

Dec. 6, 1960

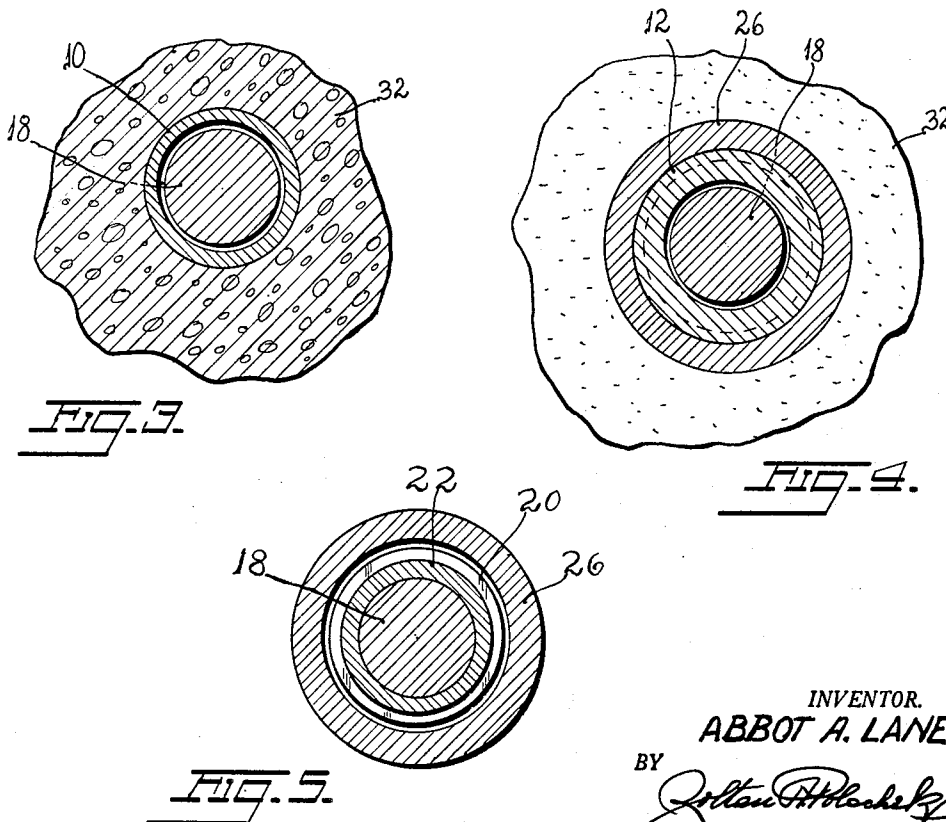
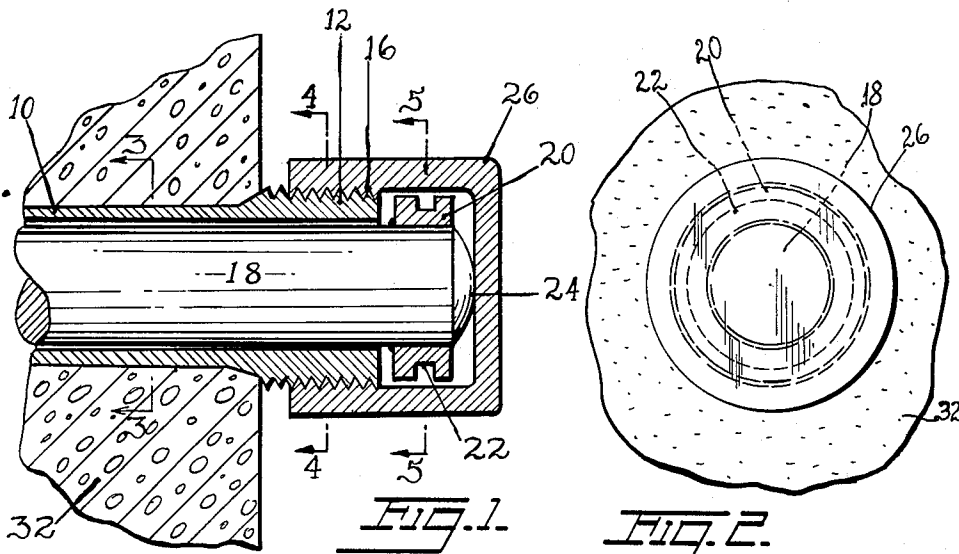
A. A. LANE

2,963,273

ROD ASSEMBLY FOR PRESTRESSED CONCRETE

Filed Nov. 21, 1957

2 Sheets-Sheet 1



INVENTOR.
ABBOT A. LANE
BY *John P. Blackley*
ATTORNEY

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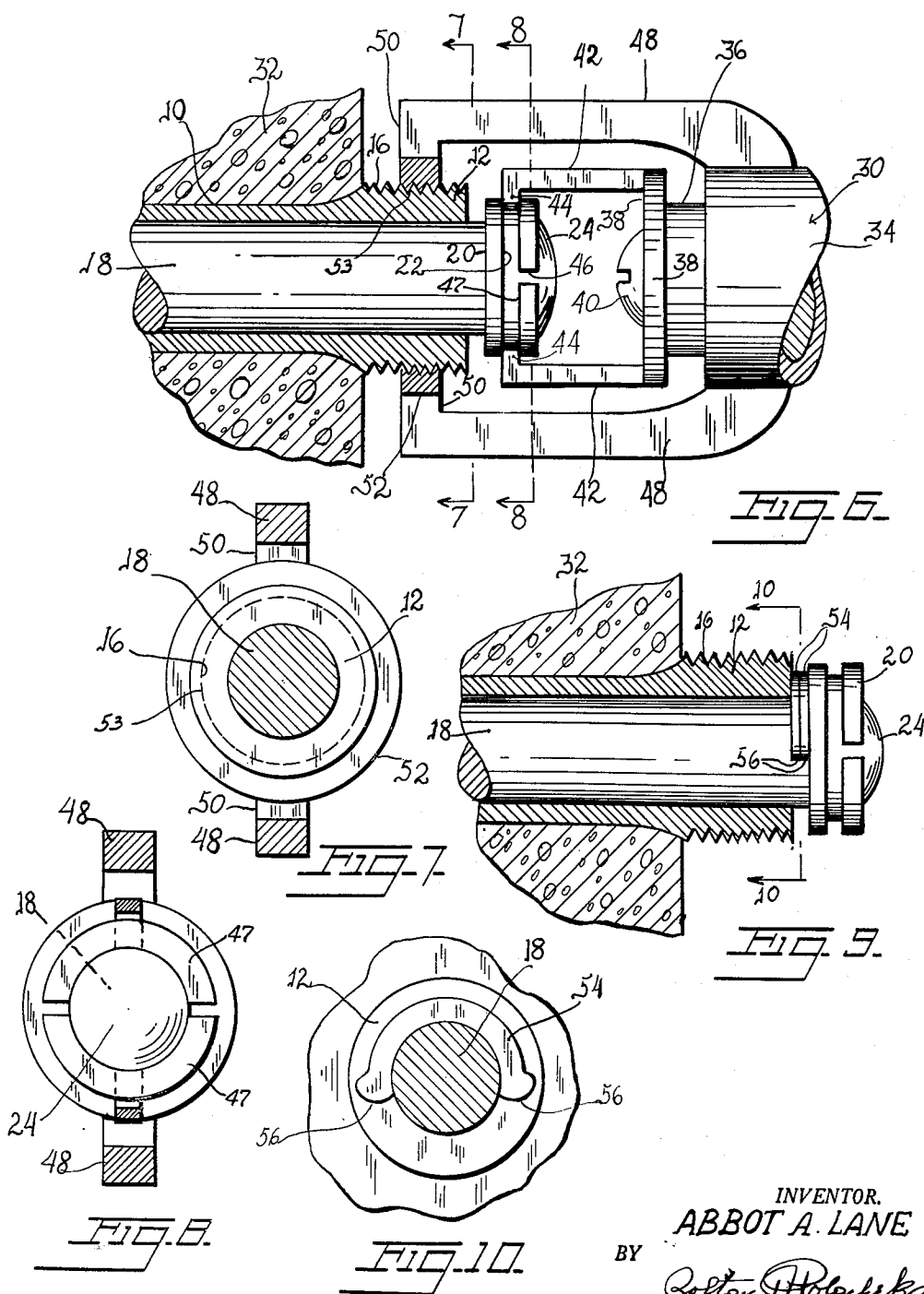
A. A. LANE

2,963,273

ROD ASSEMBLY FOR PRESTRESSED CONCRETE

Filed Nov. 21, 1957

2 Sheets-Sheet 2



INVENTOR.
ABBOT A. LANE
BY *Golden H. Polach*
ATTORNEY

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2,963,273

ROD ASSEMBLY FOR PRESTRESSED CONCRETE

Abbot A. Lane, Montclair, N.J. (9 Ethan Allen Drive, Flagg Hill Estates, West Acton, Mass.)

Filed Nov. 21, 1957, Ser. No. 697,884

1 Claim. (Cl. 254—29)

This invention relates to prestressed concrete, and more particularly has reference to an improved rod assembly for producing the desired prestressing action.

In accordance with the invention, a rod is extended through a length of tubing, and the tubing is stressed in tension by compression of the rod, with concrete then being poured and bonded to the tubing while the same is in a stressed condition. The stress in the tubing is then transferred from the rod to the concrete. The rod is then stressed in tension with the tubing being used as an anchor. By inserting spacers between the rod end and the tubing the tension in the rod is maintained for stressing the concrete. A hydraulic jack, screw jack, or equivalent means can be used to produce this tension in the rod.

The invention has as a main object the provision of a stressed rod for reinforced concrete which will not require an outside anchor for stressing the rod and which will provide a method of installing a stressed rod in the forms into which the concrete is to be poured, by means of which method the rod is bonded immediately with the concrete when the concrete is poured. By reason of this arrangement, there is no necessity for any outside anchor, and the same total stress can be obtained in the final assembly as could be obtained with a rod of a diameter equal to the diameter of the outside of the tubing. As distinguished from arrangements heretofore followed, there is no necessity of providing protection for the rod while the concrete is being poured and thereafter attempting to obtain a bond between the concrete and the rod by injecting grout around the stressed rod after the concrete has set.

Heretofore, the common methods used to install prestressed reinforcing rods have been two in number. One method has involved the installation of a reinforcing rod with a tube of some kind about the same to prevent a bond when the concrete is poured. After the concrete has set, the rod is stressed and grouted to the concrete by injecting grout. A second method has involved the use of tension wires about a center rod or rods with some protection about the center rod or rods to prevent bonding. After setting of the concrete, the wires are cut from the rod and the rod may be removed and the hole filled. Alternatively, the rod may be left in place in which event it discharges no function.

Another object is to provide a reinforcing rod for prestressed concrete that will be capable of installation at a substantially lower cost, and by a substantially more simplified method, than has been heretofore true of rods used for the same purpose.

Another object is to provide an improved method of prestressing concrete, that will effect the prestressing action swiftly and easily, and with full accuracy.

Still another object is to provide a prestressed concrete reinforcing rod, which will be adapted to be swiftly locked in place in the final installation.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings,

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and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

5 Fig. 1 is a sectional view through a concrete structure showing a fragmentary portion of said structure and illustrating, in longitudinal section, reinforcing means according to the present invention, at one stage of the operation.

10 Fig. 2 is an elevational view of the reinforcing means as seen from the right of Fig. 1.

Fig. 3 is a transverse sectional view on line 3—3 of Fig. 1.

15 Fig. 4 is a transverse sectional view on line 4—4 of Fig. 1.

Fig. 5 is a transverse sectional view on line 5—5 of Fig. 1.

Fig. 6 is a longitudinal sectional view showing a later stage of the operation.

20 Fig. 7 is a transverse sectional view on line 7—7 of Fig. 6.

Fig. 8 is a transverse sectional view on line 8—8 of Fig. 6.

25 Fig. 9 is a view like Fig. 6 showing a final stage of the operation.

Fig. 10 is a transverse section on line 10—10 of Fig. 9.

30 Referring to the drawings in detail, designated at 10 is an elongated, straight length of tubing. The tubing 10, at its ends 12, is upset or enlarged and is provided with threads 16.

35 A rod 18 is extended through the tubing 10, and at its ends projects beyond the corresponding ends of the tubing. Formed on rod 18 is a collar 20, having a continuous circumferential groove 22, said collar being disposed adjacent a rounded protrusion 24 of the rod end. Collar 20 could be welded, riveted, or otherwise fixedly secured in place and in the illustrated example is connected to rod 18 by a weld.

40 In practicing the invention, the tubing 10, as previously noted, is upset at its ends to increase its strength for attachments, the attachments constituting cup-shaped caps 26 (only one of these is shown) for the ends of the tubing, each cap having internal threads engageable with the threads of the tubing.

45 At the time the rod assembly is being fabricated in a manufacturing plant, the tubing and the rod 18 may be assembled, and the tubing may be stressed and the rod compressed. In other words, in the fabricating plant, the rod 18 is extended through the tubing 10. Then, 50 caps 26 are screwed onto the ends of the tubing. The caps 26 engage the rounded protrusions 24, when threaded onto the tubing to the extent shown in Fig. 1. Further rotation of the caps on the threaded ends 16 of the tubing will cause the rod to be axially compressed, that is, 55 the opposite extremities of the rod are forced toward each other on a line extending axially of the rod. At the same time, the tubing 10 is subjected to tension, that is, the tubing is in effect stretched in an axial direction with the ends 16 thereof being pulled away from each other. All this results from threading of the caps 26 in a direction toward each other, that is, in a direction axially inwardly of the ends of the tubing.

60 The tension can, of course, be predetermined by the clearance between the collar 20 and the adjacent end of the tubing.

65 The tensioning of the tubing and the compression of the rod can be effected in the fabricating plant. The inside diameter of the tubing must be sufficiently greater than the outside diameter of the rod 18 to allow for the slight but definite increase in the diameter of the rod resulting from axial compression of the rod, and for the slight but equally definite decrease in the diameter of the

tubing responsive to the axial tensioning or stretching of the tubing.

With the reinforcing rod assembly prepared in this manner, the assembly is installed in the forms, or if desired the assembly could be installed and wired in place and then stressed. In any event, following installation of the rod assembly, concrete is poured into the form and will bond to the tubing while in a stressed condition.

After the concrete has set, the stress of the tubing is transferred from the rod to the concrete by removing cap 26. Now, and referring to Fig. 6, by means of a hydraulic or mechanical jack 30, which is applied after the concrete 32 has set, the rod 18 is put under desired tension by reaction on the end of the rod 18 and on the end of the tubing 10.

Thus, jack 30 includes a cylinder 34, in which works a piston 36 to which a head 38 is connectable by bolt 40. Projecting from head 38 are arms 42 located in diametrically opposite positions on the head and terminating at their distal ends in confronting, radially inwardly projecting fingers 44. Fingers 44 engage in groove 22, and can be entered through notches 46 located diametrically opposite one another in the collar 20 in communication with groove 22.

In other words, the fingers 44 would be registered with the notches 46 so that they can be moved through the notches 46 into the groove 22, after which the head 38 and piston 36 are rotated through perhaps 90° to offset the fingers 44 from the notches 46 circumferentially of collar 20. Fingers 44 will now engage in back of the shoulder 47 defined by one wall of groove 22.

Cylinder 34 of the jack is provided with diametrically opposed arms 48 rigid with the cylinder and having radially inwardly projecting portions 50 at their outer ends integral with a continuous ring or collar 52 internally threaded at 53 to engage threaded end 16 of tubing 10.

By reason of this arrangement, with ring 52 threaded onto threaded end portion 16 of tubing 10, the tubing becomes an anchor used during axial tension of the rod, thus eliminating outside anchors and producing the anchor directly in the reinforcing rod assembly itself. In other words, cylinder 34 is anchored to the tubing by threaded engagement of ring 52 with the tubing. Then, the piston 36, by reason of hydraulic pressure exerted thereagainst within the cylinder, is retracted within the cylinder 34, that is, shifted in a direction toward the right in Fig. 6.

This subjects the rod 18 to tension in an axial direction.

When the desired stress has been developed, spacers 54 (Figs. 9 and 10) are inserted between the end of the tubing and the collar 20 of rod 18. The spacers can be any of various types and, for example, may be of C shape, with each spacer extending through slightly more than 180°, the ends 56 of each spacer being resiliently spreadable to permit the spacer to be applied to the rod 18.

A hydraulic jack is shown but a mechanical jack could be used and applied equally well for stressing rod in tension.

The result is that the tension of the rod is added to the initial tension of the tubing, and the resultant stress on the concrete is approximately the same as could be obtained on a solid rod of a diameter equal to the outer diameter of the tubing. However, said final result is obtained at far less cost and time than would be involved if solid rods were used.

Any spaces occurring between the rod and tubing would preferably be filled with a lubricating rust preventive substance.

It will be understood that the clearance between the rod and the tubing must be such as will allow the rod to increase in diameter due to compression stress while the tubing decreases in diameter due to tensile stress. The clearance must be enough to prevent binding.

While I have illustrated and described the preferred embodiment of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claim.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

Means for tensioning a rod assembly in concrete wherein said assembly includes a tube having an enlarged externally threaded end and a rod axially disposed in said tube and having one end extending axially therefrom, said end of the rod having a circumferentially disposed groove with diametrically spaced notches opening into said groove, comprising a mechanism including a rotatable cylinder, opposed arms extending from said cylinder, said arms terminating in an internally threaded collar adapted to mesh with said threaded end of the tube, a piston opposed arms, a head secured to an end of the piston, spaced arms on said head, said arms having flanged terminals adapted to interlock within said groove, whereby said tube may be initially stretched by rotation of said cylinder to move said opposed arms toward the cylinder while the rod reacts against the spaced arms on said head, the rod being then stretched by movement of said piston outwardly of the cylinder.

References Cited in the file of this patent

UNITED STATES PATENTS

2,303,394	Schorer	Dec. 1, 1942
2,328,033	Schorer	Aug. 31, 1943
2,378,584	Schorer	June 19, 1945
2,453,079	Rossmann	Nov. 2, 1948
2,677,956	Schorer	May 11, 1954
2,761,649	Woolock	Sept. 4, 1956
2,804,674	Long	Sept. 3, 1957

FOREIGN PATENTS

642,589	Great Britain	of 1950
694,596	Great Britain	of 1953