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FIBROUS GLASS PANEL

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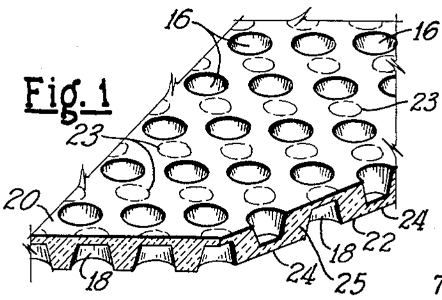

Fig. 1

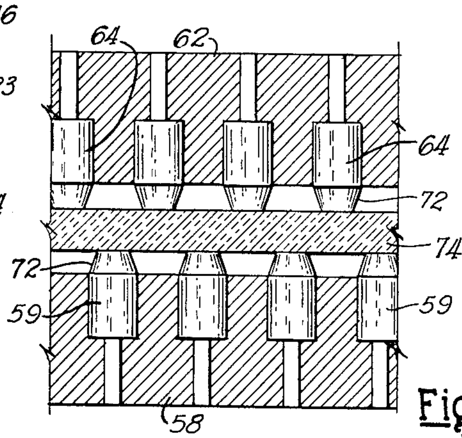

Fig. 5

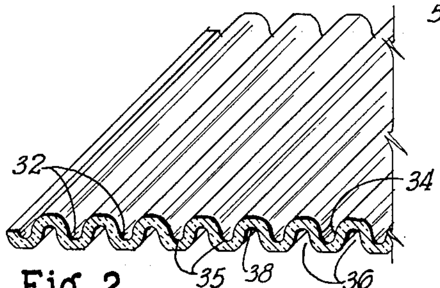

Fig. 2

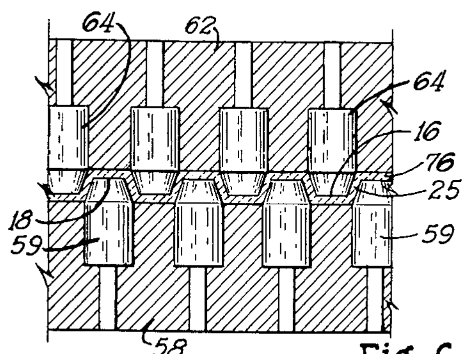

Fig. 6

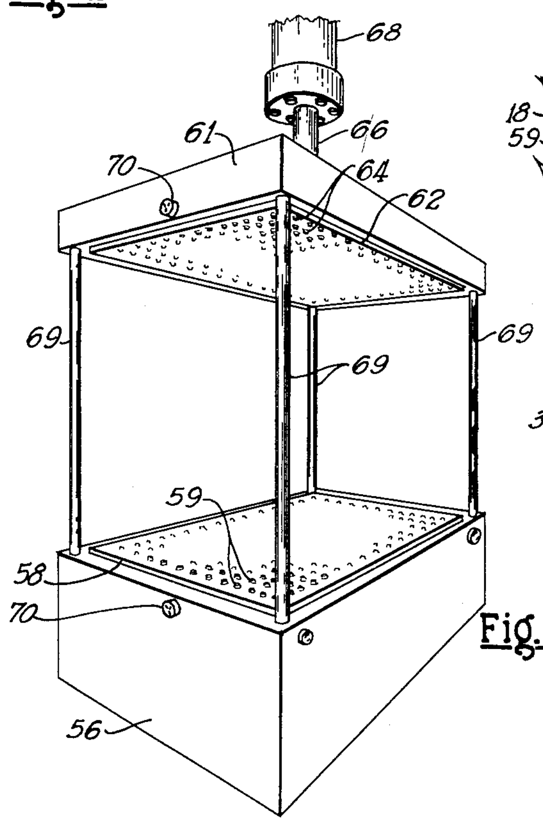

Fig. 4

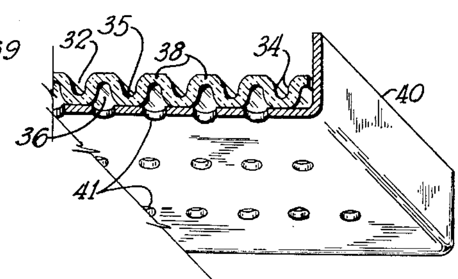

Fig. 3

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FIBROUS GLASS PANEL

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10 Claims. (Cl. 181—33)

This invention relates to a general purpose panel designed primarily for installation in abutting series as a wall and ceiling structure or covering, but also serviceable individually as a closure, partition or dunnage liner.

The panel of this invention may be utilized alone without a covering or be positioned beneath a top finishing film or sheet. Glass fibers or other comparable mineral fibers are the preferred basic material of the panels and such fibers are bonded in an air permeated, molded form to provide properties of impact cushioning as well as acoustical and thermal insulating.

Porous, low density bodies of fibrous glass are most effective in noise abatement due to the capacity of the myriad, minute communicating air cells in the maze of fibers to baffle and absorb sound waves. The tiny pockets of static air are also responsible for the high thermal insulating power of such fibrous masses.

Because of their inherent porosity and lightness, acoustical and thermal insulating panels of glass fibers are necessarily rather deficient in strength and rigidity. As a consequence, their installation is usually restricted to exposed areas where they are not apt to be submitted to physical abuse, or alternately to locations behind more sturdy, protective shields.

In line with this general practice, semi-rigid acoustical tile may be placed upon ceilings; insulating blankets are positioned between studdings or rafters and enclosed behind wall plaster or paneling; and pads of acoustical wool are placed within metal pans. Such pans are rigidly mounted and are perforated to permit sound waves to pass through and reach the shielded, sound absorbing, fibrous pads.

In consideration of the indicated limitations in prior products of this type it is a prime purpose of this invention to provide a unitary panel which not only has high acoustical and thermal insulating properties but also has a rugged structure able to cushion blows. A panel of this invention accordingly has no need of extra protective sheathing and may be employed where requirements are quite severe. Because of this impact resisting capacity the subject panels may be used for dunnage, as box liners, and elsewhere where cushioning is needed.

An additional object of the invention is to provide a fibrous glass panel which is smoothly surfaced with no loose fibers.

Another important purpose of this invention is the provision of a panel of glass fibers which is not seriously affected by fire, moisture and heat, and is light in weight and dimensionally stable.

A still further aim is to furnish a panel which is reasonable in cost and easy to install.

A further object is to provide a panel which is attractive in appearance due to a regular surface pattern.

The objects and advantages recited above, and others brought out hereafter in connection with the description of certain embodiments of the invention, are preferably attained through the provision of a molded panel with spaced depressions or valleys positioned uniformly on

the main, opposite planar faces, and compacted surface portions at high areas between the depressions, or valleys, constituting strong supporting and protective zones.

The more compacted portions are located at the base of and oppositely, through the thickness dimension of the panel, from the depressions in the opposite planar face of the panel. The panel also has porous sections for cushioning effect and the dampening and transmission of sound waves.

The body of the panel is shaped from a standard binder impregnated mat of fiber glass and has sufficient porosity throughout to make it effective in sound absorption and heat insulation.

The more compact zones in the outer surface portions serve through their greater sturdiness to protect the panel by receiving and resisting impingement or impacts, while the less compact internal regions and those bordering the indentation give more readily, and being resilient provide a cushioning effect to any pressures applied against the surfaces.

The preferred shape of the panel is one of waffle pattern in which the indentations have a circular outline. The features of the invention may also be incorporated in other shapes such as one corrugated in section. In such an alternate structure the indentations are of course elongated and the more compacted areas are in strips running along the crests of the corrugations.

The more compacted areas are those portions of the panel which receive the maximum compression in the molding operation and generally but not necessarily have less thickness than other portions of the panel. These denser surface zones besides being protective also serve in securing the panel in place. Being less porous they receive adhesive more effectively, and if metal fasteners are utilized, the latter may conveniently be driven through such zones from the bottom of the indentations on the open or outer side of the panel. The more compacted fibers in these zones naturally seize the sides of such fasteners more strongly.

The undulations, periodic indentations or other patterns derived from the shaping of the panel provide a rather unusual and decorative appearance.

The invention will be more fully explained hereafter with reference to the drawings, in which:

Figure 1 is a perspective view of a portion of a panel embodying a preferred form of the invention;

Figure 2 is a like view of a portion of a panel embodying an alternate form of the invention;

Figure 3 is an illustration, partly in section, of the panel of Figure 2 supported in a metal tray;

Figure 4 is a perspective view of a hot press adapted to mold a panel of the type depicted in Figure 1;

Figure 5 is an enlarged section of the mold portion of the press of Figure 4 with a blank of glass fibers in place to be compressed; and

Figure 6 is a similar view of the mold in closed position shaping the blank into a panel.

Referring to the drawings in more detail, a panel embodying this invention in a favored form is shown in Figure 1. Such a panel has a recommended overall thickness of one-quarter of an inch; and is of a waffle appearance having regularly spaced, inverted frusto-conical depressions **16** on its upper face and like upwardly extending indentations **18** on its lower side. The depressions and indentations may taper from an outer diameter of .375 of an inch to an inner base diameter of .239, and may be positioned on each side of the panel with centers one half inch apart.

The panel is a compressed, bonded pad of fibrous glass. From a standpoint of lightness, acoustical effectiveness, and thermal insulation, glass fibers of a diameter in the range between twelve and twenty-two hundred thousandths of an inch would serve most satisfactorily. Fibers of still smaller diameters would enhance some properties of the product, while fibers of larger diameters, up to more than seventy hundred thousandths, give quite adequate results and may be more practical for commercial purposes.

The size of the fibers is determined by the type and control of the forming equipment utilized. For creating a panel of this invention the fibers are collected at the forming station in blanket form with an uncured binder component dispersed therethrough. The binder must provide permanent, rigid ties between fibers at the cross over contact points and should not support combustion. A resin combination of melamine and phenol formaldehydes, in a proportion of roughly one to two, successfully meets these requirements. The amount of binder may run between nine and twenty-six percent by weight of the finished panel, depending upon the balance desired between strength and fire protection in the product.

The panel is so molded that the outermost upper and lower surface lands **20** and **22** of the main planar faces have undefined, circular areas **23** and **24** diametrically between the depressions **16** on the upper surface, and similarly between the indentations **18** on the lower surface. The location of the circular areas **23** and **24** is indicated in Figure 1. These areas are at the base of and are disposed oppositely to indentations on the other planar face. The denser areas in the preferred embodiment are compacted to a thickness of .0625 of an inch and to a density between sixteen and thirty-two pounds per cubic foot.

The partitioning portions **25** of the panel, disposed between the depressions **16** and the indentations **18** should have a much lower density, about one half of that of the compressed land areas, or between eight and sixteen pounds per cubic foot.

The hard areas **23** being in the high land portions of the panel meet and resist the disruptive force of any blows or impacts, while the porous walls **25** are absorptive of sound waves and resiliently give under any pressure applied against the surface of the panel. The arcing shape of the cavities on the under face of the panel also contributes strength and resilience to the structure.

The more solid panel areas **24** on the underside of the panel provide effective attaching and supporting portions for the mounting of the panel, to which adhesive may be applied or through which nails or staples may be driven.

While the waffle shape of panel has characteristics making it particularly valuable, other forms are serviceable without severe loss of function. For example, a molded pattern with a corrugated section such as shown in Figure 2 may possess characteristics similar to those of the waffle pattern. As there illustrated the panel is shaped with parallel valleys **32** on its upper surface. The sides **34** of these valleys consist of bonded glass fibers in a more porous, less compacted condition than the stock at the bottoms **35** of the valleys. These valley bottoms **35** constitute the peaks or ridges of the valleys **36** on the opposite face of the panel. Similarly the compacted bottoms **38** of the valleys **36** form the projecting ridges of the valleys **32** on the first mentioned face.

In this form of panel the harder ridges provide the blow resistant elements as well as the contacting areas by which the panel is adhered or secured by fasteners to an adjacent surface. The more porous and arcing sides of the valleys provide resilient backing support for the ridges.

The stock throughout the panel has thermal insulating and sound absorbing qualities, and the valleys provide space through which sound waves may travel to adjoining structures when the ridges are sealed with paint or adhesive.

This corrugated pattern is generally quite sturdy but is naturally bent fairly easily in lines parallel with the

corrugations. However, both disclosed designs of panels are rigidly self supporting upon a backing whether or not protected with a surface covering sheet.

These panels also may be employed loosely within metal acoustical trays such as the tray **40** shown in Figure 3. In such an arrangement the indentations or valleys in the panels are spaced in accord with the perforations **41** in the tray in order that the indentations or valleys are aligned vertically with and disposed over the imperforations. With this relationship, paint applied to the pan exterior does not reach and seal portions of the panel through the perforations.

In Figures 4, 5 and 6 the press for molding the preferred form of panel is illustrated. With reference first to Figure 4, the press is depicted as having a base **56** upon which the lower mold **58** is mounted. Ends of pins **59**, for forming the indentations **18** on the lower side of the panel, project upwardly from the main surface of the mold **58**.

Fixed to the upper platen **61** of the press is upper mold **62**. Pins **64**, similar to pins **59** but in staggered relation thereto, extend downwardly from the planar face of mold **62**. The press ram **66** is motivated by cylinder **68** to drive the upper platen **61** and upper mold **62** downwardly on guide rods **69**.

The upper and lower mold sections are heated to a temperature of around four hundred degrees Fahrenheit for setting the binder in the glass fiber stock. Steam may be utilized for this purpose but electrical elements are preferred for reasons of safety and the inclusion of such elements is indicated in Figure 4 by the electrical supply attachments **70**.

In the enlarged sectional view of Figure 5 the mold is shown approaching its closed position. As may be noted the pins **59** and **64** have protruding tapered ends **72** for impressing the depressions **16** and **18** in the blank **74** of the panel to be shaped. This blank **74** is previously cut to dimensions to fit the mold from a binder impregnated fibrous glass web of the desired specifications.

In Figure 6 the mold members **58** and **62** have been brought together compressing the blank **74** into waffle configuration. The pressure applied may be on the order of fifteen tons for a panel three feet long and two feet wide. The binder component generally requires three to five minutes to cure at the temperature of four hundred degrees Fahrenheit.

Being thus molded and resin bonded, the fibers of the formed panel **76** are smoothly held in place with no proclivity to shed. This contrasts with the loose pieces of fibers left in like porous bodies of fibrous glass when punched or cut to shape.

As may be concluded from the preceding, panels of this invention are decorative due to the regular contoured patterns with high lighted lands and shadowed valleys. The bonded fibrous glass stock is thermal insulating and sound absorbing and the more porous portions coact with the depressions for the transmission of sound waves to any backing structure.

The panels are sturdy and self supporting due to the densification on facing areas and the arcing internal structure. The latter characteristic cooperates with the resilience of the more porous regions in cushioning exteriorly applied blows of forces.

The panels are inexpensive as a minimum of standard blanket stock is utilized and they are fashioned in a single molding operation. The overall thickness is greater than would be that of a flat panel of the same material and same average density due to the undulations and the limited zones of higher compactness.

In regard to materials involved, it should be acknowledged that various other fibrous glass bonding agents are well known and would be quite equally effective. These include epoxy, urea and polyester resins. Also it is recognized that mineral fibers are similar though usually inferior in properties to glass fibers and may be substituted therefor without too severe an effect upon the resulting products. Likewise, changes in densities, shapes and dimensions may, of course, be made without departing from the invention.

Accordingly, it is desired that the accompanying claims be interpreted sufficiently broadly to encompass obvious alternate materials and natural modifications in the panels as herein described.

I claim:

1. A bonded fibrous glass panel of sound dampening and thermal insulating properties shaped with surface configurations forming regularly spaced depressions and intermediate outstanding lands, the outstanding lands including regularly spaced areas containing fibrous glass compacted to a comparatively greater density than the balance of the panel.

2. A bonded fibrous glass panel according to claim 1 in which the density of the regularly spaced areas is between sixteen and thirty-twe pounds per cubic foot.

3. A bonded fibrous glass panel according to claim 1 having an overall thickness of approximately one quarter of an inch and in which the compacted areas are approximately one sixteenth of an inch thick.

4. A molded panel of bonded glass fibers having acoustical and thermal insulating properties and shaped with similar, spaced depressions on the opposite, generally planar faces, and having blow resisting zones in which the glass fibers are compacted to a greater degree than in the balance of the panel, said zones being disposed in the most outstanding portions of the planar faces and located oppositely from depressions on the other planar face.

5. A molded panel of bonded glass fibers according to claim 4 in which the depressions are inwardly tapered and of frusto-conical outline.

6. A molded panel of bonded glass fibers according to claim 4 in which the panel is corrugated in section.

7. A bonded fibrous glass panel of acoustical and thermal insulating properties having comparatively high density outstanding lands of a semi-rigid nature on the main planar faces of the panel and compressible, comparatively low density, resilient internal portions, whereby the semi-rigid lands withstand direct blows and the internal portions provide a cushioning of such blows.

8. A porous, bonded fibrous glass panel having fairly hard lands on the main planar faces and depressions between the lands of arc shaped section, the portions of the panel bordering the depressions being more porous and resilient than the remainder of the panel.

9. A porous, bonded fibrous glass panel according to claim 8 in which the fibrous glass is bonded by a resin binder amounting from nine to twenty-six percent by weight of the panel.

10. A bonded fibrous glass panel having spacedly arrayed depressions on the opposite, generally planar surfaces of the panel, the depressions on one surface being laterally offset from the depressions on the other surface, and all of said depressions being confined between the planar surfaces of the panel, and areas of greater density than the balance of the panel on each planar surface opposite to depressions on the other planar surface.

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