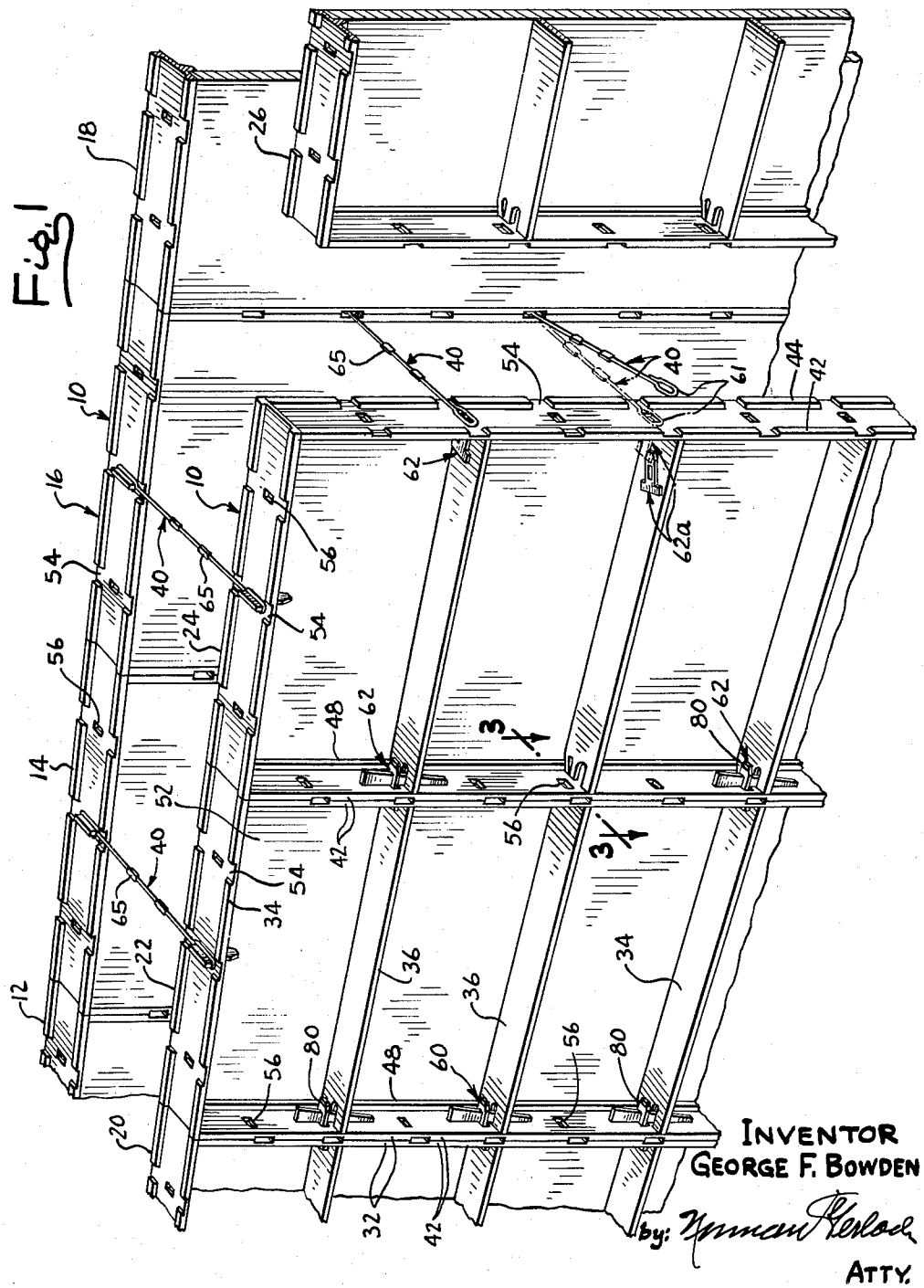
Aug. 29, 1961 G. F. BOWDEN 2,997,769

TIE ROD ASSEMBLY FOR CONCRETE WALL FORM PANELS

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Fig. 1



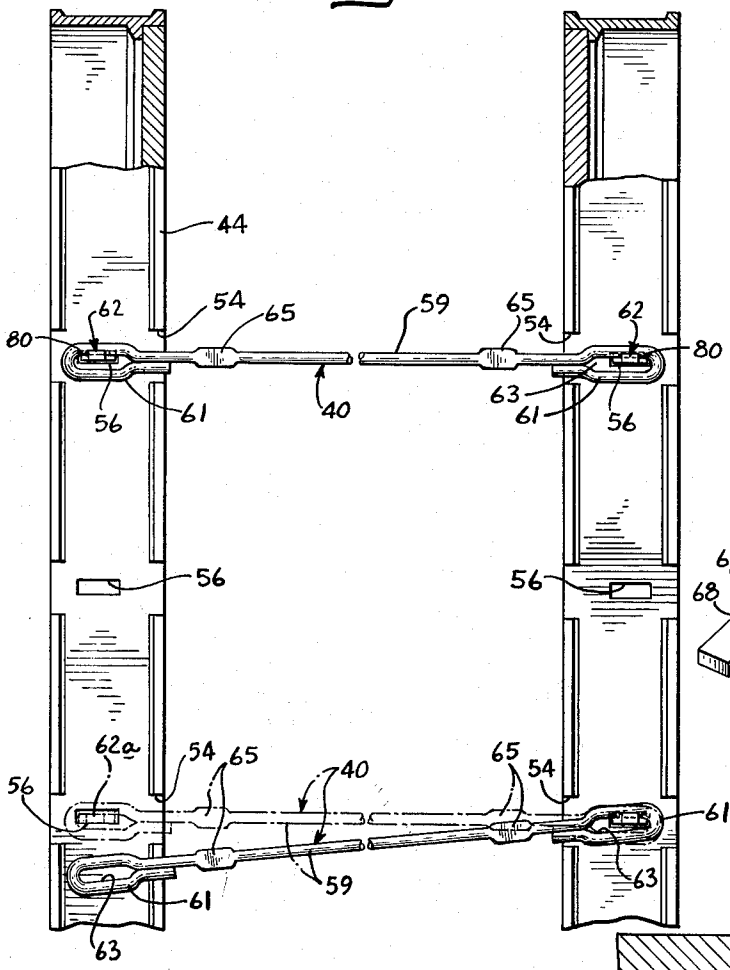
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TIE ROD ASSEMBLY FOR CONCRETE WALL FORM PANELS

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Fig. 2



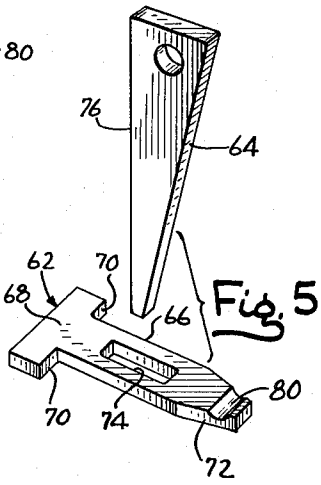
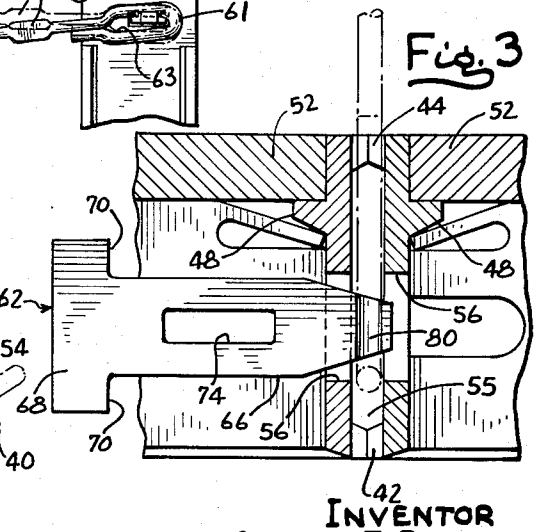


Fig. 5

Fig. 3



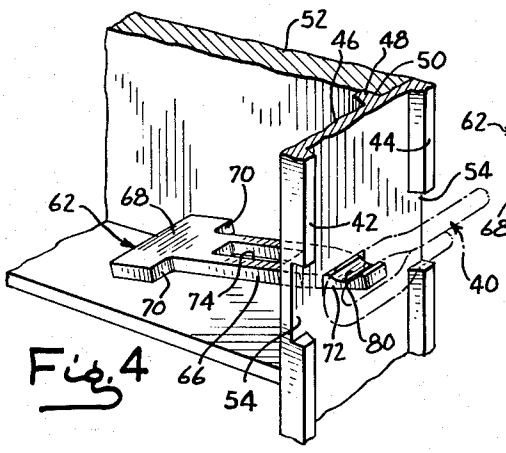


Fig. 4

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United States Patent Office

2,997,769

Patented Aug. 29, 1961

2,997,769

TIE ROD ASSEMBLY FOR CONCRETE WALL FORM PANELS

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Filed Nov. 23, 1959, Ser. No. 854,967

2 Claims. (Cl. 25—131)

The present invention relates to concrete wall forms of the panel type wherein the opposed wall forms are each constructed of a group of rectangular panels assembled in edge-to-edge relationship with the wet concrete being poured into the space existing between the walls, and with the two walls being connected by combined tie and spreader devices to prevent the wall from bulging under the thrust of the wet concrete. The panels commonly employed in this type of concrete wall form consist of facings of plywood against which the wet concrete lies, and stiffening and strengthening frames which are applied to the outer sides of the facings. Such strengthening frames include marginal horizontal and vertical members and intermediate cross bars which may extend either vertically or horizontally and which are connected at their ends to either the horizontal or the vertical marginal frame members.

The present invention has particular reference to concrete wall forms of this sort but which are known as prefabricated wall forms in that the individual panels are assembled at the factory rather than in the field, and in that the plywood panel reinforcing members including the vertical and horizontal marginal members, and any intermediate cross members which may be employed, are in the form of lengths of steel channels which are rolled to special shape and perforated, notched, grooved or otherwise fashioned to properly receive therein the plywood panel edges, as well as to facilitate the use of suitable fastening devices or other concrete form hardware whereby the adjacent panel units may be fastened together.

A typical wall form panel installation of the character briefly outlined above has been shown in the patent to Arthur H. Symons, No. 2,640,249, granted on June 2, 1953 and entitled "Wall Form Panel." As evidenced by this patent, it is customary to maintain the two panel forms in their spaced relationship by a special type of combined tie and spreader member, hereinafter referred to simply as a tie rod assembly. In the erection of the form assembly, T-bolts are passed through registering holes in the adjacent vertical marginal frame members and thereafter wedges are driven through slots provided in the shank portions of the bolts and these wedges, when driven tightly into place, coact with the bolts to draw the vertical side members together and thus clamp the panels fairly together in edge-to-edge relation. The marginal side members are recessed so that the loop portions of the tie rods may pass between the adjacent vertical side members and encircle the shank portions of the bolts so that the tie rod ends are, in this manner, operatively attached to both the front and rear form assembly. The tie rods are expendable in that after the concrete has been poured between the forms and allowed to harden and the forms removed by withdrawal of the bolt and

wedge assemblies, the tie rods remain embedded in the concrete with their looped ends projecting outwardly therefrom on opposite sides of the concrete structure. At points near the face of the concrete structure where the tie rods project outwardly, the rods are provided with weakened portions which facilitate breaking off of the projecting ends of the tie rods. Tie rods and bolt assemblies of this general character are extremely effective in use and they have been widely accepted in the building industry. However, they are possessed of one serious limitation in that they are difficult to install. It has been found that in the usual manner of erecting prefabricated wall form panels in any given installation, in order to adjoin the marginal edges of two adjacent panels, the bolts are first inserted through the openings in the vertical marginal frame members of a given pair of opposed panels and the tie rods are "hung" so to speak on the protruding shanks of the bolts by inserting the tie rod loops over the shanks so that the tie rods span the opposed forms and rest loosely in position on these forms awaiting juxtapositioning of the next adjacent pair of opposed wall form panels. As these latter panels are brought into position in the form structure and moved into edge-to-edge relationship with the already erected panels, it has been found that almost invariably, regardless of the skill of the workmen or of the care and attention given to the job, the edges of these latter panels will engage the ends of the bolts and, by impact, knock the bolts out of the loops and through the holes in the vertical marginal frame bars so that the support for the tie rod is no longer existent and one or both ends of the tie rod will fall, thus obstructing further positioning of the second pair of panels against the first erected pair of panels. It sometimes happens that because of the existence of certain recesses which are formed in the vertical side frame members, only the bolts will be dislodged from the panel structure while the tie rods will remain captured within the registering notches provided between the vertical side members. This necessitates subsequent retrieving of the bolts for application to the tie rods. More often than not, however, both the bolt and the tie rod are dislodged on one or both sides of the installation so that final erection of the forms is at best a trial and error method with repeated positioning of the tie rods against the forms before the same can be properly anchored in position.

To obviate the above-noted limitations that are attendant upon the assembly of tie rods in a form installation of this character, many operators have found that by wiring the bolts in their temporary position on one erected panel before bringing the second panel into juxtaposition therewith, the bolts will be retained in position so that after the second panel has been thus positioned, the bolt may be driven home and the wedge applied thereto. This procedure, however, is time-consuming in that it involves an initial wiring step and a subsequent wire removal step, sometimes involving the use of wire cutters and pliers to pull the severed wire from its lodged position between the forms and around the bolt. Other operators have attempted to solve the problem by the use of additional workmen for holding the bolts in position until the adjacent panels have been positioned in their edge-to-edge relationship.

The present invention is designed to overcome the

above-noted limitations that are attendant upon the use of tie rod and bolt assemblies in the erection of prefabricated form panel units, and toward this end, the invention contemplates the provision of a bolt assembly for use in connection with the looped ends of tie rods wherein the shank portion of the bolt is provided with a recess in the distal end thereof establishing a supporting cradle for the tie rod loop, the cradle being so shaped and positioned on the bolt shank that when the shank is inserted through the usual opening in the vertical marginal frame member and allowed to project outwardly therefrom a slight distance, the tie rod loop may be "hung" on the end region of the bolt with one side of the loop resting within the cradle and with the tie rod strut projecting through the usual notched margin of the frame member so that when the next panel unit is brought into juxtaposition against the first panel unit, there will be little danger of either the tie rod or the bolt being dislodged from its temporary position.

The two panels may then be moved to their final positions with the panel facings extending in edge-to-edge relationship and in a common plane, after which the bolt may be impacted from the inside of the first erected panel and driven to its home position through the tie rod loop and through the aligned openings in the adjacent vertical marginal frame members, after which the wedge may be applied to draw the frame members hard against each other with the tie rod looped confined therebetween.

The provision of a tie rod bolt having such a loop-retaining cradle associated therewith being among the principal objects of the invention, another object is to provide such a bolt which will cooperate with conventional prefabricated panel units and conventional tie rods, as well as with conventional wedges without requiring any modification whatsoever of the panel units, tie rods, or wedges.

Other objects and advantages of the invention, not at this time enumerated, will become more readily apparent as the following description ensues.

In the accompanying two sheets of drawings forming a part of this specification, a tie rod bolt constructed in accordance with the principles of the present invention has been illustrated, both singly and in its environment in a typical wall panel installation.

In these drawings:

FIG. 1 is a fragmentary perspective view, schematic in its representation, of a typical concrete wall form installation showing a number of improved tie rod bolts operatively in position thereon and also showing other such tie rod bolts in a temporary position with tie rods thereon preparatory to the assemblying of an additional panel unit;

FIG. 2 is an enlarged fragmentary end elevational view, partly in section of a portion of the structure shown in FIG. 1;

FIG. 3 is an enlarged sectional view taken substantially along the horizontal plane indicated by the line 3—3 of FIG. 1 in the direction indicated by the arrows;

FIG. 4 is a fragmentary detail perspective view of a portion of the structure shown in FIG. 1 illustrating the bolt and tie rod in an initial or temporary position on a panel unit preparatory to the juxtapositioning of a second panel unit thereagainst; and

FIG. 5 is an enlarged exploded perspective view of a bolt and wedge assembly constructed in accordance with the principles of the invention.

Referring now to the drawings in detail, and in particular to FIGS. 1 and 2, a fragmentary portion of a partially erected composite wall form of the prefabricated, metal-reinforced, panel type has been illustrated herein and designated in its entirety at **10**. The composite assembly **10** includes a rear panel form assembly made up of panel units **12, 14, 16** and **18** arranged in edge-to-edge relationship, and a front form assembly including panel units **20, 22, 24** and **26** likewise arranged in edge-to-edge relationship. All of the panel units in the rear form assembly are shown as being operatively juxtapositioned, but in the front panel form assembly, the panel unit **26** is shown as being spaced from the unit **24** preparatory to the juxtapositioning thereof. Also, in the front form assembly, certain bolt and wedge assemblies which are employed for anchoring the panels **22** and **24** together are shown in an initial temporary position while others are omitted altogether to more clearly illustrate certain principles which are involved in connection with the installation of the novel bolts of the present invention.

The panel units per se are purely conventional and no claim is made herein to any novelty associated with the same. Each panel unit is in the form of a generally rectangular plywood facing **30** having a steel marginal reinforcing frame applied to the outer face of the panel unit and consisting of vertical and horizontal marginal frame bars **32** and **34**, respectively. Intermediate horizontal frame members **36** extend across each panel unit and such members have their ends secured by welding to the opposed faces of the two vertical marginal frame bars **32**. The bars **32** extend in contiguity at the juncture between the various panel units. The front and rear form assemblies are maintained in their spaced relationship by means of conventional tie rod and spreader devices designated in their entirety at **40** and the nature and function of these assemblies **40** will be made clear presently.

The vertical frame bars **32** are of shallow channel shape in cross section and each bar includes inside and outside marginal ribs or flanges **42** and **44**, respectively, and a connecting web portion **46** (FIGS. 3 and 4). A lateral flange **48** spaced inwardly a slight distance from the inside edge of each frame bar affords a right angle recess **50** in which the adjacent vertical edge of the plywood facing or panel proper **52** seats with its inside face extending flush with the inside edge of the frame bars **32** and **34**.

In erecting the concrete wall form assembly **10**, pairs of adjacent panel units are brought into contiguity with the adjacent vertical frame bars **32** abutting each other so that the respective ribs **42** and **44** are in edge-to-edge abutting relationship, while the web portions **46** remain slightly separated. At vertically spaced regions along the marginal ribs **42** and **44**, pairs of transversely registering notches **54** are provided and these notches, when the frame bars are in contiguity, define therebetween horizontal channel voids **55** (FIG. 3) adapted to receive therethrough the tie rods proper of the tie rod and spreader assembly **40**. A rectangular hole or slot **56** is formed in the web portion **46** at the horizontal level of each pair of notches **54** and is adapted to receive therethrough T-bolt and wedge assembly devices **60** whereby the frame bars **32** may be drawn tightly together. The horizontal frame bars **34** are substantially identical in their construction to the vertical frame bars **32**, and to avoid needless repetition of description, similar reference characters have been applied to the corresponding parts of both frame bars.

The arrangement of parts thus far described, with the exception of the bolt portions of the T-bolt and wedge assemblies **60**, is purely conventional in its design and construction and no claim is made herein to any novelty associated with the same. Concrete walls of this type may vary widely in their details of construction and it will be understood that the wall form illustrated herein is purely exemplary of one embodiment of a concrete wall form to which the novel T-bolt and wedge assembly of the present invention is applicable. Only such portions of the wall form **10** as are operatively associated with, or bear a relation to, the novel wedge assembly **60** of the present invention have been illustrated herein.

The tie rod and spreader devices **40** are conventional and each consists of a tie rod proper (FIGS. 2 and 4)

having looped ends **61** which are reversed upon themselves to provide elongated loops or voids **63** designed for reception therethrough of the bolts associated with the T-bolt and wedge assemblies **60**. Flattened break-off portions **65** facilitate removal of the projecting end regions of the tie rods after the poured concrete has hardened as is well known in the art. When the devices **40** are operatively in position in the form assembly **10**, as shown in FIG. 1, the notches **54** in the marginal ribs **44** afford clearance regions for the tie rods while the looped portions or ends **61** remain entirely within the confines of the channel voids **55**.

The disclosure of FIGS. 1 and 2 is somewhat schematic in its representation in that these views illustrate certain principles of operation which are involved during assembly of adjacent form panel units when T-bolt and wedge assemblies **60** constructed in accordance with the principles of the present invention are employed, as well as when conventional T-bolt and wedge assemblies **60***a* are employed. In these views, all of the T-bolt and wedge assemblies **60** are of novel design, whereas a single T-bolt **62***a* is conventional.

Each T-bolt and wedge assembly involves in its general organization a bolt **62** and a wedge **64**. The bolt is in the form of a flat steel stamping of generally T-shape in plan and having a body or shank portion **66** (FIG. 5) of elongated design provided with a T-head **68** at one end thereof providing shoulders **70** designed for engagement with the web portion **46** of a vertical marginal side frame member **32** when the shank portion **66** is passed through the rectangular hole **56** of the web portion. The outer or distal end region of the shank **66** is tapered, as at **72**, to facilitate insertion of the shank portion **66** through the hole **56**. The shank portion **66** is formed with an elongated slot **74** therethrough designed for reception of the wedge **64**, the latter being in the form of a flat triangular steel stamping. When the shank portion **66** is passed through a pair of registering holes **56** in adjacent vertical members **32** and the wedge **64** inserted through the slot **74**, the straight edge or side **76** of the wedge bears against one of the web portions **46** of the adjacent vertical member **32** and this side, in combination with the shoulders **70**, serves to draw the two abutting vertical marginal frame members **32** together in the usual manner of installation of conventional wedge assemblies **60***a*.

The wedge assembly **60** differs from conventional wedge assemblies only in that the distal tapered end region **72** of the bolt **62** is formed with a relatively deep, transversely extending, substantially semi-cylindrical groove **80** thereacross. This groove establishes an upwardly facing curved cradle **80** designed for cooperation with one side of the looped end **61** of a tie rod **60** so as to support the adjacent end of the tie rod temporarily in position against the outside face of a marginal vertical frame member **32** in a manner that will be made clear presently.

Still referring to FIGS. 1 and 2, it is conventional practice, when utilizing conventional T-bolts **62***a* to insert only the distal end region of the T-bolt through one of the slots **56** in an already erected panel unit, as shown in the lower regions of these two views, and to temporarily support the looped end **61** of a tie rod **40** on the end region of the bolt as shown in dotted lines preparatory to bringing an adjacent panel unit into juxtaposition with the erected unit. After the two panel units are properly justapositioned with the adjacent slots **56** in register, the bolt is driven home to expose the slotted shank so that the wedge may be inserted therein and tightened by impact means. It has been found that only by the most careful handling on the part of a skilled operator or operators can the assembly be made in this manner. Almost invariably the T-bolt **62***a* will be dislodged by contact with the unfastened panel unit or by jarring of the structure, and in such an instance, the tie rod **40** is likely to fall to the full line position illustrated in FIGS. 1 and 2. In some instances, the bolt **62***a* will be dislodged as shown in full lines, but the loop will remain captured between the registering notches **54**, and in such instances, it is necessary to retrieve the bolt and again insert it through the registering slots **56** and through the loop **63**.

The novel T-bolt of the present invention obviates these difficulties in that when the wedge is partially inserted through the aligned or registering slots **56** and allowed to project a slight distance beyond the web **46** of one vertical frame member **32**, the recessed groove or cradle **80** will serve as a temporary support for the looped end **61** as shown in the upper regions of FIGS. 1 and 2 so that when the adjacent panel unit is brought into juxtaposition with an erected panel unit jarring of the structure or accidental contact of the end of the bolt **62** with the panel unit undergoing installation will not force the bolt out of the slots **56**.

The cradles or grooves **80** are preferably slightly less than 180° in circumferential extent so that after two panel units have been properly juxtapositioned in edge-to-edge relationship, an impacting blow on the head portion **68** of the bolts **62** will serve to drive the T-bolt to its home position with the looped end **61** moving upwardly by a camming action a slight distance to clear the curved wall of the cradle **80** and finally coming to rest on the medial region of the shank portion **66** of the T-bolt. To permit such vertical displacement of the looped end **61** of the tie rod **40**, the vertical extent of the various notches **54** in the flanges **44** of the vertical members **32** is appreciably greater than the diameter of the tie rod **40**.

In the manufacture of the T-bolts **60**, no machining operations are required. The grooves or cradles **80** may conveniently be formed in the distal end of the shank **66** by the provision of a suitable projection in one of the forming dies which are utilized in the stamping operation.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit of the invention. Only insofar as the invention has particularly been pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A T-bolt designed for use in temporarily supporting the flat sided looped end of a tie rod in an initial position against one vertical side of a marginal frame member associated with a concrete wall form panel unit preparatory to juxtapositioning a similar panel unit thereagainst in edge-to-edge relationship, said T-bolt comprising a flat stamping of generally T-shape design having an elongated shank portion and an enlarged head portion, said T-bolt having substantially flat upper and lower faces, there being an elongated slot extending vertically through said shank portion designed for reception therethrough of a wedge, the upper face of said T-bolt being formed with a transversely extending groove in the distal region of the shank portion between the slot and the free end of the shank portion for establishing an upwardly facing cradle designed loosely to receive therein by gravity one flat side of said looped end of the tie rod.

2. A T-bolt designed for use in temporarily supporting the flat sided looped end of a wire tie rod in an initial position against one vertical side of a marginal frame member associated with a concrete wall form panel unit preparatory to juxapositioning a similar panel unit thereagainst in edge-to-edge relationship, said T-bolt comprising a flat stamping of generally T-shape design having an elongated shank portion and an enlarged head portion, said T-bolt having substantially flat upper and lower faces, there being an elongated slot extending vertically through said shank portion designed for reception therethrough of

a wedge, the upper face of said T-bolt being formed with a transversely extending groove in the distal region of the shank portion between the slot and the free end of the shank portion for establishing an upwardly facing cradle designed loosely to receive therein by gravity one flat side of said looped end of the tie rod, the side edges of said shank portion in said distal region being tapered with said transversely extending groove extending completely across the shank portion and intersecting the tapered sides, said groove having a substantially semi-cylindrical wall the depth of which is slightly less than the radius of the wire of the tie rod which is to be received therein.

References Cited in the file of this patent

UNITED STATES PATENTS

505,215	Buffington	Sept. 19, 1893
1,301,500	Reynolds	Apr. 22, 1919
1,976,913	Beauchamp	Oct. 16, 1934
2,140,772	Slayter et al.	Dec. 20, 1938
2,640,249	Symons	June 2, 1953
2,859,503	Hennig	Nov. 11, 1958
2,912,482	Horrocks et al.	Nov. 10, 1959

FOREIGN PATENTS

787,200	Great Britain	Dec. 4, 1957