Sept. 21, 1965 A. SCHMITT 3,207,357

FOLDABLE CONTAINER FROM PLASTIC MATERIAL

Filed Jan. 28, 1963 2 Sheets-Sheet 1

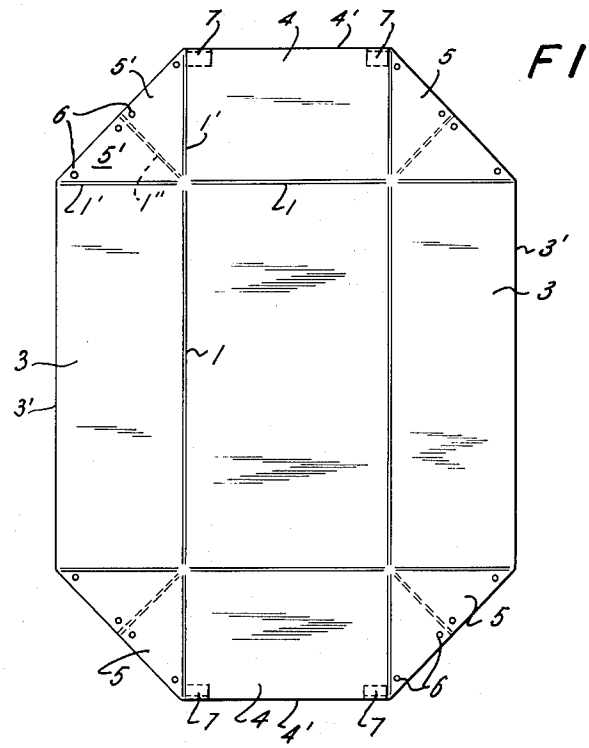


FIG. 1

FIG. 2

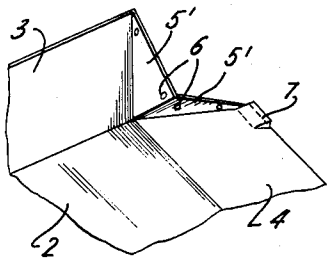


FIG. 3

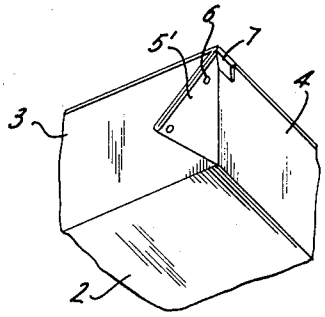


FIG. 4

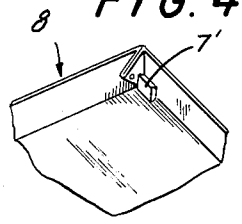
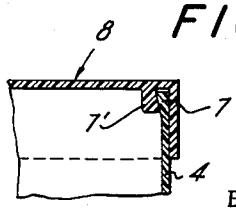


FIG. 5



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FOLDABLE CONTAINER FROM PLASTIC MATERIAL

Filed Jan. 28, 1963 2 Sheets-Sheet 2

FIG. 6

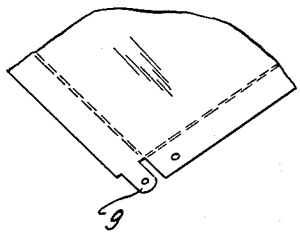


FIG. 7

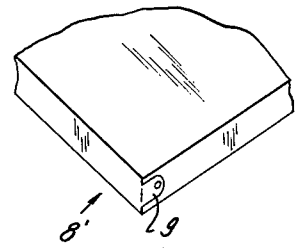


FIG. 8

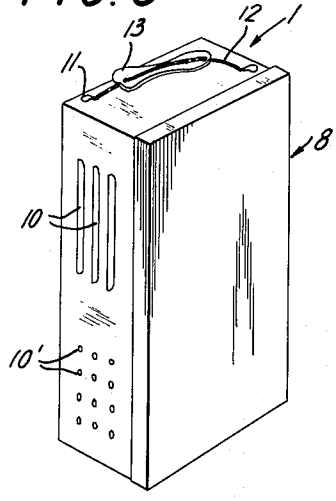


FIG. 9

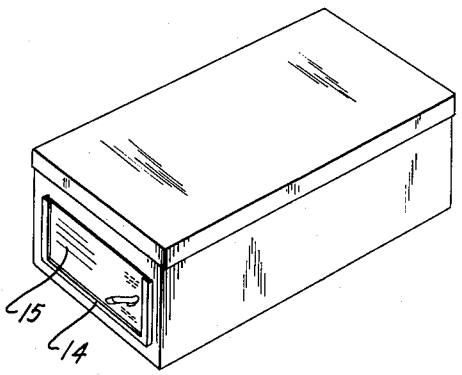


FIG. 10

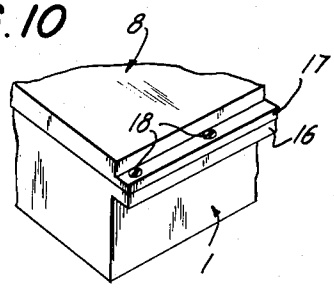
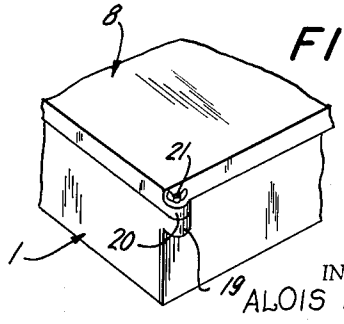


FIG. 11



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3,207,357

FOLDABLE CONTAINER FROM PLASTIC MATERIAL

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Claims priority, application Germany, Jan. 29, 1962, F 35,879
1 Claim. (Cl. 220—62)

The present invention relates to containers and more specifically to foldable containers made from plastic material.

It is an object of the present invention to provide for a foldable container which can easily be folded from a flat position in which all portions thereof are located substantially in a plane to a folded position in which an endless side wall of the container extends transverse, preferably normal to an end wall thereof.

It is a further object of the present invention to provide for such a foldable container which will be properly maintained in its folded position.

It is an additional object of the present invention to provide for a foldable container as mentioned above which is adapted to hold in its interior not only solid articles but also material in paste form, moist material or even liquids.

It is yet an additional object of the present invention to provide for such a foldable container which will properly maintain its folded position and which after use for shipping or storage purpose can be easily transformed again into its flat position so that the empty containers may be shipped or stored in a very space-saving condition.

Finally, it is an object of the present invention to provide for such a foldable container which can be manufactured in an extremely simple manner so that it can be mass produced at very reasonable cost.

With these objects in view, the container of the present invention mainly comprises a sheet of plastic material having a plurality of peripheral edge portions and being formed inwardly of the edge portion thereof with folding grooves defining in the sheet a central polygonal portion and between the edge portions and grooves a plurality of outer portions. The outer portions are foldable along the folding grooves relative to the central portion between a flat position in which all portions of the sheet are located substantially in a plane and a folded position in which the outer portions extend transverse and to one side of the plane of the central portion and abut with side edges thereof against each other to form a continuous side wall of the container, one end wall of which is formed by the central portion. Means are also provided integral with the outer portions for releasably holding the same in the folded position. These means preferably include snap fasteners which may be integrally molded likewise from plastic material during the molding of the aforementioned sheet, or the snap fasteners may be, subsequently to the molding of the sheet, fastened thereto by heat sealing or otherwise and in this case the snap fasteners may also be made from metal.

The sheet may also include a plurality of substantially triangular connecting portions extending between adjacent side edges of the outer portions integral therewith and in this case the folding grooves are also formed along the side edges of the outer portions and an additional folding groove is formed in each of said triangular portions extending from corners of the central portion of the sheet to the periphery thereof and dividing each of said triangular connecting portions into two substantially equal triangular portions which will abut against each other when the sheet is folded from the flat to the folded position. In this arrangement cooperating snap fasteners are provided

on the equal triangular portions for holding the same after folding in abutting relationship.

The means for releasably holding the sheet in folded position may also comprise a flap integral with one of the side edges of each outer portion which extends over and beyond the side edges of the outer portion adjacent thereto and which is folded against the outer portion adjacent thereto and in this case a pair of cooperating snap fasteners are respectively arranged on each flap and on the outer portion adjacent thereto for releasably connecting each flap to the outer portion adjacent thereto so as to hold the sheet in its folded position.

If the containers are to be made of relatively large size the outer portions which form the endless side wall of the container may be provided with reinforcing ribs integrally molded with the sheet, or the outer portions may be formed with corrugations which may be formed either during molding of the sheet or subsequent thereto.

Likewise, the folding grooves which define in the sheet narrow elongated portions of thinner wall thickness than the remainder of the sheet may be formed directly during the molding of the sheet, or these grooves may be subsequently formed for instance by a drawing or embossing operation after the sheet has been molded or otherwise formed with uniform thickness.

The necessary cover for the container may be formed in the same manner from a foldable sheet as described above and obviously in this case the central portion of the cover has to be made to slightly larger dimensions than the bottom part of the container so that the side wall of the cover may extend over the upper portion of the side wall of the bottom part of the container.

On the other hand, if the cover is very shallow it may be molded from plastic material in finished nonfoldable form.

The reinforcing ribs on the bottom part of the container may extend along the free edges of the outer portions of the sheet which form in the folded position thereof the endless side wall so that in the folded position the reinforcing ribs form flanges which extend outwardly from the upper edges of the side wall. In this case the cover is preferably formed with corresponding flanges and the flanges of the bottom portion as well as those of the cover are formed with corresponding bores therethrough through which connecting means, for instance screws may extend to fasten in this way the cover to the bottom portion of the container. Instead of flanges the bottom portion and the cover may also be formed with outwardly extending bosses formed with bores therethrough so that the cover may be connected to the bottom portion of the container by screws or other connecting means extending through the bores. If the container should be adapted for the storage or shipping of moist material, material in paste form or liquids, sealing means may also be provided between cover and bottom portion of the container and in this case the flanges of bottom portion and cover may be formed in the engaging faces thereof with an elongated endless groove into which a sealing means of compressible material may be inserted.

The bottom part of the container and the cover may also be provided with cooperating means which engage each other with a snap action when the cover is pressed on the bottom part of the container to releasably fix the cover to the bottom part of the container.

The bottom part of the container as well as its cover are formed from plastic material such as polystyrene or similar plastic material.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best under-

stood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a plan view showing a plastic sheet or blank from which the container of the present invention may be formed;

FIG. 2 is a partial perspective view of the sheet shown in FIG. 1 in partly folded position;

FIG. 3 is a perspective view similar to FIG. 2 and showing part of the blank in finished folded position;

FIG. 4 is a perspective view of part of a cover for the container and showing the same in finished folded position;

FIG. 5 is a partial cross sectional view showing the cover of FIG. 4 in engagement with the bottom part of FIG. 3;

FIG. 6 is a partial perspective view showing a modification of a container part in flat position;

FIG. 7 is a partial perspective view showing the part of FIG. 6 in folded position;

FIG. 8 is a perspective view showing a finished container according to the present invention preferably used as a shoe box or the like and provided with ventilating openings;

FIG. 9 is a perspective view of a container according to the present invention and provided with means for connecting a label thereto;

FIG. 10 is a partially perspective view of a modified form of the container according to the present invention and showing reinforcing ribs in form of flanges on the bottom part and on the cover of the container; and

FIG. 11 is a partial perspective view of a further modification of a container according to the present invention in which the bottom part and cover of the container are provided with connecting bosses.

FIG. 1 of the drawings shows a sheet or plate of plastic material from which the foldable container, respectively the bottom part of the container, of the present invention can be formed. As can be seen from FIG. 1 the sheet has a plurality of straight peripheral edge portions 3', 4' and the sheet is formed inwardly of the edge portions with folding grooves 1 extending respectively parallel to edge portions 3', 4' and forming in the sheet narrow strip portions of a thickness smaller than that of the remainder of the sheet and defining in the sheet a central polygonal portion 2, shown in FIG. 1 as rectangular portion, and between the folding grooves 1 and the peripheral edge portions 3', 4' respectively outer portions 3 and 4. In FIG. 1 all portions of the sheet are shown to be located substantially in one plane and due to the folding grooves 1 the outer portions 3 and 4 may be easily folded from the flat position shown in FIG. 1 into a folded position in which the outer portions extend transverse, or substantially normal, to one side of the central portion 2 to abut with side edges thereof against each other to form a continuous side wall of the container, one end wall of which is formed by the central portion 2.

As shown in FIG. 1 the sheet includes further a plurality of substantially triangular connecting portions 5 extending between adjacent side edges of the outer portions 3 and 4, integral therewith, and in this case folding grooves 1' are also provided along the side edges of the outer portions 3 and 4, which folding grooves 1' form continuation of the folding grooves 1 defining the central portion 2. An additional folding groove 1'' is provided in each of the triangular connecting portions 5 extending from the respective corner of the central portion 2 to the periphery of the sheet and dividing each of the triangular connecting portions 5 into two substantially equal triangular portions 5', 5'. During folding of the sheet shown in FIG. 1 from the flat to the folded position, each triangular connecting portion 5 will be folded along the folding groove 1'' so that in the folded position the equal triangular portions 5', 5' will abut against each other as shown in FIG. 3. FIG. 2, on the other hand, shows an intermediate step during the folding in which the outer portions 3 and 4 are partly bent upwardly with respect to the central portion 2 and in which the equal triangular portions 5', 5' are partly bent along the folding grooves 1' and 1''.

Means are provided for holding the triangular portions 5', 5' in fully folded abutting relationship as shown in FIG. 3 and these means are shown in FIGS. 1–3 as cooperating snap fasteners 6 provided on the equal triangular portions 5', 5'. The snap fasteners 6 may be made integral with the equal triangular portion 5' from the same plastic material as the remainder of the sheet and such snap fasteners may be molded directly during molding of the sheet. Of course, it is also possible to fixedly connect the snap fasteners to the sheet in any well known manner, for instance by heat sealing, and in this case the snap fasteners may also be made from metal.

The cover 8 for the container which is shown partly in the perspective view of FIG. 4 may be made in a similar manner from a foldable sheet as described above and in this case the central portion of the cover has to be made to slightly larger dimensions than that of the bottom part of the container so that the side wall of the cover may extend around the side wall of the bottom part of the container in abutting relationship with the outer surface thereof as shown in part in FIG. 5.

Means are also provided for releasably connecting and holding the cover 8 to the bottom part of the container. This means may include thickened portions 7 formed on the outer portions 4 of the foldable sheet shown in FIG. 1 tapering respectively from the peripheral edge portion 4' toward the central portion 2 so as to form wedge-shaped noses 7 as clearly shown in FIG. 2. Cooperating portions 7' are provided on the cover 8 extending from the end wall thereof and defining with the side wall of the cover 8 a groove having spaced from the end wall of the cover a width smaller than the maximum thickness of the thickened portion or nose 7 on the side wall portion 4 of the bottom part of the container. When the cover 8 is pressed on the bottom part of the container, the cooperating portions 7 and 7' will engage each other as shown in FIG. 5 with a snap action.

Instead of forming the cover 8 from a folded sheet similar to that shown in FIG. 1 and as described in connection with FIG. 4, the triangular connecting portions 5 may also be omitted and a flap 9 may be integrally formed extending from a side edge of the outer portion of a foldable sheet as shown in a partial perspective view of FIG. 6. It is understood that the sheet partially shown in FIG. 6 is provided with folding grooves as described before in connection with FIG. 1 which define in the sheet a central rectangular portion and four outer portions. When the sheet shown in flat condition in FIG. 6 is brought into the folded position as shown in FIG. 7 in a partial perspective view, each of the flaps 9, only one of which is shown in FIG. 7, is folded over the outer portion adjacent thereto and cooperating snap fasteners, as described before, are provided on each flap 9 and on the adjacent outer portion so that the flap 9 may be held in abutting relationship on the adjacent outer portion as shown in FIG. 7 to hold thereby the flat sheet shown in FIG. 6 in properly folded position. It is understood that flaps 9 with cooperating snap fasteners are provided on each of the corners of the cover 8'.

FIG. 8 shows in a perspective view a finished box according to the present invention, which comprises a main portion 1 made from a foldable sheet as described in connection with FIGS. 1–3 and a cover 8 which may for instance be formed as described in connection with FIG. 4. The box shown in FIG. 8 is intended to serve as a shoe box and this box is formed in one or two opposite wall portions thereof with a plurality of slat-shaped openings 10 and/or a plurality of small round openings 10' so that air may pass into and out of the closed box. One small side wall portion, shown in FIG. 8 as the upper side

wall portion, may also be provided with keyhole-shaped openings **11** in which the opposite ends of a cord **12** may be anchored in a known manner by providing at the opposite ends of the cord **12** enlarged rigid portions which can be respectively pushed through the circular portions of the keyhole-shaped openings **11** to slide beneath the slot-shaped portion of the openings when the central portion of the cord **12** is lifted, to thus anchor the opposite ends of the cord **12** to the container. A gripping member **13** may also be provided on the cord **12** and if the container shown in FIG. 8 is used as a shoe box the gripping member is preferably in the form of a shoe horn which can be used when the cord **12** is disconnected at one end thereof from the container and slit out of the openings formed in the shoe horn **13**.

FIG. 9 shows in a perspective view a container similar to that shown in FIG. 8, at least the bottom part thereof is formed from a foldable sheet as described in connection with FIG. 1, and this container is provided on one of the side wall portions thereof with guide rail means **14** which form a frame open at one side into which a label **15** may be pushed to specify the contents placed in the container. The guide rail means **14** may be molded in one operation with the molding of the foldable sheet, or the guide rail means may also be subsequently connected to the sheet, for instance by a heat sealing operation.

If large size containers are to be formed from a folded sheet as described in connection with FIG. 1, reinforcing ribs may be provided on some portions of the folded sheet. FIG. 10 shows in a partial perspective view a part of a container provided with reinforcing ribs and in the modification shown in FIG. 10 the reinforcing ribs form, when the sheet is in the folded position as shown in the partial view of FIG. 10, outwardly extending flanges **16**, a part of one is shown in FIG. 10, and the cover **8** is provided with corresponding flanges **17**, part of one is shown in FIG. 10, engaging the opposite flange **16** on the bottom part **1** of the container. The flanges **16** and **17** may be provided only on the upper edges of two opposite side wall portions of the lower part as well as on the cover of the container, or the flanges **16** and **17** may extend all around these upper edges. A plurality of aligned bores are provided in the flanges **16** and **17** extending therethrough and screws **18** or other connecting members may be placed into the bores to securely fasten the cover **8** to the bottom portion **1** of the container. In this case the bores in flange **16** may be formed with internal screw threads or self-tapping screws may also be used.

Instead of flanges **16** and **17** as shown in FIG. 10, the bottom part of the container **1** and the cover **8** may also be provided on each of the corners thereof with outwardly extending bosses **19** and **20** as shown in FIG. 11 for one of the corners and the bottom part **1** and the cover **8** may be held together by a screw and wing nut connection **21** extending through bores formed in the bosses **19** and **20**.

When moist material, or material in paste form, or a liquid is to be stored or shipped in a container according to the present invention, sealing means may also be provided between the bottom part and the cover of the container. In this case the cooperating flanges **16** and **17** as shown in FIG. 10 will preferably extend all around the container and grooves may be formed in the engaging faces of the flanges **16** and **17** into which an annular sealing member for instance a cord of compressible material may be placed.

Instead of providing reinforcing ribs on the side wall portions of the container, the side wall portions may also be strengthened by forming corrugations into the same and such corrugations may be formed during molding of the sheet in flat condition or subsequent thereto.

The plastic sheet shown in FIG. 1 is formed in flat condition from polystyrene, polyvinyl chloride or similar plastic material. If desired, coloring material may be added to the plastic to give the container any desired color. The plastic sheet may be injection molded in its finished form as shown in FIG. 1 and in this case the folding grooves **1**, **1'** and **1''** with a slightly smaller thickness than the remainder of the sheet may be directly molded in one operation with the forming of the sheet. In this case the snap fasteners and the nose portions **7** may also be formed simultaneously in one operation. It is also possible to stamp out the configuration of the sheet as shown in FIG. 1 from a large plastic sheet which may be formed by any process well known in the art. In this case the folding grooves are subsequently formed in an additional drawing, stamping or embossing operation and the snap fastener **6** and nose portions **7**, if desired, may be subsequently connected to the sheet by a heat sealing operation or may be fastened thereto by any other means well known in the art, for instance by cementing. When portions of the finished container are to be provided with reinforcing ribs or with flanges **16** and **17** as shown in FIG. 10 or with bosses **19** or **20** as shown in FIG. 11, the sheet is preferably injection molded and such reinforcing ribs, flanges or bosses are preferably molded in one operation with the remainder of the sheet. If the side wall portions of the finished container are corrugated to strengthen the same, such corrugations may be formed during molding of the sheet or subsequently thereto by a separate stamping, drawing or embossing operation.

The corrugations may be wave-shaped or of substantially triangular cross section. The flanges **16** and **17** may be formed as mentioned before with grooves for the reception of a sealing member, or the flanges may be formed respectively with cooperating groove-and-tongue joints which may serve as sealing means.

The sheet shown in FIG. 1 may be formed with any thickness sufficient to give the finished container the necessary rigidity and for larger containers thicknesses up to 5 to 6 mm. are used. In the latter case, the folding grooves are preferably formed with beveled or inclined side faces which will properly abut against each other when the sheet is folded from the flat to the folded position.

When the cover is very shallow, it may also be formed from plastic material in one piece, not foldable, for instance by an injection molding or drawing operation.

The container according to the present invention has the great advantage that it can be folded from a flat position to a folded position in extremely simple manner and this foldng operation can be carried out by any unskilled person. The container will be maintained in the folded position by the snap fasteners in the manner as described above or by any other connecting means formed in the side wall portions of the container. The container can be used for storage or shipment not only of solid articles or dry material, but also moist material or material in paste form or even liquids can be stored and shipped in the container according to the present invention, especially if the container is provided with sealing means as described above. When the container is not in use it may evidently be opened up to a flat position in an extremely simple manner by opening the snap fasteners and by unfolding the various portions of the sheet. In this flat position the container may be stored when not in use or a plurality of containers may be shipped in flat position to their destination whereby storage and shipment of the containers are greatly simplified. The cover may be connected to the bottom part of the container in an extremely simple manner as described especially in connection with FIG. 5 in which cover and bottom part of the container engage each other with a snap action, or if a more secure connection between cover and bottom part of the container is desired, connections as shown in FIGS. 10 or 11 may also be used.

The plastic material from which the containers are preferably made will stand up under extended use and the plastic material will permit storage or shipment of all kinds of material, even certain acids, in the container.

Evidently the container of the present invention can be mass produced in a very efficient manner and therefore at very reasonable cost.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of containers differing from the types described above.

While the invention has been illustrated and described as embodied in a foldable container made from a sheet of plastic material, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal this gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claim.

What is claimed as new and desired to be secured by Letters Patent is:

In a container, in combination, a sheet of plastic material having a plurality of straight peripheral edge portions and being formed inwardly of said edge portions with folding grooves extending substantially parallel to said straight peripheral edge portions respectively equally spaced therefrom and defining in said sheet a central polygonal portion and between said edge portions and said grooves a plurality of outer portions, each of said outer portions having a pair of side edges extending substantially normal to said folding grooves between the latter and said peripheral edge portions, said outer portions being foldable along said folding grooves relative to said central portion between a flat position in which said portions are located substantially in a plane and a folded position in which said outer portions extend transverse and to one side of the plane of said central portion and abut with said edges thereof against each other to form a continuous side wall of a container, one end wall of which is formed by said central portion, said sheet including further a plurality of substantially triangular connecting portions extending between adjacent side edges of said outer portions integral therewith and folding grooves being also formed along said side edges and an additional folding groove being formed in each of said connecting portions extending from said central portion of said sheet to the periphery thereof and dividing each of said triangular connecting portions into two substantially equal triangular portions abutting against each other when said sheet is folded from said flat to said folded position; and cooperating snap fastener means on said equal triangular portions for holding the same in abutting relationship and thereby said sheet in said folded position, said snap fastener means being integral with and consisting of the same plastic material as said sheet.

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