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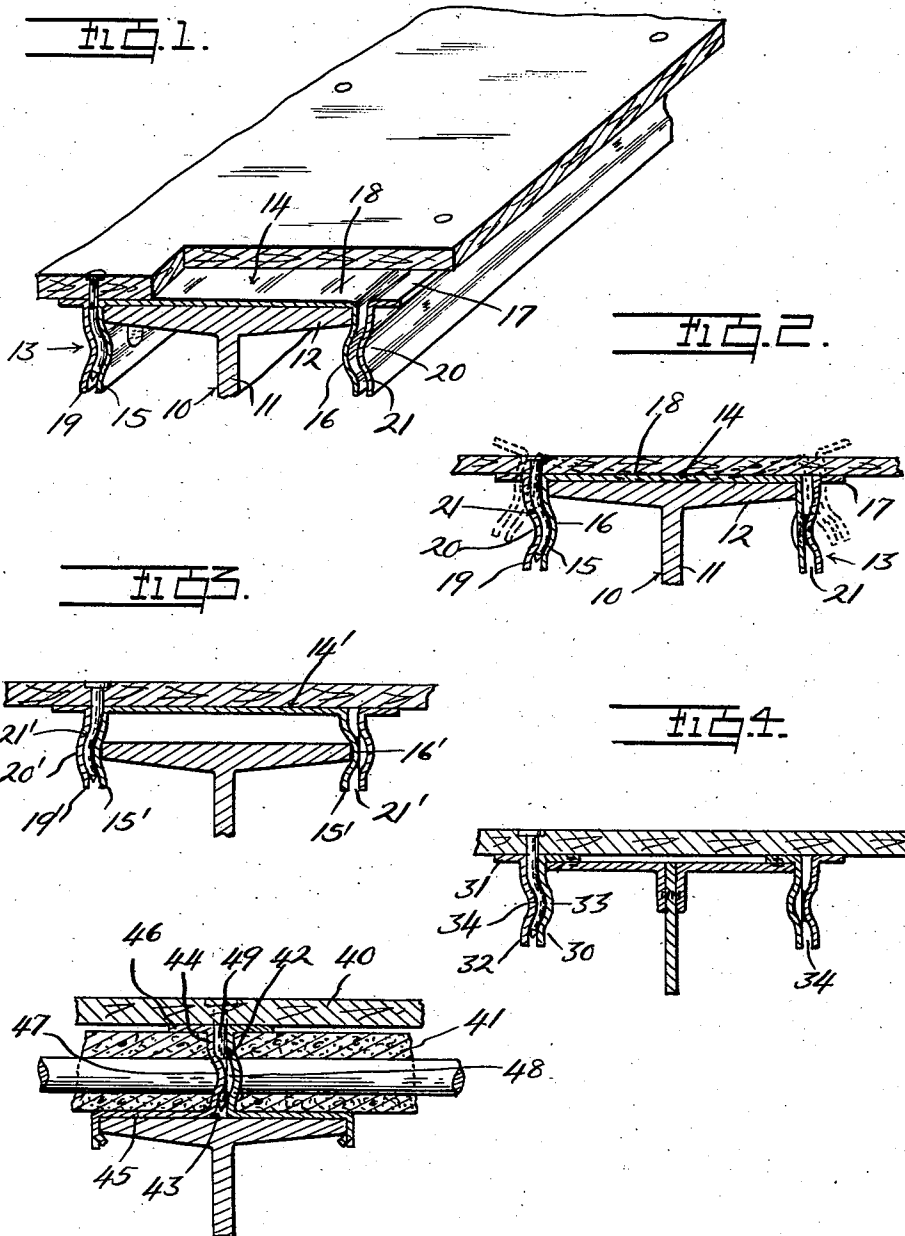


Fig. 5.

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STRUCTURAL ELEMENT

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This invention relates generally to structural elements and refers more particularly to improvements in the types of structural elements commonly employed in building constructions.

For many reasons, it is desirable to eliminate, as much as possible, the use of wood in fabricating buildings, and to this end the present invention contemplates a relatively simple as well as economical arrangement offering the possibility of utilizing a metallic nailing strip in association with any one of the various accepted types of structural elements without altering or otherwise interfering with the design of the latter.

For example, it has been customary in the past to secure, in some suitable manner, screeds to the metallic joists in order to permit the covering material usually laid over the joists to be secured thereto. The screeds necessarily had to be of relatively great cross section in order to permit the use of nails of the length required to effectively secure the covering material in place and, as a consequence the resulting structural element assembly was not only relatively heavy in weight but also relatively thick in transverse dimension. Structural elements of the foregoing type are inefficient, not only because of the increased building cost incurred by the weight of the wood screeds, but also due to the relatively thick wall or floor construction necessary when employing wood screeds on the joists or equivalent structural elements. In accordance with this invention the foregoing objections, as well as the numerous other well known disadvantages resulting from the use of wood in building constructions are eliminated by replacing the heavy wood screeds with a relatively light nailing strip formed preferably of sheet metal.

Aside from the foregoing, a further object results in the novel manner employed for attaching the metallic nailing strips to the structural elements either at the fabricating plant or at any other point which may be found more convenient, and also in the means provided for retaining nails or like securing elements of a variety of sizes in position. As will be more fully hereinafter set forth, the latter means is not only designed to afford driving the nails with substantially the same ease as the latter are driven in wood screeds and to retain the nails with at least the same efficiency as the latter are retained in wood screeds, but to also afford removal of the nails with practically the same degree of ease as the latter are now removed from wood screeds.

In addition, this invention consists in the provision of a nailing strip having the nail retention

qualities previously mentioned and having the further feature of reenforcing concrete or other composition covering materials for the joists.

The novel means employed for securing the nailing strips to the structural elements as well as the foregoing advantageous features, will be more fully hereinafter set forth and although in the following description these features are defined in association with metallic joists, it should be understood that this invention may be utilized wherever nailing strips are desired in fabricating buildings.

In the drawing:

Figure 1 is a fragmentary perspective view of a structural element constructed in accordance with this invention;

Figure 2 is a cross sectional view through the construction shown in Figure 1;

Figure 3 is a view similar to Figure 2 showing a slightly modified form of construction;

Figure 4 is also a view similar to Figure 2 showing still another modification of this invention;

Figure 5 is a fragmentary cross sectional view through a modified form of the structural element.

For the purpose of illustration this invention is shown herein as associated with steel joists of the types commonly employed in fabricating building constructions and it is to be understood that this invention is not limited to the use of the particular designs of joists featured herein. In Figures 1 and 2 of the drawing the reference character 10 designates a metallic structural element in the form of a joist having a web 11 and having flanges 12 extending in opposite directions from the upper edge of the web. In the specific embodiment of the invention the flanges are formed integral with the web, although these flanges may be formed separately and secured to the web.

In cases where wood floors are used in association with metal joists some means must be provided for securing the flooring to the joists and this has been accomplished in the past by clipping or otherwise suitably attaching wood screeds to the top supporting surfaces of the joists. For reasons discussed above, this arrangement is objectionable and is superseded herein by a lighter and more economical construction. In detail, a sheet metal nailing unit 13 is provided in place of the wood screeds heretofore employed and as shown in Figure 1 this unit is formed of a plurality of strips, preferably fashioned from sheet metal. The strip 14 is substantially channel shaped in cross section and the side flanges 15

thereof are bent inwardly intermediate the longitudinal edges thereof to form transversely curved corrugations 16 extending longitudinally of the strip. Positioned exteriorly of the channel opposite each of the side flanges 15 thereof is an angle strip 17 also fashioned from sheet metal and having one of the flanges 17 thereof disposed in a common plane with the base 18 of the channel shaped strip 14. The other flanges 19 of the strips are complementary to the side flanges 15 of the strip 14 or in other words, are also bent in directions toward the side flanges 15 to form transversely curved corrugations 20 corresponding to the corrugations 16 and located directly opposite the latter corrugations. The flanges 19 are uniformly spaced from the side flanges 15 a distance predetermined to provide sinuous recesses or grooves 21 for the reception and retention of nails or similar fastening elements. The arrangement is such that when a nail or equivalent fastening element is driven into the grooves 21 the same are reversely bent laterally by the complementary corrugations previously described so as to produce a kink in the nails. The alternate bending of the nails as the latter are driven into the grooves permits the use of nails differing in length and diameter without materially effecting the holding properties of the nails. It should also be understood that while the degree of curvature of the corrugations is so determined as to effect the required clinching action on the nail, the same offers the minimum resistance to the passage of the nail into the groove. As a matter of fact, the construction is designed to permit driving the nail into and removing the latter from the unit 13 in the same manner, and with the same ease that nails are driven into and removed from wood screeds.

The angle strips 17 are secured to the channel strip 14 and one simple method for accomplishing this result is to displace longitudinally spaced portions of the corrugations 16 in outward directions so as to effect a contact of these portions with the crests of the corrugations 20. This construction is clearly shown in Figure 1 of the drawing and permits the displaced portions of the corrugations 16 to be welded or riveted to the corrugations 20.

In the present instance the flanges 12 on the joist are received within the channel of the strip 14 and the latter is snapped into engagement with the joist. In detail, the inside width of the channel on opposite sides of the corrugations 16 approximates the combined width of the flanges 12 on the joist while the distance between the crests of the corrugations 16 is substantially less than the combined width of the flanges 12 and thereby serve to hold the unit 13 in assembled relation with the joist. In actual practice, the nailing unit 13 is transversely curved prior to being assembled with the joist and is engaged with the supporting surfaces of the joist in the manner shown by the dotted lines in Figure 2. After the nailing unit is positioned in the above manner the edges thereof are forced downwardly to the position shown by the full lines in Figure 1, whereupon the corrugations 16 assume positions adjacent the undersides of the flanges 12. Although, for reasons previously set forth the corrugations serve to hold the strip in assembled relation with the joist, nevertheless, it may be desired to positively secure the unit 13 to the joist and this may be accomplished by either welding or bolting the base 18 of the channel strip 14 to the supporting surface of the joist.

The modified form of the invention shown in Figure 3 differs from the one previously described in the manner in which the nailing grooves are formed and also in the manner in which the nailing unit is secured to the joist. In detail, the side flanges 15' of the channel shaped strip 14' are bent outwardly instead of inwardly to form the longitudinally extending corrugations 16'. The flanges 19' of the angle members are correspondingly bent outwardly to form the complementary corrugations 20' and these angle members are permanently secured to the strip 14' by displacing longitudinally spaced portions of the corrugations 20' inwardly and welding or otherwise suitably securing these portions to the crests of the corrugations 16' in the manner clearly shown in Figure 3. As in the first described form of the invention the flanges 15' and 19' are spaced uniform distances from each other so as to form the sinuous nailing grooves 21'. The nailing grooves 21' serve to kink the nails in the same manner as the grooves 21 with the exception that the nails are first bent laterally outwardly by the grooves 21' instead of inwardly as is the case in the first described form of the invention. However, the result is the same and the features discussed above are also applicable to this embodiment of the invention.

In the modification shown in Figure 3, the nailing unit is also snapped into engagement with the joist, but the construction differs from the first described construction in that the inside width of the channel on opposite sides of the corrugations 16' is less than the combined width of the joist and the dimension between the inner surfaces of the crests of the corrugations 16' is substantially equal to the width of the joist. In actual practice the free ends of the flanges 15' are merely flexed outwardly upon assembling the nailing unit with the joist permitting the corrugations 16' to be snapped into engagement with the edges of the flanges on the joist as clearly shown in Figure 3.

In some cases it may be desired to restrict the nailing of the covering material for the joist to only one side of the latter and in order to accomplish this result economically I provide the construction shown in Figure 4. In this construction complementary opposed angle members 30 are secured to each other with the upper flanges 31 extending in opposite directions and arranged in a common plane. The remaining flanges 32 are laterally bent intermediate the longitudinal edges thereof to form complementary longitudinal extending corrugations 33 providing therebetween a nailing groove 34 possessing the same characteristics as the nailing groove 21 set forth in connection with the first described form of the invention. The two angle members are secured to each other by displacing longitudinal spaced portions of the corrugations 33 outwardly to contact these portions with the crests of the opposite corrugations on the other angle member and thereby permit the same to be welded or riveted together. The unit thus formed is secured to the joist by seam-welding or otherwise permanently securing the flanges 31 to the supporting surface of the joist. In this connection, attention may be called to the fact that in this embodiment, as well as in the first described form of the invention, the flanges forming the nailing grooves extend inwardly from the supporting surface of the joist or in other words, project toward the longitudinal medium

line of the joists and thereby provide for obtaining floor constructions of minimum thickness.

The modification illustrated in Figure 5 is particularly designed for use in building constructions wherein the wood floor 40 is superimposed upon a sub-floor 41 formed of concrete or other suitable material. In detail the sheet metal nailing unit 42 comprises complementary strips 43 having web portions 44 and having oppositely extending flanges 45 adapted to seat upon the supporting surfaces of the joist in the manner clearly shown in Figure 5. The web portions 44 are of a width approximating the thickness of the concrete sub-floor and terminate above the sub-floor in opposite extending flanges 46 forming seats for the wood floor 40. In addition, the web portions 44 are laterally bent to form complementary corrugations 47 spaced from each other to form sinuous nailing grooves 48 for receiving the nails 49. As will be observed from the particular contour of the web portions 44 the nailing groove 48 functions in a manner much the same as the nailing grooves previously described in imparting a kink in the nail as the latter is driven into the groove. The two strips are secured together by displacing longitudinal spaced portions of the corrugations on one of the strips in a direction to contact these portions with the crest of the corrugation on the other strip and thereafter welding or otherwise suitably securing these portions together. The unit thus formed may be secured to the joist by clinching the extremities of the flanges 45 around the supporting surface of the joist in the manner clearly shown in Figure 5.

The unit described in the preceding paragraph not only provides a relatively simple and inexpensive arrangement for securing covering material to the joists, where concrete or other composition matter is disposed between the joists and covering material, but also acts to reenforce the concrete or other composition matter inasmuch as the web portions 44 of the strips extend through the latter matter.

From the foregoing it will be observed that I have provided a relatively simple and inexpensive arrangement for securing covering material to a metallic joist without resorting to the use of wood or its equivalent. It will further be observed that any of the various types of metallic nailing strips featured herein for accomplishing the above result may be readily and inexpensively attached to a joist of standard design either at the fabricating plant or at any other convenient point.

Although several specific embodiments of the invention have been described herein for the purpose of illustration, nevertheless, it is to be understood that I have by no means described all of the various designs that may be employed for securing the results set forth herein and accordingly reservation is made to make such changes in the details of construction as may come within the purview of the accompanying claims.

What I claim as my invention is:

1. The combination with a structural element having a laterally extending flange, of an angle member having one of the portions thereof seated on the flange and having the other angularly extending portion projecting across the edge of the flange and transversely curved beyond the flange, a second member having a portion complementary to the second named portion of the member aforesaid and cooperating with the latter to form

a sinuous groove for receiving a fastener element, means for securing the two members together to form a unit, and means for securing said unit to the structural element.

2. The combination with a structural element having a laterally extending flange, of a member having angularly extending portions with one of said portions transversely curved in the general direction of the other of said portions and cooperating with the latter to form a recess for receiving the edge portion of said flange, a second member having a curved portion complementary to the curved portion aforesaid and spaced opposite the latter to form therewith a sinuous groove for receiving and retaining a fastener element.

3. The combination with a structural element having oppositely extending flanges disposed in substantially a common plane, of a strip substantially channel shaped in cross section having side flanges transversely curved and spaced apart a distance predetermined with respect to the combined width of the flanges on the structural element to provide for snapping the strip over the latter flanges, strips located exteriorly of said channel opposite the side flanges of the latter and having transversely curved portions complementary to the curved portions aforesaid and spaced from said side flanges to form therewith a groove for the reception and retention of fastener elements, and means for securing said strips together to form a unitary construction.

4. The combination with a structural element having oppositely extending flanges disposed in substantially a common plane, of a strip substantially channel shaped in cross section fashioned to receive said flanges with the base of the channel seated upon the flanges and having longitudinally extending transversely curved corrugations in the sides of the channel beyond the flanges cooperating with the base in holding the strip in assembled relation with said element, strips located on opposite sides of the channel in spaced relation to the sides of the latter and having corrugations complementary to the corrugations aforesaid and forming with the latter a sinuous groove for the reception and retention of fastener elements, and means for securing all of said strips together to form a unitary construction.

5. The combination with a structural element having oppositely extending flanges disposed in a substantially common plane, of a sheet metal strip substantially channel shaped in cross section having a base of less width than the combined width of said flanges and having portions of the sides thereof transversely curved outwardly affording sufficient space within the channel for receiving said flanges, and correspondingly curved strips secured to the strip aforesaid in spaced relation to the sides of the latter and cooperating with said sides to form sinuous grooves for the reception and retention of fastening elements.

6. The combination with a structural element having oppositely extending flanges disposed in a substantially common plane, of a sheet metal strip substantially channel shaped in cross section having a base of less width than the combined width of said flanges and having portions of the sides thereof transversely curved outwardly, the distance between the curved portions approximating the combined width of the flanges and the extremities of the sides providing for snapping said strip onto the structural element, and correspondingly curved strips se-

cured to the channel shaped strip aforesaid in lateral spaced relation to the sides of the channel and cooperating with the latter sides to form sinuous grooves for the reception and retention of fastener elements.

7. The combination with a structural element having a supporting surface, of a member having a portion seated on the surface and having an angularly extending portion projecting across one free edge of the supporting surface of the structural element and being transversely curved beyond said surface, a second member having a portion complementary to the second named portion of the member aforesaid and cooperating with the latter to receive and retain a fastener element therebetween, and means for securing said members together.

8. The combination with a structural element having a supporting surface, of a strip substantially channel shaped in cross section having side flanges spaced apart a distance predetermined with respect to the width of the support-

ing surface on the structural element and transversely curved to provide for snapping the strip over the opposite free edges of the surface, strips located exteriorly of said channel opposite the side flanges of the latter and having transversely curved portions complementary to the curved portions aforesaid and spaced from said flanges to form therewith a sinuous groove for the reception and retention of fastener elements.

9. The combination with a structural element having a side surface, of a strip substantially channel-shaped in cross section having side flanges spaced apart a distance approximating the width of the side surface and having transversely curved portions cooperating with the opposite edges of the side surface to provide for snapping the strip on the structural element, and a strip positioned at the outer side of one of the flanges and cooperating therewith to form a sinuous groove for the reception and retention of fastener elements.

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