Aug. 11, 1942. C. A. FOURNESS ET AL 2,292,513

CELLULOSE PRODUCT

Filed Oct. 11, 1939

Fig. 1

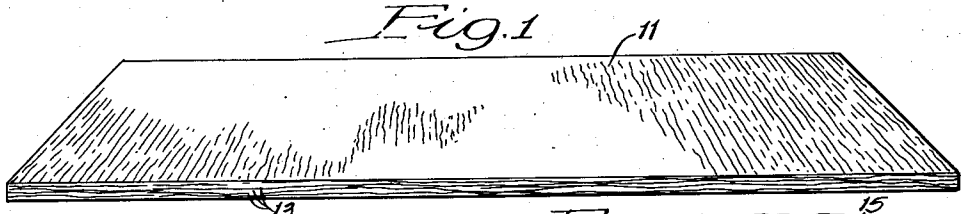


Fig. 2

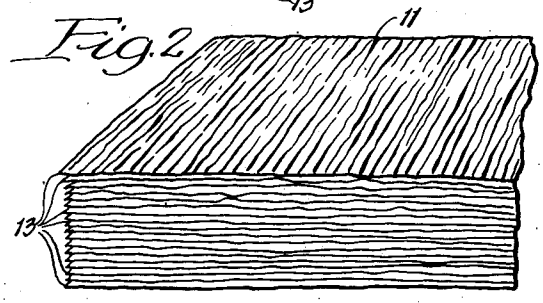


Fig. 4

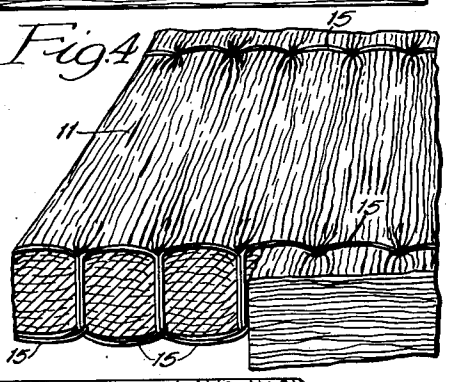


Fig. 3



Fig. 5

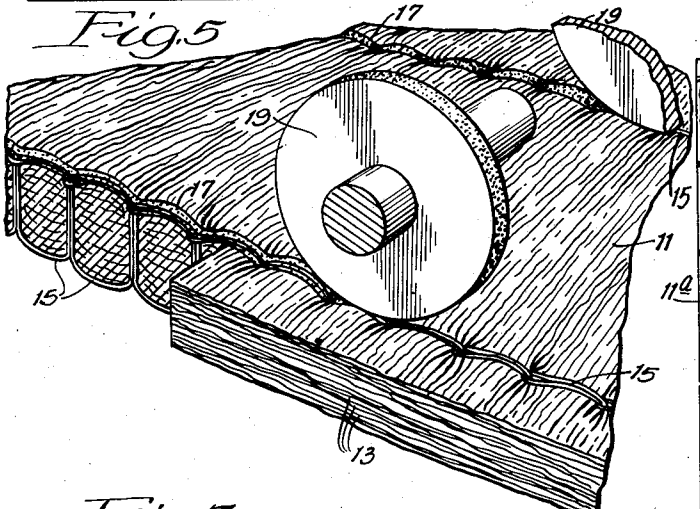


Fig. 6

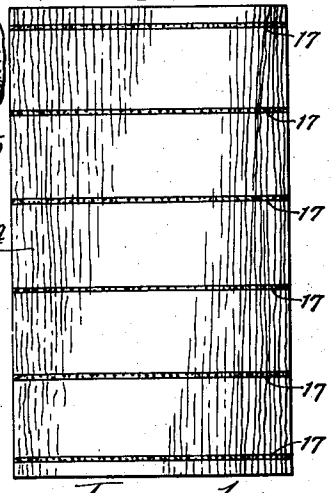
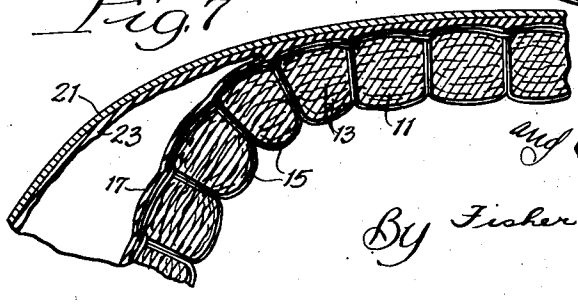


Fig. 7



Inventors:
Charles A. Fourness
and Edward H. Voigtman,
By Fisher, Clapp, Soans & Pond
Attorneys.

Patented Aug. 11, 1942 2,292,513

UNITED STATES PATENT OFFICE

2,292,513

CELLULOSE PRODUCT

Charles A. Fourness, Appleton, and Edward H. Voigtman, Neenah, Wis., assignors to Paper Patents Company, Neenah, Wis., a corporation of Wisconsin

Application October 11, 1939, Serial No. 298,920

3 Claims. (Cl. 154—44)

The present invention relates to multi-ply, creped, cellulose products of the general type disclosed in United States Letters Patent No. 2,102,233, Biederman, and United States Letters Patent No. 2,170,655, Fourness, both of which are assigned to the assignee of this invention, and in the copending application of Charles A. Fourness et al., Serial No. 114,590, which was filed on December 7, 1936, and which is also assigned to the assignee of the present invention.

Products of this general type comprise a pad or bat of low unit density which is formed by superposing a plurality of generally flat sheets of thin, creped, cellulose tissue. The constituent sheets may be plain tissue or may contain a thermo-plastic material such as asphalt as disclosed in Fourness Patent 2,170,655.

A great number of uses have been found for products of this type. For example, large quantities have been used and are being used as packing materials, liquid absorbing materials, filtering materials, etc. More recently, it has been discovered that certain of these products, particularly the products made from asphalt-containing sheets, are especially suited for use as thermal and sound insulating materials and very substantial quantities have been used for this purpose.

Substantially all of these products are, however, rather weak structurally, and in many instances this lack of physical strength has seriously limited their use. For instance, when it is desired to utilize a product of this type for insulating vertical side walls or the under-surface of horizontal walls, as for example in sound-proofing an automobile, considerable difficulty has been experienced in holding the constituent plies of the product in place without impairment of the insulating or other properties of the product.

Accordingly, the primary object of the present invention is to provide an improved method of reinforcing, and thereby increasing the physical strength of, multi-ply, cellulosic sheet products of the general type disclosed in the above mentioned Patents 2,102,233 and 2,170,655. The accomplishment of this object is complicated to a considerable extent, because of the present practice of converting these products, immediately following their manufacture, into a relatively dense, low-bulk, intermediate product which is capable of being restored at any time to its original low density state by a simple lateral extension thereof. Full details concerning this conversion method and intermediate product are set forth in the above-mentioned Fourness application, Serial No. 114,590. Hence, another object of the invention of equal and perhaps even greater importance is to provide a reinforcing means for multi-ply sheet products of the general type referred to in the foregoing which will not interfere with the compressing and reexpanding of this product in accordance with the disclosure of Fourness application Serial No. 114,590.

Other objects and the various important features and advantages of the invention will be made more apparent by reference to the accompanying drawing and the following description of one preferred embodiment thereof. In the drawing,

Figure 1 is a perspective view of a pad or bat multi-ply cellulose product of the type to which the present invention particularly appertains;

Figure 2 is an enlarged fragmentary perspective view of a portion of the pad or bat illustrated in Figure 1;

Figure 3 is a perspective view, similar to Figure 1, illustrating the first step in the reinforcing procedure of the present invention;

Figure 4 is an enlarged fragmentary perspective view showing certain of the details of the product illustrated generally in Figure 3;

Figure 5 is a perspective view illustrating the second step in the reinforcing procedure of the present invention;

Figure 6 is a bottom plan view, drawn to the same scale as Figure 3, illustrating the pad or bat product of the present invention in the compressed condition; and

Figure 7 is a fragmentary perspective view illustrating one method of applying the product of the present invention to the inside surface of the top portion of an automobile body or the like.

The multi-ply pad or bat product illustrated at 11 in Figure 1 consists of a plurality of sheets 13 of thin, creped, cellulosic tissues arranged in superposed relation to form a pad or bat of the desired thickness. Sheets having a basis weight of from 4 to 9 pounds for 480 sheets 24 x 36 inches in the flat or uncreped state will ordinarily be used. The thickness of the pad or bat 11 is of course determined by the number of the constituent sheets 13 which are used. At the present time, bats comprising from 3 to possibly 150 or more superposed tissue sheets, and having thickness within the range of from possibly ⅛ to 2 or 3 inches, or more, are used. The small enlarged section illustrated in Figure 2 shows the general arrangement of the sheets 13, and it will be noted that the creping in all of the

superposed sheets 13 extends in the same direction, transversely of the particular pad or bat 11 illustrated in the drawing. This product, as has been pointed out heretofore, is very bulky, porous, and of low unit density, and in addition to its desirable properties which adapt it for use as a packing material, liquid absorbing material, and the like, it possesses very remarkable thermal and sound insulating characteristics, particularly when the sheets include asphalt, as disclosed in Patent 2,170,655.

Products of the general type illustrated in Figure 1 may be longitudinally compresed in a direction generally perpendicular to the creping of the individual sheets making up the pad or bat, as disclosed in Fourness application Serial No. 114,590. This compression increases the unit density and decreases the unit bulk of the product within the range of from about 3 to 20 times, and is of very great value in reducing shipping costs and facilitating the handling and installation of the product. Hence, it is essential that any strengthening or reinforcement of the pad or bat product 11 to adapt it for use in locations where it may be suspended vertically or on the under-side of a horizontal surface must be of such a nature that it will not interfere with either the compressing or the subsequent reexpanding of the product.

After extended consideration of this problem and various tests, we have ascertained that reinforcement of this desired character can be accomplished by stitching together the superposed plies 13 and then anchoring the stitching in such manner that the anchoring will not interfere with either the compression or the subsequent reexpansion of the product. Stitching alone is insufficient, since the inherent weakness of the product is such that the stitching cannot be relied upon to hold the plies 13 in place against the repeated jars and shocks to which the product may be subjected when used, as for example, for sound insulation in an automobile. This is particularly true where there are stitch misses or thread failures, which sometimes occur during the stitching operation. The anchoring means accomplishes a further important function in that it prevents unravelling where the insulation is cut off, as will frequently be the case during its installation.

The provision of a satisfactory anchoring means proved one of the most difficult parts of the entire problem, and as will hereinafter appear, the particular type of anchoring means utilized constitutes one of the most important features of the invention.

Beginning with the multi-ply pad or bat illustrated at 11 in Figure 1, the first step in the reinforcing procedure of the present invention consists in stitching the plies 13 together at spaced intervals. Preferably, this stitching takes the form of continuous parallel rows of stitches 15 which may be applied directly to the pad or bat 11, as it is manufactured, by a multiple head sewing machine. The stitching 15 should extend generally transversely of the creping in the superposed plies 13. While any type of stitching may be used, the stitch anchoring means of the present invention is of such character that stitches of the chain type, as illustrated in Figure 4, may be used without danger of the stitches pulling out, and since chain stitching can be done more easily and at a higher rate of speed than lock stitching or other forms, this is an important advantage.

After the plies 13 have been joined by the rows of stitching 15, the stitching is anchored in place. This anchoring is accomplished by applying to each of the rows 15, preferably at the looped side if chain stitches are used, a narrow line 17 of a suitable, liquid, adhesive anchoring material. This material may be conveniently applied as a printing operation through the use of narrow printing rollers 19 (Figure 5), which bear against a suitable supply roll for the liquid anchoring material. Apparatus of this general type is well known in the art and accordingly has not been illustrated in detail in the drawing.

After the application of the anchoring material 17 to the rows of stitching 15, the pad or bat 11 may be compressed longitudinally in a direction substantially perpendicular to the direction of the creping in the superposed sheets or plies 13 to decrease its length and increase its unit density. Ordinarily, this compression will be of an amount sufficient to reduce the length of the pad or bat to about 1/3 to 1/20 of its original length, this reduction in length being accomplished by a corresponding increase in the unit density of the product. The compression may be accomplished as taught in Fourness application Serial No. 114,590 or by use of the mechanism disclosed in Neller application Serial No. 247,561. The compressed product is illustrated at 11*a* in Figure 6, this figure being to the same scale as Figure 3. When it is desired to use the product for insulation or other purposes, the compressed pad or bat 11*a* illustrated in Figure 6 may be readily restored to its original length and original low density state by simply reversing the compressing operation. During this operation, especially if it is carried out by hand, it will be found that the reinforcing stitching 15 will serve both to hold the plies 13 in place and as a guide for indicating when the proper degree of expansion has been reached.

The particular material used for locking the stitching in place is a very important feature of the present invention. Due to the fact that in practically all instances the stitched pad or bat will be compressed and reexpanded before use, the locking material 17 must not only lock the stitching threads together so as to prevent individual stitches from pulling out and at the same time securely attach the stitching to the adjacent constituent plies of the pad or bat, but in addition the locking material 17 must be of such nature that it will not stick together when the stitched pad or bat is compressed, or otherwise interfere in any way with the compression and reexpansion of the stitched pad or bat.

After extensive investigations, it has been found that the most satisfactory locking material constitutes a mixture of a relatively high melting point asphalt and a paraffin wax having a melting point which is substantially lower than the melting point of the asphalt. Reasonably satisfactory results have been obtained with various mixtures of Select Gilsonite type asphalt and paraffin waxes having a melting point within the range of about 105° F. to 160° F. Mixtures of these materials exhibit a dull, waxy, non-tacky surface and possess a high softening point. Gilsonite is the trade name for that group of asphaltic substances which are characterized by a relatively high fusing point, i. e., within the range of about 270° F. to 400° F., and which must be heated well above that temperature to become fluid.

Particularly satisfactory results are obtained

through the use of equal amounts, by weight, of Gilsonite type asphalt having a ball and ring fusing point within the range of about 270° F. to 300° F. and a paraffin wax having a melting point of approximately 123° F. In this connection it should be noted that the proportions of this optimum mixture were found to be quite critical. A 46–54 or a 56–44 mixture was not nearly as satisfactory as the exact 50–50 mixture.

The reinforced product can of course be used either before compression or after compression and reexpansion. However, as pointed out above, pads or bats provided with the reinforcing stitching 15 and the locking means 17 can be expanded more easily and more satisfactorily after compression than the prior unreinforced products. The reinforcing stitching 15 in combination with the stitch locking means 17 result in the provision of a product which is much stronger physically and much easier to use than the prior unreinforced product. In fact, the inherent strength of the product is increased sufficiently by this means to make it possible to fasten the product in almost any location by the use of nothing more than a layer of an adhesive such as asphalt or tar. This is illustrated in Figure 7, which is a fragmentary view showing the use of the product of the present invention for sound-proofing an automobile. A portion of the top of the car body is illustrated at 21, and the layer of adhesive is illustrated at 23. If asphalt is used as the adhesive it should be applied in the molten state or as a liquid emulsion. When the product is adhesively secured in place it is preferable that the stitch locking means 17 shall contact the adhesive.

In the foregoing we have disclosed the features of a new type of reinforced, multi-ply, cellulosic insulating material, particularly adapted for use in locations where the insulating material must be suspended from a vertical side wall or on the under-surface of a horizontal wall. The important features of our invention include not only the concept of this material but also the provision of certain novel methods and materials whereby the manufacture of this product may be accomplished.

Various other types of reinforced, multi-ply, cellulosic products embodying the principles of the present invention may be developed. For this reason, it is our desire that the accompanying claims shall be accorded the broadest reasonable construction consistent with the language appearing therein and with the prior art.

We claim the following as our invention:

1. A multi-ply, relatively dense extensible pad or bat comprising a plurality of superposed, similarly arranged sheets of thin, creped, cellulosic tissue, the creping in said sheets extending generally transversely of the length of said pad or bat and said sheets being joined together by a plurality of spaced, longitudinally extending rows of stitching, and a narrow, line-like area of a non-tacky adhesive anchoring said stitching to said pad or bat, said adhesive consisting of a mixture of approximately equal parts by weight of asphalt having a melting point within the range of about 270° F. to 400° F. and paraffin wax having a melting point within the range of about 105° F. to 160° F., said pad or bat being longitudinally extensible, in a direction substantially perpendicular to the direction of creping therein, within a range of two to twenty times to form an elongated, low-density pad or bat which is particularly suitable for use as an insulating material.

2. A multi-ply, relatively dense extensible pad or bat comprising a plurality of superposed, similarly arranged sheets of thin, creped, cellulosic tissue, the creping in said sheets extending generally transversely of the length of said pad or bat and said sheets being joined together by a plurality of spaced, longitudinally extending rows of stitching, and a narrow, line-like area of a non-tacky adhesive anchoring said stitching to said pad or bat, said adhesive consisting of a mixture of approximately equal parts by weight of asphalt having a melting point within the range of about 270° F. to 300° F. and paraffin wax having a melting point of about 123° F.

3. A multi-ply, relatively dense extensible pad or bat comprising a plurality of superposed, similarly arranged sheets of thin, creped, cellulosic tissue, the creping in said sheets extending generally transversely of the length of said pad or bat and said sheets being joined together by a plurality of spaced, longitudinally extending rows of stitching, and a narrow, line-like area of a non-tacky adhesive anchoring said stitching to said pad or bat, said adhesive consisting of a mixture of approximately equal parts by weight of asphalt having a melting point within the range of about 270° F. to 300° F. and paraffin wax having a melting point of about 123° F., said pad or bat being longitudinally extensible in a direction substantially perpendicular to the direction of creping therein within a range of two to twenty times to form an elongated, low density pad or bat which is particularly suitable for use as an insulating material.

CHARLES A. FOURNESS.
EDWARD H. VOIGTMAN.