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(54) **Air stream filter for a laundry dryer**

Luftstromfilter für Wäschetrockner

Filtre à flux d'air pour sèche-linge

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Group Patents
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**EP-A1- 2 458 071 EP-A2- 0 106 289
GB-A- 2 091 123 US-A- 3 378 934**

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Description

[0001] The present invention relates to an air stream filter for a laundry dryer. Further, the present invention relates to a laundry dryer with at least one air stream filter.

[0002] In a laundry dryer a hot and dry air stream passes a laundry drum containing laundry to be dried. After passing the laundry drum the humidity of the air stream increases and its temperature decreases. Further, the air stream carries an amount of fluff removed from the laundry to be dried. Thus, the air stream has to be filtered in order to remove the fluff. Moreover, the air stream has to be dehumidified by passing an evaporator of a heat pump circuit or by a heat exchanger receiving cold ambient air. Additionally, the air stream has to be heated up by a condenser of the heat pump circuit or by an electric resistance, for example. These three operations are carried out in that order before the air stream is reintroduced again into the laundry drum.

[0003] An air stream filter for removing fluff according to the prior art is disclosed in GB 2 091 123, US 3 378 934 and EP 2 458 071. Said air stream filter comprises two sieves connected by a hinge. Two net patches are supported by a frame in each case. The two frames are connected by the hinge.

[0004] Usually air stream filters are formed as an openable pocket having a rigid plastic frame. Said plastic frame is over-injected on a net sheet. The net sheet is the air filtering part. The plastic frame supports the net sheet. The plastic frame is formed by two separate parts, while the net sheet is a single foil extending on the both separate parts of the plastic frame. Thus, the net sheet is permanently joining the parts of the plastic frame. The filter in the pocket form may be opened in a book-like fashion in order to remove the fluff. A hinge may be provided on the bottom part of the pocket in order to allow an opening of the air stream filter without separating the two parts of the plastic frame. In the prior art said hinge is simply formed by the net sheet itself connecting the two parts of the plastic frame.

[0005] Since the net sheet is damageable and the pocket is frequently opened and closed by the user, often the net sheet breaks in the connecting portion between the two parts of the plastic frame. The air stream filter has to be cleaned after one or two drying cycles. Further, the plastic frame of large size air stream filters is heavy.

[0006] It is an object of the present invention to provide an air stream filter for a laundry dryer, wherein said air stream filter has an improved connecting portion between the two parts of the plastic frame.

[0007] The object of the present invention is achieved by the air stream filter according to claim 1.

[0008] The present invention relates to an air stream filter, in particular for an air stream channel in a laundry dryer, wherein

- the air stream filter includes at least one plastic frame,

- the plastic frame comprises two substantially symmetric wings,
- a net sheet, provided for filtering fluff, covers the plastic frame,
- a hinge extends along a symmetry axis between the wings of the plastic frame, so that the plastic frame is openable and closable in a book-like fashion, and
- at least one reinforcing element is attached on at least one side of the net sheet in a hinge portion between the wings of the plastic frame

characterised in that

the hinge is formed by the net sheet between the wings of the plastic frame and additionally by the reinforcing element.

[0009] According to the present invention the reinforcing element is attached at the net sheet in a hinge portion between the wings of the plastic frame. Thus, the hinge is formed by the net sheet between the wings of the plastic frame and additionally by the reinforcing element.

[0010] In particular, the plastic frame comprises a grid. The grid provides an increased stability of the plastic frame and the airstream filter.

[0011] For example, the reinforcing element is a plastic layer connecting the wings of the plastic frame.

[0012] Further, the plastic frame may comprise at least two layers, wherein the net sheet is sandwiched between said two layers.

[0013] In particular, the at least two layers of the plastic frame extend over the two wings of the plastic frame.

[0014] For example, a part of the net sheet is over-injected by the plastic frame.

[0015] In a similar way, the hinge portion of the net sheet may be over-injected by the reinforcing element.

[0016] The net sheet may preferably be in a single foil extending over the two wings of the air stream filter.

[0017] Further, at least a part of a hinge portion of the net sheet may be uncovered by the over-injection of the reinforcing element. In this case, the hinge can act as an air filter.

[0018] Moreover, at least a part of the hinge region of the net sheet may have a pattern which is different than that of the net extending on the wings of the air stream filter.

[0019] At last, the present invention relates to a laundry dryer with at least one air stream filter, wherein the laundry dryer comprises at least one air stream filter mentioned above.

[0020] The novel and inventive features believed to be the characteristic of the present invention are set forth in the appended claims.

[0021] The invention will be described in further detail with reference to the drawings, in which

FIG 1 shows a schematic perspective view of an outer side of a plastic frame of an air stream filter according to a preferred embodiment of the present invention,

- FIG 2 shows a detailed schematic perspective view of the outside hinge region of the air stream filter shown in Figure 1,
- FIG 3 shows a schematic front view of a inner side of the plastic frame of the air stream filter shown in Figure 1,
- FIG 4 shows a detailed schematic front view of the inside hinge region of the air stream filter shown in Figure 1,
- FIG 5 shows a more detailed schematic front view of an end portion of the inside hinge region of the air stream filter according to the preferred embodiment of the present invention,
- FIG 6 shows a sectional side view taken along line A-A of Figure 5 of a hinge portion of the air stream filter according to the preferred embodiment of the present invention,
- FIG 7 shows a sectional side view taken along line A-A of Figure 5 of a hinge portion of the air stream filter according to a further embodiment of the present invention,
- FIG. 8 shows a partial front view of a laundry dryer with the air stream filter according to the present invention, and
- FIG 9 shows a partial perspective view of the laundry dryer with the air stream filter according to the present invention.

[0022] FIG 1 illustrates a schematic perspective view of a plastic frame 10 of an air stream filter according to a preferred embodiment of the present invention. The air stream filter is preferably provided for a laundry dryer.

[0023] The plastic frame 10 includes two symmetric wings. A hinge 12 extends along the symmetry axis between said wings, so that the plastic frame 10 can be closed and opened in a book-like fashion. In the closed state of the plastic frame 10 the air stream filter has the form of a pocket and is insertable into the laundry dryer, in a region of an opening for loading laundry into a treating chamber. In the open state of the plastic frame 10 the air stream filter can be cleaned by the user. Each wing of the plastic frame 10 comprises a grid 22. The grids 22 provide an increased stability of the plastic frame and the air stream filter. A hinge portion 16 of the plastic frame 10 is shown in FIG 2 by more details.

[0024] FIG 2 illustrates a detailed schematic perspective view of the plastic frame 10 of the air stream filter according to a preferred embodiment of the present invention. FIG 2 is a detailed representation of the hinge portion 16 in FIG 1 as viewed from the outside of the air stream filter, i.e. the hinge part resting outside the pocket

formed by the filter in a closed state. FIG 2 clarifies the structure of the plastic frame 10 in the hinge portion 16.

[0025] FIG 3 illustrates a schematic front view of the inner side of the plastic frame 10 of the air stream filter according to a preferred embodiment of the present invention. A net sheet 14 covers the whole plastic frame 10. The plastic frame 10 and the net sheet 14 form the air stream filter. The net sheet is preferably in a single foil extending over the plastic frame 10.

[0026] For example, a reinforcing element 20 formed as a plastic layer is attached on one side of the net sheet 14 in the portion of the hinge 12, as shown in Figure 6. The plastic layer rests on the outside of the hinge region 16, i.e. on the outer side of the pocket formed by the air stream filter in a closed state. Alternatively, in a further preferred embodiment of the present invention, the net sheet 214 is embedded in the plastic frame 210 in the portion of the hinge 212, as illustrated in Figure 7. In the latter case, the net sheet 214 is sandwiched between two layers of the plastic frame 210 in the portion of the hinge 212. Further, the net sheet 14, 214 is over-injected by the plastic frame 10, 210. Thus, the plastic frame 10, 210 is formed as a single-piece part, and the net sheet 14, 214 is not the only connection between the wings of the plastic frame. A part from the different arrangement of the net 214 and the plastic frame 210 in the hinge region 16, the air stream filter embodiment shown in figure 7 is identical to that described with reference to Figures 1 to 6.

[0027] FIG 4 illustrates a detailed schematic front view of the plastic frame 10 of the air stream filter according to a preferred embodiment of the present invention. FIG 4 shows by more details the hinge portion 16 in FIG 3 as viewed from the inside of the pocket formed by the filter in a closed state.

[0028] FIG 5 illustrates a more detailed schematic front view of the plastic frame 10 of the air stream filter according to a preferred embodiment of the present invention. FIG 5 shows an end portion 18 of FIG 4 by more details.

[0029] FIG 6 illustrates a sectional side view of a hinge portion 16 of the air stream filter according to a preferred embodiment of the present invention. FIG 6 shows the sectional side view along the axis A-A in FIG 5.

[0030] In this example, the reinforcing element 20 is attached at one side of the net sheet 14. The reinforcing element 20 extends along the hinge 12. Thus, the hinge is formed by the net sheet 14 and the reinforcing element 20.

[0031] Figure 7 illustrates a sectional side view of a hinge portion 16 of the air stream filter according to a further embodiment of the invention.

In this further example, the plastic frame 210 includes two layers. The net sheet 214 is sandwiched between said two layers of the plastic frame 210. The two layers of the plastic frame 210 may also extend over the two wings of the plastic frame.

[0032] The reinforcing element 20, 220 is a plastic layer connecting the wings of the plastic frame 10, 210.

[0033] According to the invention, along the hinge por-

tion 16 of the air stream filter it is possible to over-inject the reinforcing element 20, 220 only on some parts of the net sheet 14, 214, while keeping other parts of the net sheet free from the over-injection, and therefore exposed to air for filtering it. In this way, even the hinge part 16 of the filter maintains filtering properties. The over-injection of the reinforcing element 20, 220 may be made on one or both sides of the net sheet 14, 214

[0034] As a further embodiment, the filtering net sheet 14, 214, over-injected on one or both sides thereof with plastic to form the pocket air stream filter, may have a strip, corresponding in position and dimensions to the hinge region 16, wherein the pattern of the net is different compared to the pattern of the net extending on the grid 22.

Since in the hinge portion 16 the net 14, 214 may lose its air filtering function because the hinge region 16 may be completely over-injected with plastic, the pattern of the strip extending on the hinge region 16 may comprise lower air permeability compared to the net sheet portions extending on the grid 22 thereby enhancing the reinforcement of the hinge region 16. Alternatively said strip extending on the hinge region 16 may be air impermeable; for example the strip may be imperforate.

Even the thickness of the net sheet strip to be embedded into the plastic frame in the hinge region 16 may be thicker than the rest of the net extending on the grid 22.

[0035] The air stream filter according to the present invention allows a very solid hinge 12. The reinforcing element 20, 220 prevents that the net sheet 14, 214 breaks in the hinge portion 16.

[0036] FIG 8 illustrates a partial front view of a laundry dryer 24 with the air stream filter according to the present invention.

[0037] FIG 9 illustrates a partial perspective view of the laundry dryer 24 with the air stream filter according to present invention.

[0038] FIG 8 and FIG 9 show the position of the air stream filter within the laundry dryer 24. The air stream filter is arranged below an opening 26 for loading a laundry drum. The air stream filter can be removed and inserted via said opening 26. FIG 9 clarifies that the air stream filter is formed as a pocket.

[0039] Although an illustrative embodiment of the present invention has been described herein with reference to the accompanying drawings, it is to be understood that the present invention is not limited to that precise embodiment, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the claimed the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of reference numerals

[0040]

10, 210	plastic frame
12, 212	hinge
14, 214	net sheet
16	hinge portion
18	hinge end portion
20, 220	reinforcing element
22	grid
24	laundry dryer
26	opening

Claims

1. An air stream filter, in particular for an air stream channel in a laundry dryer (26), wherein

- the air stream filter includes at least one plastic frame (10, 210),
- the plastic frame (10, 210) comprises two substantially symmetric wings,
- a net sheet (14, 214), provided for filtering fluff, covers the plastic frame (10, 210),
- a hinge (12, 212) extends along a symmetry axis between the wings of the plastic frame (10, 210), so that the plastic frame (10, 210) is openable and closable in a book-like fashion,
- at least one reinforcing element (20, 220) is attached on at least one side of the net sheet (14, 214) in a hinge portion (16) between the wings of the plastic frame (10, 210),

characterised in that

the hinge (12, 212) is formed by the net sheet (14, 214) between the wings of the plastic frame and additionally by the reinforcing element.

2. The air stream filter according to claim 1,

characterized in that

the plastic frame (10, 210) comprises a grid (22).

3. The air stream filter according to claim 1 or 2,

characterized in that

the reinforcing element (20, 220) is a plastic layer connecting the wings of the plastic frame (10, 210).

4. The air stream filter according to any one of the preceding claims,

characterized in that

the plastic frame (210) comprises at least two layers, wherein the net sheet (214) is sandwiched between said two layers.

5. The air stream filter according to claim 4,

characterized in that

the at least two layers of the plastic frame (210) extend over the two wings of the plastic frame (210).

6. The air stream filter according to any one of the pre-

ceding claims,

characterized in that

a part of the net sheet (14, 214) is over-injected by the plastic frame (10, 210).

7. The air stream filter according to any one of the preceding claims,

characterized in that

a hinge portion (16) of the net sheet (14, 214) is over-injected by the reinforcing element (20, 220).

8. The air stream filter according to claim 7,

characterized in that

at least a part of a hinge portion (16) of the net sheet (14, 214) is uncovered by the over-injected reinforcing element (20, 220).

9. The air stream filter according to any one of the preceding claims,

characterized in that

in a hinge portion (16), the net sheet (14, 214) comprises a strip having a first pattern that is different from a second pattern of a net sheet part extending on a grid (22) of the plastic frame (10, 210).

10. The air stream filter according claim 9

characterized in that

the first pattern comprises a lower air-permeability than the second pattern.

11. The air stream filter according to claim 9 or 10

characterized in that

the first pattern is air-impermeable.

12. A laundry dryer with at least one air stream filter,

characterized in, that

the laundry dryer comprises at least one air stream filter according to any one of the claims 1 to 11.

Patentansprüche

1. Luftstromfilter, insbesondere für einen Luftstromkanal in einem Wäschetrockner (26), wobei

- der Luftstromfilter mindestens einen Kunststoffrahmen (10, 210) einschließt,
- der Kunststoffrahmen (10, 210) zwei im Wesentlichen symmetrische Flügel umfasst,
- eine Netzplatte (14, 214), die zum Filtern von Flusen bereitgestellt wird, den Kunststoffrahmen (10, 210) bedeckt,
- ein Scharnier (12, 212) sich entlang einer Symmetrieachse zwischen den Flügeln des Kunststoffrahmens (10, 210) erstreckt, so dass der Kunststoffrahmen (10, 210) wie ein Buch geöffnet und geschlossen werden kann,
- mindestens ein Verstärkungselement (20, 220)

an mindestens einer Seite der Netzplatte (14, 214) in einem Scharnierabschnitt (16) zwischen den Flügeln des Kunststoffrahmens (10, 210) befestigt ist,

dadurch gekennzeichnet, dass

das Scharnier (12, 212) durch die Netzplatte (14, 214) zwischen den Flügeln des Kunststoffrahmens und zusätzlich durch das Verstärkungselement gebildet wird.

2. Luftstromfilter nach Anspruch 1,

dadurch gekennzeichnet, dass

der Kunststoffrahmen (10, 210) ein Gitter (22) umfasst.

3. Luftstromfilter nach Anspruch 1 oder 2,

dadurch gekennzeichnet, dass

das Verstärkungselement (20, 220) eine Kunststoffschicht ist, die die Flügel des Kunststoffrahmens (10, 210) verbindet.

4. Luftstromfilter nach einem der vorhergehenden Ansprüche,

dadurch gekennzeichnet, dass

der Kunststoffrahmen (210) mindestens zwei Schichten umfasst, wobei die Netzplatte (214) sandwichartig zwischen den beiden Schichten liegt.

5. Luftstromfilter nach Anspruch 4,

dadurch gekennzeichnet, dass

die mindestens zwei Schichten des Kunststoffrahmens (210) sich über die mindestens zwei Flügel des Kunststoffrahmens (210) erstrecken.

6. Luftstromfilter nach einem der vorhergehenden Ansprüche,

dadurch gekennzeichnet, dass

ein Teil der Netzplatte (14, 214) durch den Kunststoffrahmen (10, 210) überspritzt ist.

7. Luftstromfilter nach einem der vorhergehenden Ansprüche,

dadurch gekennzeichnet, dass

ein Scharnierabschnitt (16) der Netzplatte (14, 214) durch das Verstärkungselement (20, 220) überspritzt ist.

8. Luftstromfilter nach Anspruch 7,

dadurch gekennzeichnet, dass

mindestens ein Teil des Scharnierabschnitts (16) der Netzplatte (14, 214) nicht von dem überspritzten Verstärkungselement (20, 220) bedeckt ist.

9. Luftstromfilter nach einem der vorhergehenden Ansprüche,

dadurch gekennzeichnet, dass

die Netzplatte (14, 214) in einem Scharnierabschnitt

(16) einen Streifen mit einem ersten Muster aufweist, das sich von einem zweiten Muster eines Netzplattenteils unterscheidet, das sich auf einem Gitter (22) des Kunststoffrahmens (10, 210) erstreckt.

10. Luftstromfilter nach Anspruch 9, **dadurch gekennzeichnet, dass** das erste Muster eine niedrigere Luftdurchlässigkeit als das zweite Muster aufweist.
11. Luftstromfilter nach Anspruch 9 oder 10, **dadurch gekennzeichnet, dass** das erste Muster luftundurchlässig ist.
12. Wäschetrockner mit mindestens einem Luftstromfilter, **dadurch gekennzeichnet, dass** der Wäschetrockner mindestens einen Luftstromfilter gemäß einem der Ansprüche 1 bis 11 umfasst.

Revendications

1. Filtre pour flux d'air, en particulier pour un conduit à flux d'air dans un sèche-linge (26),
 - le filtre pour flux d'air comprenant au moins une structure en plastique (10, 210),
 - la structure en plastique (10, 210) comprenant deux ailettes essentiellement symétriques,
 - une toile maillée (14, 214), prévue pour filtrer les peluches, recouvrant la structure en plastique (10, 210),
 - une charnière (12, 212) s'étendant le long d'un axe de symétrie entre les ailettes de la structure en plastique (10, 210), de telle sorte que la structure en plastique (10, 210) puisse être ouverte et fermée à la manière d'un livre,
 - au moins un élément de renforcement (20, 220) étant fixé sur au moins un côté de la toile maillée (14, 214) dans une partie de charnière (16) entre les ailettes de la structure en plastique (10, 210),**caractérisé en ce que** la charnière (12, 212) est formée par la toile maillée (14, 214) entre les ailettes de la structure en plastique et, en outre, par l'élément de renforcement.
2. Filtre pour flux d'air selon la revendication 1, **caractérisé en ce que** la structure en plastique (10, 210) comprend une grille (22).
3. Filtre pour flux d'air selon la revendication 1 ou 2, **caractérisé en ce que** l'élément de renforcement (20, 220) est une couche en plastique raccordant les ailettes de la structure en plastique (10, 210).
4. Filtre pour flux d'air selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la structure en plastique (210) comprend au moins deux couches, la toile maillée (214) étant prise en sandwich entre lesdites deux couches.
5. Filtre pour flux d'air selon la revendication 4, **caractérisé en ce que** les au moins deux couches de la structure en plastique (210) s'étendent sur les deux ailettes de la structure en plastique (210).
6. Filtre pour flux d'air selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la structure en plastique (10, 210) est surinjectée sur une partie de la toile maillée (14, 214).
7. Filtre pour flux d'air selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'élément de renforcement (20, 220) est surinjecté sur une partie de charnière (16) de la toile maillée (14, 214).
8. Filtre pour flux d'air selon la revendication 7, **caractérisé en ce que** au moins une partie d'une partie de charnière (16) de la toile maillée (14, 214) n'est pas couverte par l'élément de renforcement (20, 220) surinjecté.
9. Filtre pour flux d'air selon l'une quelconque des revendications précédentes, **caractérisé en ce que** dans une partie de charnière (16), la toile maillée (14, 214) comprend une bande comportant un premier motif qui est différent d'un second motif d'une partie de toile maillée s'étendant sur une grille (22) de la structure en plastique (10, 210).
10. Filtre pour flux d'air selon la revendication 9, **caractérisé en ce que** le premier motif comprend une perméabilité à l'air inférieure à celle du second motif.
11. Filtre pour flux d'air selon la revendication 9 ou 10, **caractérisé en ce que** le premier motif est imperméable à l'air.
12. Sèche-linge comportant au moins un filtre pour flux d'air, **caractérisé en ce que** le sèche-linge comprend au moins un filtre pour flux d'air selon l'une quelconque des revendications 1 à 11.

FIG 1

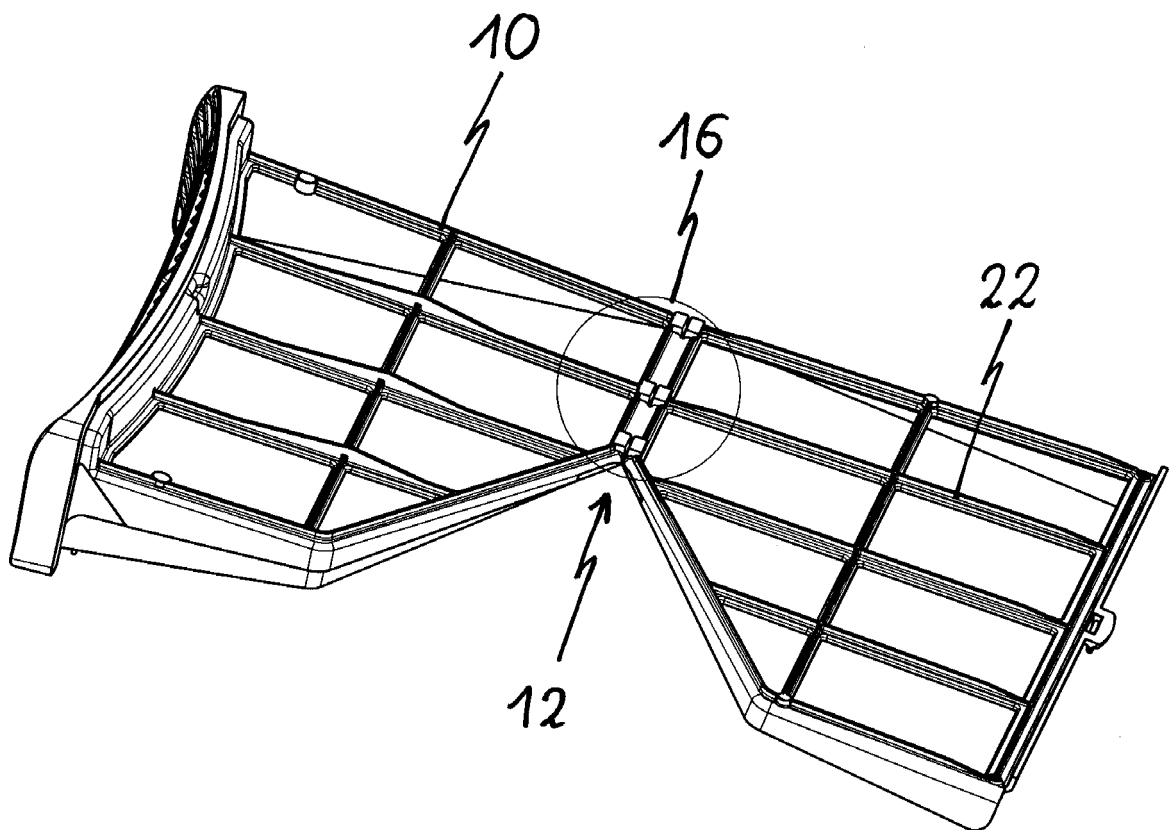


FIG 2

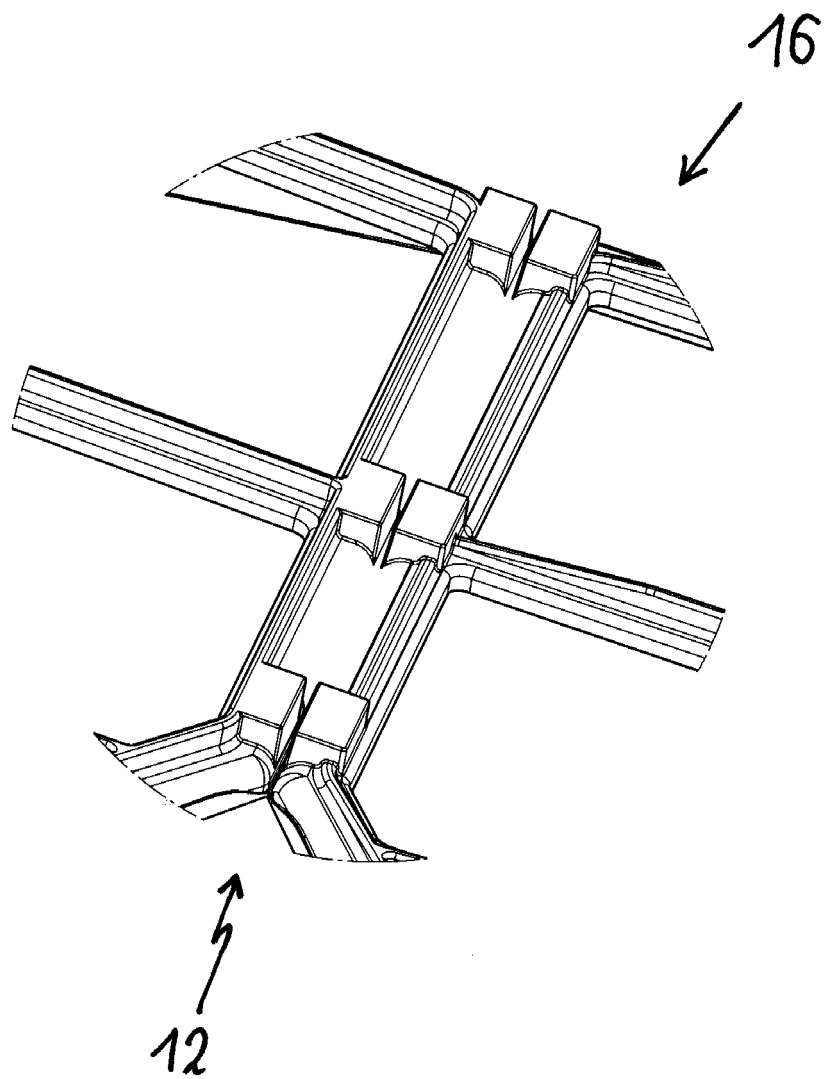


FIG 3

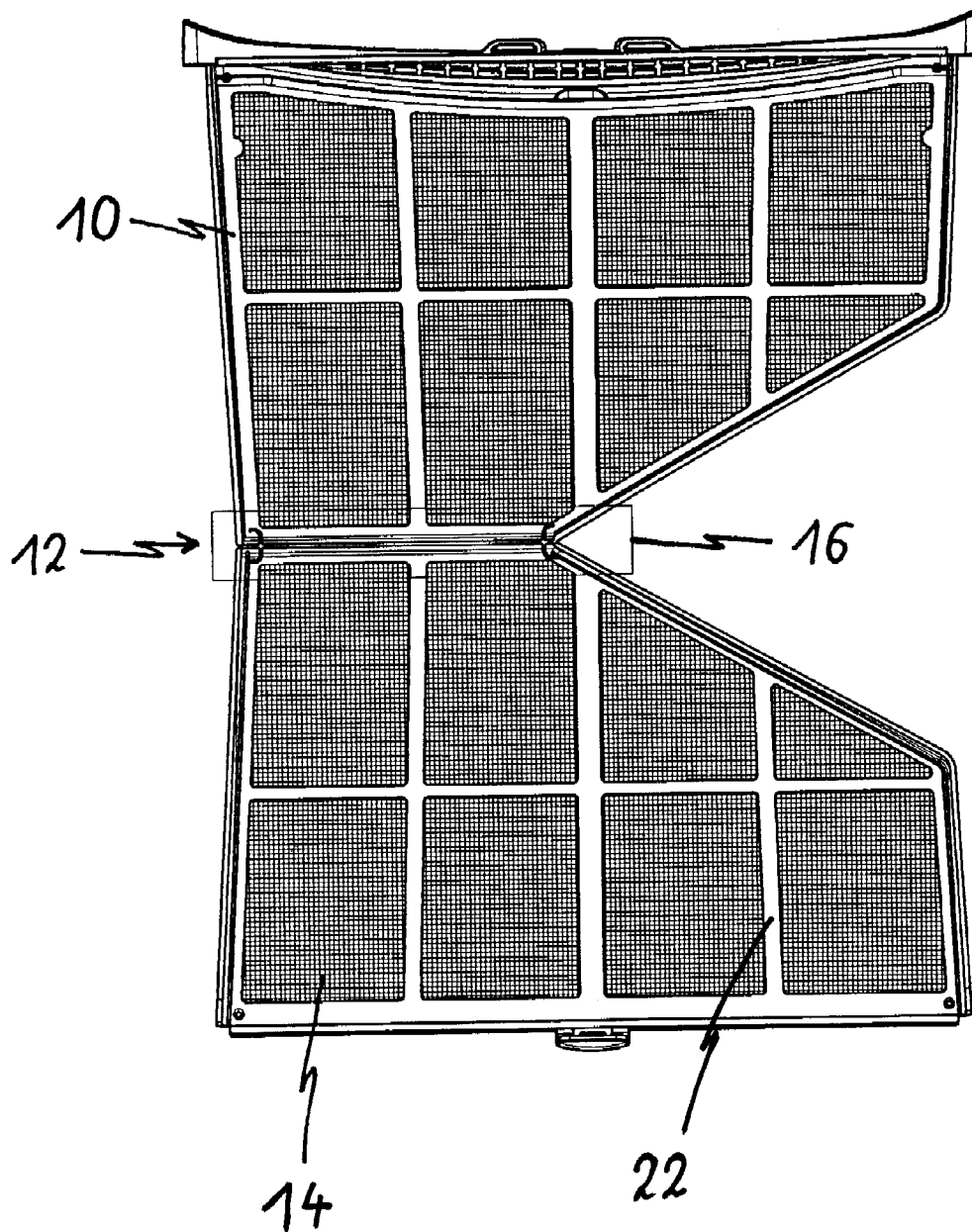


FIG 4

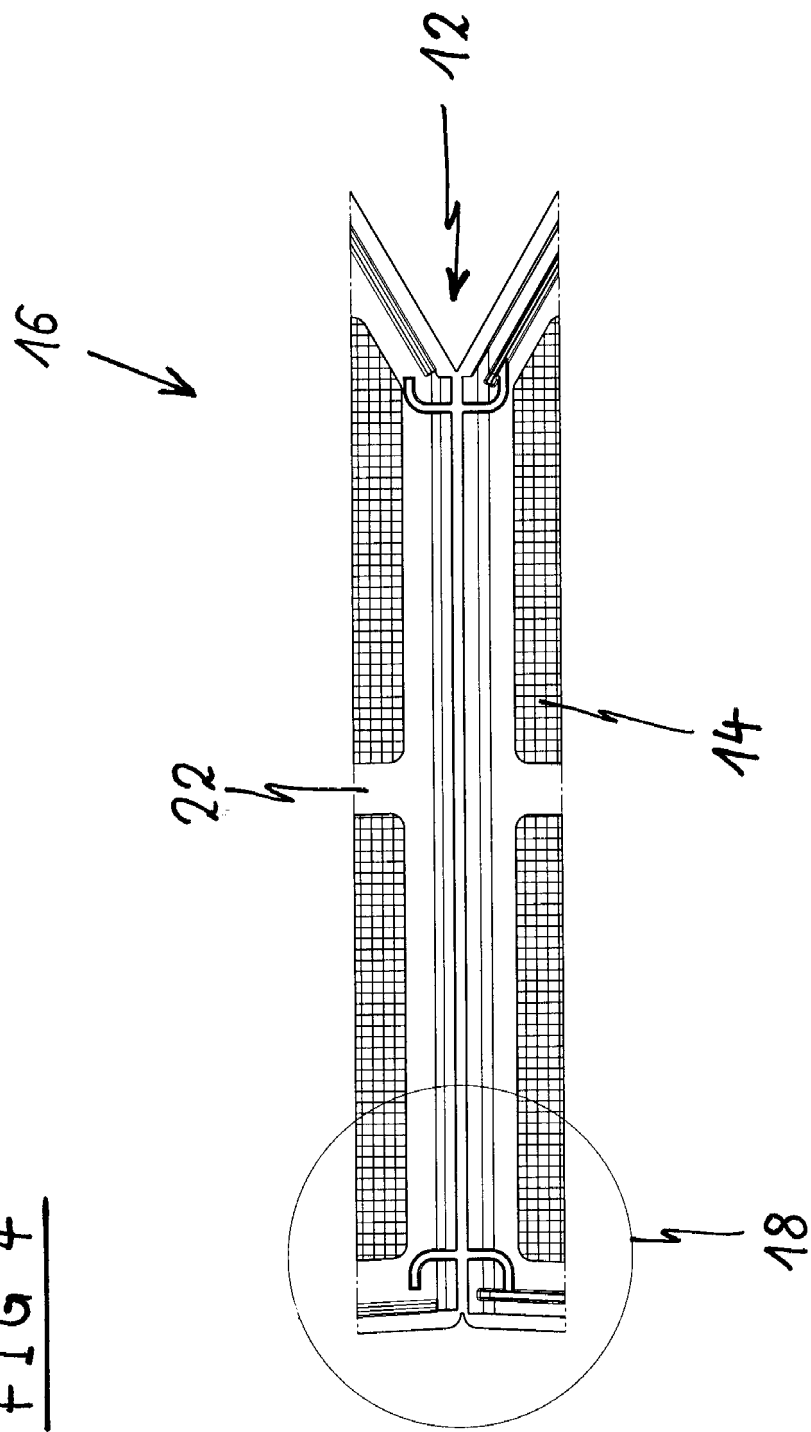


FIG 5

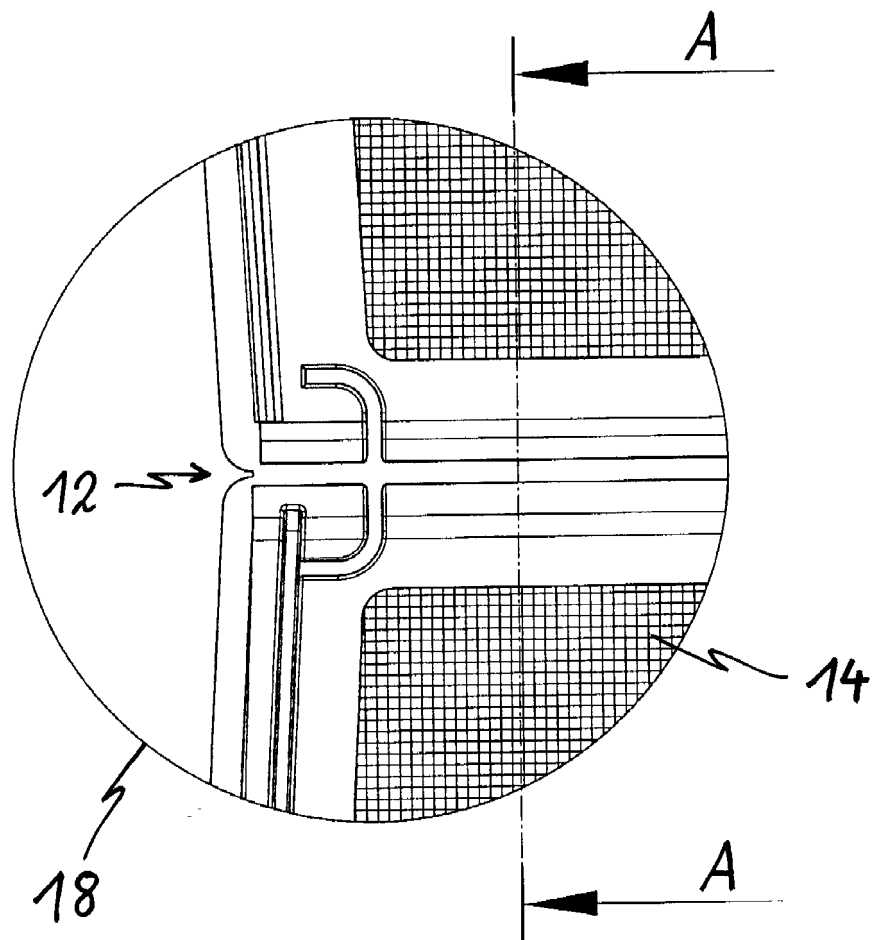


FIG 6

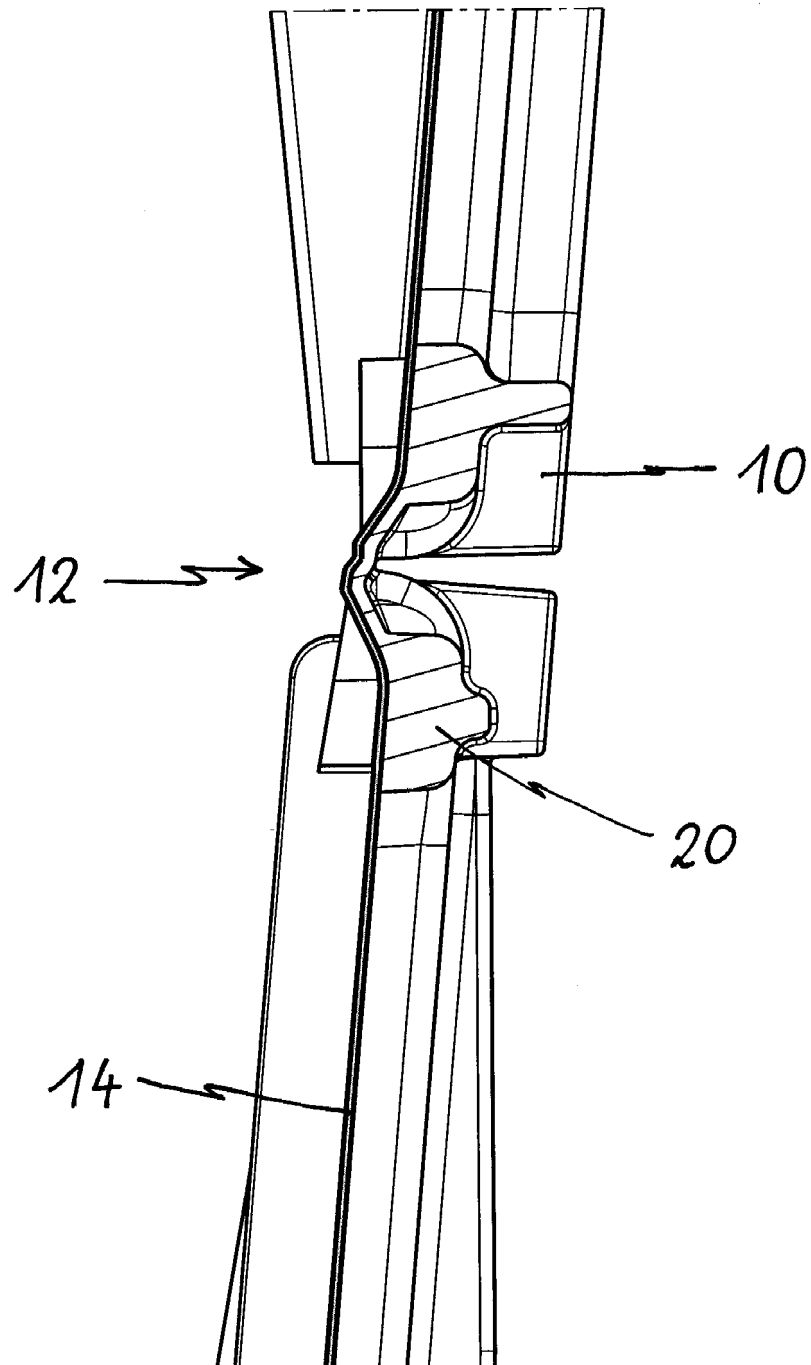


FIG 7

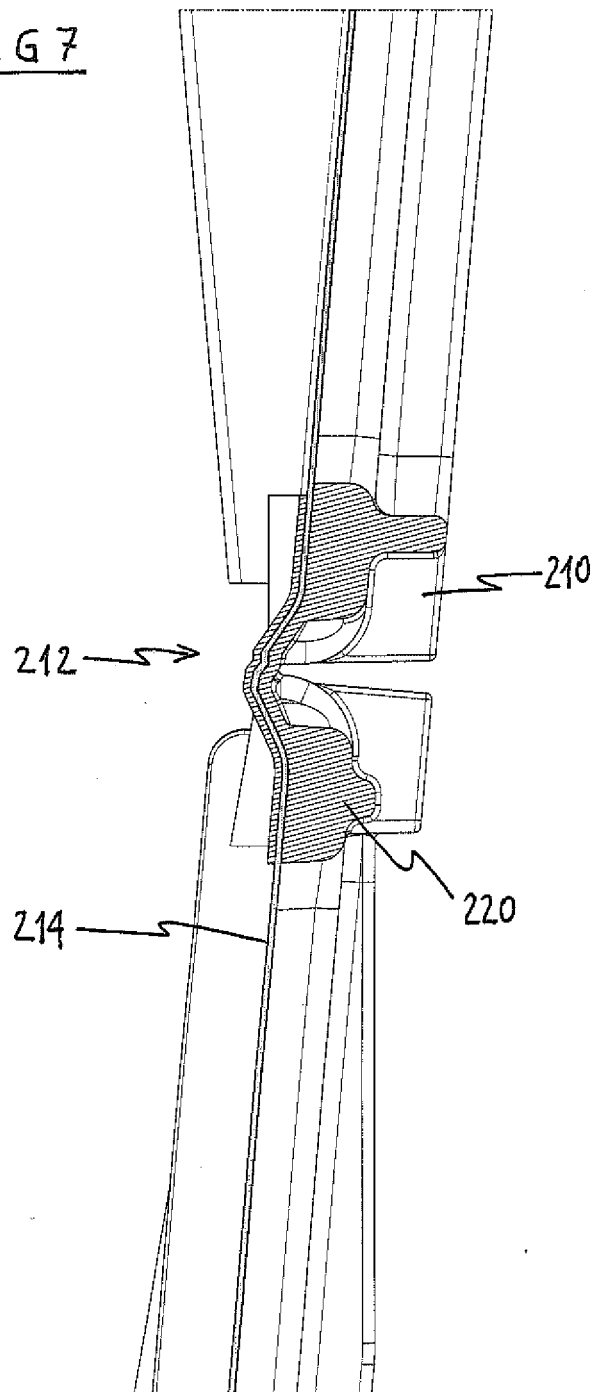


FIG 8

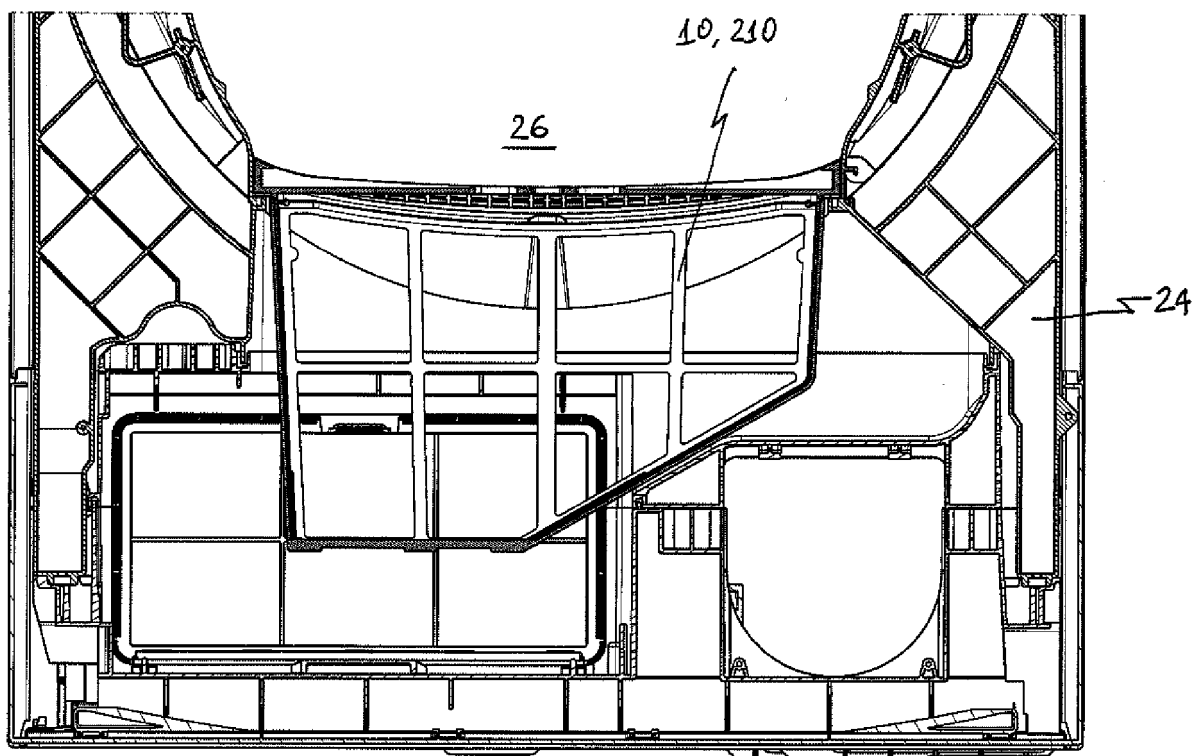
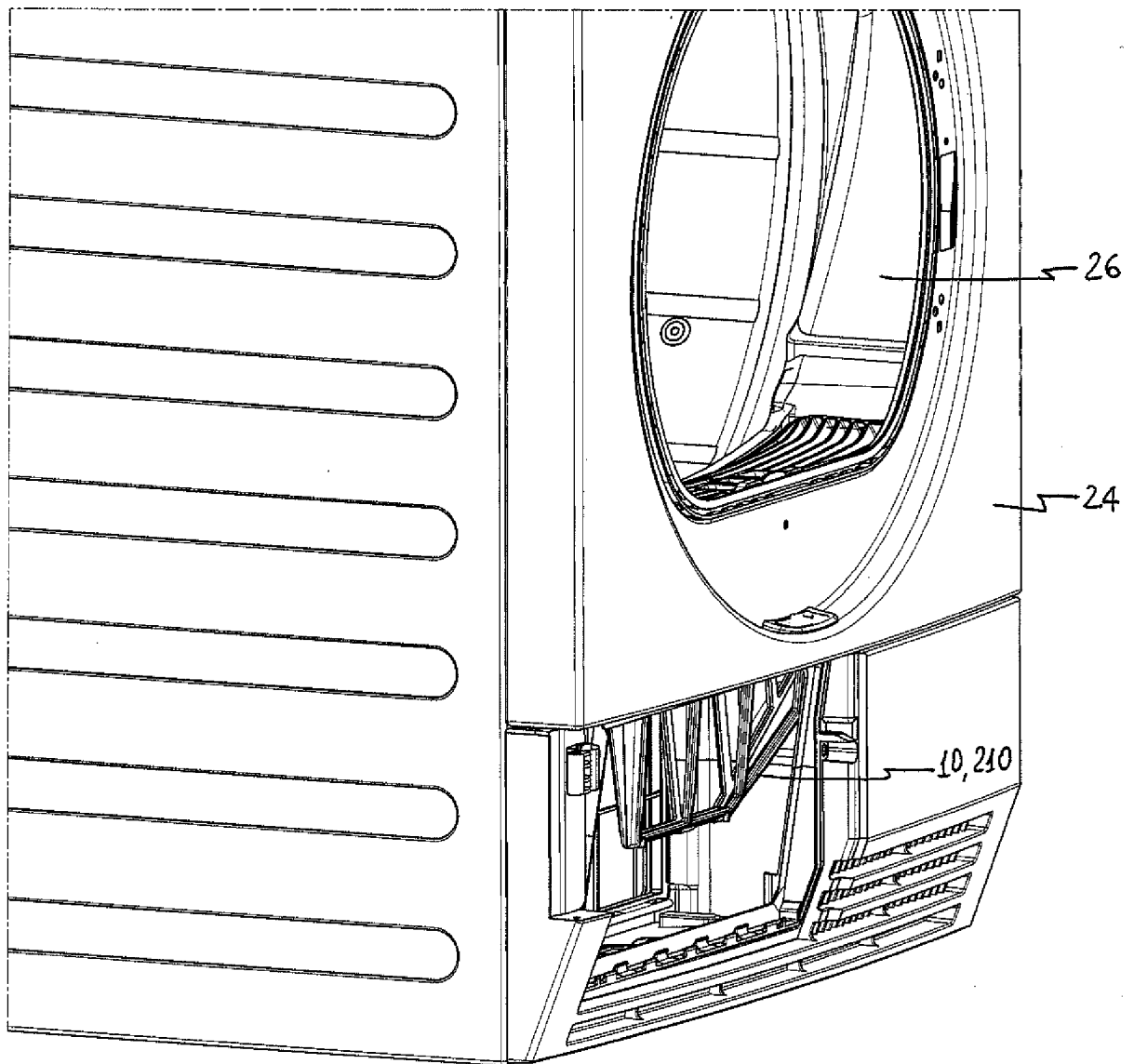


FIG 9



REFERENCES CITED IN THE DESCRIPTION

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