May 27, 1969 N. NELSSON 3,445,975

SOUND CONTROL PARTITION WITH RESILIENT SUPPORT STUDS

Filed March 18, 1966

Fig. 1

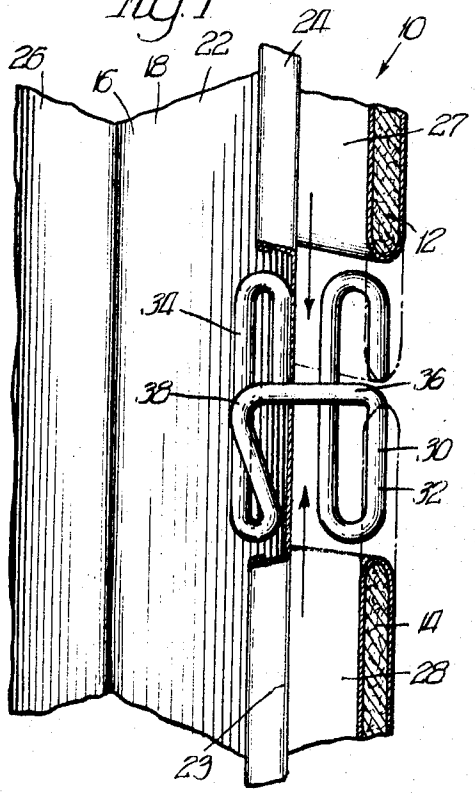


Fig. 2

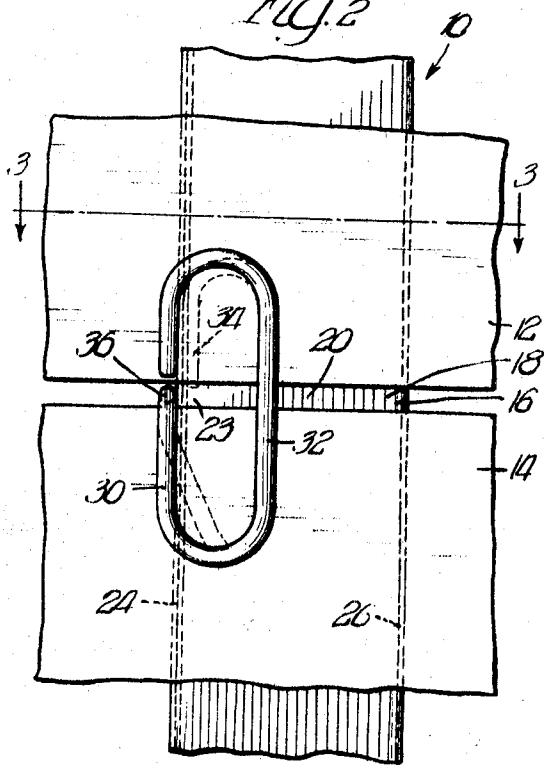


Fig. 3

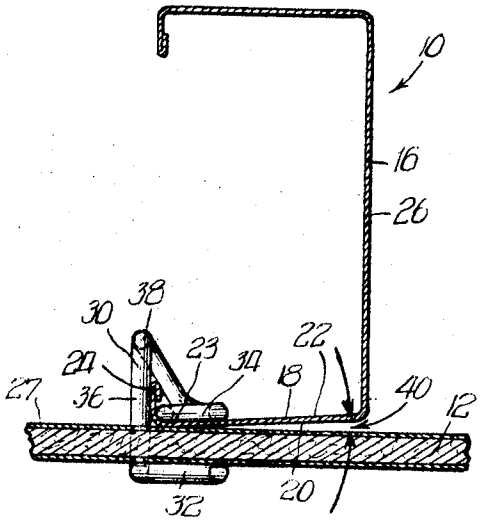
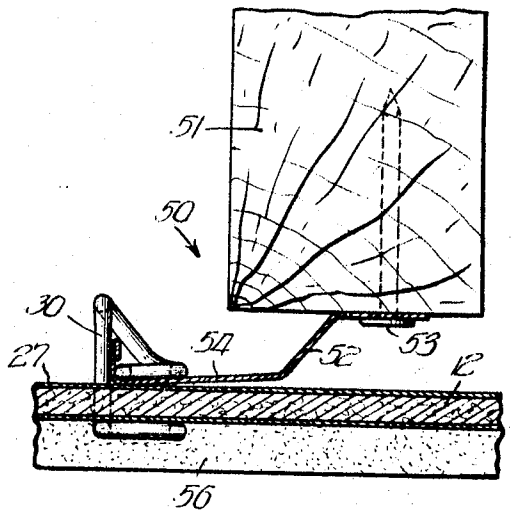


Fig. 4



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SOUND CONTROL PARTITION WITH RESILIENT SUPPORT STUDS

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U.S. Cl. 52—346 9 Claims

ABSTRACT OF THE DISCLOSURE

A sound control partition including coplanar lath panels and longitudinal resilient members supporting the panels. Each member includes a web spaced and projecting away from the panels and a flange cantilevered from said web at an acute angle to the panels and having a free end spaced a substantial distance from said web. Securing means fastens the panels to each flange such that the lath and flanges contact adjacent said free ends and said flanges and panels are otherwise spaced. Each free flange end preferably includes a return lip extending away from said panels, and said securing means preferably comprises a unitary clip having first and second portions connected by linking means and adapted to abut, respectively, the outer surfaces of said panels and the inside of the free flange end adjacent said lip.

This invention relates to building partitions and more particularly it relates to a lath panel partition construction having improved sound attenuation properties.

Sound transmission attenuation in buildings is becoming increasingly important due to more compact construction and the use of more appliances, machines, and educational and entertainment devices which generate sound. Conventional partition constructions having suitable sound attenuation are excessively heavy and thick and require excessive amounts of materials and labor for economical modern construction, particularly in multistory buildings.

It is an object of this invention to provide an economical sound control partition which is highly effective in attenuating the transmission of incident sound.

It is a further object of this invention to provide a partition which may be simply constructed from largely conventional materials yet provide substantially reduced sound transmission over conventional panel constructions.

It is another object of this invention to provide a novel combination of elements in a partition which substantially reduces the transmission of sound without any increase in the mass, of the partition.

It is yet another object of this invention to provide a partition having clip attachment means for securing lath to a portion of a support member to form a partition having reduced sound transmission.

The above and other objects of the invention will be better understood by reference to the following specification and the drawings forming a part thereof, wherein:

FIGURE 1 is a perspective view of an exemplary embodiment of the invention (with the return lip of the stud flange partly broken away and the lath panels partly disassembled and unplastered to more clearly illustrate the configuration and assembly);

FIGURE 2 is a front view of the embodiment of FIGURE 1 with the components fully assembled;

FIGURE 3 is a cross-sectional view taken along the line 3—3 of FIGURE 2; and

FIGURE 4 is a cross-sectional view similar to FIGURE 3 of another embodiment of the invention.

The embodiments of the invention described herein and showin in the drawings provide a partition in which

lath panels for receiving plaster are erected in coplanar relation abutting lath panel support members. These support members are longitudinally extending resilient studs, channels, furring members or the like having a cantilevered flange adapted to retain a lath retaining clip at the free edge of the flange. The flange is preferably disposed at a minor acute angle to the plane of the lath panels so that contact between the lath and flange is limited to that portion of the flange immediately adjacent the clip. The entire balance of the flange extends close to the lath but out of contact with it to enable a slight, but acoustically effective movement of the lath normal to the plane in which the lath are lying. This construction is highly effective in sound attenuation even when applied to only one side of a partition (conventional construction being employed on the other), and the sound attenuation is increased further if both sides of the partition are so constructed.

Referring to FIGURES 1 through 3, there is shown an exemplary partition **10**. Adjacent conventional lath panels **12** and **14** are held against, and supported by, a metallic stud **16**. The stud **16** has a cantilevered elongated flange **18** with a front face **20** and a rear face **22**. Extending rearwardly from the flange **18** at its free end **23** is a return lip **24**. The opposite edge of the flange **18** is integral with a fixed supporting web **26**. The lath panels **12** and **14** have their respective rear surfaces **27** and **28** positioned against the front face **20** of the flange **18** and are assembled together by movement as indicated by the arrows thereon in FIGURE 1.

A portion of the return lip **24** is broken away in FIGURE 1 to reveal the construction and position of a unitary bent wire clip fastener **30**. The clip **30** has an elongated first loop **32** positioned to lie flat against and retain the front surfaces of the two lath panels **12** and **14** when the lath panels are in the assembled position. Each lath panel slides under an opposing half of this first loop **32**.

Positioned abutting the rear face **22** of the flange **16** and approximately parallel with and overlying the first loop **32** is a second loop **34**. The second loop **34** is connected between the lath panels to the first loop **32** by a link portion **36**. The link **36** has sufficient length to extend through the lath panels and around the return lip **24**. The link **36** extends centrally from the first loop **32** toward but beyond the second loop **34**, passing along the outside of the return lip **24**. The link **36** then bends back toward, and connects with, the second loop **34** near one end thereof. In assembling the partition, the clip **30** is easily fitted over the free end **23** of the flange **18**. The exact shape of the loops is a matter of choice, and others which would supply adequate contact area may serve equally well.

A feature clearly illustrated in FIGURE 3 is the cooperation of the link **36** with the outside of the second loop **34** to position the clip **30** by embracing opposite sides of the return lip **24**. The clip **30** is thus retained at the free end of the flange **18** without engaging the web **26**.

It will be noted from FIGURE 3 that the lath panels contact the front face **20** of the flange **18** only in an area confined to its free end **23** at the juncture of the flange and the return lip **24**. This is for practical purposes a line contact only and is established and continuously maintained by the engagement of the clip **30** only at this area of the flange.

There is a continuous clearance between the rear surfaces of the lath panels and the flange **18** everywhere except at the extreme free edge of the flange. Thus the web **26** is substantially spaced from the lath panels, as is the entire substantial length of the flange **18** between the web **26** and the free end **23**. To provide this clearance, the stud **16** is formed to define a small angle **40** between the

flange **18** and the lath panels. An angle **40** of about 2 degrees is sufficient to maintain an adequate clearance.

The web **26** is generally perpendicular and at an obtuse interior angle to the flange **18**. Thus the web **26** is generally perpendicular to the direction of the sound forces acting against the free end **23** of the flange.

FIGURE 4 illustrates another and similar embodiment of the invention in a partition **50** with a wood stud **51**. The wood stud **51** has attached thereto a metal channel or furring member **52** by means of a nail **53** or other suitable fastener. The channel **52** has a flange **54** which may be identical to the flange **18** and may be fastened by the same clip **30**. A coat of sanded plaster **56** is shown on the exterior surfaces of the lath panels (plaster is also preferably applied to the lath panels of the partition **10** but is not shown thereon for clarity).

While not intending to be bound by the explanation herein of the theory of operation of the invention, it is believed that the clearance between the web and all but the free end of the flange and the lath panels is essential to the operation of the invention as it enables a slight flexing of the free end of the flange as the partition surface and the lath panels respond to incident sound waves. This surface movement is damped by the remainder of the structure. The flexing of the flange at the end of its lever arm provides mechanical decoupling between the surfaces of the partition and the studs, and vice versa, thereby reducing transmission of sound to the opposite partition surface. This flexure may be allowed by flexure of the web **26** and/or the flange **18**.

As indicated previously, it is preferable that both sides of the partition be constructed in accordance with the invention. However, this is not essential as substantial improvements in sound transmission attenuation can be achieved even when employing conventional construction on one surface of the partition.

Proper determination of the degree of sound isolation provided by a partition between two rooms must include measurements at several frequencies and the results of tests can be computed, interpreted and reported according to several formulae. In one of the recognized and accepted rating methods, ASTM E90–61T "Sound Transmission Class" (STC), the response of the partition measured at several frequencies to the nearest decibel is compared to a standard contour based upon known subjective responses to sound intensity. This procedure has the advantage that the determinations made at 11 measuring frequencies are reported as a single numerical value. The numerical value or STC rating so assigned in this method of rating partitions gives a very good approximation of service performance.

An STC rating of 50 is recommended for party walls in multifamily housing buildings to insure only minor disturbances to the occupants from sound originating outside the apartment unit. At an STC rating of 45, which is sometimes employed for party walls in economy housing, some disturbance from outside noise will be experienced by about half the occupants.

The performance of panels constructed according to the present invention as measured by the above rating system is illustrated by the following test examples.

Example 1

A sample partition approximately 9 feet by 14 feet was erected under field conditions over metal channel studs on 24 inch centers. The studs were manufactured from hot dipped galvanized steel about 0.023 inch thick. The dimensions of the web, flange and return lip were 2½ inch, 1 5/16 inch and ¼ inch, respectively. The angle between the flange and the web was 92 degrees, and the return lip was at 90 degrees to the flange. The studs were installed in matching runner tracks caulked in place at the ceiling and floor. Conventional paper covered gypsum lath panels 16 inches by 48 inches and ⅜ inch thick were applied horizontally with their vertical joints staggered on opposite sides and secured with conventional joint bridging clips. The lath panels were attached to the studs with clips of the configuration of the clip **11** disclosed herein constructed from a bent 12 gauge (0.105 inch diameter) galvanized steel wire. Facings on both sides of the partition were ½ inch thick gypsum plaster including a 7/16 inch thickness of scratch and brown coats sanded 2½:1 and a 1/16 inch thick lime putty finish coat. The partition weighed about 14.2 pounds per square foot and was about 4¼ inches thick. The partition was tested after 69 hours drying by mechanical ventilation on both sides and determined to have a sound transmission class rating of 53.

Example 2

A second partition was constructed similar to that of Example 1 with the exception of the addition of 2 inch thick mineral fiber sound attenuation blankets 24 inches by 48 inches stapled between the studs against the lath on one side. This panel weighed about 14.6 pounds per square foot and was about 4¼ inches thick. This partition achieved a sound transmission class rating of 56.

Example 3

A partition similar to Example 1 was constructed using identical studs but, instead of employing the fastening arrangement described herein, the lath panels (in this instance having plaster "keying" perforations) were conventionally secured to the metal studs with screw fasteners similar to those described in U.S. Patent 3,056,234, two screws being applied per lath-stud intersection. The screw fasteners were located approximately on the centerline of the stud flange and drew the full face of the stud flange tightly abutting the rear face of the lath panels. This panel was tested and determined to have a class rating of only 37.

Example 4

Another partition was constructed according to Example 3, but with the lath panels attached to the metal studs with three screws per lath-stud intersection and with 2 inch mineral fiber sound attenuating blankets stapled into the stud cavities. The partition of this Example 4 weighed about 14.4 pounds per square foot and was about 4 5/16 inches thick. This panel was tested and found to have a class rating of 38.

The results of the above four tests are summarized in the following table.

LATH AND PLASTER PARTITIONS, SOUND TRANSMISSION CLASS RATING

Ex.	Lath attachment	Mineral wool	Weight, lbs./sq. ft.	Thickness, inches	STC
1	Clip at flange edge (present invention).	No	14.2	4¼	53
2	do	Yes	14.6	4¼	56
3	Screws	No			37
4	do	Yes	15.4	4 5/16	38

It may be clearly seen from the above table that the Example 1 constructed according to this invention and even without mineral wool shows an STC improvement of 16 over the comparable Example 3 of conventional construction. When sound attenuating wool was used, Example 2 in accordance with this invention exhibited an improvement of 18 in its STC rating over the conventionally erected Example 4 with mineral wool.

It will be noted that the class numbers are related to decibels and are therefore logarithmic. Example 4 therefore transmitted about 128 times as much sound as did Example 2.

To further illustrate the significance of these results, a conventionally accepted rule of thumb in the art states that to add 5 decibels to the sound transmission class rating of a partition the air space between the partition surfaces must be doubled, or, alternatively, the mass of the partitions must be doubled. For example, to obtain

an STC rating of 45, a masonry wall would have to weigh about 36 pounds per square foot, and for an STC rating of 50 it would have have to weigh about 80 pounds per square foot. The measurements reported herein show that this invention has provided greatly improved STC ratings without any increase in partition mass or thickness, thus constituting a significant advance over the prior art. Furthermore, the results show that this invention provides a highly improved efficiency in the use of building materials and allows deductions in building weight as suitable STC ratings of more than 50 were achieved with a partition weighing less than 15 pounds per square foot.

While the present invention has been described herein with particular reference to certain specific examples, such specific examples are intended to be merely descriptive, and the inventive concept is not necessarily limited thereto. Many alternative modifications will be apparent to those skilled in the art from the above description. It is intended to encompass any and all such variations and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A partition of enhanced resistance to sound transmission therethrough comprising:

a plurality of lath panels in adjacent coplanar relation and having inside surfaces and outside plaster-receiving surfaces;

a plurality of substantially parallel longitudinally extending resilient members supporting said lath panels; individually said members comprising

a web portion spaced from and projecting away from said inside surfaces and

a flange portion cantilevered from said web portion and extending a substantial distance to a free end,

said flange portion forming an acute angle to the plane of the lath panels;

and securing means fastening said lath panels to said free end of said flange portions with said lath panels and flange portions in substantially line contact adjacent said free flange ends and otherwise spaced so that substantially the entire length of said flange portions project away from said lath panels at said acute angle.

2. The partition of claim **1** wherein said flange portion defines an obtuse interior angle with said web portion.

3. The partition of claim **1** wherein said flange portion has a return lip at the edge of said free end extending away from said lath panel, and said securing means is retained by said return lip.

4. The partition of claim **3** wherein said securing means comprises a unitary clip having a first retaining portion flatly abutting said outside plaster-receiving surfaces of said lath panels, a second retaining portion abutting the inside of said free end of said flange portion adjacent said return lip, and linking means connecting said first and second retaining portions, said linking means and said second retaining portion of said clip being on opposite sides of said return lip and engageable therewith to secure said clip to said return lip.

5. The partition of claim **4** wherein said first retaining portion of said securing means overlies said plaster-receiving surfaces of two said adjacent lath panels and said linking means extends between said panels.

6. The partition of claim **4** wherein said flange portion defines an obtuse interior angle with said web portion.

7. The partition of claim **4** wherein said linking means extends centrally from said first retaining portion toward said second retaining portion and projects outside of and beyond said return lip and then bends back toward and connects with said second retaining portion.

8. The partition of claim **7** wherein said first and second retaining portions of said clip comprise substantially parallel and overlying first and second loops integral with and spaced a predetermined distance apart by said linking means.

9. The partition of claim **8** wherein said linking means comprises a single member extending centrally from said first loop toward said second loop and projects outside of and beyond said return lip and then bends back toward and connects with said second loop.

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U.S. Cl. X.R.

52—359; 181—33