(54) Title: PRESSURE MEASURING INTEGRATED CONNECTING DEVICE ADAPTED FOR FLUID CIRCUITS

(57) Abstract: The present invention relates to an integrated connector device for detecting the pressure in an hydraulic circuit of a washing machine (28), the pressure value of the circulating wash water in the circuit being detected and interpreted by a control logic of a management system of the machine itself (28); the integrated connector device (10) connecting a first (30) and second component (32) of the hydraulic circuit, and further comprising a connector body (11) being apt for sealing, said connector body (11) also comprising: a first mouthpiece (13) being apt for carrying out a sealed fluid connection with an outlet (30A) of said first component (30) of said hydraulic circuit, a second mouthpiece (15) being apt for carrying out a sealed fluid connection with said second component (32) of said hydraulic circuit, an intermediate area (14) being apt to connect said mouthpieces (13, 15) with fluid connections. The peculiarity of the present invention is that the integrated connector device (10) comprises pressure detecting means (20) in connection to an inner side of said connector body (11) for detecting the pressure value inside said integrated connector device (10), and that its intermediate area integrates a flaring (14) extending substantially in radial direction towards the outside for increasing its volume, and that the pressure sensor means (20) are associated to the flaring (14).
as to the applicant’s entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designation US

Published:
— with international search report

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PRESSURE MEASURING INTEGRATED CONNECTING DEVICE ADAPTED FOR FLUID CIRCUITS

DESCRIPTION
The present invention relates to an integrated connector device for detecting the pressure in a fluid circuit of a washing machine, in which the connector device is located between two operating elements of the circuit, of which at least one brings about vibrations. This device is of a type comprising an integrated pressure sensor electrically connected to a management and control system of the fluid circuit and/or machine operation.

Moreover, the integrated connector device is designed for washing machines, having a strong need to limit the costs of the fluid circuit components assembled in them.

A machine containing the integrated connector device according to the present invention may for instance be a dishwashing machine. The connector device can be located between one of the two wash pump outlets of the hydraulic circuit of the dishwasher and the delivery duct to the upper and/or lower sprayer, to which the wash water to be spread inside the dishwasher tub is flowing.

For a clear detailed description of the technical problem concerning the present invention, from now on reference is made to the example of a dishwashing machine.

A dishwashing machine consists of a plurality of components and circuits, within which an hydraulic circuit surely can be identified, in which the water used for cleaning the kitchenware is supplied by the water mains. According to the various steps of the operation cycle, such water is circulated several times inside the hydraulic circuit and reused for various operating steps of the machine, such as in a wash step of the kitchenware.

Generally, an hydraulic circuit of a present dishwashing machine is made up of:
- A supplying duct in the tub for the water coming from the water
mains, with a set of safety and regulation devices assembled in it, as known at the state of art;

- A softener device for reducing the hardness of the water supplied from the water main for an improved chemical action of the detergent agents used for washing;

- a wash tub, where the wash water is sprayed on the kitchenware at least in one operating step of the dishwasher, which operation is controlled by appropriate wash programs contained in a management and control system of the machine;

- a sump located below the wash tub, which is provided to collect and filter the water from the supplying duct and the water dropped in the tub after being sprayed on the kitchenware to be washed;

- a wash pump for continuous water circulation in the hydraulic circuit when activated, which is in liquid connection with the sump through an outlet generally located in the lower section of the latter;

- spraying means for conveying the water on the kitchenware to be washed according to appropriate dynamic properties;

- means for heating the circulating water;

- a wash water discharge circuit, where a discharge pump when activated intakes the water from the sump and convey it to a discharge duct.

The hydraulic circuit further incorporates sensor means for detecting the pressure, in particular for detecting whether the fluid pressure drops below a predetermined design threshold. These sensors, namely pressure switches, are electrically connected to the management and control system of the machine detecting and processing the information received.

In most present applications a pressure switch is commonly associated to the lower section of the sump, being apt to detect if a determined pressure is present in the sump according to a pre-set water quantity or level, and subsequently send the relevant information to the management and control system logic of the machine.

Quite often, the pressure switch in the sump represents the sole
pressure detecting element in the hydraulic circuits of many dishwashers, at least for machines pertaining to low-cost products. Such a solution provides to detect a so-called static pressure measure, particularly apt to detect the presence or not of a determined hydraulic head in the sump in respect to which the instrument comes to be calibrated. However, the pressure switch does not report any information about the dynamic situation inside the hydraulic circuit, i.e. whether inside the ducts conveying water to the sprayers in the wash tub, the pressure is high enough for a correct washing of the kitchenware.

In the practice, whenever the filters are obstructed due to soil rests collecting in them, the amount of water being able to dynamically circulate in the circuit may be reduced compared to its theoretical or design quantity, so that the wash pump intakes air along with water, with a consequent hydraulic pressure drop. As a result, the dishwasher performs a bad washing due to a reduced or even non existing mechanical action of the water on the kitchenware.

Also in those cases where the circulating water is less than provided for an efficient washing performance, the electric motor associated to the wash pump is subject to the risk of burning out, since the associated wash pump operates with a minor total head than the designed one; as a result, the electric motor can reach higher rotation speeds than the maximum admitted and warranted one.

Other dishwashing machines are also known, in which a further pressure sensor or pressure switch is used, a so-called “high pressure” switch applied to one portion of the circuit with circulating wash water. The management and control system logic of the machine acknowledges whether the supplying pressure detected by the high pressure switch is enough or not, so as to implement likely corrective actions. Some dishwashers use the information transmitted about the pressure being insufficient or below a pre-set threshold in order to stop supplying the heaters apt to heat water during a heating step of the wash water. Thus, the heaters are not subject to overheating when the circulating
amount of water is considerably reduced, avoiding their possible
damage or burning-out, as well as to damage any plastic covers in
contact with such heaters. However, concerning this type of
dishwashing machines, the management and control system logic of
this known type of dishwashers does not provide for deactivation of the
wash pump to avoid the risk of poor washing of the kitchenware and/or
burning the motor actuating the wash pump.

Concluding, the above dishwashing machines have no management and
control systems using fluid pressure meters in the hydraulic circuit,
being apt to prevent a possible poor washing of the kitchenware due to
a lack of pressure condition in the circuit, rather than hindering a
wrong operation of the electric motor fitted for wash pump
empowering.

Connectors are also known in the art, which are usually assembled in
washing machines, in particular dishwashers, being apt to connect one
of the pump outlets to a delivery duct of the upper and/or lower sprayer
of the wash water; one such connector is depicted in the Figure 1 of the
annexed drawings.

The known connector, indicated on the whole with 1, comprises an
pipe coupling 2 made of a sole body and having two mouthpieces 2A,
2B, one above and one below, centrally spaced by an intermediate area
2C having a minor lengthwise extension compared to the one of the
mouthpieces 2A and 2B. The mouthpieces 2A and 2B are appointed to
house the ends of a threaded connector 3 apt to be screwed on the
lower end of the delivery duct of the upper and/or lower sprayer of the
dishwashing machine and one of two outlets downstream the wash
pump, respectively. When assembled in its operating position, the pipe
coupling 2 is engaged by the above ends for nearly its total extension,
save for the intermediate area 2C.

The pipe coupling 2 of the connector 1 is made from plastic material of
appropriate hardness and strength for ensuring efficient sealing to the
flowing water after locking the above ends, e.g. by means of metal
bands. The intermediate area 2C of the pipe coupling 2 is thinner than
the one related to the mouthpieces 2A and 2B of the pipe coupling 2, and so designed to permit only a minimum misalignment between the ends going to engage in the pipe coupling 2.

A first drawback of the known connector is that of permitting an extremely reduced misalignment between the elements going to engage in the mouthpieces of the coupling. As a result, the assembly of the connector itself is difficult whenever the elements to be connected are not perfectly aligned.

Additionally, a misalignment of the above connector causes a choke of the fluid vein flowing in the pipe coupling, generating possible operation failures in terms of a reduced fluid flow-rate and a higher charge on the washing pump.

Another drawback is due to the reduced extension of the pipe coupling intermediate area, which is the most suitable one for vibrations damping, and to the required hardness of the plastic material for manufacturing the whole pipe coupling. According to this embodiment, the pipe coupling transmits the vibrations received nearly integrally to one of its ends. As a result, the vibrations caused by the wash pump are scarcely damped by common pipe couplings and are transmitted nearly integrally to the delivery duct to the sprayer and from it to the overall dishwasher with an increased noise level of the latter.

Another drawback consists in the need for the operator assembling the connector on the machine to perform a double operation for fastening a pair of metal bands being apt to strengthen the sealing of the pipe coupling.

According to other known solutions, a pressure sensor is directly assembled on a takeoff of an hydraulic duct of a washing machine.

A drawback related to these solutions is the precarious reliability of the measure obtained due to the instability of the detectable pressure signal. The pressure meter has often difficulty to sense likely pressure changes in the hydraulic circuit, which changes have to be kept under control for correct operation of the hydraulic circuit of the machine.

The technical problem developed in the specific instance of dishwashing
machines relates to an application field where the machines have the following features:
1) a fluid circuit where the pressure and speed values of the circulating fluid are not high;
2) correct operation of the above circuit depends on the pressure value the fluid circulating in it reaches at least in one portion of the circuit itself, which value can be interpreted through an appropriate control logic of a management system of the machine itself;
3) the above fluid circuit includes a first component producing vibrations and a further component, which should preferably not vibrate for technical reasons.

The present invention is particularly efficient when connectors with a reduced length-wise extension have to be manufactured and the elements to be jointed have their ends located in such a way they do not need to be perfectly aligned.

The present invention is also particularly suitable for household washing machines, a field where low manufacturing costs are strongly needed.

It is the main purpose of the present invention to solve the above drawbacks and provide an improved integrated connector device for detecting the pressure in a fluid circuit of a washing machine, in particular a dishwashing machine of an improved type.
In this frame, it is an object to permit an also significant misalignment between the elements going to engage the mouthpieces of the above connector device, to the full advantage of an easy and correct assembly of the connector.
Another object is to provide a considerable damping improvement of the vibrations transmitted by a vibrating component fastened on one of its ends. In particular, the vibrations caused by the wash pump of a dishwashing machine are efficiently damped and transmitted in attenuated level to the delivery duct jointed to the sprayer in the wash tub.
Another object is to provide an integrated connector device according to
the present invention, which simplifies the assembly operations of the machine and reduces the risk of a wrong assembly of the component compared to what is required for the pipe coupling known in the art.

A further object is to ensure good reliability of the measure obtained by the detecting element provided for measuring the pressure of the fluid circuit in which the connector is assembled, and its consequent reliability in detecting pressure drops that may jeopardize a correct operation of the machine, since an absolute stable measure is required. In the particular case of a dishwasher, the integrated connector device according to the present invention makes reliable the operation threshold of the pressure switch or other sensor associated to the connector, as well as to the hydraulic circuit, over a length in which there is a continuous water flow with the wash pump activated.

Another object of the integrated connector device according to the present invention is to reach the above targets maintaining low manufacturing costs, practically of the same magnitude order with respect to the connector known in the art (clearly, not including the integrated pressure sensor in the calculation).

Finally, the connector device has to be reliable, safe and versatile for application in many technical fields.

In order to achieve such aims, it is the object of the present invention to provide an integrated connector device for detecting the pressure in a fluid circuit of a washing machine as well as a machine supplied of such a device, including the features of the annexed claims, which form an integral part of the present description.

Further objects and advantages of the present invention will become apparent from the following detailed description and annexed drawings, which are supplied by way of a non limiting example, wherein:

- Fig. 1 shows a perspective view of a connector known at the state of the art;
- Fig. 2 shows a perspective view of the connector device according to the invention, deprived of one of its component;
- Fig. 3 shows a sectional view with respect to a median plane of the
connector device according to the present invention;

Fig. 4 shows a perspective assembly view of the connector device of Figure 3 assembled in a dishwashing machine.

Fig. 2 illustrates a perspective view of an integrated connector device for detecting the pressure in a fluid circuit of a machine, such device being indicated as a whole with reference 10. Such a device consists of a connector body 11 with a substantially cylindrical symmetry, where a passage 12 of cylindrical form radially protrudes and connects the inside of the body 11 to a pressure sensor, indicated as a whole with reference 20.

The details of the connector body 11, as well as the ones of the pressure sensor 20, are further illustrated in Fig. 3. From the bottom upwards are sequentially identified a lower mouthpiece 13, a flaring or “plenum” 14, where in the maximum radial extension the passage 12 develops, and an upper mouthpiece 15. The above elements 12, 13, 14, 15 form an integral body, and are appropriately made from plastic material of appropriate consistency, in order to provide efficient sealing to the fluid flowing from the bottom upwards according to the present application.

The lower mouthpiece 13 of the connector body 11 has substantially a cylindrical form with a consistent section and shows radially, on its lower edge, a notch 13A in line with the passage 12, but on the opposite side.

In a dishwashing machine of the previously disclosed type, the lower mouthpiece 13 is apt to be fastened, e.g. by means of a metal band, to an outlet of the wash pump of the dishwashing machine itself through which the operative fluid flows. The notch 13A provides a reference for a correct assembly and radial arrangement of the integrated connector device 10, providing e.g. a strike element located outside the pump outlet going to engage inside the same notch 13A in its operating position.

Above the lower mouthpiece 13 a flaring 14 is provided, which forms a stagnation volume for the fluid circulating in the integrated connector device 10. In the sectional form of Fig. 3, said flaring 14 is defined by a
length having regular curving and thickness, which extends radially towards the outside so as to increase the inner volume of the flaring 14 considerably. This flaring 14 ends with an inner lip 14L extending inside until it reaches a smaller diameter than the inner diameter of the lower mouthpiece 13. This configuration contributes to obtain a higher decelerating effect of the fluid flow, i.e. a stagnation effect; in other words, a pressure recovery is obtained for the working fluid flowing in the “plenum” 14.

The inner lip 14L of the flaring 14 forms a separation element with the upper mouthpiece 15, which has downstream and always inside a conical lead-in 15I. The upper mouthpiece 15 extends with a cylindrical section having a substantially constant diameter ending with a small flare 15S closed by a further lip 15L protruding inside the connector body 11.

The inner lip 14L, the conical lead-in 15I, the small flare 15S and further lip 15L are apt to house a threaded body 16 inside them, which is inserted in the upper mouthpiece 15 of the connector body 11 by co-moulding, closed on the top by the further lip 15L. Thus, the threaded body 16 operates substantially as an integral body along with the connector body 11. Therefore, a threaded element of a dishwashing machine can be screwed to the overall connector device 10.

The pressure sensor 20 associated to the passage 12 is known in the art as a so-called “high-pressure” pressure switch. Briefly, it consists of a pair of a mutually welded shells 21A and 21B, housing the edges of an elastic membrane 22 that moves length-wise inside a cylindrical recess of the first shell 21A. The second shell 21B has an inlet 23 for inserting the pressure sensor 20 inside the passage 12 of the connector body 11, and such inlet 23 is in fluid connection to a face of the elastic membrane 22. The membrane 22 is associated in a known way to an inertial micro-switch 24; when the membrane 22 exerts a force exceeding a pre-set calibrated value, the inertial micro-switch 24 switches in the usual way the control to be sent to a management and control system of the machine on which the integrated connector device
10 described herein, is assembled.

Fig. 4 illustrates the integrated connector device 10 with the pressure sensor 20 according to the present invention, assembled on a dishwasher machine indicated overall with reference 28, namely on a fitting of a tub bottom shown partially mounted in Fig. 4. A tub bottom 29 is identified here, to which is suspended in a known way a motor pump group 30, 31 consisting of a wash pump 30 driven by an electric motor 31.

The integrated connector device 10 is assembled in a known way in correspondence with the lower mouthpiece 13 of the connector body 11 on a first outlet 30A of the pump 30, such as through the use of metal bands. The threaded body 16 is screwed on a threaded male element associated to the delivery duct 32 to the upper and/or lower sprayer of the dishwashing machine 28, where not all the details are illustrated for simplicity’s sake, being already known.

In particular, the further lip 15L of the upper mouthpiece 15 of the connector body 11 is assembled as a seal on its top to the lower surface of the tub bottom 29; such a sealing being obtained on an end edge of a hole 29A in the tub bottom 29 of the dishwasher 28, such as through inserting inside it a conical lead-in 15C, which is located on the top edge of the upper mouthpiece 15, outside it.

The pressure sensor 20 is connected as known but not represented for simplicity’s sake, to a management and control system of the dishwashing machine 28, so as to have the micro-switch 24 signalling whether the pressure of the water flowing inside the hydraulic circuit, in particular downstream the first outlet 30A of the wash pump 30, exceeds a pre-set calibration value or not.

Operation of the integrated connector device 10 described above is as follows.

The operative fluid, i.e. wash water, enters directly the flaring 14 of the connector body 11 from the first outlet 30A of the wash pump 30 of the dishwasher 28; in its assembled condition, the lower mouthpiece 13 is in fact substantially engaged by the first outlet 30A of the wash pump
30. In the flaring or "plenum" 14 the fluid diverges, decelerates and so stagnates due to the radial widened form of the flaring 14, besides meeting also the hindrance of the lip 14L. Such lip 14L leads the inner diameter of the connector body 11 and generally of the duct going to be delimited inside it, to a value equivalent or lower than the inner one of the first outlet 30A of the wash pump 30.

Entering the flaring 14, the fluid, i.e. water, reduces its kinetic contents to the advantage of an increase of the static pressure. Such a static pressure is detected by the pressure sensor or pressure switch 20 which, through the passage 12, senses the static pressure of the fluid impacting on the elastic membrane. This pressure is then transduced as known into a signal being sent to the management and control system of the machine, i.e. of the dishwasher 28. Once the signal has been acquired by the system, it is processed depending on the control logic used to program it and the system driving the subsequent actions to be implemented.

The following path of the fluid, i.e. wash water, consists in entering inside the delivery duct 32 until to the sprayer of the dishwasher 28. The duct has an inner diameter equal to or slightly greater than the relevant one defined by the lip 14L of the flaring 14 of the connector body 11.

It should be noticed that the passage 12 of the connector body 11 is obtained at the point of maximum radial extension of the flaring or "plenum" 14. In fluid-dynamics it is actually correct to foresee a maximum stagnation pressure of the fluid at the maximum radial extension. As a result, the measured value of the pressure, i.e. of the pressure change, is surely reliable since the pressure is stable.

The flaring 14 of the connector body 11 has a length-wise development of the same order of amplitude, i.e. it does not exceed the one related to the mouthpieces 13 and 15 of the connector body 11, so as to contain the global length of the connector body 11 at the utmost. Therefore, the length-wise development, i.e. in the height of the whole machine
including the integrated connector device 10, is smaller than the known implementations.

However, the length-wise development of the flaring 14 cannot be below a value obtained by test or through fluid-dynamics simulation. This value depends on the state of the circulating fluid when flowing through the wash pump 30 of the dishwasher 28. Such values must be determined so as to avoid that the flaring 14 may loose its function of a stagnation volume.

Now, a few considerations at structural level will follow about the integrated connector device 10, in order to understand its capacity for supporting misalignment and damp vibrations.

Based on the even rounded form of the flaring 14, the integrated connector device 10 has the following properties:

1) With an equivalent total length of the integrated connector device 10, i.e. of the length-wise extension of the flaring 14, the surface development of the flaring walls 14 is greater than e.g. the cylindrical extension of the connector 1 known in the art;

2) The even curving of the flaring 14 can ensure improved operation of the material forming the connector body 11, in particular the flaring 14 itself, in terms of a homogeneous distribution of the inner stresses in normal flexure and torque efforts.

In particular, the combination of these properties advantageously implies that the integrated connector device 10 is able to misalign the lower mouthpiece 13 from the upper one 15 without loosing the peculiarity of providing an efficient stagnation area, i.e. without possible chokes of the fluid vein; moreover, the above mouthpieces 13 and 15 can further be mutually oriented to a solid angle in the space.

It is also advantageously allowed a certain absorption of the efforts directed length-wise to the connector body 11.

If the material used for the manufacture of the connector body 11 is actually a special plastic material maintaining a certain compactness for its sealing function but having elasticity and absorbing capacity, brilliant results can be obtained in vibrations damping and in the
mutual orientation capacity in the space of the mouthpieces 13 and 15 of the same body 11.

From the above description the features of the integrated connector device and dishwashing machine including the object of the present invention are clear, and also the resulting advantages are evident.

With an equivalent thickness and hardness of the material, the integrated connector device 10 can operate homogeneously a higher volume of material compared to the known connector 1. As a result, the damping capacities of the connector body 11 are surely higher than the ones obtained in the known art with an equivalent material.

For applications in hydraulic circuits of dishwashing machines, advantageously the vibrations caused by the wash pump 30 are efficiently damped and transmitted properly attenuated to the delivery duct 32 until to the sprayer in the wash tub.

Another advantage derives from the simplified assembly operations of the machine. The connector body 11 has just to be tightened in correspondence with the lower mouthpiece 13, since the threaded body 16 is co-moulded with the upper mouthpiece 15. Therefore, the risks of a wrong assembly of the integrated connector device 10 are reduced compared to what occurs when mounting the connector 1 known at the state of the art.

A further advantage is a good reliability of the measure performed by the pressure sensor 20 provided for measuring the pressure of the fluid circuit where the connector is assembled, i.e. the hydraulic circuit of the dishwasher 28. Therefore, it results valid and adequate the evaluation of the pressure drops that may jeopardize a correct operation of the machine. In particular, in the cited example of the dishwashing machine 28 of Fig. 1-4, the operation threshold of the pressure switch 20 associated to the passage 12 of the connector body 11 of the integrated connector device 10 is reliable over the length of the hydraulic circuit downstream the wash pump 31, wherein a continuous water flow with the wash pump 31 activated occurs.

The above technical advantages are reached maintaining low
manufacturing costs, comparable to the costs of the connector 1 known in the art, without considering the pressure sensor 20 in the financial plan.

Advantageously, the integrated connector device 10 according to the present invention is reliable, safe and versatile, being particularly apt for assembly in the field of washing machines. It is evident that many changes can be made by the man skilled in the art to the integrated connector device for detecting the pressure in a fluid circuit of a washing machine, as well as to the washing machine incorporating such a device, without departing from the novelty principles of the innovative idea; and it is also clear how in its practical actuation the details of the illustrated components may be different from the ones illustrated and may be replaced with technical equivalent elements.

By way of example, the flaring 14 of the connector body 11 may have any other even form being apt to increase the volume of the flaring 14 itself, maintaining an even trend to avoid jeopardizing the behaviour of the manufacturing material with respect to its inner stresses. Another possible embodiment may be that of thinking to use different plastic materials for manufacturing the connector body 11, in particular various plastic materials with appropriate elasticity and damping properties. These embodiments can be finely studied through a deep finite elements structural analysis providing efficient simulation of the materials behaviour in their mutual interaction and with reference to their form in the space. In conclusion, the integrated connector device according to the present invention can be provided in such a way to have its connector body 11 damping the vibrations and providing a mutual orientation capacity in the space of its mouthpieces 13 and 15 in assembled position. Advantageously, the various materials forming the components 13, 14, 15 of the body 11 may be jointed together through common plastic-on-plastic co-moulding techniques.
CLAIMS

1. An integrated connector device for detecting the pressure in an hydraulic circuit of a washing machine (28), the pressure value of the circulating wash water in the circuit being detected and interpreted by a control logic of a management system of the machine itself (28); said integrated connector device (10) connecting a first component (30) and a second component (32) of said hydraulic circuit, and further comprising a connector body (11) being apt for sealing, said connector body (11) comprising:
   - a first mouthpiece (13) being apt to carry out a sealed fluid connection to an outlet (30A) of said first component (30) of said hydraulic circuit,
   - a second mouthpiece (15) being apt to carry out a sealed fluid connection to said second component (32) of said hydraulic circuit,
   - an intermediate area (14) being apt to connect said mouthpieces in fluid connection (13, 15),
   characterized in that said integrated connector device (10) comprises pressure detecting means (20) in connection to an inner side of said connector body (11) for detecting the pressure value inside said integrated connector device (10); said intermediate area of said connector body (11) comprising a flaring (14) extending substantially in radial direction towards the outside for increasing its volume, and said pressure detecting means (20) being associated to said flaring (14).

2. A device according to claim 1, characterized in that said flaring (14) of said connector body (11) has even curving and thickness.

3. A device according to claim 1 or 2, characterized in that said flaring (14) of said connector body (11) has an even form.

4. A device according to one or more of the previous claims, characterized in that said pressure detecting means (20) are associated to said flaring (14) of said connector body (11) next to a point of maximum radial extension of said flaring (14).

5. A device according to one or more of the previous claims, characterized in that said flaring (14) of said connector body (11) has a
length-wise extension of the same order of amplitude or substantially smaller or equal to the length-wise development of said first and/or second mouthpiece (13 and/or 15), in order to contain the total length of said integrated connector device (10).

6. A device according to one or more of the previous claims 1-3, characterized in that said flaring (14) of said connector body (11) has a length-wise extension not less than a value to be obtained by test and depending on the state of the fluid stream flowing into said integrated connector device (10), said length-wise development being such to avoid that said flaring (14) is no more a function of the stagnation volume for said flowing fluid.

7. A device according to one or more of the previous claims, characterized in that at least a portion of said connector body (11) consists of deformable material.

8. A device according to one or more of the previous claims, characterized in that at least a portion of said connector body (11) is made of substantially plastic material, of a type maintaining a certain compactness for its sealing function, but providing elasticity and damping capacity under loading.

9. A device according to one or more of the previous claims, characterized in that said connector body (11) is made of various plastic materials adapted to improve damping of the transmitted vibrations and to carry out an improved mutual orientation in the space of said mouthpieces (13, 15) of the same body (11) in the assembled position of said integrated connector device (10).

10. A device according to the previous claim, characterized in that said plastic materials forming said connector body (11) of said integrated connector device (10) provide an integral body through co-moulding techniques.

11. A device according to one or more of the previous claims, characterized in that one of said mouthpieces (13, 15) of said connector body (11) comprises a threaded body (16) associated to it.

12. A device according to the previous claim, characterized in that said
threaded body (16) of said connector body (11) is associated by co-moulding to one of said mouthpieces (13, 15) of said connector body (11).

13. A device according to claim 1 or 5, characterized in that said pressure detecting means associated to said integrated connector device (10) comprise a pressure switch (20).

14. A device according to the previous claim, characterized in that said pressure switch (20) associated to said integrated connector device (10) comprises an inertial micro-switch (24).

15. A device according to one or more of the previous claims, characterized in that said first component (32) of said fluid circuit brings about vibrations for said machine (28) in its operating conditions.

16. A device according to the previous claim, characterized in that said first component of said fluid circuit comprises a pump (30) of said fluid circuit of said machine (28), in particular a wash pump (30) of a dishwasher (28).

17. A device according to one or more of the previous claims, characterized in that said second component of said fluid circuit comprises a duct (32) of the same circuit, in particular a delivery duct (32) to the upper and/or lower sprayer of a dishwasher (28).

18. A washing machine comprising an integrated connector device for detecting the pressure in an hydraulic circuit of said washing machine (28), according to one or more of the claims 1 to 17.

19. A machine according to the previous claim, characterized in comprising a dishwashing machine (28).
### A. CLASSIFICATION OF SUBJECT MATTER

**IPC 7**
- A47L15/42

According to International Patent Classification (IPC) or to both national classification and IPC.

### B. FIELDS SEARCHED

**Minimum documentation searched (classification system followed by classification symbols)**
- IPC 7 A47L D06F G01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched.

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
- EPO-Internal, WPI Data, PAJ

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tr>
<td>A</td>
<td>DE 956 173 C (ATLAS WERKE AG) 17 January 1957 (1957-01-17) the whole document</td>
<td>1,18</td>
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<td>A</td>
<td>FR 2 417 042 A (DELES ANDRE) 7 September 1979 (1979-09-07) page 1, line 1 - line 4</td>
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<td></td>
<td>page 2, line 26 - page 3, line 11 page 5, line 1 - line 7 figure 1</td>
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<td>A</td>
<td>DE 44 41 194 A (BAADER HELMUT DR) 23 May 1996 (1996-05-23) column 1, line 3 - line 6 claims 1,10,25,33,40,43 figures 1-15</td>
<td>1,18</td>
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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* Special categories of cited documents:
  * "A" document defining the general state of the art which is not considered to be of particular relevance
  * "E" earlier document but published on or after the international filing date
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Date of the actual completion of the international search: 24 November 2004

Date of mailing of the international search report: 06/12/2004

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