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Installation for fighting fire

The present invention relates to an installation for fighting fire, comprising a drive unit for extinguishing liquid.

5 In the Finnish patent application 924752 is described an installation for fighting fire having as a drive unit e.g. a plurality of parallel hydraulic accumulators with an initial charge pressure of e.g. about 200 bar. Such an installation is well suited for
10 fighting fire e.g. in an engine room of a ship. The engine room is usually divided into a number of separate fire sections or fire zones.

It is desirable to connect the drive unit of the fire fighting installation selectively to that
15 particular fire section where a fire has started. High pressure guide or pilot valves are available for that purpose but they are unproportionally expensive.

The object of the invention is to provide, for an installation of the kind mentioned above, a new
20 pilot valve means which is of a simple structure and thus is cheap.

The basic idea of the invention is that after an alarm signal has been received, but before actuating the drive unit of the fire fighting installation, the
25 desired flow path is opened through the pilot valve means to connect the drive unit for extinguishing liquid to the respective fire section. Thanks to the invention it is possible to use simple and cheap pilot valves dimensioned for low pressure, or alternatively,
30 small pilot valves intended for high pressure which likewise are cheap.

According to a preferred embodiment of the invention, liquid is in a first step delivered at a
35 relatively low pressure, e.g. about 20 bar, in order to fill the lines leading to the respective fire

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5 section with liquid and to cool the respective spray
heads and nozzles before actuating the drive unit
intended for high pressure liquid spraying, and by
utilizing the said initial low pressure liquid the
connection from the outgoing line of the drive unit is
at the same time opened through the pilot valve means
to the respective fire section. The said outgoing line
is still closed at the drive unit during the initial
step of combined low pressure spray and opening said
10 connection through the pilot valve means, and thus it
is possible to use pilot valves dimensioned for low
pressure.

The initial spraying of low pressure liquid as
well as establishing the connection from the
15 respective fire section to the main drive unit of the
installation can, alternatively, be accomplished by
means of e.g. a hydraulic accumulator which can be
charged to either a high pressure or a low pressure.
If the accumulator is charged to a high pressure, the
20 connection thereof to the respective outgoing fire
section line is arranged through a small high pressure
valve which passes a small flow of liquid. Instead of
a separate hydraulic accumulator it is also possible
to for this purpose use the main drive unit itself
25 which preferably comprises a plurality of hydraulic
accumulators coupled in parallel, whereat thus the
drive unit at first is connected to the pilot valve
means through a small high pressure valve in order to,
before commencing the main extinguishing procedure,
30 open such a connection from the respective fire
section to the main drive unit that is capable of
passing the whole liquid delivery capacity of the
drive unit.

35 By a small high pressure valve, which acts as a
pilot valve within the pilot valve means, is here
meant a valve having a pass flow aperture diameter of



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the order e.g. 2 mm. In comparison, if one were to actuate the drive unit directly at full power, the pilot valve means would require high pressure valves having a pass flow aperture diameter of about 40 mm.

5 It is essential to perform the establishment of the desired connection in the pilot valve means, intended for the main extinguishing process, by means of a small power, i.e. either by utilizing a low drive pressure, whereat the amount of liquid can be
10 relatively great, although considerably smaller than the main flow during the main extinguishing process, or by utilizing a high pressure and a small amount of liquid.

15 The invention is defined in the claims following the description.

In the following the invention shall be described in more detail with reference to the attached drawing which, by way of example, shows preferable embodiments of the invention.

20 Figure 1 shows a fire fighting installation in inactive state.

Figure 2 illustrates the function of the pilot valve means when a fire has started.

25 Figure 3 shows, as a partial longitudinal section, a practical embodiment of a pilot valve means in the state of figure 2.

Figure 4 shows an embodiment utilizing high pressure guiding.

30 In figure 1 a drive unit for delivering high pressure extinguishing liquid in a fire fighting installation is generally indicated by the reference numeral 1. A pilot valve means leads from the drive unit 1 to four fire sections A, B, C and D. A liquid pump with an operating pressure of e.g. 15 to 20 bar is indicated by 2 and a high pressure liquid pump with
35 an operating pressure of e.g. 200 bar is indicated by



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3. The high pressure pump 3 is arranged to charge a plurality of hydraulic accumulators 4 which preferably are of a structure as described in the Finnish patent application 924752. The outgoing line of the drive unit 1 is indicated by 5 and a shut-off valve in the line 5 is indicated by 6. The valve 6 is usually open, as in figure 1.

Figure 1 shows the installation in inactive state of stand-by.

In figure 2, a fire has broken out in fire section A. The pump 2 has been activated to deliver liquid through its feed line 7 (alternatively, e.g. in case of electric power fall-out, initial pilot liquid can be delivered by a low pressure hydraulic accumulator 8), through the opened valve 9 and a subsequent back valve to the line 10 which leads to spray heads or sprinklers in the fire section A. The pressure in the line 10 moves a first change valve 11, positioned between the feed line to the fire section A and the feed line to the fire section B, from the position shown in figure 1 to the position shown in figure 2, and a second change valve 12 likewise from the position shown in figure 1 to the position shown in figure 2. The delivery of low pressure liquid to the fire section A thus opens the connection from the feed line 5 of the high pressure drive unit 1, when the hydraulic accumulators 4 are not yet activated, to the fire section A, while the connections from the feed line 5 of the drive unit 1 to the fire sections B, C and D are closed.

The high pressure unit 1 can now be activated at will. The valve 9, as well as the corresponding valves to the fire sections B, C and D, can be of a simple and cheap structure.

Between the feed lines to the fire sections C and D is provided a third change valve 13 which in the

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present case has not moved. The positions of the change valves 12 and 13 in figure 1 indicate that the previous activation, e.g. in order to test the installation, has occurred in the fire section D which in figure 1 is in connection to the feed line 5 of the drive unit 1, while the connections to the fire sections A, B and C are closed.

The valve arrangement 11, 12, 13 can be of a simple structure. Figure 3 shows one embodiment where the change valves 11, 12 and 13 comprise a movable sleeve 21, 22 and 23, respectively, with one end closed. If desirable, the pilot valve means can without difficulty be extended to serve a larger number of fire sections, utilizing the same principle.

Figures 1-3 show a favourable embodiment of the invention. It is, however, possible to replace the low pressure valves 9 by small high pressure valves, whereat it for the initial low pressure liquid spraying and simultaneous establishing of the respective connection via the change valves 11, 12 and 13, respectively, is possible to use a hydraulic high pressure accumulator which is not shown in the drawing but which could replace the low pressure hydraulic accumulator 8 and be charged by the high pressure pump 3. The valves 11, 12 and 13 could in principle also be actuated by means of pressurized gas, if it is considered unnecessary to initially cool the nozzles and the spray heads and to fill the feed lines with liquid before the high pressure drive unit 1 is activated.

Alternatively, it is further possible to utilize the hydraulic high pressure accumulators for establishing a connection to a respective fire section. An example is shown in figure 4.

From the bottom region of a hydraulic accumulator 4 runs a pipe 30, preferably provided with

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apertures in its wall, as presented in the Finnish patent application 924752, to a valve structure at the outlet end of the accumulator 4. From the pipe 30 leads a throttled connection 31 in a valve spindle 32, which is forced against the outlet end of the pipe 30 by a spring 33, to a narrow gap 34 between the spindle end of a manually operable valve 35 and the housing of the outlet valve structure. From the passage 34 there is a line 36 to a pilot valve means which in principle is of the same kind as the one shown in figures 1-3. The line 36 corresponds to the line 7 or to the feed line of the hydraulic low pressure accumulator 8 in figure 1, while the line 37 in figure 4 corresponds to the main feed line 5 in figure 1.

In figure 4 the installation is in a state of stand-by, whereat the pressure in the line 36 is the same as in the accumulator 4, via the connection 31-34. The line 36 can be filled with liquid but there is no liquid flow in the line 36, because the valves 9 to the fire sections A, B, C and D are all closed.

It shall again be assumed that there is a fire in the fire section A. Alarm results in that the respective valve 9 is opened and liquid flows from the line 36 to the section A and at the same time the valves 11 and 12 are moved to the positions of figure 2 in the same way as described earlier, establishing connection from the section A to the line 37. The pressure in the line 37 has access, via a groove 38 or the like formed in the valve spindle 32, to act on a face 39 of the spindle 32, in a direction against the spring 33, whereat the force effected by the pressure on said face 39 together with the force effected by the pressure in the accumulator 4, due to the pressure fall over the throttle 31, drive the valve spindle 32 upwards from the position shown in figure 4, so that there is a direct connection from the outlet of the

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pipe 30 to the line 37, for full delivery of liquid to section A.

5 The embodiment shown in figure 4 can without difficulty be extended to comprise a plurality of hydraulic accumulators 4, e.g. as shown in figure 1. This embodiment has an additional advantage in that it is fully workable independently of electric power supply; the valve symbols in figure 4 indicate that the valves in first place are intended to be operated automatically, eg. electrically, with a possibility to be manually operated, as a reserve. With suitable dimensions for the throttles at 31 and 34 the valves 9 in figure 4 can be low pressure valves, like in figures 1-3, or alternatively high pressure valves with a small pass flow aperture.

10 The spray heads, including nozzles, of the installation, in the respective fire sections A, B, C and D can preferably be of such constructions that are presented e.g. i the international patent applications PCT/FI92/00060, PCT/FI92/00155 and PCT/FI92/00156.

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Claims

1. Installation for fighting fire, comprising a drive unit for extinguishing liquid, characterized in

5 that the outgoing line (5) of the drive unit (1) is connected to a pilot valve means having outgoing lines to a plurality of fire sections (A, B, C, D),

10 that the respective outgoing lines of the pilot valve means are connectable to a pressure source, preferably a liquid source (3; 8), and

15 that the pilot valve means comprises a number of valves, preferably change valves (11, 12, 13), mutually combined in such a manner that connecting said pressure source (3;8) to one outgoing line (10) to a fire section (A) brings about the establishing of a connection (11, 12) from that fire section (A) to the outgoing line (5) of the drive unit (1) and the closing of the connections from the other fire sections (B, C, D) to the outgoing line (5) of the drive unit.

20 2. Installation according to claim 1, characterized in that the outgoing lines from the pilot valve means to the fire sections are interconnected pairwise (A, B; C, D) by means of a change valve (11; 13) and that these change valves are interconnected pairwise by means of a change valve (12) which is in direct or indirect connection to the outgoing line (5) of the drive unit (1).

25 3. Installation according to claim 2, characterized in that the change elements of the change valves (11, 12, 13) are axially movable sleeves (21, 22, 23).

30 4. Installation according to claim 1, characterized in that said pressure source is a liquid source (3; 8) having a low operating pressure

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in relation to the operating pressure of the drive unit (1).

5 5. Installation according to claim 4, characterized in that the liquid source (3, 8) is connectable to a respective outgoing fire section line (10) through a low pressure valve (9).

10 6. Installation according to claim 1, characterized in that said pressure source is a high pressure liquid source and that it is connectable to to a respective outgoing fire section line through a small high pressure valve.

15 7. Installation according to claim 6, characterized in that said high pressure liquid source is a hydraulic accumulator or the like, separate from the drive unit (1) of the installation.

 8. Installation according to claim 6, characterized in that said high pressure liquid source is the drive unit (1; 4) of the installation.

20 9. Installation according to claim 8, characterized in that the initial pilot liquid flow is made to pass a through throttle (31) in a spindle (32) of an outlet valve of the high pressure liquid source (4) and that the pressure in the main outgoing line (37) of the liquid source (4), after establishing
25 connection to a respective fire section, is arranged to, together with the pressure fall over said throttle (31), to drive said spindle (32) to open direct connection from the liquid source to its main outgoing line (37).

30 10. Installation according to claim 9, characterized in that said pressure in the main outgoing line (37) is arranged to act through a groove (38) or the like on a face (39) provided on said spindle (32).

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Abstract

5 The invention relates to an installation
comprising a high pressure drive unit for
extinguishing liquid. When a fire has broken out in a
fire section (A), a low pressure liquid source is
connected (9, 10) to the respective fire section and
the pressure of this liquid is utilized both for
establishing a connection (11, 12) through a pilot
valve means from the respective fire section to the
10 outgoing line (5) of the high pressure drive unit,
before this drive unit is activated, and for closing
the connections from other fire sections to said
outgoing line (5). The invention makes it possible to
use cheap low pressure valves (9) in the pilot valve
15 means. (Figure 2)

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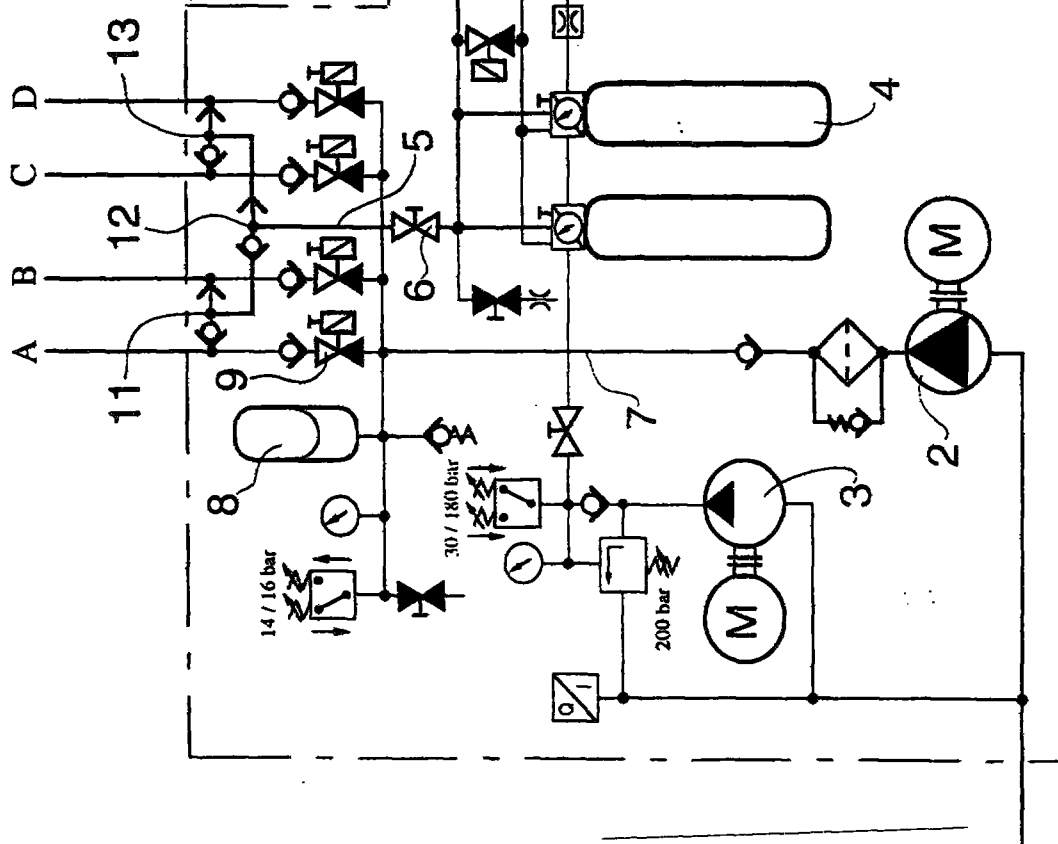
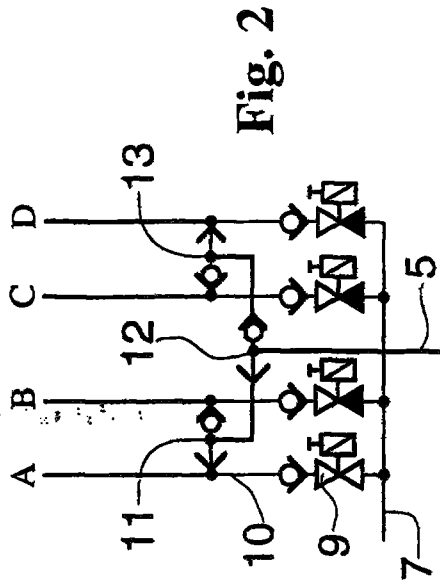


Fig. 1

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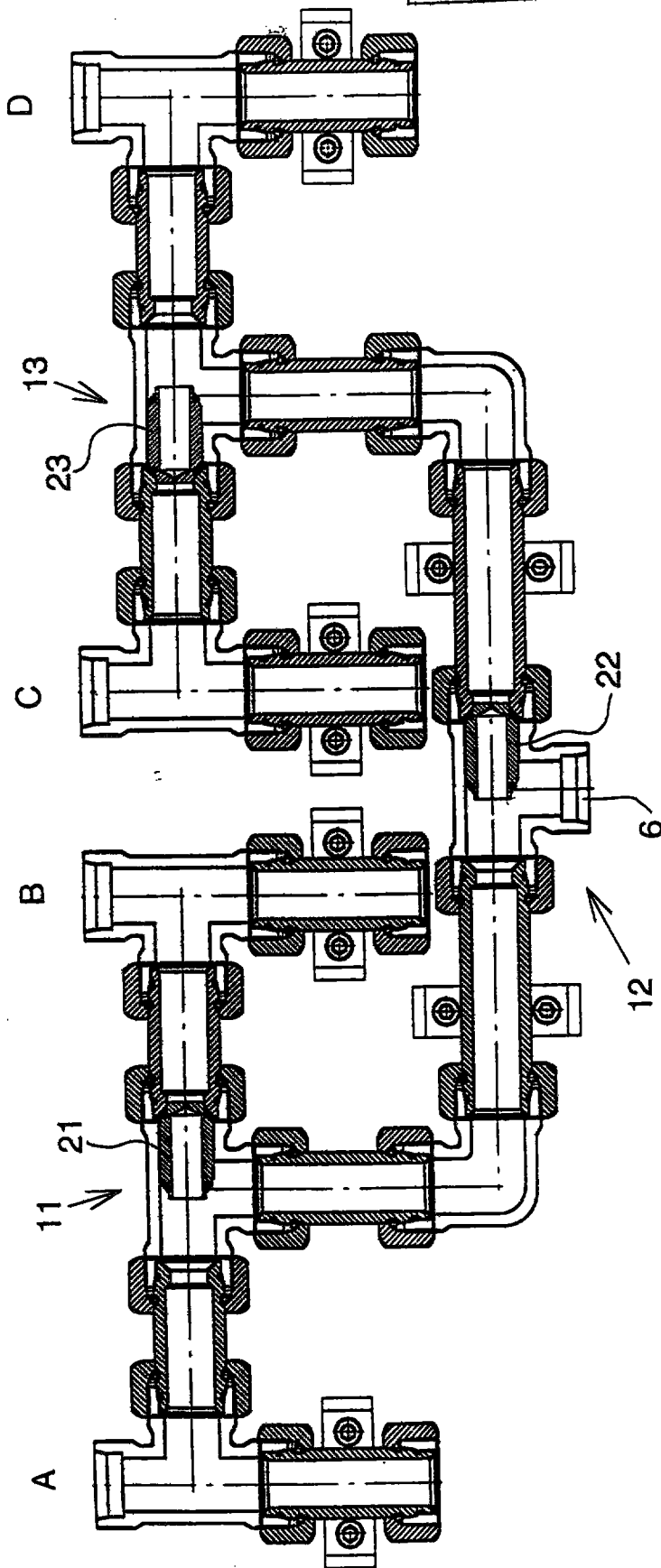


Fig. 3

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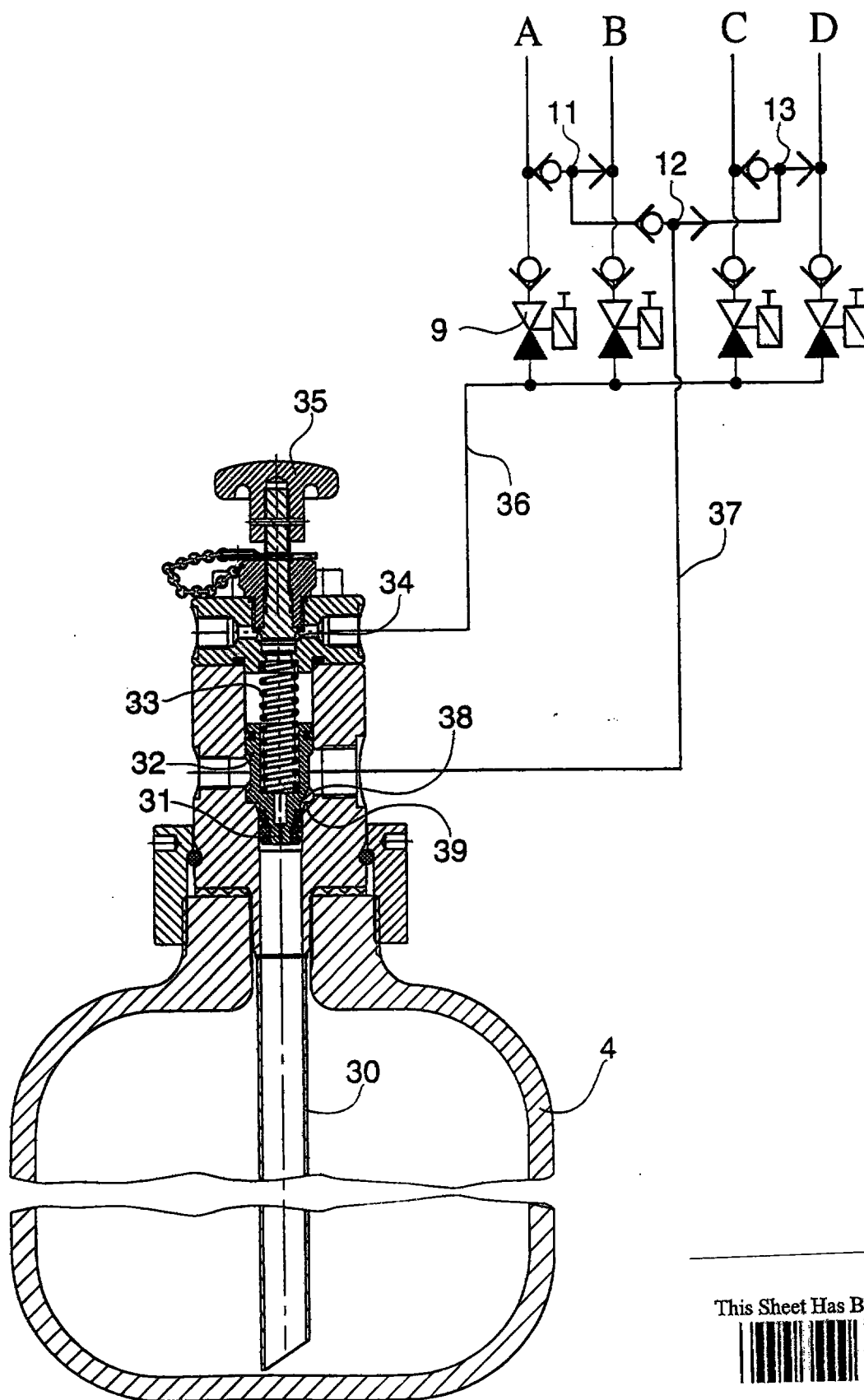


Fig. 4

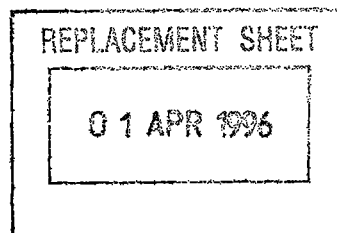
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Installation for fighting fire

The present invention relates to an installation for fighting fire, comprising a drive unit for extinguishing liquid.

In the Finnish patent application 924752 is described an installation for fighting fire having as a drive unit e.g. a plurality of parallel hydraulic accumulators with an initial charge pressure of e.g. about 200 bar. Such an installation is well suited for fighting fire e.g. in an engine room of a ship. The engine room is usually divided into a number of separate fire sections or fire zones.

It is desirable to connect the drive unit of the fire fighting installation selectively to that particular fire section where a fire has started. High pressure guide or pilot valves are available for that purpose but they are unproportionally expensive.

The object of the invention is to provide, for an installation of the kind mentioned above, a new pilot valve means which is of a simple structure and thus is cheap.

The basic idea of the invention is that after an alarm signal has been received, but before actuating the drive unit of the fire fighting installation, the desired flow path is opened through the pilot valve means to connect the drive unit for extinguishing liquid to the respective fire section. Thanks to the invention it is possible to use simple and cheap pilot valves dimensioned for low pressure, or alternatively, small pilot valves intended for high pressure which likewise are cheap.

According to a preferred embodiment of the invention, liquid is in a first step delivered at a relatively low pressure, e.g. about 20 bar, in order to fill the lines leading to the respective fire

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section with liquid and to cool the respective spray heads and nozzles before actuating the drive unit intended for high pressure liquid spraying, and by utilizing the said initial low pressure liquid the connection from the outgoing line of the drive unit is at the same time opened through the pilot valve means to the respective fire section. The said outgoing line is still closed at the drive unit during the initial step of combined low pressure spray and opening said connection through the pilot valve means, and thus it is possible to use pilot valves dimensioned for low pressure.

The initial spraying of low pressure liquid as well as establishing the connection from the respective fire section to the main drive unit of the installation can, alternatively, be accomplished by means of e.g. a hydraulic accumulator which can be charged to either a high pressure or a low pressure. If the accumulator is charged to a high pressure, the connection thereof to the respective outgoing fire section line is arranged through a small high pressure valve which passes a small flow of liquid. Instead of a separate hydraulic accumulator it is also possible to for this purpose use the main drive unit itself which preferably comprises a plurality of hydraulic accumulators coupled in parallel, whereat thus the drive unit at first is connected to the pilot valve means through a small high pressure valve in order to, before commencing the main extinguishing procedure, open such a connection from the respective fire section to the main drive unit that is capable of passing the whole liquid delivery capacity of the drive unit.

By a small high pressure valve, which acts as a pilot valve within the pilot valve means, is here meant a valve having a pass flow aperture diameter of

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the order e.g. 2 mm. In comparison, if one were to actuate the drive unit directly at full power, the pilot valve means would require high pressure valves having a pass flow aperture diameter of about 40 mm.

It is essential to perform the establishment of the desired connection in the pilot valve means, intended for the main extinguishing process, by means of a small power, i.e. either by utilizing a low drive pressure, whereat the amount of liquid can be relatively great, although considerably smaller than the main flow during the main extinguishing process, or by utilizing a high pressure and a small amount of liquid.

The invention is defined in the claims following the description.

In the following the invention shall be described in more detail with reference to the attached drawing which, by way of example, shows preferable embodiments of the invention.

Figure 1 shows a fire fighting installation in inactive state.

Figure 2 illustrates the function of the pilot valve means when a fire has started.

Figure 3 shows, as a partial longitudinal section, a practical embodiment of a pilot valve means in the state of figure 2.

Figure 4 shows an embodiment utilizing high pressure guiding.

In figure 1 a drive unit for delivering high pressure extinguishing liquid in a fire fighting installation is generally indicated by the reference numeral 1. A pilot valve means leads from the drive unit 1 to four fire sections A, B, C and D. A liquid pump with an operating pressure of e.g. 15 to 20 bar is indicated by 2 and a high pressure liquid pump with an operating pressure of e.g. 200 bar is indicated by

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3. The high pressure pump 3 is arranged to charge a plurality of hydraulic accumulators 4 which preferably are of a structure as described in the Finnish patent application 924752. The outgoing line of the drive unit 1 is indicated by 5 and a shut-off valve in the line 5 is indicated by 6. The valve 6 is usually open, as in figure 1.

Figure 1 shows the installation in inactive state of stand-by.

In figure 2, a fire has broken out in fire section A. The pump 2 has been activated to deliver liquid through its feed line 7 (alternatively, e.g. in case of electric power fall-out, initial pilot liquid can be delivered by a low pressure hydraulic accumulator 8), through the opened valve 9 and a subsequent back valve to the line 10 which leads to spray heads or sprinklers in the fire section A. The pressure in the line 10 moves a first change valve 11, positioned between the feed line to the fire section A and the feed line to the fire section B, from the position shown in figure 1 to the position shown in figure 2, and a second change valve 12 likewise from the position shown in figure 1 to the position shown in figure 2. The delivery of low pressure liquid to the fire section A thus opens the connection from the feed line 5 of the high pressure drive unit 1, when the hydraulic accumulators 4 are not yet activated, to the fire section A, while the connections from the feed line 5 of the drive unit 1 to the fire sections B, C and D are closed.

The high pressure unit 1 can now be activated at will. The valve 9, as well as the corresponding valves to the fire sections B, C and D, can be of a simple and cheap structure.

Between the feed lines to the fire sections C and D is provided a third change valve 13 which in the

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present case has not moved. The positions of the change valves 12 and 13 in figure 1 indicate that the previous activation, e.g. in order to test the installation, has occurred in the fire section D which in figure 1 is in connection to the feed line 5 of the drive unit 1, while the connections to the fire sections A, B and C are closed.

The valve arrangement 11, 12, 13 can be of a simple structure. Figure 3 shows one embodiment where the change valves 11, 12 and 13 comprise a movable sleeve 21, 22 and 23, respectively, with one end closed. If desirable, the pilot valve means can without difficulty be extended to serve a larger number of fire sections, utilizing the same principle.

Figures 1-3 show a favourable embodiment of the invention. It is, however, possible to replace the low pressure valves 9 by small high pressure valves, whereat it for the initial low pressure liquid spraying and simultaneous establishing of the respective connection via the change valves 11, 12 and 13, respectively, is possible to use a hydraulic high pressure accumulator which is not shown in the drawing but which could replace the low pressure hydraulic accumulator 8 and be charged by the high pressure pump 3. The valves 11, 12 and 13 could in principle also be actuated by means of pressurized gas, if it is considered unnecessary to initially cool the nozzles and the spray heads and to fill the feed lines with liquid before the high pressure drive unit 1 is activated.

Alternatively, it is further possible to utilize the hydraulic high pressure accumulators for establishing a connection to a respective fire section. An example is shown in figure 4.

From the bottom region of a hydraulic accumulator 4 runs a pipe 30, preferably provided with

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apertures in its wall, as presented in the Finnish patent application 924752, to a valve structure at the outlet end of the accumulator 4. From the pipe 30 leads a throttled connection 31 in a valve spindle 32, which is forced against the outlet end of the pipe 30 by a spring 33, to a narrow gap 34 between the spindle end of a manually operable valve 35 and the housing of the outlet valve structure. From the passage 34 there is a line 36 to a pilot valve means which in principle is of the same kind as the one shown in figures 1-3. The line 36 corresponds to the line 7 or to the feed line of the hydraulic low pressure accumulator 8 in figure 1, while the line 37 in figure 4 corresponds to the main feed line 5 in figure 1.

In figure 4 the installation is in a state of stand-by, whereat the pressure in the line 36 is the same as in the accumulator 4, via the connection 31-34. The line 36 can be filled with liquid but there is no liquid flow in the line 36, because the valves 9 to the fire sections A, B, C and D are all closed.

It shall again be assumed that there is a fire in the fire section A. Alarm results in that the respective valve 9 is opened and liquid flows from the line 36 to the section A and at the same time the valves 11 and 12 are moved to the positions of figure 2 in the same way as described earlier, establishing connection from the section A to the line 37. The pressure in the line 37 has access, via a groove 38 or the like formed in the valve spindle 32, to act on a face 39 of the spindle 32, in a direction against the spring 33, whereat the force effected by the pressure on said face 39 together with the force effected by the pressure in the accumulator 4, due to the pressure fall over the throttle 31, drive the valve spindle 32 upwards from the position shown in figure 4, so that there is a direct connection from the outlet of the

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pipe 30 to the line 37, for full delivery of liquid to section A.

The embodiment shown in figure 4 can without difficulty be extended to comprise a plurality of hydraulic accumulators 4, e.g. as shown in figure 1. This embodiment has an additional advantage in that it is fully workable independently of electric power supply; the valve symbols in figure 4 indicate that the valves in first place are intended to be operated automatically, eg. electrically, with a possibility to be manually operated, as a reserve. With suitable dimensions for the throttles at 31 and 34 the valves 9 in figure 4 can be low pressure valves, like in figures 1-3, or alternatively high pressure valves with a small pass flow aperture.

The spray heads, including nozzles, of the installation, in the respective fire sections A, B, C and D can preferably be of such constructions that are presented e.g. in the international patent applications PCT/FI92/00060, PCT/FI92/00155 and PCT/FI92/00156.

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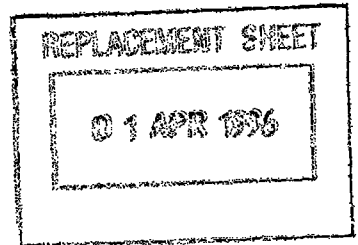


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Claims



1. Installation for fighting fire, comprising a drive unit for extinguishing liquid, characterized in

that the outgoing line (5) of the drive unit (1) is connected to a pilot valve means having outgoing lines to a plurality of fire sections (A, B, C, D),

that the respective outgoing lines of the pilot valve means are connectable to a pressure source, preferably a liquid source (3; 8), and

that the pilot valve means comprises a number of valves, preferably change valves (11, 12, 13), mutually combined in such a manner that connecting said pressure source (3;8) to one outgoing line (10) to a fire section (A) brings about the establishing of a connection (11, 12) from that fire section (A) to the outgoing line (5) of the drive unit (1) and the closing of the connections from the other fire sections (B, C, D) to the outgoing line (5) of the drive unit.

2. Installation according to claim 1, characterized in that the outgoing lines from the pilot valve means to the fire sections are interconnected pairwise (A, B; C, D) by means of a change valve (11; 13) and that these change valves are interconnected pairwise by means of a change valve (12) which is in direct or indirect connection to the outgoing line (5) of the drive unit (1).

3. Installation according to claim 2, characterized in that the change elements of the change valves (11, 12, 13) are axially movable sleeves (21, 22, 23).

4. Installation according to claim 1, characterized in that said pressure source is a liquid source (3; 8) having a low operating pressure

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in relation to the operating pressure of the drive unit (1).

5. Installation according to claim 4, characterized in that the liquid source (3, 8) is connectable to a respective outgoing fire section line (10) through a low pressure valve (9).

6. Installation according to claim 1, characterized in that said pressure source is a high pressure liquid source and that it is connectable to to a respective outgoing fire section line through a small high pressure valve.

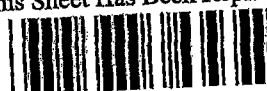
7. Installation according to claim 6, characterized in that said high pressure liquid source is a hydraulic accumulator or the like, separate from the drive unit (1) of the installation.

8. Installation according to claim 6, characterized in that said high pressure liquid source is the drive unit (1; 4) of the installation.

9. Installation according to claim 8, characterized in that the initial pilot liquid flow is made to pass a through throttle (31) in a spindle (32) of an outlet valve of the high pressure liquid source (4) and that the pressure in the main outgoing line (37) of the liquid source (4), after establishing connection to a respective fire section, is arranged to, together with the pressure fall over said throttle (31), to drive said spindle (32) to open direct connection from the liquid source to its main outgoing line (37).

10. Installation according to claim 9, characterized in that said pressure in the main outgoing line (37) is arranged to act through a groove (38) or the like on a face (39) provided on said spindle (32).

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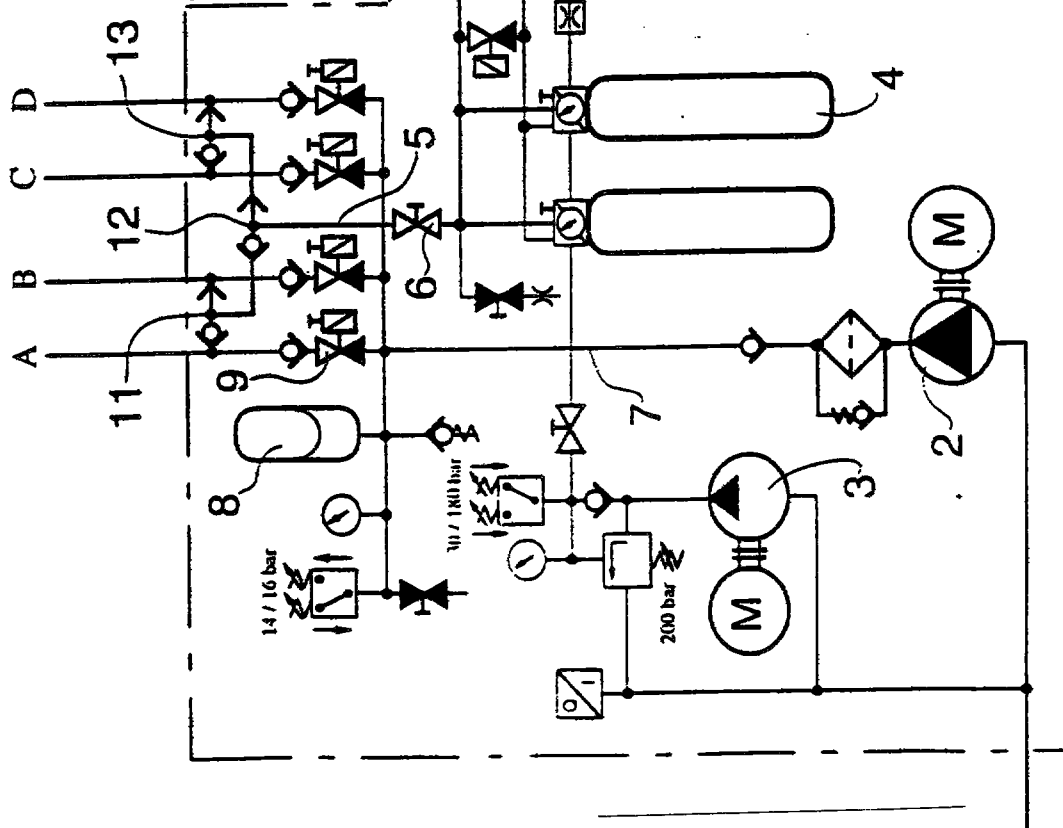
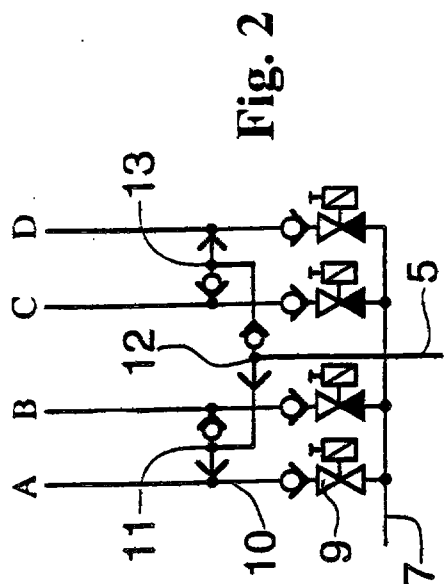


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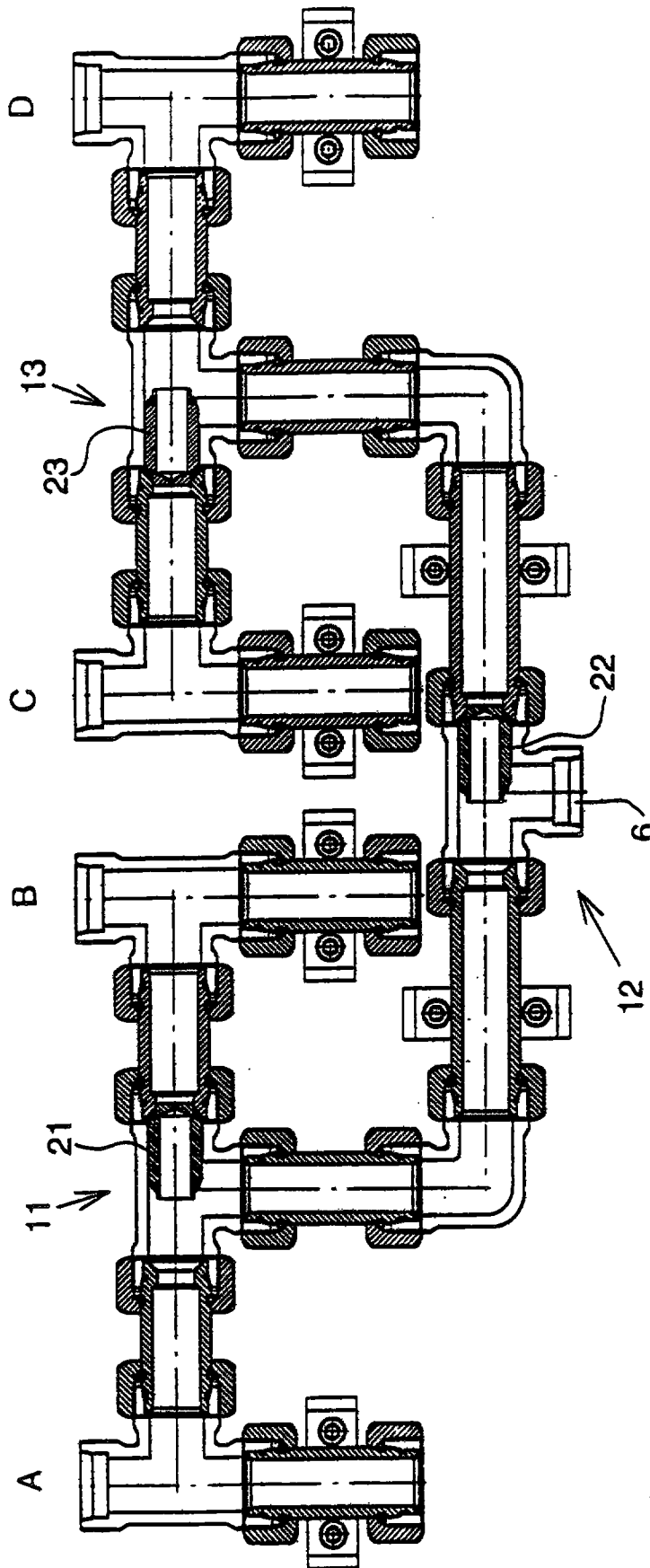


Fig. 3

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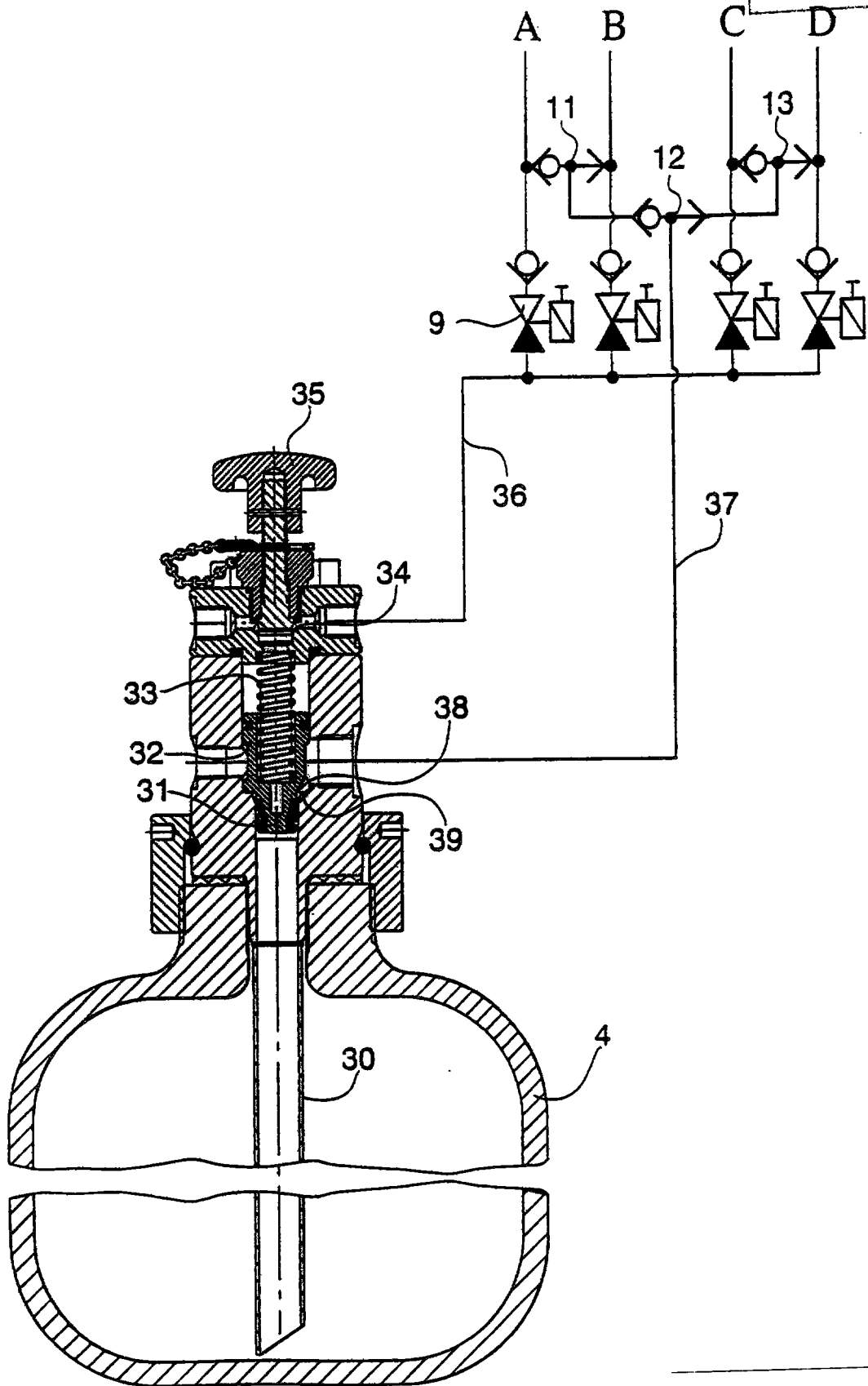


Fig. 4

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INSTALLATION FOR FIGHTING FIRE
Abstract

The invention relates to an installation comprising a high pressure drive unit for extinguishing liquid. When a fire has broken out in a fire section (A), a low pressure liquid source is connected (9, 10) to the respective fire section and the pressure of this liquid is utilized both for establishing a connection (11, 12) through a pilot valve means from the respective fire section to the outgoing line (5) of the high pressure drive unit, before this drive unit is activated, and for closing the connections from other fire sections to said outgoing line (5). The invention makes it possible to use cheap low pressure valves (9) in the pilot valve means. Figure 2

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INSTALLATION FOR FIGHTING FIRE.

The present invention relates to an installation for fighting fire, comprising a drive unit for extinguishing liquid.

In the Finnish patent application 924752 (WO-A-9310859, published on 10.06.93, WO-A-9408659, published on 20.04.94) is described as installation for fighting fire having as a drive unit e.g. a plurality of parallel hydraulic accumulators with an initial charge pressure of e.g. about 200 bar. Such an installation is well suited for fighting fire e.g. in an engine room of a ship. The engine room is usually divided into a number of separate fire sections or fire zones.

It is desirable to connect the drive unit of the fire fighting installation selectively to that particular fire section where a fire has started. High pressure guide or pilot valves are available for that purpose but they are unproportionally expensive.

The object of the invention is to provide, for an installation of the kind mentioned above, a new pilot valve means which is of a simple structure and thus is cheap.

The basic idea of the invention is that after an alarm signal has been received, but before actuating the drive unit of the fire fighting installation, the desired flow path is opened through the pilot valve means to connect the drive unit for extinguishing liquid to the respective fire section. Thanks to the invention it is possible to use simple and cheap pilot valves dimensioned for low pressure, or alternatively, small pilot valves intended for high pressure which likewise are cheap.

According to a preferred embodiment of the invention, liquid is in a first step delivered at a relatively low pressure, e.g. about 20 bar, in order to fill the lines leading to the respective fire

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section with liquid and to cool the respective spray heads and nozzles before actuating the drive unit intended for high pressure liquid spraying, and by utilizing the said initial low pressure liquid the connection from the outgoing line of the drive unit is at the same time opened through the pilot valve means to the respective fire section. The said outgoing line is still closed at the drive unit during the initial step of combined low pressure spray and opening said connection through the pilot valve means, and thus it is possible to use pilot valves dimensioned for low pressure.

The initial spraying of low pressure liquid as well as establishing the connection from the respective fire section to the main drive unit of the installation can, alternatively, be accomplished by means of e.g. a hydraulic accumulator which can be charged to either a high pressure or a low pressure. If the accumulator is charged to a high pressure, the connection thereof to the respective outgoing fire section line is arranged through a small high pressure valve which passes a small flow of liquid. Instead of a separate hydraulic accumulator it is also possible to for this purpose use the main drive unit itself which preferably comprises a plurality of hydraulic accumulators coupled in parallel, whereat thus the drive unit at first is connected to the pilot valve means through a small high pressure valve in order to, before commencing the main extinguishing procedure, open such a connection from the respective fire section to the main drive unit that is capable of passing the whole liquid delivery capacity of the drive unit.

By a small high pressure valve, which acts as a pilot valve within the pilot valve means, is here meant a valve having a pass flow aperture diameter of

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the order e.g. 2 mm. In comparison, if one were to actuate the drive unit directly at full power, the pilot valve means would require high pressure valves having a pass flow aperture diameter of about 40mm.

It is essential to perform the establishment of the desired connection in the pilot valve means, intended for the main extinguishing process, by means of a small power, i.e. either by utilizing a low drive pressure, whereat the amount of liquid can be relatively great, although considerably smaller than the main flow during the main extinguishing process, or by utilizing a high pressure and a small amount of liquid.

The invention is defined in the claims following the description.

In the following the invention shall be described in more detail with reference to the attached drawing which, by way of example, shows preferable embodiments of the invention.

Figure 1 shows a fire fighting installation in inactive state.

Figure 2 illustrates the function of the pilot valve means when a fire has started.

Figure 3 shows, as a partial longitudinal section, a practical embodiment of a pilot valve means in the state of figure 2.

Figure 4 shows an embodiment utilizing high pressure guiding.

In figure 1 a drive unit for delivering high pressure extinguishing liquid in a fire fighting installation is generally indicated by the reference numeral 1. A pilot valve means leads from the drive unit 1 to four fire sections A, B, C and D. A liquid pump with an operating pressure of e.g. 15 to 20 bar is indicated by 2 and a high pressure liquid pump with an operating pressure of e.g. 200 bar is indicated by

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3. The high pressure pump 3 is arranged to charge a plurality of hydraulic accumulators 4 which preferably are of a structure as described in the Finnish patent application 924752. The outgoing line of the drive unit 1 is indicated by 5 and a shut-off valve in the line 5 is indicated by 6. The valve 6 is usually open, as in figure 1.

Figure 1 shows the installation in inactive state of stand-by.

In figure 2, a fire has broken out in fire section A. The pump 2 has been activated to deliver liquid through its feed line 7 (alternatively, e.g. in case of electric power fall-out, initial pilot liquid can be delivered by a low pressure hydraulic accumulator 8), through the opened valve 9 and a subsequent back valve to the line 10 which leads to spray heads or sprinklers in the fire section A. The pressure in the line 10 moves a first change valve 11, positioned between the feed line to the fire section A and the feed line to the fire section B, from the position shown in figure 1 to the position shown in figure 2, and a second change valve 12 likewise from the position shown in figure 1 to the position shown in figure 2. The delivery of low pressure liquid to the fire section A thus opens the connection from the feed line 5 of the high pressure drive unit 1, when the hydraulic accumulators 4 are not yet activated, to the fire section A, while the connections from the feed line 5 of the drive unit 1 to the fire sections B, C and D are closed.

The high pressure unit 1 can now be activated at will. The valve 9, as well as the corresponding valves to the fire sections B, C and D, can be of a simple and cheap structure.

Between the feed lines to the fire sections C and D is provided a third change valve 13 which in the

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present case has not moved. The positions of the change valves 12 and 13 in figure 1 indicate that the previous activation, e.g. in order to test the installation, has occurred in the fire section D which in figure 1 is in connection to the feed line 5 of the drive unit 1, while the connections to the fire sections A, B and C are closed.

The valve arrangement 11, 12, 13 can be of a simple structure. Figure 3 shows one embodiment where the change valves 11, 12 and 13 comprise a movable sleeve 21, 22 and 23, respectively, with one end closed. If desirable, the pilot valve means can without difficulty be extended to serve a larger number of fire sections, utilizing the same principle.

Figures 1-3 show a favourable embodiment of the invention. It is, however, possible to replace the low pressure valves 9 by small high pressure valves, whereat it for the initial low pressure liquid spraying and simultaneous establishing of the respective connection via the change valves 11, 12 and 13, respectively, is possible to use a hydraulic high pressure accumulator which is not shown in the drawing but which could replace the low pressure hydraulic accumulator 8 and be charged by the high pressure pump 3. The valves 11, 12 and 13 could in principle also be actuated by means of pressurized gas, if it is considered unnecessary to initially cool the nozzles and the spray heads and to fill the feed lines with liquid before the high pressure drive unit 1 is activated.

Alternatively, it is further possible to utilize the hydraulic high pressure accumulators for establishing a connection to a respective fire section. An example is shown in figure 4.

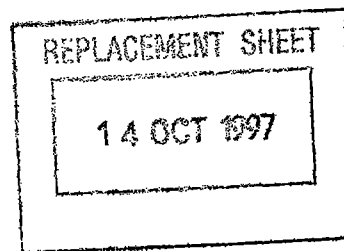
From the bottom region of a hydraulic accumulator 4 runs a pipe 30, preferably provided with

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apertures in its wall, as presented in the Finnish patent application 924752, to a valve structure at the outlet end of the accumulator 4. From the pipe 30 leads a throttled connection 31 in a valve spindle 32, which is forced against the outlet end of the pipe 30 by a spring 33, to a narrow gap 34 between the spindle end of a manually operable valve 35 and the housing of the outlet valve structure. From the passage 34 there is a line 36 to a pilot valve means which in principle is of the same kind as the one shown in figures 1-3. The line 36 corresponds to the line 7 or to the feed line of the hydraulic low pressure accumulator 8 in figure 1, while the line 37 in figure 4 corresponds to the main feed line 5 in figure 1.

In figure 4 the installation is in a state of stand-by, whereat the pressure in the line 36 is the same as in the accumulator 4, via the connection 31-34. The line 36 can be filled with liquid but there is no liquid flow in the line 36, because the valves 9 to the fire sections A, B, C and D are all closed.

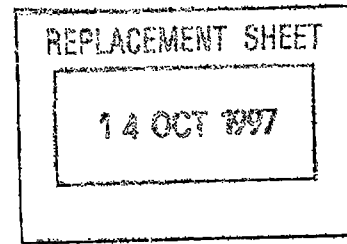
It shall again be assumed that there is a fire in the fire section A. Alarm results in that the respective valve 9 is opened and liquid flows from the line 36 to the section A and at the same time the valves 11 and 12 are moved to the positions of figure 2 in the same way as described earlier, establishing connection from the section A to the line 37. The pressure in the line 37 has access, via a groove 38 or the like formed in the valve spindle 32, to act on a face 39 of the spindle 32, in a direction against the spring 33, whereat the force effected by the pressure on said face 39 together with the force effected by the pressure in the accumulator 4, due to the pressure fall over the throttle 31, drive the valve spindle 32 upwards from the position shown in figure 4, so that there is a direct connection from the outlet of the



pipe 30 to the line 37, for full delivery of liquid to section A.

The embodiment shown in figure 4 can without difficulty be extended to comprise a plurality of hydraulic accumulators 4, e.g. as shown in figure 1. This embodiment has an additional advantage in that it is fully workable independently of electric power supply; the valve symbols in figure 4 indicate that the valves in first place are intended to be operated automatically, eg. electrically, with a possibility to be manually operated, as a reserve. With suitable dimensions for the throttles at 31 and 34 the valves 9 in figure 4 can be low pressure valves, like in figures 1-3, or alternatively high pressure valves with a small pass flow aperture.

The spray heads, including nozzles, of the installation, in the respective fire sections A, B, C and D can preferably be of such constructions that are presented e.g. in the international patent applications PCT/FI92/00060(WO-A-9215370), PCT/FI92/00155(WO-A-9220453) and PCT/FI92/00156(WO-A-9220454).



1. Installation for fighting fire, comprising a drive unit for extinguishing liquid, wherein :

the outgoing line (5) of the drive unit (1) is connected to a pilot valve means having outgoing lines to a plurality of fire sections (A, B, C, D).

the respective outgoing lines of the pilot valve means are connectable to a pressure source, preferably a liquid source (3; 8), and

the pilot valve means comprises a number of valves, preferably change valves (11, 12, 13), mutually combined in such a manner that connecting said pressure source (3;8) to one outgoing line (10) to a fire section (A) brings about the establishing of a connection (11, 12) from that fire section (A) to the outgoing line (5) of the drive unit (1) and the closing of the connections from the other fire sections (B, C, D) to the outgoing line (5) of the drive unit.

2. Installation according to claim 1, characterized in that the outgoing lines from the pilot valve means to the fire sections are interconnected pairwise (A, B; C, D) by means of a change valve (11; 13) and that these change valves are interconnected pairwise by means of a change valve (12) which is in direct or indirect connection to the outgoing line (5) of the drive unit (1):

3. Installation according to claim 2, characterized in that the change elements of the change valves (11, 12, 13) are axially movable sleeves (21, 22, 23).

4. Installation according to claim 1, characterized in that said pressure source is a liquid source (3; 8) having a low operating pressure



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in relation to the operating pressure of the drive unit (1).

5. Installation according to claim 4, characterized in that the liquid source (3, 8) is connectable to a respective outgoing fire section line (10) through a low pressure valve (9).

6. Installation according to claim 1, characterized in that said pressure source is a high pressure liquid source and that it is connectable to ~~to~~ a respective outgoing fire section line through a small high pressure valve.

7. Installation according to claim 6, characterized in that said high pressure liquid source is a hydraulic accumulator or the like, separate from the drive unit (1) of the installation.

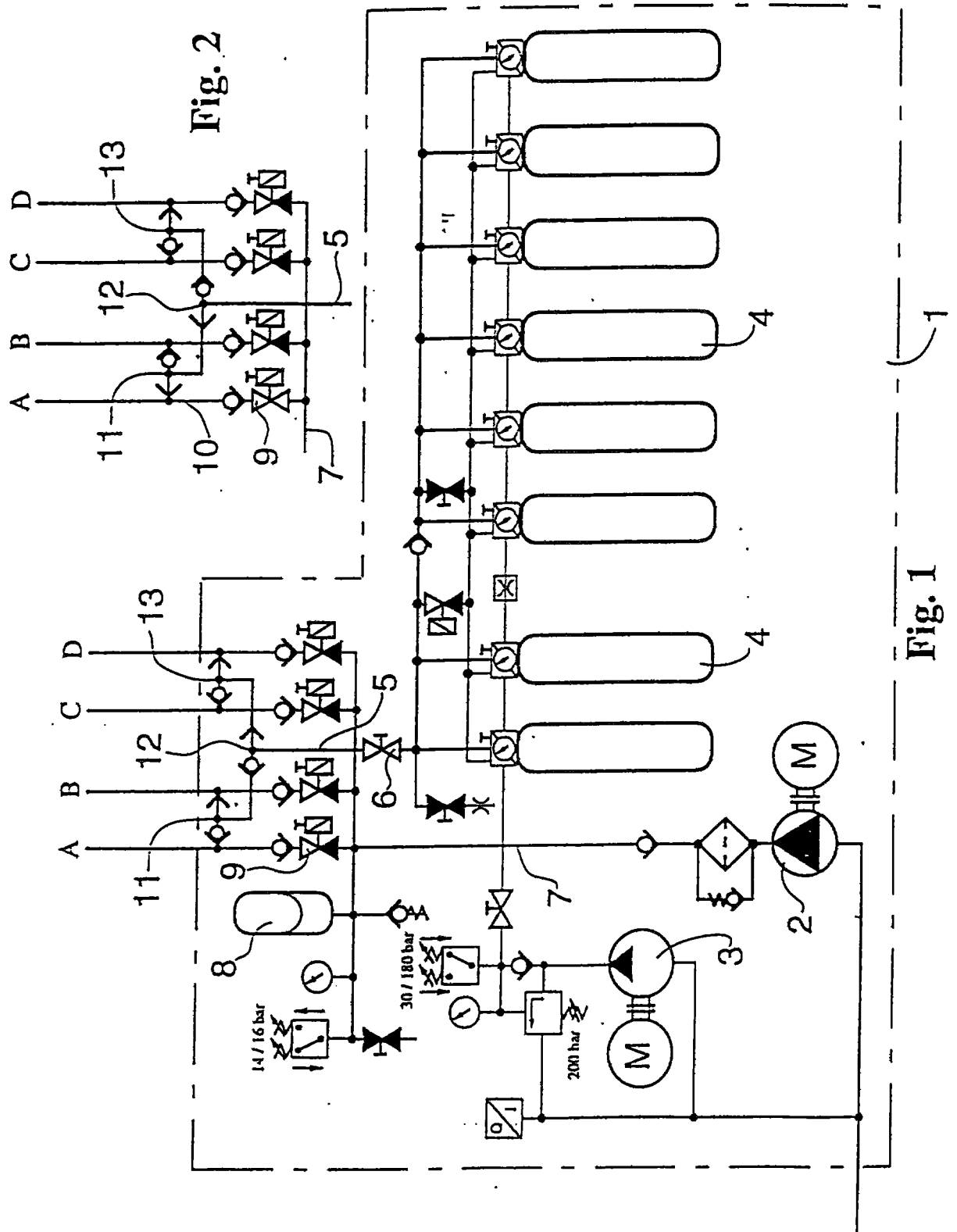
8. Installation according to claim 6, characterized in that said high pressure liquid source is the drive unit (1; 4) of the installation.

9. Installation according to claim 8, characterized in that the initial pilot liquid flow is made to pass a through throttle (31) in a spindle (32) of an outlet valve of the high pressure liquid source (4) and that the pressure in the main outgoing line (37) of the liquid source (4), after establishing connection to a respective fire section, is arranged to, together with the pressure fall over said throttle (31), to drive said spindle (32) to open direct connection from the liquid source to its main outgoing line (37).

10. Installation according to claim 9, characterized in that said pressure in the main outgoing line (37) is arranged to act through a groove (38) or the like on a face (39) provided on said spindle (32).

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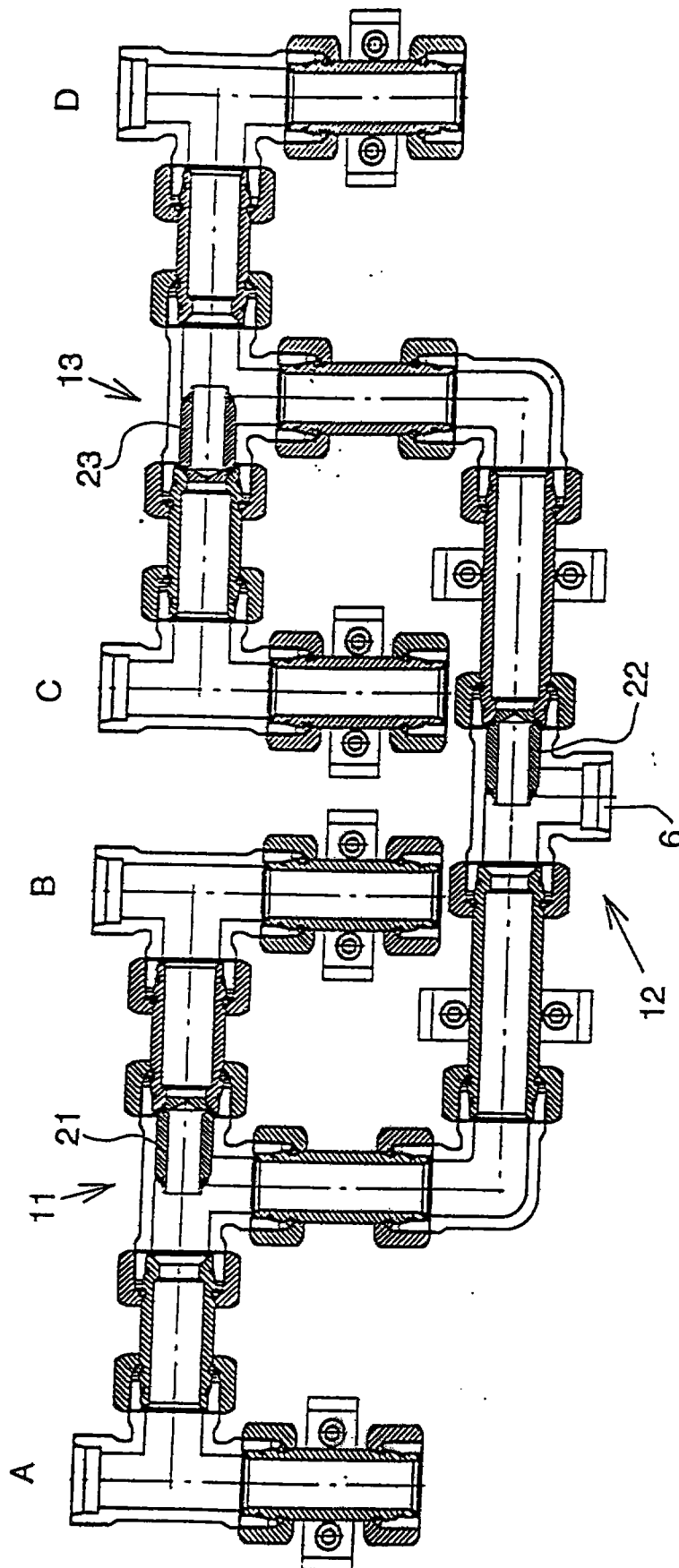


Fig. 3

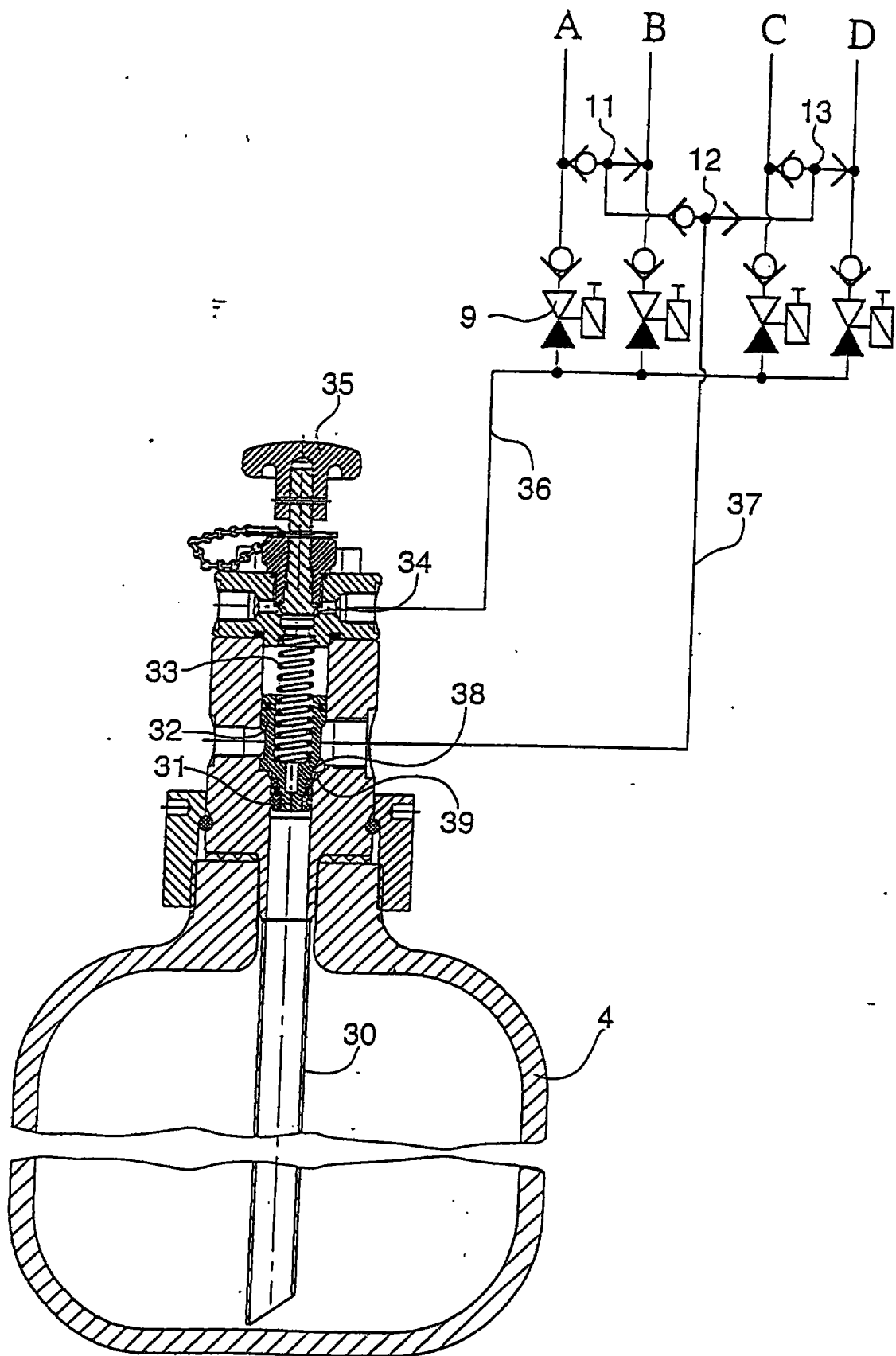
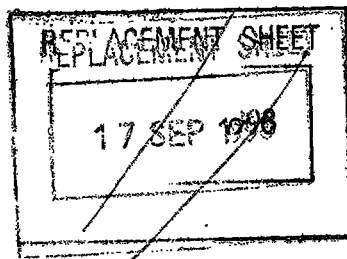
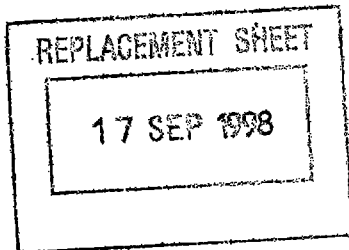


Fig. 4



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INSTALLATION FOR FIGHTING FIRE
Abstract

The invention relates to an installation comprising a high pressure drive unit for extinguishing liquid. When a fire has broken out in a fire section (A), a low pressure liquid source is connected (9, 10) to the respective fire section and the pressure of this liquid is utilized both for establishing a connection (11, 12) through a pilot valve means from the respective fire section to the outgoing line (5) of the high pressure drive unit, before this drive unit is activated, and for closing the connections from other fire sections to said outgoing line (5). The invention makes it possible to use cheap low pressure valves (9) in the pilot valve means. Figure 2