(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 066 316**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 82200568.2

(22) Date of filing: 11.05.82

(51) Int. Cl.³: D 06 F 58/04

(30) Priority: 18.05.81 GB 8115161

(43) Date of publication of application:
08.12.82 Bulletin 82/49

(84) Designated Contracting States:
DE FR GB IT NL

(71) Applicant: PHILIPS ELECTRONIC AND ASSOCIATED INDUSTRIES LIMITED
Arundel Great Court 8 Arundel Street
London WC2R 3DT(GB)

(84) Designated Contracting States:
GB

(71) Applicant: N.V. Philips' Gloeilampenfabrieken
Groenewoudseweg 1
NL-5621 BA Eindhoven(NL)

(84) Designated Contracting States:
DE FR IT NL

(72) Inventor: Cash, Peter PHILIPS DOMESTIC APPLIANCES LIMITED
Lightcliffe Factory Hipperholme
Halifax Yorkshire HX3 8DE(GB)

(74) Representative: Boxall, Robin John et al,
Philips Electronic and Associated Ind. Ltd. Patent Department Mullard House Torrington Place
London WC1E 7HD(GB)

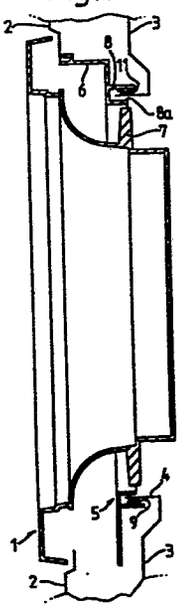
(54) **Tumble drier.**

(57) A tumble drier including a cabinet (2) and a drum (3) mounted therein, one end of which drum (3) is pivoted for rotation about a horizontal axis and the other end of the drum (3) has a loading aperture and is provided with support means including first and second parallel concentric flanges (8, 4) the first (8) of which is fixed relative to the cabinet and the second (4) of which is located on the drum (3) around the periphery of the aperture, the two flanges defining a gap therebetween which is closed by an air seal (10), the support means further including bearing means carried on said first flange (8) for supporting the drum (3) via the other flange (4), the bearing means comprising two or more bearing pads (9) spaced apart around the circumference of the first flange with the intervening spaces between the pads (9) occupied by said air seal (10), characterised in that said air seal (10) is a single strip of a brush-like air sealing material which extends substantially entirely around said first flange (8) between and beneath the bearing pads (9), the bristles of said brush having a length greater than the thickness of said gap.

EP 0 066 316 A1

./...

Fig.1.



"TUMBLE DRIER"

This invention relates to a tumble drier including a cabinet and a drum mounted therein, one end of which drum is pivoted for rotation about a horizontal axis and the other end of the drum has a loading aperture and is provided with support means including first and second parallel concentric flanges, the first of which is fixed relative to the cabinet and the second of which is located on the drum around the periphery of the aperture, the two flanges defining a gap therebetween which is closed by an air seal, the support means further including bearing means carried on said first flange for supporting the drum via the other flange, the bearing means comprising two or more bearing pads spaced around the circumference of the first flange with the intervening spaces between the pads occupied by said air seal.

Such a drier is disclosed in United States Patent No. 3,027,653. The cost of manufacturing a tumble drier depends not only on the costs of the individual components of the construction but also on that of the labour required to assemble the drier. If the air sealing means at the front of the drum is difficult to assemble this can cause an unjustifiable increase in the manufacturing cost of the appliance.

In the drier of the patent, it is necessary for the assembly worker to locate bearing pads on a flange and then to close the circumferential spaces between the pads with lengths of felt. The pieces of felt will of course need to be individually cut to length and fitted and secured into place. Such a construction is laborious and slow to assemble since it is essential that no gaps are left in the annular continuity of the seal. The construction also provides an additional annular seal as protection against air leakage and the need for this further seal suggests that

the working of the primary seal may not be entirely satisfactory in its operation.

A disadvantage of the use of felt is that it is not inherently a very springy material so that if it is subjected to being repeatedly compressed it will eventually become flattened and then will leave a gap through which an air leakage can occur. Since the two concentric flanges of the drier are made of sheet metal or plastics material there is a risk that at least one of them will become distorted slightly from a truly circular shape either whilst it is being formed or whilst being stored before the assembly operation. If this has happened, the gap between the two flanges instead of being the same width all round the circumference of the flanges will be wider than normal in some places and narrower than normal in other places. When one of the flanges is rotated with respect to the other flange, a portion of a felt seal in the region of the narrowest gap between the flanges will become squashed down to the width of the narrowest gap and then it will be unable to expand fully to provide an air seal when the gap in that region increases to the maximum width. After the drier has been in operation for some time, the felt air seal will become permanently compressed so that it adopts the width of the narrower gap between the flanges and in this condition it will be ineffective to provide good air sealing round the remaining parts of the circumference between the flanges.

Since felt sealing material usually has a close random fibrous structure, particles of moisture which can be expected to be present in the air stream will tend to be retained in the interior of a body of felt and over a long period this may cause premature deterioration of the felt.

An object of the present invention is to provide an air sealing means which can be assembled in a very simple manner and which uses a smaller number of component parts.

According to the invention, there is provided a tumble drier of the kind described in the opening paragraph, characterised in

that said air seal is a single strip of a brush-like air sealing material which extends substantially entirely around said first flange between and beneath the bearing pads, the bristles of said brush having a length greater than the thickness of said gap. The bristles of the air seal strip extend parallel to each other and, compared with the randomly-arranged and closely-matted fibres of a felt strip, have a relatively open texture which does not tend to trap water particles. This arrangement further makes it possible to reduce the number of parts needed to be handled by the assembly worker and thus the means needed to fasten these parts can also be reduced. If suitably designed, the bearing pads can be used to secure the air sealing material to the flange. These pads may possibly provide the sole fastening means necessary to fix the sealing material to the flange. A bearing pad can also be used to cover over the two ends of the sealing strip on the flange so that these ends are securely held and, hence, to eliminate the need for any precise cutting of the length of the strip or the formation of a butt joint.

In one embodiment, where one of the said flanges forms one side wall of an annular channel, the other flange extends into this channel. This construction ensures that any rough edges or unevenness that may be present on the edge of the said other flange will be concealed since this edge is enclosed by the channel.

In another embodiment, the said air seal strip is carried on a resilient backing strip which has a width greater than that of the air seal strip, the backing strip being fully inserted into the annular channel whereby the air seal strip will be supported at a predetermined fixed distance from the bottom of the channel. The presence of the resilient backing at least helps to retain the air seal strip against the side wall of the channel and it ensures that the air seal strip is located in a position which is spaced away from the free edge of the flange which extends into the channel. This avoids the risk of any

damage to the strip by a rough and/or sharp edge on said flange.

In a further embodiment, the air seal strip is of polypropylene. This ensures that the material of the strip is resistant to being deformed by compression and is sufficiently resilient at the operating temperature of the drier to provide a fully effective air seal in the gap between the flanges. The material does not absorb water and it does not deteriorate when exposed to water vapour at the drier operating temperature.

By way of example, a particular embodiment of the invention will now be described with reference to the accompanying drawing, in which:

Figure 1 is a cross-sectional view taken on the axis of rotation of the drum and which shows the door and part of the drum of a tumble drier,

Figure 2 is a part end view of an annular channel of Figure 1,

Figure 3 is a detail on an enlarged scale of part of Figure 1, and

Figure 4 is a part cross-sectional view taken on the line IV-IV of Figure 3 when looking in the direction indicated.

Figure 1 shows part of the front cabinet wall of a tumble drier in a schematic view where the door hinge, door seals, and most of the working components have been omitted. A door 1 of the drier is located in an opening in the front cabinet wall 2 so that access may be gained to a loading aperture of a rotatable drum 3 in which a laundry load may be placed for the drying operation. At a rear end wall (not shown) the drum 3 is mounted on a central pivot to enable it to be rotated about a horizontal axis. At its front end wall, the drum carries an axially-directed flange 4 which is supported in an annular channel 5 carried on a door surround 6. The annular channel 5 thus surrounds the loading aperture of the drum 3 and makes it easy to insert and remove the articles of a laundry load without causing any snagging of these articles. To prevent the articles

from blocking the passage by which the drying air stream in operation leaves the drum 3, the door 1 carries a perforated guard ring 7 which partly closes the loading aperture when the door is in a closed condition.

To prevent leakage of air between the rotatable drum 3 and the fixed door surround 6, the joint between these two parts is required to carry an air seal as well as to provide suitable bearing surfaces to allow the rotation of the drum. For this purpose, the annular channel 5 has an outer side wall 8 and an inner side wall 8a. Side wall 8 constitutes a first parallel concentric flange for cooperation with a second flange formed by the flange 4 of the drum. The side wall 8 carries four bearing pads 9 which are clipped on to and are spaced circumferentially round the wall 8 in an arrangement as shown somewhat diagrammatically in Figure 2 which is an end view of the channel 5. The circumferential spaces between the pads 9 are occupied by portions of an air sealing strip comprising upstanding fibres 10 made of polypropylene which are supported on a flexible polypropylene base 11. The sealing strip thus has a brush-like construction and, whilst the fibres can be squashed without being damaged, the fibres tend to remain close together so that an air flow through the body of the material in a direction parallel to the base is hardly possible.

In this embodiment, the air sealing material is in the form of a single strip which is placed round the inner surface of the wall 8 and then passes beneath each bearing pad 9. The two ends 12 of the strip are located beneath one of the bearing pads 9 so that they are securely held in place. In the cutting to length of the portion of air sealing material a great accuracy of cutting is not necessary since the concealment of the two ends 12 beneath one of the bearing pads 9 means that the two ends do not have to form a butt joint provided that any gap between the ends remains covered by the pad 9.

The presence of the bearing pad causes the fibres of the air sealing material immediately below that pad to be squashed.

However, to either side of the pad, the fibres stand up normally so that they will provide a good air seal. In practice, the squashing of the fibres below the bearing pad has not proved detrimental to the effectiveness of the air sealing since any air leakage in the vicinity of the bearing pad is negligible.

Figure 3 shows on a greatly enlarged scale a cross-sectional view of the lower part of the seal in Figure 1. For the sake of clarity in Figure 3, the drum flange 4 has been moved out of the annular channel in a horizontal direction, which has allowed the fibres 10 of the air sealing material to regain their full height.

As depicted in Figure 3, the outer side wall 8 supports a bearing pad 9 which is shaped in the form of a clip which fits round the wall 8 and provides a bearing surface on the inner side of the wall 8 for supporting the drum flange 4. To enable the bearing pad 9 to be readily fastened to the wall 8, the wall 8 carries a tooth 13 which engages in a slot 14 of the pad 9. If it should be required to remove the pad 9 from the wall 8, a screwdriver blade may be inserted into an opening 15 at the foot of the wall 8 to move the slot 14 away from the tooth 13.

In order to space the strip of air sealing material at a fixed distance from the foot of the wall 8, the base 11 of the air sealing strip is initially mounted on a thin resilient backing strip 16 which has a width greater than that of the air sealing strip. The air sealing strip carried on the backing strip 16 may then be easily cut to length, inserted into the annular channel 5 and secured into place by using the four bearing pads 9 as fixing clips. One of the bearing pads 9 is positioned to cover the two ends 12 of the air sealing strip so that a complete circumferential seal will be achieved.

As can be seen from Figure 3, the side of the resilient backing strip 16 which carries the air sealing strip also includes a longitudinal ridge 17. The purpose of the ridge 17 is to support the portion of the bearing pad 9 lying within the channel so that the innermost surface of the bearing pad 9 will lie

parallel to the drum axis in order to provide a maximum effective contact area for the resulting bearing surfaces.

When the drum flange 4 is pushed within the annular channel, the drum flange 4 becomes supported on the four bearing pads 9 and the spaces between the bearing pads are sealed by the presence of the fibres 10 of the air seal material. The drum is thus freely rotatable with respect to the door surround 6 whilst the presence of the air seal prevents significant air leakage between these two members.

Figure 4 shows a view of part of the annular channel 5 before the drum flange 4 has been inserted therein. The channel 5 includes the outer side wall 8 which supports the bearing pad 9. The pad 9 additionally secures the resilient backing strip 16 supporting the air seal material base carrying the resilient fibres 10. The two ends 12 of the base are secured by the bearing pad 9. The eventual position of the drum flange 4 when this is inserted in the channel 5 is indicated by dotted lines.

The foregoing description of an embodiment of the invention has been given by way of example only and a number of modifications may be made without departing from the scope of the invention as defined by the appended claims. For example, it is not essential that the annular channel 5 should be carried on the door surround 6, in a different embodiment the annular channel 5 might be carried on the rotatable drum 3 whilst the axial flange 4 could be part of the door surround 6. In a further embodiment, the sealing strip and the bearing pads 9 might be secured to the inner wall of the channel 5. Also, it is not essential that the flange to which the air sealing strip is fitted is part of an annular channel 5. Thus the other wall (e.g. 8a) of the channel may be omitted.

CLAIMS:

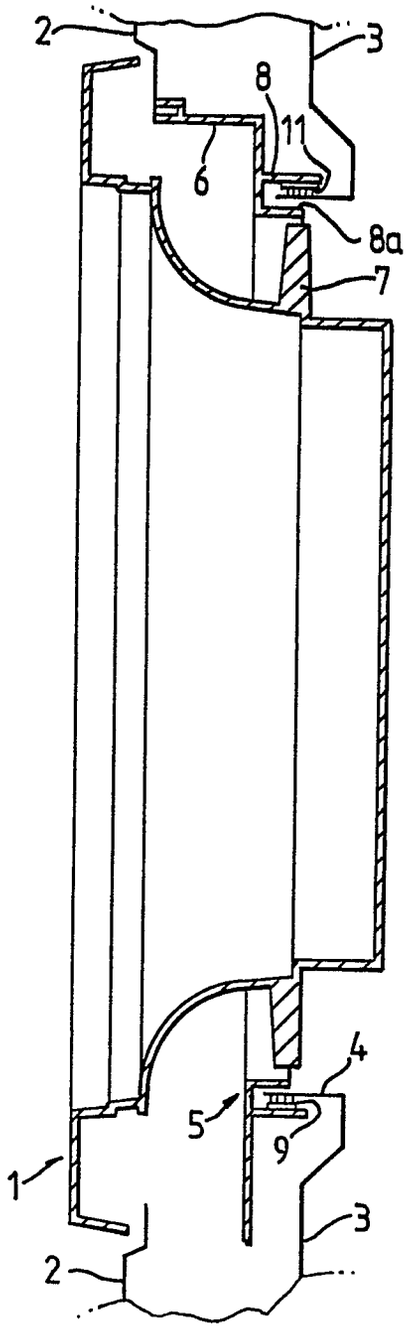
1. A tumble drier including a cabinet and a drum mounted therein, one end of which drum is pivoted for rotation about a horizontal axis and the other end of the drum has a loading aperture and is provided with support means including first and second parallel concentric flanges the first of which is fixed relative to the cabinet and the second of which is located on the drum around the periphery of the aperture, the two flanges defining a gap therebetween which is closed by an air seal, the support means further including bearing means carried on said first flange for supporting the drum via the other flange, the bearing means comprising two or more bearing pads spaced apart around the circumference of the first flange with the intervening spaces between the pads occupied by said air seal, characterised in that said air seal is a single strip of a brush-like air sealing material which extends substantially entirely around said first flange between and beneath the bearing pads, the bristles of said brush having a length greater than the thickness of said gap.

2. A drier as claimed in Claim 1, in which one of said flanges forms one side wall of an annular channel and the other flange extends into this channel.

3. A drier as claimed in Claim 2, in which said air seal strip is carried on a resilient backing strip which has a width greater than that of the air seal strip, such that when the backing strip is fully inserted into the annular channel the air seal strip will be supported at a fixed distance from the bottom of said channel.

4. A drier as claimed in any previous Claim, in which said air seal strip is of polypropylene.

Fig.1.



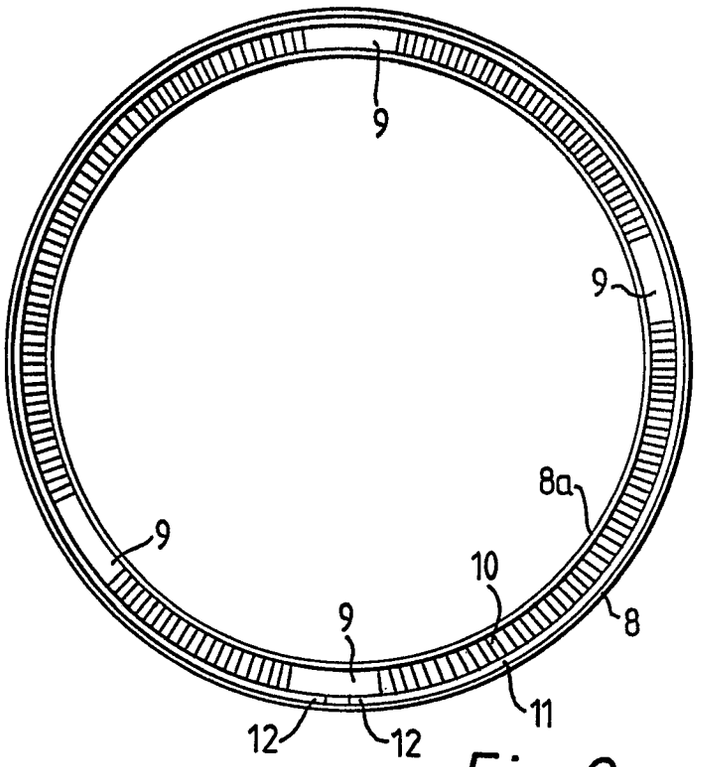


Fig.2.

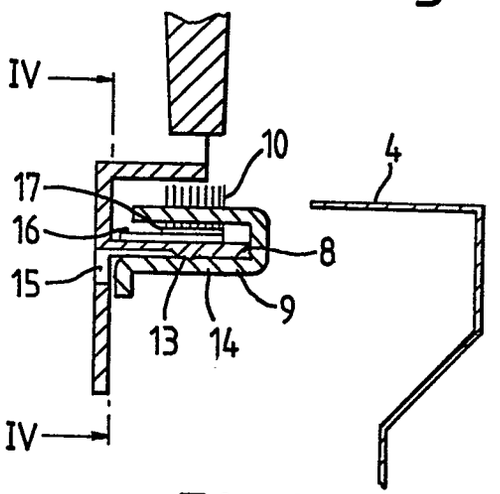


Fig.3.

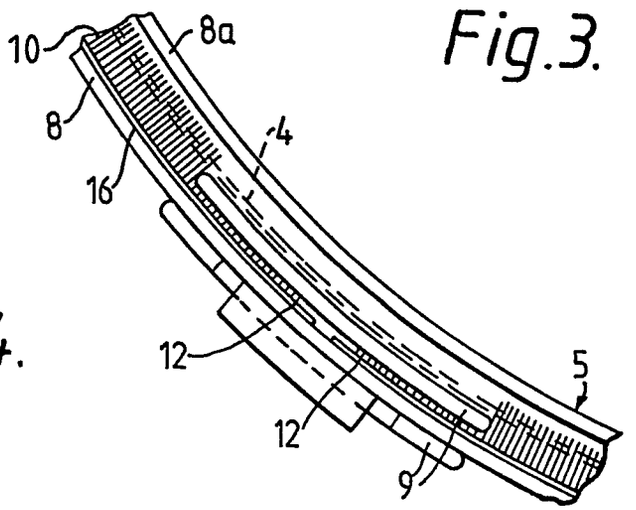


Fig.4.

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 82 20 0568

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	GB-A-1 496 655 (T.I. DOMESTIC APPLIANCES)		D 06 F 58/04
A	GB-A-1 541 001 (SCHLEGEL)		
A	US-A-3 875 686 (SMOOT)		
D,A	US-A-3 027 653 (LONG et al.)		
A	US-A-3 399 464 (ERICKSON)		
A	US-A-3 932 947 (SMOOT)		TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	US-A-3 000 108 (JONES)		D 06 F F 26 B F 16 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26-08-1982	D HULSTER E.W.F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document