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(54) Drum paddle for a washing machine

Trommelschaufel für Waschmaschine

Pale de tambour pour machine à laver

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Description

TECHNICAL FIELD

[0001] The invention relates in general to a drum for a washing machine and in particular to the design of the paddles and drainage holes of the drum for ensuring efficient evacuation or removal of undesired particles and/or water from the drum at the same time.

BACKGROUND ART

[0002] Drums, or washing drums, designed for today's washing machines must preferably be designed so as to be able to ensure a good washing action, such that laundry is made clean, and efficient spin-drying, such that the drying of the laundry, after the latter has been washed, is quicker and more energy-efficient. Washing machines can be divided into two main groups, the first group being agitator machines which are provided with an agitator or stirrer that is normally placed in the centre of the drum, in which case the agitator, during rotation, moves round and stirs the laundry in a usually vertical drum.

[0003] The second type of machine has a rotating drum whose rotation causes the laundry to be stirred and rinsed around in the washing water. The rotating drums are normally placed such that they have a horizontal rotation axis around which they rotate. To improve the ability to stir the laundry around, the inside of the jacket surface of the rotating drum is usually provided with a number of paddles placed equidistantly from one another. During washing, the drum rotates and the paddles help to lift the laundry slightly before its falls from the paddle, thus improving the stirring action compared to the situation if the drum was completely smooth. The drum is also usually provided with perforations in the jacket surface, so-called drainage holes, through which washing and rinsing water can pass in and out. An example is known from WO 2005/071154 A2.

[0004] These holes also function for drainage of small particles that may have been present in the laundry when the latter was loaded into the drum. There is normally a requirement that these drainage holes must be relatively large in respect of the actual washing process, in order to achieve good drainage of water and particles and also good mixing of detergent with the water. In spin-drying, however, there is an opposite requirement as regards the size of the drainage holes, i.e. they must be relatively small in order to permit spin-drying that is as gentle as possible. The invention relates to a washing drum that is designed to solve this problem, i.e. a washing drum that ensures efficient drainage and also ensures gentle spin-drying.

DISCLOSURE OF INVENTION

[0005] The invention thus relates to a drum, or washing drum, for a washing machine. The drum comprises a jacket surface provided with drainage holes and at least one paddle. There are normally at least two paddles in the washing drum, usually two to four washing paddles, placed on the jacket surface of the inside of the drum. These paddles are preferably placed rotationally symmetrically such that the drum, during rotation, is subjected to the lowest possible rolling forces. A usual construction is for the paddle to extend parallel to the centre axis of the drum, i.e. along generatrices of the drum, and along almost the entire extent of the drum in the axial direction. The paddle can also be shorter and/or slightly angled with respect to the centre axis of the drum. The paddles can vary considerably in appearance.

[0006] The simplest type of paddle consists of a plate that protrudes from the inside face of the drum. However, the paddles usually have more sophisticated shapes and can, for example, be substantially V-shaped (seen in a radial cross section of the drum) with two equilateral walls which are secured to the jacket surface of the drum and form the broad base and come together at a top which is usually slightly rounded in order to avoid too sharp an edge pulling too hard on the laundry.

[0007] It is also possible to design the paddle with unequal sides, such that one side is relatively gently sloping and provides a relatively soft transition between the jacket surface of the drum and the paddle, while the other side of the paddle has a more vertical angle with respect to the jacket surface. The paddle can also be U-shaped with substantially perpendicular walls at its base on the jacket surface of the drum and a gently rounded top or can be of a shape that is a combination of a U-shape and the previously described variants of the V-shape. The shape of the paddle can also resemble a sinus curve or can be of a type that has a more or less cuboid character with walls secured to the jacket surface and, between these, a more clearly defined "roof" which constitutes the top of the paddle at its distal end as seen from the jacket surface of the drum. The shape of the paddle can also vary along its axial extent along the drum, and such variations will be described in more detail below. The paddles can thus be configured in a number of different ways in order to perform their function of stirring the laundry.

[0008] According to a first embodiment of the invention, at least one of the paddles is provided with at least one evacuation hole. The aim of such an evacuation hole is to ensure that coarse particles of dirt, for example grit or small stones, which cannot normally pass through the drainage holes of the washing drum, will be able to pass through the evacuation holes and in this way be evacuated from the drum during washing.

[0009] The evacuation hole or evacuation holes is/are normally positioned in the paddle near the base thereof on the jacket surface of the drum, such that the undesired particles that have ended up in the drum can easily be conveyed into the evacuation holes during washing. In normal cases, the particles that are freed from the laundry gather in the lower part of the drum and rest against the jacket surface of the drum. During rotation of the drum,

the particles which rest against the surface of the drum, but which are too large to pass through the usual drainage holes in the jacket surface of the drum, are transported towards the paddle, where they can then disappear from the drum through the evacuation holes in the paddle. Drainage holes mean the holes which are formed in the jacket surface of the drum and which are open and are intended to be in contact with the laundry during washing. Therefore, drainage holes are not holes that lie hidden underneath or behind the paddle and are thus protected from direct contact with the laundry.

[0010] When the evacuation holes are said to lie near the surface of the drum, this means that the holes are placed at most 2 cm from the jacket surface of the drum and more preferably less than 1 cm from the jacket surface of the drum. A normally advantageous position of the evacuation hole is one in which it adjoins the jacket surface.

[0011] In order to provide good evacuation of particles, the area of the evacuation hole should be at least twice as great as the mean area of the drainage holes located in the jacket surface of the drum, and the size of the evacuation holes is often up to 3 times as great or even 4 times as great as the mean area of the drainage holes in the jacket surface. The drainage holes in the jacket surface can vary in size and shape but are normally round holes with a diameter of between 2 and 4 mm. To ensure that the evacuation holes perform a good function, they should be larger than the largest drainage holes in the jacket surface of the drum, and the evacuation holes are normally at least twice as large as the largest holes and in many cases at least 3 times as large.

[0012] In addition to the size of the evacuation holes, the shape of the holes may also be of great importance. While the usual drainage holes in the washing drum are in most cases round, the shape of the evacuation holes can vary from oblong parallelepipeds to rectangular or round, semicircular or oval. In order to achieve good evacuation of different types of particles, it may be an advantage to provide the paddles with evacuation holes of different sizes and different shapes.

[0013] The evacuation holes should be at least 20 square millimetres, and in many cases it is preferable for them to be larger and the evacuation holes can be at least 30 square millimetres or even 40 square millimetres. As regards the maximum size, it should be small enough to minimize the risk of any laundry becoming stuck in the evacuation hole. In addition to its size, the shape of the hole and the configuration of its opening are also of importance as regards the risk of laundry becoming stuck in the hole.

[0014] For machines designed for domestic use with great variation in the laundry in the form of different items of clothing and the like, the shape and size of the hole should be adopted such that, for example, buttons or other parts of an item of clothing cannot become stuck in the evacuation holes such that the clothes are torn mechanically by some of them getting caught in the hole. For these machines, the size of the evacuation hole is not normally greater than 1 square centimetre, in order to avoid damage to the laundry. The size of the evacuation holes is normally between 20 and 100 square millimetres, although there may be deviations from this range.

[0015] As has been described earlier, the paddle can vary in terms of its shape, and, by adapting the paddle according to the position of the evacuation holes, the evacuation of particles through these holes can be improved. Evacuation can be improved many times over if the angle between the side surface of the paddle, in which the evacuation hole is located, and the jacket surface of the drum is less than 135 degrees, preferably less than 120 degrees and most preferably less than 105 degrees. By having the evacuation hole located in a wall or side surface of the paddle that is relatively vertical, the particles located in the washing drum follow the paddle further than if the side surface of the paddle lies relatively flat along the jacket surface of the drum.

[0016] In order to further improve the evacuation of particles through the evacuation hole or the evacuation holes in the paddle, the base of the paddle, where it bears against the jacket surface of the drum, can be designed such that particles are conveyed in the axial direction towards the evacuation hole during rotation of the drum. For example, the base could be outwardly wedge-shaped or convex in the middle part of the paddle in the longitudinal extent thereof (i.e. the paddle is provided, in its middle part, with an outward curve or wedge in the direction of rotation of the drum), which normally coincides with the axial direction of the drum, such that particles resting against the base of the paddle on the jacket surface of the drum are guided to each end of the paddle towards evacuation holes located relatively near the ends.

[0017] It is of course also possible to design the base of the paddle such that it is wider at the ends of the paddle, in the longitudinal direction, than at its middle, with the effect that particles are conveyed in towards the middle where one or more evacuation holes are located. It is of course also possible that the base has an undulating or sawtooth-shaped geometry, such that it bulges out and curves in with uniform (or non-uniform) spaces there between, and that evacuation holes are positioned in the inward curves to which particles are conveyed and can disappear through the evacuation holes. Another possible configuration is one in which the base of the paddle has a contour narrowing in the longitudinal direction, such that the paddle, at its base, is narrower at one end of the drum than at the other end, and such that particles are conveyed towards evacuation holes placed at one end of the drum.

[0018] A method of further improving the properties of the washing drum, both in terms of its drainage properties and also in terms of its ability to perform gentle spin-drying, can be achieved if the jacket surface of the drum comprises at least one axially limited first zone with drainage holes (3) primarily designed to ensure good drainage

during washing (drainage zone), and also an axially limited second zone with drainage holes primarily designed to ensure support of the laundry during spin-drying (spin-drying zone).

[0019] It is obvious to a person skilled in the art that such a division into different zones would also be possible without these zones being used in a drum provided with evacuation holes in the paddles. It is also obvious that the measures described below for guiding the wash in the drum also function without evacuation holes in the paddles. If the drum is provided with two or more different zones (spin-drying zones and drainage zones), the drum should be designed such that the laundry is initially guided towards the zone or zones of the drum that are designed for gentle spin-drying. In many cases, when it is desirable to have gentle spin-drying, this entails laundry that is quite delicate and, consequently, in many instances such laundry is washed separately or in washes with relatively little detergent in the drum, such that the latter is not full. By various measures, the laundry can therefore be more or less guided to axially different zones of the drum. Such guiding could, for example, take place if the centre axis of the drum slopes, such that the laundry is guided towards one of the two edges in the axial direction.

[0020] It is also possible to guide the laundry by having the jacket surface of the drum curved, for example by having the drum narrow slightly at the centre such that it has a smaller radius at its middle, in the axial direction, than at its axial ends, i.e. a contour resembling an hour-glass, which carries the laundry towards the ends in the axial direction. It is also possible to imagine the drum having a greater radius at its middle, in the axial direction, than at its axial ends, such that it has a barrel-shaped contour, and such that the laundry in such a drum is guided away from the ends of the "barrel" towards the middle of the barrel in the axial direction. A further possibility is one in which the drum is slightly conical and has the shape of a truncated cone, such that its radius at one axial end is smaller than at its other axial end, and such that the laundry is thus guided during washing towards the end with the greater radius. It may also be possible to guide the laundry to different zones of the drum by means of the design of the paddles of the drum.

[0021] The side surface of the paddle can be shaped at its upper part or distal end, i.e. the end of the side surface farthest away from the base on the jacket surface of the drum, in such a way that it is concave, convex or wedge-shaped in the longitudinal direction, such that laundry is conveyed in the axial direction, during rotation of the drum, towards the zone of the drum in the axial direction that is designed for spin-drying the laundry. Therefore, at least the upper third of the side surface is preferably designed in this way, and in some cases the entire side surface, from its base to its distal end, can have such a configuration. It will be noted that the paddle does not need to have a special configuration of this kind along the entire longitudinal extent, and in many cases only part of the paddle in the longitudinal extent is designed in this way.

[0022] Another way of guiding the laundry towards the desired part of the drum in the axial direction can be if the angle between the side surface of the paddle and the jacket surface of the drum differs along the longitudinal extent of the paddle. By means of the inclination of the paddle differing, the ability of the laundry to follow the paddle during rotation differs along the longitudinal extent of the paddle. If the angle between the paddle is more or less a right angle, i.e. around 90 degrees or even below 90 degrees, the laundry is guided a relatively long distance. By contrast, if the angle is greater than 90 degrees, for example from 105 degrees and upwards, the laundry will drop from the paddle at an earlier stage. As the laundry drops, laundry lying to the side of the laundry is able to move towards the space that has been emptied, and the laundry is thus guided to the desired part of the drum in the axial direction.

[0023] The movement of the laundry towards the space that has been emptied often occurs as a result of the fact that the laundry has been partially pressed together, and a spontaneous shifting of the laundry takes place in the direction towards the space that has been emptied when the laundry drops from the paddle. The guiding of the laundry is especially of interest for the spin-drying phase of the wash cycle, and the drum is therefore intended to be designed such that the part of the paddle placed in the spin-drying zone or the spin-drying zones has, on average, a greater angle than the part of the paddle (5) placed in the drainage zone or drainage zones, which means that the laundry, during rotation of the drum, will drop earlier from those parts of the paddle located in the spin-drying zone, and the laundry is thus guided towards the spin-drying zone.

[0024] According to one embodiment of the invention, the above two principles concerning the design of the paddle for guiding the laundry can be combined, that is to say, on the one hand, the paddle has a different inclination in different parts of its longitudinal extent, such that the laundry drops earlier at those parts that are more angled, and, on the other hand, the paddle is concave, convex or wedge-shaped in the longitudinal extent, such that laundry is conveyed in the axial direction during rotation of the drum. These features are preferably arranged such that they cooperate to guide the laundry towards the desired axial position, which is normally the zone of the drum where the laundry is to be located during spin-drying.

[0025] If the drum comprises paddles provided with evacuation holes, these holes can advantageously be placed in the axially defined first zone (first type of zone) that is designed for good drainage (drainage zone).

[0026] For a drum comprising different types of axially limited zones, it is normally the case that the mean area of the drainage holes in the first zone, the drainage zone, is greater than the mean area of the drainage holes in the second zone, the spin-drying zone. The different zones can, for example, consist of round drainage holes,

of the same size in each zone, in the jacket surface of the drum, and the holes in the spin-drying zone can, for example, have a diameter of between just below 2 mm and up to 4 mm, while the radius of the holes in the drainage zone is, for example, from ca. 3 mm up to ca. 5 mm. These values apply normally to a washing machine designed for domestic use and for normal domestic laundry. Deviations can of course occur in the size of the holes, especially for washing machines designed for other areas of application. Normally, however, the area of the holes (or, in the case of holes with different areas within each zone, the mean area of the holes in the zone) is preferably at least twice as great for the holes in the drainage zone as for the holes in the spin-drying zone.

[0027] A drum can therefore be designed such that at least the width of one of its paddles, at the distal end thereof, is narrower in the middle third of the longitudinal extent of the paddle than in the two outer thirds. This means therefore that the paddle in its uppermost part, that is to say the part of the paddle or side wall of the paddle farthest from its base, is designed such that, when normally placed in the drum with an extent in the longitudinal direction substantially parallel to the axial direction of the drum and along most of the length of the drum in the axial direction, is wider at its ends placed near the axial ends of the drum than at the axial middle of the drum, i.e. the distal part has a contour resembling an hour-glass. According to one embodiment, such a contour in the upper, distal part of the paddle is combined with a contour in which the paddle, at its base, curves outwards at the middle in the longitudinal direction of the paddle and narrows at its ends.

[0028] If the paddle sits securely on the jacket surface of the drum with an extent in the longitudinal direction substantially parallel to the axial direction of the drum, such a shape of the paddle would have the effect that, during washing of laundry, i.e. during rotation of the drum about its axis, material or particles primarily in contact with the base of the paddle will be guided out towards the axial ends of the drum, whereas particles or material primarily in contact with the upper part of the paddles and with the distal end of the side walls of the paddle will be centred towards the middle. This normally means that small particles lying against the jacket surface of the drum, for example grit, are primarily in contact with the base of the paddle and are guided out towards the ends of the paddle, whereas larger units, normally laundry, often lie more against the upper part of the paddle and are thus guided towards the middle of the paddle. Such a design can be especially suitable for a drum which, in a zone around the drum in the axially middle part of the drum, is primarily designed with drainage holes for ensuring support for gentle spin-drying of the laundry, which corresponds to a spin-drying zone, and if the drum, in the axially outer zones on each side of the central zone, is primarily designed with drainage holes for ensuring good drainage of the drum during washing, which corresponds to a drainage zone. If the paddle is additionally provided with drainage holes, these are in this case placed, for example, in the outer zones, the drainage zones, or near these zones.

[0029] The design of the paddle at its base and its design at different heights do not always need to be adapted to each other and can be designed independently of each other according to which functions it is desired to achieve. For example, it is possible to combine a paddle whose average width at its base is wider in the middle third of the longitudinal direction of the paddle than in the two outer thirds with many different shapes of the paddle in its upper parts, for example if it is only of interest to guide those items and particles that are relatively small and lie against the jacket surface of the drum in the lower region thereof, for example grit, and it is not of interest to seek to any great extent to guide other larger items, for example laundry, to a particular axial position.

[0030] It is also obvious that different shapes of the paddle can be combined with different geometries of the actual drum, in order to enhance the effect of guiding particles and laundry, or that different effects can be allowed to complement one another. In many cases it is undesirable for laundry and/or particles to be guided too far out towards the axial edges of the drum. This can be remedied, for example, by the radius of the drum being greater at the middle of its axial extent than at each axial end. Such a design of the drum can be suitable, for example, if the average width of the paddle at its base is wider in the middle third of the longitudinal extent of the paddle, for example by having an outwardly rounded curve, than in the two outer thirds, where the paddle can be substantially straight. If the paddle is provided with evacuation holes, these can in this case be located at one or both of the outer thirds, such that, during rotation of the drum, particles and grit are carried outwards from the middle by the design of the paddle, whereas grit and particles at the distal ends of the drum are conveyed inwards by the shape of the jacket surface of the drum, and, in this way, the particles both from the ends and from the middle are conveyed towards the evacuation hole.

DESCRIPTION OF THE FIGURES

[0031]

Fig. 1 shows a perspective view of a drum provided with a paddle according to a first embodiment of the invention, with a first type of evacuation hole,

Fig. 2 shows an axial cross section of the drum in Figure 1 according to the first embodiment,

Fig. 3 shows an enlarged view of a paddle from Figure 1 according to the first embodiment,

Fig. 4 shows a paddle according to the first embodiment of the invention, in a perspective view from

above,

Fig. 5 shows a paddle according to the first embodiment of the invention, in a perspective view from below,

Fig. 6 shows a perspective view of a barrel provided with a paddle according to a second embodiment of the invention,

Fig. 7 shows an axial cross section through the drum in Figure 6 according to the second embodiment,

Fig. 8 shows an enlarged view of a paddle from Figure 6 according to the second embodiment,

Fig. 9 shows a paddle according to the first embodiment of the invention, in a perspective view from above, with a second type of evacuation hole,

Fig. 10 shows a paddle according to the first embodiment of the invention, in a perspective view from above, with a third type of evacuation hole.

PREFERRED EMBODIMENTS

[0032] Figures 1 and 2 show a drum 1 designed to be placed in a washing machine, in which it constitutes part of the boundary surface for the laundry that is intended to be washed in the washing machine. In the figures, the drum is shown with openings at both ends thereof in the axial direction. When mounted in a washing machine, one opening comes to be blocked off by a back piece, while the front end can normally be closed by a door in the front of the washing machine and is used to allow laundry to be loaded into and removed from the drum 1. The drum 1, or wash drum as it can also be called, has a jacket surface 2 that is normally made of stainless metal but can also be made of other materials. As regards the concept of the invention, the choice of material for the drum 1 is not considered to be of particular importance.

[0033] The jacket surface 2 has been provided with a number of drainage holes 3, 4, which are intended to allow washing water and rinsing water to pass through the jacket surface 2 of the drum and in this way give a good washing and rinsing action. Drums with drainage holes 3, 4 of the same size are presumably most common, but there are also variants with holes of different sizes, and, in the drum 1 shown here, there are two axially outer regions with larger drainage holes 3, and these holes are advantageous primarily on account of their ability to allow particles and water out of the drum 1, while the central region of the drum 1 is provided with smaller drainage holes 4, which means that the surface of the drum is less uneven or does not have such large depressions, thus providing better support during spin-drying of the laundry. These different zones can, for example, function as what are here called spin-drying zones (the central zone with smaller holes) and drainage zones (the zones with larger drainage holes located on both sides of the spin-drying zone).

[0034] The drum is also provided with three paddles 5, of which only one is seen clearly in the figure, while the others can only be gleaned from the design of the outside of the lower part of the drum in Figure 1, where the drum has been provided with outlet holes 12 under the paddle, and can be discerned in the upper left part of the figure. The three paddles 5 are placed equidistantly around the jacket surface of the drum 1, such that the paddles 5 are placed rotationally symmetrically. In this case, the longitudinal extents of the paddles 5 are parallel to the centre axis of the drum, although it is possible to imagine them having an extent that is at a slight angle with respect to the axial direction of the drum.

[0035] The paddle that is visible in Figure 1 is shown in an enlarged view in Figure 3. In this figure, it is easier to see the evacuation holes 6 that are located on the paddle 5, or more precisely in the side surface 7 of the paddle, quite near the longitudinal ends of the paddle. The evacuation holes 6 are located at the base 8 of the paddle, such that they adjoin the jacket surface 2. The holes are rectangular, as can be seen more clearly from Figure 4. The latter also shows the general shape of the paddle which, at the base 8 thereof, is uniformly thick at the longitudinal ends but bulges out or is convex at the longitudinal middle part of the paddle, i.e. the central part in the axial direction of the drum.

[0036] At the upper part and distal end 9 of the paddle, i.e. the part farthest from the base of the paddle, the paddle 5 is uniformly thick at its longitudinal ends, while the longitudinal middle part curves inwards, and the upper part of the paddle 5 is thus reminiscent of the contour of an hour-glass. In this embodiment, most of the middle part or middle segment of the paddle 5 is designed with a surface having a shape similar to part of a ball or a sphere which, at the far bottom at the base 8, has been provided with an edge. The aim of this design is, on the one hand, to provide a middle part of the side surface 7 of the paddle that slopes more than the outer parts of the paddle 5 relative to the jacket surface 2 of the drum and, in this way, ensure that the laundry rolls off the paddle 5 at an earlier stage during rotation of the drum 1, and the hollowing-out in the middle part of the drum 1 ensures that the laundry is more easily moved in towards the centre of the drum 1 and thus provides a movement of the laundry in the desired direction.

[0037] With a paddle 5 designed and placed in the drum 1 according to this first embodiment, the laundry is thus guided to the middle part of the drum (the spin-drying zone) which, by virtue of its design with the relatively small drainage holes 4, is specially adapted for spin-drying the laundry. In this embodiment, the holes in the spin-drying zone are of uniform size and round, with a hole diameter of 2.2 mm, while the round and uniform holes in the outer drainage zones are 3.3 mm. It is of course possible to use other sizes or shapes of the holes in the

different zones, and the holes also do not need to be the same size or the same shape within one zone.

[0038] The paddle 5 according to the first embodiment is shown in a view from above in Figure 4. The evacuation holes 6 can be seen more clearly here, and it can be seen that they have a rectangular shape. A suitable size of the holes is that they are ca. 10 mm long and 5 mm high, i.e. have an area of ca. 50 square millimetres. This can be compared to the sizes of the drainage holes 3, 4 which measure ca. 7 and 10 square millimetres, respectively. In this case, therefore, the evacuation hole 6 is 5 times as large as the largest drainage holes 3. However, the difference in size between the drainage holes 3, 4 and the evacuation hole 6 can vary considerably and is usually in the range of 2 to 10 times different.

[0039] Figure 5 shows the paddle 5 in a perspective view from below. It will be seen here how the evacuation hole 6 is connected via a channel 10 to an outlet 11, where the particles can be conveyed out of the drum 1. The outlet 11 is adapted to fit into specially punched outlet holes 12 in the drum (see Figure 1), which are placed under the paddle 5. The channel 10, the outlet 11 and the outlet hole 12 should be designed such that particles and the like that may pass through the evacuation hole 6 do not become stuck in any of them and instead can be conveyed out of the drum 1.

[0040] Figures 6, 7 and 8 correspond substantially to Figures 1, 2 and 3 but show a paddle 5' according to a second embodiment of the invention. In this embodiment, the portion that in the first embodiment was placed in the middle of the drum 1 (see Figure 1) has been shifted towards one of the edges of the drum 1'. During rotation of the drum 1', the laundry is therefore moved to the site where the paddle 5' narrows at its distal end 8, which corresponds to a position, in the axial direction of the drum 1', nearer to one edge and has an axially delimited spin-drying zone all around the drum, which is provided with relatively small drainage holes 4 and functions as a good support surface for the laundry during spin-drying.

[0041] This spin-drying zone is preferably offset toward that end of the drum 1' nearest to the rear part of a washing machine when the drum is mounted in same. The reason for this is that, for a front-load washing machine, the drum is usually suspended and supported in the rear part of the washing machine and, by guiding the laundry towards the rear part, the forces acting on the suspension during spin-drying are lower than if the laundry is placed farther forwards in the drum, i.e. nearer the part that is nearest the loading door.

[0042] In this embodiment, there are no evacuation holes in the paddle 5'. It is of course possible to provide the paddle 5' according to the second embodiment with evacuation holes if so desired. It is of course also possible, conversely, to use a paddle as shown in Figures 1-5 according to the first embodiment of the invention without any evacuation hole, if it is only the function whereby the paddle 5 axially moves the laundry that is of interest.

[0043] Figure 9 shows a second type of evacuation hole 6' in the form of a semicircular hole in the paddle 5, and Figure 10 shows a third type of evacuation hole 6" in the form of a triangular hole. It is therefore possible to use a number of different shapes and sizes of holes.

[0044] In the various figures shown, these have shown that each paddle is provided with 2 evacuation holes on each side of the paddle. It is obvious that the paddle can be provided with fewer or more holes if so desired, and that these can have different shapes. For example, one hole could be relatively narrow and one wide, and another hole more square or round, such that the holes can be adapted to allow particles of different shapes to pass through. In another example, the paddle, in the lower part thereof, can have a system more like bars, such that it resembles a comb which has gap-like openings along part or all of the lower part of the paddle, on the base thereof. Therefore, within the scope of the invention, there are a number of variants as regards the appearance of the evacuation holes.

Claims

1. A drum (1) for a washing machine comprising a jacket surface (2) and at least one paddle (5) with a base (8) placed on the jacket surface, the paddle having a distal end (9) being the part farthest from the base (8),
the jacket surface (2) of the drum comprises at least one axially limited drainage zone with drainage holes (3) primarily designed to ensure good drainage during washing, and also an axially limited spin-drying zone with drainage holes (4) primarily designed to ensure support of the laundry during spin-drying,
characterized in
that a side surface (7) of the paddle (5) is concave, convex or wedge-shaped at a distal end (9) thereof, such that laundry is conveyed in the axial direction from the drainage zone, during rotation of the drum (1), towards the spin-drying zone of the drum,
the angle between the side surface (7) of the paddle (5) and the jacket surface (2) of the drum differs along the longitudinal extent of the paddle, and in that the part of the paddle (5) placed in the spin-drying zone or spin-drying zones has, a greater angle than the part of the paddle (5) placed in the drainage zone or drainage zones (3).

2. A drum (1) according to any of the preceding claims, wherein the mean area of the drainage holes (3) in the first zone, the drainage zone, is greater than the mean area of the drainage holes (4) in the second zone, the spin-drying zone, preferably at least twice as great.

3. A drum (1) according to any of the preceding claims, wherein the average width of the paddle (5) at the distal end (9) thereof is narrower in the middle third

of the length of the paddle (5), in the longitudinal direction thereof, than in the two outer thirds.

4. A drum (1) according to any of the preceding claims, wherein the average width of the paddle (5), at the base (8) thereof, is wider in the middle third of the length of the paddle (5), in the longitudinal direction, than in the two outer thirds.

5. A drum (1) according to any of the preceding claims, wherein the radius of the drum is greater at the centre of the axial extent thereof than at each axial end.

6. A drum (1) according to any of the preceding claims, wherein said at least one paddle (5) is provided with at least one evacuation hole (6).

7. A drum (1) according to claim 6, wherein the evacuation hole (6) adjoins the jacket surface (2).

8. A drum (1) according to any of the claims 6 and 7, wherein the area of the evacuation hole (6) is at least 2 times as great as the mean area of the drainage holes (3, 4) in the jacket surface (2) of the drum (1), more preferably at least 3 times as great, and most preferably 4 times as great.

9. A drum (1) according to any of the claims 6 - 8, wherein the area of the evacuation hole (6) is greater than the largest drainage hole (3) in the jacket surface (2) of the drum and preferably at least 2 times as great as the area of the largest drainage hole (3).

10. A drum (1) according to any of the claims 6 - 9, wherein the area of the evacuation hole (6) is at least 20 square millimetres, preferably at least 30 square millimetres, and most preferably at least 40 square millimetres.

11. A drum (1) according to any of the claims 6 - 10, wherein the angle between the side surface (7) of the paddle (5), in which the evacuation hole (6) is located, and the jacket surface (2) of the drum is less than 135 degrees, preferably less than 120 degrees, and most preferably less than 105 degrees.

12. A drum (1) according to any of the claims 6 - 11, wherein the paddle (5), at the base (8) thereof, is wedge-shaped, concave or convex, such that particles are conveyed in the axial direction towards the evacuation hole (6) during rotation of the drum (1).

Patentansprüche

1. Trommel (1) für eine Waschmaschine, umfassend eine Mantelfläche (2) und zumindest eine Schaufel (5) mit einem auf der Mantelfläche angeordneten Basiselement (8), wobei die Schaufel ein Distalende (9) aufweist, welches der vom Basiselement (8) am weitesten entfernte Teil ist,
wobei die Mantelfläche (2) der Trommel zumindest einen axial begrenzten Ablaufbereich mit Ablauflöchern (3), vorwiegend dazu ausgebildet, während des Waschens einen guten Ablauf zu gewährleisten, und außerdem einen axial begrenzten Trockenschleuderbereich mit Ablauflöchern (4) umfasst, vorwiegend dazu ausgebildet, die Unterstützung der Wäsche während des Trockenschleuderns zu gewährleisten,
dadurch gekennzeichnet,
dass eine Seitenfläche (7) der Schaufel (5) an einem Distalende (9) davon konkav, konvex oder keilförmig ist, so dass die Wäsche während der Drehung der Trommel (1) aus dem Ablaufbereich in der axialen Richtung zum Trockenschleuderbereich der Trommel transportiert wird,
der Winkel zwischen der Seitenfläche (7) der Schaufel (5) und der Mantelfläche (2) der Trommel entlang der Längserstreckung der Schaufel differiert, und dadurch dass der im Trockenschleuderbereich oder den Trockenschleuderbereichen angeordnete Teil der Schaufel (5) einen größeren Winkel aufweist als der im Trockenschleuderbereich oder den Trockenschleuderbereichen (3) angeordnete Teil der Schaufel (5).

2. Trommel (1) nach irgendeinem der vorhergehenden Ansprüche, wobei das Mittelgebiet der Ablauflöcher (3) im ersten Bereich, dem Ablaufbereich, größer als das Mittelgebiet der Ablauflöcher (4) im zweiten Bereich, dem Trockenschleuderbereich, bevorzugt mindestens doppelt so groß ist.

3. Trommel (1) nach irgendeinem der vorhergehenden Ansprüche, wobei die Durchschnittsbreite der Schaufel (5) am Distalende (9) davon im mittleren Drittel der Länge der Schaufel (5), in der Längsrichtung davon, schmaler ist als in den beiden äußeren Dritteln.

4. Trommel (1) nach irgendeinem der vorhergehenden Ansprüche, wobei die Durchschnittsbreite der Schaufel (5) am Basiselement (8) davon im mittleren Drittel der Länge der Schaufel (5), in der Längsrichtung, weiter ist als in den beiden äußeren Dritteln.

5. Trommel (1) nach irgendeinem der vorhergehenden Ansprüche, wobei der Radius der Trommel in der Mitte der axialen Erstreckung davon größer ist als an jedem axialen Ende.

6. Trommel (1) nach irgendeinem der vorhergehenden Ansprüche, wobei die zumindest eine Schaufel (5) mit wenigstens einem Entleerungsloch (6) versehen ist.

7. Trommel (1) nach Anspruch 6, wobei das Entleerungsloch (6) an die Mantelfläche (2) angrenzt.

8. Trommel (1) nach irgendeinem der Ansprüche 6 und 7, wobei die Stelle des Entleerungslochs (6) zumindest zweimal so groß wie das Mittelgebiet der Ablauflöcher (3, 4) in der Mantelfläche (2) der Trommel (1), mehr bevorzugt zumindest dreimal so groß, und am meisten bevorzugt viermal so groß, ist.

9. Trommel (1) nach irgendeinem der Ansprüche 6-8, wobei die Stelle des Entleerungslochs (6) größer als das größte Ablaufloch (3) in der Mantelfläche (2) der Trommel und bevorzugt zumindest zweimal so groß wie die Stelle des größten Ablauflochs (3) ist.

10. Trommel (1) nach irgendeinem der Ansprüche 6-9, wobei die Stelle des Entleerungslochs (6) zumindest 20 Quadratmillimeter, bevorzugt zumindest 30 Quadratmillimeter, und am meisten bevorzugt zumindest 40 Quadratmillimeter beträgt.

11. Trommel (1) nach irgendeinem der Ansprüche 6-10, wobei der Winkel zwischen der Seitenfläche (7) der Schaufel (5), in der sich das Entleerungsloch (6) befindet, und der Mantelfläche (2) der Trommel weniger als 135 Grad, bevorzugt weniger als 120 Grad, und am meisten bevorzugt weniger als 105 Grad beträgt.

12. Trommel (1) nach irgendeinem der Ansprüche 6-11, wobei die Schaufel (5) am Basiselement (8) davon keilförmig, konkav oder konvex ist, so dass Partikel während der Drehung der Trommel (1) in der axialen Richtung zum Entleerungsloch (6) transportiert werden.

Revendications

1. Tambour (1) pour une machine à laver comprenant une surface d'enveloppe (2) et au moins une pale (5) avec une base (8) arrangée sur la surface d'enveloppe, la pale présentant une extrémité distale (9) étant la partie la plus éloignée de la base (8),
la surface d'enveloppe (2) du tambour comporte au moins une première zone de drainage axialement limitée avec des trous de drainage (3) principalement destinée à assurer un bon drainage pendant le lavage, et également une zone d'essorage axialement limitée avec des trous de drainage (4) principalement destinée à assurer l'appui du linge au cours de l'essorage,
caractérisé en ce
qu'une surface latérale (7) de la pale (5) est concave, convexe ou cunéiforme à une extrémité distale (9) de celle-ci, si bien que le linge est transporté dans la direction axiale à partir de la zone de drainage, pendant la rotation du tambour (1), vers la zone d'essorage du tambour,
l'angle entre la surface latérale (7) de la pale (5) et la surface d'enveloppe (2) du tambour varie le long de l'étendue longitudinale de la pale, et en ce que la partie de la pale (5) placée dans la zone d'essorage ou les zones d'essorage présente un angle supérieur à la partie de la pale (5) placée dans la zone de drainage ou les zones de drainage (3).

2. Tambour (1) selon l'une quelconque des revendications précédentes, dans lequel la surface moyenne des trous de drainage (3) dans la première zone, la zone de drainage, est supérieure à la surface moyenne des trous de drainage (4) dans la deuxième zone, la zone d'essorage, préférablement au moins deux fois plus grande.

3. Tambour (1) selon l'une quelconque des revendications précédentes, dans lequel la largeur moyenne de la pale (5) à l'extrémité distale (9) de celle-ci est plus étroite dans le tiers central de la longueur de la pale (5), dans la direction longitudinale de celle-ci, que dans les deux tiers extérieurs.

4. Tambour (1) selon l'une quelconque des revendications précédentes, dans lequel la largeur moyenne de la pale (5), à la base (8) de celle-ci, est plus large dans le tiers central de la longueur de la pale (5), dans la direction longitudinale, que dans les deux tiers extérieurs.

5. Tambour (1) selon l'une quelconque des revendications précédentes, dans lequel le rayon du tambour est plus grand au centre de l'étendue axiale de celui-ci qu'à chaque extrémité axiale.

6. Tambour (1) selon l'une quelconque des revendications précédentes, dans lequel ladite au moins une pale (5) est pourvue d'au moins un trou d'évacuation (6).

7. Tambour (1) selon la revendication 6, dans lequel le trou d'évacuation (6) est contigu à la surface d'enveloppe (2).

8. Tambour (1) selon l'une quelconque des revendications 6 et 7, dans lequel la surface du trou d'évacuation (6) est au moins 2 fois plus grande que la surface moyenne des trous de drainage (3, 4) dans la surface d'enveloppe (2) du tambour (1), plus préférablement au moins 3 fois plus grande, et le plus préférablement quatre fois plus grande.

9. Tambour (1) selon l'une quelconque des revendications 6 à 8, dans lequel la surface du trou d'évacuation (6) est plus grande que le trou d'évacuation le plus grand (3) dans la surface d'enveloppe (2) du

tambour et préférablement au moins 2 fois plus grande que la surface du trou de drainage (3) le plus grand.

10. Tambour (1) selon l'une quelconque des les revendications 6 à 9, dans lequel la surface du trou d'évacuation (6) est au moins 20 millimètres carrés, préférablement au moins 30 millimètres carrés, et le plus préférablement au moins 40 millimètres carrés

11. Tambour (1) selon l'une quelconque des les revendications 6 à 10, dans lequel l'angle entre la surface latérale (7) de la pale (5), dans laquelle le trou d'évacuation (6) est situé, et la surface d'enveloppe (2) du tambour est inférieur à 135 degrés, préférablement inférieur à 120 degrés, et le plus préférablement inférieur à 105 degrés.

12. Tambour (1) selon l'une quelconque des revendications 6 à 11, dans lequel la pale (5), à la base (8) de celle-ci, est cunéiforme, concave ou convexe, si bien que les particules sont transportées dans la direction axiale vers le trou d'évacuation (6) pendant la rotation du tambour (1).

FIG. 1

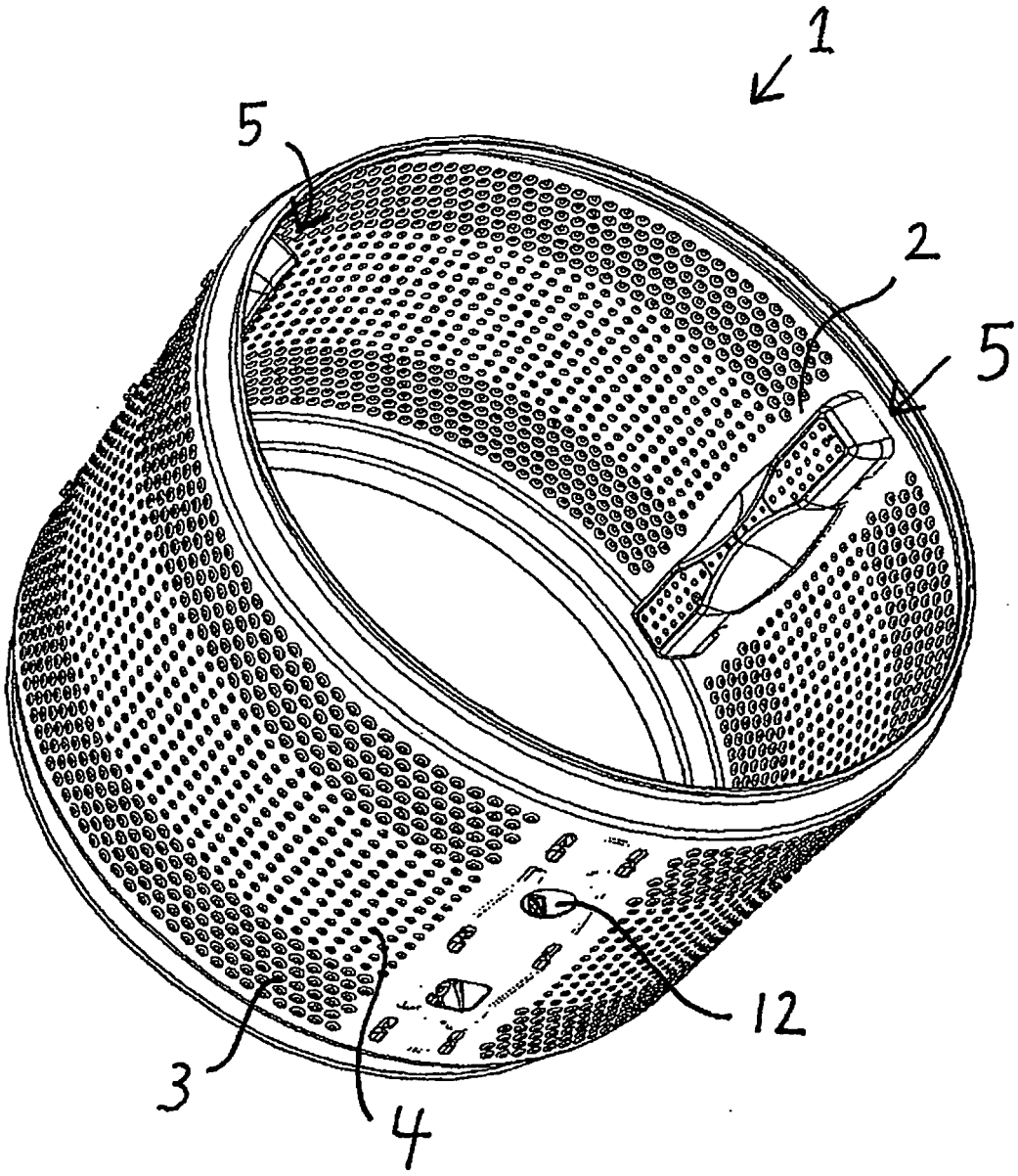


FIG. 2

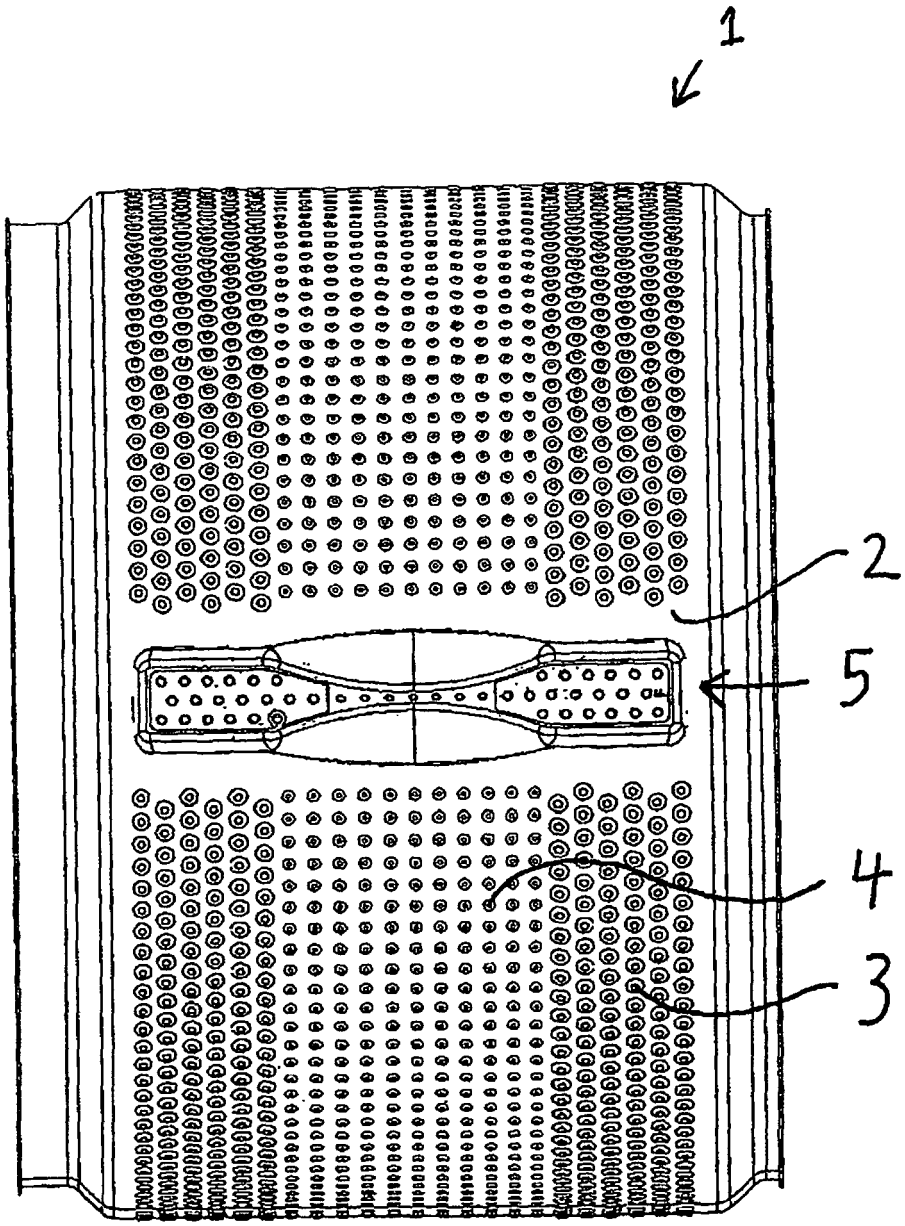


FIG. 3

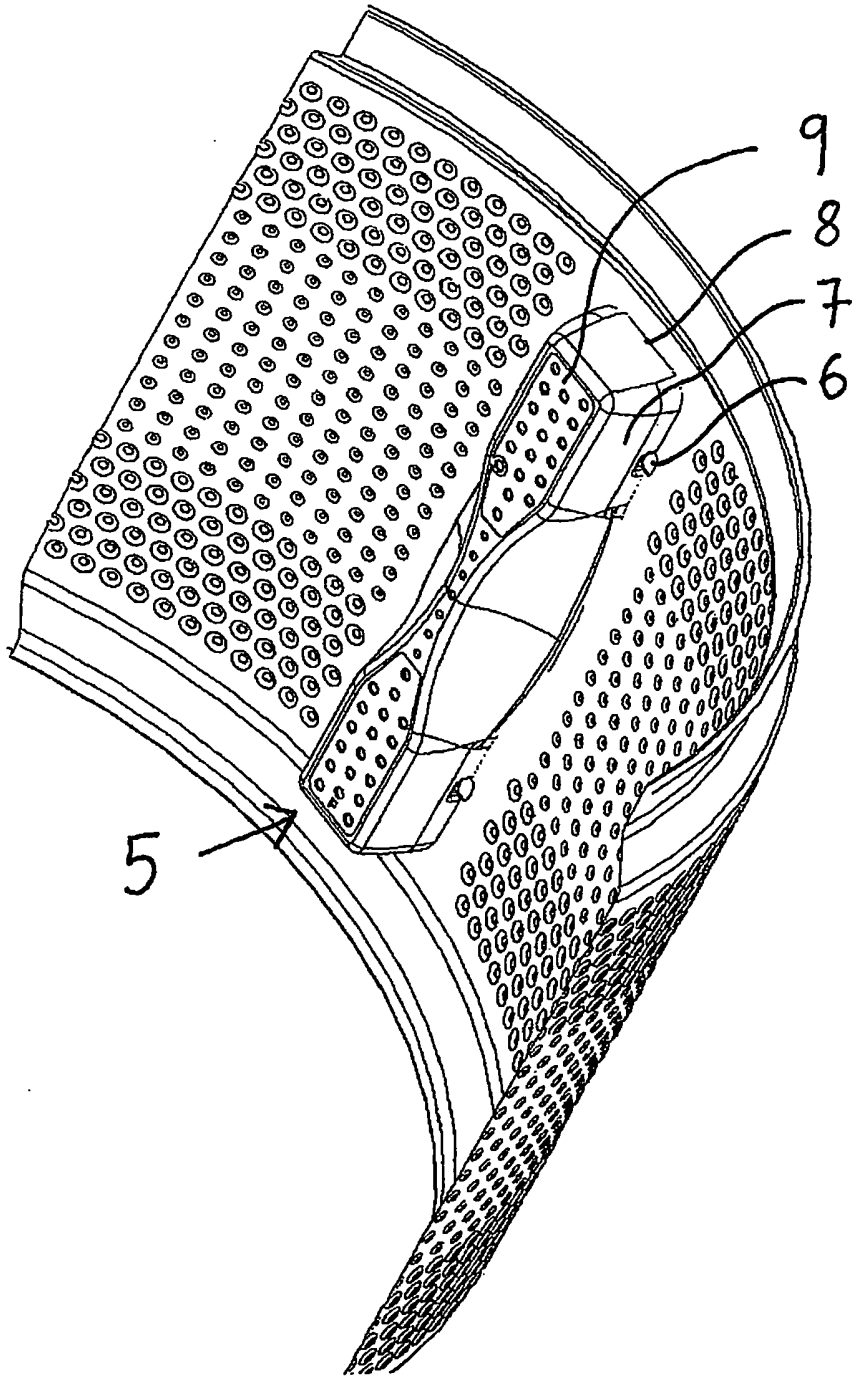


FIG. 4

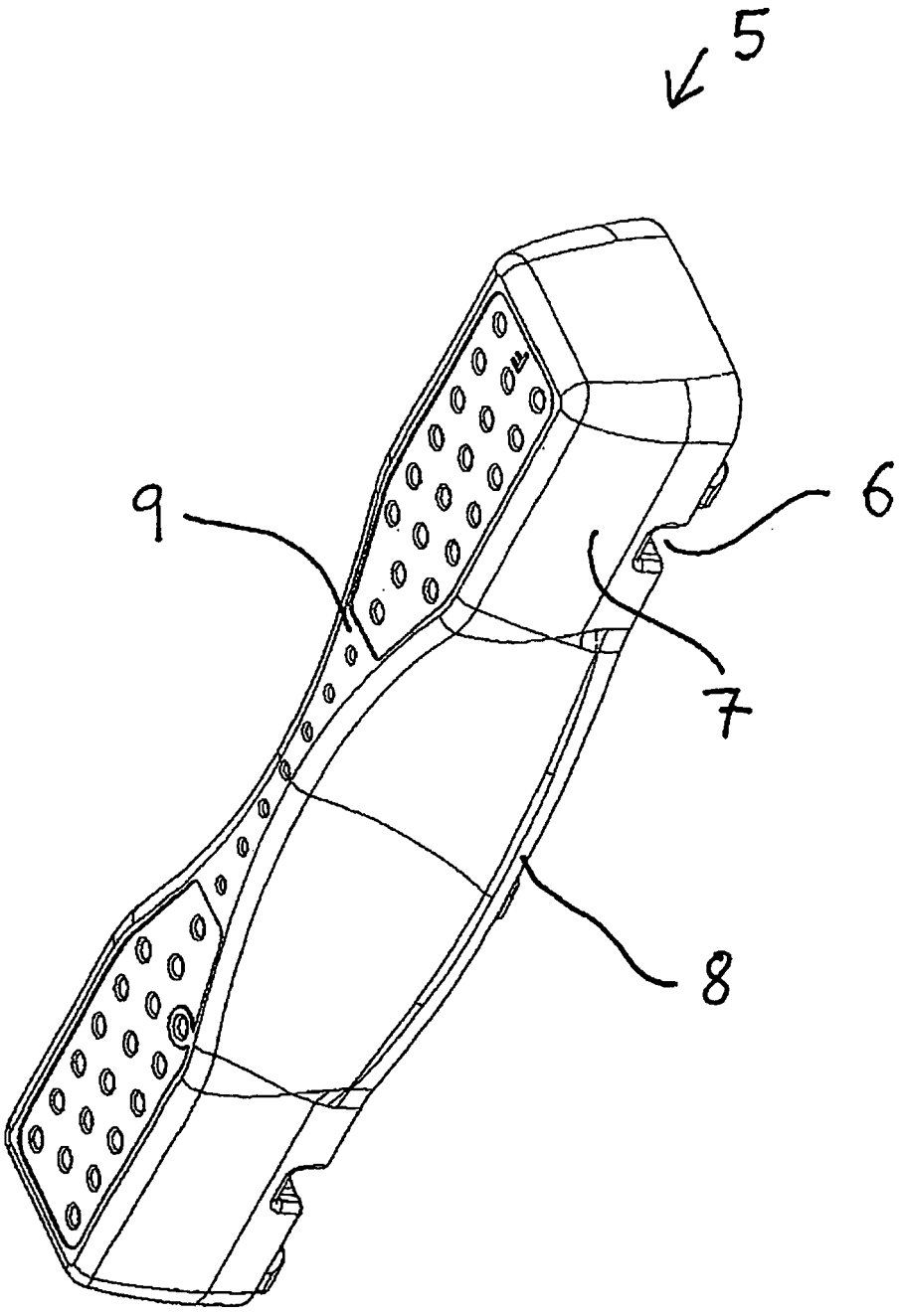


FIG. 5

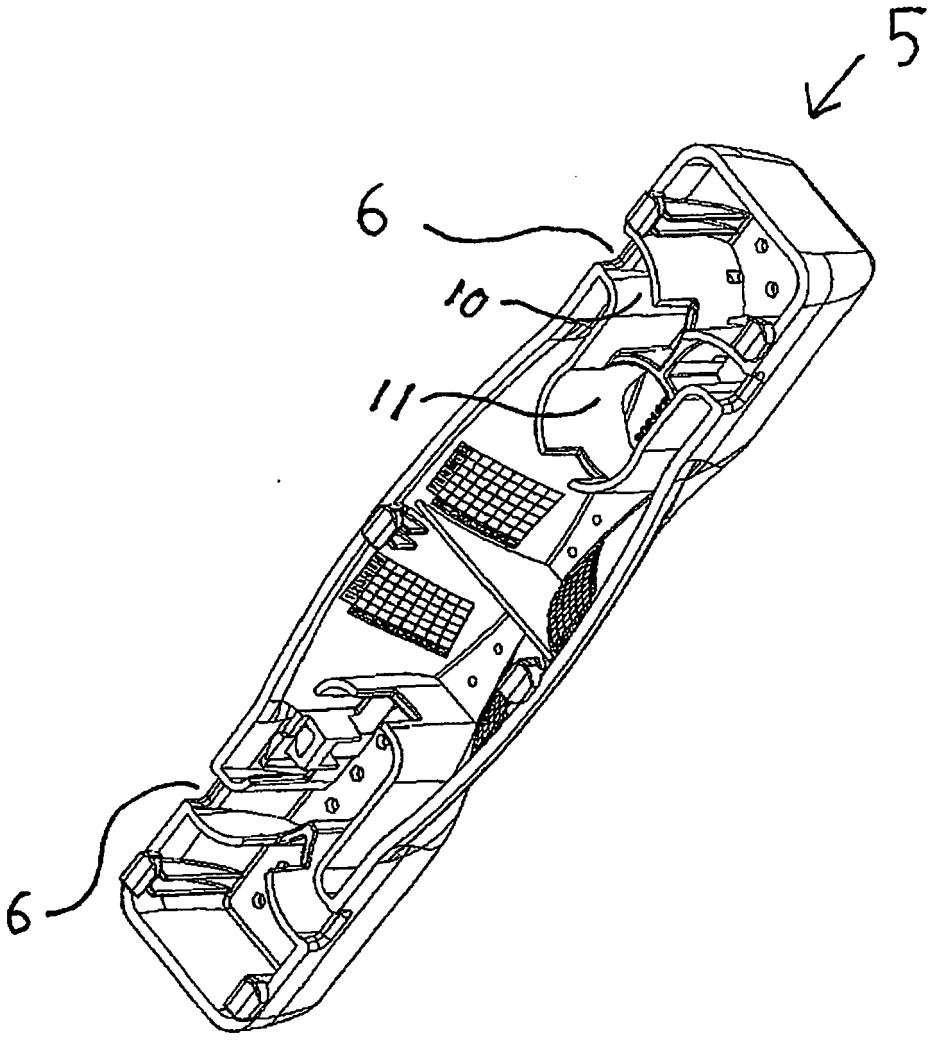


FIG. 6

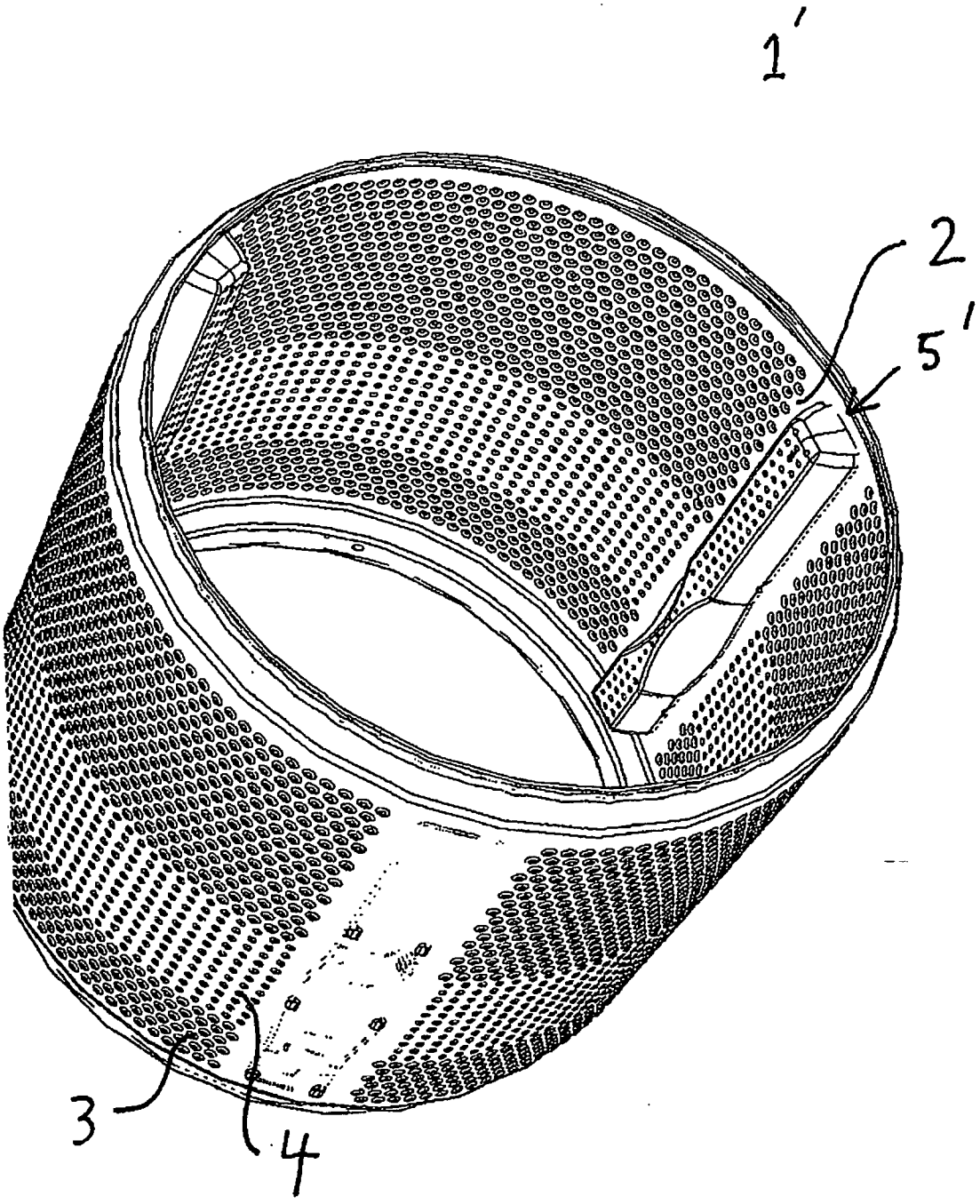


FIG. 7

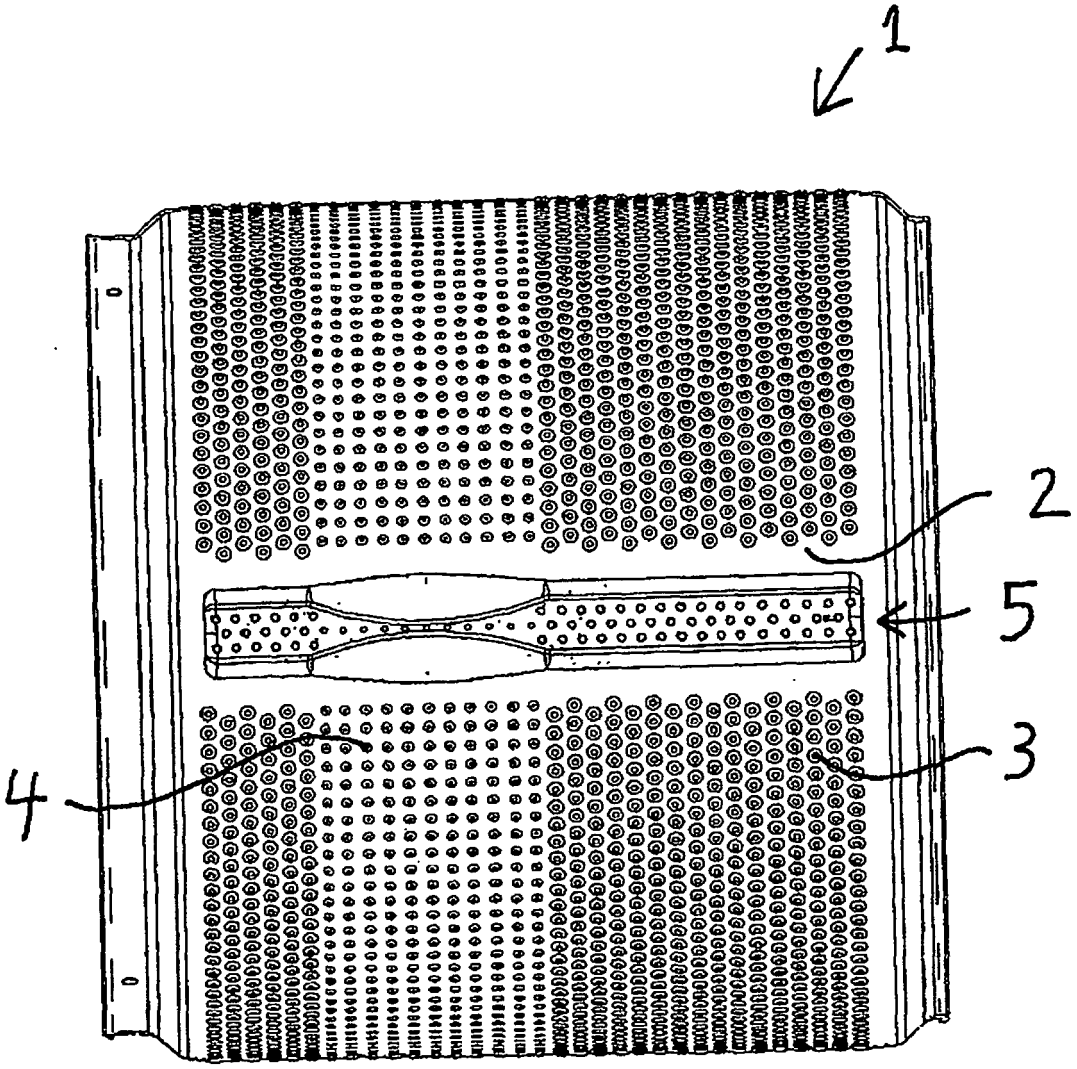


FIG. 8

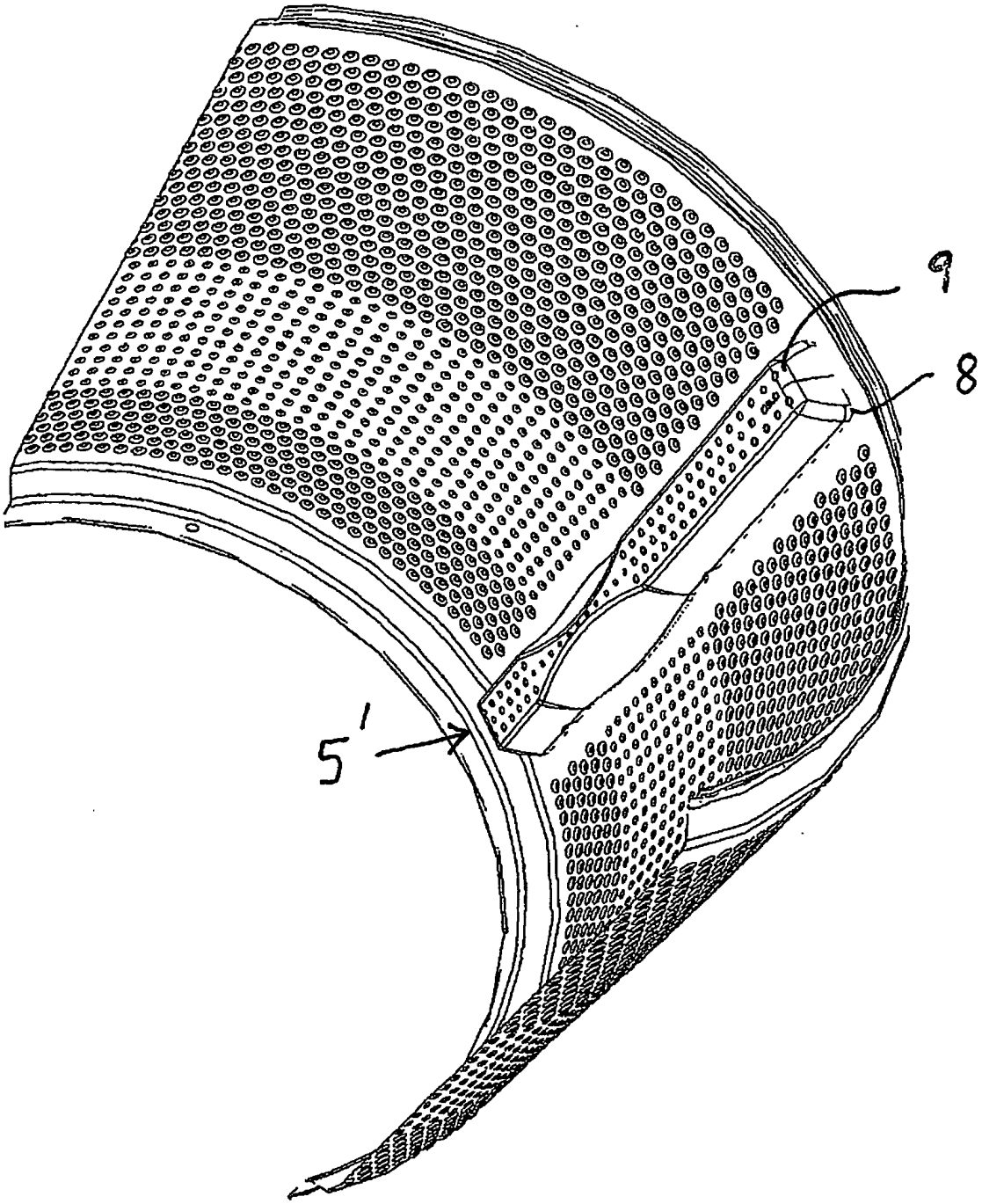


FIG. 9

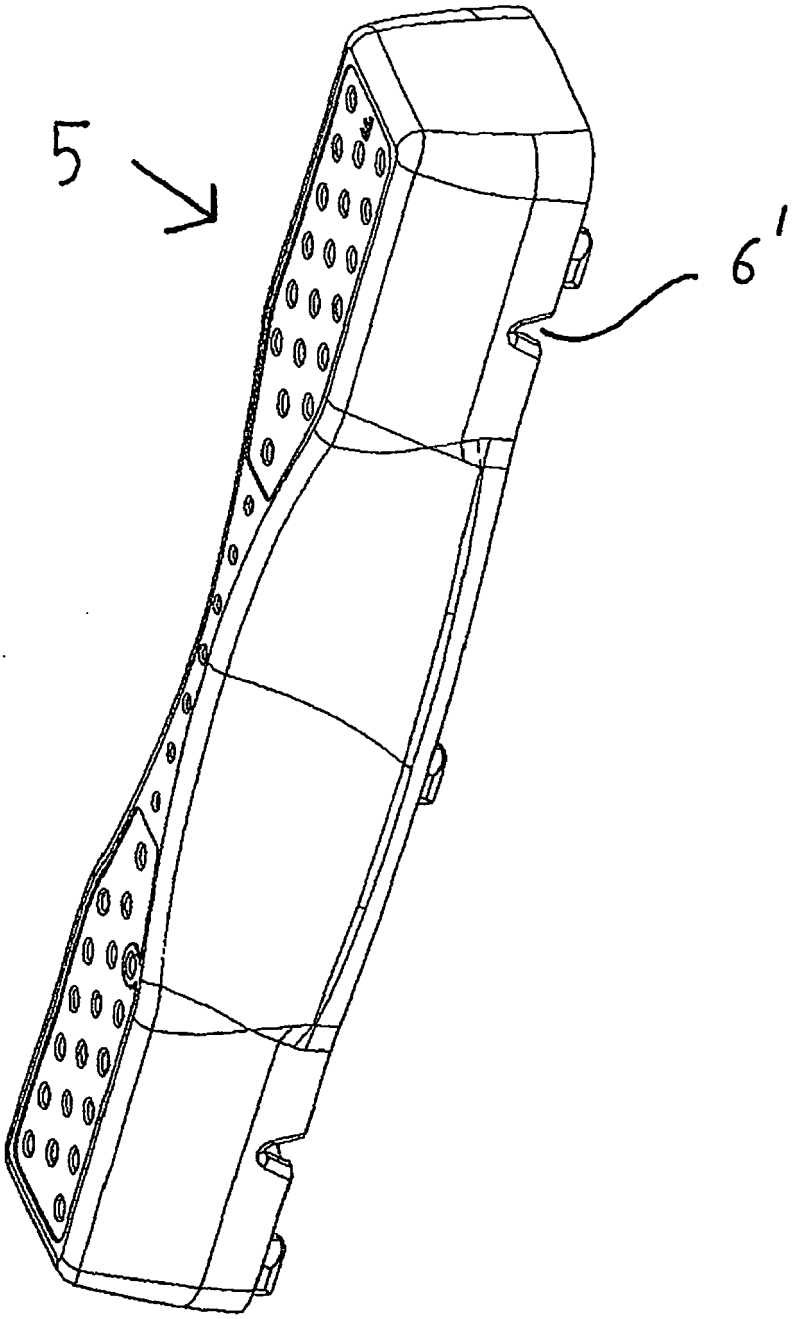
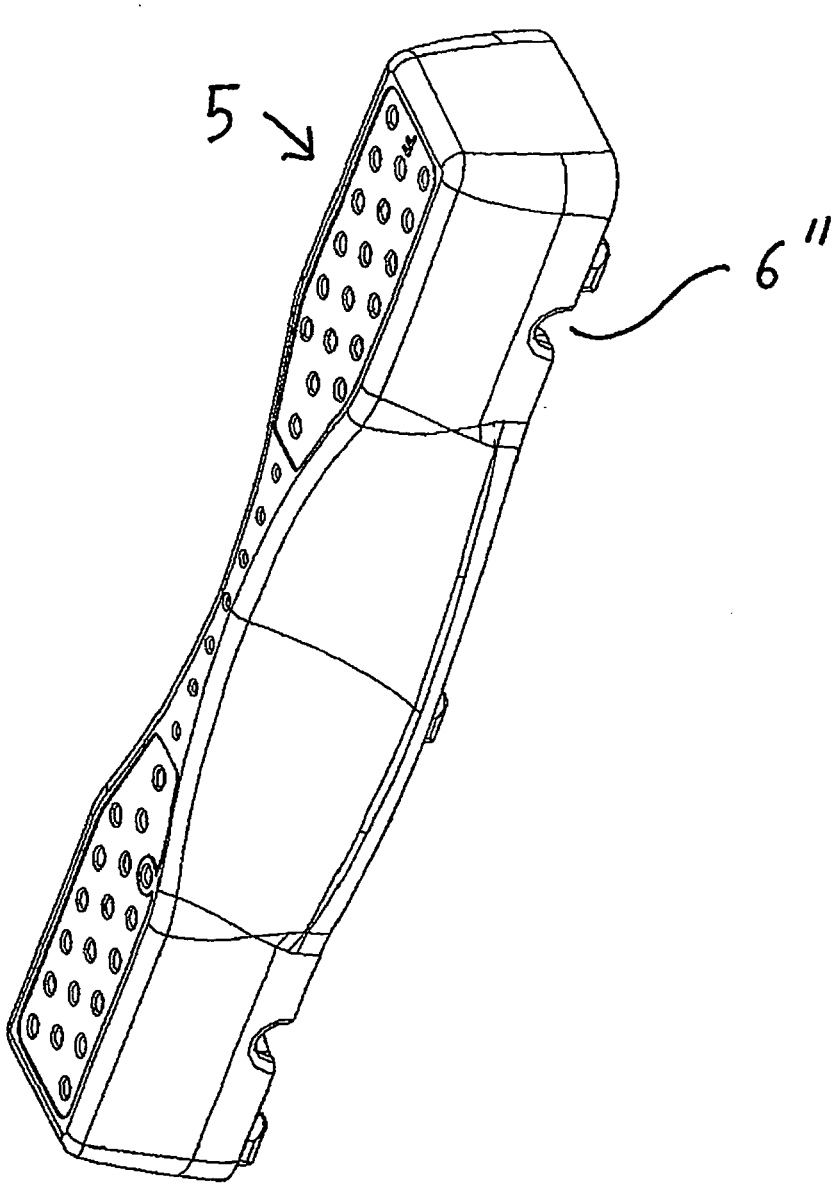


FIG. 10



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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