June 9, 1925. 1,540,931

W. E. DUNCANSON

SOUND INSULATING PARTITION

Filed April 7, 1924

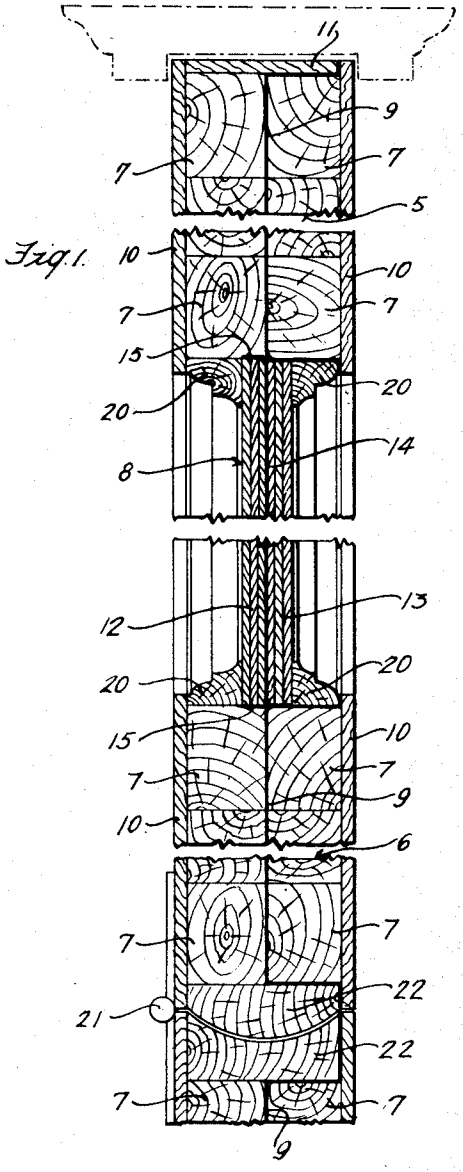


Fig. 1.

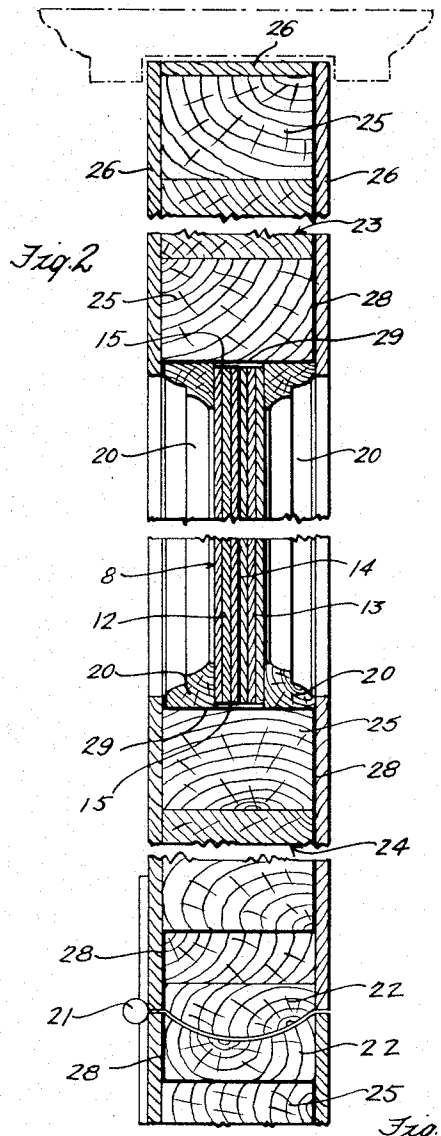


Fig. 2.

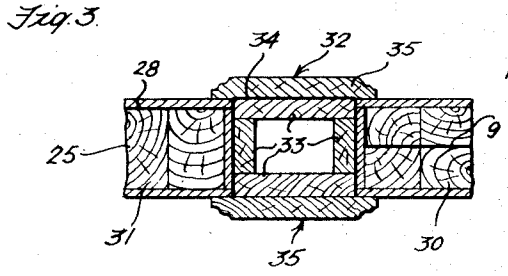


Fig. 3.

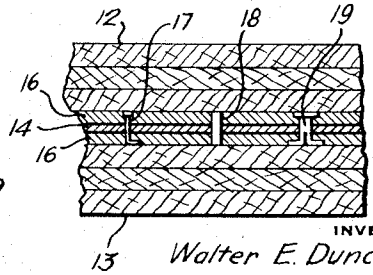


Fig. 4.

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UNITED STATES PATENT OFFICE.

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SOUND-INSULATING PARTITION.

Application filed April 7, 1924. Serial No. 704,626.

To all whom it may concern:

Be it known that I, WALTER E. DUNCANSON, a citizen of the United States, residing at New York, county of New York, State of New York, have invented a certain new and useful Improvement in Sound-Insulating Partitions, of which the following is a clear, full, and exact description.

This invention relates to sound insulating structures, and particularly to doors and partitions which effectively resist the passage of sound therethrough.

I am aware that fixed walls may be made good insulators of sound merely by making them sufficiently thick, also that various expedients have been suggested for making walls relatively soundproof without unduly increasing their thickness, but so far as I am aware, none of these expedients have been or could be adapted to doors and light partitions since they involve the use of relatively cumbersome material which would not be suitable for doors and light partitions.

The main object of my invention is to provide an improved sectional partition which shall effectively resist the passage of sound from one side through to the other.

A further object is to provide such a substantially sound-proof partition of which sections will be sufficiently light and compact to be useful as movable doors, either singly to close small doorways or in groups making up what are known as folding partitions to close openings of any desired size.

Another object is to provide sound insulating partitions which cost but little more to build than partitions lacking this advantage, which cost no more to maintain, and in which the sound insulating characteristics are so permanently incorporated as to last the full life of the remainder of the structure.

I have found that these and other desirable objects may be accomplished by employing a thin sheet of sound-resisting metal, preferably as a core, in constructing partitions which are in other respects identical with those now in use. The ability of metals to resist the passage of sound in my construction appears to be inverse to their elasticity, that is to say, the more inelastic the metal, the more sound resistant will it be.

Experiments have indicated that the sound insulating or retarding properties of metals vary with the density of the metal, the greater the density of the metal, the greater its value as a sound retardant. The value of a metal sheet as a sound retardant also may depend on the thickness of the sheet. A layer of sound-resisting metal in the form of a foil is found to produce highly efficient results in the sound-resisting structure. Certain other properties of the metal, such as its softness and pliancy, may also enter into its efficiency as a sound retardant. Of the metals which might be employed in carrying out my invention, I have found lead to be particularly suitable. Lead is a dense, relatively inelastic, pliant metal having a relatively low degree of hardness, the hardness of lead being 2— Moh scale and its specific gravity being 11.4. The thickness of the sound-resisting sheets used in my construction may vary within wide limits, for example, good results may be obtained with sheets as thin as two thousandths of an inch (0.002″) while in some cases it may be desirable to employ much thicker sheets.

I have illustrated two of the many possible ways of incorporating the sound-resisting metal sheet in partitions according to my invention in the accompanying drawings, in which:

Fig. 1 is a horizontal section of part of a folding partition with a sound-resisting sheet at the center;

Fig. 2 is a horizontal section of a similar partition showing a different position of the sound-resisting sheet;

Fig. 3 is a fragmentary section on a smaller scale of the two constructions shown in the previous figures, used as a permanent partition supported by a pilaster; and

Fig. 4 is a greatly enlarged section through a panel, showing various expedients for fastening the sound-resisting sheet in place.

The door or partition section shown in Fig. 1 has the usual frame consisting of rails and stiles, of which the stiles 5, 6 are illustrated. The frame members are made up of the usual substantial strips of wood 7 which extend longitudinally of the rail or stile. Within the frame there are one or more panels 8 in accordance with a standard practice. The strips of wood 7 in this construction are only one-half the thickness of the frame member, and are separated by a sheet 9 of sound-resisting metal. As is usual, the frame

members are veneered with sheets 10 of suitable veneer. In making up a rail or stile, a sheet of veneer 10 is laid face down on the work bench, the number of strips 7 required to make up a frame member of the desired size are assembled upon the sheet of veneer and glued together and to the sheet. The exposed surface is then coated with a suitable adhesive, such as glue, varnish, or shellac, and a sound-resisting metal sheet 9 is laid over the adhesive-coated surface so that it will be firmly held in place when the adhesive sets. The upper strips 7 with their veneer are then glued together and placed upon the sound-resisting sheet, the face of the strips 7 being previously coated with suitable adhesive. The end veneer strip 11 is then glued on and the frame member is ready for assembly with a panel to make up a partition section.

The panels may be made up, as shown in Fig. 1, of two plates 12 and 13, each composed of a number of plies glued together in any usual manner, and the sound-resisting sheet 14 may be secured between plates 12 and 13 by suitable adhesive, the edges 15 being lapped over one of the plates. Or the panel may be made up as shown in Fig. 4, in which the sound-resisting sheet 14 is backed on both sides with relatively thin sheets 16 of fibrous material, such as paper, box-board, or wood. In this construction the sound-resisting sheet, according to its weight and composition, may either be secured directly to the backing 16 by suitable adhesives or it may be secured thereto as by clinched nails 17, dowels 18, or rivets 19. The backing sheets 16 are in any event to be glued to multi-ply plates 12 and 13.

Whichever type of panel is employed is set in the previously prepared frame by the usual or any desired type of molding 20, and the partition section or door is then ready for erection. In the construction shown in Fig. 1, the section is used as a unit in a folding partition, being secured by hinges 21 to a cooperating section of similar construction. In this construction the end strips 22 of the meeting stiles of the doors extend the full thickness of the door between veneers.

In Fig. 2 I have shown the frame members 23 and 24 made up of strips 25 which extend the full thickness of the door and are covered by sheets of veneer 26. This necessitates placing of the sound-resisting sheet 28 between the veneer 26 and the strips 25, to both of which it is united in the same manner as in the other construction. The end 29 of the sound-resisting sheet 28 is preferably lapped around the inner end of the frame member. Panels of either type previously described are placed within the frame members as thus constructed, and secured by molding 20 to complete the construction.

In both the types of frame construction shown in Figs. 1 and 2, it will be observed that I provide a sheet of sound-resisting material which is co-extensive with the partition section, that is, sound striking any part of either side of the section will not find any opportunity to pass through the section without being interrupted and resisted by the metal sheet.

In Fig. 3 I have shown a permanent partition made up of sections 30 and 31, supported by a pilaster 32. The pilaster is made up in any usual manner, such as by the four longitudinal frame members 33 which are permanently secured together in any desired manner. The outside of the frame, as thus constructed, is covered preferably on three sides with a sheet of sound-resisting metal 34. The pilaster is then completed by the application of the finished, and if desired, ornamented strips 35. The partition section 30 on the right of the pilaster is constructed with the sound-resisting sheet as a central core, as shown in Fig. 1, while the section 31 on the left of the pilaster has the sound-resisting sheet 28 between one of the sheets of veneer and the strips 25, as shown in Fig. 2. In both cases, however, the sound-resisting sheet constitutes a core.

While I have shown and described the invention in connection with doors and partitions, I would have it understood that I do not consider its use thus restricted, since it may be employed with advantage in any part of a structure to which it is desired to give sound-insulating character. For example, my invention is particularly adapted for use in sub-dividing stores in which phonograph records or other musical merchandise is sold.

What I claim is:

1. A sound insulating structure comprising two layers of non-metallic material and a sound-resisting metal foil interposed between said layers.

2. A sound insulating structure comprising a supporting frame of suitable non-metallic material, and one or more thin sheets of metallic lead secured to said supporting frame.

3. A sound insulating structure comprising two layers of non-metallic material, and a thin sheet of pliant metal having a hardness of 3+ or less, Moh scale, interposed between said layers.

4. A sound insulating structure comprising two layers of fibrous material and a sound-resisting metal foil interposed between said layers and secured thereto.

5. A sound insulating structure comprising two layers of non-metallic material and a layer of relatively soft inelastic metal having a thickness of not more than 1/32 of an inch interposed between said layers of non-metallic material to retard the passage of sound.

6. A sound insulating partition comprising two layers of non-metallic material, and an internal thin sheet of relatively inelastic metal having a specific gravity of over 10 located between said layers of non-metallic material to deaden the passage of sound.

7. A sound insulating partition comprising a layer of wood, a foil of sound-resisting metal, a second layer of wood, and means for securing the layers of wood and said metal foil together.

8. A sound insulating partition comprising two layers of non-metallic material, and a thin sheet of relatively soft, pliant, dense and inelastic metal interposed between said layers of non-metallic material to retard the passage of sound.

9. A sound insulating structure comprising a frame, a panel secured within the frame, and a thin sheet of relatively dense inelastic metal substantially co-extensive with the panel and frame for retarding the passage of sound.

Signed at New York, New York, this 4th day of April, 1924.

WALTER E. DUNCANSON.