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E. D. CODDINGTON

2,099,470

STUD

Filed Sept. 3, 1935

Fig. 1.

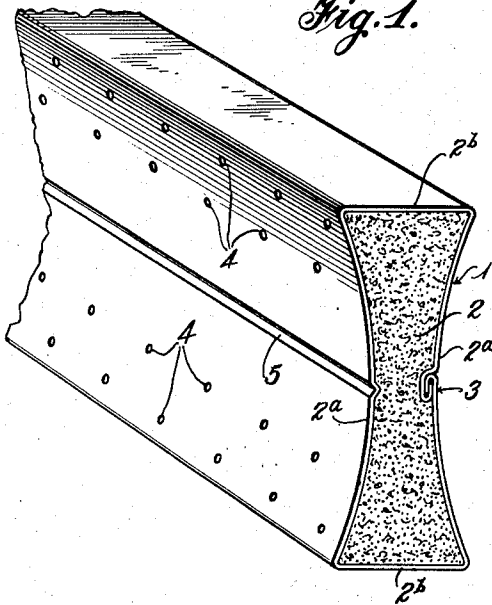


Fig. 2.

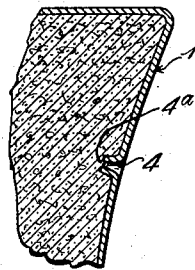


Fig. 3.

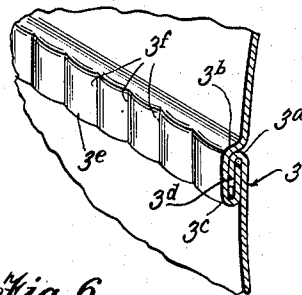


Fig. 4.

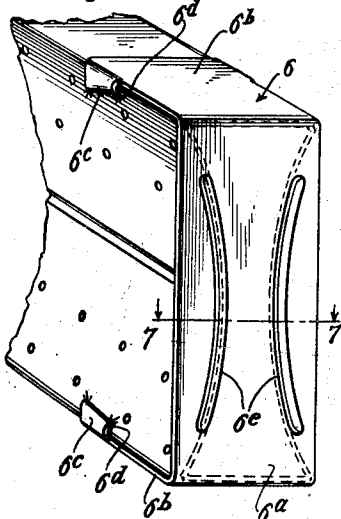


Fig. 5.

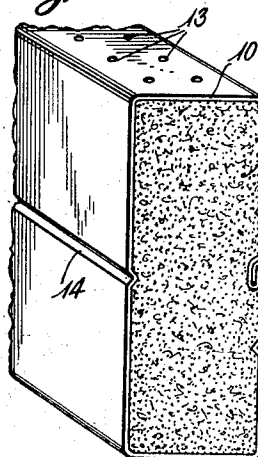
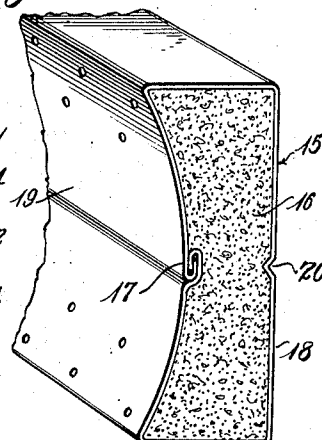


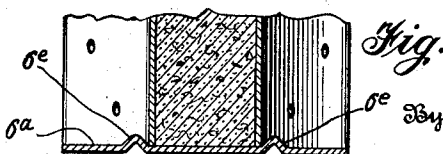
Fig. 6.



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Fig. 7.



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UNITED STATES PATENT OFFICE

2,099,470

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Application September 3, 1935, Serial No. 39,023

11 Claims. (Cl. 72-115)

This invention relates to composite structural members designed to take the place of timber in building construction.

Structural members of the above character are commonly composed of a light sheet metal casing enclosing a nailable cementitious core and in building construction are superior to wood because of their greater strength and also because of their proof against fire and decay and the action of destructive insects. In addition such members possess advantages over metal structural elements by virtue of their lighter weight and their capability of being sawed to length and nailed in position.

In the fabrications of such composite structural members simplicity of construction is a desideratum, admitting of rapid and economical manufacture. Such members heretofore have been commonly produced by rolling a strip of sheet metal to desired shape, uniting the longitudinally-extending overlapped edges of the sheet so as to form a tubular casing and then filling the casing with a plastic medium which upon hardening forms a core. Another process for producing these members represents the subject of my co-pending application Serial No. 39,022 filed September 3, 1935, in which an intimate mixture of gypsum, Portland cement and sawdust is packed into the casing in a dry state, and moisture then introduced through perforations in the casing to supply the water of crystallization. But, however produced, an important objective is to obtain a tight, rigid and permanent bond between the overlapped edges of the metal sheet composing the casing.

While it has heretofore been proposed to unite the edges of the casing by an interlocked seam, as disclosed by the patent of Bruner, No. 573,839, dated December 22, 1896, such a seam being disposed upon the exterior of the casing is disadvantageous because of the tendency for it to open during filling or in the course of the rough handling which such members ordinarily receive on the job, and also because such a seam forms a pertuberant ridge extending lengthwise of the member interfering with the attachment of floor and wall pieces thereto in flat face-to-face contact.

It is an important object of my invention to provide a structural member in which the casing, composed of a sheet of relatively thin metal, is joined together at its overlapped edges by a lock seam disposed upon the interior of the casing and embedded within the core. The seam is thus concealed within the interior of the casing

and protected against mutilation. To avoid lengthwise slipping of one of the overlapped edges of the casing relative to the other when the structural member is placed under stress, the seam is desirably formed with a series of interlocking depressions extending crosswise of the seam which depressions perform the additional service of stiffening the seam and keying the casing to the core.

The structural member is capable of employment as an upright or as a horizontal framing element so as to assume a load in compression or to withstand bending stresses. In order to effectively function as a horizontal element, such as a stringer, rafter or joist, (in which event the member is ordinarily supported upon one of its narrower faces), I prefer to locate the seam in a plane including its neutral axis so that any "give" or flexing of the member within small limits does not impose any appreciable stress upon the seam.

It is also an object of my invention to provide a structural member in which the casing is formed with concave side walls so that a crushing force exerted between the opposite flat faces of the member, tending to cause inward yielding of the side walls, is resisted by the core material. In order to rigidify the casing one or more inwardly-directed, longitudinally-extending ribs may be advantageously formed upon its side walls.

The invention further contemplates the provision of caps for sealing the ends of the member, these caps preferably being held in association with the member by means of bendable ears carried by the caps and engaged within recesses in the sheet metal casing. However, these caps may be held in place by other means, such as by nailing or soldering.

Other objects and advantages of the invention will become apparent from the following detailed description of certain preferred embodiments thereof, reference being had to the annexed drawing in which:

Figure 1 is a perspective view of one end of a stud having concave sides;

Figure 2 is a detail sectional view of a portion of the stud of Fig. 1;

Figure 3 is a fragmentary detail view of the lock seam which unites the overlapped edges of the metal sheet forming the casing;

Figure 4 illustrates an end of the stud of Fig. 1 provided with a cap for closing the ends of the stud;

Figure 5 is a perspective view of a stud of generally rectangular section;

Figure 6 illustrates another form of stud; and Figure 7 is a sectional view on the line 7—7 of the stud of Fig. 4.

The stud illustrated in Fig. 1 comprises a casing 1 enclosing a relatively hard cementitious core 2, the casing being formed of a single flat sheet of metal rolled into tubular shape. The longitudinally-extending edges of the sheet are folded together and united by a lock seam 3 forming a fluid-tight joint coextensive with the length of the stud medially of its height. The metal sheet constituting the casing is of sufficiently thin gauge to permit nails to be readily driven through it into the core. The sides 2a of the stud are dished so that the member is of least cross-sectional thickness midway of its height and is outwardly flared towards its top and bottom faces 2b.

The core 2 is composed of a mixture of gypsum, Portland cement and sawdust in approximately the proportions, by weight, 55:20:9, this filler being preferably packed within the casing in a dry state and afterwards wetted, as described in my copending application above referred to. Upon crystallization the confined material hardens into a solid core which completely fills the interior of the casing and serves as a nailing block which does not crack or crumble when nails are driven thereinto. In order to obtain complete and uniform curing of the filler, perforations 4 are formed in the casing (as shown in Fig. 2) through which the excess moisture contained in the filler may effect its escape. These perforations are located in the sides of the casing extending in pairs of parallel rows throughout the length of the stud adjacent its top and bottom. The perforations are punched inwardly so as to produce burrs 4a upon the inner surface of the casing which embed within the core and serve to anchor the casing thereto.

The lock seam 3 uniting the two overlapped edges of the metal sheet composing the casings is shown on an enlarged scale in Fig. 3. As illustrated in this figure, one edge of the sheet is bent into the form of an inwardly directed hook 3a while its other edge is offset inwardly at 3b so as to overlie the hook 3a. This offset edge extends downwardly slightly below the end of hook 3a where it is rebent outwardly to form a second hook 3c which passes up into locking engagement with the hook 3a, leaving a small clearance space intermediate the end of hook 3a and the inception of hook 3c. To compensate for elongation of the metal at the time the seam is formed, I provide upon the longitudinally-extending rib 3e thus raised upon the inside of the casing by the offset portion of hook 3c a series of transverse depressions 3f, these depressions in the completed casing maintaining the hooks against longitudinal displacement and providing small recesses which are filled by the material composing the core and serving, like the burrs 4a surrounding the perforations, to lock the casing to the core.

In order to rigidify the casing and to prevent its deformation while being packed with cementitious filling material in the course of manufacture of the stud, I provide an inwardly directed rib 5 arranged coextensive with the length of the stud upon the side wall 2a opposite to that which includes the lock seam 3. The rib is located medially of the height of the side wall corresponding to the location of the seam upon the opposite side wall so as to counterbalance the rigidifying effect of this seam. However, additional ribs may be provided if desired.

In the preferred form of my invention clips are provided for closing the ends of the stud. One such clip is shown in Fig. 4 in association with the end of the stud just described. This clip is fashioned from a flat, elongated strip of nail-penetrable sheet metal bent into generally U-shape so as to define a cover portion 6a having a pair of parallel arms 6b extending at right angles thereto and overlying the flat top and bottom faces of the stud for a short distance inwardly from its end. The arms 6a at their ends are formed with laterally projecting ears 6c which are bent so as to curl around the corners of the beam and lock within slots 6d punched in the side walls of the stud. In order to prevent lateral play between the clip and the stud, the cover is stamped along two arcuate lines 6e to form ribs which contact the exposed faces of the dished side walls 2a adjacent the end of the stud (Fig. 7). By virtue of these clips the entire core is enclosed in a protective and strengthening casing of sheet metal, through which nails may be driven.

The structural member just described is light and exceptionally sturdy, being ideally suited for use either as a horizontal or a vertical load sustaining member. As an upright member its strength in longitudinal compression is superior to that of a wood stud of equal cross-section. As a horizontal member it is adapted to withstand intense lateral compression between its top and bottom faces by reason of the fact such compression tends to collapse the arcuate sides inwardly toward each other, which action is resisted by the intermediate body of filling material. Furthermore the casing of sheet metal protects the member by limiting the flexing thereof to a point beyond which injury to the core might result.

The stud, however, may assume other shapes than that of Fig. 1. For example, it may be of rectangular cross-section as illustrated in Fig. 5. In the stud of this latter figure, opposite sides of the casing 10 enclosing the core 11 are approximately parallel and the edges of the casing are united by a lock seam 12, in all respects similar to the lock seam 3 of the stud of Fig. 1. The casing 10 is provided with perforations 13 extending in rows along its top and bottom to afford aeration of the filler. Rigidifying ribs 14 may also be provided upon opposite sides of the casing. The advantage presented by this form of stud is that all of its faces afford flat nailing surfaces.

In Fig. 6 still another form of stud is shown. This stud in all essential respects corresponds to the stud of Fig. 1 comprising a sheet metal casing 15 surrounding a cementitious core 16 and having the overlapped edges of the casing united by an internal lock seam 17. However in this structural member one of its sides 18 is approximately flat while its opposite side 19 is concave. The casing is strengthened by a longitudinal rib 20 extending medially along one of its wider flat sides in a position corresponding to the seam 17 upon its concave side. This form of stud may be found desirable under certain conditions as an alternative for the studs of Figs. 1 and 5.

It is to be understood that the preferred embodiments of the invention described above are merely by way of example, and obviously the invention may be incorporated in other forms of structural members without departing from the spirit of my invention.

I claim:

1. A prefabricated composite structural mem-

ber comprising a casing of light nail-penetrable sheet metal and a core of nailable cementitious material enclosed by the casing, and a longitudinally-extending inwardly-projecting lock seam uniting the two adjacent edges of the metal sheet forming the casing, said seam being disposed interiorly of the casing to provide a smooth exterior surface.

2. A composite structural member comprising a casing of light nail-penetrable sheet metal and a core of nailable cementitious material enclosed by the casing, and a longitudinally-extending lock seam uniting the two adjacent edges of the metal sheet forming the casing, said seam comprising an inwardly offset portion upon one of the edges of the sheet terminating in an outwardly disposed hook and a hook on the other edge of the sheet engaging the first-mentioned hook, said seam being located medially with respect to one of the longer transverse cross-sectional dimensions of the member.

3. A composite structural member comprising a casing of light nail-penetrable sheet metal and a core of nailable cementitious material enclosed by the casing, and a longitudinally-extending lock seam uniting the two adjacent edges of the metal sheet forming the casing, said seam comprising an inwardly offset portion on one of the edges of the sheet terminating in an outwardly disposed hook, an inturned hook on the other edge of the sheet engaging the first mentioned hook, and a series of depressions arranged at spaced intervals lengthwise of the seam interlocking the edges and serving to retain them against relative slippage.

4. A composite structural member comprising a casing formed of a single sheet of light nail-penetrable metal rolled to tubular shape, and a core of nailable cementitious material enclosed by the casing, a lock seam uniting the two edges of the sheet, said seam comprising an inwardly offset portion of one of the edges of the sheet terminating in an outturned hook, an inturned hook on the other edge of the sheet engaging therewith the first mentioned hook, and a series of indentations extending transversely of the seam at spaced intervals lengthwise thereof interlocking the edges and serving to retain them against slippage.

5. A composite structural member comprising a casing of light nail-penetrable sheet metal, a core of nailable cementitious material enclosed by said casing, having two opposed top and bottom faces and two opposed concave sides, the concave sides being wider than the top and bottom faces, and a longitudinally-extending lock seam uniting the two adjacent edges of the metal sheet forming the casing located medially with respect to one of the concave sides, said seam comprising an inwardly offset portion on one of the edges of the sheet terminating in an outturned hook, and an inturned hook on the other edge of the sheet engaging the first mentioned hook.

6. A composite stud comprising a casing of light nail-penetrable sheet metal having flat top and bottom faces, a core of cementitious nailable material enclosed by said casing, and a relatively narrow inwardly directed rib extending longitudinally of the casing for rigidifying the

same, said rib being located intermediate of and spaced from the top and bottom faces.

7. A composite structural member comprising a casing of light nail-penetrable sheet metal having flat top and bottom faces, a core of cementitious nailable material enclosed by said casing and a plurality of longitudinally-extending inwardly offset ribs for rigidifying the same and located intermediate of and spaced from the top and bottom faces, one of the sides of the casing being concave.

8. A composite structural member comprising a casing of light nail-penetrable sheet metal, a core of cementitious nailable material enclosed by said casing, and a clip closing one end of the member, said clip comprising a cover extending between the top and bottom of the casing, arms extending from opposite ends of said cover and overlying the top and bottom of the casing and laterally-projecting ears formed upon the arms and engaged within recesses in the sides of the casing.

9. A composite structural member comprising a casing of light nail-penetrable sheet metal, a core of nailable cementitious material enclosed by said casing, said casing having two opposed top and bottom faces and two opposed concave sides, a longitudinally-extending lock seam uniting the two adjacent edges of the metal sheet forming the casing located medially with respect to one of the concave sides, said seam comprising an inwardly offset portion on one of the edges of the sheet terminating in an out-turned hook and an inturned hook on the other edge of the sheet engaging with the first mentioned hook, and a plurality of longitudinally-extending ribs upon the concave sides of the casing intermediate of and spaced from the top and bottom faces for rigidifying the same.

10. A prefabricated structural member comprising a tubular casing of light nail-penetrable sheet metal and a filler of a nailable cementitious mixture completely circumferentially enclosed by the casing, said filler when dry containing small particles of material and said casing being provided for a substantial portion of its length with a multiplicity of small perforations located at closely spaced intervals, said openings being of a size such as to prevent the escape of any substantial amount of the small dry particles of the filler from the casing and said perforations being punched inwardly so as to form hollow tapered projections upon the interior of the casing surrounding the perforations so as to further prevent the escape of the dry particles from the casing.

11. A prefabricated structural member comprising a tubular casing of light nail-penetrable sheet metal and a filler of a nailable cementitious mixture completely circumferentially enclosed by the casing, said filler when dry including a component of sawdust, and said casing being provided for a substantial portion of its length with a multiplicity of small perforations located at closely spaced intervals, the walls around said perforations forming indentations extending inwardly, and said openings being of a size such as to prevent the escape of any substantial amount of dry sawdust from the casing.

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