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FLOOR PANEL FASTENING CONSTRUCTION

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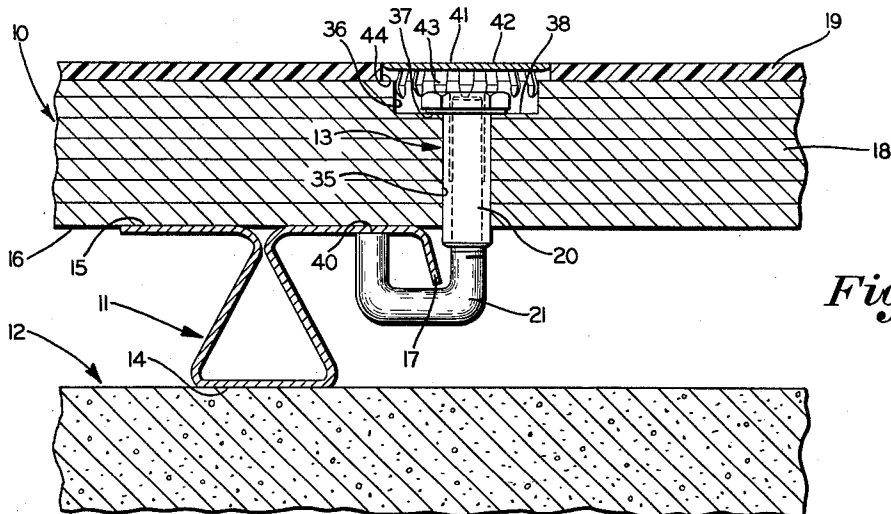


Fig. 1

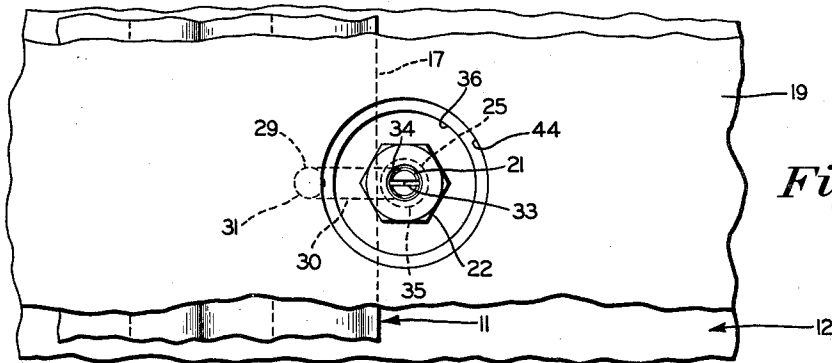


Fig. 2

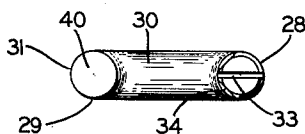


Fig. 4

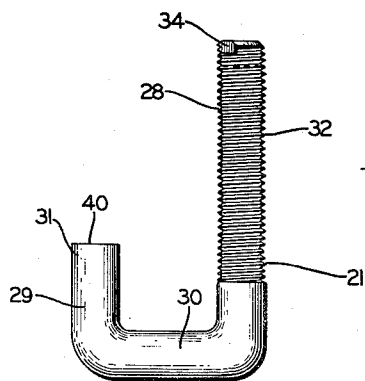


Fig. 3

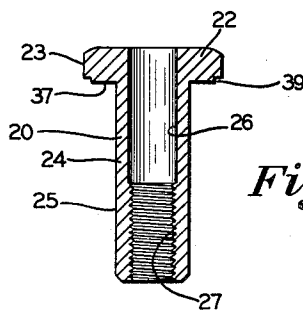


Fig. 5

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FLOOR PANEL FASTENING CONSTRUCTION

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My invention relates generally to improvements in floor panel fastening construction and more specifically to a construction and arrangement of fastener for use in combination with floor panels and underlying support members for securing the floor panels to these support members.

It has become common practice in modern building construction, such as buildings for industrial plants and offices, to construct the buildings with concrete floors throughout the entire building, whether the buildings are single or multiple story. In an industrial plant, for instance, a certain portion of the building is used for manufacturing operations with the remainder being constructed for office space, so that these offices likewise are provided with the concrete floors.

Although in some cases no covering is used over this concrete in the offices and in some cases merely a layer of asphalt covering is used, it is highly desirable for numerous reasons, including the comfort of the office workers and for facilitating the installation of power cables and certain types of business machine air conditioning systems, to install a wooden flooring on and spaced above the concrete floor surface in order to provide cushioning as well as space for installation below the wooden flooring and over this hard concrete surface. With the advent of heavy office machinery, such as the modern business machines, however, it has become a problem to provide a sufficiently strong support for the wooden flooring over the concrete and also to provide means for fastening this wooden flooring to its support which will withstand the weight as well as vibratory forces created by this heavy business machinery.

One of the more usual forms of construction solving this support problem includes the use of metal support members between the concrete and wooden flooring, such as formed steel mats having lower horizontal surfaces resting on the concrete and upper horizontal surfaces abutting and supporting sheets of wooden flooring. In such a case, it becomes a further problem, however, as to how to fasten the wooden flooring to the metal support members, such as the steel mats, in a manner in which the flooring will remain secured to its metal support for an extended period of time, despite heavy loading and the resultant slight moving of the wooden flooring due to its inherent resilience.

This problem is even further complicated when it is considered that once the metal supports are positioned resting on the concrete and the wooden flooring sheets are laid thereover, these metal supports and the under sides of the wooden flooring sheets are inaccessible so that conventional forms of fastening means, such as, for instance, nuts and bolts, cannot be used. Certain attempts have been made to solve this problem by the use of the usual self-tapping metal screws, but it has been found, particularly where the heavy business machines are supported, that these self-tapping screws eventually work loose and permit the wooden flooring sheets to become detached from their underlying metal supports.

It is therefore a general object of the present invention to provide a floor panel fastening construction which overcomes the difficulties and disadvantages of the prior constructions and specifically solves the foregoing problems.

It is a primary object of the present invention to provide a floor panel fastening construction which may be used for fastening flooring to underlying support mem-

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bers, such as wooden flooring sheets to metal supporting mats positioned on concrete floors, which will maintain the flooring securely fastened despite excessive vibrations or uneven loading of the flooring.

It is a further object of the present invention to provide a floor panel fastening construction which may include special sleeve bolt engagement means, accessible from the upper side of the flooring, constructed specifically for preventing horizontal as well as vertical shifting of the flooring being fastened.

It is still a further object of the present invention to provide a floor panel fastening construction which may include a particularly formed and particularly engageable J-bolt means for preventing horizontal and vertical shifting of the flooring being fastened.

It is an additional object of the present invention to provide a floor panel fastening construction which may include indicator means for providing accurate positioning and a quick visual indication for determining the proper engaged and disengaged positions of the fastening means.

It is also an object of the present invention to provide a floor panel fastening construction which may be formed so that damage thereto is not encountered despite repeated fastening and unfastening thereof.

Finally it is an object of the present invention to provide a floor panel fastening construction which may be formed to satisfy all of the above objects, yet is relatively simple in construction and may be manufactured at a reasonable cost.

These and other objects are accomplished by the parts, constructions, arrangements, combinations and subcombinations comprising the present invention, the nature of which is set forth in the following general statement, a preferred embodiment of which—illustrative of the best mode in which applicant has contemplated applying the principles—is set forth in the following description and illustrated in the accompanying drawings, and which is particularly and distinctly pointed out and set forth in the appended claims forming a part hereof.

In general terms, the floor panel fastening construction comprising the present invention may be stated as including the combination of a generally horizontally extending preferably metal support member preferably having a downwardly directed side flange, generally horizontally extending flooring preferably in the form of wooden sheets overlying the support members, and J-bolt fastening means preferably formed with a sleeved fastening nut engaged with the flooring and engaging a specifically formed generally J-shaped bolt which in turn engages the support members.

Further the J-shaped bolt of the J-bolt fastening means may include indicator means thereon visible from the upper side of the flooring for accurately indicating the particular rotational position of this J-shaped bolt member. Finally the sleeved nut member of this J-bolt fastening means may be formed in such a manner so as to virtually eliminate the possibility of damage thereto during the fastening and unfastening operations of the J-shaped bolt with the support members.

By way of example, an embodiment of the floor panel fastening construction of the present invention is illustrated in the accompanying drawings forming a part hereof, wherein like numerals indicate similar parts throughout the several views, and in which:

FIG. 1 is a fragmentary vertical section, part in elevation, showing the fastening construction of the present invention in assembled and engaged position;

FIG. 2, a fragmentary top plan view of the construction of FIG. 1;

FIG. 3, an enlarged side elevation of the generally J-shaped bolt removed from the assembly of FIG. 1;

FIG. 4, a top plan view of the generally J-shaped bolt of FIG. 3; and

FIG. 5, an enlarged vertical section, part in elevation, of the sleeved nut removed from the assembly of FIG. 1.

Although the floor panel fastening construction comprising the present invention is shown in the drawings in combination with a particular form of flooring and underlying support means, it should be understood that it is not intended to limit the principles of the present invention to the exact specific form of flooring and underlying support means shown. Furthermore, other types of flooring and support means are contemplated within the principles of the present invention.

Referring to FIGS. 1 and 2 of the drawings, wooden flooring, generally indicated at 10, is shown positioned on a metal support member, generally indicated at 11, both of which are supported on a concrete floor surface, generally indicated at 12. Further, the flooring 10 is secured to the support member 11 by J-bolt fastening means, preferably formed of steel and generally indicated at 13.

As shown in FIG. 1, in the particular embodiment illustrated, the support member 11 is a formed steel mat having a lower horizontal web 14 supported abutting the concrete floor surface 12 and having the upper horizontal web 15 abutting the lower horizontal surface 16 of the flooring 10. Further the support member upper horizontal web 15 terminates at the edges of support member 11 preferably in a downwardly extending side flange 17 with this flange providing an opening at the side edge of support member 11 beneath the web 15.

The flooring 10 is preferably in the form of plywood sheets 18 having a covering layer of any usual asphalt covering material 19 bonded thereto. Plywood sheet 18 is positioned with its lower horizontal surface 16 supported on the support member upper horizontal web 15 and with the support member side flange 17 extending downwardly therefrom.

The J-bolt fastening means, generally indicated at 13, preferably includes the sleeved nut member 20 and generally J-shaped bolt member 21 which are engaged and serve to secure the flooring 10 to the support member 11. The sleeve nut member 20, shown in vertical cross section in FIG. 5, is formed with an enlarged head portion 22 having the usual flat sided hexagon outer side surface 23 for convenient engagement by the usual socket wrench, as will be hereinafter described.

Further the nut member 20 is provided with a sleeve portion 24 integrally formed coaxially with the head portion 22 and extending downwardly therefrom. Sleeve portion 24 is provided with a smooth generally cylindrical outer surface 25 and an inner axially extending opening 26, which opening also extends through the head portion 22.

Also sleeve portion 24 is provided with the internal threads 27 within the opening 26, which threads are formed in the lower portion of sleeve portion 24 and terminate intermediate the axial length thereof. Thus the lower portion of the opening 26 is provided with the threads 27 with the upper portion of this opening, including that portion extending through the head portion 22, being completely free of threads.

The generally J-shaped bolt member 21, as shown in FIGS. 3 and 4, is provided with a preferably cylindrical vertically extending shank portion 28 and a hook portion 29 integrally connected with the lower end of shank portion 28. Hook portion 29 is formed from a generally horizontally extending leg 30 connected to the lower end of shank portion 28 at substantially a right angle, and a vertical leg 31 connected to horizontal leg 30 by substantially a right angle and spaced horizontally from shank portion 28. Horizontal leg 30 preferably is positioned with its axis substantially perpendicular to the axis of shank portion 28.

The bolt member shank portion 28 is provided with the external threads 32 covering the greater portion of the

vertical length thereof. Further the upper end of shank portion 28 is provided with a tool engaging portion in the form of the slot 33, as seen in FIG. 4, preferably positioned extending across the upper end of shank portion 28 the same direction as the hook portion horizontal leg 30 extends from the lower end of this shank portion. Also a portion of the upper end of shank portion 28 adjacent the end of the slot 33 toward the hook portion horizontal leg 30 may be milled to form the angled flats 34, so that these flats 34 with the slot 33 form an indicating arrow, when viewed from above, to indicate the direction of extension of the hook portion 29 from shank portion 28.

Referring to FIG. 1, in final assembled position the nut member 20 is received vertically through the flooring 10 with the sleeve portion 24 received in the small diameter opening 35, the head portion 22 received in the large diameter opening 36, and with the lower surface 37 of head portion 22 abutting the horizontal surface 38 formed between openings 35 and 36. Opening 35 is formed so that the plywood sheet 18 closely surrounds the sleeve portion outer surface 25 and opening 36 is formed so that sufficient clearance is provided around the head portion side surface 23 so that a socket wrench may be telescoped over this head portion 22.

Further, the vertical height of the large diameter opening 36 is greater than the vertical thickness of the nut member head portion 22 so that head portion 22 is completely recessed within the plywood sheet 18 and below the layer of covering material 19. Also, the head portion lower surface 37 is preferably machined and is formed on a generally cylindrical inset portion 39, with the sleeve portion 24 extending downwardly from this lower surface 37 and preferably completely through the plywood sheet 18 so that it projects below the plywood sheet lower horizontal surface 16.

Further, referring to FIG. 1, in final assembled position the external threads 32 of the bolt member shank portion 28 are engaged with the internal threads 27 of the nut member sleeve portion 24. As shown, it is preferred that the length of the bolt member shank portion 28 be calculated so that the upper end of this shank portion, when the parts are in assembled position, does not extend above the upper end of the nut member 20, although it can extend a slight distance thereabove without interfering with the finished assembly.

With the bolt member shank 28 threadably engaged with the nut member 20, the hook portion vertical leg 31 of bolt member 21 is received within the opening formed beneath the support member upper horizontal web 15 so that the upper horizontal end surface 40 of this vertical leg abuts the under surface of web 15. For maximum results of this fastening construction, it is important for this upper horizontal end surface 40 of bolt member vertical leg 31 to extend substantially parallel to the support member upper horizontal web 15, and also when the support member downwardly extending side flange 17 is provided, it is important for the vertical length of the bolt member vertical leg 31 extending above the bolt member horizontal leg 30 to be greater than the vertical height of this support member side flange, so that the hook portion telescopes this side flange, as shown, but the horizontal leg 30 is always spaced at least slightly below the lowermost edge of this side flange, as shown.

Still further, it is also important, for the maximum results of the present invention when the support member downwardly extending side flange 17 is provided, to have the vertical length of the bolt member shank portion 28 great enough so that it extends above the nut member internal threads, when the parts are assembled, a distance at least as great or greater than the vertical height of the bolt member vertical leg 31 above the bolt member horizontal leg 30. This is important in order to receive the full advantages of the particular construction of the bolt member 21, that is, with the internal threads 27

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only in the lower portion thereof and with the remainder of the opening 26 being free of threads, the advantages of which will be hereinafter more clearly explained.

The assembly, as shown in FIG. 1, may be completed by insertion of the spring-engaged button plug 41, which plug has the cap portion 42 with an exposed generally horizontal upper surface in the same plane as the upper horizontal surface of the layer of covering material 19, and the spring flanges 43 extending downwardly and engaging against the plywood sheet 18 within the large diameter opening 36. The button plug cap portion 42 is slightly larger in diameter than the sheet large diameter opening 36 and is received in an opening 44 in the layer of covering material 19, which opening 44 is, of course, also slightly larger than large diameter opening 36 and is formed coaxially therewith.

In actual assembly of the floor panel fastening construction of the present invention using the particular embodiment shown, the support member 11 would first be positioned on the concrete floor surface 12. The plywood sheet 18, having its layer of covering material 19 assembled thereon and having the various openings 35, 36 and 44 formed therethrough and at the proper desired location with respect to the support member 11, would then be initially pre-assembled with the J-bolt fastening means 13 prior to being positioned on the support member 11.

In this pre-assembly of the J-bolt fastening means 13 with the flooring 10, the nut member 20 is positioned from the upper side of the layer of covering material 19 through the opening 44 and in proper position within the plywood sheet openings 35 and 36. The upper end of the bolt member shank portion 28 is then inserted in the lower end of nut member 20 from the under side of the plywood sheet 18 and the nut member internal threads 27 are engaged with the bolt member external threads 32 until the upper end of the bolt member shank portion 28 is at or only slightly above the upper end of the bolt member internal threads 27.

With this pre-assembly of the flooring 10 and J-bolt fastening means 13, as described, the upper horizontal end surface 40 of the bolt member vertical leg 31 is still spaced a greater distance from the plywood sheet lower horizontal surface 16 than the distance the support member downwardly extending side flange extends below the support member upper horizontal web 15. Thus, the plywood sheet 18 may then be positioned on the support member upper horizontal web 15 and the bolt member 21 will still clear the support member downwardly extending side flange 17.

Thereafter, a tool such as a screw driver may be inserted in the bolt member slot 33 and the bolt member hook portion 29 properly positioned underlying the support member downwardly extending side flange 17 and received within the opening beneath the support member upper horizontal web 15. Due to the particular positioning of the bolt member slot 33 and the flats 34 formed in conjunction with this slot to provide the indicating arrow indicating the particular direction that the bolt member hook portion 29 extends, this hook portion may be properly positioned at this time and retained so positioned throughout the remainder of the assembly.

After the first positioning of the bolt member hook portion 29, the nut member head portion 22 is engaged with a socket wrench having a vertical opening formed therethrough so that the bolt member slot 33 can be simultaneously maintained engaged by the screw driver. The nut member 20 can then be rotated by the socket wrench while at the same time the bolt member 21 can be held properly positioned with reference to the support member downwardly extending side flange 17.

As the nut member 20 is rotated while the bolt member 21 is held stationary, the bolt member will be drawn upwardly through the nut member and with reference

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to the plywood sheet 18 and the support member 11. This will ultimately cause the upper horizontal end surface 40 of the bolt member vertical leg 31 to engage the under side of the support member upper horizontal web 15 and tightly draw the plywood sheet lower horizontal surface 16 against the support member upper horizontal web 15, securing the plywood sheet and support member tightly together in abutting relationship.

With the provision of the milled lower surface 37 on the nut member head portion 22 and the smooth outer surface 25 on the nut member sleeve portion 24, the rotation of the nut member 20 in this final drawing up operation is relatively easy despite the fact that the plywood sheet is, of course, wood and presents a relatively rough, possibly otherwise binding surface within the openings 35 and 36. Furthermore, because of the inset portion 39 of the nut member head portion 22 being formed circular, the nut member 20 does not present any sharp edges at this point to dig into the lower surface 37 of the plywood sheet large diameter opening 36, but rather this inset portion 39 permits free rotation of the nut member 20 and firmly seats on the surface 37.

Still further, since the bolt member shank portion 28, after the pre-assembly of the J-bolt fastening means 13 with the flooring 10, as described above, extends to or slightly above the upper end of the nut member internal threads 27 and since during the remainder of the assembly operation this upper end of the bolt member shank portion 28 moves progressively upwardly through the nut member smooth opening 26 which is free of threads, the nut member internal threads 27 can never be damaged by the screw driver inserted in the nut member opening 26 and engaged with the bolt member slot 33. For this reason, no damaged threads which could cause difficulty in assembly can be accidentally formed during the first assembly of this J-bolt fastening means 13 or during repeated disassembly and reassembly thereafter.

Also with the vertical length of the bolt member vertical leg 31 being greater than the vertical height of the support member downwardly extending side flange 17, this flange 17 can never engage the bolt member horizontal leg 30 so that the upper horizontal end surface 40 of the bolt member vertical leg 29 will always properly engage the under surface of the support member upper horizontal web 15 and properly retain the plane surfaces formed by this upper horizontal web 15 and the lower horizontal surface 16 of the plywood sheet 18 together. At the same time, the downwardly extending side flange 17 on the support member 11 insures that the support member 11 and bolt member 21 cannot become accidentally horizontally disengaged and also presents a barrier preventing the accidental disengagement between these parts during the assembly operation once the bolt member vertical leg 29 is engaged behind the support member downwardly extending side flange 17 within the opening formed beneath the support member upper horizontal web 15.

Additionally, with the provision of the upper horizontal end surface 40 on the bolt member vertical leg 29, a greater surface is provided for properly abutting the under side of the support member upper horizontal web 15 and for holding this web tightly against the plywood sheet lower horizontal surface 16. With his end surface 40 being horizontal, it is likewise impossible for the bolt member vertical leg 29 to dig into the support member upper horizontal web 15 during loading on the flooring 10, which digging in could ultimately cause the J-bolt fastening means 13 to become loose and permit movement between the flooring 10 and support member 11.

Still further, with the bolt member shank portion 28, horizontal leg 30 and the bolt member vertical leg 31 being connected at substantially right angles, there is little danger of the bolt member 21 springing or flexing during the assembly operation or during loading thereafter on the flooring 10 which springing could more readily take

place if the bolt member shank portion 28 and hook portion 29 were formed in an arcuate fashion. These right-angle connections also provide little, if any, danger of the support member downwardly extending side flange 17 ever tightly engaging any portion of the bolt member 21 during the assembly operation, since as long as there is even a slight spacing between the bolt member shank portion 28 and this support member flange 17, there is sufficient clearance so that this flange and bolt member cannot engage.

Finally due to the particular formation of the nut member sleeve portion 24 providing the close bearing surface over an extensive vertical height within the plywood sheet opening 35, a great resistance to horizontal shifting between the plywood sheet 18 and the support member 11 is provided. If the nut member 20 were not formed with this sleeve portion 24, a greater clearance would be required in order to permit insertion of the externally threaded shank portion 28 which could permit horizontal shifting and might ultimately result in failure of the assembly.

As before described, the foregoing assembly is completed after the final drawing up of the J-bolt fastening means nut and bolt members 20 and 21 by merely inserting the button plug 41 in the opening 44 formed in the layer of covering material 19. The cap portion 42 of this button plug thereby forms a continuous plane horizontal surface with the upper surface of the layer of covering material.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiment of the improved construction illustrated and described herein is by way of example, and the scope of the present invention is not limited to the exact details of the construction shown.

Having now described the invention, the construction, operation and use of preferred embodiments thereof, and the advantageous, new and useful results obtained thereby; the new and useful construction and reasonable mechanical equivalents thereof obvious to those skilled in the art are set forth in the appended claims.

I claim:

1. Floor panel fastening construction including generally horizontally extending flooring having an upper and lower surface, support means underlying and supporting the flooring, the support means having a generally horizontal flange abutting the flooring lower surface, said support means horizontal flange having an under surface and being connected to a downwardly extending flange terminating spaced downwardly from said horizontal flange under surface, a nut member having a head portion and a generally cylindrical elongated sleeve portion, said nut member sleeve portion having a smooth cylindrical outer surface, the head and sleeve portions extending co-axially with the head portion projecting radially from the sleeve portion, the nut member being positioned with the head portion engaged with the flooring upper surface with the sleeve portion extending downwardly from the head portion within the flooring and the sleeve portion smooth outer surface abutting the flooring in a close rotatable fit, a generally J-shaped bolt member having a generally vertically extending shank portion and a hook portion connected to said shank portion, the bolt member shank portion being engaged with the nut member with the bolt member hook portion extending beneath the support means downwardly extending flange, the hook portion telescoping the support means downwardly extending flange and extending upwardly engaging the support means under surface to firmly secure the generally horizontal flooring tightly to the support means horizontal flange, and the bolt member hook portion being free

of contact with the support means downwardly extending flange.

2. Floor panel fastening construction including generally horizontally extending flooring having an upper and lower surface, support means underlying and supporting the flooring, the support means having a generally horizontal flange abutting the flooring lower surface, said support means horizontal flange having an under surface and being connected to a downwardly extending flange terminating spaced downwardly from said horizontal flange under surface, a nut member having a head portion and a generally cylindrical elongated sleeve portion, said nut member sleeve portion having a smooth cylindrical outer surface, the head and sleeve portions extending co-axially with the head portion projecting radially from the sleeve portion, the nut member being positioned with the head portion engaged with the flooring upper surface with the sleeve portion extending downwardly from the head portion within the flooring and the sleeve portion smooth outer surface abutting the flooring in a close rotatable fit, a generally J-shaped bolt member having a generally vertically extending shank portion and a hook portion connected to said shank portion, the bolt member shank portion being threadably engaged with at least the nut member sleeve portion with the bolt member hook portion extending beneath the support means downwardly extending flange, the bolt member hook portion terminating upwardly in a generally horizontal end surface, the bolt member hook portion extending beneath and telescoping the support means downwardly extending flange with the hook portion terminating upwardly and the hook portion horizontal end surface abutting the under surface of the support means horizontal flange to firmly secure the generally horizontal flooring tightly to the support means horizontal flange, and the bolt member hook portion being free of contact with the support means downwardly extending flange.

3. Floor panel fastening construction including generally horizontally extending flooring having an upper and lower surface, support means underlying and supporting the flooring, the support means having a generally horizontal flange abutting the flooring lower surface, said support means horizontal flange having an under surface and being connected to a downward extending flange terminating spaced downwardly from said horizontal flange under surface, a nut member having a head portion and a generally cylindrical elongated sleeve portion, said nut member sleeve portion having a smooth cylindrical outer surface, the head and sleeve portions extending co-axially with the head portion projecting radially from the sleeve portion, the nut member being positioned with the head portion engaged with the flooring upper surface with the sleeve portion extending downwardly from the head portion within the flooring and the sleeve portion smooth outer surface abutting the flooring in a close rotatable fit, the nut member having an opening formed therethrough axially of the head and sleeve portions, the nut member sleeve portion having a lower part spaced downwardly from the head portion, internal threads formed in the nut member opening in the sleeve lower part, the nut member opening being free of threads other than in said sleeve lower part, a generally J-shaped bolt member having a generally vertically extending shank portion and a hook portion connected to said shank portion, the bolt member shank portion having an upper tool engaging end portion, the bolt member hook portion terminating in an end, the bolt member shank portion having external threads engaged with the nut member internal threads with a pair of said shank portion including the upper tool engaging end portion extending above the nut member threads within the nut member opening, said bolt member hook portion extending beneath the support means downwardly extending flange, the hook portion telescoping the support means downwardly extending flange and extending upwardly with the hook portion end engaging the support

means under surface to firmly secure the generally horizontal flooring tightly to the support means horizontal flange, the bolt member hook portion being free of contact with the support means downwardly extending flange, and the part of the bolt member shank portion extending 5 above the nut member internal threads having at least as great a length as the distance the support means downwardly extending flange extends downwardly below the hook portion end.

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