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(54) **Household washing machine with improved detergent drawer**

(57) Washing or washing-drying machine comprising top surface, a detergent drawer placed on the machine front upper wall, and provided with a front panel (4) with a top portion (5) partially extending on said top surface itself, means for the engagement and disengagement of said drawer into and from a related lodgement by a pushing on said front panel; said means comprise

a push-push arrangement, composed by two devices able of interacting each other, whose one device is mounted on said drawer, and the second device is firm with the machine main frame.
Said machine is provided with means able of automatically giving said front panel a lifting movement, and a contemporary lateral movement when it takes the end inner position of said push-push arrangement.

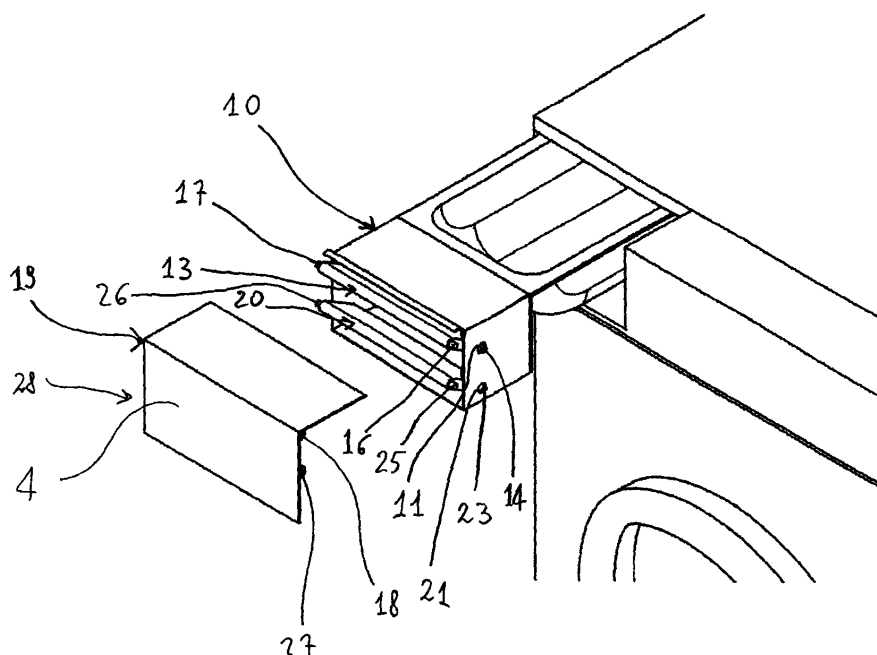


FIG. 18

Description

[0001] The present invention relates to an improved, preferably household washing machine, provided with a front drawer for the introduction and delivery of products for the washing, as detergents, softeners and so on.

[0002] Such drawer, which is widely known, and that in the following will be briefly called "detergent drawer", is realized and lodged in a way to be easily extractable and introduced in the machine with an horizontal movement.

[0003] Such drawer can be moved into and out of the machine without specific problems; however, in order to facilitate its control by the user, and also to make the front panel of it more aligned with the machine front wall, essentially for aesthetic reasons, sometimes the drawer is provided with a mechanism called "push-push", per se known, which offers the possibility of disengaging the drawer from the introduced position simply by a light front pushing.

[0004] Inversely in order to insert said drawer in its seat, it needs to be introduced by a very short over-run, usually of 1 to 3 mm., beyond its final position, in order to allow the mechanism itself of automatically resetting; after that an elastic means of the same mechanism takes ahead the drawer until the final position is reached.

[0005] However when the drawer is being introduced for said short over-run, it may happen an annoying drawback; in the facts, with ref. to **fig. 1**, it may happen that the machine top is composed of two separate flat elements, i. e. of a flat rear surface 1 and of a front frame 2, extending for the whole machine width.

[0006] Said two elements 1 and 2 are separated by a groove 3.

[0007] The drawer front panel 4 is, for aesthetic reasons, provided with a top portion 5 which is flat, horizontal, extending back at the level of said machine top, and interrupting a front part of said frame 2 until said groove 3, as clearly shown in figure 1.

[0008] With such embodiment it comes difficult, and sometimes even impossible, to provide the drawer with the cited push-push mechanism, as when the drawer is introduced and in resting condition, as shown in the figure, the rear rim 6 of said frame 2 does not interfere with the front rim 7 of said flat rear surface 1; however during the short over-run required by said push-push mechanism, it obviously happens that said rims 6 and 7 approach to each other across said groove 3, until they come into collision, as schematically shown in fig. 2.

[0009] It would therefore be desirable, and is actually a main purpose of the present invention, to provide a clothes washing machine provided with a top surface, with a detergent drawer, and an associated push-push mechanism, placed on the machine upper front wall, said drawer being provided with a front panel with a top portion extending at least partially and horizontally towards the machine flat rear surface, and with a groove horizontally extending between said flat rear surface and said top

portion of the front panel of said drawer, that will eliminate, or at least reduce the drawback of the collision between said flat rear surface and said top portion of the detergent drawer during the over-run of the push-push mechanism.

[0010] According to the present invention, this and further aims are reached in a washing machine incorporating the characteristics as recited in the appended claims and including such operating means as described below by mere way of non-limiting example with reference to the accompanying drawings, in which:

- Fig. 1 is a perspective view of a front wall of a washing machine with a detergent drawer and related front panel according to the prior art,
- Fig. 2 is a perspective view on the top surface of a machine, showing the explained drawback,
- Fig. 3 is a symbolical view of a vertical transversal section of the machine in fig. 2 according to the invention, and with the drawer fully inserted,
- Fig. 4 shows a perspective, transparent and partially exploded views of a detergent drawer according to the invention,
- Fig. 4A shows an exploded view of fig. 4,
- Fig. 5 and 5A do show two plan views of two respective components of a detergent drawer according to the invention,
- Fig. 6 shows a plan vertical and side section of the drawer according to the invention,
- Fig. 7 shows some specific features of fig. 6,
- Fig. 8 show a perspective side and outer view of a side wall of a washing machine provided with a detergent drawer and related front panel according to the prior art,
- Fig. 9 shows a plan top and transparent view of an improved embodiment of a detergent drawer according to the invention,
- Fig. 10 shows a perspective view of the embodiment in fig. 9, with the drawer in its resting position,
- Fig. 11 show the view of fig. 10, but the drawer pressed in the end position of the push-push run,
- Fig. 12 and 13 show two top views of the machine according to an improved embodiment of the invention, respectively with the drawer inserted in the resting position, and fully pressed in the end position of the push-push run,
- Figures 14 and 15 do show the machine in the conditions respectively of figures 12 and 13, but represented in the side vertical views.
- Figures 16 and 17 do show a symbolic and top representation of a different embodiment of a drawer according to the invention.
- Fig. 18 shows a view in schematic perspective of a washing machine detail referring to a detergent drawer and related front panel according to the invention.

[0011] With ref. to figures 1 and 3, a front-loader wash-

ing machine according to the prior art comprises:

- a top wall, consisting of a flat rear surface 1 and a front frame 2,
- a detergent drawer placed on the front and top wall of the machine, and provided with a vertical front panel 4 with a top portion 5 at least partially extending on the machine top wall,
- a push-push mechanism, which is known per se and not shown, which allows the engaging and disengaging of said drawer within the related seat inside the machine.

[0012] According to the invention, the machine and specifically the detergent drawer is provided with means and devices which allow to avoid the described drawback, through a simple lifting of the drawer front panel 4, that is a raising movement of said front panel when it is being fully inserted for the whole over-run of the push-push.

[0013] When said panel is lifted, its top portion 5 is obviously lifted too, and as a final consequence, due to such lifting its rear rim 6 is being made to overcome and slip over the front rim 7 of the flat rear surface 1, so avoiding the collision (Fig. 3).

[0014] The invention may be implemented according to the following profitable embodiment: with ref. to the **figures 4, and 4A** said detergent drawer comprises a front structure 10 placed just behind said front panel 4, into said structure being arranged:

- two cylindrical lodgings 11 and 12, aligned on a same first horizontal axis X1, transverse to the direction of drawer insertion, and placed at a distance around similar to the drawer width,
- a first rotation element 13 (fig. 5), flat and rectangular, but it can also show a trapezoidal shape, wherein two contiguous angles are provided with two respective coaxial pivots 14 and 15, aligned on said first axis X1, and sized and shaped at such a distance to be able to be inserted into respective said cylindrical lodgings; in practice said first rotation element 13 may so rotate with respect to said front structure 10, around said two pivots 14 and 15 in the respective lodgings 11 and 12.

[0015] Said first rotation element 13 is also provided with a second pair of pivots 16, 17 which are coaxial, the relevant axis X2 being parallel to said first axis X1, and the inner wall of said front panel 4 is correspondently provided with respective cylindrical lodgings 18, 19 which are coaxial, placed and sized so to be able of lodging respective said pivots 16, 17.

[0016] Said first rotation element is moreover sized and arranged with such an inclination that its contiguous but non aligned pivots 14 and 16 are so placed that the pivot 16 is arranged in a higher and fore position with respect to the respective pivot 14, as schematically

shown in fig. 6; the same is realized also for the pivot 15 with respect to the corresponding contiguous and not coaxial pivot 17.

[0017] During the push-push over-run, when the front panel 4 is being pressed from the resting position, the drawer is then inserted in its normal operating position, the structure 10 is stopped and therefore the pressure on said panel 4 is being transferred, across the lodgings 18 and 19, on said respective pivots 16 e 17 of said first rotation element 13; the force acting on said pivots 16 and 17 is composed by two components, a radial force F1, and a tangential force F2 (**see Fig. 7**), the latter making the pivots 16 and 17 to rotate around the respective rotation centres constituted by said pivots 14 and 15 on said axis X1, properly engaged into the respective lodgings 11 and 12 of the structure 10.

[0018] Therefore said rotation is turned into a lifting movement, further over a backwards movement, of the pivots 16 and 17, said lifting movement being so transferred, across the lodgings 18 and 19, to the front panel 4, and particularly to the top portion 5, making it to raise, as schematically shown in fig. 3.

[0019] So the requested panel lifting action is achieved, which is done in the same time of drawer insertion during the push-push over-run.

[0020] It is supposed here useful to remind that the panel 4 is connected not firmly to the structure 10, but only through the pivots 16 and 17 and related lodgings, and therefore it is basically movable with respect to the panel 4 itself.

[0021] Obviously the push-push mechanism, not shown as well known in the art, will be implemented by a first device firm with the front panel 4, and by a second corresponding device connected to the machine main frame, in such a way that the mechanism itself can act only on the front panel 4 and not on the detergent drawer itself.

[0022] The just described solution offers some profitable improvements: in the facts it comes that the front panel results pivoted to the coaxial pivots 16 and 17 through the respective lodgings 18 and 19; all that apparently causes an uncertainty in the inclination/orientation of the front panel itself, which is be unacceptable.

[0023] In order to avoid such a problem an improvement is made, consisting in carrying out a second rotation element 20 (Figures 4 to 6), fully identical to the first one 13, and mounted on said structure 10 and connected to said front panel 4 with the same criterion.

[0024] Therefore, with ref. to said figures, the following items are defined:

- into said structure 10, two further cylindrical lodgings 21, 22 placed on a common third axis (X3), and placed at a definite distance, preferably similar to the drawer width, said third axis, (X3) being basically horizontal and transversely oriented with respect to the insertion direction of said drawer,
- in said second rotation element 20, rotating around

said structure 10, and comprising four corners, a third couple of pivots 23, 24 are placed on two respective corners, said pivots 22, 24 being able to be inserted in respective said further cylindrical lodgings 21, 22, said second rotation 20 element being able to rotate through said two respective pivots 23, 24 with respect to said structure.

Said second rotation element is provided with a fourth couple of pivots 25, 26 which are coaxial, with a relevant fourth axis X4 parallel to said third axis X3, able of engaging with respective cylindrical lodgings 27, 28 placed on the inner side of said front panel 4.

[0025] Said second rotation element 20 is moreover shaped and oriented with an inclination such that the two contiguous and not aligned pivots 23 and 25, (belonging to respective and different couples of pivots), are placed in such a way that the pivots 25, 26 are arranged in a higher and fore position with respect to the respective contiguous pivots 23, 24 of said third couple of pivots (fig. 4, 4A, 6 and 7).

[0026] Furthermore said third axis X3 and fourth axis X4, which are parallel, are also parallel to said two axis X1 and X2.

[0027] It comes also profitable (fig. 7) that the distance S, between said first and second axis X1 and X2, be made equal to the distance given to the lodgings between the third and the fourth axis X3 and X4.

[0028] Moreover the distance R between the first and the third axis X1 and X3 is made equal to the distance between the axis X2 of the lodgings 16, 17, and the axis X4 of the lodgings 21, 22.

[0029] This allows to place these axis in such a way that, in an orthogonal section as shown in fig. 7, the sections of said axis are being exactly placed in the corners of a parallelogram; it allows that during the final push-push insertion run, the said front panel may only be moved backwards and upwards, but remaining always parallel to itself.

[0030] The proposed solution fully solves the initial problem; however it was observed that a further problem may be generated, i. e. the side rim 30 of the front panel 4, even if lifted, in its final run may collide with the rim 31 which is the prolongation, on the machine side wall, of the fore rim 7 of the flat rear surface 1, as shown in fig. 8.

[0031] In order to overcome such problem, and with ref. to the figures 9 and 10, on said structure 10 an inclined edge 32 is formed, and on at least on one of said rotation elements 13 a corresponding contact surface 33 is formed too, which is able of being touched by said inclined edge, so that it can be pushed by a force acting towards the side wall of the machine, caused by the reciprocal interaction between said elements 32 and 33 when said rotation element 13 is pushed backwards during the final push-push run.

[0032] In order to assure such effect of side movement of the front panel, together with the upwards movement,

such inclined edge 32 shows an inclination with a not null angle α with respect to a vertical plane P1 orthogonal to the machine front wall; in such a way the contact surface 33 of the rotation element 13 acts as a tappet, and slides on said inclined edge 32, here working as a cam.

[0033] The final effect is that, during the rotation of the rotation element 13, when pushing the front panel, schematically represented by the figures 10 and 11 in the initial and final orientations, said element 13 is urged to move towards the direction of said inclined edge 32, and therefore, in the embodiment of figures 12 and 13, and also represented in the figures 14 and 15, towards the choose side wall, with the result of also departing and separating said side rim 30 of the front panel 4 from said rim 31, as desired to avoid the side collision.

[0034] To sum up, the movement of said element is oriented both upwards and sideward.

[0035] Obviously the solution, just referred to one of said rotation element, identified as 13, is identically extendable and applicable also to the second rotation element 20 and to a corresponding edge of the structure 10, in a fully similar way.

[0036] The purpose of such extension is to allow also the side movement of the front panel 4, through a simple movement of translation, and without any modification of the orientation of the front panel itself.

[0037] The just described solutions to move the front panel with an upwards and sideward movement in the over-run step of the push-push may be achieved also with the following embodiment, which very shortly is based on the following features: the front panel 4 upwards and sideward movement is now implemented by a solution based on the fact that the push-push over-run alone may create in a contemporary way both the movements.

[0038] Reference is here made to the figures 16 and 17, which show transparent top views of the structure 10 and of the rotating elements 13, 20 and of front panel 4 according to an improved embodiment.

[0039] It was observed that, in order of achieving the result of moving the control panel both upwards and sideward together with its pushing in the end position of the push-push run, it is sufficient to provide the structure 10 with lodgings and pivots in a fully similar way as described, and the same for the front panel 4, however with a main difference: in the facts the axis X1, X2, X3 and X4 of figure 1 to 7 even if remaining parallel and on the horizontal plane, are not more oriented parallel also to the machine front wall, but they are slightly inclined respect to it with a proper angle β , as shown in said figures 16 and 17, showing two schematic top views of the structure 10 and of the rotation element 13, respectively with the drawer closed and at a rest, and with the drawer in the extreme push-push run, that is with the panel 4 slightly shifted towards the extreme side wall of the machine.

[0040] Therefore the front panel 4 rotation, which basically rotates being driven by the axis X1 and X2, takes also a sideward component, further to the upward component as just described.

[0041] And so the desired result of a combined movement upwards and sideward of the front panel 4 in the push-push over-run is achieved.

[0042] For sake of brevity and clarity a whole repetition of the features just explained is avoided, being understood that the sole difference resides in the fact that in the present embodiment the axis Xa1, Xa2, corresponding to the axis X1 and X2 in the embodiment previously explained, are horizontal but slightly inclined, just for the angle β , with respect to the machine front wall.

[0043] For simplicity it is here omitted the fully equivalent description in the case, already previously explained, that two distinct but equal rotation elements, in order to realize a parallelogram, are provided.

[0044] In Fig 18 is shown a washing machine detail referring to a detergent drawer and related front panel, according to a preferred embodiment of the invention as previously described.

[0045] At this point the man skilled in the art will have surely already guessed that the invention configuration is such that the lifting, and possibly the side movement of the detergent drawer begins from the position wherein the drawer is closed and at a rest; in the fact in this condition the drawer position results to be perfectly aligned with the remaining contiguous machine surfaces, i. e. the top and the front wall.

[0046] Only during the push-push over-run said front panel 4 has to be handled and reoriented as described, and therefore the described devices are realized, sized, and reciprocally arranged mounted in a way that the described upwards and sideward movement of the front panel 4 can be achieved in the same time and fully automatically, and begins and stops during the push-push over-run step, and in said step only.

Claims

1. Front loader washing or washing-drying machine comprising:

- a top surface,
- a detergent drawer placed on the machine front upper wall, and provided with a front panel (4) with a top portion (5) at least partially extending on said top surface itself,
- means for the engagement and dis-engagement of said drawer into and from a related lodgement by a pushing on said front panel, said means comprising a push-push arrangement, composed by two devices able of interact each other, whose one device is mounted on said drawer, and the second device is firm with the machine main frame, **characterized in that** it is provided with means able of automatically giving said front panel a lifting movement, when it takes the extreme inner position of said push-push arrangement.

2. Washing machine according to claim 1, **characterized in that** said detergent drawer comprises a structure (10) which includes:

- two cylindrical lodgings (11, 12) placed on a common first axis (X1) and placed at a pre-defined distance, preferably similar to the drawer width, said first axis being substantially horizontal,
- a first rotating element (13) comprising four corners, having two coaxial pivots (14, 15) arranged on two respective contiguous corners, said pivots being able to be engaged with two respective cylindrical lodgings (11, 12), said first rotation element being able of rotating with said two coaxial pivots with respect to said structure,
- said first rotation element being provided with two coaxial pivots (16, 17), whose common axis (X2) is parallel to said first axis (X1), able to be engaged with respective cylindrical lodgings (18, 19) placed on the inner side of said front panel (4),
- said first rotation element being shaped and oriented with an inclination such as two contiguous, corresponding and not aligned pivots (14, 16), are placed in a way that the pivot (16) on said second axis (X2) is placed in higher and fore position with respect to the contiguous pivots (14) on said first axis (X1).

3. Machine according to claim 2, **characterized in that** said first and second axis (X1, X2) are oriented in a way essentially parallel to plane of the machine front wall.

4. Machine according to any of the claims 3, **characterized in that** said detergent drawer comprises:

- two further cylindrical lodgings (21, 22) placed on a common third axis (X3) and placed at a pre-defined distance, preferably similar to the drawer width, said third axis being substantially horizontal and oriented transversal to the insertion direction of said drawer,
- a second rotating element (20) comprising four corners, having two coaxial pivots (23, 24) arranged on two respective contiguous corners, said pivots being able to be engaged with two respective cylindrical lodgings (21, 22), said second rotation element being able of rotating with said two coaxial pivots with respect to said structure,
- said second rotating element being provided with two coaxial pivots (25, 26), whose common axis (X4) is parallel to said third axis (X3), able to be engaged with respective cylindrical lodgings (27, 28) placed on the inner side of said front panel (4),

- said second rotation element being shaped and oriented with an inclination such as two contiguous, corresponding and not aligned pivots (23, 25), are placed in a way that the pivot (25) on said fourth axis (X4) is placed in higher and fore position with respect to the contiguous pivots (23) on said third axis (X3). 5

5. Machine according to one of the preceding claims, **characterized in that** said means for the front panel (4) lifting are able to give the panel itself a contemporary sideward movement when it is pushed in the end position of the push-push run. 10

6. Machine according to claim 6, **characterized in that** said structure (10) comprises an edge (32) which is inclined outwards by a not null angle (a) with respect to a vertical plane (P1) orthogonal to the machine front wall, and that at least one of said one of said rotating elements (13) is provided with respective contact surface (33) able of touching and sliding on said inclined edge (32) so as to be urged towards a side movement caused by the inter-action between said inclined edge (32) and said contact surface (33). 15 20 25

7. Machine according to claims 5 or 6, **characterized in that** said first and second axis (X1, X2) are substantially oriented on an inclined way (b) with respect to the machine front wall. 30

8. Machine according to any of the preceding claims, **characterized in that** said first and second rotating elements (13, 20) are basically identical, and that the four pivots (14, 16, 23, 25) which are placed on a same side of said drawer, and the four corresponding pivots (15, 17, 24, 26) placed on the opposite drawer side do define a parallelogram. 35

9. Machine according to any of the preceding claims, **characterized in that** said push-push arrangement is positioned and assembled in such a way that said upwards and sideward movements of said front panel (4) are implemented during the over-run step only of said push-push arrangement. 40 45

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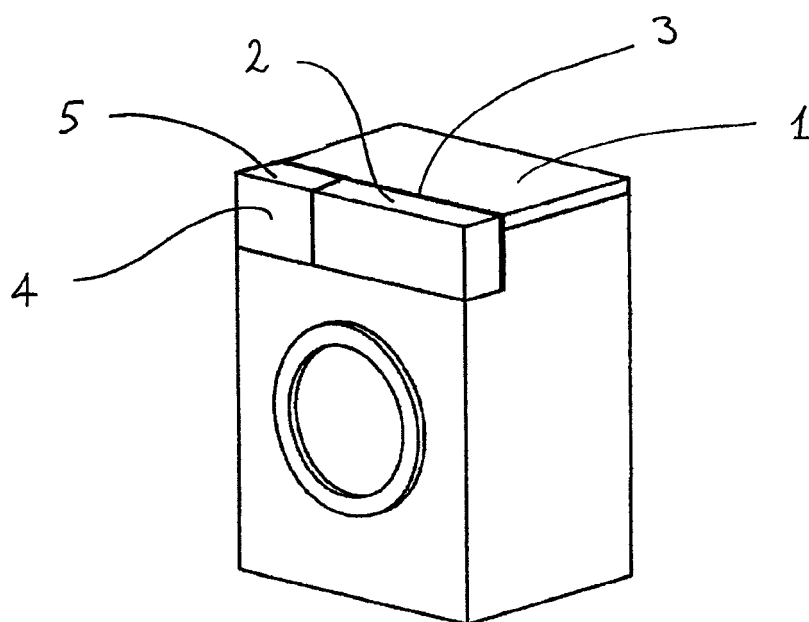


FIG. 1

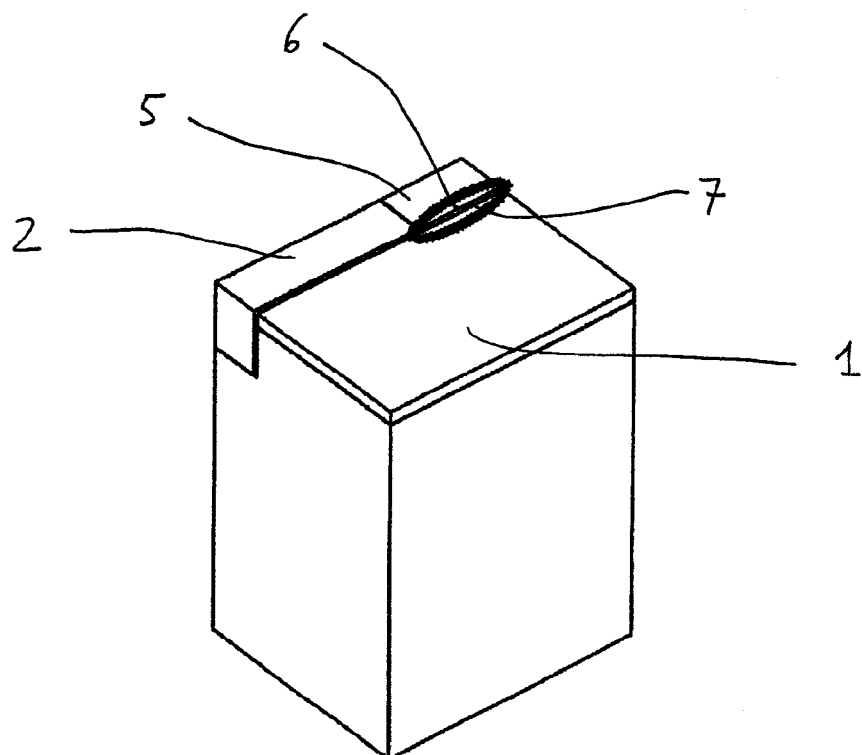


FIG. 2

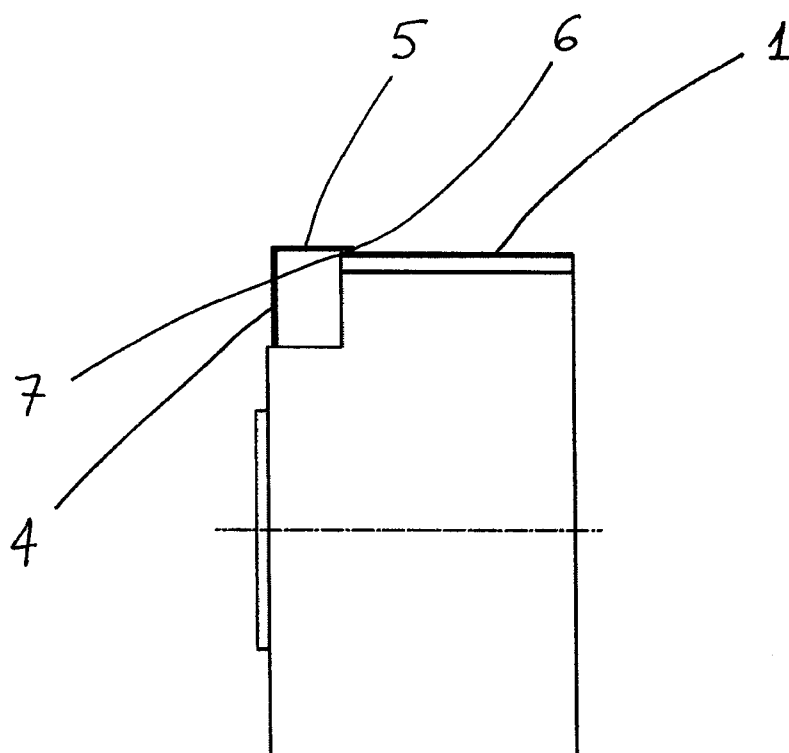


FIG. 3

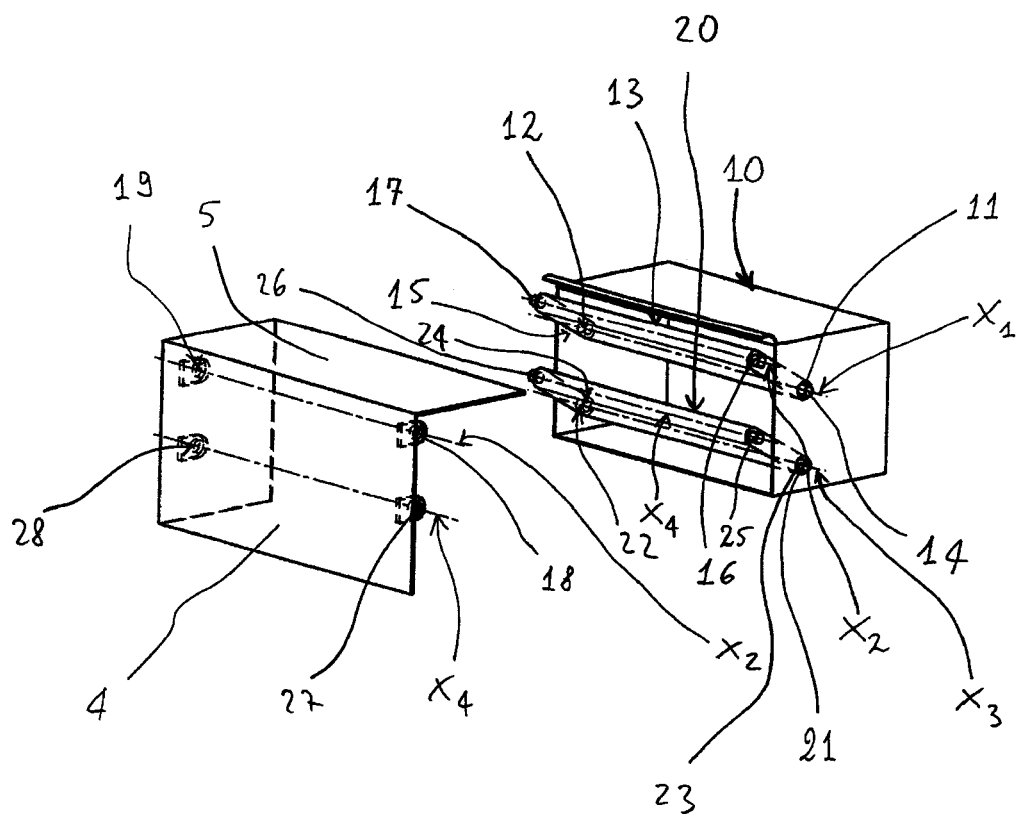


FIG. 4

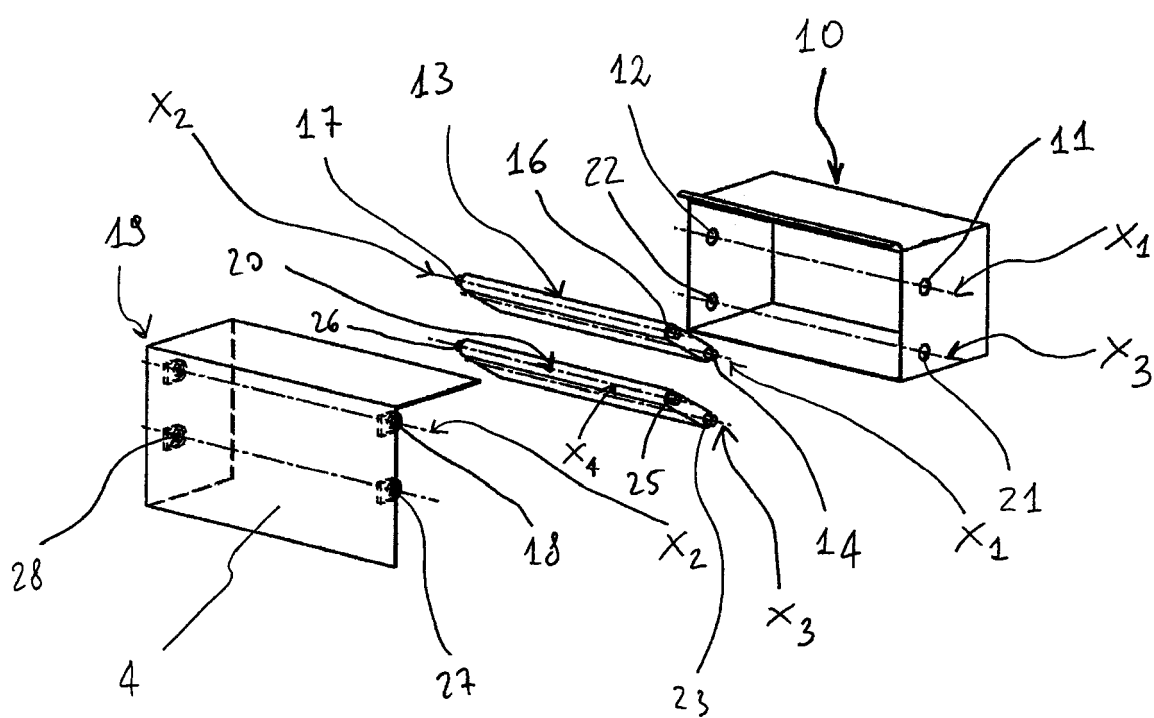


FIG. 4A

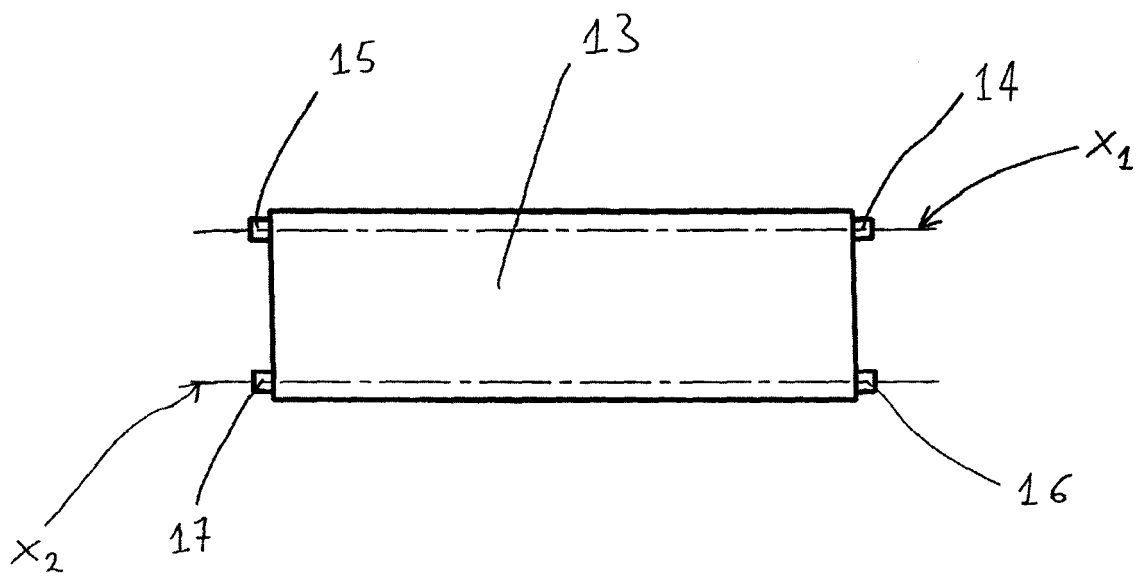


FIG. 5

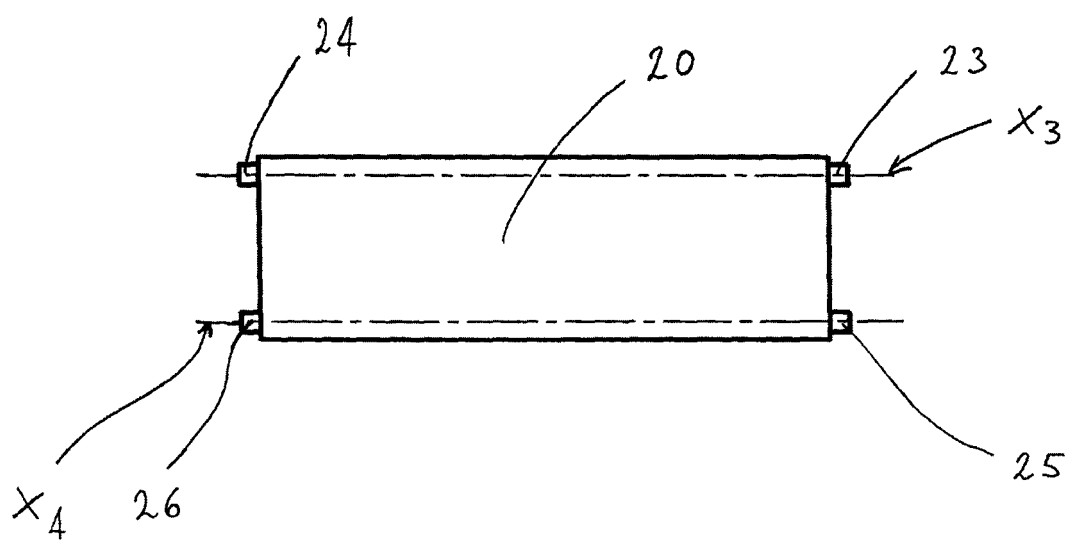


FIG. 5A

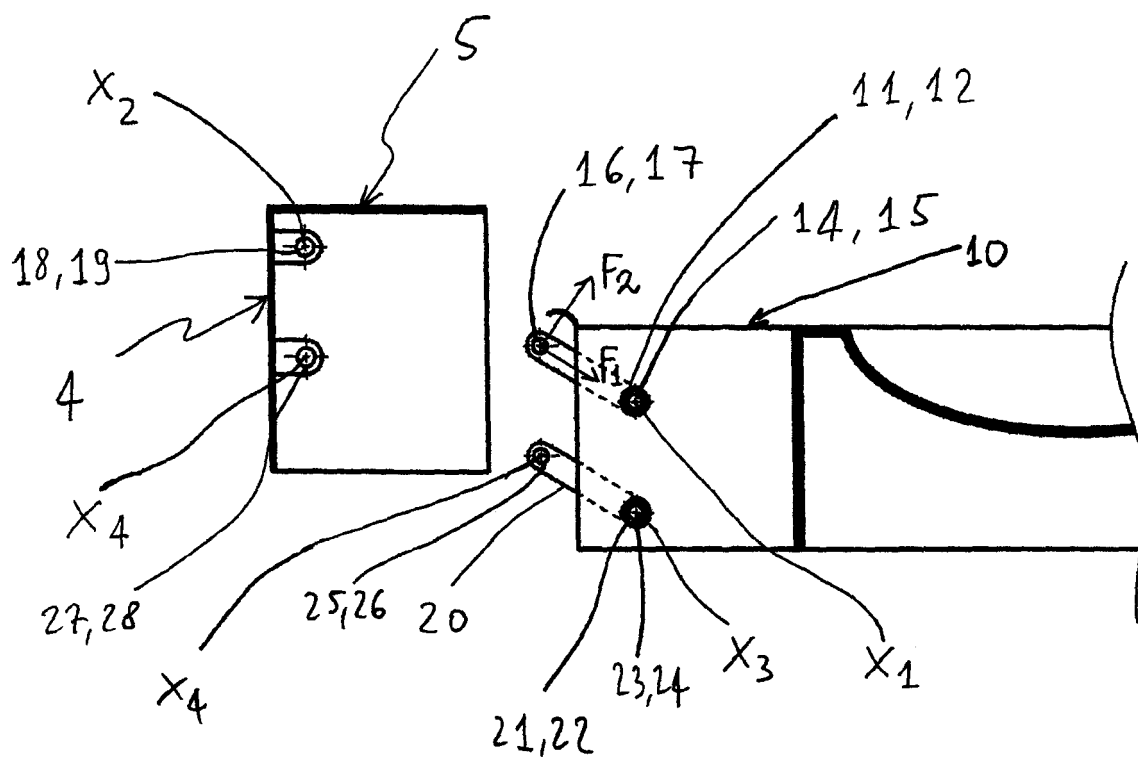


FIG. 6

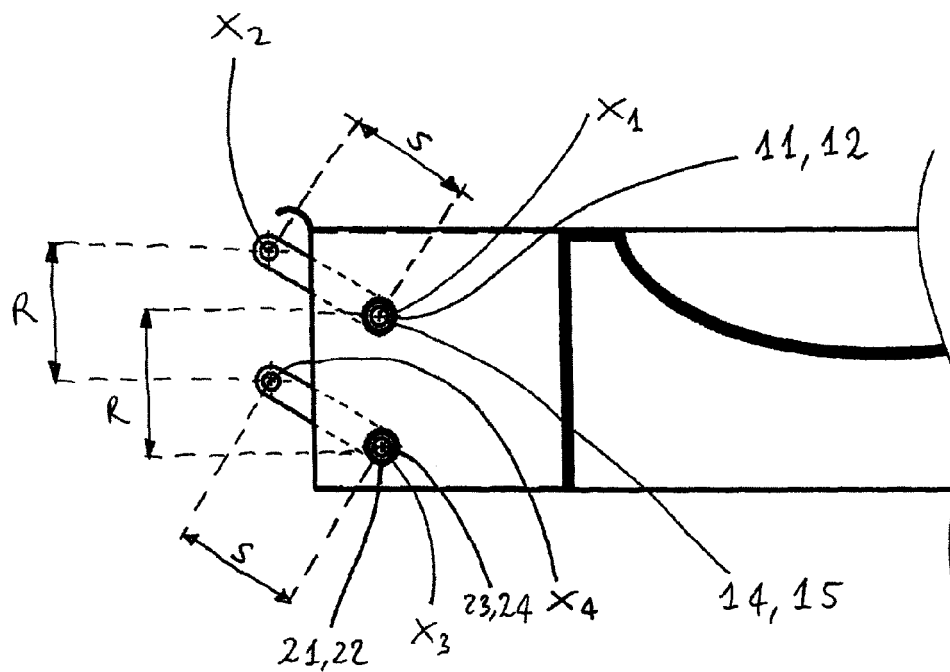


FIG. 7

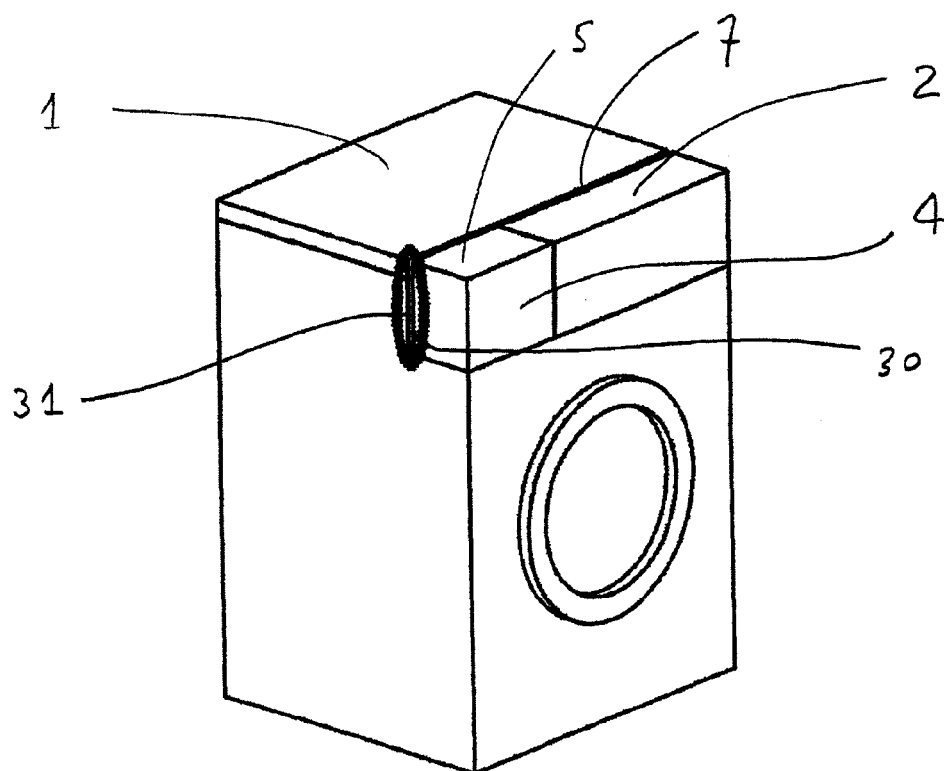


FIG. 8

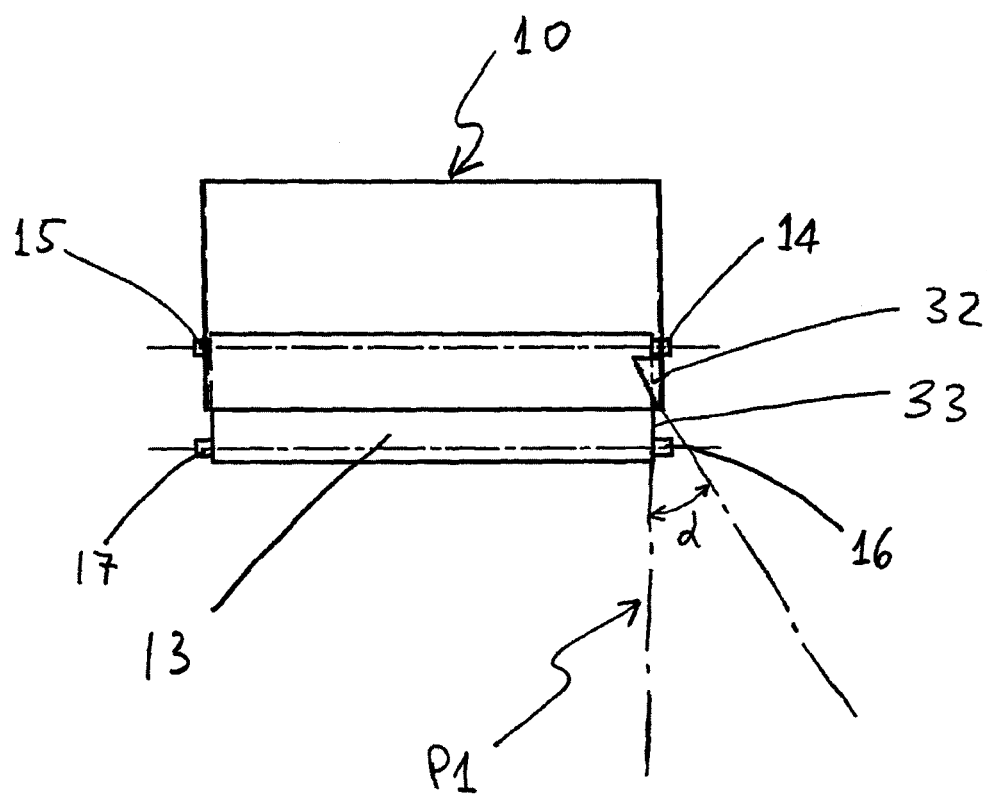
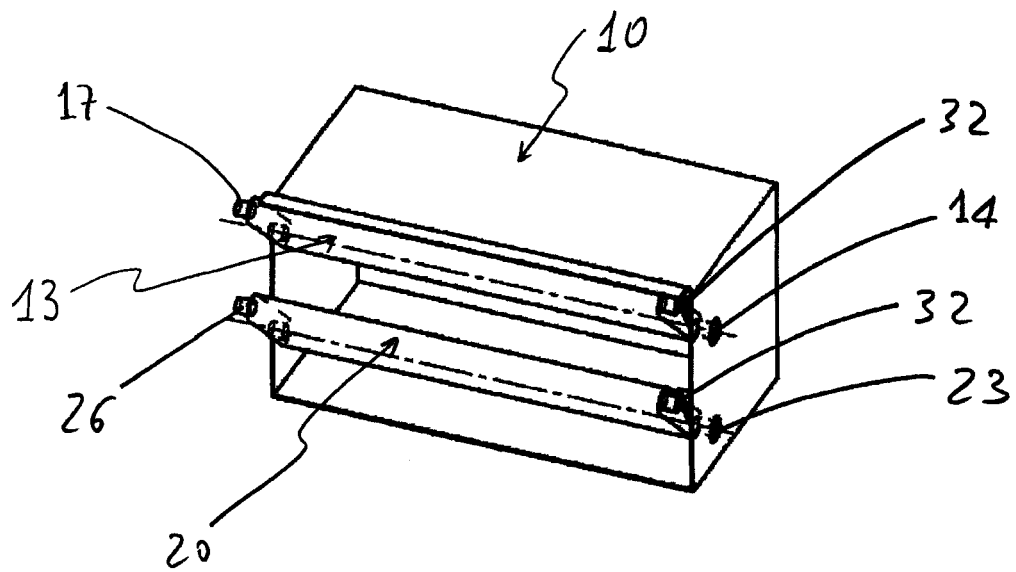
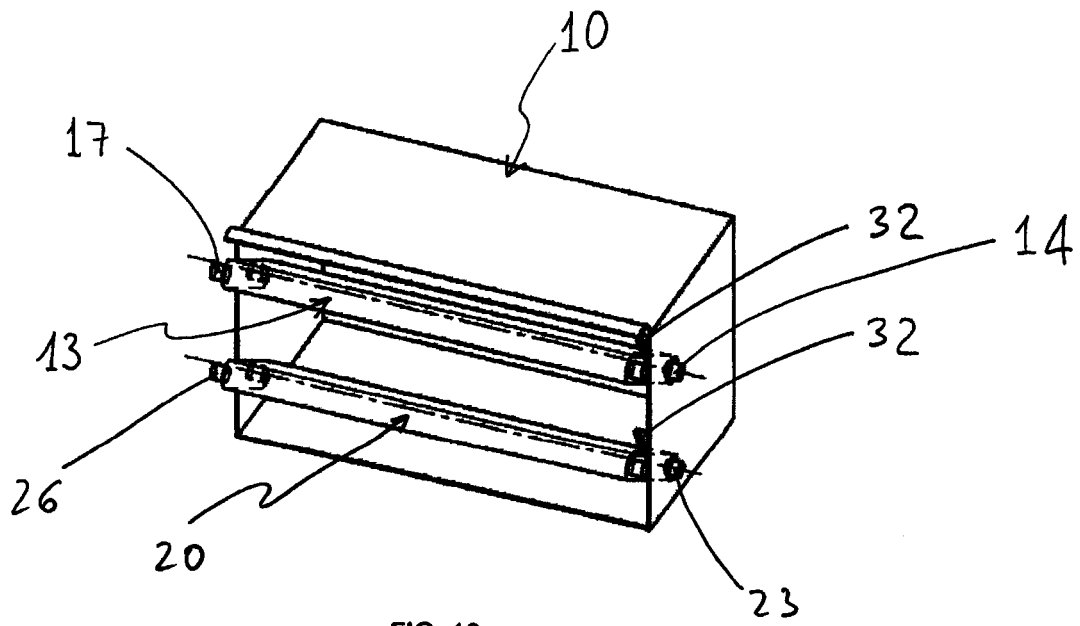


FIG. 9



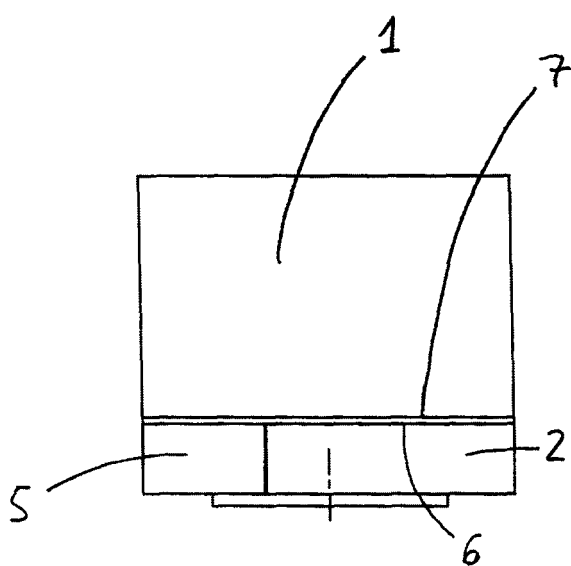


FIG. 12

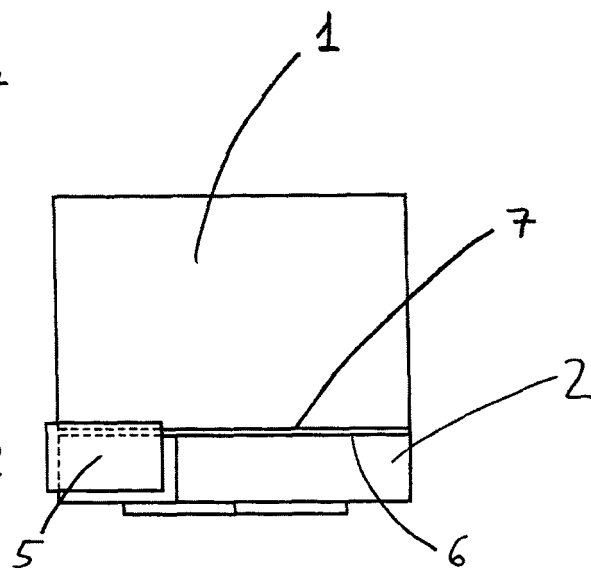


FIG. 13

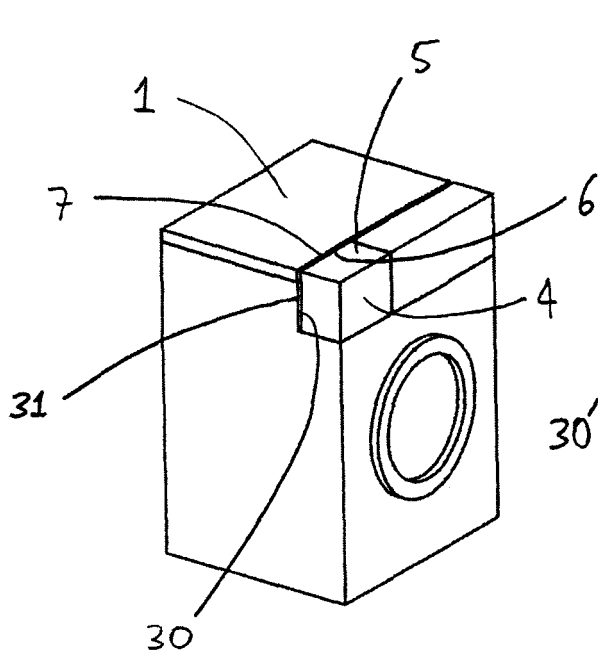


FIG. 14

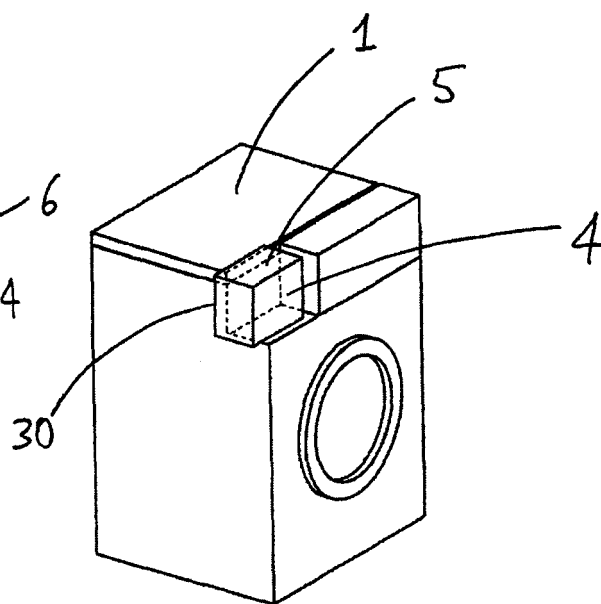


FIG. 15

FIG. 16

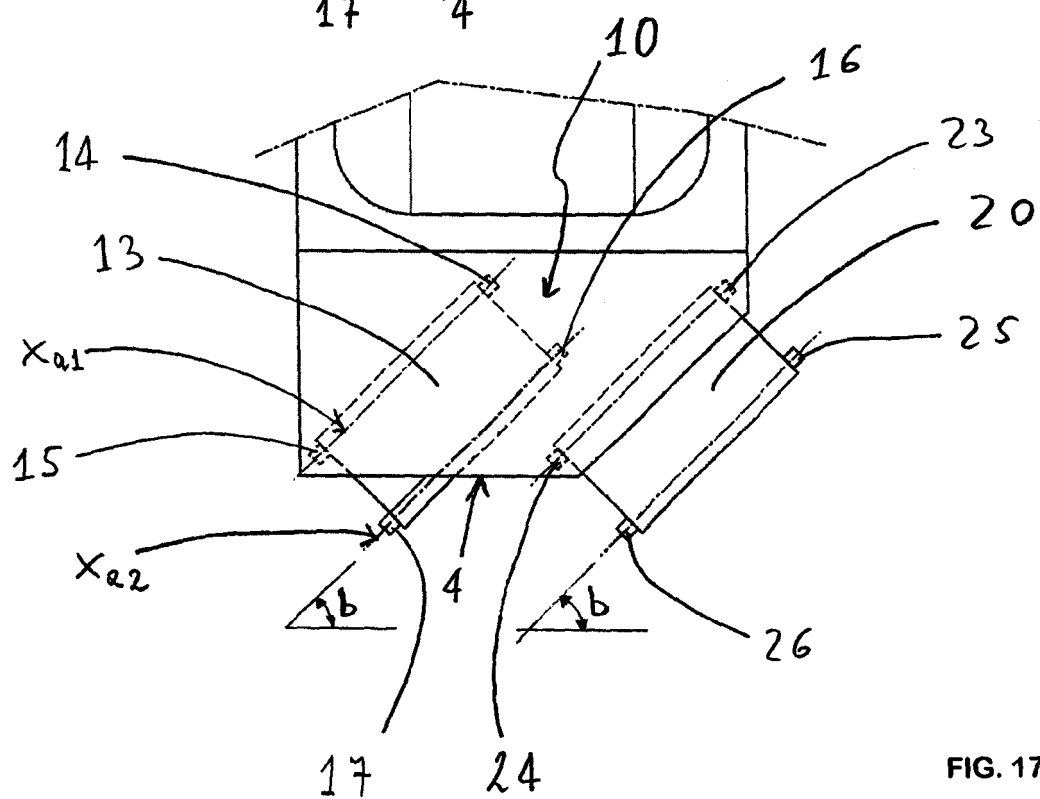
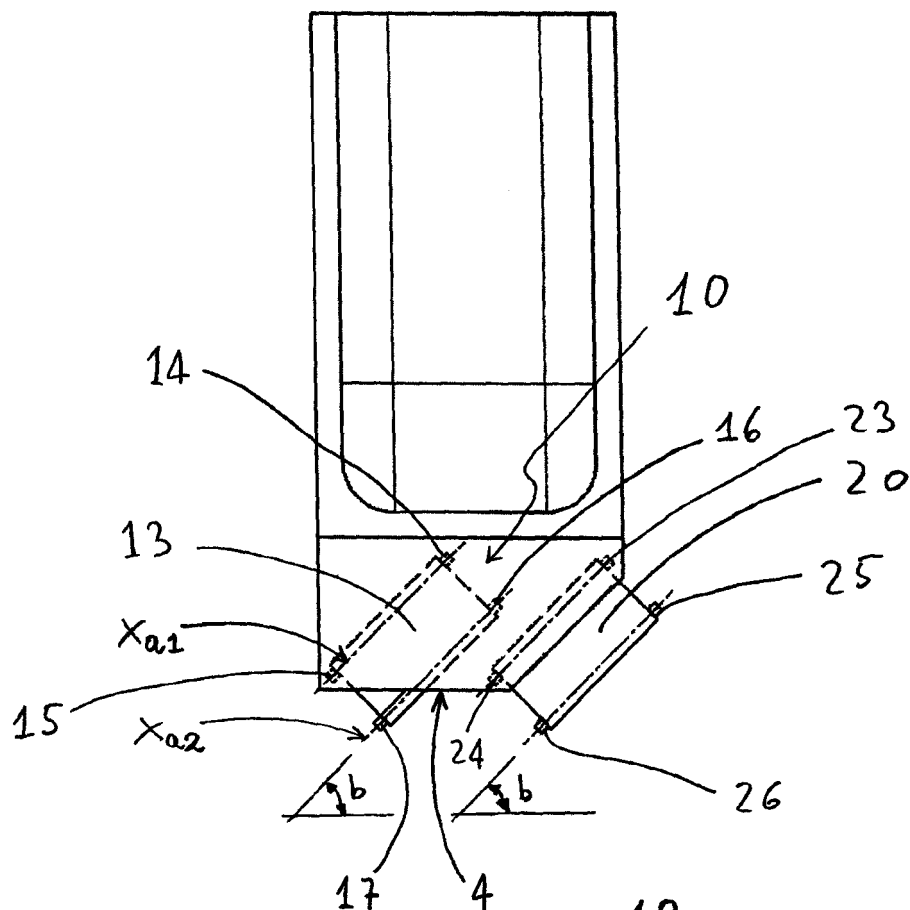


FIG. 17

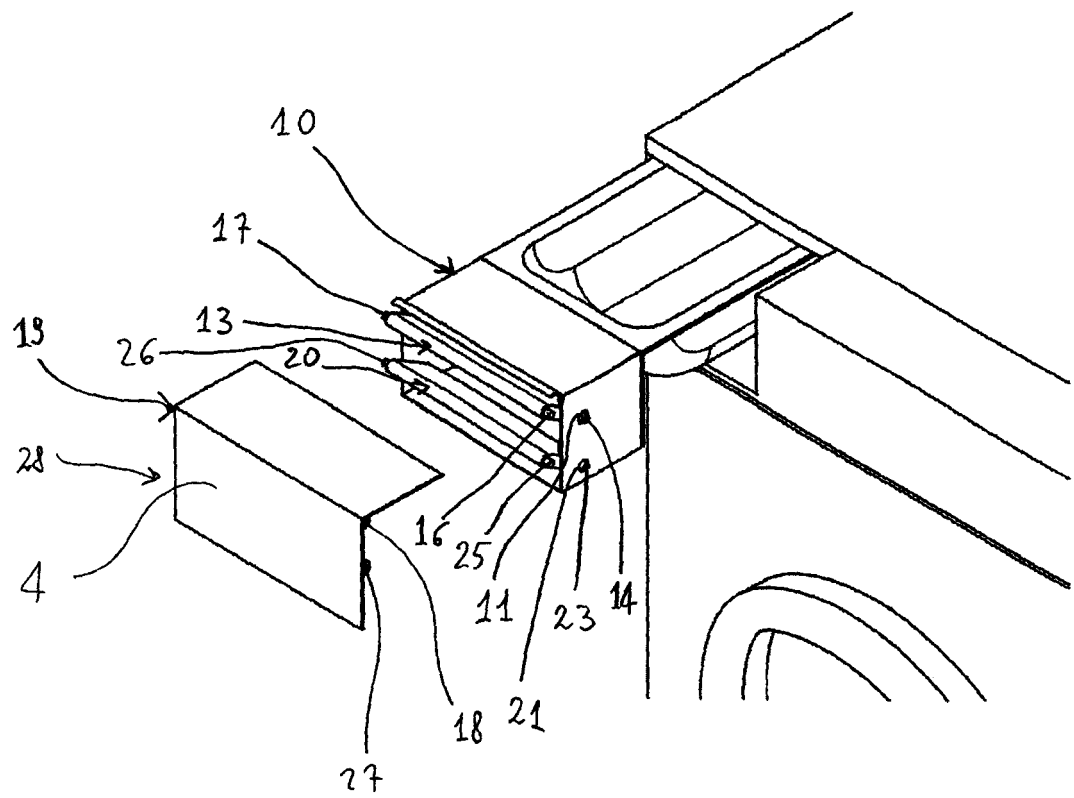


FIG. 18



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 11 2980

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	EP 0 410 086 A (BOSCH SIEMENS HAUSGERAETE [DE]) 30 January 1991 (1991-01-30) * the whole document *	1-9	INV. D06F39/02
E	EP 1 842 953 A (IAR SILTAL S P A [IT]) 10 October 2007 (2007-10-10) * the whole document *	1-9	
			TECHNICAL FIELDS SEARCHED (IPC)
			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 November 2007	Examiner DIAZ, M
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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23-11-2007

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