Dec. 20, 1932. H. ERNST 1,891,670

MULTICONNECTION HYDRAULIC CABLE

Filed Nov. 28, 1930 2 Sheets-Sheet 1

Fig. 1

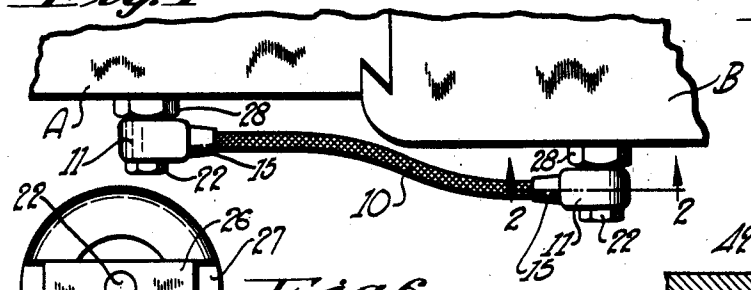


Fig. 3



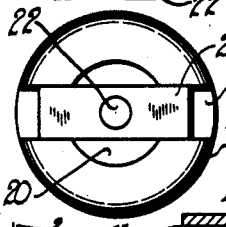


Fig. 6

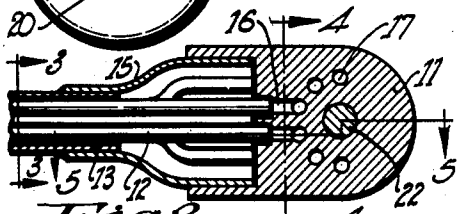


Fig. 2

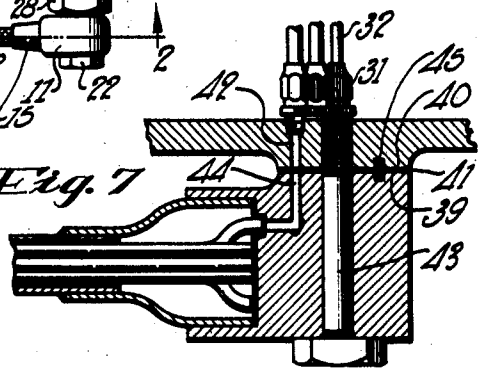


Fig. 7

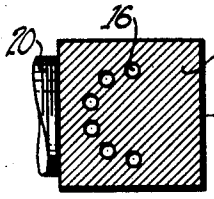


Fig. 4

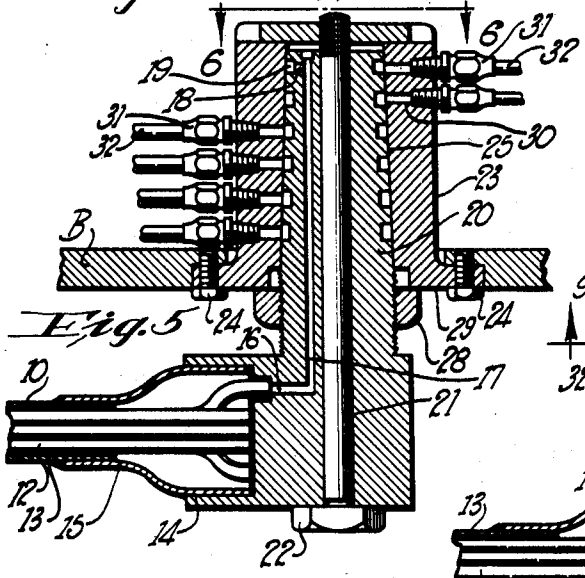


Fig. 5

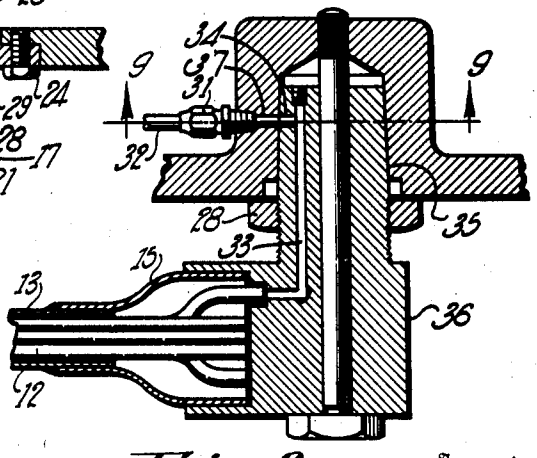


Fig. 8

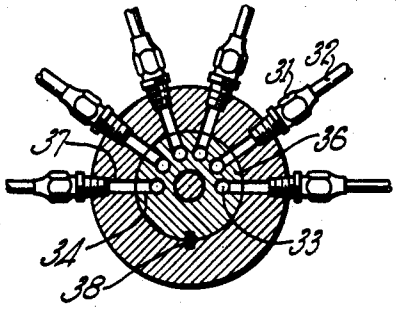


Fig. 9

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Dec. 20, 1932. H. ERNST 1,891,670

MULTICONNECTION HYDRAULIC CABLE

Filed Nov. 28, 1930 2 Sheets-Sheet 2

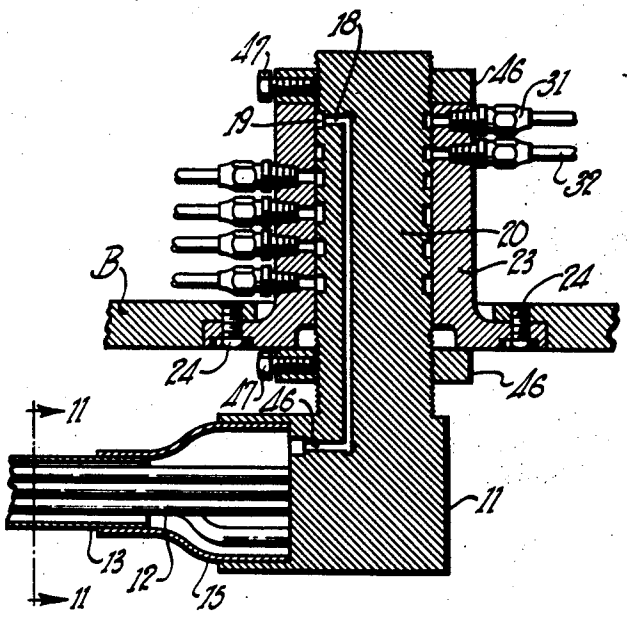


Fig. 10

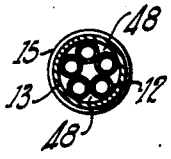


Fig. 11

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UNITED STATES PATENT OFFICE

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MULTICONNECTION HYDRAULIC CABLE

Application filed November 28, 1930. Serial No. 498,633.

This invention relates to fluid conveying devices and more particularly to a new and improved multiple channel hydraulic cable connector.

Hydraulic machinery, in general, is usually composed of a power unit and an actuated unit, one of which is connected to the other by channels of a sufficient number to carry out the functions of the machine. For the convenience of manufacture and assembly these units may be built separately and afterwards assembled on a main structure to produce a complete operative machine. Since these units are usually spaced from one another, due to principles of design, the pipes must be extended from one to the other, sometimes through narrow confined spaces involving a considerable expenditure of time. Upon disassembly for repairs or other reasons, it is, therefore, necessary to make a number of pipe disconnections before one unit may be separated from the other. Furthermore, on reassembly, besides the necessity of reconnecting all the pipes, there is always the possibility of error, due to the number of pipes, which might result in damage to the machine upon starting up.

For these and sundry other reasons it is one of the objects of this invention to provide an improved means for simplifying the establishment of fluid communication between spaced groups of hydraulic transmission line termini.

Another object of this invention is to provide an hydraulic cable connector comprising a multi-channel cable terminating in multi-channel union couplings whereby a plurality of hydraulic transmission lines may be simultaneously connected with their respective continuations thereof.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification considered in conjunction with the accompanying drawings, illustrative of one embodiment thereof, but it will be understood that any modifications may be made in the specific structural details hereinafter disclosed, within the scope of the appended claims, without departing from or exceeding the spirit of the invention.

Referring to the drawings in which like reference numerals indicate like parts:

Figure 1 is a plan view showing one application of the present invention.

Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is a section on the line 4—4 of Figure 2.

Figure 5 is a longitudinal section on the line 5—5 of Figure 2.

Figure 6 is a detail end view as taken on the line 6—6 of Figure 5.

Figure 7 is a sectional view, similar to Figure 5, showing a modified form of the invention.

Figure 8 is a sectional view showing another form of the invention.

Figure 9 is a detail section on the line 9—9 of Figure 8.

Figure 10 is a detail showing a rotatable connector.

Figure 11 is a section on the line 11—11 of Figure 10.

In Figure 1 the cable connector forming the subject matter of this invention is shown for illustrative purposes as connecting together two units A and B in which one of the units, such as the unit A, is detachably mounted on the unit B. It will be understood, of course, that the unit A may instead be adjustably mounted on the unit B for relative movement thereon or the units may be physically separate and still be within the contemplation of this invention.

The hydraulic connector comprises in general the cable portion 10 having secured to each end thereof couplings 11. As more particularly shown in Figures 2 and 3, the cable portion 10 comprises a plurality of tubes 12 which may be of any desirable number grouped together in cylindrical form and surrounded by an outer sheathing 13 of pressure resisting and leak-proof material, such as woven metal hose. Each coupling 11 is provided with a counter bore 14 in which is received a ferrule 15 for enclosing the end of

the sheathing 13. Since the sheathing is preferably of woven metal it may be connected to the ferrule by soldering, brazing or other affixing operation. The coupling is further provided with a plurality of bores 16 arcuately arranged, as shown in Figure 4. The enlarged space in the mouth of the ferrule permits the tubes to be spread out and a separate tube inserted in each bore 16 and suitably soldered or brazed therein. The bores 16 terminate in passages 17 at right angles thereto, each of which has a port 18 connecting the passage with an annular groove 19 formed in the periphery of the tapered portion 20 of the coupling. The coupling is further provided with a longitudinal bolt hole 21 for receiving a clamping bolt 22.

As shown in Figure 5, a header 23 is provided which is adapted to be permanently secured to one of the units as by bolts 24. This header has a tapered bore 25 complementary to the taper on the coupling and is adapted to tightly receive the same without leakage. For convenience of manufacture a cross bar 26 is mounted in a cross slot 27 formed in the end of the header and provided with a threaded hole for receiving the lock bolt 22 whereby upon tightening of the bolt the coupling will be firmly secured within the header. To facilitate disassembly a nut 28 is threaded on the coupling and adapted to bear against the face 29 of the header whereby upon rotation of the nut the coupling will be withdrawn from the header.

The annular grooves 19 make it possible to drill the radial outlets 30 at any point around the periphery of the header 23. A single outlet is drilled for each annular groove and has its exterior end threaded to receive a coupling 31 by which the tube 32 is connected to the header. By this construction the tubes may be run from the header in a more direct manner eliminating sharp bends which might impede the flow of an hydraulic medium and also eliminates the necessity for accurately positioning the portion 20 circumferentially in its bore which means that the cable may approach from any angle in its plane. From this construction it should also be apparent that if the header 23 were a part of a detachable unit hydraulically connected to a main unit and it became necessary to disassemble it therefrom that the termini of each pair of connected channels would be readily parted by loosening the bolt 22 and rotating the nut 28 after which the coupling 11 may be removed from the unit leaving it free to be removed from the main unit. To establish reconnection these operations would be repeated in reverse order. It is also to be noted that due to the predetermined sequence or positioning of the grooves 19 and the positioning of the corresponding ports in the header that either end of the cable may be attached to a particular header and the remaining end attached to the other header.

A simplified form of this construction is illustrated in Figures 8 and 9 in which the longitudinal channels 33 are each provided with a port 34 which extend radially in a single plane at right angles to the axis of the tapered portion 35 of the coupling 36. In such a construction it is necessary to accurately position the coupling angularly in its bore to insure that the radial ports 34 register with the radial outlets 37. This may be accomplished by providing a key, such as 38 or other suitable means, which will positively insure the proper angular position of the coupling

In some instances it may be necessary to make a connection directly to a wall or other flat surface and a construction such as shown in Figure 7 may be utilized in which the coupling is provided with a flat surface 39 adapted to abut the surface of a boss 40 with a suitable leak-proof gasket 41 interposed between the surfaces. The outlet channels 42 are arranged circumferentially around the axis of the connecting bolt 43 in a similar manner to the longitudinal channels 44 in the coupling and to insure correct registry of each channel with its outlet a dowel pin, such as 45, may be utilized to circumferentially position the coupling on the boss.

As previously mentioned, it is sometimes necessary to maintain fluid connection between a fixed unit and a movable unit and for this purpose a flexible connection may be utilized. By the use of known forms of flexible tubing of which the tubes 12 may be made, the cable 10 as a whole, may be given a certain amount of flexibilty. However, it is not susceptible to sharp bends and to reduce the amount of bending an oscillating adjustable coupling has been provided, as shown more particularly in Figure 10, which is similar in construction to that shown in Figure 5. The coupling is provided, however, with adjusting nuts 46 threaded upon opposite ends of its tapered portion 20. The nuts are provided with set screws 47 for locking them in position after the coupling has been longitudinally adjusted in its tapered bore to insure a reasonably leak-proof fit compatible with the ability to be rotated in its bore without the expenditure of a great amount of force.

Attention is invited to the fact that in the illustrations in Figures 2, 3 and 5, each of the tubes in the cable has been connected to an individual tube in the coupling but since in many hydraulic systems there is usually a low pressure return line one of the tubes in the cable may be eliminated and the spaces around and in between the tubes, such as 48 in Figure 11, may be utilized for this low pressure return into which a low pressure line, such as 49, in the coupling may discharge. This makes it possible to reduce the

size of the cable somewhat, as well as provide lubricant around the exterior surfaces of the enclosed tubes, if the hydraulic medium should happen to be oil, which would reduce the amount of friction between the tubes during bending thereby adding to the flexibility of the cable.

From the foregoing description considered in connection with the accompanying drawings, it should now be apparent that a multiple channel cable connector has been provided which may be utilized for running a plurality of hydraulic transmission lines from one point to another, and which is especially adaptable for hydraulically connecting a removable hydraulic unit with a main unit; or a unit that is movable upon another and which requires a flexible connection in order to permit such movement.

That which is claimed is:

1. An hydraulic connector comprising a multi-channel cable, coupling means secured to the end of the cable, said coupling means comprising an elbow having a tapered shank, the channels of said cable terminating in outlet ports formed in said shank, an associate member having a tapered socket for receiving the shank, outlet channels formed in the member registering with the ports of said elbow, means for securing the parts together to simultaneously establish flow communication between the individual ports and the channels, and additional means for disassembling the parts, said last named means comprising an ejecting member threaded on said shank and into engagement with said associate member.

2. In a device of the class described for coupling a plurality of different pressure lines in one member with the respective continuations of said lines in a second member, the combination of headers adapted to be fixed to each member having a plurality of ports therein, means to connect each line of the respective members with an individual port in the respective headers, channel means connecting together the ports of the respective headers comprising a cable formed of a plurality of flexible tubes, a coupler secured to each end of the cable, a plurality of ports formed in each coupler, means to connect the terminals of each tube with a port of each coupler and means to secure the couplers in the headers with their respective ports in registry whereby each line in one member will be simultaneously connected to its continuation in the second member.

3. In a device of the class described for coupling a plurality of different pressure lines in one member with the respective continuations of said lines in a second member, the combination of headers adapted to be fixed to each member having a plurality of ports therein, means to connect each line of the respective members with an individual port in the respective headers, channel means connecting together the ports of the respective headers comprising a cable formed of a plurality of flexible tubes, a coupler secured to each end of the cable, a plurality of ports formed in each coupler, means to connect the terminals of each tube with a port of each coupler, means to secure the couplers in the headers with their respective ports in registry whereby each line in one member will be simultaneously connected to its continuation in the second member, said means comprising a clamping bolt passed thru one of said members and threaded in the other for drawing the parts together, and independent means on each coupler to effect its disconnection from its respective headers upon withdrawal of the clamping bolt.

4. An hydraulic connector for coupling a plurality of different pressure lines in one member with the respective continuations of said lines in a second member comprising the combination of headers adapted to be fixed to each member, said headers having a plurality of ports therein, means to connect each line of the respective members with an individual port in the respective headers, a flexible connector between the headers comprising a plurality of tubes, a tubular fluid-tight sheave surrounding said tubes to form a cable having interstices between the tubes, a coupler secured to each end of the cable, a plurality of ports formed in each coupler, means to connect the terminals of each tube with a port in each header, one of said ports in each header communicating with the interstices between the tubes, and means to secure the couplers in the headers with their respective ports in registry whereby the tubes will serve to connect certain lines in one member with their continuations in the second member and the interstices will serve to connect an additional line in one member with its continuation in the other member.

5. An hydraulic connector for coupling a plurality of pressure lines in one member with the respective continuations of said lines in a second member spaced from the first comprising the combination of headers adapted to be fixed with each member, said headers having a plurality of ports therein, means to connect each line of the respective members with an individual port in the respective headers, a flexible connector between the headers comprising a plurality of tubes one less in number than the number of ports in a header, a tubular fluid-tight sheave surrounding said tubes to form a cable having interstices between the tubes, a coupler secured to each end of the cable, a plurality of ports formed in each coupler equal in number to the ports in a header, one of said ports in each header communicating with the interstices between the tubes and means to secure the couplers in the headers with their respective

ports in registry whereby the tubes will serve to connect certain lines in one member with their continuations in the second member, and the interstices will serve to connect an additional line in one member with its respective continuation in the other member.

6. In a device of the class described for coupling a plurality of different pressure lines in one member with the respective continuations of said lines in a second member, the combination of headers adapted to be fixed to each member, each header having an axially tapered socket therein, a plurality of axially spaced ports intersecting said socket, means to connect each line of the respective members with an individual port in the respective headers, a flexible connector between the headers comprising a cable formed of a plurality of flexible tubes, a coupler secured to each end of the cable, said coupler having a tapered shank fitting the socket of said headers, a plurality of axially spaced annular grooves on the shanks adapted to register with the ports and said headers, means to connect the terminals of each tube with a groove in each coupler, and means to secure the shanks of the couplers in the sockets of the headers whereby each line in one member will be simultaneously connected to its continuation in a second member.

7. In a device of the class described for coupling a plurality of different pressure lines in one member with the respective continuations of said lines in a second member, the combination of headers adapted to be fixed to each member, each header having an axially tapered socket therein, a plurality of circumferentially spaced ports lying in the same plane intersecting said socket, means to connect each line of the respective members with an individual port in the respective headers, flexible channel means for connecting the headers comprising a cable formed of a plurality of flexible tubes, a coupler secured to each end of the cable, said coupler having a tapered shank fitting the socket of said headers, a plurality of radial ports formed in the shanks adapted to register with the ports and said headers, means to connect the terminals of each tube with a radial port in each coupler, and a locking bolt to secure the shanks of the couplers in the sockets of the headers whereby each line in one member will be simultaneously connected to its continuation in the second member.

8. In a device of the class described for coupling a plurality of hydraulic channels in one member with the respective continuations thereof in a second member remote from the first, the combination of multi-ported headers in each member to the ports of which the respective channels are connected, means to connect the ports of one header with corresponding ports in the other header comprising a multi-tubed cable having couplers on each end thereof, the tubes in said cable terminating in a port in each coupler, and means to connect the couplers detachably to said headers with their respective ports in registry whereby each channel in one member will be simultaneously connected to its continuation in the second member.

9. In a device of the class described for coupling a plurality of hydraulic channels in one member to the respective continuations thereof in a second member the combination of multi-ported headers in each member, means to connect the respective channels to a respective port in the headers, each header having its ports arranged in a predetermined sequence, means to connect the ports of one header with the corresponding ports in the other header comprising a multi-tubed cable having couplers on each end thereof, the tubes in said cable terminating in ports in each coupler, the ports in each coupler being arranged in the same predetermined sequence and in accordance with the port sequence of the headers whereby either end of the cable may be attached to one member and the opposite end attached to the remaining header.

In testimony whereof I affix my signature.

HANS ERNST.