Claims

1.- Method for connecting, in a fluid manner, a first (10) and a second (20) fluid valve in a first direction X and comprising the following steps:

a. providing said first (10) and second (20) fluid valve,

- said first fluid valve (10) comprising at least two first ports (11, 12) each having an opening (111, 112) towards the outside;
- said second fluid valve (20) comprising at least two second ports (21, 22) each having an opening (221, 222) towards the outside;

b. providing a first pipe (60) having a first (61) and a second (62) end:

- the first end (61) being suitable for being inserted into an opening (111, 112) of a first port (11, 12) of the first fluid valve (10);
- the second end (62) being suitable for being inserted into an opening (221, 222) of a second port (21, 22) of the second fluid valve (20);

c. inserting the first end (61) of the first pipe (60) into an opening (111, 112) of a first port (11, 12) of the first fluid valve (10) and inserting the second end (62) of the first pipe (60) into an opening (221, 222) of a second port (21, 22) of the second fluid valve (20), in order to form a fluid assembly;

d. providing a first compression means (1) comprising:

- two ends (2, 3) being two plates in order to compress said fluid assembly comprising said first (10) and second (20) fluid valve and said first pipe (60) in said first direction X between said two ends (2, 3);
- a hollow profile (4) suitable for receiving the first and second fluid valve (10; 20);

- fastening means (5) for fastening said two plates to two ends of said hollow profile (4);

e. positioning said two ends (2, 3) being two plates of said first compression means (1) on either side of said fluid assembly in said first direction X;

f. applying a compression force, in parallel to said first direction X, onto said fluid assembly via said first compression means (1) in order to compress said first pipe (60) between said first (10) and second (20) fluid valve.

2.- Method comprising the steps of the previous claim, characterised in that:

- step a. also comprises the fact that a sixth (120) and a seventh (130) fluid valve are provided;
  - said sixth fluid valve (120) comprising at least two sixth ports each having an opening towards the outside;
  - said seventh fluid valve (130) comprising at least two seventh ports each having an opening towards the outside;
- step b. also comprises the fact that a fifth (140) and a sixth (150) pipe are provided;
  - said fifth pipe (140) having a first (141) and a second (142) end:
    - the first end (141) of the fifth pipe (140) being suitable for being inserted into an opening (111, 112) of a first port (11, 12) of the first fluid valve (10);
    - the second end (142) of the second pipe (140) being suitable for being inserted into an opening of a sixth port of the sixth fluid valve (120);
  - said sixth pipe (150) having a first (151) and a second (152) end:

- the first end (151) of the sixth pipe (150) being suitable for being inserted into an opening (221, 222) of a second port (21, 22) of the second fluid valve (20);
- the second end (152) of the sixth pipe (150) being suitable for being inserted into an opening of a seventh port of the seventh fluid valve (130);

o said seventh pipe (160) having a first (161) and a second (162) end:

- the first end (161) of the seventh pipe (160) being suitable for being inserted into an opening of a sixth port of the sixth fluid valve (120);
- the second end (162) of the seventh pipe (160) being suitable for being inserted into an opening of a seventh port of the seventh fluid valve (130) and in that;

- step c. also comprises the fact that:

o the first end (141) of the fifth pipe (140) is inserted into an opening (111, 112) of a first port (11, 12) of the first fluid valve (10) and the second end (142) of the fifth pipe (140) is inserted into an opening of a sixth port of the sixth fluid valve (120);

o the first end (151) of the sixth pipe (150) is inserted into an opening (221, 222) of a second port (21, 22) of the second fluid valve (20) and the second end (152) of the sixth pipe (150) is inserted into an opening of a seventh port of the seventh fluid valve (130);

o the first end (161) of the seventh pipe (160) is inserted into an opening of a sixth port of the sixth fluid valve (120) and the second end (162) of the seventh pipe (160) is inserted into an opening of a seventh port of the seventh fluid valve (130),

in order to form an extended fluid assembly;

- step d. also comprises the fact that the following are provided:

- a second compression means (501) comprising two ends in order to compress said extended fluid assembly in a second direction Y between said two ends;
- a third compression means (601) comprising two ends in order to compress said sixth (120), seventh (130) fluid valve and seventh pipe (170) in the first direction X between said two ends;

- step e. also comprises the fact that:
  - said two ends of said second compression means (501) are positioned on either side of said extended fluid assembly in said second direction Y;
  - said two ends of said third compression means (601) are positioned on either side of said sixth (120), seventh (130) fluid valve and seventh pipe (170) in said first direction X;
- step f. also comprises the fact that a compression force is applied in parallel to said second direction Y onto said extended fluid assembly via said second compression means (501) in order to compress said fifth (140) and sixth (150) pipe together with said first (10) and sixth (120) fluid valve and said second (20) and seventh (130) fluid valve, respectively.

3.- Method according to any one of claims 1 to 2, characterised in that:

- step a. also comprises the fact that a third (30), a fourth (40) and a fifth (50) fluid valve are provided;
  - said third fluid valve (30) comprising at least two third ports (31, 32) each having an opening (331, 332) towards the outside;
  - said fourth fluid valve (40) comprising at least two fourth ports (41, 42) each having an opening (441, 442) towards the outside;

- said fifth fluid valve (50) comprising at least two fifth ports (51, 52) each having an opening (551, 552) towards the outside, in that

- step b. also comprises the fact that a second (70), a third (80) and a fourth (90) pipe are provided;

- said second pipe (70) having a first (71) and a second (72) end:

  - the first end (71) of the second pipe (70) being suitable for being inserted into an opening (221, 222) of a second port (21, 22) of the second fluid valve (20);

  - the second end (72) of the second pipe (70) being suitable for being inserted into an opening (331, 332) of a third port (31, 32) of the third fluid valve (30);

- said third pipe (80) having a first (81) and a second (82) end:

  - the first end (81) of the third pipe (80) being suitable for being inserted into an opening (331, 332) of a third port (31, 32) of the third fluid valve (30);

  - the second end (82) of the second pipe (80) being suitable for being inserted into an opening (441, 442) of a fourth port (41, 42) of the fourth fluid valve (40);

- said fourth pipe (90) having a first (91) and a second (92) end:

  - the first end (91) of the fourth pipe (90) being suitable for being inserted into an opening (441, 442) of a fourth port (41, 42) of the fourth fluid valve (40);

  - the second end (92) of the fourth pipe (90) being suitable for being inserted into an opening (551, 552) of a fifth port (51, 52) of the fifth fluid valve (50) and in that;

- step c. also comprises the fact that:

- the first end (71) of the second pipe (70) is inserted into an opening (221, 222) of a second port (21, 22) of the second fluid valve (20) and the second end (72) of the second pipe (70) is inserted into an opening (331, 332) of a third port (31, 32) of the third fluid valve (30);
- the first end (81) of the third pipe (80) is inserted into an opening (331, 332) of a third port (31, 32) of the third fluid valve (30) and the second end (82) of the third pipe (80) is inserted into an opening (441, 442) of a fourth port (41, 42) of the fourth fluid valve (40);
- the first end (91) of the fourth pipe (90) is inserted into an opening (441, 442) of a fourth port (41, 42) of the fourth fluid valve (40) and the second end (92) of the fourth pipe (90) is inserted into an opening (551, 552) of a fifth port (51, 52) of the fifth fluid valve (50);

in order to form said fluid assembly.

4.- System (100) for fluid communication, comprising:

- a fluid assembly comprising:
  - a first (10) and a second (20) fluid valve in a first direction X:
    - said first fluid valve (10) comprising two first ports (11, 12) each having an opening (111, 112) towards the outside;
    - said second fluid valve (20) comprising two second ports (21, 22) each having an opening (221, 222) towards the outside;
  - a first pipe (60):
    - having a first (61) and a second (62) end;
    - located between said first (10) and second (20) fluid valve in such a way that said first end of the first pipe (61) is housed in an opening (111, 112) of a first port (11, 12) of the first fluid valve (10) and said second end of the first pipe (62) is housed in an opening (221, 222) of a second port (21, 22) of the second fluid valve (20);

- a first compression means (1), mechanically coupled to said fluid assembly, and comprising:
  - a hollow profile (4) suitable for receiving the fluid valves (10; 20);
  - two ends (2, 3) located on either side of said fluid assembly, suitable for compressing said fluid valves (10; 20) in said profile (4), and said first pipe (60) between said first (10) and second (20) fluid valve, in said first direction X;
  - means (5) for fastening said ends (2, 3) of the first compression means (1) to said profile (4).

5.- System (100) for fluid communication according to the previous claim, characterised in that the first (10) and second (20) fluid valve comprise, respectively:

- a first (15) and a second (25) valve body;
  - said first valve body (15) of the first fluid valve (10) comprising two first ports (11, 12);
  - said second valve body (25) of the second fluid valve (20) comprising two second ports (21, 22);
- a first (14) and a second (24) valve-body lining;
  - said first lining (14) of the valve body (15) of the first valve (10) comprising two openings (111, 112) centred on the two first ports (11, 12);
  - said second lining (24) of the valve body (25) of the second valve (20) comprising two openings (221, 222) centred on the two second ports (21, 22).

6.- System (100) for fluid communication according to the previous claim, characterised in that said first (15) and second (25) valve body are made of a plastic material.

7.- System (100) for fluid communication according to claim 5, characterised in that said first (15) and second (25) valve body are made of a polymer resistant to solvents.

8.- System (100) for fluid communication according to claim 5, characterised in that the material of said valve bodies (15; 25) is more flexible than the material of said first pipe (60).

9. System (100) for fluid communication according to any one of claims 4 to 8, characterised in that the fluid connections between said first and second end of said pipe and the first (10) and second (20) valve are sealed for pressures between atmospheric pressure and 5 x 10^5Pa.

10.- System (100) for fluid communication according to any one of claims 4 to 9, further comprising a controlled system for controlling fluid valves.

11.- System (100) for fluid communication according to any one of claims 4 to 10, further comprising a first and a second coupling means (16, 26) and a first and a second stem of valves (17, 27), characterised in that:

- said first valve stem (17) allowing the movement of said first fluid valve (10) being connected to said controlled system for controlling fluid valves by said first coupling means (16);

- said second valve stem (27) allowing the movement of said second fluid valve (20) being connected to said controlled system for controlling fluid valves by said first coupling means (26).

12.- System (100) for fluid communication according to any one of claims 4 to 11, characterised in that the fluid assembly further comprises:

- a sixth (120) and a seventh (130) fluid valve:
  - said sixth fluid valve (120) comprising at least two sixth ports each having an opening towards the outside;

- said seventh fluid valve (130) comprising at least two seventh ports each having an opening towards the outside;
  - a fifth pipe (140):
    - having a first (141) and a second (142) end in a second direction Y;
    - located between said first (10) and sixth (120) fluid valve in such a way that said first end of the fifth pipe (140) is housed in an opening (111, 112) of a port (11, 12) of the first fluid valve (10) and said second end of the fifth pipe (142) is housed in an opening of a port of the sixth fluid valve (120);
  - a sixth pipe (150):
    - having a first (151) and a second (152) end in said second direction Y;
    - located between said second (20) and seventh (130) fluid valve in such a way that said first end of the sixth pipe (151) is housed in an opening (221, 222) of a port (21, 22) of the second fluid valve (20) and said second end of the sixth pipe (152) is housed in an opening of a port of the seventh fluid valve (130);
  - a seventh pipe (160):
    - having a first (161) and a second (162) end in said first direction X;
    - located between said sixth (120) and seventh (130) fluid valve in such a way that said first end of the seventh pipe (161) is housed in an opening of a port of the sixth fluid valve (120) and said second end of the sixth pipe (162) is housed in an opening of a port of the seventh fluid valve (130);

in order to form an extended fluid assembly, said extended fluid assembly further comprising:

- a second compression means (501), mechanically coupled to said extended fluid assembly, and comprising at least two

ends located on either side of said extended fluid assembly in said second direction Y, in order to compress said fifth (140) and sixth (150) pipe between said first (10) and sixth (120) fluid valve and said second (20) and seventh (130) fluid valve, respectively;

- a third compression means (601), mechanically coupled to said sixth (120), seventh (130) fluid valve and seventh pipe (160), comprising at least two ends located on either side of said sixth (120), seventh (130) fluid valve and seventh pipe (160), in said first direction X, in order to compress said seventh pipe (160) between said sixth (120) and seventh (130) fluid valve;

said sixth (120) and seventh (130) fluid valve having outer dimensions identical to said first (10) and second (20) fluid valve, said seventh pipe being identical to said first pipe (60) and said fifth (140) and sixth (150) being identical to each other.

13.- System (100) for fluid communication according to any one of claims 4 to 12, characterised in that the fluid assembly comprises:

- a third (30), a fourth (40) and a fifth (50) fluid valve:
  - said third fluid valve (30) comprising at least two third ports (31, 32) each having an opening (331, 332) towards the outside;
  - said fourth fluid valve (40) comprising at least two fourth ports (41, 42) each having an opening (441, 442) towards the outside;
  - said fifth fluid valve (50) comprising at least two fifth ports (51, 52) each having an opening (551, 552) towards the outside;
- a second pipe (70):
  - having a first (71) and a second (72) end;
  - located between said second (20) and third (30) fluid valve in such a way that said first end of the second pipe (71) is housed in an opening (221) of a first port (21) of the second fluid valve (20) and

said second end of the second pipe (72) is housed in an opening (332) of a second port (32) of the third fluid valve (30);

- a third pipe (80):
  - having a first (81) and a second (82) end;
  - located between said third (30) and fourth (40) fluid valve in such a way that said first end of the third pipe (81) is housed in an opening (331) of a first port (31) of the third fluid valve (30) and said second end of the third pipe (82) is housed in an opening (442) of a second port (42) of the fourth fluid valve (40);
- a fourth pipe (90):
  - having a first (91) and a second (92) end;
  - located between said fourth (40) and fifth (50) fluid valve in such a way that said first end of the fourth pipe (91) is housed in an opening (441) of a first port (41) of the fourth fluid valve (40) and said second end of the fourth pipe (92) is housed in an opening (552) of a second port (52) of the fifth fluid valve (50);

said third (30), fourth (40) and fifth (50) fluid valve being identical to said first (10) and second (20) fluid valve and said second (70), third (80) and fourth (90) pipe being identical to said first pipe (60).

14.- System (100) for fluid communication according to previous claim, characterised in that the pipes (60, 70, 80, 90) are inserted freely into the fluid valves (10, 20, 30, 40, 50).

15.- System (100) for fluid communication according to any one of claims 13 to 14, characterised in that the third (30), fourth (40) and fifth (50) fluid valve comprise:

- a third (35), a fourth (45) and a fifth (55) valve body;
- said third valve body (35) of the third fluid valve (30) comprising at least two third ports (31, 32);

- said fourth valve body (45) of the fourth fluid valve (40) comprising at least two fourth ports (41, 42);
- said fifth valve body (55) of the fifth fluid valve (50) comprising at least two fifth ports (51, 52);

- a third (34), a fourth (44) and a fifth (54) lining of bodies of valves;
  - said third lining (34) of the third valve body (35) of the first valve (30) comprising at least two openings (331, 332) positioned along the axis of the two third ports (31, 32);
  - said fourth lining (44) of the valve body (45) of the fourth valve (40) comprising at least two openings (441, 442) positioned along the axis of the two fourth ports (41, 42);
  - said fifth lining (54) of the valve body (55) of the fifth valve (50) comprising at least two openings (551, 552) positioned along the axis of the two fifth ports (51, 52).