

(21) Application No: 1020096.2

(22) Date of Filing: 26.11.2010

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(51) INT CL:
F16L 11/127 (2006.01) F16L 25/01 (2006.01)
F16L 37/407 (2006.01) H01R 13/00 (2006.01)

(56) Documents Cited:
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DE 002212656 A1 US 5810048 A1
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(58) Field of Search:
INT CL F16L, H01R
Other: EPODOC, WPI

(54) Title of the Invention: **A fluid supply and data communication system and couplings for use in such a system**
Abstract Title: **A combined fluid coupling and data communication connection**

(57) A combined fluid supply and data communication conduit comprising a fluid supply duct / pipe 2, a data communication cable / wire 10 within the pipe, at least one end of the duct having a coupling 5 comprising a fluid tight valve 8 which is closed when the coupling is uncoupled (shown) and opened when the coupling is coupled, wherein the coupling comprises a data connection terminal 12 connected to the cable. The data cable may be an electrical wire for providing audio / radio link, or may be an optic fibre cable for a camera link, amongst others. The data terminals may be concentric, spring mounted, etc. Contactless RF induction coupling may alternatively be used to transmit data for safety reasons (fig. 7). Preferably air is fed in the pipe to a user on an oil-platform. Other independent claims relate to mating components of a releasable combined fluid supply and communications coupling, a retro-fit data communication connector and a retro-fitted adaptor.

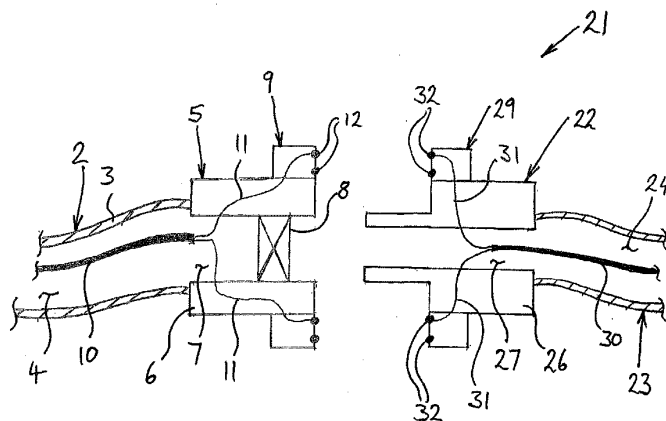


FIGURE 2

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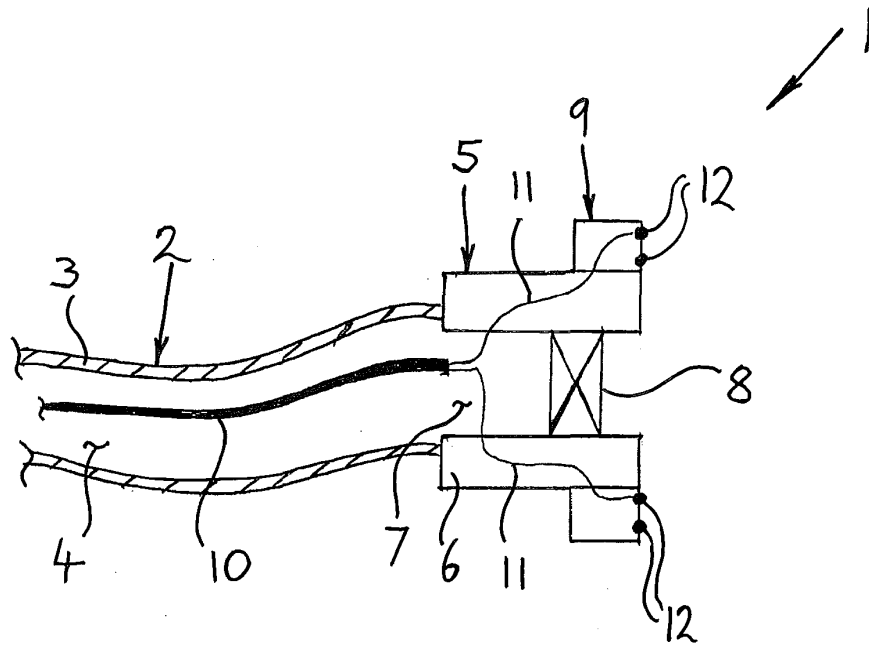


FIGURE 1

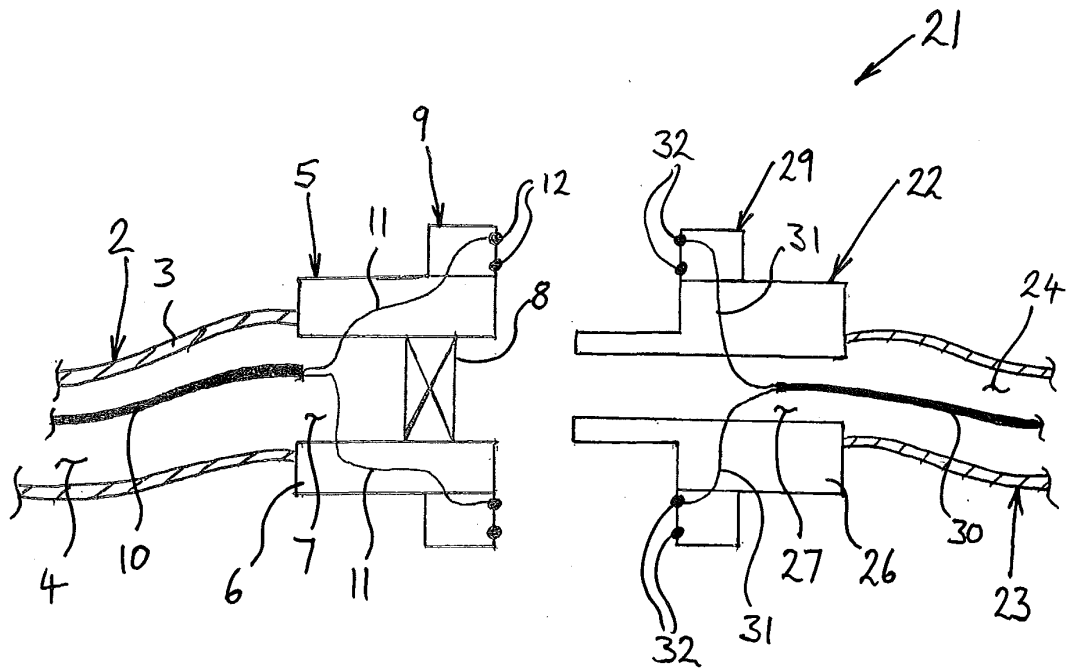


FIGURE 2

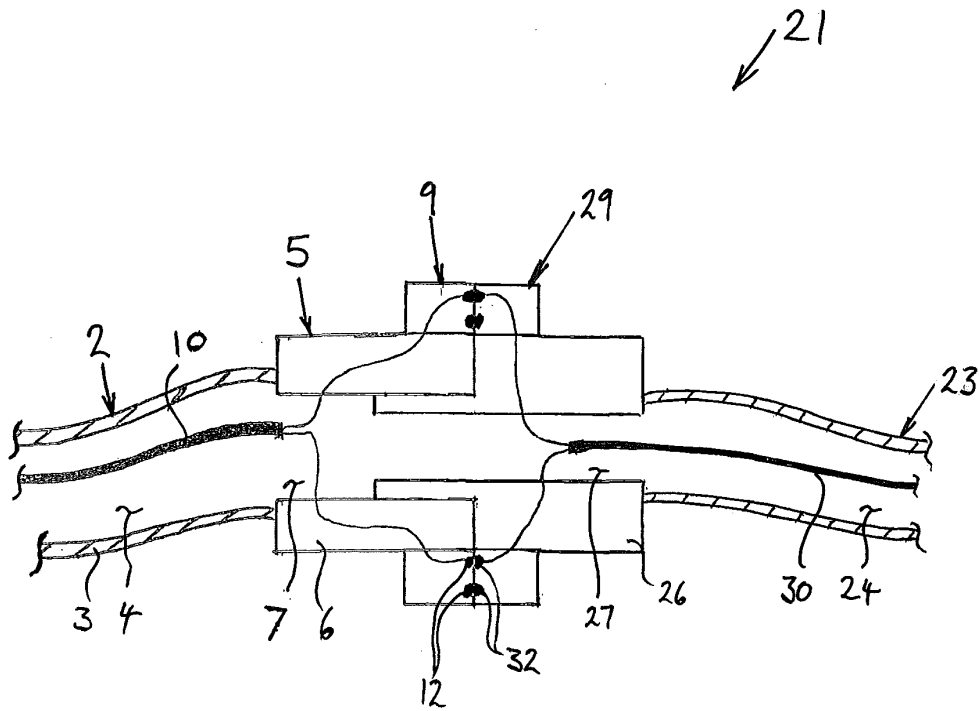


FIGURE 3

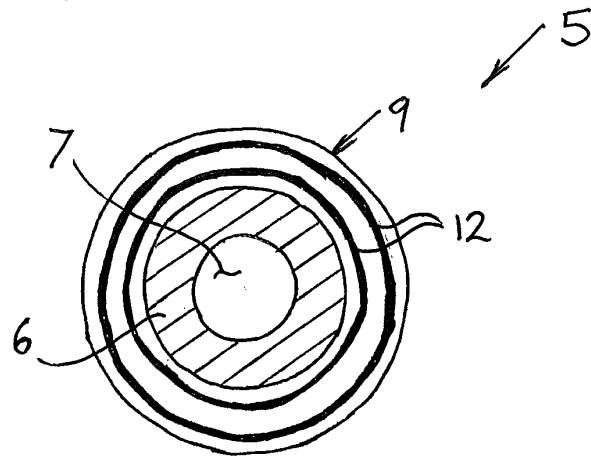


FIGURE 4A

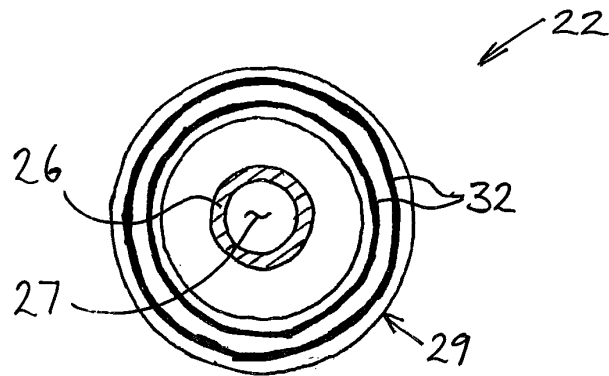


FIGURE 4B

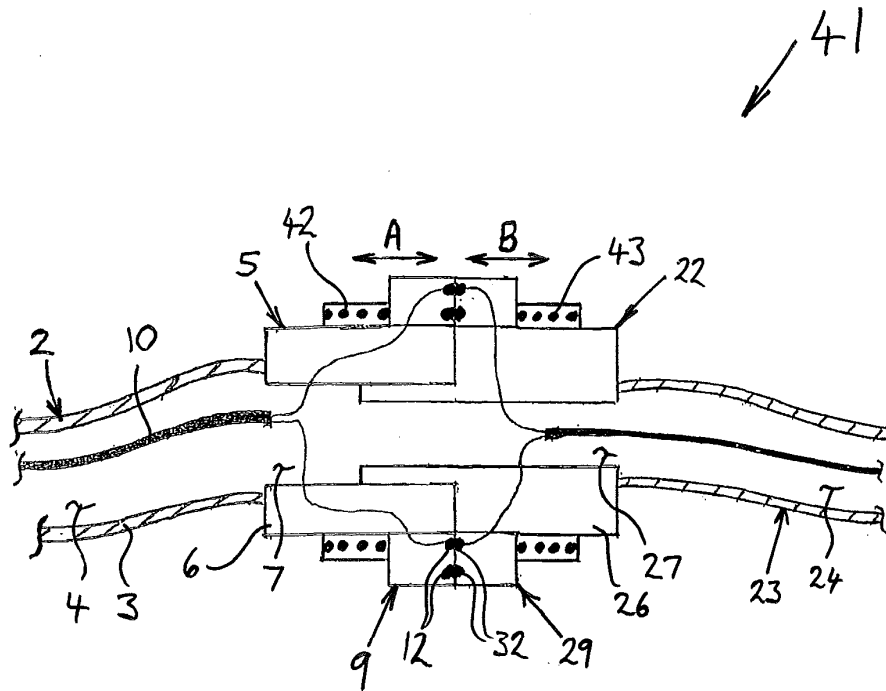


FIGURE 5

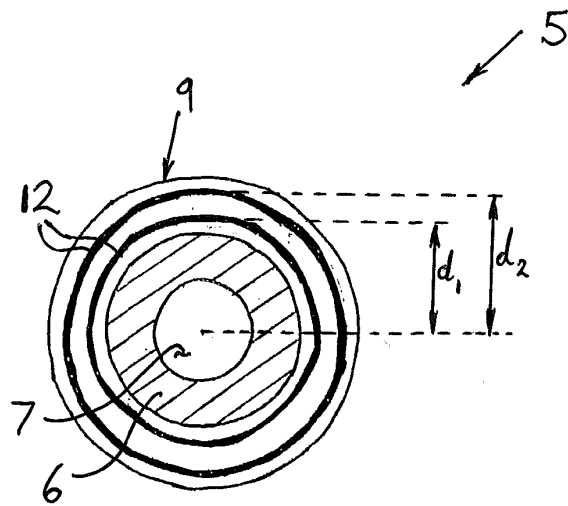


FIGURE 6A

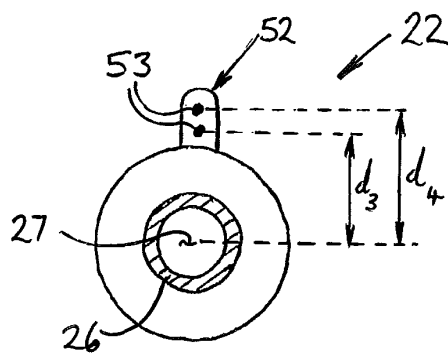


FIGURE 6B

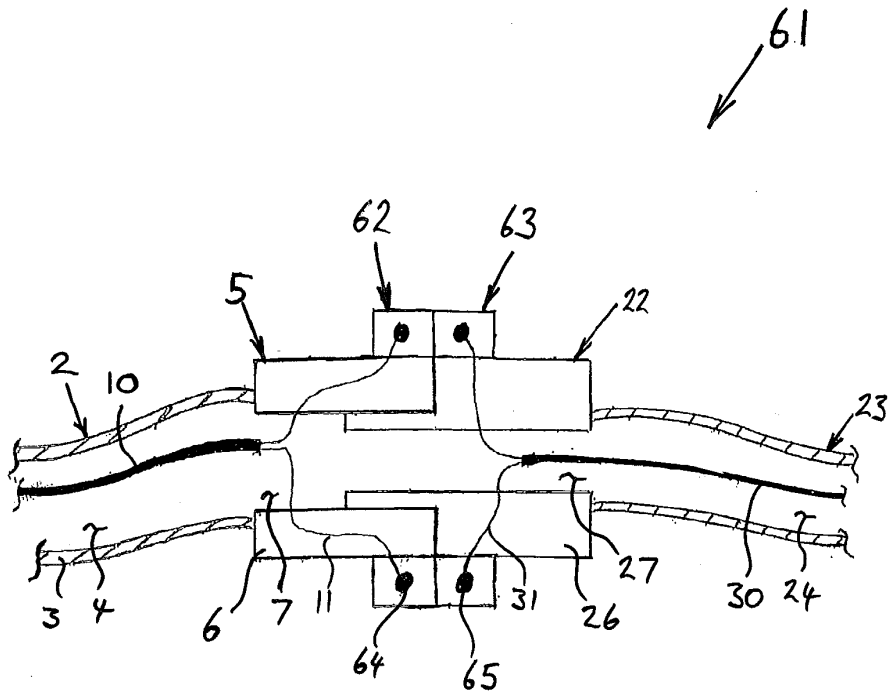


FIGURE 7

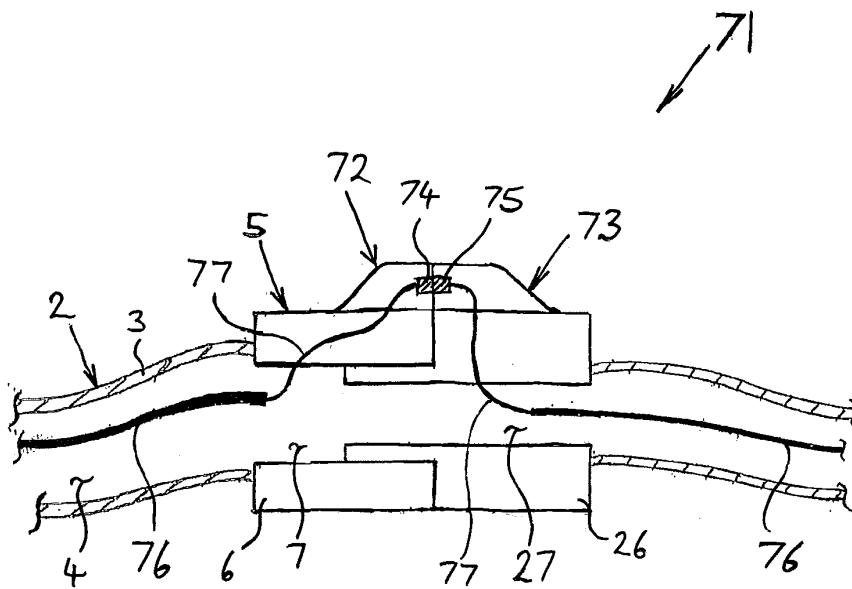


FIGURE 8

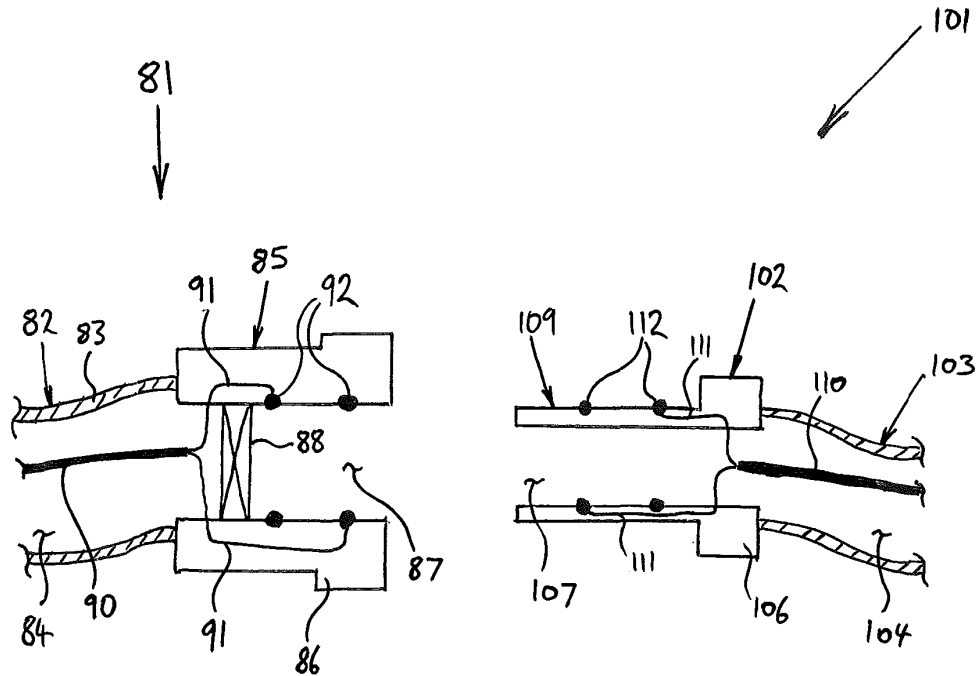


FIGURE 9

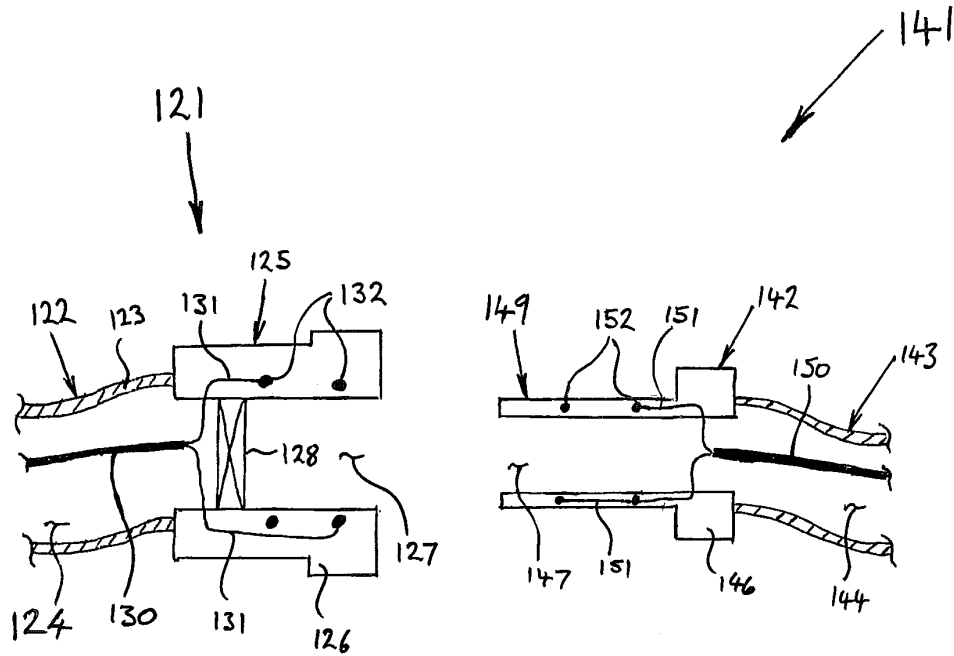


FIGURE 10

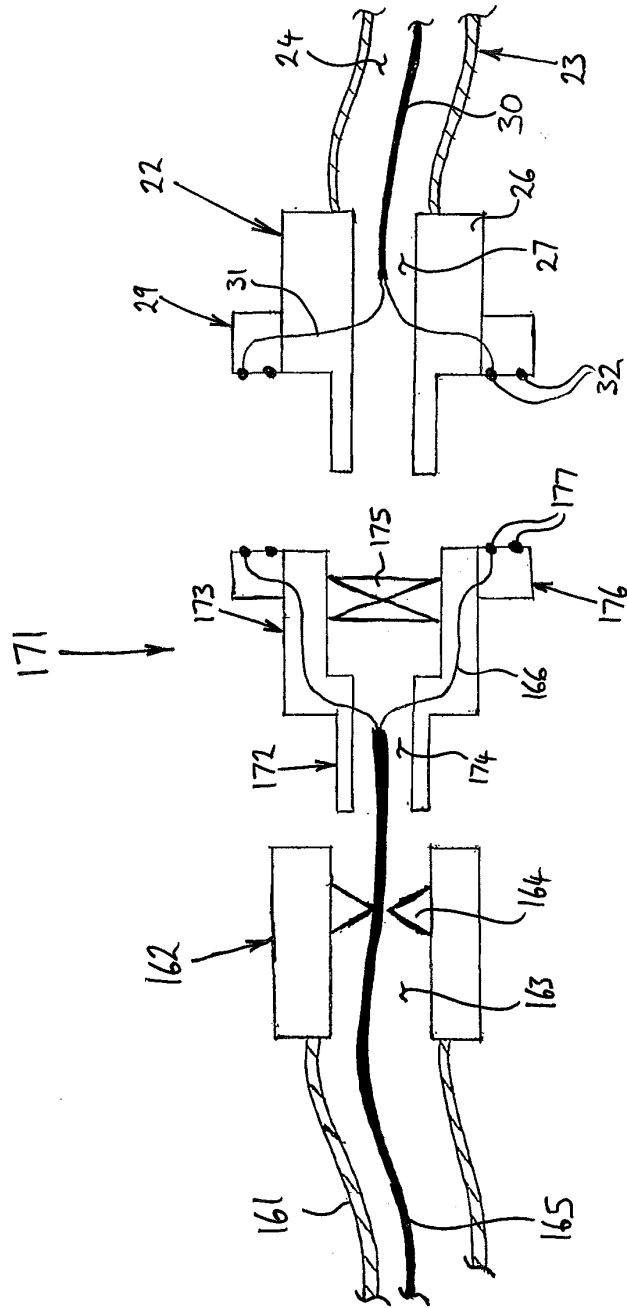


FIGURE 11

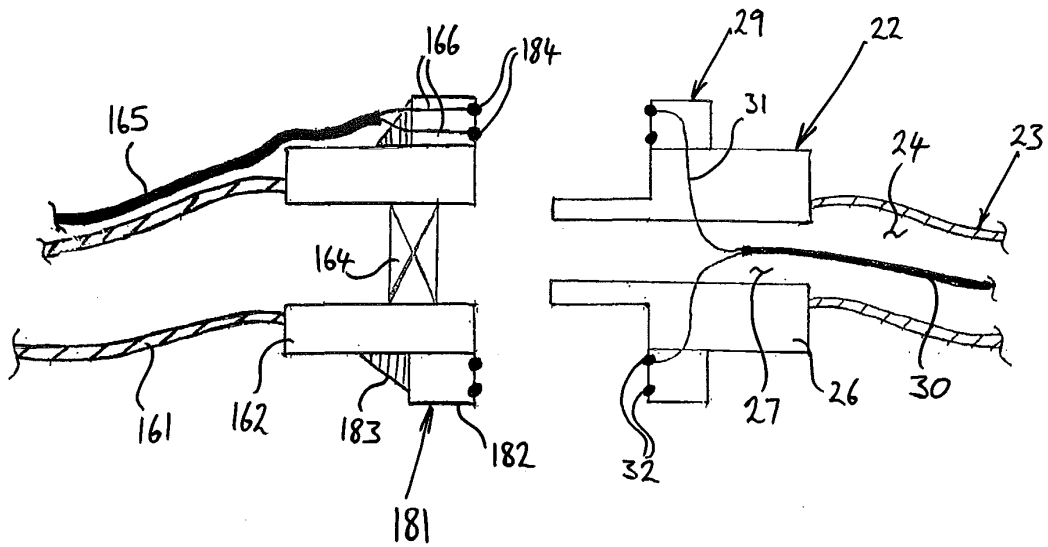


FIGURE 13

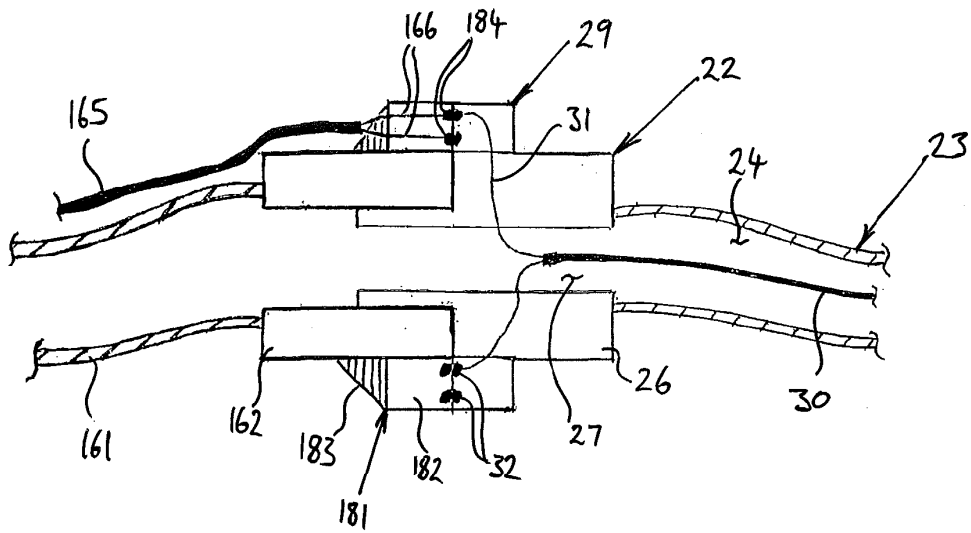


FIGURE 14

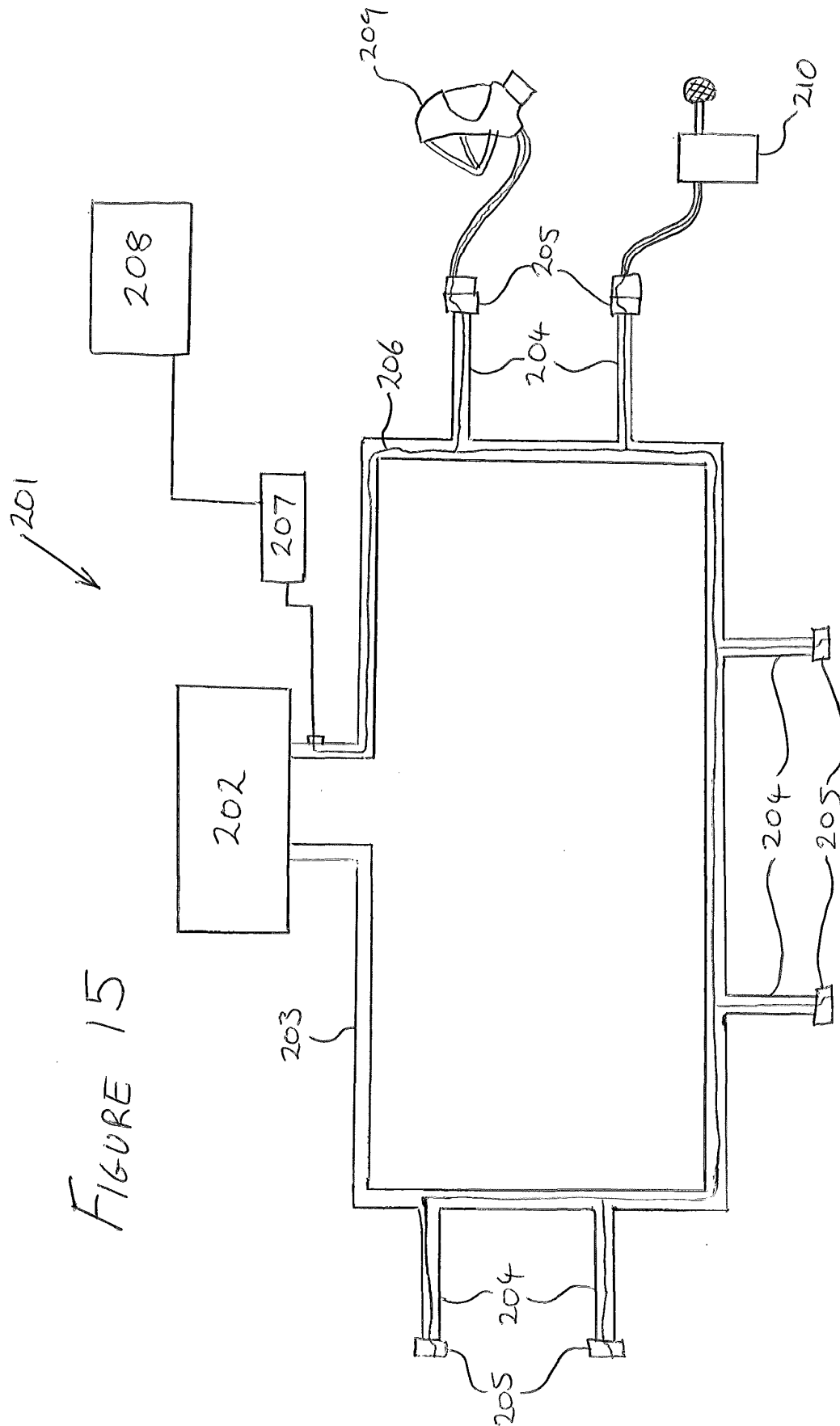


FIGURE 15

A Fluid Supply and Data Communication System and Couplings for use in such a System.

Description

5

The present invention relates to a combined system for fluid supply and data communication, and to couplings for use with such a system, as well as couplings for retrofitting to existing fluid supply systems to create such a combined fluid supply and data communication system.

10

There are various situations where it is necessary to supply fluid from one place to another, or from a source to individual outlets, and also communicate data between those places or source/outlet. One such situation is on off-shore drilling platforms or oil refinery facilities. These facilities are provided with a closed breathable air supply conduit network comprising a mains air supply ring extending around the whole facility through which filtered breathable air is pumped. A plurality of branch lines extend off the main ring, usually in the form of flexible air hoses, which terminate in a valve coupling. Workers on the facilities are required to wear breathing apparatuses at all times. These breathing apparatuses, or 'respirators', also known as 'working sets', include their own self-contained compressed air supply bottles. However, these bottles are only capable of providing 10 – 15 minutes of breathable air supply and are intended solely for emergency evacuation purposes, not for normal day-to-day operational use. At all other times, the worker is required to connect their respirator to one of the branch lines of the mains air supply ring by means of a connector configured to mate with the valve coupling on the end of the branch line air hoses. Connection of the respirator to the valve coupling opens the valve and allows air to flow from the air hose to the worker's respirator. Such fluid couplings are known, for example, sliding ring couplings commonly used in pressurised air supply connections.

30

When a worker in the above-described facility wishes to move around the room or area he is in, the hose can be extended, for example on a tensioned reel, to allow a finite range of freedom up to the maximum hose extension. If the worker wishes to

move beyond that finite range, he moves to the next air hose location, disconnects his respirator from the first air hose which auto-recoils back onto the tensioned reel, and the worker re-connects his respirator to a second air hose at the new location. The facilities are provided with a sufficient number of branch air lines
5 located such that a user can work anywhere on the facility and always have his respirator connected to an air hose for the supply of breathable air thereto.

It will be appreciated that by use of the above air supply system, breathable air can be supplied to workers at any location on the facility in question. However, as well
10 as an air supply, it is also necessary for various data to be communicated between workers, or between a worker and a communication hub or control centre. For example, a worker may be wearing a body-mounted or respirator-mounted video camera so that supervisors can monitor the worker's operation and actions, the signal from which will need to be transmitted to a communication hub/control
15 centre. To provide such data communication, it is necessary to have a separate data communication network on the facility for the worker to connect to. For example, the worker may need to connect a video feed connection from a person-mounted video camera to a video feed network. However, there may well be additional data to be communicated from the worker to a communication hub or control centre,
20 such as a signal from a health-monitoring device worn by the worker, e.g. heart-rate monitor, breathing monitor or other vital statistics monitor. Also, it may be necessary for a control centre to convey information to a worker – for example, if a supervisor identifies a hazardous situation via a fixed CCTV camera in an area near the worker, the supervisor would need to warn the worker to evacuate the area or
25 take certain corrective actions to deal with the hazard. This would require an audio signal to be transmitted from the control centre to an earpiece in the worker's respirator or a headset and for a two-way conversation, the worker would also need an audio signal to be transmitted from a microphone on his person or in the respirator to the control centre. All of the above functional features result in the
30 need for additional connection(s) between the worker and a separate data/communication network, and so more connections for the workers to have between themselves and the facility, and more data communication networks that the facility must have installed therein. This results in a complex arrangement of

personal support systems to which the worker must be connected, which are cumbersome and obstructive for the worker and are complex and expensive to install and maintain on the facility. In normal day-to-day operations, this is a time consuming inconvenience but in an emergency situation, it means that the worker
5 has a lot of equipment connections which are to be uncoupled before he can evacuate the facility.

In addition to all of the above, in potentially explosive working environments such as oil drilling platforms or oil refineries, all electrical equipment and their
10 connections/couplings must be intrinsically safe – that is, there must be no risk of sparks or over-heating of electrical components which may have the potential to cause ignition of a hazardous atmosphere.

It is therefore an object of the present invention to provide a fluid supply and data
15 communication system, and a coupling therefor, which substantially alleviates or overcomes the problems mentioned above.

Accordingly, the present invention provides a combined fluid supply and data communication conduit comprising an enclosed fluid supply duct having at least
20 two distal open ends, and a data communication cable extending within the fluid supply duct, at least one of the distal open ends of the fluid supply duct including a coupling comprising a fluid-tight valve configured to seal closed said at least one distal open end of the fluid supply duct when the coupling is in an un-coupled state and, configured to remain open to allow fluid to pass therethrough when in a
25 coupled state, the coupling further including a data connection terminal connected to the data communication cable within the fluid supply duct and configured to connect to a corresponding terminal of a corresponding coupling to allow combined fluid and data communication through the conduit via said coupling in a coupled state thereof.

30

The present invention also provides A combined fluid supply and data communication coupling comprising a first part having a hollow bore and a valve therein and a first data communication terminal for connection to a first data

communication cable, and a second part having a hollow bore and a second data communication terminal for connection to a second data communication cable, the first and second parts being configured to be releasably coupled to each other such that, when in a coupled state, the valve is open and the hollow bore of the first and
5 second parts are in sealed fluid communication to allow fluid to pass therethrough and the first and second data communication terminals are in contact to allow a data signal to pass from one terminal to the other terminal, and when the first and second parts are in an un-coupled state, the valve is closed to prevent fluid flow therethrough and the data communication terminals are out of contact with each
10 other to prevent data signals passing therebetween.

The present invention also provides a data communication connector for retrofitting to a conventional fluid supply coupling, the connector comprising a mounting portion configured to securely attach the connector to a fluid supply duct
15 or fluid supply coupling, and a data coupling portion configured to be connected to a data communication cable and, in use, to be in contact with a corresponding data coupling portion of a combined fluid supply and data communication coupling for data signals to be transmitted between the data coupling portions.

20 The present invention also provides a combined fluid supply and data communication adaptor for retrofitting to a conventional fluid supply coupling, the adaptor comprising a main body portion having a hollow bore, and a data coupling portion configured to be connected to a data communication cable and, in use, to be in contact with a corresponding data coupling portion of a combined fluid
25 supply and data communication coupling for data signals to be transmitted between the data coupling portions.

The present invention also provides a combined fluid supply and data communication network comprising a main fluid supply duct coupled at one end to
30 a source of fluid and having a plurality of branch lines in fluid communication therewith, at least one branch line including a coupling at one end thereof including a valve to seal the branch line closed in an un-coupled state, the network further comprising a plurality of data communication cables extending within the main fluid

supply duct and branch lines, at least one cable connected to a communications control unit and at least one cable connected to the at least one coupling at a terminal formed on the at least one coupling, the network configured to simultaneously provide fluid to a fluid-compatible equipment when coupled to the
5 at least one coupling, and to transmit data signals between the communication control unit and an electrical device connected to the terminal on the at least one coupling.

Preferred and/or optional features of the above embodiments of the invention are
10 set out in the claims hereafter.

Embodiments of the present invention will now be described, with reference to the accompanying drawings, in which:

- 15 Figure 1 shows a schematic cross-sectional view of a combined fluid supply and data communication conduit according to a first embodiment of the invention;
Figure 2 shows a schematic cross-sectional view of a combined fluid supply and data communication coupling, in an un-coupled state, according to a second embodiment of the invention;
20 Figure 3 shows a schematic cross-sectional view of the combined fluid supply and data communication coupling shown in Figure 2, but in a coupled state;
Figure 4A shows an end view of a female part of the combined fluid supply and data communication coupling of Figure 2;
Figure 4B shows an end view of a male part of the fluid supply and data
25 communication coupling of Figure 2;
Figure 5 shows a schematic cross-sectional view of an alternative combined fluid supply and data communication coupling of a third embodiment of the invention in a coupled state;
Figure 6A shows an end view of a female part of a further alternative combined
30 fluid supply and data communication coupling of a fourth embodiment of the invention;
Figure 6B shows an end view of a male part of the combined fluid supply and data communication coupling of the fourth embodiment of the invention;

Figure 7 shows a schematic cross-sectional view of a further alternative combined fluid supply and data communication coupling of a fifth embodiment of the invention in a coupled state;

Figure 8 shows a schematic cross-sectional view of a further alternative combined
5 fluid supply and data communication coupling of a sixth embodiment of the invention in a coupled state;

Figure 9 shows a schematic cross-sectional view of a combined fluid supply and data communication conduit according to a seventh embodiment of the invention and also a schematic cross-sectional view of a combined fluid supply and data
10 communication coupling, in an un-coupled state, according to an eighth embodiment of the invention;

Figure 10 shows a schematic cross-sectional view of a combined fluid supply and data communication conduit according to a ninth embodiment of the invention and also a schematic cross-sectional view of a combined fluid supply and data
15 communication coupling, in an un-coupled state, according to a tenth embodiment of the invention;

Figure 11 shows a schematic cross-sectional view of a retro-fit adaptor coupling of an eleventh embodiment of the invention in an un-coupled state with a conventional fluid supply coupling and a male coupling part of a combined fluid
20 supply and data communication coupling of the second embodiment of the invention;

Figure 12 shows a schematic cross-sectional view of the retro-fit adaptor of Figure 11 in a coupled state with a conventional fluid supply coupling and a male coupling part of a combined fluid supply and data communication coupling of the second
25 embodiment of the invention;

Figure 13 shows a retro-fit coupling of a twelfth embodiment of the invention mounted to a conventional fluid supply coupling which is in an un-coupled state with a male coupling part of a combined fluid supply and data communication coupling of the second embodiment of the invention;

30 Figure 14 shows the retro-fit coupling of Figure 13 mounted to a conventional fluid supply coupling which is in an un-coupled state with a male coupling part of a combined fluid supply and data communication coupling of the second embodiment of the invention; and

Figure 15 shows a schematic system diagram of a combined fluid supply and data communication network of a thirteenth embodiment of the invention.

Referring now to Figure 1, a combined fluid supply and data communication
5 conduit 1 according to a first embodiment of the invention is shown, and comprises
a fluid supply duct 2 in the form of an enclosed flexible hose having an outer
peripheral wall 3 defining a central bore 4. A fluid coupling 5 is provided at one
distal end of the fluid supply duct 2 and comprises a main body portion 6 having a
10 hollow bore 7 in fluid communication with the central bore 4 of the fluid supply
duct 2. The fluid coupling includes a valve 8 which closes the central bore 7 of the
fluid coupling 5 when the fluid coupling 5 is in a disconnected or 'uncoupled' state,
preventing fluid from flowing out of the fluid supply duct 2 through the fluid
coupling 5.

15 The main body portion 6 of the fluid coupling 5 includes a data coupling portion 9
around the perimeter of the distal end of the body portion 6. A data communication
cable 10 is disposed within the bore 4 of the fluid supply duct 2 and includes data
communication elements 11 which are connected to terminals 12 in the data
coupling portion 9.

20

The fluid coupling 5 is a first part of a two-part fluid coupling and comprises a
female coupling which is configured to connect with a corresponding male coupling
to provide a combined fluid supply and data communication coupling 21 which
comprises a second embodiment of the invention and is shown in Figure 2. The
25 features of the female part of the coupling 5 already described above with reference
to the combined fluid supply and data communication conduit 1 of the first
embodiment of the invention retain the same reference numerals. The combined
fluid supply and data communication coupling 21 also comprises a male coupling 22
comprising a main body portion 26 having a hollow bore 27 which, in use, would be
30 in fluid communication with a bore 24 of a fluid supply duct 23, such as an enclosed
flexible hose. The male coupling 22 also includes a data coupling portion 29 around
the perimeter of the distal end of the body portion 26 remote from the fluid supply
duct 23 which includes terminals 32 configured to be connected to data

communication elements 31 of a data communication cable 30 which would be disposed within the bore 24 of the fluid supply duct 23.

In the embodiment shown, the data coupling portions 9, 29 of the male and female
5 couplings 5, 22 comprise annular elements extending around the respective main
body portions 6, 26, and the terminals 12, 32 are exposed metal contact rings, as
shown more clearly in Figures 4A and 4B, which are concentric about the central
axis of the bores 7, 27 of the main body portion 6, 26. It will be appreciated that in
the un-coupled state shown in Figure 2, the terminals 12, 32 are spaced from each
10 other and so not capable of transmitting data signals between each other. Also in
this un-coupled state, the valve 8 in the female coupling 5 is closed and so fluid is
prevented from flowing through the bore 7 of the coupling 5 and therefore to/from
the fluid supply duct 2.

15 In the coupled state of the fluid supply and data communication coupling shown in
Figure 3, the male coupling part 22 is fully inserted into the female part 5 and
locked thereto by a conventional known locking means (not shown). In this coupled
state, the terminals 12 of the data coupling portion 9 of the female coupling 5 are in
contact with the terminals 32 of the data coupling portion 29 of the male coupling
20 22 and so data signals can be transmitted between the data cable 10 in the fluid
supply duct 2 on the female coupling side and the data cable 30 in the fluid supply
duct 23 on the male coupling side. Also in this coupled state, the distal end of the
male coupling 22 is engaged with and opens the valve 8 of the female coupling 5,
thereby rendering the hollow bores 7, 27 of the female and male couplings 5, 22,
25 and therefore the fluid supply ducts 2, 23, in fluid communication.

It will be appreciated that the terminals 12, 32 of the data coupling portions 9, 29
are concentric and symmetrical about the central axis of the female/male couplings
5, 22 respectively. Accordingly, the terminals 12, 32 will always make contact with
30 each other as the female and male couplings 5, 22 are connected into the coupled
state, irrespective of the orientation of each coupling 5, 22 about its respective
central axis.

In order to ensure a consistent and secure connection between the data coupling portions, it is intended within the scope of the invention that the data coupling portions may be biased towards the distal end of each coupling so that, in a coupled state, the terminals 12, 32 of each coupling 5, 22 are biased into contact with each other. Such an embodiment is shown in Figure 5, which shows an alternative combined fluid supply and data communication coupling 41 of a third embodiment of the invention, in which corresponding features to the combined fluid supply and data communication coupling of the second embodiment of the invention shown in Figures 2 – 4A retain the same reference numerals and description thereof will not be repeated for sake of brevity.

The alternative combined fluid supply and data communication coupling of the third embodiment of the invention differs from that of the second embodiment of the invention in that the data coupling portions 9, 29 are not fixed to the respective main body portions 6, 26 of the couplings 5, 22 but instead are axially slidable thereon about the central axis of the bore 7, 27 of each coupling 5, 22, in a direction shown by arrows A and B respectively. Furthermore, each data coupling portion 9, 29 includes a biasing element in the form of a spring 42, 43 configured to bias the respective data coupling portion 9, 29 toward the other data coupling portion 9, 29 so that in a coupled state of the combined fluid supply and data communication coupling 41, the terminals 12, 32 of each are pushed into contact with each other. This ensures a data connection is maintained even if the coupling 41 is subject to shocks or other physical disruption.

In the second the third embodiments of the invention shown and described above, both data coupling portions include annular terminals 12, 32. However, an alternative configuration of combined fluid supply and data communication coupling 51 of a fourth embodiment of the invention is shown in Figures 6A and 6B, which are end views of the female and male coupling portions 5, 22 respectively. Similar features to those of the combined fluid supply and data communication couplings of the second and third embodiments of the invention retain the same reference numerals and description thereof will not be repeated for sake of brevity. The combined fluid supply and data communication coupling 51 of the fourth

embodiment of the invention differs from those of the second and third embodiments of the invention in that the data coupling 52 on the male coupling 22 is not an annular element like on the female coupling 5 but instead is an elongate element extending radially relative to the central axis of the bore 27 of the male coupling 22. Also, the data coupling 52 includes terminals 53 which are point contacts rather than annular contacts. However, the position of the point contacts 53 in a radial direction relative to the central axis of the bore 27 of the male coupling 22 corresponds to the position of the annular terminals 12 in a radial direction relative to the central axis of the bore 7 of the female coupling 5.

Referring to Figures 6A and 6B, this is shown by dimensions $d_1 = d_3$ and dimensions $d_2 = d_4$. Therefore, upon coupling together of the female and male couplings 5, 22, the terminals 12, 53 are aligned and in contact to allow data signals to be transmitted therebetween, and also, as with the second and third embodiments of the invention, the terminals 12, 53 will always make contact with each other as the female and male couplings 5, 22 are connected into the coupled state, irrespective of the orientation of each coupling 5, 22 about its respective central axis.

Although not shown in Figures 6A and 6B, the data couplings 9, 52 may be axially slidable on the main body portions 6, 26 and spring biased into a contact position to provide a more secure and reliable connection, as per the third embodiment of the invention shown in Figure 5 and described above.

The data couplings of the combined fluid supply and data communication couplings of the second to fourth embodiments of the invention described above all include terminals which are exposed and make direct contact with each other in the coupled state of the couplings to enable data signal transmission through them. However, it is intended that alternative configurations of data couplings are to be encompassed within the scope of the invention other than direct contact data couplings. One such alternative is shown in Figure 7 which shows a combined fluid supply and data communication coupling 61 of a fifth embodiment of the invention. Features identical to those of the second embodiment of the invention shown in Figures 2 – 4B retain the same reference numerals and description thereof will not be repeated.

The combined fluid supply and data communication coupling 61 of the fifth embodiment of the invention differs from that of the second embodiment of the invention in that the main body portions 6, 26 of the female and male couplings 5, 22 include modified data coupling portions 62, 63. Each data coupling portion 62, 63 is an annular member with a looped induction element 64, 65 embedded within the body of the annular member and so not exposed on the outside surface of the data coupling 62, 63. Each looped induction element 64, 65 is connected to data communication elements 11, 31 of a respective data communication cable 10, 30.

In use, the male and female couplings 5, 22 are connected together by the male coupling part 22 being fully inserted into the female part 5 and locked thereto by a conventional known locking means (not shown). In this coupled state, the two data coupling portions 62, 63 are in direct contact with each other. However, as the induction elements 64, 65 are embedded within in each data coupling 62, 63, they are not in direct contact with each other. Nevertheless, data signals are able to be transmitted between the data couplings 62, 63 by inductive RF coupling. This would require one of the data communication cables 10, 30 to provide power to one of the induction coils 64, 65, and this could be provided by a battery or other suitable power source.

Although not shown in Figure 7, the male and female couplings 5, 22 could include additional means to secure the inductive connection between the two data couplings 62, 63. For example, the data couplings 62, 63 may be slidable on the respective main body portions 6, 26, as with the third embodiment of the invention shown in Figure 5, and include a biasing means such as a spring to bias the data couplings 62, 63 into contact with each other in the coupled state of the female and male couplings 5, 22. Alternatively, or in addition, the data couplings 62, 63 may include one or more magnets embedded therein to attract the data couplings 62, 63 together to further secure them together in the coupled state. Indeed, any of the data coupling portions of the first to fourth embodiments of the invention may also include magnets therein to further secure them together in the coupled state. It will be appreciated that such measures help to maintain the integrity of the data communication link should the coupling 61 be subjected to physical shocks.

In all embodiments of the invention so far described, data coupling portions have included terminals or induction coils connected to data communication elements of a data communication cable. Such terminals/induction coils would typically be
5 required to be connected to a metallic electrical conductor, and so the data communication elements would be a copper element or similar such electrically conductive element. However, it is intended that alternative data coupling means may be used in a combined fluid supply and data communication coupling within the scope of the invention. Such an alternative is shown in Figure 8 which shows a
10 combined fluid supply and data communication coupling 71 of a sixth embodiment of the invention. Features identical to those of the second embodiment of the invention shown in Figures 2 – 4B retain the same reference numerals and description thereof will not be repeated. The combined fluid supply and data communication coupling 71 of the sixth embodiment of the invention differs from
15 that of the second embodiment of the invention in that the main body portion 6, 26 of the female and male couplings 5, 22 includes modified data coupling portions 72, 73. Each data coupling portion 72, 73 is an elongate lug extending from the outer surface of the respective main body portion 6, 26 in a radial direction relative to the central axis of the bore 7, 27 of the female/male couplings 5, 22, respectively. Each
20 data coupling portion 72, 73 includes an interface element 74, 75. Instead of each of the data coupling portions 72, 73 being connected to an electrically conductive data communication cable as with the previous embodiments, each interface element 74, 75 is an optical connector connected to a remote end of an optical fibre 77 of a fibre-optic data communication cable 76.

25

In use, the male and female couplings 5, 22 are connected together by the male coupling part 22 being fully inserted into the female part 5 and locked thereto by a conventional known locking means (not shown). In this coupled state, the two data coupling portions 72, 73 are in direct contact with each other and are
30 configured such that, when aligned, the interface elements 74, 75 of each data coupling 72, 73, are in direct contact with each other. This establishes an optical connection and enables data signals to be transmitted between the data couplings

72, 73 and thereby between the respective fibre-optic data communication cables 76.

It will be appreciated that with the sixth embodiment of the invention described
5 above, the correct alignment of the two interface elements 74, 75 is essential to
create an effective data communication link. Therefore, the data coupling portions
72, 73 may be configured with cooperating elements to ensure an exact engagement
and alignment with one another in the coupled state. Also, they may be provided
with spring biasing means and/or magnetic elements as described above with
10 reference to the fifth embodiment of the invention to ensure the integrity of the
data communication link should the coupling 71 be subjected to physical shocks.

A further alternative configuration of a combined fluid supply and data
communication conduit 81 of a seventh embodiment of the invention is shown in
15 Figure 9 and comprises a fluid supply duct 82 in the form of an enclosed flexible
hose having an outer peripheral wall 83 defining a central bore 84. A fluid coupling
85 is provided at one distal end of the fluid supply duct 82 and comprises a main
body portion 86 having a hollow bore 87 in fluid communication with the central
bore 84 of the fluid supply duct 82. The fluid coupling includes a valve 88 which
20 closes the central bore 87 of the fluid coupling 85 when the fluid coupling 85 is in a
disconnected or 'uncoupled' state, preventing fluid from flowing out of the fluid
supply duct 82 through the fluid coupling 85.

The combined fluid supply and data communication conduit 81 of the seventh
25 embodiment of the invention differs from that of the first embodiment of the
invention in the configuration of its data coupling portion 89, wherein the main
body portion 86 includes a pair of annular terminals 92 on the inside wall of the
hollow bore 87 which are spaced in an axial direction of the bore 87. A data
communication cable 90 is disposed within the bore 84 of the fluid supply duct 82
30 and includes data communication elements 91 which are connected to the terminals
92.

The fluid coupling 85 is a first part of a two-part fluid coupling and comprises a female coupling which is configured to connect with a corresponding male coupling to provide a combined fluid supply and data communication coupling 101 which comprises an eighth embodiment of the invention and is also shown in Figure 9.

5 The features of the female part of the coupling 85 already described above with reference to the combined fluid supply and data communication conduit 81 of the seventh embodiment of the invention retain the same reference numerals. The combined fluid supply and data communication coupling 101 also comprises a male coupling 102 comprising a main body portion 106 having a hollow bore 107 which,
10 in use, would be in fluid communication with a bore 104 of a fluid supply duct 103, such as an enclosed flexible hose. The male coupling 102 includes an elongate data coupling portion 109 comprising a pair of annular terminals 112 around the outer perimeter of the data coupling portion 109 and which are spaced in an axial direction thereof. The terminals 112 are configured to be connected to data
15 communication elements 111 of a data communication cable 110 which would be disposed within the bore 104 of the fluid supply duct 103.

It will be appreciated that in the un-coupled state shown in Figure 9, the terminals 92, 112 are spaced from each other and so not capable of transmitting data signals
20 between each other. Also in this un-coupled state, the valve 88 in the female coupling 85 is closed and so fluid is prevented from flowing through the bore 87 of the coupling 85 and therefore to/from the fluid supply duct 82.

In a coupled state (not shown) of the fluid supply and data communication coupling 101, the data coupling portion 109 of the male coupling part 102 is fully inserted
25 into the female part 85 and locked thereto by a conventional known locking means (not shown). In this coupled state, the terminals 92 of the data coupling portion 89 of the female coupling 85 are aligned with and in contact with the terminals 112 of the data coupling portion 109 of the male coupling 102 and so data signals can be
30 transmitted between the data cable 90 in the fluid supply duct 82 on the female coupling side and the data cable 110 in the fluid supply duct 103 on the male coupling side. Also in this coupled state, the distal end of the male coupling 102 is engaged with and opens the valve 88 of the female coupling 85, thereby rendering

the hollow bores 87, 107 of the female and male couplings 85, 102, and therefore the fluid supply ducts 82, 103, in fluid communication.

It will be appreciated that the terminals 92, 112 of the data coupling portions 89,
5 109 are symmetrical about the central axis of the female/male couplings 85, 102 respectively. Accordingly, the terminals 92, 112 will always make contact with each other as the female and male couplings 85, 102 are connected into the coupled state, irrespective of the orientation of each coupling 85, 102 about its respective central axis.

10

A further alternative configuration of a combined fluid supply and data communication conduit 121 of a ninth embodiment of the invention is shown in Figure 10 and is similar in configuration to the conduit of the seventh embodiment of the invention shown in Figure 9 and similarly comprises a fluid supply duct 122
15 having an outer peripheral wall 123 defining a central bore 124, a fluid coupling 125 at one distal end of the fluid supply duct 122 comprising a main body portion 126 having a hollow bore 127 in fluid communication with the central bore 124 of the fluid supply duct 122, and a valve 128 which is closed in a disconnected or 'uncoupled' state of the fluid coupling 125.

20

The combined fluid supply and data communication conduit 121 of the ninth embodiment of the invention differs from that of the seventh embodiment of the invention in that annular terminals 92 on the inside wall of the hollow bore 87 spaced in an axial direction of the bore 87 are omitted and instead a pair of annular
25 induction elements 132 are embedded in the body portion 126 of the coupling 125. A data communication cable 130 is disposed within the bore 124 of the fluid supply duct 122 and includes data communication elements 131 which are connected to the induction elements 132.

30 The fluid coupling 125 is a first part of a two-part fluid coupling and comprises a female coupling which is configured to connect with a corresponding male coupling to provide a combined fluid supply and data communication coupling 141 which comprises a tenth embodiment of the invention and is also shown in Figure 10.

The features of the female part of the coupling 125 already described above with reference to the combined fluid supply and data communication conduit 121 of the ninth embodiment of the invention retain the same reference numerals. The combined fluid supply and data communication coupling 141 also comprises a male coupling 142 comprising a main body portion 146 having a hollow bore 147 which, in use, would be in fluid communication with a bore 144 of a fluid supply duct 143, such as an enclosed flexible hose. The male coupling 142 includes an elongate data coupling portion 149 comprising a pair of annular induction elements 152 embedded therein and spaced from the surface, and which are spaced in an axial direction of the data coupling portion 149. The induction elements 152 are configured to be connected to data communication elements 151 of a data communication cable 150 which would be disposed within the bore 144 of the fluid supply duct 143.

It will be appreciated that in the un-coupled state shown in Figure 10, the induction elements 132, 152 are spaced from each other and so not capable of transmitting data signals between each other. Also in this un-coupled state, the valve 128 in the female coupling 125 is closed and so fluid is prevented from flowing through the bore 127 of the coupling 125 and therefore to/from the fluid supply duct 122.

In a coupled state (not shown) of the fluid supply and data communication coupling 121, the data coupling portion 149 of the male coupling part 142 is fully inserted into the female part 125 and locked thereto by a conventional known locking means (not shown). In this coupled state, as the induction elements 132, 152 are embedded within in each coupling 125, 142, they are not in direct contact with each other. Nevertheless, data signals are able to be transmitted between the male/female couplings 125, 142 by inductive RF coupling and so data signals can be transmitted between the data cable 130 in the fluid supply duct 122 on the female coupling side and the data cable 150 in the fluid supply duct 143 on the male coupling side. This would require one of the data communication cables 130, 150 to provide power to one of the induction elements 132, 152 and this could be provided by a battery or other suitable power source.

Also in this coupled state, the distal end of the male coupling 142 is engaged with and opens the valve 128 of the female coupling 125, thereby rendering the hollow bores 127, 147 of the female and male couplings 125, 142, and therefore the fluid supply ducts 122, 143, in fluid communication.

5

As with the terminals of the seventh/eighth embodiments of the invention, the induction elements 132, 152 are symmetrical about the central axis of the female/male couplings 125, 142 respectively and so will always be aligned with each other as the female and male couplings 125, 142 are connected into the coupled
10 state, irrespective of the orientation of each coupling 125, 142 about its respective central axis.

All of the couplings described above are intended to be 'intrinsically safe' and so could be suitable for use in environments such as off-shore drilling platforms, as
15 described above. The contact-type couplings of the first to fourth, seventh and eighth embodiments of the invention may utilise sufficiently low electrical energy that there is no risk of spark between them or any chance of ignition of an explosive atmosphere which may surround the couplings. The inductive data coupling and the fibre-optic data coupling of the fifth, sixth, ninth and tenth embodiments of the
20 invention have no physically touching contacts and so are inherently intrinsically safe and suitable for use in the hazardous environments described above.

Furthermore, in all cases, the data communication cables are housed within the enclosed fluid supply ducts and so are not exposed to any hazardous external
25 environments, thereby further rendering the conduit and couplings of the invention intrinsically safe. It should be noted, however, that the invention is not intended to be limited to couplings/conduits in which a data coupling portion forms in intrinsically safe connection, as the couplings/conduits of the invention may be equally suitable for use in neutral or non-hazardous/non-explosive environments.
30 Aside from the safety element, the conduit and couplings of the invention are also much more convenient and less cumbersome than conventional systems as both breathable air supply and data communication can be provided to the worker from the facility with a single, convenient coupling and conduit.

Although all embodiments of the invention shown and described above show the respective data communication cables as being disposed within the bores of the fluid supply ducts, it is intended within the scope of the invention that the data
5 communication cables may alternatively be embedded within the walls of the fluid supply ducts, in a dedicated unitary fluid supply and data communication ducting.

Although various couplings and conduits of the invention have been shown and described above, modifications to these exemplary embodiments are intended to fall
10 within the scope of the invention. For example, although each embodiment shows two terminals or two induction elements in each coupling part, only one or more than two terminals/induction elements may be provided. Also, the embodiments show specific configurations of data connection terminals/induction elements in combination with the fluid coupling portions, but various other configurations of
15 data communication coupling means in combination with fluid coupling portions, are intended to fall within the scope of the invention.

The embodiments of the invention so far shown and described comprise conduits and couplings suitable for installation in the type of facilities mentioned above
20 where hazardous/explosive environments may exist, such as oil drilling platforms. However, such existing facilities will already have a network of air supply lines including flexible air hoses with valve couplings thereon, but will not have an integrated data communication system with the air supply network. Therefore, the present invention also provides a solution to retro-fit data communication apparatus
25 and couplings to existing fluid supply equipment to provide combined fluid supply and data communication conduits, couplings and overall system.

A retro-fit adaptor coupling of an eleventh embodiment of the invention is shown in Figure 11 in an uncoupled state, together with a conventional fluid supply pipe
30 161 and a coupling 162 attached to one end thereof. The conventional coupling 162 is a female coupling which includes has a central bore 163 a valve 164 configured to close the bore 163 when the coupling 162 is in a disconnected state. One method of adapting an existing fluid supply system to be a combined fluid supply and data

communication system is to feed data supply cables 165 through all existing fluid supply pipes of the system and centrally connect them to a data control system, data bus or similar unit. Once the data supply cables 165 are installed within the existing fluid supply pipes, they may be connected to a coupling of the invention (such as
5 described above and shown in Figures 1 – 9) which replaces the existing fluid coupling 162 on the end of the fluid supply pipes. Alternatively, an adaptor coupling 171 as shown in Figure 11 may be fitted to the existing fluid coupling 162. In the latter case, the data supply cable 165 would feed through the existing fluid coupling 162 and through the valve 164, thereby holding the valve in an open position at all
10 times whether the fluid coupling 162 is in a coupled or un-coupled state.

The adaptor coupling 171 comprises a male portion 172 and a female portion 173 and has a hollow bore 174 extending therethrough. A valve 175 is disposed in the bore 174. The adaptor also includes a data coupling portion 176 including terminals
15 177.

As the valve 164 of the existing fluid coupling 162 is held open by the data communication cable 165, air is free to escape from the fluid supply pipe therethrough. However, the adaptor coupling 171 is fitted to the fluid coupling 162
20 with the male portion 172 received in the bore 163 of the fluid coupling and locked in place by conventional fluid coupling securing means (not shown). Data communication elements 166 of the data communication cable 165 are connected to the terminals 177 of the data coupling portion 176. The valve 175 of the adaptor coupling 171 is closed when no further combined fluid and data supply coupling is
25 connected thereto and so prevents air from the fluid supply pipe 161 from escaping.

In use, a male coupling 22 part of a combined fluid supply and data communication coupling of the invention can be connected to the adaptor coupling 171. Such a male coupling part 22 is shown in Figure 11 in the un-coupled state with the
30 adaptor coupling 171 and is the same as the male coupling part of the second embodiment of the invention shown in Figures 2 and 3, the features of which retain the same reference numerals and description of its features will not be repeated again to avoid repetition.

The fluid coupling 162, adaptor coupling 171 and male coupling part 22 are shown in the connected/coupled state in Figure 12. The male coupling part 22 is inserted into the female part 173 of the adaptor coupling 171 and locked thereto by a
5 conventional known locking means (not shown). In this coupled state, the terminals 177 of the data coupling portion 176 of the adaptor coupling 171 are in contact with the terminals 32 of the data coupling portion 29 of the male coupling part 22 and so data signals can be transmitted between the data cable 165 in the fluid supply duct 161 on the existing fluid coupling 162 side and the data cable 30 in the fluid supply
10 duct 23 on the male coupling part side. Also in this coupled state, the distal end of the male coupling part 22 is engaged with and opens the valve 175 of the adaptor coupling 171, thereby rendering the fluid supply ducts 161, 23 in fluid communication.

15 Although the adaptor coupling 171 shown in Figures 11 and 12 and described above includes data coupling portions similar to those of the second embodiment of the invention, it will be appreciated that any alternative data coupling means shown and described previously could alternatively be used in an adaptor coupling within the scope of the invention, such as biased data coupling portions, inductive data
20 couplings, fibre optic data couplings, magnetic data coupling securing means, etc. Also, all portions shown as male may be female, and vice versa, within the scope of the invention.

An alternative retro-fit coupling 181 of a twelfth embodiment of the invention is
25 shown in Figure 13 in an uncoupled state. In this embodiment, the retro-fit coupling 181 is fitted to a conventional fluid coupling 162 attached to one end of a conventional fluid supply pipe 161, as shown in Figure 11 and described above. Like features retain the same reference numerals. Unlike the retrofit adaptor coupling 171 shown in Figures 11 and 12, the data communication cable 165 to be retro-
30 fitted to the existing fluid supply system is not fed into the existing fluid supply pipes 161, but remains on the outside thereof and may be secured thereto by conventional means (not shown). The retro-fit coupling 181 is secured to the existing fluid coupling 162 and comprises a data coupling portion 182 and a

mounting means 183. The data coupling portion 182 includes terminals 184 which are connected to the data communication elements 166 of the data communication cable 165. The mounting means may comprise any suitable means within the scope of the invention, for example, a clamp, bracket, adhesive, weld etc.

5

Upon fitment of the retro-fit coupling 181 to the fluid coupling 162, a first part (female part in this case) of a combined fluid supply and data communication coupling is formed. This is then capable of connecting to a corresponding (male) coupling part 22 of a combined fluid supply and data communication coupling, as
10 shown in Figure 13. The male coupling part 22 is the same as that of the second embodiment of the invention shown in Figures 2 and 3, the features of which retain the same reference numerals.

In the coupled state, the male coupling part 22 is inserted into the fluid coupling
15 162 and locked thereto by a conventional known locking means (not shown). In this coupled state, the terminals 185 of the data coupling portion 182 of the retro-fit coupling 181 are in contact with the terminals 32 of the data coupling portion 29 of the male coupling part 22 and so data signals can be transmitted between the data cable 165 which is external of the fluid supply duct 161 on the existing fluid
20 coupling 162 side and the data cable 30 in the fluid supply duct 23 on the male coupling part side, enabling data to be transmitted to/from a data control system, data bus or similar unit. Also in this coupled state, the distal end of the male coupling part 22 is engaged with and opens the valve 164 of the fluid coupling 162, thereby rendering the fluid supply ducts 161, 23 in fluid communication.

25

As mentioned above with the adaptor coupling 171 shown in Figures 11 and 12, although the data coupling portion 182 is similar to those of the second embodiment of the invention, it will be appreciated that any alternative data coupling means shown and described previously could alternatively be used in a
30 retro-fit coupling within the scope of the invention, such as biased data coupling portions (possibly including slidably moveable mounting means for the data coupling portion 182), inductive data couplings, fibre optic data couplings, magnetic data coupling securing means, etc.

The present invention also provides a combined fluid supply and data communication network 201 which is shown schematically in Figure 15. The network comprises an air supply source 202 (e.g. pump, filter, etc.) fluidly coupled
5 to a mains air supply ring 203. Such a ring would extend around a facility such as an oil drilling platform, oil refinery, etc. Branch air lines 204 extend off the main ring 203 and terminate in combined fluid supply and data communication couplings 205 (of any form as described above) for individual workers to connect their respirators/working sets 209 to, as described above. A network of data
10 communication cables 206 extend from a data bus 207 into the mains air ring 203 and into each branch air line 204, each terminating in one of the combined fluid supply and data communication couplings 205. A data control centre 208 is connected to the data bus 207.

15 In use, a worker can connect his working set 209 to a combined fluid supply and data communication coupling 205 of the network 201 and receive breathable air through the branch air line 204. Simultaneously, any equipment he is wearing or operating on his person, which would be connected to the respirator's combined fluid supply and data communication coupling portion, would be connected to the
20 data communication cable 206 in the network via the combined fluid supply and data communication coupling 205 on the end of the branch air line 204.

Using the above system, data from a user's equipment can be fed to the data bus 207 and received by a data control centre 208. Likewise, the data control centre can
25 transmit data to individual workers connected to the network and to equipment they may have on their person or be coupled to.

Examples of equipment that a worker may couple to the combined fluid supply and data communication network in the above manner may include audio equipment,
30 such as microphones and headsets to allow communication between the worker and a control centre, video equipment, for example a head-mounted camera worn by the worker, health/vital statistic monitoring equipment such as breathing/hearth-rate monitor to be relayed to the data control centre to monitor each individual worker's

health. Also, workers may be provided with locator means such as GPS devices which could relay their position via the combined fluid supply and data communication network to the control centre.

5 In order to provide an intrinsically safe system, it is preferable that the combined fluid supply and data communication network is passive, and power to transmit data signals can come from the equipment coupled to the system via the combined fluid supply and data communication couplings 205, such as battery power provided with the audio/video/health-monitoring equipment, etc.

10

As well as personnel mounted equipment, the combined fluid supply and data communication network of the invention can be used to connect only equipment thereto. For example, an air-quality monitor 210 may include a coupling compatible with the combined fluid supply and data communication coupling 205 on the end of
15 the branch air line 205 to form a data coupling therewith. Although the equipment may likely not need an air supply, it can utilise only the data communication function of the network to feed information from areas on the facility, such as air-quality, to detect toxic/explosive gases in the air, back to the data control centre.

20 Although the above exemplary combined fluid supply and data communication network of the invention is shown and described as an air-supply network, the invention is not limited to such a specific fluid supply, and any other fluid supply system may be included. For example, a combined fluid supply and data communication network of the invention may provide fuel such as gas or liquid fuel
25 such as petrol/diesel/aviation fuel to branch-line supply pipes, which may simultaneously connect to equipment such as pumping equipment, vehicle fuel tank fill level monitoring equipment, vehicle temperature monitoring equipment, fluid volume transfer monitoring equipment, etc. Again, in such use, it would be much by preference that the data communication coupling portion is intrinsically safe to
30 avoid accidents/explosions of any combustible/explosive fluids, in use.

Also, although the exemplary combined fluid supply and data communication network of the invention shown and described above shows the data

communication cables disposed within the fluid supply pipes, they may alternatively be disposed on the outside of the fluid supply pipes (as shown in the embodiments in Figures 13 and 14), or alternatively, may be embedded within the walls of the fluid supply pipes.

Claims

1. A combined fluid supply and data communication conduit comprising an enclosed fluid supply duct having at least two distal open ends, and a data
5 communication cable extending within the fluid supply duct, at least one of the distal open ends of the fluid supply duct including a coupling comprising a fluid-tight valve configured to seal closed said at least one distal open end of the fluid supply duct when the coupling is in an un-coupled state and, configured to remain open to allow fluid to pass therethrough when in a coupled state, the coupling
10 further including a data connection terminal connected to the data communication cable within the fluid supply duct and configured to connect to a corresponding terminal of a corresponding coupling to allow combined fluid and data communication through the conduit via said coupling in a coupled state thereof.
- 15 2. A conduit according to claim 1 wherein the data connection terminal includes at least one induction element connected to the data communication cable and which is configured to make an inductive data connection with a corresponding induction element of a corresponding coupling when placed adjacent thereto.
- 20 3. A conduit according to claim 2 wherein the induction element comprises a loop of conductive material embedded in the body of the data connection terminal.
4. A conduit according to claim 1 wherein the data connection terminal includes at least one exposed electrical contact connected to the data
25 communication cable.
5. A conduit according to any of claims 2 to 4 wherein the at least one induction element/electrical contact is an annular member.
- 30 6. A conduit according to claim 5 comprising a plurality of concentric induction elements/electrical contacts.

7. A conduit according to claim 1 wherein the data connection terminal includes at least one optical connector and the data communication cable comprises an optical fibre connected to the optical connector, the optical connector being configured to make an optical data link with a corresponding optical connector of a corresponding coupling when placed adjacent thereto.

8. A conduit according to any preceding claim wherein the coupling further comprises a magnet configured to hold the data connection terminal in contact with a corresponding data connection terminal of a corresponding coupling when placed adjacent thereto in a coupled state of the coupling.

9. A conduit according to any preceding claim wherein the coupling comprises a main body portion and the data connection terminal is disposed on an outer periphery of the main body portion.

10. A conduit according to claim 9 wherein the data connection terminal is slidably mounted on the main body portion.

11. A conduit according to claim 10 wherein the data connection terminal is biased towards a distal end of the coupling.

12. A conduit according to any preceding claim wherein the fluid supply duct defines a central bore and the data communication cable is disposed in the central bore of the fluid supply duct.

13. A conduit according to any of claim 1 to 11 wherein the fluid supply duct comprises a peripheral wall defining a central bore and the data communication cable is disposed within the peripheral wall of the fluid supply duct.

14. A combined fluid supply and data communication coupling comprising a first part having a hollow bore and a valve therein and a first data communication terminal for connection to a first data communication cable, and a second part having a hollow bore and a second data communication terminal for connection to a

second data communication cable, the first and second parts being configured to be releasably coupled to each other such that, when in a coupled state, the valve is open and the hollow bore of the first and second parts are in sealed fluid communication to allow fluid to pass therethrough and the first and second data communication terminals are in contact to allow a data signal to pass from one terminal to the other terminal, and when the first and second parts are in an uncoupled state, the valve is closed to prevent fluid flow therethrough and the data communication terminals are out of contact with each other to prevent data signals passing therebetween.

10

15. A coupling according to claim 14 wherein the first and second data connection terminals each include at least one induction element connected to the first and second data communication cables, respectively, and which are configured to make an inductive data connection with each other when adjacent to each other in the coupled state of the coupling.

15

16. A coupling according to claim 15 wherein the induction elements each comprise a loop of conductive material embedded in the body of the respective first and second data connection terminals.

20

17. A coupling according to claim 14 wherein the first and second data connection terminals each include at least one exposed electrical contact connected to the respective first and second data communication cable.

25 18. A coupling according to any of claims 15 to 17 wherein each of the at least one first and second induction elements/electrical contacts is an annular member.

19. A coupling according to claim 18 comprising a plurality of concentric first and second induction elements/electrical contacts.

30

20. A coupling according to claim 14 wherein the first and second data connection terminals each include at least one optical connector and the first and second data communication cables each comprise an optical fibre connected to the

respective first and second optical connector, the first and second optical connectors being configured to make an optical data link with each other when placed adjacent to each other in the coupled state of the coupling.

5 21. A coupling according to any of claims 14 – 20 further comprising a magnet configured to hold the first and second data connection terminals in contact with each other when placed adjacent to each other in a coupled state of the coupling.

22. A coupling according to any of claims 14 – 21 wherein the first and second
10 coupling parts each comprise a main body portion and each of the first and second data connection terminals are disposed on an outer periphery of the respective main body portions.

23. A coupling according to claim 22 wherein at least one of the first and second
15 data connection terminals is slidably mounted on the respective main body portion.

24. A coupling according to claim 23 wherein the at least one slidably mounted data connection terminal is biased towards the other of the data connection terminals in a coupled state of the coupling.

20 25. A coupling according to any of claims 14 – 24 wherein at least one of the first and second coupling parts is connected to an enclosed fluid supply duct, and a data communication cable extends within the at least one fluid supply duct, the respective first and/or second data connection terminals being connected to the
25 respective data communication cable within the respective fluid supply duct.

26. A coupling according to claim 25 wherein the at least one fluid supply duct defines a central bore and the at least one data communication cable is disposed in the central bore of the at least one fluid supply duct.

30 27. A coupling according to claim 25 wherein the at least one fluid supply duct comprises a peripheral wall defining a central bore and the at least one data

communication cable is disposed within the peripheral wall of the at least one fluid supply duct

28. A data communication connector for retro-fitting to a conventional fluid
5 supply coupling, the connector comprising a mounting portion configured to
securely attach the connector to a fluid supply duct or fluid supply coupling, and a
data coupling portion configured to be connected to a data communication cable
and, in use, to be in contact with a corresponding data coupling portion of a
combined fluid supply and data communication coupling for data signals to be
10 transmitted between the data coupling portions.

29. A connector according to claim 28 wherein the data coupling portion
includes at least one induction element to be connected to a data communication
cable and which is configured to make an inductive data connection with a
15 corresponding induction element of a combined fluid supply and data
communication coupling when placed adjacent thereto.

30. A connector according to claim 29 wherein the induction element comprises
a loop of conductive material embedded in the body of the data coupling portion.

20

31. A connector according to claim 28 wherein the data coupling portion
includes at least one exposed electrical contact to be connected to a data
communication cable.

25 32. A connector according to any of claims 29 to 31 wherein the at least one
induction element/electrical contact is an annular member.

33. A connector according to claim 32 comprising a plurality of concentric
induction elements/electrical contacts.

30

34. A connector according to claim 28 wherein the data coupling portion
includes at least one optical connector to be connected to an optical fibre of a data
communication cable, the optical connector being configured to make an optical

data link with a corresponding optical connector of a combined fluid supply and data communication coupling when placed adjacent thereto.

35. A connector according to any of claims 28 – 34 configured to be mounted
5 on an outer periphery of a substantially cylindrical conventional fluid supply coupling.

36. A combined fluid supply and data communication adaptor for retro-fitting to
a conventional fluid supply coupling, the adaptor comprising a main body portion
10 having a hollow bore, and a data coupling portion configured to be connected to a data communication cable and, in use, to be in contact with a corresponding data coupling portion of a combined fluid supply and data communication coupling for data signals to be transmitted between the data coupling portions.

15 37. An adaptor according to claim 36 wherein the hollow bore comprises a valve operable to prevent or permit fluid flow through the hollow bore.

38. An adaptor according to claim 37 wherein the main body portion comprises a first part configured to couple with a conventional fluid supply valve and a second
20 portion configured to couple with a combined fluid supply and data communication coupling.

39. An adaptor according to claim 38 wherein the first portion comprises a male portion configured to be received in a conventional female fluid supply coupling
25 and the second portion comprises a female portion configured to receive a male portion of a combined fluid supply and data communication coupling.

40. An adaptor according to any of claims 36 – 39 wherein the data coupling portion includes at least one induction element to be connected to a data
30 communication cable and which is configured to make an inductive data connection with a corresponding induction element of a combined fluid supply and data communication coupling when placed adjacent thereto.

41. An adaptor according to claim 40 wherein the induction element comprises a loop of conductive material embedded in the body of the data coupling portion.

42. A connector according to any of claims 36 – 39 wherein the data coupling
5 portion includes at least one exposed electrical contact to be connected to a data communication cable.

43. A connector according to any of claims 40 – 42 wherein the at least one induction element/electrical contact is an annular member.

10

44. A connector according to claim 43 comprising a plurality of concentric induction elements/electrical contacts.

45. A connector according to any of claims 36 – 39 wherein the data coupling
15 portion includes at least one optical connector to be connected to an optical fibre of a data communication cable, the optical connector being configured to make an optical data link with a corresponding optical connector of a combined fluid supply and data communication coupling when placed adjacent thereto.

20 46. A combined fluid supply and data communication network comprising a main fluid supply duct coupled at one end to a source of fluid and having a plurality of branch lines in fluid communication therewith, at least one branch line including a coupling at one end thereof including a valve to seal the branch line closed in an un-coupled state, the network further comprising a plurality of data communication
25 cables extending within the main fluid supply duct and branch lines, at least one cable connected to a communications control unit and at least one cable connected to the at least one coupling at a terminal formed on the at least one coupling, the network configured to simultaneously provide fluid to a fluid-compatible equipment when coupled to the at least one coupling, and to transmit data signals between the
30 communication control unit and an electrical device connected to the terminal on the at least one coupling.

47. A network according to claim 46 wherein the source of fluid is a source of compressed breathable air and the network is configured to provide breathable air to breathing equipment coupled to the at least one coupling.

5 48. A network according to claim 46 or claim 47 wherein a data bus is connected between the communications control unit and the data communication cable(s).

49. A network according to any of claims 46 – 48 wherein the network is a passive network and power to transmit data signals between an electrical device
10 connected to the terminal on the at least one coupling and the communications control unit is to be provided by a power source on the electrical device.

15

Application No: GB1020096.2

Examiner: Mr Nithi Nithianathan

Claims searched: 1-13

Date of search: 25 August 2011

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-13	DE2333620 A1 (Kernforschung); see air and telephone line quick-release connector with valve, and wiring located within air duct
X	1-13	DE2212656 A1 (Kernforschung); see air and telephone line quick-release connector with valve, and wiring located within air duct
X	1-13	US5810048 A1 (Zeiner); see figure 6-9 relating to electrical wiring and fibre optic cables in fluid connectors with valve
X	1-13	EP1901382 A2 (Yamaha); note various electrical coupling connections in the fluid coupling with valve
A	-	US2002/135179 A1 (Schlumberger); discusses inductive coupling in fluid connectors
A	-	EP0337055 A2 (Teikoku); see electrical terminals of connectors in figures 1 and 2
A	-	US2004/025682 A1 (Festo); see light guides in fluid coupler
A	-	EP1127583 A2 (Siemens); see electrical contacts of fluid coupler in figures

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X:



Worldwide search of patent documents classified in the following areas of the IPC

F16L; H01R

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
F16L	0011/127	01/01/2006
F16L	0025/01	01/01/2006
F16L	0037/407	01/01/2006
H01R	0013/00	01/01/2006