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(54) **INSTALLATION TOOL FOR UNIVERSAL FASTENER**

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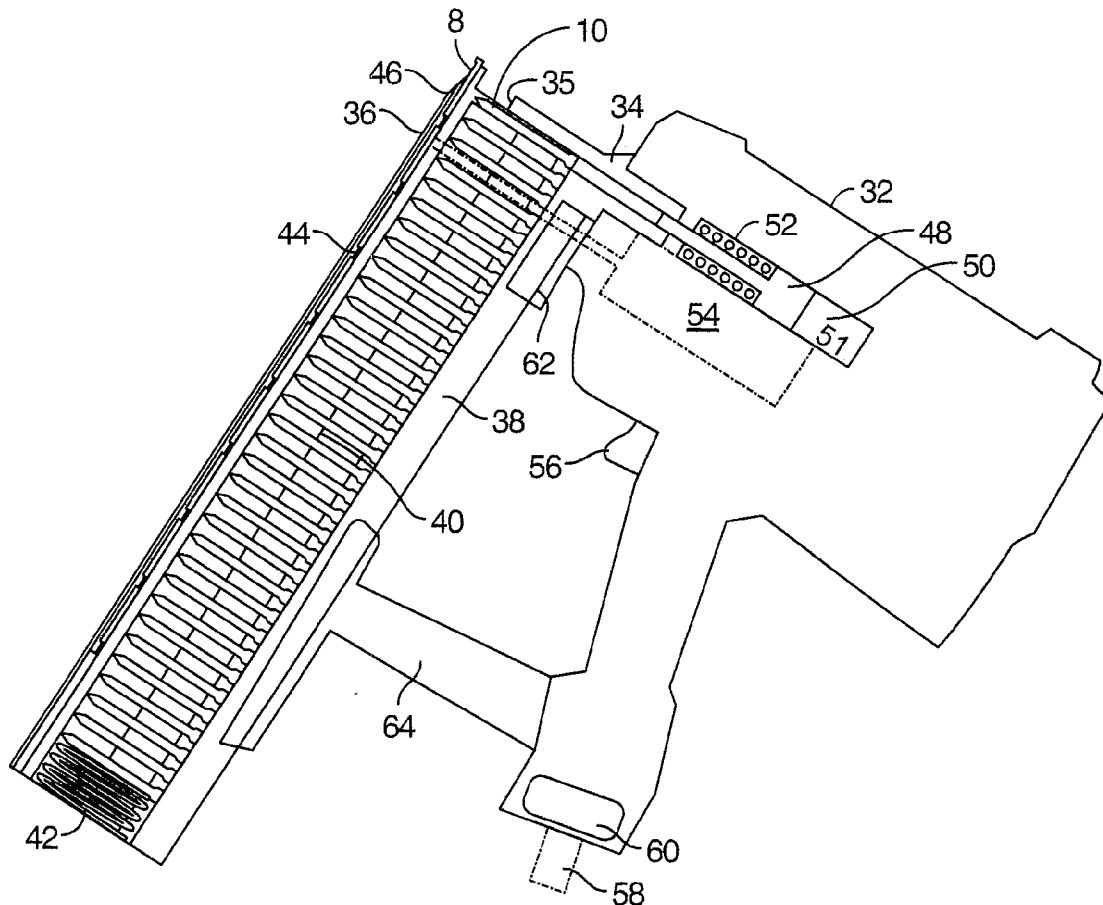
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- (63) Continuation-in-part of application No. 13/169,175, filed on Jun. 27, 2011, now Pat. No. 8,555,570.
- (60) Provisional application No. 61/358,676, filed on Jun. 25, 2010, provisional application No. 61/711,243, filed on Oct. 9, 2012, provisional application No. 61/779,071, filed on Mar. 13, 2013.

(57) **ABSTRACT**

A tool for installation of a concealed fastener which may be formed in situ during attachment of a first grooved sheathing member to an underlying support member. The tool has a barrel for holding a fixing member axially and a feeding mechanism for holding and advancing cross members and maintaining a cross member aligned with the fixing member in the barrel. The tool allows insertion of a front end of the cross member into a plank groove whereupon a fixing member may be driven from the barrel through the cross member and partially into a support, thereby securing the plank to the support. The feeding mechanism thereafter advances an uninstalled cross member to the forward position aligned with a fixing member.



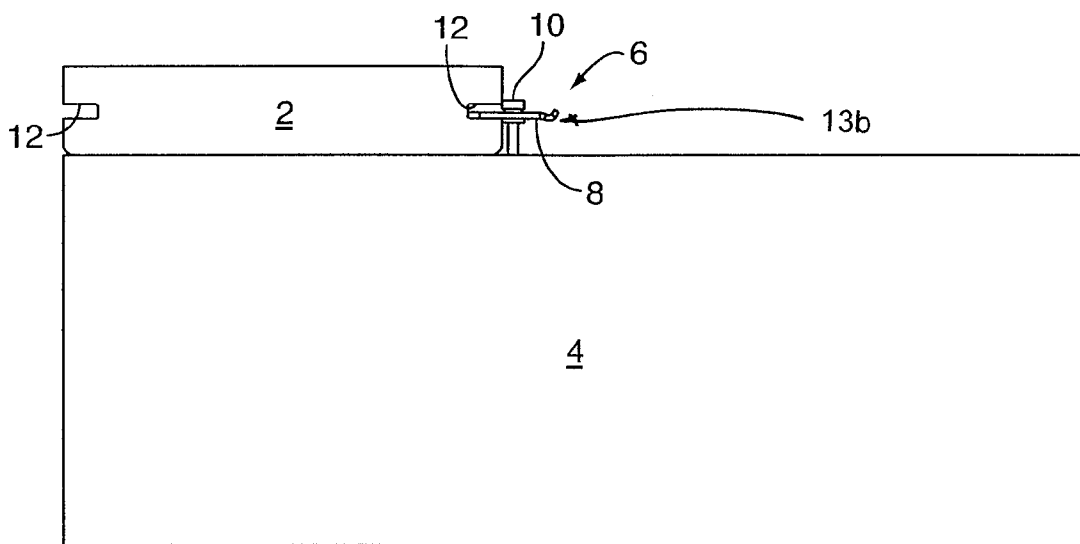


FIG. 1

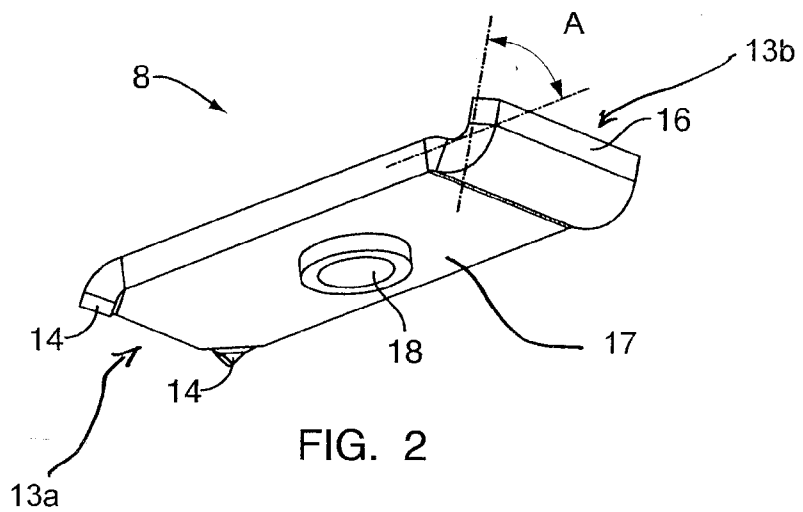


FIG. 2

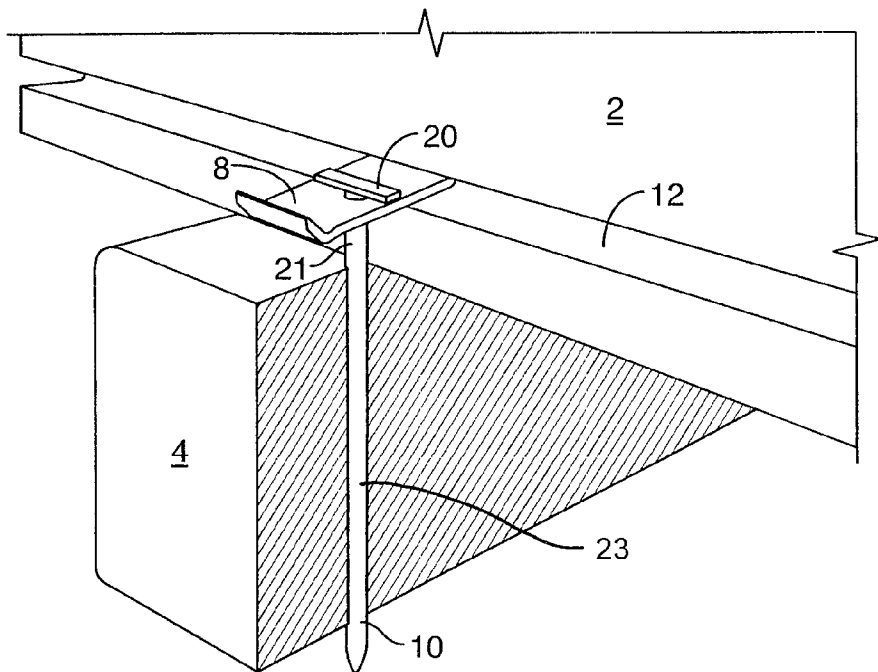


FIG. 3

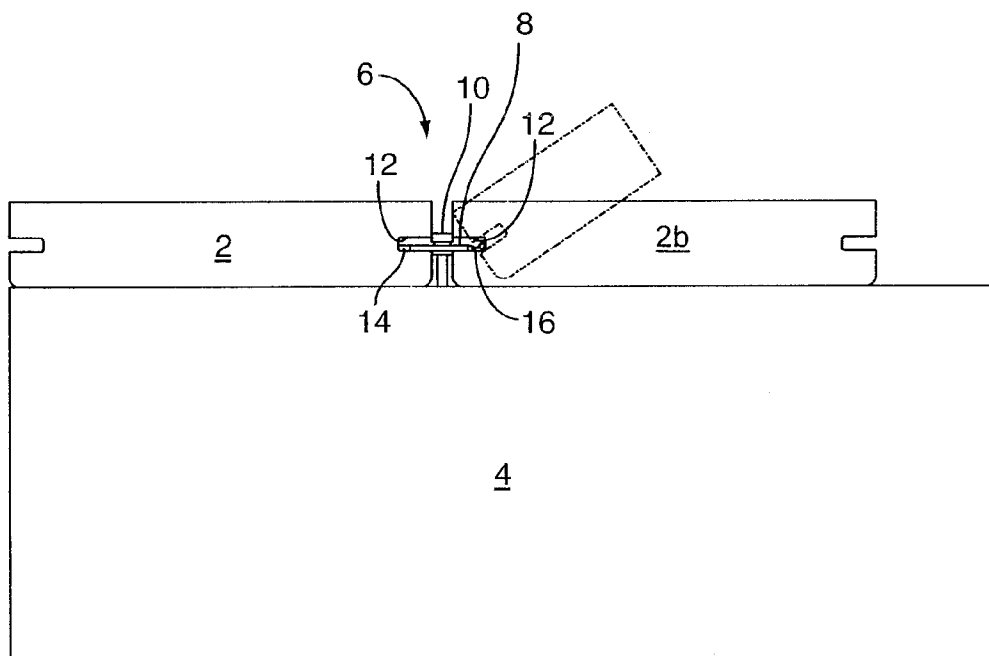


FIG. 4

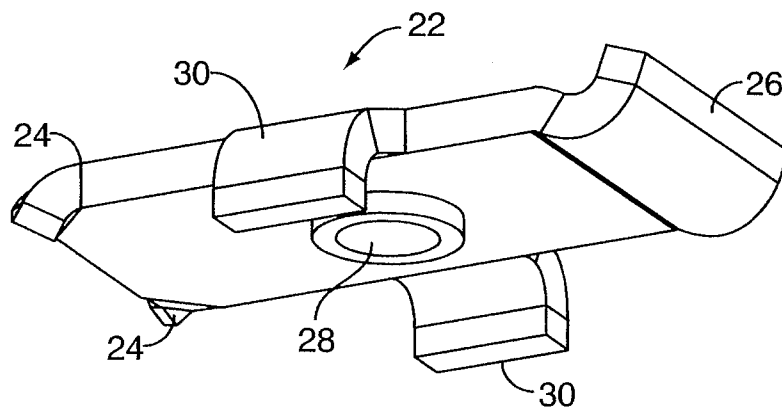


FIG. 5

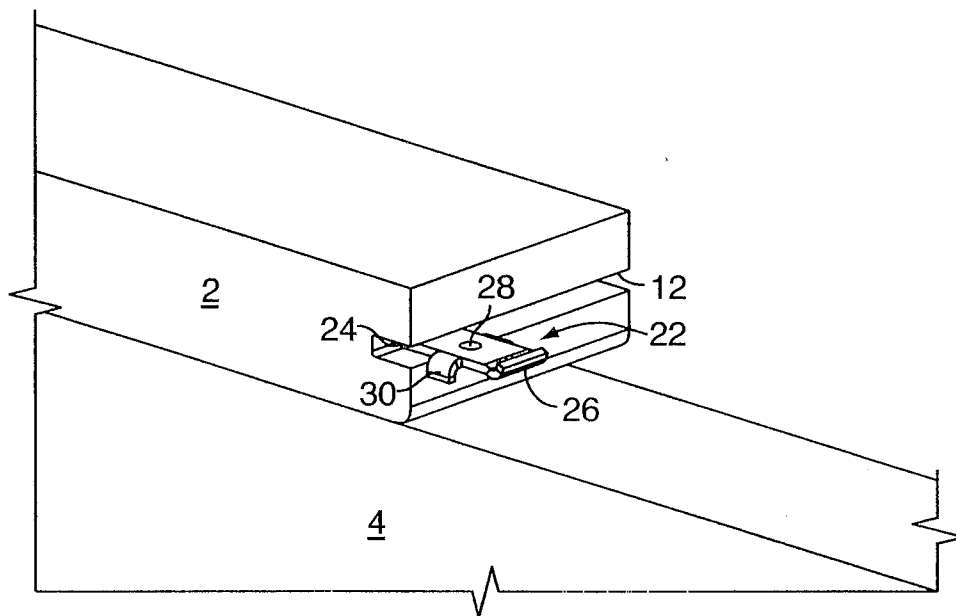


FIG. 6

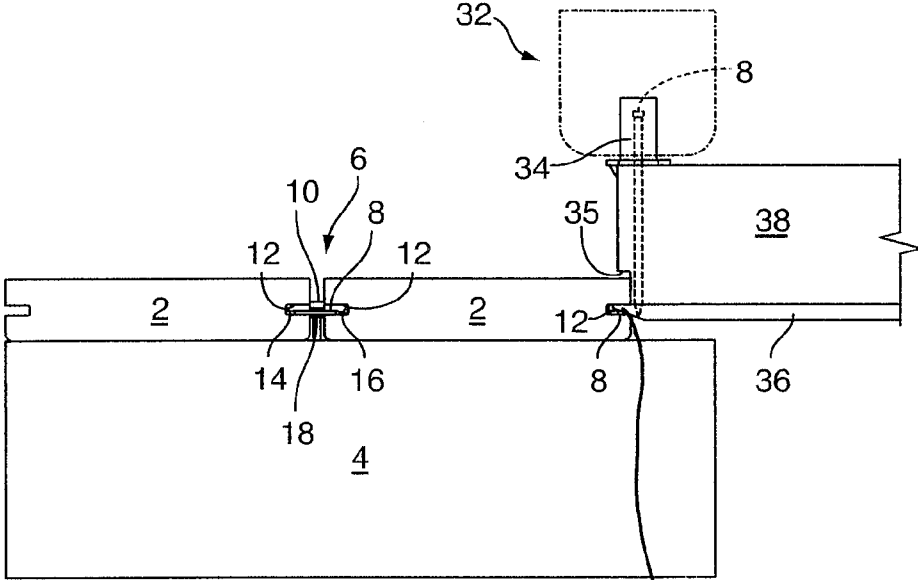


FIG. 7

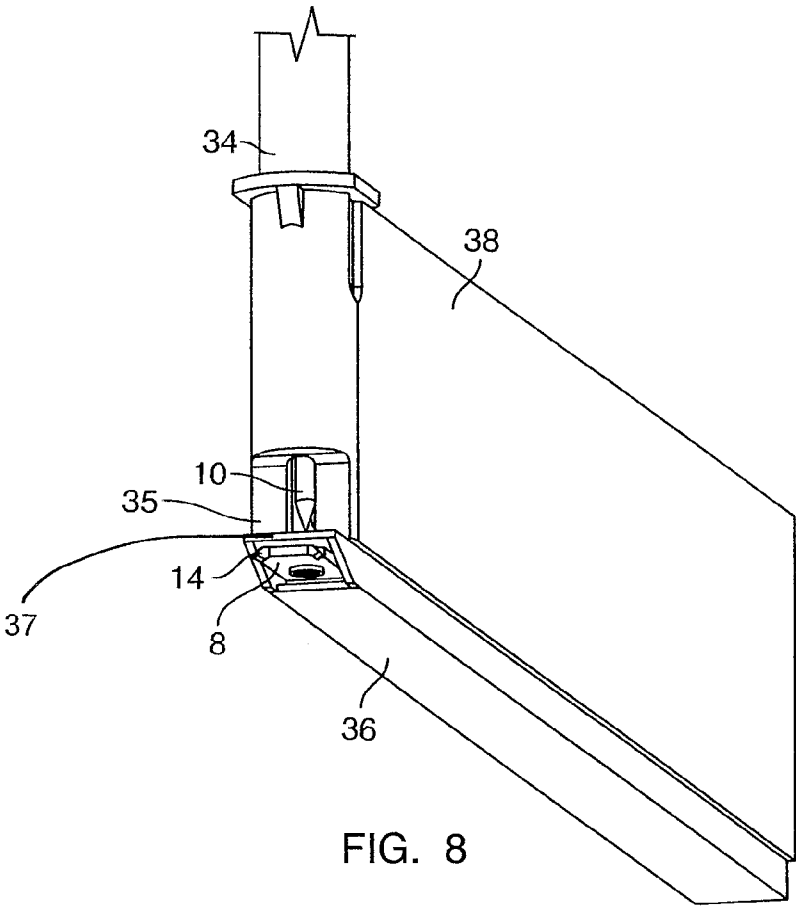


FIG. 8

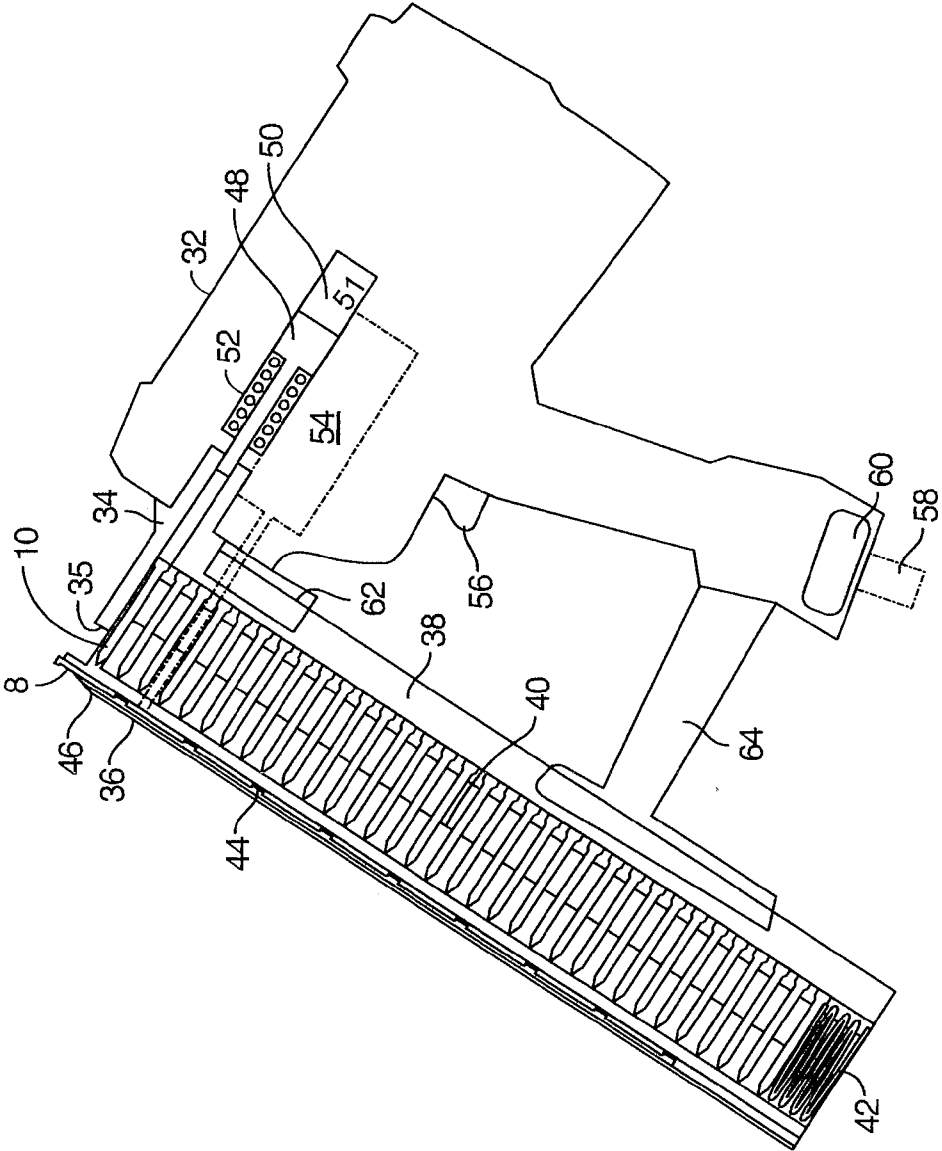


FIG. 9

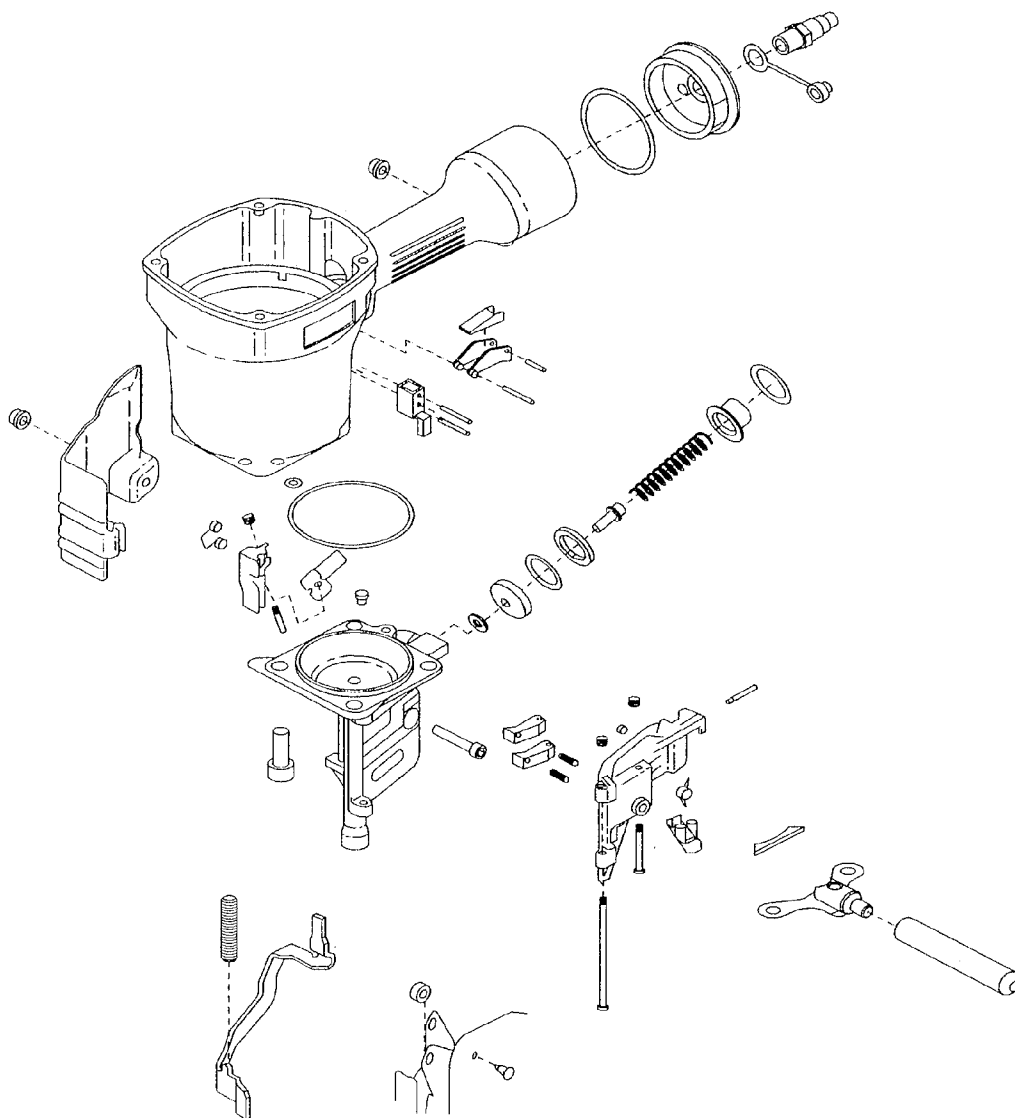


FIG. 10
Prior Art

INSTALLATION TOOL FOR UNIVERSAL FASTENER

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 13/169,175 filed Jun. 27, 2011, which claims priority from U.S. Provisional Application No. 61/358,676 filed Jun. 25, 2010, and claims priority from U.S. Provisional Application No. 61/711,243, filed Oct. 9, 2012, and U.S. Provisional Application No. 61/779,071, filed Mar. 13, 2013, the entire disclosures of which are hereby incorporated by reference.

BACKGROUND OF THE DISCLOSURE

[0002] The disclosure relates to carpentry and, more particularly, to articles and methods for concealed attachment of grooved surface members to structural members.

[0003] Conventionally, deck planks or other sheathing members have been attached to joists or similar support members by a plurality of fixing or anchoring members, such as nails or screws, driven downward through the top of a plank, such as a wood or composite board, and into the top surface of a supporting beam, such as a joist or ledger board. Although the concept is simple, professional quality installation using this approach requires a high degree of precision, significant time expenditure, and sometimes leads to a flawed result. In particular, planks must be carefully aligned to achieve desirable aesthetic as well as functional results, for example, secure attachment and uniform spacing or parallelism with gaps of proper size for surface drainage and for appearance. Also, the insertion of the nails or screws must be performed carefully to ensure proper penetration of the joist, which will be concealed from view by the overlying wood board at the time of insertion, in order to achieve optimal attachment. This process is time consuming and requires some skill.

[0004] Even if the installation is performed properly, the securing member's penetration of the upper surface of the plank leaves the plank with a pock-marked appearance and prone to rot and weather damage, which severely decreases the longevity of the deck. In addition, the nail or screws may work loose and protrude from the upper surface of the planks, which poses a risk of injury to users of the deck. Penetration of the top of the plank decreases the integrity of the plank and thus the deck as a whole, and increases the risk of injury.

[0005] These and other problems have spurred on numerous advancements in the field. For instance, an improved deck plank fastening system includes fasteners that attach to a side surface of the plank and a top surface of the joist using nails or screws. Such designs facilitate uniform spacing or parallelism of planks by providing tabs or vertically oriented flanges that engage adjacent planks. The tabs facilitate installation by locating the points of penetration at more readily visible and accessible positions. The fasteners improve the longevity of the resulting deck by repositioning the point of penetration to the side of the plank, which is less prone to weathering. In addition, the tabs reduce the risk of injury to the user of the deck by hiding the nails or screws below the surface. Also, the hidden fasteners improve the aesthetic appeal of the deck.

[0006] Many other improvements and permutations have been conceived in this field, including the provision of deck planks with side grooves for receiving the teeth or tabs of

hidden fasteners. Such improvements have specific advantages in specific circumstances, but have not foreclosed innovation in the field. For example, different sizes and types of grooved planks require distinct sizes and configurations of hidden fasteners. The broad variety of possible fasteners to be purchased can make installation of grooved planks both confusing and costly.

SUMMARY

[0007] Disclosed herein is a concealed fastener, which, among other desirable attributes, can be used interchangeably with many varieties of side-grooved planks. The interchangeability of the inventive concealed or hidden fastener arises from its in situ formation during installation of the fastener to attach a plank to a joist.

[0008] A hidden fastener is formed in situ during attachment of sheathing members such as deck planks or wood siding onto a support such as a joist or beam. The hidden fastener includes a cross member that engages adjacent sheathing members, and also includes an anchoring member that becomes rigidly attached to the cross member during installation of the hidden fastener and sheathing.

[0009] In some embodiments, the cross member includes a central sleeve formed to generally match the anchoring member diameter, and the anchoring member becomes press-fitted into the sleeve by being driven through the sleeve into the support member. Preferably, the cross member includes a first clawed end that is engaged into a groove of a previously-installed sheathing member, and also includes a second winged end with an upward bend for engaging a groove of a subsequent sheathing member to be installed over the hidden fastener. Rigid attachment of the anchoring member to the cross member supports the winged end of the hidden fastener to enable smooth installation of the subsequent sheathing member.

[0010] Preferably, the cross member and the anchoring member are installed together using a power driving tool, such as a gas or pneumatic nail driver. In some embodiments, the cross member and the anchoring member are fed together from feeding mechanisms, such as magazines, to be in alignment at the barrel of the power driving tool. Preferably, the winged end of the cross member is supported in its magazine during driving of the anchoring member.

[0011] Other features and advantages of the disclosed fastener, method and tool will become apparent in light of the detailed description as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 shows in side view a hidden fastener attaching a sheathing member to a support member, according to an embodiment of the present invention.

[0013] FIG. 2 shows in perspective view a first embodiment of a cross member for use in forming a hidden fastener, according to the present invention.

[0014] FIG. 3 shows in perspective a sectional view of the first embodiment of a hidden fastener attaching a sheathing member to a support member.

[0015] FIG. 4 shows in side view a subsequent sheathing member installed over the hidden fastener shown in FIGS. 1-3.

[0016] FIG. 5 shows in perspective view a second embodiment of a cross member for use in forming a hidden fastener, according to the present invention.

[0017] FIG. 6 shows in perspective view the second embodiment of a cross member shown in FIG. 5, positioned for attaching a sheathing member to a support member.

[0018] FIG. 7 shows in side view a subsequent hidden fastener being installed and formed to attach the subsequent sheathing member to the support member shown in FIG. 2.

[0019] FIG. 8 shows in perspective view a custom barrel and magazines for use with a conventional power driving tool for installing and forming the inventive hidden fastener.

[0020] FIG. 9 shows in side schematic view an exemplary power driving tool for installing and forming the hidden fasteners shown in FIGS. 1-3.

[0021] FIG. 10 shows in perspective view an exploded assembly of a conventional power driving tool.

DETAILED DESCRIPTION

[0022] Referring to FIG. 1, a sheathing member 2, such as for example a deck plank, is attached to a support member 4, such as for example a deck joist, by way of a hidden fastener 6. The hidden fastener includes a cross member 8, which has a first end 13a engaged into a groove 12 formed on the side of the deck plank 2. The hidden fastener also includes an anchoring member or fixing member 10, such as for example a nail or a ballistic screw, which is rigidly attached to the cross member 8 and holds the cross member 8 substantially parallel to the joist when installed. Preferably, the anchoring member 10 is attached to the cross member by a press fit formed when the anchoring member 10 is driven through the cross member 8. Accordingly, the second end 13b of the cross member 8 is supported at a fixed distance from the joist or support member, substantially of equal height with the first end of the cross member.

[0023] Referring to FIG. 2, the cross member 8 includes a first end 13a formed with downward-curving corners or claws 14 for gripping a lower side of the groove 12 formed in a previously-installed plank or sheathing member 2. The cross member also includes a second end 13b formed with an upward-curving wing 16 that provides for easier assembly of a subsequent plank or sheathing member 2 onto the already-installed cross member. Preferably, the wing 16 forms an angle A with the generally planar body 17 of the cross member 8, for optimal engagement of the subsequent plank onto the wing 16. Preferably the angle A is within a range of approximately 10° to approximately 90°; more preferably between 15° and 75°; more preferably between 30° and 60°. In the depicted preferred embodiment, the angle A is approximately 45°. As shown, this embodiment of cross member 8 also has a small dip proximate the apex of the body 13 and wing 16.

[0024] In this embodiment, the body 17 of the cross member 8 also includes a hole 18 configured for receiving the anchoring member 10 during installation of the fastener. Here, the hole 18 is downwardly sleeved. Preferably, the sleeved hole 18 is carefully dimensioned to provide a press fit on the anchoring member 10. For example, the sleeved hole 18 may be formed by sequential punch and draw steps to provide an inner diameter within press fit tolerances of a few thousandths of an inch. A press fit between the cross member 8 and the anchoring member 10 permits the anchoring member 10 to support the cross member 8 substantially parallel to the support member 4 after installation of the hidden fastener

6. This in turn allows quicker and more facile installation of a subsequent plank 2 onto the winged end 16 of the cross member 8.

[0025] Referring to FIG. 3, the nail, ballistic screw, or other anchoring member 10 may be of a conventional shape. Preferably, the nail includes a T-head 20 sized to fit between adjoining deck boards such that no spacer other than the nail is needed in order to obtain adequate drainage from the upper surface of the deck. The anchoring member 10 also may include a collared portion 21, immediately below the T-head, for properly locating the press fit between the anchoring member 10 and the cross member 8. In one preferred embodiment, the collared portion 21 of the anchoring member 10 is the only portion that press fits to the sleeved hole 18 of the cross member, with the main shank 23 of the anchoring member 10 being sized to pass freely through the sleeved hole 18.

[0026] Referring now to FIG. 4, when rigidly supported by the anchoring member 10, the cross member 8 is well positioned for installation of a subsequent sheathing member or deck plank 2b onto the winged end 16 of the cross member 8. As will be appreciated from the phantom lines in FIG. 4, the subsequent sheathing member 2b first is engaged with the winged end 13b of the cross member 8 at an angle to the joist 4, then is rotated downward onto the joist to fully engage the winged end 16 of the cross member 8 into one of the side grooves 12.

[0027] Referring to FIG. 5, an additional embodiment of a cross member 22 also is suitable for use in forming the hidden fastener 6. Like the previous embodiment, this cross member 22 includes a first end with downward-curving claws 24, an opposing second end with an upwardly curved wing 26, and a sleeved hole 28 for receiving an anchoring member 10. The cross member 22 also includes at least one downwardly bent spacer legs 30, which extend outward from lateral edges of the cross member 22. As shown in FIG. 5, this embodiment has two spacer legs 30 positioned to extend from opposite lateral edges of the cross member 22.

[0028] Referring to FIG. 6, the spacer legs 30 can be employed for at least two reasons. First, the legs 30 serve to space a subsequent plank (not depicted) from a plank 2 previously attached to a joist 4 by means of the hidden fastener 6. Secondly, the legs 30 serve to brace the cross member 22 against the side of a plank 2 with which the claws 24 are engaged, so that the cross member 8 extends from the plank substantially parallel to the underlying joist, for enhanced ease of installing the subsequent plank (not depicted). A cross member, 8 or 22, and/or legs 30 may cooperate with a positive stopper mechanism within a front end of an automatic feeding system of an installation tool (discussed below) to aid in alignment of the cross member 22 prior to installation via a driven securing member 10. In other embodiments, the spacer legs may be configured to be driven partially into the support member during installation.

[0029] Referring to FIG. 7, the hidden fastener 6 can be installed by means of a power driving tool 32, shown in phantom lines, specially configured for installing the hidden fastener 6. For example, as shown in FIG. 8, a pneumatic or combustion-powered nail driver may be used with substitution of a suitable barrel 34 including a notch 35, a generally flat first feeding mechanism 36 (here, a magazine), and a second feeding mechanism 38 (a nail magazine). Alternatively, one or both feeding mechanisms and the barrel may be formed integrally with the power driving tool. Here, the notch 35 of the barrel 34 permits the cross member 8 to be held by

the driving tool 32 while being fully inserted into one of the grooves 12 formed on a deck plank 2, as shown in FIG. 7. The notch 35 also permits an upper nose or point 37 of the flat magazine 36 to be engaged into the groove 12, so that the gun 32 and magazine 36 are held substantially parallel to the joist 4. As noted above, the power driving tool may include a positive stopper mechanism for aiding alignment of the fixing member and cross member prior to installation.

[0030] Referring also to FIG. 8, the notch 35 also exposes a portion of the most forward anchoring member 10 in the second feeding mechanism 38 so that the anchoring member 10 can be positioned directly adjacent the plank 2 to provide proper spacing between adjacent planks. Still referring to FIGS. 7 and 8, in some embodiments the first and second feeding mechanisms 36 and 38 are provided integrally with the barrel 34 to provide for quick adaptation of a standard nail driver to other uses. In some embodiments the nail driver also includes a push feed mechanism 54 (shown in FIG. 9) that is customized for installation of the inventive hidden fasteners 6.

[0031] Referring now to FIG. 9, an exemplary power driving tool 32 for use in attaching the disclosed hidden fasteners 6 is shown in schematic outline with key components partly sketched. The barrel 34 and the first and second feeding mechanisms 36 and 38 are sectioned to show a strip of cross members 8 and a stick of anchoring members 10. In one preferred embodiment, the stick of anchoring members 10 are collared by a wire 40 and are sequentially push-fed into the barrel 34 by a leaf spring 42. As will be understood, each actuation of the driver 32 makes room for a next anchoring member 10 to be fed from the second feeding mechanism 38 into the barrel 34. The strip of cross members 8 can be collared on a tape 44, and can be fed from the first feeding mechanism 36 at least by the pulling action of removing the driver 32 from an already-installed hidden fastener 6, or by a push feed mechanism. The flat magazine 36 includes a lip or brace 46 for supporting the winged end 16 or 26 of each cross member 8 or 22 during firing of a corresponding anchoring member.

[0032] In addition to the barrel 34 and the feeding mechanisms 36, 38, the depicted embodiment of power driving tool 32 also includes a hammer 48, which reciprocates within a chamber 50 by means of a spring 52 on a barrel side of the hammer piston and a propulsion fluid 51 on a chamber side of the hammer piston. The tool also may include a push feed mechanism 54, as discussed above and shown in FIG. 9 by phantom lines. As known, the nail driver is actuated by a trigger 56 and may be powered at least by compressed air provided through an inlet fitting 58, or by combustion of butane or other gas provided from a removable flask 60. The feeding mechanisms 36, 38 can be attached to the driver 32 by way of top and bottom braces, 44 and 46, respectively, or a like means of attachment, or formed integrally with the body of the tool.

[0033] In operation, in preparation for installation and in situ forming of the inventive hidden fastener 6, the tool 32 is used to position the clawed first end 14 or 24 of a cross member 8 or 22 into a groove 12 of a deck plank 2 resting on a joist 4. During installation and forming of the hidden fastener 6, the nose or point 37 of the flat first feeding mechanism 36 is engaged into the groove 12 of the plank, and/or one of the top or bottom braces 62, 64 may contact the joist 4 and support the tool 32 with the feeding mechanism 36 substantially parallel to the joist 4, while the lip 46 formed in the flat

magazine 36 supports the winged end 16 or 26 of the cross member 8 or 22 substantially parallel to the joist 4. Actuating the tool 32 via the trigger 56 causes the hammer 48 to drive an anchoring member 10 through the sleeved hole 18 of the cross member 8 or 22 and into the joist 4. The collared portion 21 of the anchoring member forms a press fit with the sleeved hole 18 or 28, thereby rigidly attaching the cross member, anchoring member, joist, and plank. A subsequent plank then can be assembled over the winged end 16 or 26 of the cross member 8 or 22, as shown in FIG. 4. Another fastener can then be attached to the free end of the subsequent plank, and the process repeated as necessary.

[0034] A benefit of the disclosed fastener, method and tool is that they allow various types and sizes of side-grooved sheathing members to be securely yet invisibly attached to underlying support members. Additionally, the secure and hidden attachment can be accomplished for any type of side-grooved sheathing member using identical cross members and anchoring members in combination with a power driving tool specially configured for use with the fasteners, like the disclosed driver. Thus, the disclosed embodiments permit bulk manufacturing and purchasing of a single hidden fastener model for use with many different models of side-grooved deck planking.

[0035] While a preferred embodiment has been set forth for purposes of illustration, the foregoing description should not be deemed a limitation of the invention herein. Accordingly, various modifications, adaptations and alternatives may occur to one skilled in the art without departing from the spirit of the invention and scope of the claimed coverage.

What is claimed is:

1. A power driving tool for attaching a plank having at least one side groove in an edge to a support member with a fastener comprising a cross member with an opening for receiving an elongate fixing member having a shank positioned between a first end and a second end, comprising:

a barrel configured to hold a front most fixing member in an axial position, the barrel having an open front notch defining an upper surface and exposing a front portion of a front most fixing member shank;

a first feeding mechanism for holding a plurality of cross members and positioning and maintaining a front cross member in a forward position with the cross member opening aligned with the front most fixing member and the first end of the cross member exposed from the feeding mechanism in the forward position; wherein

the feeding mechanism is configured to allow insertion of the first end of the front cross member into and substantially parallel with a side groove in a plank and the front most fixing member shank is driven through the cross member opening and partially into the support member thereby attaching the plank and support member, whereafter another of the plurality of cross members in the feeding mechanism is automatically positioned in the forward position.

2. The power driving tool of claim 1, wherein the first feeding mechanism defines a first channel with a longitudinal axis extending from a rear end to a front end and slidably retains a series of cross members.

3. The power driving tool of claim 2, wherein the cross members are retained to slide longitudinally within the channel.

4. The power driving tool of claim 1, comprising a second feeding mechanism for retaining a plurality of fixing mem-

bers and advancing the front most fixing member to the barrel for retention in the axial position.

5. The power driving tool of claim 4, wherein the second feeding mechanism defines a second channel defining a second axis extending from a rear end to a front end and slidingly retains a series of fixing members.

6. The power driving tool of claim 4, wherein the first feeding mechanism is housed within a first magazine attachable to an outer portion of the power driving tool.

7. The power driving tool of claim 6, wherein the second feeding mechanism is housed within a second magazine attachable to an outer portion of the power driving tool independent from the first magazine.

8. The power driving tool of claim 2, comprising a bias element positioned toward the rear end of the first channel for biasing the series of cross members frontward.

9. The power driving tool of claim 5, comprising a bias element positioned toward the rear end of the second channel for biasing the series of fixing members frontward.

10. The power driving tool of claim 1, wherein the cross member is maintained substantially perpendicular to the front most fixing member axis when positioned in the forward position.

11. The power driving tool of claim 1, wherein the front most fixing member shank is driven through the cross member opening partially into the support member substantially perpendicular to the cross member.

12. The power driving tool of claim 11, wherein the front most fixing member shank is driven substantially perpendicular to the side groove of the plank which is being attached to the support member.

13. The power driving tool of claim 1, wherein driving of the front most fixing member shank creates a press fit between the cross member and fixing member.

14. The power driving tool of claim 8, comprising a positive stopper mechanism positioned opposite the bias element in the first channel for aiding alignment of the front cross member in the forward position.

15. The power driving tool of claim 1, wherein the cross member has at least one downwardly projecting prong on the

first end which is exposed from the first feeding mechanism when the cross member is in the forward position.

16. The power driving tool of claim 1, wherein the notch defines an upper surface opposite a lower surface spaced therefrom, and upper surface is a positive stop on the power driving tool against the plank during installation of the fastener.

17. The power driving tool of claim 16, wherein the notch lower surface abuts the cross member positioned in the forward position.

18. The power driving tool of claim 1, comprising a support surface for maintaining the rear portion of the front cross member in a position with the cross member within 15 degrees of parallel to the plank when attached.

19. A power driving tool for attaching a plank having at least one side groove in an edge to a support member with a fastener comprising a cross member with an opening for receiving an elongate fixing member having a shank positioned between a first end and a second end, comprising

a barrel configured to hold a front most fixing member in an axial position, the barrel having a notch-like front opening defining an upper surface and a substantially perpendicular side surface and which exposes a front portion of the front most fixing member shank;

a feeding mechanism defining a channel for holding a plurality of cross members and automatically positioning a cross member in a forward position substantially perpendicular to the front most fixing member axis and the cross member opening and front most fixing member aligned, a front end of the cross member being exposed from the channel in the forward position; wherein

the feeding mechanism is configured to allow insertion of the first end of the cross member into and substantially parallel with a side groove in a plank and a user initiates driving of the front most fixing member shank substantially perpendicularly through the cross member opening and partially into the support member thereby attaching the plank and support member and forming a hidden fastener.

* * * * *