Oct. 30, 1962 J. R. FIELDS ET AL 3,060,639

PRESTRESSING APPARATUS

Filed Dec. 5, 1958 3 Sheets-Sheet 1

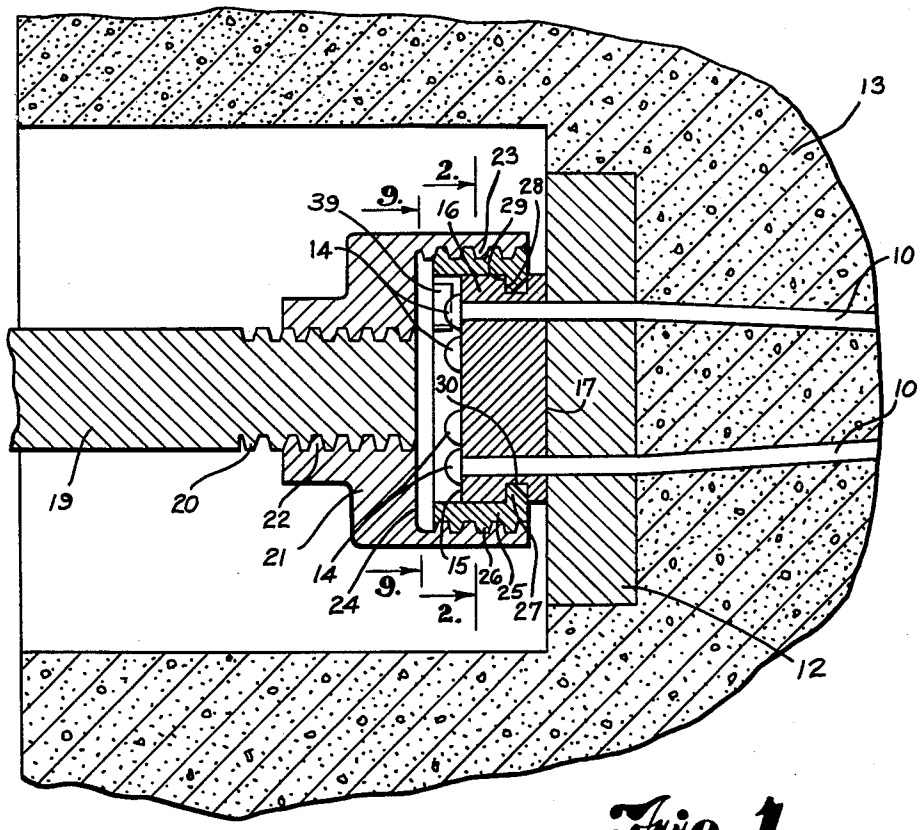


Fig. 1.

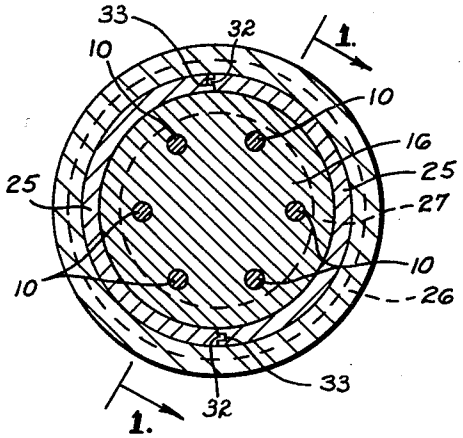


Fig. 2.

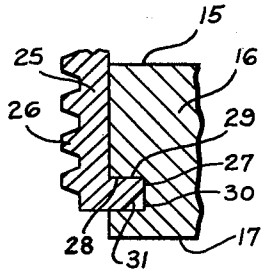


Fig. 7.

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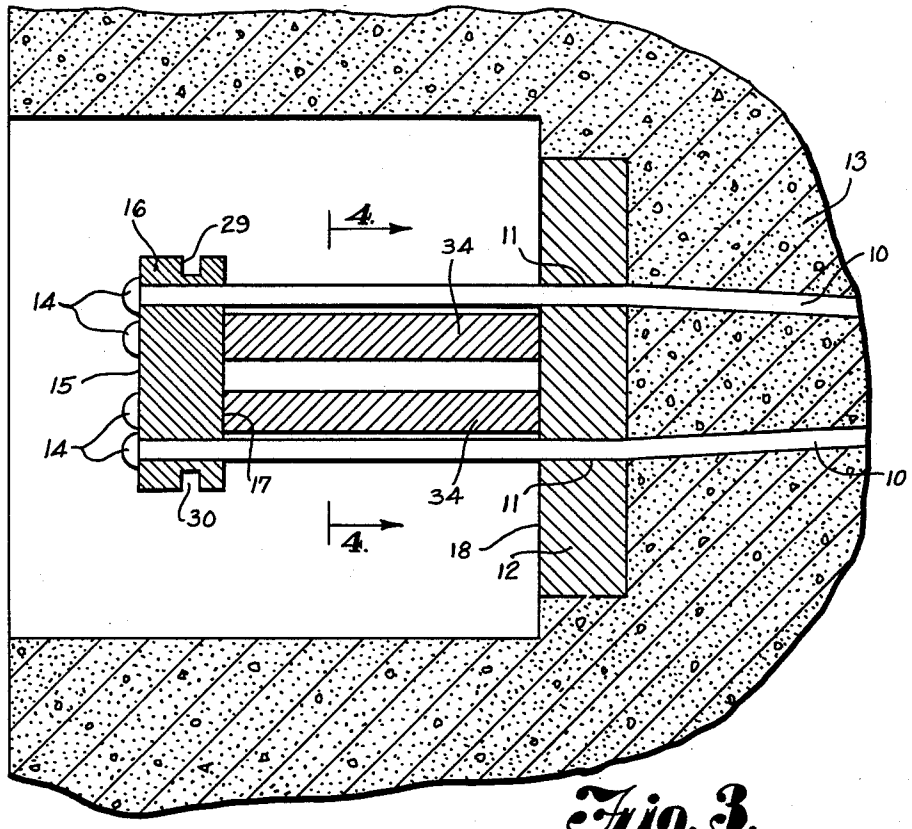


Fig. 3.

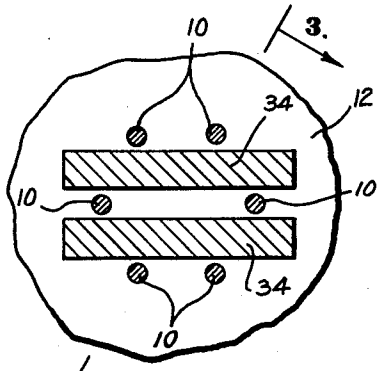


Fig. 4.

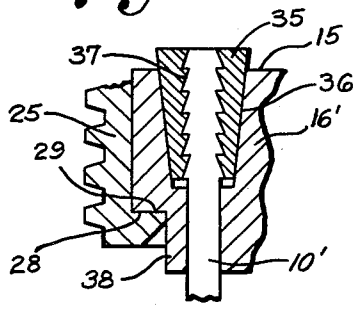


Fig. 8.

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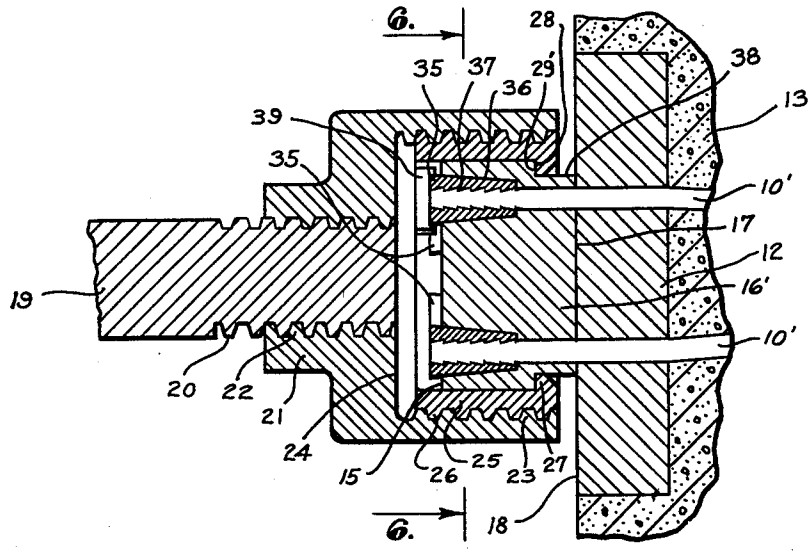


Fig. 5.

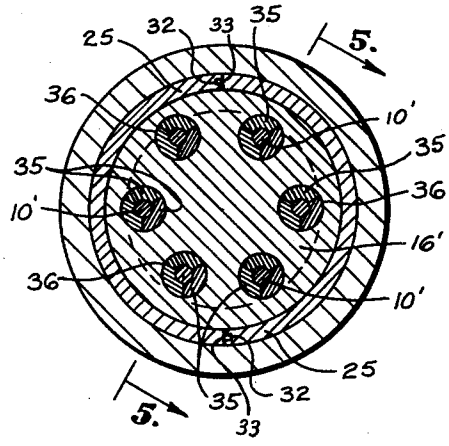


Fig. 6.

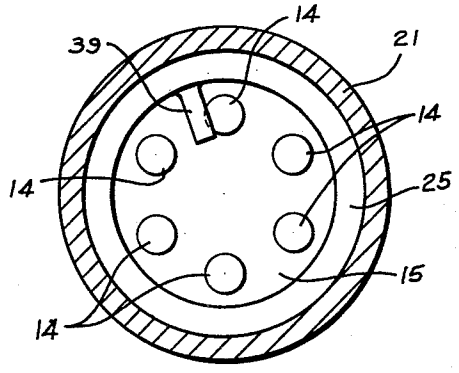


Fig. 9.

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3,060,639

Patented Oct. 30, 1962

3,060,639

PRESTRESSING APPARATUS

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Filed Dec. 5, 1958, Ser. No. 778,523
2 Claims. (Cl. 50—103)

Our invention relates to a prestressing method and apparatus, and more particularly to such a prestressing method and apparatus that is of such a character that the use of a threaded anchor member is eliminated.

In the prestressing methods at present used for post-tensioning the tension members in a concrete structure, the hydraulic jack or similar pulling means for tensioning the tension members is provided with an externally threaded member to which a coupling is applied that has screw-threaded means engaging said pulling member and which is screw-threadedly connected with an anchor member to which the ends of a plurality of tension members are secured. The provision of a screw-thread on the anchoring member, commonly referred to as a stressing washer, involves a machining operation that greatly increases the expense of such a stressing washer or anchoring member, and inasmuch as the stressing washer or anchoring member must be left in position in the concrete structure that is prestressed, the elimination of such screw-threads on the anchor member provides a considerable reduction in the cost of the anchoring member or stressing washer.

It is accordingly a purpose of our invention to utilize a method of prestressing a concrete structure in which the usual bearing plate or member is mounted in the concrete in the usual manner, the reinforcing members that are to be tensioned extending through openings therein, and to provide an anchor member, that is secured to the portions of the tension members extending outwardly beyond the bearing member or plate, that is detachably connected with a pulling member by means that is of such a character that the screw-threads that are necessary for connection with a coupling member are on a part that is separable from the anchor member after the pulling member has pulled the anchor member into such a position that the tension members connected therewith are stressed to the desired extent and after spacing members have been inserted between the anchor member or stressing washer and the bearing plate to maintain the tension members in their stressed condition.

More specifically our invention comprises the provision of a split ring-like member that is externally threaded for engagement with internal threads provided in an opening in the coupling member and which is interlocked with the anchor member or stressing washer in such a manner that the anchor member is held against movement relative to the split ring axially of the internally threaded opening away from the pulling member.

This is accomplished by providing inwardly projecting means on the split ring-like member providing a shoulder and a reduced portion on the anchor member or stressing washer that is also reduced to provide a shoulder thereon, so as to form a pair of shoulders on the split ring-like member and the anchor member that engage in such a manner as to prevent movement of the anchor member relative to the split ring-like member away from the pulling member during the pulling action exerted thereby. The reduced portion may be in the form of a groove or other reduction in the diameter of the anchor member or stressing washer so as to provide the shoulder thereon and the projection on the split ring-like member is preferably in the form of an inwardly projecting rib on the two portions of the split ring-like member providing an annular rib when the two portions of the split ring-like member are assembled in operative position.

By providing this improved method of stressing the tension members and improved apparatus for tensioning the same and holding the same in stressed condition, all threaded parts are removed from the anchor member or stressing washer upon completion of the stressing of the tension members and may be re-used for the next stressing operation, thus avoiding the costs involved in utilizing stressing washers or anchor members that are provided with suitable threads for connection with a pulling means and which must remain in the concrete structure after it has been prestressed.

Other objects and advantages of our invention will appear as the description of the drawings proceeds. We desire to have it understood, however, that we do not intend to limit ourselves to the particular details shown or described, except as defined in the claims.

In the drawings:

FIG. 1 is a longitudinal sectional view through the anchoring means for a plurality of tension members, showing a portion of the pulling means that is attached thereto and a fragmentary portion of the concrete structure that is to be prestressed, showing the parts in the position that the same have prior to stressing of the tension members, the section being taken on a plane corresponding to the line 1—1 of FIG. 2.

FIG. 2 is a section taken on the line 2—2 of FIG. 1.

FIG. 3 is a view similar to FIG. 1, showing the position of the parts after the prestressing of the tension members has been accomplished, the section being taken on a plane corresponding to the line 3—3 of FIG. 4.

FIG. 4 is a fragmentary section taken on the line 4—4 FIG. 3.

FIG. 5 is a view similar to FIG. 1 of a modification.

FIG. 6 is a section taken on the line 6—6 of FIG. 5.

FIG. 7 is a greatly enlarged fragmentary view of a portion of the structure shown in FIG. 1.

FIG. 8 is a similarly enlarged fragmentary view of a portion of the structure shown in FIG. 5, and

FIG. 9 is a section taken on the line 9—9 of FIG. 1.

Referring in detail to the drawings, in FIGS. 1 to 4 and FIG. 7, is shown a plurality of tension members **10**, which extend through openings **11** in a bearing plate **12** of steel, which is mounted in the concrete body portion **13** of the concrete structure that is to be prestressed. While a relatively small number of tension members **10** is shown in the drawings, obviously the number thereof may be varied as may be desirable, the number shown being merely for purposes of illustration. The tension members **10** are shown as being provided with heads **14** thereon that are seated against a flat face **15** of the anchor member or stressing washer **16**, the other flat face **17** of said anchor member **16** lying adjacent the flat outer face **18** of the bearing plate **12** when the parts are in the position shown in FIG. 1.

Prior to the pouring of the concrete body portion **13** the parts **10**, **12** and **16** are assembled in the position shown. When the concrete body portion **13** has set sufficiently for prestressing the same by means of the tension members **10**, the pulling member **19** of the tensioning apparatus, which ordinarily includes a hydraulic jack, is connected with the anchor member or stressing washer **16**. Said pulling member is ordinarily provided with a threaded portion **20** and a coupling member **21** is provided that has an internally threaded bore **22** that screw-threadedly engages with the external threads **20** on the pulling member **19**. In the embodiment of our invention shown in the drawings the coupling member **21** has a considerably larger opening than the threaded bore **22** therein, which is co-axial with the bore **22**, and which is provided with internal screw-threads **23** providing a shoulder **24** in said coupling member between the threaded bore **22** and the internally threaded opening **23**.

A split ring-like member **25** is provided with external threads **26** that engage the internally threaded portion **23** of the coupling member **21** and with an inwardly directed annular rib **27**, which provides a shoulder **28** thereon that engages with a shoulder **29** provided by means of an annular groove **30** in the anchor member or stressing washer **16**. It will be noted upon reference to FIG. 7 that the rib **27** is provided with an oblique face **31** to thus taper the same for more ready insertion into the groove **30**. The two halves of the split ring **25** are preferably held in assembled relation after placing in position on the anchor member **16** for engagement of the screw-threaded coupling member **21** therewith by means of pins **32** projecting from one end of each of the halves of the split ring **25** and entering snugly an opening **33** in the other end of each of the halves of the split ring **25**. Means is preferably provided for preventing relative rotation of the split ring **25** and the anchor member **16**, such as the lug **39** projecting inwardly from the inner face of one of the halves of said split ring **25**, between a pair of said heads **14**.

In the assembly of the parts shown in FIG. 1 the split ring-like member **25** is placed in position on the anchor member **16**, after which the coupling member **21** is screw-threadedly engaged therewith, said coupling member being either previously assembled with the pulling member **19** or then screw-threadedly engaged therewith. The hydraulic jack or other suitable means is then operated to move the pulling member **19** outwardly away from the bearing plate **12** to the position desired for applying the proper tension to the tension members **10**, such as the position shown in FIG. 3 of the drawings. The shims or spacing members **34** are then inserted in position between the tension members **10** and between the flat face **17** of the anchor member **16** and the flat face **18** of the bearing plate **12** so as to hold the anchor member **16** in the position to which it has been pulled and the tension members **10** under the desired tension. After this has been done the coupling **21** is disconnected from the pulling member **19** and from the split ring **25**, whereupon the split ring can be separated and removed from the anchor member **16**, the anchor member remaining in position in the structure as shown in FIG. 3. Thus all the screw-threaded members that are expensive to make are removed from the structure that remains in position on the structural member and can be re-used for the next stressing operation.

Instead of providing heads **14** on the tension members for holding the same assembled with the anchor member **16**, the tension members **10'** shown in FIG. 5 can be provided with wedging means **35**, which are mounted in suitable tapering openings **36** in the anchor member **16'**, as shown in FIGS. 5, 6 and 8, and said wedging means may be provided with serrations or other roughening thereon, such as the ratchet teeth **37**, in order to provide a suitable grip on the tension members **10'**. Also it will be noted that in FIGS. 5 and 6 the reduced portion of the anchor member **16'**, instead of being shown in the form of a groove, is shown merely as a reduced end portion **38** providing the shoulder **29'**, serving the same purpose as the shoulder **29** previously described, and cooperating with the shoulder **28** on the rib **27** in the same manner as previously described. As the ends of the tension members **10'** and portions of the wedges **35** project beyond the face **15** of the anchor member **16'** the lug **39** will engage between said projecting ends and wedges to prevent relative rotation of the anchor member **16'** and split ring **25**. The other parts of the form of the invention shown in FIGS. 5, 6 and 8 are the same as that shown in FIGS. 1 to 4 inclusive, and FIG. 7, and the same reference numerals are applied to the parts in FIGS. 5, 6 and 8 that correspond to the parts shown in FIGS. 1 to 4 inclusive, and FIG. 7. The operation of the apparatus shown in FIGS. 5, 6 and 8 in carrying out our improved method is the same as previously described in connection with the operation of the apparatus shown in FIGS. 1 to 4 inclusive, and FIG. 7.

What we claim is:

1. In tensioning means for reinforcing members, an externally screw-threaded pulling member, a coupling member having a small end and a large end, said small end having an internally screw-threaded bore receiving asid pulling member and having an internally threaded opening in said large end of greater diameter than and co-axial with said bore, a split ring-like member having external threads engaging said last mentioned internal threads, an anchor member, reinforcing members secured thereto, said ring-like member having a portion embracing said anchor member and a portion projecting axially beyond said anchor member, said anchor embracing portion of said ring-like member and said anchor member having interengaging shoulders thereon holding said anchor member against movement relative to said ring-like member away from said pulling member, said reinforcing members projecting beyond said anchor member toward said pulling member, and a lug on said split ring-like member engaging a projecting reinforcing member to hold said split ring-like member and said anchor member against relative rotation.

2. In tensioning means for reinforcing members, a disk-like anchor member having a side wall having a major portion convexly curved on the surface of a cylinder and a reduced portion convexly curved on the surface of a cylinder to provide an annular shoulder extending around said side wall and having flat surfaces extending over the opposed faces thereof from the center of said faces to said side wall, said disk-like member having a plurality of openings therethrough spaced from the axial center thereof adapted to receive said reinforcing members therethrough and an externally screw-threaded ring-like member split to provide a pair of semi-annular sections, said ring-like member being mounted in embracing relation to said anchor member with one end thereof projecting beyond said anchor member, said reinforcing members projecting beyond said anchor member into said projecting end of said ring-like member, each of said sections having a concavely cylindrically curved inner surface engaging said convexly curved surface of said major portion of said side wall of said anchor member, having an inwardly directed annular rib portion thereon engaging said shoulder, and means for preventing relative rotation of said ring-like member and said anchor member comprising an inwardly projecting stop lug on the projecting end of one of said sections engaging the projecting portion of a reinforcing member, each of said sections having an opening in one end face thereof and a pin in the other end face thereof snugly received in the opening of the other section to detachably hold said sections in assembled relation to form said ring-like member.

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