

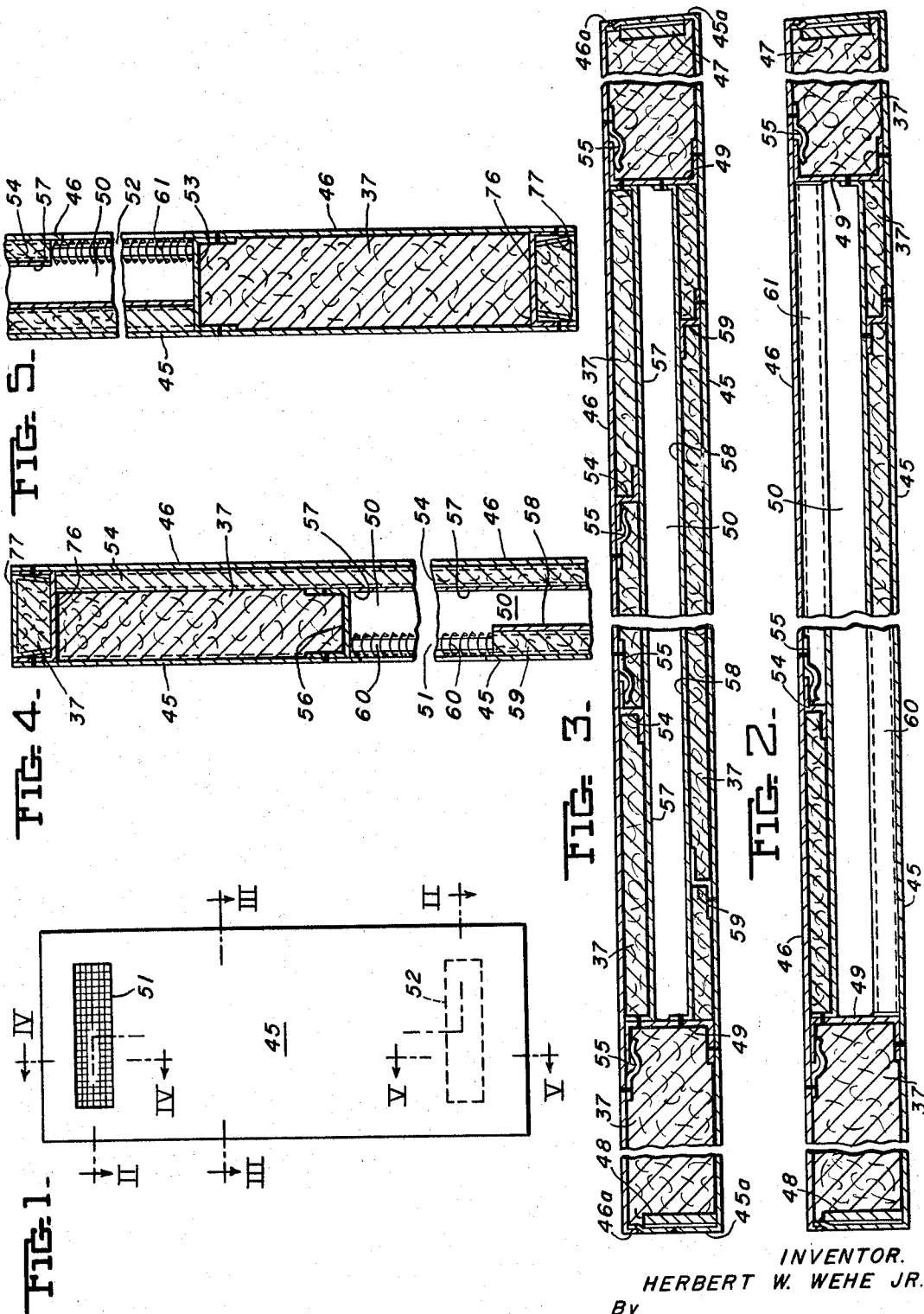
Jan. 3, 1967

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3,295,273

DOOR AND PANEL CONSTRUCTION

Original Filed June 7, 1963



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3,295,273

DOOR AND PANEL CONSTRUCTION

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Original application June 7, 1963, Ser. No. 286,289, now Patent No. 3,273,297, dated Sept. 20, 1966. Divided and this application Sept. 27, 1965, Ser. No. 495,754
2 Claims. (Cl. 52-145)

This application is a division of my copending application Serial No. 286,289, filed June 7, 1963, now Patent No. 3,273,297.

The present invention relates generally to partition and door panels employed in the division of floor space in commercial buildings to provide separated work areas. More specifically, the invention is concerned with door and partition panels constructed to suppress passage of noise therethrough, particularly those noises within the sound frequencies of 125 c.p.s. and 1400 c.p.s. These latter sound frequencies are within normal conversation and business machine noises.

Although industry has successfully employed noise reducing single and double doors and partitions of considerable thickness, up to 6 inches and more, relatively little success has heretofore been had with noise reducing doors and partitions employed in dividing floor areas in office and other commercial buildings. These latter doors and partitions are constructed so as to be frequently rearranged to suit changing needs and, of necessity, must be both relatively light in weight and readily set up and removed. Thus the invention herein disclosed is concerned with door and partition panels in the area of 1 3/4 inches thick.

Although the same panel construction may be employed in both doors and partitions, the latter may be readily sealed to floors and walls. Doors being intended for frequent movement cannot fit tightly within their frames and for maximum efficiencies must be provided with seals about their periphery which permit door movement but restrict passage of sound.

As is well known in the science of noise control, sound volume is measured in decibels and frequency is measured in cycles per second. Thus in rating a panel for noise suppression a graph is prepared comparing decibels with cycles per second. Conversation and business machine noises are generally audible within the frequencies of 125 c.p.s. and 1400 c.p.s. Conversation noises outside this range may be heard but are not understandable. Since sound transmission loss, at a given sound frequency is measured in decibels which are based upon a logarithmic scale, a few decibels of sound transmission loss represents a considerable percentage of noise control. For example, a partition having an A.S.T.M., Sound Transmission Class, rating of 40 decibels transmits 1/10,000 of the incident sound, a 43 decibel Class Rating transmits 1/20,000 of the incident sound, a 46 decibel Class Rating transmits 1/40,000 of the incident sound, etc. Otherwise stated, for every three decibel rise in sound transmission loss the efficiency of the panel to suppress passage of sound therethrough is doubled. In the case of a movable panel, as a door, the clearance between the periphery of the door and the adjacent door frame opening must be sealed to prevent unrestricted passage of sound.

One object of the invention is to provide a metal door or partition panel of low cost construction having improved restriction of sound passage therethrough.

A further object of the invention is to provide an improved metal door or partition panel resistant to passage of sound therethrough and providing passage of ventilation air therethrough.

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A still further object of the invention is to provide a metal door or partition panel having high sound transmission loss and which is fire resistant.

These and other objects of the invention will be made apparent from the following description and the drawing forming a part thereof, wherein:

FIG. 1 shows in front elevation a door panel providing for ventilation and restriction of passage of sound through the panel;

FIG. 2 shows a transverse section through FIG. 1 taken on lines II—II;

FIG. 3 shows a transverse section taken on lines III—III of FIG. 1;

FIG. 4 shows a vertical section taken on lines IV—IV of FIG. 1;

FIG. 5 shows a section taken on lines V—V of FIG. 1.

Referring now to FIGS. 1 to 5 of the drawing, a further modification of the door panel is shown providing for ventilation through the door panel and sound attenuation. Here the front and back skin plates 45 and 46 are provided with opposing connected flanges 45a and 46a at each vertical edge and each vertical edge is provided with a reinforcing plate 47 and 48. Two vertically extending stiffening channels 49 are disposed between the skin plates 45 and 46 and extend to adjacent the top and bottom edges thereof defining the width of a ventilating louver throat 50. Adjacent the top of the panel in skin plate 45 and adjacent the bottom of the panel in skin plate 46 are rectangular louver openings 51 and 52 extending transversely between stiffening channels 49. Extending transversely between said channels 49 and beneath the louver opening 52 is a channel shaped member 53 having its opposite flanges connected to the skin plates 45, 46 and defining the bottom of the louver throat 50. Extending vertically from above louver opening 52 in skin plate 46 to the vertical height of stiffeners 49 are transversely spaced stiffeners 54 each having one flange thereof abutting the skin plate 46 and the other flange spaced inwardly therefrom. Each said stiffener 54 flanges abutting the skin plate 46 being held in engagement therewith by spaced spring clips 55, each clip having one end welded to the skin plate and the opposite end resiliently engaging the stiffener flange. The top of the louver throat 50 is defined by the web of a channel member 56 whose upturned flanges are secured to the skin plates 45, and inner flanges of stiffeners 54. The ends of channel 56 abut and are secured to the webs of stiffeners 49. Secured to stiffeners 54 inwardly spaced flanges is an expanded metal plate 57 forming the back wall of louver throat 50. Plate 57 extends vertically from the top of the louver opening 52 to the web of channel 56 and transversely between stiffeners 49. Upon the inner face of skin plate 45 and extending upwardly from channel 53 to the bottom edge of the louver opening 51 are transversely spaced channel stiffeners 59 having one flange abutting and welded to the skin plate 45 and the opposite flange disposed inwardly therefrom. Disposed upon the latter flanges to form the front wall of the louver throat is an expanded metal plate 58 having its vertical edges secured to the webs of the stiffeners 49 and extending above the channel 53 to the bottom of louver opening 51. The louver openings 51 and 52 are covered by louvers 60 and 61 suitably secured therein. Preferably the plates 57 and 58 may be of flattened expanded metal having 60 percent open area, as shown. The louvers 60 and 61 may be of grill type having 80 percent open area as shown.

The hereinbefore described door constructions have as their basic purpose to restrict passage of sound therethrough. In the art this is referred to as structures having large or high "sound transmission loss." Such doors find uses in not only commercial and industrial structures,

but are also highly desirable in public buildings, apartment buildings, hospitals, residences and, in fact, any structure where noise reduction is a desirable feature. The details of construction have been discussed in relation to door panels, however, the same structures are also desirable as fixed panels or partitions dividing a given floor area into rooms.

It is acknowledged that door and partition panels having a high sound transmission loss are not new in the art, especially in industrial buildings and similar establishments. Such prior panel constructions were both bulky, heavy and relatively expensive. Maximum results have previously been obtained by use of multiple doors and panels, also thick concrete and concrete block walls. However, door and wall panels having high "sound transmission loss" for use in office buildings, hospitals, apartments, etc. are desired to be of minimum thickness and of reasonable cost.

The panel constructions hereinbefore described and the results obtained therefrom were based upon a maximum thickness of about 1 3/4 inches. The basic structure is of metal and the interior contains materials generally referred to as non-metallic. The panels are described as having front and rear skin plates, but these designations are solely in reference to the drawing since sound, to be excluded, may impinge upon either face of the panel. For purposes of both economy and convenience the metal portions of the door are desirably light in weight. For purposes of the drawings the metal members have been shown enlarged. By way of example and not intending any limitations upon the inventions, the panel metal skin plates and the metal stiffeners therefor may be of 16, 18 and 20 gauge metal.

I claim:

1. In a metal sound attenuating door panel providing ventilation between opposite faces thereof, in combination

- (a) spaced front and back skin plates having their horizontal and vertical margins connected to provide an integral structure,
- (b) a pair of transversely spaced vertical extending members disposed between the said skin plates and defining between them the width of a louvre throat,
- (c) a member extending transversely between said vertically extending members adjacent the bottom margin of the panel defining the bottom of said louvre throat,
- (d) louvre openings through the front skin plate adjacent the top of the door and through the rear skin plate adjacent the bottom of the door connecting with said louvre throat,
- (e) plate-like members extending the width of the louvre throat in inwardly spaced relation to each skin plate defining the thickness of the louvre throat and secured to the first said vertical members,
- (f) the plate-like member adjacent the front skin plate terminating at the bottom of the louvre opening therein and the plate-like member adjacent the rear skin plate extending from the top of the louvre opening therein to the top of the louvre throat,
- (g) stiffening members extending vertically between the front skin plate and adjacent plate-like member from the bottom of the louvre throat to the bottom of the skin plate louvre opening,

- (h) stiffening members extending vertically between the rear skin plate and adjacent plate-like member from the top of the louvre opening in the rear skin plate to adjacent the top of said panel,
 - (i) a member extending transversely of the door between said first-named members defining the width of the throat and closing the top thereof, said transversely extending member being attached to the front skin plate and the adjacent stiffeners for the rear skin plate,
 - (j) louvre members disposed within the plane of the louvre openings in each skin plate, and
 - (k) non-continuous sound attenuating material filling the spaces between said skin plates and except within the louvre throat.
2. In a metal sound attenuating door panel construction in combination,
- (a) vertically extending spaced front and rear skin plates having their adjacent vertical edges connected to provide an open ended hollow metal structure,
 - (b) vertically disposed stiffening members spaced transversely between the vertical marginal edges of said skin plates with each said stiffening member secured to the inner faces of each of said skin plates to define between them a vertically disposed ventilating louvre throat,
 - (c) a member extending transversely of said skin plates adjacent each horizontal edge of said panel and between said vertically disposed stiffening members defining the vertical margins of said ventilating louvre throat,
 - (d) an opening through each said skin plate adjacent said transversely extending members connecting said louvre throat with the opposite faces of said door panel,
 - (e) perforated plate members in spaced relation to said skin plates defining opposite walls of said louvre throat between said skin plate openings and having their vertical marginal edges attached to said vertical stiffening members,
 - (f) louvre members closing said skin plate louvre openings,
 - (g) a porous non-continuous sound attenuating material filling the spaces between said skin plates and stiffening members and between said skin plates and perforated louvre lining plates and,
 - (h) closure members disposed between and secured to said skin plates for enclosing said porous material and defining the top and bottom horizontal edges of said door panel.

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