

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 80106629.1

(51) Int. Cl.³: **D 06 F 37/02**

(22) Date of filing: 29.10.80

(30) Priority: 07.11.79 GB 7938588

(43) Date of publication of application:
03.06.81 Bulletin 81/22

(84) Designated Contracting States:
DE IT NL SE

(71) Applicant: **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)

(72) Inventor: **Wilkins, Henry Ravenscroft**
Brocton House Brocton
Shifnal Shropshire(GB)

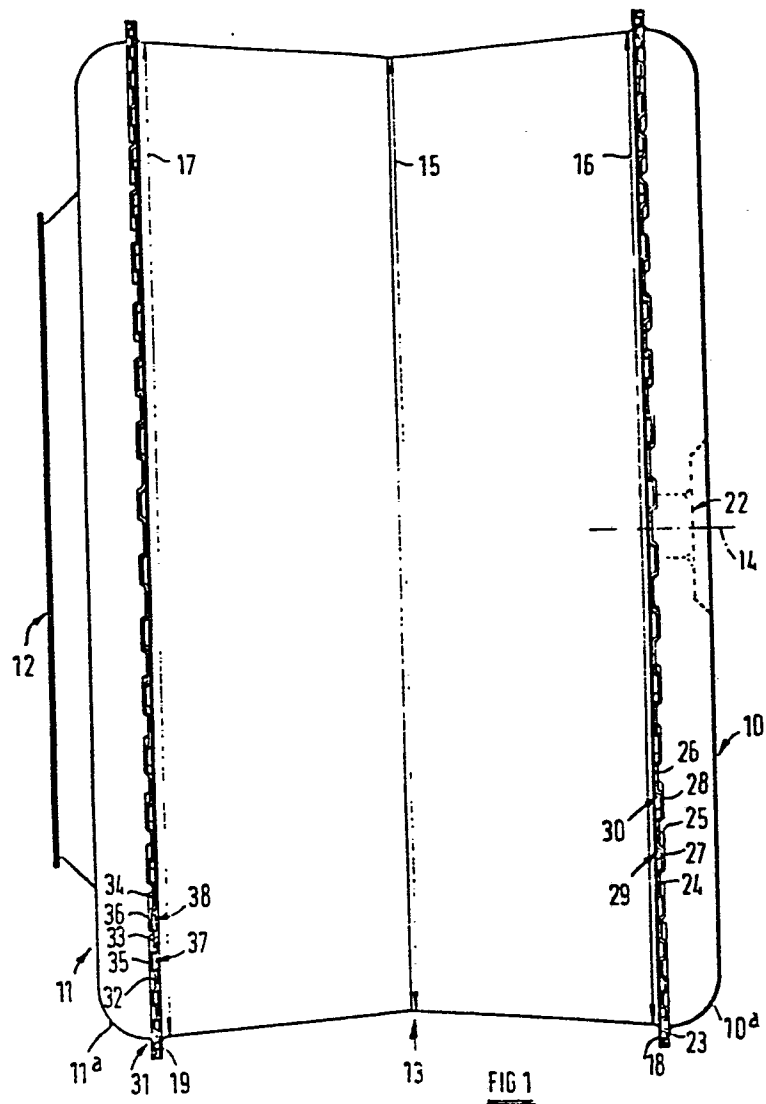
(74) Representative: **Symes, Robert George et al,**
FORRESTER & BOEHMERT Widenmayer Strasse 5/IV
D-8000 München 22(DE)

(54) **Drum for a laundry machine.**

(57) A drum for a laundry machine having a side wall member (13) and end parts (10,11), the side wall member (13) is divergent from a mid region towards its ends and has a flange (18, 19) formed at each end adapted to co-operate with flanges (23,31) of the end parts (10,11) to form successive areas of contact by means of which the end parts may be secured to the side wall member (13) by welding and apertures (29,37) to allow for entry of water into the drum and exit of water from the drum. The side wall member (13) is substantially apertureless thereby minimising wear on any clothes placed therein and the divergent side wall enhances good distribution of the clothes in the drum, the end parts (10,11) are of shallow dish-like configuration having arcuate rim portions (10a, 11a) which contribute to the strength of the construction of the drum, the radially outwardly extending flanges enabling a strong construction that may be assembled without undue difficulty.

EP 0 029 516 A1

./...



TITLE MODIFIED
see front page

0029516

Title: "Laundry Machines"

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.

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

10 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
15 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.

20 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,
25 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.

30 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 now 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 length-wise of the drum in the direction parallel to the rotational axis has yet to be properly solved.

Machines have been proposed in which the circumferential side wall of the drum is not cylindrical and may be of frusto-conical configuration for example, and drums which have a smaller diameter in the middle than at its ends have also been proposed. With the last construction however, such an arrangement has only been proposed for drums which are supported at each end in bearing means. It is thought that such a configuration was probably not suitable, due to lack of internal strength, for a drum having no support at one end thereof.

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 present invention we provide a drum in or for a laundry machine, the drum comprising end parts connected to each other by a side wall which, from a position in the mid-region of its length, is divergent internally towards each of the ends and which is generally imperforate, characterised in that the end parts have rim portions of arcuate section presenting concave faces innermost of the drum, the rim portions terminating in flanges, one of the end parts having a central aperture for access to the inside of the drum, the other end part having means whereby the drum may be mounted for rotation about a rotational axis; and in that the side wall is provided with a flange at each end thereof, each flange is adapted to cooperate with and be secured to a flange of a respective end part; and in that co-operating flanges of said end parts and said side wall are such that a plurality of mutually abutting faces are presented around the flanges consecutive mutually

abutting faces being separated by mutually spaced regions, said spaced regions defining a plurality of apertures by means of which water may enter into and exit from the drum.

5 Preferably, either the flange on the side wall or the flange on the respective end part is deformed to form a plurality of depressions and lands, the flange with which it is to co-operate being of a generally planar configuration such that when an end part is placed in
10 juxtaposition with the side wall in a correct assembled relationship, the lands on one of the flanges abut the other planar flange to provide abutment faces which may be secured together by welding for example, the depressions providing apertures for the entry and exit of
15 water.

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

20 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 and sufficient apertures for the inlet and exit of water.

25 Since the drum is divergent from a central axis from a position mid-region of its length, the apertures formed by the inter-connected flanges will be substantially at positions of maximum diameter of the drum i.e. the position at which water would otherwise collect in the
30 drum and thus, by providing the apertures in this region, maximum efficiency of water extraction is enhanced.

 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
35 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.

5 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,
10 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

15 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° .

20 It is another object of the invention to provide a method of making an improved drum for a laundry machine, the drum being both strong in construction which can be manufactured by simple operations.

25 According to a second aspect of the invention we provide a method of making a drum for a laundry machine comprising the steps of forming a side wall which from a position in the mid-region of its length is divergent internally towards each of its ends and which is generally imperforate, forming a radially outwardly extending flange at each end of the side wall, forming a
30 first end part having a central aperture and a rim portion of arcuate section presenting a concave face innermost, the rim portion terminating in a radially outwardly extending flange, forming a second end part having means for supporting the drum for rotation about
35 an axis and a rim portion of arcuate section presenting a concave face innermost, the rim portion terminating in a flange, deforming the flanges on the end plates or the

flanges on the side wall member or both to form a plurality of successive depressions and lands, presenting the end parts to respective ends of the side wall member such that there are areas of contact between the
5 flanges of the end parts and the flanges of the respective side walls and securing the end parts to the side wall member at said areas of contact.

Preferably, such securement may be provided for by welding for example spot welding the mutual abutting
10 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
15 drum, and furthermore presenting easily accesible 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
20 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
25 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
30 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 aforementioned concerned with washing machine drums, the internal surface of the side
35 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
5 convenient and strong assembly of the drum as a whole.

The positioning of the water outlet adjacent to the end parts of the drum i.e. at position of maximum diameter ensure that during a drying operation, water can easily leave the drum there being no position where it
10 can become trapped therein.

The drum of the present invention 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
15 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
20 present invention;

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

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

25 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.

30 The opening 12 is closed during use of the machine by a door which co-operates and closes an aligned 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
35 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.

5 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.

10 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-
15 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
20 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
25 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
30 relatively 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
35 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.

5 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
10 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
15 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.

20 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,
25 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
30 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
35 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 in or for a laundry machine, the drum comprising end parts (10,11) connected to each other by a side wall (13) which, from a position in the mid-region of its length is divergent internally towards each of the ends and which is generally imperforate; characterised in that the end parts (10, 11) have rim portions (10a,11a) of arcuate section presenting concave faces innermost of the drum, the rim portions (10a, 11a) terminating in flanges (23, 31), one of the end parts (11) having a central aperture (12) for access to the inside of the drum, the other end part (10) having means (22) whereby the drum may be mounted for rotation about a rotational axis; and in that, the side wall (13) is provided with a flange at each end thereof (18, 19) each flange is adapted to co-operate and be secured to a flange of a respective end part; and in that, co-operating flanges of said end parts and said side wall (23,18 and 31,19) are such that a plurality of mutually abutting faces are presented around the flanges the consecutive mutually abutting faces being separated by mutually spaced regions, said spaced regions defining a plurality of apertures (24,37) by means of which water may enter into and exit from the drum.
2. A drum as claimed in Claim 1 characterised in that flanges (23,31) on the end parts (10, 11) are deformed to form a plurality of successive depressions (35,27) and lands (32, 24), the respective co-operating flange on the side wall member (13) being of generally planar configuration.
3. A drum as claimed in Claim 1 or Claim 1 characterised in that the side wall member (13) of the drum is of diabolo-like configuration.

4. A drum as claimed in Claim 3 characterised in that the acute angle between the rotational axis of the drum and the divergent sections of the side wall is greater than $2\frac{1}{2}^{\circ}$ and less than 10° .
- 5 5. A drum as claimed in Claim 4 characterised in that said acute angle is greater than 5° and less than 7° .
6. A drum as claimed in any one of the preceding claims characterised in that said apertures (29, 37) are provided at positions of maximum diameter of the drum.
- 10 7. A drum as claimed in any one of the preceding claims characterised in that said end part (10) having means for supporting the drum for rotation is provided with a plurality of radially extending strengthening ribs (20,21).
- 15 8. A method of forming a drum in or for a laundry machine comprising the steps of forming a side wall (13) which from a position in the mid-region of its length is divergent internally towards each of its ends and which is generally imperforate, forming a radially outwardly
20 extending flange (18,19) at each end of the side wall, forming a first end part (11) having a central aperture (12) and a rim portion (11a) of arcuate section presenting a concave face innermost, the rim portion (11a) terminating in a radially outwardly extending
25 flange (31), forming a second end part (10) having means (22) for supporting the drum for rotation about an axis (14) and a rim portion (10a) of arcuate section presenting a concave face innermost, the rim portion terminating in a flange (23), deforming the flanges (23,
30 31) on the end plates or the flanges (18, 19) of the side wall member (13) or both to form a plurality of successive depressions and lands, presenting the end parts (10,11) to respective ends of the side wall member

(13) such that there are areas of contact between the flanges of the end parts and the flanges of the respective side walls and securing the end parts to the side wall member at said areas of contact.

5 9. A method as claimed in Claim 8 characterised in that the end parts are secured to the side wall member by welding.

10 10. A method as claimed in Claim 8 or Claim 9 characterised in that the flanges on the end walls are deformed to form said depressions and lands and the flanges (18,19) on the side wall member (13) are substantially planar.

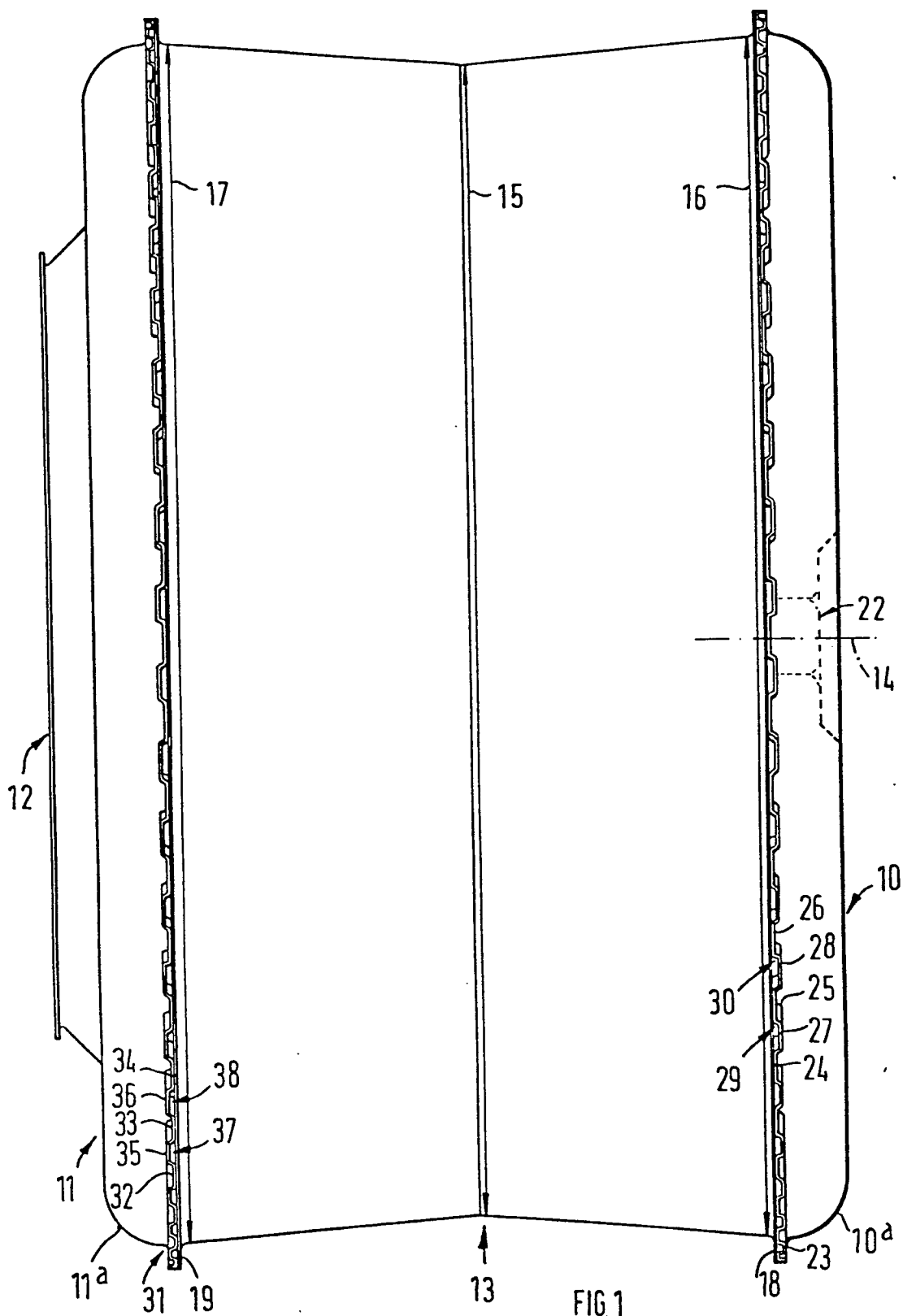


FIG. 1

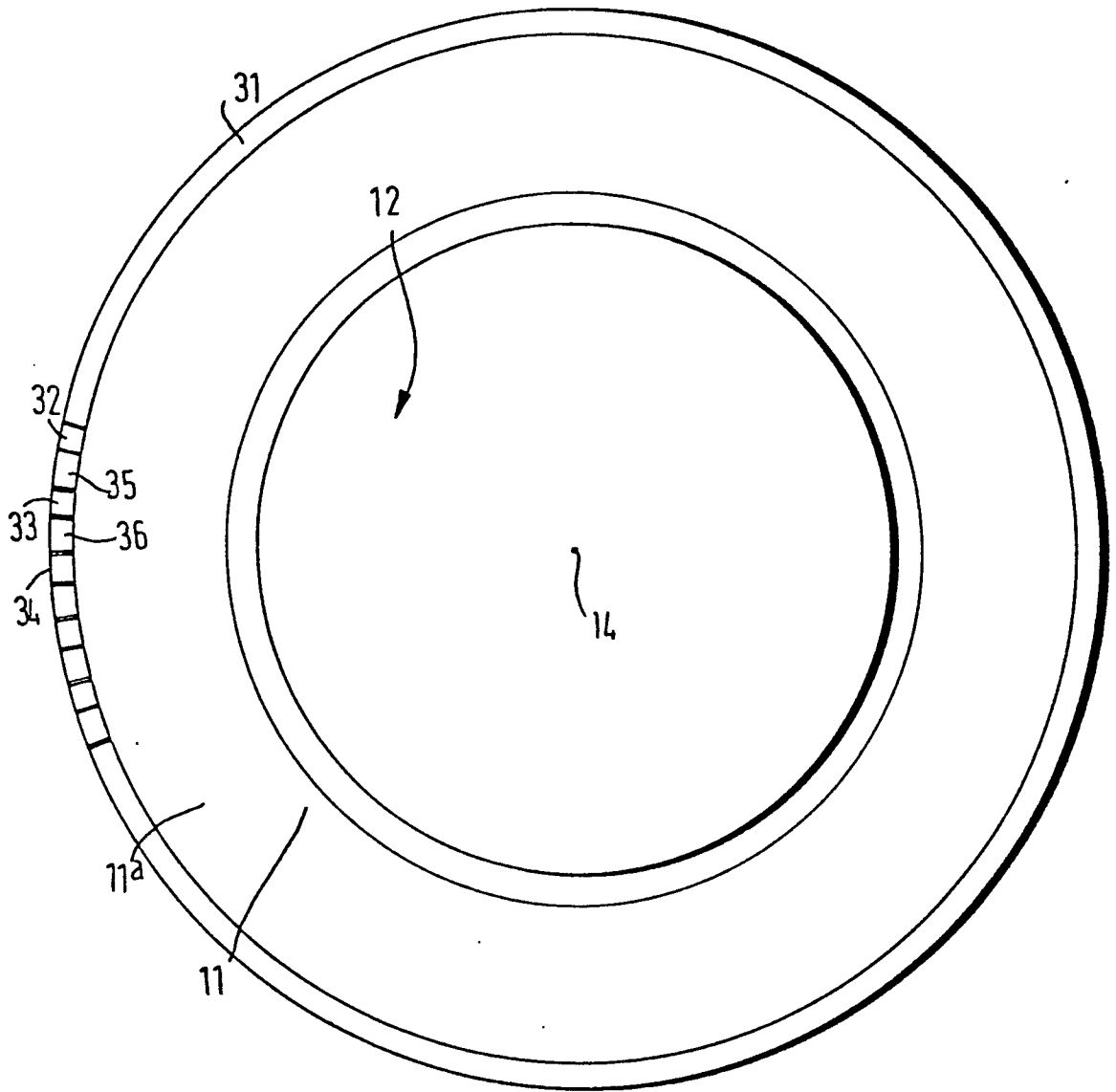


FIG. 2



FIG 3

0029516



European Patent
Office

EUROPEAN SEARCH REPORT

Application number

EP 80 10 6629

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>GB - A - 906 720 (THOMSON-HOUSTON)</u> * Entire document * --	1-10	D 06 F 37/02
	<u>FR - A - 1 370 320 (SIEMENS)</u> * Page 2, right-hand column, lines 29-35; figure 3 * --	1,3-5	
	<u>GB - A - 829 380 (GENERAL MOTORS)</u> * Claims * --	8,9	TECHNICAL FIELDS SEARCHED (Int. Cl.)
	<u>DE - C - 571 646 (KRAUSS)</u> * Lines 59-86 * --	8,9	D 06 F
A	<u>FR - A - 2 394 633 (BERTOLINO)</u> * Claims * & GB - A - 1 568 045 --		
A	<u>FR - A - 2 140 036 (ZANUSSI)</u> * Page 2, lines 24-38; page 3, lines 1-30 & GB - A - 1 388 731 ----		
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 06-02-1981	Examiner D' HULSTER