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ADJUSTABLE PLUMBING FITTINGS

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Fig. 1

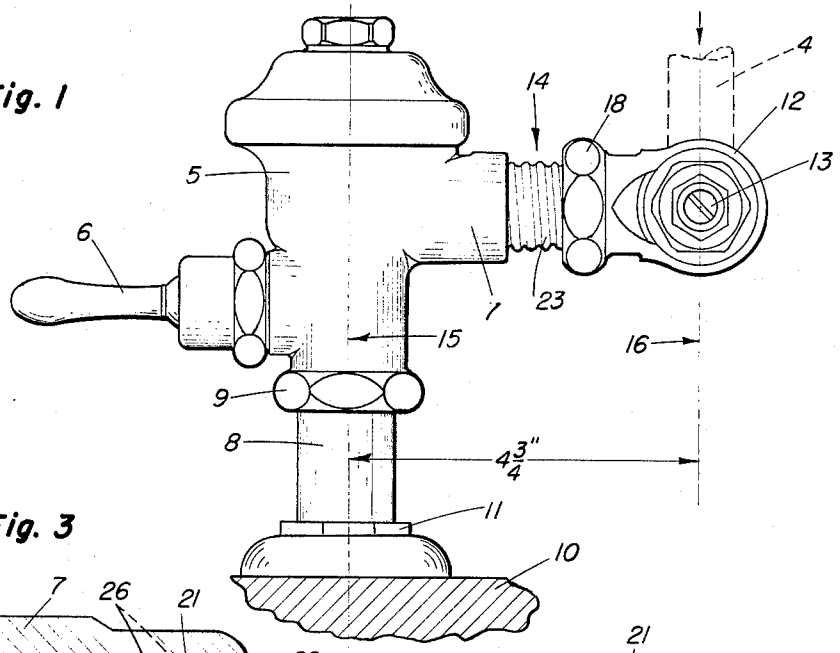
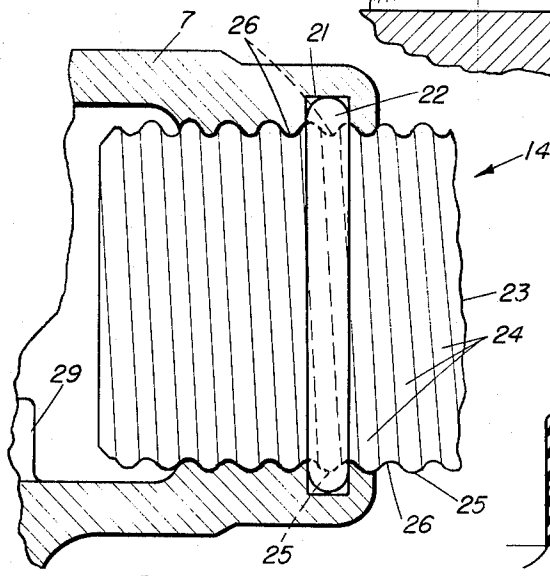


Fig. 3



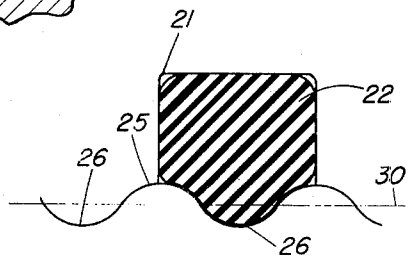


Fig. 4

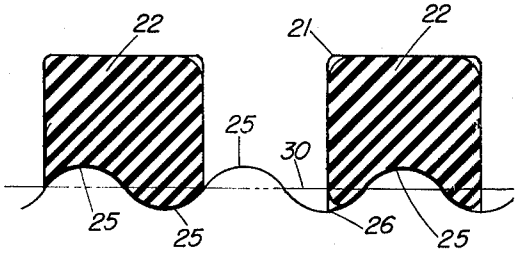


Fig. 5

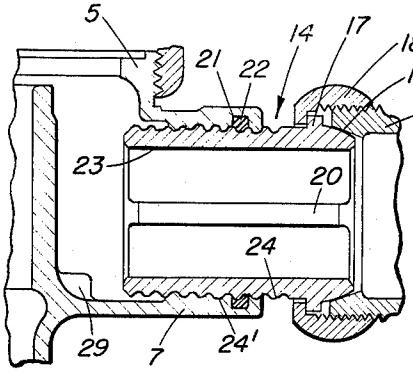


Fig. 2

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ADJUSTABLE PLUMBING FITTINGS

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This invention relates to fluid connections, but more particularly to fittings of the class which provide an adjustable length for a connection between two valves spaced a variable distance apart. More specifically, the invention is directed to plumbing fixtures such as water closets having a direct-connected flush valve for flushing the water closet and a control valve connected to the flush valve for controlling the inlet water supply. In common practice the flush valve is connected to the control valve by a fitting or nipple which is threaded into the inlet side of the flush valve and connected to the control valve by a ground-joint connection and coupling nut.

There are a number of problems which a plumber must consider when he installs plumbing equipment of the aforesaid type. For example, when he installs the water closet in its proper position with the flush valve on it so both are on the same center-line, he must be very careful to line up the inlet water supply pipe with the vertical center-line of the control valve to meet the factory set dimension of 4¾ inches which is standard throughout the plumbing trade. Any variation in the vertical dimension is readily compensated for by the usual slip-joint connection on the outlet flush tube extending from the bottom of the flush valve and connected to the closet bowl.

However, in the event that there is any variation in the roughing-in dimension between the supply pipe center-line and the flush valve due to carelessness or other reasons on the plumber's part, no adjustment can be made, because if the connecting nipple between the flush valve and control valve is disturbed or an attempt made to screw it in or out of the flush valve, leakage will occur. It is therefore necessary for the plumber to supply a new fitting or nipple of the correct length to establish the correct connection which he originally failed to achieve. This action causes undue delay in installation, increases costs, and is annoying to the installer. It also requires the plumber to have an assortment of different length fittings in stock and to carry them around on the job.

Many attempts have been made in the past to provide a fitting or nipple between the flush valve and its control valve, which would be adjustable in length so that any variations between the vertical center-line of the two valves could be compensated for without causing leakage. Ordinarily threaded pipe connections are not satisfactory because any adjustment once made could not be changed without causing leakage. The use of compression type fittings was not practical because of the danger of blowout or leakage at high water pressures, since the connection is on the inlet pressure side of the flush valve. There is also the problem of not having sufficient room between the flush valve and control valve, due to the short nipple length, so that any possible additional elements to provide the variable length adjustment, cannot be readily accommodated.

It is an object of the present invention therefore to provide a new and improved fitting or nipple for the above stated purpose which overcomes all the foregoing disadvantages, which is simple in construction, easy to apply, and economical to produce.

A further object is to provide a new and improved fitting which can be adjusted to provide for variations in center-line dimensions between the flush valve and control valve up to at least ¾ inch from the standard 4¾ inch dimension.

Another object is to provide a novel fitting between a flush valve and its control valve which will be leakproof regardless of how often an adjustment may be made.

Another object is to design a fitting having a ground-joint and coupling means at one end for connection with a control valve, and a special threading adjacent to the other end for adjustably threading the fitting in leakproof engagement with the flush valve.

An additional object is to provide a special knuckle type adjustable threading between the fitting and flush valve inlet, together with an O-ring sealing member engaging the threads of said fitting.

A further object is to provide an adjustable fitting which will not blow out on high pressures and which does not require extra sleeves, compression nuts, packing, etc., thereby enabling short fittings to be used.

Other objects, advantages and results will be apparent from the following description of a preferred form of the invention, reference being made to the accompanying drawing in which:

FIG. 1 is a plan view of a typical flush valve installation with the invention applied thereto;

FIG. 2 is an enlarged cross-section of a portion of an installation showing the novel fitting and its connections;

FIG. 3 is an enlarged cross-sectional view of the novel fitting; while

FIGS. 4 and 5 are diagrammatic enlarged showings of the novel threading and O-ring arrangement.

In FIG. 1, there is illustrated a well-known "Sloan Royal" flush valve 5 with the usual operating handle 6 and the inlet connection 7. The outlet flush tube 8 secured by a slip-joint connection and coupling nut 9, leads into a plumbing fixture 10, which may be either a water closet or a urinal. The spud nut 11 and associated flange and the necessary seal connect the fixture to the flush valve tube 8. In the type of installation shown in which the flush valve 5 is exposed, the water supply pipe 4 projects through the wall surface and is threaded into the rear of the control or throttle valve 12. The screw 13 in the valve 12 enables the water supply to the flush valve to be shut off, or to throttle the flow to the proper rate to suit the plumbing fixture. A fitting or conduit indicated generally at 14 connects the flush valve 5 with the control valve 12.

The flush valve 5 is always shipped with the fitting 14 already threaded into the inlet 7 and upon mounting the flush valve upon the water closet 10, the coupling nut 18 is merely tightened up to the receiving structure, in this instance a control valve 12, to complete the installation. However, it is not always possible for the installing plumber to properly bring out the water pipe 4 through the wall and have it come out to fit the manufacturer's standard dimension of 4¾ inches, which is the distance between the center-line 15 of the flush valve 5 and closet bowl 10, and the center-line 16 through the control valve 12 and the supply pipe 4. Sometimes it is possible to enlarge the hole in the wall through which the pipe 4 projects and to shift the piping slightly and then cover up the enlarged hole with the usual pipe flange. This can only be done when the necessary movement is small and in the case of tiled washroom walls, this is impossible to accomplish. The present invention makes it possible to compensate for variations in pipe roughing in up to at least ¾ inch to the right of center-line 16 and about ⅛ inch to the left of center-line 15. This is considered ample since most errors are made in the direction to the right side of center-line 16. The adjustments are accomplished with the novel fitting 14 without the use of extra coupling nuts, compression fittings or packing materials. The fitting 14

is simply roated or screwed into or out of the inlet connection 7 in the flush valve to the correct distance and then the coupling nut 18 is secured to the control valve.

As seen in FIG. 2, the means for securing the fitting 14 to the control stop 12 includes a flange portion 17 around the right hand end of fitting 14 which is engaged by a coupling nut 18, in turn threaded onto the body of the control valve 12. This clamps together the metal-to-metal ground joint 19 in leak-proof engagement. Fitting 14 comprises a hollow tubular member 23 having at least one rib 20 formed along its internal length for the purpose of accommodating a tool or arbor which is inserted in the fitting to enable the same to be screwed into or out of the inlet connection 7 of the flush valve.

The tubular fitting 23 is provided with external male threads 24 formed on its periphery throughout most of its length, and the inlet connection 7 with similar female internal threads 24^1 for mutual engagement with the fitting threads. The thread elements 24 and 24^1 are formed rather shallow and are smoothly rounded at the crest and root portions thereof and may be designated as knuckle type threads. They are similar to the type of thread commonly used on electric lamp bases and the sockets that they are screwed into. The fit between the knuckle thread on the fitting 23 and the inlet 7 is such that the fitting is easily screwed into the inlet, the threading being straight i.e.: continuously advancing along the common pitch circle 30 of the threads. These knuckle threads while relatively shallow, are still sufficiently strong to prevent any "blowout" of the fitting 23 from its engagement with the inlet 7 at high water pressures up to at least 150 pounds, such as may be encountered in practice on some installations. The threads are preferably eight threads to the inch and about .030 inch in depth with a .041 inch radius on the crest and root.

In order to provide for absolute leak-proof protective means through the knuckle threads 24 and outward of the inlet connection 7, an O-ring 22 is provided which encircles the threads of the fitting 23 and is recessed in the groove 21 formed internally of the inlet 7 and adjacent its outer end as shown. The O-ring 22 fits snugly into the groove 21 and projects normally outward of the groove a slight amount beyond the crest portion of the knuckle threads in the inlet 7 so that when the fitting is screwed into the inlet, the O-ring will be under some compression and slightly deformed so that it is squeezed into the groove 21 to almost fill up the entire groove except for the small portions on the top side of the groove as indicated. The O-ring thereby provides a static seal for the fitting to prevent leakage outward while the knuckle threads provide the blow-out protection on high pressures.

The peripheral recess 21 in the inlet 7 is arranged so that it is perpendicular to the axis of the inlet 7 and to the fitting 23, and therefore the O-ring in this recess is not parallel to the convolutions of the knuckle threads on the fittings. The pitch of the threads with respect to the O-ring is such that a portion of the O-ring engages a root portion 26 for example, then passes over in engagement with a crest portion 25 and into the root portion of the next adjacent thread, as is clearly seen in FIG. 3. The entire circumference of the O-ring therefore extends from root to crest to root of a single thread on the fitting, as the O-ring encircles the fitting to thereby form a strip or band of high pressure sealing engagement.

In its encirclement of the knuckle threads the O-ring 22 is deformed or squeezed onto the threads, as indicated diagrammatically in FIGS. 4 and 5. In FIG. 4 the O-ring is shown riding in the root 26 portion of one of the knuckle threads between the crest portions 25 on each side to provide a perfect seal while being compressed in the groove 21. In the left-hand side of FIG. 5, the O-ring is shown extending over the crest 25 of a thread where it is compressed its maximum amount and then into the root portion. At the right-hand side of FIG. 5 the O-ring is shown engaging a root portion 26 of a thread

while still being under some compression, then it rides over the crest 25 to the next root. In all positions the O-ring is compressed the same amount because, as shown in FIGS. 4 and 5, the cross-section areas are the same in all positions in which it is squeezed around the threads. The pitch of the threads is ⅛ inch and the cross-section of the O-ring is also ⅛ inch so the amount of compression is the same on the O-ring all around the threads. As shown, the vertical slot 21 is almost completely filled by the O-ring when the fitting is screwed into place.

In all positions of deformity of the O-ring 22 the seal is maintained and the degree of compression is such that the fitting 23 may be easily adjusted in or out of the inlet 7 without distorting, cutting or breaking the O-ring in its groove 21. The shallow knuckle type threads slide easily on the inner diameter of the O-ring. To assist this slipping action, the O-ring is preferably slightly coated with silicon fluid or other lubricant.

With the foregoing arrangement, any inaccurate roughing-in of the inlet pipe 4 is readily compensated for by merely adjusting the fitting 14 with respect to the inlet connection 7. This adjustment can be made repeatedly without affecting the leak-proof seal. Since most inaccuracies are made in dimensions greater than the standard 4¾ inches, the fitting 23 can be extended outward to as much as ¾ inch while any position toward the flush valve is adjustable around ⅛ inch. As best seen in FIGURE 2, the distance between the ends of the thread element spans the range of adjustment of the conduit with respect to the nipple. The inner extent of movement of the fitting is limited by the stop 29, inside the flush valve or the coupling 18 engaging the flush valve inlet 8.

While the invention has been described and illustrated as applying to a specific purpose, namely, a flush valve installation, it is to be understood that it is equally capable of use in other types of installations involving leak-proof and pressure-proof connections of many kinds where an adjustment is required between two fixed elements. The use of the terms "flush valve" and "control valve" is for the purpose of illustration, not limitation.

What is claimed is:

1. A plumbing fitting for rapidly connecting in high pressure sealing engagement and disconnecting two plumbing fixtures such as a flush valve and a control valve which may be spaced variable distances apart initially, and for rapidly making subsequent rapid non-destructive high pressure connections and disconnections between the plumbing fixtures within the range of adjustment of the fitting, said plumbing fitting comprising

a conduit, and

structure for connecting the conduit to a receiving structure in high pressure sealing engagement therewith, said structure including

a continuously advancing thread element formed on the periphery of the conduit,

the axial length of the thread element defining the range of adjustment of the conduit with respect to the receiving structure and flanking a high pressure sealing engagement band between the receiving structure and the conduit,

a second continously advancing thread element formed about the periphery of an aperture in the receiving structure,

the thread elements having opposed, interengaging crests and roots,

said thread elements being formed with a clearance therebetween sufficient to enable the elements to be quickly and easily rotated into and out of engagement with one another,

the overlap between opposed roots and crests being sufficiently deep to substantially prevent blow-out at high fluid pressures,

a peripheral recess coaxial with and having the side wall thereof normal to the axis of said conduit formed in one of the thread elements within the

range of adjustment of the fitting, the axial length of the recess being at least equal to the pitch of said thread elements, and

an annular elastomeric sealing member disposed within said recess,

said sealing member, in an undistorted condition, incompletely filling the recess and having an inner diameter less than the common pitch circle of the thread elements,

said sealing member, when distorted and in engagement with the recess and the root and crest of the opposing thread element, substantially filling the entire area defined by the recess and the root and crest of the thread element opposing said peripheral recess thereby overlapping and making sealing engagement with a complete turn of a thread element and forming a band of high pressure sealing engagement,

the roots and crests being sufficiently rounded to avoid

destruction of the distortable member upon repeated assembling.

2. The plumbing fitting of claim 1 further characterized in that the roots and crests of the thread elements are at least .030 inch in depth and have a radial dimension of at least .041 inch.

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