(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 597 185 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
**10.09.2014 Bulletin 2014/37**

(51) Int Cl.:
***D06F 25/00*** *(2006.01)* ***D06F 37/26*** *(2006.01)*

(21) Application number: **11190350.6**

(22) Date of filing: **23.11.2011**

(54) **Washing and drying machine with an improved insulating element between tub and hot air duct**

Waschmaschine und Trockner mit verbessertem Isolierelement zwischen Wanne und Heißluftleitung

Machine lavante et séchante dotée d'un élément isolant amélioré entre la cuve et le conduit d'air chaud

(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**

(43) Date of publication of application:
**29.05.2013 Bulletin 2013/22**

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EP 2 597 185 B1

Printed by Jouve, 75001 PARIS (FR)

## Description

### Field of technology

**[0001]** The present invention relates to a washing and drying machine (called also "washer dryer") comprising an article treating chamber including a washing tub containing a rotatable drum in which the laundry may be loaded, and a hot air duct, adapted to carry hot air into the tub so as to dry the laundry contained in the drum, comprising one or more fixing regions connected to the tub via a spacing element made of thermal insulating material.

### Background

**[0002]** Known washing and drying machines comprise an external casing provided with a washing tub which contains a rotatable perforated drum where the laundry to be washed /dried is placed. A loading/unloading door ensures access to the tub and the drum.

**[0003]** The tub is usually made of a plastic and obtained by injection molding, while the drum is normally made of metal (e.g. stainless steel).

**[0004]** Washing and drying machines typically comprise a detergent supply unit and a water inlet circuit for the introduction of water and washing/rinsing products (i.e. detergent, softener, etc.) into the tub; such machines are also provided with a water draining circuit (typically comprising pipes, pumps, etc.) to drain the water from the tub.

**[0005]** Known washing and drying machines are also provided with a drying circuit adapted to make a stream of hot air to get through the rotatable drum, so as to dry the laundry contained therein.

**[0006]** The drying circuit typically comprises a hot air duct, containing an electric heater and a fan, which outlet is connected to the washing tub, so that the air heated by the electric heater is driven by the fan into the tub, and therefore into the drum. A condensing duct is typically connected with one end to the rear of the tub, and with the other end to inlet of the drying duct; the condenser condenses the moisture-laden air exiting the drum.

**[0007]** A water supply supplies cooling water to the condensing duct, for condensing and removing moisture from air.

**[0008]** Upon starting the drying cycle the heater warms up air which is blown into the tub by the fan. The hot air is introduced into the tub, and therefrom into the drum, via inlet holes, heating the laundry and vaporizing the moisture. After that, air containing the vaporized moisture is discharged through the outlet hole, and it goes into condensing duct where vaporized moisture is removed. The condensed moisture falls down in the condensing duct and into the tub, but outside the drum. Lastly, the air having the moisture removed is heated again and is introduced again into the drying duct. By repeating the foregoing process, the laundry is dried.

**[0009]** In some known washing and drying machines, the drying duct is secured to a top side of the tub with fastening members, such as screws.

**[0010]** EP1738011B1 and EP1738012B1 describe two examples of such washing and drying machine.

**[0011]** In the appliances described in EP1738011B1 and EP1738012B1, a heat shielding plate, or insulator, is provided between the tub and the drying duct to prevent heat of the drying duct from being transferred to the tub. In particular, the heat shielding plate, or insulator, is fastened to the tub, and the drying duct is fastened to the shielding plate.

**[0012]** The known solution disclosed in above mentioned patents seems however very costly, since it requires using a shielding plate which is quite big, and therefore, being made of thermal insulating material, very costly.

**[0013]** Moreover in the known solution the drying duct is connected to the tub by screws, typically made of metal, which has a high thermal conductivity, and therefore there is the risk that heat can be transferred from the drying duct to the plastic tub by the screws, with the risk that the plastic tub is locally melted.

### Objects of the disclosure

**[0014]** It is an object of the present disclosure to provide a washing and drying machine in which the hot air duct is directly supported by a plastic washing tub, without the risk that high temperature of the hot air duct could melt or otherwise damage the plastic tub, and without increasing too much the costs of the machine.

### Summary

**[0015]** Applicant has found that by providing a washing and drying machine comprising a hot air duct provided with one or more fixing regions connected to the washing tub via a spacing element made of thermal insulating material and comprising two parts fixed (i.e. attached, fastened, secured) to one another and to the respective fixing region on opposite sides of the latter, it is possible to effectively protect the washing tub from possible local melting due to the high temperatures of the hot air duct, without increasing the complexity and the costs of the machine. Moreover, since the two parts of the spacing element may be fixed to one another and to the respective fixing region of the hot air duct, the spacing element can be pre-assembled on the hot air duct, thus making easier and quicker the assemblage of the hot air duct to the tub.

**[0016]** The present disclosure provides a washing and drying machine, including a spacing element as set out in the accompanying claims.

**[0017]** According to a first aspect of the present invention there is provided a washing and drying machine comprising: a washing tub containing a rotatable drum; a hot air duct for carrying hot air into the tub. The hot air duct comprises one or more fixing regions connected to the

tub via a spacing element made of thermal insulating material. The spacing element comprises two parts fixed (i.e. attached, fastened, secured) to one another and to a respective fixing region, on opposite sides of the fixing region.

**[0018]** Preferably the two parts of the spacing element may be substantially identical to one another; this is particularly advantageous, since allows producing both the two parts with a single mould, which highly reduces production cost of the spacing element, and also the cost for transport and storage are reduced with respect to the prior art solution, since actually a single kind of component has to be transported and stored in order to allow the assembly of the spacing element. Advantageously the one or more fixing regions of the hot air duct may be fixed to the tub by one or more fixing devices (e.g. screws or rivets), and one or more of above mentioned spacing elements are associated to each fixing region and are interposed between the fixing region and the respective one or more fixing devices, so as to thermally insulate the fixing region from the one or more fixing devices; this advantageous embodiment of the invention allows ensuring that heat is not transmitted from the hot air circuit to the washing tub via the fixing devices (e.g. screws) which fasten the hot air circuit to the tub, reducing the risk of local melting of the latter.

**[0019]** Advantageously each one of the two parts of the spacing element may include a head with at least one hole and at least one wing protruding from the rim of the hole or from a region contiguous to the rim of the hole; the at least one wing comprises an engaging surface adapted to engage and retain a corresponding engaging surface of the other part of the spacing element, so as to fix the two parts to one another.

**[0020]** In an advantageous embodiment the engaging surface comprises a serrated surface or a waved surface.

**[0021]** Preferably the at least one wing is made of a resilient material, so that, during the assembling of the two parts of the spacing element, the wings of the two parts elastically deform to allow engagement of the two parts.

**[0022]** In an advantageous embodiment the head comprises a single hole including a one or more of the wings protruding from the rim of the hole or from a region contiguous to the rim of the hole; one or more of the wings comprise the engaging surface.

**[0023]** Preferably each one of the two parts includes two wings which are diametrically opposed to each other with respect to the respective hole, and each wing extends substantially along a quarter of the hole circumference, the engaging surfaces of the two wings being diametrically opposed to one another with respect to the respective hole.

**[0024]** In another advantageous embodiment, the head is in the form of an elongated plate and has at least two holes, each hole having at least one wings protruding from the rim of the hole or from a region contiguous to the rim of the hole, wherein one or more of the wings comprise said engaging surface.

**[0025]** Preferably each hole includes two wings which are diametrically opposed to one another, and each wing extends substantially along a quarter of the related hole circumference, the engaging surfaces of the two wings being diametrically opposed to one another with respect to the respective hole.

**[0026]** Advantageously the one or more fixing regions of the hot air duct comprise at least one fixing hole for inserting therein a fixing device for securing the hot air duct to the washing tub In this case the heads of the two parts of the spacing element associated to the fixing region are placed respectively on opposite sides of the fixing region, and at least one wing, comprising the engaging surface, of both the two parts of the spacing element associated to the fixing region is positioned at least partially inside the fixing hole, between the fixing region and the fixing device, in such a way that the engaging surfaces of the wings of the two parts of the spacing element positioned inside the fixing hole and engaging to one another, engage one another at least partially internally to the fixing hole. Advantageously the two parts are adapted to mate and engage to one another if rotated of 180 degrees one with respect to the other.

**[0027]** The present invention offers a number of benefits. One of the advantages is that the spacing element according to the present invention is simple, easy to produce and to mount, and ensures an effective thermal insulation between the hot air channel and the tub.

**[0028]** The embodiment in which the spacing element includes a pair of alike parts, which can be likewise mounted on either side of the fixing region is advantageous because, when the spacing element is produced, only one type of component is to be molded, which is capable of mating with a same overturned (i.e. rotated of 180 degrees) component, and when the spacing element is mounted very little, or no, particular attention is to be paid to which part is mounted first and on what side of the fixing region. Moreover, in this embodiment, the parts can be mounted without paying attention to their orientation.

**[0029]** Another advantage of the spacing element made in accordance with the invention is that it can be pre-assembled on the fixing region without the risk that it is accidentally separated from the hot air duct during the assembly of the latter to the washing tub. Also this is a very advantageous feature, in that assemblage of the drying air duct to the tub is made easier and quicker, with economical advantages.

**[0030]** Yet a further advantage of the spacing element made in accordance with the invention is that it can be easily produced with a simple mold, without necessity of complicated mechanisms or further machining steps, without increasing manufacturing cost and reducing productivity. Therefore, also this feature has economical benefits in spacing element production.

**[0031]** In addition, a washing and drying machine according to the invention results to be improved in reliability

because a safe fixing of the drying air duct to the tub or other article treating chamber is ensured. Furthermore, the shape of the two parts of the spacing element provides an improved tightness and more reliable connection between each other.

## Brief description of the drawings

**[0032]** Reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 is a perspective view of an article treating chamber of a washing and drying machine, in particular the plastic tub of a laundry washing and drying machine, according to a preferred embodiment of the present invention;
Figure 1A is an enlarged, perspective view of a detail of the tub of Figure 1;
Figure 2 is a sectional side view of the tub of Figure 1;
Figure 2A is an enlarged sectional, side view of a detail of Figure 2;
Figure 3 is an enlarged, perspective exploded view of the top portion of the tub of Figure 1;
Figures 4A and 4B are a side view and a top view, respectively, of a part of the spacing element according to an embodiment of the present invention;
Figure 5A is a side view of the spacing element according to an embodiment of the present invention, in assembled condition;
Figure 5B is a perspective view of the spacing element according to an embodiment of the present invention, in unassembled condition;
Figures 6A and 6B are a side view and a top view, respectively, of a part of the spacing element according to an alternative embodiment of the present invention;
Figure 7A is a bottom view of the spacing element according to the alternative embodiment of the present invention;
Figure 7B is a perspective view of the spacing element according to the alternative embodiment of the present invention, in unassembled condition.

## Detailed description of preferred embodiments

**[0033]** Referring to Figure 1, a washing and drying machine according to the invention, includes a cabinet (not shown) for containing common operational devices of the machine (e.g. pumps, fluid ducts, motor, etc., mostly not shown nor described as they are well known to those skilled in the art), including an a washing tub 10, for carrying out a treating process, such as a washing and/or drying cycle. The washing tub contains a rotatable perforated drum 50 (perforations are not illustrated in enclosed Figures), in which the laundry may be loaded/unloaded, preferably, but not necessarily, via a front opening 51 closable by a door (not shown), preferably hinged to the front cabinet wall. In a further embodiment, not disclosed, in which the washing and drying machine is of the so called "top-loading" type, the internal of the drum may be reached by an opening obtained in the lateral surface of the drum and of the tub.

**[0034]** The tub 10 is made advantageously of a plastic material whereas the drum is preferably made of stainless steel.

**[0035]** Moreover, as can be better seen in Figures 1 to 3, the washing and drying machine includes a hot air duct 20, connected to the upper portion of the tub 10. The hot air duct 20 includes a heating element (e.g. an electric heater), not illustrated, and a fan 21 for producing hot air, which is forced inside the tub 10. The hot air duct 20 is advantageously made of metal and becomes hot when the heating element is activated (i.e. during the drying procedure).

**[0036]** The hot air duct 20 is secured to the top side of the plastic tub 10 with fixing devices 12, for example screws.

**[0037]** Advantageously the hot air duct 20 comprises one or more fixing regions 15 for his fixation to corresponding supporting regions 53 of the washing tub 10.

**[0038]** Advantageously the fixing regions 15 are made in a single piece construction with the hot air duct 20; in the embodiment illustrated in the enclosed figures, the fixing regions 15 of the hot air duct 20 advantageously comprise lug nuts or fins or wings 15a, preferably substantially flat, protruding laterally from the hot air duct 20 and made in a single piece construction with the latter.

**[0039]** Advantageously each fixing region 15 comprises one or more fixing holes 25 for inserting the fixing devices 12 (e.g. screws) therein.

**[0040]** In the embodiment illustrated in the enclosed figures, the supporting regions 53 of the tub 10 advantageously comprise bushings 53a protruding from the tub 10 and preferably made in a single piece construction with the latter, which are adapted to support the fixing regions 15 of the hot air duct 20.

**[0041]** Advantageously the supporting regions 53 of the tub 10 comprise one or more threaded holes 22, adapted to receive the fixing devices 12 (e.g. screws) passing through the fixing holes 25 of the fixing regions 15.

**[0042]** To prevent the heat being transferred from the hot air duct 20 to the fixing devices 12 (which could cause the local melting of the bushings 53a, with consequent loosing of the fixation of the screws), a spacing element 13, made of heat insulating material (for example Polyamide reinforced with glass fibers) is associated to the fixing region 15, preferably at least partially inserted into the fixing holes 25, in such a way to be positioned between (i.e. interposed) the fixing region 15 and the fixing devices 12, so as to thermally insulate the latter from the hot air duct 20.

**[0043]** Preferably, but not necessarily, in particular if the fixing devices 12 are screws, between a fixing device and the respective spacing element 13 there may be a washer (or lock washer), not illustrated, positioned be-

tween the head of the screw and the respective spacing element 13.

**[0044]** According to a first embodiment of the present invention, designed to be used in case of a single fixing hole 25 with a single fixing devices 12 (e.g. screw), the spacing element 13 includes two parts 24a, 24b, adapted to be fixed to one another and to a respective fixing region 15, on opposite sides of this fixing region 15. Preferably, but not necessarily, the two parts 24a and 24b are substantially identical to one another, as in the example illustrated in figures 4A, 4B and 5A, 5B. Preferably each part 24a,24b includes a head 17a,17b with one hole 19 and preferably a pair of wings 34a,34b, preferably diametrically facing to one another, extending from the rim of the hole 19 or from a region contiguous (or close, proximal) to the rim of the hole 19.

**[0045]** Each wing 34a, 34b preferably extends along a quarter of the circumference of the respective hole 19.

**[0046]** Each wing 34a, 34b preferably comprises an engaging surface 36a, 36b adapted to engage and retain a corresponding engaging surface of the other part.

**[0047]** In the example illustrated in enclosed figures, the engaging surface 36a, 36b are advantageously serrated.

**[0048]** Preferably the engaging surface 36a, 36b comprises at least one lateral side (for example radial in the embodiment illustrated in the enclosed figures) of the respective wing.

**[0049]** Preferably the wings are so positioned that the engaging surfaces 36a, 36b are diametrically opposed to one other with respect to the respective hole 19.

**[0050]** In figure 5B the two parts 24a, 24b can be seen in unassembled condition.

**[0051]** For assembly a spacing element 13 to a fixing region 15, the wings 34a, 34b of one of the parts (e.g. 24a) are first introduced in the fixing hole 25, on either side thereof. Then the wings 34a, 34b of the other part (e.g. 24b) (which is rotated of about 180 degrees with respect to the other part) are inserted in the fixing hole 25, on the other side thereof, taking care that the wings of this second part are introduced between the wings of the part 24a first inserted in the fixing hole 25, in such a way that their serrated surfaces mate (engage) to one another.

**[0052]** Pushing on the holed heads 17a,17b of the parts 24a,24b makes them get closer and the engaging surface 36a, 36b of the opposite wings 34a, 34b of the parts 24a, 24b steadily engage with each other, as can be better seen in Figure 5A, where the spacing element is shown in the assembled condition (in Figure 5A the fixing region 15 has not been illustrated).

**[0053]** During assembly, the wings are preferably adapted to elastically deform in order to allow the two opposite serrated sides to engage to one another.

**[0054]** The wall of the fixing region 15 is therefore positioned between the two opposite heads 17a, 17b, and a fixing devices 12 (e.g. screw) can now be introduced into the fixing hole 25 and in the threaded hole 22 of the plastic tub 10, being thermally insulated from the hot air duct 20.

**[0055]** The spacing element 13 insulates the fixing device from the fixing region 15, so that heat cannot be transmitted from the fixing region to the fixing device (e.g. screw), or at least in a very limited, acceptable amount. Moreover the spacing element 13 avoids also direct heat transmission from the hot air duct 20 to the washing tub 10, so as to prevent the latter form damages due to the high temperature of the hot air duct 20.

**[0056]** Turning now to Figures 6A, 6B and 7A, 7B, according to a second embodiment of the invention, the spacing element 13 comprises two parts 23a, 23b, adapted to be fixed to one another and to a respective fixing region 15, on opposite sides of this fixing region 15.

**[0057]** The head 16a,16b of each part 23a, 23b forming the spacing element 13 is preferably in the form of an elongated plate and has two holes 18a, 18b, preferably symmetrically arranged therein.

**[0058]** Each hole 18a, 18b has preferably a pair of wings 33a, 33b, preferably diametrically facing, extending substantially from the rim thereof (i.e. exactly form the rim or from a region close to the rim), and each wing 33a, 33b preferably comprises an engaging surface 35a, 35b adapted to engage and retain a corresponding engaging surface of the other part.

**[0059]** In the example illustrated in enclosed figures, the engaging surface 35a, 35b are advantageously serrated.

**[0060]** Preferably the engaging surface 35a, 35b comprises at least one lateral side (for example radial in the embodiment illustrated in the enclosed figures) of the respective wing.

**[0061]** Each wing 33a, 33b preferably extends along a quarter of the related hole circumference, and the engaging surface 35a,35b of the wings of each hole are diametrically opposed to each other with respect to the respective hole 18a,18b. As for the first embodiment, in order to fix the spacing element 13 to a fixing region 15 of the hot air duct 20, one of the parts (e.g. part 24a) is first associated to the fixing region 15 by introducing the related wings in the fixing holes 25 of the fixing region 15, on one side thereof. Then the wings of the other part (in this case for example part 24b, which is rotated of about 180 degrees with respect to the former part 24a) are inserted in the fixing holes 25 of the fixing region 15, on the other side thereof; in this advantageous embodiment it is not necessary to pay attention that the wings of this second part 24b are correctly introduced between the wings of the part 24a first inserted in the fixing holes 25, because the double pair of wings and fixing holes allow the parts to be set only with the wings in the correct position (i.e. there is a sort of automatic centering between the two parts).

**[0062]** Now, pushing on the heads 16a,16b of each part 23a, 23b forming the spacing element 13 makes them get closer and the engaging surface 35a, 35b of the opposite wings 33a, 33b of the parts 23a, 23b engage

with each other, in the assembled condition. This condition can be seen in the sectional, side view of Figure 2A.

**[0063]** The wall of the fixing region 15 is therefore enclosed between the two opposite heads 16a, 16b, and the fixing devices 12 (e.g. screws) can now be introduced into the fixing holes 25 and in the threaded holes 22 of the plastic tub 10. The spacing element 13 insulates the screws from the fixing region 15 and the heat cannot be transmitted from the fixing region 15 to the screws, or at least in a very limited, acceptable amount. Moreover the spacing element 13 avoids heat transmission from the hot air duct 20 to the washing tub 10, so as to prevent the latter form damages due to the high temperature of the hot air duct.

**[0064]** In the embodiments here described, each hole of the head has a pair of wings associated, however a different number of wings can be provided. In the alternative embodiment described with reference to Figures 6A,B-7A,B the number of wings is advantageously even, so that the two opposite parts correctly match when assembled.

**[0065]** The spacing element of the present invention for insulating the tub from the hot air duct is cheap (because of its small dimensions), simple, easy to produce and to mount.

**[0066]** However it effectively thermally insulates the hot air duct from the screws or rivets and from the tub.

**[0067]** Moreover the two parts of the spacing element can be likewise mounted on either side of the fixing region, easily and with very little or no particular attention.

**[0068]** In particular, the advantageous embodiment in which two parts of the spacing element are substantially identical to one another, allows producing them with a single mould, which highly reduces production cost of the spacing element, and also the cost for transport and storage are reduced with respect to the prior art solution, since actually a single kind of component has to be transported and stored in order to allow the assembly of the spacing element.

**[0069]** Moreover, e.g. in the case of the second embodiment, the parts are mounted without necessity of paying attention to their orientation.

**[0070]** Another advantage of the spacing element made in accordance with the invention is that it can be pre-assembled on the hot air duct, thus making easier and quicker the assemblage of the hot air duct to the tub.

**[0071]** Yet a further advantage of the spacing element made in accordance with the invention is that it can be easily produced with a simple mold, without necessity of complicated mechanisms or further machining steps.

**[0072]** Moreover, the advantageous embodiment in which the engaging surfaces are provided in the wings of the two parts, and therefore not in the heads of the latter, allows using fixing screws with smaller screw-head (and therefore less costly) for fixing the hot air channel to the tub; in fact in this case the screw-head may act directly the head of one of the two parts of the spacing element, which is a region of the latter not involved by the engaging surface, and therefore more rigid and stable.

**[0073]** It will be appreciated that alterations and modifications may be made to the above without departing from the scope of the disclosure. Naturally, in order to satisfy local and specific requirements, a person skilled in the art may apply to the solution described above many modifications and alterations. Although the present disclosure has been described with a certain degree of particularity with reference to preferred embodiment(s) thereof, it should be understood that various omissions, substitutions and changes in the form and details as well as other embodiments are possible; moreover, it is expressly intended that specific elements described in connection with any disclosed embodiment of the disclosure may be incorporated in any other embodiment as a general matter of design choice.

## Claims

1. Washing and drying machine comprising:

   - a washing tub (10) containing a rotatable drum (50);
   - a hot air duct (20) for carrying hot air into the tub (10),

   said hot air duct (20) comprising one or more fixing regions (15) connected to said tub (10) via a spacing element (13) made of thermal insulating material, **characterized in that**

   said spacing element (13) comprises two parts (23a, 23b; 24a, 24b) fixed to one another and to a respective fixing region (15), on opposite sides of said fixing region (15).

2. A washing and drying machine according to claim 1 wherein said two parts (23a, 23b; 24a, 24b) of said spacing element (13) are substantially identical to one another.

3. A washing and drying machine according to claim 1 or 2 wherein said one or more fixing regions (15) are fixed to said tub (10) by one or more fixing devices (12), and wherein one or more of said spacing elements (13) are associated to each fixing region (15) and are interposed between said fixing region (15) and the respective one or more fixing devices (12), so as to thermally insulate said fixing region (15) from said one or more fixing devices (12).

4. A washing and drying machine according to claim 1 or 2 or 3 wherein each one of the two parts (23a, 23b; 24a, 24b) of said spacing element (13) includes a head (16a, 16b; 17a, 17b) with at least one hole (18a, 18b; 19) and at least one wing (33a,33b; 34a, 34b) protruding from the rim of said hole (18a, 18b; 19) or from a region contiguous to the rim of said

hole (18a, 18b; 19), wherein said at least one wing (33a, 33b; 34a, 34b) comprises an engaging surface (35a, 35b, 36a, 36b) adapted to engage and retain a corresponding engaging surface (35a, 35b, 36a, 36b) of the other part (23a, 23b; 24a, 24b) of said spacing element (13), so as to fix the two parts (23a, 23b; 24a, 24b) to one another.

**5.** A washing and drying machine according to claim 4 wherein said engaging surface (35a, 35b, 36a, 36b) comprises a serrated surface or a waved surface.

**6.** A washing and drying machine according to claim 4 or 5, wherein said at least one wing (33a, 33b; 34a, 34b) is made of a resilient material, so that, during the assembling of the two parts (23a, 23b; 24a, 24b) of said spacing element (13), the wings of the two parts (23a, 23b; 24a, 24b) elastically deform to allow engagement of the two parts (23a, 23b; 24a, 24b).

**7.** A washing and drying machine according to any claim 4 to 6, wherein said head (17a,17b) comprises a single hole (19) including one or more of said wings (34a,34b) protruding from the rim of said hole (19) or from a region contiguous to the rim of said hole (19), wherein said one or more of said wings (34a, 34b) comprise said engaging surface (35a, 35b, 36a, 36b).

**8.** A washing and drying machine according to claim 7 wherein each one of the two parts includes two wings which are diametrically opposed to each other with respect to the respective hole (19), and each wing (34a,34b) extends substantially along a quarter of the hole circumference, the engaging surfaces (36a, 36b) of said two wings being diametrically opposed to one another with respect to the respective hole (19).

**9.** A washing and drying machine according to any claim 4 to 6 wherein said head (16a,16b) is in the form of an elongated plate and has at least two holes (18a,18b), each hole (18a,18b) having at least one wings (33a,33b) protruding from the rim of said hole (18a, 18b) or from a region contiguous to the rim of said hole (18a, 18b), wherein said one or more of said wings (33a, 33b) comprise said engaging surface (35a, 35b).

**10.** A washing and drying machine according to claim 9 wherein each hole includes two wings which are diametrically opposed to one another, and each wing (33a,33b) extends substantially along a quarter of the related hole circumference, said engaging surfaces (35a, 35b)of said two wings being diametrically opposed to one another with respect to the respective hole (18a,18b).

**11.** A washing and drying machine according to claim 3 and one or more of claims 4 to 10, wherein said one or more fixing regions (15) of said hot air duct (20) comprise at least one fixing hole (25) for inserting therein said fixing device (12) for securing said hot air duct (20) said washing tub (10), wherein the heads (16a, 16b; 17a, 17b) of the two parts (23a, 23b; 24a, 24b) of the spacing element (13) associated to said fixing region (15) are placed respectively on opposite sides of said fixing region (15), and wherein at least one wing, comprising said engaging surface (35a, 35b, 36a, 36b), of both the two parts of the spacing element (13) associated to said fixing region (15) is positioned at least partially inside said fixing hole (25), between the fixing region (15) and said fixing device (12), in such a way that the engaging surfaces (35a, 35b, 36a, 36b) of the wings of the two parts of the spacing element (19) positioned inside said fixing hole (25) and engaging to one another, engage to one another at least partially internally to said fixing hole (25).

**12.** A washing and drying machine according to any preceding claim wherein the two parts are adapted to mate and engage to one another if rotated of 180 degrees one with respect to the other.

**Patentansprüche**

**1.** Waschmaschine/Trockner, der Folgendes umfasst:

- einen Waschbottich (10), der eine drehbare Trommel (50) enthält;
- einen Heißluftkanal (20) zum Befördern von Heißluft in den Bottich (10),

wobei der Heißluftkanal (20) ein oder mehrere Befestigungsbereiche (15) umfasst, die mit dem Bottich (10) mittels eines Abstandselements (13) verbunden sind, das aus einem Wärmedämmstoff hergestellt ist,
**dadurch gekennzeichnet, dass**
das Abstandselement (13) zwei Teile (23a, 23b; 24a, 24b) umfasst, die aneinander und an einem jeweiligen Befestigungsbereich (15) an entgegengesetzten Seiten des Befestigungsbereichs (15) befestigt sind.

**2.** Waschmaschine/Trockner nach Anspruch 1, wobei die zwei Teile (23a, 23b; 24a, 24b) des Abstandselements (13) im Wesentlichen miteinander identisch sind.

**3.** Waschmaschine/Trockner nach Anspruch 1 oder 2, wobei der eine oder die mehreren Befestigungsbereiche (15) an dem Bottich (10) durch eine oder mehrere Befestigungsvorrichtungen (12) befestigt sind und wobei ein oder mehrere der Abstandselemente

(13) mit jedem Befestigungsbereich (15) in Verbindung stehen und zwischen dem Befestigungsbereich (15) und dem jeweiligen einen oder den jeweiligen mehreren Befestigungsvorrichtungen (12) eingeschoben sind, um den Befestigungsbereich (15) von der einen oder den mehreren Befestigungsvorrichtungen (12) wärmezudämmen.

**4.** Waschmaschine/Trockner nach Anspruch 1 oder 2 oder 3, wobei jeder der zwei Teile (23a, 23b; 24a, 24b) des Abstandselements (13) einen Kopf (16a, 16b; 17a, 17b) mit mindestens einem Loch (18a, 18b; 19) und mindestens einem Flügel (33a, 33b; 34a, 34b) aufweist, der von dem Rand des Lochs (18a, 18b; 19) oder von einem Bereich neben dem Rand des Lochs (18a, 18b; 19) hervorsteht, wobei der mindestens eine Flügel (33a, 33b; 34a, 34b) eine Eingriffsfläche (35a, 35b, 36a, 36b) umfasst, die dazu eingerichtet ist, eine entsprechende Eingriffsfläche (35a, 35b, 36a, 36b) des anderen Teils (23a, 23b; 24a, 24b) des Abstandselements (13) in Eingriff zu nehmen und zu halten, um die zwei Teile (23a, 23b; 24a, 24b) aneinander zu befestigen.

**5.** Waschmaschine/Trockner nach Anspruch 4, wobei die Eingriffsfläche (35a, 35b, 36a, 36b) eine gezackte Fläche oder eine gewellte Fläche umfasst.

**6.** Waschmaschine/Trockner nach Anspruch 4 oder 5, wobei der mindestens eine Flügel (33a, 33b; 34a, 34b) aus einem federnden Material hergestellt ist, so dass während des Zusammenfügens der zwei Teile (23a, 23b; 24a, 24b) des Abstandselements (13) die Flügel der zwei Teile (23a, 23b; 24a, 24b) sich elastisch verformen, um einen Eingriff der zwei Teile (23a, 23b; 24a, 24b) zu ermöglichen.

**7.** Waschmaschine/Trockner nach einem der Ansprüche 4 bis 6, wobei der Kopf (17a, 17b) ein einziges Loch (19) umfasst, das einen oder mehrere der Flügel (34a, 34b) aufweist, die von dem Rand des Lochs (19) oder von einem Bereich neben dem Rand des Lochs (19) hervorstehen, wobei der eine oder die mehreren der Flügel (34a, 34b) die Eingriffsfläche (35a, 35b, 36a, 36b) umfassen.

**8.** Waschmaschine/Trockner nach Anspruch 7, wobei jeder der zwei Teile zwei Flügel aufweist, die in Bezug auf das jeweilige Loch (19) zueinander diametral entgegengesetzt sind, und jeder Flügel (34a, 34b) sich im Wesentlichen entlang eines Viertels des Lochumfangs erstreckt, wobei die Eingriffsflächen (36a, 36b) der zwei Flügel in Bezug auf das jeweilige Loch (19) zueinander diametral entgegengesetzt sind.

**9.** Waschmaschine/Trockner nach einem der Ansprüche 4 bis 6, wobei der Kopf (16a, 16b) in der Form einer länglichen Platte ist und mindestens zwei Löcher (18a, 18b) hat, wobei jedes Loch (18a, 18b) mindestens zwei Flügel (33a, 33b) hat, die von dem Rand des Lochs (18a, 18b) oder von einem Bereich neben dem Rand des Lochs (18a, 18b) hervorstehen, wobei der eine oder die mehreren der Flügel (33a, 33b) die Eingriffsfläche (35a, 35b) umfassen.

**10.** Waschmaschine/Trockner nach Anspruch 9, wobei jedes Loch zwei Flügel aufweist, die zueinander diametral entgegengesetzt sind, und jeder Flügel (33a, 33b) sich im Wesentlichen entlang eines Viertels des zugehörigen Lochumfangs erstreckt, wobei die Eingriffsflächen (35a, 35b) der zwei Flügel in Bezug auf das jeweilige Loch (18a, 18b) zueinander diametral entgegengesetzt sind.

**11.** Waschmaschine/Trockner nach Anspruch 3 und einem oder mehreren der Ansprüche 4 bis 10, wobei der eine oder die mehreren Befestigungsbereiche (15) des Heißluftkanals (20) mindestens ein Befestigungsloch (25) zum Einfügen der Befestigungsvorrichtung (12) darin zum Sichern des Heißluftkanals (20) an dem Waschbottich (10) umfassen, wobei die Köpfe (16a, 16b; 17a, 17b) der zwei Teile (23a, 23b; 24a, 24b) des Abstandselements (13), das mit dem Befestigungsbereich (15) in Verbindung steht, jeweils auf entgegengesetzten Seiten des Befestigungsbereichs (15) angeordnet werden
und wobei mindestens ein Flügel, der die Eingriffsfläche (35a, 35b, 36a, 36b) umfasst, von beiden der zwei Teile des Abstandselements (13), das mit dem Befestigungsbereich (15) in Verbindung steht, zumindest zum Teil in dem Befestigungsloch (25) zwischen dem Befestigungsbereich (15) und der Befestigungsvorrichtung (12) derart positioniert wird, dass die Eingriffsflächen (35a, 35b, 36a, 36b) der Flügel der zwei Teile des Abstandselements (19), die in dem Befestigungsloch (25) positioniert sind und einander in Eingriff nehmen, einander zumindest zum Teil innen zu dem Befestigungsloch (25) in Eingriff nehmen.

**12.** Waschmaschine/Trockner nach einem vorhergehenden Anspruch, wobei die zwei Teile dazu eingerichtet sind, zusammenzupassen und einander in Eingriff zu nehmen, wenn sie zueinander um 180 Grad gedreht werden.

**Revendications**

**1.** Machine lavante et séchante comprenant :

- une cuve de lavage (10) contenant un tambour rotatif (50) ;
- un conduit d'air chaud (20) pour transporter de l'air chaud dans la cuve (10),

ledit conduit d'air chaud (20) comprenant une ou plusieurs régions de fixation (15) reliées à ladite cuve (10) par l'intermédiaire d'un élément d'espacement (13) fait de matériau d'isolation thermique,
**caractérisée par le fait que**
ledit élément d'espacement (13) comprend deux parties (23a, 23b ; 24a, 24b) fixées l'une à l'autre et à une région de fixation respective (15), sur des côtés opposés de ladite région de fixation (15).

**2.** Machine lavante et séchante selon la revendication 1, dans laquelle lesdites deux parties (23a, 23b ; 24a, 24b) dudit élément d'espacement (13) sont sensiblement identiques l'une à l'autre.

**3.** Machine lavante et séchante selon l'une des revendications 1 ou 2, dans laquelle ladite ou lesdites régions de fixation (15) sont fixées à ladite cuve (10) par un ou plusieurs dispositifs de fixation (12), et dans laquelle ledit ou lesdits éléments d'espacement (13) sont associés à chaque région de fixation (15) et sont interposés entre ladite région de fixation (15) et le ou les dispositifs de fixation respectifs (12), de façon à isoler thermiquement ladite région de fixation (15) vis-à-vis dudit ou desdits dispositifs de fixation (12).

**4.** Machine lavante et séchante selon l'une des revendications 1, 2 ou 3, dans laquelle chacune des deux parties (23a, 23b ; 24a, 24b) dudit élément d'espacement (13) comprend une tête (16a, 16b ; 17a, 17b) ayant au moins un trou (18a, 18b ; 19) et au moins une ailette (33a, 33b ; 34a, 34b) faisant saillie du rebord dudit trou (18a, 18b ; 19) ou d'une région contiguë au rebord dudit trou (18a, 18b ; 19), ladite au moins une ailette (33a, 33b ; 34a, 34b) comprenant une surface d'engagement (35a, 35b, 36a, 36b) apte à engager et retenir une surface d'engagement correspondante (35a, 35b, 36a, 36b) de l'autre partie (23a, 23b ; 24a, 24b) dudit élément d'espacement (13), de façon à fixer les deux parties (23a, 23b ; 24a, 24b) l'une à l'autre.

**5.** Machine lavante et séchante selon la revendication 4, dans laquelle ladite surface d'engagement (35a, 35b, 36a, 36b) comprend une surface dentelée ou une surface ondulée.

**6.** Machine lavante et séchante selon l'une des revendications 4 ou 5, dans laquelle ladite au moins une ailette (33a, 33b ; 34a, 34b) est faite d'un matériau élastique, de telle sorte que, durant l'assemblage des deux parties (23a, 23b ; 24a, 24b) dudit élément d'espacement (13), les ailettes des deux parties (23a, 23b ; 24a, 24b) se déforment élastiquement pour autoriser un engagement des deux parties (23a, 23b ; 24a, 24b).

**7.** Machine lavante et séchante selon l'une quelconque des revendications 4 à 6, dans laquelle ladite tête (17a, 17b) comprend un seul trou (19) ayant une ou plusieurs desdites ailettes (34a, 34b) faisant saillie du rebord dudit trou (19) ou d'une région contiguë au rebord dudit trou (19), ladite ou lesdites ailettes desdites ailettes (34a, 34b) comprenant ladite surface d'engagement (35a, 35b, 36a, 36b).

**8.** Machine lavante et séchante selon la revendication 7, dans laquelle chacune des deux parties comprend deux ailettes qui sont diamétralement opposées l'une à l'autre par rapport au trou respectif (19), et chaque ailette (34a, 34b) s'étend sensiblement le long d'un quart de la circonférence du trou, les surfaces d'engagement (36a, 36b) desdites deux ailettes étant diamétralement opposées l'une à l'autre par rapport au trou respectif (19).

**9.** Machine lavante et séchante selon l'une quelconque des revendications 4 à 6, dans laquelle ladite tête (16a, 16b) est sous la forme d'une plaque allongée et a au moins deux trous (18a, 18b), chaque trou (18a, 18b) ayant au moins une ailette (33a, 33b) faisant saillie du rebord dudit trou (18a, 18b) ou d'une région contiguë au rebord dudit trou (18a, 18b), ladite ou lesdites ailettes (33a, 33b) comprenant ladite surface d'engagement (35a, 35b).

**10.** Machine lavante et séchante selon la revendication 9, dans laquelle chaque trou comprend deux ailettes qui sont diamétralement opposées l'une à l'autre, et chaque ailette (33a, 33b) s'étend sensiblement le long d'un quart de la circonférence du trou associé, lesdites surfaces d'engagement (35a, 35b) desdites deux ailettes étant diamétralement opposées l'une à l'autre par rapport au trou respectif (18a, 18b).

**11.** Machine lavante et séchante selon la revendication 3 et une ou plusieurs des revendications 4 à 10, dans laquelle ladite ou lesdites régions de fixation (15) dudit conduit d'air chaud (20) comprennent au moins un trou de fixation (25) pour introduire dans celui-ci ledit dispositif de fixation (12) pour fixer ledit conduit d'air chaud (20) à ladite cuve de lavage (10),
les têtes (16a, 16b ; 17a, 17b) des deux parties (23a, 23b ; 24a, 24b) de l'élément d'espacement (13) associé à ladite région de fixation (15) étant placées respectivement sur des côtés opposés de ladite région de fixation (15),
et au moins une ailette, comprenant ladite surface d'engagement (35a, 35b, 36a, 36b), des deux parties de l'élément d'espacement (13) associé à ladite région de fixation (15) étant positionnée au moins partiellement à l'intérieur dudit trou de fixation (25), entre la région de fixation (15) et ledit dispositif de fixation

(12), d'une manière telle que les surfaces d'engagement (35a, 35b, 36a, 36b) des ailettes des deux parties de l'élément d'espacement (19), positionnées à l'intérieur dudit trou de fixation (25) et s'engageant l'une l'autre, s'engagent l'une l'autre au moins partiellement à l'intérieur dudit trou de fixation (25).

**12.** Machine lavante et séchante selon l'une quelconque des revendications précédentes, dans laquelle les deux parties sont agencées pour s'accoupler et s'engager l'une l'autre si elles sont tournées de 180 degrés l'une par rapport à l'autre.

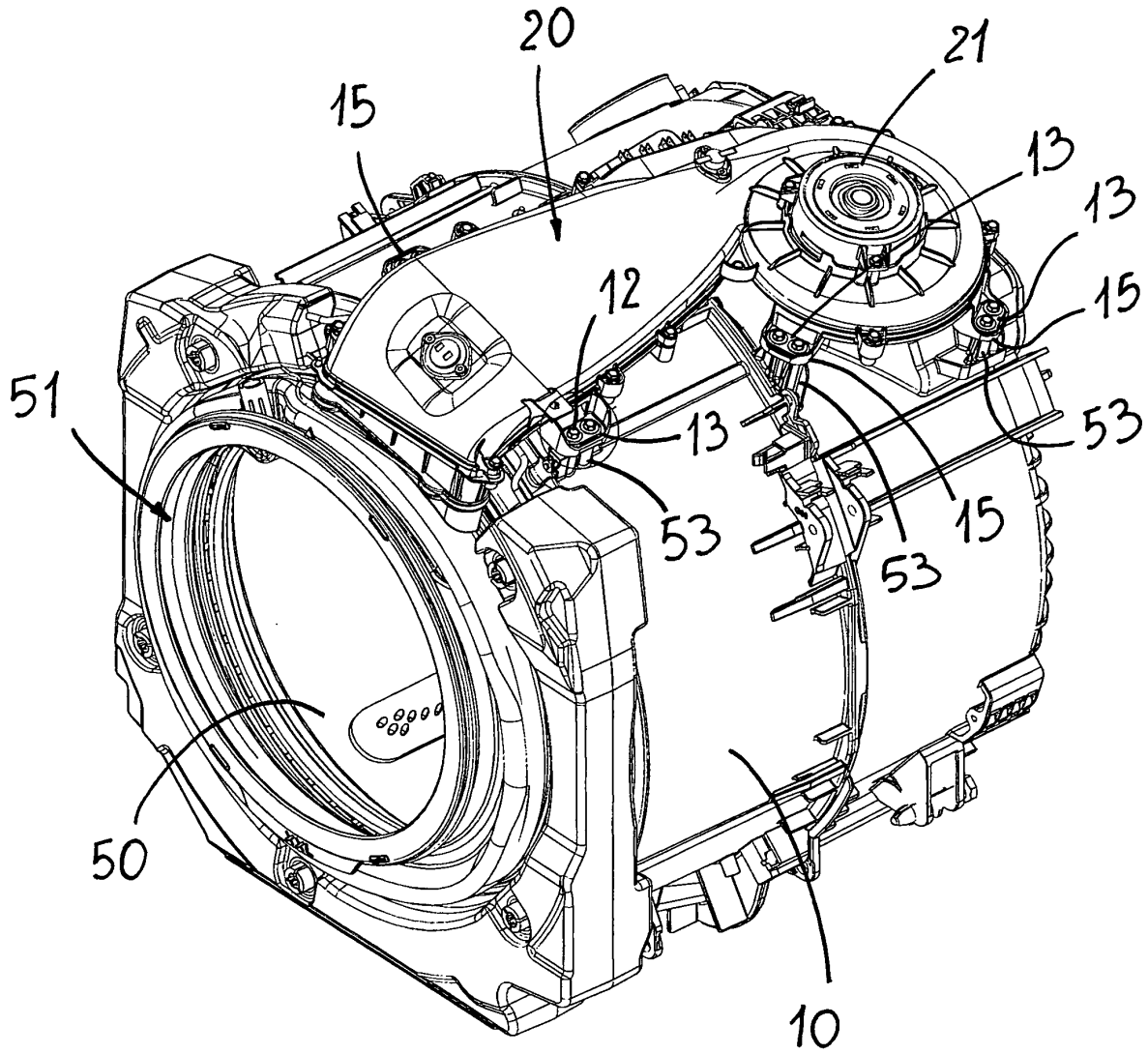



Fig. 1

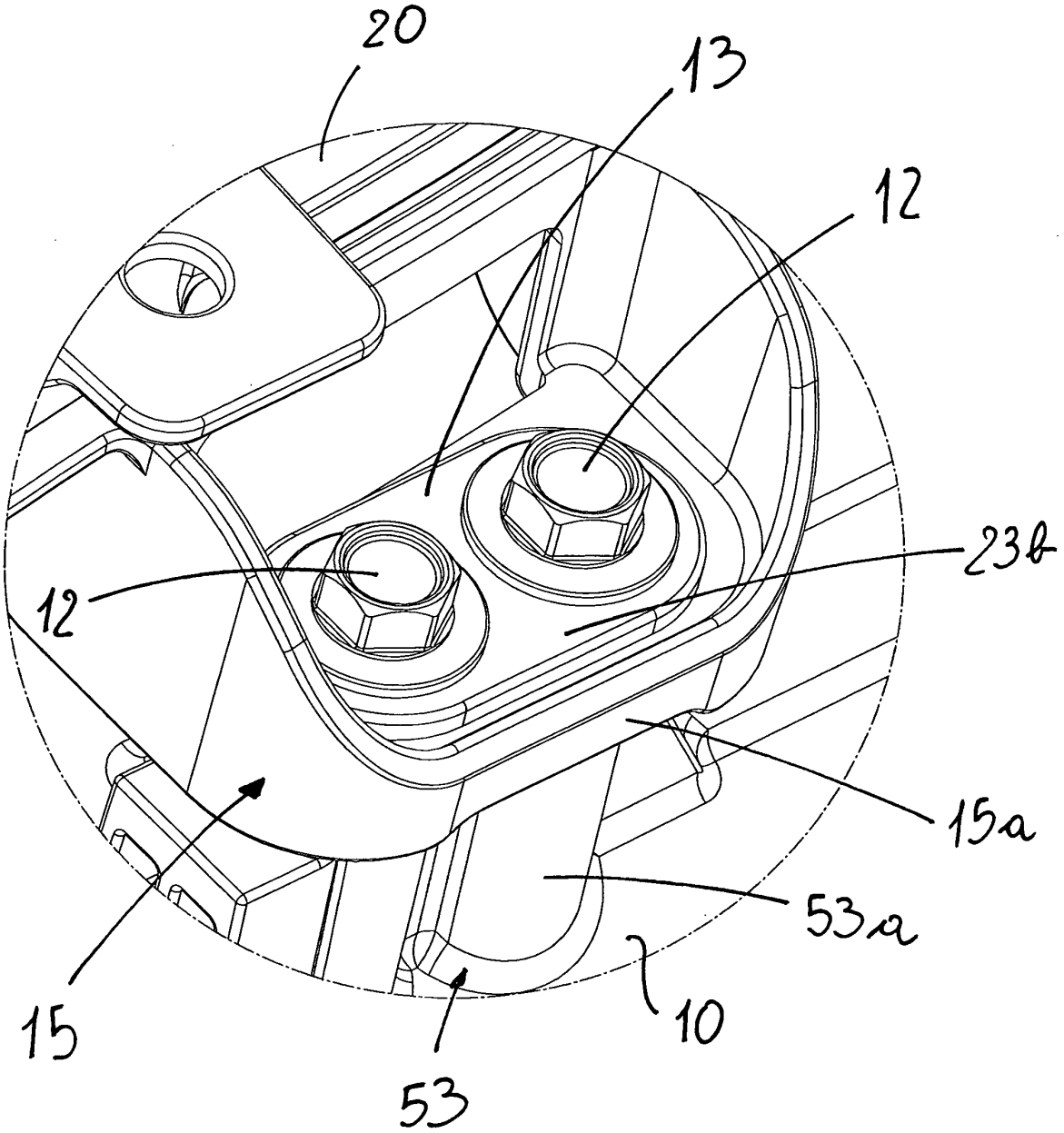



Fig. 1A

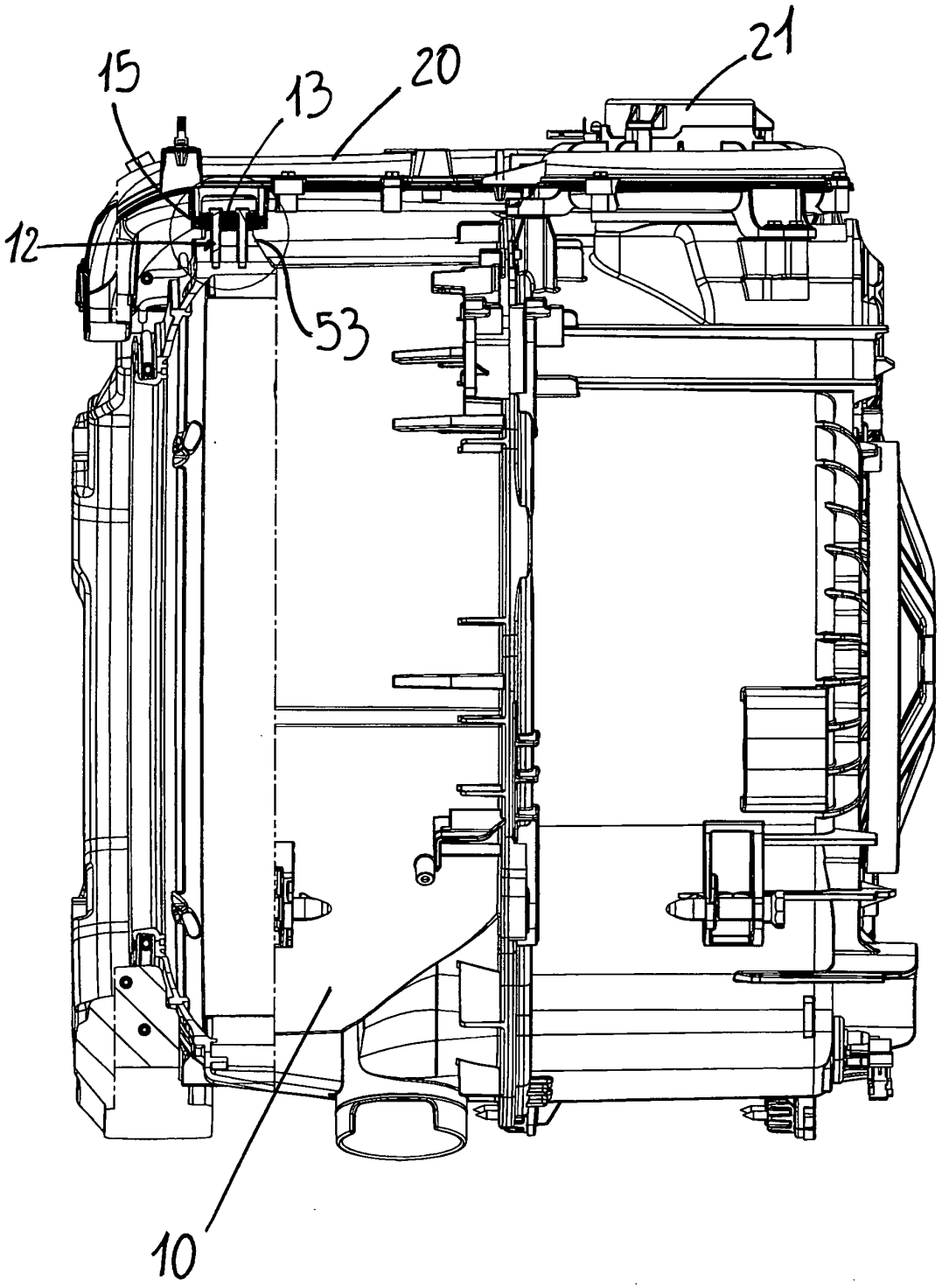



Fig. 2

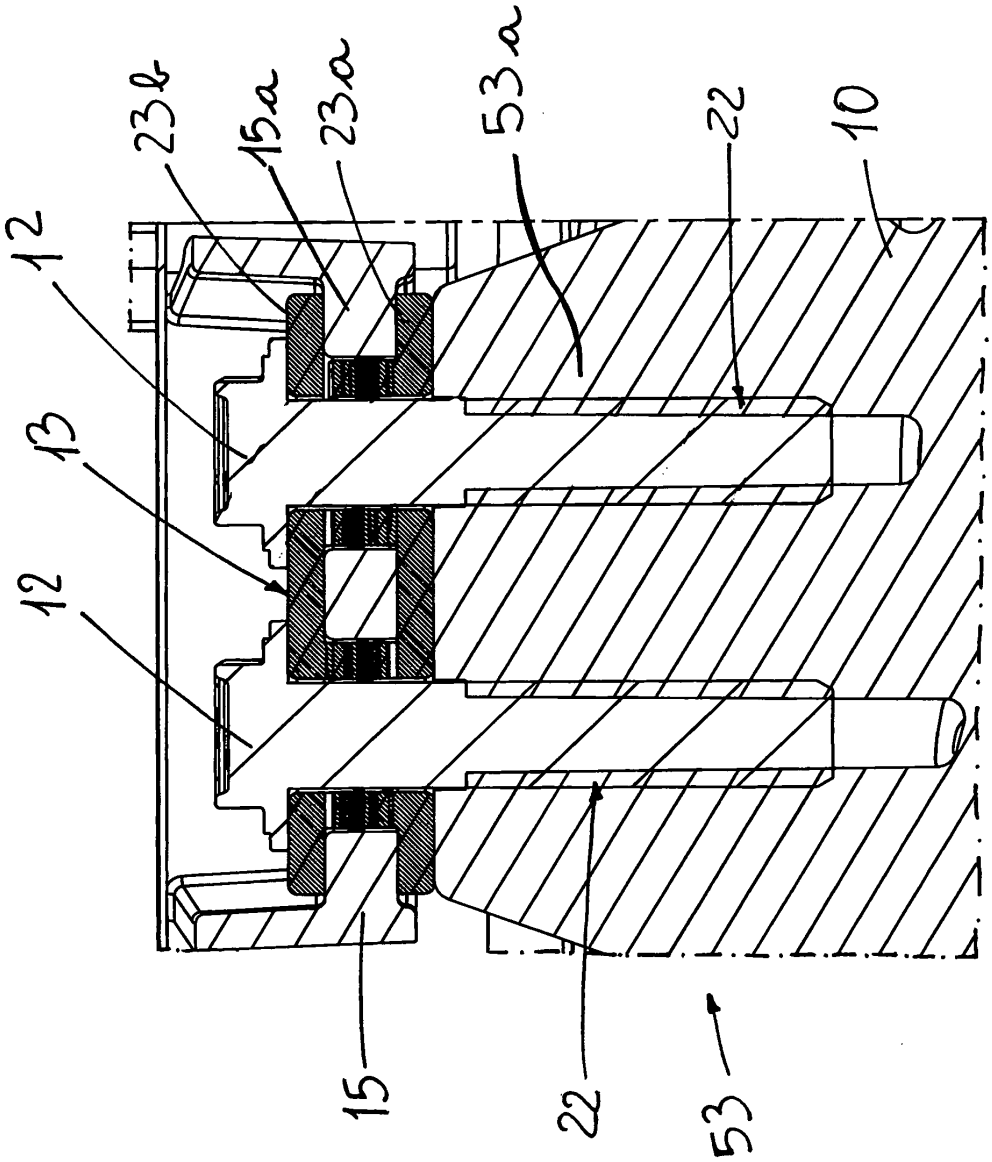



Fig. 2A

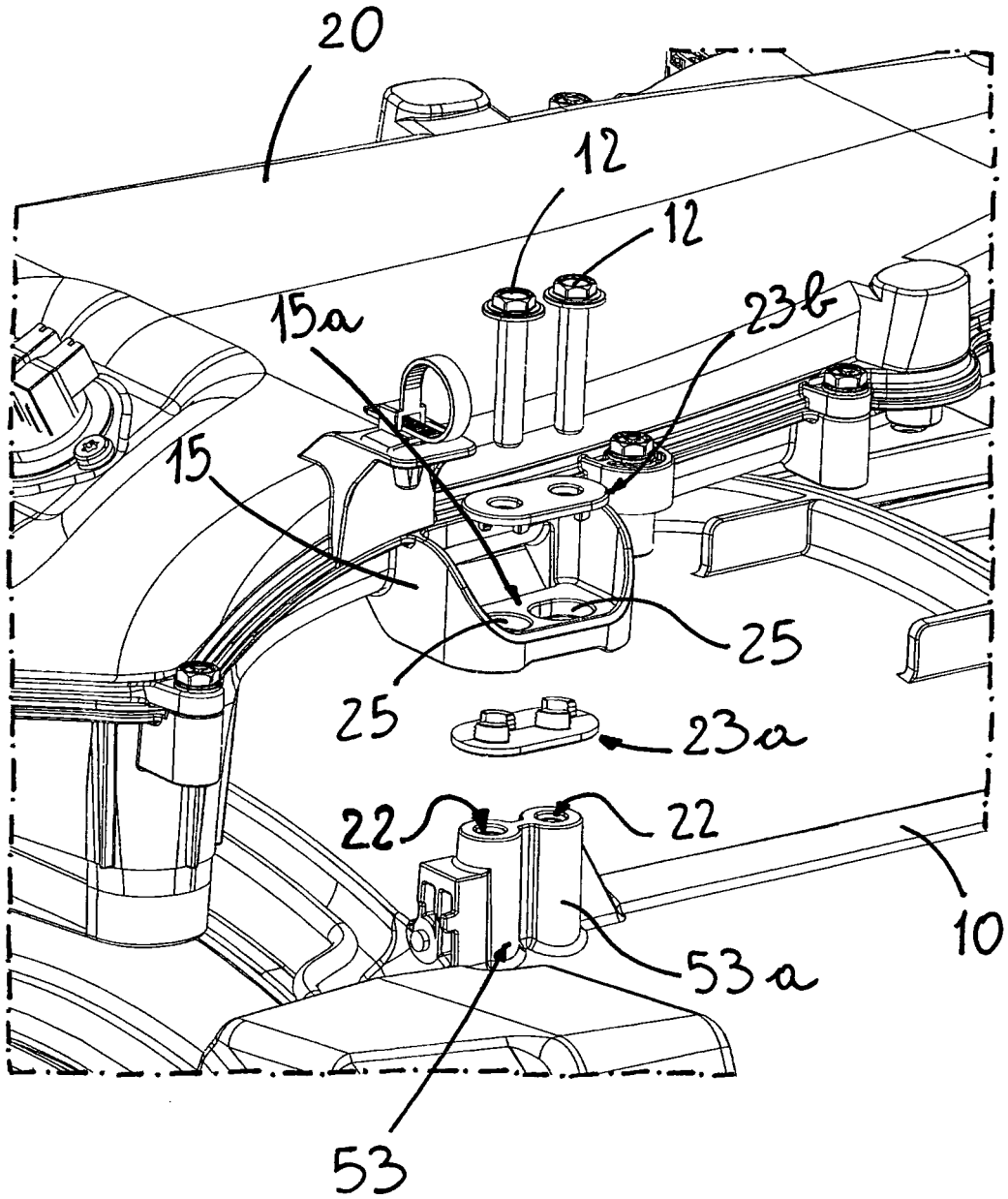



Fig. 3

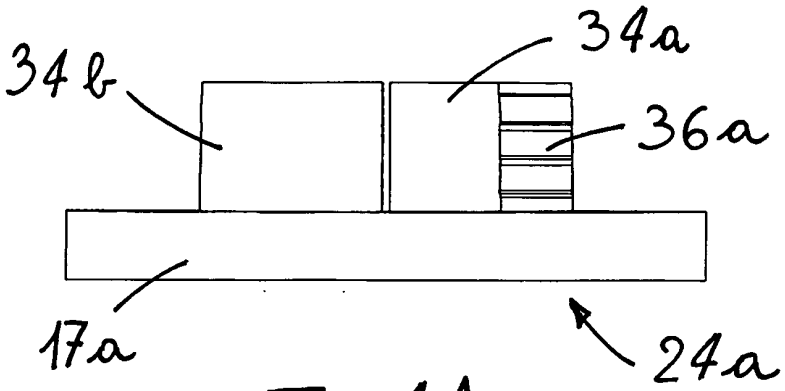



Fig. 4A

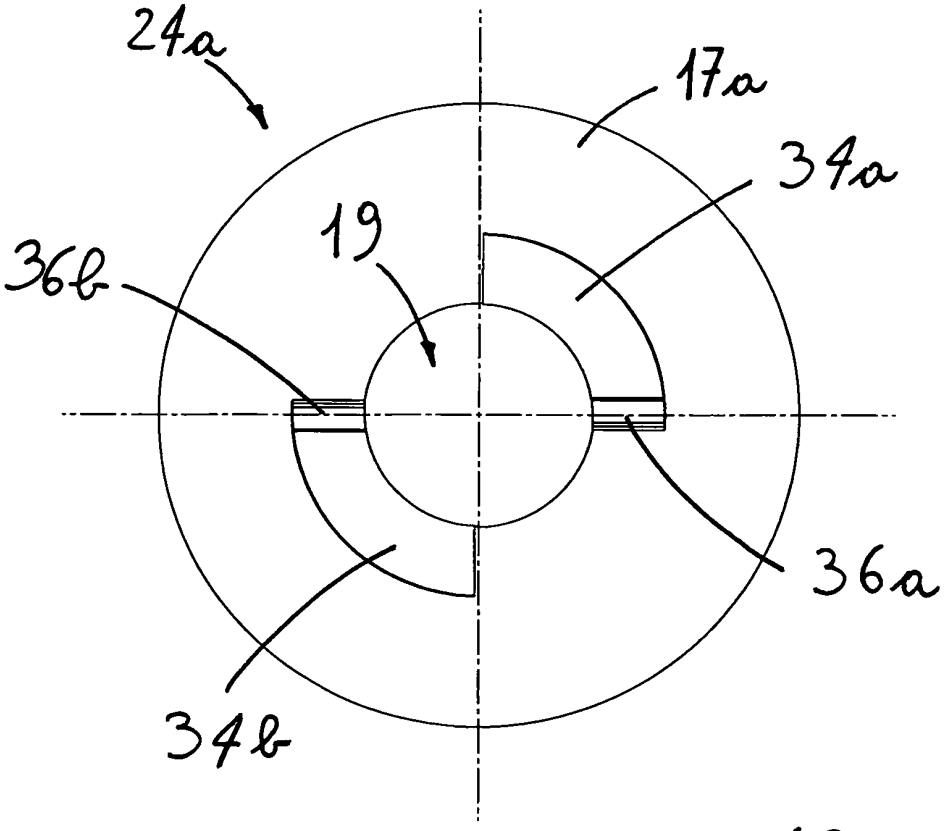



Fig. 4B

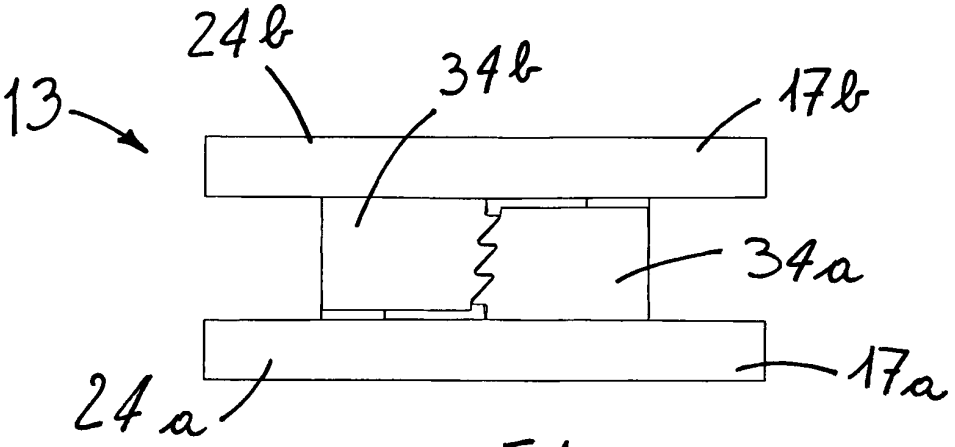

24b
34b
17b
13
34a
17a
24a

Fig. 5A

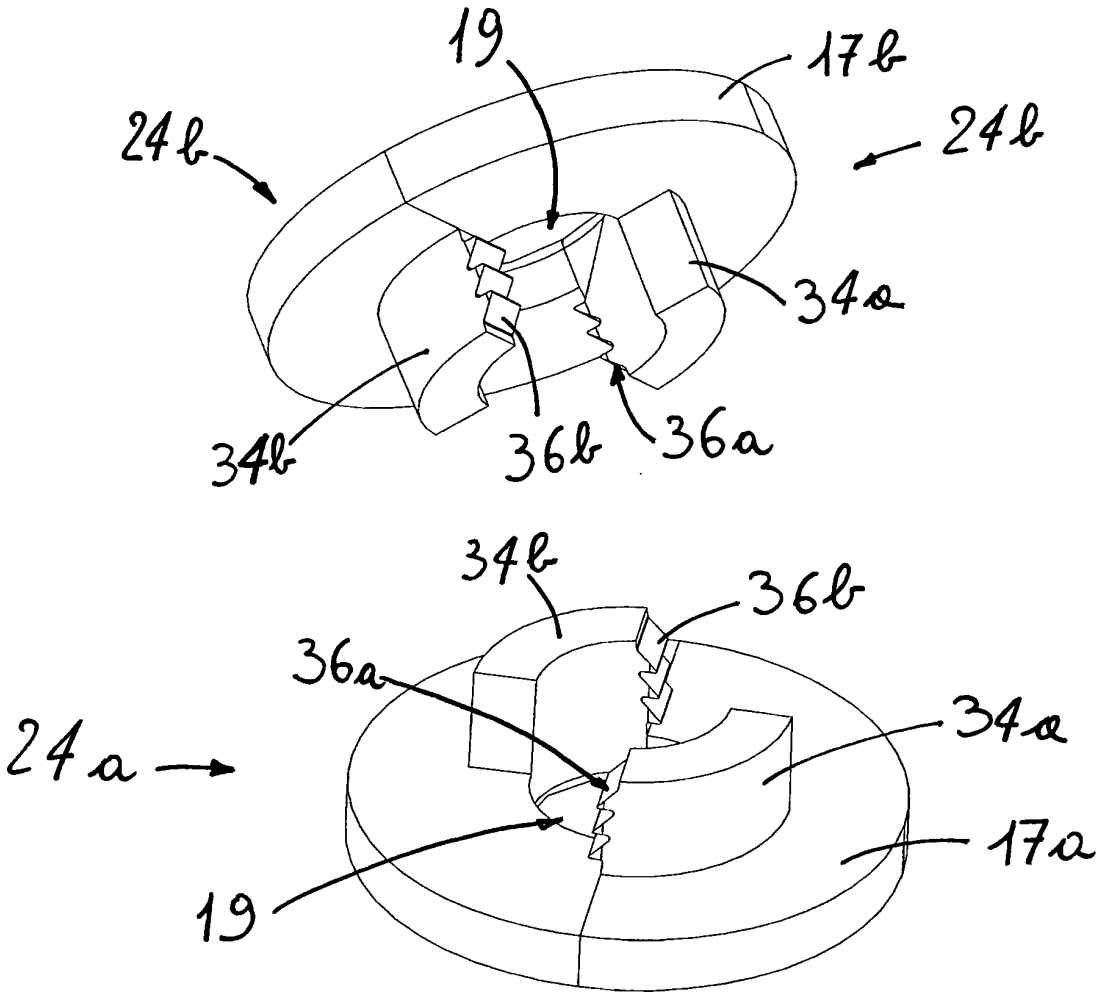

19
17b
24b
24b
34a
34b
36b
36a
34b
36b
36a
34a
24a
17a
19

Fig. 5B

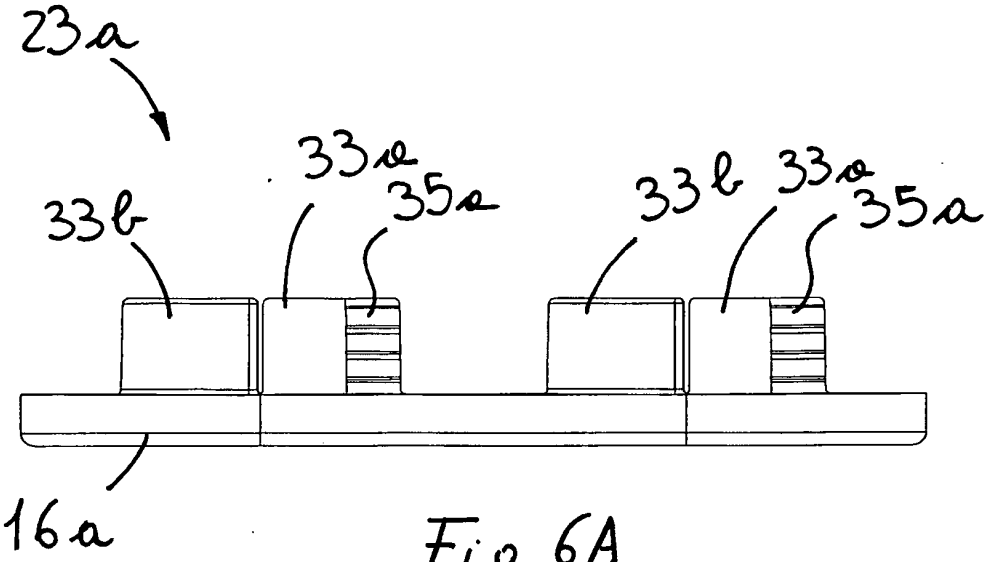

23a
33a
33b
35a
33b
33a
35a
16a

Fig. 6A

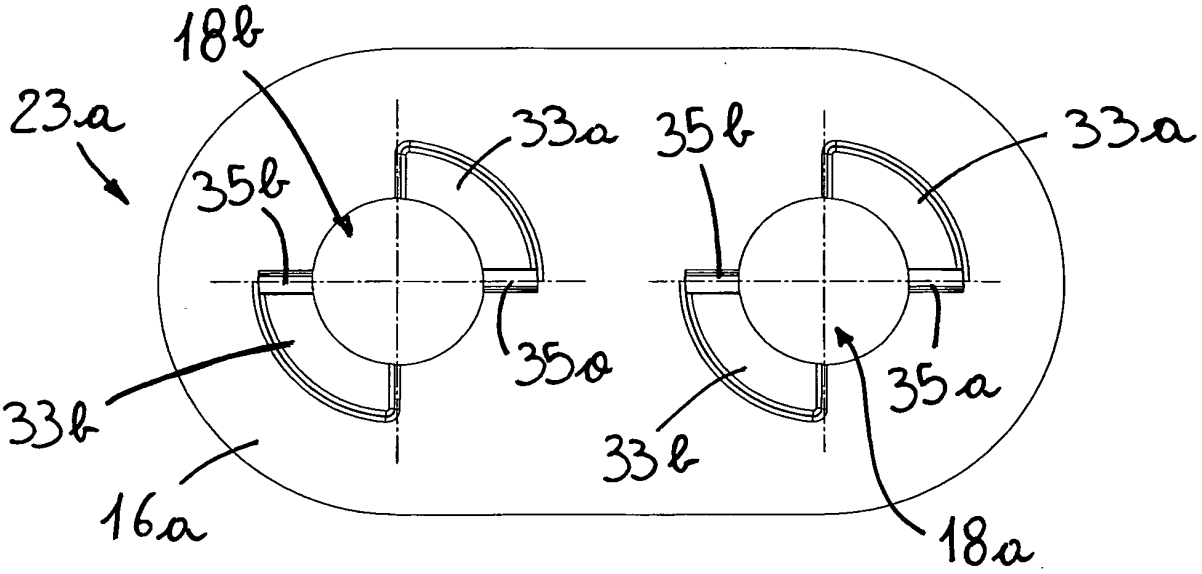
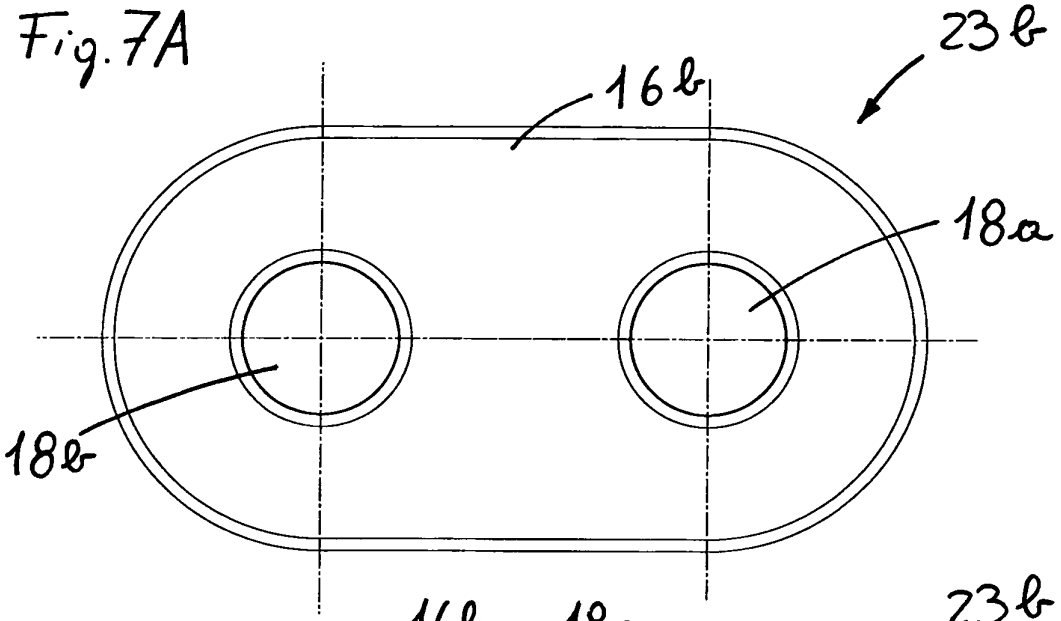

18b
23a
33a
35b
35b
33a
35a
35a
33b
33b
16a
18a

Fig. 6B

Fig. 7A


23b
16b
18a
18b

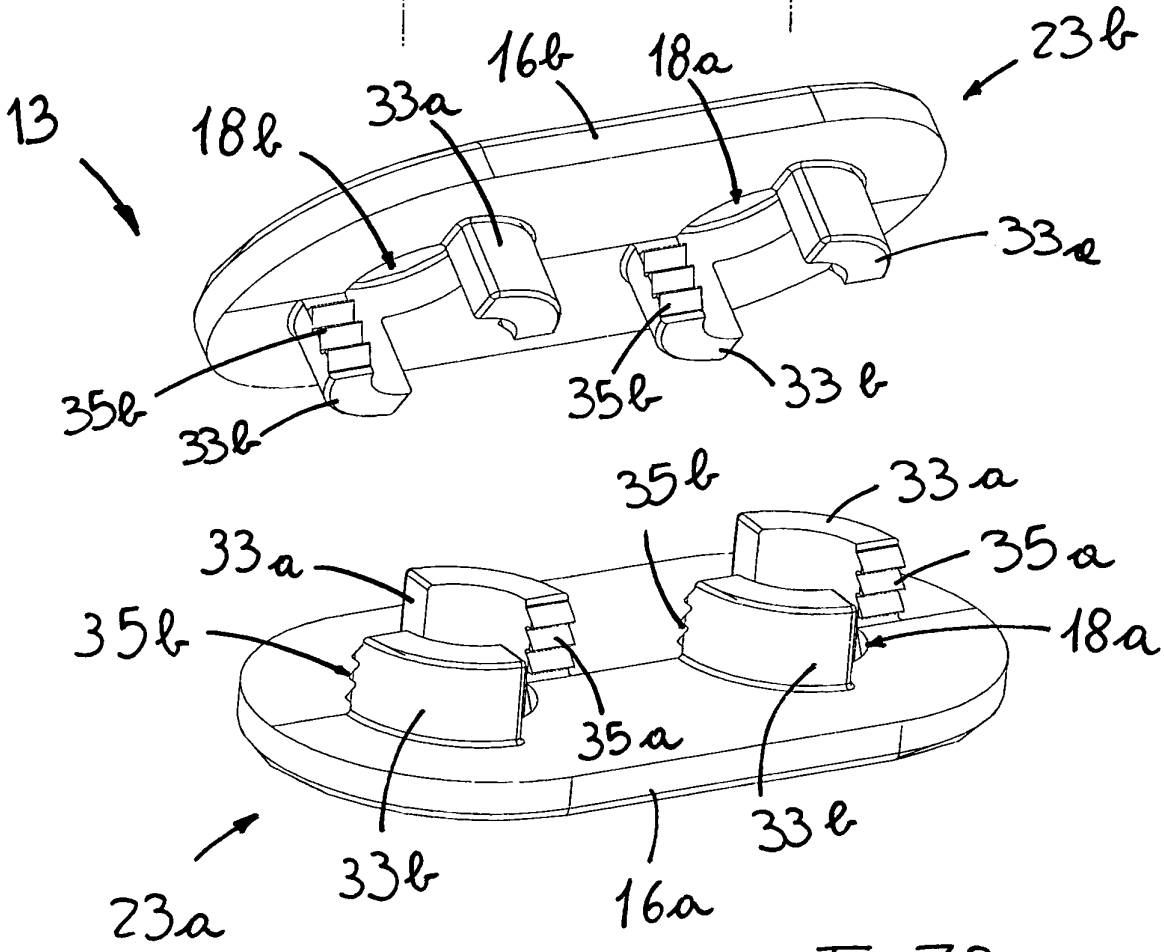

13
23b
16b
18a
18b
33a
33a
35b
35b
35a
35b
33b
33b
33a
35a
18a
35a
33b
33b
16a
23a

Fig. 7B

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


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