

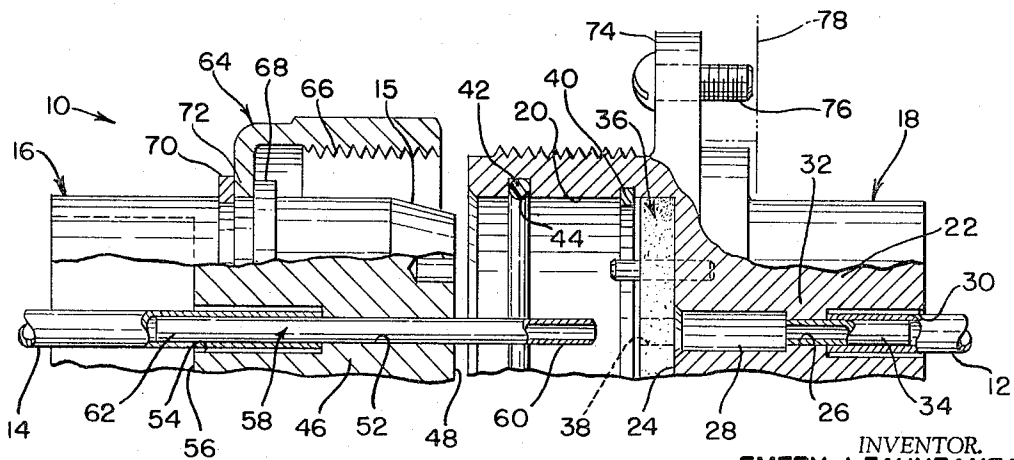
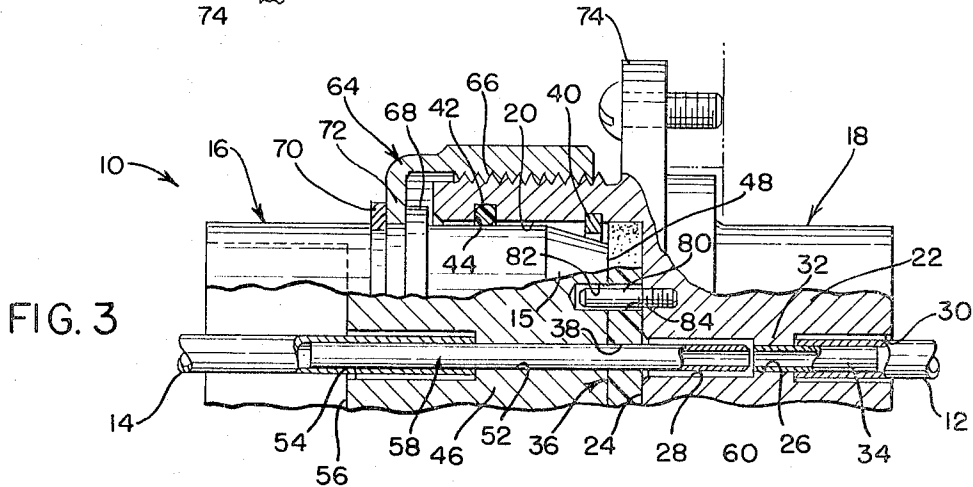
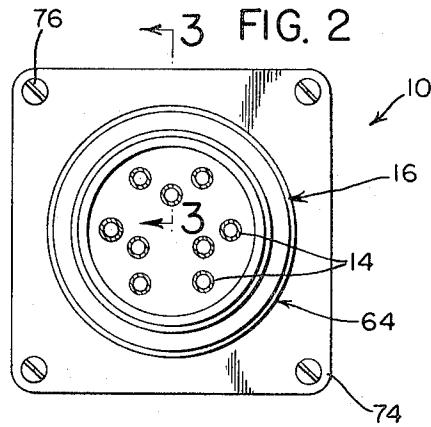
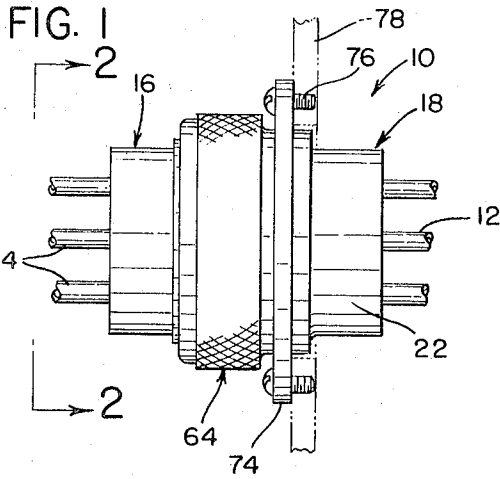
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QUICK-CONNECT DEVICE FOR MULTIPLE FLUID LINES

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QUICK-CONNECT DEVICE FOR MULTIPLE FLUID LINES

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This invention is concerned with coupling devices having particularly useful application in connecting together a multiplicity of noncommunicating fluid lines and, more specifically, it is concerned with a coupling device of that type commonly referred to as a quick-connect.

The relatively rapid expansion of the processing and instrumentation industries over the past few years has underlined the need for a coupling device which may be used in simultaneously connecting and disconnecting a multiplicity of fluid conducting lines. In these industries, it is often necessary to couple a large number of relatively small lines used in feeding gauges, metering apparatus, test equipment, process control devices and other instruments of the type commonly used in connection with large control panels and the like.

In the case of complex panels, test chambers and so on, scores of feed lines and other fluid conduits may form a part of the system. It is necessary in systems of this type to connect and disconnect these fluid feed lines for purposes of cleaning, maintenance and replacement of various system components and test fixtures. Usually, this necessity is repeated with a relatively high degree of frequency.

In the past, it has not uncommonly been the practice to fit each line with one or more separate connectors. Obviously, the task of individually connecting and disconnecting a number of such lines each time it is necessary to do so can and does reach sizeable proportions in terms of time expenditure and human effort. This unhappy fact is reflected in the high cost of operation and maintenance.

In order to conserve time and effort in coupling and uncoupling multiple lines of the type described, this invention contemplates the use of appropriate means by which a single coupling device may be used for the purpose of connecting and disconnecting plural lines, thus to minimize the problems which have heretofore prevailed in operating and maintaining complex fluid handling equipment and installations of the type prevalent in instrumentation, processing and testing environments.

While multiple line connectors broadly have formed a part of the known technology for some time, it is common knowledge that the devices presently in use are not particularly well adapted to satisfying the rather demanding requirements of the highly sophisticated environments in which such connectors have present day application.

The inadequacies of known multiple line connector designs stem from one or more of a relatively large number of factors depending upon the particular circumstances of each case. However, it may be said generally that these designs are not sufficiently refined to satisfy the exacting set of parameters within which they must function.

Perhaps one of the most common and perplexing shortcomings of prior art designs is to be found in the lack of sufficiently positive sealing characteristics to provide requisite dependability. It has also been found difficult to find in the prior art coupling devices adequate insurance against incorrect orientation of one set of fluid lines relative to another. As in all design matters, simplicity, economy in manufacture and durability in use have been consistent problems confronting the industry.

With the foregoing considerations in mind, it is an object of the invention to provide a coupling device suited for connecting simultaneously a relatively large number of

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noncommunicating fluid lines in a rapid and efficient manner.

It is a further object of the invention to provide in a coupling device of the type described means to insure a positive, dependable, leak-tight seal about each of the fluid conducting members interconnected by the device.

It is an even further object of the invention to provide a coupling device for plural noncommunicating fluid lines which will insure proper orientation between respective ones of such lines, thereby to prevent inadvertent interconnection of lines not intended to communicate with one another.

It is another object of the invention to provide a coupling device of the type described which is sufficiently economical to manufacture and maintain and sufficiently lacking in complexity to be commercially feasible.

Other and further objects will be apparent from the detailed description to follow.

In the drawings wherein for purposes of simplicity but one concrete embodiment of the invention is disclosed,

FIG. 1 is a side elevational view of a coupling device embodying the essential principles of the invention;

FIG. 2 is an end view of the coupling device shown in FIG. 1 and taken along line 2-2 of that figure;

FIG. 3 is a fragmentary sectional view in enlarged scale taken along line 3-3 of FIG. 2 and showing the male and female coupling members interconnected with one another to establish fluid communication between multiple lines, and

FIG. 4 is a view similar to FIG. 3 in which the male and female coupling members are shown in disconnected relationship.

By this invention, it is possible to couple together a multiplicity of fluid lines in such a way as to establish at the coupling a dependable leak-tight relationship between the coupling parts. This improved result is obtained through the use of suitable elastomer sealing means placed by the coupling parts under positive compression of adjustable magnitude. Cooperating locator means is provided to insure proper orientation between coupling members prior to assembly and thereby avoid the possibility of establishing fluid communication between lines not intended to assume such relationship. The ease and rapidity with which multiple lines may be connected and disconnected using a coupling device which embodies the essential principles of the invention represents a considerable advantage over prior designs.

Referring now more specifically to the drawings, I have shown a device indicated generally at 10 for simultaneously connecting a multiplicity of noncommunicating fluid lines 12 and 14. The coupling device 10 includes male and female coupling members 16 and 18, respectively.

The female coupling member 18 is provided with a generally axially extending inwardly directed socket 20. A partition means 22 defines a transverse bottom wall 24 at the inner end of socket 20. Transverse bottom wall 24, in the illustrated embodiment, lies in a plane generally perpendicular to the longitudinal axis of the female coupling member 18.

A multiplicity of bores 26 are formed through partition means 22 on axes generally parallel to the central longitudinal axis of female coupling member 18. Suitable means is provided for establishing fluid conducting communication between each bore 26 and a corresponding fluid line 12 and male nipple member to be described hereinafter. To the accomplishment of this purpose, in the illustrated embodiment, coaxial counterbores 28 and 30 have been provided at the forward and rearward ends, respectively, of each bore 26. Mounted within the central reduced diameter portion 32 of each bore 26 as by means of press fitting, brazing or the like, is a hollow, gen-

erally cylindrical stem 34 which extends rearwardly into counterbore 30 defining a radial clearance with respect thereto. Each fluid line 12 is inserted into its corresponding counterbore 30 and over the rearward end portion of one such stem 34 and is maintained in place by friction or any other suitable means.

Received within socket 20, in face to face engagement with transverse bottom wall 24, and, in the illustrated embodiment, carried by female coupling member 18, is a generally flat elastomer pad 36 having a shape and size generally complementary to that of the socket. A plurality of apertures 38 are formed through pad 36 on axes generally parallel to the central longitudinal axis of female coupling member 18, and when the pad is in operative position, such apertures are in register with the counterbores 28. A suitable snap ring 40 may be provided, if desired, to retain elastomer pad 36 in position within socket 20.

Supplementary sealing means 42, disposed in internal annular groove 44 at the forward end portion of socket 20, may be employed to engage the external surface of the forward end portion of the male coupling member 16 to provide added protection against fluid leakage.

Male coupling member 16 has a forward end so configured and proportioned as to be snugly received within socket 20 of female coupling member 18 when the device is assembled. The male member 16 includes partition means 46 having a transverse end wall 48 shown in the illustrated embodiment as lying in a plane generally perpendicular to the longitudinal axis of the male coupling member. As seen in FIG. 3, when the male and female coupling members are connected, transverse end wall 48 lies in substantially axially spaced opposed parallelism with respect to bottom wall 24 and in face to face engagement with elastomer pad 36.

The forward terminus of male coupling member 16 is tapered or beveled as at 15 so as to clear the radially inwardly projecting edge of snap ring 40 when the forward end of the male coupling member is inserted into socket 20 of female coupling member 18.

A suitable means is provided for mounting fluid lines 14 to the male coupling member 16. In the illustrated form of the invention, such means includes a plurality of bores 52 extending through partition means 46 on axes generally parallel to the central longitudinal axis of the male member. As seen in the drawings, the bores 52 are substantially coaxial, when the coupling members are connected, with their counterparts formed in the partition means 22 of female coupling member 18.

Each bore 52 includes a coaxial counterbore 54 formed in the rearward portion thereof and extending axially forwardly from the rearward face 56 of partition means 46. Affixed within each bore 52 by press-fitting, brazing or the like, is a hollow elongated male nipple member 58. Each such male nipple member includes a forward portion 60 extending a substantial distance longitudinally beyond transverse end wall 48 and of a size and shape to be inserted through a corresponding aperture 38 in elastomer pad 36 into a mating counterbore 28 in female coupling member 18.

Rearward portion 62 of each male nipple member 58 extends longitudinally through counterbore 52 and somewhat beyond rearward face 56 of partition means 46. A radial clearance of appropriate magnitude is defined between the external surface of rearward portion 62 of the male nipple member and counterbore 54 so as to permit the terminal portion of a corresponding fluid line 14 to be mounted, as by friction or the like, upon the portion 62 of the male nipple member.

Quite obviously, the illustrated means for attaching lines 12 and 14 to male and female coupling members 16 and 18, respectively, is particularly suited for use in connection with low pressure applications. Where high pressure lines are to be coupled, however, it may be

desirable to utilize means of a design giving rise to greater holding power.

For the dual purpose of connecting male and female coupling members 16 and 18, respectively, together, a coupling nut 64 of suitable design may be employed. Means, such as mating threads 66, is utilized to interlock coupling nut 64 with female coupling member 18. In order that the coupling nut may be mounted upon male member 16 for rotational movement, a radial flange 68 is provided on the periphery of such male member, and longitudinally spaced therefrom is a snap ring 70 such that the radially inwardly turned internal flange 72 of coupling nut 64 may be disposed in axially locked relation therewith.

If desired, the female coupling member 18 may be provided with an external mounting flange 74 apertured to receive fastening members 76 to adapt the coupling device for mounting upon a bulkhead 78 or the like seen in phantom in FIGS. 1, 3 and 4.

In order to insure proper orientation between respective male nipple members and the bores in the female member with which they are adapted to mate, a locator lug or guide pin 80 is mounted in one of the coupling members. A cavity 82 is provided in the other member and receives the forward end portion of the locator lug or guide pin 80 when the coupling members are interconnected. Aperture 84 is provided in elastomer pad 36 to permit guide pin 80 to extend therethrough to be received into such cavity. Through the use of a guide pin arrangement of the type hereinbefore described, inadvertent interconnection of fluid lines not intended for communication can be prevented.

In operation, when it is desired to establish connections between the multiplicity of fluid lines 12 and 14, the male and female coupling members 16 and 18 are aligned as shown in FIG. 4. The forward end portions 60 of the male nipple members 58 are subsequently inserted through corresponding apertures in elastomer pad 36 into their respective counterbores 28, guide pin 80 in the meantime serving to cause a proper orientation of the various nipples and bores. Coupling nut 64 is then taken up on the mating threads provided on the female coupling member 18 to bring transverse end wall 48 of male coupling member into face to face engagement with elastomer pad 36. By further taking up the coupling nut 64, compression of desired magnitude may be exerted upon elastomer pad 36, thereby to cause the same to flow tightly against the external surfaces of the various male nipple members 58 and establish a fluid-tight seal therearound. When it is desired to disconnect the coupling members, a reverse procedure is followed.

Thus, it will be seen that by this invention it has been possible to provide a highly efficient device by which a multiplicity of noncommunicating fluid lines may be coupled simultaneously without the necessity of reverting to separate connections for establishing joints individually between each of the lines to be coupled. It is further possible, using a device embodying the underlying principles of the invention, to optimize coupling performance and dependability and to insure a positive, leak-tight seal at each joint.

For ease of description, only one embodiment of the invention has been illustrated and described. Quite obviously, however, the basic principles of the invention may be employed in designs other than that shown without at the same time departing from the true spirit of the invention. Consequently, it is my desire to be limited only by the scope of the appended claims.

I claim:

1. A coupling for multiple fluid lines comprising:
 - (a) a female coupling member having an end with an inwardly extending generally axially directed socket;
 - (b) transverse bottom wall defining means at the inner end of said socket;

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- (c) a male coupling member having an end received within said socket when the coupling members are connected and provided with transverse end wall defining means opposed to the bottom wall defining means of the socket;
- 5 said male coupling means having its said end axially separated from said socket bottom wall and defining therewith a fully enclosed annular cavity;
- (d) a plurality of elongated hollow male nipple members generally parallel to the axis of the coupling, said male nipple members being carried by one of said wall defining means and projecting longitudinally therebeyond;
- 10 (e) a plurality of bores provided in the other of said wall defining means and aligned with the male nipple members when the coupling is connected;
- (f) elastomer sealing means disposed between said end and bottom wall defining means with said sealing means being characterized in that it substantially fills the cavity at least between the transverse bottom wall defining means and the transverse end wall defining means when the coupling members are interconnected;
- 20 (g) a plurality of apertures provided through said elastomer sealing means with the number of said apertures being at least equal to the number of said male nipple members and of a size and shape generally corresponding to that of the male nipple members, said male nipple members extending through and beyond corresponding ones of such apertures into corresponding bores of said other wall defining means when the coupling members are connected;
- 30 locator lug means comprising a pin carried by one of said wall defining means with the axis of said pin being generally parallel to the axis of the coupling;
- 35 a cavity formed in the other of said wall defining means adapted to receive said lug means when the coupling is connected;
- an aperture in said sealing means through which said

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- pin projects at least when said coupling members are interconnected;
- (h) means to connect the nipple members and said bores, respectively, with appropriate fluid lines, and
- (i) means to draw the male and female coupling members together into connected relationship and to compress the elastomer sealing means between the wall defining means and against the external surfaces of the male nipple members to establish a fluid seal between the coupling members;
- said last mentioned means including a coupling nut rotatably received over the end of one of said coupling members;
- means restraining said coupling nut from movement longitudinally of said one member;
- means on the exterior of the other of said coupling members adapted to cooperate with said coupling nut thereby to connect the coupling members.
2. A coupling as defined in claim 1, further including supplementary sealing means carried by one of said members and in engagement with the other of said members when the coupling members are interconnected for preventing leakage between said socket and the male coupling member.

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