

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.09.2006 Bulletin 2006/37

(51) Int Cl.:
E05D 15/00 (2006.01)

(21) Application number: **06002945.1**

(22) Date of filing: **14.02.2006**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**
Designated Extension States:
AL BA HR MK YU

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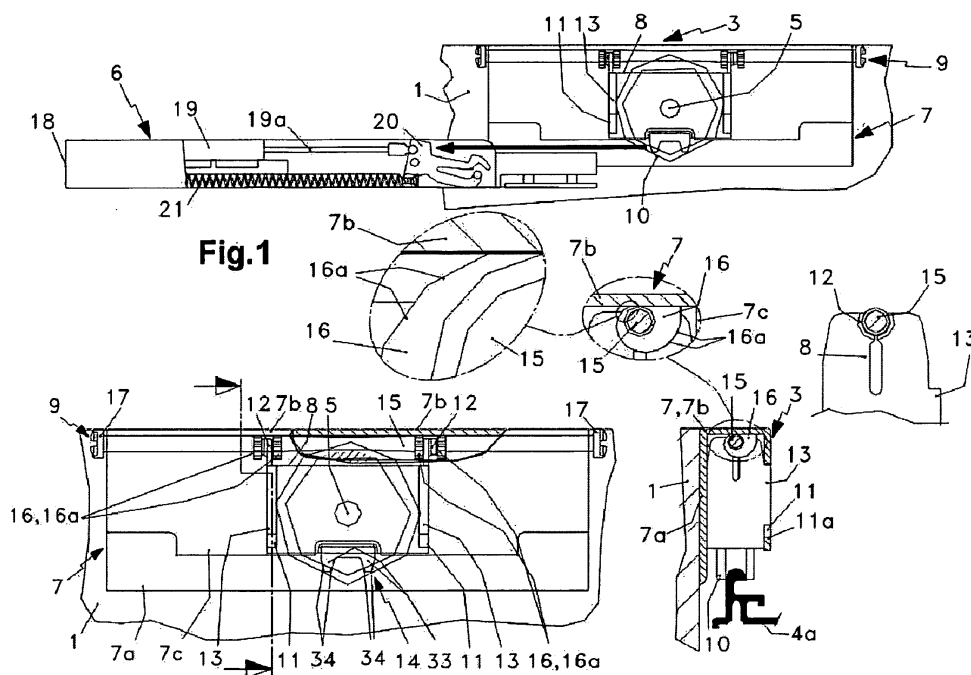
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(30) Priority: **25.02.2005 ES 200500433**
20.12.2005 ES 200503126

(54) **Rolling and locking device for sliding wardrobe doors**

(57) This invention relates to a device which is intended to bring about the rolling and closure of sliding wardrobe doors. The device has a general arrangement in which each extremity of each sliding door of the wardrobe in question comprises a rolling assembly attached thereto with means for vertical adjustment with respect to its rail and comprising a locking assembly which through a first fluid damper whose shank is connected to a downwardly retractable horizontal tilting hook guided horizontally in a body, which in its retracted position is acted upon by the charged state of a helical tension spring which is also horizontal, this locking assembly interacting with a member of the rolling assembly in such a way that it brings about locking at the end of the travel, damps it and holds it waiting for an opening force. A system with two sliding doors is considered in the graphic illustration accompanying this description.

This Patent of Addition relates to a number of improvements to the device which is intended to bring about the rolling and closure of sliding wardrobe doors according to the subject matter of Patent of Invention P200500433.



Description**SCOPE OF THE INVENTION**

5 **[0001]** This invention relates to a device which is intended to bring about the rolling and closure of sliding wardrobe doors. The device has a general arrangement in which each extremity of each sliding door of the wardrobe in question comprises a rolling assembly attached thereto with means for vertical adjustment with respect to its rail and comprising a locking assembly which through a first fluid damper whose shank is connected to a downwardly retractable horizontal tilting hook guided horizontally in a body, which in its retracted position is acted upon by the charged state of a helical

10 tension spring which is also horizontal, this locking assembly interacting with a member of the rolling assembly in such a way that it brings about locking at the end of the travel, damps it and holds it waiting for an opening force. A system with two sliding doors is considered in the graphic illustration accompanying this description.

[0002] This Patent of Addition relates to a number of improvements to the device which is intended to bring about the rolling and closure of sliding wardrobe doors according to the subject matter of Patent of Invention P200500433.

PRIOR ART

[0003] Devices in which the rolling assembly comprises an inverted "U"-shaped support which is fixed to the sliding door together with a chassis in which the wheel is mounted fitted to it and on which a vertical adjustment mechanism comprising a movable horizontal wedge positioned between the wheel chassis and the support fixed to the sliding door is fitted, this wedge being driven by the tip of a screw which is threaded through a block fixed to the said support secured to the sliding door, are known. The wheel chassis is assembled by sliding the same between the sides of the inverted "U"-shaped support, followed by an operation of inserting a transverse plate which simultaneously penetrates the said chassis and support without passing through more than one of the walls of the latter. The mounting for the block in which

20 the vertical adjustment screw is threaded also requires the latter to be pre-positioned so that it can then be secured by a blind pin passing through only one of the walls of the support mounted on the sliding door.

[0004] This construction implies an assembly of some complexity as regards the number of parts involved and the number and type of operations required, with the special feature that the block for the vertical adjustment screw cannot be dismantled, and removal of the plate securing the wheel chassis to the support mounted on the sliding door is complicated. Another no less important disadvantage is that the vertical adjustment device is asymmetrical, which means that the rolling assembly for one extremity of a given door is not appropriate for the other extremity; that is this known rolling assembly device with vertical adjustment has handedness, it is either right- or left-handed.

[0005] On the other hand, with regard to the locking assembly, which brings about locking, damping and retention, in known devices the place of impact between the rolling assembly member and the hook of the locking assembly is not longitudinally aligned with the shaft of the fluid damper (of that locking assembly), which is specifically the component intended to produce damping of the locking impulse provided by the sliding door. This means that there is a certain amount of lever arm between the point of impact and the damper component. This has the effect that the shank of the damper suffers a bending moment which is prejudicial to its proper functioning because permanent deformations can be produced in the said shank, apart from being prejudicial to the integrity of the locking assembly as a result of the possibility that this shank might break. Furthermore, this defect in alignment between the point of impact means that the damping response is not as direct and immediate as it should be. These disadvantages are quite significant when we consider the great comparative inertia of the door in comparison to the structural and functional slightness of the locking assembly.

[0006] The invention in the Patent of Addition with which we are now concerned is through its nature essentially protected in the principal Patent of Invention.

[0007] When the rolling assemblies are provided with standard wheels in which the groove engaging the rail has a depth which can be critical at any time, it will be borne in mind that when fitting and levelling sliding doors there will be a fit which gives rise to the possibility that they will be derailed if they are subjected to a strong opening or closing force, or because they impact against some obstacle along their opening or closing path.

50 **[0008]** Furthermore, when fitting the second fluid damper (on the lower rail) in a position suitable for it, it requires trial and error which is laborious, and when once completed it must be held while attachment through the attachment means is checked, which is not easy to do.

[0009] Also, in connection with this second fluid damper, it is desirable that the attachment to the rail should be firm in relation to the appropriate position selected and that there should be some lateral mobility of the body of the second damper with respect to the said rail.

EXPLANATION OF THE INVENTION AND ITS ADVANTAGES

[0010] Given this state of affairs, this invention provides a rolling and locking device for sliding doors which while complying with the general basic arrangement for this type of product as described above has a special arrangement in that the said rolling assembly comprises a support which is mounted on the inside face of the sliding door, a frame which carries at least one wheel and which is fitted to the said support, and means for vertical adjustment through rotatory action which are placed between the said support and frame, in which the said support has an inverted "U"-shaped cross-section which is folded into right angles forming a front wall which is secured to the back of the sliding door, an upper wall and a rear wall which is fitted with at least one vertical window, the said wheel-support and frame being open at the base opposite the top guide rail thereof, as it is also open at the top where the sides of this frame transverse to the sliding door are extended at the top thereof each forming bearings which do not come into contact with the upper wall of the support, being open at their top, and conveniently cover an arc of more than 180°, this frame forming at least a flat tenon which extends vertically with a width which is slidably adjusted with respect to a corresponding said vertical window and of a height which is conveniently less than that of this vertical window, this frame incorporating a rear lower appendage which extends behind the rear wall of the support and which acts together with the said closure assembly and the said means for vertical adjustment by rotary operation of a shaft whose diameter is adjusted by rotation with tightening onto the said bearings and is capable of penetrating therein through a resilient snap-fit mechanism, in relation to which bearings this shaft has individual spiral levers of polygonal profile which form a succession of facets acting in conjunction with the upper wall of the support while the extremities thereof terminate in corresponding screw heads which extend longitudinally from the said support. Furthermore, in accordance with the invention it happens that with movement of the sliding door the frame appendage is longitudinally aligned with the place where the extremity of the rod of the first fluid damper is coupled to the retractable tilting horizontal hook.

[0011] In relation to the rolling assembly this recommended arrangement will result in a smaller number of parts which are of simple construction and which will allow rapid and straightforward assembly which can be easily dismantled and which incorporates a vertical adjustment mechanism which is symmetrical and therefore appropriate for both extremities of the same sliding door. Assembly of the wheel-supporting frame with the support anchored to the sliding door produces sufficient forced resilient separation of the front and rear walls of the support for the extremity of the flat tenon(s) of the frame to penetrate the vertical window in the rear wall of the support and then by pressing on this frame bring about complete insertion and therefore final assembly. In this respect a preferred embodiment of the invention has two vertical windows acting with corresponding flat vertical tenons located at the two extremities of the frame in the rear wall of the support with respect to the door. As far as fitting of the vertical adjustment mechanism is concerned, it must be pointed out that this will now be associated with the wheel-supporting frame instead of the support attached to the sliding door, with the result that it is sufficient to press on the shaft to bring about the resilient snap mechanism which ensures that it is secured in the bearings with rotary tightening adjustment, with the result that the shaft is fitted before the wheel-supporting frame is fitted to the support attached to the sliding door, and vertical adjustment may be effected by acting on either of the two extremities of the screw of the said adjusting shaft. In this respect, in a preferred embodiment, there are two twin said faceted spiral levers located one on each side of the said bearings in relation to each bearing in the frame, although the invention may also have a single central faceted lever.

[0012] On the other hand, with regard to the interactive operating mechanism between the rolling assembly and the locking assembly, when inserted the said rear lower appendage of the wheel-supporting frame has a longitudinal profile in the form of a bridge having abutments with oblique transverse faces which converge upon each other at their extremities. At the same time the said tilting hook of the locking assembly comprises a resilient arm, has a recess having a longitudinal profile of oblique sides converging upon each other towards the base matching the said oblique faces of the appendage which are capable of joining them together in a loose-fitting manner, the side of these oblique sides which is closest to the tip of the hook being shorter, and this hook extending as far as its tip in an inverse hook shape thereby forming a projection towards its tip which engages with the said smaller oblique side, and a descending oblique lip. The said tilting hook is capable of operating between a tilted or retracted position and a non-tilted or engaging position such that, in relation to the closing movement of the sliding door, in the retracted position the front oblique face of the appendage is longitudinally in line with the oblique side which is the larger of the two and closest to the coupling between the hook and the shank of the first fluid damper, while in the engaged position the appendage is received within the hook.

[0013] Another special feature of the invention lies in the fact that with respect to the lower rail over which the sliding door rolls, there is at each extremity at least a second fluid damper of telescopic construction which is formed of a fixed or inner part, a moving or outer part and a helical compression spring placed between the two, the fixed part having a hole for attachment to the base of the wardrobe and a first "T"-shaped longitudinal fin which is slidably adjustable in a box of the said lower rail, the moving part receiving within it the spring which itself is wound about the shank of the said second damper, and this moving part has a second longitudinal fin which is slidably adjustable within the said box of the lower rail. This second fluid damper is to prevent pitching of the sliding door which might occur when the latter reaches the point of impact and braking, caused by the locking assembly. The design of this second fluid damper also

makes it possible for it to be used reversibly for one or other extremity of the lower rail.

[0014] Given this state of affairs, one of the improvements in this Patent comprises the fact that in the parts of the shaft which project between the support of the rolling assembly and the screw heads of the shaft itself supplementary members which in their lower part form a groove which is substantially deeper than that of the wheel and which therefore receives within it the upper rail of the corresponding door are attached thereto. With this arrangement, as fitting onto the rails takes place at the same time and in the same way as regards the wheel and the supplementary members, the problem of any derailment is eliminated, because even if the door should be sufficiently raised to cause the wheel to come off the rail its position on the rail will remain ensured through the grooves of the supplementary members.

[0015] In addition to this, these supplementary members provide additional services. One of these is to give greater rigidity to the projecting parts of the shaft which bear the faceted spiral levers. Another is to help indicate the position of the said levers within the range of rotary adjustment at all times; in order to do this the supplementary members form a projection at the extremity opposite the support in two places coinciding with the extreme positions of the operating travel of the faceted spiral levers of the shaft, this projection interfering with the rotary path of a radial projection passing beyond the periphery of the said screw heads of that shaft. This means that this projection acts as an adjustment end stop at both extremities thereof. For assembly purposes the supplementary members have an omega-shaped profile on their upper edge which can receive the said shaft within it through a resilient snap-fit mechanism.

[0016] Another of the improvements lies in the fact that in the second fluid damper of the sliding doors, the first longitudinal fin of the fixed part has a portion forming a strip which can flex elastically between a relaxed condition extending above the first fin as far as the top of the corresponding box of the lower rail, and a tensioned condition in which it lies alongside this first fin. This simple arrangement makes the trial and error operation for appropriate location of the second damper on the lower rail easier and more accurate, because the strip exerts a pressure (against the top of the box of this lower rail) which ensures that the chosen position is maintained while the permanent attachment is checked.

[0017] Another improvement lies in the fact that a cap which is slightly longer than the hole itself and whose upper part forms a first plate seated in the upper opening of that hole is slid downwards into the hole holding the fixed part for the means of attachment to the lower rail, this hole receiving within it a through screw which screws into a second plate which together with the first plate is capable of anchoring a pair of collateral flanges which extend longitudinally within the box of the corresponding lower rail. In this way firm attachment to the lower rail is brought about by anchoring the longitudinal flanges between the first and second plates, but at the same time the screw does not immobilize the body of the second damper either rotationally or vertically because the head of the screw tightens against the lower opening of the cap and not against the hole in which the cap lies, which forms part of the body of the second damper.

[0018] This and other features of this invention are clearly illustrated through the appended illustrations.

DRAWINGS AND REFERENCES

[0019] To provide a better understanding of the nature of this invention a preferred industrial embodiment is illustrated in the appended drawings and is in the nature of a purely illustrative and non-restrictive example.

Figure 1 is a view in the direction of cross-section I-I indicated in Figure 9, relating only to inner sliding door (1) and in Figure 1 the components are in a relative position corresponding to one extremity of the door's travel. This Figure 1 includes magnified details - one, relating to the rolling assembly (3), where there is a partial upper cross-section of the rear wall (7c) and in this detail there is shown a cross-section line whose content is illustrated in another detail located in a corresponding position in which a transverse cross-section through the support (7) will be seen; in this detail three small magnifications illustrate: resilient hooking of shaft (15) onto bearing (12), the position of faceted spiral lever (16) and the appearance of the flat faces (16a) of faceted spiral lever (16).

Figure 2 shows the frame (8) of the rolling assembly (3) in perspective to show the shape of its flat tenons (13), its bearings (12) and its rear appendage (14).

Figures 3 and 4 show diagrammatically and sequentially the assembly insertion of shaft (15) into bearings (12) of frame (8) through a resilient snap fit.

Figures 5, 6 and 7 show diagrammatically and sequentially the assembly of frame (8) of rolling assembly (3) into the support for the assembly. Figure 5 shows the rear wall (7c) of the support which has been moved resiliently by the force illustrated by the arrow shown, bringing about sufficient amplitude for support (8) shown opposite it to be inserted in accordance with the direction shown by the arrow. Figure 6 shows a support (8) with its flat tenons (13) partly within windows (11). In Figure 7 rear wall (7c) has resiliently recovered its position and its vertical windows (11) act as a vertical guide for flat tenons (13) ensuring correct vertical adjustment movement.

Figure 8 shows the same assembly as in Figure 7, but with its faceted spiral lever (16) in the maximum position corresponding to the highest elevation of the door hung on this rolling assembly (3), and the magnified detail provides an illustration of the top which in this flat position tenon (13) makes with the lower edge (11 a) of vertical window (11).

Figure 9 is a view in transverse cross-section of an arrangement of two inner (1) and outer (2) sliding doors according to the invention.

Figure 10 shows the frame (8) of rolling assembly (3) in Figure 1, also including locking assembly (6), but omitting inner sliding door (1), support (7) and corresponding rail (4) and without shaft (15) with its faceted spiral levers (16).

Figure 11 is like the transverse cross-section of rolling assembly (3) included in the magnified detail in Figure 1, but showing the position of maximum vertical adjustment of faceted spiral levers (16).

Figure 12 is a view similar to the principal view in Figure 1, but only showing frame (8), with wheel (10) and appendage (14), and closure assembly (6) without body (18); all this in relation to a position immediately prior to impact of appendage (14) against hook (20) in its tilted or retracted position.

Figures 13 and 14 are views similar to Figure 12 which illustrate the operation of locking assembly (6), in which body (16) of the latter is included.

Figures 15 and 16 show the same as Figures 13 and 14, but illustrate the resetting of lock assembly (6).

Figure 17 is a perspective view of a second fluid damper (23) in the extended condition.

Figure 18 is a magnification of detail XI indicated in Figure 9.

Figures 19 and 20 are lateral views, in orthogonal projection, showing the extended and retracted conditions of second damper (23) respectively.

[0020] It will be noted that the numbers in these figures follow from the main Patent of Invention to which this Patent refers.

[0021] Figure 21 is a vertical transverse cross-section of one of the sliding doors, in this case inner door (1), mounted on its upper (4a) and lower (22) rails, which incorporates a magnified detail of the top relating to rolling assembly (3). It also incorporates the right lateral view corresponding to this magnified detail and two views of one of the supplementary members (38), these being a lateral elevation view and of right lateral view thereof.

[0022] Figure 22 illustrates the means and range of height adjustment for door (1, 2), showing the lowest position on the left and the highest position on the right. Each of these positions is supplemented by an illustration of the corresponding position of faceted spiral lever (16) which, as in Figures 7 and 8 of the Principal Patent of Invention, are shown along shaft (15) in transverse cross-section.

[0023] Figure 23 is a magnification of detail XXIII which appears circled in Figure 21 and which corresponds to the lowest position of door (1, 2) as shown on the left-hand side of Figure 22.

[0024] Figure 24 is similar to Figure 23, but relates to the highest position of door (1, 2), as shown on the right-hand side of Figure 22.

[0025] Figure 25 is an illustration, shortened in length, of the second fluid damper (23) according to this Patent, illustrated in its condition when dismantled from lower rail (22).

[0026] Figure 26 is a left-hand lateral view of Figure 25 placed alongside the profile of lower rail (22).

[0027] Figure 27 shows second fluid damper (23) in Figure 26 fitted into lower rail (22).

[0028] Figure 28 is a left lateral view of Figure 27.

[0029] Figure 29 is a magnification of detail XXIX shown circled in Figure 27, but showing the cross-section along the longitudinal median plane through second fluid damper (23).

[0030] Figure 30 is an exploded view according to Figure 29, but omitting screw (47) and lower rail (22); this figure includes a magnified detail of tooth (50).

[0031] Figure 31 is an overhead view in plan corresponding to cap (45) in Figure 30.

[0032] These figures include both the reference numbers listed below which are specific to this Patent, and those used for the same purpose already listed in the principal Patent:

- 1. - Inner sliding door
- 2.- Outer sliding door
- 3. - Rolling assembly
- 4.- Rail profile (4a and 4b)
- 4a. - Rail for inner sliding door (1)
- 4b. - Rail for outer sliding door (2)
- 5. - Openings-bearing for wheel shaft (10)
- 6. - Locking assembly
- 7. - Support for rolling assembly (3)
- 7a. - Front wall of support (7)
- 7b. - Upper wall of support (7)
- 7c. - Rear wall of support (7)
- 8. - Frame for rolling assembly (3)
- 9. - Means for vertical adjustment

- 10. - Wheel in frame (8)
- 11. - Vertical windows in rear wall (7c)
- 11 a. - Lower edge of vertical window (11)
- 12. - Bearings on frame (8)
- 5 13. - Flat vertical tenons on frame (8)
- 14. - Lower rear appendage of frame (8)
- 15. - Shaft of vertical adjustment means (9)
- 16. - Faceted spiral lever of shaft (15)
- 16a. - Facets of faceted spiral lever (16)
- 10 17. - Screw heads of shaft (15)
- 18. - Body of locking assembly (6)
- 19. - First fluid damper of (upper) locking assembly (6)
- 19a. - Shank of first damper (19)
- 20. - Tilting hook of locking assembly (6)
- 15 21. - Helical tension spring in locking assembly (6)
- 22. - Lower rail
- 23. - Second (lower) fluid damper
- 24. - Fixed or inner part of second damper (23)
- 25. - Moving or outer part of second damper (23)
- 20 26. - Helical compression spring in second damper (23)
- 27. - Hole in fixed part (24)
- 28. - Wardrobe floor
- 29. - First longitudinal fin on fixed part (24)
- 30. - Box of lower rail (22)
- 25 31. - Shaft of second damper (23)
- 32. - Second longitudinal fin in moving part (25)
- 33. - Tenons of appendage (14)
- 34. - Transverse oblique faces of tenons (33)
- 35. - Oblique sides of hook (20)
- 30 36. - Extended top part of hook (20)
- 37. - Oblique lip in the prolongation of hook (20)
- 38. - Supplementary members
- 39. - Groove of supplementary members (38)
- 40. - "Omega" groove in supplementary members (38)
- 35 41. - Projecting part of supplementary members (38)
- 42. - Radial projection of the heads of screw (17)
- 43. - Strip of fixed part (24)
- 44. - Loop of strip (43)
- 45. - Cap
- 40 46. - First plate in cap (45)
- 47. - Screw
- 48. - Second plate
- 49. - Longitudinal flanges of box (30)
- 50. - Teeth in first plate (46)
- 45 51. - Threaded opening in second plate (48)
- 52. - Recess in second plate (48)
- 53. - Shoulder in fixed part (24)

DESCRIPTION OF A PREFERRED EMBODIMENT

50 **[0033]** With reference to the drawings and reference numbers listed above, the appended plates illustrate a preferred embodiment of the invention with reference to a rolling and locking assembly for sliding wardrobe doors which in those drawings take the physical form of a system (Figure 9) of two inner (1) and outer (2) sliding doors which have a general basic structure comprising a rolling assembly (3) fixed thereto with vertical means for adjustment with respect to its rail (4a, 4b), and comprising a locking assembly (6) which through a first fluid damper (19) has its shank (19a) coupled to a downwardly retractable horizontal tilting hook (20) which is horizontally guided in a body (18) and which in its retracted position is acted upon by the charged condition of a helical tension spring (21) which is also horizontal, this locking assembly (6) acting together with a member of rolling assembly (3) in such a way as to bring about locking at the end

of its travel, damping it and holding it awaiting an opening force.

[0034] As will be seen from the following description, the device proposed can be applied to one or other end of sliding doors (1, 2), and to each of these individually. Thus the detailed graphic description (Figure 1) specifically relates to any rolling assembly (3), in this case the one at the right-hand extremity (seen from outside the piece of furniture) of inner sliding door (1). Specifically the recommended device is such that said rolling assembly (3) comprises a support (7) which is attached to the inner face of sliding door (1, 2), a frame (8) bearing at least one wheel (10) which is mounted in the said support (7), and means for vertical adjustment through rotary action (9) which are placed between the said support (7) and frame (8), where said support (7) has an inverted "U"-shaped cross-section folded into right angles forming a front wall (7a) which is attached to the back of sliding door (1, 2), an upper wall (7b) and a rear wall (7c) which is provided with at least one vertical window (11), the said frame (8) supporting the wheels being open at the bottom opposite upper rail (4a, 4b) guiding the latter, and also open at the top, where the sides of this frame (8) which are transverse to sliding door (1, 2) extend in their upper part each forming bearings (12) which are not in contact with upper wall (7b) of support (7), are open at the top and cover an arc which is conveniently greater than 180°, this frame (8) forming at least one flat tenon (13) which extends vertically with a width which is slidably adjusted with respect to a corresponding said vertical window (11) and of a height which is conveniently less than that of that vertical window (11), and which frame (8) incorporates a lower rear appendage (14) which projects behind rear wall (7c) of support (7) and which acts in conjunction with said locking assembly (6), and the said vertical means of adjustment through rotary action comprise a shaft (15) whose diameter is adjusted in rotation with tightening towards the said bearings (12) and which can penetrate therein through a resilient snap fit, in connection with which bearings (12) of this shaft (15) has faceted spiral levers (16) of polygonal profile which form a succession of facets (16a) which act jointly with the upper wall (7b) of support (7) when the extremities of that shaft (15) each terminate in screw heads (17) projecting longitudinally beyond said support (7); in particular, in rear wall (7c) of support (7) with respect to the door there are two vertical windows (11) which act together with the corresponding said vertical flat tenons (13) located at the extremities of said frame (8); likewise, in relation to each bearing (12) of frame (8) there are two of said twin faceted spiral levers (16) located one on each side of the said bearings (12), although the invention may have only one central faceted lever.

[0035] Rolling assembly (3) is quick and easy to fit. Shaft (15) is pressure fitted into bearings (12) through resilient snap-fit locating faceted spiral levers (16) in such a way that one is on each side of its corresponding bearing (12), which has the effect of axially immobilising shaft (15); this same effect could be achieved by placing a faceted spiral lever (16) on each bearing (12) provided that both faceted spiral levers (16) are on the outer side of corresponding bearings (12), or the two are on the inner side thereof. Subsequently resilient separation of front (7a) and rear (7c) walls is brought about sufficiently for flat vertical tenons (13) of frame (8) to have their extremities enter corresponding vertical windows (11) in rear wall (7c); from this position it is sufficient to push on frame (8) for tenons (13) to be guided until they fully penetrate vertical windows (11), at which time the said forced resilient separation ceases and the front (7a) and rear (7c) walls recover their normal operating conditions.

[0036] Once this assembly has been completed, in order to effect vertical adjustment it is sufficient to act on any of the screw heads (17) on the extremities of shaft (15) with the result that facets (16a) of faceted spiral levers (16) provide successive supports for upper wall (7b) of support (7), bringing about relative movement thereof, and therefore of sliding door (1) with respect to frame (8) incorporating wheel (10) which runs along corresponding rail (4); this movement is made possible through the different lengths of flat tenons (13) and their corresponding vertical windows (11) in which they are housed, and the zero and maximum extreme positions of adjustment are those shown in Figures 1 and 11 respectively.

[0037] The position in which faceted spiral lever (16) is at its greatest height (maximum door height) coincides with the top of at least one flat tenon (13) at the lower edge (11 a) of at least one vertical window (11) as shown in Figure 8; and in its magnified detail this limit safely ensures that the lever cannot go beyond the maximum height rotation and can only go back from this position.

[0038] Figures 1 and 12 to 14 illustrate the structure and function of locking assembly (6) according to the invention, which provides that with respect to sliding door (1, 2) appendage (14) of frame (8) is longitudinally aligned with the place where the extremity of shaft (19a) of first fluid damper (19) is connected to retractable tilting horizontal hook (20). As sliding door (1) closes, oblique front face (34) of appendage (14) impacts (Figures 12 and 13) against corresponding oblique side (35) of hook (20) bringing about (Figure 14) tilting of the latter which through the resilient recovering action of helical tension spring (21) is displaced, travelling with shank (19a) of first damper (19) and bringing about damping and holding of the closure. If for any reason hook (20) was in the position in Figure 14 without sliding door (1) having reached its terminal locked position, it is possible to reset the mechanism of the closure assembly because when said sliding door (1) is lifted at the end of its path front oblique face (34) of appendage (14) impacts (Figure 15) on oblique lip (37) of hook (20) bringing about resilient descent of the latter which enables appendage (14) to penetrate (Figure 16) within that hook (20) and when sliding door (1) is next opened the assembly is reset recovering the position in Figures 12 and 13.

[0039] Another feature of the invention (Figures 17 to 20) is that with respect to lower rail (22) over which sliding door

(1, 2) travels, there is at each extremity at least a second fluid damper (23) of telescopic construction formed by a fixed or inner part (24), a moving or outer part (25) and a helical compression spring (26) placed between the two, fixed part (24) having a hole (27) for attachment to the floor (28) of the wardrobe and a first longitudinal "T"-shaped fin (29) which is slidably adjusted in a box (30) of the said lower rail (22), moving part (25) housing within it spring (26) which in turn surrounds shank (31) of said second damper (23), and this moving part (25) has a second longitudinal fin (32) which is slidably adjustable in said box (30) of lower rail (22). This mechanism compensates for any pitching tendency of sliding door (1) to impact at the top against locking assembly (6); this mechanism is reversible and has a firm and reliable mounting thanks to the slidably adjustable location of first (29) and second (32) longitudinal fins in corresponding box (30) of lower rail (22).

[0040] It could also be that the damping and locking system was at the top and the additional damping system was at the bottom. Another possibility is that the damping system could be one piece with the door or not within the profile.

[0041] In relation to the drawings and references numbered above, a preferred embodiment of the improvements intended through this Patent are illustrated in the appended plates. One of these improvements is illustrated in Figures 21 to 24. In Figure 21 it will be seen that in the parts of shaft (15) which project between support (7) of rolling assembly (3) and the screw heads (17) of its own shaft (15), there are attached supplementary members (38) which in their lower parts form a groove (39) which has a substantially greater depth than that of wheel (10) and which receives corresponding upper rail (4a, 4b) of door (1, 2) within it. The great depth of the grooves (39) of supplementary members (38) engaging the rails can be appreciated, this ensuring that rolling assembly (3) remains on upper rail (4a, 4b) even if door (1, 2) undergoes an upward displacement which in itself would be sufficient to cause wheel (10) to be derailed; it can also be appreciated that fitting supplementary members (38) brings about an increase in rigidity in the extreme projecting portions of shaft (15). In this Figure 21 it will also be seen that at their upper edge supplementary members (38) have a groove (40) of omega-shaped profile which can receive said shaft (15) within it through a resilient snap-fit mechanism. Figure 22 illustrates the function of the top of the operating travel of lever (16) which is exerted by projecting member (41) with respect to radial projection (42) and Figures 23 and 24 show the position with respect to lower rail (22) for the lowest position (on the left, in Figure 22) and the highest position (on the right, in Figure 22) of the range of adjustment brought about through lever (16).

[0042] Another improvement in this Patent is illustrated in Figures 25 to 28. It lies in the fact that in the second fluid damper (23) for sliding doors (1, 2), the first longitudinal fin (29) of the fixed part (24) has a portion comprising a band (43) which can flex resiliently between a relaxed condition in which it rises above first fin (29), extending as far as the top of the corresponding box (30) in lower rail (22), and a tensioned condition in which it lies alongside this first fin (29), a preferred embodiment being that in which the said band (43) has an inverted "V"-shape which forms at its top a loop (44) directed towards the inner part of the "V" which has a width which is equal to or slightly greater than the height of first fin (29) with respect to the said fixed part (24) of second fluid damper (23). Figure 25 shows band (43) in the relaxed condition corresponding to the situation when second damper (23) is not fitted in lower rail (22), as shown in Figure 26. Conversely Figures 27 and 28 show the condition in which second damper (23) is fitted in lower rail (22), when the resilient flexure experienced by band (43) can be seen and is translated into a pressure against lower rail (22), which in the course of trial and error searching for the appropriate position of the second damper (23) along lower rail (22) makes it possible to hold the chosen position while final support thereof by the tightening means is checked.

[0043] Other improvements to the invention relate specifically to the tightening means for second damper (23) in relation to lower rail (22), as illustrated in Figures 29 to 31. It comprises (Figures 29 and 30) the fact that a cap (45) which is slightly larger than the said hole (27) in fixed part (24) is slid downwards into said hole (27) and its upper part forms a first plate (46) resting on the upper opening of this hole (27), which hole (27) receives within it a through screw (47) which engages a second plate (48) which together with first plate (46) is capable of anchoring a pair of collateral flanges (49) which extend longitudinally in the box (30) of corresponding lower rail (22). This means that the body of second damper (23) is not involved in this support through its fixed part (24) but, as mentioned, support is provided between the said first (46) and second (48) plates; furthermore, as screw (47) tightens onto cap (45), it follows that the part of the body of second damper (23) in which hole (27) is provided has mobility with respect to cap (45), which is very convenient for rendering the damping action independent of the attachment.

[0044] In the Principal Patent to which this Patent refers, this support is provided in such a way that collateral flanges (49) are anchored between a bridle similar to the said second plate (48) and the body of second damper (23) itself, with the result that when firmly tightened onto the chosen position on lower rail (22), complete lateral immobilisation of second damper (23) is also brought about. In order to ensure a better said anchorage for flanges (49), on its side opposite the second plate (48) first plate (46) has collateral teeth (50) (Figures 30 and 31) which extend longitudinally. In order to assist assembly between said first plate (46) and second plate (48), said first plate (46) has a boss matching a recess (52) in second plate (48) around threaded opening (51) which engages said screw (47), as illustrated in Figure 30. To mark the correct position and prevent cap (45) from rotating during the operation of securing it to lower rail (22), the transverse edge of first plate (46) facing movable part (25) of second damper (23) abuts against (Figures 29 and 30) a shoulder (53) formed in fixed part (24) of the latter.

Claims

1. Rolling and locking device for sliding wardrobe doors, comprising for each extremity of each sliding door (1, 2) a rolling assembly (3) fixed thereto and having means for vertical adjustment with respect to its rail (4a, 4b) and comprising a locking assembly (6) which through a first fluid damper (19) whose shank (19a) is coupled to a downwardly retractable horizontal tilting hook (20) and is guided horizontally within a body (18), and which in its retracted position is stressed by the charged condition of a helical tension spring (21) which is also horizontal, this locking assembly (6) interacting with a member of rolling assembly (3) in such a way that it brings about locking at the end of its travel, damps it and holds it awaiting an opening force, **characterized in that** the said rolling assembly (3) comprises a support (7) which is anchored to the inside of the sliding door (1, 2), a frame (8) which bears at least one wheel (10) which is installed on the said support (7), and means for vertical adjustment through rotary action (9) which are located between the said support (7) and frame (8), in which the said support (7) has a cross-section of inverted "U"-shape folded into right angles forming a front wall (7a) which is attached to the back of the sliding door (1, 2), an upper wall (7b) and a lower wall (7c) which is provided with at least one vertical window (11), the said wheel-bearing frame (8) being open at the bottom opposite the upper rail (4a, 4b) guiding the same, and also being open at the top, where the sides of this frame (8) which are transverse to the sliding door (1, 2) extend at the top each forming bearings (12) which do not come into contact with the upper wall (7b) of the support (7), being open at the top and forming an arc which is conveniently greater than 180°, which frame (8) forms at least one flat tenon (13) extending vertically with a width which is slidably adjusted with respect to a corresponding said vertical window (11) and has a height which is conveniently less than that of the vertical window (11), and which frame (8) incorporates a rear lower appendage (14) which extends beyond the rear wall (7c) of the support (7) and which operates jointly with the said locking assembly (6), and the said means for vertical adjustment through rotary action comprise a shaft (15) whose diameter is adjusted in rotation with tightening onto the said bearings (12) and is capable of penetrating therein through a resilient snap fit, in connection with which bearings (12) this shaft (15) has faceted spiral levers (16) of polygonal profile which form a succession of facets (16a) operating in conjunction with the upper wall (7b) of the support (7), while the extremities of the shaft (15) each terminate in screw heads (17) which extend longitudinally from the said support (7).
2. Rolling and locking device for sliding wardrobe doors according to Claim 1, **characterized in that** the said appendage (14) has a longitudinal profile in the shape of a bridge with abutments (33) which have oblique transverse faces (34) which converge upon each other at their extremities.
3. Rolling and locking device for sliding wardrobe doors according to the preceding claims, **characterized in that** the rear wall (7c) of the support (7) has with respect to the door two vertical windows (11) which act together with corresponding said flat vertical tenons (13) located at the extremities of the said frame (8).
4. Rolling and locking device for sliding wardrobe doors according to the preceding claims, **characterized in that** in a preferred embodiment, in relation to each bearing (12) of the frame (8) there are two of the said spiral faceted levers (16) which are twins and are located one on each side of the said bearings (12), although the invention may also comprise only one central faceted lever.
5. Rolling and locking device for sliding wardrobe doors according to the preceding claims, **characterized in that** the position of greatest height of the faceted spiral lever (16) (maximum door height) coincides with the top of at least one flat tenon (13) and with the lower edge (11 a) of at least one vertical window (11).
6. Rolling and locking device for sliding wardrobe doors according to the preceding claims, **characterized in that** the said tilting hook (20) is formed of a resilient arm, has a recess having a longitudinal profile with oblique sides (35) converging together downwards which match the said oblique surfaces (34) of the appendage (14) and are capable of receiving them jointly in a loose fit, of which oblique sides (35) the one located close to the tip of the hook (20) is the shorter, and from its tip this hook (20) extends in the form of an inverse hook forming up to its tip and in this order top (36) which engages the said smaller oblique side (35) and an oblique descending lip (37), and the said tilting hook (20) is capable of operating between a tilted or retracted position and a non-tilted or engaging position such that in relation to the closing movement of the sliding door (1, 2) in the retracted position the oblique front face (34) of the appendage (14) is longitudinally in line with the oblique edge (35) which is the greater of the two and the closer to the coupling of the hook (20) with the shank (19a) of the first fluid damper (19), while **in that** engaged position the appendage (14) is received within the hook (20).
7. Rolling and locking device for sliding wardrobe doors according to the preceding claims, **characterized in that** in

relation to the movement of the sliding door (1, 2) the appendage (14) of the frame (8) is directly longitudinally in line with the extremity of the shank (19a) of the first fluid damper (19) which is coupled to the retractable tilting horizontal hook (20).

- 5 **8.** Rolling and locking device for sliding wardrobe doors according to the preceding claims, **characterized in that** with respect to the lower rail (22) over which the sliding door (1, 2) runs, there is at each extremity at least a second fluid damper (23) of telescopic construction formed of a fixed or inner part (24), a moving or outer part (25) and a helical compression spring (26) located between the two, the fixed part (24) having a whole (27) for attachment to the floor (28) of the wardrobe and a first longitudinal "T"-shaped fin (29) which is slidably adjustable in a box (30) of the said lower rail (22), the moving part (25) receives within it a spring (26) which in turn surrounds the shank (31) of the said second damper (23), and this moving part (25) has a second longitudinal fin (32) which has a sliding adjustment in the said box (30) of the lower rail (22).
- 10 **9.** Improvements to Patent of Invention No. P-200500433 for a "Rolling and locking device for sliding wardrobe doors", **characterized in that** the parts of the shaft (15) which project between the support (7) for the rolling assembly (3) and the screw heads (17) of its shaft (15) are each attached to supplementary members (38) which in their lower parts form a groove (39) which has a depth substantially greater than that of the wheel (10) and which as such receives within it the upper rail (4a, 4b) of the corresponding door (1, 2).
- 15 **10.** Improvements to Patent of Invention No. P-200500433 for a "Rolling and locking device for sliding wardrobe doors" according to the preceding claim, **characterized in that** in its upper edge the supplementary members (38) have a channel (40) having an omega-shaped profile which through a resilient snap-fit mechanism can receive the said shaft (15) within it.
- 20 **11.** Improvements to Patent of Invention No. P-200500433 for a "Rolling and locking device for sliding wardrobe doors", **characterized in that** at their ends opposite the support (7) the supplementary members (38) form a projection (41) where at two places coinciding with the extreme positions of the operating travel of the faceted spiral levers (16) of the shaft (15) this projection (41) interferes with the rotary travel of a radial projection (42) projecting beyond the periphery of the said screw heads (17) of the shaft (15).
- 25 **12.** Improvements to Patent of Invention No. P-200500433 for a "Rolling and locking device for sliding wardrobe doors", **characterized in that** in the second fluid damper (23) of the sliding doors (1, 2), the first longitudinal fin (29) of the fixed part (24) has a portion forming a band (43) which can flex resiliently between a relaxed condition in which it rises above the said first fin (29) extending as far as the top of the corresponding box (30) in the lower rail (22) and a tensioned condition in which it lies alongside the said first fin (29).
- 30 **13.** Improvements to Patent of Invention No. P-200500433 for a "Rolling and locking device for sliding wardrobe doors", **characterized in that** in its relaxed condition the said band (43) has an inverted "V"-shape which at its top forms a loop (44) facing the inner part of the "V" which has a width which is equal to or slightly greater than the height of the first fin (29) with respect to the said fixed part (24) of the second fluid damper (23).
- 35 **14.** Improvements to Patent of Invention No. P-200500433 for a "Rolling and locking device for sliding wardrobe doors", **characterized in that** in the said hole (27) in the fixed part (24) a cap (45) which is slightly longer than the hole (27) and which at its top forms a first plate (46) which is seated on the upper opening of this hole (27) is slid downwards into the said hole (27) of the fixed part (24), which hole (27) receives within it a through screw (47) which screws into a second plate (48) which together with the first plate (46) is capable of anchoring a pair of collateral flanges (49) which extend longitudinally in the box (30) of the corresponding lower rail (22).
- 40 **15.** Improvements to Patent of Invention No. P-200500433 for a "Rolling and locking device for sliding wardrobe doors", **characterized in that** on the side thereof opposite the second plate (48), the said first plate (46) has collateral teeth (50) which extend longitudinally.
- 45 **16.** Improvements to Patent of Invention No. P-200500433 for a "Rolling and locking device for sliding wardrobe doors", **characterized in that** on its upper face the said first plate (46) has a boss which is matched by a recess (52) which the second plate (48) has around the threaded opening (51) into which the said screw (47) screws.
- 50 **17.** Improvements to Patent of Invention No. P-200500433 for a "Rolling and locking device for sliding wardrobe doors", **characterized in that** the transverse edge of the first plate (46) which faces the moving part (25) of the second
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damper (23) abuts against a shoulder (53) formed in the fixed part (24) of the latter.

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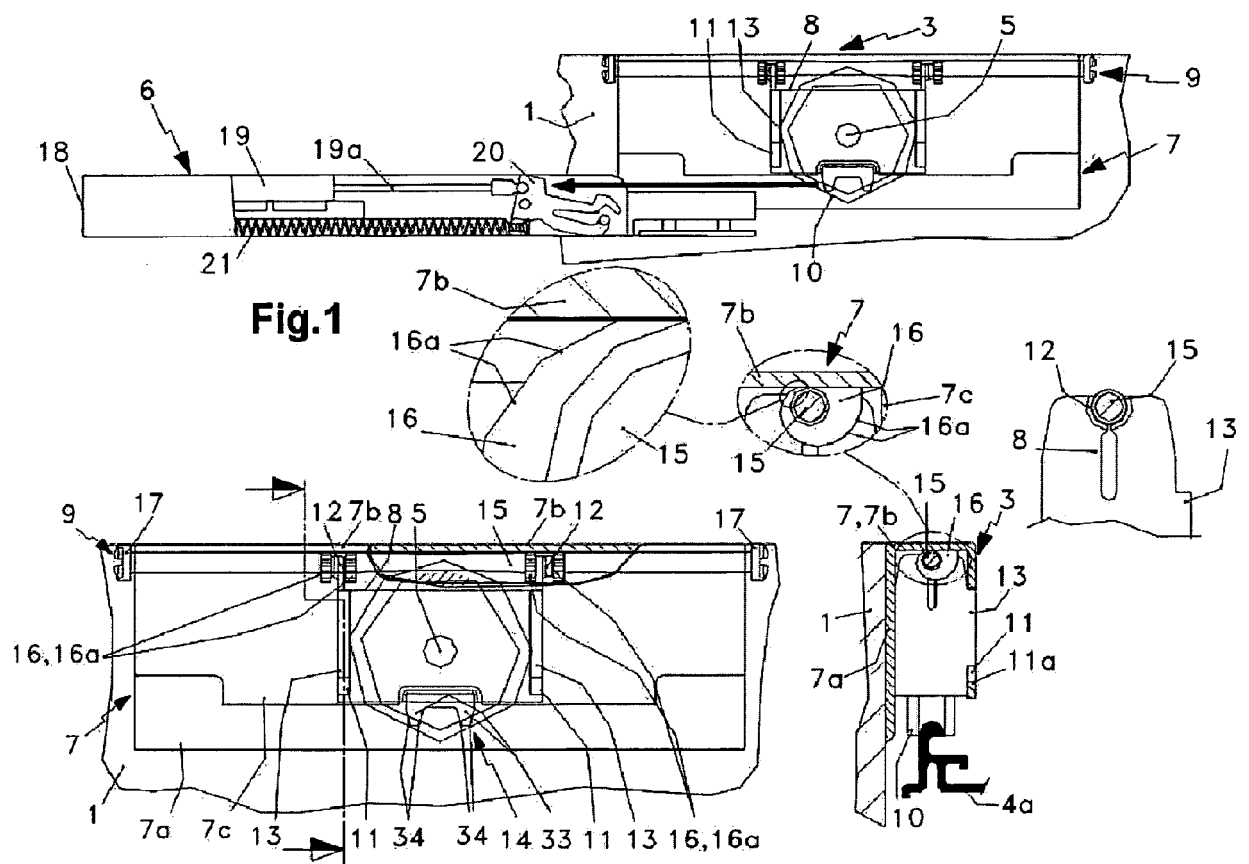
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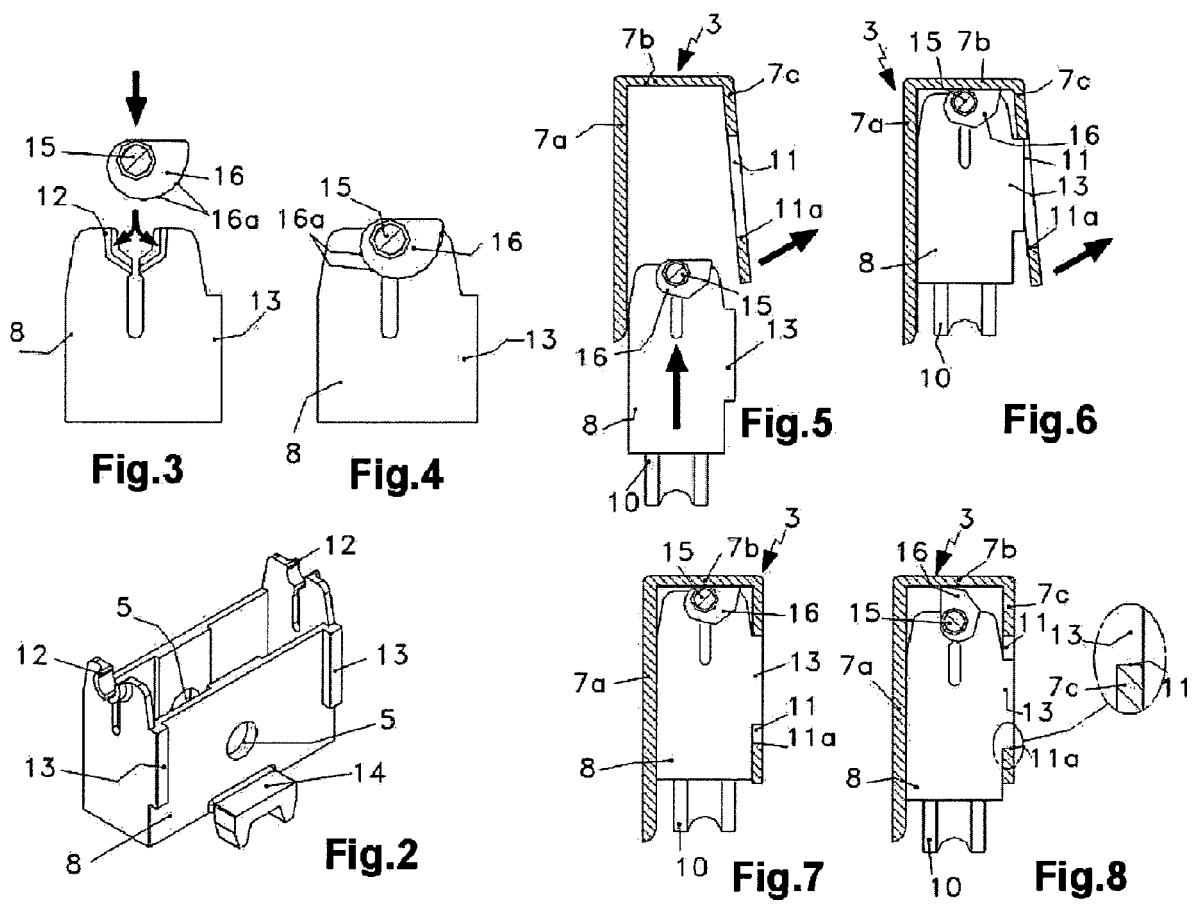
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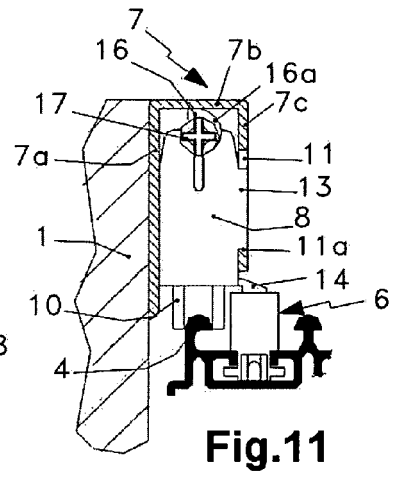
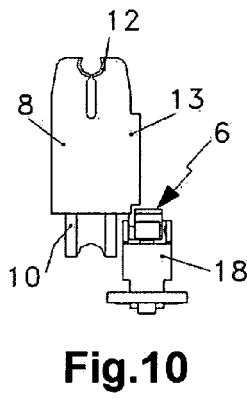
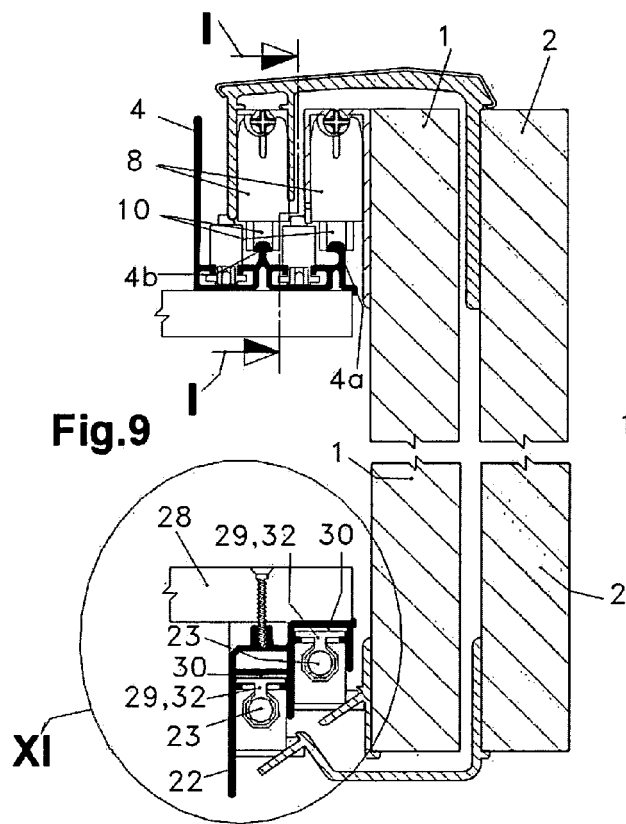
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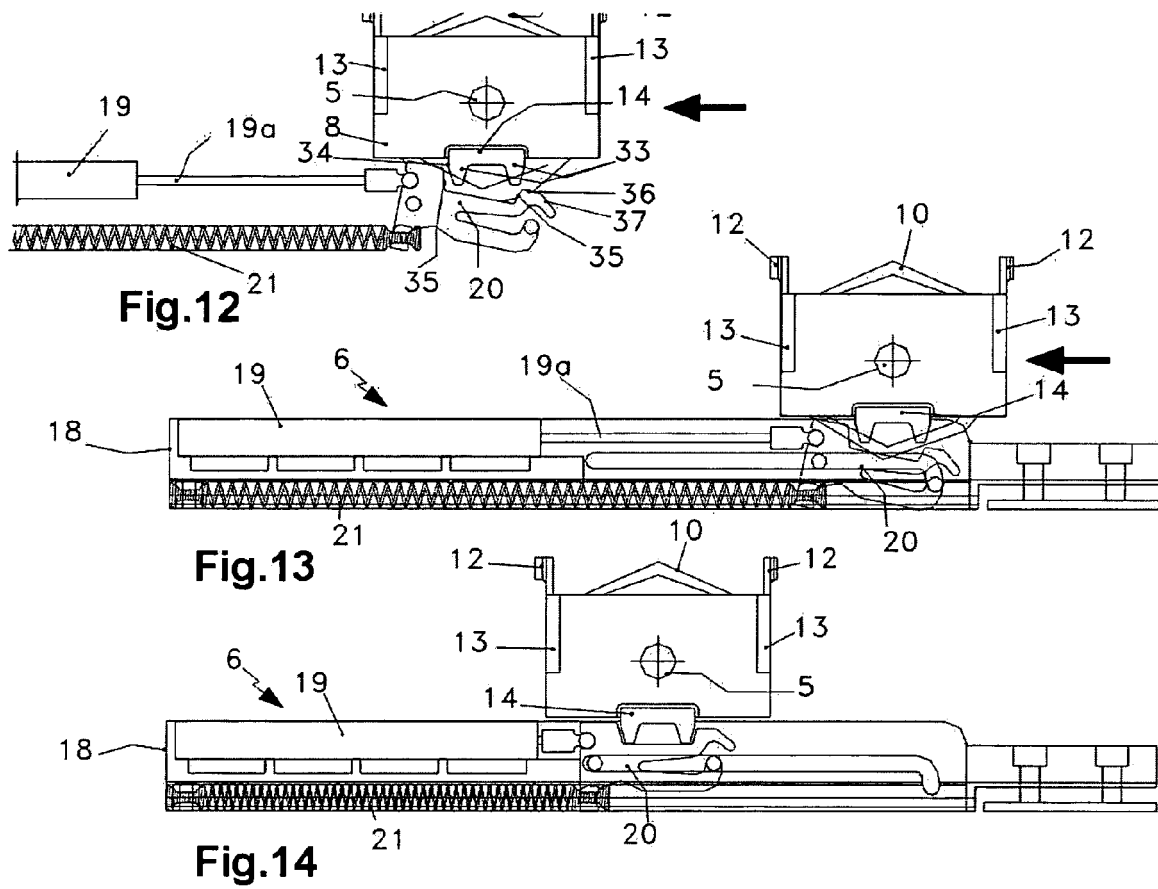
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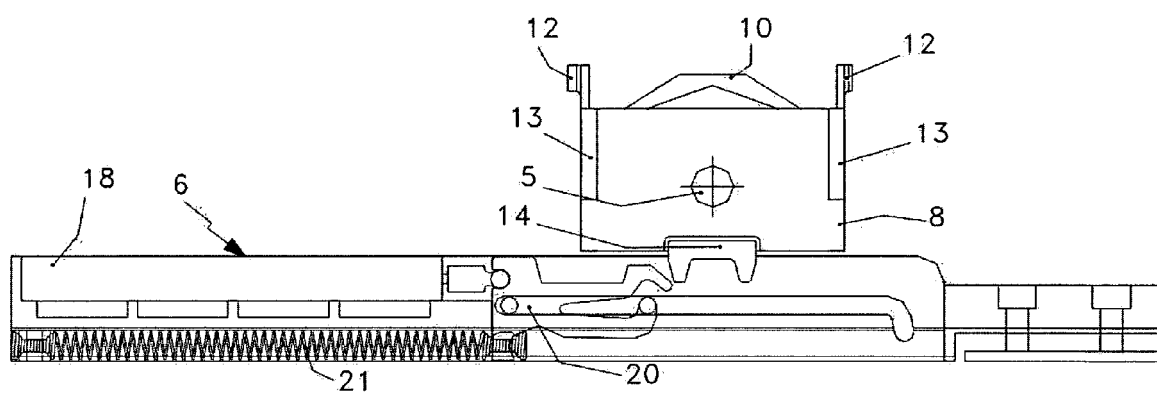


Fig.15

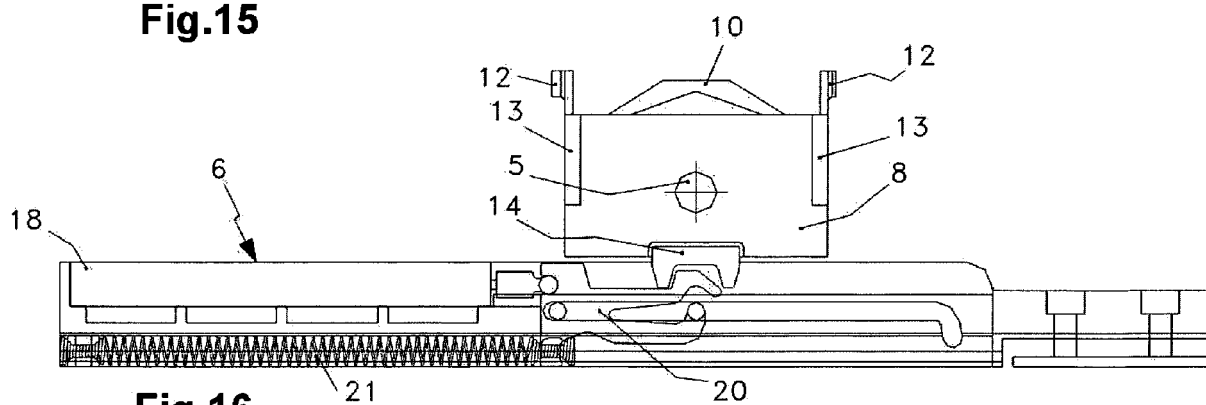
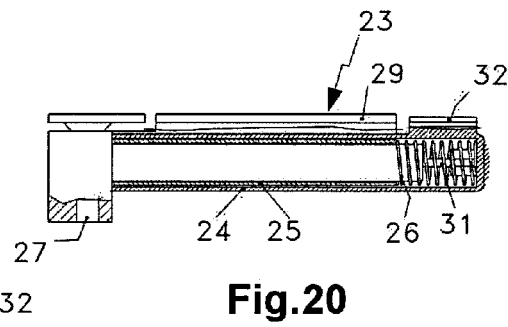
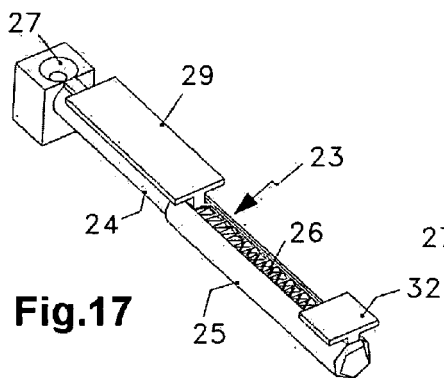
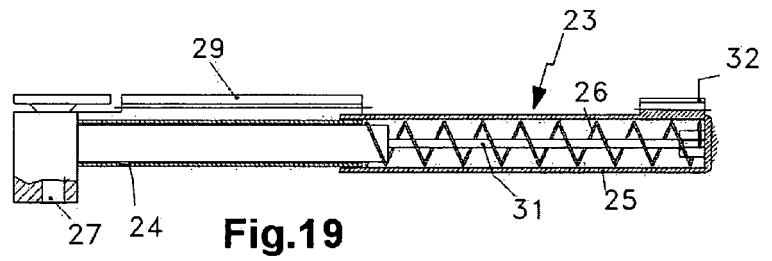
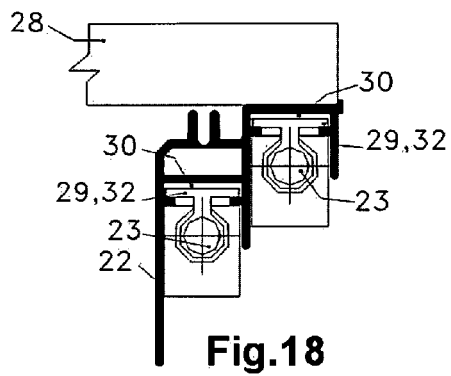
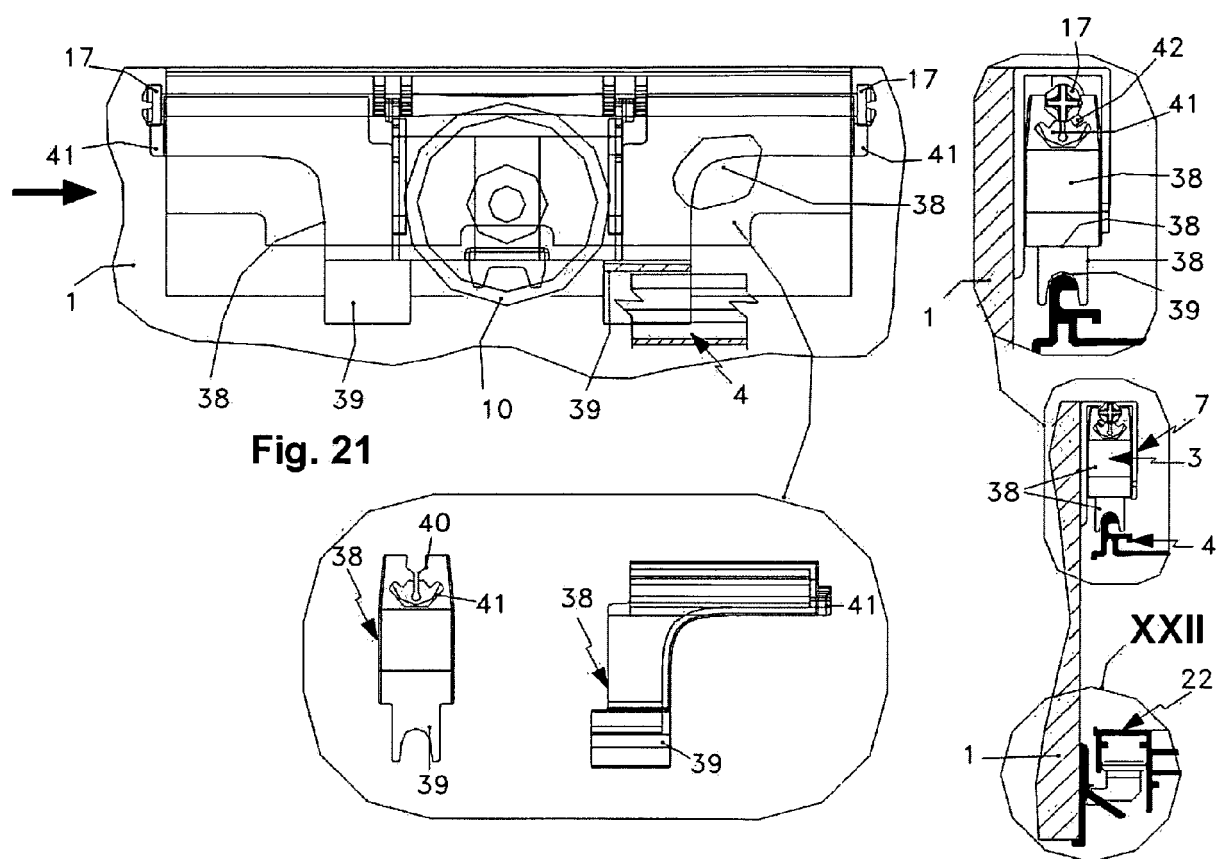


Fig.16





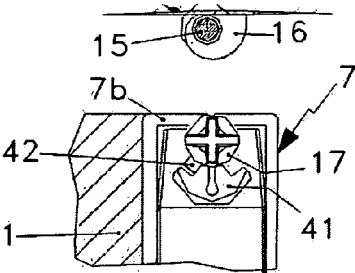


Fig.22

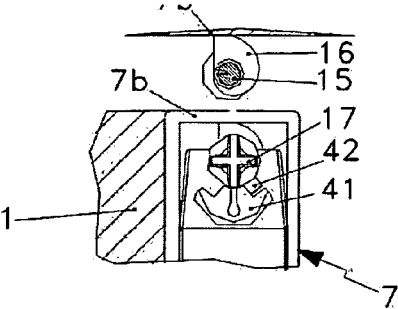


Fig.23

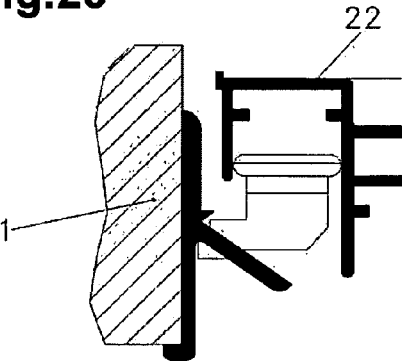
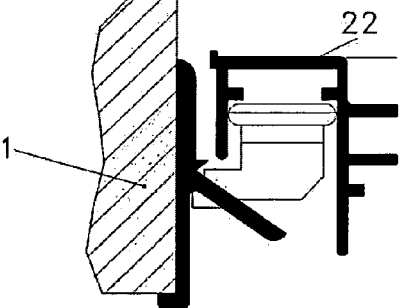


Fig.24



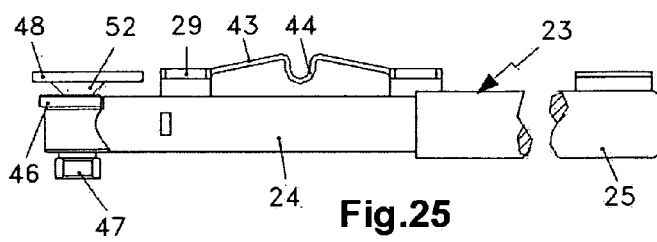


Fig.25

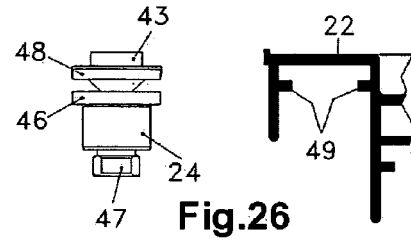


Fig.26

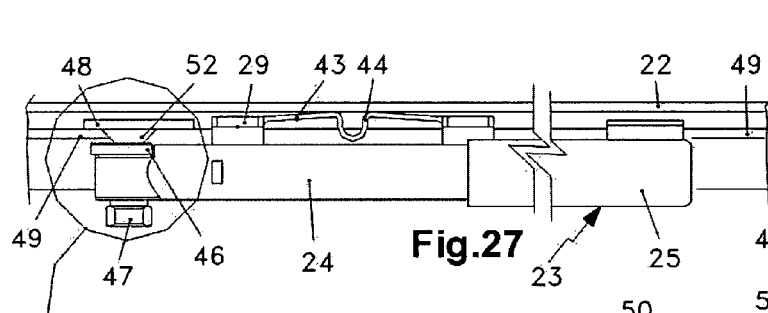


Fig.27

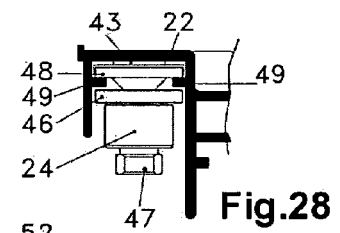


Fig.28

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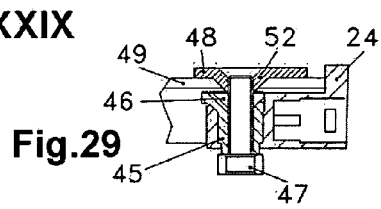


Fig.29

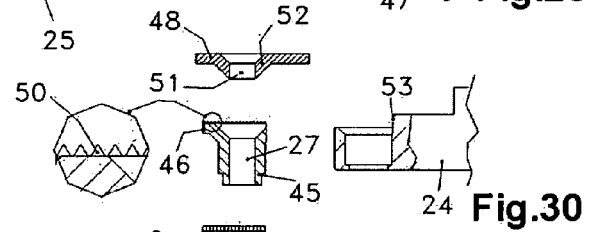


Fig.30

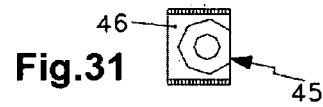


Fig.31



European Patent
Office

PARTIAL EUROPEAN SEARCH REPORT

Application Number

which under Rule 45 of the European Patent Convention EP 06 00 2945 shall be considered, for the purposes of subsequent proceedings, as the European search report

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2005/011041 A1 (NESS JOHN T) 20 January 2005 (2005-01-20) * paragraph [0002] * * paragraph [0040] - paragraph [0050]; claim 1; figures 5-9 * -----	1-8	INV. E05D15/00
A	EP 0 044 799 A (FERCO INTERNATIONAL USINE DE FERRURES DE BATIMENT SOCIETE A RESPONSABI) 27 January 1982 (1982-01-27) * the whole document *	1-8	
A	FR 2 441 041 A (NOVOBAT SARL) 6 June 1980 (1980-06-06) * the whole document * -----	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05D
INCOMPLETE SEARCH			
The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims. Claims searched completely : Claims searched incompletely : Claims not searched : Reason for the limitation of the search: see sheet C			
Place of search		Date of completion of the search	Examiner
Munich		22 June 2006	Balice, M
CATEGORY OF CITED DOCUMENTS		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	
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			

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EPO FORM 1503 03.02 (P04C07)



Claim(s) searched completely:
1-8

Claim(s) not searched:
9-17

Reason for the limitation of the search:

Claim 9 is drafted as an independent claim and in such a way that the claim as a whole is not in compliance with the provisions of clarity of Article 84 EPC. The expression "improvement to Patent of Invention No. P-200500433" does not allow the skilled person to establish exactly the subject-matter for which protection is sought: by simply referring to another patent application without giving any particular detail, the applicant has not specified which features will be part of the claimed invention. The non-compliance with the substantive provisions is to such an extent, that a meaningful search of the whole claimed subject-matter could not be carried out (Rule 45 EPC and Guidelines B-VIII, 3). The extent of the search was consequently limited.

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

EP 06 00 2945

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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22-06-2006

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