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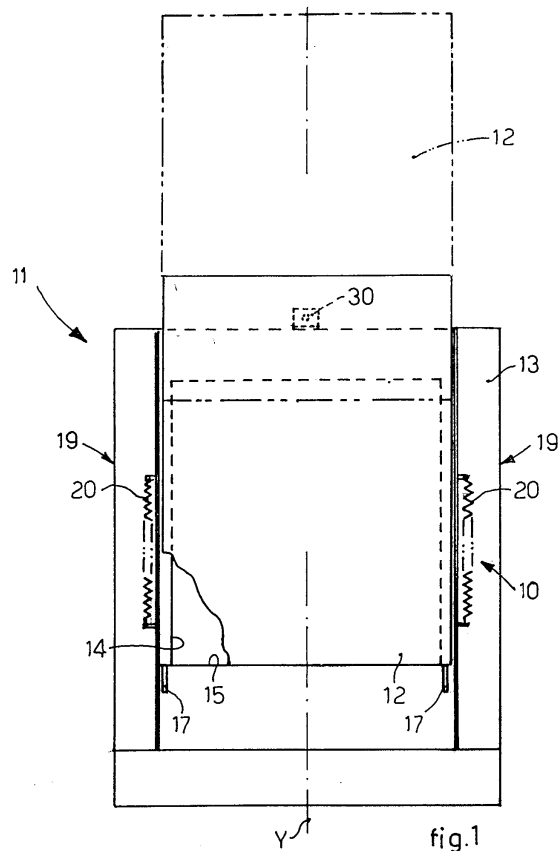
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(54) **Safety device for a closing element of a washing, thermal-disinfection, sterilization, preservation, refrigeration, heating machine, or suchlike**

(57) A safety device (10) for a closing element (12) of a machine (11) with a frame (13) that defines an internal compartment (14) provided frontally with an entrance (15) selectively closed by the closing element (12), and moved by at least one trolley, which is able to be selectively moved with respect to the frame (13), along a vertical axis (Y), comprises elastic means (20), interposed between the closing element (12) and the trolley, and able to exert on the closing element (12) a force in the opposite direction to the gravity force of the closing element (12).



## Description

### FIELD OF THE INVENTION

**[0001]** The present invention concerns a safety device, so-called "anti-shearing", for a closing element of a machine that shuts off access to said machine.

**[0002]** By machine we mean any washing machine, such as a dishwasher, washing machine or similar, for thermal-disinfection, sterilization, dessicating, drying, heating, or preserving food, such as freezers or fridges, for cooking, such as ovens, both for domestic use and for communities, both for laboratories and hospitals, and for industrial use.

### BACKGROUND OF THE INVENTION

**[0003]** Machines, such as washing machines, are known, which have a washing chamber into which access is gained by means of an entrance opening, selectively closed by a door. The door is vertically mobile, by means of a drawing chain rotated by a pair of pulleys, which are in turn driven by a motor.

**[0004]** Such washing machines have the disadvantage that the relative door creates, in its downward closing travel, a risk of "shearing", that is, an impact, even violent, with an object or an operator that finds himself between the same door and the lower part, or threshold, of the entrance opening.

**[0005]** To overcome this shortcoming, a washing machine is known, provided with an anti-shearing safety device that, in the event of an impact, commands an inversion of rotation of the motor, and therefore the opening of the door, according to the increase in the torque delivered, so as to overcome the resistance of the obstacle, by the motor that drives the pulleys.

**[0006]** A washing machine is also known, wherein the safety device is provided with a mechanical device that, in the event of impact of the door, diverts the door towards the entrance, in a position close to the washing chamber, so that the door can activate a relative command switch, which in turn commands the inversion of rotation of the motor and the opening of the door.

**[0007]** Such known washing machines, however, have the disadvantage that an object or an operator, interfering with the downward closing travel, suffers the impact of the whole weight of the door before the relative safety device is activated, with evident safety risks, most of all for the operators of the washing machine.

**[0008]** Purpose of the present invention is to achieve a safety device for the closing element of a machine, as described above, that guarantees a high level of safety for operators, preventing objects or foreign bodies from being hit by the closing element with all its weight.

**[0009]** The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain this and other purposes and advantages.

## SUMMARY OF THE INVENTION

**[0010]** The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

**[0011]** In accordance with the above purpose, a safety device according to the present invention can be used for the closing element of a machine with a frame that defines an internal compartment provided at the front with an entrance selectively closed by said closing element. The closing element is moved by at least one trolley, which is able to be selectively moved with respect to the frame, along a vertical axis.

**[0012]** In accordance with a characteristic feature of the present invention, the safety device comprises elastic means, disposed between the closing element and the trolley, and able to exert on the closing element a force in the opposite direction to the gravity force of the closing element.

**[0013]** The safety device achieved in this way guarantees a high level of safety for operators, preventing objects or foreign bodies from being hit by the closing door with a force equal to the total weight of the moving door. In fact, the elastic means is able to pull the door upwards, thus partly discharging its total weight.

**[0014]** Advantageously, furthermore, in order to further increase operating safety, the closing element, or door, and the trolley are coupled to each other in a sliding manner, so as to determine, both in the event of impact, and also in the event of an abutment closure, a pre-determined horizontal movement of the door towards the entrance of the washing chamber, between a distanced position and a close-up position, or ajar, with respect to the entrance. In this way, in the event of impact, the door, in the close-up position, contacts a relative switch element that provides to invert or arrest the downward closing travel of the door. In the event of an abutment closure, said horizontal movement determines the sealed closure, with corresponding compression of a suitable packing, of the door on the entrance.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0015]** These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a front view, partly sectioned, of a safety device according to the present invention;
- fig. 2 is a lateral view of part of the safety device of fig. 1 in a first condition of use;
- fig. 3 is a lateral view of part of the safety device of fig. 1 in a second closed condition of use;
- fig. 4 is a plane view of part of the safety device of fig. 1.

## DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

**[0016]** With reference to fig. 1, a safety device 10 according to the present invention can be used, as a non-restrictive example, on a washing machine 11 provided with a frame 13 that defines an internal washing chamber 14, in which various treatments are performed on objects, such as washing, thermal-disinfection and drying. Access to the washing chamber 14 is through a front entrance 15, which is selectively closed by a door 12 with alternate vertical movement, along a vertical axis Y (fig. 1), and whose sides are adjacent to the relative sides of the entrance 15. In fig. 1 the door 12 is shown by a dotted line in an open condition, and by a continuous line in a closed condition.

**[0017]** On each of the sides 19 of the frame 13 respective trolleys 16 are positioned, selectively movable vertically; in the drawings, for convenience, in figs. 2, 3 and 4, only the trolley 16 on the left side of the washing machine 11 is shown.

**[0018]** Each trolley 16 is provided with eyelets 24, 28 (figs. 2 and 3) in which, by means of horizontal pins 22, 26, the door 12 rests. In this specific case, a first pin 22 is inserted in a first eyelet 24 and a second pin 26 is inserted in a second eyelet 28.

**[0019]** The trolleys 16 are able to be moved, by means of a movement device 18, along the vertical axis Y, so as to determine, as a consequence, the opening and closing movement of the door 12 too. In particular, each trolley 16 is provided with longitudinal guide seatings 35 (fig. 4), which extend along the sides 19 of the frame 13, parallel to the vertical axis Y, which are able to be moved, solid with the trolley 16, cooperating with relative sliding rollers 34, disposed fixed along each of the sides 19 of the frame 13.

**[0020]** In this specific case, which is not to be intended as restrictive to the present invention, the movement device 18 comprises, in correspondence with each side 19 of the frame 13, a pair of pulleys, of which the drive pulley, indicated by the reference number 36 in the drawings and disposed, in this specific case, at the lower part, is driven in rotation by a relative motor 39 and, in cooperation with the relative driven pulley, disposed, in this specific case, at the upper part and not shown in the drawings, makes rotate a relative drawing belt 37 disposed vertically. The drawing belt 37, which therefore acts parallel with the vertical axis Y, is fixed solidly, by means of a bracket 38, to a portion of the trolley 16, in this specific case to the relative guide seating 35. In this way, the belt 37 is able to draw the trolley 16 in a vertical and alternate movement.

**[0021]** According to the present invention, the safety device 10 is provided with two elastic springs 20, each mounted on one side of the door 12, in cooperation between each trolley 16 and one of the pins 22, 26 (figs. 1, 2, 3 and 4). In this specific case, the spring 20 is solid, by means of a first springhead 27, with the first pin 22

and is solid, by means of a second springhead 29, with an attachment portion 25, such as a pin, of the respective trolley 16.

**[0022]** Each spring 20 is disposed substantially parallel to the vertical axis Y, or in any case slightly displaced from the vertical, and is able to exert on the door 12 an upward traction force K, in a direction opposite to the gravity force G of the door 12. When the door 12 is open, the spring 20 is extended under tension, in order to support at least partly the weight of the door 12, while when the door 12 is shut and rests its weight on relative abutment shelves 17 (figs. 1, 2, 3 and 4), the spring 20 discharges and tends to shorten, in accordance with the size of the eyelets 24, 28, so as to recover its normal extension. In the event of an impact with an obstacle during the downward closing movement, the weight of the door 12 felt by the obstacle is thus equal to a value P which is given by the value of G less twice the value of K, that is, it is decreased by a pre-determined value, imposed by the elastic force of the springs 20. It is therefore advantageous to use a spring 20 that is able to support at least a pre-determined fraction of the weight of the door 12. The elastic force of the spring 20, and therefore the value of K, can be regulated by varying the elastic properties thereof, so as to satisfy the safety norms of the sector, which establish that the value of P must be lower than 15 daN.

**[0023]** The eyelets 24, 28 are made the same and disposed aligned along the vertical axis Y and lie on relative parallel planes T, T', which are transverse to the vertical axis Y and inclined towards the entrance 15 (fig. 2).

**[0024]** The pins 22, 26 and consequently the door 12 can therefore slide with respect to the respective eyelets 24, 28 and move, with respect to the relative trolley 16, by a pre-determined length, directly related to the length of the eyelets 24, 28. This movement is determined by a component of vertical movement with a length L (fig. 2) and by a component of horizontal movement with a length S (fig. 2). Length S, in particular, corresponds to the distance at which the door 12 is positioned when it is open, as can be seen in fig. 2.

**[0025]** In particular, in the event of vertical impact with an obstacle, or of an abutment closure on the relative abutment shelf 17, since vertical movement is prevented, the door 12 only moves horizontally, by the length S, towards the entrance 15, from a distant position with respect to the entrance 15, to a close-up position, as can be seen in figs. 2 and 3.

**[0026]** Therefore, when the door 12 hits an object or closes in abutment, the eyelets 24, 28 not only support part of the weight of the door 12 but also act as a cam that transforms the vertical movement of the door 12 into a horizontal movement towards the entrance 15. In particular, the eyelet 28 acts as a proper guide for the door 12, while the eyelet 24 follows the movement imposed by eyelet 28, advantageously preventing any possible twisting that could divert the door 12. The shape and size of the eyelets 24, 28, and the travel they determine for

the door 12, can be varied, according to necessity. Furthermore, since the eyelet effectively acts as a guide for the door 12, it is preferably made of a material with high resistance to wear.

**[0027]** In a closed condition (fig. 3), the door 12 rests on the abutment shelf 17 and the rotation of the motor 39 and the consequent movement of the belt 37 causes the door 12 to move towards the entrance 15, as described above, and to compress a relative sealing packing 21 of the entrance 15.

**[0028]** Similarly, in the event of impact of the door 12 along the downward closing travel, the impact itself is partly decreased, as described above, by the elastic force of the springs 20, and the door 12 moves horizontally, as described above. With this movement, a portion 23 of the door 12 contacts a switch device 30, shown in fig. 2 in an inactive condition and in fig. 3 in an active position. The switch device 30 can, in this way, be selectively activated in order to arrest and/or invert the action of the movement means 18, in particular to invert the direction of rotation of the motor 39, and therefore prevent the door 12 from compressing with its weight an object or foreign body interfering with the closing travel. Advantageously, for greater safety, two switch devices 30, coupled, can be provided.

**[0029]** It is clear that modifications and/or additions of parts may be made to the safety device 10 as described heretofore, without departing from the scope of the present invention.

**[0030]** It is also clear that, although the present invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of safety device, having the characteristics as set forth in the claims and hence all coming within the scope of protection defined thereby.

## Claims

1. Safety device for a closing element (12) of a machine (11) with a frame (13) that defines an internal compartment (14) provided frontally with an entrance (15) selectively closed by said closing element (12), said closing element (12) being moved by at least one trolley (16), which is able to be selectively moved with respect to said frame (13), along a vertical axis (Y), **characterized in that** it comprises elastic means (20), interposed between said closing element (12) and said trolley (16), and able to exert on said closing element (12) a force (K) in the opposite direction to the gravity force (G) of said closing element (12).
2. Device as in claim 1, **characterized in that** said trolley (16) is positioned in correspondence with one of the sides (19) of said frame (13).
3. Device as in claim 2, **characterized in that** it comprises two trolleys (16), positioned each on one of said sides (19) of said frame (13).
4. Device as in any claim hereinbefore, **characterized in that** said closing element (12) is provided with at least a pin (22, 26) disposed horizontally and that said trolley (16) comprises at least an eyelet (24, 28), in which said pin (22, 26) is able to rest and selectively slide.
5. Device as in any claim hereinbefore, **characterized in that** said elastic means comprises a spring (20) disposed substantially parallel to said vertical axis (Y).
6. Device as in claim 3, **characterized in that** said elastic means comprises two springs (20), each of which is able to cooperate with a relative one of said trolleys (16).
7. Device as in claim 4 and 6, **characterized in that** each of said springs (20) is solid, by means of a first springhead (27), with a first pin (22) of said pins (22, 24) of said closing element (12), and is solid, by means of a second springhead (29), with an attachment portion (25) of said trolley (16).
8. Device as in claim 4, **characterized in that** each eyelet (24, 28) is inclined, towards said entrance (15), along respective inclined planes (T, T') transverse to said vertical axis (Y), and is able to cooperate with the relative pin (22, 26) so as to selectively determine the sliding of each pin (22, 26) along the relative eyelet (24, 28), and, consequently, in order to determine a movement, substantially horizontal, of said closing element (12) towards said entrance (15), from a distanced position to a close-up position to said internal compartment (14).
9. Device as in any claim hereinbefore, **characterized in that** it comprises movement means (18) able to move vertically said at least one trolley (16).
10. Device as in claim 9, **characterized in that** said movement means (18) comprises at least one drive pulley (36), driven by a relative motor (39) mounted on said frame (13), in order to make rotate at least a relative drawing belt (37), and at least a bracket (38), solid both with said drawing belt (37) and with said trolley (16), so as to draw said trolley into motion (16).
11. Device as in claim 10, **characterized in that** said drawing belt (37) extends parallel to said vertical axis (Y).
12. Device as in claims 8 and 9, **characterized in that**

it also comprises at least a switch element (30) which can be selectively activated, in said close-up position, by means of a portion (23) of said closing element (12), in order to arrest and/or invert the action of said movement means (18).

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13. Device as in claim 3, **characterized in that** each trolley (16) comprises longitudinal guide seatings (35), which extend along the sides (19) of said frame (13) and parallel to said vertical axis (Y), able to cooperate with relative rollers (34), disposed along the sides (19) of said frame (13).
14. Machine comprising a safety device as in any claim hereinbefore.

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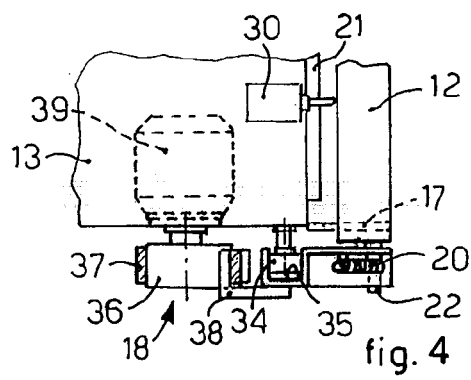
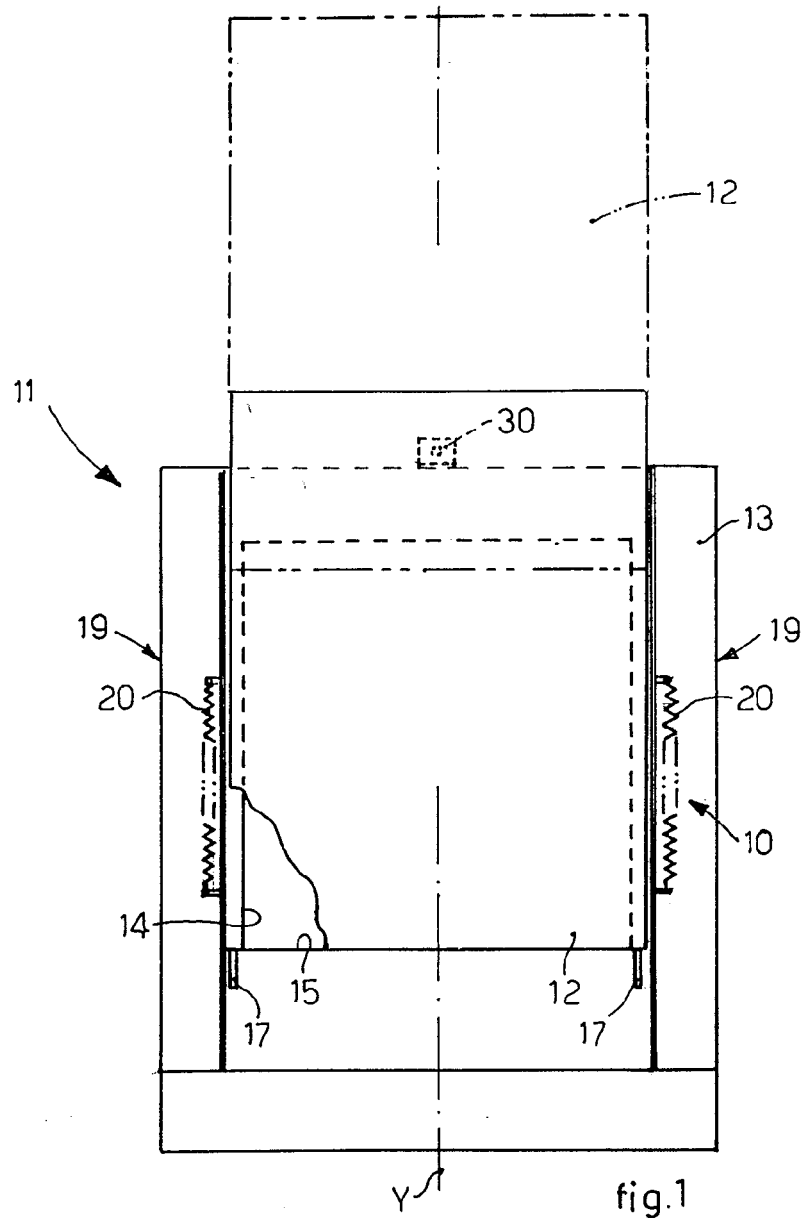
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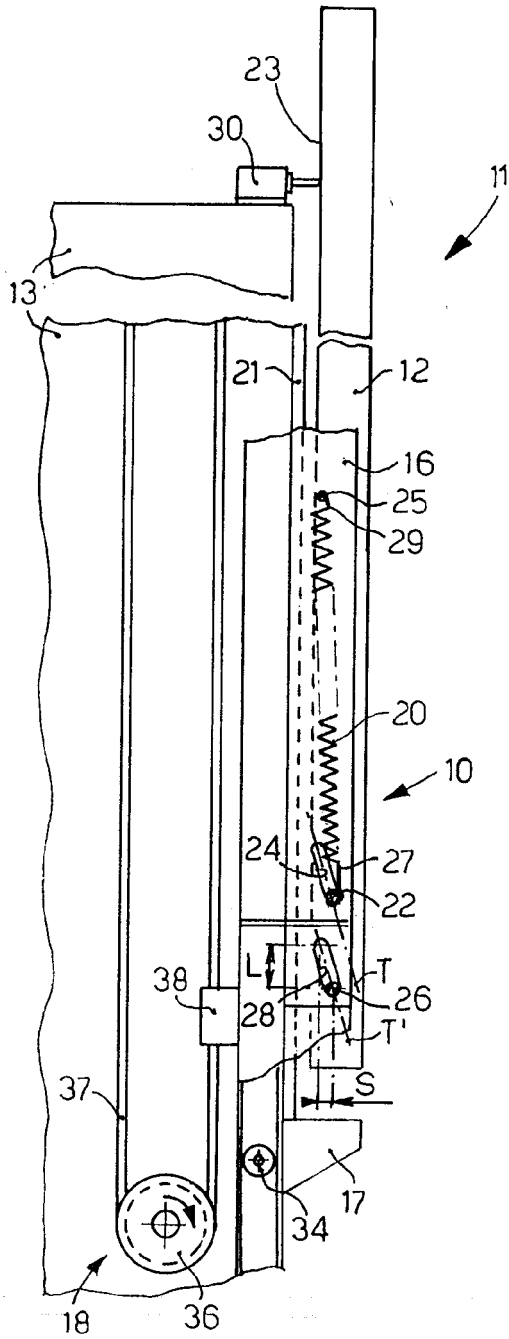


fig. 2

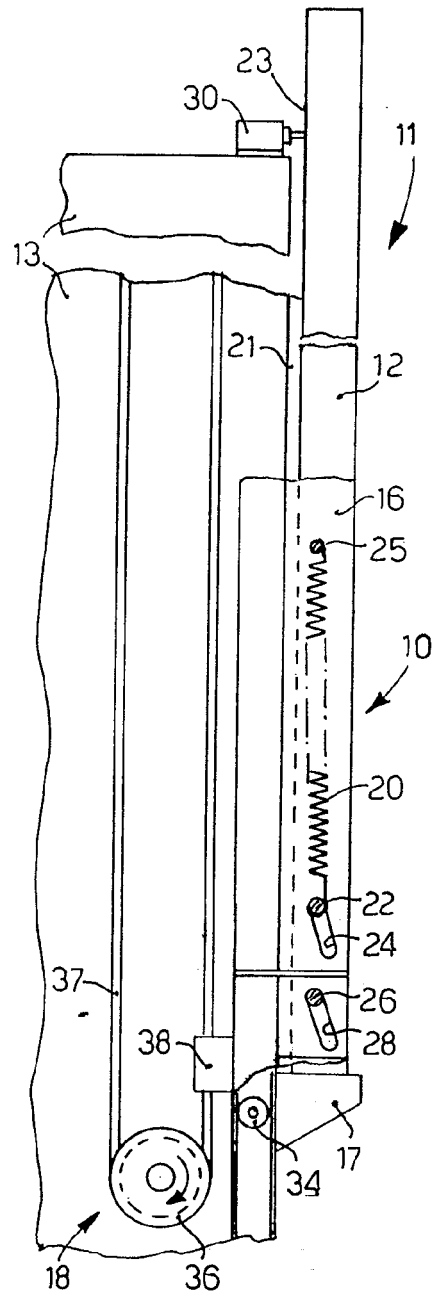


fig. 3



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 08 15 0682

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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A	US 4 583 655 A (FISHER KENNETH J [US] ET AL) 22 April 1986 (1986-04-22) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 May 2008	Examiner Courrier, Gilles
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p> <p>&amp; : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 15 0682

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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20-05-2008

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