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(54) **Improved laundry machine**

(57) A laundry machine (**100**) for treating laundry items is proposed. The laundry machine comprises an outer casing (**105**) housing a rotatable laundry drum (110) for containing laundry items to be treated, a fluid flow path comprising at least one seat (**109**) adapted to receive a fluid impeller element (**205**), a transmission member (**150**) extending through a passage (**155**) formed in said seat (**109**) to operate the impeller element (**105**), a sealing member (**220**) arranged in the passage (**155**). In the solution according to the present invention, a friction element (**305**) is arranged between at least a portion of the sealing member (**220**) and at least a portion of said passage (**155**).

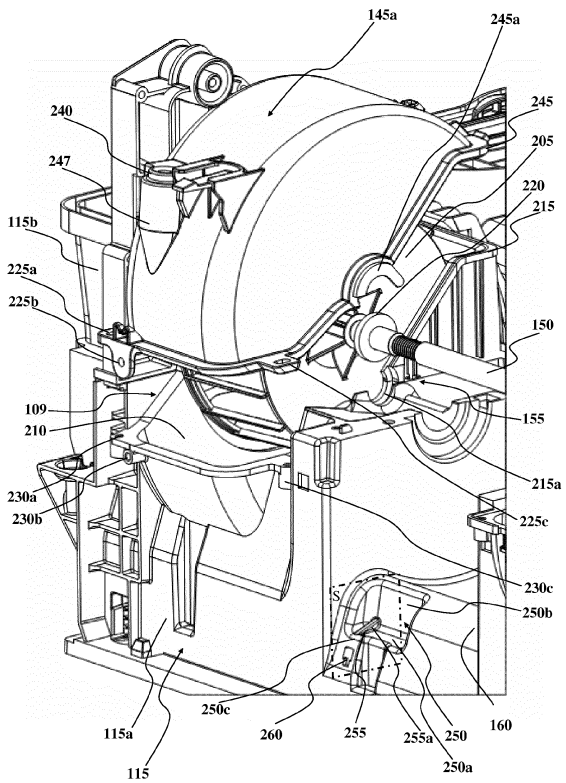

FIG.2

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Description

[0001] The present invention relates to laundry machines, such as laundry drying machines and laundry washing/drying machines, both for domestic and/or professional use. More particularly, the present invention relates to improvements in components of laundry machines.

[0002] A household and/or professional laundry machine - such as a laundry washing/drying machine and a laundry drying machine - typically comprises an inner compartment accessible by a user for loading/unloading the laundry; for example, in the case of a laundry washing machine or laundry washing/drying machine, the inner compartment includes a washing tub housing a rotatable drum in which the laundry can be loaded/unloaded. In a laundry drying machine the washing tub is not present and the inner compartment includes only a rotatable drum in which the laundry can be loaded/unloaded.

[0003] A basement may be provided in a lower position of the laundry machine. The basement is preferably made of a suitable polymer (*i.e.*, plastic) and may be in the form of a shell, comprising a lower and an upper portion or half-shells separately molded and coupled one to another during an assembly phase of the laundry machine. The basement may be expediently exploited for accommodating therein at least a part of a hydraulic circuit comprising, for example, pipes, hoses, draining pumps *etc.* and/or at least a part of an air circuit for conveying drying air and/or cooling air taken from and exhausted to the environment outside the machine, said air circuit comprising, for example, fans, air ducts, a moisture condenser, a heater, *etc.*

[0004] In addition, the basement is usually adapted to support one or more actuators mounted thereto, usually one or more motors, provided in the laundry machine for rotating the drum and/or actuating pumps for pumping a washing liquid in/out the tub of a laundry washing/drying machine, and/or one or more fans for circulating drying air through the rotating drum or for circulating a cooling air flow in a laundry drying machine or in a washing/drying machine.

[0005] Said one or more fans may be positioned in housings partly formed in the basement, which are closed, each, by a cover element that is separate from the basement and is coupled therewith, for example by means of screws or snap elements. The fan housing formed in the basement and the cover element are shaped in such a way that, when the cover is coupled to the basement, a passage is formed for passing therethrough a transmission member, such as a shaft of the fan motor which is mounted to the basement externally of the fan housing. The passage generally has a radial dimension which is greater than the radial dimension of the transmission member passing therethrough.

[0006] The coupling between the cover element and the fan housing formed in the basement should be airtight, for avoiding air/pressure losses and preventing air, especially drying air, from escaping from the air circuit thereby reducing the overall performance of the machine. A leakage of drying air is particularly undesired because moist air escaping for the drying circuit may possibly reach mechanical, electromechanical and electronic component parts which may be damaged by the humidity. The airtight coupling is generally achieved by means of a gasket that is inserted in a groove running along a portion of the peripheral edge of the cover that abuts against the periphery of the fan housing formed in the basement once assembled. The passage formed by the cover associated to the basement for receiving the transmission member, i.e. the fan motor shaft, is properly sealed in an airtight manner by using a felt disc that is slipped over the transmission member so as to avoid air to run along the transmission member and escaping through the space formed among the transmission member, the basement and the cover.

[0007] In such an arrangement, it may occur that, due to wearing of the felt disc as a consequence of the friction with the rotating motor shaft, or due to vibration of the motor when in operation, the felt disc deforms and/or starts to be dragged in rotation by the shaft, thereby becoming loose and permitting air leakages.

[0008] The Applicant has faced the problem of devising a satisfactory solution able to overcome the above-discussed problems.

[0009] One aspect of the present invention proposes a laundry machine for treating laundry items. The laundry machine comprises an outer casing housing a rotatable laundry drum for containing laundry items to be treated, a fluid flow path comprising at least one seat adapted to receive a fluid impeller element, a transmission member extending through a passage formed in said seat to operate the impeller element, a sealing member arranged in the passage. In the solution according to the present invention, a friction element is arranged between at least a portion of the sealing member and at least a portion of said passage.

[0010] Preferred features of the present invention are set in the dependent claims.

[0011] In an embodiment of the invention, said fluid flow path is formed in a basement of the machine.

[0012] In an embodiment of the invention, the fluid flow path is in fluid communication with the laundry drum or with the environment outside the machine.

[0013] In an embodiment of the invention, said seat comprises a first housing formed in a basement of the machine and a second housing formed in a cover element associable to the basement over the first housing.

[0014] In an embodiment of the invention, said passage is partly formed in the first housing and partly in the second housing formed in a cover element.

[0015] In an embodiment of the invention, said friction element is provided on a border flange either of the first housing or the second housing formed in a cover element.

[0016] In an embodiment of the invention, said pas-

sage comprises walls extending radially relative to a rotational axis of the impeller element and further walls extending around a part of the transmission member.

[0017] In an embodiment of the invention, said friction element is provided in at least a part of one or more of said walls.

[0018] In an embodiment of the invention, said friction element is a gasket formed by over-injection molding.

[0019] In an embodiment of the invention, said transmission member is a shaft which is connected to a motor device and the sealing member is a disc-shaped body extending around the shaft.

[0020] Another aspect of the present invention provides a laundry machine, comprising a motor for driving at least the laundry drum, a basement, and a damping element adapted to couple the motor with the basement for reducing vibrations of the motor during operation. The basement comprises at least one reinforcement element adapted to prevent damages to the basement in case the damping element recoils towards the basement.

[0021] In an embodiment of the invention, the basement further comprises a recess adapted to allow the damping element to extend between the motor and the basement without interfering with the latter, a retaining portion adapted to be engaged by a first end of the damping element. Moreover, the at least one reinforcement element comprises a first reinforcement element provided on a base surface of the recess so as to intercept an impact direction of the damping element towards the basement, and a second reinforcement element provided on the basement between the retaining portion and a border of the recess.

[0022] Another aspect of the present invention provides a laundry machine comprising a basement, and at least one cover element associable to the basement comprising a plurality of protruding portions in which trough-holes are formed for the insertion of a fastening element, each protruding portion protruding from a cover border flange. The basement further comprises a plurality of appendages protruding from a base border, each for matching one corresponding protruding portion. At least one protruding portion of the plurality protruding portions and at least one matching appendage of the plurality of appendages are formed transversal with respect to the other protruding portions of the plurality protruding portion and the other matching appendages of the plurality of appendages.

[0023] Another aspect of the present invention provides a seat comprising a cover element having a receptacle for accommodating a sensor, and a support element for supporting the sensor. In the solution according to the present invention, said support element is formed integral with the cover element by means of an over-injection or co-injection molding.

[0024] In an embodiment of the invention, the support element is adapted to support the sensor by engaging said sensor in an airtight manner.

[0025] These, and others, features and advantages of the solution according to the present invention will be better understood by reading the following detailed description of an embodiment thereof, provided merely by way of non-limitative example, to be read in conjunction with the attached drawings, wherein:

Figure 1 is a perspective view of a laundry machine according to an embodiment of the present invention with a side panel of a casing thereof removed;

Figure 2 is a partially exploded and enlarged view illustrating a lower portion of the laundry machine of **Figure 1;**

Figure 3 is a perspective view of a cover element for an impeller seat according to an embodiment of the present invention;

Figure 4A is an perspective enlarged view showing a receptacle, provided in the cover element in correspondence of a passage for the fan motor shaft, for accommodating a sealing element, according to an embodiment of the present invention;

Figure 4B is similar to **Figure 4A,** but shows another embodiment of the present invention;

Figure 5A is an elevation view in cross-section, along the fan motor shaft rotation axis, of an impeller seat with cover element accommodating an impeller, according to an embodiment of the present invention;

Figure 5B is a side view of the impeller seat with cover element of **Figure 5A,** in cross-section according to plane **VB-VB;**

Figure 6 shows, in perspective and exploded view, a detail of the cover element with integrated support for an air temperature sensor;

Figures 7 and **8** are detailed views of a portion of a basement of the laundry machine wherein a spring for dampening the vibrations of a laundry machine motor is attached, according to an embodiment of the present invention.

[0026] With reference to the drawings, in **Figure 1** there is shown in a perspective view a laundry machine **100** according to an embodiment of the present invention. In the figure, for a better understanding, the laundry machine **100** is shown with a side panel of a laundry machine casing **105** removed.

[0027] The laundry machine **100** is a machine for treating laundry; in particular, the laundry machine of the herein considered example is a laundry dryer, but the present invention may as well be applied to other types of laundry machines, such as laundry washing/drying machines or laundry washing machines. In the present example, the laundry machine **100** is of the front-loading type, anyway, also laundry machines of the top-loading type may benefit from the solution according to the present invention.

[0028] The laundry machine **100** comprises a drum **110** for containing laundry to be treated, such as clothes, garments, linen, and similar articles.

[0029] In the example at issue, the drum **110** is a ge-

nerically cylindrical body, for example made of stainless steel, open at the two ends **110a** and **110b** thereof (*i.e.,* a front end **110a** and a rear end **110b).** In other embodiments according to the present invention (*e.g.*, in washing-type laundry machines), the drum may comprise a back wall, closing its rear end.

[0030] In the example at issue, the drum **110** is rotatably supported on a support element, such as a machine basement, or simply basement **115,** by means of idle rollers that are preferably mounted to the basement **115;** one of the rollers is visible in **Figure 1,** being denoted with the reference **117.** However, in some laundry machines, a tub may be provided for enclosing the drum **110;** for example, in the case of a laundry washing/drying machine, the drum is mounted rotatably inside the tub (*e.g.*, by means of a shaft fixed to the back wall of the drum). The tub is adapted to contain treatment liquid during the laundry machine operation.

[0031] The basement **115** forms the base of the machine casing **105** which encloses the drum **110** as well as other machine components like, for example, an actuator of mechanical parts of the laundry machine **100,** such as a motor **120** (*e.g.*, an electric motor for rotating the drum **110,** for example, by means of a belt transmission **125).** In addition, the same motor **120** may be used for actuating fans like a laundry drying air ("process" air) recirculation fan and/or a cooling air fan for causing circulation of a cooling air flow used for cooling and demoisturizing the drying air.

[0032] The casing **105** further comprises a front panel **130,** with an access opening (not visible in the drawing) for accessing the interior of the drum **110,** opening that is closable by an associated door (also not visible in the drawing); a rear panel **135,** and two side panels (not shown in the drawing for better clarity). A top panel **140** closes a top portion of the laundry machine **100.** In the example at issue, the front and rear panels **130** and **135** form respectively front and rear bulkheads, against which the rim of the front and rear drum ends **110a** and **110b** abuts (gaskets or seals may be provided along the rims of the drum ends **110a** and **110b,** and/or on the inner side of the front and rear panels **130** and **135,** in corresponding positions).

[0033] Preferably, although not limitatively, the basement **115** may be a sort of shell, being formed by a lower basement portion **115a** and an upper basement portion **115b,** which constitute two half-shells mounted the latter onto the former. Advantageously, the lower and upper basement portions **115a** and **115b** are made in a polymeric material (*e.g.*, plastic), and they may for example be formed by injection molding. The lower and upper basement portions **115a** and **115b** are attached each other preferably in a removable manner, for example by means of screws or snap-on elements complementary provided on the matching edges of basements portions **115a** and **115b.** In alternative embodiments of the invention, the basement **115** may be formed directly in a single-piece construction.

[0034] As mentioned above, the lower and upper basement portions **115a** and **115b** may be advantageously shaped in such a way that, when they are assembled, they define a sort of shell within which fluid paths (only partly shown in the figure) are formed, and which may comprise housings for accommodating operational devices provided for carrying out a treatment on laundry. Such operational devices may be fans, pumps, heat exchangers, heaters and so on. In a laundry drying machine, for example, ducts for a flow of drying air (process air) may be defined within the basement **115,** which, by means of a process air fan, are able to cause the drying air flow to repeatedly circulate through the drum **110,** and, at the same time, conveying said process air through a heating device and a moisture condensing device (both not shown in the figures). The basement **115** may also contain at least part of a drying-air moisture condensing system, for removing humidity from the moisture-laden air exiting the drum **110,** for example, the moisture condensing system may comprise an air-air heat exchanger or a refrigerant evaporator portion of a heat pump system. Another air path may be formed in the basement **115** to convey air taken from environment outside the machine through an air-air type heat exchanger working as moisture condensing device and then exhausting said air to the environment again. A further fluid path can be formed in the basement **115** to collect moisture removed from laundry and direct it towards a basin or a water tank (not visible in the figures).

[0035] Preferably, one or more cover elements are provided, such as a first cover element **145a** and a second cover element **145b** are provided, each one for closing a respective housing **210,** formed in the basement **115,** for one or more of the abovementioned machine fan impellers, when such cover elements **145a** and **145b** are coupled with the basement **115.** Each cover element **145a, 145b** comprises a housing **108** that receives a portion of the fan impeller when the cover is associated over the housing **210** formed in the basement **115.** The fan impellers are each rotatably accommodated in a respective impeller seat **109,** being the space delimited by the impeller housing **210** in the basement **115** and the cover element **145a** and **145b,** i.e. the space formed by the housing **210** in the basement **115** and the housing **108** of the cover **145a, 145b;** the impeller housing **210** and the associated cover element are shaped so that, when they are coupled, a passage **155** exists in the impeller seat **109** for a transmission member, i.e. a fan motor shaft **150,** to which the fan impeller is mounted and that transmits the rotation from the fan motor **120** to the impeller (in **Figure 1,** one such passage **155** is visible).

[0036] Advantageously, the cover elements **145a** and **145b** are coupled with the basement **115 -** for example, with the lower basement portion **115b -** in a sealed or airtight manner, as will be described in greater detail in the following.

[0037] The cover elements **145a** and **145b** are formed as distinct, separate parts with respect to the basement

115, for facilitating an access to the fan impellers (*i.e.*, without the need of removing the whole upper basement portion **115b** and, therefore, the drum **110),** for example, during the assembly operation of the laundry machine **100** and/or during repair/substitution operations of component parts (*e.g.*, the fan impeller and/or the shaft **150).**

[0038] The motor **120** may be mounted in a recessed area **160** provided in the basement **115.** Advantageously, the recessed area **160** may be provided in the basement **115** in a position between the two fan impeller housings; in this way, one single motor may be exploited to drive both the fan impellers.

[0039] Preferably, in order to reduce mechanical vibrations of the motor **120** during operation, the motor **120** is coupled with the basement **115** by means of one (or more) damping element, such as a coil spring **165.** Preferably, the coil spring **165** is made of a resistant material having a suitable spring coefficient, such as steel. In this way, it is possible to reduce the vibrations of the motor **120,** which may be detrimental, since they might cause deformations or even breaks of basement **115,** excessive noise during the laundry machine **100** operation, *etc.*

[0040] Turning now to **Figure 2,** there is shown a partially exploded and enlarged view of a lower portion of the laundry machine **100,** namely a portion of the basement **115** where one **210** of the fan impeller housings is formed, the fan impeller **205** and the respective cover element **145a** being also visible.

[0041] Advantageously, the first cover element **145a** has substantially the shape of a portion of a hollow cylinder, and is shaped so to have a cover periphery or border flange **245** matching a corresponding periphery or border flange **215** of the fan impeller housing **210** formed in the basement **115,** for example in the lower portion **115a** thereof. The fan impeller housing border flange **215** has a preferably half circular portion **215a** that matches a corresponding preferably half-circular portion **245a** on the cover border flange **245** so that, when the first cover element **145** is mounted to the basement **115** in a way that the border flanges **215** and **245** matches, a passage **155** for the fan transmission member, i.e. a shaft, **150** is defined. As mentioned above, the fan impeller **205** is mounted to a transmission member, i.e. the shaft **150.** Preferably, a sealing element, such as a felt disc **220,** or other disc-shaped body, is slipped over the shaft **150** and preferably arranged in a seat **505** formed in both the border flanges **215, 245** for closing the passage **155** (as will be described in greater detail in the following).

[0042] The first cover element **145a** has a plurality of protruding portions or wings formed along the cover border **245,** with trough-holes formed therein; for example, three protruding portions or wings **225a, 225b** and **225c** are provided. Each protruding portion or wing **225a, 225b** and **225c** is formed in such a way as to match a corresponding appendage, such as a hollow cylinder **230a, 230b** and **230c,** respectively, formed along the basement border **215.** A suitable fastening element (not shown in the figure), such as a screw or a bolt of a bolt-die pair, may be inserted into the through holes of the protruding portions or wings **225a, 225b** and **225c** and the corresponding hollow cylinder **230a, 230b** and **230c** once the first cover element **145** is coupled to the fan impeller housing **210,** in order to fasten the first cover element **145a** to the basement **115.** Advantageously, at least one of the matching pairs of protruding portion - hollow cylinder is formed so as to have an axis that is transversal, preferably orthogonal, with respect to another one of the pairs protruding portion - hollow cylinder. In the example at issue, the pair protruding portion **225b-**hollow cylinder **230b** have an axis orthogonal with respect to the other pairs of protruding portions **225a** and **225c** and hollow cylinders **230a** and **230c.** By forming at least one of the pairs protruding portion - hollow cylinder that has an axis transversal, *e.g.* orthogonal with respect to the others ensures a greater robustness in the coupling between the first cover element **145a** and the basement **115** than having all the pairs parallel one to another, because the fastening elements (*e.g.*, the screws) provided for fastening the cover element **145** to the basement **115** act in two distinct fastening directions. Moreover, with such an arrangement the coupling between the cover element **145a** and the basement **115** results more even than if all the three pairs were parallel one another.

[0043] Advantageously, the first cover element **145a,** which closes the fan impeller housing **210** for the fan impeller **205** of the drying or process air, may be provided with a receptacle **247** for accommodating a temperature sensor (such as an NTC thermistor, not shown in the figure). The temperature sensor senses the temperature of the drying air in the fan impeller housing **210** and the sensed temperature may advantageously be exploited for regulating the operation of the laundry machine **100** *e.g.*, by adjusting the power supplied to drying air heating elements or, alternatively, the operation of a heat pump. The receptacle **247** preferably has a top opening in which a support element **240** for supporting the temperature sensor is provided.

[0044] **Figure 3** is an upside-down perspective view of the first cover element **145a** according to an embodiment of the present invention.

[0045] In order to make the coupling between the cover element **145a** and the fan impeller housing **210** air-tight so as to prevent leakage of moisturized process air, a gasket **305** is provided, which, when the cover element **145a** is coupled to the fan impeller housing **210,** is sandwiched between the fan impeller housing border flange **215** and the cover border flange **245.** As it will be described in greater detail later on, the gasket **305** works as a friction enhancing element for the surface in contact with a sealing element, such as the felt disc **220.** The gasket **305** is preferably made of a resilient material, such as a nitrile rubber (*e.g.*, Nitrile Butadiene Rubber or NBR). Advantageously, the gasket **305** may be formed by over-injection molding on the cover border flange **245.** It is preferable to form the gasket **305** on the border flange

of the cover element instead that on the border flange of the fan impeller housing, because in a molding process the cover element **145a** is easier to handle and to be inserted in a mold than the basement **115.** However, if preferred, the gasket **305** may be formed by over-injection molding on the fan impeller housing border flange **215.** Thanks to over-injection techniques, the gasket **305** is essentially integral to, almost in one piece with, the first cover element **145a.** However, in alternative embodiments of the present invention, it is possible to provide the gasket **305** as a separate element and arrange it on the basement border **215** or the cover border flange **245.**

[0046] In a solution according to an embodiment of the present invention, the gasket **305** is provided along the whole cover border flange **245,** for example by means of over-injection, including at least a portion of the seat **505** where the sealing member **220** is received. Thus, also the semicircular portion **245a** wherein the felt disc **220** has to be arranged is, at least partly, provided with the gasket **305.** In this way, the gasket **305** is able to retain the felt disc **220** and hold the same in position, thanks to friction forces that arise between the felt disc **220** and the gasket **305** once the cover element **145a** is mounted to the basement **115,** in a better way with respect to the solution known in the art, wherein the gasket is not provided in such semicircular portion **245a.** More generally, a friction element, such as the gasket **305,** is interposed between at least a portion of a sealing member, such as the felt disc **220,** and at least a portion of the passage **155** provided in the impeller seat **109** for being passed through by the transmission member **150.** Thus, moisture and pressure leaks from the shaft passage **155** are eliminated, or at least greatly reduced.

[0047] Turning to **Figures 4A,** there is shown an enlarged view of the semicircular portion **245a,** i.e. a portion of the seat **505** receiving therein the sealing member **220.** The semicircular portion **245a** comprises the gasket **305** according to a first embodiment of the present invention.

[0048] In detail, the semicircular portion **245a** comprises a first sidewall **445a** and a second sidewall **445b** delimiting a semicircular bottom wall **445c** therebetween. The first and the second sidewalls **445a, 445b** are preferably parallel one another and extend in a radial direction relative to the rotational axis of the fan impeller **205.** The bottom wall **445c** extends around a part of the transmission member **150.** The semicircular portion **245a** is advantageously formed in order to fittingly house both the gasket **305** and the felt disc **220.** Analogously, also the preferably half-circular shaped portion **215a** comprises a couple of parallel sidewalls delimiting a semicircular bottom wall therebetween. Said sidewalls are preferably parallel one another and extend in a radial direction relative to the rotational axis of the fan impeller **205.** The bottom wall extends around a part of the transmission member **150.** In the cavity formed by said sidewalls and the bottom wall is received a part of the felt disc **220** and, if desired, also a part of a friction element.

[0049] The gasket **305** according to the present invention comprises a semicircular gasket portion **405a** provided on at least a part of the semicircular bottom wall **445c** and on the second sidewall **445b** thereof. The semicircular portion **405a** of the gasket **305** is adapted to engage the felt disc **220** and retain it in position after the assembly of the first cover element **145** with the basement **115.**

[0050] In order to ensure a proper engagement between the gasket **305** and the felt disc **220,** the bottom wall **445c** is shaped so as to form a gasket seat **505** for the semicircular portion **405a** of the gasket **305,** and the first sidewall **445a** is spaced apart from the second sidewall **445b** by a distance substantially equal to the cross-section of the felt disc **220** and of the semicircular portion **405a** of the gasket **305** fitted to the second sidewall **445b.**

[0051] It should be noted that in alternative embodiments according to the present invention (not shown in the drawings) the semicircular gasket portion **405a** may be provided on the first sidewall **445a** of the semicircular portion **245a** instead that on the second sidewall **445b** thereof.

[0052] As an alternative, shown in **Figure 4B,** the semicircular portion **245a** of the first cover element **145** may be designed with a further semicircular gasket portion **405b** in such a way that both the first sidewall **445a** and the second sidewall **445b** of the semicircular portion **245a** result covered with the gasket **305.** In this way, the friction forces between the semicircular gasket portion **405b** and the felt disc **220** substantially have a symmetrical distribution with respect to the bottom wall **445c.** Further preferably, the whole bottom wall **445c** may be covered by the gasket **305.**

[0053] **Figures 5A** and **5B** show cross-sectional front and side views of the first cover element **145** mounted on the basement **115.**

[0054] As previously described, the friction forces between the felt disc **220** and the semicircular gasket portion **405a** positioned in its gasket seat **505** prevents the former from being dragged in rotation by the shaft **150** during operation thus, preventing a loosening of the sealing action provided by the felt disc **220** and, subsequently, prevents detrimental effects on the felt disc **220** itself, such as raveling. Moreover, the engagement between the felt disc **220** and the semicircular gasket part **405a** is able to improve the airtight sealing of the passage **155.**

[0055] **Figure 6** is a perspective and exploded view of a detail of the first cover element **145a** with the support element **240** for an air temperature sensor **600** according to an embodiment of the present invention.

[0056] The support element **240** is advantageously made of a thermoplastic elastomer (such as a silicone rubber) and the temperature sensor **600** is airtight fitted in the support element **240.** In an embodiment of the present invention, the support element **240** is formed integral with the first cover element **145a,** for example, by over-injection molding over the cover element **145a,** or by forming the cover element **145a** and the support element **240** by co-injection molding. Forming the support

element **240** integral with the first cover element **145a** also ensures a better airtight coupling of the latter with the former. The over-injection or co-injection molding process allows reducing the overall assembly costs and times, since manufacturing phases for forming the support element **240** and inserting it into the receptacle **247** are no longer required.

[0057] Referring again to **Figure 2,** and to **Figure 7,** which shows an enlarged perspective view of a detail of the basement **115,** the basement **115** advantageously comprises a spring recess **250** for the coil spring **165.**

[0058] In an embodiment of the present invention, the spring recess **250** is advantageously provided with at least one reinforcement element, such as a first reinforcing rib **255.** Advantageously, the first reinforcing rib **255** is provided in a base surface **250a** of the spring recess **250.** An eyelet **260** is provided below the spring recess **250** for the engagement of a hooked end of the coil spring **165** to the basement **115.** The first reinforcing rib **255** and the eyelet **260** have respective symmetry axes lying on a same symmetry plane S, *i.e.* the first reinforcing rib **255** and the eyelet **260** are aligned one another.

[0059] Preferably, although not limitatively, the first reinforcing rib **255** is advantageously made of the same polymeric material as the basement **115** and, more preferably, the first reinforcing rib **255** is formed monolithically, in one piece with the basement **115.** Alternatively, the first reinforcing rib **255** may be made of a denser polymeric material or of metal, ensuring a greater resistance thereof, or the first reinforcing rib **255** may be made of a resilient material (such as an elastomeric material), the first reinforcing rib **255** may in this case be attached to the basement **115** in any suitable manner *e.g.*, by means of a snap-fit engagement, gluing, welding, *etc.*

[0060] The first reinforcing rib **255** is adapted to reinforce locally the structure of the basement **115.** Preferably, although not necessarily, the first reinforcing rib **255** has substantially the shape of a prism with two right-angled triangle opposite faces, only one of which is visible in the **Figure 2** and denoted with reference numeral **255a,** protruding vertically from a base surface **250a.** The first reinforcing rib **255** that protrudes from a base surface **250a,** forms a plane that is inclined relative to the base surface **250a** with an angle comprised between 0° and 60° and more preferably between 0° and 45°. The first reinforcing rib **255** preferably extends from a border **250c** of the spring recess **250** up to a back wall **250b** of the spring recess **250** which protrudes substantially perpendicularly from the base surface **250a.** The distance between the inclined plane formed by the first reinforcing rib **255** and the base surface **250a** is maximum in the region where the first reinforcing rib **255** joins the back wall **250b** of the spring recess **250** and is minimum in a region adjacent to a border **250c** of the spring recess **250.**

[0061] Advantageously, the first reinforcing rib **255** is adapted to reinforce the basement **115** substantially at the spring recess **250.** In detail, the first reinforcing rib **255** reinforces the base surface **250a** of the spring recess **250,** where it is more likely that the coil spring **165** beats against the basement **115** if for example the coil spring **165** is accidentally released from the hold of a technician or of an assembling machine during the assembly of the laundry machine **100.** The first reinforcing rib **255** is able to absorb the impact forces of the recoiling coil spring **165** without suffering damages and, at the same time, preventing damages to the basement **115** which otherwise might be broken by the impact.

[0062] In a preferred embodiment, a further reinforcement element may be provided, for example a second reinforcing rib **755.** Advantageously, the second reinforcing rib **755** is provided on the basement **115** between the spring recess **250** and the eyelet **260;** the reinforcing ribs **255** and **755,** and the eyelet **260,** have a symmetry plane S in common, *i.e.*, the reinforcing ribs **255** and **755** and the eyelet **260** are mutually aligned.

[0063] Preferably, although not limitatively, the second reinforcing rib **755** may advantageously be made of the same polymeric material of the basement **115** and, more preferably, formed monolithically, in one piece therewith. Alternatively, the second reinforcing rib **755** may be made of a denser polymeric material than the basement material or it can be made of metal material thereby ensuring a greater resistance. The second reinforcing rib **755** may further be made of a resilient material such as an elastomeric material in order to act as a cushion for the coil spring **165** recoiling; in these cases, the second reinforcing rib **755** may be attached to the basement **115** in any suitable manner such as via a snap-fit engagement, glue, welding, and the like.

[0064] The second reinforcing rib **755** is adapted to reinforce locally the structure of the basement **115.**

[0065] Preferably, although not limitatively, the second reinforcing rib **755** comprises a prism having two trapezoidal opposite faces, only one of which is visible in the **Figure 7** and denoted with reference numeral **755a.** Advantageously, the second reinforcing rib **755** may comprise an elongated portion substantially perpendicular to the elongated portion of the first reinforcing rib **255** and to the eyelet **260.** Furthermore, the second reinforcing rib **755** may also comprise a second prism having two right triangle opposite faces, which protrudes substantially from the middle of the first prism towards the first reinforcing rib **255** at the border **250c** of the spring recess **250,** thus being aligned with the eyelet **260** and the first reinforcing rib **255.**

[0066] The second reinforcing rib **755** reinforces a basement **115** portion between the border **250c** of the spring recess **250** and the eyelet **260.** Therefore, the second reinforcing rib **755,** along with improving a resistance of the basement **115** against impacts of the coil spring **165,** may also be advantageously adapted to reinforce a portion of the basement **115** where the hooked end of the coil spring **165** may abut once engaged in the eyelet **260** making the same more resistant against oscillating forces during the laundry machine **100** operation.

[0067] It should be noted that, in other embodiments

of the present invention (not shown in the figures), more than two reinforcing ribs may be provided, and/or such reinforcing ribs may have different shapes.

[0068] **Figure 8** shows an enlarged cross-sectional view of the basement **115** with the coil spring **165** engaged within the eyelet **260** with respect to the symmetry plane S. Particularly, **Figure 8** shows a rest position reached by the coil spring **165** after an impact with the basement **115.**

[0069] When the coil spring **165** escapes from the hold of the technician or the assembling machine, for example during the assembly of the laundry machine **100,** the coil spring **165** hits the first reinforcing rib **255** and/or the second reinforcing rib **755** which absorb the recoiling strength and disperse the same in the base surface **250a** and, therefrom, in the whole basement **115.** Advantageously, the dispersion of the spring recoiling strength prevents damages to the basement **115.**

[0070] After the impact between the coil spring **165** and the first reinforcing rib **255** and/or the second reinforcing rib **755,** the coil spring **165** may bounce repeatedly, due to the action-reaction principle and residual recoiling force, which is consumed bounce after bounce. Advantageously, the right triangle shape of the first reinforcing rib **255** makes the coil spring **165** slide towards the second reinforcing rib **755** until the spring **165** reaches a rest position, which is slanted outwardly with respect to the spring recess **250** and the recessed area **160** receiving the motor **120,** with a first hooked end **865a** of the coil spring **165** abutting against an inside surface **805** opposite to the base surface **250a** of the spring recess **250;** the coil spring **165** is thus kept bounded to the eyelet **260,** while a second hooked end **865b** of the coil spring **165** is free and facing towards the outside of the basement **115.** Therefore, the coil spring **165** bounces oscillating substantially along the plane S, from the rest position towards the spring recess **250** and *vice versa,* until a residual spring force fades. The inclined plane formed by the first reinforcing rib **255** helps to incline the coil spring **165** relative to the base surface **250a** of the spring recess **250** so as to avoid that the spring **165** hits the base surface **250a** with an impact direction perpendicular thereto. The provision of the first reinforcing rib **255** with its inclined plane allows only a component of the overall impact force to act on the base surface **250a,** thereby reducing the risk of damaging it. In addition, the coil spring **165** is advantageously retained engaged within the eyelet **260,** even in the case of particularly intense recoiling strength. Indeed, the coil spring **165,** falling downwards abuts the second reinforcing rib **755,** which blocks the coil spring **165** before it can rotate sufficiently to disengage the first hooked end **865a** from the eyelet **260.**

[0071] In this way, it is possible to effectively disperse spring forces and prevent damages to the basement **115.** Moreover, the controlled bouncing of the coil spring **165** prevents the same from engaging any other part of the laundry machine **100** while bouncing, which may complicate and/or prolong the assembly operation of the laundry machine and increase the manufacturing costs. Therefore, laundry machines according to the present invention above described have an overall lower manufacturing cost than laundry machines known in the prior art. This is possible thanks to the fact that the basement will not suffer any damage by an impact, and therefore will not be substituted. Furthermore, also the overall manufacturing time is reduced, since no substitution time is required and the elastic element will not be tangled by any other parts of the laundry machine - thanks to the reinforce elements provided.

[0072] It should be noted that both a cover element comprising the gasket along its border but not the support element for the sensor element or, *vice versa,* a cover element having the support element for the sensor element but not the gasket along its border may be provided without departing from the scope of the present invention as described. Nevertheless, also only a basement featuring one or more reinforcing elements as above described should be considered within the scope of the present invention. In other words, the various solutions of gasket for an impeller housing cover element, a temperature sensor support formed integrally to an impeller housing cover element, reinforcing elements in the basement for strengthening it where the coil spring is hooked, may each be implemented individually and not necessarily in combination one with the other.

[0073] In the description above, only the first cover element **145a** has been considered, although similar consideration may be applied equivalently to the second cover element **145b** as well, and in general to any additional cover element for closing the housing of an impeller.

Claims

1. A laundry machine **(100)** for treating laundry items comprising:

   an outer casing **(105)** housing a rotatable laundry drum **(110)** for containing laundry items to be treated,
   a fluid flow path comprising at least one seat **(109)** adapted to receive a fluid impeller element **(205),**
   a transmission member **(150)** extending through a passage **(155)** formed in said seat **(109)** to operate the impeller element **(105),**
   a sealing member **(220)** arranged in the passage **(155),**
   characterized in that
   a friction element **(305)** is arranged between at least a portion of the sealing member **(220)** and at least a portion of said passage **(155).**

2. A laundry machine **(100)** according to claim 1 wherein said fluid flow path is formed in a basement **(115)** of the machine **(100).**

3. A laundry machine **(100)** according to claim 1 or 2 wherein the fluid flow path is in fluid communication with the laundry drum **(110)** or with the environment outside the machine **(100).**

4. A laundry machine **(100)** according to any preceding claim wherein said seat **(109)** comprises a first housing **(210)** formed in a basement **(115)** of the machine **(100)** and a second housing **(108)** formed in a cover element **(145a, 145b)** associable to the basement **(115)** over the first housing **(210).**

5. A laundry machine **(100)** according to claim 4 wherein said passage **(155)** is partly formed in the first housing **(210)** and partly in the second housing **(108)** formed in a cover element **(145a, 145b).**

6. A laundry machine **(100)** according to claim 4 or 5 wherein said friction element **(305)** is provided on a border flange **(215, 245)** either of the first housing **(210)** or the second housing **(108)** formed in a cover element **(145a, 145b).**

7. A laundry machine **(100)** according to any preceding claim wherein said passage **(155)** comprises walls **(445a, 445b; 445e, 445f)** extending radially relative to a rotational axis of the impeller element **(105)** and further walls **(445c, 445f)** extending around a part of the transmission member **(150).**

8. A laundry machine **(100)** according to claim 7 wherein said friction element **(305)** is provided in at least a part of one or more of said walls **(445a, 445b; 445e, 445f, 445c, 445f).**

9. A laundry machine **(100)** according to any preceding claim wherein said friction element **(305)** is a gasket formed by over-injection molding.

10. A laundry machine **(100)** according to any preceding claim wherein said transmission member is a shaft **(150)** which is connected to a motor device **(120)** and the sealing member **(220)** is a disc-shaped body extending around the shaft **(150).**

11. A laundry machine **(100)** according to any of the preceding claims, further comprising:

    a motor **(120)** for driving at least the laundry drum **(110),**
    a basement **(115),** and
    a damping element **(165)** adapted to couple the motor **(120)** with the basement **(115)** for reducing vibrations of the motor **(120)** during operation, wherein
    the basement **(115)** comprises at least one reinforcement element **(255, 755)** adapted to prevent damages to the basement **(115)** in case the damping element **(165)** recoils towards the basement **(115).**

12. The laundry machine **(100)** according to claim 11, wherein the basement **(115)** further comprises:

    A recess **(250)** adapted to allow the damping element **(165)** to extend between the motor **(120)** and the basement **(115)** without interfering with the latter,
    a retaining portion **(260)** adapted to be engaged by a first end **(865a)** of the damping element **(165),** and
    wherein the at least one reinforcement element **(255, 755)** comprises a first reinforcement element **(255)** provided on a base surface **(250a)** of the recess **(250)** so as to intercept an impact direction of the damping element **(165)** towards the basement **(115),** and
    a second reinforcement element **(755)** provided on the basement **(115)** between the retaining portion **(260)** and a border **(250c)** of the recess **(250).**

13. A laundry machine **(100)** according to any of the preceding claims comprising
    a basement **(115),** and
    at least one cover element **(145a, 145b)** associable to the basement **(115)** comprising a plurality of protruding portions **(225a, 225b, 225c)** in which trough-holes are formed for the insertion of a fastening element, each protruding portion **(225a, 225b, 225c)** protruding from a cover border flange **(245),**
    the basement **(115)** further comprises a plurality of appendages **(230a, 230b, 230c)** protruding from a base border **(215),** each for matching one corresponding protruding portion **(225a, 225b, 225c),** and wherein
    at least one protruding portion **(225b)** of the plurality protruding portions **(225a, 225b, 225c)** and at least one matching appendage **(230b)** of the plurality of appendages **(230a, 230b, 230c)** are formed transversal with respect to the other protruding portions **(225a, 225c)** of the plurality protruding portion **(225a, 225b, 225c)** and the other matching appendages **(230a, 230c)** of the plurality of appendages **(230a, 230b, 230c).**

14. The laundry machine **(100)** according to any of the preceding claims, wherein said seat **(109)** comprises a cover element **(145a, 145b)** having
    a receptacle **(247)** for accommodating a sensor **(600),**
    a support element **(240)** for supporting the sensor, said support element **(240)** being formed integral with the cover element **(145a, 145b)** by means of an over-injection or co-injection molding.

15. The laundry machine **(100)** according to claim 14, wherein support element **(240)** is adapted to support the sensor **(600)** by engaging said sensor in an air-tight manner.

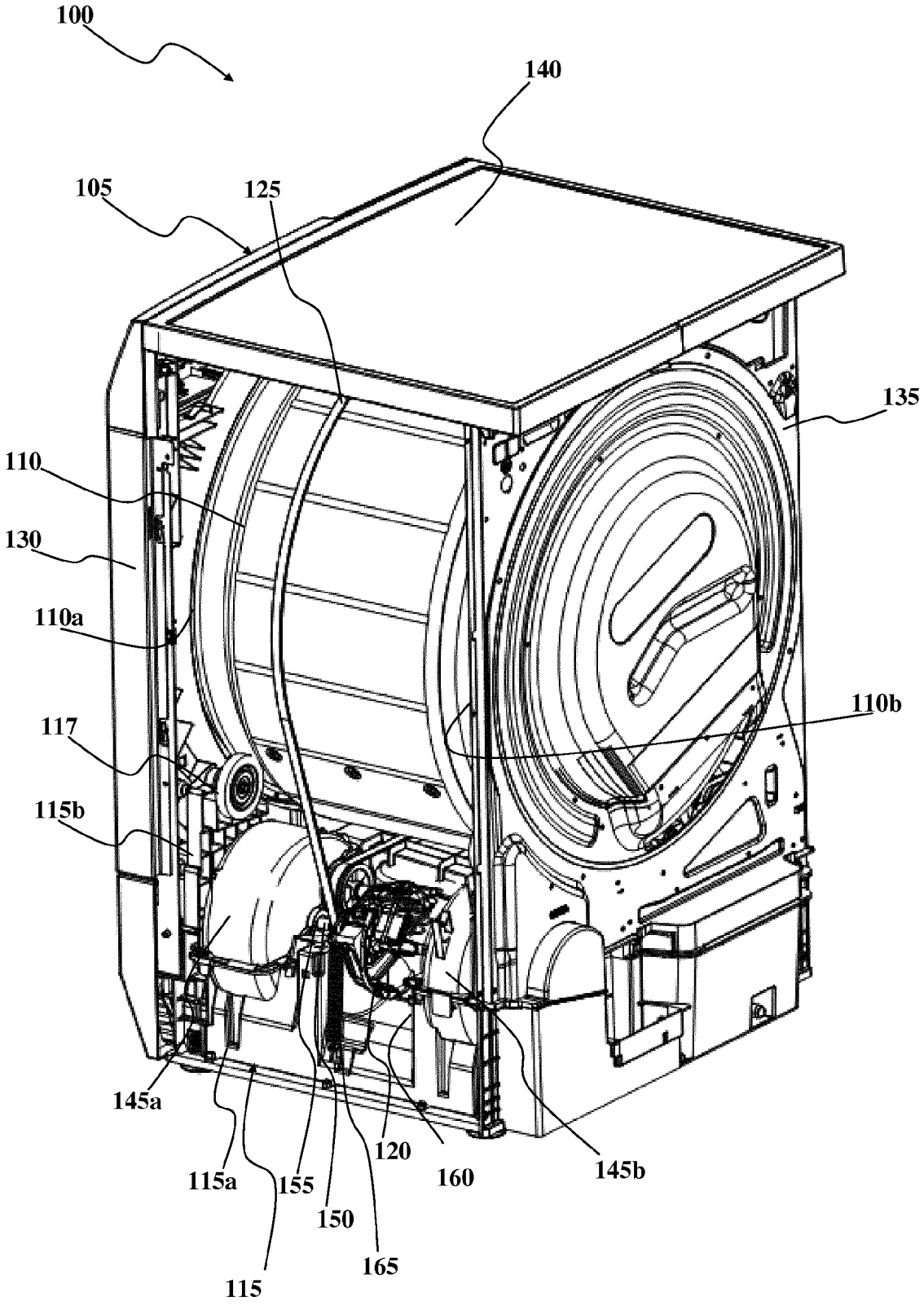
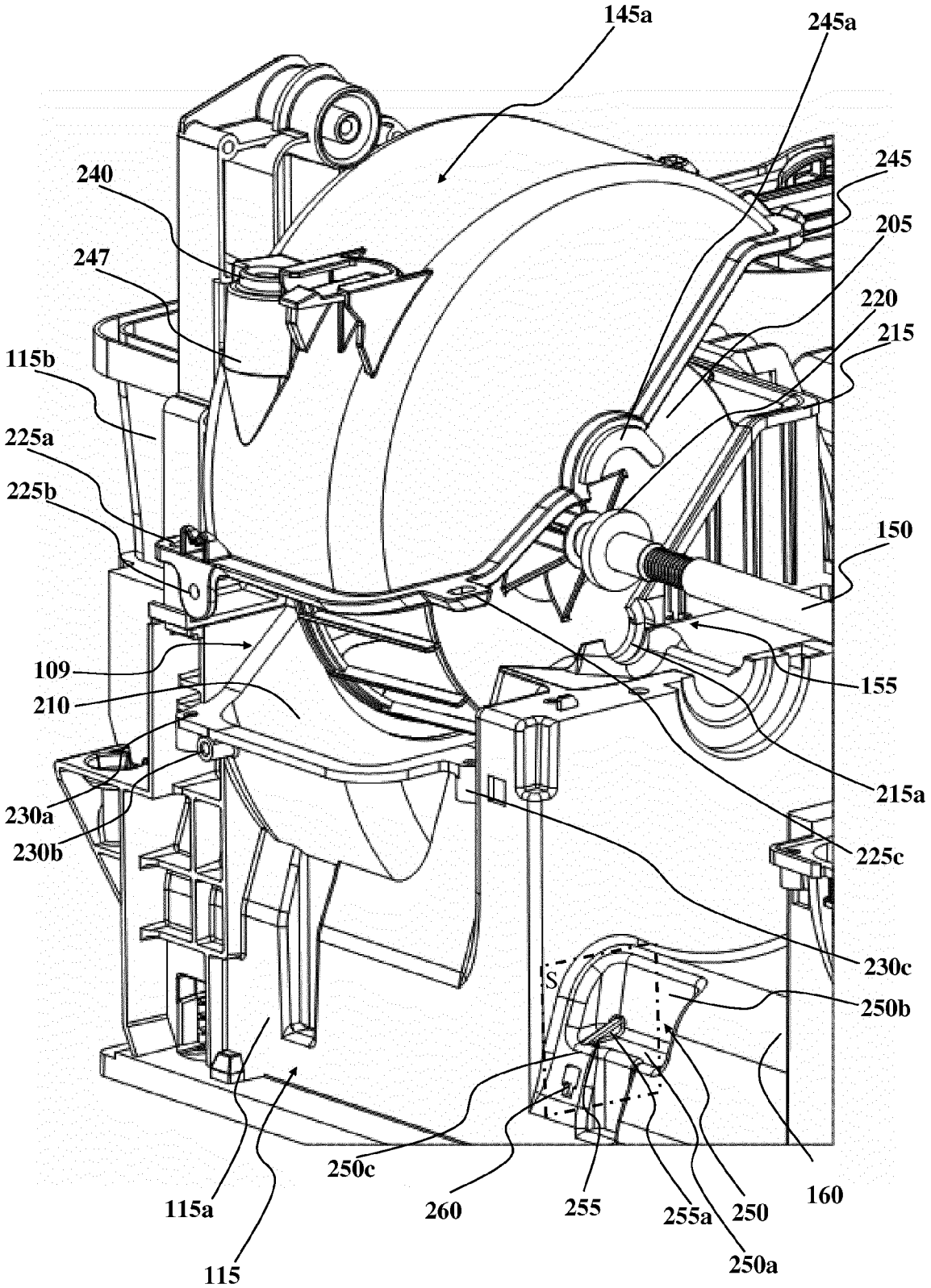

100
140
105
125
135
110
130
110a
110b
117
115b
145a
115a
155
150
115
165
120
160
145b

FIG.1


145a
245a
240
245
205
247
220
215
115b
225a
225b
150
109
155
210
215a
230a
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250c
160
115a
260
255
255a
250
250a
115

FIG.2

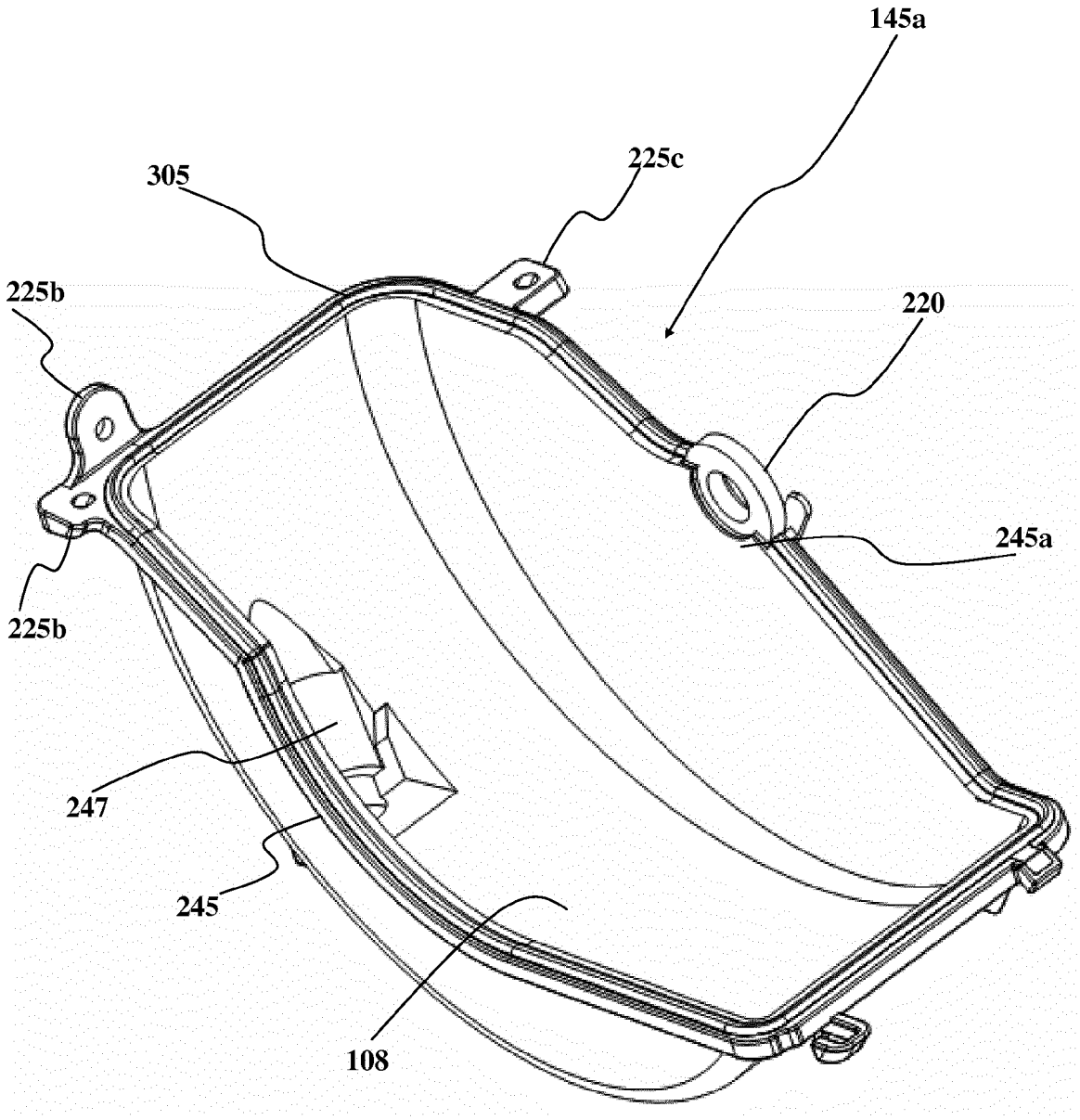

FIG.3

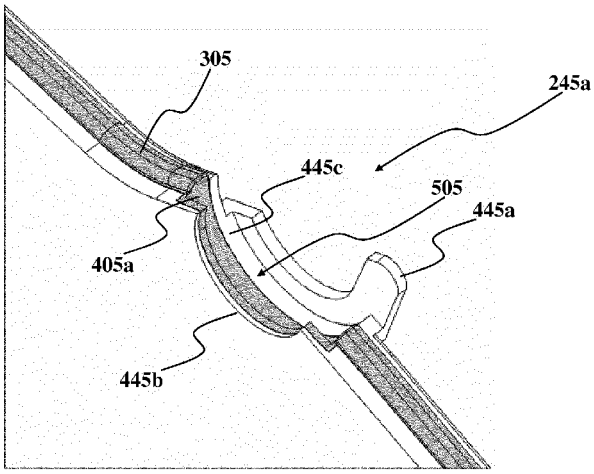

FIG.4A

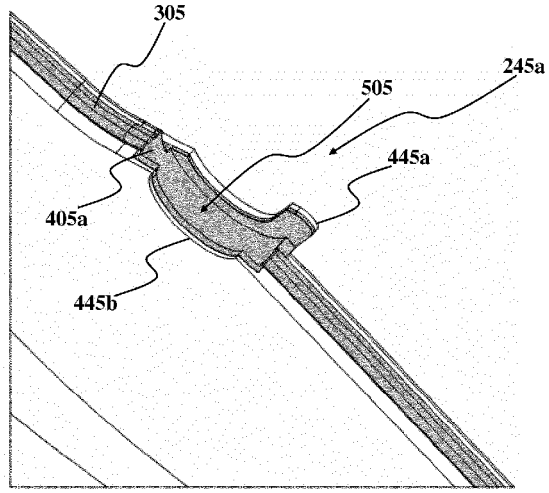

FIG.4B

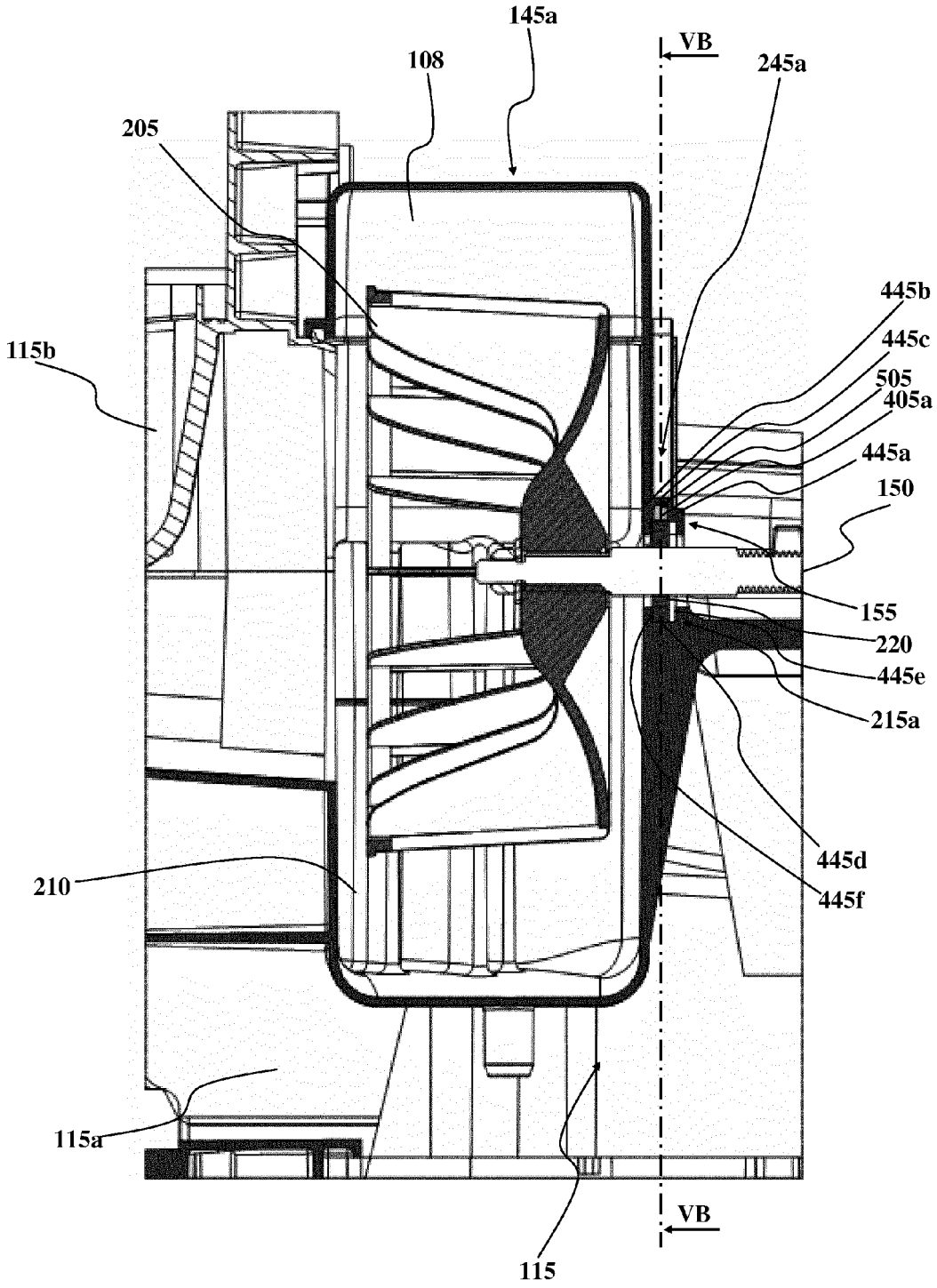
145a
VB
108
245a
205
445b
115b
445c
505
405a
445a
150
155
220
445e
215a
445d
210
445f
115a
VB
115

FIG.5A

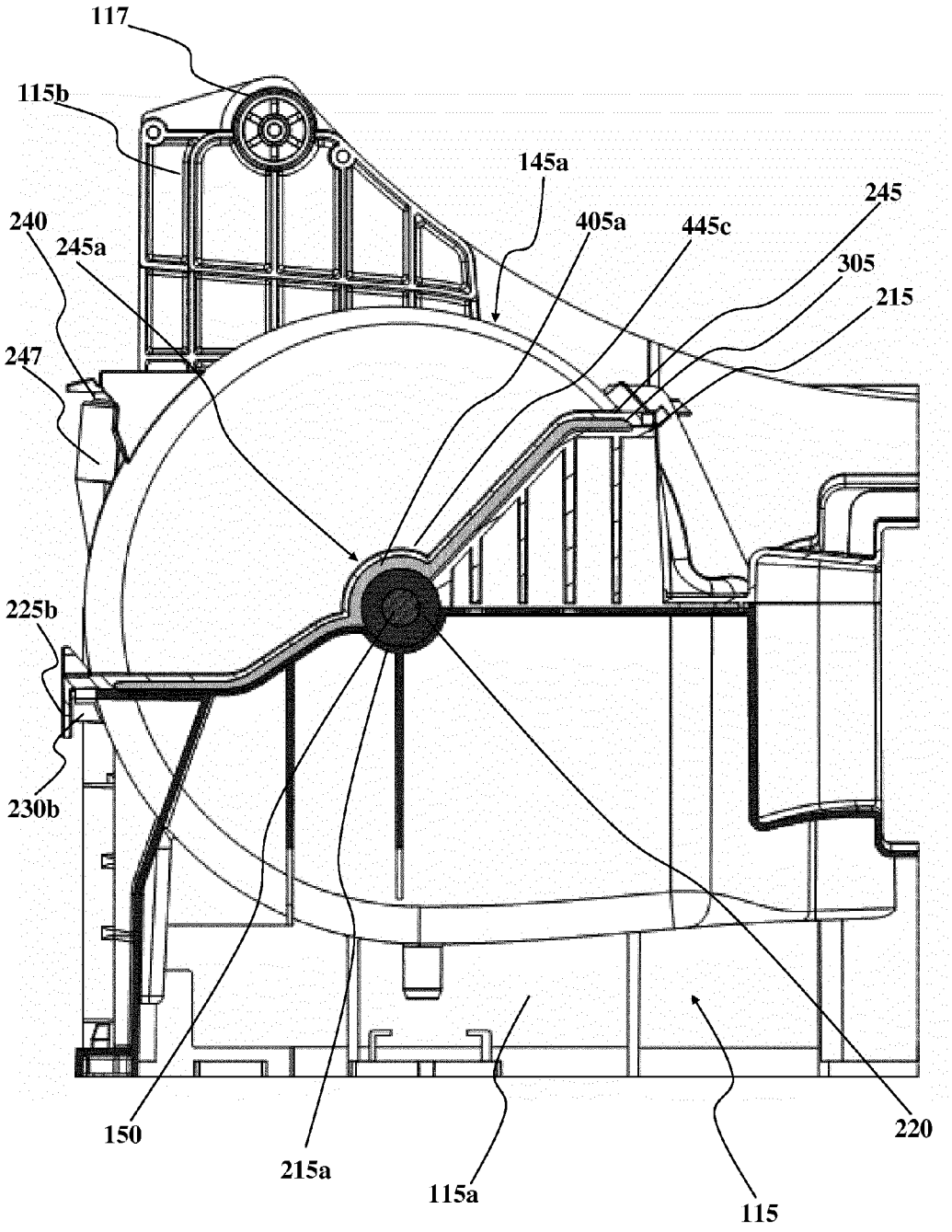
117
115b
145a
245
240
405a
445c
245a
305
215
247
225b
230b
150
215a
115a
115
220

FIG.5B

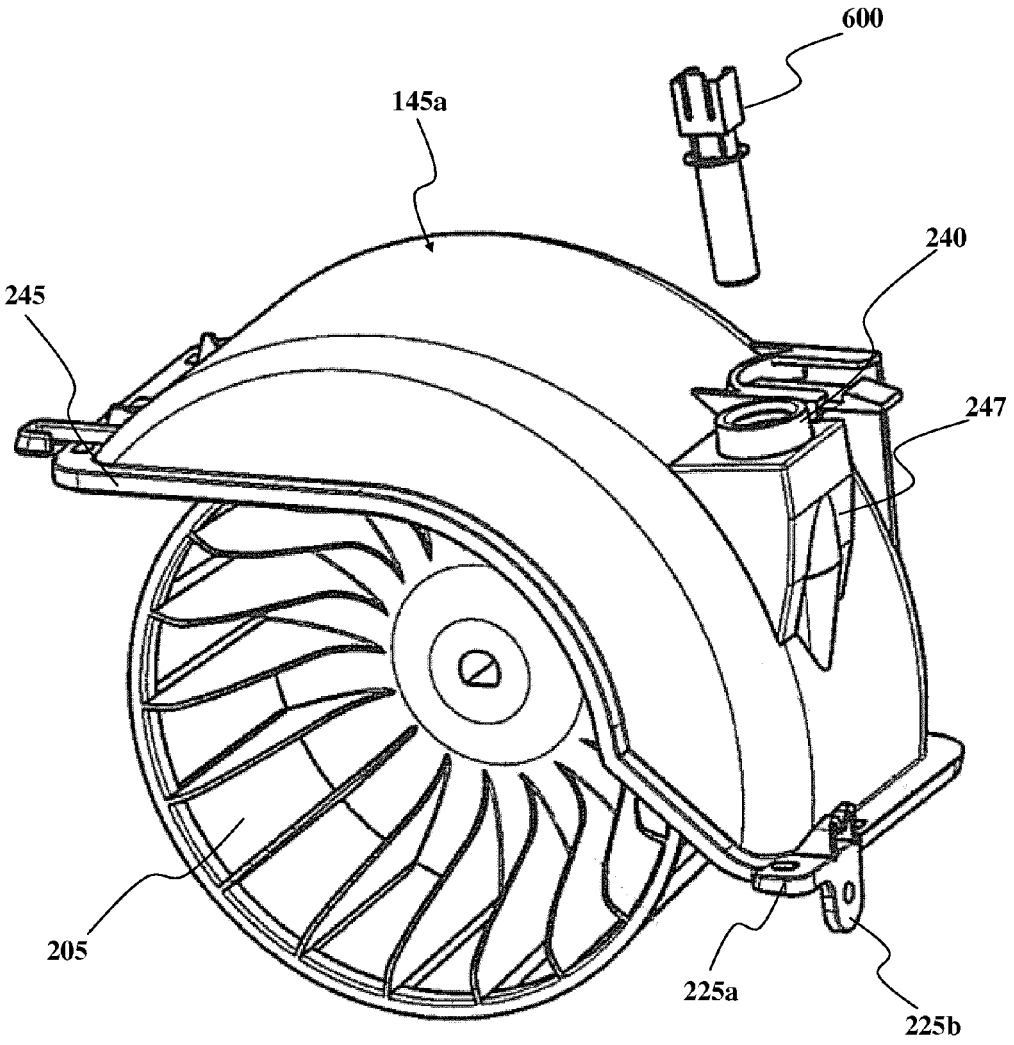

FIG.6

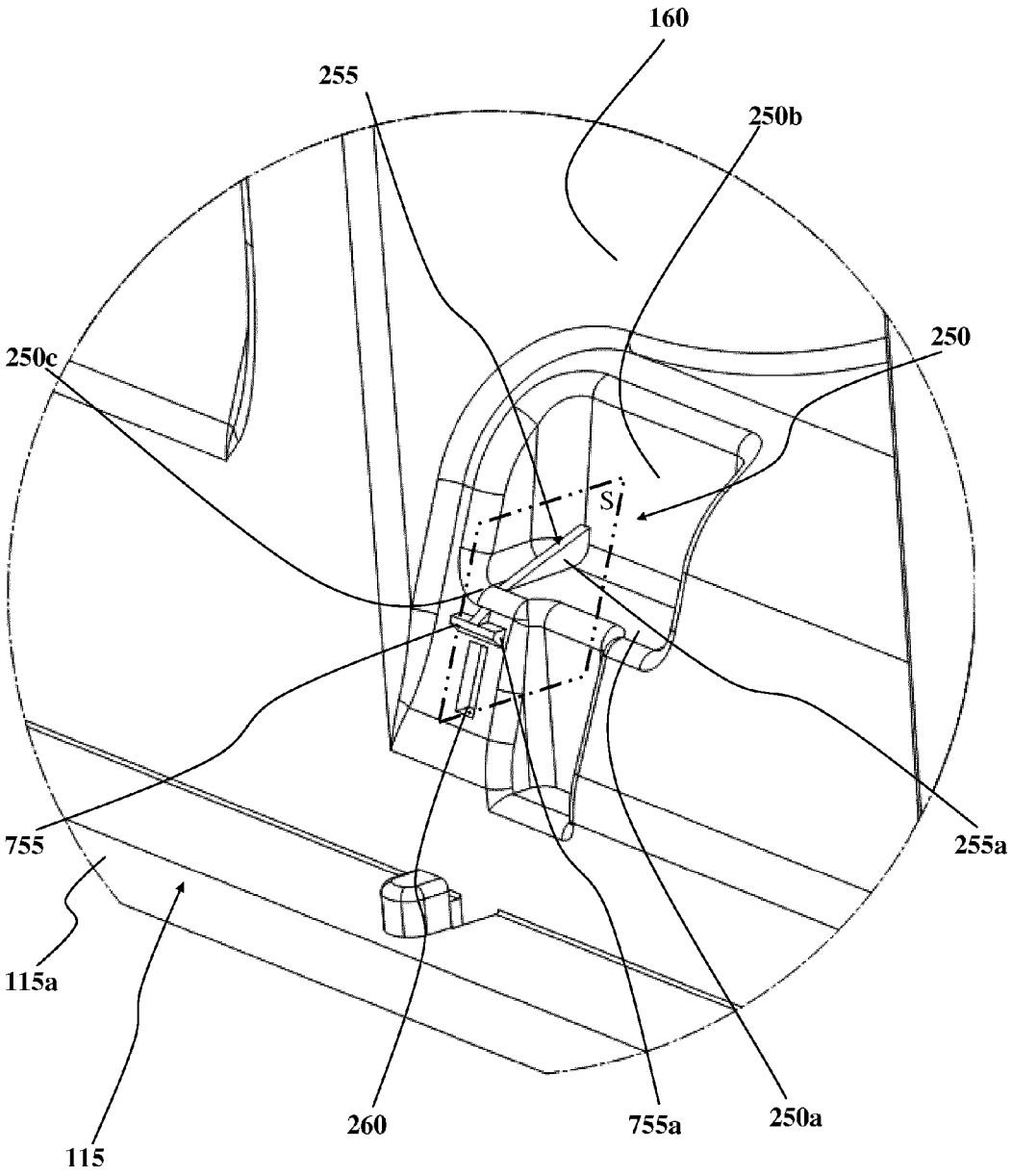

FIG.7

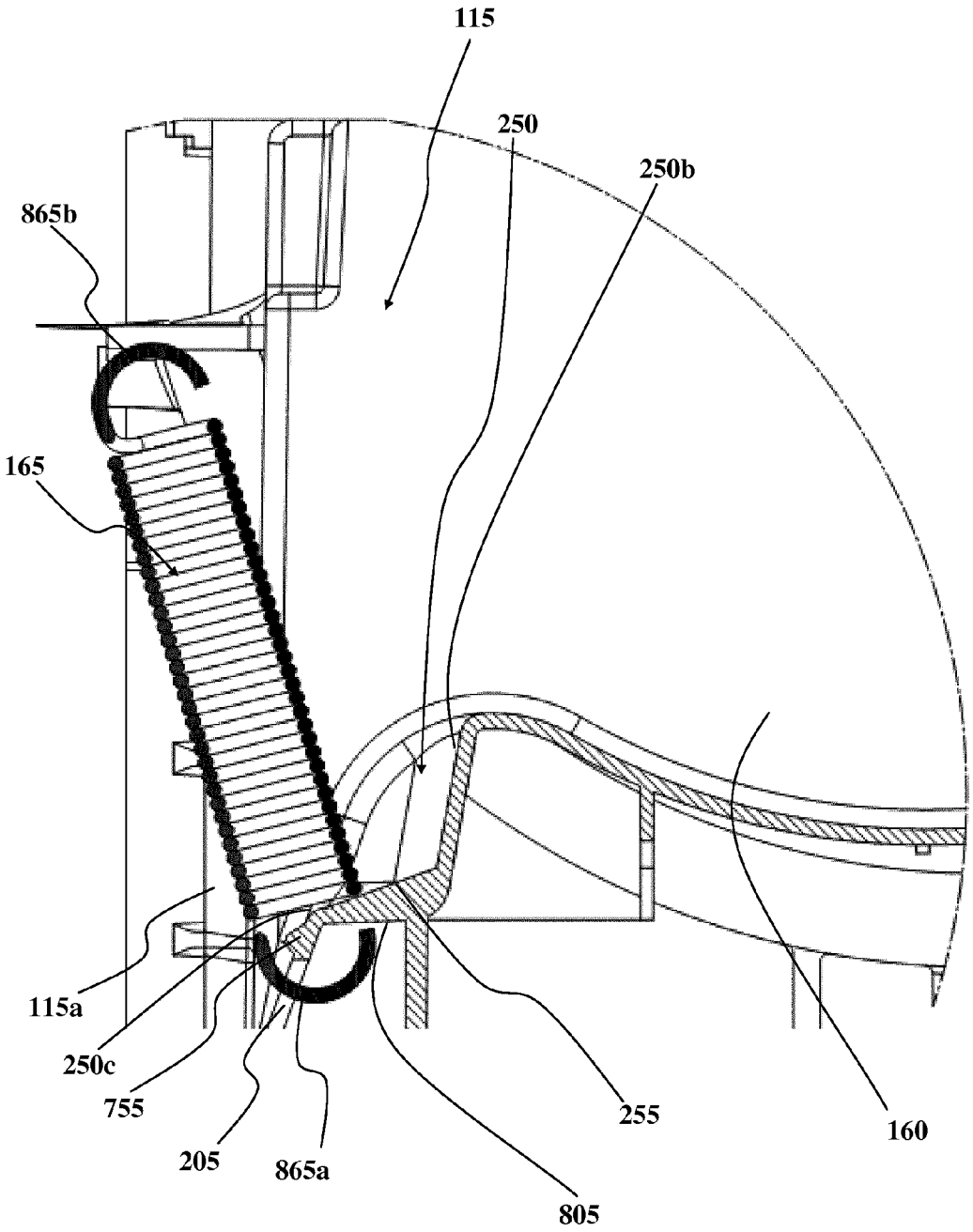

FIG.8

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EUROPEAN SEARCH REPORT

Application Number
EP 12 17 1518

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2009/064533 A1 (NAKIRI KAZUTOSHI [JP]) 12 March 2009 (2009-03-12) * paragraphs [0091] - [0095]; figures 5-7 *	1-15	INV. D06F58/20
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TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	6 December 2012	Stroppa, Giovanni

CATEGORY OF CITED DOCUMENTS

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06-12-2012

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82