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(73) Proprietor: **SERVIS DOMESTIC APPLIANCES
LIMITED**
Darlaston Road Kings Hill
Wednesbury West Midlands WS10 7TE (GB)

(72) Inventor: **Percival, William Harry**
162 Sutherland Road
Cheslyn Hay, Near Walsall Staffordshire (GB)
Inventor: **Wilkins, Henry Ravenscroft**
Brocton House Brocton
Shifnal Shropshire (GB)

(74) Representative: **Symes, Robert George et al,**
FORRESTER & BOEHMERT Widenmayerstrasse
4/1
D-8000 München 22 (DE)

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Drum for a laundry machine

The present invention relates to a laundry machine such as a washing machine, spin dryer, or tumble dryer, or any machine capable of carrying out any combination of the functions of the above mentioned machines.

The invention is specifically concerned with a drum in which the laundry is to be placed during washing and/or drying operations.

The best known type of drum in use in laundry machines typically comprises two cup-shaped parts, one at each end joined at the centre to form a drum, one of which parts has a large central aperture in one end thereof through which the laundry may be placed in and removed from the drum, the other part being provided with an axle or other bearing means by means of which the drum may be supported for rotation at a generally horizontal axis, the cylindrical side wall formed by the connecting parts having therein a large number of apertures usually in the form of circular holes to enable water to pass through the wall.

When the laundry machine is a washing machine, the drum as aforescribed will be placed in a substantially water-tight container and mounted for rotation within said container, the container being partially filled with water and emptied, either automatically or manually, during a washing cycle.

In a normal automatic washing cycle the container can be filled and emptied several times to provide more than one washing operation and usually several rinsing operations.

The type of drum described above has been in use for many years, however, there are problems with such drums. The apertures in the side wall of the drum, even though they may be formed with rounded edge surfaces to avoid presentation of sharp edges to the laundry, are still detrimental to the laundry being washed or dried since damage can be caused by the tendency of the laundry to be pressed into the apertures. This is especially the case where the drum is being used in a centrifugal drying mode in which case the drum is rotated at high speed, the laundry then being pressed against the inner surface of the side wall of the drum and since the clothes are wet and heavy, the pressure is considerable and the clothes adjacent the side wall of the drum are forced into the apertures and extend partly therethrough which can cause undue stretching and general distortion of the material of the clothes, the pressure exerted on them being proportional to the square of the speed of revolution of the drum.

The speed at which the conventional automatic washing machine used to spin was typically in the order of 400 to 500 revolutions per minute, however, in recent years, there has been a tendency to increase the spin speeds in particular in automatic washing machines and it is not very common for washing machines to have spin speeds from 800 revolutions per

minute to a speed in excess of 1,000 revolutions per minute.

The above mentioned problem therefore has become much more serious and, in view of the higher spin speeds it is ever increasingly important to ensure that once the spinning cycle of such a machine commences, the clothes are evenly distributed around the drum, both circumferentially and lengthwise, parallel to the rotational axis, in the best manner possible.

The problem of distributing the clothes circumferentially around the drum has been at least partially overcome by rotating the drum immediately prior to a spinning cycle at a so-called "critical speed" for a certain length of time at which speed the clothes have a radially outwardly directed force acting upon them of a magnitude that assists in distributing the clothes, circumferentially around the drum.

The problem of ensuring even distribution lengthwise of the drum in the direction parallel to the rotational axis has yet to be properly solved.

Machines have been proposed (GB—A—906,720) in which the side wall of the drum is imperforate and of diabolo-shape. Such a drum has end parts connected to the ends of the side wall part through a flange either on the side wall part and projecting radially outwardly or on the end part and projecting axially outwardly, and leaving a gap or space between the connected parts. In either case however the interior surface of the drum necessarily presents an acute angled corner into which it is possible for the articles undergoing washing to become packed into a triangular section mass which would impede the flow of water through the gap or space and fails to utilise the potentially good qualities of the diabolo-shaped side wall part in achieving satisfactory longitudinal distribution.

Machines have also been (FR—A—2,140,036) proposed in which a drum comprising a cylindrical perforated side wall part has been connected to end parts by way of radially projecting flanges on the side wall and end parts, the latter including portions of arcuate section presenting interior concave faces adjacent to the connections with the side wall part. This construction however would not promote good longitudinal distribution and moreover would suffer from the damaging effect of forcing the articles into the holes of the perforated side wall part.

It is an object of the present invention to provide a drum in or for a laundry machine that overcomes or reduces the problems mentioned above.

According to the invention we provide a drum in or for a laundry machine the drum comprising end parts connected to opposite ends of an imperforate side wall part divergent internally from a position in the mid region of its length towards each of its ends, the connection

in each case being through the intermediary of a flange on one of the parts projecting outwardly in a direction transverse to the interior surface of this part and through the intermediary of a spaced opposing face on the other of the parts, providing a plurality of circumferentially spaced apertures between the end parts and the side wall part, one only of the end parts being provided with mounting means for rotation of the drum about its axis, and the other of the end parts having a central aperture for access to the inside of the drum, characterized in that the end parts have rim portions of arcuate section presenting concave faces inwardly of the drum which are arranged to be in smooth continuation of the interior surface of the side wall part by providing outwardly projecting mutually opposing and connected flanges and on both the side wall and the end wall parts, the connected flanges and being formed to provide a plurality of circumferentially spaced mutually abutting faces and circumferentially intervening mutually axially spaced faces defining the plurality of apertures.

Preferably, the flanges of the end parts are provided with the depression and lands, the flanges on the side wall being left substantially planar.

It has been found that by forming the depressions and lands of approximately the same circumferential lengths, there is both a sufficient length by means of which the end parts can be secured firmly to the side wall part and sufficient apertures for the inlet and exit of water.

Preferably also, such securement may be provided for by welding for example spot welding the mutual abutting contacting parts of the flanges.

By providing radially outwardly directed flanges, the innermost surface of the drum is as smooth as possible thereby greatly reducing the amount of damage to the clothes being washed or centrifugally dried in the drum, and furthermore presenting easily accessible contact surfaces by means of which the end parts may be secured firmly to the side wall member of the drum, thereby making the assembly of the drum an operation which can be carried out with simple spot welding apparatus.

Furthermore, the resultant construction may be easily inspected to ensure that the drum has been properly assembled.

The arcuate rim portions of the end parts make a large contribution towards the strength of the drum and by providing the contact areas between the end parts and the side wall member at the radially outermost point of the drum, i.e. at positions of maximum diameter, it ensures that the contact surfaces between the end parts and the side wall member are at a position of maximum area and also at a position subjected to a smaller force.

The drum of the present invention assists greatly in overcoming the problems aforemen-

tioned concerned with washing drums, the internal surface of the side wall member being generally imperforate will be as smooth as possible to minimise wear on the laundry during a washing or drying operation. Furthermore, the divergent side wall member contributes towards better distribution of clothes in the drum. The positioning of the apertures ensures there is minimum contact between the clothes and the apertures themselves in addition to providing a very convenient and strong assembly of the drum as a whole.

Preferably, the drum is of a diabolo shape but may be of generally arcuate form provided the position of minimum diameter is approximately mid-way between its ends.

As a further alternative, the mid-region of the side wall may be of substantially cylindrical configuration over a certain axial length of the drum, the two end regions of the side wall being divergent with respect to the rotational axis towards the ends of the drum.

The angle of divergence relative to the central axis of the drum is such that it is large enough to aid separation of individual items of laundry being washed or dried in a drum to prevent "balling" of several items together and generally assists separation of the laundry to improve the washing and drying thereof. Furthermore, the angle of divergence is not too large that would cause "bunching", at each end region, of the items of laundry being washed or dried.

Preferably the acute angle between the central axis of the drum and such divergent section of the side wall should be greater than $2\frac{1}{2}^\circ$ and less than 10° .

Good results have been obtained in which the above mentioned divergent angle is between 5° and 7° .

The drum of the present invention may be mounted for rotation about a horizontal or vertical axis or any angle therebetween but is primarily intended for a laundry machine in which the drum is rotated or oscillated about a substantially horizontal axis.

The invention will now be described in more detail by way of example only with reference to the accompanying drawings wherein:

FIGURE 1 is a side elevation of a drum of the present invention;

FIGURE 2 is an end elevation showing the end part having the central aperture;

FIGURE 3 is an end elevation showing the other end part.

A laundry machine drum has a first end part generally indicated at 10, a second end part generally indicated at 11, the second end part 11 having a central aperture 12 through which laundry may be put in or taken out of the drum in use of the laundry machine.

The opening 12 is closed during use of the machine by a door which co-operates and closes an ligned aperture in a water-tight compartment in which the drum in use is mounted

for rotation. The two end parts 10 and 11 are each connected to a respective end of the side wall member generally indicated at 13. The two end parts are formed of shallow dish-like configuration each having rim portions 10a and 11a respectively of arcuate section which present concave faces inwardly resulting in end parts having a very rigid form to increase the strength of the drum.

The drum, in use, is rotated about an axis 14 which may be either vertical or horizontal or some position therebetween. The drum illustrated in the drawings is designed particularly, but not exclusively, for rotation about a horizontal axis.

The side wall member 13 is made from sheet-like material for example stainless steel, the side wall being substantially apertureless and having a smooth internal surface. The side wall 13 is shaped so that it has a diabolo-like configuration, the side wall 13 having a minimum diameter between opposing surfaces 15 at a mid-region of the drum and thereafter diverging towards each end two positions of maximum diameter 16 and 17 adjacent respective end parts 10 and 11.

The side wall member 13 is provided at its ends with radially outwardly directed flanges 18 and 19, to the flanges 18 and 19 are secured respective end parts 10 and 11. The end part 10 comprises a dished member which may be a stainless steel pressing, the end part 10 may have a plurality of additional reinforcing ribs two of which can be seen at 20 and 21, which reinforcing ribs extend from a recess 22 to the radially outermost part of the end part 10.

The end part 10 is also formed with a radially outwardly extending flange 23 which is deformed to form a plurality of depressions and lands such that only relatively circumferentially spaced portions, for example 24, 25 and 26, make face-to-face contact with the flange 18 provided on the side wall member 13. Where face-to-face contact occurs between the end part 10 and the side wall member 13 they may be secured together by spot welding or any other satisfactory means of fastening.

The intermediate portions 27 and 28 for example will not make contact with the flange 18 thus, an annular array of apertures, for example 29 and 30, are provided at one of the positions at maximum diameter of the drum, which array of apertures provides water inlet/outlet means.

The other end part 11 is formed in a similar manner with the exception of the provision of the central aperture 12 and the absence of reinforcing ribs. Since the drum is mounted for rotation by means provided on the end part 10, the end part 11 is not subjected to the same strains and forces in use as the end part 10.

The end part 11 is formed with a flange 31 having similar lands and depressions on its flange 31, the lands for example 32, 33 and 34 make face-to-face contact with the flange 19 on

the side wall member 13 and are secured thereto by spot welding for example. The depressions 35 and 36 defining combination with the flange 19 of the side wall member 13, an annular array of apertures 37 and 38 providing water inlet/outlet means once again located at a position of maximum diameter of the drum.

The embodiment described in the drawing is only one example of a drum in accordance with the present invention.

It will be appreciated that dimensions of the two maximum diameter regions need not be identical. However, since the diameter of the drum increases from a mid-region towards each end part of the drum, then water inlet/outlet means must be provided adjacent each position of maximum diameter.

The drum may be provided on its inside preferably at circumferentially spaced intervals with "lifters", which extend substantially parallel to the rotational axis and are secured to the side wall member or the end parts or all three, the lifters being adapted in known manner to cause tumbling action of the laundry in order to improve the washing or drying thereof. The lifters will be of a smooth material being apertureless so as to prevent undue wear and abrasion to the laundry being washed or dried.

It will be permissible for the side wall of the drum to be provided with apertures "underneath" the lifters since clothes will not be able to come into contact with such apertures and so could not cause any undue wear to the clothes being washed or dried.

Claims

1. A drum for a laundry machine, the drum comprising end parts (10, 11) connected to opposite ends of an imperforate side wall part (13) divergent internally from a position in the mid region of its length towards each of its ends, the connection in each case being through the intermediary of a flange on one of the parts projecting outwardly in a direction transverse to the interior surface of this part and through the intermediary of a spaced opposing face on the other of the parts, providing a plurality of circumferentially spaced apertures (29, 30, 37, 38) between the end parts (10 and 11) and the side wall part (13), one (10) only of the end parts being provided with mounting means (22) for rotation of the drum about its axis (14), and the other of the end parts (11) having a central aperture for access to the inside of the drum, characterized in that the end parts (10, 11) have rim portions (10a, 11a) of arcuate section presenting concave faces inwardly of the drum which are arranged to be in smooth continuation of the interior surface of the side wall part (13) by providing outwardly projecting mutually opposing and connected flanges (18, 23) and (19, 31) on both the side wall (13) and the end wall parts (10, 11), the connected flanges (18,

23) and (19, 31) being formed to provide a plurality of circumferentially spaced mutually abutting faces and circumferentially intervening mutually axially spaced faces defining the plurality of apertures (29, 30, 37, 38).

2. A drum as claimed in claim 1, characterized in that flanges (23, 31) on the end parts (10, 11) are deformed to form a plurality of successive depressions (27, 28, 35, 36) and intervening lands (24, 25, 26, 32, 33, 34), each of circumferential length approximately equal to that of the depressions, the respective cooperating flange on the side wall member (13) being of generally planar configuration.

3. A drum as claimed in claim 1 or claim 2, characterized in that the side wall member (13) of the drum is of diabolo-like configuration, and the acute angle between the rotational axis (14) of the drum and the divergent sections of the side wall (13) is greater than $2\frac{1}{2}^\circ$ and less than 10° .

4. A drum as claimed in claim 3, characterized in that said acute angle is greater than 5° and less than 7° .

Revendications

1. Tambour pour une machine à laver comportant des parties d'extrémités (10, 11) reliées aux extrémités opposées d'une partie de paroi latérale non perforée (13) divergeant intérieurement à partir d'une position dans la région médiane de sa longueur en direction de chacune de ses extrémités, la liaison étant réalisée dans chaque cas par l'intermédiaire d'un flasque sur l'une des parties faisant saillie vers l'extérieur dans une direction transversale à la surface intérieure de cette partie et par l'intermédiaire d'une face opposée à distance sur l'autre des parties présentant une pluralité d'ouvertures (29, 30, 37, 38) circonférentiellement espacées entre les parties d'extrémités (10 et 11) et la partie de paroi latérale (13), une seule (10) des parties d'extrémité étant munie de moyens rapportés (22) pour la rotation du tambour autour de son axe (14), et l'autre (11) des parties d'extrémités présentant une ouverture centrale permettant l'accès à l'intérieur du tambour, caractérisé en ce que les parties d'extrémités (10, 11) sont dotées de parties de bordures (10a, 11a) de section courbe et présentant des faces concaves vers l'intérieur du tambour et qui sont disposées de façon à assurer la continuité sans ressaut de la surface intérieure de la partie de paroi latérale (13) en ménageant des flasques (18, 23) et (19, 31), mutuellement opposés, reliés entre-eux et faisant saillie vers l'extérieur, à la fois sur la paroi latérale (13) et sur les parties de paroi d'extrémités (10, 11), les flasques reliés (18, 23) et (19, 31) étant conformés pour former une pluralité de faces venant mutuellement en butée et espacées circonférentiellement et de faces mutuellement espacées dans le sens axial intervenant circonférentiellement pour définir la

pluralité d'ouvertures (29, 30, 37, 38).

2. Tambour selon la revendication 1, caractérisé en ce que les flasques (23, 31) sur les parties d'extrémités (10, 11) sont déformés pour venir former une pluralité de dépressions successives (27, 28, 35, 36) et de plats intermédiaires (24, 25, 26, 32, 33, 34) présentant chacun une longueur circonférentielle sensiblement égale à celle des dépressions, les flasques respectifs coopérant sur l'organe de paroi latérale (13) présentant une configuration générale plane.

3. Tambour selon la revendication 1 ou 2, caractérisé en ce que l'organe de paroi latérale (13) du tambour présente une configuration en diabolo, et en ce que l'angle aigu entre l'axe de rotation (14) du tambour et les sections divergentes de la paroi latérale (13), est supérieur à $2\frac{1}{2}^\circ$ et inférieur à 10° .

4. Tambour selon la revendication 3, caractérisé en ce que ledit angle aigu est supérieur à 5° et inférieur à 7° .

Patentansprüche

1. Trommel für eine Waschmaschine, wobei die Trommel Endteile (10, 11) aufweist, die mit den gegenüberliegenden Enden eines nicht perforierten Seitenwandteiles (13) verbunden sind, das sich von innen von seinem Mittelbereich gegen jedes seiner Enden divergierend erstreckt, wobei die Verbindung in jedem Fall mittels eines Flansches auf einem der Teile, der sich nach außen senkrecht zur Innenoberfläche dieses Teiles erstreckt und mittels einer mit Abstand angeordneten gegenüberliegenden Flächen auf dem anderen Teil erfolgt, wobei mehrere auf dem Umfang mit Abstand angeordnete Öffnungen (29, 30, 37, 38) zwischen den Endteilen (10 und 11) in den Seitenwandteilen (13) vorgesehen sind, wobei nur eines (10) der Endstücke mit einer Montageeinrichtung (22) zum Drehen der Trommel um ihre Achse (14) ausgerüstet ist, und das andere Endstück (11) eine Mittelöffnung zwecks Zugang zum Trommelinneren besitzt, dadurch gekennzeichnet, daß die Endteile (10, 11) äußere Abschnitte (10a, 11a) bogenförmigen Querschnittes besitzen, die konkave Flächen zum Inneren der Trommel bieten, die so angeordnet sind, daß sie eine weiche Fortsetzung der Innenoberfläche des Seitenwandteiles (13) sind, indem nach außen vorspringende, wechselseitig einander gegenüberliegende und miteinander verbundene Flansche (18, 23 und 19, 31) sowohl an den Seitenwand- (13) und den Endwandteilen (10, 11) vorgesehen sind, wobei die miteinander verbundenen Flansche (18, 23) und (19, 31) so ausgebildet sind, daß sie mehrere auf dem Umfang mit Abstand angeordnete, wechselseitig aneinanderstoßende Flächen und auf dem Umfang dazwischen liegende, wechselnd mit axialem Abstand angeordnete Flächen, die die Öffnungen (29, 30, 37, 38) begrenzen, bieten.

2. Trommel wie in Anspruch 1 beansprucht, dadurch gekennzeichnet, daß die Flansche (23, 31) auf den Endstücken (10, 11) derart verformt sind, daß sie eine Vielzahl aufeinanderfolgender Vertiefungen (27, 28, 35, 36) und dazwischen liegender erhabener Flächen (24, 25, 26, 32, 33, 34) bilden, wobei jede in Umfangsrichtung etwa gleich lang wie die Vertiefungen ist, und der zusammenwirkende Flansch auf dem Seitenwandteil (13) im allgemeinen planarer Konfiguration ist.

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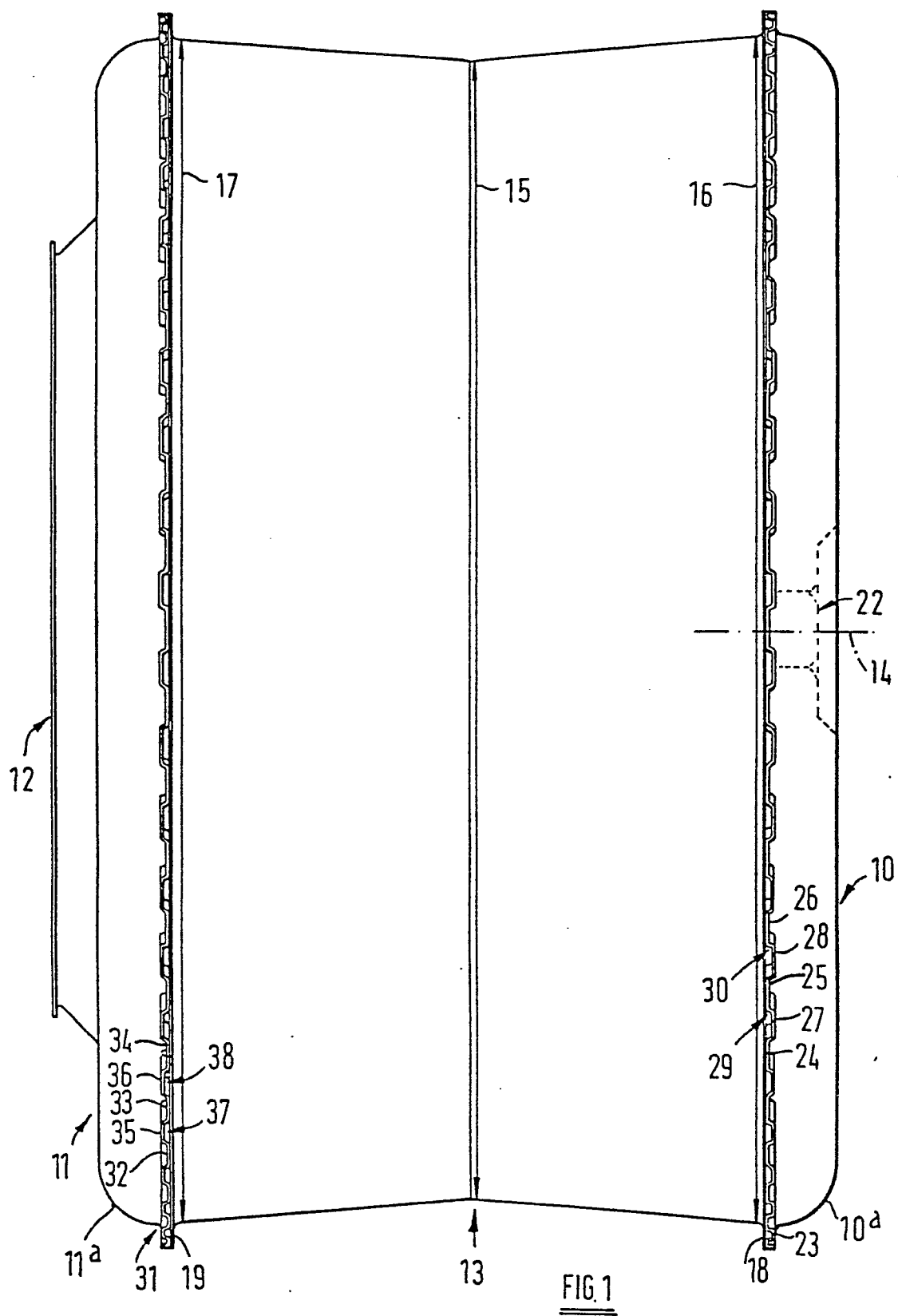
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3. Trommel wie in Anspruch 1 oder 2 beansprucht, dadurch gekennzeichnet, daß das Seitenwandteil (13) der Trommel diabolo-förmig ist und der spitze Winkel zwischen der Rotationsachse (14) zu der Trommel und den divergierenden Abschnitten der Seitenwand (13) größer als $2\frac{1}{2}^\circ$ und weniger als 10° ist.

4. Trommel wie in Anspruch 3 beansprucht, dadurch gekennzeichnet, daß der spitze Winkel größer als 5° und kleiner als 7° ist.



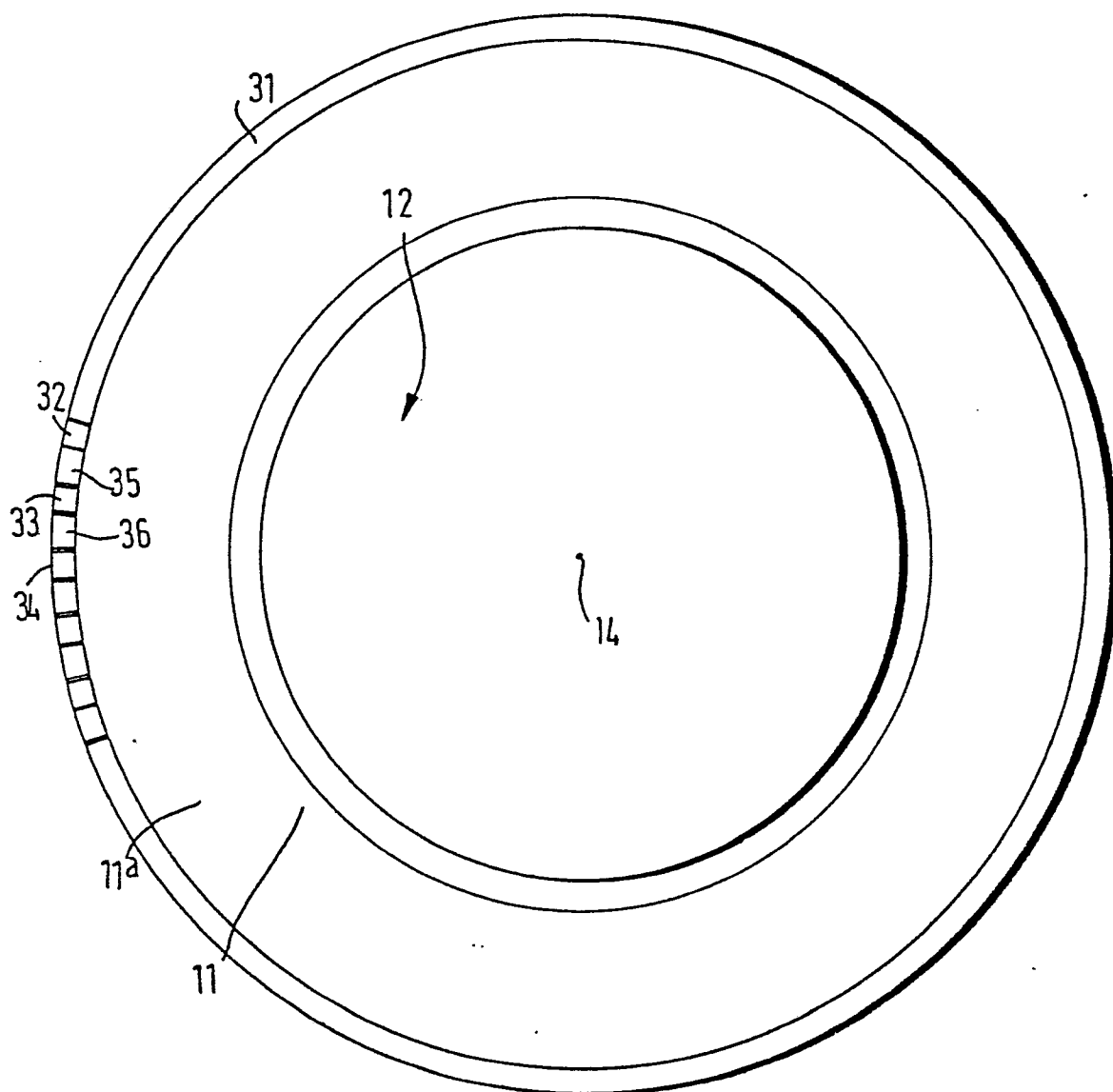


FIG 2

