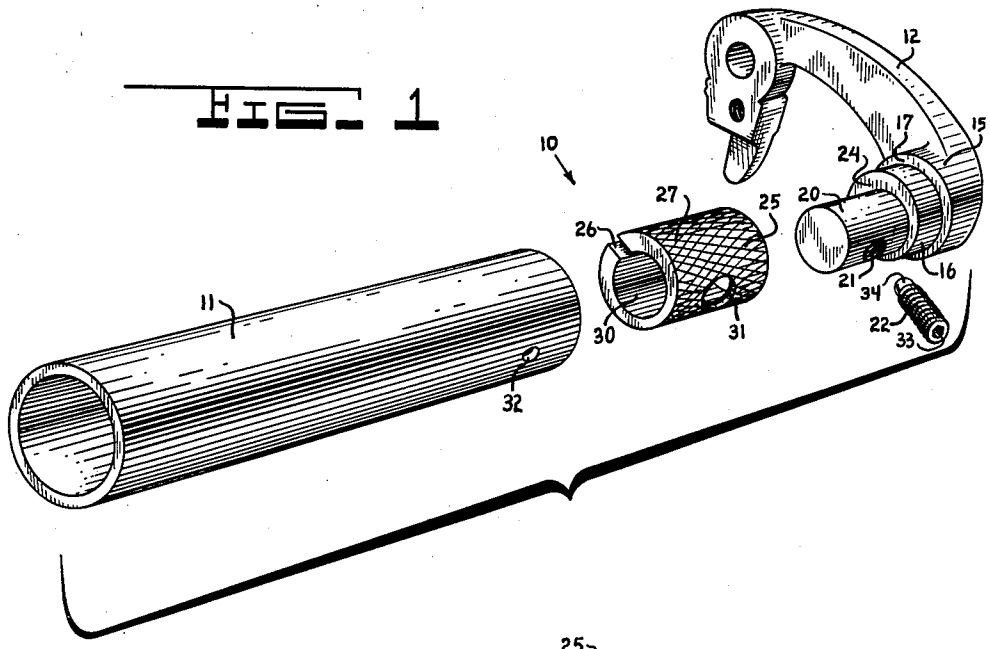
Feb. 26, 1963 J. R. FOSTER 3,079,185

COUPLING

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FIG. 1



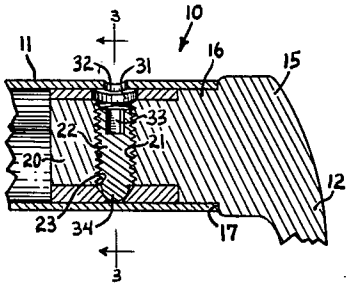


FIG. 2

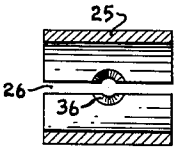


FIG. 4

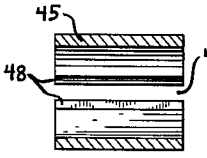


FIG. 5

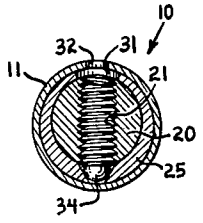


FIG. 3

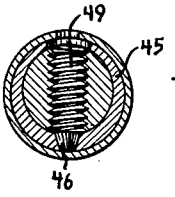


FIG. 6

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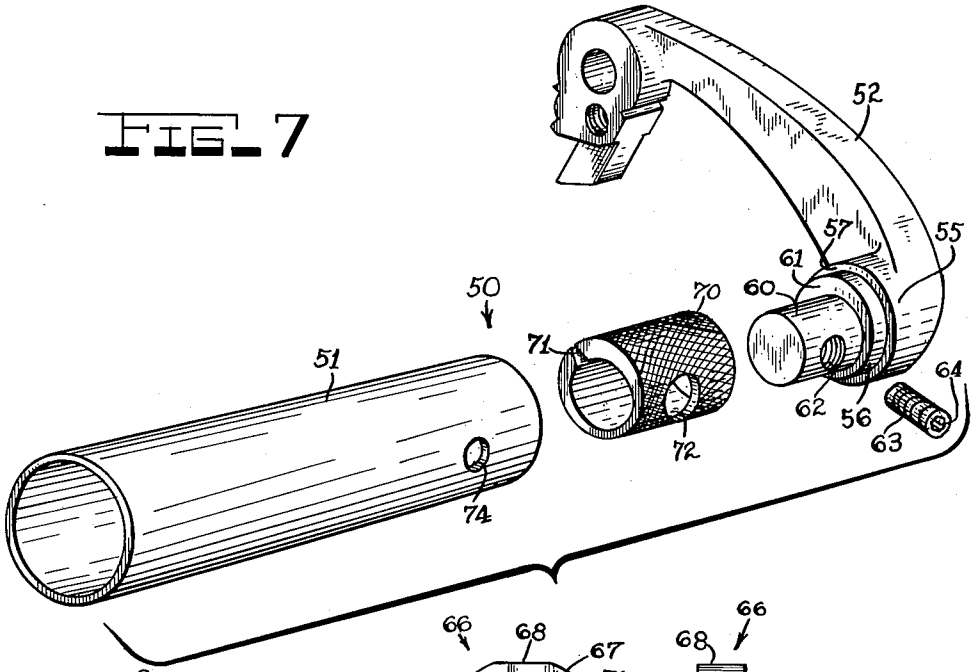
ATTORNEY

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COUPLING

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FIG. 7



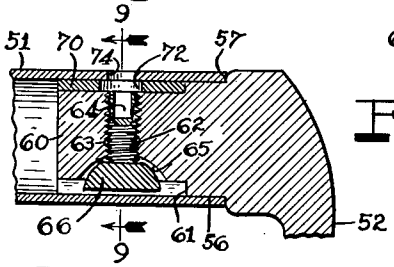


FIG. 8

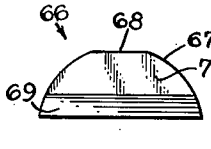


FIG. 11

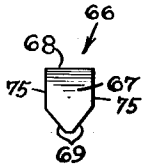


FIG. 12

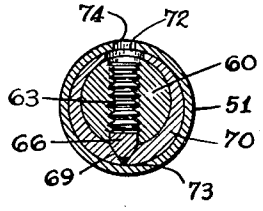


FIG. 9

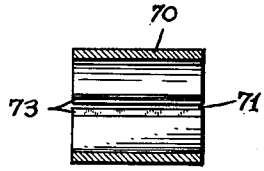


FIG. 10

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3,079,185

COUPLING

John R. Foster, Indianapolis, Ind., assignor to Vonnegut Hardware Company, Indianapolis, Ind., a corporation of Indiana

Filed Nov. 20, 1959, Ser. No. 854,516
11 Claims. (Cl. 287—114)

The present invention relates to a coupling, and this application is a continuationin-part of my copending application Serial No. 802,784 filed March 30, 1959, for Coupling and now abandoned.

It is an object of the invention to provide an improved coupling.

Another object of the invention is to provide an improved device for coupling a tube to and about a stud.

Still a further object is to provide a coupling for a tube and a stud which will resist repeated torsional stresses.

In a panic exit assembly, such as the one illustrated and described in U.S. Patent 2,836,451 to W. L. Clifton, Jr., it is desirable that the panic bar of the assembly be securely fixed to the rocker arms of the assembly because of the frequent rough handling to which the panic exit assembly is subjected in schools and other public buildings. Frequently, a panic exit assembly will be dogged by means of a dog screw, such as the screw 88 in the above-mentioned patent, to hold a rocker arm in a latch bolt retracting position. When only one rocker arm is so dogged, it is possible, by the exertion of up and down forces on the panic bar adjacent the other rocker arm, to move the other rocker arm and panic bar connected thereto up and down a small amount. Such forces, which might be produced through normal use or by a child curious as to why the bar doesn't move more, cause repeated wracking torsional stresses at the connections between the panic bar and the rocker arms and especially at the connection between the panic bar and the dogged rocker arm. It is therefore highly desirable that the connection between such a panic bar and such rocker arms be capable of resisting such repeated torsional forces.

It is therefore a further object of the present invention to provide an improved device for coupling a tube, forming a panic bar, to a rocker arm of a panic exit assembly.

Frequently a door size is changed after the hardware for a panic exit assembly for the door has been ordered and/or received by the builder or installer. Thus it is frequently desirable that the tube forming the panic bar can be cut to length in the field even though a sturdy connection must be made between the tube and the rocker arm.

It is therefore a further object of the present invention to provide a tube-stud coupling in which only simple, easily performed preparations of the end of the tube are necessary prior to effecting the coupling.

Still another object of the present invention is to provide a sturdy coupling for a stud and an aluminum tube, aluminum being stretchable and not readily soldered or brazed.

Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only and that change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

FIG. 1 is an exploded perspective view of a coupling embodying the present invention and showing the elements of the coupling in detail;

FIG. 2 is a longitudinal section of the coupling of FIG. 1 showing the coupling in assembled condition;

FIG. 3 is a transverse section taken in the direction of the arrows and along the line 3—3 of FIG. 2;

FIG. 4 is a longitudinal section of a split sleeve forming a portion of the coupling of FIGS. 1–3;

FIG. 5 is a longitudinal section of an alternative form of split sleeve;

FIG. 6 is a transverse section of an alternative form of coupling incorporating the split sleeve of FIG. 5;

FIG. 7 is a view similar to FIG. 1 but showing still another form of coupling;

FIG. 8 is a longitudinal section of the coupling of FIG. 7 showing the coupling in assembled condition;

FIG. 9 is a transverse section taken substantially on the line 9—9 of FIG. 8;

FIG. 10 is a longitudinal section of the form of split sleeve used in the coupling of FIG. 7;

FIG. 11 is an enlarged side elevation of a key constituting an element of the coupling of FIG. 7; and

FIG. 12 is an end elevation of such a key.

Referring now to the drawings and more particularly to FIGS. 1 to 4, I have illustrated my improved coupling 10 as connecting a rocker arm 12 and a cylindrical tube 11 suitable for use as a panic bar. The rocker arm 12 has a cylindrical portion 15 and a reduced diameter, cylindrical portion 16 projecting coaxially from the cylindrical portion 15 with a radial surface 17 between the surfaces of the portions 15 and 16. When the coupling is assembled, the end of the tube 11 abuts the radial surface 17. A cylindrical stud 20, having a further reduced diameter, extends axially but eccentrically from the cylindrical portion 16 and has extending therethrough a threaded bore 21, the axis of which is perpendicular to and intersects the axis of the stud 20. A screw 22 is of a suitable diameter and thread arrangement to be threadedly adjustably received in the bore 21.

A unitary sleeve 25 is split longitudinally at 26 and may be received upon the stud 20 as shown in FIGS. 2 and 3 with one end abutting a radial surface 24 of the rocker arm 12 and with its split 26 registering with one end 23 of the bore 21. The sleeve 25 is formed with a knurled, cylindrical, outer surface 27 and with a cylindrical, inner surface 30, the axis of said inner surface being eccentrically spaced from the axis of said outer surface an amount such that, when the sleeve is received on the stud, the outer surface may be arranged coaxially and substantially flush with the cylindrical portion 16. It will be seen that such an eccentric arrangement of the outer and inner surfaces 27 and 30 causes the wall thickness of the sleeve to increase progressively in both peripheral directions from a minimum at one point to a maximum at a point 180° removed from said one point. The split 26 in the wall of the sleeve is so located as to extend longitudinally of the sleeve through the thickest portion of the wall.

The sleeve is provided with an aperture or port 31 sufficiently large and so located (in the thinnest portion of the wall of the sleeve) as to allow the screw 22 to pass through the aperture 31 into the bore 21 when the sleeve is received upon the stud 20 with the knurled, cylindrical outer surface 27 coaxially arranged with the cylindrical portion 16. The tube 11 is provided with an aperture 32 sufficiently large to allow passage therethrough of a screw driver suitable for engagement with a screw-driver-receiving end 33 of the screw whereby the screw may be manipulated within the bore 21.

In the forms of the invention illustrated in FIGS. 1 through 6, the screw is formed at its other end to increase in diameter toward the main body of the screw; and in the embodiment illustrated in FIGS. 1 through 4 the end 34

of the screw 22 has a part-spherical or ball shape. The sleeve 25 used with the screw 22 is formed at the split 26 thereof with a tapered, frusto-conical socket 36 (including a surface at each side of the split 26). The socket 36 is so located that, when the sleeve is received on the stud in the above-described relationship and the screw 22 is in the bore 21, the socket 36 opens toward the one end 23 of the bore and toward the part-spherical end 34 of the screw 22. The greatest transverse dimension of the split 26 at the socket 36 is approximately equal to the diameter of the screw 22 and to the greatest diameter of its end 34 while the least transverse dimension of the split 26 at the socket is appreciably less than the diameter of the screw 22 and the greatest diameter of its end 34.

In most cases it will be desirable that the coupling of the present invention be partially assembled at the factory. That is, the sleeve 25 will be placed upon the stud 20 in the position shown in FIGS. 2 and 3 and the screw 22 will be threadedly received within the stud 20 in such a position, as shown in FIG. 2, that it will prevent the sleeve 15 from slipping off of the stud 20. Thus when the builder or other person installing the panic exit assembly within a building receives the rocker arm 12 with the sleeve 25 and screw 22 assembled therewith, he need only cut the tube 11 to the desired length of the panic bar (if it is not already the desired length) and drill the aperture 32 a suitable distance from the end of the panic bar. He can then insert the stud 20 into the end of the tube 11 and into the position shown in FIGS. 2 and 3 and can then insert a screw driver through the apertures 31 and 32 into engagement with the end 33 of the screw 22. Next he can rotate the screw until it engages the socket 36, forcing against the walls of the socket and spreading the sleeve 25 until its knurled, cylindrical outer surface tightly and firmly grips the interior wall of the tube 11. It will be noted that the fact that the thinnest portion of the wall of the sleeve 25 is opposite the split 26 will cause the sleeve to bend the greatest amount at that thinnest portion and will cause the greatest possible amount of knurled surface to tightly engage the inner wall of the tube 11. Such a thin wall structure opposite the split 26 also makes possible the spreading of the sleeve 25 with the least amount of force being exerted on the part of the person assembling the coupling and also makes rupture of the sleeve unlikely.

An alternative form of sleeve 45 is illustrated in FIG. 5 which will find its greatest application where the material making up the sleeve is such as to make desirable the extrusion of the sleeve in substantially completed form. The sleeve of FIG. 5 has a constant cross section longitudinally. The sleeve 45 forms a portion of the alternative embodiment of the invention which is illustrated in FIG. 6 and which differs from the above described embodiment in that one end 46 of the screw 49 has a frusto-conical instead of a part-sperical shape. The split 47 of the sleeve 45 is bounded by beveled surfaces 48—48 which are located in a pair of planes which intersect at an angle approximately equal to the vertex angle of the frusto-conical end 46 of the screw. The greatest transverse dimension of the split 47 is approximately equal to the diameter of the screw 49 and to the greatest diameter of its end 46 while the least transverse dimension of the split 47 is appreciably less than the diameter of the screw 49 and the greatest diameter of its end 46.

If it is desired, as above described to partly assemble the coupling of FIGS. 5 and 6 at the factory, the screw 49 may be provided with a somewhat greater length than the screw 22 so that the sleeve may be retained on the stud by the screw engaging the sleeve at its aperture; however, the ease with which the sleeve of FIGS. 5 and 6 may be slipped off the stud with the screw in the bore may in some environments be considered an advantage.

From the above it will be obvious that various alternatives within the scope of the invention can be conceived. For example, a cylindrical portion such as 16 having two oppositely projecting studs such as the stud 20 could be used to securely couple a pair of tubes such as the tube 11 in abutting relationship. It also should be understood that the element 20, referred to in the specification and claims as a stud, may also be tubular or hollow, so long as the walls thereof are thick enough to provide a sufficient grip for the screw, and may also be non-cylindrical. The word "stud" as used in the claims is intended to include such variations and the claims are intended to cover such variations unless otherwise limited.

While the forms of invention thus far described accomplish the stated objectives to a reasonably satisfactory degree, certain imperfections of performance have been noted; and they may be effectively overcome by the embodiment of the invention illustrated in FIGS. 7 through 12. Notably, it is found that, under certain circumstances, some slight rocking may occur between the stud 20 and the sleeve 25 or 45 about the axis of the bore 21; and that play may be most effectively overcome through the medium of the structure now to be described.

In FIG. 7, I have shown an exploded view of parts which are generally similar to the parts illustrated in FIG. 1. The coupling indicated generally by the reference numeral 50 is intended firmly to join a thin walled tube 51 to a stud 60 which may be a part of a rocker arm 52. Said rocker arm is formed to provide a cylindrical surface 55 from which projects a reduced, coaxial cylindrical surface 56 defining a shoulder 57 whose radial depth is substantially equal to the wall thickness of the tube 51 and against which the end of the tube 51 is adapted to abut. The stud 60 is arranged eccentrically with respect to the surface 56 and defines a shoulder 61.

A transaxial bore 62 in the stud 60 is internally threaded for the adjustable, threaded reception of a screw 63 one end of which is formed as at 64 for the reception of a manipulating tool, the other end of said screw, in this form of the invention, being flat.

One end of the bore 62 is intersected by a socket 65 which is elongated in the direction of the axis of the stud, which opens through the peripheral surface of the stud and which has a substantially arcuate base which is intersected and substantially bisected by an end of the bore 62 in the manner most clearly illustrated in FIG. 8. Freely seated in the socket 65 is a key 66 whose base surface is generally arcuate, as at 67, to conform to the base of the socket 65. The base of the key, however, is preferably formed with a median, flat land 68 which, when the key is seated in the socket 65, directly faces the flat end of the screw 63 and is engageable thereby.

The opposite surface of the key 66 is formed to define a wedging surface 69, as is most clearly illustrated in FIGS. 9, 11 and 12, said wedging surface being elongated in the direction of the axis of the stud 60 and being presented radially outwardly with respect to the stud 60. The parts are so proportioned and designed that, when the key 66 is seated to its maximum depth in the socket 65, the apex of its wedging surface is substantially flush with the peripheral surface of the stud 60. The lateral surfaces 75, 75 of the key have a snug sliding fit against the lateral walls of the socket 65.

The sleeve 70 is in all respects similar to the sleeve 45 hereinbefore described. It is internally and externally substantially cylindrical, the internal and external surfaces being formed on respectively off-set axes, whereby the wall thickness of said sleeve increases progressively in both directions from a minimum at one point to a maximum at a point 180° removed from said one point; and said sleeve is formed with a longitudinally extending split 71 at its point of maximum wall thickness. The sleeve 70, like the sleeves 25 and 45 is preferably formed of resilient flexible materials; and it is important that said sleeves shall be unitary so that, as described above, they may be mounted on their respective studs at the factory and will be held in assembled relation therewith

by their associated screws during shipment and until final assembly at the installation site.

At a point diametrically opposite the split 71, the sleeve 70 is formed with a port 72, the parts being so proportioned and arranged that, when the sleeve 70 is mounted on the stud 60 with the split 71 in registry with the apex of the wedging surface of the key 66, the port 72 will register with the opposite end of the bore 62 and the external surface of the sleeve will be coaxial and flush with the cylindrical surface 56 on the rocker arm 52. The beveled surfaces 73 at the edges of the split 71 are preferably inclined to conform to the inclination of the wedging surface 69 of the key 66.

The tube 51, of course, is formed with a port 74 which, when the tube is telescopically received on the sleeve 70 with the end of the tube in abutment with the shoulder 57, will register with the port 72, as shown in FIG. 8, to permit the insertion of a manipulatory tool into the socket 64 of the screw 63. Now, when the screw is rotated to advance through the bore 62, its squared end will press upon the land 68 of the key 66 to force the wedging surface 69 of the key against the beveled surfaces 73 of the sleeve 70 to expand said sleeve into firm, gripping engagement with the internal surface of the tube 51.

If, at any time, disassembly of the coupling becomes desirable, the screw 63 may be backed away, by reverse manipulation, whereupon, because of the resilient character of the sleeve 70, said sleeve will contract toward its original condition, thereby releasing the tube 51 for ready removal.

I claim as my invention:

1. A device for coupling a stud and a tube comprising a unitary, split sleeve received upon the stud, the tube being receivable upon the split sleeve, said stud being formed with a transaxial, threaded bore therethrough and means including a member having a threaded portion threadedly adjustably seated in said bore for spreading said sleeve at the split thereof into firm engagement with the internal wall of said tube.

2. A device for coupling a stud and a tube comprising a unitary, split sleeve telescopically received on said stud, said stud being formed with a socket having a mouth opening through the surface of said stud in registry with the split in said sleeve, a key seated in said socket and formed with a wedging surface, elongated in the direction of the axis of said stud and presented in registry with said split in said sleeve, said stud further being formed with a transaxial, threaded bore communicating with the base of said socket and opening through the opposite surface of said stud, and a screw threadedly adjustably seated in said bore and engageable with said key, said tube being telescopically receivable upon said sleeve and being provided with a port registrable with said bore to facilitate manipulation of said screw.

3. In a device for the class described, a cylindrical stud formed with a socket elongated in the direction of the axis of said stud and opening through the peripheral surface of said stud, a key seated in said socket and formed with a wedging surface similarly elongated and presented outwardly from said socket, said stud further being formed with a transaxial, threaded bore communicating with the base of said socket and opening through the peripheral surface of said stud substantially diametrically oppositely from said socket, a screw adjustably threadedly seated in said bore and bearing against a surface of said key opposite the wedging surface thereof, a unitary, resiliently-flexible, split sleeve telescopically received on said stud with the split in said sleeve in registry with the wedging surface of said key, said sleeve further being provided with a port registering with the opening of said bore through said stud surface, and a tubular element telescopically enshrouding said sleeve, said tubular element having a port registering with said sleeve port, the recited parts being so proportioned and arranged as to render said screw accessible for manipulation through said registering ports in said tubular element and said sleeve and said screw acting, upon advancement in said bore, to force said key outwardly from said socket, thereby pressing said key wedging surface into the split in said sleeve to flex said sleeve into gripping engagement with the internal surface of said tubular element.

4. The device of claim 3 in which the internal and external surfaces of said sleeve are substantially cylindrical but are disposed respectively upon offset, parallel axes, whereby the wall thickness of said sleeve increases progressively from a minimum at one point, to a maximum at a point 180° removed from said one point, the split in said sleeve being formed substantially in the region of maximum wall thickness and the port in said sleeve being formed substantially in the region of minimum wall thickness.

5. In a device of the class described, a cylindrical stud, said stud being formed with a threaded, transaxial bore therethrough, said stud further being provided with a socket elongated in the direction of the axis of said stud, opening through the peripheral surface of said stud and having a substantially arcuate base intersecting and substantially bisected by one end of said bore, a key seated in said socket and having a substantially arcuate base proportioned and designed substantially to conform to the base of said socket and formed with a wedging surface, opposite said key base, elongated in the direction of said stud axis, said key being so proportioned and designed that, when said key base rests on said socket base, the apex of said wedging surface is substantially flush with the peripheral surface of said stud, a screw adjustably threadedly seated in said bore to bear against the base of said key, the length of said screw not substantially exceeding the diameter of said stud reduced by the depth of said socket at the point of intersection of said bore, a unitary, split sleeve telescopically received on said stud, the split in said sleeve registering with the apex of said key wedging surface, said sleeve further being formed with a port registering with that end of said bore remote from said socket, and a tubular element telescopically enshrouding said sleeve, said tubular element having a port registering with said sleeve port to render said screw accessible for manipulation to force said key wedging surface into said sleeve split to expand said sleeve into gripping engagement with the internal surface of said tubular element.

6. A device for coupling a stud and a tube comprising a unitary split sleeve received upon the stud, the stud being provided with a transaxial threaded bore therethrough which opens at one end in registry with the split of said split sleeve, said sleeve having an aperture through the wall thereof registering with the other end of said bore, a screw threadedly received within said bore and having a screwdriver-receiving end adjacent said other end of said bore, the least transverse dimension of the split of said sleeve being less than the diameter of said screw, the tube being receivable upon said sleeve and having an aperture registrable with the aperture of said sleeve, whereby, when said tube is received on said sleeve, a screw driver can be inserted through said apertures into engagement with the one end of said screw to rotate said screw, thereby forcing the other end of said screw against said sleeve at the split thereof to spread said sleeve and to cause it to tightly grip the inside wall of said tube.

7. A device for coupling a stud and a tube comprising a unitary split sleeve having a knurled outer surface received upon the stud, said sleeve having its greatest wall thickness at the split thereof and its least wall thickness opposite the split thereof, the stud being provided with a transaxial threaded bore therethrough which opens at one end in registry with the split of said split sleeve, said sleeve having an aperture through the wall thereof registering with the other end of said bore, a screw threadedly received within said bore and having a screw-driver-receiving end adjacent said other end of said bore, the other end of said screw being formed so as to increase in diameter toward

the body of said screw, the least transverse dimension of the split of said sleeve being less than the diameter of said screw, the surfaces of the sleeve at the split thereof and adjacent said screw being arranged to converge toward the outer surface of said sleeve, the tube being receivable upon said sleeve and having an aperture registrable with the aperture of said sleeve, whereby, when said tube is received on said sleeve, a screw driver can be inserted through said apertures into engagement with said first-named end of said screw to rotate said screw, thereby forcing said other end of said screw against said sleeve at the split thereof to spread said sleeve and to cause it to tightly grip the inside wall of the tube.

8. A device for coupling a cylindrical tube in coaxial relationship with and about a cylindrical portion of a member, which comprises a cylindrical stud projecting axially but eccentrically from the cylindrical portion, a unitary sleeve having a knurled cylindrical outer surface and a cylindrical inner surface, the axis of said inner surface being eccentrically spaced from the axis of said outer surface an amount such that, when said sleeve is received on said stud, said outer sleeve surface can be coaxial and flush with said cylindrical portion, and with the further result that the wall of said sleeve is thickest at one side of said sleeve and gradually decreases in thickness to the opposite side of said sleeve, said sleeve being split longitudinally at the thickest portion thereof, the stud being provided with a transaxial threaded bore therethrough which opens at one end in registry with the split of said split sleeve, said sleeve having an aperture through the wall thereof registering with the other end of said bore, a screw threadedly received within said bore and having a screw-driver-receiving end adjacent said other end of said bore, the other end of said screw being formed so as to increase in diameter toward the body of said screw, the greatest transverse dimension of the split of said sleeve being approximately equal to the diameter of said screw, the surfaces of the sleeve at the split thereof and adjacent said screw being arranged to converge toward the outer surface of said sleeve, the tube being receivable upon said sleeve and having an aperture registrable with the aperture of said sleeve, whereby, when said tube is received on said sleeve, a screw driver can be inserted through said apertures into engagement with said first-named end of said screw to rotate said screw, thereby forcing said other end of said screw against said sleeve at the split thereof to spread said sleeve and to cause it to tightly grip the inside wall of said tube.

9. The device of claim 8 in which said other end of said screw is of part-spherical shape and in which said sleeve is formed at said split with a tapered socket, said socket being so located that, when said sleeve is received on said stud, said socket opens and diverges toward said one end of said bore.

10. The device of claim 8 in which said other end of said screw is of frusto-conical shape and in which the surfaces of said sleeve at said split are located in a pair of planes which intersect at an angle approximately equal to the vertex angle of said frusto-conical shape.

11. A device for coupling a solid stud and a tube comprising a unitary, split sleeve received upon the stud, the tube being receivable upon the split sleeve, said stud being formed with a transaxial, threaded bore therethrough, and means, including a member having a threaded portion threadedly adjustably seated in said bore, for spreading said sleeve at the split thereof into a firm engagement with the internal wall of said tube, said sleeve and said tube having registering openings therein at points diametrically opposite the split in said sleeve to provide manipulating access to said screw.

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