July 16, 1968 J. E. DE REMER ET AL Re. 26,426

PACKAGING

Original Filed Oct. 6, 1961 3 Sheets-Sheet 1

FIG. 1.

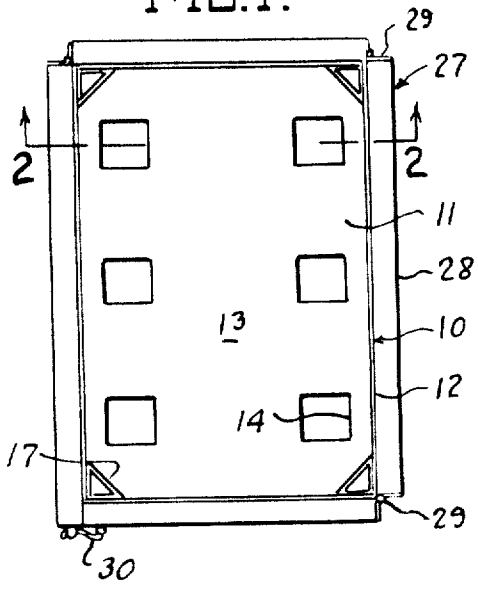


FIG. 2.

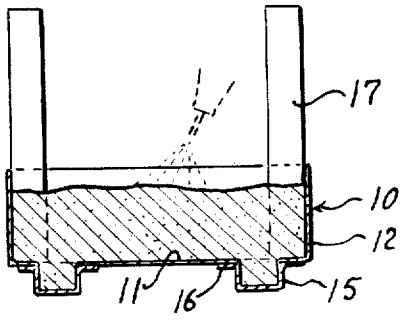


FIG. 3.

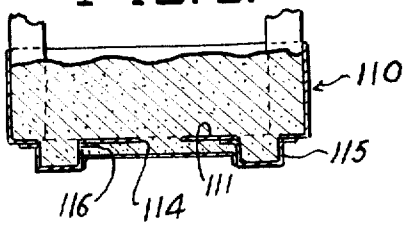


FIG. 4.

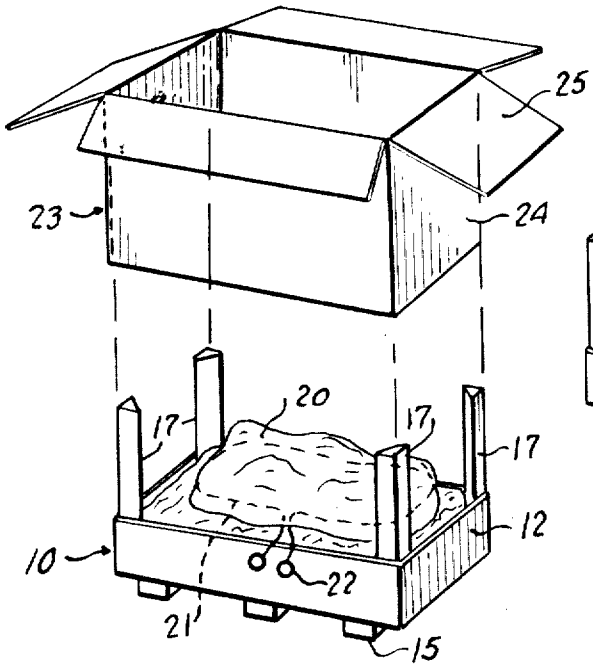
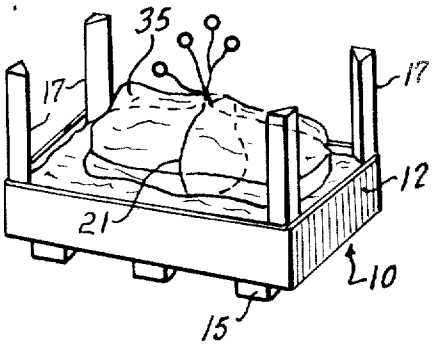


FIG. 5.



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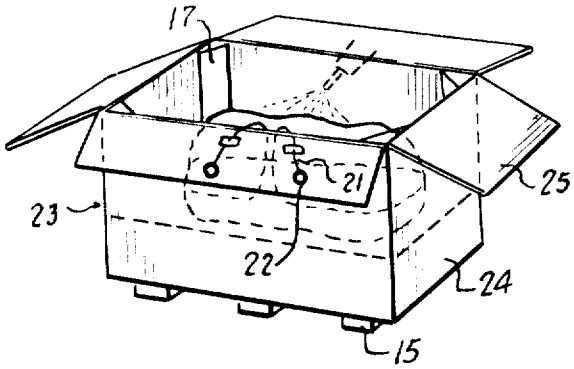
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FIG. 6.



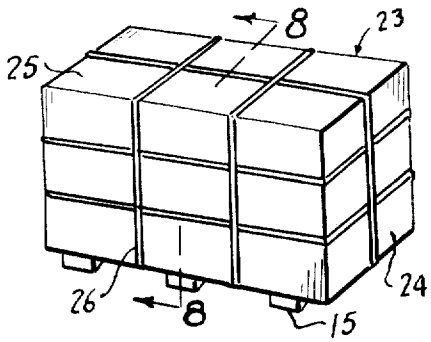


FIG. 7.

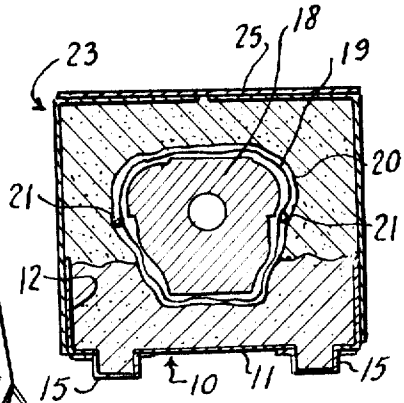


FIG. 8.

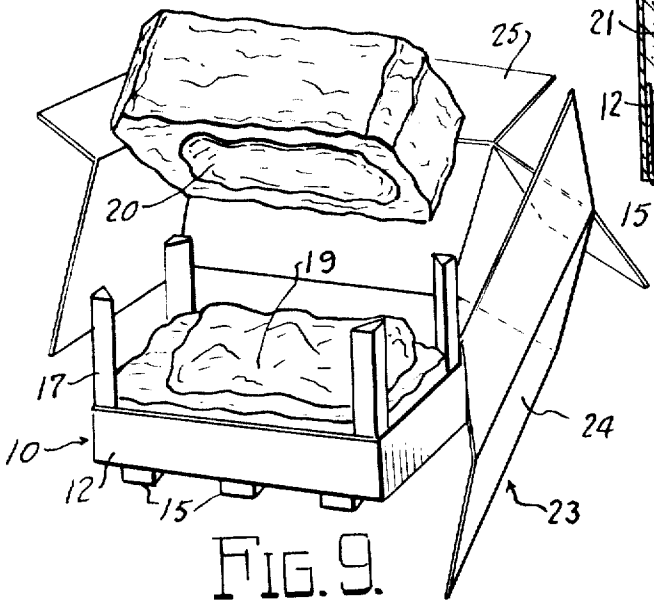


FIG. 9.

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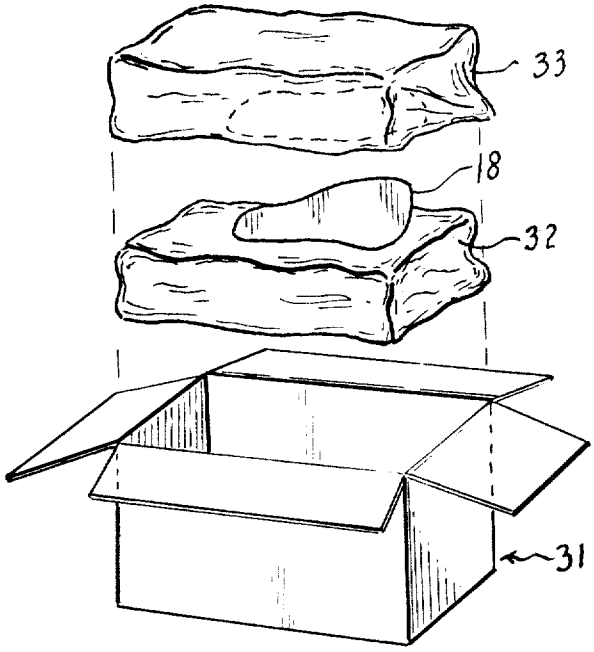


FIG. 10.

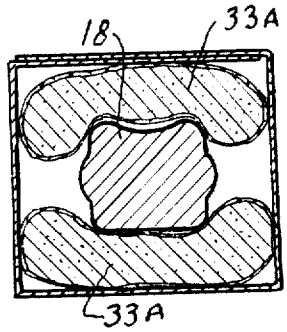


FIG. 12.

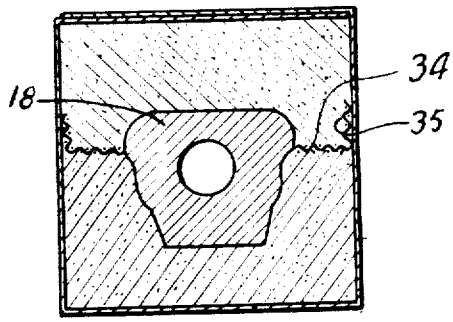
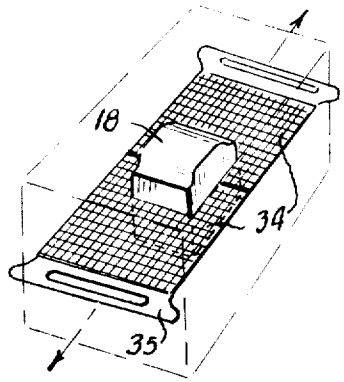


FIG. 11.

FIG 13.



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PACKAGING

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Original No. 3,237,760, dated Mar. 1, 1966, Ser. No. 383,717, July 20, 1964, which is a division of Ser. No. 143,210, Oct. 5, 1961, now Patent No. 3,204,385, dated Sept. 7, 1965. Application for reissue Apr. 10, 1967, Ser. No. 659,825

8 Claims. (Cl. 206—56)

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

ABSTRACT OF THE DISCLOSURE

A package including a cardboard container and a rigid foam material, such as polyurethane, filling the container to encompass the article carried within the package. Several different packages are disclosed including one utilizing a two part container so that the lower part can be filled with the plastic foam first and others in which wires or other separating devices form a part of the package and can be used to remove the article.

The present application is a division of copending application Ser. No. 143,210, filed Oct. 5, 1961, and now Patent No. 3,204,385, dated Sept. 7, 1965.

This invention relates to packaging and particularly to a lightweight, reusable container utilizing a rigid foam plastic which completely encompasses the article being packaged.

In general there are two types of packages in widespread use today for protecting assembled products during shipping. Heavy objects such as aircraft engines are usually packed by being carfully supported inside metal containers which are ultimately shipped back to the manufacturer for reuse. Smaller delicate objects are packed in disposable corrugated cartons with impact protection being provided by some type of loose packing such as strips of paper or by fitted pieces of corrugated cardboard. Each of these methods of packaging has important disadvantages. For instance, metal containers have an initial cost which is high, and small turbine engine containers with which we have particular experience cost well over three hundred dollars. In addition, costs for shipping are high due to the weight of these containers and the engine supports, and if they are to be reused, it often costs as much as one-fifth the original cost to repair and repaint the container each time it is to be reused. Further, metal will deteriorate and thus packages made of it cannot be left exposed for any great length of time.

Corrugated packages are much less expensive than metal containers but they do not have the necessary strength for carrying large and massive objects. In addition, such packages do not have the desired impact resistance for more delicate parts.

It is an object of the present invention to provide a relatively inexpensive package for objects of any size or shape by providing a container which has a low initial cost and which is reusable with negligible rehabilitation cost.

Another object of our invention is to provide a package which is a hermetically sealed enclosure, corrosion resistant, first resistant, impact resistant, vibration dampening, and which will float indefinitely without damage to the packaged article by providing a package which utilizes a rigid plastic foam material, such as polyurethane.

Still another object of the present invention is to minimize shipping costs and handling problems by providing a package which is very lightweight, of small cost and capable of extensive stacking.

Yet another object of the present invention is to reduce the time and labor required in packing and unpacking articles by providing a package which may easily and quickly be packed and unpacked.

Still further objects and advantages will be readily apparent to one skilled in the art upon reference to the following drawings in which like characters refer to like parts throughout the several views and in which

FIGURE 1 is a top elevational view of a base section of a preferred embodiment of the present invention showing structure designed to retain the shape of the container during packaging.

FIG. 2 is a cross-sectional view taken substantially on the line **2—2** of FIG. 1 but with the retaining structure removed.

FIG. 3 is a cross-sectional view similar to FIG. 2 but showing a preferred modification of the base section shown there.

FIG. 4 is an exploded perspective view of an embodiment of the present invention illustrating a step in the packaging of an article.

FIG. 5 is a perspective view of a preferred modification of the embodiment shown in FIG. 4.

FIG. 6 is a perspective view of the preferred embodiment illustrating another step in the packaging of an article.

FIG. 7 is a perspective view of the preferred embodiment in completed form.

FIG. 8 is a cross-sectional view taken substantially on line **8—8** of FIG. 7.

FIG. 9 is an exploded perspective view of the preferred embodiment illustrating a step in unpacking an article.

FIG. 10 is an exploded perspective view of another preferred embodiment of the present invention.

FIG. 11 is a lateral cross-sectional view of still another preferred embodiment of the present invention.

FIG. 12 is a cross-sectional view of a modification of the embodiment shown in FIG. 10, and

FIG. 13 is a perspective view of the package illustrated in FIG. 11.

Referring now to the drawings for a more detailed description of our invention, FIG. 1 shows a base section **10** preferably of corrugated cardboard or similar construction such as weatherproof hardboard and having a floor portion **11** and upright walls **12** which define a base enclosure **13**. The floor portion **11** is provided with a plurality of square perforations **14** equally spaced to form three lateral rows. Each of the perforations **14** provides communication with the enclosure **13** and the inside of a cardboard cube **15** having turned edges **16** stapled or otherwise fixed to the floor portion **11**. The cubes **15** are sufficiently high to provide a standard configuration for fork lifting and stacking. Where fork lift provisions are not required, ordinary containers without integral pallets can be used to reduce the foam usage to a more uniform distribution about the item packaged. Corner posts **17** of cardboard or similar construction are provided at the junctures of the upright walls **12**. The corner posts **17** preferably extend somewhat higher than the walls **12**.

Packaging begins by introducing a plastic foam material such as polyurethane into each of the cubes **15** through the perforations **14**. The foam material is preferably introduced by spraying and any of the many foaming systems now available may be employed for this purpose. Rigid polyurethane foam is preferred since it hardens into a rigid yet foaming substance. The cubes **15** having been filled with foam, take on the necessary strength needed for trucking and stacking. If even more strength

is required for these purposes a modified base section **110** may be used as shown in FIG. 3. In this modification, the floor portion **111** is provided with three rows of square perforations **114** each row of which opens into a hollow rib structure **116**, so that when the cubes **115** are filled with rigid polyurethane foam a reinforced base section **110** is produced.

After this has been completed, the rest of the base section **110** is substantially filled with the foam as shown in FIG. 2. The foam is then allowed to set until the foam has become resilient but before it has reached a stage of rigidity. The exact amount of time for this step depends upon many variables including the mixture employed.

As best seen in FIG. 8, the article **18** which is to be packaged, in this case a motor, is preperably wrapped in two pieces of heavy paper or similar material. The inside wrapping is designated as **19** and the outside **20**. The outside wrapping **20** must in this embodiment of the invention have the characteristics of adhering to the foam and yielding to the cutting action of the wire. The inside wrapping serves to protect the article from foam dust and damage during opening, allow better contouring of the item packaged and provide a base for wire location and various materials are suitable for the purpose. Between these layers of wrapping and completely encircling the article **18** is a thin wire **21** preferably having grasping means **22** on one or both ends located exteriorly of the wrappings **19** and **20**. This can best be seen in FIG. 4.

The article **18** including the wrappings **19** and **20** and the wire **21** is placed upon the resilient foam retained in the base section **10**. Since the foam has not yet become rigid, it will conform to the configuration of the lower part of the wrapped article **18** and will adhere to the outer wrapper **20**.

A top box section **23** is provided with walls **24** each of which has a flap portion **25**. The top section **23** is large enough to slide down over the corner posts **17** and the walls **12** and completely cover these. The interior of the bottom section and the top section **23** and the exterior of the posts **17** are preferably waxed or otherwise coated with a parting agent to prevent the foam plastic from adhering to their surfaces. After the top section **23** has been placed over the base section **10**, the grasping means **22** of the wire **21** are taped or otherwise secured to one of the flaps **25** as shown in FIG. 6. The top section **23** is thereupon filled with foam. The flaps **25** are closed and the package is preferably completed by providing retaining bands **26** as shown in FIG. 7.

Where ordinary containers are used a similar procedure of filling and closing is employed.

Where the base section **10** and the top section **23** are constructed of rather thin material or the package is large, a retaining structure **27**, as shown in FIG. 1, may be used to prevent the plastic from pushing out the sides of the container while it is hardening. Such a retaining structure **27** preferably comprises a walled structure sufficiently large to enclose the sides of the container. Each wall **28**, which may be of a paneled or slotted construction, is provided with a hinged connection **29** between it and its adjacent wall except that one of such junctures is provided with latching means **30**. This retaining structure is removed after the foam has hardened and conformed to the inside contours of the box.

The resultant package is suitable for labeling and stenciling. Data carriers can be formed in place at the same time the item is foamed with openings placed so as to be available at the surface of the foam. Weathering characteristics of the final package can be improved by the use of triwall or similar materials or the foam block may be suitably coated with one of the many aavilable colored coatings.

When the package has reached its destination, it may be unpacked by first removing the bands **26** and then opening the flaps **25** exposing the end or ends of the wire **21** which may then be removed by loosening the tape or other fastening means. Since the interior of the top section **23** has been treated with wax or a similar substance, it will be easily lifted or unfolded from the base section **10**, exposing a unitary block of rigid plastic encompassing the article **18**. This block may be separated into two sections by simply pulling the wire **21** outwardly around the article **18** or where large thicknesses are involved by applying a voltage through the wire which will then be resistance heated (below red heat—approximately 300° F.) and will cut readily through the foam without burning.

Another configuration of value is the attachment of the foam pull wire to a second stripper wire built into the cardboad container so that stripping of the container also cuts through the foam block. In this configuration the foam is allowed to adhere to the container walls and the container and foam block part in halves as a unit.

The outside wrapping **20**, since it sticks to the foam, will permit easy removal of the two sections of foam from the article **18** still protected by the inside wrapper **19** as shown in FIG. 9. The impressions left in the two foam sections become paper lined molds into which more articles may be placed for further shipping, being closed either by merely taping the foam cube sections together or reconstituting a hermetic seal by use of various adhesives.

It should be noted that while polyurethane is a strong material in compression, it can be cut quite easily. Thus the pull on wire **21** will not have to be too great. The corner posts **17** act as fill, lessening the amount of foam which must be severed by the wire **21**. If more sections are preferred, particularly on very irregularly shaped articles, several pieces of wire **21** may be wrapped about the article **18** as shown in FIG. 5.

FIG. 10 illustrates another preferred embodiment of the present invention utilizing unitary box **31** or corrugated cardboard or similar construction. A polyurethane bag **32** of a size approximately half the volume of the box **31** is placed in the bottom of the box **31**. The bag **32** is filled with foam and the article **18** is placed upon this bag of foam **32** before the plastic substance becomes hard. A second polyurethane bag **33** of substantially the same size or smaller, depending on degree of support or padding desired is placed on top of the article **18** and it too is filled with foam before the box **31** is closed. Upon opening after the foam has hardened, the article **18** may be exposed by simply removing the bag **33**.

In FIG. 12, an article **18** is illustrated as merely being supported, rather than being completely encased, by two foam-fiilled polyurethane bags **33A** formed in the same way as the bags of FIG. 10.

In FIG. 5, the wires are shown to be wrapped around the outside wrapping **35** of the article, which wrapping consists of a polyethylene bag. When the wires are pulled to cut the foam, the pieces of foam will separate from the polyethylene. The impressions remaining in the foam-filled bags provide a mold into which the article will fit for reusing the container.

FIGS. 11 and 13 illustrate yet another preferred embodiment of the present invention. A pair of sheets of perforated material **34** such as wire, synthetic screen or even a perforated polyethylene sheet or other material to which the foam will not adhere, is placed in a plane around the article **18** after it has been placed upon the resilient base. The sheet **34** has edges **35** extending outside of the foam package. When the article has been covered by foam, the edges **35** remain outside the foam and provide means whereby the foam block may be separated into two or more sections by simply pulling on these edges **35** as indicated by the arrows of FIG. 13 to slice the foam along the plane of the sheet **34**. Variations in number of perforations and adhesion of

foam to the sheet material can be employed to control separation forces and vapor barrier characteristics.

It should be noted that the use of a box structure having a separated base section **10** and top section **23** is preferred where large articles are to be packaged since the smaller base enables the bottom to be reached with the necessary equipment for foaming with less difficulty than would be encountered if a unitary box structure like that shown in FIG. 10 were employed.

It is apparent from the foregoing description that our invention provides a package with important advantages not found in containers presently being utilized. The following examples will help illustrate these advantages.

A metal container for packaging a 300 pound aircraft turbine engine costs approximately $340.00. In addition, to this initial cost it costs approximately $70.00 to prepare the package each time it is to be re-used. Because empty it weighs approximately 700 pounds, freight charges to return it for re-use are very high. The foam package of the present invention for this same 300 pound engine would cost only $50.00. It can be prepared for re-use indefinitely by simply supplying a new corrugated outer pack as it deteriorates at a cost of approximately $4.00. Its empty weight is somewhat around 75 to 80 pounds, depending upon the density of the material desired and for this reason, great savings can result in shipping costs both ways.

Further, the foam package of the present invention provides a hermetically sealed container, having extremely high impact resistance and vibration dampening characteristics. Also, due to the properties of the polyurethane foam, the package will float high density items without damage to the packaged article due to the high buoyancy factor. It will not deteriorate if left outside for long periods of time. The insulation and vapor barrier characteristics are extremely high. Finally, it is fire resistant as defined by Government specifications, and self extinguishing since gases generated while burning tend to extinguish the fire.

Corrugated packages have heretofore been used for smaller articles. They generally are not reusable since unpacking normally destroys the package. The initial cost of a foam package is approximately three-fifths that of a similar corrugated package. The foam package can be refitted for reuse for about one-eighth the initial cost. It weighs half that of a similar corrugated package and thus produces a savings over such packages in freight costs. Further, corrugated packages have low impact resistance, no weather resistance, will float only for a short period of time and are readily burned.

Although only several preferred embodiments of the invention have been described, it will be apparent to one skilled in the art to which the invention pertains that various changes and modifications may be made therein without departing from the spirit of the invention or the scope of the appended claims.

We claim:

1. A method of preparing a package for an article comprising: preparing a container having a bottom provided with downwardly extending hollow leg members openly communicating with the interior of the container, and introducing an amount of rigid foaming plastic into said leg members sufficient to fill same whereupon said leg members become supporting pallets for said container.

2. The method of preparing a package as defined in claim **1** and including the subsequent step of introducing into said container after a predetermined interval in which the plastic in the legs has begun solidifying a further quantity of said rigid foaming plastic sufficient to form a base in the bottom of the container in contact with the plastic in said legs.

3. A packaging container comprising a carton having a bottom, and hollow legs disposed on the exterior side of said bottom and openly communicating with the interior of said carton.

4. The container as defined in claim **3** and in which said carton bottom is provided with openings communicating with the interior of said legs.

5. The container as defined in claim **3** and having hollow stiffener members exteriorly of said carton bottom and connecting said legs, the inside of said stiffener members openly communicating with the interior of said carton.

6. The container as defined in claim **3** and having hollow stiffener members exteriorly of said carton bottom and connecting said legs, the inside of said stiffener members openly communicating with the interior of said legs.

7. A packaging means comprising

(a) a carton,

(b) hollow legs affixed to said carton and having the interior thereof communicating with the interior of said carton,

(c) an article to be packaged carried in said carton,

(d) a rigid plastic foam in said carton and in the interior of said hollow legs, said rigid plastic foam encasing said article.

8. The packaging means as defined in claim **7** and including a wire disposed intermediate said foam and said article and completely encompassing said article and the ends of said wire extending outwardly through said foam to a point adjacent the interior surface of said carton.

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