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Kuchuris et al.

[11] **3,901,962**

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[54] **METHOD OF MAKING EXPANDED POLYSTYRENE PARTITION STRUCTURE**

[75] Inventors: **Louis G. Kuchuris**, Chicago; **Stanley Gembicki**, Des Plaines, both of Ill.

[73] Assignee: **Cutting Equipment Leasing, Inc.**, Chicago, Ill.

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[21] Appl. No.: **440,256**

Related U.S. Application Data

[62] Division of Ser. No. 254,749, May 18, 1972, Pat. No. 3,837,560.

[52] **U.S. Cl.** ..... **264/154;** 93/37 R; 264/45.5; 264/152; 264/321; 264/DIG. 14

[51] **Int. Cl.** **B29h 3/06;** B31d 3/04

[58] **Field of Search** ..... 264/154, 321, 45.5, 152, 264/DIG. 14; 93/37 R; 83/171, 651.1, 926 B

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Primary Examiner—Roy Lake
Assistant Examiner—James F. Coan
Attorney, Agent, or Firm—Wegner, Stellman, McCord, Wiles & Wood

[57] **ABSTRACT**

A partition structure for shipping or storage containers having a plurality of interfitting partition strips with interlocking slots and with the partition strips being formed of expanded polystyrene. In one form thereof, the planar faces of a partition strip have a relatively low density because of said surfaces being formed by saw cut from a block of expanded polystyrene, while the entire peripheral edge of the partition strip, including the interlocking slots, are formed by hot wire cutting to have a higher density on the surface thereof to provide greater physical strength for the partition strip.

5 Claims, 5 Drawing Figures

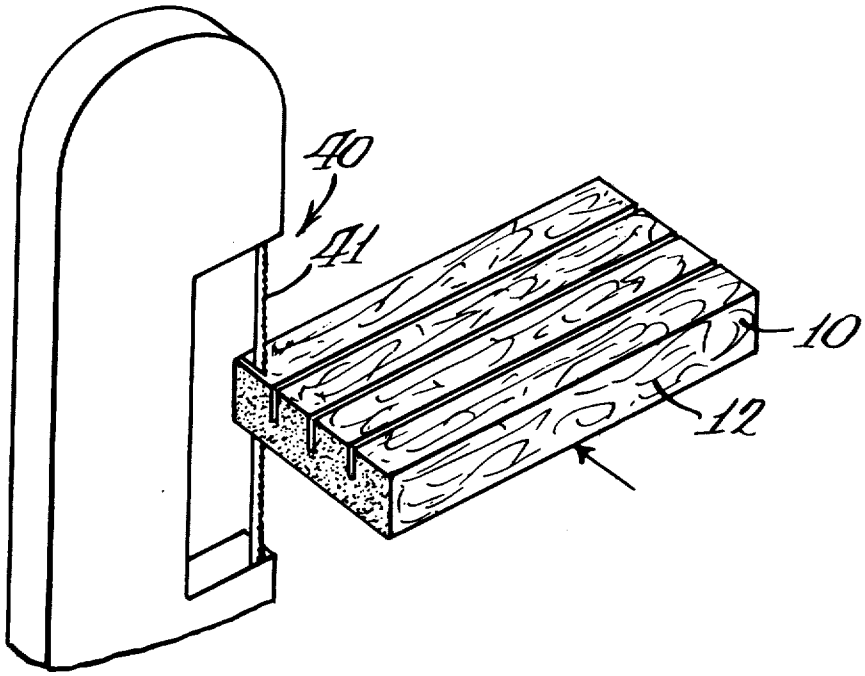


Fig. 1.

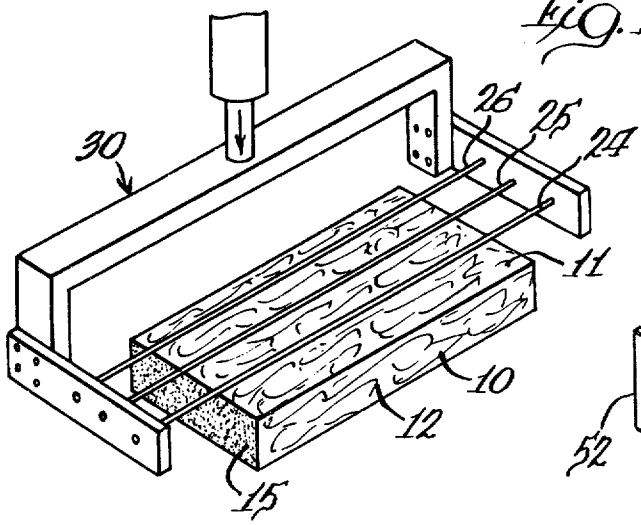


Fig. 3.

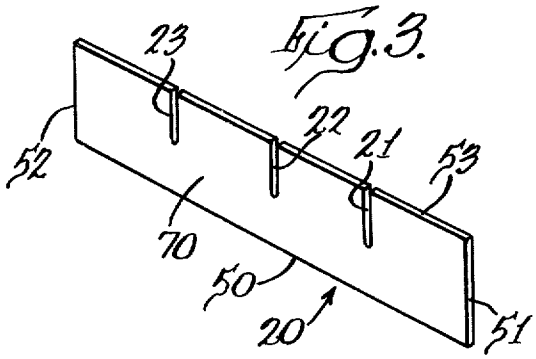


Fig. 2.

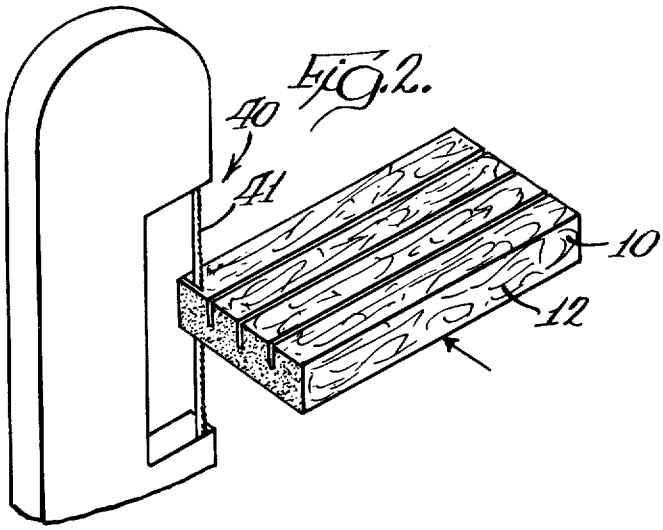


Fig. 4.

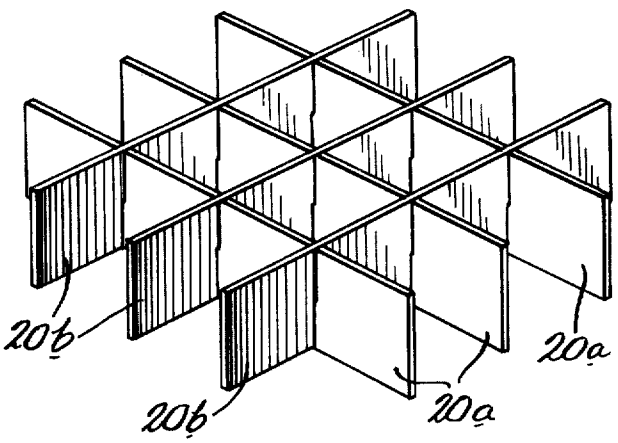
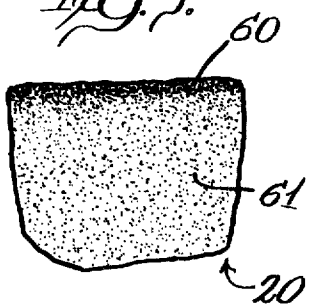


Fig. 5.



METHOD OF MAKING EXPANDED POLYSTYRENE PARTITION STRUCTURE

This is a division, of application Ser. No. 254,749 filed May 18, 1972 now U.S. letters Pat. No. 3,837,560.

BACKGROUND OF THE INVENTION

This invention pertains to partition structure and, more particularly, to partition strips formed of expanded polystyrene.

Partition structures for shipping and storage containers, as generally known prior to this invention, are formed from corrugated paper material. Such structures are relatively expensive considering the cost of raw materials and labor in manufacture. Apart from the cost thereof, a less than satisfactory partition structure results because the paper material has many properties which are undesirable in the shipping and storing of material. The paper is subject to mold, staining, combustion, water damage and, once subject to crushing forces, does not have any memory to return to its original shape.

SUMMARY

With the partition structure and partition strips disclosed herein and formed of expanded polystyrene, the partition is a relatively inert structure which is not subject to water damage, mold, staining and is practically noncombustible and a vapor barrier. Additionally, the cost of the raw material and labor, in forming the partition strips, is less than that of conventional corrugated paper partition structure, adding to the advantages thereof. The resulting partition structure is relatively lightweight and provides the desired cushioning contact and structural strength for a shipping container without substantial addition to the shipping weight of the container.

In addition to the novelty of the partition strip formed of expanded polystyrene, it is possible to provide a one-piece laminate, in effect, with the planar faces of the partition strip being formed by saw-cutting of the strip from a block of expanded polystyrene to have the faces with the same low density as that of the basic block from which they are formed, while the entire peripheral edge, including the interlocking slots formed in a partition strip, are subject to hot wire formation to provide melting of the surface of the partition strip along the entire edge. This melting provides a relatively high density layer along the surface of the partition strip edge to provide added structural strength and also forms a tension surface to provide a prestressed beam effect for the partition strip. The hot wire forming of the interlocking slots, due to the melting of the surface polystyrene, also provides strength to the interlocking slots.

Additionally disclosed herein is a novel method of forming the partition strips wherein a block of expanded polystyrene has its top, bottom and sides and a plurality of interlocking slots shaped by hot wire cutting to form the higher density surface layer followed by saw cuts of successive partition strips along a line transverse to the length of the block to have the exposed planar faces of the partition strip of unmodified low density expanded polystyrene for cushioning contact with a product.

In view of the foregoing, a general object of this invention is to provide a new and improved partition structure wherein interlocking partition strips are formed of expanded polystyrene.

Another object of the invention is to provide a partition strip for interlocking relation with other such strips to form a partition structure usable in shipping or storage containers comprising a generally planar integral body of expanded polystyrene with the planar faces of said body having relatively low density for cushioning contact with the product and the edge of the strip having a higher density for adding structural strength to the strip.

Still another object of the invention is to provide a partition structure for shipping and storage containers having a plurality of interfitting partition strips with interlocking slots wherein the partition strips are formed of a molded plastic material and with the partition strip having generally planar faces with relatively low density for cushioning contact with the product and the peripheral edge of the strip having a higher density for added structural strength.

A further object of the invention is to provide a method of forming a partition strip and a partition strip resulting from said method wherein successive partition strips are sawed from a block of expanded polystyrene to have the planar faces thereof of the same density as the basic block of material and with the slots formed in the partition strip and the entire edge of the strip being preformed prior to sawing by hot wire cutting applied to the block with resulting melting of expanded polystyrene at the surfaces contacted by the hot wire to form a higher density surface layer in the partition strip.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a tool usable in forming the interlocking slots in a block of expanded polystyrene prior to formation of an individual partition strip;

FIG. 2 is a perspective view showing the saw-cutting of a partition strip from a block of expanded polystyrene;

FIG. 3 is a perspective view of a formed partition strip;

FIG. 4 is a perspective view of a partition structure showing a plurality of interlocked partition strips; and

FIG. 5 is a fragmentary, enlarged view of a part of a partition strip showing the different density between the major part of the body of the partition strip and the edge thereof, with the latter being formed by hot wire cutting.

DESCRIPTION OF THE PREFERRED METHOD AND EMBODIMENT

In describing the method, reference may be made to FIGS. 1 and 2 wherein a block **10** of expanded polystyrene is shown. This block has a length extending from left to right as viewed in FIGS. 1 and 2, with a top **11** and a bottom (not shown) and with a front side **12** and a rear side (not shown). One end is indicated at **15.** This block **10** has a height and width equal to the height and length, respectively, of a partition strip indicated generally at **20** in FIG. 3.

The top **11**, bottom and front side **12** and rear side of the block **10** are formed by hot wire cutting prior to the step of the method illustrated in FIG. 1. As shown in FIG. 1, a tool, which is illustrative only, is provided for hot wire forming of a plurality of slots **21, 22,** and

23 in the partition strip **20**. A plurality of hot wires **24**, 25 and **26** are, as known in the art, electrically heated and suitably mounted in a vertically-movable frame, indicated generally at **30**, whereby they may be lowered into the block **10** to a desired depth to form the interlocking slots **21-23** by melting of the expanded polystyrene. Following formation of the interlocking slots along the entire length of the block **10**, the block **10** is then moved relative to a saw-cut device, such as a band saw, indicated generally at **40**, having a travelling blade **41**, to cut successive partition strips **20** of the desired thickness from the block **10**. This is accomplished by relative movement between the block and the blade along a line transverse to the length of the block, with successive repositioning of the block and blade relative to each other for a succeeding cut. After the step performed as shown in FIG. **2**, the partition strip **20** is then complete and is as shown in FIG. **3**. A series of partition strips **20***a* are then positioned in spaced, parallel relation with their interlocking slots faced upwardly and are interfitted with an inverted series of parallel spaced partition strips **20***b* to form the partition structure illustrated in FIG. **4**.

With the method as described herein, the entire peripheral edge of the partition strip **20** including a bottom edge **50**, the front and rear edges **51** and **52**, respectively, and the top edge **53** including the entire surface of the interlocking slots **21–23** are initially formed by hot wire cutting which results in melting of the expanded polystyrene. This melting results in a relatively high density surface layer, as illustrated at **60** in FIG. **5**, while the major part of the partition strip is of a low density and the same as that of the basic block **10** of expanded polystyrene and as indicated at **61** in FIG. **5**. This results in the formation of a tension surface for the partition strip about the entire edge thereof having a higher density for structural strength and, in effect, providing a prestressed beam effect for the partition strip, and with resultant strengthening of the bottom of the interlocking slots.

The generally planar partition strip **20** has a pair of opposed planar faces, with one face **70** shown in FIG. **3** and with each of these faces being formed by the saw-cut step of the method illustrated in FIG. **2**. The saw cut results in the formation of the partition strip from the block **10** without creating any dust and without any modification of the density of the planar surface whereby the density is the same as that of the basic block and is of a relatively low value. This results in "soft" surfaces for the partition strips which can be in cushioning contact with a product in a shipping or storage container and when the partition strips are assembled into the partition grid structure illustrated in FIG. **4**.

The partition strips of expanded polystyrene are capable of meeting many different packaging requirements. The basic block **10** can be selected to have a density in the range of 1 pound per cubic foot, or less, up to a density of 4 to 5 pounds per cubic foot. This results in planar faces for the partition strip which are relatively soft but which still have a memory to return to the initial shape after compression. The surface layer density along the peripheral edge of the partition strip and in the slots **21–23** of the strip can then be controlled by the hot wire cutting process, with density variation being controlled by the temperature of the wire, the diameter of the wire, and the speed of travel of the wire relative to the block **10** in the formation of the slots as well as the initial shaping of the block **10**. Additionally, the size of the slots **21–23** of the partition strip **20** can also be varied by control of the temperature, diameter, and speed of travel of the wires **24–26**, shown in FIG. **1**.

With the structure and process disclosed herein, it will be seen that partition strips are provided of relatively low-cost basic material and minimal production cost wherein the partition strip, in effect, is an integral laminate with a high density peripheral edge surface to provide for handling strength and resistance to crushing of the partition strip, while the planar faces thereof are of low density to provide maximum cushioning effect in contact with products.

Examination of a partition strip made by the process disclosed herein shows that the planar faces thereof have a relatively smooth, soft surface, while the peripheral edge around the entire partition strip, including the interlocking slots, has a rougher and harder surface.

As an example, partition strips of expanded polystyrene have been found to perform satisfactorily wherein the density of the basic block **10** is approximately one-half pound per cubic foot and with the peripheral edge of the strip being formed by hot wire cutting to have a surface layer with a density of approximately 40 pounds per cubic foot. These values are not limiting, but are only given as an example of one particular strip made by the process disclosed herein.

We claim:

1. A method of forming a partition strip of expanded polystyrene comprising the steps of: shaping a block of polystyrene to a width and height equal to the desired length and height of a partition strip by hot wire cutting along the top, bottom and sides of the block; forming a series of spaced slots extending lengthwise of the block by hot wire forming to a depth sufficient to provide for subsequent interlocking with other strips; and sawing said block along a line transverse to the length thereof in successive cuts to form individual partition strips with relative soft planar faces for contact with a product while the entire exposed edge of the strip including said slots and the bottom thereof has a higher surface density resulting from the hot wire cutting to provide added physical strength to the partition strip.

2. A method of forming a partition strip of expanded polystyrene comprising the steps of: forming a series of spaced slots by hot wire cutting in a block of expanded polystyrene to a depth sufficient to provide interlocking slots for assembly with other partition strips, sawing a partition strip from said block, and subjecting the entire edges of said partition strip to a hot wire to form a higher density surface along said edges.

3. The method of claim **2** in which the step of subjecting the entire edges of said partition strip to a hot wire to form a higher density surface along said edges includes the step of shaping the block to a width and height equal to the desired length and height of the partition strip by hot wire cutting along the top, bottom and sides of the block.

4. The method of claim **2** in which the step of sawing a partition strip from said block is successively repeated to form a plurality of partition strips, and said edges of the partition strip are subjected to a hot wire prior to sawing the strip from the block.

5. The method of claim **2** in which the hot wire cutting results in a density increase in the polystyrene adja-

cent the cut, and the precise change in density varies with the temperature of the wire, the diameter of the wire, and the speed of travel of the wire relative to the block, and said step of forming a series of spaced slots by hot wire cutting includes the steps of maintaining the wire at a selected temperature and moving the wire into the block at a selected speed corresponding to the desired density.

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