HU000028754T2

(19) **HU**

(11) Lajstromszám: **E 028 754** (13) **T2**

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EURÓPAI SZABADALOM
SZÖVEGÉNEK FORDÍTÁSA

(21) Magyar ügyszám: **E 10 778927**
(22) A bejelentés napja: **2010. 10. 29.**

(96) Az európai bejelentés bejelentési száma:
EP 20100778927
(97) Az európai bejelentés közzétételi adatai:
EP 2496850 A1 **2011. 05. 12.**
(97) Az európai szabadalom megadásának meghirdetési adatai:
EP 2496850 B1 **2016. 02. 10.**

(51) Int. Cl.: ***F16B 47/00*** *(2006.01)*

(86) A nemzetközi (PCT) bejelentési szám:
PCT/EP 10/066520
(87) A nemzetközi közzétételi szám:
WO 11054764

(30) Elsőbbségi adatok:
102009046508 **2009. 11. 06.** **DE**

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(54) **Tapadókorong**

SUCTION CUP

Description

Background to the invention

The present invention relates to a suction cup to be applied to a contact surface, in particular in accordance with the precharacterising clause of claim 1. A suction cup of this kind is known from DE 20 2008 011 812 U1.

Prior art

Suction cups of this type are used in many different ways in practice. For example suction cups can be used as household fastening means. A further field of application is automated production, during which a very wide range of parts and components have to be moved. Also known are suction cups used as carrying aids for glass plates, in order to be able to provide a suitable grip for carrying the unwieldy glass plates. Suction cups are generally applied to smooth surfaces and they form a type of suction apparatus, with the aim of providing the greatest possible vacuum and a relatively wide contact surface on the smooth substrate. The suction cups are generally produced as rubber bodies and are pressed onto the surface so that a vacuum can be produced in the suction shell. A press-on edge ensures that the vacuum in the suction shell can be maintained in order thus to achieve a retention force on or at the surface. This retention force should be strong enough for the suction cup to adhere firmly to the surface.

In order to improve this adhesion, DE 10 2007 057 889 A1 proposes the deployment of a peripheral rib, which presses onto the outer edge of a suction cup in order to ensure a powerful sealing action or reliable maintaining of the vacuum in the suction shell. This structure means that air can no longer flow into the suction cup, providing reliable and stable adhesion of the suction cup to the surface.

Also known is the use of suction cups as feet for different apparatuses or appliances, which can be positioned and operated for example on a table. The suction cups are intended to

prevent movement of the appliance, resulting due to vibration and other forces for example when processing food, when the suction cups have been used to secure a kitchen appliance.

Adhesion to the surface is a major factor for all known suction cups and fastening apparatuses with suction cups. The release of the suction cups is generally ensured by means of additional apparatuses, such as lever parts, which provide the air inlet or air ingress into the suction shell. Another possibility for releasing a suction cup is for a user to apply a strong force. These known solutions have proven disadvantageous in practice however, as the force exerted when a number of suction cups are used, in particular when they are deployed as feet, has to be relatively strong, making an appliance difficult to handle. For example a user must overcome the retention force or suction force of the suction cups deployed as feet by exerting a relatively strong force on the housing. This can cause the housing to be destroyed or in the worst instance can cause the user to be injured.

The object underlying the invention

The object of the invention is to provide a suction cup which ensures safe and simple handling.

Inventive solution

The solution to the stated object is achieved by a suction cup with the features of claim 1. Advantageous embodiments and developments, which can be employed individually or in combination, are the subject matter of the dependent claims.

A suction cup to be applied to a contact surface, comprising a vacuum chamber for producing a retention force, is provided. The vacuum chamber is defined by a peripheral sealing region for interacting with the contact surface. The suction cup comprises at least one means disposed on the sealing region for reducing a release force that counteracts the retention force. The inventive means for reducing the release force ensures that a user does not have to apply a relatively strong release force to release the suction cup from a contact surface to which it adheres. The reducing means ensures a defined time point for release and until this time point demonstrates a strong retention force, since the reducing means does not influence

functionality in this region, i.e. until the release time point. The release time point is defined by the pressure equalisation between vacuum chamber or suction shell and surroundings, resulting from the ingress of air through a sealing lip.

According to the invention, the means for reducing the release force has a plurality of mouldings, which are disposed in an edge region of the peripheral sealing region. The mouldings provide a particularly preferred embodiment of the reducing means, as they are easy to produce and can also provide a precise release time point.

Preferred embodiment of the invention

According to one embodiment of the present invention the mouldings are disposed with symmetrical spacing on the sealing region of the suction cup. The symmetrical structure ensures that when the pressure is equalised, in other words when the suction cup is released, the air can flow past the mouldings into the vacuum chamber from all sides. It is also possible for the suction cup just to have one or two mouldings. The two mouldings can preferably be disposed with diametrical symmetry.

The mouldings are expediently configured on the essentially flat sealing region. This simplifies production and ensures the mode of action of the mouldings.

The suction cup is preferably produced as a single piece from an elastically flexible material. Such a selection of the material, in particular of a material comprising rubber, ensures a powerful sealing action for the vacuum in the vacuum chamber and also allows the release force to be transmitted to the reducing means by means of the elastically flexible body of the suction cup.

It is preferable for the sealing region to be configured as a ring shape in a contact region between the vacuum chamber and the contact surface. The rotationally symmetrical structure of the sealing region allows a particularly reliable sealing action to be achieved for the vacuum in the vacuum chamber.

According to one embodiment of the invention the mouldings are each configured as a circle segment on the peripheral sealing region. This advantageous shape can assist the lever structure and the defined and reduced release force can be set precisely during production of the suction cup.

It is particularly preferable for the arc of the circle segment-shaped mouldings to be disposed in the direction of the vacuum chamber and for the chord of the circle segment-shaped mouldings to run along an outer line of the edge region. The distance between the arc and the contact region or the sealing lip can therefore define the release force.

The suction cup advantageously comprises a fastening means for fitting the suction cup to an apparatus. The fastening means allows simple fitting and provides a secure hold.

According to one embodiment of the present invention a kitchen appliance base comprises at least one suction cup, which is designed to secure the kitchen appliance to the contact surface. The use of the inventive suction cup as a foot for a kitchen appliance ensures a high level of stability, while at the same time improving handling when the kitchen appliance is released from a contact surface.

Brief description of the drawings

Further advantageous embodiments are described in more detail below with reference to an exemplary embodiment illustrated in the drawing, to which the invention is not however limited. In the drawing:

Figure 1 shows a view of the vacuum chamber of the suction cup according to the present invention;

Figure 2 shows a perspective view of the suction cup;

Figure 3 shows a side view of the suction cup according to the present invention;

Figures 4a to 4d show the basic mode of operation of the suction cup;

Figure 5 shows the pattern of the release force of a conventional suction cup compared with a suction cup according to the present invention, and finally

Figure 6 shows the base of a kitchen appliance with suction cups according to the present invention.

Detailed description with reference to an exemplary embodiment

In the description which follows of the present invention identical reference characters designate identical or comparable components.

Figure 1 shows a suction cup according to the present invention. The suction cup 1 comprises a vacuum chamber or suction shell 2 and a sealing region 3. The suction cup is generally pressed onto a contact surface 11 and the air can escape from the vacuum chamber due to the pressure exerted. The suction cup 1 is made of an elastically flexible material, in particular rubber, so that the vacuum chamber 2 can be distorted to allow the air to escape. Once the air has escaped from the vacuum chamber, a vacuum results, which can be maintained in respect of the surroundings by means of the sealing region 3, in particular the sealing lip 3a in the contact region with the contact surface 11, of the suction cup 1.

As a result of the vacuum atmospheric pressure acts on the suction cup 1, causing the suction cup 1 to be pressed onto the contact surface 11. This pressure or retention force can also be seen as a suction force, which fixes or holds the suction cup 1 on the surface or contact surface 11. The material selection also allows the suction force or retention force of the suction cup 1 to be defined.

According to one embodiment of the present invention the means for reducing 4 the release force is realised as a plurality of mouldings 5. The mouldings are configured with

symmetrical spacing on a sealing region 3. It is however possible for an asymmetrical arrangement of the mouldings 5 to be realised. In the pressureless state the mouldings 5 lie flat against the contact surface 11. The pressureless state refers to the state in which there is no vacuum present in the chamber 2. Once the suction cup has been pressed onto a surface 11, the sealing region 3 forms a sealing lip in the contact region 3a with the contact surface 11, so that the vacuum within the vacuum chamber 2 can be maintained. If air flows into the vacuum chamber 2 at the sealing lip or contact region 3a, the suction cup 1 loses adhesion, as the vacuum is eliminated by the ingress of air, in other words pressure equalisation has taken place between vacuum chamber 2 and atmospheric surroundings. The contact region or sealing lip 3a forms once the air has escaped from the vacuum chamber 3 due to the contact pressure.

The elastic properties of the material of the suction cup 1 mean that in the pressed-on state the mouldings 5 have no contact with the contact surface 11.

According to one possible embodiment of the invention the mouldings or studs 5 are moulded on the sealing region 3 in the manner of circle segments 8. The height of the circle segment-shaped mouldings 5 in relation to the surface of the sealing region is preferably 0.2 mm. The distance between the arc 9 of the circle segment 8 and the contact region 3a corresponds to L2 and is approximately 1 mm, although other values are also possible. The chord 10 of the circle segment 8 runs essentially along an outer line 14 in the edge region 6 of the sealing region 3 of the suction cup 1. According to one embodiment of the present invention the chord is approx. 4 mm. The suction cup 1 is configured as circular and has a radius L1. This radius L1 also defines the extent of the retention force or suction force of the suction cup 1. A large radius corresponds to a larger vacuum chamber 3, which therefore defines a larger vacuum region.

Figure 2 shows a perspective view of a suction cup according to the present invention. The vacuum chamber 2 of the suction cup 1 is configured in the manner of a dome and the elastically flexible material allows a vacuum to be produced by pressing the suction cup 1 onto a contact surface 11. In order to allow easier release of the suction cup 1 from a surface 11, in particular if the suction cup 1 is used as the foot of a kitchen appliance, according to the invention a means for reducing 4 the release force of the suction cup 1 is provided. According

to one preferred embodiment the means for reducing 4 the release force F1 is a plurality of circle segment-shaped mouldings 5, which are preferably configured as a single piece with the body of the suction cup 1.

The suction cup 1 can be manufactured simply as a rubber body with mouldings 5 in one production step for example by injection moulding. The suction cup 1 further comprises a fastening means 7, which is embodied so that the suction cup 1 can be deployed as a foot for a kitchen appliance base 13 for example. When the suction cup 1 has been applied, in other words once a vacuum has been produced in the vacuum chamber 2, a contact region 3a forms a sealing lip on the contact surface 11 and the mouldings have no contact with the contact surface 11. The sealing region 3 on which the mouldings 5 are configured is configured in such a manner that the outer line 14 of the edge region 6 moves or rises away from the contact surface 11 when the suction cup is applied, so that the mouldings 5 cannot make contact with the contact surface 11. The sealing lip in the contact region 3a of the sealing region 3 ensures that no air can enter the vacuum chamber 2, in which a vacuum can thus be maintained when the suction cup 1 is applied.

The suction cup 1 is generally released from a contact surface 11 by exerting a release force F1, for example in the region of the fastening means 7. The force F1 should counteract the suction force or retention force of the suction cup 1 on the contact surface 11. The exertion of the release force F1 and the elastic properties of the suction cup material mean that the mouldings 5 are pushed against the contact surface 11, so that a lever action can be produced, which reduces the release force compared with standard suction cups. The mode of operation of the simplified release of the suction cup 1 is described in more detail below, in particular in Figure 4.

Figure 3 shows a side view of a suction cup according to the present invention. The suction cup 1 is shown in the not-applied state and the mouldings 5 could therefore make contact with a contact surface 11. The vacuum chamber or suction shell 2 has a domed structure, in which a vacuum can form in the applied state. The fastening facility 7 has a seam or flange, at which the suction cup 1 could be fixed or fastened for example in an appliance base. This fitting flange secures the suction cup to the appliance base 13.

Figures 4a to 4d show the basic mode of operation of the suction cup based on a diagram. Half of the suction cup 1 is shown, in order to illustrate the force distribution during release more clearly. The contact surface 11, for example the surface of a worktop in the kitchen, is likewise shown schematically. Figure 4a shows the suction cup 1 in the applied state. In other words a vacuum has formed in the vacuum chamber 2 or suction shell and this vacuum causes the atmospheric pressure to exert a suction force or retention force on the suction cup, so that the suction cup 1 adheres to the contact surface 11 and stabilises or secures for example a kitchen appliance (not shown) or its base 13 during operation.

A release force F1 can be exerted for example in a vertical direction at the fastening means 7, it being possible in principle for the suction cup 1 also to be applied to a wall or oblique surface. The fastening means 7 is not shown in Figures 4a to 4d for the sake of simplicity. The release force F1 causes the elastic body of the suction cup 1 to distort so that a rotation is produced about the contact region or sealing lip 3a. The schematically illustrated mouldings 5 are therefore moved in the direction of the contact surface. The distance L2 defines the time point when the contact point 5a of the mouldings 5 makes contact with the surface 11. This distance L2 to the sealing lip 3a of the suction cup 1 also defines the extent of the release force F1, which acts by means of a lever structure, see Figures 4c and 4d, on the sealing lip in the contact region 3a.

Figure 4c shows the time point when the contact point 5a of the moulding 5 has made contact with the contact surface 11, thereby giving rise to the abovementioned lever structure with a rotation point which corresponds to the contact point 5a of the moulding 5. It should be noted that the contact point 5a does not necessarily have to correspond to a single point but rather, due to the elasticity of the body of the suction cup 1 or the arc 9 of the respective mouldings 5, corresponds to a region where the lever action of the release force F1 can act. This lever structure therefore causes a force F2 to be exerted on the sealing lip 3a, counteracting the retention force or suction force of the suction cup 1. So that the suction cup 1 can be released from the surface 11 by a reduced release force F1, the means for reducing 4 are provided according to the invention, being realised as mouldings 5 in this exemplary embodiment.

Finally Figure 4d shows the time point when the sealing lip 3a has yielded and an air ingress or pressure equalisation in respect of the surroundings has taken place and the suction cup 1

has lost its suction force or retention force. The reduced release force F2 is therefore defined by the lever action about the contact point 5a and is a function of the distance L2 between sealing lip 3a and arc 9 of the moulding 5.

The reduced release force F1 is therefore defined or set by the arrangement of the means for reducing 4 relative to the sealing lip or contact region 3a of the suction cup.

Figure 5 shows the basic force pattern of the suction cup compared with a conventional suction cup. The left side of Figure 5 shows the pattern of the release force F2 of a conventional suction cup. The x-axis corresponds to the lift in respect of the action point, for example of the fastening means 7 of the suction cup. The elasticity of the suction cup produces the lift, which is shown schematically on the x-axis of both diagrams. The y-axis shows the pattern of the release force F2. With the conventional suction cup the force pattern is linear up to the lift and there is no defined early time point of a release or pressure equalisation due to air ingress into the vacuum chamber 2.

According to the invention the means for reducing 4 the release force F2 causes the pressure equalisation and therefore the release of the suction cup to result at a defined time point, with the curve patterns running analogously up to this time point. In other words until this defined time point the invention suction cup 1 supplies the same retention force or stability. The time point or value of the defined release force is shown schematically with the aid of the broken line.

Finally Figure 6 shows a possible application of suction cups according to the present invention. The suction cups 1 are fastened with the aid of the fastening means 7 for example to a base 13 of a kitchen appliance. The suction cups 1 act as feet and absorb the vibration of the operating food processor or kitchen appliance. If the kitchen appliance has to be moved from a contact surface 11 after work has been completed or so that it can be repositioned, the force required to release the appliance is no longer relatively strong as with standard suction cups but has a defined value, which was brought about by means of the mouldings 5 or the means for reducing 4 the release force.

The inventive suction cup has a defined and reduced release force, which improves the handling of the suction cup 1. A user does not have to apply relatively strong forces to achieve release, which has proven particularly advantageous when the suction cup is used as a foot for an electrical appliance

List of reference characters

Suction cup	1
Vacuum chamber or suction shell	2
Sealing region	3
Contact region or sealing lip	3a
Means for reducing the release force	4
Mouldings or studs or projections	5
Contact point	5a
Edge region	6
Fastening means	7
Circle segment	8
Arc of circle segment	9
Chord of circle segment	10
Contact surface	11
Kitchen appliance base	13
Outer line of edge region	14

714450/DO

TAPADÓKORONG

SZABADALMI IGÉNYPONTOK

1. Tapadókorong (1) egy érintkező felületre (11) történő rögzítésre amely tartalmaz egy tartóerő kialakításához egy alacsony nyomású kamrát (2), amely egy körbefutó tömítő terület (3) által az érintkező felülettel (11) való kapcsolatra van kialakítva, ahol a tapadókorong (1) legalább egy a tömítő területen (3) elrendezett, a tartóerővel szemben ható egy oldási erő (F1) csökkenésére való eszközt (4) tartalmaz, azzal jellemezve, hogy a az oldási erő (F1) csökkentésére való eszköz (4) több mintázattal (5) van ellátva, amelyek a körbefutó tömítő terület (3) perem részén (6) vannak elrendezve.

2. Az 1. igénypont szerinti tapadókorong (1) azzal jellemezve hogy, hogy a mintázatok (5) a tapadókorong (1) tömítő területén (3) szimmetrikusan elosztva helyezkednek el.

3. Az 1. igénypont szerinti tapadókorong (1) azzal jellemezve, hogy hogy a mintázatok (5) a lényegében sík tömítő részen (3) vannak elrendezve.

4. Az előző igénypontok egyike szerinti tapadókorong (1) azzal jellemezve, hogy a tapadókorong (1) egy darabként egy rugalmas anyagból van előállítva.

5. Az előző igénypontok egyike szerinti tapadókorong (1) azzal jellemezve, hogy a tömítő rész (3) egy érintkezési területen (3a) az alacsony nyomású kamra és az érintkező felület (11) között gyűrűszerűen van kialakítva.

6. Az előző igénypontok egyike szerinti tapadókorong (1) azzal jellemezve, hogy a mintázatok (5) lényegében a körbefutó tömítő területen (3) körszegmensekként (8) vannak kialakítva.

7. A 6. igénypont szerinti tapadókorong (1), azzal jellemezve, hogy a körívszerű mintázatok (5) körívei (9) az alacsony nyomású kamra (2) irányába vannak elrendezve, és a körívszerű mintázatok (5) húrjai (10) egy külső vonal (14) mentén futnak.

8. Az előző igénypontok egyike szerinti tapadókorong (1) azzal jellemezve, hogy a tapadókorong (1) egy, a tapadókorong egy berendezéshez (12) való rögzítésére szolgáló rögzítő eszközt (7) tartalmaz.

9. Konyhai eszköz talp (13) egy konyhai eszköz számára, amely legalább egy, az 1-8. igénypontok egyike szerinti tapadókorongot (1) tartalmazza, azzal jellemezve, hogy a legalább egy tapadókorong (1) úgy van felszerelve, hogy a konyhai eszközt a felfekvő felületen tartja.

A meghatalmazott:

Mészárosné Dénesz Kata
SBGK Szabadalmi Ügyvivői Iroda

Fig. 1

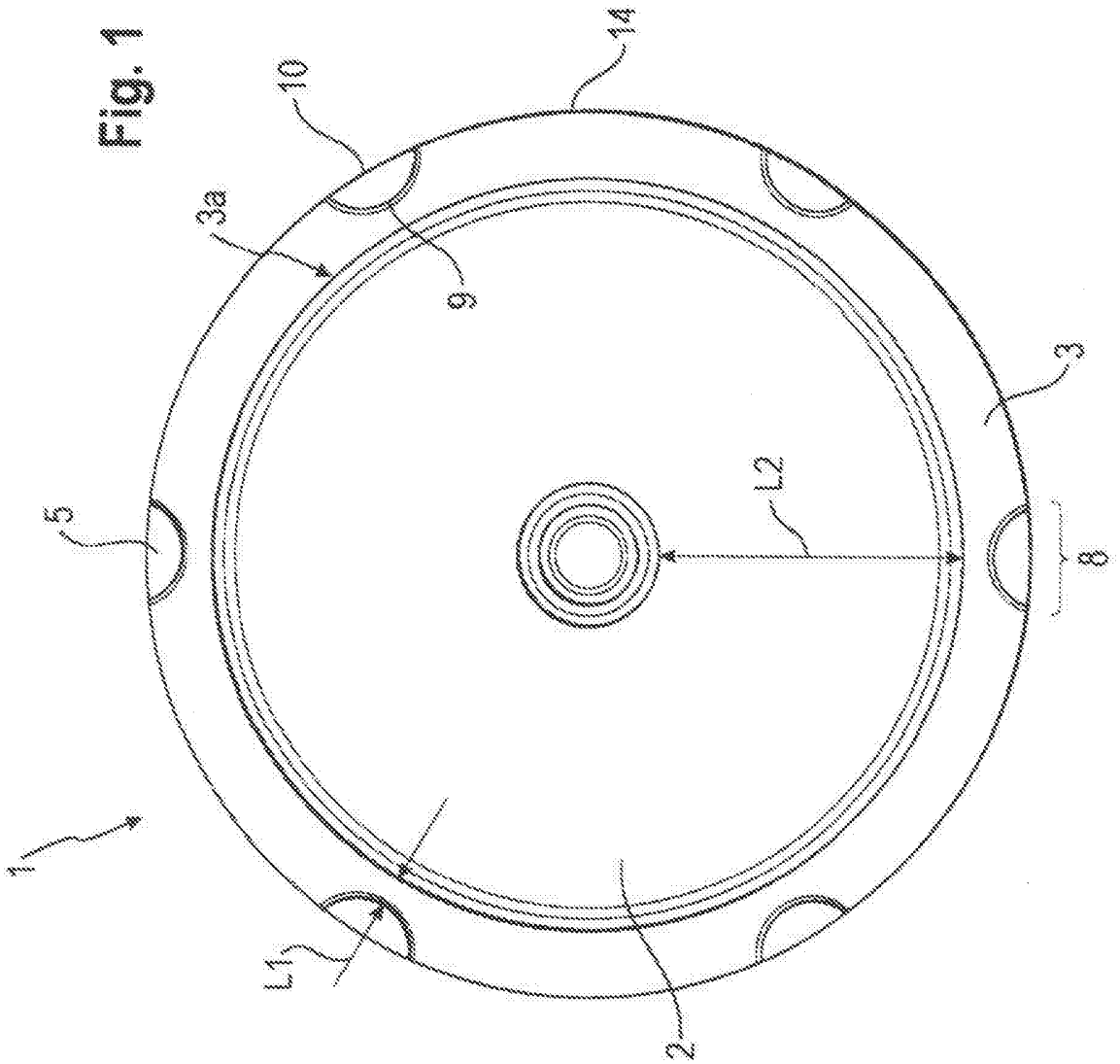


Fig. 2

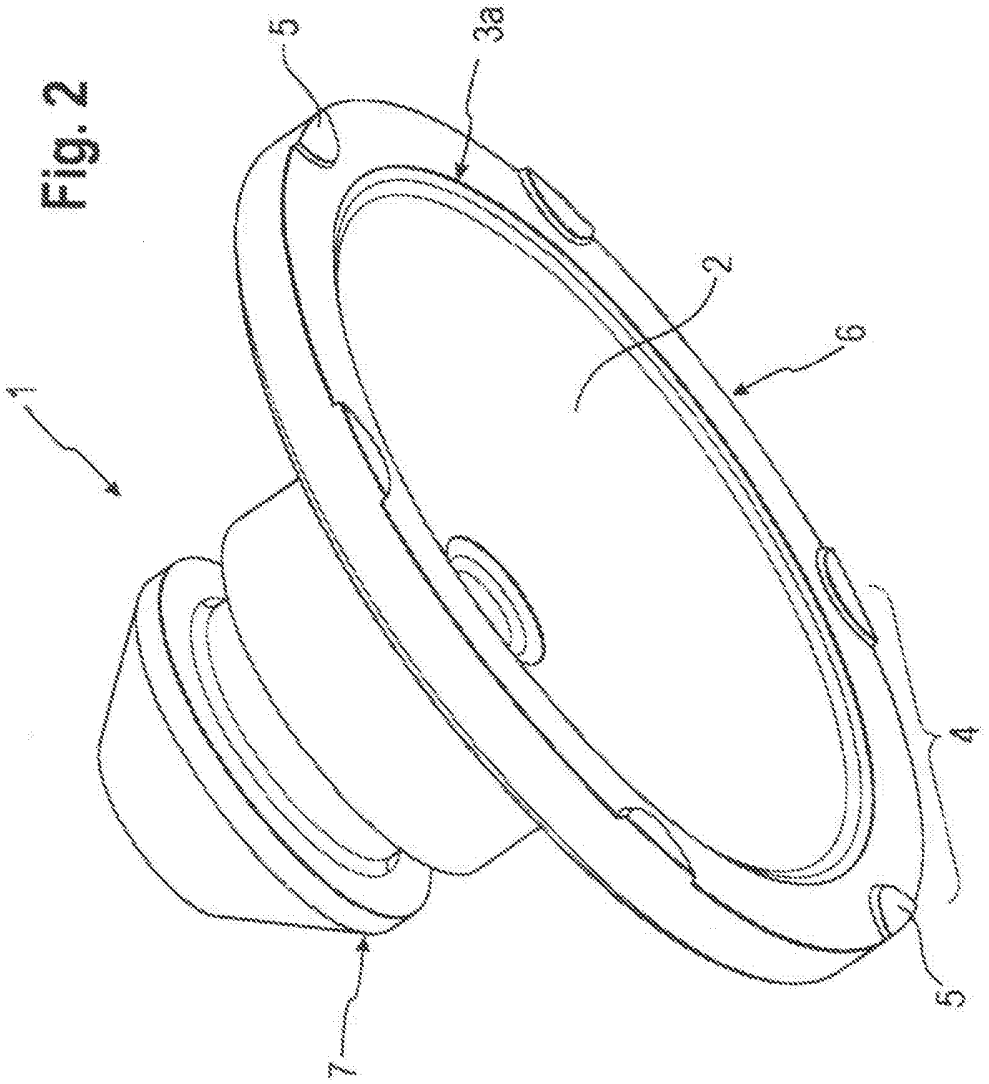


Fig. 3

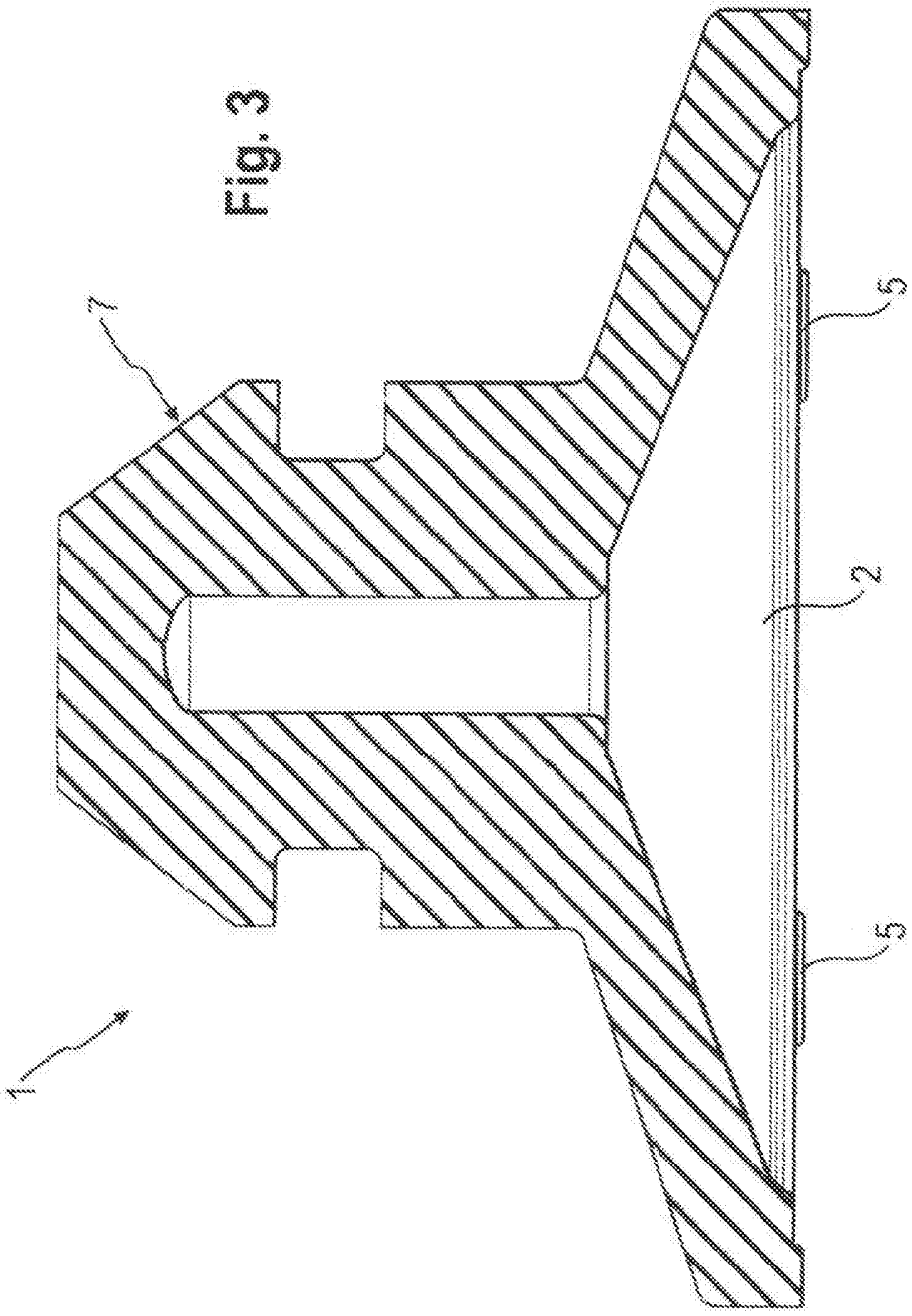


Fig. 4a

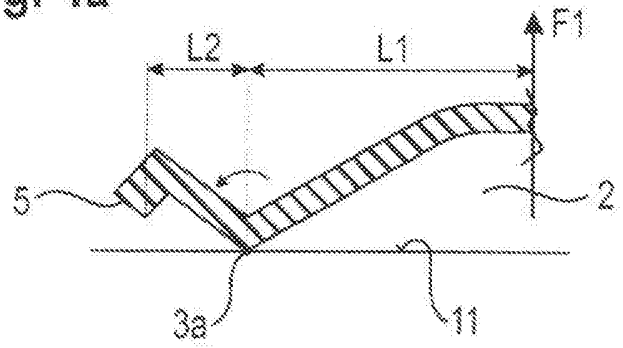


Fig. 4b

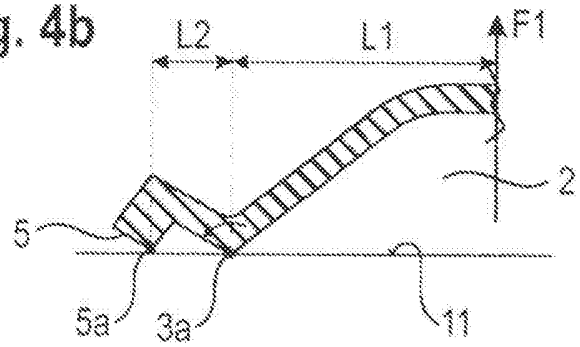


Fig. 4c

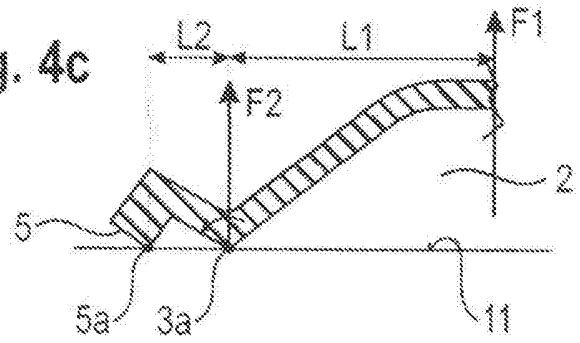


Fig. 4d

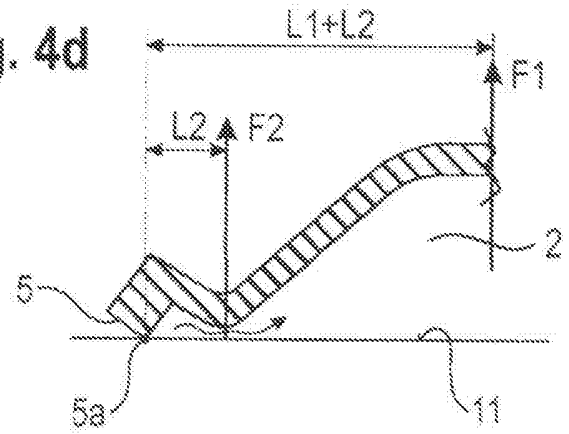
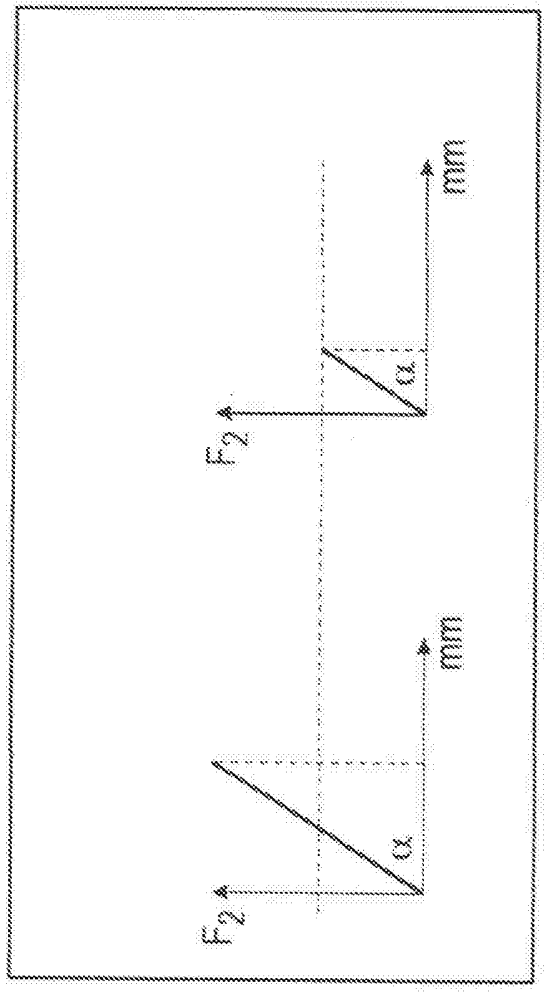


Fig. 5



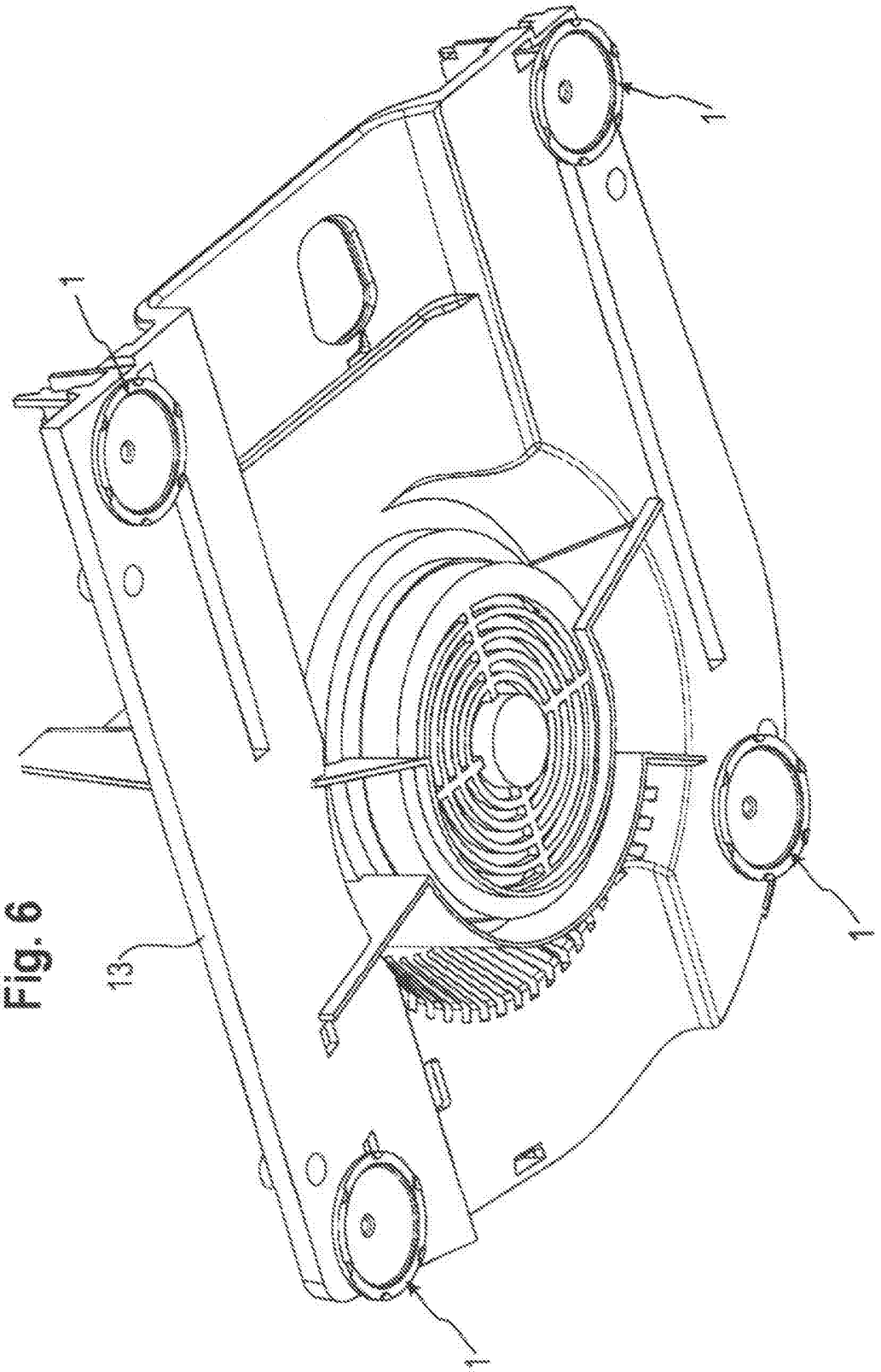


Fig. 6