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D. L. ZINN

3,611,653

SOUND ATTENUATION WALL PARTITION

Filed April 13, 1970

2 Sheets-Sheet 1

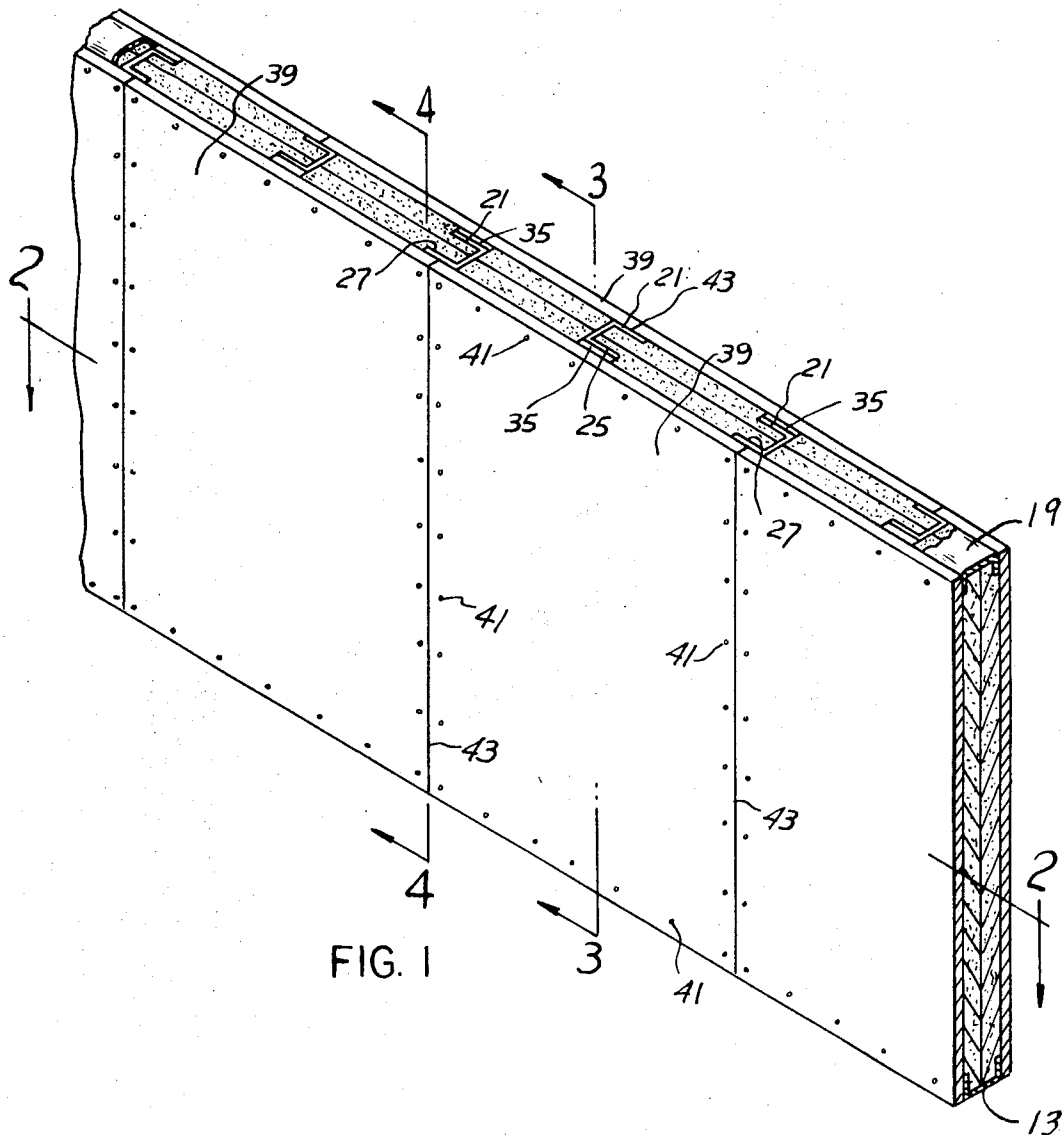


FIG. 1

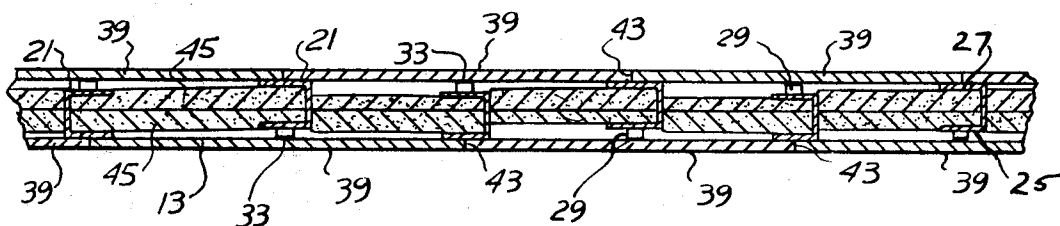


FIG. 2

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2 Sheets-Sheet 2

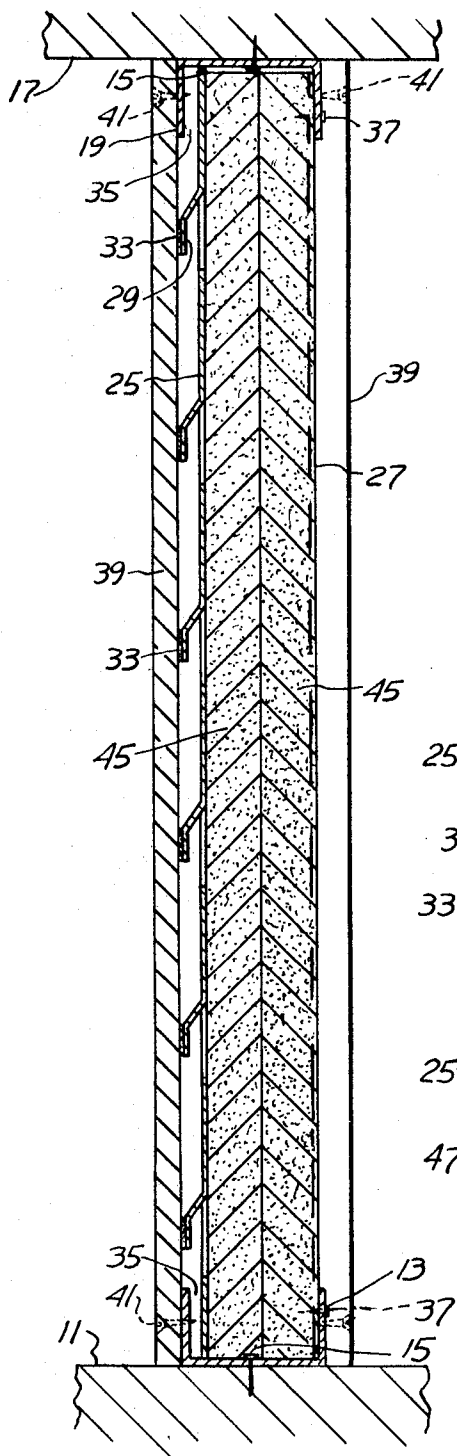


FIG. 3

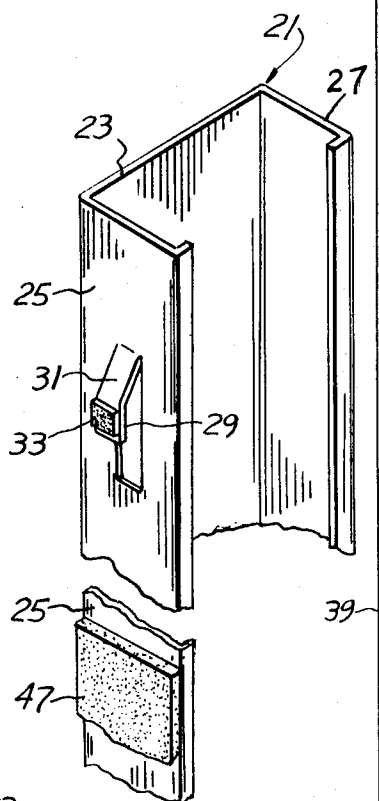


FIG. 5

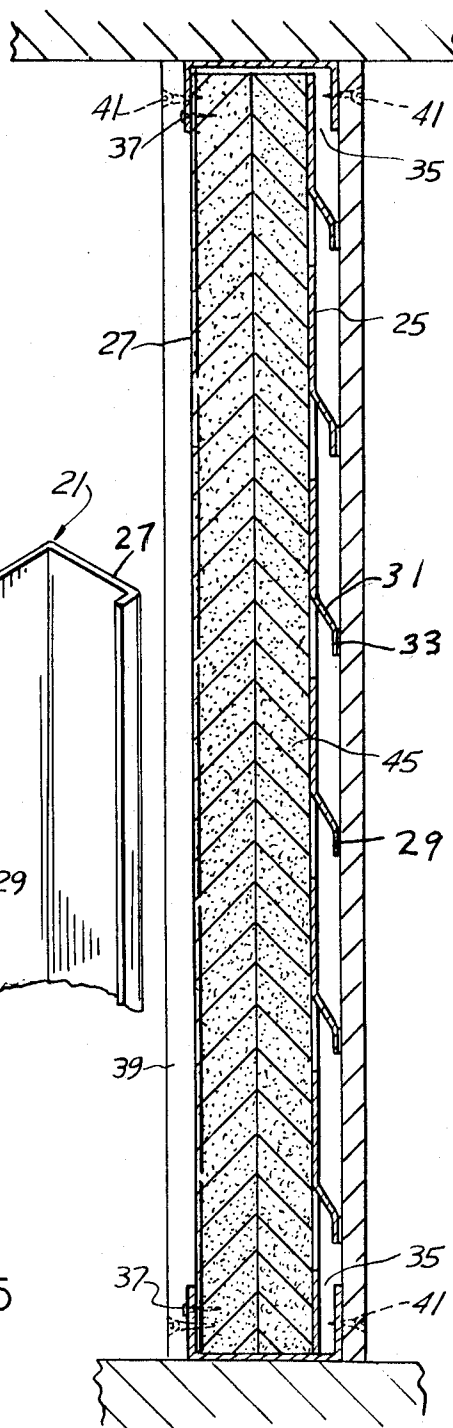


FIG. 4

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SOUND ATTENUATION WALL PARTITION
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10 Claims

ABSTRACT OF THE DISCLOSURE

A sound attenuation wall partition for use between a building floor and ceiling which includes between opposed floor and ceiling channels, a series of spaced studs interposed between the channels, the studs each being U-shaped in cross-section with a plane flange and a stop flange, the latter including a series of longitudinally spaced yieldable tabs, the studs being so arranged that the plane flanges, the stop flanges of adjacent studs are alternately arranged, with the plane flanges bearing against and secured to the adjacent wall of a channel and the respective stop flanges laterally staggered and spaced from the adjacent wall of said channels, and opposed wallboards applied to opposite sides of said studs, the outer upright edges of each wallboard spanning and secured to the plane flanges of a pair of studs, and the intermediate upright portion of said wallboard yieldably bearing against the tabs of the intermediate stud, opposing wallboards being staggered.

BACKGROUND OF INVENTION

Heretofore, in the construction of wall partitions between building floor and ceiling there has long existed the problem of sound transmission therethrough between adjacent rooms on opposite sides of such partition. Various efforts have been made heretofore in order to solve this sound transmission problem and to reduce said sound transmission.

Various efforts have been made in the use of sound deadeners between the wallboards and in specific manners of mounting the said wallboards with respect to the supporting studs so as to attenuate sound transmission there-through.

The difficulty with most efforts in this respect has been that once the opposing wallboards have been affixed in one manner or another to the supporting upright studs that there has been defined a relatively rigid relationship which seems to facilitate sound transmission.

The problem has, therefore, long existed of providing building wall partitions which will have the characteristics of greatly reducing and minimizing the transmission of sound therethrough at the same time with an inexpensive construction.

BRIEF DESCRIPTION OF THE INVENTION

It is an object of the present invention to provide an improved sound attenuation wall partition wherein the mounting of the wallboards to the studs forming a part thereof approach the theoretical suspension of said wallboards just as if no studs existed.

It is another object to provide an improved sound attenuation wall partition wherein sound transmission therethrough has been reduced materially and which is brought about by an improved manner of mounting the wallboards in an upright position with respect to a series of longitudinally spaced studs interposed between floor and ceiling channels and secured in a novel manner.

It is another object to provide an improved sound attenuation wall partition wherein wallboards in alignment are arranged upon opposite sides of a row of spaced studs and wherein the wallboards on opposite sides of said studs are staggered with respect to each other and the outer

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upright edges of each individual wallboard is fixedly secured to a fixed flange forming a part of the stud and the top and bottom edges thereof are fixedly secured to the adjacent floor and ceiling, channel and the central portion of each wallboard throughout its height loosely and yieldably bears against the resilient, non-fixed support tabs forming a part of an intermediate stud to thus provide yieldable mountings for the said wallboards.

It is another object to provide an improved building stud construction for such a wall partition wherein the stud is of substantially U-shape in cross-section and which includes a plane flange and a wallboard yieldable stop flange, the latter having formed therefrom a series of longitudinally spaced yieldable wallboard engaging and supporting resilient tabs.

It is another object to provide a wall partition that represents the most economical way yet devised for construction of a partition of a sound transmission class equal to that required for an adequate building party wall.

It is another object to provide for the proper use of a stud so made as to allow one to build staggered resilience into the partition. It is this staggered resilience which, in effect, weaves a blanket of resilience around every stud and makes the stud (which normally affects adversely the sound attenuation characteristics of the partition) practically disappears as affecting the partitions sound attenuation characteristics.

However, the stud shown and tested is only one form of stud. If one took ordinary metal studs and adhered ½ inch thick sponge rubber pads to one side of each stud, one foot on center, or provided a sponge rubber strip and erected such a partition as was done, the same test results would be achieved.

The point is that while resilient walls have been erected with resilience on one side and also two sides, no wall prior to the present invention has been erected using resiliency in a staggered manner as herein; that is, resilience on both sides but alternating from one side to the other from stud to stud. It appears from the test results that I have achieved a sound transmission class of 52 in a partition weighing only 5.35 pounds per square foot. This staggered resiliency is far superior for sound attenuation purposes to any other manner of applying resiliency to a partition. It will be noted that a seven inch thick concrete wall is in a sound transmission class of 50—52.

It is an object to provide that each stud be secured on only one side to the floor and ceiling channels. This has materially helped the sound attenuation characteristics of the partition by making the stud slightly more resilient than it would otherwise have been.

It is another object to provide for some partition an adhesive on the tabs to adhere the tabs to the paper of the gypsum board or other covering.

It is another object to employ between the wallboards any compressible sound absorbing material such as rock wool, fiber glass or any other compressible sound absorbing material.

It is contemplated that the partition construction could be of substances other than gypsum board, an example being wood paneling the back of which is coated with an adhesive damping compound, paper covered.

These and other objects will be seen from the following specification and claims in conjunction with the appended drawings.

THE DRAWINGS

FIG. 1 is a fragmentary perspective view of a portion of the present sound attenuation wall partition.

FIG. 2 is a fragmentary section taken in the direction of arrows 2—2 of FIG. 1.

FIG. 3 is a fragmentary section taken in the direction of arrows 3—3 of FIG. 1.

FIG. 4 is a fragmentary section taken in the direction of arrows 4—4 of FIG. 1.

FIG. 5 is a fragmentary perspective view of the present improved stud construction for said wall partition.

DETAILED DESCRIPTION

Referring to the drawings, an improved form of sound attenuation wall partition is shown in FIG. 1, and as indicated in FIGS. 3 and 4 is adapted for use between a building floor 11 and ceiling 17.

The continuous floor channel 13, of U-shape in cross-section, FIG. 3, is mounted upon said floor and is secured thereto by a series of spaced fasteners 15. An opposed downwardly extending ceiling channel 19 overlies said floor channel and is similarly secured to said ceiling by a series of fasteners 15.

While the floor and ceiling channels have been shown as U-shaped, it is contemplated as an equivalent construction, that the respective channels could be made up of opposed L-shaped members which when assembled to the respective floor and ceiling would nevertheless provide essentially the opposed U-shaped channels shown in FIG. 3.

A series of upright longitudinally spaced studs 21 of channel form, are interposed between and project into the respective floor and ceiling channels 13 and 19 and are suitably secured thereto as hereafter set forth.

Each of the studs includes central elongated web 23 which terminates on one side in a stop flange 25 and on its opposite side in a plane flange 27 as fragmentarily shown in FIG. 5.

A series of longitudinally spaced tabs 29 are struck out from stop flange 25 as further shown in FIGS. 3 and 4, said tabs being substantially coplanar and resiliently arranged with respect to stop flange 25, by the intermediate acute angularly arranged connectors 31 which form a part of said stop flange.

Upon each of the tabs 29 is applied a cushion member 33 which in the illustrative embodiment is an adhesive material but which could be constructed as equivalent of sponge rubber or of a porous plastic or the like, to serve as a cushion spacer made of either rubber or plastic or a suitable adhesive material. Under many conditions this cushion member may be omitted. The adhesive used is a commercial contact bond adhesive readily available on the market.

The respective upright studs 21 as best shown in FIG. 2 are alternately arranged so that the plane flanges and stop flanges of adjacent studs are alternately arranged in substantial alignment though laterally displaced as best shown in FIG. 2, respectively.

The plane flanges 27 of each stud bear against and are secured respectively to the side of the adjacent floor and ceiling channel as by fasteners 37. At the same time the corresponding stop flange is spaced from corresponding side of the adjacent floor and ceiling channel, said space being designated by the numeral 35, FIGS. 3 and 4.

Thus, the respective studs are laterally staggered with respect to the floor and ceiling channels so that in all cases the plane flange bears against and is fixedly secured to the side wall of the corresponding floor and ceiling channel whereas the stop flange of each stud is materially spaced from the corresponding side wall of the corresponding floor and ceiling channel and is not secured thereto.

Preferably, gypsum wallboard generally designated at 39, is applied to opposite sides of the respective studs with the wallboards on each side being in alignment and in engagement with each other at the upright vertical edges throughout the length of the partition such as is shown fragmentarily in FIG. 1 and in FIG. 2.

The wallboard is of a conventional construction essentially of a gypsum composition covered with a suitable paper, the wallboards on each side of the respective studs

throughout the length of the partition being in engagement along the registry line 43, FIG. 1 which corresponds to the central portion of the particular plane flange to which the wallboards at the respective edges are fixedly secured.

It is noted that each wallboard spans three studs 21 with the outer upright edges of each wallboard fixedly secured to the corresponding plane flange of the outer of said three studs as by a series of fasteners 41.

At the same time the central portion of each wallboard 39 throughout its height bears against the corresponding series of spaced tabs 29.

In the illustrative embodiment a suitable amount of adhesive is provided over each of the respective tabs 29 so as to cooperatively bear upon interior wall portions of the corresponding wallboard as best shown in FIGS. 2, 3 and 4.

It is noted particularly with respect to FIGS. 1 and 2 that the wallboards 39 upon opposite sides of the partition at their respective meeting edges 43 are staggered.

Thus, meeting line 43 between a pair of wallboards on one side of the partition is in registry with corresponding central portion of an opposed wallboard. Thus, the wallboards upon opposite sides of the partition are staggered whereby wallboard on one side of the partition spans three adjacent studs and the opposing but staggered wallboard on the opposite side of the partition spans two of the said three studs.

By this construction it is seen that the outer upright edges of each wallboard are fixedly secured to the plane flanges of the corresponding stud whereas the upright central portion of each wallboard yieldingly bears against the corresponding resilient tabs 29—33 of the intermediate stud.

Thus the individual wallboards affixed at their upright edges, are yieldably bearing against the respective central stud and are adapted to flex inwardly and outwardly in the operation of the present sound attenuation panel. The wallboards along their top and bottom edges are fixedly secured to the floor and ceiling channels by fasteners 41.

Suitable sound absorbing pads or blankets 45, of which a pair are shown, FIGS. 3 and 4, are interposed in slight compression between the assembled and opposed wallboards 39 and have a very definite function in the final operation of the present sound attenuation panel. While the present panel as constructed is effective as a sound attenuation panel even without the second absorbing pads interposed, it is contemplated that an improved sound attenuation panel is provided when such pads are provided.

It has been found in operation that any inward flexing of the corresponding wallboards due to the transmission of sound vibrations therethrough causes a frictional rubbing action of the wallboard with respect to the sound absorbing pad. This rubbing action transforms sound energy to heat, thus, dissipating the sound and provides an improved sound attenuation wall partition. Also, the pad absorbs sound in the same fashion.

Fiber glass strips are shown in the illustrative embodiment, nine feet long for example, and thus extend between the floor and ceiling and are interposed in slight compression between the wallboards when assembled.

The adhesive layer may remain tacky so that there is adhesion between the respective tab and adjacent wallboard. This is not necessary to the functioning of the present sound attenuation partition. The resilient backing for the entire wallboard throughout its height is achieved by the tabs 29 providing a yielding relationship between the wallboard and the supporting stud.

The actual performance of the present sound attenuation wall partition comes close to possible theoretical performance since the provision of the yieldable mounting of the wallboards seems to function as if no studs were present. The studs are actually present in the illustrative embodiment, however, and have such yieldable relation-

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ship between the corresponding wallboards that the objective is achieved, namely, great reduction of sound transmission through the said wall partitions such as to screen out a large percentage of sound vibrations which might otherwise be transmitted therethrough.

It is contemplated that the resilient tabs 29 could be replaced by a strip 47 of resilient material adhered along the face of stop flange 25, or as a series of spaced resilient blades, as fragmentarily shown in FIG. 5. The strip 47 or blocks may be of rubber or sponge plastic material or the like. Such strip or blocks 47 would be equivalent to the yieldable tabs 29-31, and function similarly.

Having described my invention, reference should now be had to the following claims.

I claim:

1. A sound attenuation wall partition adapted for use between a building floor and ceiling comprising:

opposed floor and ceiling channels secured respectively to and along said floor and ceiling;

a series of upright longitudinally spaced studs of channel form interposed between and projected into said channels;

each stud including a transverse web terminating in a plane flange on one side and a panel stop flange on its other side having formed and projecting therefrom a series of longitudinally spaced coplanar yieldable tabs, said tabs being spaced outwardly of and parallel to said stop flange;

said studs being arranged so that the plane flanges and stop flanges of adjacent studs are alternately arranged in substantial alignment, with the plane flanges of each stud bearing against and secured respectively to the side of the adjacent floor and ceiling channel; and with the corresponding stop flange spaced from the side of the adjacent floor and ceiling channel;

said studs being thus laterally staggered with respect to said floor and ceiling channels;

and upright spaced opposed wall boards interposed between said floor and ceiling channels and at their top and bottom edges secured to the opposite sides of said channels; each wall board spanning three adjacent studs;

and fastening means interconnecting the upright outer edges of each wall board with the plane flanges of the outer studs, and with the central portion of each wallboard throughout its height yieldingly bearing against the respective tabs on the intermediate stud stop flange;

the opposing wallboards being longitudinally staggered whereby the outer upright edges of one wallboard spans three adjacent studs which include two of the opposite wallboard supporting studs;

and the edge of a wallboard on one side of said channel being in registry with the channel portion of the wallboard on the opposite side of the said channels.

2. In the sound attenuation wall partition of claim 1, a spacer mounted on each tab interposed between said tab and wallboard.

3. In the sound attenuation wall partition of claim 1, a flexible, resilient spacer mounted on each tab, each interposed between said tab and wallboard.

4. In the sound attenuation wall partition of claim 1, an adhesive layer on each tab between said tab and corresponding wallboard.

5. In the sound attenuation wall partition of claim 1, a sound absorbing resilient pad snugly interposed in compression between opposing wallboards, extending between said floor and ceiling channels and filling the space therebetween.

6. In the sound attenuation wall partition of claim 1, an adhesive layer on said tabs between said tabs and corresponding wallboards;

and a sound absorbing resilient pad extending between said floor and ceiling channels and snugly interposed in compression between opposing wallboard, filling the space therebetween;

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inward flexing of said wallboards due to transmission of vibrations, causing a frictional rubbing action of the wallboard and resilient pad transforming sound energy into heat and, thus, dissipating sound.

7. In the sound attenuation partition of claim 1, the wallboards on each side of the studs being edge to edge, the corresponding edges of an adjacent pair of wallboards bearing against and secured to a single stud plain flange.

8. A sound attenuation wall partition adapted for use between a building floor and ceiling comprising:

opposed floor and ceiling channels secured respectively to and along said floor and ceiling;

a series of upright longitudinally spaced studs of channel form interposed between and projected into said channels;

each stud including a transverse web terminating in a plane flange on one side and a wallboard stop flange on its other side;

a strip of flexible resilient material secured to and along said stop flange;

said studs being arranged so that the plane flanges and stop flanges of adjacent studs are alternately arranged in substantial alignment, with the plane flanges of each stud bearing against and secured respectively to the side of the adjacent floor and ceiling channel; and with the corresponding stop flange spaced from the side of the adjacent floor and ceiling channel;

said studs being thus laterally staggered with respect to said floor and ceiling channels and at their top and bottom edges secured to the opposite sides of said channels; each wallboard spanning three adjacent studs;

said fastening means interconnecting the upright outer edges of each wallboard with the plane flanges of the outer studs, and with the central portion of each wallboard throughout its height yieldingly bearing against the resilient strip on the intermediate stud stop flange;

the opposing wallboards being longitudinally staggered whereby the outer upright edges of one wallboard spans three adjacent studs which include two of the opposite wallboard supporting studs;

and the edge of a wallboard on one side of said channels being in registry with the central portion of the wallboard on the opposite side of the said channels.

9. In the sound attenuation wall partition of claim 1, a sound absorbing resilient pad snugly interposed in compression between opposing wallboards, extending between said floor and ceiling channels and filling the space therebetween;

inward flexing of said wallboards due to transmission of vibrations, causing a frictional rubbing action of the wallboard and resilient pad transforming sound energy into heat and, thus, dissipating sound.

10. A sound attenuation wall partition adapted for use between a building floor and ceiling comprising:

opposed floor and ceiling channels secured respectively to and along said floor and ceiling;

a series of upright longitudinally spaced studs of channel form interposed between and projected into said channels;

each stud including a transverse web terminating in a plane flange on one side and a panel stop flange on its other side having formed and projecting therefrom a series of longitudinally spaced coplanar yieldable tabs, said tabs being spaced outwardly of and parallel to said stop flange;

said studs being arranged so that the plane flanges and stop flanges of adjacent studs are alternately arranged in substantial alignment, with the plane flanges of each stud bearing against and secured respectively to the side of the adjacent floor and ceiling channel; and with the corresponding stop flange spaced from the side of the adjacent floor and ceiling channel;

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said studs being thus laterally staggered with respect to
said floor and ceiling channels;
upright spaced opposed wallboards spanning at least
three adjacent studs;
and fastening means interconnecting spaced portions 5
of each wallboard to the plane flanges of the outer
of said three studs and with intermediate portions
of said wallboard throughout its height yieldably
bearing against the respective tabs of the intermediate
stud stop flange.

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