



(11) **EP 3 916 243 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
08.03.2023 Bulletin 2023/10

(51) International Patent Classification (IPC):
F04D 29/42 ^(2006.01) **F04D 29/66** ^(2006.01)
F04D 29/62 ^(2006.01) **F04D 29/02** ^(2006.01)

(21) Application number: **21174457.8**

(52) Cooperative Patent Classification (CPC):
F04D 29/4226; F04D 29/023; F04D 29/626;
F04D 29/668; F04D 25/0606; F05D 2260/36;
F05D 2300/10; F05D 2300/43

(22) Date of filing: **18.05.2021**

(54) **FAN FOR AIR-GAS MIXING SYSTEMS IN BURNERS OF HEATING EQUIPMENT**

GEBLÄSE FÜR LUFT-GAS-MISCHSYSTEME IN BRENNERN VON HEIZUNGSANLAGEN

VENTILATEUR POUR SYSTÈMES DE MÉLANGE AIR-GAZ DANS LES BRÛLEURS D'APPAREILS DE CHAUFFAGE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

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(30) Priority: **27.05.2020 IT 202000012616**

(43) Date of publication of application:
01.12.2021 Bulletin 2021/48

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Description

[0001] The present invention relates to a fan for air/gas mixing systems in burners of heating equipment, having the features set out in the preamble of the main claim 1.

[0002] In the technical field being referred to, there are known and widely used heating apparatuses, such as gas boilers, which are provided with burners with premixing systems for the combustible air/gas mixture, such apparatuses being configured for heating sanitary water and/or water which flows in the heating circuits for environments.

[0003] Burners of this type are associated with a fan, in particular an electric fan, which is provided in order to draw in or impel a combustible mixture of air and gas which is generated in a mixing device in order to supply this combustible mixture to the burner.

[0004] Merely by way of application example, there may be cited a centrifugal fan for wall-mounted gas boilers.

[0005] These fans, see e.g. DE 20 2016 103134 U1, usually comprise an impeller which is received in a casing or volute which is provided with a motor support plate, an electric motor on the shaft of which the impeller is keyed, a motor support which comprises a metal frame for mounting vibration damping elements, which is fixedly joined to the plate, a motor control printed circuit board which is positioned near the motor, generally in a position above the motor itself and a protection and containment cap for the board/motor assembly.

[0006] The vibration damping elements which are also known using the term "silent block" are fixed, for example, with screws, to the above-mentioned frame so as to remain interposed between the motor and the motor support plate in order to reduce the transmission of vibrations to the structure of the fan.

[0007] One of the problems addressed by the invention relates to the noise which is generated by the fan during the operation thereof, in particular the additional noise generated by the covering cap of the motor control printed circuit board and substantially correlated with the system for fixing the cap to the fan. The structure with a box-shaped formation of the cap further tends to produce an amplification of the sound waves of the noise generated.

[0008] A known fixing system provides for the cap to be connected to a stationary frame member of the rotary motor or to the motor support plate (which is typically constructed from sheet metal or diecast metal) by means of additional fixing elements, such as screws or hooks.

[0009] Another known system provides for the cap to be connected to the above-mentioned plate by means of couplings, normally made of metal, without using additional fixing elements.

[0010] In these systems, the function of acting counter to the formation of noise emitted by the fan is entrusted during use to the vibration dampers (for example, made from rubber or elastomer materials) which are interposed between the motor member and the rigid structure of the

fan body to which the protection cap of the printed circuit board is fixed.

[0011] In the case of connections without using additional fixing elements, such as screws or hooks, the connection between materials of different types, that is to say, generally of a plastics type for the cap and metal type for the motor support or body of the fan, causes thermal expansions to different extents with variations in temperature with a resultant variation in the assembly state.

[0012] This differentiated expansion which correlates to the different type of the materials is translated into a variation in the tolerances and occurrences of play of connection between the components, which may generate during operation of the fan the trigger for unexpected vibrations with the resultant generation of noise.

[0013] An object of the invention is to provide a fan which is structurally and functionally configured to overcome the limitations set out with reference to the known solutions, in particular directed towards detaching the protection cap of the motor control printed circuit board from the vibrations generated by the motor during operation of the fan, thereby preventing the generation of additional noise.

[0014] Another object is to make the system for fixing the cap to the fan independent of the expansions of a thermal type as a result of the temperatures reached under the conditions of use of the fan.

[0015] Yet another object is to construct the connection of the cap to the fan without any need for additional fixing components or elements for a consequent reduction of times and costs in the assembly process line.

[0016] These objects and other objects which will be appreciated more clearly below are achieved by the invention by means of a fan for air/gas mixing systems in burners of heating equipment which is constructed according to the appended claims.

[0017] Additional features and advantages of the invention will be better appreciated from the following detailed description of a preferred embodiment thereof which is illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Figure 1 is an exploded perspective view of an example of a fan constructed according to the present invention,
- Figures 1A and 1B are perspective views of a detail of the fan of Figure 1,
- Figure 2 is a plan view from above of the fan of Figure 1,
- Figure 3 is a view corresponding to that of Figure 2 of a detail of the fan of the invention,
- Figure 4 is a perspective view of the detail of the fan shown in Figure 3,
- Figures 5 and 6 are perspective views of the detail of Figure 3 shown in respective and different operating positions of a group of components of the fan,
- Figures 7, 8 and 9 are partial sections drawn to an

enlarged scale of details of the fan of the preceding Figures,

- Figure 10 is a perspective, partially sectioned view of the fan according to the invention,
- Figure 11 is a partial perspective view drawn to an enlarged scale of a detail of Figure 10.

[0018] With reference to the cited Figures, there is generally designated 1 a fan for air/gas mixing systems in burners of heating equipment constructed according to the invention.

[0019] The fan 1 which is of the centrifugal type comprises an impeller 2 which has a main rotation axis designated X and which is provided with a plurality of radial blades 2a and is received in a volute or casing 3 which defines the conveying conduit for the fluid which is processed by the impeller between an axial intake zone and a tangential delivery zone.

[0020] The volute 3 comprises a main volute body 3a to which there is fixed, for example, by means of screws, a closure plate 4 (made from sheet metal or diecast metal) and which is configured as a motor support plate.

[0021] There is designated 5 an electric motor for actuating the fan, to the shaft 5a of which the impeller 2 is keyed.

[0022] The fan further comprises a motor support comprising a first metal frame 6 which is provided to be fixedly joined to the plate 4 and on which there is provision for mounting vibration damping elements 7. The motor 5 is therefore supported on the frame 6 with the damping elements 7 being interposed and being configured, for example, as silent block cylinders of the type conventional per se.

[0023] There is designated 8 a motor control printed circuit board which is positioned near the motor itself, preferably in a position above the motor, that is to say, at a side axially opposite the frame 6 with respect to the motor. The printed circuit board 8 is fixed, for example, screwed, to a stationary portion 5b of the motor 5. The portion 5b can be constructed in the form of a collar which is fixedly joined to the stator casing of the motor, from which a series of bridges 5c (three of them in the example described) which carry respective mushroom-like extension pieces 5d which are used for engaging in the respective members of the damping elements extend radially.

[0024] There is designated 9 a cooling fan which is intended to be keyed to the motor shaft 5a at the opposite side of the motor with respect to the impeller.

[0025] The fan 1 further comprises a protection and containment cap 10 of the board/motor assembly, which has an open box-like formation with lateral walls 10a which extend upwards from a base wall 10b.

[0026] In one embodiment, the base wall 10b has a peripheral formation which is substantially quadrilateral for defining four lateral walls which are mutually connected. There is designated 10c a through-opening through the cap 10 which is formed in the region of the lateral

walls for the passage of a connector (not illustrated) of a cable for power supply and data transmission to the printed circuit board 8.

[0027] The cap 10 is advantageously produced from a plastics material with electrical insulation characteristics.

[0028] According to a main feature of the invention, the fan comprises a second frame 11 which is produced from plastics material identical to or compatible with the plastics material of the cap. The frame 11 can be connected to the metal frame 6 of the motor support and further comprises interconnection means and counter-means which are provided on the cap 10 and on the second frame 11, respectively, and which mutually cooperate in order to fix the cap to the fan by means of the second frame.

[0029] Via the interconnection means and counter-means, there is further produced a connection of the removable type between the cap 10 and the second frame 11.

[0030] The interconnection means and counter-means are further configured to preferably produce a connection with snap-fitting interlocking between the cap and the second frame.

[0031] In an embodiment, the interconnection means and counter-means comprise a plurality of through-openings 12 which extend through the second frame 11 and a corresponding plurality of interlocking extension pieces 13 which project from the cap and which are formed in such positions that each opening 12 is provided for the insertion of a corresponding interlocking extension piece 13 when the cap 10 is connected to the frame 11.

[0032] Each extension piece 13 advantageously has at its own free end a toothed formation 14 which is capable of engaging with snap-fitting interlocking in the corresponding opening 12.

[0033] In an embodiment, the frame 11 has a base 11a with a small thickness with a peripheral profile with an open contour, on which there are located three sides which extend in continuation of each other and with pairs of contiguous sides which are substantially orthogonal to each other, each side having a counterpart at a respective free edge of a corresponding lateral wall of the cap. In this configuration, there are provided on each of the sides of the base 11a a pair of openings 12 which are arranged in such a position as to be engaged by a corresponding pair of extension pieces 13 which project from the free edge of the corresponding wall 10a of the cap so as to form the connection with snap-fitting interlocking between the cap 10 and the frame 11. This connection is therefore brought about by the total involvement of six extension pieces 13 in the respective six openings 12. It will be understood that a different number and positioning of openings and corresponding extension pieces may be provided in order to ensure suitable fixing of the cap 10 to the frame 11. There are provided on the base 11a column-like extension pieces which are all designated 20 and which extend in the same direction from the surface of the base facing the cap. The column-

like extension pieces 20 are arranged along the sides of the base, particularly in the region of the openings 12, and are selected to have a number, formation and positioning suitable for allowing the interaction thereof, by means of contact, with the internal surfaces of the lateral walls of the cap, in order to generate a state of tension which is suitable for ensuring greater stability of connection between the cap and frame, in particular by taking up the occurrences of play of the connection between extension pieces 13 and corresponding openings 12.

[0034] The frame 11 further comprises engagement means with respect to the frame 6 in order to produce an interlocking securing action, of the removable type, between the frames themselves.

[0035] The engagement means comprise at least one seat 15 on the frame 11 for engaging at least one portion 6a of the frame 6 and at least one fin 16 which projects from the frame 11 and which is capable of abutting the portion of the frame 6 so as to retain the frame 6 in the seat 15 and to mutually secure the frames. Advantageously, the engagement means produce a snap-fitting connection between the frames 6 and 11. To this end, the at least one fin 16 has at the free end thereof a toothed formation 16a which can be positioned against the portion 6a of the frame 6, prior to resilient flexion of the fin, during the relative engagement movement between the frames.

[0036] In an embodiment, the frame 6 is constructed from sheet metal which is cut or bent and which has a central annular flat portion which is delimited by a peripheral mount which has three portions 6a with a substantially rectilinear profile, each pair of contiguous portions 6a being connected in a corresponding portion 6b of the mount, each portion 6b having a respective through-hole 6c which is provided for mounting the corresponding cylindrical damping element 7. The edge of the hole 6c can be used for interlocking in a counter-shaped peripheral channel 7a of the damping element.

[0037] Such a configuration provides for the three holes 6c to be positioned with an angular pitch of 120° relative to each other (about the main axis coincident with the axis X) and the portions 6a to extend along the respective sides of a hypothetical equilateral triangular profile.

[0038] The frame 6 is fixedly joined to the plate 4 by means of plastic deformation of a portion of the central flat portion against a surface portion of the plate. Following the relative fixing thereof, the mount of the frame which has the portions 6a remains spaced apart from the plate 4, allowing the engagement of the frame 11 with the frame 6.

[0039] In the embodiment described here, there is provided in the frame 11 a pair of seats 15 which are laterally opposite, each seat being delimited by surfaces 15a which can at least partially surround the corresponding portion 6a of the frame 6, during the relative engagement movement. There are designated 15b reliefs which project from the base and which are capable of cooper-

ating with the surfaces 15a, abutting the portions 6a of the frame 6 in the condition of engagement with the frame 11. There are further provided in the frame 11 two pairs of fins 16 which are directed parallel with the base 11a, the fins of each pair having different longitudinal extents so as to be connected with the corresponding portion 6a, in different positions, in order to be engaged with the portion and to retain it in the respective seat 15, thereby securing the frames to each other.

[0040] Each fin 16, with the individual free toothed end thereof, is suitable for snap-fitting engagement and abutting the corresponding portion 6a of the frame 6. There are further provided in the frame 11 three notches or recesses which have a substantially semi-circular profile and which are designated 18 and which are configured to surround, with limited connection play, portions of the lateral cylindrical coverings of the respective damping elements 7 during the mutual engagement movement of the frames 6 and 11. The notches 18 allow the centring of the frame 11 to be brought about relative to the frame 6 during the relative engagement step.

[0041] The formation of the frame 11 described above is configured to allow the engagement of the frame 11 with the frame 6 in three different relative orientations, which are angularly arranged at 120° relative to each other (about the axis X). In the Figures 4 to 6, there are shown the three relative positions between the frames which can be configured, respectively.

[0042] As a result of the orientability of relative positioning, the assembly constituted by the frame 11, motor 5 (and the stationary portion 5b thereof), control printed circuit board 8 and cap 10 can be fixed to the volute 3 in three different positions which are orientated at 120° relative to each other, allowing the cap 10 to be arranged, and in particular the opening 10c thereof for the access of the connection connector to the printed circuit board, in three different positions relative to the delivery section of the fan, with the advantageous result that, during installation, it is easier to select the most suitable positioning as a function of the dimensions and requirements of the plant encountered in situ.

[0043] It will be observed that the solution proposed by the invention addresses the problem of counteracting the onset of vibrations and the consequent additional noise generated by the protection cap of the motor control printed circuit board and substantially correlated with the fixing system of the cap with respect to the fan. This additional noise component is added to other noise components which are emitted by the fan in the entire range of operation, in particular it is added to a relevant component connected with the type of motor used, typically, for example, a brushless monophasic motor with a permanent magnet, the cause of which is a result of the tuning of the harmonics of the drive torque generated by the motor and the structural resonance frequencies of the mechanical components which constitute the fan itself.

[0044] Below, there is set out a brief outline of this prob-

lem and the technical solutions provided to overcome it.

[0045] Nowadays, the monophasic brushless motor with a permanent magnet installed in centrifugal fans is typically actuated by means of an inverter device with a control technique which provides for the motor to be supplied with an electric voltage with a square-wave profile.

[0046] With this control, the motor generates a drive torque with a range characterized by a wide number of harmonics. This feature, together with the fact that the harmonics vary the amplitude and frequency thereof when the speed of the motor varies, brings about a substantial increase in the probability of having tuning of the harmonics of the drive torque with the structural resonance frequencies of the components of the fan and this effect of tuning is one of the causes of the acoustic noise emitted by the fan. Therefore, the problem is to substantially reduce the number of tunings between torque harmonics and resonance frequencies because such a reduction translates into a reduction of sound emission and therefore a reduction of the mean noise level.

[0047] A solution which addresses this problem provides for a voltage with a sinusoidal profile to be supplied to the motor by the inverter. Such a solution allows a reduction, including up to complete elimination, of the amplitude of all the harmonics of the drive torque greater than the first one and therefore a reduction in the probability that there will be tuning with the structural resonance frequencies. With this control technique, with respect to the technique with voltage with a square profile, it is possible to substantially reduce the mean acoustic noise emitted by the fan over the entire operating range. Such a solution, which occurs in the technique for controlling the voltage with which the motor is supplied, is not suitable for completely eliminating the problem of the onset of additional noise correlated with the structure of the fan and in particular the structural characteristics of the protection cap of the control printed circuit board and the system for fixing the cap to the fan.

[0048] The present invention addresses this specific problem and achieves the objectives proposed while affording a number of advantages compared with the known solutions.

[0049] A first advantage involves the fact that the provision according to the invention of a fixing frame for the cap produced from the same material as the cap or from a material compatible with the material of the cap (advantageously, a plastics material with electrical insulation characteristics) prevents the onset of different thermal expansions which are connected with the temperature of operation of the fan and which are typically responsible for causing vibrations with a resultant generation of noise sound waves.

[0050] Another advantage is that the fixing frame for the cap is engaged with the motor support plate for closing the volute, which plate is detached from the vibrations generated by the operation of the fan, as a result of the action of the vibration damping elements interposed between the motor and plate, consequently also detaching

the cap from the above-mentioned vibrations. Another advantage is connected with the fact that the protection and containment cap of the printed circuit board is secured to the frame without additional fixing elements over more than half of the extent of the peripheral connection profile, thereby effectively limiting the deformation susceptible to vibrations of the cap itself, this deformation in fact being able to be the cause of sound waves being generated.

[0051] The connection of the cap to the frame without additional fixing elements (screws, hooks and similar means) is further advantageous in terms of reducing assembly costs and times along the production line of the fan, in addition to the fact that the use of tools is not needed.

[0052] Furthermore, the connection provided between the cap and the frame in the assembly step is of a resilient type (interlocking with snap-fitting engagement), therefore it does not have any tension forces once the final engagement condition is reached. Such a connection further does not have assembly conditions which can become degraded over time and during the service-life of the fan.

Claims

1. A fan for air/gas mixing systems in burners of heating equipment, comprising:

- a fan impeller (2) which is received in a volute (3) which is provided with a motor support plate (4),
- a motor (5) on the shaft (5a) of which the impeller (2) is keyed,
- a motor support comprising a first metal frame (6) for mounting vibration damping elements (7), the first metal frame (6) being fixedly joined to the motor support plate (4), the motor (5) being supported on the first metal frame (6) with the vibration damping elements (7) being interposed,
- a motor control (5) printed circuit board (8) which is positioned near the motor,
- a protection and containment cap (10) of the board/motor assembly,

characterized in that the cap (10) is produced from plastics material and **in that** it comprises a second frame (11) of plastics material which can be connected to the first metal frame (6) and interconnection means and counter-means which are provided on the cap (10) and on the second frame (11), respectively, and which mutually cooperate in order to fix the cap to the fan by means of the second frame.

2. A fan according to claim 1, wherein the interconnection means and counter-means produce a connec-

tion of the removable type between the cap (10) and the second frame (11).

3. A fan according to claim 1 or claim 2, wherein the interconnection means and counter-means are configured to produce a connection with snap-fitting interlocking. 5
4. A fan according to claim 3, wherein the interconnection means and counter-means comprise a plurality of through-openings (12) in the second frame (11) and a respective plurality of interlocking extension pieces (13) which project from the cap (10), each opening (12) being provided for the insertion of a respective interlocking extension piece (13). 10
5. A fan according to claim 4, wherein each of the extension pieces (13) has a free end which carries a toothed formation (14) for engaging with snap-fitting interlocking in the corresponding opening (12) of the second frame (11). 15
6. A fan according to one or more of the preceding claims, wherein the second frame (11) comprises means for engagement with the first frame (6) in order to produce an interlocking securing action, of the removable type, between the first and second frames. 20
7. A fan according to claim 6, wherein the engagement means comprise at least one seat (15) on the second frame (11) for engaging at least a portion (6a) of the first frame (6) and at least one fin (16) which projects from the second frame (11) and which is capable of abutting the portion (6a) of the first frame (6) so as to retain the first frame in the seat (15) of the second frame and to mutually secure the frames. 25
8. A fan according to claim 7, wherein the engagement means produce a snap-fit connection between the first (6) and second (11) frames. 30
9. A fan according to claim 7 or claim 8, wherein the first and second frames (6, 11) have such respective formations that the second frame (11) is capable of being engaged with the first frame (6) in more than one position orientated in relation to the first frame. 35
10. A fan according to claim 9, wherein there are provided between the first frame (6) and the second frame (11) three relative engagement positions which are orientated at 120° relative to each other about a main axis (X) of the first frame (6). 40
11. A fan according to one or more of the preceding claims, wherein the cap (10) is produced from electrically insulating material. 45

Patentansprüche

1. Lüfter für Luft/Gas-Mischsysteme in Brennern von Heizungsanlagen, umfassend:
 - ein Lüfterrad (2), das in einem Spiralgehäuse (3) aufgenommen ist, das mit einer Motorträgerplatte (4) versehen ist,
 - einen Motor (5), auf dessen Welle (5a) das Laufrad (2) aufgekeilt ist,
 - einen Motorträger mit einem ersten Metallrahmen (6) zur Montage von Schwingungsdämpfungselementen (7), wobei der erste Metallrahmen (6) fest mit der Motorträgerplatte (4) verbunden ist, wobei der Motor (5) auf dem ersten Metallrahmen (6) mit den Schwingungsdämpfungselementen (7), die dazwischen angeordnet sind, abgestützt ist,
 - eine Leiterplattenplatine (8) für die Motorsteuerung (5), die in der Nähe des Motors positioniert ist,
 - eine Schutz- und Einschlusskappe (10) der Platinen-/Motoranordnung,
 - **dadurch gekennzeichnet, dass** die Kappe (10) aus Kunststoffmaterial hergestellt ist und dadurch, dass sie einen zweiten Rahmen (11) aus Kunststoffmaterial aufweist, der mit dem ersten Metallrahmen (6) und Verbindungsmittel und Gegenmitteln verbunden werden kann, die jeweils an der Kappe (10) und am zweiten Rahmen (11) vorgesehen sind, und die wechselseitig zusammenwirken, um die Kappe mittels des zweiten Rahmens am Lüfter zu fixieren.
2. Lüfter nach Anspruch 1, wobei die Verbindungsmittel und Gegenmittel eine lösbare Verbindung zwischen der Kappe (10) und dem zweiten Rahmen (11) herstellen. 35
3. Lüfter nach Anspruch 1 oder Anspruch 2, wobei die Verbindungsmittel und Gegenmittel eingerichtet sind, um eine Verbindung mit Schnappverriegelung herzustellen. 40
4. Lüfter nach Anspruch 3, wobei die Verbindungsmittel und Gegenmittel eine Mehrzahl von Durchgangsöffnungen (12) im zweiten Rahmen (11) und eine jeweilige Mehrzahl von verriegelbaren Verlängerungsstücken (13) aufweisen, die von der Kappe hervorstehen (10), wobei jede Öffnung (12) zum Einsetzen eines jeweiligen verriegelbaren Verlängerungsstücks (13) vorgesehen ist. 45
5. Lüfter nach Anspruch 4, wobei jedes der Verlängerungsstücke (13) ein freies Ende aufweist, das eine Verzahnung (14) zum Einrasten mit der Schnappverriegelung in die entsprechende Öffnung (12) des zweiten Rahmens (11) trägt. 50

6. Lüfter nach einem oder mehreren der vorhergehenden Ansprüche, wobei der zweite Rahmen (11) Mittel zum Eingriff mit dem ersten Rahmen (6) aufweist, um zwischen den ersten und zweiten Rahmen eine entfernbare Verriegelungsmaßnahme zu erzeugen. 5
7. Lüfter nach Anspruch 6, wobei die Eingriffsmittel zumindest einen Sitz (15) am zweiten Rahmen (11) zum Eingriff mit zumindest einem Abschnitt (6a) des ersten Rahmens (6) und zumindest einer Rippe (16) aufweisen, die vom zweiten Rahmen (11) hervorsticht und die in der Lage ist, am Abschnitt (6a) des ersten Rahmens (6) anzuliegen, um so den ersten Rahmen im Sitz (15) des zweiten Rahmens zu halten und die Rahmen gegenseitig zu sichern. 10 15
8. Lüfter nach Anspruch 7, wobei die Eingriffsmittel eine Schnappverriegelung zwischen den ersten (6) und zweiten (11) Rahmen herstellen. 20
9. Lüfter nach Anspruch 7 oder Anspruch 8, wobei die ersten und zweiten Rahmen (6, 11) jeweils derartige Ausbildungen aufweisen, dass der zweite Rahmen (11) mit dem ersten Rahmen (6) in mehr als einer Position, die in Bezug auf den ersten Rahmen ausgerichtet ist, in Eingriff gebracht werden kann. 25
10. Lüfter nach Anspruch 9, wobei zwischen dem ersten Rahmen (6) und dem zweiten Rahmen (11) drei relative Eingriffspositionen vorgesehen sind, die in einem Winkel von 120° relativ zueinander um eine Hauptachse (X) des ersten Rahmens (6) ausgerichtet sind. 30
11. Lüfter nach einem oder mehreren der vorhergehenden Ansprüche, wobei die Kappe (10) aus elektrisch isolierendem Material hergestellt ist. 35
- Revendications** 40
1. Ventilateur destiné à des systèmes de mélange air/gaz de brûleurs d'équipement de chauffage, comprenant : 45
- une turbine (2) de ventilateur qui est reçue dans une volute (3) qui est pourvue d'une plaque de support de moteur (4),
 - un moteur (5) sur l'arbre (5a) duquel est clavetée la turbine (2), 50
 - un support de moteur comprenant un premier bâti métallique (6) destiné au montage d'éléments d'amortissement de vibration (7), le premier bâti métallique (6) étant relié fixement à la plaque de support de moteur (4), 55
- le moteur (5) étant supporté sur le premier bâti métallique (6), les éléments d'amortissement de vibration (7) étant interposés entre ces derniers,
- une carte à circuits imprimés (8) de commande du moteur (5) qui est positionnée à proximité du moteur,
 - un couvercle de protection et de confinement (10) de l'ensemble moteur/carte,
- caractérisé en ce que** le couvercle (10) est produit à partir de matière plastique et **en ce qu'il** comprend un second bâti (11) en matière plastique qui peut être connecté au premier bâti métallique (6) et des moyens d'interconnexion et des moyens complémentaires qui sont disposés respectivement sur le couvercle (10) et sur le second bâti (11), et qui coopèrent les uns avec les autres pour fixer le couvercle au ventilateur au moyen du second bâti.
2. Ventilateur selon la revendication 1, dans lequel les moyens d'interconnexion et les moyens complémentaires établissent une liaison de type amovible entre le couvercle (10) et le second bâti (11).
3. Ventilateur selon la revendication 1 ou la revendication 2, dans lequel les moyens d'interconnexion et les moyens complémentaires sont conçus pour établir une connexion avec enclenchement par encliquetage.
4. Ventilateur selon la revendication 3, dans lequel les moyens d'interconnexion et les moyens complémentaires comprennent une pluralité d'ouvertures traversantes (12) ménagées dans le second bâti (11) et une pluralité respective de pièces de prolongement d'enclenchement (13) qui font saillie du couvercle (10), chaque ouverture (12) étant prévue pour l'introduction d'une pièce de prolongement d'enclenchement respective (13).
5. Ventilateur selon la revendication 4, dans lequel chacune des pièces de prolongement (13) comporte une extrémité libre qui porte une formation dentée (14) permettant un enclenchement par encliquetage dans l'ouverture correspondante (12) du second bâti (11).
6. Ventilateur selon une ou plusieurs des revendications précédentes, dans lequel le second bâti (11) comprend des moyens de prise avec le premier bâti (6) afin d'établir une action de sécurisation d'enclenchement, de type amovible, entre les premier et second bâtis.
7. Ventilateur selon la revendication 6, dans lequel les moyens de prise comprennent au moins un logement (15) situé sur le second bâti (11) destiné à venir en prise avec au moins une partie (6a) du premier bâti (6) et au moins une ailette (16) qui fait saillie du second bâti (11) et qui peut venir en butée contre la

partie (6a) du premier bâti (6) de façon à retenir le premier bâti (6) dans le logement (15) du second bâti et à sécuriser mutuellement les bâtis.

8. Ventilateur selon la revendication 7, dans lequel les moyens de prise établissent une connexion à encliquetage entre le premier bâti (6) et le second bâti (11) . 5
9. Ventilateur selon la revendication 7 ou la revendication 8, dans lequel les premier et second bâtis (6, 11) comportent des formations respectives permettant d'amener le second bâti (11) en prise avec le premier bâti (6) dans plus d'une position orientée par rapport au premier bâti. 10
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10. Ventilateur selon la revendication 9, dans lequel trois positions de prise relative orientées à 120° les unes par rapport aux autres sont prévues autour d'un axe principal (X) du premier bâti (6). 20
11. Ventilateur selon une ou plusieurs des revendications précédentes, dans lequel le couvercle (10) est produit en matériau électriquement isolant. 25

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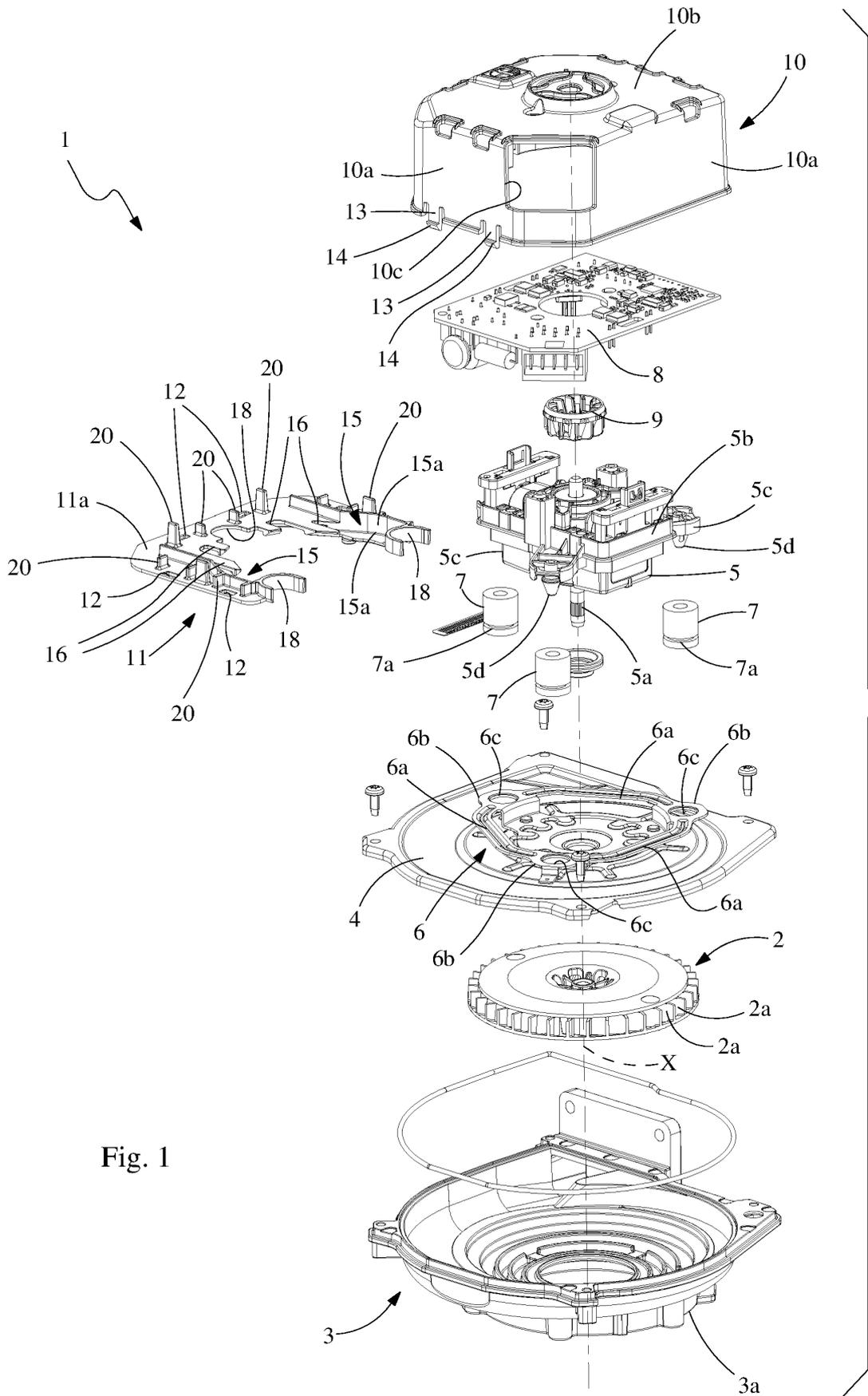


Fig. 1

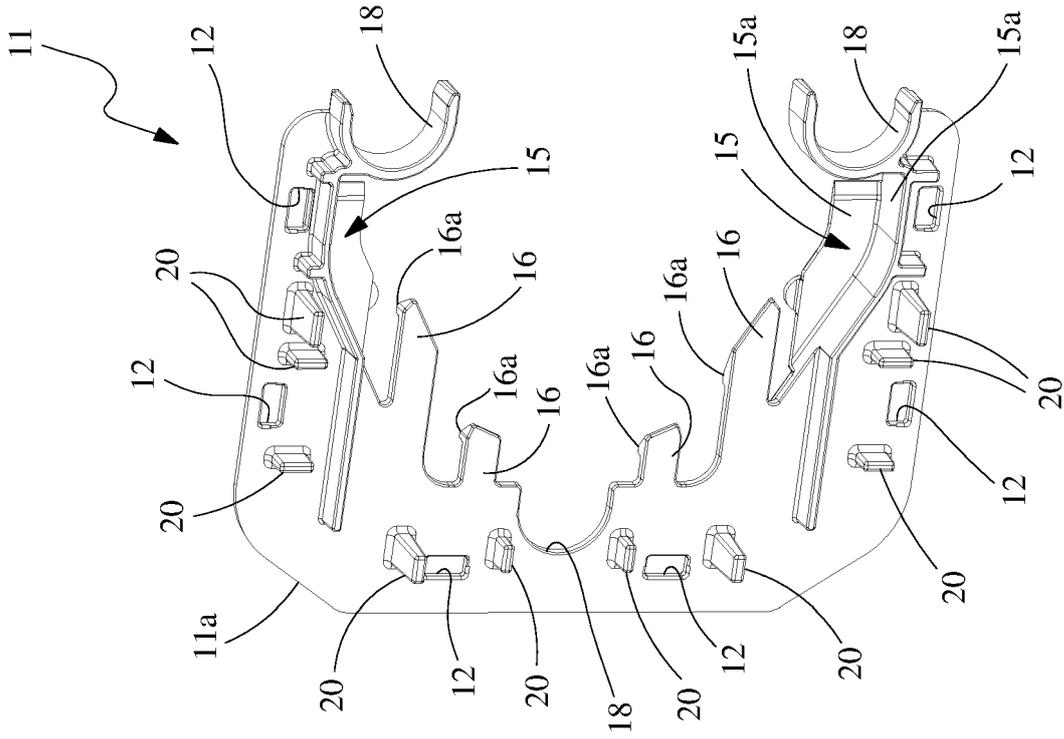


Fig. 1A

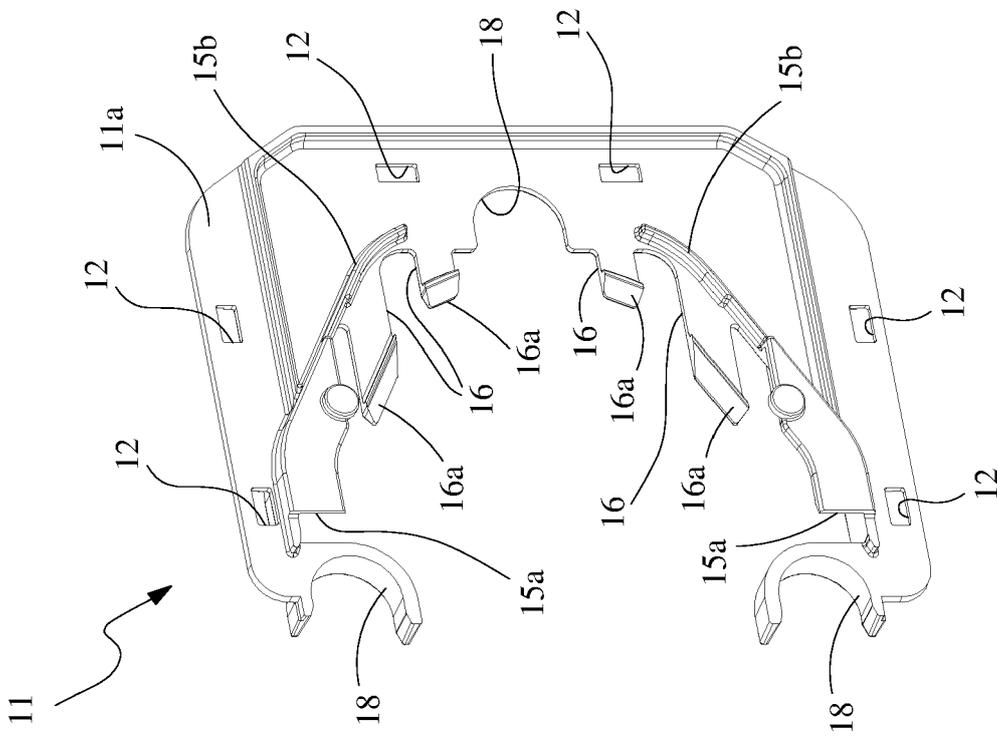


Fig. 1B

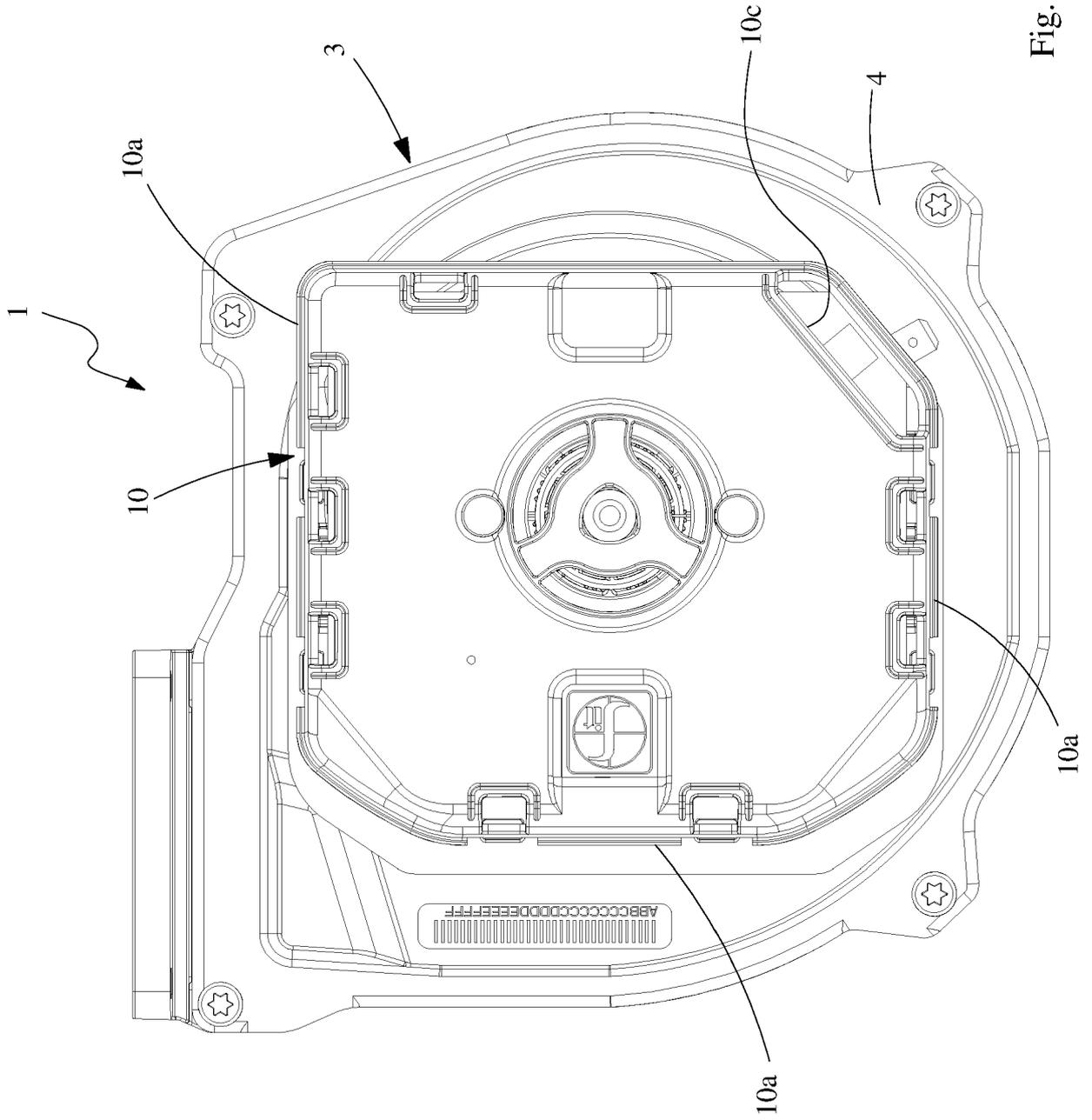


Fig. 2

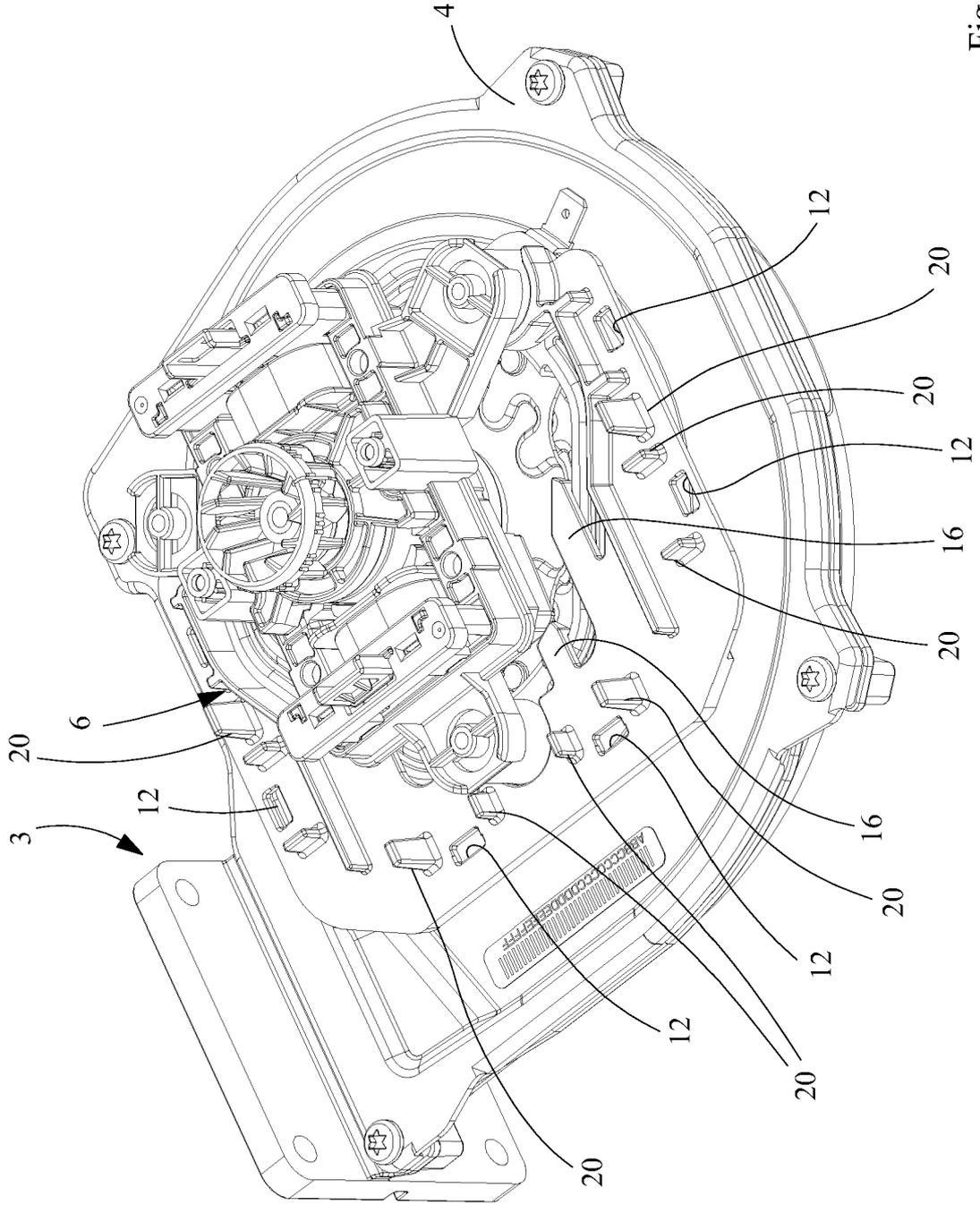


Fig. 4

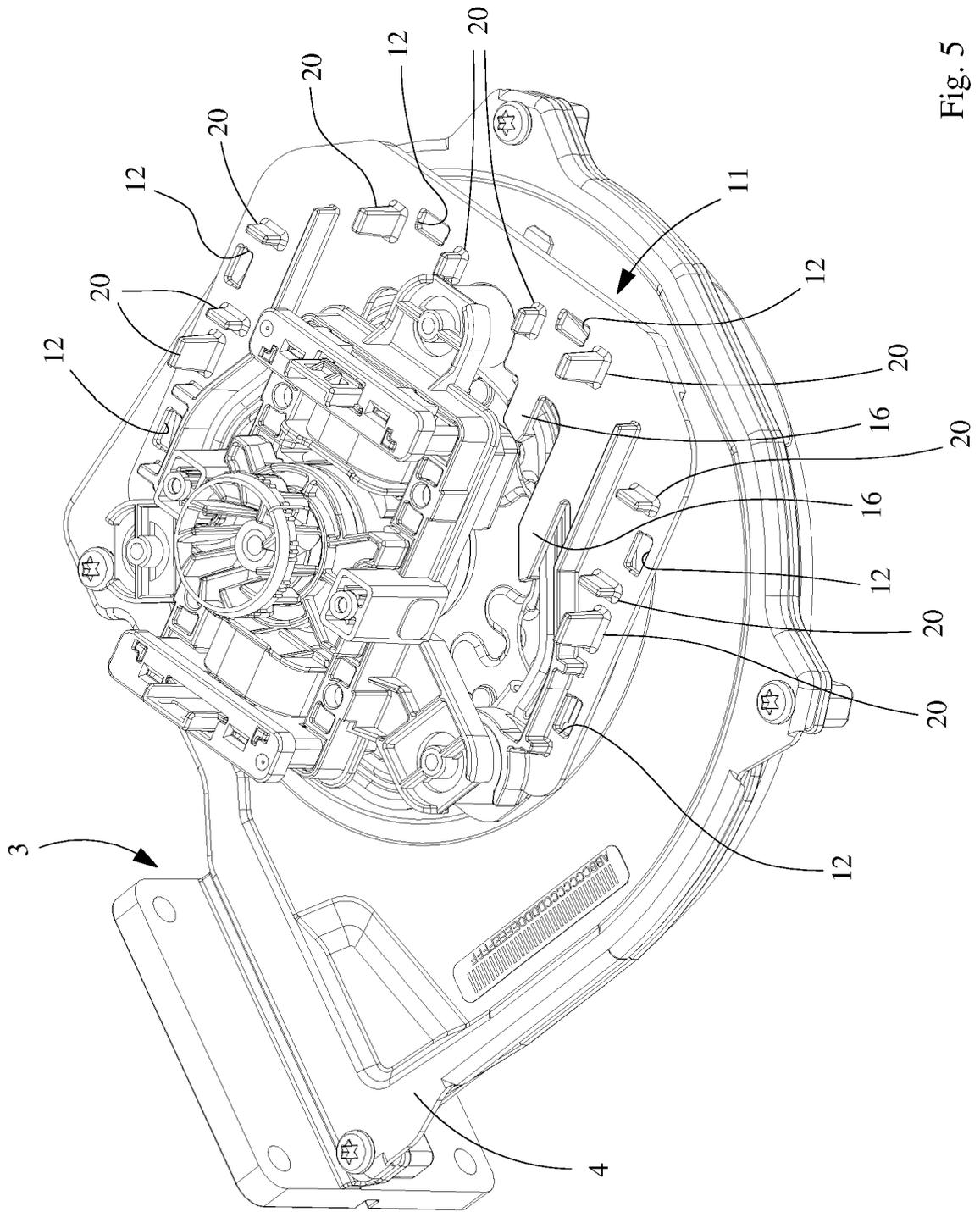


Fig. 5

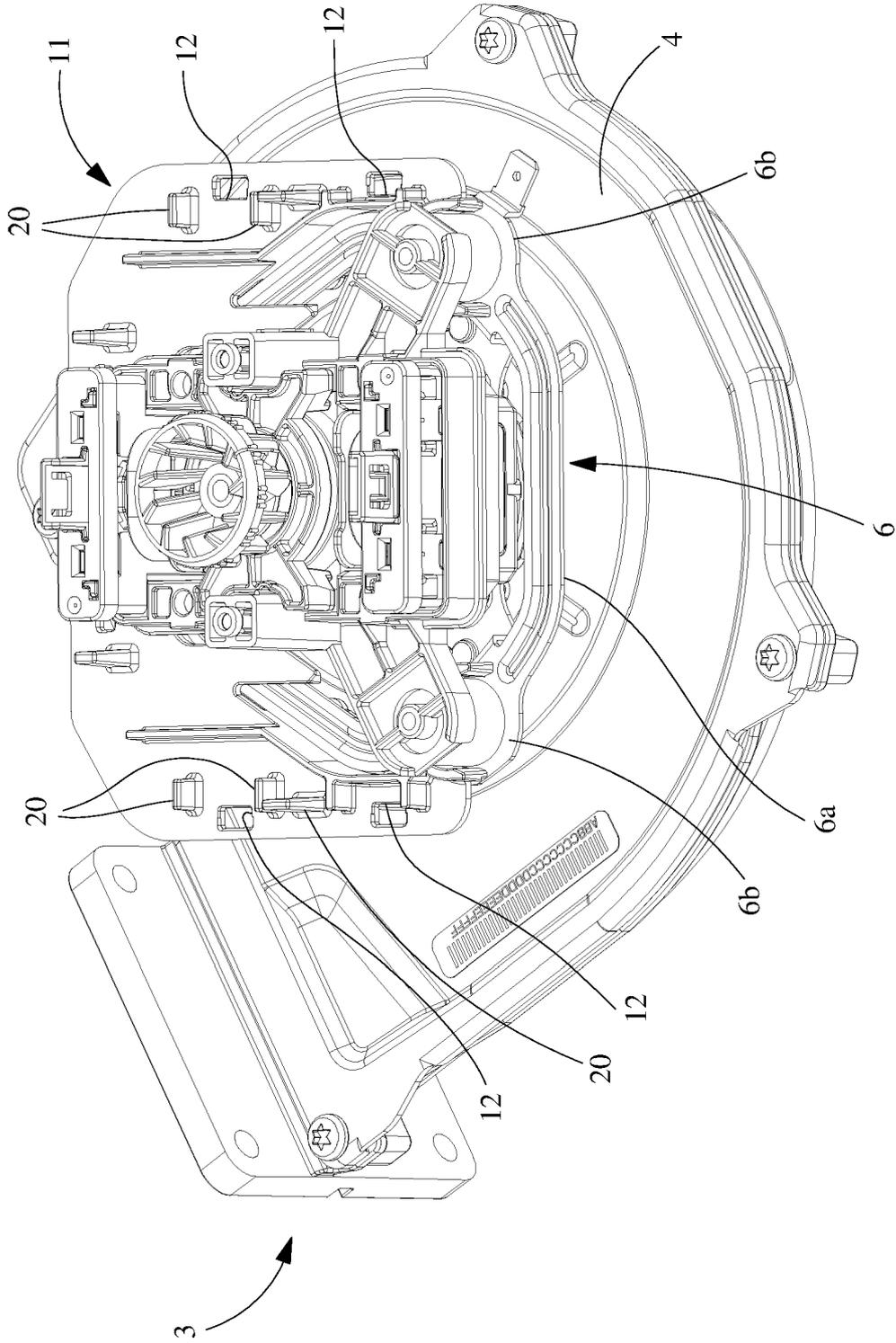


Fig. 6

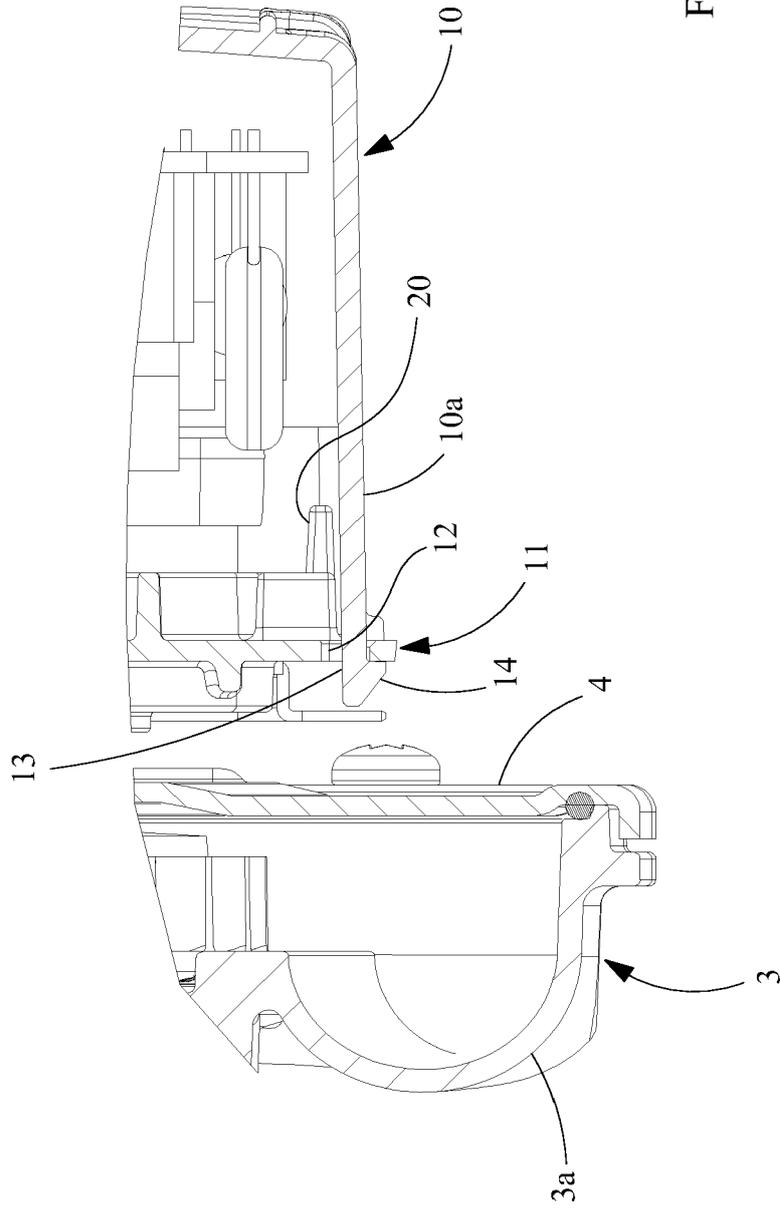


Fig. 7

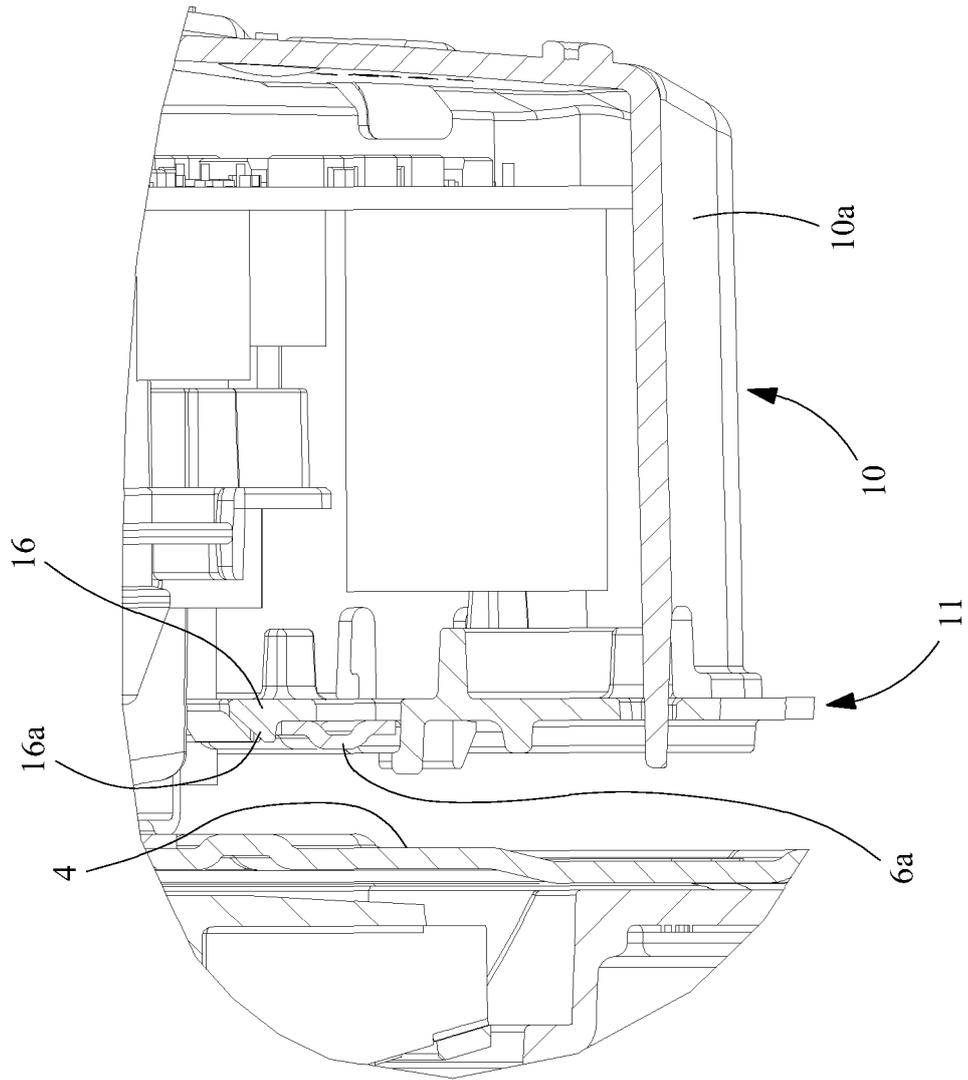
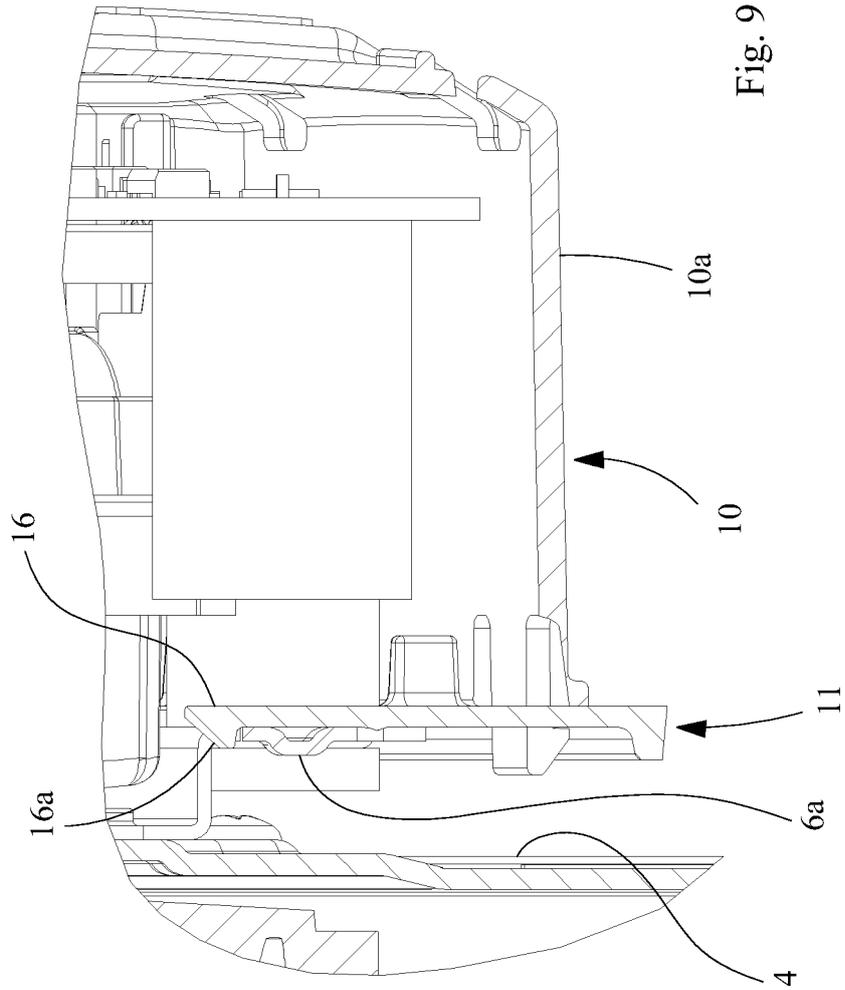


Fig. 8



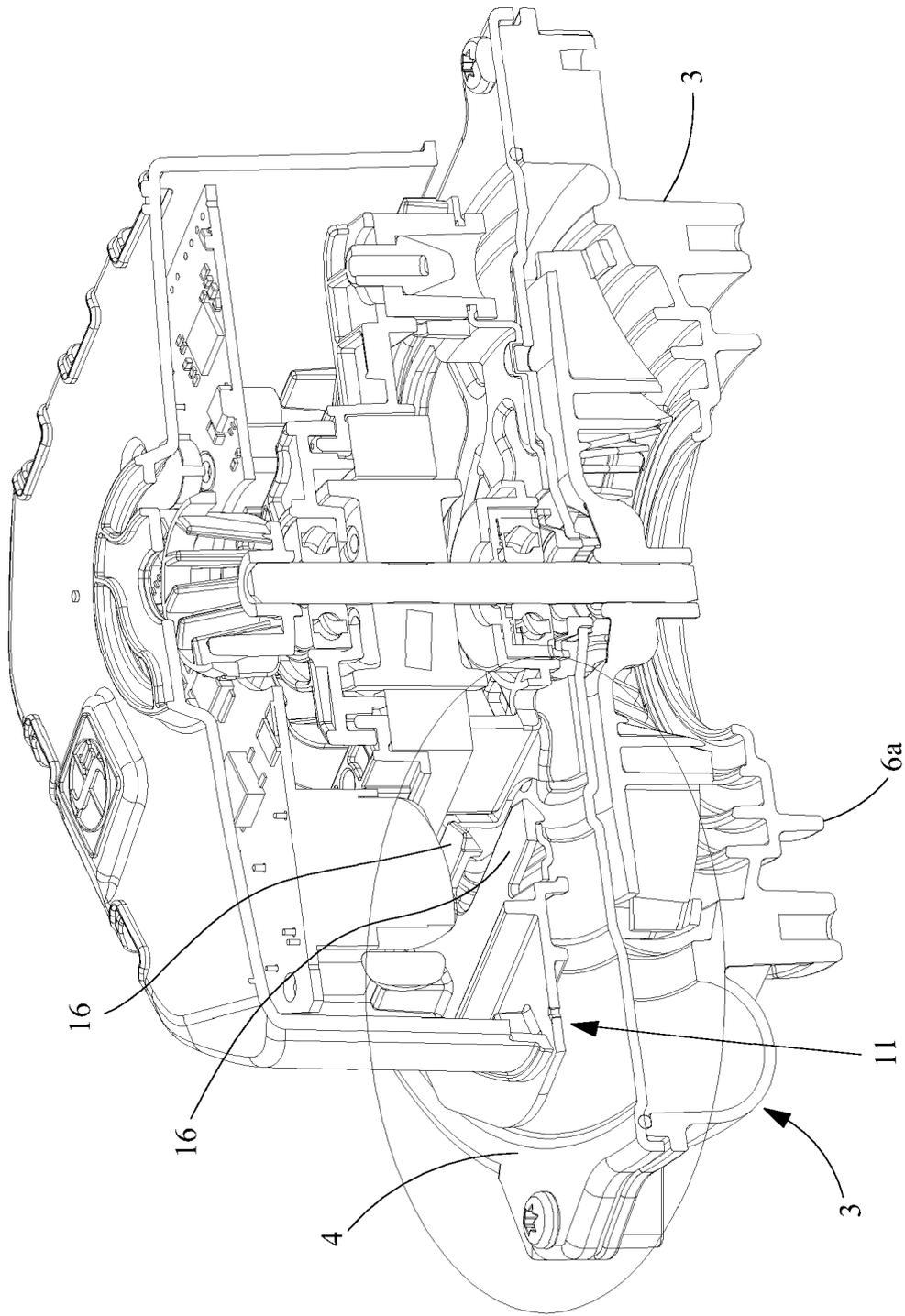


Fig. 10

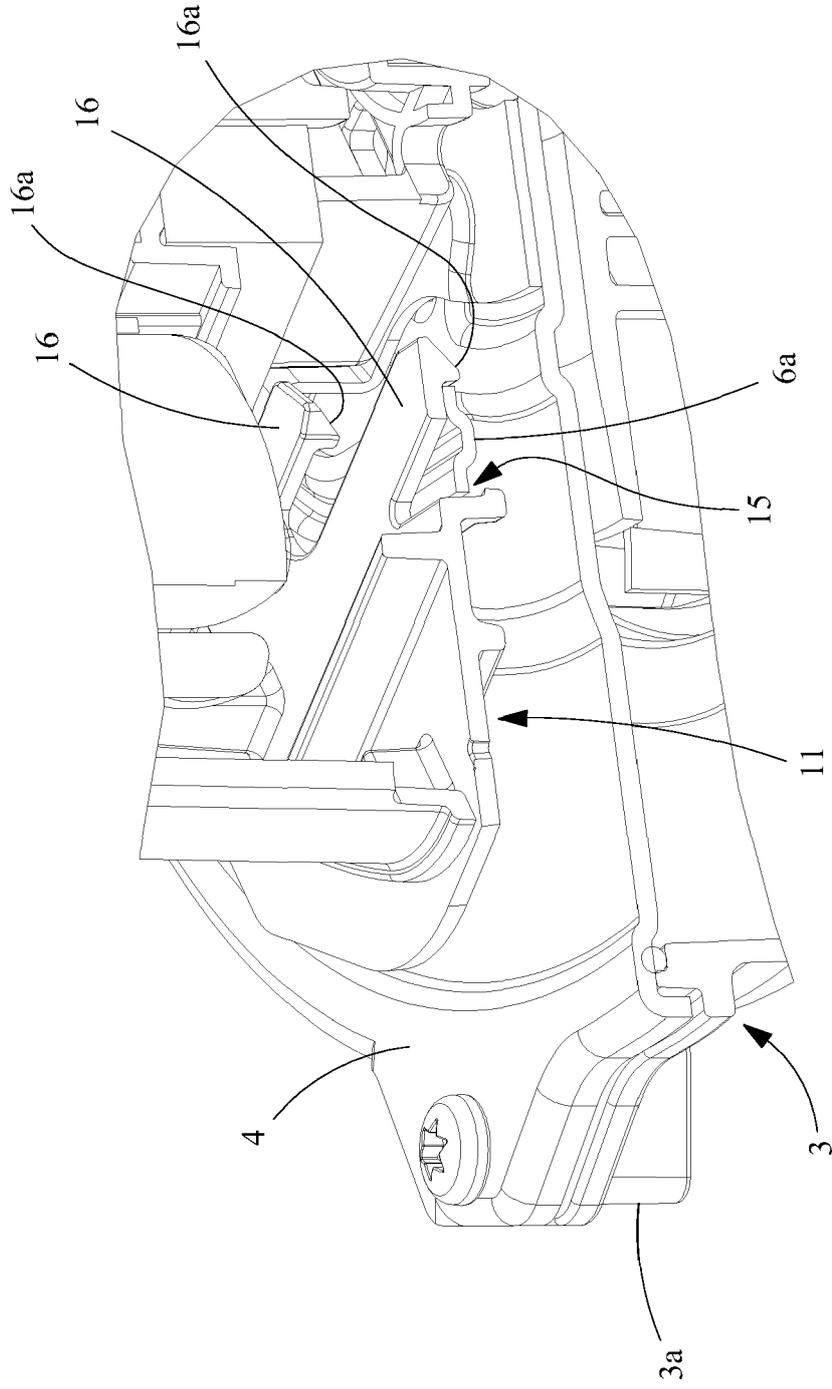


Fig. 11

REFERENCES CITED IN THE DESCRIPTION

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