

Aug. 20, 1963

E. L. HAWLEY ETAL
PROTECTIVE CONTAINERS

3,101,109

Filed June 29, 1961

5 Sheets-Sheet 1

Fig. 1.

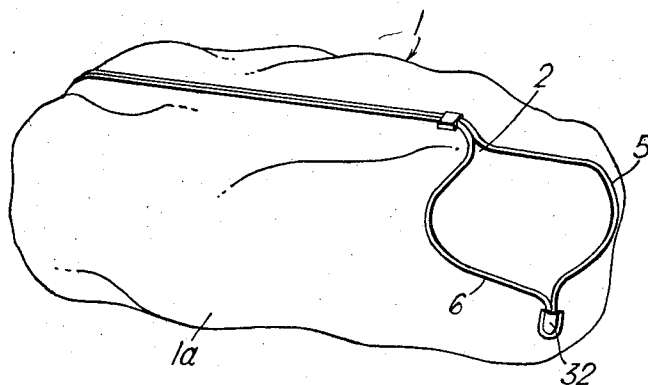
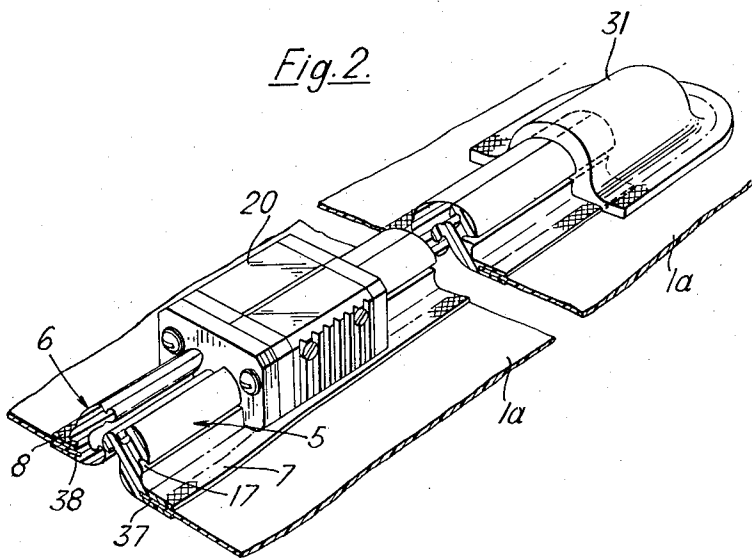


Fig. 2.



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Fig. 3.

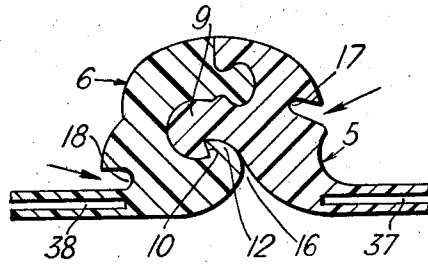


Fig. 4.

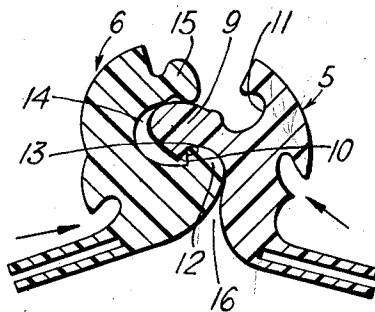
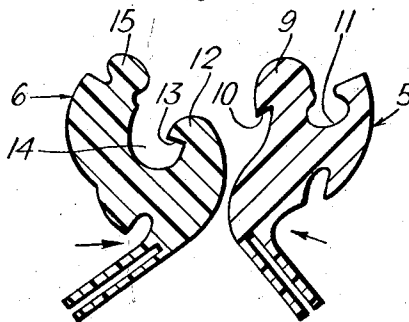


Fig. 5.



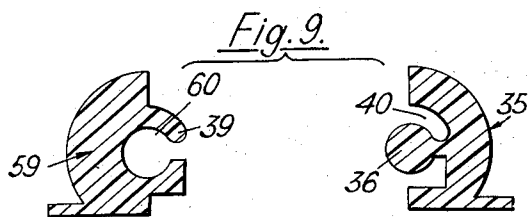
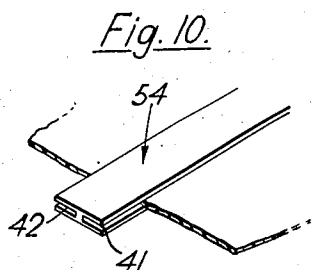
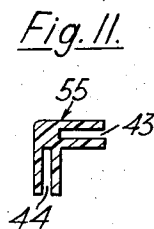
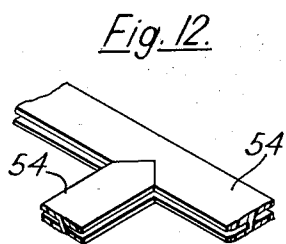
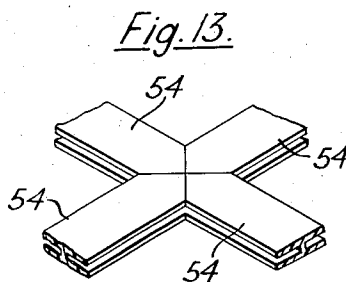
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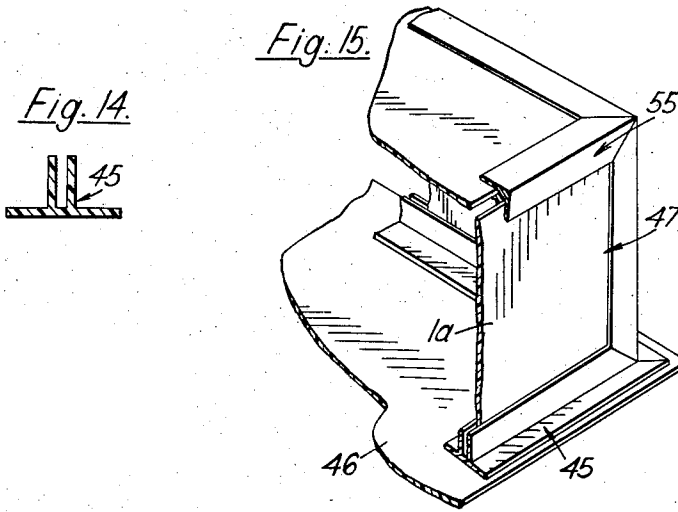
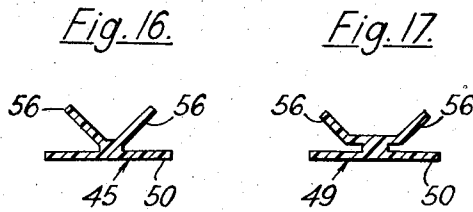
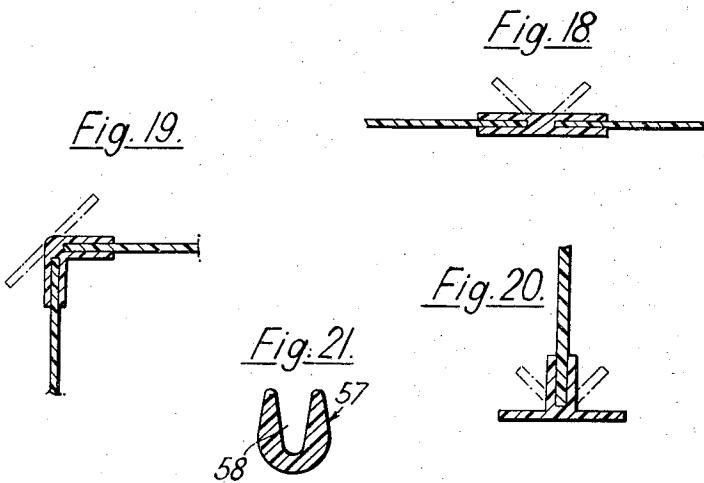
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PROTECTIVE CONTAINERS

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Filed June 29, 1961, Ser. No. 120,548
10 Claims. (Cl. 150—52)

This invention concerns new or improved containers for the protection during storage and/or transport of objects which would be liable to deterioration if subjected to atmospheric conditions for substantial periods.

This application is a continuation-in-part of copending applications Serial No. 706,782, filed Jan. 2, 1958 on which Patent No. 3,035,956 has issued; Serial No. 1,290, filed Jan. 8, 1960, now Patent No. 3,074,137; and Serial No. 118,410, filed June 20, 1961.

Expensive equipment of a wide variety such, for example, as aircraft components, engines of many kinds, machine tools, electrical and electronic apparatus, frequently have to be transported and stored (often for long periods) in widely differing climates, and are often subjected to corrosion or deterioration during such transport and storage, and this is especially so in climatic conditions where the equipment is likely to be subjected to widely varying temperatures and to very humid conditions.

It is therefore desirable that such equipment should be enclosed in a protective covering which is moisture and substantially moisture-vapour proof. In addition it is desirable that the said containers should be openable so that their contents can be inspected from time to time and it is important that a container after opening can be resealed again in a moisture proof manner.

It is an object of the invention, therefore, to provide a container for the storage and/or transport of an object or objects subject to deteriorations when exposed unprotected to atmospheric condition for substantial periods, such container being substantially proof against the ingress of moisture and moisture vapour but also being openable so that the object or objects may be readily placed in or removed from the container or readily inspected when in the container, and to provide means whereby the opening or openings of the container are readily closable in a moisture vapour transmission resistant manner.

Other objects of the invention will appear from the following description and the accompanying drawings and will be pointed out in the annexed claims.

In the drawings:

FIGURE 1 is an isometric view of one form of container in accordance with the invention;

FIGURE 2 is a fragmentary perspective view partly in section showing the slide fastener assembly of the container shown in FIGURE 1, and showing one end portion and an intermediate portion of the fastener strips of such assembly;

FIGURES 3, 4 and 5 are three enlarged cross-sectional views showing the configuration of the fastener strips and their operation;

FIGURE 6 is an exploded perspective view of the slider of the slide fastener shown in FIGURES 2 to 5;

FIGURE 7 is another fragmentary perspective view partly in section showing the other end of the fastener strips shown in FIGURE 2;

FIGURE 8 is an underneath fragmentary perspective view showing the junction of one end of the fastener strips with the container;

FIGURE 9 illustrates the cross-section of an alternative pair of interlocking male and female fastener strips;

FIGURES 10 to 14 show various jointing members for use in making up containers in accordance with the invention;

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FIGURE 15 is a fragmentary perspective view showing a corner of an alternative form of container constructed in accordance with the invention;

FIGURES 16 to 21 show further jointing members for use in making up containers in accordance with the invention.

Referring to FIGURE 1 of the accompanying drawings a container 1 for the storage and/or transport of an object or objects subject to deterioration when exposed unprotected to atmospheric conditions for substantial periods is, in the example shown, of generally cylindrical configuration. The particular container shown in this figure is approximately 10 feet long and 3 feet in diameter, the container being suitable for the transport of, for instance, an aeroplane jet engine.

The container is formed of flexible and heat sealable sheet material 1a which is resistant to the transmission of water or moisture vapour. The sheet material 1a comprises at least one layer formed of natural, artificial or synthetic reinforcing fibres woven, felted or otherwise aggregated together, such layer being impregnated with at least one vinyl chloride polymer or co-polymer resin, such resins hereinafter being referred to generically as P.V.C. Thus, the sheet material 1a may comprise, for example, plasticised P.V.C. impregnated woven cotton or a layer of felted polyester, glass or other fibres felted together and coated on both sides with a plasticised P.V.C. film. Preferably the sheet material 1a also includes a moisture vapour barrier layer coated, interleaved or laminated on or with the said P.V.C. impregnated layer or layers. The barrier layer may, as described in our co-pending patent application Serial No. 706,782 (of which patent application the present application forms a continuation in part), i.e. comprise a layer of lead foil. In an alternative sheet material the barrier layer may be formed of a thermoplastic synthetic resin material. In certain circumstances, particularly if the reinforcing fibres are glass fibres, the barrier layer may be omitted completely and a reasonably satisfactory resistance to the transmission of moisture still attained.

The container includes a longitudinally extending opening 2 adapted to be closed by a slide fastener assembly comprising interlocking male and female fastener strips 5 and 6 formed as extrusions of a thermoplastic synthetic resin, e.g. a P.V.C. resin, and having flanges 7 and 8 (see FIGURE 2) fixed, by heat sealing in a moisture vapour resistant manner to the flexible sheet material 1a from which the container is constructed. The flanges 7 and 8 preferably include longitudinal slots 37 and 38 for the reception of those edges of the said sheet material 1a which define the opening 2.

Referring particularly to FIGURES 3, 4 and 5 of the drawings it will be seen that the fastener strip 5 (hereinafter referred to as the "male" strip) includes a longitudinally extending rib 9 and that such rib is formed at its outer or free edge portion with a downwardly and longitudinally extending barb 10 and a narrow necked longitudinally extending groove 11 positioned immediately above said rib (viewing the fastener strip in the position shown in FIGURES 3 to 5).

The other fastener strip 6 (hereinafter referred to as the "female" strip) includes a longitudinally extending rib 12 formed at its outer edge portion with an upwardly and longitudinally extending barb 13, the rib 12 forming the lower shoulder of a groove 14 complementarily shaped to house the barbed rib 9 of the male strip 5. Above the groove 14 a longitudinally extending undercut rib 15 is formed to interlock with the narrow necked groove 11 of the male strip.

The under inner corners (again viewing the fastener strips positioned as in FIGURES 3 to 5) of the fastener strips 5 and 6 are chamfered off to provide a longitudinal-

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ly extending gap 16 along the underside of the strips when these are interlocked. Such gap ensures that inward compressive pressure exerted upon the interlocked fastener strips transversely of their lengths near their lower parts i.e. in the direction of the arrows shown in FIGURES 3, 4 and 5 will cause the strips to close together at these parts with a rolling action about longitudinal axes so as to disengage the barb 10 of the rib 9 from the barb 13 of the rib 12 and thus to separate the ribs 9 and 12 to open the fastener. This rolling action is clearly illustrated in FIGURES 4 and 5 of the drawings. On the other hand, transverse compressive pressure exerted upon the upper parts of the fastener strips when juxtaposed prior to interlocking, causes the barbed ribs 9 and 12 to move into interlocked engagement. Such fastener strips per se form the subject of, and are described in more detail in co-pending United States patent application of Edwin Lawrence Hawley, Serial No. 1,290.

The fastener strips are preferably furnished with a slide fastener assembly which serve to open and close the fastener strips i.e. to move them into and out of interlocking engagement or, which may, alternatively, be adapted only to close the fastener strips, but if desired the fastener strips may be opened and closed manually.

Preferably the outer surface of the male and female fastener strips each include a channel referenced 17 and 18 respectively in the drawings for engagement with fastener opening and closing members carried on a slider as will subsequently be described.

In FIGURES 2 and 6 of the drawings an opening and closing slider is illustrated and this slider comprises a body 20 of saddle shape which, in the example shown, is longitudinally divided so that its width may be adjusted by the use of a shim 51, the two halves of the slider being secured together by screws 52, 53.

A fastener closing member 21, also of saddle shape, is fixed to one end of the body 20 in register therewith and has a pair of inwardly directed closure prongs 22 and 23 adapted respectively to engage in longitudinal channels 17 and 18 formed in the outer surfaces respectively of the fastener strips 5 and 6. The fastener closing member 21 is located at that end of the body 20 of the slider which is trailing when the slider is moved in a closing direction and during such closing movement the prongs 22 and 23 engage in and travel along the channels 17 and 18 to exert transverse inwards compressive pressure upon the upper parts i.e. those parts in the region of the narrow necked groove 11 and the undercut rib 15, of the fastener strips 5 and 6 to urge the strips into interlocking engagement.

The body 20 of the slider also has at a position adjacent its second or leading end, a saddle shaped fastener opening member 24 in register therewith, such member having inwardly and upwardly directed prongs 25 and 26 which, when the slider moves in an opening direction, exert the aforementioned inward compressive pressure to the lower parts of the fastener strips 5 and 6 to spring to the upper portions of such strips apart with a rolling action about longitudinal axes as hereinbefore described. The separation of the strips is completed by a downwardly projecting strip separating element 27 which depends from a saddle shaped stripper member 28 mounted at the leading end of the slider body 20 and in register with the latter. The element 27 has downwardly divergent prongs 29 and 30 which respectively engage in use in the grooves 14 and 11 of the female and male fastener strips 5 and 6 respectively and serve to push the said strips apart during the opening movement of the slider.

The said slider is described in more detail in our previously mentioned co-pending United States patent application, Serial No. 1,290.

At each end of the opening 2 the fastener strips 5 and 6 are covered by hoods 31 and 32 (see FIGURES 2 and 7) formed as mouldings of a heat sealable material and

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preferably of the same material as the fastener strips e.g. a P.V.C. resin.

Each hood 31 and 32 is formed as a hollow moulding of a substantially semi-cylindrical form having one end closed and flanges 35 around its base by which the hood is secured by heat sealing to the material 1a of the container and to the fastener strip flanges 7 and 8. The fastener strips 5 and 6 are heat sealed in a moisture vapour transmission resistant manner to the hoods 31 and 32 and each such hood is secured in like manner to the sheet material from which the container is formed.

In the embodiment of the invention shown in FIGURE 2, the hood 31 at the closed end of the fastener i.e. that end from which the slider moves in a closing direction, has an internal configuration matching the external configuration of the fully interlocked fastener strips whereas the hood 32 at the open end of the fastener strips (see FIGURE 7) i.e., at that end away from which the slider is moved in an opening direction, has an internal configuration similar to that of the saddle shaped member 28 of the slider of the strip separating element 27 of the member 28. At each end of the fastener the strips 5 and 6 are heat sealed together over a short length, for instance, three inches, and a panel of heat sealable material 34 (see FIGURE 8) is heat sealed at the underside of the strips and to the container material 1a to extend across the end of the fastener assembly.

An alternative form of cross-section for the fastener strips is shown in FIGURE 9 of the accompanying drawings. Here one strip 35, hereinafter referred to as the male strip, has a longitudinal tongue 36 enlarged to a rod-like form at its outer end while the other strip 59 (the female strip) has a longitudinal keyhole shaped groove 60 adapted closely to receive the said tongue. The upper wall 39 of the longitudinal groove 60 in effect forms an auxiliary male mating tongue which fits into the female recess 40 above the tongue 36. Other configurations of fastener strips may be employed but in general it may be said that in order to obtain a satisfactory resistance to the transmission of moisture vapour together with the necessary mechanical resistance to transverse separation, two pairs of mating elements must be provided e.g. each strip should have a male and a female mating member.

It will be appreciated that a container of any desired shape can be constructed by cutting off sections of sheet material 1a in such shapes and sizes as to form a container having the general shape and dimensions of the article which it is intended to receive and heat sealing the sections together to make up the container. Although sections of sheet material 1a can be directly heat sealed together it is a preferred feature of the invention that jointing members formed, for example by extrusion, from heat sealable material should be used to heat seal sections of sheet material 1a together. Preferably the jointing members are formed with at least one channel to receive the edges of sections of material 1a to be sealed together. The edges of the sections may then be heat or high frequency sealed into the channels of the jointing member.

For instance, if the pieces or sections of material 1a to be joined are intended to be co-planar, or substantially co-planar, the jointing member may have a flat or somewhat H-shaped cross-sectional form defining two channels 41 and 42 such as, for example, 54 in FIGURE 10 of the drawings. It will be appreciated, however, that, where the pieces or parts of material are to be joined so that their planes are at an angle to one another, the said jointing member may comprise a strip having two longitudinal parts or flanges diverging from one another at the desired angle and having longitudinal channels in their outer edges. A particularly useful jointing member is one having an L-shaped cross-section (e.g. 55 in FIGURE 11 of the drawings) having longitudinal channels 43 and 44 in the free edges of its flanges. Such a member enables two pieces or parts of material to be secured together with

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their planes at or substantially at right angles to one another.

Where, in the construction of a protective covering according to this invention, two or more jointing members are to be joined they may be mitred and heat sealed together to produce a secure and sealed (i.e. moisture and moisture vapour transmission resistant) joint. FIGURES 12 and 13 of the drawings show respectively two and four jointing members 54 mitred and heat sealed together.

Thus a protective covering of an angular configuration may be constructed with the aid of jointing members as described above, mitred and heat sealed together. For example, in forming a rectangular parallel-epipedonal boxlike covering from six rectangular sections of material 1a, each section forming a side of said covering and being secured to adjacent panels along edges of the covering, the jointing members 55 (FIGURE 11) may be used and the three mutually perpendicular jointing members meeting at each corner may be mitred and heat sealed together. The said corners may be reinforced by flexible corner pieces secured thereover. Alternatively, moulded corner jointing members of a mouldable heat sealable material may be used, if desired.

It is advantageous in certain applications to build a protective covering on an existing structure such as, for example, a ship's deck. In this case the jointing member 45 illustrated in FIGURE 14 may conveniently be used. FIGURE 15 shows how a covering 47 may be formed on an existing structure 46 using jointing members 55 (see FIGURE 8) and 45 (see FIGURE 14).

Other useful jointing members are shown in section in FIGURES 16 and 17. Each of these members comprises a web 49 from which two flanges 56 outwardly diverge. By bending of the flanges during heat sealing such members could be made to serve three separate functions; i.e. for jointing flat co-planar sheets as shown in FIGURE 18; for forming corners as shown in FIGURE 19 or for attaching a container to a structure as shown in FIGURE 20.

A further useful jointing member is of U-shaped cross-section e.g. 57 in FIGURE 21. The channel 58 of the jointing member is adapted to embrace the adjoining edges of two sections of material 1a in side-by-side relationship.

The heat or high frequency sealing operations referred to in this specification may be carried out by any of the methods known in the thermoplastics industry e.g. by di-electric or hot air welding.

We claim:

1. A protective container for substantially enclosing an object, said container having the general shape of said object and comprising a sheet of flexible material, said sheet material including a layer of flexible plastic-impregnated fibrous material and a barrier layer of moisture-vapor resistant material laminated to the first said layer, means defining a container access opening having opposed edge portions, and a fastener for closing said access opening along its full length, said fastener comprising a pair of oppositely disposed fastener strips of flexible plastic material extending respectively along said opposed edge portions of the access opening, each of said fastener strips having longitudinally extending male and female elements adapted for moisture-vapor resistant interlocking engagement connection with said male and female elements of the other of said strips whereby said fastener is manually openable and closable, flexible and moisture-vapor resistant attachment means attaching said fastener strips to the respective of said opposed edge portions of the access opening, and means providing moisture-vapor resistant securement together of said fastener strips at each of the respectively opposite ends of said fastener.

2. A protective container according to claim 1 wherein said barrier layer is lead foil.

3. A protective container according to claim 1 wherein said barrier layer is thermoplastic synthetic resin material.

4. A protective container in accordance with claim 1 wherein each of said fastener strips includes along an

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underside surface thereof a chamfered surface portion to provide, in conjunction with said chamfered surface portion of the other of said fastener strips, a longitudinally extending gap along the underside of the fastener strips when so interlocked, whereby transversely applied inward compressive pressure on said strips in the region of said underside surfaces thereof promotes longitudinal rolling action one with respect to the other to open said fastener.

5. A protective container according to claim 1 wherein said means providing moisture-vapor resistant securement together of said fastener strips at each of the respectively opposite ends of said fastener comprises a first molded hood element covering and holding said fastener strips in said interlocking engagement connection at one of said ends of the fastener, a second molded hood element covering and holding said fastener strips at least partially out of said interlocking engagement connection at the other of said ends of the fastener, and moisture-vapor resistant attachment means attaching each of said molded hood elements to said fastener strips and to said sheet material.

6. A protective container according to claim 1 wherein said means providing moisture-vapor resistant securement together of said fastener strips at each of the respectively opposite ends of said fastener comprises a molded hood element covering each of the respectively opposite ends of said fastener strips, moisture-vapor resistant attachment means attaching each of said molded hood elements to said fastener strips and to said sheet material, and a panel of flexible and moisture-vapor resistant material bonded in moisture-vapor resistant attachment to the underside of each of said respectively opposite ends of the fastener strips and to said sheet material.

7. A protective container for substantially enclosing an object, said container having the general shape of said object and comprising a plurality of sections of flexible sheet material, said sheet material including a layer of flexible plastic-impregnated fibrous material and a barrier layer of moisture-vapor resistant material laminated to the first said layer, a flexible plastic jointing member in moisture-vapor resistant attachment to, and attaching together each of the respective of said sections to form the container, means defining a container access opening having opposed edge portions, and a fastener for closing said access opening along its full length, said fastener comprising a pair of oppositely disposed fastener strips of flexible plastic material extending respectively along said opposed edge portions of the access opening, each of said fastener strips having longitudinally extending male and female elements adapted for moisture-vapor resistant interlocking engagement connection with said male and female elements of the other of said strips whereby said fastener is manually openable and closable, flexible and moisture-vapor resistant attachment means attaching said fastener strips to the respective of said opposed edge portions of the access opening, and means providing moisture-vapor resistant securement together of said fastener strips at each of the respectively opposite ends of said fastener.

8. A protective container according to claim 7 wherein said jointing member comprises a strip of flexible plastic material having cross-sectional configuration providing a longitudinally extending channel receiving an edge of one of said container sections, and further providing a longitudinally extending channel receiving an edge of another of said container sections, whereby said two container sections are attached together.

9. A protective container according to claim 8 wherein said cross-sectional configuration is substantially H-shaped.

10. A protective container according to claim 9 wherein said jointing member comprises a strip of flexible plastic material having substantially U-shaped cross-sectional configuration providing a single channel receiving in contiguous relation the adjoining edges of two of said container sections to be joined.

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