

[54] DEFLECTOR FOR THE DOOR OF A WASHING-MACHINE TUB

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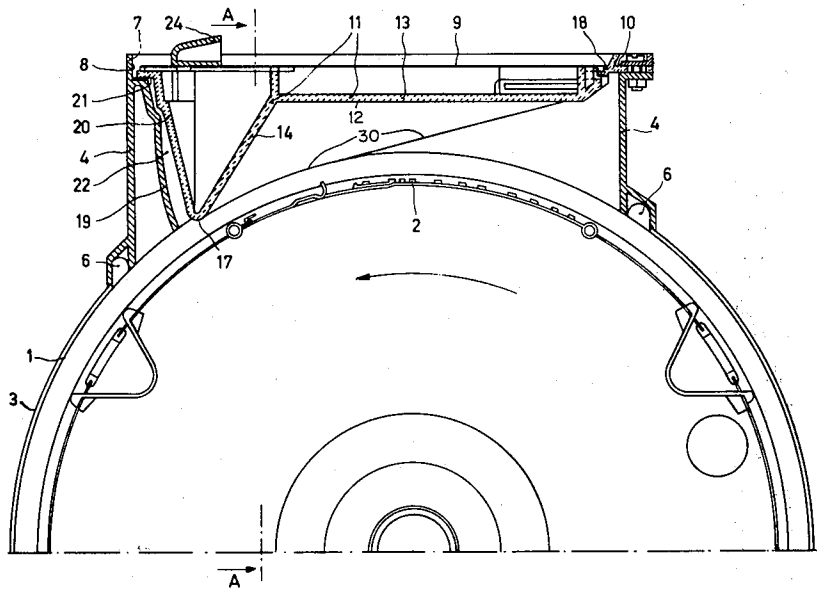
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[57] ABSTRACT

A deflector for a door of a top-loading washing machine for use with a non-watertight door. A ridge at the last side of the door viewed in the direction of rotation during spin-drying produces suction between the edge of the loading funnel and the deflector so that any water around the deflector is sucked towards the tub.

13 Claims, 4 Drawing Figures



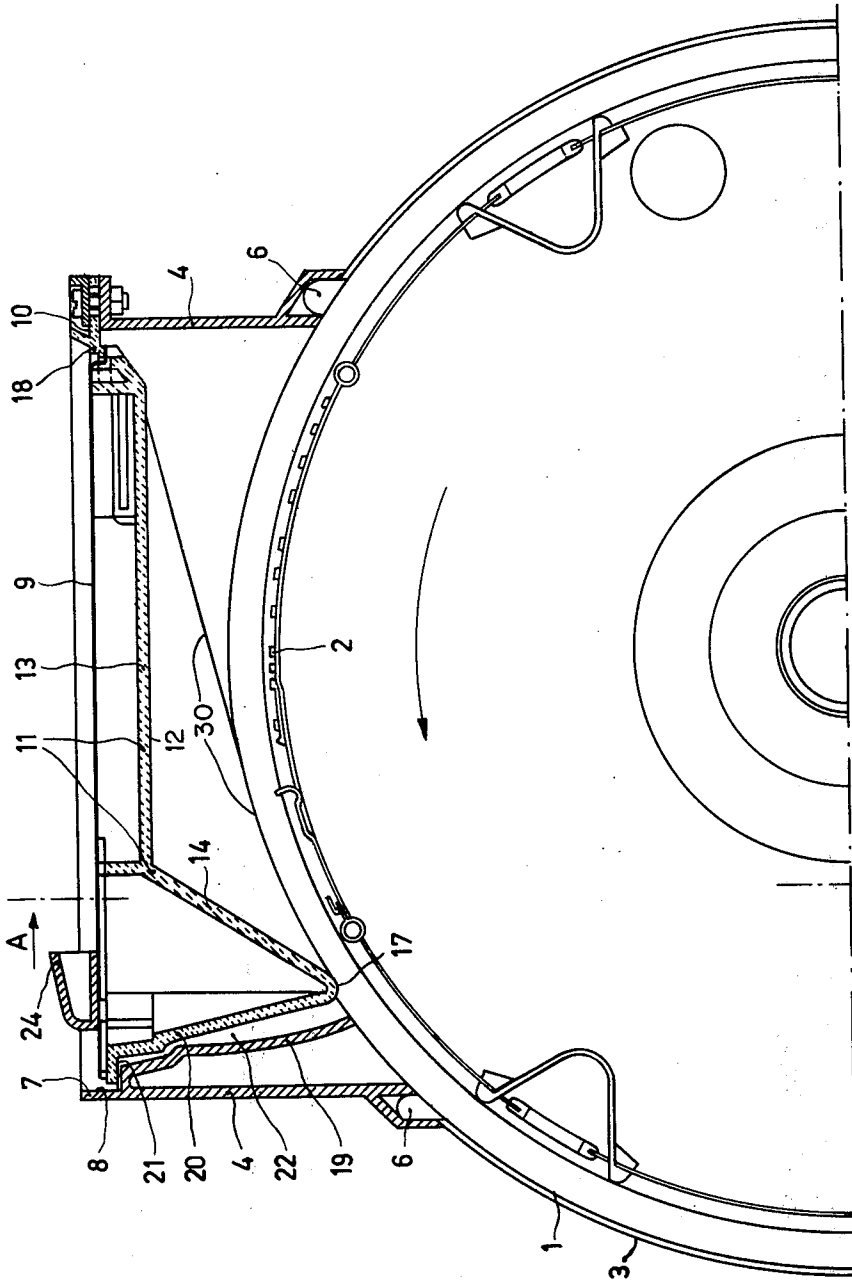


Fig. 1

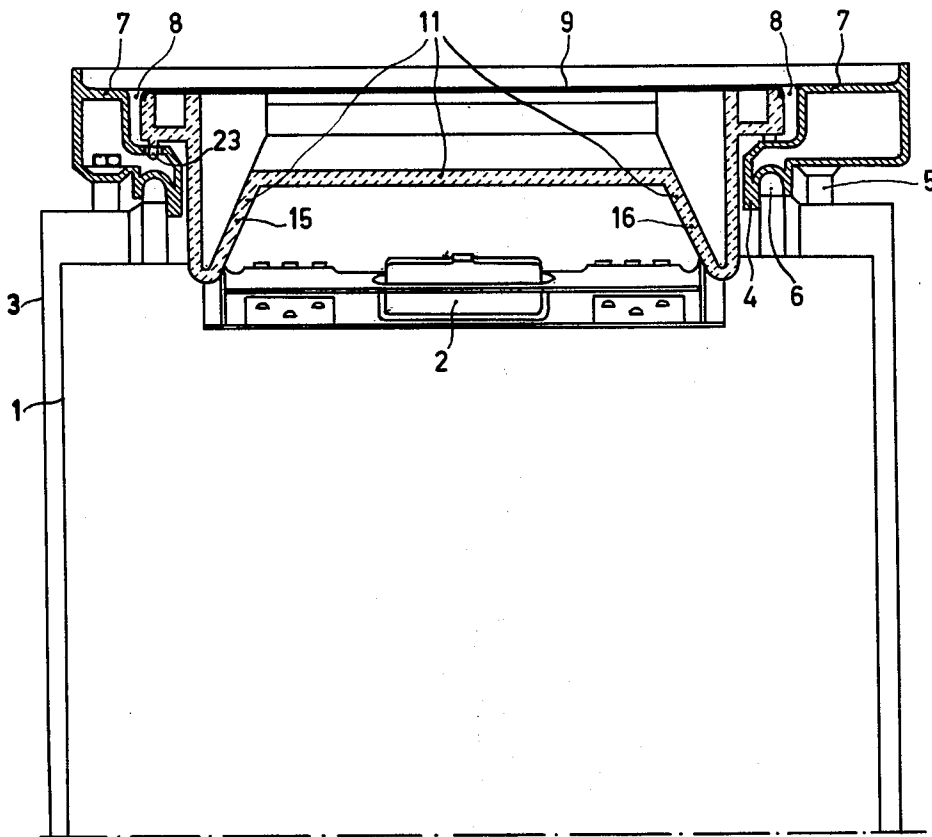


Fig.2

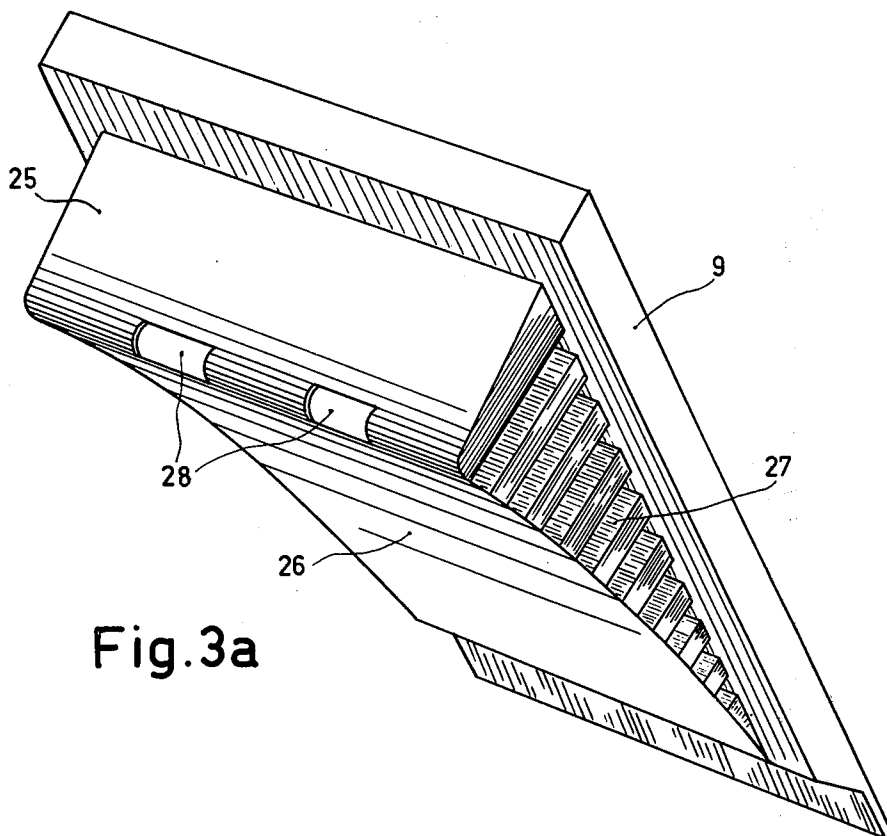


Fig. 3a

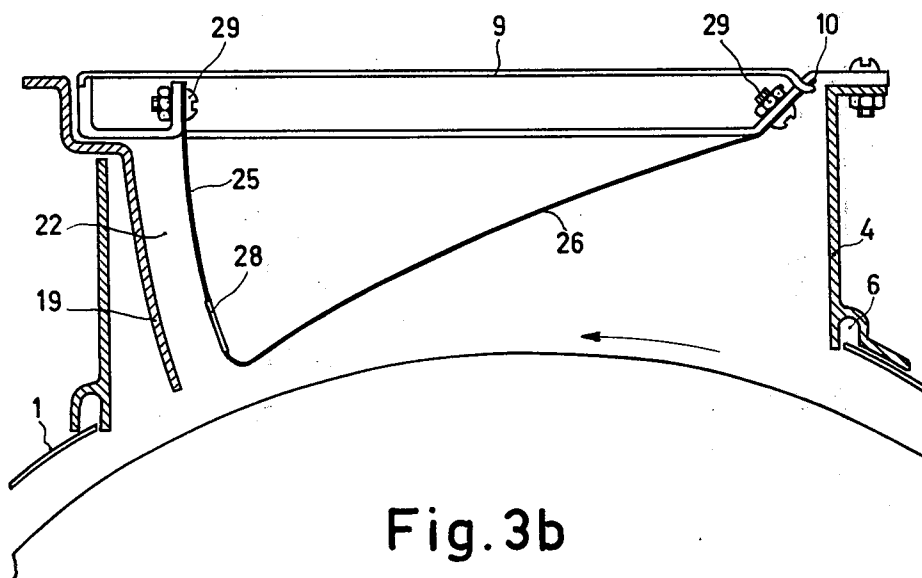


Fig. 3b

DEFLECTOR FOR THE DOOR OF A WASHING-MACHINE TUB

The invention relates to a deflector for the door of a washing-machine tub, said door closing the loading funnel of a tub of a washing machine having a drum with a horizontal shaft.

Sealing the tub door of a washing-machine with a horizontal shaft presents problems that are difficult to solve in a simple and economic manner. Water tight sealing is mainly required during the spin-drying phase and said requirement is especially urgent when the machine is of a type in which acceleration to spin-drying is effected with filled tub.

A currently employed solution is to use a watertight door, which necessitates the use of a seal of a plastic material and of a locking device which is capable of permanently providing sufficient pressure to compress the seal and thus to provide the necessary watertight sealing. Said system is expensive and excludes the use of a plastic material that can be deformed, at least in a quality and thickness allowing conventional materials to be replaced with advantage.

It is an object of the invention to provide a deflector which allows the use of a door of a plastic material of commercial quality and thickness, which neither necessitates the use of a seal nor a locking device which exerts pressure on the seal, while the water which may be flung out as the drum rotates and which penetrates between the edge of the door and its frame is sucked into the tub during rotation of the drum in the spin-drying mode.

According to the invention a deflector for a door of a washing-machine tub, said door closing the loading funnel of a tub of a washing-machine having a drum with a horizontal shaft, faces the drum and is generated by a generatrix, lying in a plane which passes through and is rotated about the axis of rotation of the drum, the path generatrix being determined by a directrix located in a median plane which is perpendicular to said axis, the distance of the directrix from said axis decreasing in the direction of rotation of the drum during spin-drying.

In a different embodiment of the invention the surface of the deflector which faces the drum is generated by a generatrix, lying in a plane that passes through the axis of rotation of the drum, according to a directrix which is located in a median plane perpendicular to said axis, the directrix having a radius of curvature decreasing in the direction of rotation of the drum during spin-drying.

In yet another embodiment said generatrix is an open curve whose radius of curvature decreases symmetrically from the center towards the ends.

In a particularly simple embodiment, the directrix is formed by at least two straight line segments which contain an obtuse angle, the distance between the free end of the last segment viewed in the direction of rotation of the drum during spin-drying and the axis of rotation of the drum, being shorter than the distance between any point of any other segment and said axis.

The generatrix for this embodiment consists of at least three straight line segments, the central segment which is located in a vertical plane, parallel to the axis of rotation of the drum, is parallel to said axis; the end segments form equal obtuse angles with the central segment; the lengths of said end segments varying from

zero to the distance between the free end of the last segment of the directrix viewed in the direction of rotation of the drum during spin-drying and a horizontal plane which contains at least one point of the first segment of the directrix viewed in the direction of rotation of the drum during spin-drying.

In still another embodiment the deflector for a door of a washing-machine tub consists of a flat part which is bounded at three of its four sides at the surface which faces the drum by a ridge which makes an angle greater than 90° with said flat part, the first and last sides being parallel to the drum axis, the last side as viewed in the direction of rotation of the drum during spin-drying being provided with the highest ridge and the height of the two adjacent ridges increasing from the first side viewed in the direction of rotation of the drum during spin-drying towards the highest ridge.

In a still further embodiment of the deflector, which acts as a tub door, the first edge parallel to the drum axis viewed in the direction of rotation of the drum during spin-drying is provided with a hinge to the edge of the funnel.

In order to avoid that, when the door is opened, water drips off the door onto the top of the machine, the edge provided with the hinge is provided with an extension which makes an angle with the flat part, said angle being a right or obtuse angle directed towards the outside of the tub, said extension which comes from the top of the funnel guiding the drops into the tub.

In an inexpensive embodiment, the deflector is made of a single piece of a plastic material.

According to one feature of the invention a space is provided between the part of the funnel which is situated opposite the highest ridge part and the outer surface of said ridge.

This part of the funnel may take the form of a separate component.

The space thus provided communicates with the supporting edge of the door provided with the deflector and constitutes a suction duct for the water which may be contained in the door frame.

In yet a further embodiment of the invention, the wall which connects to the part of the deflector, which is defined by the generatrix in the positions for which the distance of the directrix to the drum axis is smallest, is provided with openings which are located at a small distance from the inner surface of said part.

The following descriptions and drawings are given by way of example in order that the invention be more fully understood.

FIG. 1 shows a sectional view, along a plane perpendicular to the drum axis, of a deflector according to the invention.

FIG. 2 is a sectional view in accordance with A of the preceding Figure.

FIGS. 3a and 3b show different embodiments of a deflector according to the invention.

FIG. 1 is a sectional view, viewed parallel to the drum axis, of a part of a washing-machine of the top loading type with a horizontal drum shaft.

A drum 1 with a door 2 is located in the tub 3. At the upper part of the tub an opening is provided over which a loading funnel 4 is mounted by means of a sealing device, known per se, which consists of fixing bolts 5 which attach the funnel 4 to the tub 3, a seal 6 being inserted between them. Said funnel defines a rectangular opening to the edges of which a surrounding casing

7 is fixed in which a frame 8 for a rectangular door 9 is provided. A hinging device 10 is mounted at the small edge of the door and the frame which is first passed in the direction of rotation of the drum during spin-drying. The door 9 has a flat surface which is flush with the frame 8 and which forms a horizontal plane. Opening said door, by rotating it upward about the hinge 10, gives access to the drum for loading or unloading purposes.

At the inside of the door 9 opposite the tub, a deflector 11 is located whose surface which faces the drum is defined by a generatrix lying in a plane that passes through and is rotated about the axis of rotation of the drum, the path of the generatrix being determined by a directrix located in a median plane perpendicular to said axis. The radius of curvature of the directrix relative to said axis decreases in the direction of rotation of the drum during spin-drying.

The generatrix which is situated in a plane which passes through the axis of rotation of the drum, is represented in FIG. 2 by the part 11, while the directrix which is situated in a plane which is median and perpendicular to the drum axis is represented by 13 in FIG. 1. The radius of curvature of the path 30 of a free end of said generatrix decreases in the direction of rotation of the drum during spin-drying, which is denoted by the arrow, so that a part 14 is obtained whose distance to the drum axis is smaller than the distance between the part 13 and the drum axis.

In one embodiment the generatrix of the deflector of FIG. 1 is an open curve whose radius of curvature decreases symmetrically from the center towards the ends 15 and 16.

In a preferred embodiment of the deflector shown in FIGS. 1 and 2, the various curves consists of straight line segments. For example, the generatrix comprises a central segment 12 parallel to the drum axis and two end segments 15 and 16 which make obtuse angles with the central segment. The directrix represented in FIG. 1 consists of two straight line segments, a first horizontal segment 13 and a second segment 14 which makes an obtuse angle therewith.

As is shown in FIG. 2, the segments 15 and 16 relative to a vertical plane which is parallel to the axis of rotation of the drum, have lengths increasing from 0 to the distance between the free end 17 of the last segment of the directrix viewed in the direction of rotation of the drum during spin-drying and a horizontal plane which contains at least one point of the first segment 13 of the directrix viewed in the direction of rotation of the drum during spin-drying.

Accordingly, the deflector, in said preferred embodiment, consists of a flat central part, represented in cross-section by 13, which is bounded at three of its four sides by ridges 14, 15 and 16 which make an obtuse angle with the flat part, whilst the highest ridge 14 is provided at a small side parallel to the drum axis which is situated last viewed in the direction of rotation of the drum during spin-drying, the heights of the edges 15 and 16 increasing from 0 at the hinge 10 to the height of the ridge 14 at the side opposite the hinge 10.

At the sides facing the sides of the funnel, the ridges are enclosed by walls whose edges engage with the door 9. The walls which adjoin the ridges 15 and 16 are perpendicular to the surface of the door 9, while the wall which adjoins the ridge 14 makes an angle with the surface of said door 9.

The edge of the deflector located near the hinge 10 has an extension 18 which makes an acute or obtuse angle with the flat part 13, which angle is directed towards the outside of the tub. Such extension 18 serves to ensure that when the door is opened drops from the deflector can flow to the tub thus avoiding that drops fall onto the machine surface or in the door frame.

A space 22 is provided between the funnel part 19 and a wall 20 which adjoins the highest ridge of the deflector, which space communicates with the part of the frame 8 on which the supporting edge 21 of the door 9 with the deflector 11 rests. Said space functions as a suction duct during spin-drying and sucks water which may be contained in the door frame 8 towards the tub.

In an embodiment of the invention shown in the Figures, the funnel part 19 consists of a separate part which substantially follows the shape of the wall 20 of the ridge 14.

The operation of such a deflector is based on the fact that during spin-drying the water which at the inlet of the funnel is thrown towards the door is diverted by the deflector in the form of a high-speed water jet which, as it emerges at 17 to fall back into the tub, produces a reduced pressure in the space 22 and thus sucks back the water that happens to pass between the ridges 15 and 16 and the sides of the funnel. In order not to break the water jet which escapes at 17, said part 17 should preferably be located slightly underneath the wall 19 of the funnel, i.e. slightly closer to the drum wall than the tub wall.

Said suction to a certain extent also keeps the door in engagement with its frame. In the frame (FIG. 2) a safety device 23 must be provided which stops the drum when the door is opened. Said device in an embodiment known per se comprises a circuit breaker (not shown) which is included in the circuit which interrupts the motor supply.

The deflector takes the form of an injection-molded plastics part. The hollow shape thus obtained helps to support the actual door 9 of the machine, which door 9 only has a secondary function because at its edges the deflector is provided with the necessary supports, so as to ensure that the door remains in its frame, and a part of the hinge, whilst the door handle 24 of the door may even be integral with a part of the wall 20.

The embodiment of the deflector of FIGS. 3a and 3b is based on the same concept as the previously described embodiments. FIG. 3a is a perspective view of the door 9 provided with a deflector which consists of a part 25 which is defined by two surfaces.

The surface 26 which faces the drum is generated by a generatrix, which is disposed in a plane that passes through the drum axis, according to a directrix which is disposed in a median plane perpendicular to said axis; its distance to said axis, and the radius of curvature, decrease in the direction of rotation of the drum during spin-drying which is indicated by the arrow in FIG. 3b. The sides which are perpendicular to the drum axis are left open or, as shown in FIG. 3a, are provided with a sort of grille 27 which permits the water which may rise along the walls during spin-drying, to penetrate the deflector and to leave through an end surface apertures 28 in the wall connected to the surface 26 at the position for which the distance of the directrix to the drum axis is minimal. The lower part of said apertures is level with the inner surface of the deflector 26.

The suction obtained in the suction duct 22 (FIG. 3b) owing to the shape of the deflector ensures that water can be drained through the apertures 28, so that water cannot rise between the edges 27 of the deflector and of the loading funnel.

FIG. 3b is a sectional view of a door having a deflector of the shape shown in FIG. 3a mounted over the opening of the loading funnel 4. The door 9, whose hinge 10 is at the end first passed in the direction of rotation of the drum during spin-drying, is equipped with a deflector which consists of a surface having the shape according to the invention. Said deflector is attached to the inner surface of the door 9 by devices known per se and in FIG. 3b represented by screws 29.

The deflector may consist of a sheet of a stainless metallic material or of a profile of a plastic material, in which case the door and the deflector can be made of a single piece.

What is claimed is:

1. A door for a washing-machine tub, said door of the type closing a loading funnel of a tub of a washing-machine having a drum which rotates about an axis of a horizontal shaft, wherein the improvement comprises a deflector for said door, said deflector comprising a surface which faces the drum and is defined by a generatrix, lying in a plane that passes through and is rotated about the axis of rotation of the drum, a directrix of said generatrix lying in a plane which is median and perpendicular to said axis, said directrix having a distance from said axis which decreases in the direction of rotation of the drum during spin-drying, and means for supporting said surface from said door.

2. A deflector as claimed in claim 1 wherein said generatrix is an open curve having a center and ends whose radius of curvature decreases symmetrically from the center towards the ends.

3. A deflector for as claimed in claim 1 wherein said directrix consists of at least two intersecting straight line segments which enclose an obtuse angle, the distance between a free end of a last segment, viewed in the direction of rotation of the drum during spin-drying and the axis of rotation of the drum being shorter than a distance between any point of any other segment and said axis.

4. A deflector as claimed in claim 1, wherein said generatrix consists of at least a central and two end straight line segments, the central segment being disposed in a vertical plane, parallel to the axis of rotation of the drum, and parallel to said axis; the end segments forming equal obtuse angles with the central segment, the lengths of said end segments increasing from zero to a distance between a last free end of the directrix as viewed in the direction of rotation of the drum during spin-drying and a horizontal plane which contains at least one point of a first segment of the directrix viewed in the direction of rotation of the drum during spin-drying.

5. A deflector as claimed in claim 4, wherein said surface comprises a flat part having four sides, at least three adjacent sides being bounded by ridges which make an angle of minimum 90° with said flat part, a last side viewed in the direction of rotation of the drum during spin-drying being parallel to the drum axis having a highest ridge, the height of the two adjacent ridges increasing from a first side viewed in the direction of rotation of the drum during spin-drying towards the highest ridge.

6. A deflector as claimed in claim 5, wherein the first side is parallel to the drum axis, said first side being adjacent a corresponding side of the door hinged to the edge of the funnel.

7. A deflector as claimed in claim 6, further comprising an extension of said surface along said first side, extending at an obtuse angle from the flat part directed towards the outside of the tub.

8. A deflector as claimed in claim 7, wherein said deflector consists of a single piece of a plastic material.

9. A deflector as claimed in claim 6, wherein said highest ridge is spaced from a part of the funnel so as to form a duct therebetween, said duct communicating with an edge of the door which supports the deflector, such that a suction duct is formed.

10. A door for a washing-machine tub, said door of the type closing a loading funnel of a tub of a washing-machine having a drum which rotates about an axis of a horizontal shaft, wherein the improvement comprises a deflector for said door, said deflector comprising a surface which faces the drum and is defined by a generatrix lying in a plane that passes through and is rotated about the axis of rotation of the drum, a directrix of said generatrix lying in a plane which is median and perpendicular to said axis said directrix having a radius of curvature which decreases in the direction of rotation of the drum during spin-drying, and means for supporting said surface from said door.

11. A deflector as claimed in claim 10 wherein an edge of said surface is adjacent a corresponding edge of the door hinged to the edge of a funnel, said edge corresponding to an end of said directrix having the greatest radius of curvature.

12. A deflector as claimed in claim 11, comprising in addition an end surface connecting to the surface connecting to the surface which faces the drum along a line corresponding to a least radius of curvature of said directrix, said end surface spaced from a part of the funnel so as to form a duct therebetween, said duct communicating with an edge of the door which supports the deflector, such that a suction duct is formed.

13. A deflector as claimed in claim 12 wherein said end surface has openings adjacent said line of connection with said surface which faces the drum, whereby water collected inside said deflector may be sucked therefrom.

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