30** along hinge lines **17**, **18** and **19**, respectively, and similarly flaps **32'**, **33'** and **34'** are pivoted to the other three edges of the front wall **31** along hinge lines **17'**, **18'** and **19'**, respectively.

While the flaps **32** and **32'** which are positioned adjacent to the top wall of the carton liner are formed as cushioning pads along the entire area thereof, the side flaps **33** and **34** on the rear end wall **30** and **33'** and **34'** on the front end wall **31** are provided with cushioning pads on the inner faces thereof, **33***a*, **34***a*, **33***a'* and **34***a'*, which are of lesser length than the flaps in order that they may be accommodated between the cushioning pads **32** and **32'** and the cushioning layer on the bottom wall **10** formed by cushioning members **20**, tracks **25** and capping plate **26**, when the flaps are swung inward to form the ends of the carton liner.

Cushioning elements **21** and **21'** extend along the side walls **11**, **11'** with a sufficient displacement from the hinge lines **12** and **12'**, respectively, that the bottom edges thereof superpose the tracks **25** when the sides are swung upwardly. Furthermore, the lengths of these cushioning elements are shorter than the side walls **11** and **11'** so that they fit between the cushioning pads **34***a* and **34***a'* and **33***a* and **33***a'* which overlie the ends of the cushioning members **20** and guide tracks **25**.

Additional cushioning elements **22** are disposed at the tops of the side walls **11** and **11'** adjacent to the hinge lines **14** and **14'** of a length coextensive with that of cushioning elements **21** for accommodation between the cushioning pads on the end flaps. However, the thickness of the cushioning elements **22** and **22'** is preferably less than that of the cushioning elements **21** and **21'** in order to accommodate bolts and nuts B at the upper end of the housing which are not provided at the bottom of the housing adjacent to the track members **25**.

Similarly cushioning elements **23** and **23'** are provided on the top wall members **13** and **13'**, respectively, of a length and thickness corresponding to the cushioning elements **22** and **22'**, respectively.

In order to enhance the cushioning effects afforded by the several cushioning members and to attain a more intimate interfitting of the parts, the side flaps **33** and **34** of rear end wall **30** are provided with extensions **35** and **36** which carry the external parts of the padding layers **33***a* and **34***a* therewith into the space between the cushioning elements **21'**, **22'**, and **21**, **22** of the side walls **11'** and **11**, respectively. Similarly, the external layers of cushioning pads **33***a'* and **34***a'* connected with the front wall **31** are formed with extensions **37** and **38**, respectively, and are shaped as quadrants. These extensions are of a height designed to fit within the space between the cushioning elements on the side wall.

While the extensions **35** and **36** are formed of rectangular outline, the upper edges **37'** and **38'** of the extensions **37** and **38** (Fig. 4) are curved along a circumference of a circle having the hinge line **16'** as a center. This arrangement permits the swinging of the front end wall **31** from the position shown in Fig. 1 to that shown in Fig. 2 and it is for this purpose that the top wall is provided with notches **13***a* and **13***a'* in order to permit the inner edge of the top flap **32'** to clear the top wall **13** and **13'** as the end wall **31** is swung into its open position. This opening is facilitated by the hand-hold **40** provided in the end wall, which permits an opening of the carton, as shown in Fig. 2, to enable the withdrawal of the rectangular prismatic housing H therefrom and the insertion of another one thereinto, which is followed by the closing of the end wall which is shown in Fig. 1, whereupon the liner may be slid into the surrounding case C preparatory to the closure of the open end thereof by means of closure flaps **5**, **6** and **7**. Since the opposite end of carton C is closed, no provision need be made for the swinging of the end wall **30**.

Of course, as an alternative, the carton liner may be withdrawn in its entirety from its confining casing C and spread out upon a flat surface, as shown in Fig. 3, to enable the electronic instrument to be picked up therefrom. When another one is to be repacked, the same may be placed upon the bottom **10** and the ends, sides and tops folded therearound preparatory to the sliding of the liner in its assembled condition into the surrounding casing C.

As clearly shown in Figs. 4 and 5, the cushioning pads at the ends of the carton liner, by virtue of their greater thickness, cooperate with the cushioning members on the bottom wall and the cushioning elements affixed to the side and top walls to secure the rectangular prismatic housing H against sliding or shifting, while affording spaces at the ends of the carton liner for the accommodation of any handle **1**, "doghouses" **3** or extensions of any other type which may form part of the electronic apparatus. These extensions are shielded against blows, shocks and vibrations by the padded protective chambers formed at the ends of the carton liner.

The provision of guide tracks **25** of wear resistant material on the bottom of the liner and the critical proportioning of the thickness of the cushioning elements to accommodate any protuberances from the prismatic housing prolongs the useful life of the liner so that it may be reused several times.

While we have described our invention as embodied in a specific form and as operating in a specific manner

for purpose of illustration, it should be understood that we do not limit our invention thereto, since various modifications will suggest themselves to those skilled in the art without departing from the spirit of our invention, the scope of which is set forth in the annexed claims.

We claim:

1. In combination with an encompassing rectangular outer casing, an integral reusable carton liner for cushioning a rectangular prismatic body which houses sensitive apparatus comprising a rectangular bottom wall, rectangular side walls foldable upwardly from opposite sides of said bottom wall along hinge lines extending along the full length of said walls and a rectangular top wall hingedly mounted to at least one of said side walls, rectangular front and rear end walls each foldable upwardly along one edge thereof from the opposite ends of said bottom wall, longitudinally disposed cushioning members affixed to said bottom wall adjacent to said first-mentioned hinge lines, pivoted flaps extending from the remaining three edges of the front and rear end walls, cushioning pads mounted on the inner faces of said flaps to form a protective chamber at the front and rear ends of said liner for any appendages which may be affixed to said prismatic body, cushioning elements affixed to said side and top walls terminating short of the opposite ends thereof for accommodation between the cushioning pads on the flaps connected to the front and rear walls, said cushioning elements on said side walls being spaced, and extensions on the cushioning pads on the pivoted side flaps of the front and rear end walls fitting between the spaces of said last-mentioned cushioning elements.

2. A carton liner as set forth in claim 1 wherein said extensions are of lesser thickness than the cushioning elements on the side walls which in turn are of lesser thickness than the entire cushioning pads on the pivoted side flaps which, together with the remaining cushioning pads, are adapted to serve as stops for the ends of the prismatic body.

3. A carton liner as set forth in claim 2 wherein the cushioning elements on the side walls remote from the cushioning members affixed to the bottom wall are of slightly lesser thickness than the cushioning elements adjacent to said cushioning members.

4. An integral reusable carton liner for cushioning a rectangular prismatic body which houses sensitive instrumentalities comprising a rectangular bottom wall, rectangular side walls foldable upwardly from opposite sides of said bottom wall along hinge lines extending along the full length of said walls and a rectangular top wall formed by hingedly mounting a top wall section to each of said side walls with a short slot at the front of each of the hinge lines between the side walls and top wall sections, rectangular front and rear end walls each foldable upwardly along one edge thereof from the opposite ends of said bottom wall, longitudinally disposed cushioning members affixed to said bottom wall adjacent to said first-

mentioned hinge lines, pivoted flaps extending from the remaining three edges of the front and rear end walls, cushioning pads affixed to the inner faces of said flaps to form a protective chamber at the front and rear ends of said liner for any appendages which may be affixed to said body, cushioning elements affixed to said side and top walls terminating short of the opposite ends thereof for accommodation between the cushioning pads on the flaps connected to the front and rear walls, said cushioning elements on said side walls being spaced, rectangular extensions on the cushioning pads affixed to the pivoted side flaps of the rear end wall fitting between the spaces of said last-mentioned cushioning elements, quadrant-shaped extensions on the cushioning pads affixed to the pivoted side flaps on the front end wall fitting between said last-mentioned cushioning elements and capable of swinging therefrom around the hinge line with the bottom wall, the slots at the top wall permitting the clearance of the flap and pad affixed to the top of the front end wall, and a rectangular outer casing for retaining the liner in closed condition having an opening at the end thereof adjacent to the front end wall of the carton liner.

5. A carton liner as set forth in claim 4 wherein said longitudinally disposed cushioning members affixed to said bottom wall comprise multiple layers of yieldable corrugated board superposed by strips of hard fiberboard of a width at least as great as the thickness of the cushioning elements affixed to said side walls, said strips affording guide tracks for the lateral walls of said prismatic body.

6. A carton liner as set forth in claim 5 wherein the rectangular and quadrant-shaped extensions from the cushioning pads affixed to the side flaps are of lesser thickness than that of the cushioning elements affixed to the side walls while the main portions of said pads are of greater thickness than said cushioning elements whereby they serve as stops for the ends of the prismatic body.

7. A carton liner as set forth in claim 5 wherein the cushioning pads affixed to the flaps adjacent to the top wall of the liner are of greater thickness than the cushioning elements affixed to said top wall so that the ends thereof function as additional stops for the ends of the prismatic body while the spaces therebelow serve as shielding chambers for any extensions protruding from the ends of said body.

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