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(54) **Laundry dryer having a fire protection system**

Wäschetrockner mit Brandschutzsystem

Sèche-linge disposant d'un système de protection contre les incendies

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Description

[0001] The present invention refers to a laundry dryer having a fire protection system.

[0002] A laundry dryer, in particular a condenser-type laundry dryer, is generally provided with a heat exchanger where moisture is removed from a drying air flow leaving a laundry treating chamber and it is further provided with heating elements, such as an electric resistance for heating up said drying air. It is also known that drying air passed through laundry is enriched of fluff material that needs to be filtered so as to limit its deposition on operational devices encountered by the drying air flow after having exited a laundry treatment chamber and before being reintroduced into said chamber.

[0003] Generally, user accessible air filtering means are provided just in the first portion of a drying air circuit having its air inlet opening placed in the laundry treating chamber. Such arrangement is disclosed in EP 2145999 and US 3866333. Such filtering means, however, cannot trap all fluff present in drying air and an amount of it passes beyond the filter and flows towards the condenser and the heating units.

[0004] It has been found that fluff contacting an active electric resistance as heating unit may be burnt almost instantaneously thereby causing not only production of incandescent fragments but also of flames having a temperature that may fuse at least partially the air conduit inner surface and its gaskets which, normally, are both made of polymeric material. This problem arises particularly on bent portions of the drying air conduit that are normally formed in a region adjacent to electric resistance. An arrangement provided for preventing an object exiting the laundry treating chamber in counter-flow relative to the drying flow from reaching the heating elements is disclosed in EP 1847644.

[0005] The aim of the present invention is therefore to solve the noted drawbacks and thus providing a laundry dryer in which the risk of fusion or fire damages to the inner surface of a drying circuit are avoided.

[0006] An object of the present invention is to provide a laundry dryer having an improved fire protection system that does not cause further losses in drying air flow.

[0007] A further object of the invention is to provide a laundry dryer having an improved fire protection system that may be inspected and promptly removed from laundry dryer structure.

[0008] Another object of the invention is to provide a laundry dryer wherein the fire protection system provided therein is suitable to collect any possible incandescent fluff that me be ignited, even when drying air is flowing through the drying air conduit.

[0009] Still another object of the present invention is to provide a laundry dryer wherein the fire protection system provided therein cannot be ignited.

[0010] Advantages, objects, and features of the invention will be set forth in part in the description and drawings which follow and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objects and advantages of the invention may be reached and attained as particularly pointed out in the appended claims.

[0011] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate possible embodiments of the invention and together with the description serve to explain the principles of the invention. Like reference numbers represents like features throughout the accompanying drawings, wherein

[0012] Figure 1 schematically shows a sectional side view of a laundry dryer according to the invention provided with a fire protection system;

[0013] Figure 2 shows a perspective rear view of the laundry dryer rear bulkhead and a basement with a disassembled fire protection system;

[0014] Figure 3 shows a perspective rear view of the fire protection system assembled on a basement portion;

[0015] Figure 4 is a perspective front view of the laundry dryer rear bulkhead associated to the basement where fire protection system is partially extracted therefrom;

[0016] Figure 5 shows a perspective front view of a fire protection system.

[0017] Figure 6 shows a perspective rear view of the laundry dryer rear bulkhead and a basement with a fire protection system mounted therein;

[0018] Figure 7 shows an enlarged view of the fire protection system associated to the laundry dryer basement;

[0019] With reference to the attached Figures, a laundry dryer according to the invention comprises a drying air circuit 1 in which drying air is circulated so as to be passed through a laundry treating chamber 2 formed by a rotating drum 3. Drying air is moved along the drying air circuit 1 by means of a fan (not shown) and it is introduced into laundry treating chamber 2 from a rear bulkhead 4 having a perforated wall 5 and being arranged on a supporting wall 17, which, preferably, is the rear wall of the cabinet of the laundry dryer. Drying air exits laundry treating chamber 2 from a front passage 6 provided in proximity of a main opening 7 that allows laundry to be loaded within chamber 2. Air exiting the laundry treating chamber 2 passes through a drying air moisture condensing unit 8 consisting, for example, in a air-air heat exchanger accommodated in a seat 11 formed in a basement 12, that is preferably made of polymeric material. Such unit 8 removes moisture from drying air through a condensation process. Downstream of condensing unit 8 a drying air heating device 9, for example one or more electric resistance, heats up drying air exiting condensing unit 8 before reintroducing air within laundry treating chamber 2.

[0020] Drying air circuit 1 comprises a conduit portion 10 placed upstream said drying air heating device 9 relative to the drying air flow illustrated by arrows "A" in

Figure 1. Conduit portion 10 preferably imparts a change in the drying air flow direction from a substantially horizontal plane to a substantially vertical plane. Conduit portion 10 is formed by joining an upper portion 13 to a lower portion 14 of basement 12, as it can be better seen in Figures 2 and 3.

[0021] Conduit portion 10 is provided with a fire protection system 15 having a shield region 16 that is suitable for preventing particles, such as fluff material removed from laundry by drying air, that may be ignited by the high temperature existing around the heating device 9 from reaching/contacting/touching the conduit portion 10 itself causing fusion thereof and/or a possible source of fire. Considering the drying air flow direction shown in Figure 1 by arrows "A", fire protection system 15 is placed upstream of heating device 9 so as to collect ignited particles avoiding them to fall towards the lower portion 14 of basement 12.

[0022] Fire protection system 15 is inserted in a seat 18 formed on the upper portion 13 of basement 12 and extends downwards into the lower portion 14 of said basement 12. A manifold 19 associates drying air heating means 9 with the upper portion 13 of basement 12 in correspondence of seat 18. Preferably, the manifold 19 comprises a rear cabinet cover 21 and the back side 22 of the supporting wall 17 so as to form a conduit for conveying drying air from the basement 12 to the heating device 9. Preferably, sealing means are provided between the rear cabinet cover 21 and back side 22 of the supporting wall 17 for preventing drying air leakages. Preferably, the rear cabinet cover 21 and the supporting wall 17 rest on the basement 12 and particularly on a section of the seat 18 of the upper portion 13 of basement 12. A gasket 32 is arranged/pinched between the seat 18 on one side and the rear cabinet cover 21 and the supporting wall 17 on the other side for making the manifold 19 air-tight. In order to prevent ignited particles to reach the gasket and to avoid such particles to escape shield region 16, the fire protection system 15 comprises a coupling surface 20 that interposes between manifold 19 and the upper portion 13 of basement 12 by resting on seat 18. As it can be seen in Figures 1 the fire protection system 15 is arranged between a rear cabinet cover 21 and a back side 22 of supporting wall 17, so as to be dismountable from the rear side of laundry dryer as better shown in Figure 4.

[0023] Figure 5 shows a perspective front view of a fire protection system 15. Such system 15 comprises a basket-like body 23 that is removably received within conduit portion 10 as described above. Basket-like body 23 has a coupling surface 20 delimiting an aperture 24 that allows drying air to leave the fire protection system 15 and to be directed towards the heating device 9. When the basket-like body 23 is received within seat 18 of the upper portion 13 of basement 12, the coupling surface 20 of fire protection system 15 rests on seat 18 and an air permeable wall 25 of body 23 faces a drying air outlet port 26 of the moisture condensing unit 8 as shown in Figure 1. In this way drying air leaving the condensing unit 8 can pass through the fire protection system 15 without relevant air flow losses.

[0024] The air permeable wall 25 is made by forming a plurality of apertures 28A, 28B, 28C, 28D on wall 25. A solid wall 27 is provided opposite to the air permeable wall 25 and spaced apart from the latter. Drying air passing through the air permeable wall 25 hits on solid wall 27 and goes up to the heating device 9. Air permeable wall 25 slopes downwardly towards the solid wall 27 such that ignited particles descending from the heating device 9 and being pushed by the drying air flow passing through the air permeable wall 25, may be collected within the bottom wall 30 of basket-like body 23.

[0025] A couple of eyelets 29A, 29B are provided on the air permeable wall 25 side for joining body 23 to back side 22 of supporting wall 17 by means of threaded fastening device, rivets or the like. In this way, basket-like body 23 is kept stable under the effect of the drying air flow.

[0026] Alternatively the body 23 can be snap fitted to the seat 18.

[0027] In order to avoid any risk of fire, the fire protection system 15 is made by a fireproof material. Fluff that may be ignited by the heating device 9 and falling towards the basket-like body 23 of fire protection system 15 does not cause fusion of the bottom wall 30 thereof.

[0028] It should be noted that drying air circuit 1 has an opening 31 formed on the upper portion 13 of basement 12 in correspondence of seat 11 for drying air moisture condensing unit 8. Such opening 31 serves to let a drying air portion to exit circuit 1 and flowing inside the machine cabinet for ventilating the interior space thereof. In this way condensation of vapor onto electronic components like a user interface may be avoided.

[0029] As it can be inferred from the description above, a laundry dryer has been provided with a fire protection system that is capable to collect any possible incandescent fluff that me be ignited by contacting an active electric resistance heating up drying air. Said fire protection system avoid ignited fluff from dispersing along the drying air circuit thereby preventing any possible risk of conduit damages and fire promotion. Advantageously, the fire preventing system is efficient even when drying air is flowing within the drying air conduit, i.e. when incandescent fluff may be agitated randomly in any direction by the action of drying air flow. According to the invention a fire protection system is designed so as not to cause further losses in drying air flow and is made in a fireproof material. The same fire protection system may be promptly removed by laundry dryer structure for inspection

Claims

1. A laundry dryer comprising a drying air circuit (1) for circulating drying air through laundry to be dried, a

drying air heating device (9) and a drying air moisture condensing unit (8), **characterized in that** said drying air circuit (1) comprises a conduit portion (10) provided with a fire protection system (15) which is arranged upstream of the drying air heating device (9) and allows particles to pass therethrough, the fire protection system (15) having a shield region (16) for preventing particles, which passed through the fire protection system (15), being ignited by said drying air heating device (9), and falling therefrom against drying air flow, from reaching the conduit portion (10).

2. A laundry dryer according to claim 1 wherein said fire protection system (15) is arranged downstream to said moisture condensing unit (8) relative to the drying air flow.

3. A laundry dryer according to claim 1 or 2 wherein said fire protection system (15) comprises a basket-like body (23) removably received within the conduit portion (10).

4. A laundry dryer according to any preceding claim wherein the fire protection system (15) comprises an air permeable wall (25) to allow said drying air to be passed therethrough.

5. A laundry dryer according to any preceding claim wherein the fire protection system (15) is arranged between a rear cabinet cover (21) and a back side (22) of a supporting wall (17).

6. A laundry dryer according to any preceding claim wherein the fire protection system (15) is arranged between a rear cabinet cover (21) and a back side (22) of a rear wall (17), which forms a cabinet of the laundry dryer.

7. A laundry dryer according to any preceding claim further comprising a basement (12) having a seat (18) for accommodating said fire protection system (15).

8. A laundry dryer according to claim 7 wherein said basement (12) comprise an upper portion (13) and a lower portion (14) associated one another, said seat (18) being formed on the upper portion (13).

9. A laundry dryer according to claim 8 wherein the upper portion (13) of basement (12) is associated to said drying air heating device (9) by means of a manifold (19), the fire protection system (15) having a coupling surface (20) interposed between the manifold (19) and the upper portion (13) of basement (12).

10. A laundry dryer according to claim 4 wherein said air permeable wall (25) faces a drying air outlet port (26) of the moisture condensing unit (8).

11. A laundry dryer according to claim 4 or 10 wherein a solid wall (27) is provided opposite and spaced apart from said air permeable wall (25).

12. A laundry dryer according to claim 1 wherein said air permeable wall (25) slopes towards the solid wall (27).

13. A laundry dryer according to any claim 4, 10-12 wherein said air permeable wall (25) is provided with a couple of eyelets (29A, 29B).

14. A laundry dryer according to any preceding claim wherein the fire protection system (15) is made by a fireproof material.

15. A laundry dryer according to any preceding claim wherein the fire protection system (15) is fixed to the back side (22) of a supporting wall (17).

Patentansprüche

1. Wäschetrockner, umfassend einen Trocknungsluftkreislauf (1) zum Zirkulieren von Trocknungsluft durch die zu trocknende Wäsche, eine Trocknungsluft-Erwärmungsvorrichtung (9) und eine Trocknungsluft-Feuchtigkeitskondensatoreinheit (8), **dadurch gekennzeichnet, dass** der Trocknungsluftkreislauf (1) einen Leitungsabschnitt (10) umfasst, der mit einem Brandschutzsystem (15) bereitgestellt wird, das stromaufwärts der Trocknungsluft-Erwärmungsvorrichtung (9) angeordnet ist und ermöglicht, dass Teilchen dadurch laufen, wobei das Brandschutzsystem (15) einen Abschirmbereich (16) aufweist, um zu verhindern, dass Teilchen, die das Brandschutzsystem (15) durchlaufen haben, von der Trocknungsluft-Erwärmungsvorrichtung (9) entzündet werden und in die Trocknungsluftströmung fallen und den Leitungsabschnitt (10) erreichen.

2. Wäschetrockner nach Anspruch 1, wobei das Brandschutzsystem (15) stromabwärts der Feuchtigkeitskondensatoreinheit (8) in Bezug auf die Trocknungsluftströmung angeordnet ist.

3. Wäschetrockner nach Anspruch 1 oder 2, wobei das Brandschutzsystem (15) einen korbähnlichen Körper (23) umfasst, der entfernbar in dem Leitungsabschnitt (10) aufgenommen ist.

4. Wäschetrockner nach einem der vorherigen Ansprüche, wobei das Brandschutzsystem (15) eine luftdurchlässige Wand (25) umfasst, damit die Trock-

nungsluft diese durchlaufen kann.

5. Wäschetrockner nach einem der vorherigen Ansprüche, wobei das Brandschutzsystem (15) zwischen einer hinteren Gehäuseabdeckung (21) und einer Rückseite (22) einer Stützwand (17) angeordnet ist.

6. Wäschetrockner nach einem der vorherigen Ansprüche, wobei das Brandschutzsystem (15) zwischen einer hinteren Gehäuseabdeckung (21) und Rückseite (22) einer Rückwand (17) angeordnet ist, die ein Gehäuse des Wäschetrockners bildet.

7. Wäschetrockner nach einem der vorherigen Ansprüche, ferner umfassend eine Basis (12) mit einem Sitz (18) zum Unterbringen des Brandschutzsystems (15).

8. Wäschetrockner nach Anspruch 7, wobei die Basis (12) einen oberen Abschnitt (13) und einen unteren Abschnitt (14) umfasst, die miteinander verbunden sind, wobei der Sitz (18) an dem oberen Abschnitt (13) ausgebildet ist.

9. Wäschetrockner nach Anspruch 8, wobei der obere Abschnitt (13) der Basis (12) mit der Trocknungsluft-Erwärmungsvorrichtung (9) über einen Verteiler (19) verbunden ist, wobei das Brandschutzsystem (15) eine Kopplungsoberfläche (20) aufweist, die zwischen dem Verteiler (19) und dem oberen Abschnitt (13) der Basis (12) angeordnet ist.

10. Wäschetrockner nach Anspruch 4, wobei die luftdurchlässige Wand (25) zu einer Trocknungsluft-Auslassöffnung (26) der Feuchtigkeitskondensatoreinheit (8) weist.

11. Wäschetrockner nach Anspruch 4 oder 10, wobei eine feste Wand (27) gegenüber und beabstandet von der luftdurchlässigen Wand (25) bereitgestellt ist.

12. Wäschetrockner nach Anspruch 11, wobei sich die luftdurchlässige Wand (25) zu der festen Wand (27) neigt.

13. Wäschetrockner nach einem der Ansprüche 4, 10 bis 12, wobei die luftdurchlässige Wand (25) mit einem Paar Ösen (29A, 29B) bereitgestellt ist.

14. Wäschetrockner nach einem der vorherigen Ansprüche, wobei das Brandschutzsystem (15) aus einem feuerfesten Material hergestellt ist.

15. Wäschetrockner nach einem der vorherigen Ansprüche, wobei das Brandschutzsystem (15) an der Rückseite (22) einer Stützwand (17) befestigt ist.

Revendications

1. Sèche-linge comprenant un circuit d'air de séchage (1) pour faire circuler de l'air de séchage à travers du linge devant être séché, un dispositif de chauffage d'air de séchage (9) et une unité de condensation d'humidité d'air de séchage (8), **caractérisé par le fait que** ledit circuit d'air de séchage (1) comprend une partie conduit (10) comportant un système de protection contre les incendies (15) qui est disposé en amont du dispositif de chauffage d'air de séchage (9) et permet à des particules de passer à travers celui-ci, le système de protection contre les incendies (15) ayant une région écran (16) pour empêcher des particules, qui ont passées à travers le système de protection contre les incendies (15), qui sont enflammées par ledit dispositif de chauffage d'air de séchage (9) et tombent à partir de celui-ci à l'encontre de l'écoulement d'air de séchage, d'atteindre la partie conduit (10).

2. Sèche-linge selon la revendication 1, dans lequel ledit système de protection contre les incendies (15) est disposé en aval de ladite unité de condensation d'humidité (8) par rapport à l'écoulement d'air de séchage.

3. Sèche-linge selon l'une des revendications 1 ou 2, dans lequel ledit système de protection contre les incendies (15) comprend un corps de type panier (23) reçu de façon amovible à l'intérieur de la partie conduit (10).

4. Sèche-linge selon l'une quelconque des revendications précédentes, dans lequel le système de protection contre les incendies (15) comprend une paroi perméable à l'air (25) pour permettre audit air de séchage de passer à travers celle-ci.

5. Sèche-linge selon l'une quelconque des revendications précédentes, dans lequel le système de protection contre les incendies (15) est disposé entre un couvercle de corps arrière (21) et un côté arrière (22) d'une paroi de support (17).

6. Sèche-linge selon l'une quelconque des revendications précédentes, dans lequel le système de protection contre les incendies (15) est disposé entre un couvercle de corps arrière (21) et un côté arrière (22) d'une paroi arrière (17), qui forme un corps du sèche-linge.

7. Sèche-linge selon l'une quelconque des revendications précédentes, comprenant en outre une base (12) ayant un siège (18) pour recevoir ledit système de protection contre les incendies (15).

8. Sèche-linge selon la revendication 7, dans lequel

ladite base (12) comprend une partie supérieure (13) et une partie inférieure (14) associées l'une à l'autre, ledit siège (18) étant formé sur la partie supérieure (13).

9. Sèche-linge selon la revendication 8, dans lequel la partie supérieure (13) de la base (12) est associée audit dispositif de chauffage d'air de séchage (9) au moyen d'un collecteur (19), le système de protection contre les incendies (15) ayant une surface d'accouplement (20) interposée entre le collecteur (19) et la partie supérieure (13) de la base (12).

10. Sèche-linge selon la revendication 4, dans lequel ladite paroi perméable à l'air (25) fait face à un orifice de sortie d'air de séchage (26) de l'unité de condensation d'humidité (8).

11. Sèche-linge selon l'une des revendications 4 ou 10, dans lequel une paroi pleine (27) est disposée en opposition et espacée de ladite paroi perméable à l'air (25).

12. Sèche-linge selon la revendication 11, dans lequel ladite paroi perméable à l'air (25) est inclinée vers la paroi pleine (27).

13. Sèche-linge selon l'une quelconque des revendications 4, 10-12, dans lequel ladite paroi perméable à l'air (25) comporte un couple d'oeillets (29A, 29B).

14. Sèche-linge selon l'une quelconque des revendications précédentes, dans lequel le système de protection contre les incendies (15) est fait d'un matériau à l'épreuve du feu.

15. Sèche-linge selon l'une quelconque des revendications précédentes, dans lequel le système de protection contre les incendies (15) est fixé au côté arrière (22) d'une paroi de support (17).

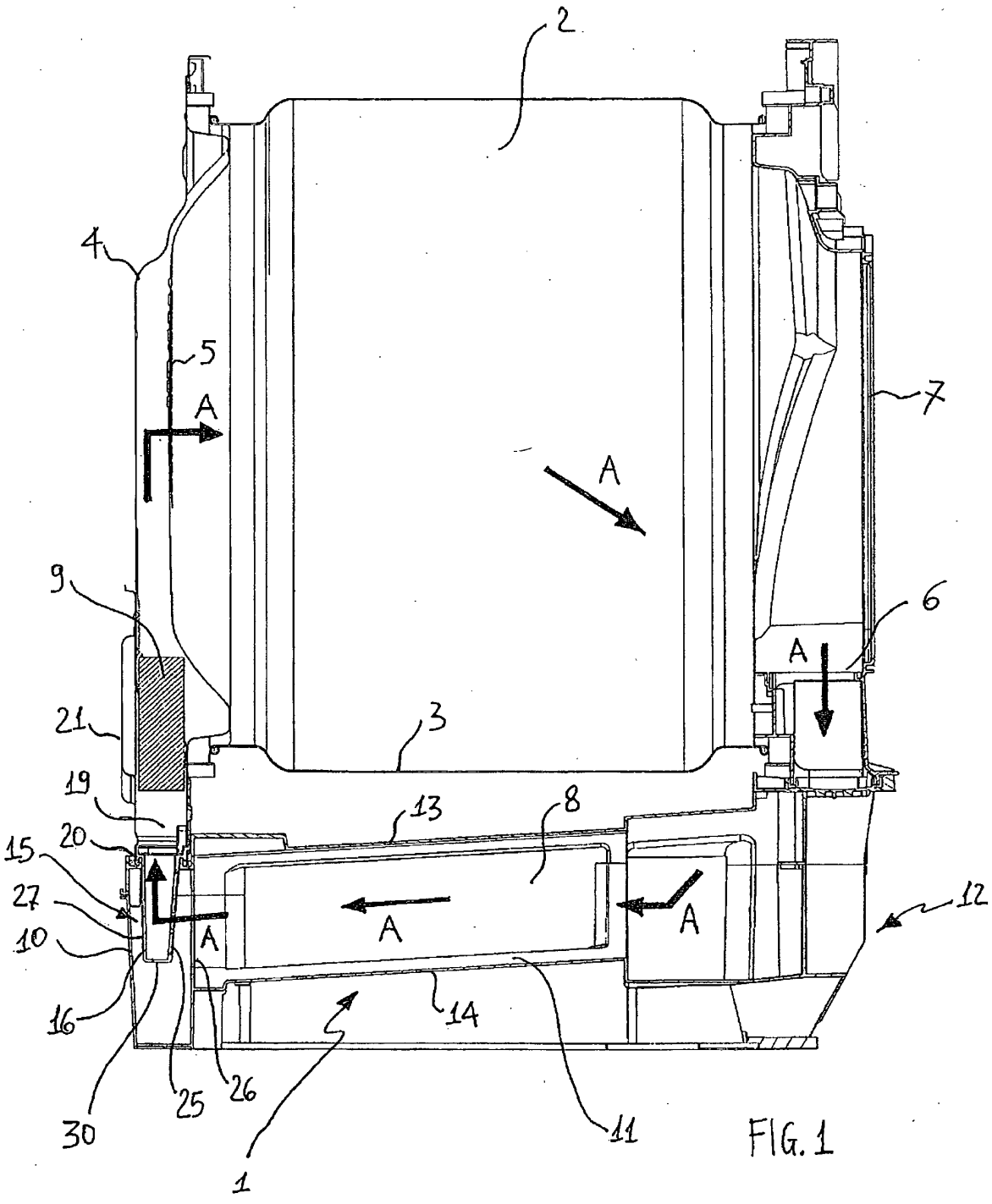


FIG. 1

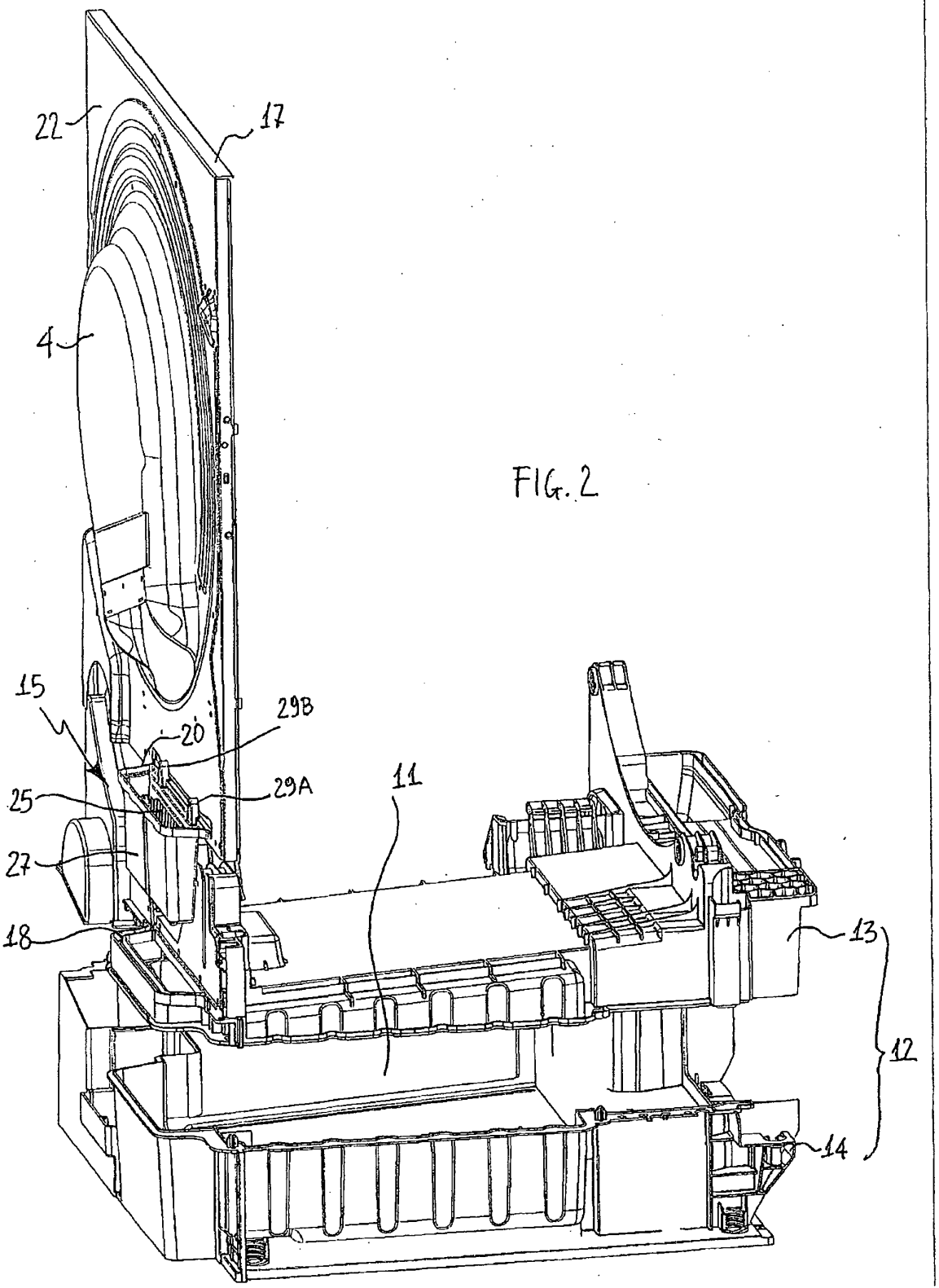


FIG. 2

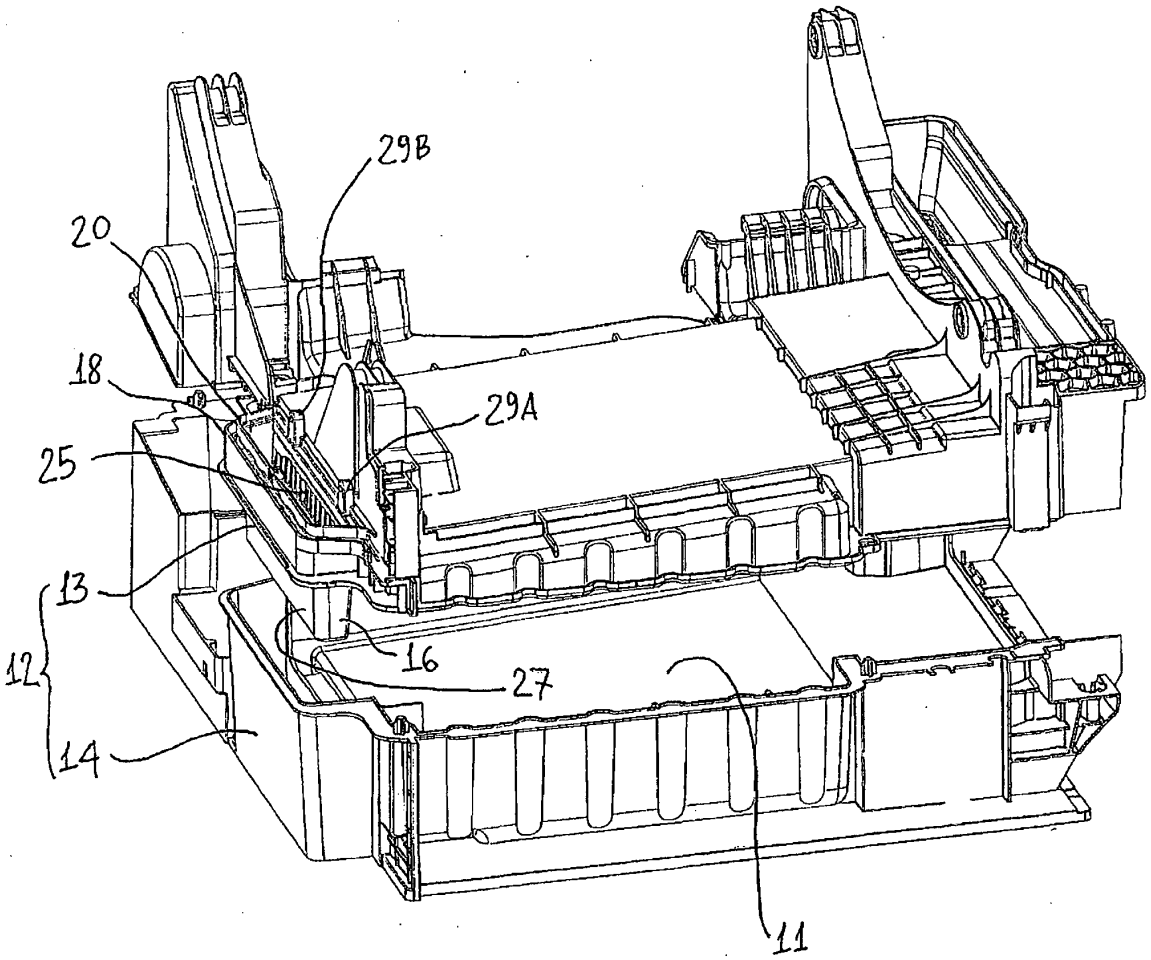


FIG.3

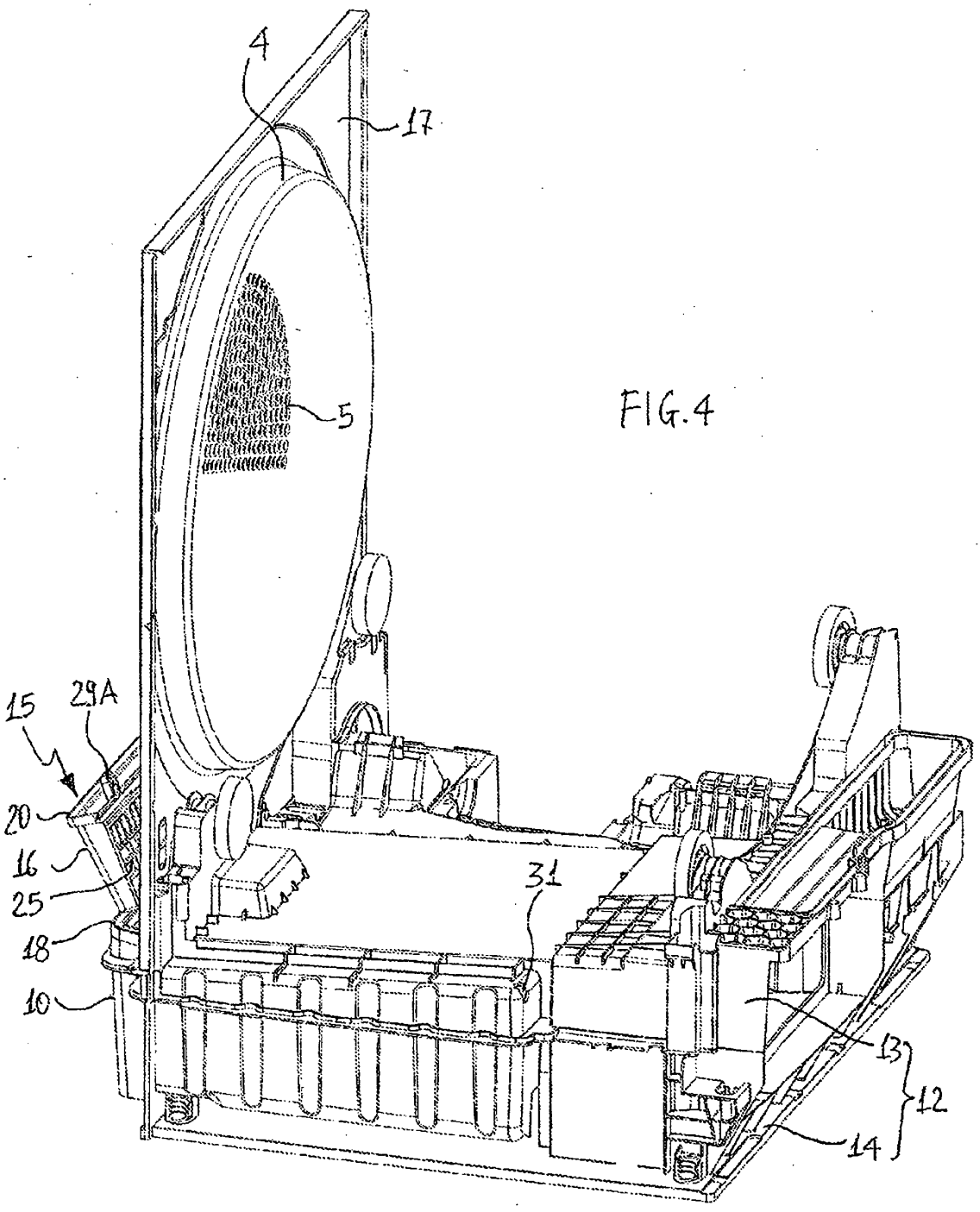


FIG.4

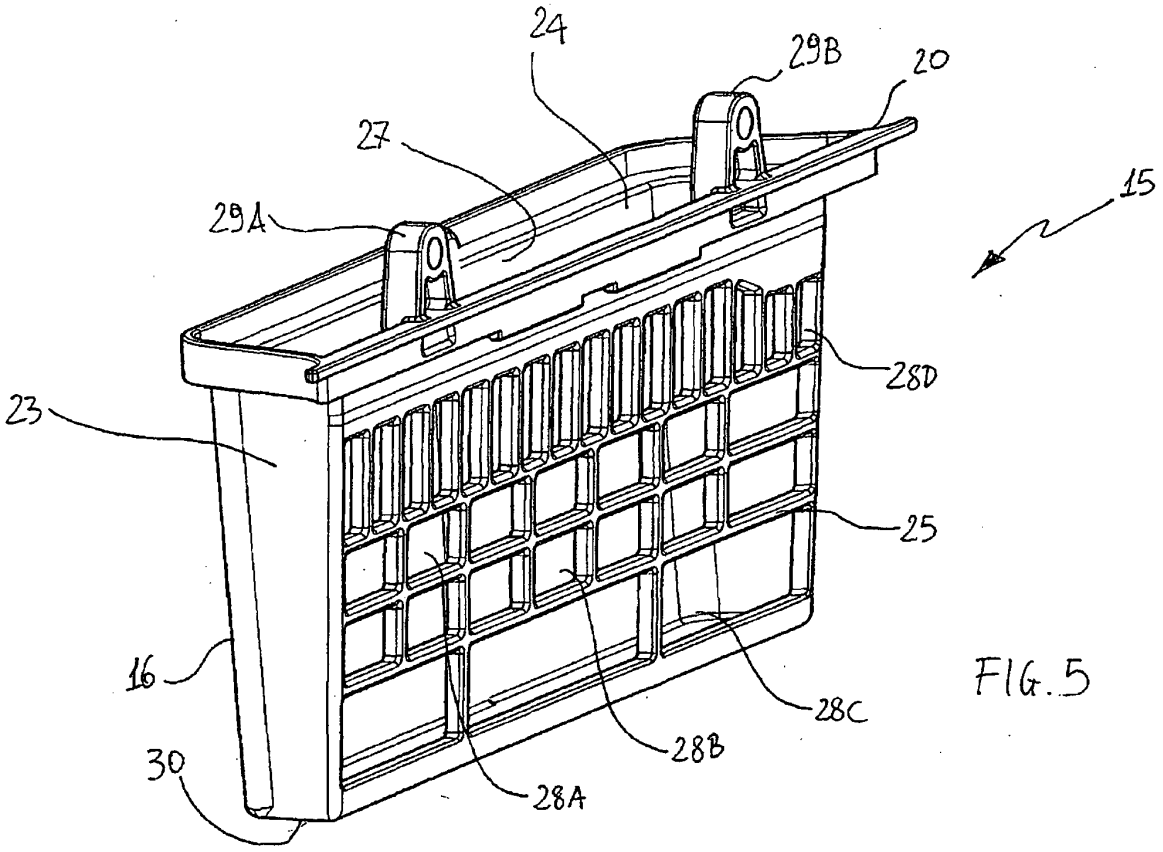


FIG. 5

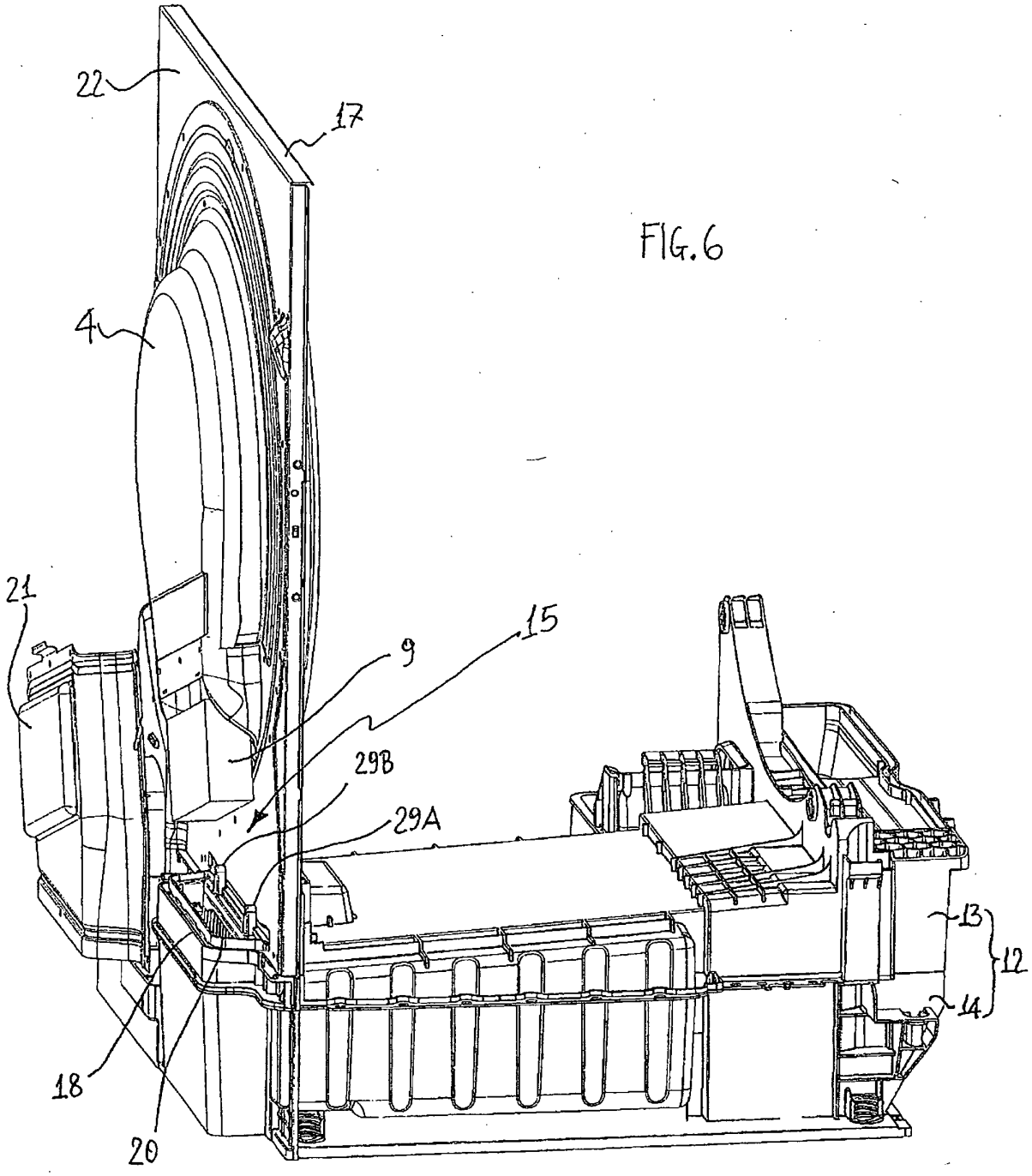
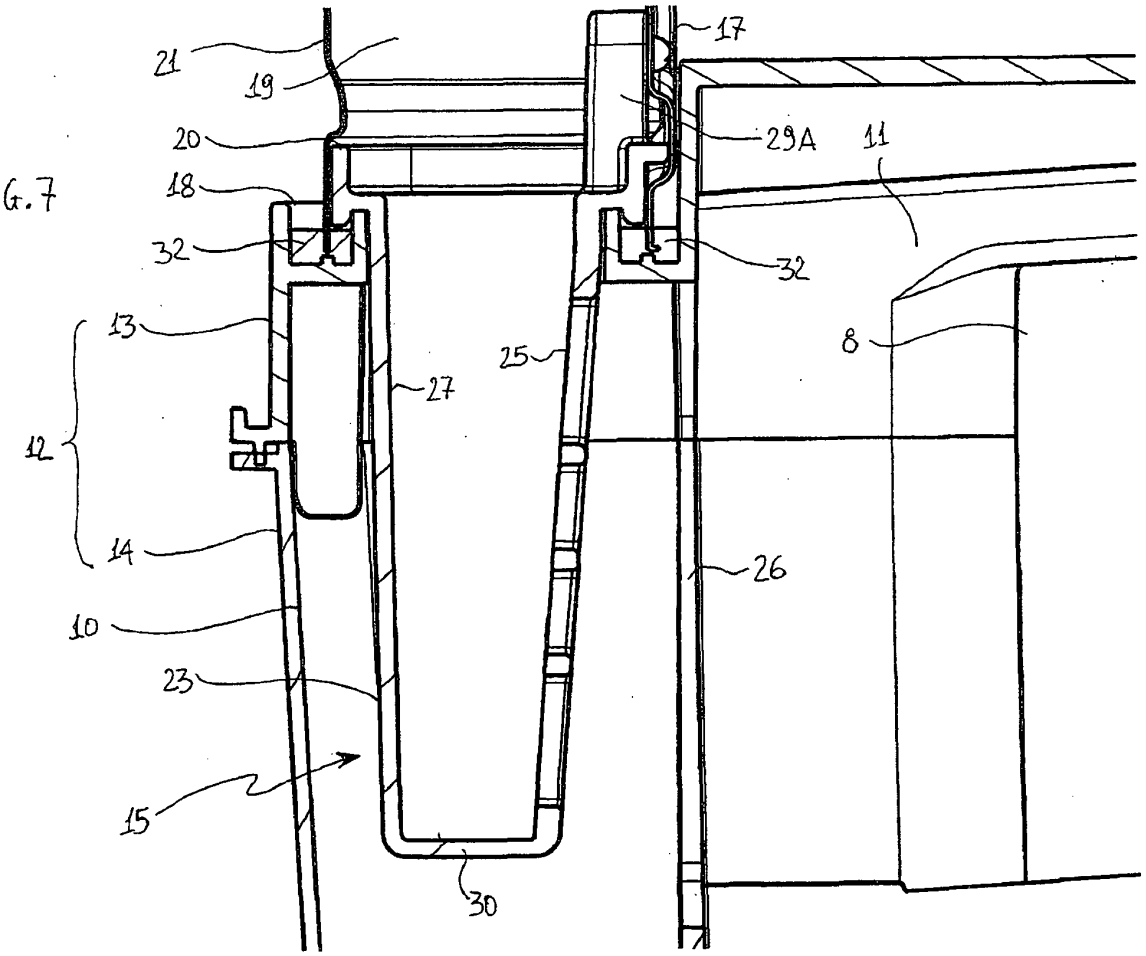


FIG.6

FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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- US 3866333 A **[0003]**
- EP 1847644 A **[0004]**