March 3, 1936. G. D. KELLOGG 2,033,100

STRUCTURAL ASSEMBLY

Filed Oct. 20, 1932 3 Sheets-Sheet 1

Fig. 1.

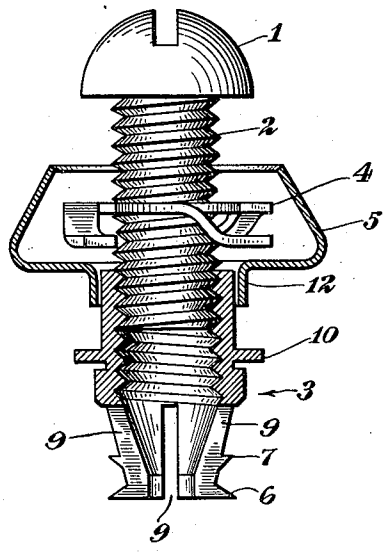


Fig. 3.

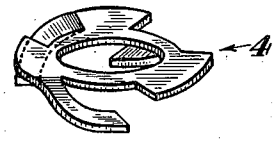


Fig. 4.

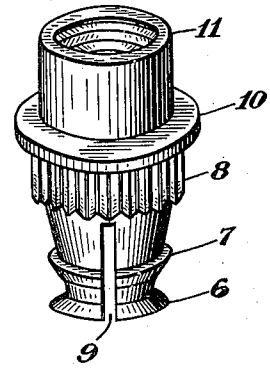
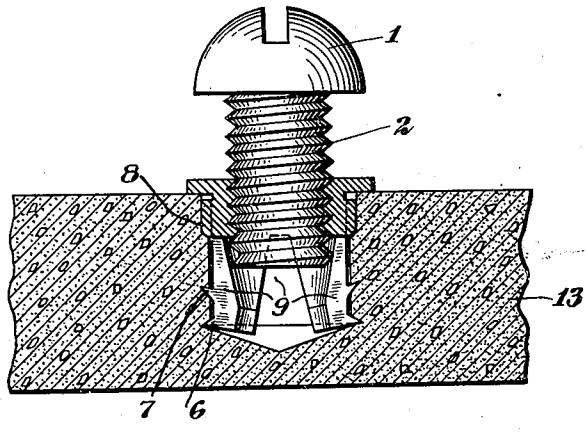


Fig. 2.



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STRUCTURAL ASSEMBLY

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Fig. 5.

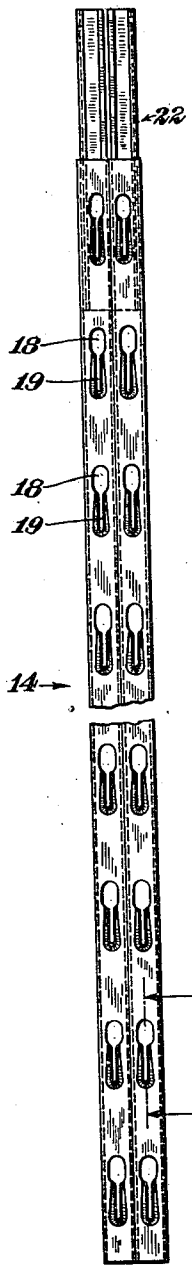


Fig. 6.

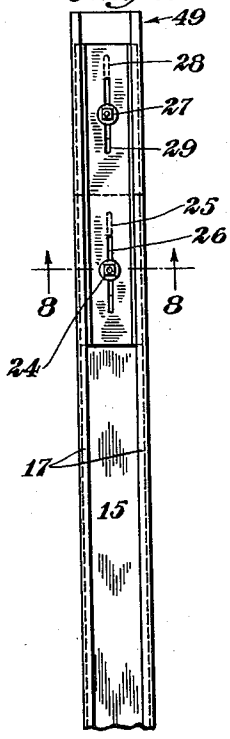


Fig. 7.

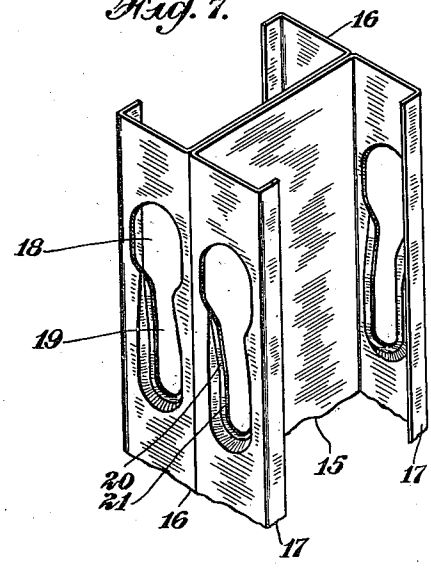


Fig. 9.

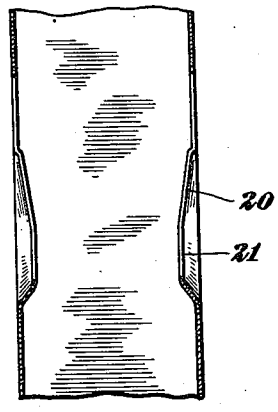
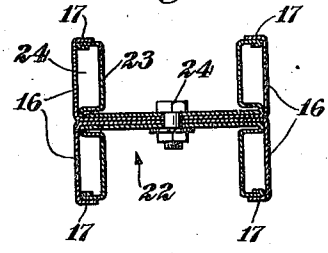


Fig. 8.



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STRUCTURAL ASSEMBLY

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Fig. 12.

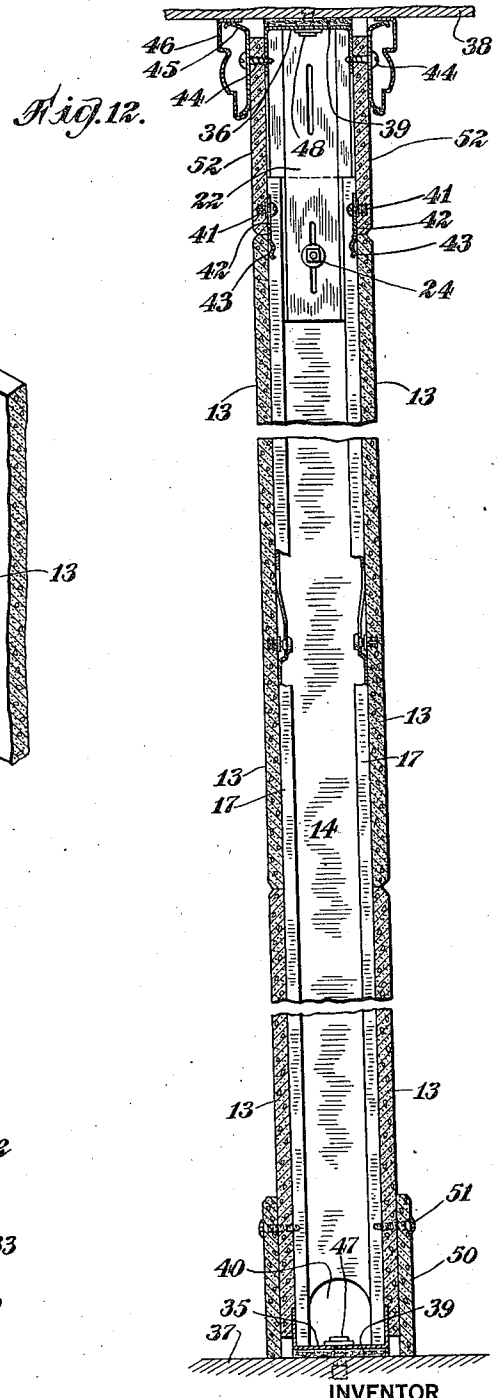


Fig. 10.

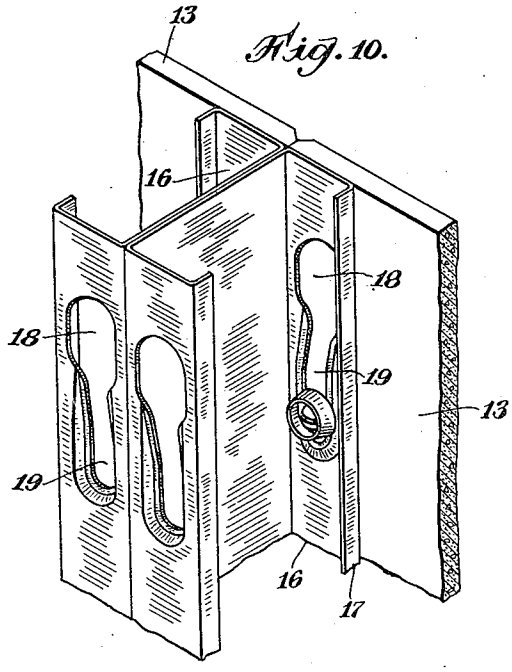
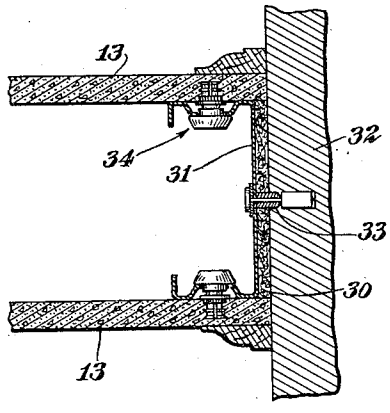


Fig. 11.



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UNITED STATES PATENT OFFICE

2,033,100

STRUCTURAL ASSEMBLY

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Application October 20, 1932, Serial No. 638,738

12 Claims. (Cl. 72—105)

This invention relates to a structural assembly of preformed units and particularly to such an assembly of minimized tendency to rattle or vibrate.

A preferred embodiment of the invention comprises the combination of preformed panels, suitably heavy and relatively non-vibratile, a supporting substructure that is vibration-damped, and antirattling fastening means securing the panels to the substructure. The fastening means preferably comprise a spring tightening element and engage springy walls in slots in an element in the substructure. The substructure may include studs provided with an extension head adapted to be fitted closely against a transverse support member. The extension element or head may fit slidably around an end portion of a union member while an end of the main portion of the stud fits similarly around the other end of the union member, in such manner that the corresponding parts of the head and main portion of the stud lie in the same plane and thus provide a smooth face upon which to secure panels in the assembly.

To fire-resistant walls made heretofore by assembling preformed panels upon a supporting substructure of metal, there have been certain objections. Usually such assemblies are more or less misfitted or loosely held in certain positions and inclined to rattle or to vibrate under the influence of incident sound or intermittent mechanical stresses. The studs, if cut to a standard length, may not fit snugly, in every instance, the floor and ceiling head plates, for example. If extension heads are used on the studs, to permit snug fitting at the ends, there is commonly a slight offset between the face of the head and the face of the main portion of the stud, and this contributes to the lack of firmness of support of a panel held to such a stud and extending over the offset in the face. The fasteners which are used, if of predetermined dimensions, may not fit tightly in every case. Furthermore, the fasteners may be difficult to secure adequately to the panel, particularly when the panel is of preferred type such as a stonelike composition consisting essentially of asbestos and Portland cement.

It is an object of the invention to overcome the above mentioned disadvantages of assembled walls and to provide a structure which may be quickly and conveniently assembled in a building, to form a firm wall of minimized tendency to vibrate or rattle.

The invention is illustrated in the drawings which exemplify various members adapted for use in the present invention and also a finished assembly combining the said various members.

Fig. 1 is a sectional view of the preferred form of fastening means;

Fig. 2 is a sectional view of a modified form of fastening means showing the expansion nut thereon, like that shown in Fig. 1 in the portion below the shoulder, but here expanded into engagement with the sidewalls of a hole in a panel;

Fig. 3 is a perspective view of the spring tightening element which is shown in sectional view in a portion of Fig. 1;

Fig. 4 is a perspective view showing the expansion nut illustrated in section in a portion of Fig. 1;

Fig. 5 is a face view of a preferred form of support which, in this embodiment, is a stud with union or extension members in engagement with the upper part of the stud;

Fig. 6 is a side view of a portion of the assembly shown in Fig. 5, but with the addition of a short length of stud or extension head engaged over the upper part of the union member;

Fig. 7 is a perspective view of a portion of a stud support of preferred type, showing particularly the shape of the faces and of the slots therein;

Fig. 8 is a cross sectional view, on line 8—8 of Fig. 6, showing particularly the means of engagement of the union members within the stud support;

Fig. 9 is a sectional view, on line 9—9 of Fig. 5, showing particularly the slope of the side walls or edges of the slots in the face of the stud;

Fig. 10 is a perspective view of a portion of a stud with panels secured, by fastening means, to slots in one face of the stud;

Fig. 11 is a sectional plan view of an assembly in which a wall structure of preferred type is united at its side edge portion to a permanent side wall of a building or to other firm support; and

Fig. 12 is a vertical sectional view of a wall assembled in accordance with the present invention.

In the various figures like reference characters denote like parts.

The fastening means illustrated in Fig. 1 comprises a machine bolt with head portion 1 and a threaded stem portion 2, and an expansion nut 3 engaged on the end of the stem that is remote from the head, a spring tightening element 4, and spacing means including the washer 5.

The expansion nut which is illustrated in perspective in Fig. 4, comprises sharp projecting

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portions adapted to penetrate the side wall of a countersunk hole in a unit of structural material such as a panel of asbestos and Portland cement. These projections include the sharp encircling rings 6 and 7 and the longitudinal knurling 8, consisting of a series of sharp, longitudinal ridges. The nut is provided with grooves 9, which divide the lower part into portions, such as quarters, which are readily expanded or spread apart, as indicated in Fig. 2, when the stem of a bolt is screwed into the nut. When this is done, the sharp projections on the surface of the nut are forced into the panel. The nut is provided also with a shoulder 10, which, when the lower portion of the nut is inserted into a preformed hole in a unit of structural material, extends over the rim of the hole and rests upon the said rim, as illustrated. In the embodiment shown in Figs. 1 and 4, the nut is provided also with a sleeve portion 11, about which fits the spacing washer or member 5, illustrated in Fig. 1. This washer has a flanged portion 12, in the form of a collar extending around the sleeve 11 and towards the shoulder 10. When the bolt is screwed into the nut to the position of final setting, the flange of the washer rests upon the shoulder 10, and defines therewith a space of predetermined width approximately equal to the width of the collar 12. It will be seen later that this space provides a convenient and desirable means to receive the side wall of a slot in the sheet metal face 16 of a stud support and permit its being held firmly but slidably between the washer and the nut.

The spring washer 4 provides spring tightening means in the finished assembly, as will appear later.

In the partial assembly illustrated in Fig. 2, the nut is the same as illustrated in Figs. 1 and 4, with the exception that in Fig. 2 the sleeve portion 11 is omitted and, as stated, the nut has been expanded into engagement with a panel by turning the stem of the bolt into the nut farther than shown in Fig. 1. The sharp projections on the outer surface of the nut penetrate into the panel 13, suitably a compressed and then hardened slab consisting essentially of asbestos and Portland cement. The sharp ridges 6 and 7 prevent slipping of the nut lengthwise within the hole in the panel while the knurling 8 prevents rotational movement.

Figs. 5–9 show details of stud supports adapted for use in antirattling structures of the present invention.

The stud 14 is of modified I-shape of cross section, having a web member 15, and faces 16 consisting each of two flanges extending outwardly, at right angles to the web member. The flanges are provided at their edges with narrower flanges or heels 17, which extend rearwardly, at approximately right angles, from the faces of the stud. The studs are suitably of pressed sheet steel.

In the flanges constituting the faces of the stud there is provided a series of spaced holes that may be in the form of slots lying wholly within the face portion of the stud and provided with an enlargement 18, to facilitate the insertion into the slot of the head portion of the selected fastening means, and a more narrow portion 19 extending downwardly from the wider portion. The side walls of the slot have a portion 20 that extends obliquely and rearwardly with respect to the plane of the face of the stud, as the side wall is followed in a downward direction, that is, away from the enlargement 18. The side wall below the lower extremity of the obliquely extending portion extends for a substantial distance, in portion 21, in a direction that is approximately parallel to the plane of the face of the stud.

In order to have an adjustable length of the stud and also to permit extending the stud lengthwise into a recess into which a stud of invariable length could not be inserted conveniently and tightly from a sideward position, there are provided extension or union members 22, which consist of modified channel irons inserted one on each side of the web member of the I-shaped stud and extensibly and slidably engaged in the approximately channel-shaped space defined between either side of the web member of the stud and the flanges thereon. The flanges 23 of the channel iron union members are suitably bent into the form of secondary or smaller modified channel shapes and define a space 24 between them and the flanges of the I-stud. This space is adapted to permit the insertion of the head of a bolt or the like through a slot in the face of the stud and between the said face and the base of the secondary channel 23. The base members of the union or extension members and the web of the stud are secured together as by bolt 24, which passes through slot 25 in the stud and slot 26 in the union members.

The assembly illustrated in Fig. 6 shows union members engaged at their lower ends within the primary element or main portion of the stud and at its upper end within a secondary element or extension head 49 constituting a short length of stud of the same dimensions of cross section, angles, and type as the primary element or main portion. The primary and secondary elements of the stud are each approximately I-shaped in cross section and include each a web member and flanges on the opposite side edges thereof. Within these elements the union member is adjustably and slidably engaged at either end. Since the primary and secondary elements have the same size and shape of cross section and are assembled end to end, they may be held in position with the corresponding parts of the two elements lying in the same planes. Thus, the faces abut to form a smooth surface over which panels may be applied and held firmly, to give an important advantage as compared with the usual type of extension stud in which the extension head is inserted within or over the main portion of the stud, in such manner as to provide an offset in the zone of union.

When the union member unites two stud elements, as illustrated in Fig. 6, the union member may be secured to the lower element by bolt 24 passing through slots 25 and 26 as described. Likewise, the member may be secured to the upper or extension head by bolt 27 passing through slot 28 in the head and slot 29 in the union member.

The slots in the end portion of the web member of the stud should be slightly longer than the space between slots in the union members and spaced apart by a lesser distance than the length of the individual slots in the union members, thus permitting changes in combined length of the stud and union members by infinitesimal amounts.

Fig. 10 shows stone-like panels 13 in position on the face of the stud.

At the place of union of the side edge of an assembled wall to a relatively non-vibratile base support, such as a permanent wall of a building, that is, a side wall, floor or ceiling, the assembly

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illustrated in Fig. 11 may be used. Thus, a channel iron 31, provided with flanges bearing spaced slots of the type illustrated in connection with the I-studs, may be secured to the permanent or base support 32, by means of conventional fastening devices 33, which may be drive-in or toggle bolts inserted through a hole in the web member of the channel and into a hole in the base support. In the slots in the flanges in the channel are engaged fasteners 24, of the type illustrated in Fig. 1. These fasteners secure the panels 13 to the flanges of the channel iron. A sheet of vibration-damping material 30, such as hair felt, may be disposed continuously between the base of the channel and the supporting member or permanent wall 32. Preferably, the felt is adhered to the face of the stud by suitable adhesive before the stud is placed in the assembly. Besides damping vibrations and decreasing rattling, the felt serves also the useful purpose of minimizing the circulation of air and the carrying of dust through the assembled wall.

In the wall assembly illustrated in Fig. 12 there are shown a channel sill 35 and a channel ceiling head plate 36 with their bases secured, respectively, to the floor 37 and to the ceiling 38 of the building. Vibration-damping felts 39 in the form of continuous sheets may be disposed between the bases of the channel irons and the said floor or ceiling and held permanently in position, in contact with the said bases. The method of securing these channels to their supports may involve securing means such as the drive-in or toggle bolts 47 and 48. In assembling the wall these channel irons are first secured in position and then there is erected the stud 14, with union members 22, in this case serving as an extension head. The base of the stud which may be cut out in the portion 40, to facilitate the insertion of electric conduits and the like, is engaged within the flanges of the channel constituting the sill. The member 22 is then pushed upward into engagement between the flanges of the channel constituting the ceiling head plate. The bolt 24, in appropriate slots in the union and stud elements is then tightened, to make the extension permanent. The panels 13, in which holes have been drilled at appropriate intervals, are provided in the said holes with fastening means of the type illustrated in Fig. 1. The nut 3 of the fastening means is driven into the hole until the shoulder 10 contacts with the rim of the hole and the knurling 8 is engaged tightly, by penetration of the sharp ridges into the side walls of the hole in such manner that, when the machine bolt is screwed into position in the nut, the nut is held without rotation. The machine bolt, with the spring washer 4, and the spacing washer 5 in position around the stem of the bolt, is then screwed into position. As the stem of the bolt moves into the nut, the lower portion of the nut, which has initially a tapered, threaded interior, as illustrated, is caused to expand and the sharp projections on the exterior, near the lower end of the nut, are caused to penetrate the side walls of the hole. The machine bolt is turned into the nut until it compresses the spring washer 4 and thereby holds the washer 5, by spring tightening means, with the collar 12 against the shoulder 10 on the nut.

The panels provided thus with fasteners are now secured to the studs, by inserting the heads and washers on the fasteners through the enlargement or head portion 18 of the slot and then pushing the panel and fastener downward, to tighten the engagement. In this engagement the washer 5 and the shoulder 10 are on opposite sides of the springy walls of the slot and define between them a space which permits ready slipping of the fastener on the side walls of the slot. At the same time, the springy nature of the walls of the slot and also the spring washer or means 4 make possible that the final engagement shall be tight and antirattling and that the panels and studs are held by spring action in close contact with each other. As the fastener is pushed downward from the place of first insertion through the head 18 of the slot, the washer passes initially over the inclined portion 20 of the edge of the slot, which tightens the engagement of the panel to the support, and passes finally over the straight portion 21, which makes possible maintaining the tightness of the engagement, even though there may be a substantial variation in the position of the fastener in the slot, without either loosening the engagement as the position of the fastener is varied slightly, or increasing it to a tightness that is impossible of being obtained readily.

When panels have thus been assembled on the studs to an adequate height, a frieze strip assembly is then made. Narrow panels 52, suitably of the same composition as the panels 13, are provided with fasteners 41, say, of the type illustrated in Fig. 2, which hold a strip of sheet metal 42 provided preferably with a bent or spring portion 43. The frieze strip with the fastener assembly described is then placed in position over the upper edge of the uppermost panel 13 and is allowed to rest upon said edge, with the strip of metal 42 extending downward behind the panel. In the finished assembly this metal strip, with its spring portion, gives a spring engagement which contributes to the elimination of rattling and vibration of the wall. The top portion of the frieze strip is pushed against a downwardly extending flange of the ceiling head plate 36 and is secured thereto and to a flange of the rearwardly disposed extension member by suitable means, as, for example, by a self-tapping and threading screw 44. Under the head of this screw and held tightly thereby against the outside of the frieze strip may be a metal molding clip 45, over which is engaged, finally, a metal molding strip 46. At the lower portion of the wall there may be attached baseboard 50, by means of self-tapping and threading screws 51 inserted through the baseboard and panel 13 and the face of the stud 14.

It will be seen that the various features of the invention acting in combination contribute mutually to the whole and produce an assembled wall of outstanding utility.

While the invention has been described particularly with reference to the construction of a partition, it is to be understood that other boundaries of an enclosure may be constructed in accordance with the invention and that also materials of construction other than those described may be used.

The details that have been given are for the purpose of illustration and not restriction and many variations therefrom may be made without departing from the spirit and scope of the invention.

What I claim is:

1. A structural assembly comprising in combination a sub-structure including supports, panels, fastening means securing the panels to the supports, the said supports being provided each

with slots with springy side walls that engage the fastening means and that extend at their back for a substantial distance obliquely with respect to the face of the support and then for a substantial distance parallel thereto.

2. A structural assembly comprising in combination supports, panels, fastening means securing the panels to the supports, and a spring tightening element in the said fastening means, the said supports being provided each with slots with side walls that engage the fastening means and that extend at their back for a substantial distance obliquely with respect to the face of the support and then for a substantial distance parallel thereto.

3. A structural assembly comprising in combination a substructure including supports provided with openings, panels, and fastening means securing the panels to the supports, the said fastening means comprising a bolt including a threaded stem portion, a head engaging one of the said supports and extending through one of the openings therein, and an expansion nut engaging, in the inside, the threaded portion of the bolt and engaging, on the outside, one of the said panels.

4. A structural assembly comprising in combination a substructure including supports provided with slots, panels, and fastening means securing the panels to the supports, the said fastening means comprising a bolt including a threaded stem portion, a head engaging a slot in one of the said supports, and an expansion nut engaging, in the inside, the threaded portion of the bolt and provided, on the outside, with sharp, projecting portions penetrating into the side walls of a hole in one of the said panels and thereby preventing lengthwise and rotational movement of the nut within the panel.

5. A structural assembly comprising in combination a substructure including supports provided with slots, panels, and fastening means securing the panels to the supports, the said fastening means comprising an element with a head portion engaged in one of the said slots and with a stem portion attached at one end to the said head portion and at the other end to a panel, and comprising also spring tightening means disposed between the head portion and panel for holding the panel tightly to the support.

6. A structural assembly comprising in combination a substructure including supports provided with slots, panels, and fastening means securing the panels to the supports, the said fastening means comprising an element with a head portion engaged in one of the said slots and with a stem portion attached at one end to the said head portion and at the other end to a panel and comprising also members extending transversely with respect to the stem portion and defining between them a space adapted to receive the side walls of one of the said slots and permit slidable engagement thereof by the fastening means.

7. A structural assembly comprising, in combination, a substructure including supports of the type of studs, panels of facing material, fastening means engaging at one end the panels and at the other end engaging the supports, and spring tightening elements, constituting a part of the said fastening means, by spring action holding the panels and the supports in close contact with each other.

8. A structural assembly comprising, in combination, panels of facing material, supports of the type of studs provided on their face portions with a plurality of slots lying wholly within the said face portions, springy side walls of the said slots, and fastening means at one end engaging the panels and at the other end engaging the said springy side walls, whereby the panels are held by spring action upon the supports.

9. A structural assembly comprising in combination a permanent wall of a building, a supporting substructure adjoining at an edge the said permanent wall, preformed panels of facing material, means supporting the said panels upon the substructure and securing the panels tightly thereto in antirattling manner, and sealing and vibration-damping material, of the type of a sheet of felt, disposed continuously between the said edge of the substructure and the permanent wall, closing the joint therebetween, minimizing the circulation of air through the joint, and minimizing the transmission of vibration between the said substructure and permanent wall.

10. A structural assembly comprising in combination supports of the type of studs, preformed rigid panels, fastening means securing the panels to the supports and spring tightening elements coacting with the fastening means and holding the panels against the supports.

11. A structural assembly comprising in combination supports provided with openings therein, panels provided with countersunk holes registering with the said openings and bolt assemblies securing the panels to the supports, the bolt assemblies comprising each a head of a bolt engaging one of the supports, a stem of the bolt threaded at its end portion and extending through one of the said openings, an expansion nut engaging, on the inside, the threaded portion of the stem of the bolt, sharp portions projecting outwardly from the nut and engaged in the wall of one of the said countersunk holes and a shoulder of the nut extending over and resting upon the rim of the countersunk hole.

12. A structural assembly comprising in combination supports provided with openings therein, panels provided with countersunk holes registering with the said openings and bolt assemblies securing the panels to the supports, the bolt assemblies comprising each a head of a bolt engaging one of the supports, a stem of the bolt threaded at its end portion and extending through one of the said openings, an expansion nut engaging, on the inside, the threaded portion of the stem of the bolt, sharp portions projecting outwardly from the nut and engaged in the wall of one of the said countersunk holes and a shoulder of the nut extending over and resting upon the rim of the countersunk hole, the threaded end of the said stem terminating within the said nut.

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