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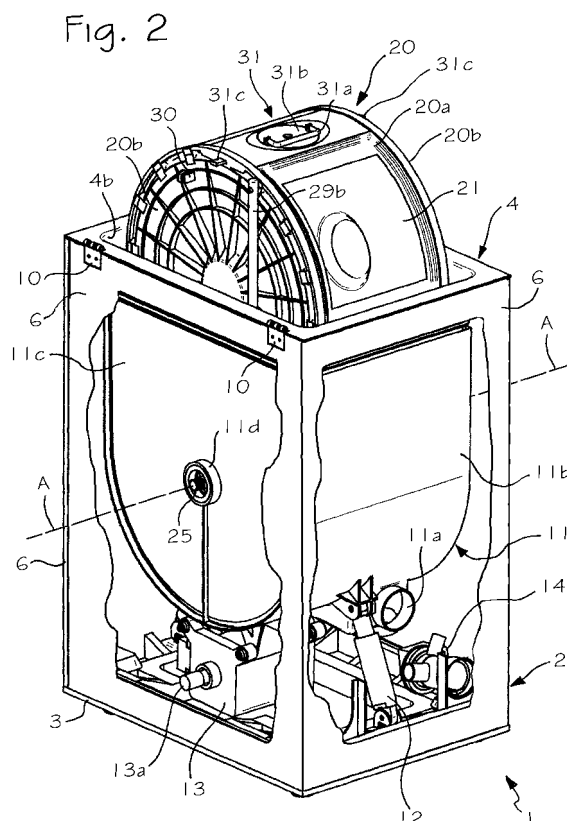
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(54) **Top-loading machine for washing and/or drying laundry**

(57) A top-loading machine for washing and/or drying laundry (1) comprises a drum (20) for containing the laundry and a washtub (11) inside which the drum (20) is able to rotate about a respective axis (A). The drum (20) can be displaced between a lowered position, for operation of the machine, and a raised position, for loading/unloading of the laundry. The drum (20) is mounted slidably on a respective frame (22) that is able to rotate in the washtub (11) about the aforesaid axis (A). The machine further comprises switchable locking means (31; 20c, 24a), provided for maintaining the drum (20) in a fixed position with respect to the frame (22) or else enabling displacement between the lowered position and said raised position.



Description

[0001] The present invention relates to a top-loading machine for washing and/or drying laundry.

[0002] Machines of the type indicated above typically comprise a cabinet, supported inside which is a washtub. Mounted in the washtub is a drum for containing the laundry, which is movable about a respective axis of rotation, which is usually horizontal. The washtub has a top opening that faces a circumferential wall of the drum, provided on which is a respective hatch. The cabinet in turn comprises a respective top door, which enables access to the opening of the washtub, and hence to the hatch of the drum. In order to enable the operations of loading and unloading of the laundry, the drum is brought into an angular position such that its hatch is found in a position corresponding to the top opening of the washtub.

[0003] Top-loading machines of the type referred to above are particularly appreciated by virtue of their reduced overall dimensions in operation. In particular, the fact that the operations of loading/unloading of the laundry can be carried out from the top part of the cabinet enables flexibility of installation of the machine itself, in the sense that - broadly speaking - any side of the cabinet can be set up against a wall of an environment or against an adjacent furnishing component. Said possibility is not allowed in the case of front-loading washing and/or drying machines, i.e., machines of the type in which the cabinet is provided with a front door for enabling introduction of the laundry into the drum.

[0004] In top-loading machines, however, the operations of loading/unloading the drum with the laundry are relatively more difficult as compared to the case of front-loading machines. In order to limit said drawback, with certain solutions an attempt has been made to increase the dimensions of the top passage of the cabinet in order to facilitate access to the opening of the washtub and to the drum. With other solutions an attempt has been made to bestow on the top part of the cabinet a possibly more ergonomic conformation. Said compromise solutions, however, do not prove fully satisfactory. There is hence felt the need to make available a top-loading machine for washing and/or drying laundry in which the operations of loading/unloading of the laundry are facilitated, particularly from the ergonomic standpoint.

[0005] The main purpose of the present invention is to meet the aforesaid need. According to the present invention, said purpose is achieved thanks to a machine having the characteristics recalled in the ensuing claims, which form an integral part of the technical teaching provided herein in relation to the invention.

[0006] In extreme synthesis, the invention mainly regards the solution whereby the drum, albeit constrained with respect to the washtub, is mounted so as to enable its selective displacement between a lowered position, for machine's working, and a raised position, for loading/unloading of the laundry. For said purpose, the machine is preferably provided with a frame that supports the

drum, said frame being rotatable in the washtub about a respective axis of rotation, and the drum being selectively displaceable on the frame between the aforesaid lowered position and raised position, in a direction that is substantially transverse with respect to the aforesaid axis.

[0007] Moreover advantageously provided are locking means that can be switched between an operative condition and an inoperative condition. In the operative condition, the locking means keep the drum in a fixed position with respect to the frame, in such a way that the drum and the frame rotate together during operation of the machine. In the inoperative condition of the locking means, instead, displacement of the drum on the frame between the aforesaid lowered position and said raised position is made possible in order to render the operations of loading/unloading of the laundry convenient.

[0008] In an embodiment at the moment deemed preferential, the aforesaid frame comprises at least one upright element facing one of the end walls of the drum, said upright element being constrained to the drum via slidable-coupling means. The frame preferably comprises also a transverse element, which faces the circumferential wall of the drum.

[0009] Further purposes, characteristics, and advantages of the present invention will emerge clearly from the description of the ensuing invention, provided purely by way of explanatory and non-limiting example, with reference to the annexed plate of drawings, in which:

- Figure 1 is a perspective view of a top-loading machine for washing and/or drying laundry according to the present invention;
- Figure 2 is a perspective view of the machine of Figure 1, with the corresponding cabinet partially sectioned, with some internal components removed, and with the corresponding drum for the laundry in a raised position;
- Figure 3 is a perspective view of the drum for the laundry of a machine according to the invention, with a corresponding supporting frame in a first condition;
- Figure 4 is a perspective view of the drum for the laundry of a machine according to the invention with a corresponding supporting frame in a second condition; and
- Figure 5 is a plan view of the machine of Figure 1.

[0010] With particular reference to Figures 1, 2 and 5, the reference number 1 designates as a whole a top-loading machine for washing and/or drying laundry made according to the teachings of the present invention. It will be assumed that, in the case exemplified, the machine 1 is of the type designed to perform only washing of laundry, even though the invention can be applied also to the so-called washing-drying machines and to drying machines.

[0011] The machine comprises a cabinet or supporting structure, designated as a whole by 2. Said structure comprises a base 3, which is basically rectangular in plan

view, and a top body, designated by 4, which in the example provided has basically the shape of a frame, provided with a corresponding through opening designated by 4b. As may be noted, also the top body 4 has a shape that is substantially rectangular in plan view. Fixed to the base 3 and to the top body 4 are side closing panels, two of which are designated by 6 in Figure 1, which provide the vertical walls of the cabinet of the machine.

[0012] The reference number 8 designates the top door of the machine 1. In the case exemplified, directly associated to the door 8 are the control devices of the machine, designated as a whole by 9. The door 9 is mounted on the body 4 by means of hinges 10, partially visible in Figures 2 and 5.

[0013] Once again in Figures 1, 2 and 5, the reference number 11 designates as a whole the washtub of the machine, preferably but not necessarily made of moulded plastic material. The washtub 11 comprises, in its bottom part, a discharge outlet 11a, formed in the peripheral wall 11b of the washtub itself. The body of the washtub 11 is completed by two opposite side walls, designated by 11c, on each of which a hub 11d is present, the hubs carried by the aforesaid two side walls being in coaxial positions. Advantageously the aforesaid hubs 11d can have a respective metal anchorage part that is at least partially embedded in the plastic material constituting the washtub. As may be seen in particular in Figures 1 and 5, the peripheral walls 11b and side walls 11c are shaped and arranged in such a way that the washtub 11 presents a top access opening, designated by 11e.

[0014] The washtub 11 is supported at the bottom via two shock-absorbing feet, one of which may be seen in Figure 2, where it is designated by 12. The shock-absorbing feet extend on opposed sides of the bottom area of the washtub 11 and are connected, at the bottom end, to the base 3. In its top part, the washtub 11 is instead constrained to the body 4 via elastic elements (not visible), preferably comprising spiral springs.

[0015] Moreover visible in Figure 2 is an electric actuation motor, designated by 13, provided with a respective rotating shaft 13a, as well as a washing pump, designated by 14. The electrical and hydraulic connections of the elements 13 and 14 are not represented, as likewise not represented are other internal components of the machine that are not of specific interest for an understanding of the invention.

[0016] Designated as a whole by 20 is the drum for the laundry of the machine 1, which has a generally cylindrical shape and is able to rotate within the washtub about a substantially horizontal axis, designated by A and passing through the two hubs 11d, or in any case transverse with respect to the vertical; the axis A could thus have a certain inclination.

[0017] The drum 20 comprises a circumferential wall 20a and two end walls 20b. In the preferred embodiment, the drum 20 is of the so-called "hybrid" type, i.e., of the type in which the circumferential wall 20a is made of stainless steel and the two end walls 20b are made of moulded

plastic material. In the case exemplified, the drum 20 comprises a single element for entraining the laundry, designated by 20c, having the function of facilitating mixing of the clothes within the drum 20, during rotation of the latter. The entraining element 20c is obtained via deformation of a portion of the circumferential wall 20a and basically consists of a V-shaped recess having the vertex facing inside the drum 20. Said recess extends throughout the width of the circumferential wall 20a and ends at the two respective longitudinal ends in homologous portions of the walls 20b. The drum 20 is moreover provided with a respective hatch, represented only schematically and designated by 21, of a type in itself known, and comprises at least one movable flap hinged to the circumferential wall 20a.

[0018] According to the main aspect of the present invention, the drum 20 is mounted movable with respect to the washtub so as to be able to be displaced between a lowered position, visible for example in Figure 1, and a raised position, visible in Figure 2. In this way, in the lowered position, the geometrical axis of the drum 20 substantially coincides with the axis A, whilst, in the raised position, the geometrical axis of the drum 20 is substantially parallel to the axis A.

[0019] In the embodiment exemplified herein, to enable said possibility of displacement, the machine 1 is equipped with a frame for supporting the drum 20, said frame being mounted in a rotatable way within of the washtub 11 so as to rotate about the axis A.

[0020] As visible particularly in Figures 3 and 4, the aforesaid frame, designated as a whole by 22, basically comprises two uprights 23 and a cross member 24, preferably made of stainless steel. The cross member 24 extends between respective end parts of the two uprights 23 and has an engagement element 24a, which projects in the direction of the drum 20 and extends longitudinally through at least part of the length of the cross member itself. Said engagement element 24a has preferably an outer profile complementary to the internal profile of the entraining element 20c of the drum 20 (and hence is substantially V-shaped) and is, for example, formed directly via shaping of the cross member 24.

[0021] The two uprights 23 have a longitudinal development approximately equal to or slightly larger than the diameter of the drum 20 and each have, in an intermediate area, a respective rotation pin or shaft, one of which is visible in Figure 3 and is designated by 25a. Each pin 25 is anchored to the central part of the respective upright 23 via means in themselves known, comprising, for example, a flange element 25a fixed with screws or the like.

[0022] As may be seen in particular in Figures 3 and 5, each upright 23 has respective seats 26 and 27, which extend basically throughout the length of the upright itself and are preferably formed via shaping thereof. The seat 26 of each upright 23 provides a rectilinear running guide designed to co-operate with wheels 30 associated to a respective end wall 20b of the drum 20. As may be seen in particular in Figure 3, the wheels 30 are rotatably

mounted on supports 30a that are at least partially embedded in the thermoplastic material that forms the corresponding end wall 20b.

[0023] The seats 27 of each upright 23 are, instead, designed to house a respective gas spring, designated as a whole by 29 in Figure 3, of a type in itself known. Each spring 29 comprises a piston element or stem 29a and a cylinder element 29b. In the case exemplified, the piston element 29a has one end rendered fixed to the respective upright 23 (but it could be the cross member 24), and the cylinder element 29b has one end fixed to an attachment formed or partially embedded in the respective end wall 20b of the drum 20. The gas springs 29 constitute, in a way similar to the system formed by the guide 26 and the wheels 30, means for slidable coupling between the frame 22 and the drum 20, given that the piston elements 29 are slidable within the cylinder elements 29b.

[0024] The machine according to the invention is further provided with locking means, that can be switched between an operative position and an inoperative position in order to maintain the drum 20 blocked with respect to the frame 22 or else enable displacement of the drum with respect to the frame between the aforesaid lowered position and said raised position.

[0025] In the case exemplified, the locking means comprise a mechanism with two catches, which are designed to project in opposite points of the drum, substantially in the proximity of the edge of a respective end wall 20b. The aforesaid mechanism, designated as a whole by 31, comprises a handle 31a associated to a rotating member 31b. Associated to said rotating member 31b are transmission means for producing sliding of the aforesaid catches, designated by 31c, between a position where they project from the two sides of the drum, visible in the figures, and a retracted position, not visible in the figures. The mechanism for producing displacement of the catches 31c can be of any known type, for example comprising transmission rods having one end hinged to the member 31b in an eccentric position and the other end hinged to the catches 31.

[0026] In the case exemplified, each catch 31c is designed to co-operate with a respective seat formed in a top cross member of a respective upright 23. One of said seats is designated by 28 in Figure 3. The condition of engagement of one of the catches 31c in the respective seat 28 is visible, for example, in Figure 4.

[0027] In the condition where the components described above are assembled, the pins or shafts for rotation 25 of the upright elements 23 are coupled in the respective hubs 11d. Fitted on one of said pins, and in particular the one visible in Figure 2, projecting on the outside of the washtub, is a pulley (not represented), which, via a suitable belt (not represented either), receives the motion from the shaft 13a of the driving motor 13.

[0028] Operation of the machine 1, as regards the normal washing operations, is substantially similar to the

typical operation of a top-loading washing machine. In the case of the present invention, when the drum 20 is in the respective lowered position with respect to the frame 20 (see, for example, Figure 1, Figure 4 and Figure 5) the drum itself is completely contained within the washtub 11. In said condition, the locking assembly 31 is in the respective operative position, i.e., in the condition in which the catches 31c are engaged in the corresponding seats 28 of the uprights 23. It should be noted that, in said lowered position, inserted in the cavity formed by the entraining element 20c is the engagement element 24a of the cross member 24 of the frame 22. Consequently, as may be readily understood, the drum 20 is clamped with respect to the frame 22, in two diametrically opposite regions.

[0029] Actuation of the motor 13, via the aforesaid belt-and-pulley drive system, imparts the motion on the pin 25 visible in Figure 2 and hence on the frame 23. Given the condition of mutual clamping between the frame 23 and the drum 20, the assembly thus formed is set in rotation within the washtub, about the axis A. In this way the normal washing operations are carried out. As may be noted in particular from Figure 5, the arrangement of the slidable-coupling means 26-30 and 29 is not specular on the two upright elements 23. Said arrangement is considered preferable considering the fact that, in the course of one and the same washing cycle, the drum 20 is made to rotate in opposite directions.

[0030] At the end of a washing cycle, the user opens the door 8 of the machine, as may be seen, for example, in Figures 1 and 5. In this way, through the passage 4b of the body 4 and the top opening 11e of the washtub 11 the user can gain access to the drum 20. The assembly formed by the drum 20 and the frame 22 can be displaced manually by the user in the position visible for example in Figures 1 and 5, with the handle 31a substantially in a position corresponding to the top dead centre of the drum. It should consequently be noted that, in a possible embodiment, the control system of the machine can be provided in such a way that, at the end of a washing cycle, the motor will be controlled for leading the assembly formed by the drum 20 and the frame 22 autonomously into the aforesaid position.

[0031] When the drum 20 is in the position indicated, the user grips the handle 31a and causes an angular movement thereof, for example through approximately 90°. In this way, rotation of the member 31b is produced, and hence actuation of the mechanism that causes recession of the catches 31c towards the respective retracted position. When, at the end of said movement, the catches 31c are released from the respective seats 28 of the uprights 23, the gas springs 29 intervene so as to facilitate the movement of the drum 20 towards the respective raised position, visible for example in Figure 2 (Figure 3 represents the raised condition of the drum with respect to the frame alone). It is to be noted in this regards that the force of reaction of the gas springs 29 is preferably such as to facilitate only the passage from the low-

ered position to the raised position of the drum, and not to bring about an autonomous raising of the drum 20. In other words, raising of the drum 20 presupposes in any case a pulling action upwards exerted by the user, via the handle 31a. Thanks to the action of the springs 29, however, said operation does not entail any significant effort on the part of the user, in so far as the movement is in effect "servo-assisted". The force of the springs 29 is in any case such as to maintain the drum in the raised position.

[0032] Rolling of the drum 20 with respect to the frame 22 is guided and ensured via the wheels 30, which are free to run within the respective guides 26 of each upright 23. As has been clarified above, the components themselves of the two gas springs 29, i.e., the piston element 29a, and the corresponding cylinder element 29b, constitute in themselves slidable-coupling means guided between the drum 20 and the frame 22.

[0033] In the non-limiting example illustrated, the major sides of the opening 11e of the washtub 11 are slightly longer than the diameter of the end walls 20b of the drum 20, and the minor sides of the opening 11e are slightly longer than the depth of the drum 20. Similar considerations, as regards the dimensions of the cross section, apply to the passage 4b of the top body 4. In this way, in the raised position, the drum 20 can project to a substantial extent outside the washtub 11 and the cabinet 2, respectively, through the opening 11e and through the passage 4b, as may be clearly seen, for example, in Figure 2.

[0034] It will be appreciated that, in the raised position, the drum 20 and the frame 22 are prevented from performing any significant oscillations, precisely by virtue of the fact that the lateral encumbrance of the drum 20 occupies almost the entire section of the aforesaid opening 11e and passage 4b. It should moreover be noted that, in the raised condition, the relative position of the drum and the frame is such that the hatch with flaps 21 is in an advantageous position from the ergonomic standpoint, preferably not in a position corresponding to the top dead centre of the drum, but rather facing one of the minor sides of the machine.

[0035] With the drum 20 in the position of Figure 2, the user can open the hatch 21 and take out the laundry from the drum itself.

[0036] After unloading of the washed clothes, or possibly after loading of other clothes to be washed, the hatch 21 can be reclosed. At this point, the user has to push the drum 20 down, with a force such as to overcome the reaction of the gas springs 29. As has been said, said springs 29 are of limited power, so that the lowering operation does not require an particular effort. With said movement, the wheels 30 run within the respective guides 26, and the piston elements 29a run within the respective cylinder elements 29b.

[0037] At the end of the lowering travel, the user rotates the handle 31a in the direction opposite to the previous one, i.e., into the position visible in the various figures. With said movement, the catch elements 31c come to

engage again in the respective seats 28 of the uprights. Of course, following upon lowering, within the cavity delimited by the entraining element 20c there again penetrates the engagement element 24a of the cross member 24 of the frame 22. The drum 20 is then brought back into the condition of clamping with respect to the frame 22, in a position similar to that of Figure 1. The top door 9 of the machine can then be reclosed and, if need be, the new washing cycle can be started.

[0038] From the above description the characteristics and advantages of the present invention are clear, said characteristics and advantages being mainly represented by the fact that the machine described enables, via simple and inexpensive means, a considerable ergonomic improvement of the machine, as regards the operations of loading/unloading of the drum with the laundry. It will be appreciated in particular that, thanks to the invention, said operations can be carried out without the need, for a user, to bend over towards the inside of the cabinet of the machine and of the drum, as instead typically occurs in top-loading machines of a known type.

[0039] It is also to be noted that in the machine 1 according to the invention the possible replacement of the drum 20 is extremely convenient.

[0040] Of course, the means for slidable coupling between the drum and the respective supporting frame could be shaped differently from the ones exemplified previously. Also the actuator means designed to assist the movement of raising of the drum could be of a conformation and type different from the one illustrated by way of example. It is pointed out, for example, that it is possible to provide a number of parallel series of wheels 30 on one and the same end wall 20b of the drum 20, with a corresponding number of runner guides 26 for the upright element 23 that faces said wall. In principle, there is nothing to rule out the possibility of associating the guides to the end walls of the drum and the corresponding wheels to the respective upright element.

[0041] In a preferred version, the mechanism 31 comprises safety means, provided for maintaining the mechanism itself in the respective operative condition. Said means can conveniently comprise elastic members, operative for constantly forcing the catch elements 31c towards the respective projecting position. In this way, in order to produce disengagement of the drum 20 from the frame 22, the handle 31a has to be rotated, in order to overcome the action of said elastic members, to an extent sufficient to produce disengagement of the catches 31c from the seats 28. After said disengagement, also by releasing the handle 31a, the catches return into their respective projecting positions under the action of the aforesaid elastic means. On the other hand, the projecting ends of the catches 31c and the region of the respective uprights 23 in which the seat 28 is provided can be conveniently shaped for enabling a snap-action engagement between the drum 20 and the frame 22, that can occur practically at the end of the action of lowering of the drum, without it being necessary to actuate the handle

31a. In said perspective, it is, for example, sufficient to shape the projecting end of each catch 31c as an inclined-plane or a cam-like surface, such as the latch of any spring-operated lock.

[0042] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary widely with respect to what is described and illustrated herein, purely by way of non-limiting example, without thereby departing from the scope of the invention, as defined by the annexed claims.

Claims

1. A top-loading machine for washing and/or drying laundry, comprising a drum (20) for containing the laundry and a washtub (11) inside which the drum (20) is able to rotate according to a substantially horizontal axis (A), **characterized in that** the drum (20) is mounted so that it can be displaced between a lowered position, for operation of the machine (1), and a raised position, for loading/unloading of the laundry.
2. The machine according to Claim 1, comprising a frame (22) for supporting the drum (20), the frame (22) being rotatable in the washtub (11) about said axis (A), and the drum (20) being selectively displaceable on the frame (22) between said lowered position and said raised position, in a direction substantially transverse with respect to said axis (A), where in particular the drum (20) is guided on the frame (22) so as to be displaceable in a direction substantially perpendicular with respect to said axis (A).
3. The machine according to Claim 2, further comprising locking means (31; 20c, 24a) that can be switched between an operative position and an inoperative position, where in the operative position the locking means (31; 20c, 24a) maintain the drum (20) in a fixed position with respect to the frame (22) and in the inoperative position the locking means (31; 20c, 24a) enable displacement of the drum (20) on the frame (11) between said lowered position and said raised position.
4. The machine according to Claim 2, wherein the drum (20) has a circumferential wall (20a) and two opposed end walls (20b), and wherein the frame (22) comprises an upright element (23) facing one of said end walls (20b), the upright element (23) being constrained to the drum (20) by means of respective slidable-coupling means (26, 30, 29a, 29b).
5. The machine according to Claim 4, wherein the frame (22) comprises a further upright element (23) that faces the other of said end walls (20b), the further upright element (23) being constrained to the drum (20) by means of respective slidable-coupling means (26, 30, 29a, 29b).
6. The machine according to Claim 4, wherein the frame (22) comprises at least one transverse element (24) facing said circumferential wall (20a).
7. The machine according to Claims 5 and 6, wherein the transverse element (24) extends longitudinally between respective end areas of the two upright elements (23), the upright elements (23) being substantially parallel to one another and perpendicular with respect to the transverse element (24).
8. The machine according to Claim 3, wherein the switchable locking means (31; 20c, 24a) comprise at least one of:
 - a manual-actuation means (31a), such as a handle,
 - a mechanism (31b, 31c) that includes at least one catch member (31c),
 - at least one recess (20c) of one of said frame (22) and said drum (20) and a projecting part (24a) of the other of said frame (24) and said drum (20), the projecting part (24a) being engaged with the recess (20c) when the drum is in said lowered position.
9. The machine according to Claims 5 and 8, wherein the mechanism (31b, 31c) comprises at least two catch members (31c), each of which is able to assume a projecting position and a retracted position with reference to a respective end wall (20b) of the drum (20), in the projecting position each catch member (31c) being engageable in a respective seat (28) of a respective upright element (23) of the frame (22).
10. The machine according to Claims 6 and 8, wherein said recess is at least in part defined by an element for entraining the laundry (20c) formed at least in part in said circumferential wall of the drum (20), and said projecting part (24a) is formed in, or associated to, said transverse element (24) of the frame (22), the recess and the projecting part having shapes basically complementary to one another.
11. The machine according to Claim 1, further comprising actuator means (29) operative for facilitating passage of the drum (20) from the lowered position to the raised position.
12. The machine according to Claim 4 and/or Claim 5, wherein
 - said upright element (23) extends longitudinally and has, in an intermediate region thereof, a

pin (25) co-operating with a hub member (11d),
the latter being preferably carried by a respec-
tive side wall (11c) of the washtub (11), and/or
- the slidable-coupling means (26, 30, 29a, 29b)
comprise at least one guide extending longitu- 5
dinally (26) and rolling means (30) co-operating
with said guide (26), where in particular the roll-
ing means comprise one or more wheels (30)
having respective supporting means (30a) par- 10
tially embedded in a plastic material that forms
an end wall (20b) of the drum (20), and/or
- the slidable-coupling means (26, 30, 29a, 29b)
comprise a piston element (29a) and a cylinder
element (29b) that form part of a fluid actuator 15
(29), in particular a gas spring.

13. The machine according to Claim 1, wherein in said
raised position the drum (20) projects at least in part
on the outside of the washtub (11), through a top
opening (11a) of the washtub itself. 20

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Fig. 1

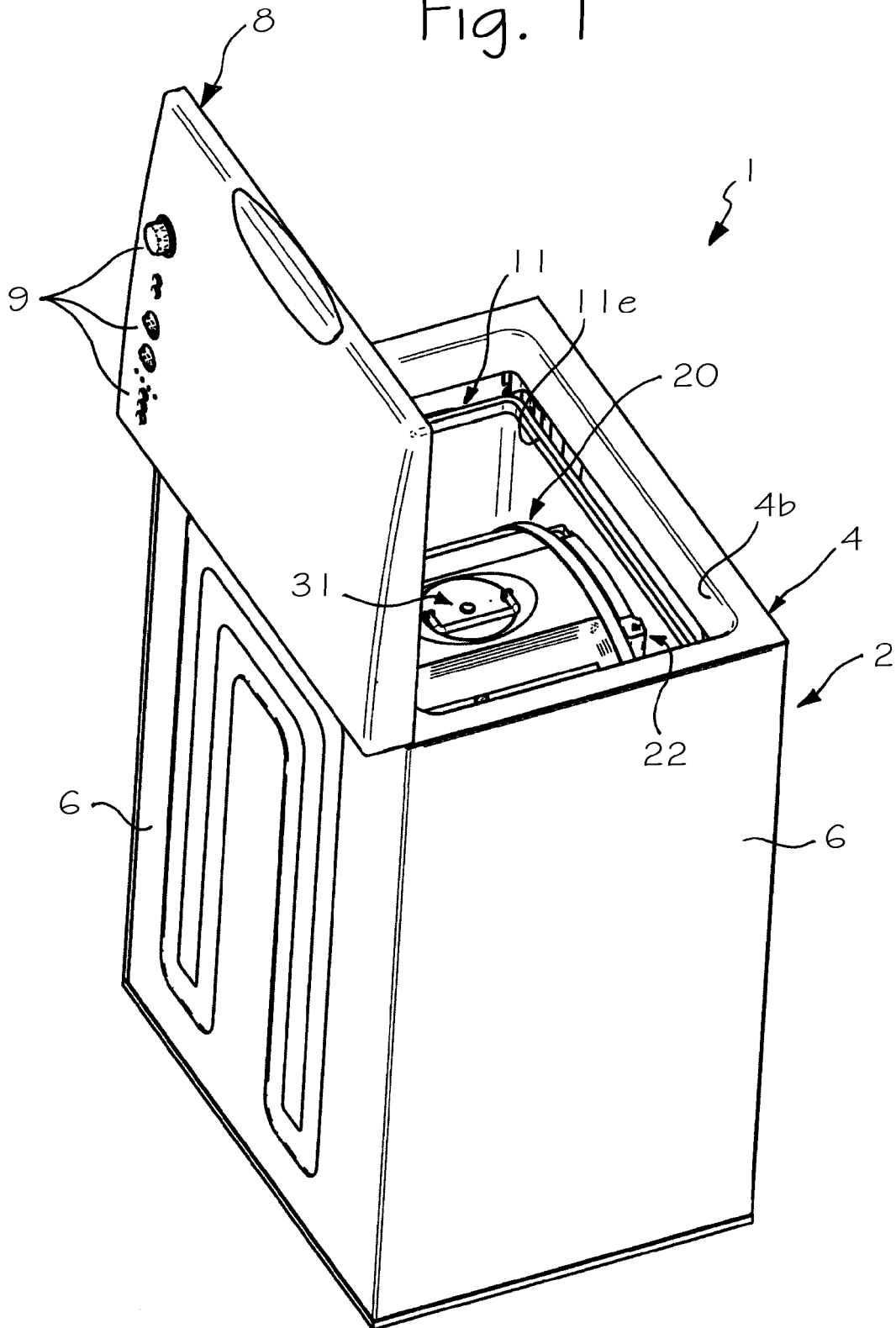


Fig. 2

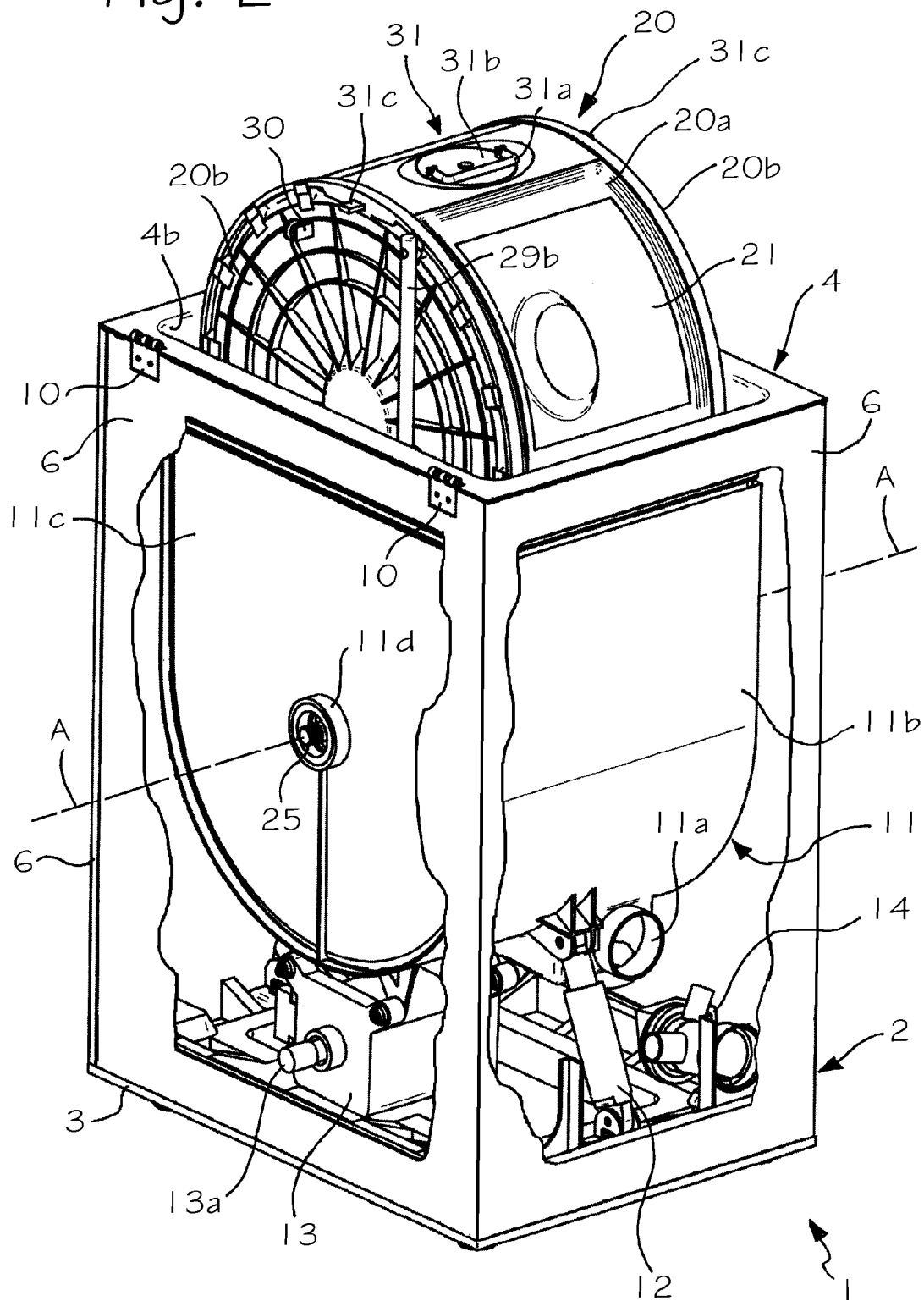


Fig. 3

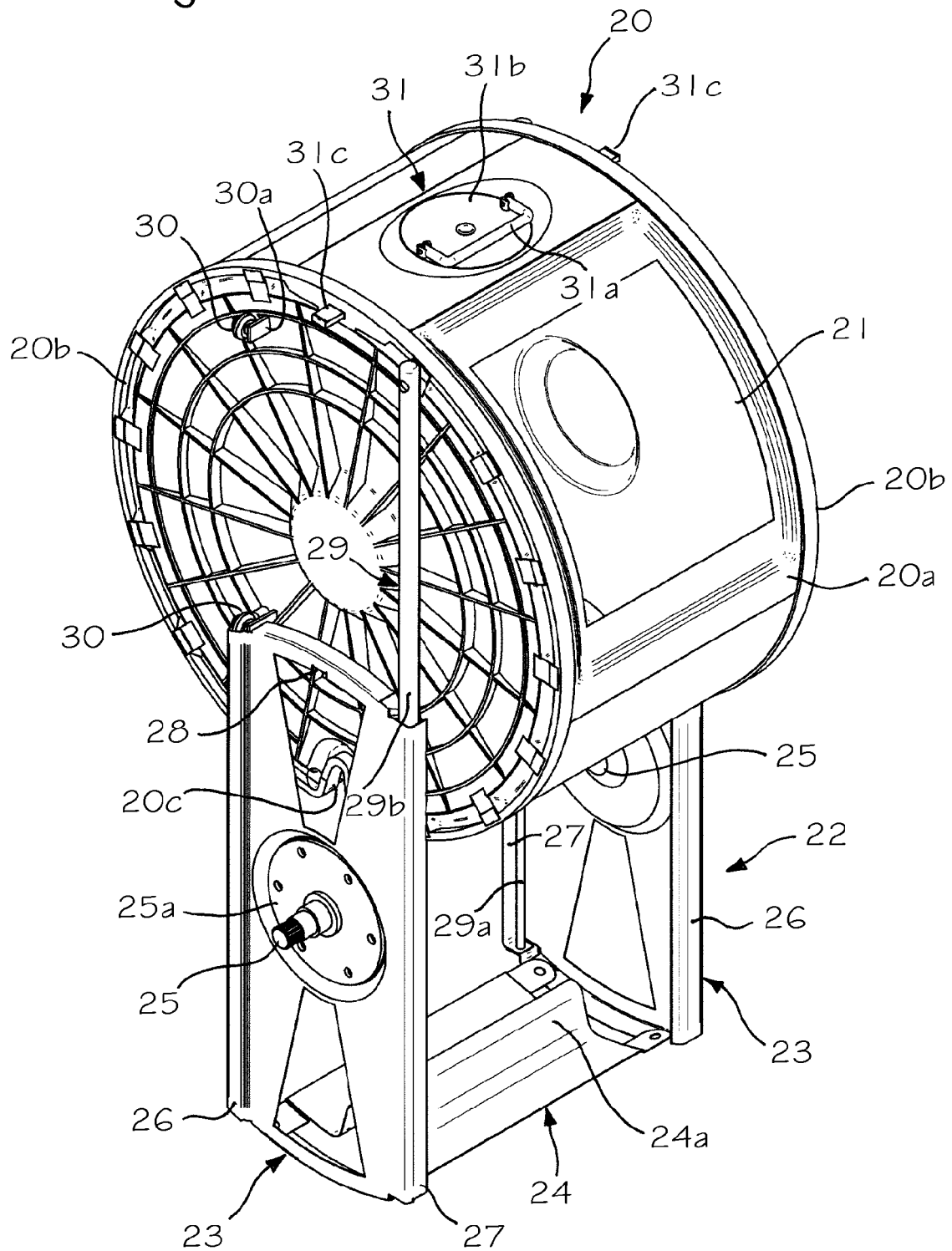


Fig. 4

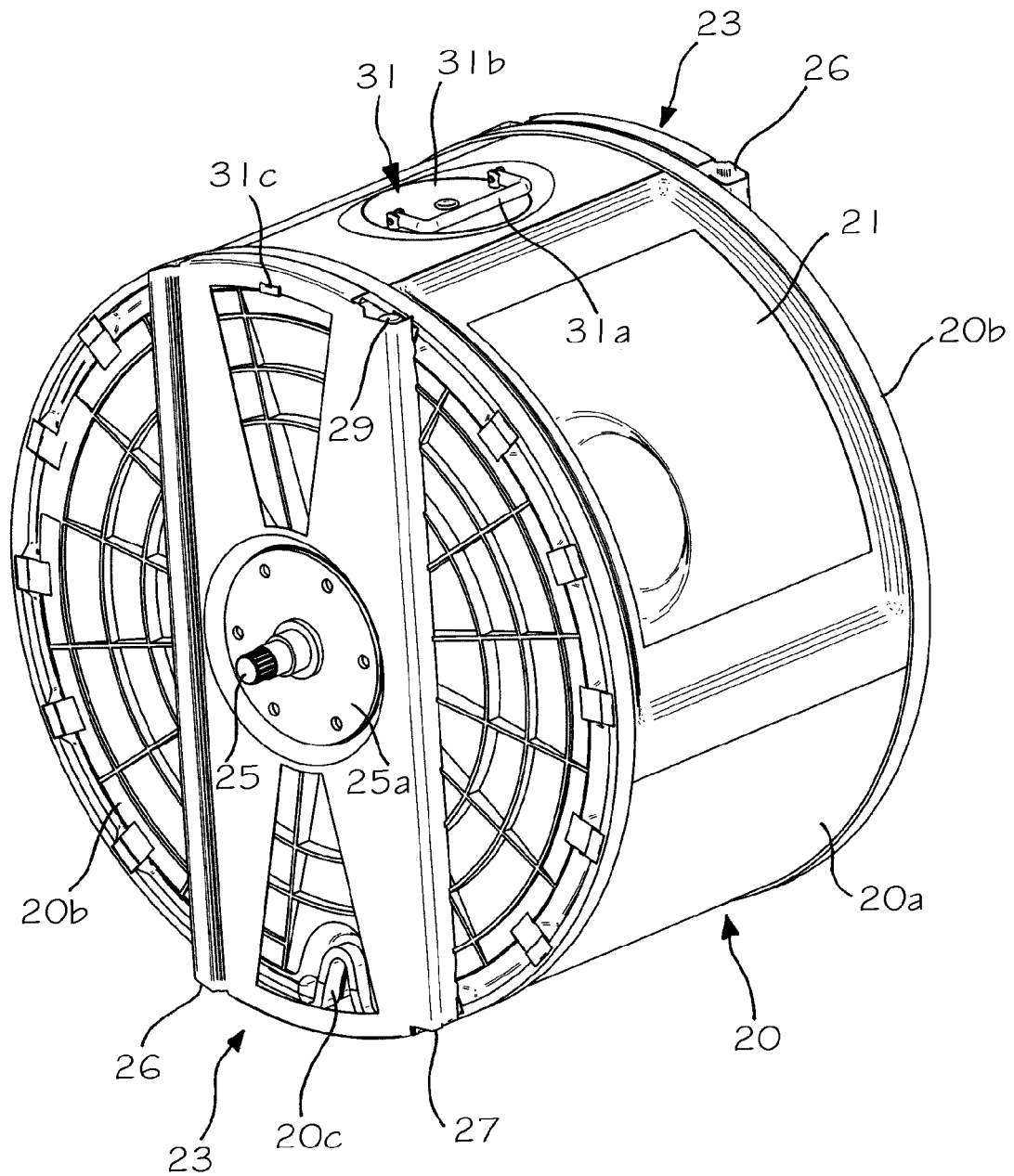


Fig. 5

