May 13, 1958 C. W. STUMP, JR 2,834,081

ROD FASTENER

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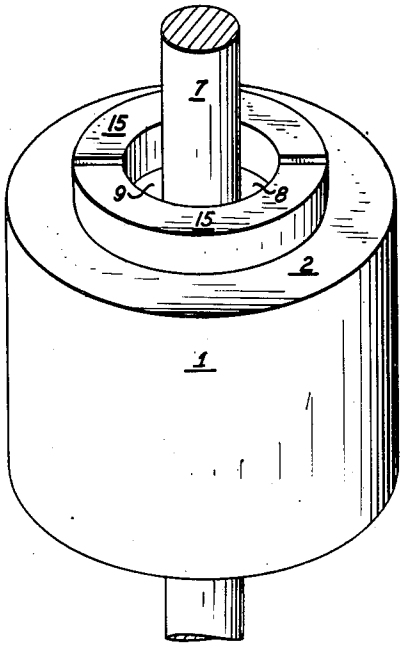


Fig. 1

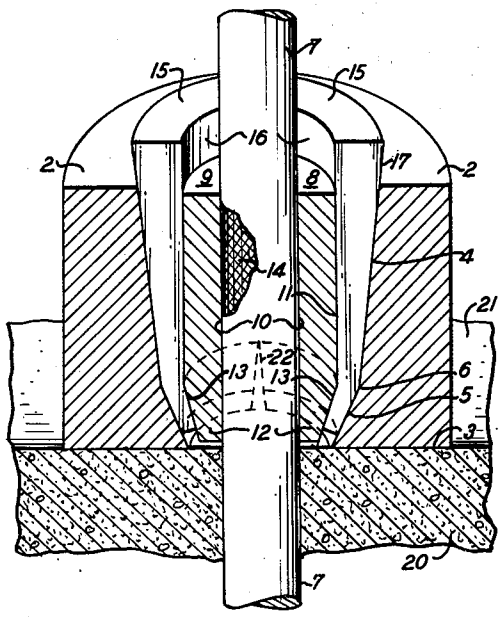


Fig. 4

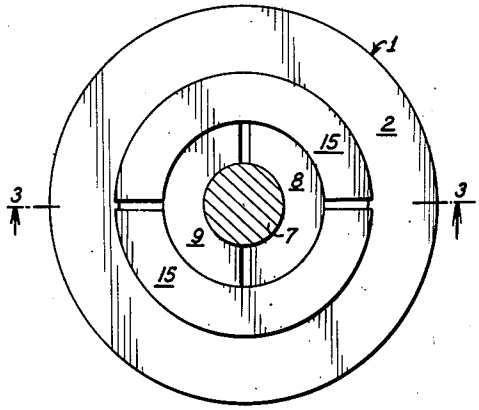


Fig. 2

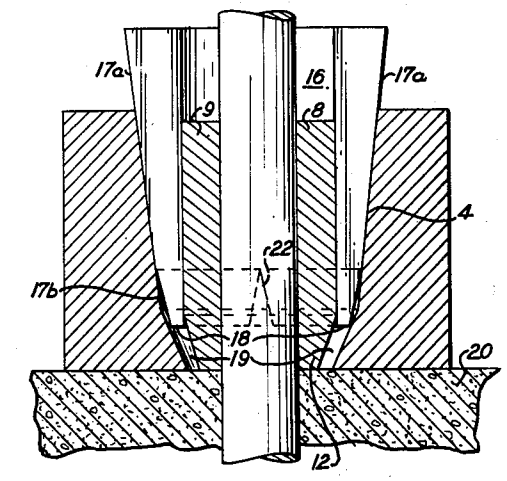


Fig. 3

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ROD FASTENER

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10 Claims. (Cl. 24—126)

This invention is a rod fastener for use in connection with prestressed concrete building structures and is designed particularly to hold the tension in a prestressed reinforcing rod or similar element after release of the tension-applying devices.

As is well known in the art, reinforcing elements in concrete building structures are prestressed by applying tension force thereto in order to increase the strength of the concrete structure. In one method of stressing the reinforcing rods, they are passed through apertures in formed concrete blocks or slabs and tension applied thereto by well-known apparatus such as tension jacks attached to the protruding ends of the rods. The present invention relates to fastening devices which may be associated with the protruding ends of the reinforcing rods, between the concrete structure and the tension device and associated with the rod members in a manner such as to retain within these rods, the tension forces applied thereto by the tension jacks, when the latter are released.

One object of the invention is to provide a rod fastener of the type described which may be threaded over the end of a reinforcing rod before the tension jack is applied thereto and which may be operated to securely lock the rod against movement with respect to the concrete structure after the tension jacks have been released.

Another object of the invention is to provide, in a device of the character described, rod-gripping jaws which are moved into gripping engagement with the reinforcing element by wedge members which are driven between the jaws and a confining socket.

A further object of the invention is to provide in a device of the character described means for simultaneously moving the gripping jaws radially and axially of the socket, in a direction to increase the applied tension.

Another object of the invention is to provide a rod fastener employing rod-gripping jaws which move radially under the influence of axially moving wedge members and wherein the wedge members are provided with portions which may be deflected inwardly to engage the jaw members in a manner to move the latter axially concurrently with the radial movement thereof towards a rod positioned between the jaws.

These and other objects of the invention will become apparent from reading the following specification when considered in the light of the accompanying drawings wherein I have illustrated preferred forms of my invention and wherein—

Fig. 1 is a perspective view of the invention shown associated with a reinforcing rod.

Fig. 2 is a top plan view of the invention.

Fig. 3 is a longitudinal sectional view taken generally on the line 3—3 of Fig. 2 and showing the parts in their initial, non-gripping position.

Fig. 4 is a longitudinal sectional view similar to Fig. 3 showing the parts in gripping relation.

Referring more particularly to the accompanying drawings wherein like reference numerals are used to designate like parts throughout, 1 represents a socket member formed from a block of metal and shown generally cylindrical in form although the external contour thereof may take any form desired. The socket 1 is provided with a tapered bore extending therethrough as shown and opening out through the opposite end faces 2 and 3 thereof. The bore through the socket 1 is formed to provide a plurality of inverted conic sections 4 and 5 generally in the form of frustums of cones, the frustum-forming section 4 having its base in the upper face 2 of the socket 1 and the frustum-forming section 5 having its base joining the opposite end face of section 4 and terminating with its other end face in the opposite end face 3 of the socket 1. The line of juncture between the two conic sections 4 and 5 is indicated at 6. It will be noted that the wall section 4 provides a long, smooth, slightly tapered conic wall section larger in diameter at the face 2 and smaller in diameter at the line 6 whereas the wall section 5 provides a tapered conic wall section which is shorter in axial dimension and is of flatter slope with respect to the plane of the face 3 of the socket 1. This section 5 forms in effect a conic constriction within the bore for purposes hereinafter explained.

As will become apparent hereinafter, the socket 1 is adapted to receive the end of a reinforcing rod 7, the latter being shown extending axially within the bore of the socket 1. Rod-gripping jaw members 8 and 9, forming in effect a divided sleeve, are positioned within the bore of the socket 1, said jaw members being arranged in a circular series within the socket and adapted to surround and to contact the outer surface of a reinforcing rod such as 7. The jaw members 8 and 9 are thus provided with segmental inner surfaces 10, which jointly form a substantially cylindrical bore, through which the reinforcing rod 7 extends. Externally, each of the jaw members 8 and 9 is formed with a segmental surface 11 which jointly form a substantially outer cylindrical surface. The lower portion of each jaw member is formed externally with a tapered section 12 formed by the inwardly and downwardly inclined surfaces 13, said surfaces forming jointly a generally inverted conic surface as shown in Figs. 3 and 4. The jaw members 8 and 9 correspond in length generally to the axial dimension of the socket 1 between the faces 2 and 3 with the outer cylindrical wall portion 11 having substantially the same axial dimension as the axial extent of the conic section 4 of the socket 1 and with the lower tapered section 12 having substantially the same axial extent as that of the lower conic section 5 of the socket bore. It will be understood, however, that these dimensions are not critical and may be varied within limits as desired. It will be noted that while I have shown two jaw members 8 and 9, three or more such jaw members may be employed if desired and which are individually fashioned to provide jointly an inner generally cylindrical gripping surface to engage the reinforcing rod as shown and to provide jointly the external generally cylindrical surface formed by the surfaces 11, and the generally conic surface formed by the surfaces 13. The inner surface 10 may be knurled if desired as shown at 14 in Fig. 4.

I employ a circular series of wedge members 15 disposed within the bore of the socket member and between the outer surfaces 11 and 13 of the jaw members 8 and 9 and the inner surface of the bore as defined by the conic sections 4 and 5. The wedge members 15 are arranged in a circular series within the bore and form in effect a divided circular wedging sleeve. The wedge members 15 are each provided with a segmental inner surface 16 which jointly form a generally cylindrical

bore designed to contact the external cylindrical surface formed jointly by the surfaces 11 and jaws 8 and 9. The overall length of the wedge members 15 is somewhat greater than the axial extent of the socket 1, as shown in Figs. 3 and 4 and the inner surfaces 16 of the wedges extend the full length thereof as shown. The outer surface 17 of each wedge member 15 is inclined inwardly and towards the small end of the tapered bore of the socket and comprises two tapered sections 17*a* and 17*b*, the section 17*a* having a long and gradual slope conforming generally to the slope of section 4 of the bore, while the section 17*b* is shorter and has a slightly flatter slope similar to the tapered section 5 of the bore in the socket member. The relation of these surfaces and the inclinations thereof is shown in Figs. 3 and 4 wherein it will be noted that the surfaces 17*a* jointly form a long generally conic wedging section of slight slope corresponding to the inclination of the tapered wall of section 4 of the bore while the surfaces 17*b* jointly form a shorter generally conic wedging section of flatter slope. Initially the long upper conic wedging section 17*a* of the wedge members 15 substantially fills the radial space between the outer surfaces 11 of the jaws 8 and 9 of the tapered wall or conic section 4 of the socket as shown in Fig. 3. The advancing thin edges 18 of the lower conic section of the wedge members 15, in this position of the parts, lie partly within the annular conic space 19 defined by the inclined surface 5 of the bore and inclined surfaces 13 of the jaw members 8 and 9. As noted, the upper ends of the wedge members 15 extend appreciably above the upper face 2 of the socket. Although I have shown only two wedge members 15, it will be understood that three or more such members may be employed if desired so long as they are fashioned to provide jointly the outer circular wedging surfaces 17*a* and 17*b* and the inner generally cylindrical bore forming surfaces 16.

The socket 1, the rod-gripping jaws 8 and 9, and the wedge members 15 are all made of metal or similar material capable of withstanding the stresses incident to use, having in mind that the tension force which is applied to reinforcing rods may in some instances exceed 150,000 pounds per square inch.

In the use of my device, as a rod fastener to hold tension in prestressed reinforcing rods of concrete structures, reinforcing rods 7 are passed through holes or passages formed in concrete blocks or slabs such as shown at 20 in Figs. 3 and 4 and the socket 1 then passed over the protruding end of the rod and placed in contact with a flat face 21 thereof. The gripping jaws 8 and 9 and the wedging members 15 are then assembled within the bore of the socket 1 in the manner shown in Fig. 3, noting that the jaws 8 and 9 are supported on the face 21 of the concrete structure 20, as is also the socket 1. Tension is then developed in the rod 7 by any well-known device such as a tension jack (not shown), it being assumed, of course, that the opposite end of the rod 7 is properly anchored as by a tension jack or by one of the rod-fastening devices of the present invention. When the desired tension force has been developed in the rod 7, the wedging members 15 may be forcibly driven axially of the socket 1 towards the small end thereof. This may be done with a hammer operating upon the end portions of the wedge members 15 which extend above the upper surface 2 of the socket member as shown in Figs. 3 and 4. This action drives the wedge members into wedging contact with the inclined surfaces of the conic section 4 of the bore to force the jaw members 8 and 9 radially into gripping engagement with the outer surface of the rod 7. As the wedges 15 advance within the socket, the thin forward edges 18 thereof contact the flatter sloping surface of the conic section 5 of the bore with the result that the edges 18 of said wedge members are deformed or collapsed and bent inwardly as shown in Fig. 4. To facilitate this operation the wedges 15 may be provided with V-shaped notches in the thin edges 18 thereof as shown at 22 so that the advancing edges of the wedge members, operating between the opposed inclined surfaces 5 and 13, operate as axial wedges to move the jaws 8 and 9 axially in a direction opposite to the general axial movement of the wedges 15. This is an extremely important aspect of the present invention since it enables an operator not only to hold all of the tension stress applied to the rod by the conventional tension jacks (not shown), after the release thereof, but also to increase this tension slightly by the final rearward axial movement of the jaws as described.

It will be understood, of course, that once the rod fastener of the present invention has been applied to a reinforcing rod, and the tension jack released from such rod, the rod fastener remains in place so that the tension forces within the rod are transmitted to the concrete structure as compression forces due to the engagement of the socket member 1 with the supporting face 21 of the concrete structure.

Having thus described a preferred embodiment of my invention, it will be understood, by those skilled in the art, that various changes may be made in the size and proportion of parts as shown without departing from the spirit of the invention which is outlined more particularly in the appended claims.

Having thus described my invention, what I claim as new is:

1. A rod fastener for concrete reinforcing elements comprising a socket member having an inclined tapered bore extending therethrough from end to end, said socket member being adapted to receive a reinforcing rod within said bore, a plurality of rod-gripping jaw members disposed within said bore longitudinally thereof, said jaw members having inner surfaces adapted to grip a reinforcing rod within the socket member, each said jaw member also having an outer surface, said outer surfaces at the small end of the socket bore each being provided with a portion inclined inwardly towards the small end of the socket bore and jointly providing a generally conic terminal portion, a plurality of wedge members disposed in a circular series within the socket and surrounding the jaw members, each said wedge member having an inner surface which jointly define a generally cylindrical bore the inner surface of which is in contact with the outer surfaces of the jaw members and an inclined outer surface which jointly define a generally conic wedging surface engaging the inclined tapered wall of the bore in the socket member and acting to force the jaw members into gripping engagement with a reinforcing rod within the socket member when said wedge members are advanced axially towards the small end of the inclined tapered bore, said inclined tapered bore near the small end thereof being provided with a generally conic constriction disposed in opposition to the jointly formed, generally conic, terminal portion of the jaw members, the advancing ends of the wedge members bending inwardly into engagement with the inwardly inclined surface portions of the jaw members upon engagement with said conic constriction.

2. In a rod fastener including an inclined socket having tapered bore, a plurality of gripping jaws within the bore and wedge members having relatively thin leading edges and being radially interposed between the jaw members and a portion of the tapered bore in the socket and arranged to urge the jaws into gripping engagement with a rod passing centrally through said bore when the wedge members are moved within the bore towards the small end thereof, said jaw members each having an outer terminal surface portion inclined inwardly and towards the small end of the bore, and said bore having a conic constriction near the small end thereof with the surface of said conic constriction disposed in opposition to the inclined outer terminal portions surface of the jaws so that the advancing thin edges of the wedge members are de-

flected inwardly between and in contact with said inclined terminal surface portions of the jaws and the surface of the conic constriction, thereby to exert upon the jaws an axial force tending to move the jaw members towards the large end of the bore.

3. The structure described in claim 2 wherein the thin edges of the wedge members are notched to facilitate the deflection thereof by the conic constriction.

4. A rod fastener for prestressed concrete reinforcing elements comprising a socket member having an inclined tapered bore extending therethrough from end to end, a generally cylindrical divided locking sleeve within the bore in said socket, said sleeve having a central generally cylindrical longitudinal bore adapted to receive a rod passed through the socket, the outer wall of said sleeve near one end thereof being inclined inwardly to provide a tapered terminal surface portion on said sleeve, and a divided wedge member generally circular in cross section disposed in the bore of said socket and surrounding said divided sleeve, said wedge member having a thin leading edge and a generally conic outer surface, the outer, generally conic surface of said wedging sleeve and the inner tapered wall of the bore in the socket cooperating to force the locking sleeve radially inwardly to clamp said rod as said wedging sleeve is moved axially within the inclined tapered bore toward the small end thereof, the wall of the inclined bore near the small end thereof being provided with a generally conic constriction, the thin leading edge of the wedge member being adapted to bend inwardly into contact with the inclined terminal surface portion of said locking sleeve when said edge encounters said conic constriction to thereby exert an axial force on said locking sleeve tending to move the sleeve axially within the bore towards the large end thereof.

5. The structure claimed in claim 4 wherein the leading edge of the divided wedging member is provided with notches to facilitate deformation of the edge when the latter encounters the conic constriction within the bore.

6. The structure described in claim 4 wherein the divided locking sleeve comprises a circular series of rod-gripping jaws.

7. The structure described in claim 4 wherein the divided wedging member comprises a circular series of wedge members, the leading edge of each wedge member being provided with a notch to facilitate deformation of said edge upon contact with said conic constriction.

8. A rod fastener for prestressed concrete reinforcing elements comprising a socket member having a bore extending therethrough from end to end, said bore including diametrically opposed wall portions which are inclined inwardly from one end of the bore towards the other end thereof, wedge members operatively associated with each of said inclined wall portions, each such wedge member having an outer inclined wall surface in contact with the first-mentioned inclined wall portions of the bore and an inner wall surface positioned generally parallel to the axis of the bore, a jaw member interposed between each said wedge member and the axis of the bore and adapted to move radially to grip a rod passing through the socket, when the wedge members are moved axially within the bore towards said other end thereof, the inclined wall portions of the bore, near said other end thereof, each being provided with an inwardly inclined surface portion of flatter slope than is the remaining portion thereof of said inclined wall portion, the leading terminal portions of the wedge members being bendable inwardly upon contact with said inclined wall portions of flatter slope into wedging contact with terminal portions of the jaw members to move the jaw members axially towards the opposite end of the bore.

9. The structure described in claim 8 wherein the jaw members adjacent to the ends thereof that are positioned in said other end of the bore are provided with inwardly inclined terminal surface portions disposed in opposition to the inwardly inclined surface portions of flatter slope of the bore, the leading edges of the wedge members upon contact with said inwardly inclined surface portions of flatter slope, being directed inwardly into wedging contact with the inclined terminal portions of the jaw members, to move the latter in an axial direction towards the opposite end of the bore.

10. The structure described in claim 9 wherein the leading edges of said wedge members are notched to facilitate inward movement thereof upon contact with said inclined wall portions of flatter slope.

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