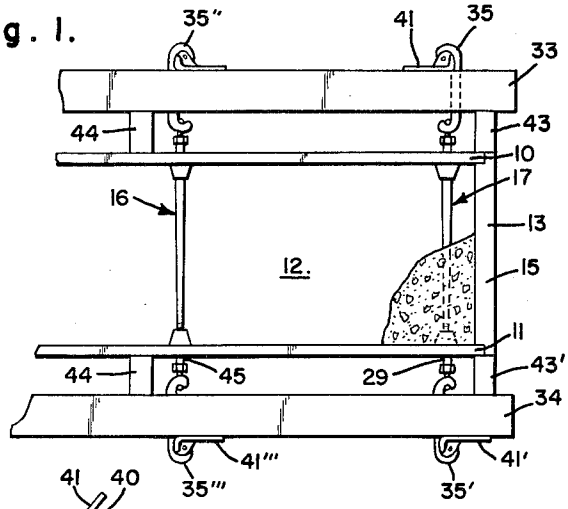
Aug. 3, 1965 W. A. SMITH 3,198,476

TAPERED TIE BOLT

Filed April 25, 1962

Fig. 1.



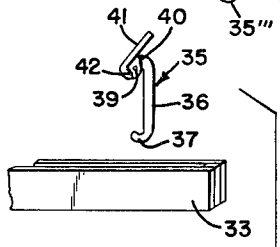


Fig. 2.

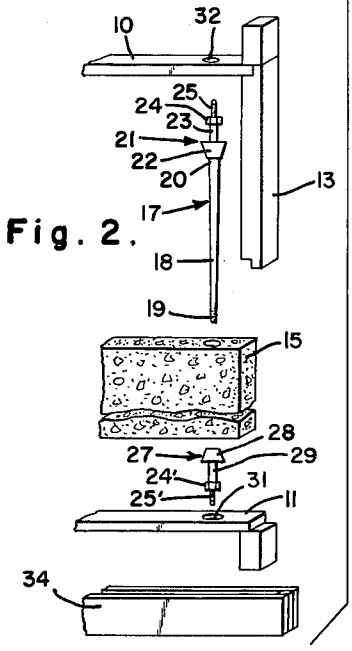
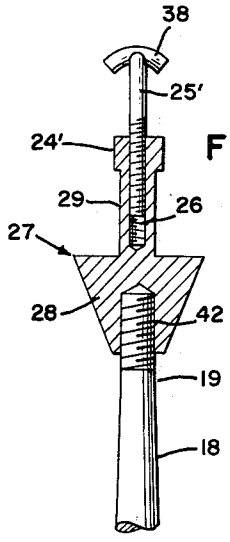


Fig. 3.



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3,198,476

Patented Aug. 3, 1965

3,198,476

TAPERED TIE BOLT

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Filed Apr. 25, 1962, Ser. No. 190,021
4 Claims. (Cl. 249—42)

This invention relates to apparatus for assistance in the shaping of concrete. More particularly it relates to removable and reusable bolt means for assisting in the maintenance of form boards in preselected fixed relative positions between which concrete may be poured and allowed to harden.

In a preferred embodiment the present invention provides an assembly for assisting in maintaining concrete form boards in preselected spaced positions comprising, in combination, a shaft having a cross section which gradually diminishes from a wider end to a narrower end. First means are statically mounted adjacent the wider end of the shaft for engaging and preventing movement of a first form board in at least one direction. Second means are removably mounted on the narrower end of the shaft for engaging a second form board aligned with the first form board and for maintaining the second form board at a preselected relative distance from the first form board.

Clamp engaging means are positioned adjustably outwardly from each of said first and second means for cooperation with clamping means operable to maintain the first and second means in engagement with the first and second form boards. The assembly is entirely withdrawable from the first and second form boards and from concrete which may be formed therebetween when the second means is removed from the shaft.

Previously there have been several varieties of means for securing form boards in fixed relative position so that they are not movable toward each other. As is well understood in the art, the form boards in conjunction with suitable end boards serve as a type of mold within which freshly prepared concrete may be poured. When the concrete sets up hard, the form boards and end boards are removed leaving a concrete structure of desired shape such as a wall or column. The tie bolts are employed at a plurality of spaced locations along the length of the boards to tie the two boards together during the foregoing steps so that the boards present sufficient structural rigidity along their length between the end boards.

The tie bolts span the distance between the form boards and normally engage the boards at the outer ends of the bolts. Consequently, when the cement is poured between the form boards it covers and hardens around the tie bolts. One conventional means for tying form boards together comprises a tie wire designed to remain embedded within the concrete. It is necessary with such a device to break off the projecting ends of the tie wire which engage the form boards in order to leave a smooth outer concrete surface. This is a burdensome and time consuming task. In addition, the tie wires are not reusable and are capable of being used only once.

Other types of tie bolts were designed to be removed from the concrete when the form boards were removed. Even with this type there was a portion of the bolt assembly which remained embedded in the concrete adding to the cost of its use. Further, the construction of the bolts made it a difficult task to remove them from the concrete after the concrete had set around the bolts. This type of bolt also required attention to both ends simultaneously in order to remove it from the concrete.

The present construction avoids all of the difficulties and expenses attendant the use of these prior art devices and offers certain other advantages. Thus, as noted

above, the present construction includes adjustable clamp engaging means for engagement with clamps or similar means used to lock the bolts to the form boards in combination with the conventional whalers and studs employed in concrete forms.

This adjustable feature permits a variation in the effective length of the tie bolt when installed. As a result, if the distances between the form boards varies over a period of time due to shrinkage or warpage, for example, of the form boards or whalers, it is a simple matter to compensate for the change in spacing of the members by appropriate adjustment of the present device. Further, the present assembly is easily removable from the hardened concrete because of its cross section which gradually diminishes from a wide end to a narrow end. By urging the wider end outwardly from the concrete after disengaging the removable end, the remainder of the bolt is easily withdrawable from the concrete. Moreover, once the bolt has been readied for withdrawal, as will become more clear hereinafter, the entire unit is withdrawable from the concrete and may be reused indefinitely without replacement of parts.

Another feature and advantage of the presently assembly lies in the fact that it can be tightened into the desired position in cooperation with the form boards entirely from one side and need not be serviced from both sides at the same time. This has particular significance where the form boards are at a height above ground in the course of building a structure and it would necessitate scaffolding or other means to reach the outside of the structure to service the outer side of the tie bolt. Analogously, when removing the tie bolts from the finished concrete portion of the structure, they may be loosened from one side only for complete disengagement. This permits the use of cranes for example, to lift away the outer form boards without requiring the presence of a workman to service the bolts on the outside of the structure and which may be at an inconvenient height.

With respect to the accompanying drawings there is shown in FIG. 1 a top plan view including two bolts provided by the present invention suitably installed between two form boards and including cooperating studs, whalers and clamps.

FIG. 2 shows in perspective an exploded view of the right isde of FIG. 1.

FIG. 3 shows in side section a segment of the tie bolt of FIG. 2 in the area of the narrow end.

Turning to the drawings, FIG. 1 in particular, there is shown a pair of spaced apart form boards **10**, **11**. An enclosure **12** is defined therebetween with the addition of end boards, one of which is shown at **13**. Conventionally, cement or concrete **15** is poured into enclosure **12** and is allowed to harden and set whereupon form boards **10** and **11** and the end boards are removed.

Preparatory to pouring cement **15**, and during the time necessary for the cement to harden, the various members noted above are maintained in fixed position by a pair of tapered tie bolts shown generally at **16**, **17**. The right hand tie bolt **17**, which is shown in greater detail in FIGS. 2 and 3, will be described more completely. The left hand tie bolt **16** is in all respects similar to tie bolt **17**.

Tie bolt **17** includes a tapered shaft **18** having a threaded narrow or smaller end **19** and a wider or larger end **20**. Statically mounted on wider end **20** is a form board retainer **21** including a frusto-conical shoulder member **22** and an outwardly extending cylindrical portion **23**. The outer end of cylindrical portion **23** may be hexagonally shaped as at **24** to facilitate turning of the member during use, or the whole of portion **23** may be so constructed. The precise shape of portion **23** is not critical.

The opposite or narrow end **19** of shaft **18** has a form

board retainer assembly 27 similar to 21 except that assembly 27 is removable from shaft 18. Thus assembly 27 includes a frusto-conical shoulder member 28 continuous with a cylindrical portion 29. Cylindrical portion 29 may also be made hexagonal as at 24' or otherwise modified as with portion 23. Conical shoulder member 28 is threaded interiorly at 42 and cooperates with the narrow end 19 of shaft 18 which is also threaded. Shaft 18 may be disengaged from assembly 27 as seen in FIG. 2.

Both cylindrical portions 23 and 29 are threaded interiorly as at 26 to receive threaded generally T-shaped clamp engaging members 25, 25' respectively. Members 25 and 25' are adjustable with respect to the longitudinal axis of shaft 18 by rotation thereof and the overall length of the unit may thereby be varied as needed.

In position for use bolt 17 spans the area between form boards 10, 11 with shoulder members 22 and 28 abutting against the mutually facing sides of form boards 10, 11. Cylindrical portions 23 and 29 extend through holes 31, 32 which are suitably cut in form boards 11 and 10, respectively.

The entire cement shaping construction includes whalers 33, 34 spaced from and parallel to form boards 10, 11, respectively. Studs 43, 43' and 44, 44' occupy part of the space between the form boards 10 and 11 and the whalers 33 and 34.

The construction is stabilized as shown in FIG. 1 by a plurality of suitable clamps 35, 35', 35'', 35'''. Any clamping member adapted for engaging clamp engaging members 25, 25' and for locking the entire structure together may be used. Preferably the clamping member should function by pulling on the clamp engaging members while pressing on the exteriors of whalers 33, 34.

In the preferred embodiment illustrated, clamp 35 (and its 3 other counterparts) is cam actuated and constructed in accordance with the disclosure of copending patent application Serial No. 161,978, filed December 26, 1961. Generally, this cam actuated clamp includes a C-frame 36 having a bifurcated jaw 37 on one leg for engaging the head 38 of clamp engaging members 25 and 25', and a camming surface 39 on the opposite leg 40. Clamp 35 also includes a lever 41 pivotally supported by frame 36. Lever 41 includes a camming surface 42 operable to engage camming surface 39. Movement of lever 41 upwardly as seen in FIG. 2 serves to release clamp 35. Movement of lever 41 downwardly as seen in FIG. 1 serves to lock clamp 35 into position and hold bolt 17 and whaler 33 in place.

In use the entire construction as shown in FIG. 1 is assembled and cement poured into enclosure 12. Any need for change in the overall length of each tie bolt with respect to the whalers 33, 34 that occurs is accomplished simply by releasing one of the clamps 35 and rotating the associated clamp engaging member 25 so that it moves outwardly or inwardly with respect to cylindrical portion 23 as required. Clamp 35 may then be re-engaged.

To remove the construction from the finished cement body it is possible to work from one side only. Thus clamps 35' and 35''' as shown in FIG. 1, for example, may be disengaged by pivoting levers 41' and 41'''. This allows the removal of the whaler 34 and form board 11, the form board 11 passing over cylindrical portions 29 of bolt 17 and the corresponding cylindrical portion 45 of bolt 16.

Tie bolt 17 is then removed by turning cylindrical portion 29 at hexagonal portion 24'. Bolt 17 is held at the other end by clamps 35 to prevent the entire bolt from rotating with portion 29. Retainer assembly 27 is then pulled from shaft 18. Since shoulder 28 is frusto-conical in configuration, it is relatively easily pulled from cement 15. Similar operations are performed on bolt 16.

A crane or other means can then be placed to pull on whaler side 33 if inconvenient to reach by hand. Since tie bolt 18 (and shaft of bolt 16) is tapered, it may also readily be withdrawn from the cement 15. As a result all of the parts are recovered and are in condition for reuse.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be practiced within the spirit of the invention as limited only by the scope of the appended claims.

What is claimed is:

1. A reusable assembly for assistance in maintaining concrete form boards in preselected spaced positions comprising: a shaft having a cross section which gradually diminishes from a wider end to a narrower end thereof; a first frusto-conical shoulder member, of rigid material and substantially shorter length than said shaft, integrally joined to the wider end of said shaft and whose taper is greater but in the same direction as the taper of said shaft, a cylindrical portion extending longitudinally outwardly therefrom, said first shoulder member for engaging and preventing movement of a first form board in at least one direction; a second frusto-conical shoulder member, of rigid material and substantially shorter length than said shaft, threadably engageable with the narrower end of said shaft and whose taper is greater and in the opposite direction as the taper of said shaft, a cylindrical portion extending longitudinally outwardly therefrom, said second shoulder member for engaging a second form board aligned with said first form board and for maintaining the second form board at a preselected relative distance from said first form board; said assembly being entirely withdrawable from said first and second form boards and from concrete which may be formed therebetween when said second means is removed from said shaft.

2. An assembly in accordance with claim 1 wherein clamp engaging means positioned outwardly from each of said first and second shoulder members for cooperation with clamping means operable to maintain said first and second means in engagement with said first and second form boards.

3. An assembly in accordance with claim 1 wherein clamp engaging means positioned outwardly from each of said first and second shoulder members, said clamp engaging means comprising an elongate member threadably engaged with the interior of each of said cylindrical portions, whereby the effective length of the tie bolt and said clamp engaging means can be relatively lengthened and shortened by threadably screwing said elongate members inwardly or outwardly.

4. A construction for shaping newly poured concrete comprising, in combination: a pair of generally parallel form boards having holes therein; at least one tie bolt spanning said form boards; said tie bolt comprising a tapered shaft having a tapered shoulder member, whose taper is in the same direction as the taper of said shaft, integrally fixed to the wide end thereof for abutment with the adjacent form board; said tie bolt having a threadably engaged tapered shoulder member, whose taper is in the opposite direction as the taper of said shaft, at its narrow end for abutment with the other of said pair of form boards whereby said pair of form boards are prevented from being moved toward each other; cylindrical portions integrally with and projecting outwardly from each said shoulder member through said holes in said form boards; a T-shaped clamp engaging member adjustably threadably connected to and projecting outwardly beyond each of said cylindrical portions; whalers and studs located exteriorly of said form boards; a pair of cam actuated clamps engaging the ends of said T-shaped clamp engaging members and with the clamps bearing against the whalers on opposite sides of the form boards whereby said whalers and studs are mutually interlocked with said form boards and tie bolt by said cam actuated clamps.

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