There is provided a novel form of winding board for textiles, cloths and other fabrics, which is molded out of expanded polystyrene. This novel board has excellent structural characteristics as well as resistance to water and bacterial damage.

7 Claims, 4 Drawing Figures
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NOVEL CLOTH WINDING BOARD

FIELD OF THE INVENTION

Device for winding cloth.

DESCRIPTION OF THE PRIOR ART

It has long been customary to merchandise retail quantities of cloth and similar fabrics in the form of bolts of cloth. These bolts of cloth comprise a cloth winding board of substantially rectangular dimensions, having a length approximately equal to, and usually very slightly larger than the width of the cloth which is wound upon it. The cloth is wound around the winding board to form the bolt in which form the material is shipped to retail outlets. The basic features of the cloth winding board are that the board shall have sufficient strength so that it will not bend or twist during the usage of the bolt. A subsidiary feature is that the exposed ends of the board shall provide a space for a label or similar identifying means to characterize the cloth comprising the bolts.

The problems associated with this apparently very simple mechanical device have long been recognized by those skilled in the art and many approaches to solving these problems have been attempted.

The original boards were constructed of wood which gave rise to certain problems, at least two of which were apparently solved by patented modifications. Priestly, U.S. Pat. No. 340,521, provided a seamless cover in order to protect the cloth from damage and marking due to the seepage of resin and other natural juices from the wood. Lonke, U.S. Pat. No. 695,062, provided reinforcing means at the ends of the wooden boards to protect the integrity thereof from splitting of the wood.

One obvious disadvantage of wood is its weight relative to the weight of the cloth which is wound upon it, giving rise to unnecessarily high freight charges for substantial quantities of bolts, as well as creating handling difficulties for the salesman utilizing the bolt.

Several approaches to this weight problem have been attempted, most of them involving the use of two or more layers of cardboard or similar material which is either laminated or provided with structural features which perpert to convey to the board adequate structural strength, examples of such boards may be found disclosed in Wilson, U.S. Pat. No. 1,112,957; Province, U.S. Pat. No. 1,977,144; Robinson U.S. Pat. No. 3,021,945; and Clark U.S. Pat. No. 3,268,069. Most of these prior art devices require the use of several pieces of material, and machinery capable of carrying out folding and gluing steps in order to obtain a board having the desirable strength characteristics. Unfortunately, the basic cardboard material utilized does not have the strength of wood, particularly with respect to problems of bending and twisting. Furthermore, the boards are subject to damage by water absorption particularly when in storage and are also subject to attack by mold particularly when damp. The water absorption characteristics of cardboard being quite substantial.

It was therefore deemed desirable to provide a cloth winding board of low weight, which had substantially high bending and twisting resistance, which would not act as a substantial absorber of water and which had substantial resistance to bacterial decay.

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SUMMARY OF THE INVENTION

There is provided a cloth winding board comprising expanded polystyrene molded to the form of said board. While the upper limit of density of the board is limited purely by considerations of cost and weight, the density of the polystyrene utilized may lie between one and ten pounds per cubic foot.

The novel boards manufactured from expanded polystyrene have excellent qualities of low density, and high strength and may be manufactured by processes well known in the art.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the novel cloth winding board.

FIG. 2 is a side elevational view of the board, FIG. 1 viewed at 2—2.

FIG. 3 is a side elevational view of the modification of the board of FIG. 1 viewed at 2—2.

FIG. 4 is a plan perspective view of the board of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The cloth winding board of the present invention comprises a substantially rectangular molded slab of expanded polystyrene 10, wherein upper surface 11 is joined to lower surface 13 by means of rounded edges 15 and 17 running along the longer dimensions of 10. These edges are suitably of semi-circular cross-section. The remaining edges 12 and 16 respectively are planar. In one modification an indentation 14 may be let into surface 12 to accommodate a label. A similar indentation 18 may be placed in surface 16.

The absolute dimensions of the cloth winding are not critical. However, it has been found convenient to produce a board wherein the long dimension is about 2 to about 6 inches longer than the width of the cloth which will be wound upon said board and the shorter dimensions of the rectangular surface is of the order of from about 8 to about 15 inches, suitably about 10 inches. The thickness of the board is from between three-quarters to about one-half inches, suitably about 1 inch.

The material utilized in the board is expanded polystyrene. Polystyrene of any density may be utilized, however densities from between 1 and 10 pounds per cubic foot will supply the necessary strength factors which are required to produce a useable board. It is not necessary, however, to utilize densities at the upper end of this range since the strength provided thereby is not required in the board. From a commercial point of view, the lowest density giving rise to a product of unquestioned commercial capability is 1.2 pounds per cubic foot, whereas it is not necessary to provide strength factors in excess of those which would be provided by using expanded polystyrene of a density greater than 2.0 pounds per cubic foot.

The boards produced in accordance with the present invention will meet certain lowest strength criteria. Thus, when tested in accordance with ASTM C—273—53, with a cross head speed of 0.5 inches per minute, the shear strength of the board at 1.2 pounds per cubic foot is approximately 15 p.s.i. and at 2 pounds per cubic foot is approximately 33 p.s.i.
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3. When tested under ASTM D1621-59 with a cross head speed of 0.10 inches per minute, the compressive strength of the board at 1.2 pounds per cubic foot is such as to give a 5 percent deformation at approximately 10 p.s.i. and at 2.0 pounds per cubic foot gives a 5 percent deformation at approximately 38 p.s.i.

When tested under ASTM C203-58 with a cross head speed of 0.5 inches per minute, the flexural strength of the board at 1.2 pounds per cubic foot is 35 p.s.i. and at 2 pounds per cubic foot is 85 p.s.i.

When tested under ASTM D1623-59 with a cross head speed of 0.5 inches per minute, the tensile strength of the board at 1.2 pounds per cubic foot is 35 p.s.i. and at 2 pounds per cubic foot is 70 p.s.i.

The boards produced in accordance with this invention will not affect the cloth wound thereon because of their chemical inertness and neutral pH. They will not deteriorate under normal conditions of use since they are water resistant and also resistant to fungal and bacterial attack. A further advantage of the novel boards of the present invention is that they have a substantially higher ignition point than wood or cardboard. In addition thereto, as set forth above, the typical board is light and has an excellent strength weight ratio.

The boards of the present invention may be produced by the techniques of expanding polystyrene and pressure molding said expanded polystyrene which are well known in the art.

In the procedure of producing the novel boards in the present invention, the raw polystyrene to be utilized is graded according to size of pellets. This grading is done by passage through U.S. Standard Sieves. To obtain expanded polystyrene of a density of 1.2 pounds per cubic foot, it is preferred to utilize raw polystyrene pellets of sieve grade between 14 and 18 for a density of 2 pounds per cubic foot, it is preferred to utilize pellets of between 16 and 20 standard sieve size.

The graded pellets are then pre-expanded by heating with very dry steam at a low partial pressure in combination with dry air, in large closed agitator type vessels, and the heat applied to the pellets in the aforementioned manner with agitation.

In the process of the expansion the raw pellets are fed into the expansion vessel, suitably through an auger type filler with variable speed capacity. It will be understood by those skilled in that art that the steam pressure and temperature, the air pressure and the rate of input of raw pellets are all variable in order to achieve a predetermined density of beads. However, in order to obtain beads suitable for the preparation of molded products having a density of between 1.2 and 2.0 pounds per square inch, there is utilized steam pressure of between 10 and 25 p.s.i. at temperatures from about 170°F to about 250°F and a controlled air pressure of from about 0 to about 75 p.s.i. The rate of input of raw pellets may lie between 50 and 500 pounds per hour.

Following the pre-expansion step, the beads must be permitted to dry and age. The purpose of the aging process is to permit the pressure on the inside of the beads to equalize with the pressure on the outside of the beads, that is to say, the ambient room pressure. Furthermore, it is important that the beads be permitted to dry properly since the presence of moisture will interfere with polymerization stage of the molding step.

In order to obtain a molded product of good quality, appearance, and strength, it is advantageous to utilize expanded beads of substantially the same diameter.

Therefore, the expanded beads are sieved, suitably through sieves of diameter between about 0.100 and about 0.300 of an inch.

The beads are then fed into the mold and subjected to the molding cycles. These cycles comprise substantially the steps of preheating, loading, heating, dwell, cooling and unloading.

The complete molding stage may take from between 1 to about 20 minutes, depending on the particular characteristics which are sought and the size of the mold utilized.

In the preheating step, the mold is preheated (externally) with steam to reduce water condensation inside the mold during the heating step. It is preferred to heat the mold to a temperature from about 90°F to about 250°F for from about 2 to about 7 seconds.

The expanded beads are then charged into the mold by venturi fill guns which are well known in this branch of the art.

The mold is then closed, and heat applied until full expansion and fusion of the pre-expanded beads has occurred. In the heating step, the mold is heated to a temperature from about 90°F to about 270°F for a period of from about 10 to about 45 seconds.

The heat is then cut off and the mold allowed to dwell for from about 3 to about 10 seconds. This permits a gradual cooling of the mold and furthermore prevents shocking the material which leads to a desirable and smooth surface finish.

The mold is then cooled suitably by application of water, air, or coolant gases thereto, water circulation being generally preferred. This step serves to condense the gases formed within the mold during the fusion step.

The mold is then opened and the molded part removed.

The molded cloth winding board produced by the process of the present invention has greatly superior structural properties to similar items produced by cutting such a board from a large block of expanded polystyrene.

It is well known to produce large slabs of expanded polystyrene, these are usually of the approximate dimension of 4 foot sided cubes. In preparing such a large block of polystyrene, it is not possible to obtain the consistent internal cross adhesion between the particles that is possible in the molding of smaller slabs such as that of the present invention, which have a thickness of the order of one inch. Furthermore, it is the nature of polystyrene that when it is cut a rough surface is obtained. This rough surface cannot be smoothed except by application of a substantially thick coating thereto to fill in all the crevices. The presence of such rough edges leads to crumbling which of course, not only reduces the mechanical strength of the board but will also contaminate any cloth wound thereon.

These problems do not occur with integrally a molded board.

I claim:

1. A cloth winding board comprising a rigid sheet of expanded polystyrene foam having substantially flat planar top and bottom surfaces of substantially rectangular plan view wherein the edge of said sheet on its longer dimension connecting said top surface to said bottom surface have a curved cross-section.

2. A cloth winding board of claim 1 wherein the curved edge has a semi-circular cross-section.
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3. A cloth winding board of claim 1 wherein the density of the expanded polystyrene foam is between 1 and 10 pounds per cubic feet.

4. A cloth winding board of claim 1 wherein the density of the expanded polystyrene foam is between 1.2 and 2 pounds per cubic feet.

5. A cloth winding board of claim 1 having a shear strength of between 15 and 33 p.s.i., a compressive strength of between 10 and 38 p.s.i., a flexural strength of between 35 and 85 p.s.i. and a tensile strength of between 35 and 70 p.s.i.

6. A cloth winding board comprising a rigid sheet of expanded polystyrene foam having substantially flat planar top and bottom surfaces of substantially rectangular plan view and having edge surfaces of curved cross section on the longer dimension between said top and bottom surfaces, the density of said expanded polystyrene foam being between 1.2 and 2 lbs. per cubic foot.

7. A cloth winding board of claim 6 having a shear strength of between 15 and 33 p.s.i., a compressive strength of between 10 and 38 p.s.i., a flexural strength of between 35 and 85 p.s.i. and a tensile strength of between 35 and 70 p.s.i.