

1

3,095,672 ANCHORAGE BOLT AND BLOCK FOR CONCRETE STRUCTURES

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This invention relates to concrete and like structures, and more particularly to anchorage means for use with such structures, by which there may be effected a securement of fittings, frames, slabs, bases or other formations to the structures.

An object of the invention is to provide a novel and improved metal anchorage means for concrete and the like, which means is especially strong and sturdy, and provides for a secure attachment or anchoring of the desired objects or structures without the likelihood of failure.

Another object of the invention is to provide an improved anchorage device as above set forth, which utilizes an attachable and removable threaded bolt to facilitate the securing operation while at the same time not adversely affecting the strength and reliability of the device.

A further object of the invention is to provide a novel anchorage means of the kind outlined, which may be readily incorporated in molded or cast concrete structures and the like without involving extensive modification or alteration of the forms employed.

Still another object of the invention is to provide an improved metal anchorage device as above characterized, which is simple in its construction and economical to fabricate and produce while at the same time retaining the desired strength and ruggedness.

A feature of the invention resides in the provision of a sturdy anchorage means in accordance with the foregoing, wherein the attachment procedure is simple and quick, and wherein removal or disassembly may be easily and rapidly effected, as well as subsequent reassembly.

Another feature of the invention resides in the provision of a threaded bolt-type anchorage means as characterized, wherein removal or separation of the secured parts or structures may be effected without completely unscrewing the threaded fastener device of the means.

Other features of the invention include the provision of an improved anchorage means as above set forth, wherein there are no parts, protruding from the concrete structure, the said anchorage means further being compact and relatively small whereby it may be used in cramped spaces and the like.

Other features and advantages will hereinafter appear.

In the drawings accompanying this specification similar characters of reference are used to designate like components and portions throughout the several views, in which:

FIG. 1 is a sectional elevational view showing the improved anchorage device of the invention in conjunction with two concrete structures which are secured together by the device. The concrete structures are shown in cross section whereas the anchorage device is shown mostly in side elevation.

FIG. 2 is a side elevational view of the bolt component of the anchorage means.

FIG. 3 is a transverse sectional view taken on the line 3—3 of FIG. 2.

FIG. 4 is a transverse sectional view of the embedded portion of the anchorage device taken on the line 4—4 of FIG. 1.

FIG. 5 is a top plan view of the anchorage formation or block which is intended to be embedded in the concrete structure at the time of the formation of the latter.

2

FIG. 6 is a fragmentary horizontal sectional view taken on the line 6—6 of FIG. 1.

Considering first FIG. 1, there are shown two concrete structures 10 and 12 which are secured together in assembled relation by the present improved anchorage and fastening means. The concrete structure 10 has embedded in it one portion of the fastening means, such portion comprising an anchorage formation or anchorage block designated generally by the numeral 14.

The concrete structure 12 has a through opening 16 in which there is disposed an anchorage bolt 18 constituting another component of the anchorage and fastening means.

Considering first the anchorage block 14 which is embedded in the concrete structure 10 at the time that such structure is being molded, cast or otherwise formed, such block comprises a main or body portion 20 having a generally rectangular configuration as viewed from the top thereof (see FIG. 5).

The anchorage formation 14 further has a pair of depending and divergent anchorage legs 22 and 24 extending downward from the upper side of the body 20 as seen in FIG. 1, the said legs terminating in outwardly extending lugs 26 and 28 respectively. Intermediate their ends the divergent legs 22 and 24 have additional lugs 30 and 32 respectively, extending inwardly or in directions generally opposite to those of the terminal lugs 26, 28.

The legs 22, 24 are characterized by a plurality of depressions or pockets 34 which may be disposed thereon in any suitable manner, even at random, to facilitate the gripping or interlocking action between the legs and the concrete material of the structure 10.

For the purpose of strengthening the anchorage formation, fillets 36 are provided at the points where the legs 22, 24 join the body 20.

As seen in FIGS. 1, 4 and 5, the upper and lower surfaces 38 and 40 of the block 20 (hereinafter also termed respectively the exposed face or one face portion and the base portion) are generally parallel with each other, whereas the side faces all slope. That is, the sides of the block 20 comprise two sloping end faces 44 and 46 respectively, as well as two sloping elongate side faces 48 and 50 respectively. Accordingly, the body 20 of the block is seen to have a tapered cross section, as clearly shown in FIG. 4.

Further, in accordance with the invention, the body 20 is provided with an elongate straight walled recess or T-slot 54 which extends midway between the two opposite sides 48, 50 and terminates at points closely adjacent the end faces 44, 46. At the termination points of the T-slot 54 there are undercut walls 56 and 58 respectively. The inner surface or base portion 40 of the block is of substantially larger area than the exposed face portion 38, to enable the undercut parts of the walls 56 and 58 to be readily accommodated without weakness while maintaining reasonably small dimensions.

As seen in FIG. 1, the anchorage formation or block 14 is intended to be embedded in the concrete structure 10 such as that indicated at 10, to an extent where the top surface or face 38 of the anchorage formation is flush with the corresponding top surface of the structure. Accordingly, there are no protruding portions of the anchorage formation 14 when the latter is properly embedded in the concrete structure 10, and instead only the top face 38 as well as the T-slot 54 is visible from the exterior. The concrete substance of the structure 10 will extend around and completely surround all of the formations of the divergent legs 22, 24, as well as the five concealed surfaces 40, 44, 46, 48 and 50 of the block body 20, and the concrete substance as well will be received in the multiplicity of pockets 34 of the divergent

legs. Any suitable procedure may be employed to effect the complete effective embedment of the anchorage formation 14 in the concrete, such procedure utilizing for example an agitation or other known practice.

Cooperable with the anchorage formation or block 14 is the anchor bolt 18, which latter in accordance with the invention is constructed in a novel manner to provide an improved and desirable cooperative action in conjunction with the body 20 and specifically with the T-slot or elongate recess 54 thereof. As seen in FIGS. 2 and 3 the anchor bolt 18 has a usual type of threaded shank 62 provided with an externally threaded end 64 arranged to carry a nut 66 in the well-known manner.

By the invention, the anchor bolt 18 has a flatted and elongate-shaped head portion 68 of novel formation, such head portion having a pair of opposite parallel sides 70, 72 which are separated by a distance roughly equal to the diameter of the shank 62. The head portion 68 is thus seen to be of roughly rectangular configuration as viewed from the end of the bolt. The head portion has oppositely disposed rounded end faces 74, and 76 comprising a pair of curved eccentric cam surfaces, and has a size and configuration such that it may be easily inserted in the T-slot 54 of the block body 20 and when so inserted as illustrated in FIG. 1 it may further be turned only a slight extent, as for example through an angle of approximately 70 degrees whereby the wing portions of the head 68 are disposed in part under the overhang of the T-slot. Thus, the anchor bolt 18 by virtue of such slight turning movement will be locked in the T-slot against removal therefrom by virtue of the cam surfaces cooperating with the straight opposite wall surfaces of the block recess 54. The portions of the cam surfaces which engage the said straight opposite wall surfaces, together with the axis of the bolt are all in alignment along a line which is normal to the said wall surfaces for the purpose of holding the bolt firmly wedged against lateral movement and fixedly supported in the slot in various locations solely in response to the bolt being slightly turned. Also, the minimum width of the recess in the block is substantially of the same order of magnitude as the thickness of the shank of the bolt, whereby the wedging of the bolt is facilitated due to its centralized positioning.

The turning of the anchor bolt to lock it in the body 20 is made in a clockwise direction, as viewed from the top of the anchorage block 14, whereby the application of the nut 66 and tightening of the same will not tend to unlock the head. As shown in FIG. 1 a simple flat washer 80 may be provided under the nut 66 prior to threading the latter on the bolt 18, to facilitate tightening of the nut during the assembly operation.

The elongate character of the T-slot 54 provides a desirable leeway in the use of the anchorage and fastening means, since it enables an adjustable positioning of the anchor bolt 18 to be had with respect to the anchorage block 14.

Thus, as seen in FIG. 1, the bolt 18 may be disposed in a number of different positions within the body 20, either more to the left or else more to the right than the position shown. This is of considerable advantage especially in connection with concrete structures and where relatively large dimensions are encountered, since tolerances need not be especially critical with respect to the relative position of the anchorage block 14 and the through aperture 16 of the structure 12. As seen in FIG. 1, the opening 16 is substantially larger than the diameter of the shank 62 of the anchorage bolt 18, thereby to further eliminate the necessity for close tolerances in connection with the present anchorage and fastening device.

It is preferred that the anchor bolt 18 and the anchorage block 14 be constituted of a strong and tough metal, as for example steel. For instance, the anchorage block 14 may be made as a steel casting, and the bolt 18 may be also formed from cast steel, or made as a drop forged

steel part, or else machined from steel bar stock. We have found that in actual use an anchorage and fastening means as above constructed is extremely sturdy and reliable, and securely fastens together structural formations such as the concrete structures 10 and 12. The anchorage means may be utilized to attach iron or steel (or other metal) structures to the concrete base 10, as for example the legs, frame members and the like of machinery. Other uses of the device will suggest themselves as the invention is understood.

The lugs 26, 28, 30 and 32 function in a manner to oppositely interlockingly engage the concrete in the manner of hooks whereby a secure anchorage is effected, and this is an important feature of the invention.

If at any time it should be desired to disassemble or separate the secured parts or members it is merely necessary to loosen the nut 66 and thereafter impart a slight counterclockwise turning movement to the shank 62 of the bolt 18. This will again align the elongate head 68 with the mouth of the T-slot 54, whereupon the head may be withdrawn from the slot, as will be readily understood. Thus, it is not necessary to entirely remove the nut 66, or to separate the bolt 18 from the associated member 12. Therefore, disassembly may be quickly and easily effected, as well as any subsequent reassembly.

It will be readily seen from an inspection of the figures that the body portion 20 of the anchorage formation 14 has somewhat the shape of a truncated pyramid, and that as a consequence the sides have an interlocking action with the concrete structure 10. Considering the anchor bolt 18, it is preferred that the curved ends 74 and 76 of the head 68 are not concentric with the axis of the shank 62 but instead follow an eccentric curve such as is commonly found in cams. Thus, while it may be considered that the corners of the head 68 are relieved, the extent of relief is different for one pair of diagonally opposite corners than for the other pair of diagonally opposite corners. The configuration of the head 68 is clearly depicted in FIG. 6, and by such construction a larger area of contact is obtained between the overhang portions of the interior walls of the body 20 and the cooperable surfaces of the head, as will be readily understood.

The components involved in the present anchorage and fastening device are relatively simple, and are few in number. They may be economically fabricated, and are extremely effective in use, providing a sturdy and reliable securement of structural members.

Variations and modifications may be made within the scope of the claims, and portions of the improvements may be used without others.

We claim:

1. An anchorage and fastening means for use with concrete and like structures, comprising in combination:
 - (a) a block adapted to be imbedded in concrete with one face thereof exposed,
 - (b) said block having a recess with oppositely disposed undercut walls constituting a T-slot, which T-slot opens at the said face, said recess having a pair of straight, opposite wall surfaces,
 - (c) an anchor bolt having a shank and a flatted and elongate shaped head, the latter being received in said T-slot with the shank protruding from the said exposed face of the block,
 - (d) said head having a size and elongate shape which prevents it from being completely turned when in the slot but enabling a partial turning to be effected, locating the outermost portions of the head in the undercut portions of the walls to prevent pull-out of the bolt from the block,
 - (e) said head portion of the bolt having oppositely disposed end faces comprising a pair of curved eccentric cam surfaces, said cam surfaces cooperating with the straight opposite wall surfaces of the block recess to hold the bolt, the portions of the cam sur-

5

faces which engage the said straight opposite wall surfaces, together with the axis of the bolt being all in alignment along a line which is normal to the said wall surfaces for the purpose of holding the bolt firmly wedged against lateral movement and fixedly supported in the slot in various locations solely in response to the bolt being slightly turned.

2. An anchorage means as in claim 1, wherein:
 (a) the minimum width of the recess in the block is substantially of the same order of magnitude as the thickness of the shank of the bolt.

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