



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.08.2009 Bulletin 2009/32

(51) Int Cl.:
F04D 29/24 (2006.01)

(21) Application number: **08150991.1**

(22) Date of filing: **01.02.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

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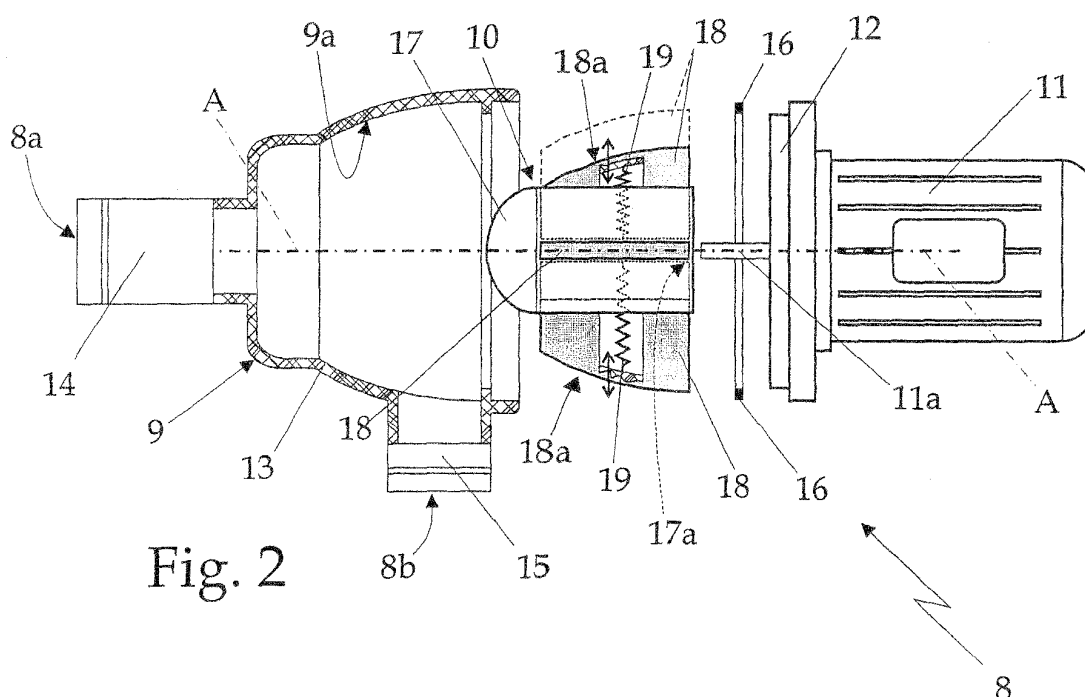
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(54) **Household appliance for washing articles**

(57) A household appliance (1) for washing articles having at least one electric pump (8) for circulating or draining water; the electric pump (8) having an outer volute (9) having an inner pumping chamber (9a), an impeller (10) housed in axially rotating manner inside the pumping chamber (9a), and an electric motor (11) connected mechanically to the impeller (10) to rotate it about a rotation axis (A); the impeller (10) in turn having a cen-

tral hub (17) coaxial with the rotation axis (A), and at least one movable projecting blade (18) fitted to the central hub (17) and movable between a fully retracted position in which the blade (18) is almost totally withdrawn inside the central hub (17), and a fully extracted position in which the blade (18) projects from the central hub (17) so that the outer lateral edge (18a) of the blade is further from the rotation axis (A) than when the blade (18) is in the fully retracted position.



Description

[0001] The present invention relates to a household appliance for washing articles.

[0002] More specifically, the present invention relates to a laundry washing machine or dishwasher having an electric water drain pump, to which the following description refers purely by way of example.

[0003] As is known, laundry washing machines and dishwashers are normally equipped with an electric water pumps for drainage. These type of pump has an impeller connected to the end of an electric motor shaft, which rotates about a central rotation axis inside a pumping chamber having an intake duct and a duct. In known water pumps, the impeller is connected mechanically to the electric motor shaft by an articulated joint or clutch, which allows a certain amount of free relative rotation (e.g. 120°) between the shaft and impeller, so that, when the electric motor is started, the electric motor shaft initially rotates substantially idly to greatly reduce the starting torque and electric current peaks. The high hydraulic inertia of the stationary water in the pumping chamber, in fact, initially generates a high resisting torque on the impeller, and hence on the electric motor shaft.

[0004] Both articulated joints and clutches, however, have several drawbacks. Clutches are expensive and noisy, whereas articulated joints contain a certain amount of grease, which may lose its properties over the working life of the joint, thus resulting in noise or even jamming of the joint.

[0005] It has recently been proposed to eliminate the articulated joint or clutch of the electric water pump. In this case, however, a much more powerful electric motor is required to overcome the high hydraulic inertia of the stationary water in the pumping chamber, thus greatly increasing cost and size.

[0006] It is an object of the present invention to provide an electric water drain pump for laundry washing machines or dishwashers, designed to eliminate the aforementioned drawbacks without oversizing the electric motor of the pump.

[0007] According to the present invention, there is provided a household appliance for washing articles as claimed in Claim 1 and preferably, though not necessarily, in any one of the dependent Claims.

[0008] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

- Figure 1 shows a side view, with parts in section and parts removed for clarity, of a laundry washing machine in accordance with the teachings of the present invention;
- Figure 2 shows an exploded side view, with parts in section and parts removed for clarity, of an electric pump of the Figure 1 laundry washing machine;
- Figures 3 and 4 show cross sections of the front portion of the Figure 2 electric pump in the stop and

operating condition respectively.

[0009] With reference to Figure 1, number 1 indicates as a whole a household appliance for washing having an hydraulic circuit for circulating the washing liquid in the appliance and/or draining the washing liquid from the appliance at the end of the washing cycle.

[0010] More specifically, in the example shown, household appliance 1 is a home laundry washing machine 1, which comprises a casing 2 resting on the floor; a preferably, though not necessarily, cylindrical washing tub 3 suspended in floating manner inside casing 2 by means of a number of coil springs 4 (only one shown in Figure 1) preferably, though not necessarily, combined with one or more shock-absorbers (not shown); a rotary drum 6 housed inside washing tub 3 to rotate about its longitudinal axis; and an hydraulic circuit 7 for feeding or draining water to or from washing tub 3 on command.

[0011] With reference to Figures 1 and 2, hydraulic circuit 7 has an electric pump 8 for circulating or draining water, and which comprises an outer volute 9 having an inner pumping chamber 9a, which communicates with the outside, i.e. with the water pipes of hydraulic circuit 7, via two openings defining the inlet 8a and outlet 8b of the pump respectively; an impeller 10 housed in axially rotating manner inside pumping chamber 9a to rotate about a barycentric axis A of rotation preferably, though not necessarily, coincident with the longitudinal axis of outer volute 9; and a rotary electric motor 11 (e.g. a synchronous permanent-magnet electric motor, or an asynchronous permanent-magnet, synchronous or asynchronous motor) connected mechanically to outer volute 9 so that its rotary shaft 11a projects inside pumping chamber 9a, coaxially with barycentric axis A, and is connected directly and rigidly to impeller 10 to rotate it about its barycentric axis A.

[0012] With reference to Figure 2, in the example shown, outer volute 9 consists of a substantially disk-shaped body 12 formed in one piece with the outer casing of electric motor 11 so that the end portion of rotary shaft 11a projects from the center of disk-shaped body 12; and of a substantially cup-shaped body 13 fitted removably to disk-shaped body 12 in fluidtight manner to internally define pumping chamber 9a of impeller 10.

[0013] More specifically, disk-shaped body 12 is coaxial with the longitudinal axis of the outer casing or volute 9, i.e. with barycentric axis A, and rotary shaft 11a is inserted inside disk-shaped body 12 in rotary and fluidtight manner.

[0014] Cup-shaped body 13 is screwed to disk-shaped body 12, and has an axial intake duct 14 extending coaxially with the longitudinal axis of outer volute 9, i.e. with barycentric axis A; and a radial drain duct 15 extending laterally with respect to cup-shaped body 13 (i.e. perpendicular to the longitudinal axis of outer volute 9). A flexible annular washer 16 is preferably, though not necessarily, fitted between cup-shaped body 13 and disk-shaped body 12 to prevent water leakage.

[0015] With reference to Figures 2, 3 and 4, impeller 10 of electric pump 8 is housed inside cup-shaped body 13, i.e. inside pumping chamber 9a, rotates about barycentric axis A, and comprises a preferably, though not necessarily, ogival-shaped central hub 17 extending co-

[0016] Unlike other laundry washing machines, each blade 18 of electric pump 8 is fixed to central hub 17 so as to be movable between a fully retracted position, in which blade 18 is almost totally withdrawn inside central hub 17 (see Figure 3), and a fully extracted position, in which blade 18 projects from central hub 17 by almost its whole length measured perpendicular to rotation axis A (see Figure 4), so that the outer lateral edge 18a of the blade is further from rotation axis A than when blade 18 is in the fully retracted position.

[0017] In addition and with reference to Figure 2, impeller 10 also comprises means for controlling the position of the movable projecting blades 18 on central hub 17 according to the instantaneous angular speed of impeller 10.

[0018] More specifically, impeller 10 comprises means for counteracting centrifugal force and moving each movable projecting blade 18 into the fully retracted position when the angular speed of central hub 17 falls below a given value.

[0019] In particular, with reference to Figure 2, in the example shown each movable projecting blade 18 consists of a substantially trapezoidal plate-like fin 18, which lies in a radial plane intersecting rotation axis A of central hub 17, and is inserted in sliding manner inside a respective radial slot 17a formed in the body of central hub 17; and the means for controlling the position of the movable projecting blades 18 comprise a number of coil springs 19, each of which is housed in a respective radial slot 17a in central hub 17, and has a first end fixed to the bottom of the radial slot 17a, and a second end fixed to the fin body, so as to pull the whole fin 18 onto the bottom of respective radial slot 17a.

[0020] In other words, each coil spring 19 is designed to counteract the centrifugal force and elastically keep the respective movable projecting blade 18 in the fully retracted position whenever the angular speed of central hub 17 is below a given value.

[0021] Operation of laundry washing machine 1 as a whole is clearly inferable from the above description, with no further explanation required.

[0022] As regards electric pump 8, with reference to Figure 3, as long as impeller 10 is stationary or rotates at a very low angular speed, coil springs 19 counteract the centrifugal force and keep the movable projecting blades 18 in the fully retracted position inside central hub 17, to prevent impeller 10 generating a high resisting torque when rotating in the stationary water inside pump-

ing chamber 9a.

[0023] Conversely, with reference to Figure 4, when the angular speed of impeller 10 reaches a given value which depends on the mechanical features of coil springs 19, the centrifugal force overcomes the elastic force of coil springs 19 and moves blades 18 out of central hub 17 into the fully extracted position, thus allowing impeller 10 to circulate water through outer volute 9.

[0024] The use of electric pump 8, as described above, has numerous advantages. By virtue of the design of impeller 10, electric pump 8 does not need an articulated joint or clutch between impeller 10 and shaft 11a of electric motor 11 to reduce the starting torque requested of electric motor 11.

[0025] Moreover, since the movable projecting blades 18 remain in the fully retracted position as long as impeller 10 is stationary, electric pump 8, when switched off, is no longer subject to clogging, on account of any fluff or debris in the water not adhering to impeller 10.

[0026] Clearly, changes may be made to laundry washing machine 1 and/or electric pump 8 as described herein without, however, departing from the scope of the present invention.

[0027] For example, impeller 10 of electric pump 8 may comprise one or more movable projecting blades 18, and one or more fixed projecting blades 18 connected rigidly to central hub 17 with no radial displacement.

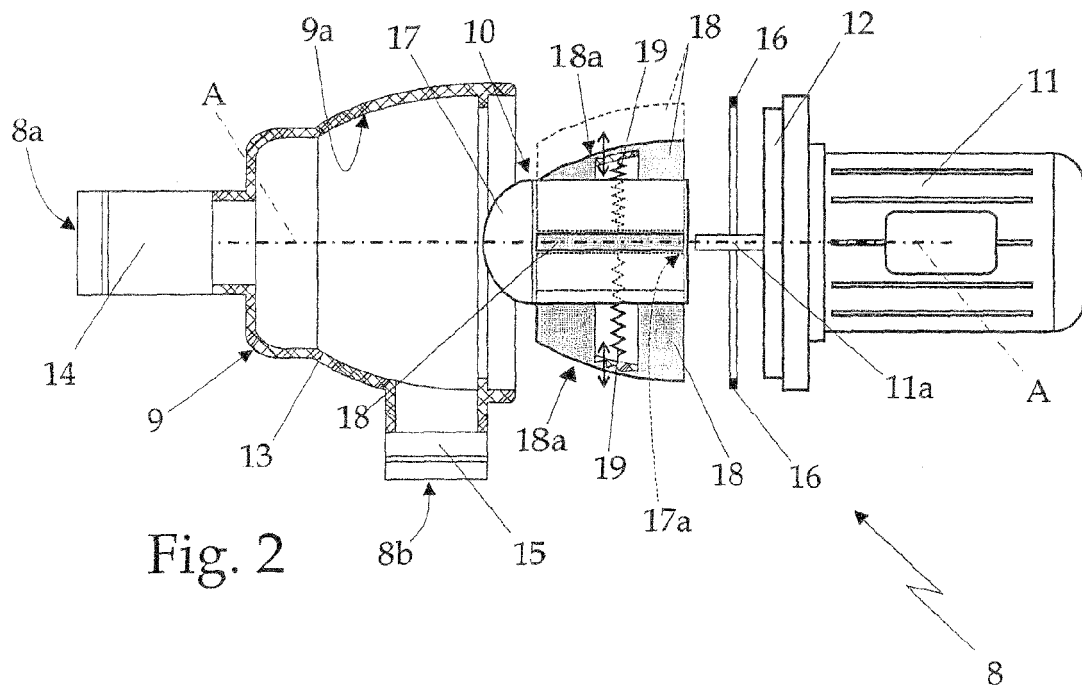
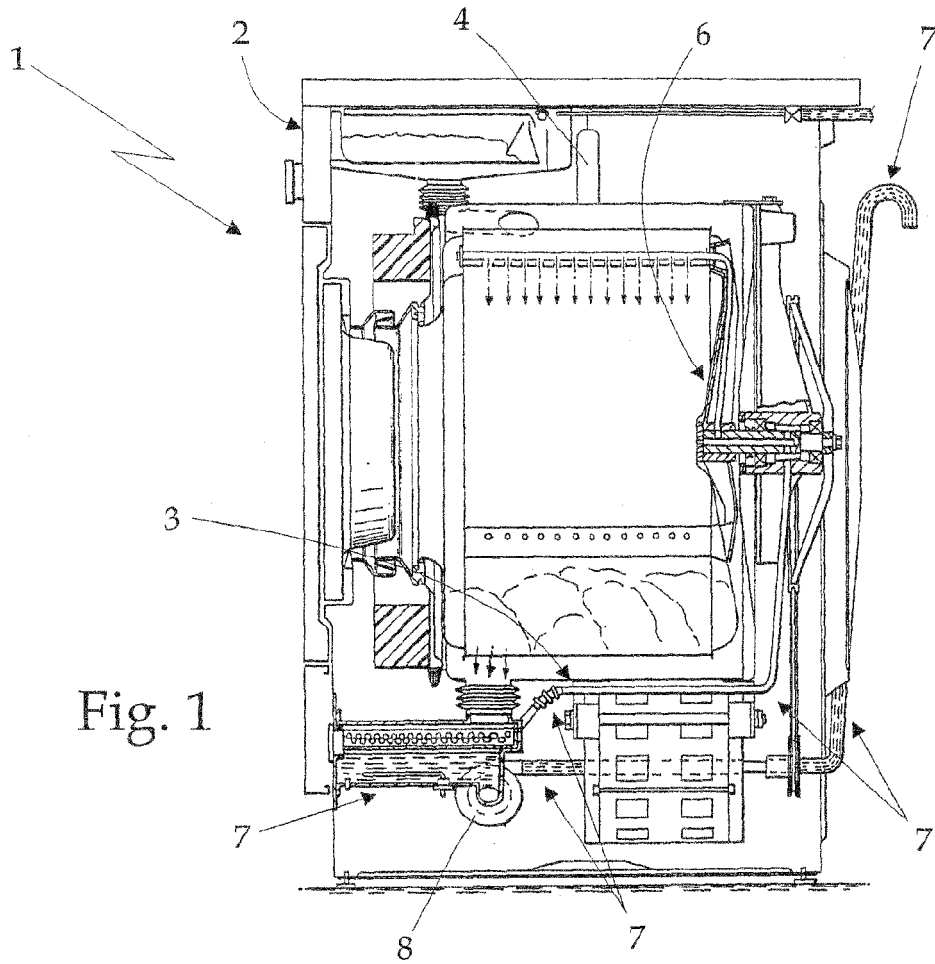
[0028] Obviously, in a different embodiment, household appliance 1 may be a dishwasher. In which case, electric pump 8 is used to circulate or drain dishwashing water.

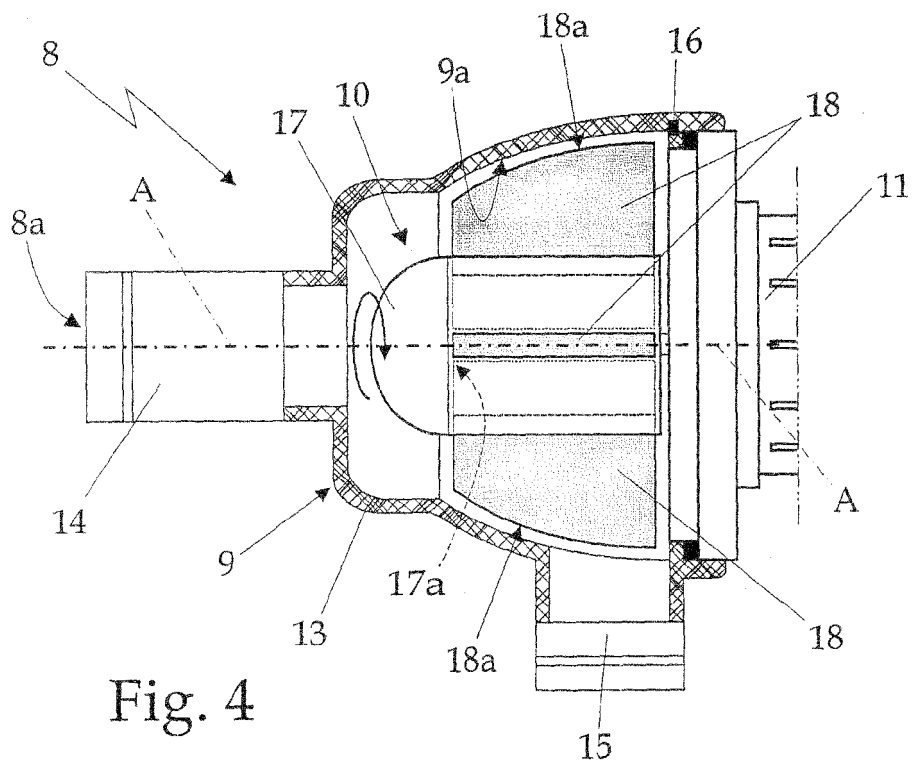
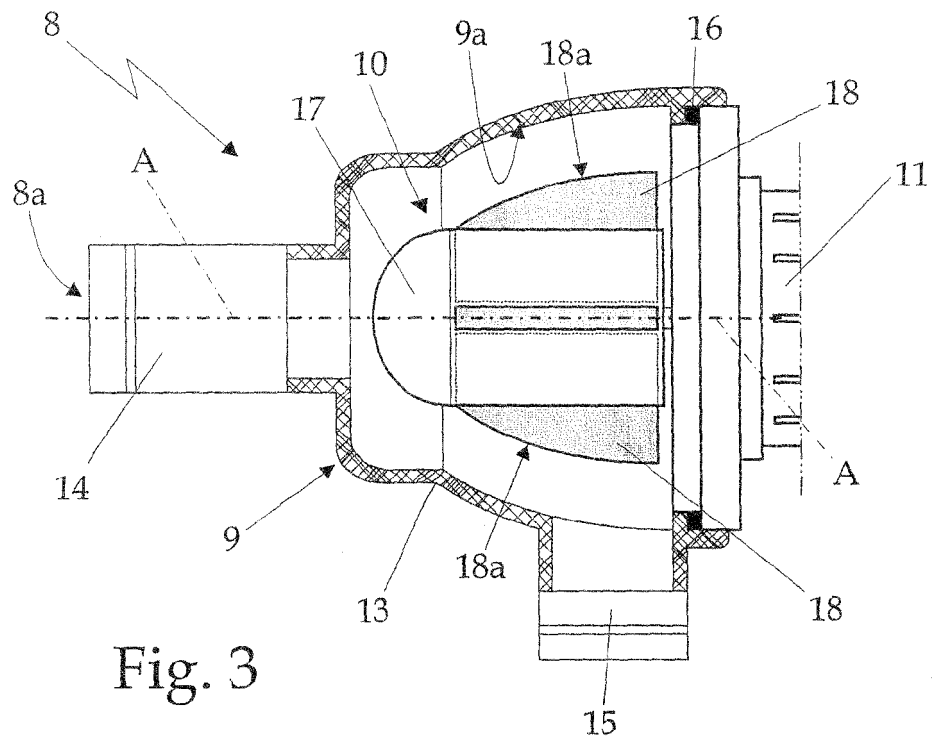
Claims

1. A household appliance (1) for washing articles having at least one electric pump (8) for circulating or draining the washing liquid; said electric pump (8) comprising an outer volute (9) having an inner pumping chamber (9a), an impeller (10) housed in axially rotating manner inside the pumping chamber (9a), and an electric motor (11) connected mechanically to the impeller (10) to rotate it about a rotation axis (A); the household appliance (1) for washing articles being **characterized in that** said impeller (10) comprises a central hub (17) coaxial with the rotation axis (A), and at least one movable projecting blade (18) fitted to the central hub (17) and movable between a fully retracted position in which the blade (18) is almost totally withdrawn inside the central hub (17), and a fully extracted position in which the blade (18) projects from the central hub (17) so that the outer lateral edge (18a) of the blade is further from said rotation axis (A) than when said blade (18) is in the fully retracted position.
2. A household appliance as claimed in Claim 1, **characterized in that** said impeller (10) comprises

means (19) for controlling the position of the movable projecting blades on the central hub (17) according to the instantaneous angular speed of said central hub (17).

3. A household appliance for washing articles as claimed in Claim 2, **characterized in that** said means (19) for controlling the position of the movable projecting blades on the central hub (17) move said at least one movable projecting blade (18) into the fully retracted position when the angular speed of the impeller (10) falls below a given value.
4. A household appliance for washing articles as claimed in any of the foregoing Claims, **characterized in that** said at least one movable projecting blade (18) consists of a substantially plate-like fin (18) which lies in a radial plane intersecting the rotation axis (A) of the impeller (10), and is inserted in sliding manner inside a respective radial slot (17a) formed in the body of the central hub (17).
5. A household appliance for washing articles as claimed in Claims 3 and 4, **characterized in that** said means (19) for controlling the position of the movable projecting blades comprise at least one elastic member (19), which is housed in the radial slot (17a) in the central hub (17), and has a first end fixed to the bottom of the radial slot (17a), and a second end fixed to the body of said plate-like fin (18), so as to pull the fin (18) onto the bottom of said radial slot (17a); said elastic member (19) being designed to counteract the centrifugal force and keep the movable projecting blade (18) in the fully retracted position when the angular speed of the impeller (10) is below a given value.
6. A household appliance for washing articles as claimed in any of the foregoing Claims, **characterized in that** said impeller (10) comprises a number of movable projecting blades (18) equally spaced angularly about the central hub (17).
7. A household appliance for washing articles as claimed in any of the foregoing Claims, **characterized by** being a laundry washing machine or a dishwasher.
8. A household appliance for washing articles as claimed in Claim 7, **characterized in that** said electric pump (8) is a water drain pump (8).







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 15 0991

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 June 2008	Examiner Di Giorgio, F
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 08 15 0991

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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