STAB-TYPE COUPLING JOINT

Inventor: Daniel A. Ellis, Decatur, Ill.
Assignee: Mueller Co., Decatur, Ill.
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ABSTRACT

A stab-type coupling joint for connecting an end portion of a smooth wall pipe to a fitting or another pipe. The stab-type coupling joint includes a body member having a passageway therethrough and a tubular member which telescopingly receives the body member, the tubular member and body member being rotatable relative to one another, but being locked against axial movement with respect to one another. Between the body member and the tubular member there is provided a frusto-conical gripper ring having spaced slots extending from the smaller end to define gripper fingers. The smooth wall pipe is stabbed through the gripper ring and since the smaller diameter of the gripper ring is less than the outside diameter of the pipe, the pipe flexes the fingers of the gripper ring outwardly. Stop means are provided within the body member to limit the amount of insertion of the smooth wall pipe. Sealing means are provided between the exterior wall of the smooth wall pipe and the tubular member, as well as between the tubular member and the body member. Such sealing means prevents ground fluids from ingress into the interior joint, as well as preventing fluids within the joint from leaking to the exterior.

9 Claims, 6 Drawing Figures
STAB-TYPE COUPLING JOINT

The present invention relates to an improvement in stab-type coupling joints for smooth wall pipes, the joints having a design which is particularly adaptable for varying different parameters of the pipe gripper ring to meet different criteria necessary for different types of pipe with respect to characteristics, such as pullout resistance, installation load, and initial and final grip of the pipe. The stab-type joint may be used for steel pipes, iron pipes, copper pipes, plastic pipes, and the like, and is particularly suitable for small diameter pipes.

BACKGROUND OF THE INVENTION

Heretofore, many efforts have been made to manufacture stab-type coupling joints for connecting an end portion of a smooth wall or flareless pipe to a fitting or another pipe for fluid distribution systems, such as gas and water. By far, the greatest problem with prior art stab-type coupling joints was the complexity of the design which required considerable machining and a complicated assembly procedure. These prior art coupling joints utilized gripper rings, both solid and the split type, and they also utilized "Bellville" springs which were frusto-conical locking rings, such latter-mentioned locking rings having to be flattened to a generally planar condition so as to reduce the interior diameter of the same to grip the pipe. While some of the prior art coupling joints were of the true stab-type, in that it was merely necessary to insert the pipe by stabbing into the joint with any outward effort to remove the pipe being resisted by the gripper ring, other types of joints required an actual mechanical manipulation of two parts to actuate the gripper ring into gripping engagement with the exterior surface of a smooth wall pipe.

In most of the prior art installations, once the coupling joint had been made, no means was provided for permitting the pipe which was stabbed to rotate relative to the fitting or another pipe to which the same had been coupled. However, one such coupling joint which did permit relative rotation between the smooth wall pipe and the fitting or another pipe is disclosed in applicant's common Assignee's co-pending U.S. application Ser. No. 504,249, filed Sept. 9, 1974, by Leopold et al. The coupling joint of the aforementioned application differs materially from the coupling joint of the present Application in that it is intended for coupling large diameter pipes, whereas the present invention is intended for coupling small diameter pipes.

With the foregoing in mind, it is an object of the present invention to provide a stab-type coupling joint particularly adapted for use in coupling small diameter pipes, regardless of whether the pipe is made of copper, steel, iron, plastic, or the like. The coupling joint may be inexpensively manufactured, easily assembled, and it may be of a character where the individual gripper ring can be varied, depending upon the characteristics required of the particular joint. In other words, some joints, depending upon the type of material of which the pipe is made, required high pullout resistance, small installation load, and good initial and final grip.

PRIOR ART

Broadly stated, the present invention contemplates an improvement in a stab-type coupling joint which is utilized for connecting an end portion of a smooth wall pipe to a fitting or another pipe and it comprises a body member having a passageway therethrough, stop means in the passageway to limit insertion of the smooth wall pipe, a bore defining a portion of the passageway and having a diameter to receive the smooth wall pipe, the bore terminating at its outer end in an outwardly flaring frusto-conical surface. A tubular member is arranged to telescopically receive the cylindrical end portion of the body member and means are provided to lock the tubular member and the body member together against axial movement, but permit relative rotatable movement between the same. A frusto-conical gripper ring is positioned in the frusto-conical space formed between the body member and the tubular member, the gripper ring having spaced slots extending from its smaller end to define gripper fingers.

The arrangement just described permits utilizing a continuous frusto-conical gripper ring rather than a split gripper ring, although a split gripper ring could be used if so desired. The gripper ring can be made of different thicknesses and the slots between the fingers of the same can be controlled in size by controlling the width and length of the same so as to influence the performance of the coupling joint for a pipe of a particular outside diameter and/or material. The control of these dimensions will be determined, depending upon the installation load desired on stabbing and the pullout resistance desired upon completion of the joint.

Sealing rings are provided between the body member and the tubular member, as well as between the tubular member and the exterior surface of the smooth wall pipe to prevent egress of fluids from the interior of the coupling joint to the exterior of the coupling joint, as well as to prevent ingress of fluids from the exterior of the coupling joint. The sealing rings are so positioned in the coupling joint that they do not engage the wall surface of the smooth wall pipe in an area that has been previously engaged by the teeth of the gripper ring and, thus, the sealing rings never engage any score marks made on the pipe by the fingers of the gripper ring.

Once the coupling joint has been assembled, it is substantially tamper-proof as the body member cannot be disengaged from the tubular member by ordinary means.

While the stab-type coupling joint of the present invention, in its broadest sense, need have only one gripper ring and sealing means for sealing with one smooth wall pipe, it will be appreciated that the body member could be so designed as to have its opposite end receive a second tubular member and a second gripper ring for
gripping another smooth wall pipe. However, usually the body member has its other end portion provided with attachment means of the type for connecting with another pipe or a fitting such as a valve or tee by welding or threading.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end view of the stab-type coupling joint of the present invention looking from the left of FIG. 2 and illustrating the insertion of the flexible locking or retaining rod for the body member and the tubular member.

FIG. 2 is a longitudinal vertical sectional view through the coupling joint of FIG. 1, the view illustrating the pipe in phantom lines, but with the fingers of the locking ring in their relaxed position.

FIG. 3 is a sectional view taken substantially on the line 3—3 of FIG. 2, the view being on a reduced scale and with the smooth wall pipe omitted therefrom for the purpose of clarity.

FIG. 4 is a longitudinal vertical sectional view, partly in elevation, of a modified form of the coupling joint of FIG. 1.

FIG. 5 is an end view looking from the left of FIG. 4.

FIG. 6 is a perspective view of the frusto-conical grip.

Detailed Description of the Drawings

Referring now to the drawings wherein like characters or reference numerals represent like or similar parts, there is disclosed in FIGS. 1 and 2 a stab-type coupling joint of the present invention generally designated 10. The joint shown in FIGS. 1 and 2 is of the type for coupling a smooth wall pipe P to a threaded pipe or fitting P', although it will be appreciated by those skilled in the art that the left hand portion of the coupling joint 10 could be identical or a mirror-image to the right hand side that the coupling joint 10 could receive two smooth wall pipes. The pipe P may be made from a metal material, such as copper, steel, or iron, or the pipe may be made from a plastic material, such as polyethylene (PE), polyvinyl chloride (PVC), polybutylene (PB), or the like.

The coupling joint 10 comprises a body member 12, a tubular member or swivel nut 14, a frusto-conical gripper ring 16, a first sealing means 18, and a second sealing means 20. While the body member 12 and tubular member 14 are preferably made of metal, such as brass, copper, iron, or steel, they can be made from a plastic material, such as polyethylene (PE), polyvinyl chloride (PVC), polybutylene (PB), Teflon, or Celcon. Additionally, it will be appreciated that the foregoing elements 12 and 14 do not all have to be made of the same material, but could be made from any combination of materials. The gripper ring 16 is usually made of spring steel or other spring-like or flexible metals or it could be made from a plastic material. However, the gripper ring is preferably a harder material than the pipe P.

The body member 12 has a passageway 22 extending therethrough, the passageway 22 being provided intermediate its ends with a stop means 24 which is an inwardly extending annular shoulder 26 having an inner diameter less than the outside diameter of the pipe P, the shoulder 26 engaging the pipe P to limit the amount the pipe P can be stabbed into the coupling joint. A portion of the passageway 22 is further defined by a bore 28 having a diameter at least as great as the diameter of the pipe P, the bore 28 receiving the smooth wall pipe P upon stabbing. The bore 28 may be provided with a countercube 30 extending from the shoulder 26, the countercube reducing the amount of material in the body member. The bore 28, at its end furthest away from the shoulder 26, flares outwardly in a frusto-conical surface 32, the purpose of which will be described later in this specification. One end portion 34 of the body member 12 has a cylindrical exterior configuration, whereas the other end portion 36 has a non-circular configuration, such as a hexagonal shape for receiving a tool, when the coupling joint is threaded onto the pipe or fitting P'. As will be noted, the passageway 22 in the end portion 36 is provided with interior threads 38 to receive the threaded end of the pipe or fitting P'.

The tubular member or swivel nut 14 has a bore 40 extending from one end thereof and terminating at its inner end in an inwardly extending annular shoulder 42. The bore 40 has a diameter sufficient to telescopically receive the cylindrical end portion 34 of the body member 12, whereas the inwardly extending annular shoulder 42 has a diameter at least as great as the diameter of the pipe P.

As best shown in FIGS. 1, 2, and 3, the bore 40 of tubular member or swivel nut 14 is provided with an annular groove 44, whereas the cylindrical end portion 34 of the body member 12 is also provided with an annular groove 46. When the tubular member 14 and the body member 12 are telescoped together, the grooves 44 and 46 mate or align with one another and define an annular passage 47 for receiving a ring-like lock or retainer element generally designated at 48. In more detail, the tubular member 14 is provided with a cutout 50 on its exterior passage which provides an opening to the annular passage 47 defined by the grooves 44 and 46. The ring-like element 48, in this particular instance, is a flexible retaining or locking rod 52 made of plastic material or metal, which may be inserted through the opening 50 into the annular passage 47 defined by the grooves 44 and 46, the rod 52 having a length which is less than the length of the annular passage 47 defined by the grooves 44 and 46. The rod is slipped through the opening 50 and conforms to the annular passage 47 and when the rod 52 is properly positioned, the ends of the rod do not extend out of the opening 50. The rod 52 locks the tubular member 14 to the body member 12 so that these members cannot be pulled axially apart, but the arrangement does permit complete 360° rotation of the members with respect to each other.

The first sealing means 18 includes an annular groove 54 and an O-ring 56, the annular groove 54 being provided on the cylindrical end portion 34 of body member 12 and positioned between the end portion of the same and the groove 46. The O-ring 56 seals the interior of the coupling joint from the exterior between the tubular member 14 and the body member 12. The second sealing means 20 includes an annular groove 58 in the bore of the shoulder 42 and an O-ring 60 positioned therein. The second sealing means 20 provides a seal between the tubular member 14 and the outside surface of the pipe P and it will be noted that the O-ring 60 is positioned outwardly of the gripper ring 16 so that should the gripper ring score the surface end portion of the pipe P upon insertion, these score marks will not come into contact with the O-ring 60.

When the tubular member or swivel nut 14 and the body member 12 have been assembled, as shown in
FIG. 2, there is a frusto-conical space 62 between the two members and positioned in this space is the frusto-conical gripper ring 16. As shown in FIG. 6, the frusto-conical gripper ring is provided with a plurality of slots 64 arcuately spaced about the same and extending from the smaller end of the gripper ring 16, but terminating short of the larger end. The slots 64 define gripping teeth 66. It will be noted by reference to FIG. 2 that the frusto-conical gripper ring 16 has a greater angle with a longitudinal axis of the joint than the angle of the frusto-conical surface 32 of the body member 12 and this provides a space between the exterior of the teeth 66 and the frusto-conical surface 32. Thus, when the pipe P is stabbed into the coupling joint 10, the teeth 66 can spring outwardly into the space provided between the teeth and the surface 32 and since the teeth are flexible, they tend to return to their normal relaxed position. Consequently, when there is an outward pull on the pipe P, the teeth will tend to dig into the exterior surface of the pipe P, thus, restraining the same from pulling out of the coupling joint 10. By controlling the kind of material and the thickness of the material of the frusto-conical gripper ring 16 and by controlling the length and width of the slots 64, the amount of flexibility of the teeth 66 can be controlled and this is important when the coupling joint is designed for use with the pipe P of a particular material. These dimensional parameters control the amount of the load for installation, as well as the pullout resistance of the coupling joint 10.

Referring now to FIGS. 4 and 5, there is disclosed a modified coupling joint 10'. In this coupling joint 10', where there is a change over the coupling joint 10 disclosed in FIGS. 1 to 3, primes will be given to the elements; otherwise, the same numerals and/or reference characters will be used. It will be noted in the arrangement of FIG. 4 that the body member 12 is provided on its end portion 36' with exterior threads 38', as well as a non-circular portion which is preferably in the form of a hexagon 37. This arrangement may be used in situations where the coupling joint 10' is to be attached to a pipe or fitting P' having interior threads.

A second difference in the coupling joint 10' of FIG. 4 is concerned with the means for retaining the body member 12' in the tubular member 14' so that there can be no axial movement, but there still can be relative rotational movement. In this arrangement, the outer end of the bore 40' of the tubular member 14' is provided with a chamfer or bevel 41 for camming a split locking ring 52' inwardly upon assembly of the two members 14' and 12'. In more detail, the member 12' on its circular end portion 34' is provided with an annular groove 46' having a depth at least equal to the radial width of the split ring 52'. A mating groove 44' is provided in the bore 40', this groove having a depth less than the radial width of the split ring 52'.

In the arrangement disclosed in FIGS. 4 and 5, the assembly of the coupling joint 10' is as follows. First, the gripper ring 16 is assembled in the frusto-conical space defined by the surface 32 in the body member 12'. Then the split retainer ring 44', which, in its relaxed condition, has an outside diameter greater than the diameter of the cylindrical portion 34' of body member 12' and an inside diameter which is less, is inserted into the groove 46' of the body member. The tubular member or swivel nut 14' is then telescoped over the cylindrical portion 34' of the body member 12' and the chamfer or bevel 41 will engage the split ring 52' and reduce its diameter in the groove 46' until the groove 44' aligns with the groove 46'. At this point in the assembly, the split retainer ring returns to its relaxed position by expanding outwardly into the groove 44' and this locks the body member 12' to the tubular member 14' so that there can be no axial movement, but, yet, can be full 360° rotation between the two members. Once the coupling 10' has been so assembled, it is similar to the coupling joint 10 of FIGS. 1 to 3 in that the retaining ring 52' cannot be readily removed and, thus, the coupling joint is effectively tamper proof. In the assembly of the coupling joint 10', it will be appreciated that the first sealing means 18 and the second sealing means 20 have their O-rings 56 and 60 respectively installed in the grooves 54 and 58 prior to assembly of the two members upon one another.

The terminology used in this specification is for the purpose of description and not limitation as the scope of this invention is defined by the claims.

What is claimed is:

1. A stab-type coupling joint for connecting an end portion of a smooth wall pipe to a fitting or another pipe, said coupling joint comprising:
   a body member having a passageway therethrough, stop means in said passageway to limit insertion of the smooth wall pipe, a bore defining a portion of said passageway and having a diameter to receive the smooth wall pipe, said bore terminating at its end from said stop means in an outwardly flaring frusto-conical surface, said body member having a cylindrical exterior configuration on the end portion which receives the smooth wall pipe; a tubular member having a bore extending from one end thereof with the bore having a diameter sufficient to telescopingly receive the cylindrical end portion of said body member, said last-mentioned bore terminating in an inwardly extending annular shoulder having an inner diameter at least as great as the diameter of the smooth wall pipe; a frusto-conical gripper ring having spaced slots extending from its smaller end to define gripping fingers, the smaller end of said gripper ring having a diameter less than the diameter of the smooth wall pipe; said annular shoulder of said tubular member and said frusto-conical surface of said body member defining a frusto-conical space receiving said frusto-conical gripper ring when said body member and said tubular member are telescoped together; means to lock said body member and said tubular member together against axial movement relative each other so as to retain said gripper ring in position while permitting relative rotation between the body member and the tubular member, said locking means including an annular groove in the bore of said tubular member, an annular groove on the cylindrical portion of said body member which cooperates with the groove of said tubular member to define an annular passage, and a ring-like element positioned entirely within said annular passage for locking the tubular member and the body member against axial movement but permitting their relative rotational movement; and, a first sealing means sealingly positioned between the bore of said tubular member and a cylindrical end portion of said body member and a second sealing means between said tubular member and the exterior of the smooth wall pipe, said second
3,924,882

sealing means being positioned outwardly of said gripper ring whereby it sealingly engages said tubular member along with said smooth wall pipe on a portion of the same not previously engaged by said gripper ring.

2. A stab-type coupling joint as claimed in claim 1 in which an opening is provided in said tubular member from its exterior to the groove in the bore and in which said ring-like element is a flexible retaining rod inserted through the opening into the annular passage.

3. A stab-type coupling joint as claimed in claim 1 in which said stop means is an annular shoulder in the passageway of said body member, said shoulder having an inner diameter less than the diameter of the smooth wall pipe.

4. A stab-type coupling joint as claimed in claim 1 in which said body member includes means to attach the same to the fitting or to another pipe.

5. A stab-type coupling joint as claimed in claim 4 in which said attachment means includes interior threads on a portion of said passageway in said body member.

6. A stab-type coupling joint as claimed in claim 4 in which said attachment means includes exterior threads on a portion of the body member's exterior surface.

7. A stab-type coupling joint as claimed in claim 1 in which said first sealing means includes an annular groove in the surface of the cylindrical end portion of said body member, a sealing ring in said groove, and in which said second sealing means is a groove in the annular shoulder of said tubular member and a sealing ring in said groove.

8. A stab-type coupling joint as claimed in claim 1 in which said frusto-conical gripper ring has a greater angle with a longitudinal axis of the joint than an angle of said frusto-conical surface of said body member has with the same axis, thereby providing a space between the exterior of said fingers of said gripper ring and said frusto-conical surface when said fingers are relaxed, said space being utilized when said fingers are flexed by insertion of the smooth wall pipe.

9. A stab-type coupling joint as claimed in claim 8 in which said frusto-conical gripper ring is continuous.