

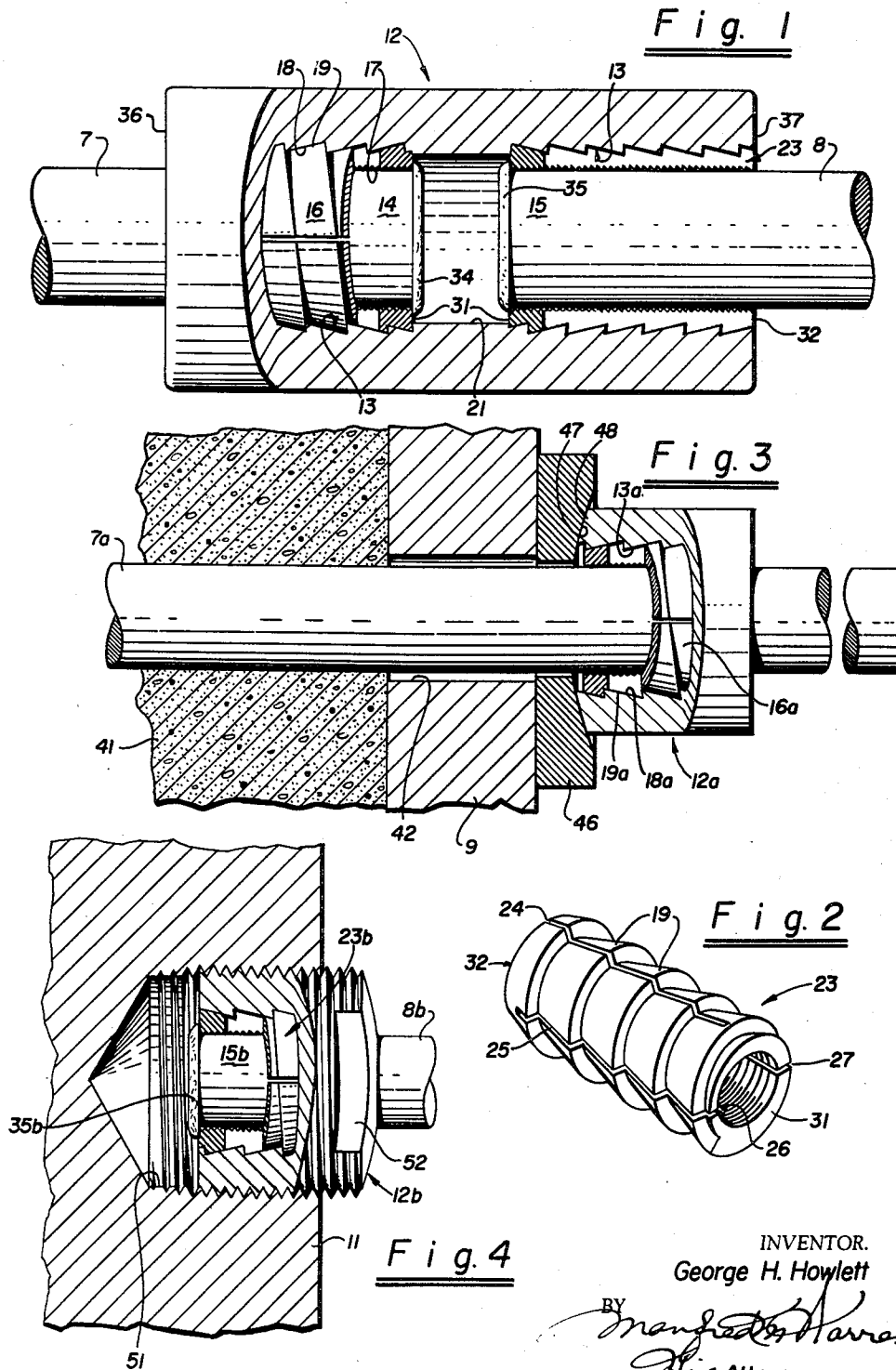
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STEEL BAR CONNECTOR FOR REINFORCING AND STRESSING CONCRETE

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STEEL BAR CONNECTOR FOR REINFORCING AND STRESSING CONCRETE

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6 Claims. (Cl. 287-114)

The invention relates generally to the art of structural fasteners and more particularly to devices designed to anchor or join together steel rods or bars employed in reinforcing and stressing concrete.

As will be understood, bars used for present purposes are subjected to very large tensional forces approaching the limit strength of the bars, and it is accordingly an object of the present invention to provide a connector of the character described which will firmly and positively hold and anchor steel bars drawn to the tensile strains described without requiring the bar to be threaded or otherwise deformed to provide an interlocking anchorage.

Another object of the present invention is to provide a steel bar connector of the character above which is composed of a minimum number of sturdily formed parts which can be expected to give long and trouble-free service and which are designed for relatively low-cost production and for easy and ready installation in the field.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawing (one sheet):

Figure 1 is a side elevation of a steel bar connector constructed in accordance with the present invention and cut away in part to better show the interior construction in cross-section.

Figure 2 is a perspective view of one of the connector parts.

Figure 3 is a cross-sectional view shown partly in elevation of a modified form of the connector.

Figure 4 is a cross-sectional view, shown partly in elevation, of a further modified form of the connector.

The connector of the present invention has several forms of application in the reinforcing and stressing of concrete as illustrated in the accompanying drawing. For example it may be used, as illustrated in Figure 1, for the joining together of end-to-end extending bars 7 and 8, or for the anchoring of one bar 7a as illustrated in Figure 3, to a concrete stressing plate 9, or the fastening of one end of bar 8b to an anchor piece 11, as illustrated in Figure 4. In each case the connector consists, briefly, of a housing 12 having an interior bore 13 for receipt of an end 14 of a bar to be connected, a plurality of annular segments 16 dimensioned to fit around the bar end 14 in bore 13 and being formed with inner surfaces 17 adapted for compressively engaging and gripping the periphery of the bar, and a plurality of longitudinally spaced annular inclined and interfitting cam planes 18 and 19 formed on the internal wall 21 of the bore 13 and the external walls of the segments 16 and set to translate the pull of the bar in an axial direction out of the bore into radially internal gripping forces of the segments

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on the bar periphery. Preferably the inner surfaces 17 of the segments 16 are formed with teeth as illustrated in Figure 1, adapted for biting into and gripping of the bar periphery.

5 Preferably the several segments 16 are made and unitarily held together as a sleeve-like member 23, as shown in Figure 2 of the drawing, and which is formed with a plurality of circumferentially spaced axially extending slits 24, 25, 26, and 27 dividing the member into a plurality of individually radially articulated annular segments. 10 As here shown, two of the slits, 25 and 27, open to and extend from the inserted end 31 of the sleeve member but are stopped just short of the outer end 32 of the sleeve member so as to leave a solid connecting portion. 15 In a similar fashion, slits 24 and 26 extend from the outer end 32 of the sleeve member to adjacent the inserted end 31 of the member. The several segments are thus unitarily hung together but permitted individual movement circumferentially and radially of the sleeve member so as to individually accommodate to and grip the bar periphery. 20

As an important feature of the present invention, the interfitting cam planes 18-19 are set at an angle of less than forty-five degrees to the axis of the bore, whereby the radial compressive gripping forces applied to the segments 16 will be greater than the axial pull of the bar. 25 Preferably this angle is considerably less than forty-five degrees and in the neighborhood of twenty to thirty degrees. An angle of about twenty-two degrees should be satisfactory for all operating conditions and is suggested. At this angle tests have demonstrated the sure holding capacity of the present connector under pulling forces stressing bars in excess of 150,000 pounds per square inch, and in testing ultimate strength, the bars have in each case broken outside of the connector, demonstrating 30 that the connector of the present invention does not weaken the bars at any place over the area of connection.

As a feature of the present construction, the inclined and interfitting cam planes 18-19 may be conveniently formed as interfitting spiral threads. This construction is convenient in manufacture and also affords a convenient 35 threading of the sleeve member into and out of the bore. In order to set the wedge action of these interfitting cam planes 18-19, a shoulder or collar 34 may be attached to the inner end of bar 7 so as to engage the end face of the inserted end 31 of the sleeve member as the pull of the bar is applied to the housing. Of course on setting of the wedge action of the cam faces 18-19, the total load is carried by the inner surfaces 17 of the gripping segments. 40

In the form of the invention illustrated in Figure 1, the housing 12 is of tubular form with the bore 13 extending axially therethrough for receipt of adjacent ends 14 and 15 of bars 7 and 8, which are extended into bore 13 from opposite ends 36 and 37 of the housing. In this case a pair of sleeve-like members 23 are inserted into bore 13 from the opposite ends 36 and 37 of the housing so that the inclined and interfitting cam planes 18-19 formed on the internal wall 21 of the bore and the external walls of the two sleeve members 23 are set to translate the pull of the two bars 7-8 away from each other in an axial direction out of the bore 13 into radial gripping forces of the segments of the two sleeve members. In this case it is required that housing 12 is designed to provide a tensile strength at least equal to that 45 of the bars 7-8 so that these bars may be drawn in tension without failure of the housing. In this case the shaft 8 is provided with an end piece 35 for setting the wedge action of the inclined cam planes in the same manner as end piece 34 on the inner end of shaft 7. As will be observed, the construction of housing 12 and the two sleeve members 23 and the shafts 7-8 are all sym- 50

metrical to a transverse central plane through the housing 12, with the parts on one side of the plane being identical in structure and function to the parts on the other side of the plane.

As will be understood, the bars 7-8 may be round or square or of other peripheral form, it being required only that the inner surfaces 17 of the gripping segments be fashioned to conform to the peripheral shape of the bars for full area of contact.

As above noted, the connector as depicted in Figure 3 of the drawing has been designed for use with an anchor or stress plate 9 formed for engagement with and for stressing a concrete mass illustrated at 41. Anchor piece 9 is formed with an opening 42 therethrough and the housing 12a is positioned in abutment against plate 9 with the internal bore 13a of the housing in registration with opening 42 for receipt and extension through the opening and bore of bar 7a. The connector in this form of the invention corresponds in structure and function to one-half of the connector illustrated in Figure 1, being the left-hand half as seen in the drawings, so that the annular inclined and interfitting cam planes 18a and 19a formed on the internal wall of the bore and the external walls of the segments 16a will translate the pull of bar 7a in an axial direction towards plate 9 into radially internal gripping forces of the segments 16a on the bar periphery. Preferably and as a feature of the present construction, a washer 46 is mounted between housing 12a and plate 9, and the washer and housing are formed with interinteresting concavo-convex faces 47 and 48, providing a universal swivel connection therebetween. With such an arrangement opening 42 is preferably made of size to permit accurate self-alignment of the bar 7a. In all other respects the connector of this form of the invention is composed of identical parts as the first described embodiment.

As above noted, the connector as depicted in Figure 4 of the drawing is designed for connection of a bar 8b to an anchor member 11 in an arrangement wherein the bar 8b cannot be extended completely through the anchor member and fastened on the back side, as illustrated in Figure 3. In such case the anchor member 11 is provided with a threaded opening 51 which may, if desired, be formed in the field, and housing 12b of the connector is formed as an exteriorly threaded nut which may be threaded into opening 51. One or more flats 52 may be formed on the nut 12b for engagement by a wrench or the like. Otherwise this form of the connector corresponds to one-half of the connector illustrated in Figure 1, being the right-hand half as seen in the drawings. To apply this form of the connector, the opening 51 is first drilled and tapped in the anchor member 11. Nut 12b may be threaded into the opening as illustrated in Figure 4 and one end 15b of bar 8b inserted. The sleeve member 23b may then be threaded into the internal bore of the nut and the wedge action of the interfitting cam planes formed on the internal wall of the bore and the external walls of the segments is set by end piece 35b on the shaft.

I claim:

1. A connector for steel bars for reinforcing and stressing concrete comprising, a housing having an interior bore for receipt of an end of a bar to be connected, a plurality of annular segments dimensioned to fit around said bar and in said bore and having inner bar engaging surfaces formed with teeth adapted for biting into and compressively engaging and gripping the periphery of said bar, and a plurality of longitudinally spaced annular inclined and interfitting cam planes formed on the internal wall of said bore and the external walls of said segments, said planes diverging away from the direction of pull out of said bar from said bore and being set at less than 45° to axis of said bore so as to translate the axial pull of said bar in an axial direction out of said bore into radially internal gripping forces of said segments on said bar periphery.

2. A connector for steel bars for reinforcing and stress-

ing concrete comprising, a housing having an interior bore for receipt of an end of a bar to be connected, a sleeve-like member dimensioned to fit around said bar and in said bore and being formed with a plurality of circumferentially spaced axially extending slits dividing said member into a plurality of individually radially articulated annular segments having inner surfaces formed with teeth adapted for biting into and compressively engaging and gripping the periphery of said bar, and a plurality of longitudinally spaced annular inclined and interfitting cam planes formed on the internal wall of said bore and the external walls of said segments, said planes diverging away from the direction of pull out of said bar from said bore and being set at an angle of less than forty-five degrees to the axis of said bore so as to translate the pull of said bar in an axial direction out of said bore into somewhat greater radially internal gripping forces of said segments on said bar periphery.

3. A connector for steel bars for reinforcing and stressing concrete comprising, a housing having an interior bore for receipt of an end of a bar to be connected, a sleeve-like member dimensioned to fit around said bar in said bore and being formed with a plurality of circumferentially spaced axially extending slits dividing said member into a plurality of individually radially articulated annular segments having inner surfaces formed with teeth adapted for biting into and compressively engaging and gripping the periphery of said bar, the internal wall of said bore and the external walls of said segments being formed with interfitting spiral threads for threading said sleeve member into and out of said bore and defining a plurality of longitudinally spaced annular inclined and interfitting cam planes diverging away from the direction of pull out of said bar from said bore and being set at an angle of less than forty-five degrees to the axis of said bore so as to translate the pull of said bar in an axial direction out of said bore into somewhat greater radially internal gripping forces of said segments on said bar periphery.

4. A connector for steel bars for reinforcing and stressing concrete comprising, a tubular housing having a bore extending axially therethrough for receipt of adjacent ends of aligned bars to be connected, a pair of sleeve-like members dimensioned to fit around said bar ends in said bore and formed with a plurality of circumferentially spaced axially extending segment defining slits, the inner bar engaging surfaces of said segments being formed with teeth adapted for biting into and compressively engaging and gripping the peripheries of said bar ends, the internal wall of said bore and the external walls of said segments being formed with interfitting spiral threads for threading said sleeve members into and out of said bore and defining a plurality of longitudinally spaced annular inclined cam planes, said planes diverging away from the direction of pull out of said bar from said bore and being set at an angle of less than forty-five degrees to the axis of said bore so as to translate the pull of said bars away from each other in an axial direction out of said bore into somewhat greater radially internal gripping forces of said segments on said bar end peripheries, said housing being designed to provide a tensile strength at least equal to said bars.

5. A connector for steel bars for reinforcing and stressing concrete comprising an anchor plate having an opening therethrough, a tubular housing having a bore extending axially therethrough and adapted for abutment against said plate with said bore in registration with said opening for receipt and extension through said opening and bore of a bar to be connected, a washer mounted between said housing and plate, said washer and housing being formed with interinteresting concavo-convex faces providing a universal swivel connection there between, a sleeve-like member dimensioned to fit around said bar ends in said bore and formed with a plurality of circumferentially spaced axially extending segment defining slits,

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the inner bar engaging surfaces of said segments being formed with teeth adapted for biting into and compressively engaging and gripping the periphery of said bar, the internal wall of said bore and the external walls of said segments being formed with interfitting spiral threads for threading said sleeve member into and out of said bore and defining a plurality of longitudinally spaced annular inclined cam planes, said planes diverging away from the direction of pull out of said bar from said bore and being set at an angle of less than forty-five degrees to the axis of said bore so as to translate the pull of said bar in an axial direction out of said bore into somewhat greater radially internal gripping forces of said segments on said bar.

6. A connector for steel bars for reinforcing and stressing concrete comprising, an anchor member having an internally threaded opening, an exteriorly threaded nut threaded into said opening and having an interior bore extending for receipt of an end of a bar to be connected, a sleeve-like member dimensioned to fit around said bar end in said bore and formed with a plurality of circumferentially spaced axially extending segment defining slits, the inner bar engaging surfaces of said segments being formed with teeth adapted for biting into and compressively

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engaging and gripping the periphery of said bar, the internal wall of said bore and the external walls of said segments being formed with interfitting spiral threads for threading said sleeve member into and out of said bore and defining a plurality of longitudinally spaced annular inclined cam planes, said planes diverging away from the direction of pull out of said bar from said bore and being set at an angle of less than forty-five degrees to the axis of said bore so as to translate the axial pull of said bar away from said anchor member into somewhat greater radially internal gripping forces of said segments on said bar.

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