Aug. 18, 1970 W. F. KELLY 3,524,228

ANCHOR FOR POST-TENSIONING PRESTRESSED CONCRETE

Filed July 9, 1968

Fig. 1

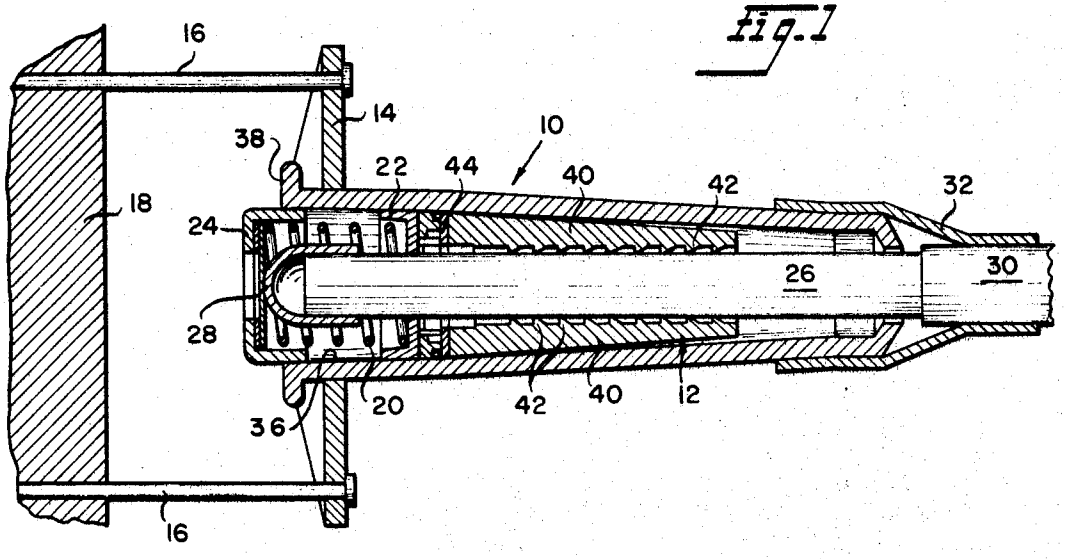


Fig. 2

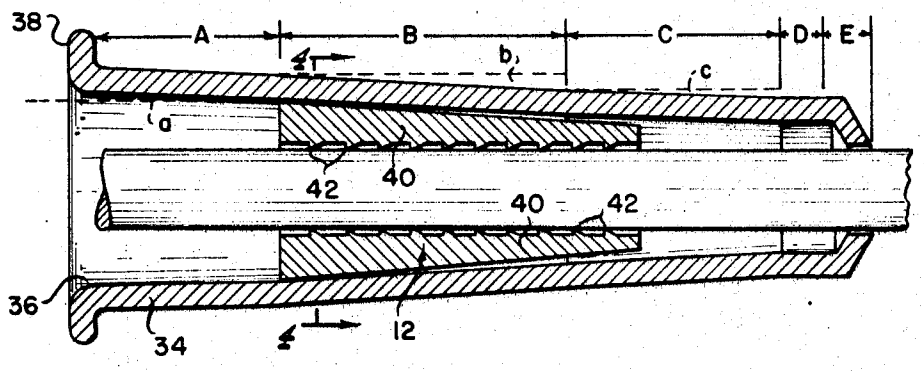


Fig. 3

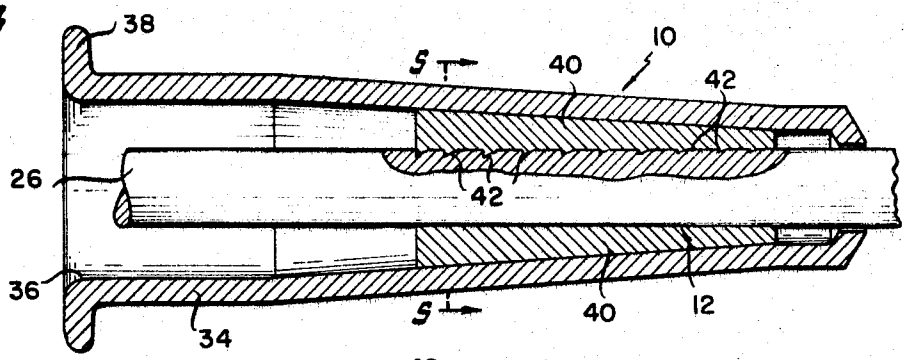


Fig. 4

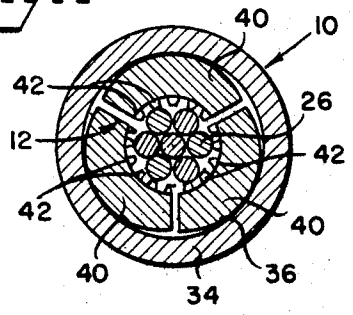
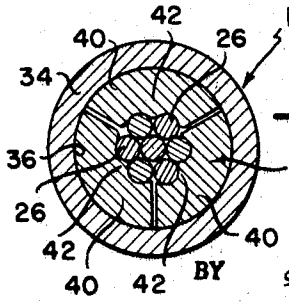


Fig. 5



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ANCHOR FOR POST-TENSIONING PRESTRESSED CONCRETE

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Continuation-in-part of application Ser. No. 490,421, Sept. 27, 1965. This application July 9, 1968, Ser. No. 743,406

Int. Cl. E04c 3/10; F16g 11/04

U.S. Cl. 24—126 4 Claims

ABSTRACT OF THE DISCLOSURE

An anchor for post-tensioning prestressed concrete including a case having a central bore through which a tendon passes, the internal wall of the case defining the central bore being tapered in a manner to form a compound angle with respect to the longitudinal axis of the case, a chuck comprising chuck segments positioned within, and movable longitudinally with respect to the case, the inner faces of the chuck segments being provided with a series of teeth engageable with the outer surface of the tendon which passes through the case and chuck, the chuck segments being made of a ductile material to effect conformation thereof to the inner wall of the case and tendon, and to distribute the forces exerted by the chuck segments on the tendon over the length thereof.

This invention is an anchor for post-tensioning prestressed concrete, and is a continuation-in-part of application Ser. No. 490,421, filed Sept. 27, 1965, now Pat. No. 3,399,434.

BACKGROUND AND OBJECTS

In the use of anchors for gripping and holding tendons or the like, difficulty is sometimes experienced due to the exertion of excessive point pressure by the tendon-engaging teeth of the chuck segments on the tendon strands, causing shearing of the tendon, with resultant failure of the anchor and/or tendon strands.

It is an object of this invention to provide a tendon-gripping anchor or the like, for post-tensioning prestressed concrete, the anchor including means for securely holding a tendon without exerting severing pressure on the strand at a point or points, but distributing the gripping forces gradually over the length or area of the tendon in contact with the holding chuck.

Another object is to provide a tendon-gripping anchor including a case having a non-uniformly tapered bore, in which is positioned a chuck comprising segments having teeth for grippingly engaging the tendon, the tendon being pressure molded to the chuck and the segments of the chuck being deformed to conform to the wall of the case and tendon.

A further object is to provide a tendon-gripping anchor of the character described, wherein the anchor case is provided with an axial bore through which the tendon passes, the inner wall of the case defining the axial bore being tapered at compound angles to the longitudinal axis of the bore through a substantial portion of the

case's length, with the angle of the taper being decreased at the small end of the bore to allow relief of the chuck on a graduated basis.

Other objects are to provide an anchor of the character described, wherein the angles of the case's and chuck's taper are small, to effect a locking together of the chuck, tendon and case to produce substantially a cold pressure weld between the three major parts, and prevent any accidental or unwanted release of the anchorage; to provide a cold-forming of the chuck against the case and tendon by the tremendous transverse pressure developed by the very low angle of the case and chuck taper, to provide an anchor wherein the deeper the chuck is pulled into the case, the greater is the distance of relief for the chuck, and to provide an anchor which aligns a tendon placed therein along the true axis of the case.

Additional objects will be obvious from a consideration of the following description of the presently preferred form of the present invention, taken in conjunction with the appended drawings.

DESCRIPTION OF FIGURES OF DRAWING

FIG. 1 is a longitudinal sectional view of the anchor of the present invention, illustrating its use;

FIG. 2 is a longitudinal sectional view of the case and chuck forming a part of the present invention, illustrating the chuck in inoperative position;

FIG. 3 is a view similar to FIG. 2, illustrating the chuck in operative position;

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 2, looking in the direction of the arrows, and

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 3, looking in the direction of the arrows.

DESCRIPTION OF FIGS. 1 TO 5

In FIG. 1, there is illustrated an anchor constructed in accordance with the present invention including a case **10** in which is positioned a chuck **12**. The case and chuck are shown in an arrangement such as set out in co-pending application Ser. No. 490,421, including a reaction plate **14** which is fixed to the outer periphery of case **10**, which reaction plate is secured by nails **16** to a form **18**. Additionally, chuck **12** is held within case **10** by means of a helical spring **20**, one terminal of which lies within a cup **22** and the opposite end thereof abuts a closure cap **24**, which is in frictional engagement with the inner walls of case **10** at the large end thereof. A tendon **26** extends through the anchor and a thimble-like finder **28** is placed over the extremity of the tendon to facilitate insertion into the anchor and to prevent the chuck from engaging the tendon until the tendon is completely inserted in the anchor. That portion of tendon **26** which extends beyond the anchor is covered by a jacket **30**, a sleeve **32** being placed over the terminal of the jacket and the adjacent terminal of the case **10** to prevent entry of concrete into the anchor.

Referring now to FIGS. 2 to 5, it will be seen that case **10** comprises an elongated cylindrical body **34** which is non-uniformally tapered from one end to the other, and having an axial bore **36** extending through body **34**, the cross-sectional area of which bore is decreased from one end of the body to the other. The large end of the body is provided with a flange **38**.

As indicated in FIGS. 2 and 3, that portion of body **34** adjacent flange **38** extends for a distance A forming an angle *a* with a line parallel to the longitudinal axis of case **10**. The angularity of body **34** is then increased through a distance designated B and forms an angle *b* with respect to a line drawn parallel to the longitudinal axis of case **10**.

The angularity of the taper of body **34** is changed again for a distance C, and forms an angle *c* with respect to a line drawn parallel to the longitudinal axis of the case.

The angularity of body **34** is once again altered for a distance D and terminates in an inwardly directed flange portion extending longitudinally for a distance E, the flange portion being angularly disposed at approximately a 60° angle to the body. In the drawing, there is illustrated an anchor adapted for a tendon of ½-inch diameter and the size and taper of the case and chuck are designed to obtain optimum results with that size tendon. Properly sized cases and chucks, with slight variations, may be employed with different sized tendons.

For use with jaw segments having a 4° angularity, optimum results are obtained when casing body is constructed having the following relationships:

EXAMPLE 1—⅜ INCH TENDON

A=1″	*a*=1°
B=2⅜″–2 7/16″	*b*=4½°
C=11/16″–⅝″	*c*=4°15′
D=⅛″	*d*=0°
E=3/16″	*e*=60°

EXAMPLE 2—½ INCH TENDON

A=1″	*a*=1°
B=2″	*b*=4°
C=1½″	*c*=3°30″
D=⅛″	*d*=0°
E=3/16″	*e*=60°

Case **10** is preferably of a die formed steel in which the contours above described can be accurately imparted thereto. Case **10** may be of various sizes to accommodate tendons of different diameters.

Chuck **12** includes a plurality of like, elongated, tapering chuck segments **40** which are transversely arcuate in cross section to nearly complement the contour of the inner wall of case **10** (see FIG. 4). Longitudinally, the tapered face is straight. However, upon exertion of pressure thereon by a tendon, the segments bend transversely and longitudinally to conform to the contour of the case.

The inner face of each segment **40** is provided with a series of individual, tendon-engaging teeth **42** extending through a substantial portion of the length of each segment. Segments **40** are held together at the large end by a suspension ring asembly **44** which also spaces the segments from each other evenly around the tendon, to effect uniform gripping engagement therewith.

The jaw segments are preferably of a cold forged ductile, surface-hardened steel, with the teeth having a brinnel hardness of approximately **58** and approximately 0.015 inch deep for the anchor size shown.

It will be noted from a comparison of FIGS. 4 and 5 that the radius of curvature of chuck segments **40** is less than that of the inner wall of case **10** defining the axial bore thereof. Upon exertion of tension on the chuck, segments **42** are deformed into contiguous engagement with the inner wall of the case.

OPERATION

In the use of the present invention, tendon **26** is inserted into the anchor in the manner illustrated in FIG. 1. At this time, chuck **12** lies adjacent that portion of case **10** extending through distance B and a portion of distance C. At this time, it will be noted that the smaller end of the chuck is spaced from the wall of case **10** and

that teeth **42** are in engagement with, but not gripping, tendon **26**.

Upon exertion of tension on tendon **26**, chuck **12** moves longitudinally through case **10** in the direction of the case taper to wedge the outer walls of the segments against the inner wall of the case, and forcing teeth **42** into gripping engagement with the tendon.

By virtue of the angularity of chuck segment **40** and the taper of that portion of the case through angle *b*, a wedging effect takes place. As the chuck segment continues to be drawn through the case, the angularity of the case is decreased as indicated by angle *c*. This allows relief of the leading portion of the chuck segments and, due to the ductile nature of the chuck segments, the latter are deformed in a direction away from the tendon, since relief is afforded by the decreased angularity indicated at angle *c* extending through distance C of the case.

Accordingly, instead of the forward teeth of the chuck segment exerting severing pressure on the tendon, this relief acts to distribute the force exerted by the teeth proportionately over the full holding portion of each of the chuck segment's length. It in effect makes a practical uniform force triangle for holding the tendon. In addition, the low angles of the case's and chuck segment's taper bring about the pressure molding of the tendon into the chuck, and the deformation of the chuck during the molding process to conform to the walls of the case and tendon, as shown to advantage in FIG. 5. This further effects a locking together of the chuck, the tendon and the case to the point of creating substantially a cold pressure weld between the three major parts which prevents any unwanted release of the anchorage. As a result of this welding effect, it has been found that a reverse pull of up to 80% of the force required to lock the parts together is necessary to release them again, with the tendon cut free. This cold forming of the chuck against the case and tendon is made possible by the tremendous transverse pressure developed by the very low angle of the chuck and the case, not exceeding 5°, plus the compounded reduction of the case taper.

While there has been herein shown and described the presently preferred form of the present invention, it is to be understood that such has been done for purposes of illustration only, and that various changes may be made therein within the scope of the claims hereto appended.

What I claim is:

1. An anchor for post-tensioning prestressed concrete comprising

(a) an elongated case having an axial bore,

(b) the inner wall of said case defining the axial bore being tapered from one end to the other, the angularity of the taper being altered at a point intermediate the length of the case to form a bore section at the larger end of the case and a first tapered bore section in an intermediate portion of said case, and

(c) a chuck of ductile material positioned within the axial bore of said case, said chuck including,

(d) a plurality of chuck segments,

(e) each of said chuck segments being transversely arcuate,

(f) each chuck segment being tapered longitudinally for engagement with the tapering inner wall of said case,

(g) the inner face of each chuck segment being provided with rows of tendon-engaging teeth,

(h) said chuck further including means for holding said chuck segments together,

(i) the angularity of the taper of the inner wall of said case being altered a second time thereby forming a second tapered bore section adjacent the narrow end of said case,

(j) the angularity of said second tapered bore section produced by the second alteration is less than the taper of said first tapered bore section to offer relief

to the forward portions of said chuck segments under tension.

2. The anchor of claim 1, with the addition of

(a) an inwardly directed flange extending angularly from the smaller end of the case for aligning a tendon inserted therein.

3. The anchor of claim 1 wherein

(a) the inner wall taper of the case with respect to a line drawn parallel to the longitudinal axis of the case does not exceed 5°.

4. The anchor of claim 1 wherein

the chuck is located between the first and second tapered bore sections when the chuck is under tension.

References Cited

UNITED STATES PATENTS

1,601,255	9/1926	Marra.	
2,209,933	7/1940	Rogoff	24—126
2,222,493	11/1940	Barlow	24—126
2,834,081	5/1958	Stump	24—126

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