

March 10, 1942.

J. MAZER

2,275,859

ACOUSTICAL MATERIAL

Filed Jan. 20, 1938

Fig. 1.

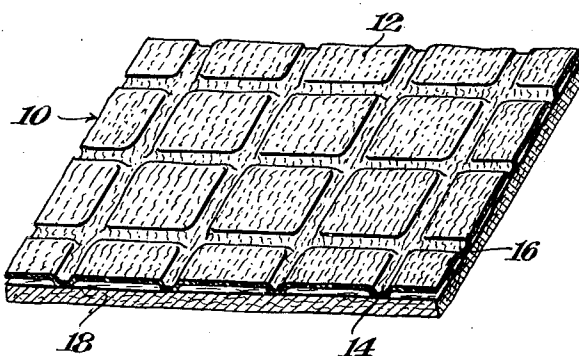


Fig. 2.

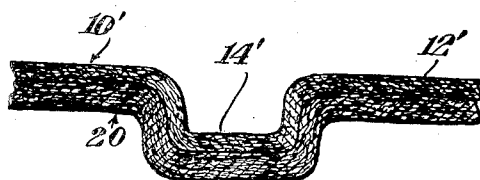
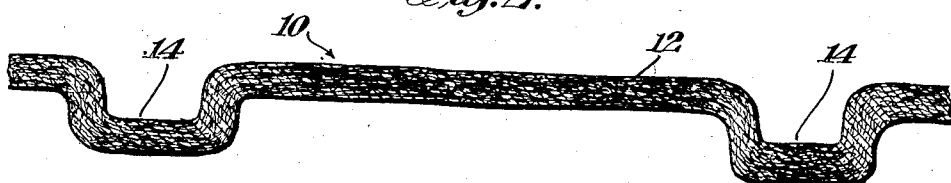


Fig. 3.

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2,275,859

ACOUSTICAL MATERIAL

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Application January 20, 1938, Serial No. 185,820

6 Claims. (Cl. 154-44)

In the manufacture of acoustical wall coverings it has previously been suggested to employ paper-like bodies having a portion in the plane of attachment and having raised squares lying out of the plane. In that case the portions lying in the plane of attachment will form intersecting grooves or channels. For example, such a structure is shown in my earlier Patent No. 1,961,374 of June 5, 1934. In that patent, I suggest that such bodies can be formed of pulpboard or asbestos or metal, as the inherent sound-absorbing capacity of the material itself is not relied upon.

In the present application I am concerned principally with the use of fibrous material in the formation of this type of structure. It will be quite obvious that if the sheet is formed as by the hardening of pulp into the shape described, the arrangement of parts at right angles to each other will have a definite stiffening effect. On the other hand, if an attempt is made to shape the material by stamping ordinary paper, the paper will be ruptured if the rectangles are raised sufficiently to accomplish any desired result.

I have discovered that an acoustical product of great value can be made by using a fibrous sheet such as the so-called asbestos paper containing asbestos fibers combined with other fibrous material or so-called rag felt or the like, and raising the squares under conditions which will thin out the side walls of the squares but without weakening them to the point where there is any danger of actual separation. In that case I find that each raised portion will move as a separate diaphragm and the weakened side walls will permit such movement to take place with sufficient ease to give the desired acoustical effect.

While it is possible when working with great care to get this result when all four walls of the raised rectangular portions are weakened, it is very difficult to control this action while getting a substantial change in plane of the raised portion. However, I have discovered that the desired flexibility can be had by stretching two of the sides and folding the other two sides. In this case the two folded sides will give adequate strength to support the raised portion and the two stretched sides will give sufficient flexibility to permit the raised portion to act as a diaphragm.

This result can best be accomplished by the use of rolls having the members which will form the intersecting grooves or channels arranged with one set running parallel to the axis of the

roll and the other at right angles to this axis. When a soft, paper-like body (preferably moistened) is run through these rolls it will be drawn into the grooves that run parallel with the axis of the roll and no substantial stretching will take place in this direction. However, the paper will be forced down into the grooves which run at right angles to the axis of the rolls in a manner similar to that which takes place during embossing and this will involve a stretching of the paper or paper-like material along these edges. By carrying out the operation in this manner, I am able to produce a sheet having intersecting grooves or channels with rectangular raised portions between them and having at least two walls of such raised portions stretched or thinned so as to give substantially increased flexibility and permit the surface of the raised portion to move bodily as a diaphragm.

As previously brought out, the stock from which my product is to be made must be sufficiently soft so as to permit relative movement of the fibers during the stretching operation so that the wall can be weakened without a continuous rupture. Actually in some cases this weakening or thinning out of the fibers may be localized in some places more than others, so that if the structure is held up to the light, gaps will appear. These gaps, however, are not continuous and are distinctly different from the type of tear which takes place with ordinary paper.

Where it is desired to have the surface of the member more or less dense, I have found that advantageous results can be had by using a composite sheet where the surfacing member is denser than the backing member. For example, a rather dense sheet of asbestos paper can be combined with a moderately dense sheet of rag felt and if the two are treated simultaneously, the desired result will be obtained. Perhaps this is due to the fact that the soft sheet permits some slippage of the denser sheet so that strains are not localized.

In the drawing which shows my invention, Fig. 1 is a perspective view showing the material of the present invention combined with a sheet of soft backing material to make a complete acoustical structure of high efficiency; Fig. 2 is an enlarged cross section showing a channel, the walls of which have been thinned out or weakened by stretching, and Fig. 3 is a similar cross section showing the same result as applied to a composite sheet.

In the drawing, the numeral 10 designates a

sheet of comparatively soft, fibrous material such as a very loosely laid paper or rag felt or loose asbestos paper. This sheet has been subjected to pressure so that rectangular areas 12 are formed by intersecting grooves of which the longitudinal grooves are indicated by the numeral 14 and the transverse grooves are indicated by the numeral 16.

While it is possible to make such sheet by a stamping operation, in which case the walls of both grooves 14 and 16 will be thinned by stretching, I prefer to make this sheet by a combination of pressing and folding so that the walls of the grooves 14 will be thinned by stretching, whereas, the walls of the groove 16 will be of substantially the same stiffness as the balance of the sheet. As previously stated, this can be accomplished by the use of a set of rolls in which the transverse markings tend to gather the paper and the circumferential markings cause the stretching.

The type of stretching which takes place along the sides of the grooves 14 is indicated in Fig. 2; where the cross sectioning indicates the fibrous arrangement of the sheet and it is to be noted that at the walls of the grooves the fibers are distributed somewhat less compactly, though there may not be an actual reduction in thickness of the sheet. This thinned-out portion will act as a hinge so that the flat portion 12 will be able to move as a diaphragm under the influence of sound waves.

This type of diaphragm is particularly efficient for absorbing high frequency sounds, and to get the maximum efficiency this type of structure can most advantageously be used in conjunction with a soft backing sheet as indicated in Fig. 1 where such backing sheet is indicated by the numeral 18. Such backing sheet may, for example, be formed of hair felt or any one of the other types of materials which are known in the art for this purpose. This built-up structure gives particularly efficient results, as is described in more detail in my co-pending application, Ser. No. 131,855, filed March 19, 1937 (now Patent No. 2,209,825).

Fig. 3 shows a composite sheet consisting of two layers. In this case, the surfacing sheet 10' is denser than the underlying sheet 20. The underlying sheet permits treatment of the dense surfacing sheet without rupture. The raised portion is indicated at 12'.

The pattern of the sheet constituting the subject-matter of the present invention is not critical but for practical purposes I have found that it is best to have a pattern of a generally rectangular nature so that this will present opposite sides which are substantially parallel and which are arranged in part at least at approximately right angles to the other two sides. This arrangement facilitates the formation of the weakened portion during the rolling operation. It is understood, however, that modifications may

be made without departing from the spirit of my invention.

I claim:

1. Acoustical material comprising a layer of fibrous material adapted for attachment to wall members or ceilings, said layer having a plurality of raised portions and a plurality of intersecting longitudinal and transverse narrow, linear depressions, the side walls of the depressions supporting the raised portions, and the side walls of the longitudinal depressions being of less density than the other walls so that the raised portions act as diaphragms under the influence of sound waves.

2. A structure as specified in claim 1 wherein the raised portions are substantially in the shape of rectangles.

3. Acoustical material comprising a layer of fibrous material adapted for attachment to wall members or ceilings, said layer having a plurality of raised portions and a plurality of intersecting longitudinal and transverse narrow, linear depressions defining said raised portions, the side walls of the depressions supporting the raised portions, and the side walls of one group of depressions being of less density than the other group of angularly related side walls, so that the raised portions act as diaphragms under the influence of sound waves, and a flexible facing sheet of denser material than the said layer disposed against the outer faces of said raised portions.

4. Acoustical material comprising a layer of fibrous material adapted for attachment to ceilings or the like, said layer having a plurality of raised portions and a plurality of intersecting longitudinal and transverse narrow, linear depressions, the side walls of the depressions being in the form of partial folds and the side walls of the longitudinal depressions being of less density than the side walls of the transversely-extending depressions, so that the folded portions support the raised portions and the walls of lesser density enable the raised portions to act as diaphragms under the influence of sound waves.

5. A structure as specified in the preceding claim, in combination with a backing member of soft compressible material.

6. In combination, acoustical material comprising an outer layer and an underlying layer of sheeted material, the outer layer being dense and the underlying layer being less dense, said material having a plurality of raised portions and a plurality of intersecting longitudinal and transverse narrow, linear depressions, the side walls of the depressions being in the form of partial folds and the side walls of the longitudinal depressions being of less density than the side walls of the transverse depressions, so that the folded portions support the raised portions and the walls of lesser density enable the raised portions to act as diaphragms, under the influence of sound waves.

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