United States Patent [19]

Birum, Jr.

[11] **3,852,927**

[45] **Dec. 10, 1974**

[54] **APPARATUS FOR MOUNTING WALLBOARD**

[76] Inventor: **Herbert L. Birum, Jr.**, Pleasant Valley Rd., Titusville, N.J. 08560

[22] Filed: **Apr. 17, 1973**

[21] Appl. No.: **351,959**

Related U.S. Application Data

[62] Division of Ser. No. 141,627, May 10, 1971, abandoned.

[52] **U.S. Cl.** **52/241,** 52/483

[51] **Int. Cl.** **E04b 2/82**

[58] **Field of Search** 52/241, 481, 483, 460, 52/463, 511, 281, 282, 479

[56] **References Cited**

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Primary Examiner—Price C. Faw, Jr.

Attorney, Agent, or Firm—D. A. N. Chase

[57] **ABSTRACT**

Wallboard is mounted upon the interior studding of buildings or other structures by mounting a strip of a first fastening member upon the studding. A strip of a second fastening member is mounted in a corresponding position along the mounting face of the wallboard. One of the first and second fastening members has a multiplicity of hooked elements of the filament type projecting outwardly from the exposed face of the member, while the remaining member is provided with a multiplicity of looped elements of the filament type extending outwardly from its exposed face. The wallboard is pressed against the studding so that the outwardly extending elements of the fastening means engage one another. As few as one conventional fastening member need be provided near the top and bottom marginal edges of the wallboard due to the holding power of the first and second fastening means. Ceiling and floor runners are mounted in a similar fashion, using hook-type and loop-type fastening means.

An alternative type of mounting assembly employs clips which are mounted only to the panelboard to embrace the supporting studs. In the alternative embodiment, first and second types of fastening members are adhesively fastened only to the panels. The first type of clip is secured adjacent to one edge of the panels and is slid into position, together with the panel, to embrace on stud. The opposite edge of the panel is pushed against another stud adjacent that edge to snappingly engage that stud. The studs intermediate the opposite edges of the panel may be joined to the panel by the snappingly engaging fasteners or through the use of the hook and loop-type fasteners joined respectively to panel and stud. Slidable studs may be employed to be embraced by one set of clips. Resilient or sponge-like pads may be positioned between the panels and the studs to prevent rattling. Also, magnetic strips may be employed to fasten the panels to the studs.

6 Claims, 36 Drawing Figures

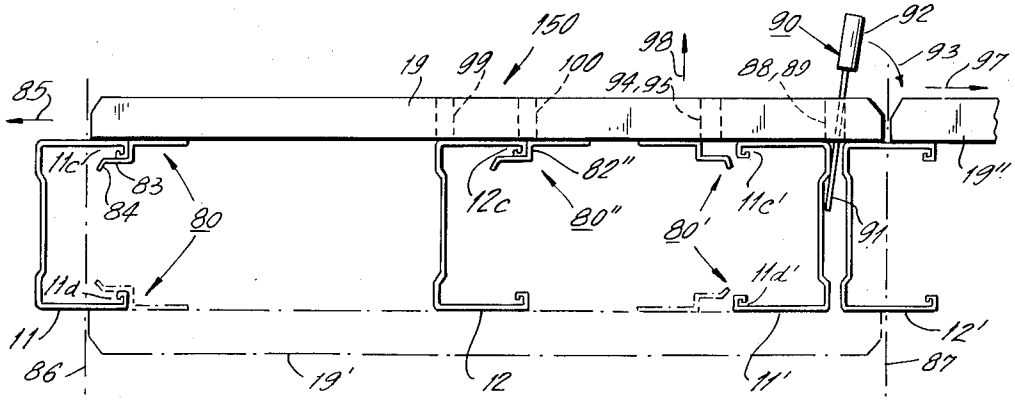


FIG. 1a.

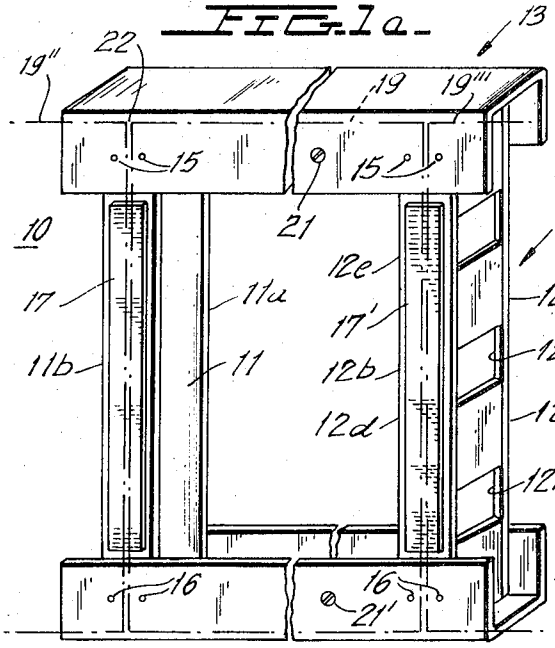


FIG. 1c.

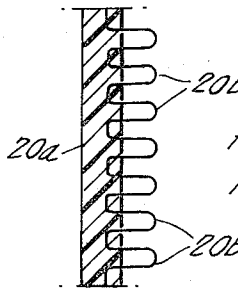


FIG. 1d.

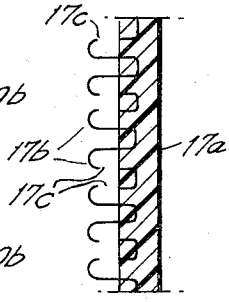


FIG. 2a.

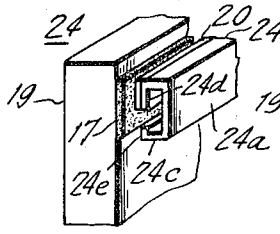


FIG. 2b.

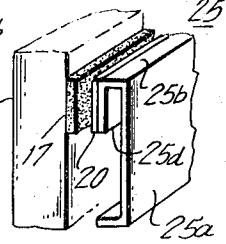


FIG. 1b.

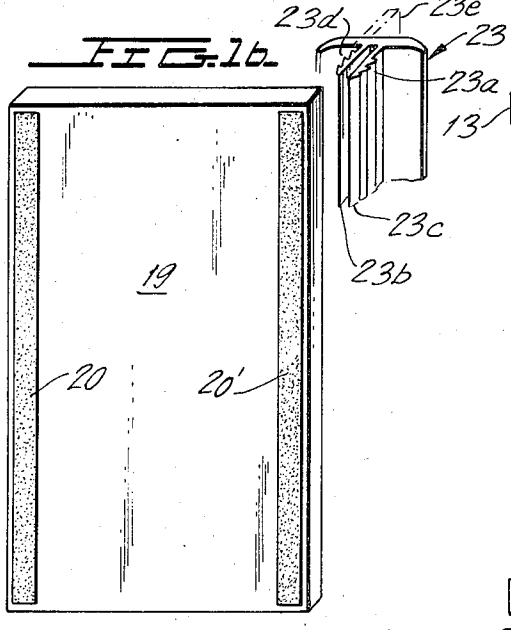


FIG. 5a.

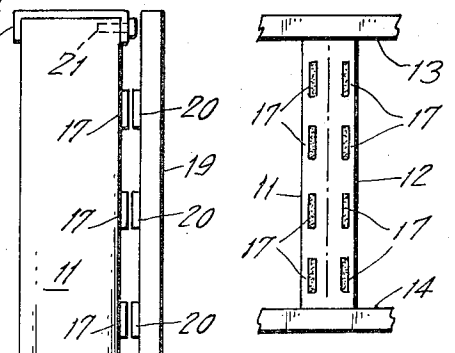


FIG. 5b.

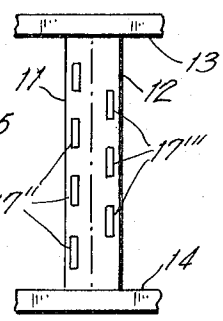


FIG. 4.

FIG. 3a.

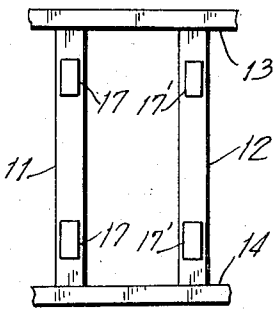
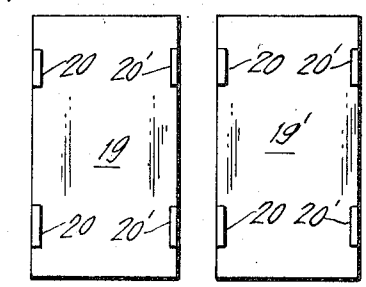


FIG. 3b.



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ATTORNEYS

FIG. 6.

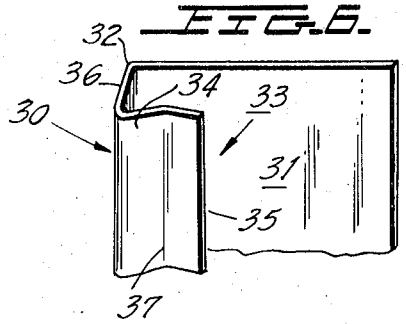


FIG. 7.

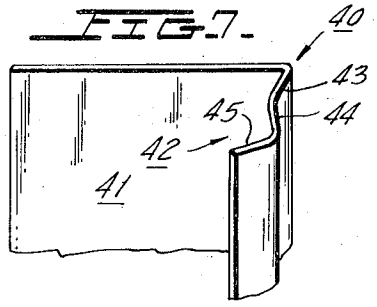


FIG. 8a.

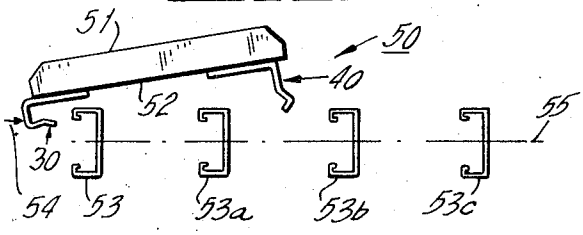


FIG. 8b.

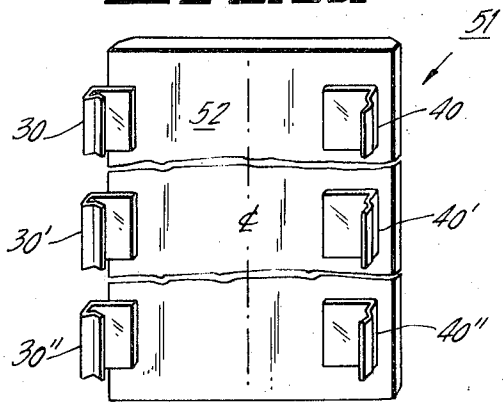


FIG. 8c.

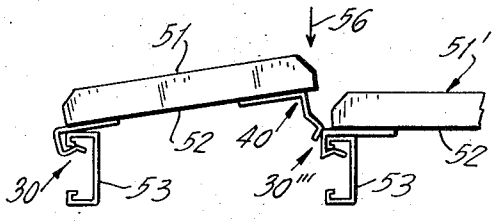


FIG. 8d.

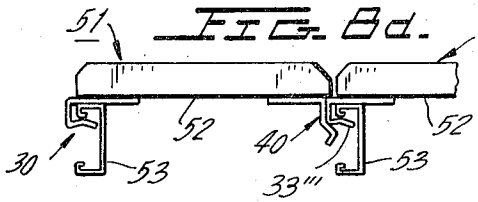


FIG. 8e.

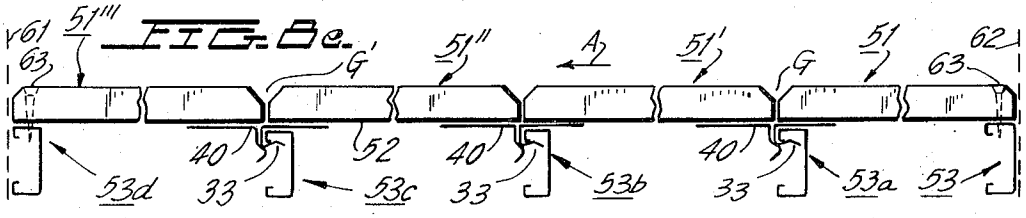


FIG. 8f.

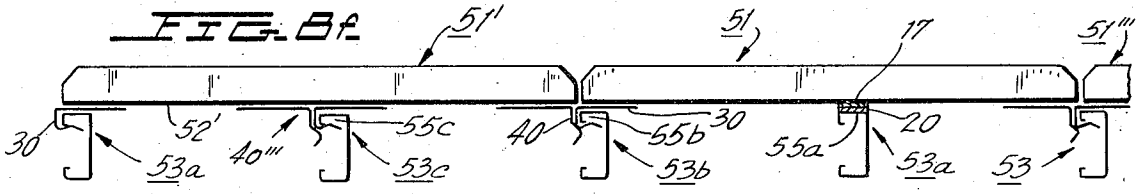


FIG. 8g.

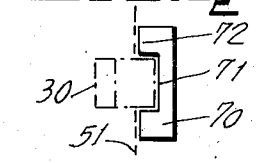


FIG. 8h.

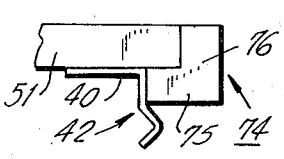


FIG. 8j.

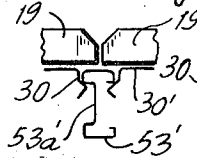
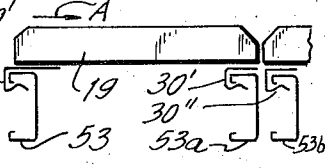


FIG. 8i.



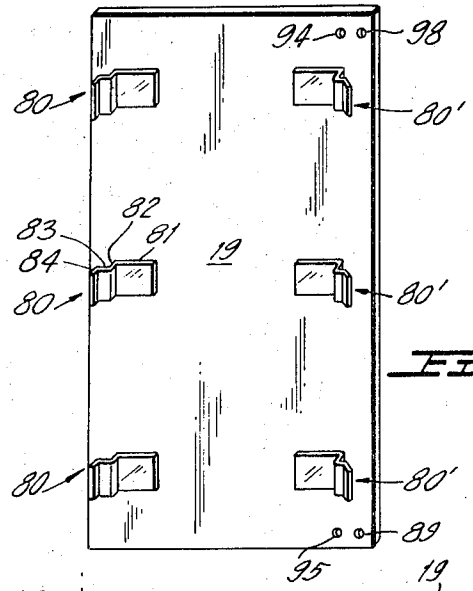


FIG. 9.

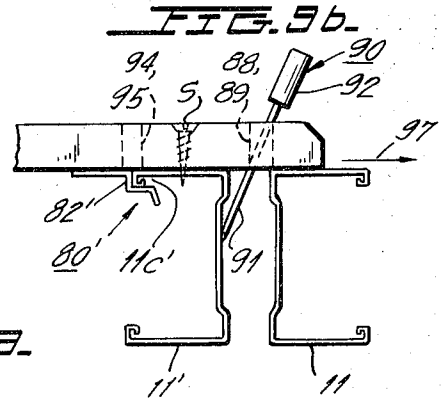


FIG. 9b.

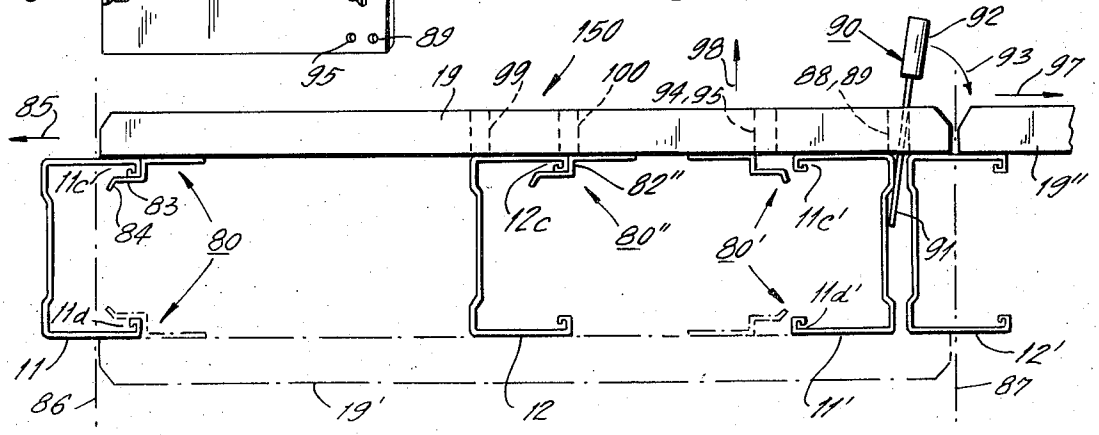


FIG. 9a.

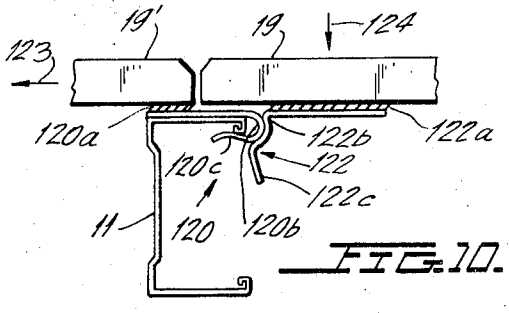


FIG. 10.

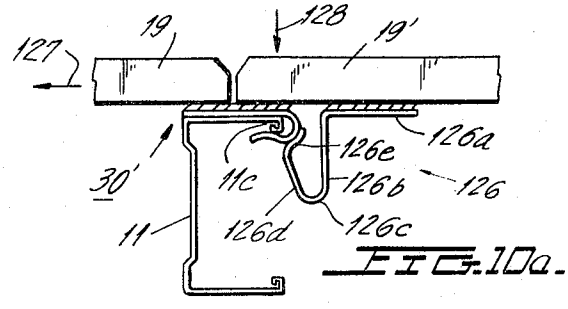


FIG. 10a.

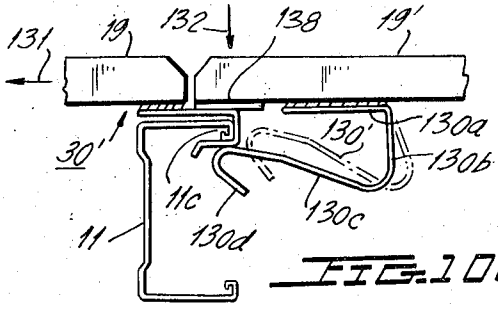


FIG. 10b.

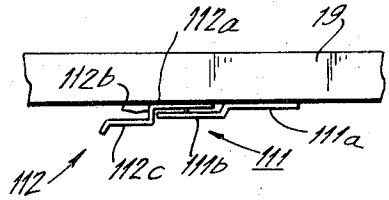


FIG. 9c.

FIG. 11.

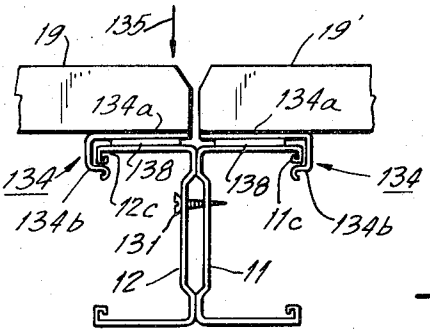


FIG. 13.

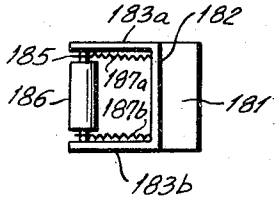


FIG. 11a.

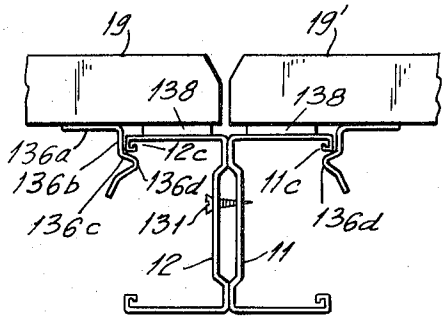


FIG. 13a.

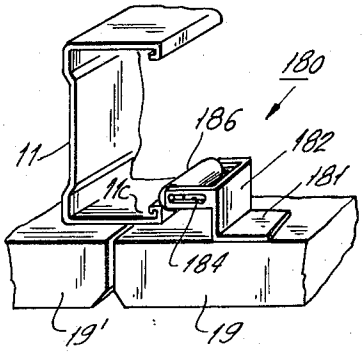
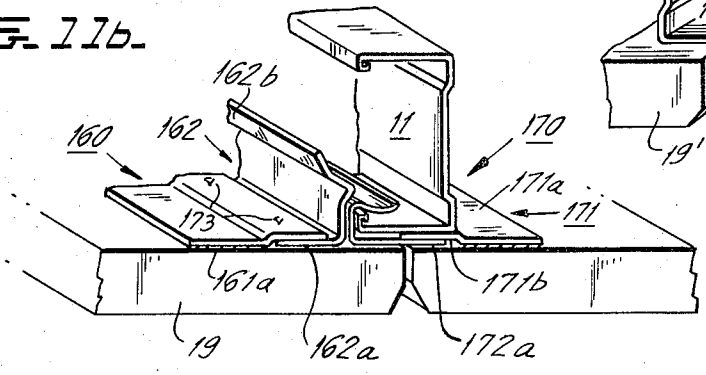


FIG. 11b.



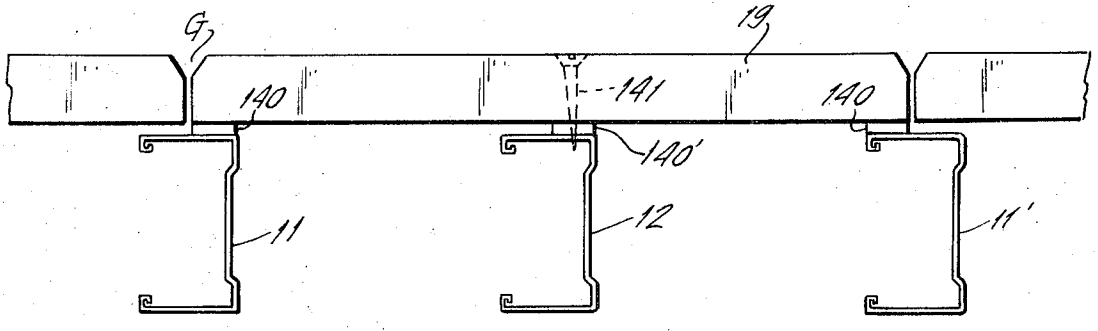


FIG. 12.

APPARATUS FOR MOUNTING WALLBOARD

This is a division of application Ser. No. 141,627, filed May 10, 1971, now abandoned.

The present invention relates to interior panelling systems and more particularly to a novel method and apparatus for mounting wallboard, panels and the like, in a simple and rapid fashion through the use of cooperating fastening means which are separately mounted to the building superstructure and the mounting faces of the wallboard or to the wallboard alone.

A major objective of all wallboard or panel mounting methods and apparatus is to provide an arrangement in which wallboard may be mounted rapidly and with a minimum of mounting components and in which the wallboard may be removed and replaced in a simple and rapid fashion.

The present invention is characterized by providing a method and apparatus for mounting wallboard which achieves the above objectives through the use of components which are few in number, and are both easy to use and to apply.

The present invention, in one preferred embodiment, utilizes first and second cooperating fastening means of a design adapted to become enmeshed with one another when pressed into engagement. One of said fastening means is comprised of a base member having a multiplicity of loop-type filaments extending from one surface thereof, while the remaining fastening means is comprised of a multiplicity of hook-type filaments dispersed over a base member and extending from one surface thereof. A strip of one of said fastening means is joined to the mounting surface of wallboard, preferably adjacent its vertically aligned marginal edges. The cooperating fastening member is joined to the superstructure or studding of the building with the fastening members being so aligned to their mounting surfaces as to become locked to one another when pressed into engagement. Thus, the mounting of a wallboard sheet may consist of the simple act of aligning the wallboard relative to the studding or superstructure and pressing the wallboard against the studding to cause them to become engaged. The simplicity of the mounting operation and holding strength of the fastening members reduces the number of conventional fastening devices required to a very minimal amount. In one preferred embodiment, as few as a single screw at the top and bottom marginal edges of the panel may be utilized, thereby greatly facilitating mounting and demounting operations of such panels.

Ceiling and floor runners may be mounted in a similar fashion through the use of the cooperating fastening members to enable the simple and yet rapid and reliable assembly of an entire wallboard system.

In another preferred embodiment of the present invention, clips of a first and a second type are respectively mounted along opposite parallel edges of a panel. The first type of clip has a substantially U-shape configuration comprised of first and second arms integrally joined to a yoke portion. One of the arms is adhesively secured to the mounting face of a panel along one marginal edge thereof and is designed to engage and embrace a mounting arm of a substantially C-shaped stud. The second clip is of L-shaped configuration comprising a first flat arm which is adhesively secured to the mounting face of a panel along the opposite marginal edge. The remaining arm has a substantially V-shaped

configuration and is adapted to snappingly engage the mounting arm of another C-shaped stud. The panels with the appropriate clips are very simply and readily mounted to the stud by aligning the panel relative to the studs, sliding the panel in a first direction so as to cause the U-shaped clips to engage and embrace one of said studs and pressing the opposite end of the panel toward the studs so as to cause the remaining clips to snappingly engage another one of the studs. This assembly is equally as simple and straightforward.

Still another preferred embodiment of the present invention is comprised of clips having outwardly directed mating flanges extending toward the vertical edges of the panel member. The clip member along one surface of the panel member is joined to a stud by sliding the panel member along the mounting surfaces of the studs until the clip engages one arm of an associated stud. The panel is then pressed firmly against the mounting surfaces of the studs which further comprises a movable stud positioned a spaced distance away from the remaining clips. The panel is provided near its upper and lower edges with openings of sufficient dimension to insert a tool such as, for example, a screw driver. The forward end of the tool is inserted through the opening until it engages the central portion of the movable stud. The head of the tool is then moved toward the face of the panel causing the movable stud to be moved into position whereby it is embraced by the remaining clip (or clips). The upper and lower ends of the movable stud are moved into the locking position by openings provided at the upper and lower edges of the panel. Additional openings are provided at a spaced distance from the aforementioned openings in order to move the movable stud out of embracing engagement with its associated clip (or clips) in cases where it is desired to remove and/or replace any particular panel section. In applications wherein it is desired to secure four foot panels to studding in which the vertical studs are arranged in 2 foot spacings, center-to-center, the stud positioned intermediate the vertical edges of the panel may be made movable. As an alternative arrangement Velcro fastening members of the type described hereinabove may be employed. As still another alternative arrangement a magnetic strip may be secured to the mounting face of the panel so as to be magnetically attracted to the intermediate stud. If desired, the panel may be provided with only magnetic strips for mounting thereof. To facilitate securement a single fastening member such as, for example, a screw may be placed at both the upper and lower edges of the panels. The aforementioned holes provided for positioning the movable studs or provided for receiving the aforementioned fastening members may be covered by ceiling and floor runners of the type described hereinabove.

In still another preferred embodiment those studs which are positioned adjacent the vertical edges of panels may be provided with adjacently positioned studs which are preferably secured thereto by fastening means and U-shaped clips are thereby provided on the mounting face of the panel for joining the panel members to the pair of joined studs. The gripping power of the clips described hereinabove may be further enhanced and the panels and clips may be restrained from movement, rattling and the like by providing resilient pads along the vertical marginal edges of the panel mounting faces.

Most of the aforementioned clip members may be modified so as to form a clip assembly comprised of first and second clip sections which are designed to facilitate stacking, handling, storing and shipping. Such clip members are comprised of a first clip section having a mounting portion which is adhesively secured to the panel member mounting surface. An integrally formed, slightly raised clip portion, slightly spaced from the mounting surface of the panel member is adapted to receive the second clip section having a mounting portion which is slid beneath the raised portion of the first clip section so as to be embraced between the clip and the mounting face of the panel. The second clip section is retained in position by peening the raised surface portion preferably with a sharply pointed instrument. The second clip section is further provided with a substantially L-shaped clip embracing portion for embracing at least one arm of a stud. The advantage of the above arrangement resides in the fact that the first clip sections may be mounted upon panel members at the factory or other place of fabrication and the panel members may be neatly and compactly stacked. The second clip section may be shipped separately and assembled at the job site.

It is, therefore, one object of the present invention to provide a novel method and apparatus for mounting wallboard through the use of hook-type and loop-type fastening members.

Another object of the present invention is to provide a novel method and apparatus for mounting wallboards through the use of mounting clips joined exclusively to the panelboard, which clips respectively embrace and snappingly engage associated studs.

Another object of the present invention is to provide a novel method and apparatus for mounting wallboard through the use of hook-type and loop-type fastening members whereby wallboard and ceiling and floor runners may all be mounted in a simple and yet reliable manner through the use of this technique.

Still another object of the present invention is to provide a novel method and apparatus for mounting wallboards through the use of mounting clips adhesively joined to the mounting surface of the wallboard wherein at least one of the clips is slid into embracing and locking position with an associated stud member and wherein at least one movable stud member is provided to lockingly embrace the remaining clip member.

Still another object of the present invention is to provide a novel method and apparatus for mounting wallboards through the use of mounting clips adhesively secured to the mounting face of the wallboard and further providing resilient pads interposed between the wallboard mounting face and the studding to enhance securement of the clips to the studding and to eliminate any movement or rattling of the clip members and wallboard.

Still another object of the present invention is to provide a novel method and apparatus for mounting wallboards through the use of flexible, magnetized strips adhesively joined to the panels for magnetically securing the wallboard to the studding.

Still another embodiment of the present invention is to provide a novel method and apparatus for mounting wallboard comprising clip members for embracing building studs and including resilient pads for enhancing the bracing support of the panel and to prevent the panels from vibrating and/or rattling.

Still another object of the present invention is to provide a novel method and apparatus for mounting wallboards to studding wherein the aforementioned fastening arrangements may be combined or otherwise utilized in various combinations to effect easy, rapid and yet reliable mounting for wallboard.

These as well as other objects of the present invention will become apparent when reading the accompanying description and drawings in which:

FIG. **1***a* is a perspective view showing the internal structure of a house, building or other facility;

FIG. **1***b* is a perspective view showing a wallboard and batten strip which may be employed with the arrangement of FIG. **1***a;*

FIGS. **1***c* and **1***d* are sectional views showing the fastening members of FIG. **1***b* in greater detail;

FIG. **2***a* is a perspective view showing a portion of a wallboard and ceiling runner incorporating the principles of the present invention.

FIG. **2***b* is a perspective view showing a portion of a wallboard and floor runner incorporating the principles of the present invention;

FIGS. **3***a* and **3***b* show a building structure and panel boards, respectively, depicting a modified embodiment as compared with FIGS. **1***a* and **1***b*, respectively;

FIG. **4** shows an end elevational view of a fully assembled structure of the type shown in FIGS. **1***a*–**2***b;*

FIGS. **5***a* and **5***b* show alternative arrangements for fastening members which may be utilized upon the building superstructure;

FIGS. **6** and **7** are perspective views of first and second types of clips employed in another preferred embodiment of the present invention;

FIGS. **8***a*–**8***f*, **8***i* and **8***j* are top plan views of panel assemblies utilizing the clips of FIGS. **6** and **7** and which are useful in explaining the assembly steps and advantages of the preferred embodiment employing the clips of FIGS. **6** and **7**;

FIGS. **8***g* and **8***h* show guide members for aligning the clips of FIGS. **6** and **7** on a panel;

FIG. **9** is an elevational view showing the mounting clips and mounting surface of a panel board employed in another preferred embodiment of the present invention;

FIGS. **9***a* and **9***b* are top plan views showing the manner of assembly of the panel board of FIG. **9** to studding;

FIG. **9***c* shows an alternative embodiment of a clip assembly which may be substituted for the clips employed in the embodiment of FIGS. **9**–**9***b;*

FIGS. **10**, **10***a*, **11**, **11***a* and **11***b* show still other embodiments of clip members which may be employed to secure panel boards to studs;

FIG. **12** is a top plan view showing still another preferred embodiment of the present invention.

FIG. **13** is a perspective view of still another embodiment of the present invention.

FIG. **13***a* is a top view of the clip assembly of FIG. **13**.

FIG. **1***a* shows a portion of the present invention which is comprised of a building superstructure **10** having vertically aligned studs **11** and **12** typically spaced 16 inches on center and which are formed from sheets of a suitable metallic material. The studs of the type shown in FIG. **1***a* have a substantially C-shaped cross-

sectional configuration. For example, vertical stud **11** is shown as having an open-ended vertical side **11***a*. Considering stud **12,** for example, this stud is comprised of a central portion **12***a* having two depending arms **12***b* and **12***c*, each turned inwardly toward one another at their marginal edges **12***d* and **12***e* respectively. Cut-out portions **12***h* may be provided at spaced distances along central portion **12***a* to allow for threading of wiring or other conduits therethrough.

The partition system **10** is further comprised of a channel shaped cornice cap **13** and a channel shaped floor track **14,** each of which are secured by suitable fastening means **15** and **16,** respectively, to the upper and lower ends of studs **11** and **12** to form a strong, rigid, unitary framework. Obviously, the framework may be of any suitable height and/or length, depending upon the particular installation. For example, in rooms of standard size, normal heights encountered are 8 feet, but the framework may be made of any other suitable height. The lengths of the framework obviously depend upon the particular room or region being enclosed.

In conventional installations, it is typical to secure sheets of plasterboard, commonly referred to as dry-wall or other types of panel boards, to the building studs through the use of conventional fastening means. In the case where the dry-wall is to be painted or wall-papered, the regions in which the fastening members are driven are finished, such as, for example, with a suitable filler or tape, and the walls are then painted or papered. It is also possible to employ coated wallboard which may be comprised of a plasterboard base having a vinyl, wood or painted finish which greatly simplifies installations through the combinations of the wall finish and plasterboard into one composite panel.

After any of the above type panel boards are secured to the studs, suitable vertical batten strips and floor and ceiling strips are then nailed to the building studs to provide a finished wall surface having a desirable aesthetic appearance.

The present invention is characterized by providing a panel board assembly method and apparatus for mounting panel board and ceiling and floor runners without the need for any or in the worst case a minimum amount of conventiinal fastening means.

Considering the structure **10** shown in FIG. **1***a*, the walls **11***b* and **12***b* of studs **11** and **12** have mounted thereto elongated strips **17** and **18,** respectively. Each of the strips **17** and **18** are comprised of a base sheet having secured thereto a multiplicity of hooked elements of the filament type which, as shown in FIG. **1***c* is comprised of a base sheet **17***a* which may preferably be formed of a plastic material having a plurality of undulating threads, a portion of which are imbedded in the base material **17***a* and which have been cut such as at **17***c* to form the hook-like elements **17***b*.

The base strip is secured to studs **11** and **12** in the manner shown in FIG. **1***a* through the use of a suitable epoxy or other adhesive. The strips **17** and **17'** preferably extend the entire length of the studs **11** and **12.**

FIG. **1***b* shows a wallboard member **19** which may, for example, be a 4 × 8 sheet of dry-wall material. The face which is to be mounted against the studding of FIG. **1***a* is provided with a pair of elongated strips **20** and **20'** which are secured along the vertical marginal edges of wallboard **19** by a suitable epoxy or other adhesive. The strips **20** and **20'** are of the type shown best in FIG. **1***d* in which the strips are comprised of a base material **20***a* having undulating threads **20***b*, a portion of which are imbedded in the base material **20***a* whereby the remaining portion **20***b* forms a multiplicity of loops over the entire surface of the strip.

For the purpose of mounting the wallboard, the surface upon which the strips **20** and **20'** have been mounted is aligned with the studs **11** and **12** as shown in FIG. **1***a* wherein the dotted rectangle **19'** represents the positioning of a wallboard member. The member is then pressed against the studding so that the loop-type strips **20** and **20'** are firmly pressed into the hook-type strips **17'** and **17,** respectively, to hold the panel board firmly in position. Conventionally, wallboard comes in 4 × 8 sheets. In order to appropriately mount the wallboard studs **11** and **12** (although not shown in FIG. **1***a*) should be preferably **48''** apart, center line to center line. Thus, one additional stud would normally be positioned between the studs **11** and **12,** but this stud would not be provided with a strip of hook-type material. As an obvious alternative, the hook-type material may be affixed to the surface of the wallboard **19** and the loop-type material strips may be affixed to the studs **11** and **12.**

Once the wallboard panel is affixed to the studding, in the manner described hereinabove so that the first wallboard member occupies the position shown by dotted rectangle **19'**, a single fastening member such as, for example, a screw **21** may be utilized to secure the top end of wallboard **19** to cornice cap **13** and a similar single screw member **21'** may be utilized to secure the bottom end. It should be understood that these fastening members are affixed thereto only after the adhering of the hook and loop-type strips to one another. The characteristics of the hook and loop-type strips are such that they are highly resistive to any shearing strength or forces. Also, when pressed firmly into one another, the strips will not come apart except in the presence of rather substantial pulling forces which forces, while they may be of lesser magnitude than shearing forces which the strips will resist, are nevertheless of a substantial magnitude.

Similar wallboard members are fastened to the studs in a similar fashion and are positioned as shown by the dotted lines **19''** and **19'''**, respectively. It should be noted in FIG. **1***a* that a slight spacing between adjacent panel boards is provided. For example, a slight gap **22** is provided between panel boards **19''** and **19'** and a similar gap **22'** is provided between wallboards **19'** and **19'''**.

Once the wallboards have been so positioned, a vertical batten strip **23,** a portion of which is shown in FIG. **1***b*, is inserted in the gaps **22** and **22'**. This batten structure **23** is described in detail in copending application Ser. No. 34,269, filed May 4, 1970 by the present inventor. The vertical batten strip **23** is comprised of a central portion **23***a* which is slightly curved in the direction transverse to its length and which is provided with a pair of spaced parallel projections **23***b* and **23***c* whose exterior surfaces **23***d* and **23***e*, respectively, are provided with sawtooth contours. The entire structure is preferably plastic and may advantageously be formed through the use of an extruding process.

Once the panels have been joined in the manner shown and described in connection with FIGS. **1***a* and **1***b*, the batten strips **23** are cut to length and positioned so that the forward free ends of projections **23***b* and **23***c* are inserted into the appropriate gaps such as, for ex-

ample, gaps 22 and 22'. The vertical batten strips are press-fitted into position either by hand or by lightly tapping the central portion 23*a* with a hammer or other suitable tool. The collar region between projections 23*b* and 23*c* permit the projections to bend or yield to a great extent so as to accommodate gaps between the panels which may deviate in width to a significant extent and yet still be sufficiently resilient to be firmly wedged within a gap.

FIG. 2*a* shows a ceiling 24 runner which may be employed in the present invention and which comprises a central portion 24*a* having a pair of inwardly bent arms 24*b* and 24*c* whose inwardly bent free ends 24*d* and 24*e*, respectively, are substantially co-planar. One of the strips of the type shown as 17 or 20 is affixed to either one or both of the flanges 24*d* and 24*e*, while a complementary strip such as, for example, the strip 17' is affixed across the upper marginal edge of panel board 19. The ceiling runner may be of any desired length and is pressed against the panel boards, preferably after insertion of the vertical batten strips 23.

FIG. 2*b* shows a floor runner assembly 25 which is comprised of a central portion 25*a* having first and second depending arms 25*b* and 25*c*. Arms 25*b* are further provided with an inwardly bent flange 25*d* upon whose surface one of the strips of the type shown as 17 or 20 is mounted. A complementary strip, for example, a strip 17 is mounted a spaced distance above the lower marginal edge of panel board 19. The floor runner 25 may be of any desired length and is pressed up against the panel boards, preferably after insertion of the vertical batten strips 23 so as to complete the assembly. The ceiling and floor runners 24 and 25, respectively, are preferably formed of an extremely light-weight plastic so that the hook and loop-type complementary fastening strips are more than satisfactory to hold the runners in position for indefinite periods of time.

FIG. 4 shows a fully assembled elevational view, including all of the components shown in FIGS. 1*a*–2*b*, with the exception that the complementary strips 17 and 20 are comprised of short sections of strips as opposed to being elongated strips. It has been found that this arrangement provides equal mounting strength as the elongated strips as shown in FIGS. 1*a* and 1*b*.

FIG. 3*a* shows a slightly modified arrangement for the strips 17 and 17' on vertical studs 11 and 12, respectively, wherein strips 17 and 17' have widths of approximately 1 inch. FIG. 3*b* shows a pair of panel boards 19 and 19' in which the strips 20 and 20' provided on each of these panel boards occupy like positions relative to the strips 17 and 17' and which strips are approximately one-half inch in width. In mounting, each of the strips 20 and 20' cover slightly less than one-half of the strips 17 and 17' mounted upon studs 11 and 12 with a small gap being provided therebetween for the purpose of inserting the flexible type vertical batten strips 23, as shown best in FIG. 1*b*.

FIG. 5*a* shows another modified embodiment wherein a single batten 11 is provided with a plurality of strips 17 of three-eighths to one-half inch width arranged in spaced parallel fashion along the batten. Similar strips of similar width are mounted upon each of the panel boards for securement thereto.

FIG. 5*b* shows another slightly modified embodiment wherein a single stud 11 is shown as being provided with a plurality of strips 17 arranged in staggered fashion with half of the strips lying to one-half of an imaginary center line (see phantom line 31) while the remaining intervening strips are arranged to the right of imaginary center line 31. By appropriately positioning complementary strips upon each of the panel boards, the panel boards may be simply and readily mounted upon the studs wherein the spaced strips on both studs and panel boards have been found to provide adequate supporting and fastening strength.

Another preferred embodiment of the present invention will now be described in connection with FIGS. 6–8*e*. FIG. 6 is a perspective view showing a first type of clip 30 being employed in the above mentioned alternative embodiment, which clip is a unitary member which may be formed of either metal or plastic and which is comprised of a panel mounting arm 31 bent at 32 so as to form a shorter clip-shaped arm 33 having an inwardly bent portion 34 and an outwardly bent portion 35, which clip-shaped portion is joined to arm 31 by a yoke portion 36.

A second type of clip 40, shown in FIG. 7, is a unitary clip member which may likewise be formed of metal or plastic and which is provided with a panel mounting arm 41 and a second arm 42 having a first portion 43 bent substantially at right angles to arm 41 and having a V-shaped free end comprised of portions 44 and 45 extending outwardly from portion 43.

FIGS. 8*a* and 8*b* show the manner in which the clips are mounted to the panels wherein the assembly 50 shown therein is comprised of a panel 51 which may, for example, be a 4 feet × 8 feet panel. The surface 52 of the panel which is mounted against the building studs is provided with three clips 30, 30' and 30'' of the type shown in FIG. 6. The arms 31 (see FIG. 6) of the clips 30–30'' are mounted along one vertical edge of panel 51 with the arms 31 thereof (see FIG. 6) being joined to surface 52 of the panel by a suitable adhesive. As can best be seen in FIG. 8*b*, the left-hand end of each of the clips 30–30'' (and relative to the alignment shown in FIG. 6) extend a predetermined distance beyond the left-hand edge of panel 51.

The panel is further provided with clips 40, 40' and 40'' which are arranged at spaced intervals adjacent the right-hand vertical edge of panel 51 whereby the arms 41 thereof (see FIG. 7) are joined to the rear surface 52 of the panel by a suitable adhesive. As can be seen from FIG. 8*b*, the clips 40–40'' are spaced slightly inwardly from the right-hand edge of the panel and are arranged at spaced intervals along a substantially vertical imaginary line. Clips 30–30'' are also vertically aligned at spaced intervals. Although the panel assemblies of FIGS. 8*a* and 8*b* show the use of three clips of the type shown in FIG. 6 and three clips of the type shown in FIG. 7, it should be understood that a greater or lesser number of such clips may be employed, depending only upon the needs of the user.

The clips are mounted in the manner shown best in FIGS. 8*a*, 8*c* and 8*d*. As shown in these three Figures, a plurality of vertically aligned studs 51, 51*a* and 51*b* are arranged at spaced intervals within a building structure so as to define an area or region which is to be partitioned to form any suitable room or other working area. Typically, the studs are spaced 2 feet on center. As shown best in FIG. 8*a*, each of the panel assemblies are mounted by positioning the face 52 of the panel toward the studs. The clips 30, 30' and 30'' are aligned relative to stud 51 in the manner shown best in FIG. 8*a*. The panel is then pushed in the direction shown by

arrow **52** causing the arms **33** of each of the clips **30–30''** to firmly embrace upper arm **53** of stud **51.** The panel **51** is aligned so as to form a small angle with imaginary line **54.**

Once the panel **51** has been moved from the position of FIG. **8***a* to the position of FIG. **8***c*, the right-hand edge of panel **51** is pressed inwardly in a direction shown by arrow **56,** causing arm **42** of each of the clips **40–40''** to snappingly engage an associated clip **30'''** of the next adjacent panel assembly further comprising panel **51'**. The assembly for that panel is thus completed, with the final arrangement of the panels **51** and **51'** being shown best in FIG. **8***d*.

FIG. **8***e* shows the manner in which an entire wall has been assembled utilizing the clip structures of FIGS. **6** and **7.** In the example shown in FIG. **8***e*, dotted lines **61** and **62** represent intersecting walls which are spanned by the panel assemblies. The manner in which the individual panel boards are mounted is to slide the clips **30** of panel **51** so as to embrace stud **53***a*. The opposite marginal portion of panel **51** is joined to stud **53** by conventional fastening means **63** such as, for example, screws. Panel **51'** is the next panel to be assembled wherein its clips **30** are slid into the joining position with stud **53***b* and subsequent thereto whereby its clips **40** are "snapped" into position so as to engage and lock with associated clips **30** of panel **51.** The remaining panels **51''** and **51'''** are secured in a similar fashion. Preferably, all of the clips **30** and **40** mounted to each panel **51** are aligned at associated heights along their respective panels so as to engage one another in the fashion shown in FIG. **8***e*.

Whereas the arrangement of FIG. **8***e* shows an assembly wherein the right-hand most panel **51** is the first to be mounted to the studs with each panel to the left thereof being the next to be mounted, with each succeeding panel to the left thereof being the next to be mounted, it should be understood that the clips **30** and **40** may be reversed as to their location along the mounting face of each panel so that clips **30** may be mounted in the position of clips **40** as shown in FIG. **8***b* and conversely so that clips **40** may be mounted in the position occupied by clips **30** of FIG. **8***b*. Thus, the mounting arrangement may be simply and readily reversed. Considering FIG. **8***e*, for example, the panel **51'''** (with the clips **30** and **40** reversed) may be the first to be mounted to the studs with the panels positioned to the right thereof to be mounted in sequential order from left to right. It should be noted that the left-hand most panel **51'''** of FIG. **8***e* requires no clips along its left-hand mounting face. This is true in the case where an intersecting wall **61** prohibits the panel from being slid into position in the manner set forth hereinabove. Thus, the left-hand marginal edge of panel **51'''** may be secured to stud **53***d* by conventional fastening means such as self-tapping screws designated by the numeral **63.** It can be seen that each of the panels may be removed as easily as they have been assembled to the studs. For example, either of the panels **51'** or **51''** may be removed by placing an instrument such as, for example, a screwdriver in the narrow gap G between panels **51** and **51'**, for example, so as to pry the right-hand edge of panel **51** away from the studs. Panel **51''** may be loosened in a similar fashion so as to permit panel **51'** to be slid toward the left as shown by arrow A in order to remove that particular panel. Panels **51** and **51'''** may be removed simply by removing the fastening members **63** and either sliding or accordingly pulling the panel away. Thus, in the example of panel **51,** this panel may be slid toward the left as shown by arrow A after removal of the fastening screws **63** and lifting away of the right-hand end of panel **51'**. In the case of panel **51'''**, this panel may be removed without the handling of any other panel simply by removing the fastening screws **63** and prying the panel away from the studding by placing a pointed instrument in the gap G' between panels **51''** and **51'''**.

Although not shown in FIG. **8***e*, it would be obvious to provide additional panels with associated clips **30** and **40** to seal the opposite sides of studs **53–53***e*. This arrangement would be required where the wall formed by studs **53–53***e* forms a common wall between two offices or work areas. In the case where the studs are positioned immediately adjacent an outside wall, obviously no such panel arrangement would be required.

As was described hereinabove, it is typical to employ 4 feet × 8 feet panels and to mount same upon the studs which are arranged at 2 feet intervals (center line to center line). In such case, a stud will lie adjacent the intermediate portion of each panel. As shown in FIG. **8***f*, panels **51** and **51'** are mounted upon studs **53–53***d*, wherein studs **53–53***b* support panel **51** and studs **53***b–53d* support panel **51'**. In order to provide further support for each of the panels **51** and **51'** either of the following two techniques may be employed:

Considering first panel **51'**, its mounting face **52'** may be provided with a plurality of clips **40** arranged in substantially the same vertical fashion as the clips **40–40''** of FIG. **8***b* except that these clips are joined by a suitable adhesive along a vertical center line of the panel (note, for example, center line CL of FIG. **8***b*). The mounting assembly is the same as has been described hereinabove where clips **30** of panel **51'** are slid into gripping engagement with stud **53***d*. After the clips are in firm engagement with stud **53***d*, the right-hand edge of the panel (relative to FIG. **8***f*) is pressed toward the studs whereby clips **40** snappingly engage the clips **30** of panel **51** and whereby the clips **40'''** mounted along the imaginary center line of panel **51'** snappingly engage one arm **55***c* of stud **53***c*. This arrangement takes advantage of the "intermediate" stud **55***c* by providing additional support for panel **51'**.

Panel **51** uses a different arrangement in connection with its central portion being mounted to stud **53***a*. As shown best in FIG. **8***f*, one or more vertically aligned strips of hook-type filament members **17** are adhesively joined to the rear surface **52** of panel **51** while one or more vertically aligned strips of loop-type fastening members **20** are adhesively joined to the engaging surface of arm **55***a* of stud **53***a*. Panel **51** is, however, mounted in a similar fashion to those panels described hereinabove wherein clips **30** are joined to the arm **55***b* of stud **53***b* by sliding the panel from the left toward the right. After the clips **30** are moved into the firmly engaged position, the right-hand edge of the panel **51** is then pressed against stud **53** and stud **53***a* so as to cause clips **40** to snappingly engage with the clips **30** of the next adjacent panel **51''** and further so as to cause the fastening members **17** and **20** (described hereinabove in detail in connection with FIGS. **1***a–3b*) to become enmeshed. This assembly of panels **51** and **51'** may be handled by the same method steps described hereinabove.

As an alternative arrangement, the clip **40** may be replaced by clip **30** along the right-hand mounting surface (relative to FIG. **8***i*). Thus, the panel may be mounted by sliding it in the direction shown by arrow A. By providing stud **53***a* between studs **53** and **53***b*, the need for mounting two clips, i.e., clips **30'** and **30''** to a single stud, is avoided. As another obvious alternative, clips **30** may be replaced by clip **40** and the entire panel may be snapped into place. Note FIG. **8***j* wherein clips **30** and **30'** are mounted respectively at the right-hand end of panel **19** and the left-hand end of panel **19'**. Stud **53'** is provided with a deep indentation **53***a'* to accommodate the stud embracing portion of clip **30.** Alternatively, the back-to-back stud arrangement of FIGS. **11** and **11***a* may be substituted for the stud **53'** of FIG. **8***j* as will be more fully described hereinbelow.

FIGS. **9–9***c* show still another embodiment of the present invention in which a panel board **19** is provided with a plurality of clips **80** adhesively secured to the mounting face of the panel board by any suitable glue or other adhesive material. Each of the clips is provided with a mounting portion **81** which engages the mounting surface of the panel board and which is adhesively secured thereto. The clip is further provided with second, third and fourth portions **82, 83** and **84,** respectively, which are each bent at an angle relative to their integrally joined adjacent portion, section **82** being bent substantially at right angles relative to section **81,** section **83** being bent substantially at right angles relative to section **82,** and section **84** being bent substantially at a 45° angle relative to section **83.**

Clips **80'** are substantially identical to the clips **80** and a detailed description of these clips will therefore be omitted for purposes of brevity. As an obvious alternative to the arrangement shown in FIG. **9,** the spaced arrangement of clips **80** and **80'** may each be replaced by a single elongated clip.

Panel board **19** is further provided with a plurality of spaced openings arranged at predetermined intervals substantially along the upper and lower marginal edges thereof and whose purposes will be better understood from a detailed description of the manner of assembly set forth hereinbelow.

FIGS. **9***a* and **9***b* show the manner in which the panel of the type shown in FIG. **9** is assembled to a building stud assembly. The stud assembly of FIGS. **9***a* and **9***b* is substantially identical to that shown in FIG. **1***a* which was described as being comprised of a plurality of vertically aligned spaced parallel studs **11** and **12** (see FIG. **1***a*) maintained in their spaced positioning by ceiling and floor channels **13** and **14,** respectively, which are riveted or otherwise secured to the studs. Although only two such studs are shown in FIG. **1***a*, it should be understood that the studs are preferably arranged 2 feet on center with the number of studs being determined by the length of the particular wall to be constructed. FIG. **9***a* shows a plurality of studs **11, 12, 11'** and **12'**, respectively, wherein studs **11, 12** and **12'** are each rigidly secured to ceiling and floor channels of the type shown in FIG. **1***a*. The ceiling and floor channels have been omitted from FIGS. **9***a* and **9***b* for purposes of simplicity. Stud **11'** is a movable stud provided for a purpose to be more fully described. At this juncture it is sufficient to understand that movable stud **11'** is simply positioned between studs **12** and **12'** and has its upper and lower marginal portions slidably embraced by the ceiling and floor channels of the type shown and designated by numerals **13** and **14** in FIG. **1***a*. To mount the panel of FIG. **9,** panel **19,** with the clip members **80** and **80'** already secured thereto, is positioned against the mounting surfaces of all of the studs and is slid in a direction shown by arrow **85** until the clip portion **83** embraces the short arm **11***c* of stud **11.** Clip portion **84,** being aligned diagonally to clip portion **83,** facilitates the slidable engagement of the clip with arm **11***c*. Panel **19** is moved in the direction shown by arrow **85** until clip **80** firmly embraces the short arm **11***c* of stud **11.** At this time the vertical edges of the panel are substantially aligned with the center lines of studs **11** and **12'** as represented by dotted lines **86** and **87,** respectively. In this position it should be noted that opening **88** near the upper edge of panel **19** (see FIGS. **9** and **9***a*) and the opening **89** provided near the lower edge of panel **19** is substantially in alignment with the small gap between stationary stud **12'** and movable stud **11'**. It should further be noted that clip **80'** is positioned a spaced distance from the short arm **11***c'* of movable stud **11'**. In order to bring clip **80'** into firm, embracing engagement with movable stud **11'** the head portion of an instrument such as, for example, a screw driver is inserted into upper opening **88** in the manner shown by FIG. **9***a*. The head **91** of screw driver **90** is then positioned in the gap between studs **11'** and **12'**. The handle **92** of screw driver **90** is then turned or rotated in the direction shown by arrow **93** so as to move from the position shown in FIG. **9***a* toward the position shown in FIG. **9***b*. The opening **88** serves as a bearing surface about which the screw driver pivots whereby the head **91** is urged against the surface of movable stud **11'** so as to move the stud as well as its short arm **11***c* into embracing engagement with clip **80'**. Although not shown in the Figures it should be understood that the stud **11'** will now be slightly diagonally aligned. In order to complete the mounting operation the screw driver **90** is removed from upper opening **88** and is inserted into lower opening **89** whereby substantially the same turning or rotating operation is repeated so as to bring the lower edge of the movable stud **11'** into embracing engagement with the lowermost clip **80'** or with the lower end of clip **80'** in the case where a single elongated clip member is employed. This completes the assembly operation of the panel. If desired, a self tapping screw S may be employed to engage panel **19** and stud **11'** to prevent movement of the stud **11'**. An additional screw (not shown) may be mounted at both the upper and lower edges of the panel, if desired.

It should be understood that the above description describes a manner in which a single panel is assembled to the building studs. Obviously, additional panels over a long wall would be mounted in a similar fashion. With the clips mounted to the panel board in the arrangement shown in FIGS. **9–9***b* the assembly sequence is such that the panel to the left of panel **19** shown in FIG. **9***a* should be installed first, panel **19** should then be installed next and the panel immediately to the right of panel **19** should be the next panel to be installed, i.e., the panels with the clips arranged as shown in FIG. **9***a* would be from left to right. It should be obvious that the installation sequence may be reversed by reversing the building studs **11, 12** and **12'** so that their openings face in the direction opposite that shown in FIG. **9***a* and by placing movable stud **11'** immediately adjacent and to the right of stud **11** so that substantially the mirror

image of the arrangement shown in FIG. 9*a* is obtained. It should further be obvious that panels may be installed on the opposite mounting faces of studs **11, 12, 11'** and **12'** in a manner similar to that described hereinabove. In cases where the building studs are positioned immediately adjacent the exterior wall of a structure, it should be understood that panels are to be mounted to the interior mounting faces only of the studs. In applications where the studding is positioned remote from the exterior wall of a structure it is then desirable to provide and mount panels on both sides of a stud run. In such applications it is preferable to mount both panels substantially simultaneously. This may be done by mounting panel **19** in the manner described hereinabove so as to cause its clip **80** to embrace short arm **11***c* of stud **11.** A second panel may be placed upon the opposite side of the stud run so that its clip embraces the short arm **11***d* of stud **11.** The movable stud **11'** need only be moved from one side of the wall being assembled by inserting a tool such as the screw driver **90** shown and completing the assembly in the manner described hereinabove. If desired, however, the head of the screw driver may be inserted through a similar opening provided in the panel **19'** shown in dotted fashion to absolutely assure that its clip **80'** is firmly embraced by the short arm **11** *d'* of the movable stud **11'.**

The panel assembly of FIG. **9** is also adapted to be readily removed at any time after assembly through the provision of openings **94** and **95** which are spaced from openings **88** and **89,** respectively, and which are positioned near the upper and lower edges, respectively, of the panel. As can best be seen from a consideration of FIG. **9***b* the openings **94** and **95** are aligned substantially with the small gap formed between the clip portion **82'** of clip **80'** and the short arm **11***c'* of movable stud **11'.** In order to release the clip from the movable stud, the head **91** of the screw driver is inserted into opening **94** and twisted in the reverse direction to that described hereinabove to cause the movable stud **11'** to move from the position shown in FIG. **9***b* to the position shown in FIG. **9***a*. To complete the disassembly operation, the screw driver is then inserted into the lower opening **95** and the operation substantially as described hereinabove is repeated. It should be obvious that the screw driver may first be inserted into the lower opening **95,** if desired. This is also true of the assembly operation wherein the screw driver may be first inserted into the lower opening **89,** if desired. In order to complete the disassembly operation, panel **19** is then moved or slid in a direction shown by arrow **97** so as to release clip **80** from the short arm **11***c* of stud **11** (note FIG. **9***a*). This completely releases the clip members of the panel from the studs enabling the panel to be removed.

As was described hereinabove, the studs are typically arranged at 2 feet intervals from the center line of one stud to the center line of the next stud. Panels are typically 4 feet in width and, as shown in FIG. **9***a*, extend between three stationary studs **11, 12** and **12'.** In order to take advantage of the presence of stud **12** and utilize this stud to provide further support for panel **19,** an additional clip member **80''** may be adhesively mounted to the mounting surface of panel **19** so as to move into embracing engagement with the short arm **12***c* of stud **12** simultaneously with the movement of clip **80** into embracing engagement with short arm **11***c* of stud **11.** The final assembly step of the insertion of the screw driver remains the same throughout.

In cases where it is desired to remove panel **19** only and wherein panel **19** is positioned between a panel to its immediate left and a panel to its immediate right, it becomes awkward to attempt to move the right-hand end of panel **19** outwardly in the direction shown by arrow **98** due to the presence of clips **80** and **80''.** It is also not possible to slide panel **19** in a direction shown by arrow **97** due to the fact that a panel is positioned immediately to the right of panel **19.** In this instance, and in the instance where it is desired to use clip **80''** to provide additional supporting strength for panel **19,** stud **12** is made movable (i.e., is not mechanically secured to the ceiling and floor channels of the stud run but is slidably embraced by the channels) and panel **19** is further provided with a pair of upper openings and a pair of lower openings similar to the upper and lower openings **88–94** and **89–95** described hereinabove. As shown in FIG. **9***a* the upper edge of the panel is provided with an opening **98** into which a screw driver is inserted to slide the upper end of slidable stud **12** into embracing engagement with clip **80''.** It should be obvious that the sliding stud **12** should be moved sufficiently to the left so as not to embrace clip **80'** when panel **19** is in the position as shown in FIG. **9***a* (i.e., when the clip **80** of panel **19** snugly embraces the short arm **11***c* of stud **11**). However, the position of stud **12** should be such as to have its left-hand edge positioned slightly to the right of opening **98.** The screw driver may then be inserted in the fashion set forth hereinabove to move the upper end of stud **12** into embracing engagement with clip **80''.** This operation is repeated whereby the screw driver is inserted into the lower opening (not shown for purposes of simplicity) to move the movable stud **12** into vertical alignmentt as well as being moved into firm and snug engagement with clip **80''.** Disassembly of panel **19** may now be performed without removing any panels to its immediate left or its immediate right in the following manner:

Movable stud **11'** is disengaged from clip **80'** in the manner described hereinabove through the insertion of the screw driver into upper opening **94** and subsequently into lower opening **95.** The next operation consists of inserting the screw driver into upper opening **100** which is substantially aligned with the small gap between the clip portion **82''** of clip **80''** and the short arm **12***c* of movable stud **12.** The screw driver is rotated in the direction shown by arrow **93** (when the screw driver is inserted into opening **100**) to move the upper end of slidable stud **12** out of embracing engagement with the upper portion of clip **80''.** The operation is then repeated by inserting the screw driver into the lower opening which is aligned similar to the upper opening **100** (and which has been omitted for purposes of simplicity) so as to totally and completely release slidable stud **12** from embracing engagement with the clip **80''.** Upon completion of this operation, only clip **80** remains in embracing engagement with the short arm **11***c* of stud **11.** The right-hand end of panel **19** may be lifted away from the stud run by moving the panel in the direction shown by arrow **98.** To facilitate this operation the head of a screw driver or other instrument may be placed in the gap between the right-hand edge of panel **19** and the left-hand edge of the adjacent panel **19''.** As soon as the right-hand edge of panel **19** has been lifted away from studs **11'** and **12'** and clears

the exterior surface of panel 19'', the panel may be moved in the direction shown by arrow 97 so as to remove clip 80 from embracing engagement with the short arm 11*c* of stud 11. This arrangement thus facilitates both assembly and removal of a single panel from the stud run while at the same time utilizing stud 12 to provide further supporting strength for the panel.

After the entire wall has been assembled in the manner described hereinabove the openings provided along the upper and lower edges of panel 19 are covered by ceiling and floor runners of the type shown and described hereinabove in connection with FIGS. 2*a* and 2*b*. Obviously, any other ceiling and floor runner assembly may be employed so long as the height of each ceiling and floor assembly is sufficient so as to cover the openings provided along the upper and lower edges of each mounted panel so that the openings will not detract from the aesthetic appearance of the finished panel assembly. It can therefore be seen that the assembly of FIGS. 9–9*b* provides a greatly simplified panel mounting assembly of high structural strength which lends itself readily to rapid assembly or disassembly from the stud run.

The clips 80, 80' and 80'' may be made adhesively mounted to the mounting face of panel board 19 either in the factory or at the job site. At job sites where a relatively small number of panels are required, it may be preferable to mount the clips at the job site. However, in job installations requiring a very large number of panel assemblies, it is preferred that the clips be mounted at the factory and shipped to the job site in completed form. Due to the nature of the clips and the manner in which they protrude from the mounting face of each panel board, the panels do not lend themselves readily to being neatly and compactly stacked so as to facilitate stacking, packaging, handling and shipping. In order to provide a clip assembly which lends itself to being compactly stacked after assembly, the arrangement of FIG. 9*c* may be employed. As shown therein, the clip assembly 110 comprises first and second clip members 111 and 112. Clip member 111 is comprised of a mounting portion 111*a* and an embracing portion 111*b*. Mounting portion 111*a* is adhesively secured to the mounting face of panel 19. Clip member 111 when securely mounted, has its embracing portion 111*b* spaced a small distance away from the mounting face of panel member 19. This completes the assembly or fabrication of the panel at the factory. Clip portions 112 are shipped separately and are mounted at the job site in the following fashion:

Clip member 112 is provided with an embracing portion 112*a* and integral portions 112*b*, 112*c* and 112*d*. Portion 112*b* is aligned at right angles to portions 112*a* and 112*c* while portion 112*d* is diagonally aligned relative to portion 112*c*. The clip assembly 110, when fully assembled in the manner shown in FIG. 9*c*, substantially resembles the clip 80, for example, shown in FIGS. 9–9*b*. The embracing portion 112*a* of clip member 112 is slid beneath the embracing portion 112*b* of clip member 111 and the mounting face 19 of the panel board. After being firmly slid beneath embracing portion 111*b*, the head of a sharp instrument is placed against the exterior surface of embracing portion 111*b* and its opposite end is struck preferably by a hammer so as to peen or otherwise form an indentation in embracing portion 111*b* (as well as portion 112*b*) causing clip member 112 to be rigidly secured to the panel assembly. It should be understood that a plurality of clip assemblies 110 are provided upon the panel with the alignments as shown for the clip assemblies 80 and 80' (as well as clip 80'', if desired). As an alternative arrangement the plate portions 112*a* and 111*b* may be provided with cooperating recesses, grooves or indentations formed at the factory. The plate 112*a* is then slid beneath plate portion 111*b* until the recesses or grooves are aligned to lock the plates together.

FIGS. 10, 10*a* and 10*b* show alternative clip embodiments which are substantially similar to the clip structures shown in FIGS. 6–8*g*. Considering the embodiment of FIG. 10, panel 19 is provided with a clip member 120 substantially similar to the clip 30 shown in FIG. 6 and having a panel mounting portion 120*a*, a bent portion of small radius 120*b*, and a bent portion of greater radius 120*c*. The major distinction between the clip 120 of FIG. 10 and the clip 30 of FIG. 6 is that the portions 34 and 35 of clip 30 are integrally joined along a sharply bent portion 37 and the portion 120*b* of clip 120 is provided with a gradually bent portion whereas the similar portion 36 of clip 30 is substantially straight.

Panel 19' has its right-hand end provided with an adhesively mounted clip 122 comprised of a mounting portion 122*a* joined at a sharp bend 122*b* by a substantially S-shaped portion 122*c*. It should be understood that the right-hand end of panel 19 although not shown in the Figure for purposes of simplicity would receive a clip of the type shown as clip 122 while the left-hand portion of panel 19', also not shown for purposes of simplicity, would receive a clip of the type shown as clip 120. The assembly steps consist of initially mounting panel 19 by sliding the panel in the direction shown by arrow 123 so as to cause clip 120 to embrace stud 11. The right-hand end of panel 19 is snapped against a clip of the type shown as clip 120 embracing the associated stud (not shown for purposes of simplicity). which is arranged approximately substantially 4 feet from stud 11. Panel 19 is then mounted in a similar fashion whereby its left-hand clip (not shown in FIG. 10) is slid in the direction shown by arrow 123 so as to cause its left-hand clip (which would be of the type shown by clip 120) with an associated stud. The right-hand end of panel 19' is then snapped into position by pressing the exposed right-hand surface of panel 19 in the direction shown by arrow 124 to cause the S-shaped portion 122*c* of clip 122 to snappingly engage the curved portion 120*b* of clip 120.

FIG. 10*a* shows a somewhat similar arrangement wherein a clip 30', substantially similar to clip 30 of FIG. 6, is adhesively mounted to panel 19 adjacent its right-hand edge and having a portion thereof protruding beyond the right-hand edge of the panel. Adjacent panel 19' is provided with a clip assembly 126 having a mounting portion 126*a*, a portion 126*b* arranged at right angles to portion 126*a*, a curved portion 126*c* of a small radius of curvature and a portion 126*d* whose free end has an S-curved portion 126*e*. It should be understood that the right-hand end of panel 19' would be provided with a clip of the type shown by clip 30' and likewise the left-hand end of panel 19 would be provided with a clip of the type shown by clip 126. The sequences of assembly is such that panel 19 is slid in the direction shown by arrow 127 to cause clip 30' to be moved into embracing engagement with the short arm 11*c* of stud 11. Its left-hand end is then pressed in-

wardly toward the stud run to cause the clip of the type shown by clip **126** to snappingly engage the associated clip of the type shown by clip **30'** of the panel positioned immediately to the left of panel **19.** Panel **19'** is mounted in a similar fashion whereby its clip of the type shown by clip **30'** is first brought into embracing engagement with an associated stud and its left-hand end is pressed inwardly in the direction shown by arrow **128** to cause clip **126** to embracingly engage the central portion of clip **30'** in the manner shown in FIG. **10***a*. In this particular arrangement portion **126***d* of clip **126** will be caused to be urged toward portion **126***b* of the resilient clip in order to clear the central portion of clip **30'**. Once portion **126***d* has cleared clip **30'** the S-shaped portion **126***e* will snappingly be urged against the central portion of clip **30'** to be rigidly held into the position as shown in FIG. **10***a*.

FIG. **10***b* shows an arrangement substantially similar to that shown in FIG. **10***a* wherein clip **30'** is substantially identical to clip **30'** of FIG. **10***a*. However, clip **126** of FIG. **10***a* is substituted by a clip **130** of FIG. **10***b* which is comprised of a mounting portion **130***a*, a portion **130***b* arranged at right angles to mounting portion **130***a*, and an elongated and S-shaped free end portion **130***c* integrally joined to portion **130***b*. The mounting sequence of the assembly of FIG. **10***b* is such that panel **19** is first moved in the direction shown by arrow **131** to cause clip **30'** to embracingly engage the short arm **11***c* of stud **11.** The left-hand end of panel **19** is then pressed against the stud run to cause the clip provided near its left-hand end to embracingly engage a clip similar to clip **30'** provided on the panel positioned immediately to the left of panel **19.** Panel **19'** is mounted in a similar fashion whereby the clip provided along its right-hand edge and similar to clip **30'** is caused to be brought into embracing engagement with an associated stud. The left-hand end of panel **19** is then urged in the direction shown by arrow **132** whereby the end portion **130***d* of clip **130** bears against the central portion of clip **30'** causing the clip to be deformed to assume the shape shown by dotted lines **130'**. As soon as the end portion **130***d* clears the central portion of clip **30'** the clip snappingly returns to its normal position so as to occupy the position shown in solid line fashion in FIG. **10***b* and thereby cause the left-hand portion of panel **199'** to be firmly embraced against stud **11.**

FIGS. **11** and **11***a* show still further alternative embodiments wherein a stud **11** which may be ridigly engaged by the ceiling and floor channels (as shown and described in connection with FIG. **1***a*) is joined with a movable stud **12** which is inserted into the stud run by diagonally aligning the stud **12** between two stationary mounted studs until its upper and lower edges clear the ceiling and floor channels, after which the stud is then moved to a vertically aligned position in engagement with stud **11** in the manner shown in FIG. **11.** If desired, a fastening member such as a sheet metal screw **131** may be threaded into the studs **11** and **12** so as to secure movable stud **12** to stationary stud **11.** Obviously, if desired, a plurality of sheet metal screws may be arranged at spaced intervals along the length of the studs **11** and **12.**

Each vertical marginal edge of each of the panels **19** and **19'** shown in FIG. **11** has secured to its mounting face a mounting clip **134** which is comprised of a mounting portion **134***a* integrally joined to a substantially S-shaped portion **134***b*. In the embodiment of FIG. **11,** the nature of the assembly is such that the panels may be assembled in either sequence, i.e., either panel **19** or panel **19'** may be mounted first. Panel **19** may have the clip provided along its left-hand mounting face either slid into or snappingly engaged with an associated stud. The right-hand end of panel **19** is then pressed inwardly as shown by arrow **135** until the free end of clip **134** clears the short arm **12***c* of stud **12** at which time the clip moves into snapping engagement with short arm **12***c*. Panel **19'** may be mounted in a similar fashion. The panels may be readily disassembled by inserting the head end of a screw driver in the gap G between panels **19** and **19'** and prying the panel away from its associated stud.

FIG. **11***a* shows a somewhat similar arrangement to that shown in FIG. **11** wherein studs **11** and **12** (either of which may be movable with the remaining one being rigidly secured to the ceiling and floor channels) are secured by one or more sheet metal screws **131.** The clip assemblies employed in FIG. **11***a*, however, are somewhat different from those shown in FIG. **11.** Clip assemblies **136** are each comprised of a mounting portion **136***a*, a portion **136***b* arranged substantially at right angles to mounting portion **136***a*, and a substantially S-shaped free end portion **136***c* which has a projecting portion **136***d* of substantially small radius of curvature. The mounting assembly is substantially similar to that described in connection with FIG. **11** wherein the clips are deformed as shown by the dotted line configuration **136'** until portion **136***d* clears the short arm of its associated stud (for example, as short arm **11***c* of stud **11**) at which time the clip returns to its normal contour so as to have the projecting portions **136***d* embrace the short arm portions **11***c* and **12***c* of studs **11** and **12,** respectively.

After assembly, it may be found that the curved propecting portions **136***d* while in the position embracing the short arm of its associated stud may leave a slight gap between the mounting face of each panel and the engaging mounting face of the stud a slight amount of rattling of the panel may occur. In order to prevent this, an elongated resilient strip **138** is mounted along each marginal mounting face of each panel in the manner shown. The strips **138** are preferably highly resilient so as to be compressible to a substantial degree and thereby take up any gap or slight spacing which may remain after mounting of the panel. It can thus be seen that the mounting face and short arm of each stud is embraced between the resilient pad **138** and the projecting portion **136***d* so as to be quite firmly embraced therebetween and thereby provide an extremely tight fit for the panels to prevent the possibility of any rattling of the panel members. It should be understood that a similar resilient pad may be employed in all of the previous clip embodiments described hereinabove. For example, in connection with FIG. **11,** the resilient pad **138** may be positioned between the mounting face of stud **11** and the exposed face of the mounting portion **134***a* of clip **134.** The resilient pad may either be adhesively secured to the mounting face of the stud or alternatively may be adhesively secured to the exposed face of mounting portion **134***a*. In the embodiment of FIG. **10***b* a resilient pad **138** may be adhesively secured to the mounting face of panel **19'** in the position as shown. Clips which are slidably moved into places such as, for example, clip **30'** may be bent so as to provide a much tighter embracing fit with its associated stud so

as to avoid the need for a resilient pad. Alternatively, if desired, a pad may be placed between the exposed face of the mounting portion of clip **30'** and the mounting face of stud **11** and may be adhesively secured to either of these two faces. Resilient pads may be mounted in a manner similar to that described hereinabove in connection with the remaining clip assemblies of FIGS. **6–8***h*, **10** and **10***a*. The clip assemblies employed in the embodiment of FIGS. **9–9***c* may be made to snugly and tightly embrace their associated studs so as to avoid the need for such resilient pads. However, if desired, pads may be employed in appropriate positions similar to that described hereinabove in connection with FIGS. **11**, **11***a* and **10***b*.

FIG. **11***b* shows an arrangement somewhat similar to that shown in FIG. **9***c* wherein clip assemblies **160** and **170** are each formed of two separate clip portions **161–162** and **171–172**, respectively. Considering clip assembly **160**, clip portion **161** is provided with a mounting portion **161***a* and an embracing portion **161***b*. Clip member **162** is provided with an embraced portion **162***a* and a stud embracing portion **162***b* whereby the final assembly is substantially similar to clip assembly **40** of FIG. **7**. The arrangement of clip assembly **160** is designed for a purpose substantially similar to that described in connection with FIG. **9***c* wherein it is desired to mount the clips at the factory and yet provide an arrangement in which the panel assemblies, after the clips are mounted, lend themselves to being simply and compactly stacked for packaging and shipping purposes. The mounting portion **161***a* is adhesively secured to the mounting face of panel **19** while the remaining clip members **162** may be packaged and shipped separately. At the job site the embraced portion **162***a* of clip **162** is slid beneath the embracing portion **161***b* of clip **161** and a sharp instrument such as, for example, the head of a screw driver or the head of a nail punch is placed against the exposed surface of embracing portion **161***b*. Its opposite end is sturck by a heavy instrument such as, for example, a hammer so as to form a depression or punch mark **173**. A plurality of punch marks are formed in the embracing portion **161***b* at spaced intervals therealong so as to cause the clip portion **162** to be firmly embraced between the mounting face of panel **19** and its associated clip member **161**.

The clip assembly **170** which, when fully assembled, substantially resembles clip **30** of FIG. **6**, is comprised of first and second clip members **171** and **172** whereby clip member **171** may be adhesively mounted to panel **19** at the factory. Its slightly raised embracing portion **171***b* does not substantially interfere with the compact stacking of a large number of panels. The separate clip arms **172** may be separately packaged and shipped. At the job site the embraced portions **172***a* are slid beneath the embracing portions **171***b* and the surface of embracing portion **171***b* is provided with a plurality of punch marks in the manner to that described hereinabove in conjunction with the assembly of clip assembly **160**. The mounting of the panel boards is substantially identical to that described in conjunction with FIGS. **8***a–8f*, the only distinction of the clip assemblies of FIG. **11***b* from that shown in FIGS. **6** and **7** being the two-piece design to facilitate packaging and handling and to reduce the amount of activity required at the job site wherein at least the adhesively mounted portions of the clip assemblies may be completed at the factory and before shipment to the job site.

FIG. **12** shows still another embodiment of the present invention in which a panel **19** is provided with three elongated plastic strips **140**, **140'** and **140''** which are adhesively secured to the mounting face of panel **19** in spaced parallel fashion so as to be substantially in alignment with the mounting faces of studs **11**, **12** and **11'**, respectively. The plastic strips **140**, **140'** and **140''** are each formed of a suitable magnetic material in granulated form which are dispersed throughout the plastic binder which is in the form of a strip of material preferably of a thickness in the range from one sixty-fourth inch to one-eighth inch. The panel is mounted by pressing the panel against the studs with the magnetic strips engaging the mounting faces of studs **11**, **12** and **11'**, respectively. The studs **11**, **12** and **11'** are formed of a metallic material which is magnetically attracted by the permanently magnetized strips of tape so as to cause the tape strips of the panel to be magnetically attracted to their associated studs. Once the panel is in position the supporting strength may be enhanced by inserting a single sheet metal screw **141** at both the upper and lower edges of the panel intermediate the vertical sides of the panel so as to threadedly engage stud **12** near its lower and upper end. This operation may be performed after mounting of the panel whereby the magnetized tape strips are of sufficient magnetic strength to maintain the panel in position. Thus the panels need not be held or supported during the time in which the sheet metal screws are inserted. If desired, the sheet metal screws may be eliminated so long as the magnetic strips employed are of suitable thickness so as to provide a magnetic force of sufficient attractive strength to hold the panel permanently in position. A panel may be released simply by inserting the head of a screw driver in the gap G between adjacent panels in prying the desired panel away from the studs to which it is magnetically attracted.

In applications wherein it is desired to use clip assemblies of the type described in FIGS. **6–11***a*, along the marginal edges of a panel and to provide further supporting strength by mounting the panel to a stud positioned intermediate its edges, either the magnetic strip shown in FIG. **12** or the velcro strip shown in FIGS. **1***a–3b* may be employed. For example, considering the embodiment of FIG. **9***a*, clip **80''** may be substituted either by a magnetic strip adhesively secured to the mounting face of panel **19** and aligned so as to make physical engagement with the mounting face of stud **12** so as to provide the additional supporting strength. Alternatively, the mating Velcro strips may be adhesively secured to the mounting faces of panel **19** and stud **12** and may be brought into engagement by pressing the panel in the direction shown by arrow **150** to cause the cooperating Velcro strips, of the type shown in FIGS. **1***c* and **1***d*, into locking engagement with one another. This arrangement eliminates the need for providing a sliding stud in the central portion while at the same time providing additional supporting strength for each panel in the region intermediate the vertical edges of the panel.

In the embodiments of FIGS. **6–12**, it is not necessary to employ conventional batten strips in the gaps between the vertical edges of adjacent panels, for example, in the gap G between panels **19** and **19'** of FIG. **11**. However, if desired, batten strips of the type shown in

FIG. 1*b* may be employed so as to cover the region between adjacent panels if desired. The force-fitted batten strips **23** shown in FIG. 1*b* may preferably be formed of a resilient plastic material so as to be readily force-fitted into the gap between adjacent panels and likewise so as to be readily removed therefrom. The exposed face of the force-fitted batten strip may be made of a glossy or matte finish and be of any desired color so as to be color-coordinated with the panels. The ceiling and floor runners, which may be of the type described in FIGS. 2*a* and 2*b*, or of any other suitable type, may likewise be made of a material which is color-coordinated with the panels and which provide an aesthetically appealing appearance when fully assembled.

While not described herein for purposes of simplicity, it should be understood that ceiling and floor runners of the type described hereinabove in connection with FIGS. 2*a* and 2*b* may be employed to finish the top and bottom horizontal marginal edges of a partition assembly. Obviously, any other floor or ceiling runner arrangement may be employed. The left-hand and right-hand most panels or, alternatively, those panels which require conventional fastening means such as, for example, the fastening means **63** of FIG. 8*e* may be covered by a batten strip of the type designated by the numeral **23** in FIG. 1*b*, wherein the left-hand arm portion **23***e* and loop-type elements strips or in which novel mounting clips are secured to the vertical studs and the mounting surfaces of the panel board to greatly expedite assembly of a partition system.

It should further be noted that the various elements shown in the Figures are not necessarily drawn to scale. Also, the relative proportions between and among the various elements of the assemblies have been modified for simplicity of the drawings and hence the relative proportions as shown should not be considered as limiting the concept or scope of the invention.

FIGS. **13** and **13***a* show another embodiment of the invention in which clip assembly **180** is comprised of a mounting portion **181** adhesively secured to panel **19.** Integrally joined to clip portion **180** is an upright portion **182** having a pair of parallel arms **183***a* and **183***b* extending from the free end thereof. The arms **183***a* and **183***b* each have an elongated slot **184** (only one such slot being shown in the Figures). Each slot receives the associated end of a pin **185** upon which a rubber (or resilient) roller **186** is mounted. The pin **185** is urged away from upright portion **182** by springs **187***a* and **187***b* wedged between pin **185** and upright portion **182.** The panel **19** may be "snapped" into position by pressing the panel against the studs, causing the roller **186** to be urged toward upright portion **182** until the roller clears short arm **11***e* of stud **11,** at which time roller **186** is snappingly urged behind arm **11***c*. The panel may be removed by prying the head of a screw driver between panels **19** and **19'**.

Although this invention has been described with respect to its preferred embodiments, it should be understood that many variations and modifications will now be obvious to those skilled in the art and, therefore, it is preferred that the invention be limited not by the specific disclosure herein but only by the appended claims.

I claim:

1. An interior movable partition system for a building structure comprising at least one panel;

a plurality of spaced parallel vertically aligned studs of substantially C-shaped cross section defined by a central portion and a pair of outwardly extending arms;

clip means being secured to the mounting face of said panel along first and second marginal edges thereof;

each of said clip means having a resilient panel mounting portion integrally joined to a stud embracing portion for snap-fittingly engaging the free end of an arm of an associated one of said studs for urging the panel toward said studs.

2. The system of claim **1** wherein said stud embracing portion of selected ones of said clips has a V-shaped configuration.

3. An interior movable partition system for a building structure comprising at least one panel:

a plurality of spaced parallel vertically aligned metallic studs of substantially C-shaped cross-section;

upper and lower channels each respectively embracing the upper and lower ends of said studs whereby said studs are slidably received by said channels;

at least one first clip member being secured to the mounting face of said panel along one marginal edge thereof;

at least one second clip member being secured to the mounting face of said panel along the opposite marginal edge thereof;

said first clip member having a substantially Z-shaped configuration comprising first and second arms extending in opposite directions from an integrally joined central portion, one of said arms being joined to said panel mounting face and the opposite arms embracing one arm of one of the studs;

said second clip member having a substantially Z-shaped configuration comprising first and second arms extending in opposite directions from an integrally joined central portion, one of said arms being joined to said panel mounting face and the opposite arm positioned a spaced distance away from another one of said studs;

said panel having a first opening adjacent its upper edge and a second opening adjacent its lower edge;

said first and second opening positioned adjacent said one of said movable studs to facilitate the insertion of a slender instrument such as a screw-driver head to enable the upper and lower ends of the said other one of said movable studs to be moved into embracing engagement with the opposite arm of said second clip member.

4. The partition system of claim **3** wherein said panel is further provided with third and fourth openings respectively along its upper and lower ends and arranged a spaced distance from said first and second openings respectively;

said third and fourth openings being positioned in close proximity to the central portion of said second clip member to facilitate the insert of a slender instrument such as screw-driver head to enable the upper and lower ends of the said one of said movable stud to be moved out of embracing engagement with the opposite arm of said second clip member.

5. An interior partition system comprising:

a plurality of vertically aligned metallic studs of substantially C-shaped cross-section;

upper and lower channels each respectively embracing the upper and lower edges of said studs whereby said studs are slidably received by said channels;

one of said studs being positioned immediately adjacent one of the studs which is rigidly secured to said channels;

a rectangular shaped panel board having a width substantially equal to the spacing between studs;

a first clip member being secured to the mounting face of said panel and adjacent one vertical edge;

a second clip member being secured to the mounting face of said panel adjacent the opposite vertical edge;

said first clip member having a substantially Z-shaped configuration comprising first and second arms extending in opposite directions from an integrally joined central portion, one of said arms being secured to said panel and the remaining arm being adapted to embrace one of said studs;

said second clip member having a substantially Z-shaped configuration comprising first and second arms extending in opposite directions from an integrally joined central portion, one of said arms being secured to said panel and the remaining arm being positioned a spaced distance away from another one of said studs;

said panel having a first opening adjacent its upper edge and a second opening adjacent its lower edge;

said first and second openings positioned adjacent the side of said movable stud remote from said second clip member to facilitate the insertion of a slender instrument such as a screw-driver head to enable the upper and lower ends of the said one of said movable studs to be moved into embracing engagement with the opposite arm of said second clip member.

6. The partition system of claim **3** wherein said panel is further provided with third and fourth openings respectively along its upper and lower ends and arranged a spaced distance from said first and second openings respectively;

said third and fourth openings being positioned in close proximity to the central portion of said second clip member to facilitate the insertion of a slender instrument such as a screw-driver head to enable the upper and lower ends of the said one of said movable studs to be moved out of embracing engagement with the opposite arm of said second clip member.

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