United States Patent [19]

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[54] **WEDGE-HELD U-BOLT CLAMP**

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[21] Appl. No.: **174,241**

Related U.S. Application Data

[63] Continuation of Ser. No. 816,645, April 16, 1969, abandoned.

[52] **U.S. Cl.** **403/188,** 52/737, 52/726, 403/375, 403/393

[51] **Int. Cl.** **F16b 7/04**

[58] **Field of Search** ..... 287/103 R, 77, 54 B, 287/1, 51, 118, 20.92 G, 20.92 C, 189.36 C, 20.924; 285/61, 64, 420; 52/726, 734, 735, 736, 737, 738; 24/126 A, 268, 19; 249/219, 219 W; 85/8.8, 36; 254/29 A; 29/126

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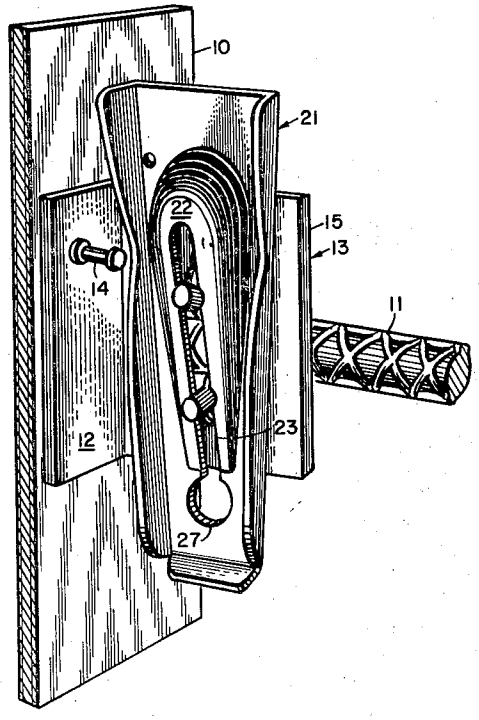
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[57] **ABSTRACT**

A device for transferring stresses to a rod having transverse ridges. In the preferred form, the device includes a U-bolt embracing the rod and traversing a member bearing against the rod, and also includes a locking device engageable with the legs of the U-bolt on the opposite side of the bearing member from the reinforcing rod. The U-bolt is receivable against at least one of the ridges to provide restraint against axial slippage.

3 Claims, 10 Drawing Figures



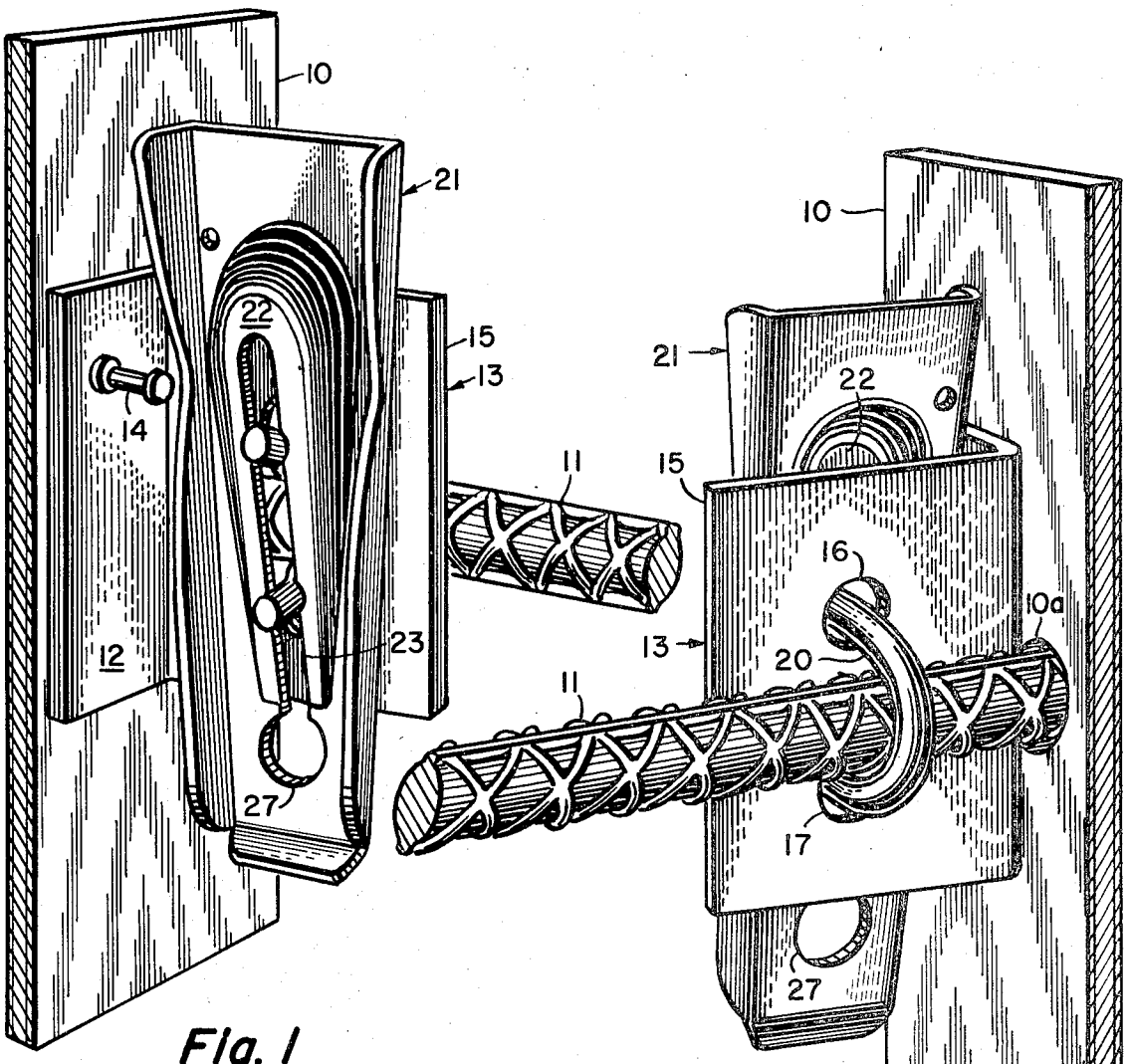


Fig. 1

Fig. 2

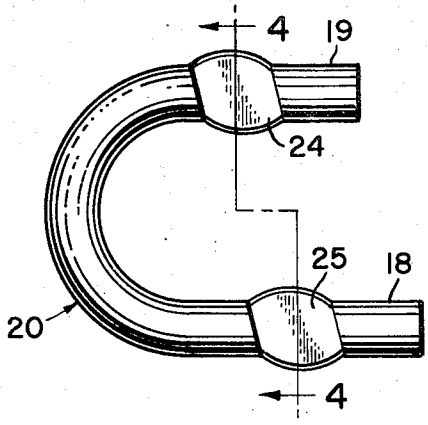


Fig. 3

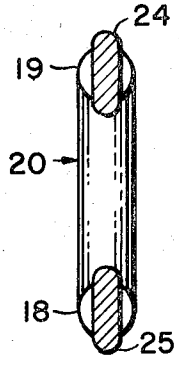


Fig. 4

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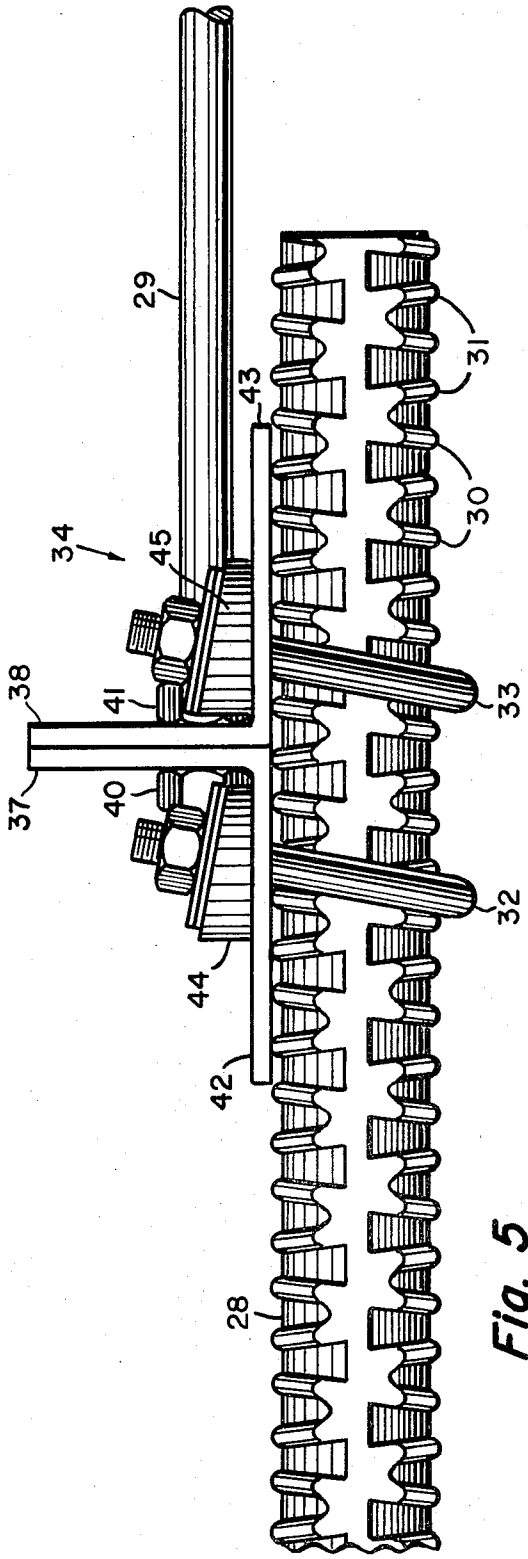


Fig. 5

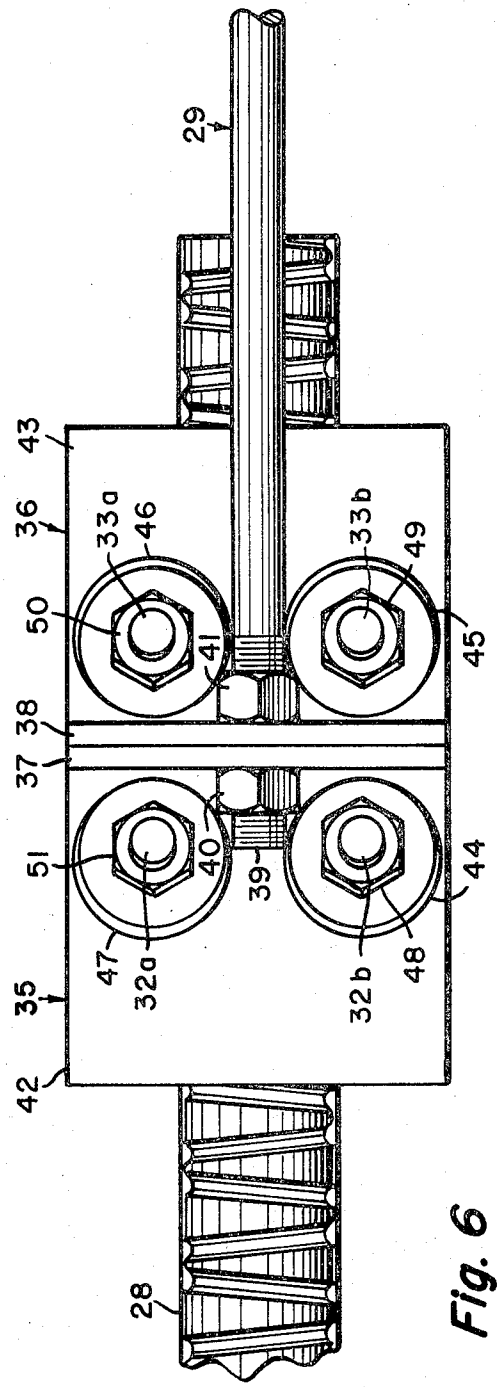


Fig. 6

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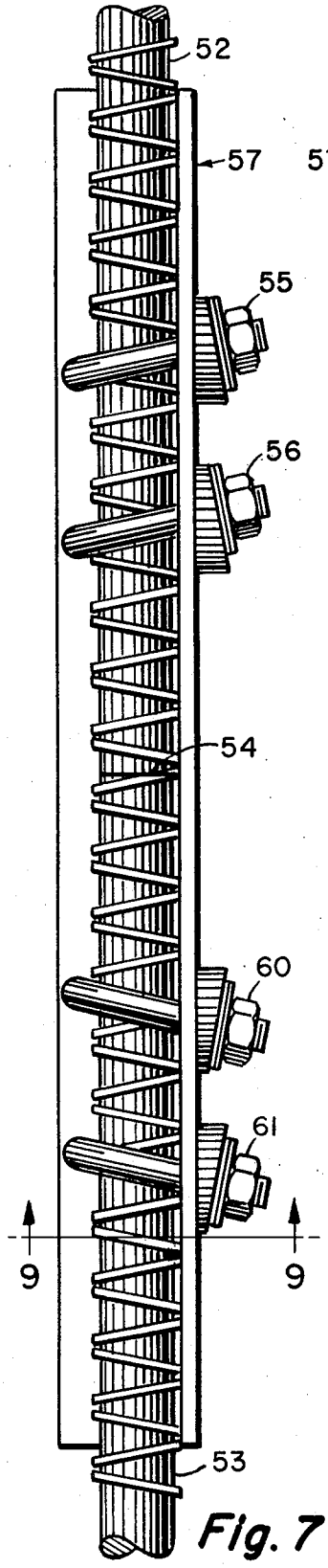


Fig. 7

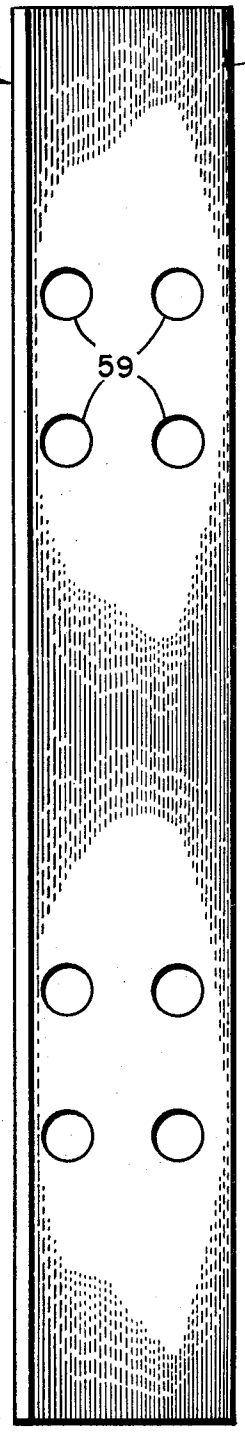


Fig. 8

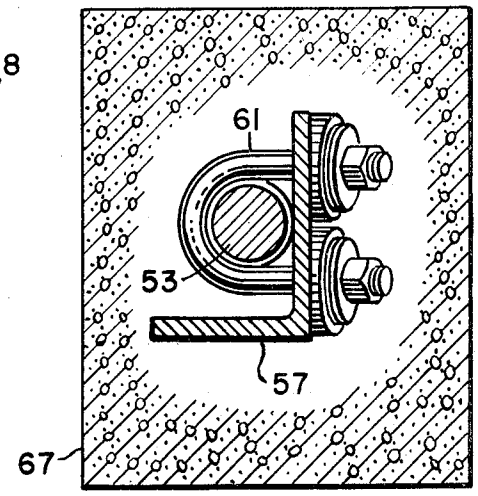


Fig. 9

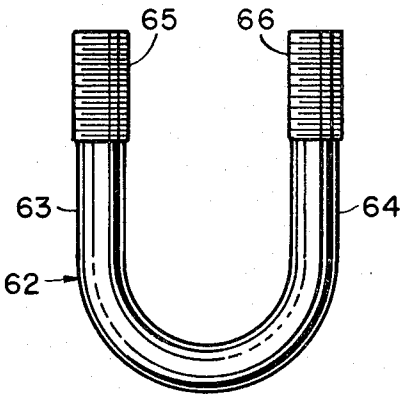


Fig. 10

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WEDGE-HELD U-BOLT CLAMP

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of Ser. No. 816,645 filed Apr. 16, 1969, now abandoned.

BACKGROUND OF THE INVENTION

Poured concrete structures normally involve a liberal use of so-called "reinforcing rods." These rods are usually of steel, and are available in a variety of sizes. The surface of the rods is deformed during manufacture to provide a pattern of transverse ridges for interengaging the rod with the surrounding concrete. The usual practice in the design of concrete structures is to dispose the rods in the positions within the structure subject to substantial tensile stresses, relying on the concrete itself to withstand the compressive loading. The progressive development of concrete structures of various sizes will continually present a situation in which the rods are partially embedded in set concrete, with the remainder extending out in position for embedment in concrete yet to be poured. It is frequently necessary to utilize these rods as anchoring points for one purpose or another, or to transfer stresses from the rods over to some connecting member. In this manner, it is a very simple matter to distribute the stresses from a concentrated point of connection out into the bulk of the concrete structure.

The progressive development of slabs and walls necessarily requires consecutive pours, and bulkheads may be used to limit the lateral outflow of each pour as it is made. The repeated setting and removal of these bulkheads is a time-consuming operation. Makeshift arrangements have been devised for holding the bulkheads in place while the concrete is poured, and these have included stakes, auxiliary braces, and a number of more sophisticated and expensive devices. While devices interconnecting one rod to another, and for connecting various items to a single rod, are in general use, applicant is not aware of a prior use of a coupling unit interengaging with a partially embedded reinforcing rod to position bulkheads against the forces of the poured concrete.

Another situation in which it is desirable to transfer stresses to a reinforcing rod is in the splicing which becomes necessary for continuity of stress along structures of substantial length. Conventional splicing devices have not proven adequate for the transfer of loading of anything approaching the full cross sectional strength of the rod, or for adequately securing the ability of the spliced joint to withstand alternating compressive and tensile stresses. Modified forms of a coupling are also frequently used to attach some form of connecting terminal to a rod for transferring loading to and from that rod. In both the splice situation and that involving a stress-transfer coupling, it has been common practice to use U-bolts embracing the rod and traversing some form of bearing member, with nuts or other securing devices generating a sufficient clamping action between the bearing member and the rod to transfer the loading involved. This arrangement is obviously limited by the amount of axial forces that can be resisted through strictly frictional interengagement, in the usual forms of the device. In addition, the conventional device disposes the U-bolt in a plane perpendicular to the axis of the rod, which results in a limited ability of the U-bolt to effectively prevent axial slippage.

SUMMARY OF THE INVENTION

A coupling device incorporating the present invention utilizes a U-bolt of a diameter selected to at least partially interengage between the lateral ridges of a standard pattern present on the surface of concrete reinforcing rods. The U-bolt embraces the rod, and is tightened against a bearing member by a securing means on the opposite sides of the bearing member from the rod. The legs of the U-bolt traverse openings in the bearing member so that this arrangement produces a severe clamping action holding the U-bolt securely in engagement with the lateral ridges. This arrangement produces a much greater transfer of axial stresses than that which could be accomplished through the reliance on frictional forces exclusively. The most widely used standard pattern of ridges on the reinforcing rods involves a disposition of the ridges on planes that are inclined to a plane perpendicular to the axis of the rod. This inclination is usually successively opposite on the ridges, so that each ridge is oppositely inclined with respect to the adjacent ridge. To most fully utilize the advantages of the invention, the preferred form of the coupling disposes the U-bolts on an incline corresponding to that of the ridges. The direction of the incline is selected so that the most significant axial force is such as to tned to induce this particular inclination of the U-bolt if slippage were to occur. In other words, the U-bolt is interengaged at a particular point along the rod where the incline is in the direction desired. When the coupling is used on rods with annular ridges, the U-bolt is merely engaged between them, with the leg spacing of the U-bolt permitting the inclined installation while retaining the engagement of the loop between the ridges. This incline is established and maintained by the use of beveled washers having a wedge configuration related to the angle at which the U-bolt intersects the bearing member.

Special applications of the coupling have been devised which themselves provide significant features. A clamp for securing bulkheads preparatory to pouring concrete slabs and walls is adapted to lock the bulkhead in position through forces applied where partially embedded reinforcing rods necessarily must intersect the bulkhead in order to extend further for engagement with the next succeeding pour. A splicing arrangement capable of applying severe axial loads in either tension or compression utilizes the form of the invention having inclined U-bolts, with the bearing member having a configuration providing a continuity of moment of inertia past the splice point.

DESCRIPTION OF THE DRAWINGS

In the drawings, FIG. 1 is a perspective view in elevation showing a clamp assembly securing a bulkhead to a reinforcing rod.

FIG. 2 is a perspective view in elevation of the opposite side of the device from that shown in FIG. 1.

FIG. 3 is a plan view showing the U-bolt associated with FIGS. 1 and 2.

FIG. 4 is a section on the plane 4—4 of FIG. 3.

FIG. 5 is an elevation showing a coupling device adapted to transfer stresses from a small high tensile rod to a reinforcing rod.

FIG. 6 is a top view with respect to FIG. 5.

FIG. 7 is a side elevation of a splice assembly for interconnecting two coaxial reinforcing rods.

FIG. 8 is a side view of the modified bearing member used in the FIG. 7 assembly for transferring stresses across the splice joint.

FIG. 9 is a section on the plane 9—9 of FIG. 7.

FIG. 10 is a plan view of the U-bolt shown in the FIG. 7 assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The clamp assembly shown in FIGS. 1 through 4 of the drawings is installed to secure the bulkhead 10 with respect to the reinforcing rod 11 to maintain the initial placement of the bulkhead, and to resist the pressure of the poured concrete on the opposite side of the panel 10 from the clamp assembly. The flange 12 of the angle bracket 13 is preferably secured directly to the bulkhead 10 by readily removable means such as the double-headed nail 14. The other flange 15 of the angle bracket 13 is disposed alongside the reinforcing rod 11, at the point where it traverses the hole 10*a* in the bulkhead 10. The flange 15 has a pair of holes 16 and 17 for receiving the legs 18 and 19 of the U-bolt 20. The formed sheet-metal wedge 21 has an inclined portion 22 provided with a slot 23 of sufficient width to receive the reduced thickness of the discontinuities 24 and 25 in the legs of the U-bolt, but the slot width is less than the diameter of the rod forming the remainder of the U-bolt. The discontinuities 24 and 25 are preferably aligned on a slanted relationship conforming to the slope of the portion 22 of the wedge. The base 26 of the wedge rests against the leg 15 of the bracket 13, and driving the wedge with a hammer in a direction to move the legs 18 and 19 toward the thickest portion of the wedge will generate a considerable clamping action against the rod 11.

The usual concrete reinforcing rod has a pattern of surface irregularity adapted for interengagement with the surrounding concrete, and these irregularities make the clamping action of the bolt 20 more secure. The legs of the U-bolt are initially engaged with the wedge at the enlarged opening 27, after which the wedge is slipped into the installed position shown in FIGS. 1 and 2. The axial length of the flange 15 is preferably selected to be less than the length of the wedge 21, so that both ends will be exposed for the blows of a hammer. Removal of the wedge is equally simple, as a solid blow will release all of the clamping action, after which the components of the assembly can be easily separated and removed. If desired, the bracket 12 may be left assembled to the panel 10 as it is re-set to another position. When the pouring operations are over, the removal of the temporary fastenings 14 will permit the entire wedge assembly components to be stored separately.

The coupling assembly illustrated in FIGS. 5 and 6 is utilized to transfer stresses between the conventional reinforcing rod 28 and the smaller high tensile rod 29. The surface of the rod 28 may be considered as a generally cylindrical configuration interrupted by two series of ridges which are inclined to a plane perpendicular to the axis of the rod 28. The ridges 30 are generally parallel, in the usual rod configuration, as are the ridges 31. These two groups are oppositely inclined, however, and the interengagement of either or both of the U-bolts 32 and 33 between these ridges provides a form of abutment which will resist movement of the coupling assembly generally indicated at 34 along the axis of the rod 28. The two angle pieces 35 and 36 are arranged back-to-back, with the flanges 37 and 38 traversed by the threaded section 39 of the rod 29. The nuts 40 and 41 receive the flanges between them, and secure the rod 29 with respect to the assembly. The flanges 42 and 43 together form a bearing member resting against the rod 28, and held securely by the action of the U-bolts 32 and 33. Assuming that the primary stress-transfer of the assembly is such as to induce movement of the assembly 34 to the right with respect to the rod 28, as shown in FIG. 5, the bevel washers 44-47 are installed to establish an alignment of the U-bolts in parallel with the group of ridges identified at 30. The illustrated attitude of the U-bolts 32 and 33 would correspond to that which would normally be induced by slippage under the influence of the predominant stresses. The clamping action between the U-bolts, the rod 28, and the coupling assembly is maintained by tightening the nuts 48-51.

The splice assembly shown in FIG. 7 has the primary function of transferring axial loading between the rods 52 and 53. The ends of these rods come together in abutting relationship at the position indicated at 54. It is often desirable to provide for the transfer of stress between the rods in either compression or tension. Inclined U-bolt assemblies indicated at 55 and 56 are identical to those shown in conjunction with the bolts 32 and 33 in FIG. 5. The inclination of these bolts is selected (by establishing the orientation of the associated bevel washers) to correspond to the inclination which would be induced by compressive forces being transferred between the rods 52 and 53. These forces are transferred from the rod via the bolts to the junction angle 57, in which the flange 58 is provided with a group of holes 59 for receiving the legs of the U-bolt assemblies 55 and 56. The angular configuration of the cross section of the member 57 establishes a substantial moment of inertia in bending which will tend to stabilize the splice. If desired, one or the other of the U-bolt assemblies 55 and 56 may be oppositely inclined to provide a greater degree of resistance to tensile stresses. The U-bolt assemblies 60 and 61 function with respect to the rod 53 in exactly the same manner as the assemblies 55 and 56 on the rod 52. Each of the U-bolts is formed in the configuration shown in FIG. 10, and is essentially a piece of bent steel rod 62 with parallel legs 63 and 64 terminating in threaded sections 65 and 66 for receiving the associated nuts. Normally, the assembly shown in FIG. 7 will be embedded in concrete as shown at 67 in FIG. 9, in which the rods 52 and 53 are disposed for purposes of reinforcement. When an assembly such as that shown in FIG. 7 is used as a column or pier, it assures that stresses are transferred between successive sections of reinforcing rod without producing points of weakness, and without interferring with the ability of the reinforcement system to transfer stresses in alternate directions, if required. Piers and support columns are frequently subject to alternating stresses where heavy wind loads or shifting work loads are involved.

I claim:

1. In combination with a reinforcing rod and a bulkhead intersected by said rod, a clamp assembly for securing a bulkhead in position preparatory to pouring concrete, comprising:

an angle bracket having one flange thereof securable to a bulkhead, and the other flange thereof dis-

posed to engage said reinforcing rod tangentially with respect thereto, the axis of said bracket being transverse to said rod;

a U-bolt adapted to embrace said reinforcing rod and engage said other bracket flange;

securing means engageable with said U-bolt to clamp said other bracket flange between said reinforcing rod and said securing means; and

wherein the legs of said U-bolt are provided with aligned discontinuities of reduced thickness, and said securing means is a wedge having a portion engageable with said discontinuities, and a base portion adapted to engage said other bracket flange.

2. A clamp assembly as defined in claim **1**, wherein the length of said wedge is greater than the axial length of said bracket flange.

3. A clamp assembly as defined in claim **1**, wherein said aligned discontinuities are disposed along a path slanted with respect to a plane perpendicular to the legs of said U-bolt.

* * * * *