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(54) **Monolithic fuel gas/air mixing device for a gas burner**

(57) Fuel gas/air mixing device (11) for a gas burner, having a monolithic housing (14) comprising a gas inlet section (14a) with a fuel gas inlet opening (15), an air inlet section (14b) with an air inlet opening (16), a gas/air mixture outlet section (14c) with an outlet opening (17), and a control pipe section (14d) with a control pipe opening (20) for accommodating an accessory element (21a). The accessory (21a) element may have a function such like a seal plug, a gas type switch, measuring, and/or control.

The gas inlet section (14a) opens into the control pipe section (14d), and the control pipe section (14d) opens to the air inlet section (14b) in such a way that an axis of the gas flow through the control pipe section (14d) runs almost perpendicular to an axis of the gas flow through the gas inlet section (14a), and almost perpendicular to the axis of the air flow through the air inlet section (14b). The control pipe section (14d) may open to the air inlet section (14b) through a main opening (24) and through a bypass opening (25).

The mixing unit (26) is a venturi nozzle (26).

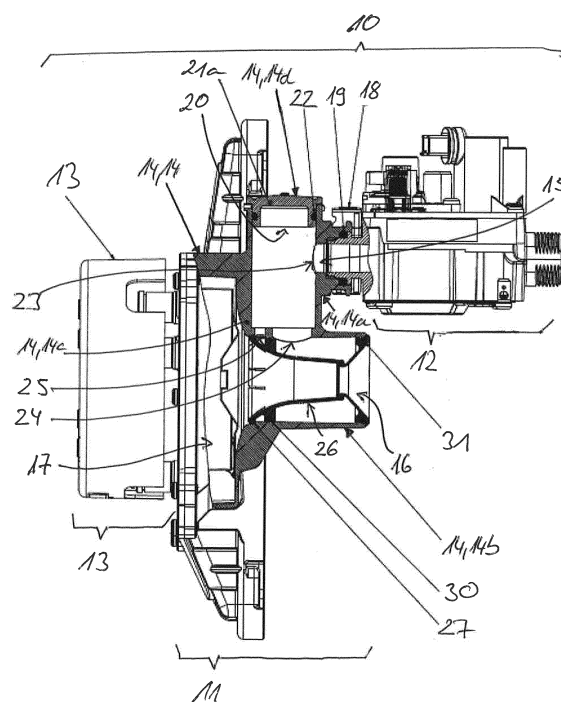


Fig. 2

Description

[0001] The present patent application relates to a gas/air mixing device for a gas burner. The present patent application relates further to an assembly for a gas burner comprising such a gas/air mixing device.

[0002] DE 296 17 621 U1 discloses a gas/air mixing device for a gas burner. The gas/air mixing device comprises a housing. The housing provides a gas inlet section with a gas inlet opening for gas, an air inlet section with an air inlet opening for air, and a gas/air outlet section with an outlet opening for a gas/air mixture.

[0003] Against this background, a novel gas/air mixing device for a gas burner according to claim 1 is provided.

[0004] The housing of the gas/air mixing according to the present application further comprises a control pipe section with a control pipe opening for accommodating at least one accessory element; wherein the gas inlet section opens into the control pipe section and the control pipe section opens to the air inlet section in such a way that an axis the gas flow through the control pipe section runs almost perpendicular to an axis of a gas flow through the gas inlet section and almost perpendicular to the axis of the air flow through the air inlet section; and wherein the gas inlet section, the air inlet section, the gas/air outlet section and the control pipe section are all integral parts of a monolithic housing. This makes it possible to easily add accessory elements to a gas burner assembly thereby providing additional functionality.

[0005] According to a preferred embodiment of the invention, the control pipe section opens to the air inlet section through a main opening and through a bypass opening. The bypass opening is initially closed and sealed by a break-out element and can be opened by breaking out said break-out element when the bypass opening is used by an accessory element providing measuring and/or control functions.

[0006] According to a preferred embodiment of the invention the air inlet section accommodates a mixing unit for mixing gas and air, wherein the mixing unit is mounted within the air inlet section of the housing by at least one snap-fit connection element or bayonet connection element. This allows to provide easily a defined mixing characteristic for the gas/air mixing device.

[0007] According to a preferred embodiment of the invention, the accessory element is mounted within the control pipe section of the housing by at least one snap-fit connection or bayonet connection element and preferably in addition by at least one anti-rotation element. This allows to easily expand the basic functionality of the gas/air mixing by a defined functionality of an accessory element.

[0008] According to a preferred embodiment of the invention, the gas inlet section, the air inlet section, the gas/air outlet section and the control pipe section are all integral parts of a monolithic die cast housing. This provides a simply design with several functionalities being integrated in one part, namely in the housing of the gas/air

mixing device.

[0009] Preferably, a burner door for a gas burner and/or a fan housing for a fan are also an integral part of the monolithic housing. This allows an increase of the functions being provided by one part, namely by the housing of the gas/air mixing device.

[0010] The assembly for a gas burner comprising such a gas/air mixing device is defined in claim 13.

[0011] Preferred developments of the invention are provided by the dependent claims and the description which follows. Exemplary embodiments are explained in more detail on the basis of the drawing, in which:

- Figure 1 shows an assembly for a gas burner in a perspective view;
- Figure 2 shows a cross-section of the assembly of Figure 1;
- Figure 3 shows a detail of Figure 2, namely a cross section through a gas/air mixing device;
- Figure 4 shows a top view of the gas/air mixing device of Figure 3;
- Figure 5 shows a side view of the gas/air mixing device of Figure 3;
- Figure 6 shows a mixing unit for the gas/air mixing device of Figure 3;
- Figure 7 shows a cross section through a detail of the gas/air mixing device of Figure 3 accommodating the mixing unit of Figure 6;
- Figure 8 shows an accessory element for the gas/air mixing device of Figure 3;
- Figure 9 shows an alternative accessory element for the gas/air mixing device of Figure 3;
- Figure 10 shows a detail of the gas/air mixing device of Figure 3 in a region where an accessory element is mounted within the gas/air mixing device;
- Figure 11 shows an alternative detail of the gas/air mixing device of Figure 3 in a region where an accessory element is mounted within the gas/air mixing device; and
- Figure 12 shows a further alternative detail of the gas/air mixing device of Figure 3 in a region where an accessory element is mounted within the gas/air mixing device.

[0012] The present application relates to a gas/air mixing device for a gas burner.

[0013] The present application relates further to an assembly for a gas burner comprising such an gas/air mixing device.

[0014] Figure 1 shows a perspective view of an assembly 10 for a gas burner (not shown) comprising a gas/air mixing device 11, a gas control valve 12 connected with/mounted to said gas/air mixing device 11 and a fan 13 connected with/mounted to said gas/air mixing device 11. Figure 2 shows a cross-section through said assembly 10.

[0015] The gas/air mixing device 11 comprises a hous-

ing 14. The housing 14 comprising a gas inlet section 14a with a gas inlet opening 15 for gas, an air inlet section 14b with an air inlet opening 16 for air, and an gas/air outlet section 14c with an outlet opening 17 for a gas/air mixture.

[0016] In the region of the air inlet section 14b gas and air become mixed. The air inlet section 14b serves also as gas/air mixing section.

[0017] The gas control valve 12 is connected to the gas inlet section 14a of the housing 14 making use of a well-known quick connect system. Figure 2 shows a mounting clip 18 of such a quick connect system. Such quick connect system comprises an anti-rotation element to mount and keep the gas control valve 12 and the gas inlet section 14a in the right orientation. This anti-rotation element is preferably provided by an inner hexagon shape of the gas inlet opening 15.

[0018] A sealing element 19 is positioned between an outlet section of the gas control valve 12 and the gas inlet section 14a of the housing 14 of the gas/air mixing device 11.

[0019] In the shown embodiment, the fan 13 is connected to the gas/air outlet section 14c of the gas/air mixing device 11. The fan 13 sucks in air through the air inlet opening 16 of the air inlet section 14b of the housing 14 depending on the fan speed. The fan 13 further sucks in gas, whereby the gas amount sucked in by the fan 13 is adjusted by gas control valve 12.

[0020] It also possible that the fan 13 is connected to the air inlet section 14b of the housing 14 of said gas/air mixing device 11.

[0021] The housing 14 of the gas/air mixing device 11 further comprises a control pipe section 14d with a control pipe opening 20 for receiving and accommodating an accessory element 21 a, 21 b.

[0022] Figures 8 and 9 show examples of such accessory elements, namely Figure 8 an accessory element designed as seal plug 21 a and Figure 9 an accessory element designed as gas type switch 21 b.

[0023] The shown accessory elements are of exemplary nature only. The invention is not limited to the shown accessory elements.

[0024] In Figures 1 and 2 the control pipe section 14d of the housing 14 of said gas/air mixing device 11 accommodates an accessory element designed as seal plug 21 a with a sealing element 22 being positioned between the control pipe section 14d and the seal plug 21 a.

[0025] The gas inlet section 14a of the housing opens into the control pipe section 14d of the housing 14, and the control pipe section 14d of the housing 14 opens into the air inlet section 14b of the housing 14.

[0026] The gas inlet section 14a, the air inlet section 14b, the gas/air outlet section 14c and the control pipe section 14d are all integral parts of a monolithic housing 14, preferably a monolithic die cast housing made from an aluminium alloy.

[0027] In the shown embodiment, the housing 14 fur-

ther provides burner door 14e for the gas burner and a fan housing part 14f for the fan 13 being also integral parts of the monolithic housing 14. The assembly of Figure 1, 2 is mountable to a gas burner though said burner door 14e.

[0028] It is also possible to keep the burner door 14e as a separate element and to provide only the fan housing part 14f for the fan 13 as an integral part of the monolithic housing 14.

[0029] The gas inlet section 14a of the housing 14 opens into the control pipe section 14d of the housing 14 through an internal opening 23.

[0030] The control pipe section 14d of the housing 14 opens into the air inlet section 14b of the housing 14 through an internal main opening 24 and through an internal bypass opening 25.

[0031] The main opening 24 is used to guide the gas flow from the control pipe section 14d into the air pipe section 14b thereby mixing the gas and the air. The bypass opening 25 is used by advanced accessory elements having measuring and/or control functions.

[0032] The bypass opening 25 is initially closed and sealed by a break-out element 41 and can be opened by removing said break-out element 41 when the bypass opening 25 is used by an accessory element providing measuring and/or control functions.

[0033] Preferably, the air inlet section 14b of the housing 14 of said gas/air mixing device 11 accommodates a mixing unit 26 for mixing gas and air. Figures 2, 7 show a mixing unit 26 designed as a venturi nozzle.

[0034] The shown venturi nozzle is of exemplary nature only. The invention is not limited to such a mixing unit 26.

[0035] It is also possible that no separate mixing unit 26 is accommodated by the air inlet section 14b. In this case the mixing of gas and air is provided by the gas flow through the main opening 24 from the control pipe section 14d of the housing 14 into the air inlet section 14b of the housing 14.

[0036] The mixing unit 26 is mounted within the air inlet section 14b of the housing 14 by at least one snap-fit connection element 27. In the shown embodiment, the mixing unit 26 uses four of such snap-fit connection elements 27.

[0037] The mixing unit 26 is insertable into the air inlet section 14b of the housing 14 in the direction of the arrow X (see Figure 7) through the air inlet opening 16. A shoulder 28 provided at an end of the mixing unit 26 opposite to the end at which the snap-fit connection elements 27 are provided has an outer diameter being larger than the inner diameter of the air inlet opening 16 of the air inlet section 14b accommodating the mixing unit 26.

[0038] Said shoulder 28 thereby provides a stop element limiting the insertion depth of the mixing unit 26 into the air inlet section 14b of the housing 14. When the mixing unit 26 is inserted into the air inlet section 14b of the housing 14 and when the shoulder 28 contacts a flange of air inlet section 14b of the housing 14 surround-

ing the air inlet opening 16, the snap-fit connection elements 27 engage behind with a recess 29 provided by the gas/air outlet section 14c of the housing 14. Instead of snap-fit connection elements 27 bayonet connection elements can be used to mount the mixing unit 26.

[0039] As can be best seen in Figure 7, two sealing elements 30, 31 are positioned between the mixing unit 26 and the air inlet section 14b of the housing 14, a first sealing element 30 in the region of the end at which the snap-fit connection elements 27 are provided and a second sealing element 31 in the region of the end at which the shoulder 28 is provided.

[0040] The second sealing element 31 is positioned in a region of the housing 14 in which the control pipe section 14d opens into the air inlet section 14b, namely adjacent to a wall section 32 which separates the main opening 24 from the bypass opening 25.

[0041] In the shown embodiment, the sealing elements 30, 31 are provided by O-rings. Alternatively, the sealing elements 30, 31 can be provided by sealing blades provided by integral protrusions of the mixing unit 26 which project into corresponding recesses of the housing 14.

[0042] The control pipe section 14d accommodates at least one accessory element providing a seal plug function and/or a gas type switch function and/or a measuring function and/or control function like a gas adaptive control function. An accessory element can provide one or more of said functions. Figure 8 shows a seal plug 21 a and Figure 9 shows a gas type switch 21 b.

[0043] The respective accessory element 21 a, 21 b is mounted within the control pipe section 14d of the housing 14 by at least one snap-fit connection element 33 or bayonet connection element and preferably by at least one anti-rotation element 34 both provided at the same end of the accessory element 21 a, 21 b and control pipe section 14d.

[0044] In case e.g. of a seal plug 21 a as accessory element an anti-rotation element is not needed. Other accessory elements like the gas type switch require an anti-rotation element to mount the same in the right orientation and to keep the same in the right orientation within the control pipe section 14d.

[0045] In Figure 10 an embodiment for a snap-fit connection element 33 and a separate anti-rotation element 34 is shown. The anti-rotation element 34 of Figure 10 is provided by at least one protrusion 35 of the respective accessory element 21 a, 21 b engaging a respective recess 36 within the control pipe section 14d of the housing 14. Figures 11 and 12 each show an alternative snap-fit connection element 33 having an integrated anti-rotation element 34.

[0046] In the shown embodiment, an axis 37 of an air flow through the air inlet section 14b and an axis 38 of a gas/air mixture flow through the gas/air outlet section 14c fall together.

[0047] An axis 40 the gas flow through the control pipe section 14d runs perpendicular to an axis 39 of the gas flow through the gas inlet section 14a and perpendicular

to the axis 37 of the air flow through the air inlet section 14b.

[0048] In the shown embodiment, an axis 39 of a gas flow through the gas inlet section 14a runs parallel to the axis 37 of the air flow through the air inlet section 14b. Alternatively, the axis 39 of a gas flow through the gas inlet section 14a runs perpendicular to the axis 37 of the air flow through the air inlet section 14b.

[0049] The axis 39 of a gas flow through the gas inlet section and the axis 37 of the air flow through the air inlet section 14b can in the projection of the same confine any angle.

[0050] The axis 37 of the air flow through the air inlet section 14b and the axis 38 of the gas/air mixture flow through the gas/air outlet section 14c lie in a common, first horizontal plane. The axis 39 of the gas flow through the gas inlet section 14b lies in a second horizontal plane running parallel to the first horizontal plane, wherein the axis 40 of the gas flow through the control pipe section 14d lies in a third plane running perpendicular to the first plane and the second plane.

[0051] Alternatively, the axis 39 of a gas flow through the gas inlet section 14a lies in a second plane running perpendicular to the first plane, wherein the axis 40 of the gas flow through the control pipe section 14d lies in a third plane running parallel to the first plane and perpendicular to the second plane.

List of reference signs

[0052]

10	assembly
11	gas/air mixing device
12	gas control valve
13	fan
14	housing
14a	gas inlet section
14b	air inlet section
14c	gas/air outlet section
14d	control pipe section
14e	burner door
14f	fan housing part
15	gas inlet opening
16	air inlet opening
17	outlet opening
18	mounting clip
19	sealing element
20	control pipe opening
21a	accessory element / seal plug
21b	accessory element / gas type switch
22	sealing element
23	opening
24	main opening
25	bypass opening
26	mixing unit
27	snap-fit connection element
28	shoulder

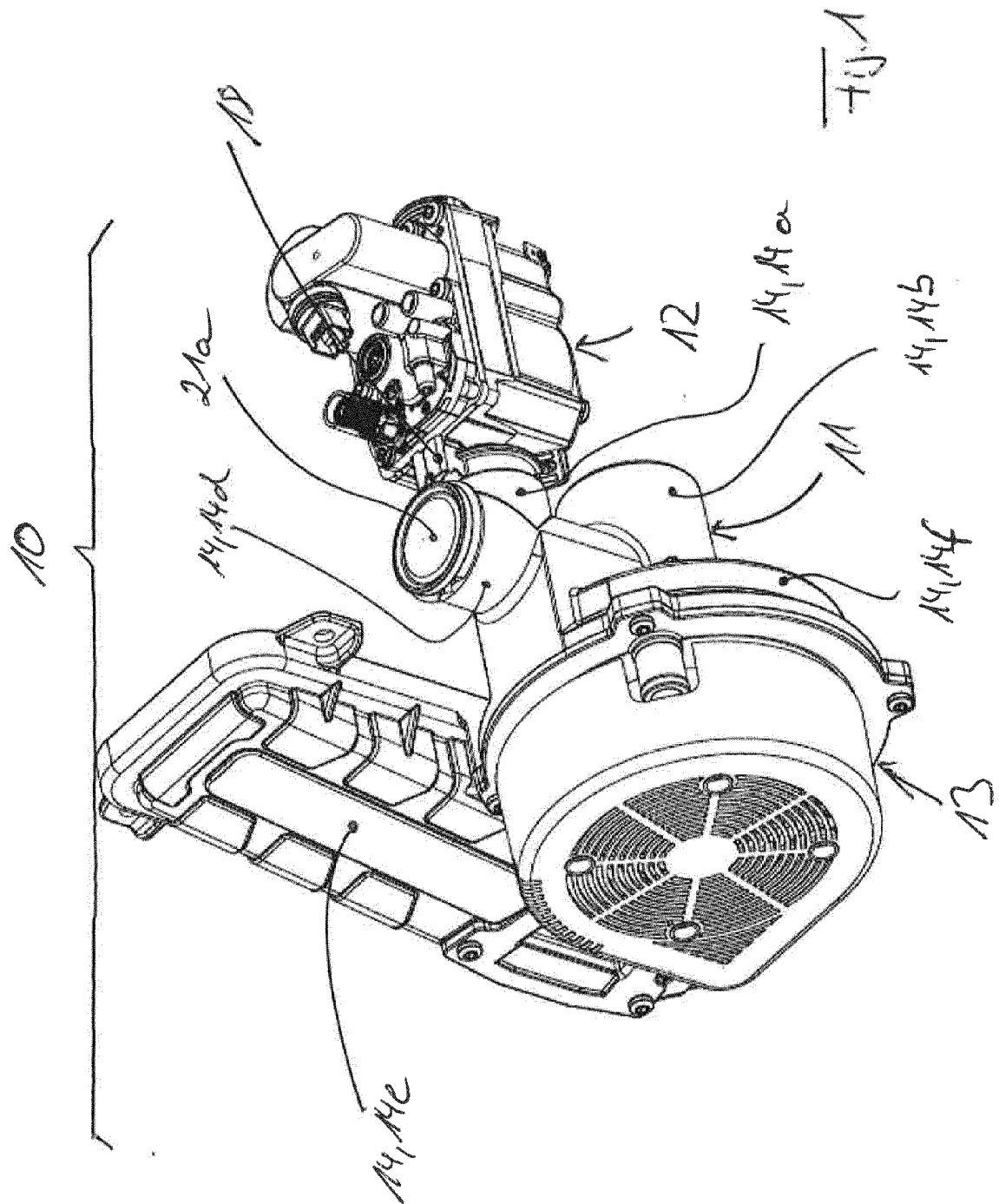
- 29 recess
- 30 sealing element
- 31 sealing element
- 32 wall section
- 33 snap-fit connection element
- 34 anti-rotation element
- 35 protrusion
- 36 recess
- 37 axis
- 38 axis
- 39 axis
- 40 axis
- 41 break-out element

Claims

1. Gas/Air mixing device (11) for a gas burner, having a housing (14) comprising a gas inlet section (14a) with a gas inlet opening (15) for gas, an air inlet section (14b) with an air inlet opening (16) for air, and a gas/air outlet section (14c) with an outlet opening (17) for a gas/air mixture, **characterized in that** the housing (14) further comprises a control pipe section (14d) with a control pipe opening (20) for accommodating at least one accessory element (21 a, 21 b);
the gas inlet section (14a) opens into the control pipe section (14d) and the control pipe section (14d) opens to the air inlet section (14b) in such a way that an axis (40) the gas flow through the control pipe section (14d) runs almost perpendicular to an axis (39) of a gas flow through the gas inlet section (14a) and almost perpendicular to the axis (37) of the air flow through the air inlet section (14b);
the gas inlet section (14a), the air inlet section (14b), the gas/air outlet section (14c) and the control pipe section (14d) are all integral parts of a monolithic housing (14).
2. Gas/Air mixing device as claimed claim 1, **characterized in that** the control pipe section (14d) opens to the air inlet section (14b) through a main opening (24) and through a bypass opening (25).
3. Gas/Air mixing device as claimed claim 2, **characterized in that** the bypass opening (25) is closed by a break-out section (41) being removable when an accessory element becomes inserted into the control pipe section (14d) which makes use of the bypass opening (25).
4. Gas/Air mixing device as claimed in one of claims 1 to 3, **characterized in that** the air inlet section (14b) accommodates a mixing unit (26) for mixing gas and air.
5. Gas/Air mixing device as claimed in claim 4, **char-**

acterized in that the mixing unit (26) is a venturi nozzle.

6. Gas/Air mixing device as claimed in claim 4 or 5, **characterized in that** the mixing unit (26) is mounted within the air inlet section (14b) of the housing (14) by at least one snap-fit connection element (27) or bayonet connection element.
7. Gas/Air mixing device as claimed in one of claims 1 to 6, **characterized in that** the control pipe section (14d) accommodates at least one accessory element providing a seal plug function and/or a gas type switch function and/or a measuring function and/or a control function.
8. Gas/Air mixing device as claimed in one of claims 1 to 7, **characterized in that** the respective accessory element is mounted within the control pipe section (14d) of the housing (14) by at least one snap-fit connection element (33) or bayonet connection element.
9. Gas/Air mixing device as claimed in one of claims 1 to 8, **characterized in that** the respective accessory element is mounted within the control pipe section (14d) of the housing (14) by at least one anti-rotation (34).
10. Gas/Air mixing device as claimed in one of claims 1 to 9, **characterized in that** an axis (37) of an air flow through the air inlet section (14b) and an axis (38) of a gas/air mixture flow through the gas/air outlet section (14c) fall together.
11. Gas/Air mixing device as claimed in claims 10, **characterized in that** an axis (39) of a gas flow through the gas inlet section (14a) runs almost perpendicular or almost parallel to the axis (37) of the air flow through the air inlet section (14b).
12. Gas/Air mixing device as claimed in one of claims 1 to 11, **characterized in that** a burner door (14e) for a gas burner and/or a fan housing part (14f) for a fan are also an integral part of the monolithic housing (14).
13. Assembly (10) for a gas burner having, a gas control valve (12) for providing a gas flow, a fan (13) for providing an air flow, and a gas/air mixing device (11) as claimed in one of claims 1 to 12.
14. Assembly as claimed in claim 13, **characterized in that** the gas control valve (12) is connected to the gas inlet section (14a) of the housing (14) of the gas/air mixing device (11) and that the fan (13) is connected to the air inlet section (14b) or to the gas/air outlet section (14c) of the housing (14) of the gas/air mixing device (11).



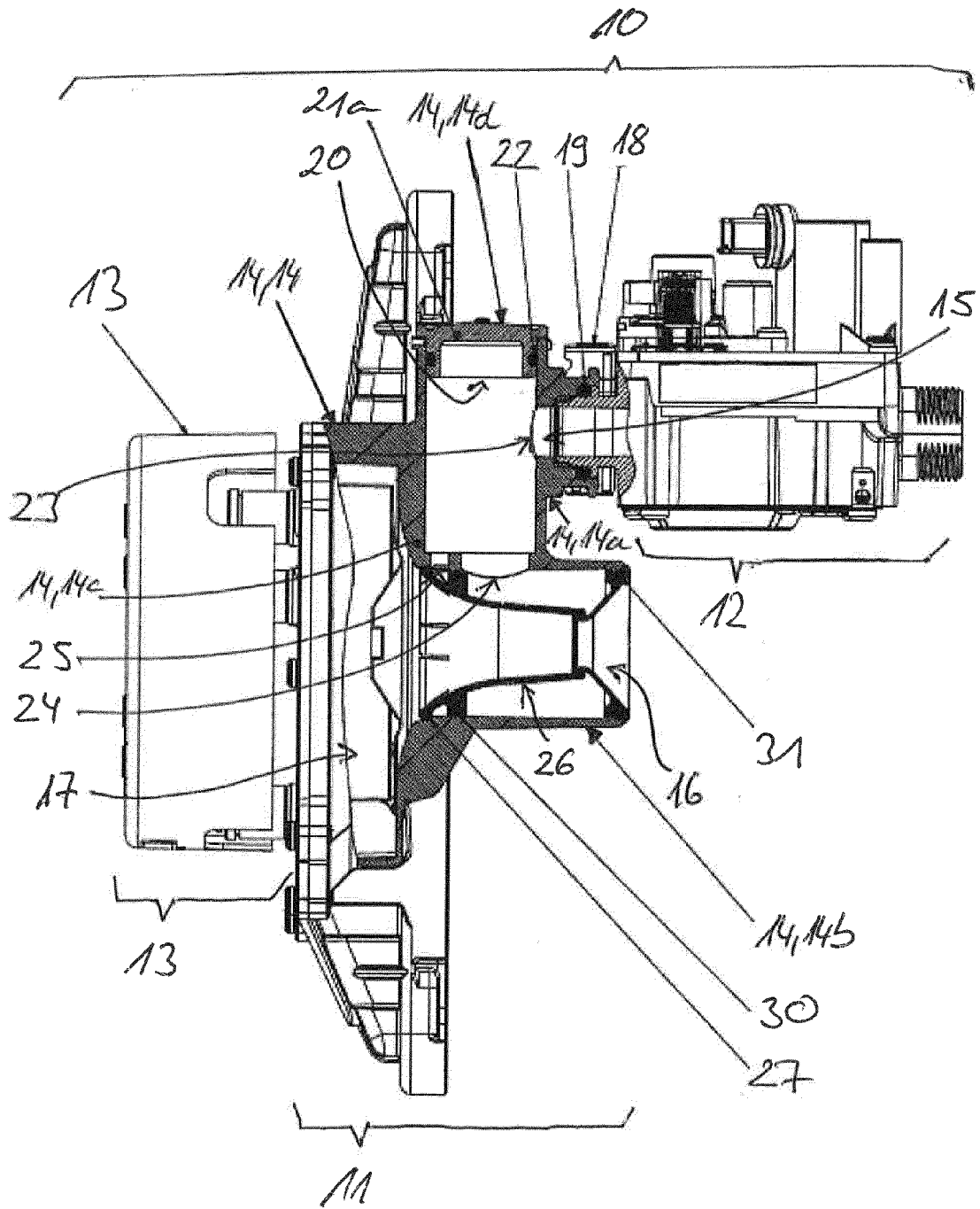
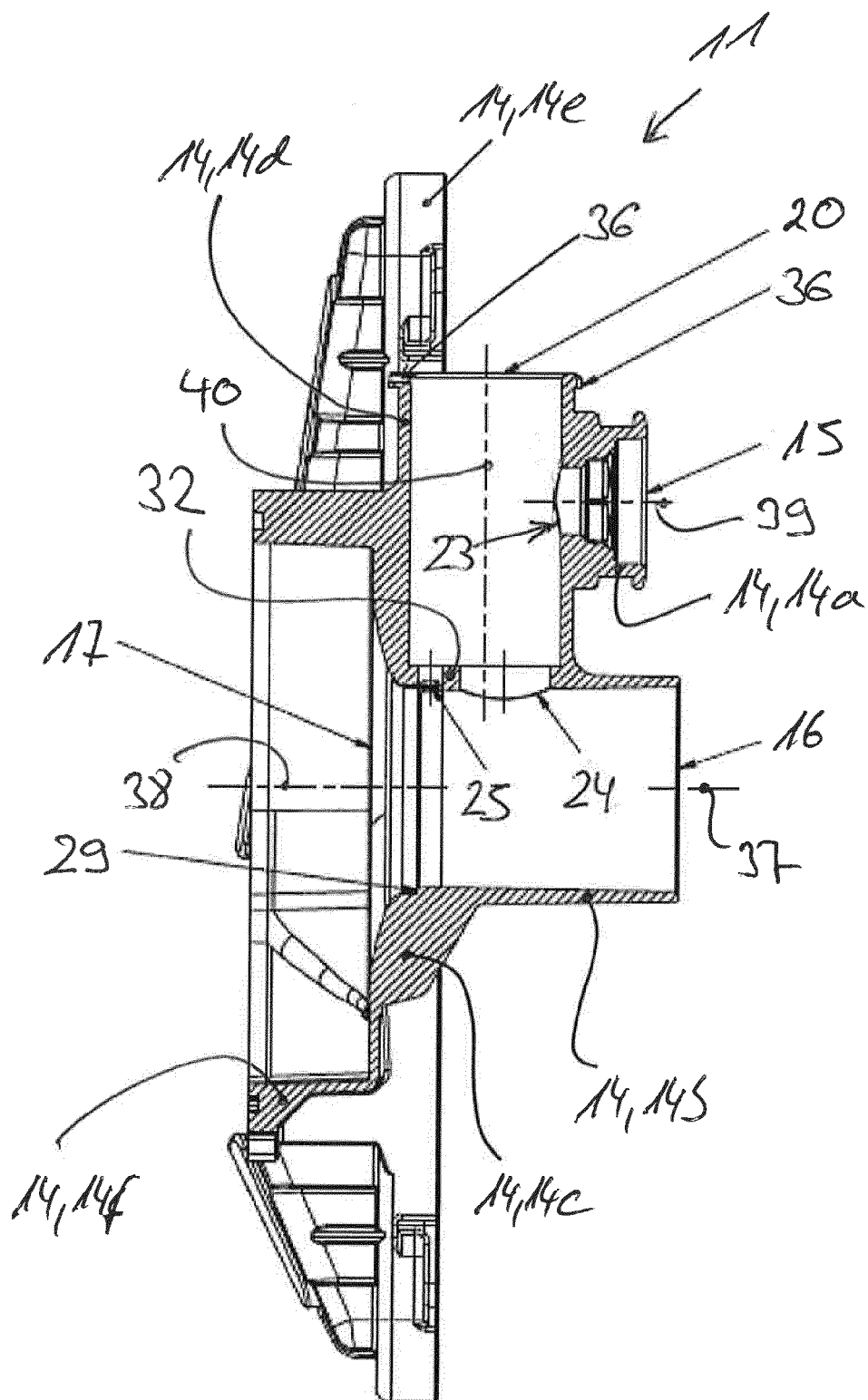
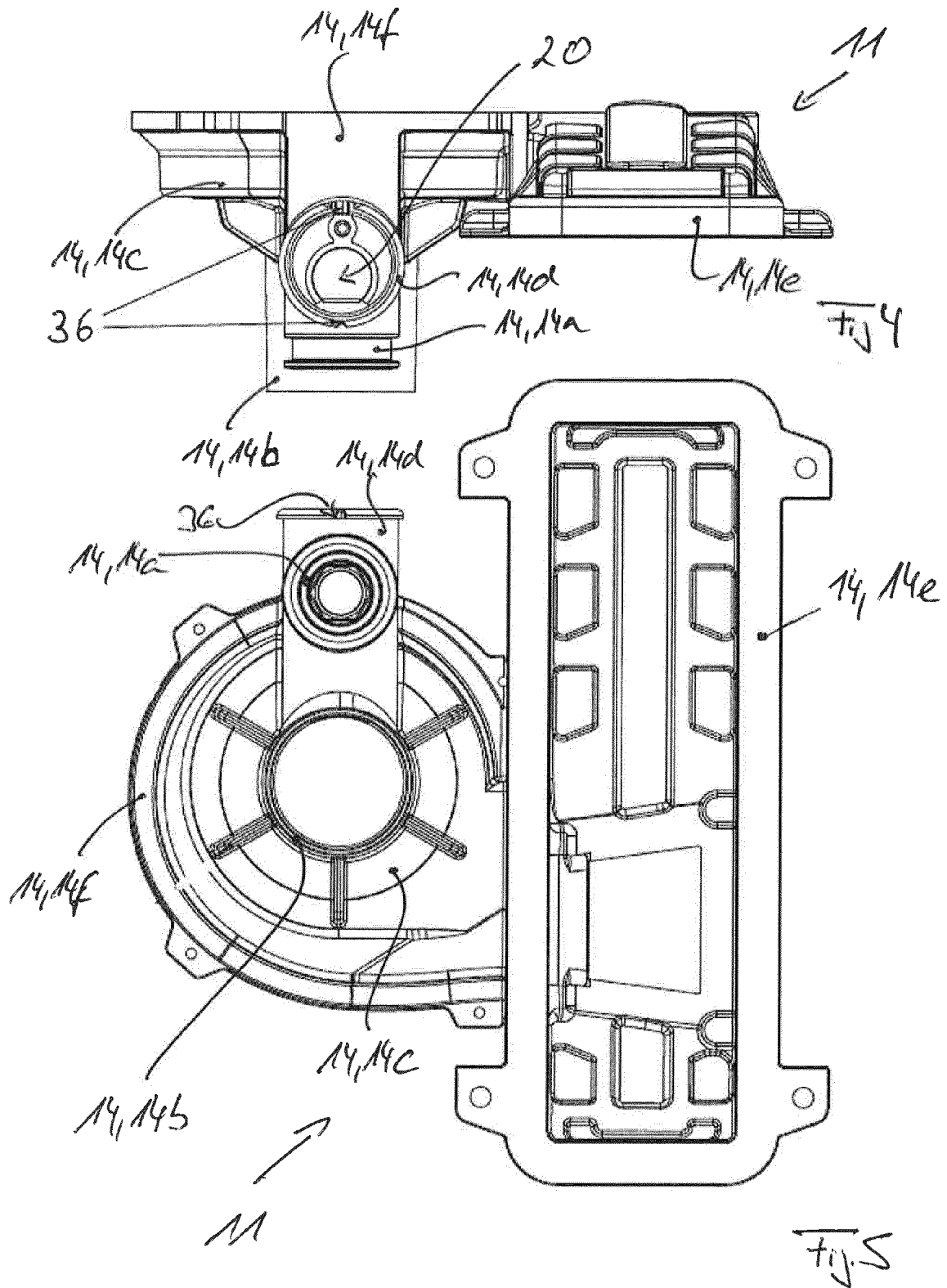
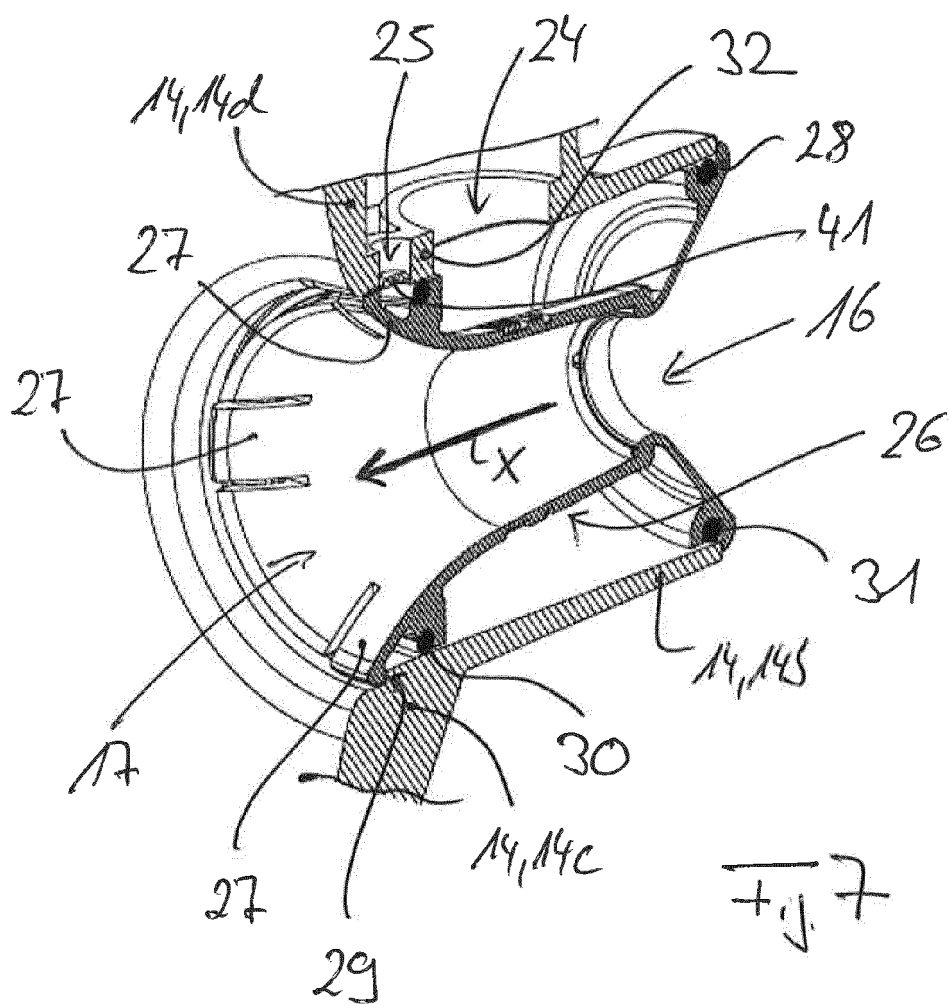
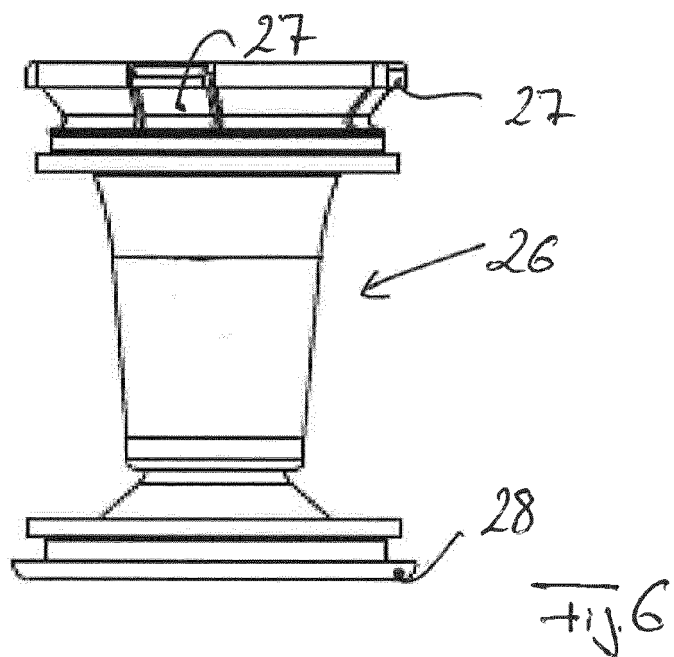


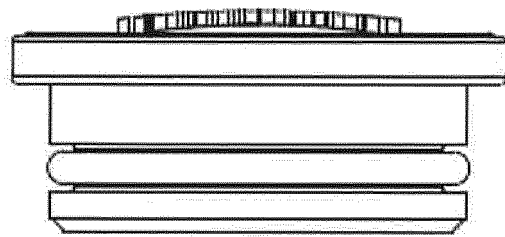
Fig. 2



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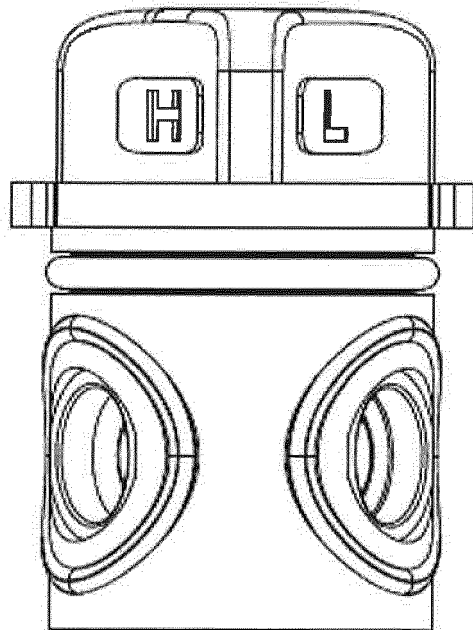






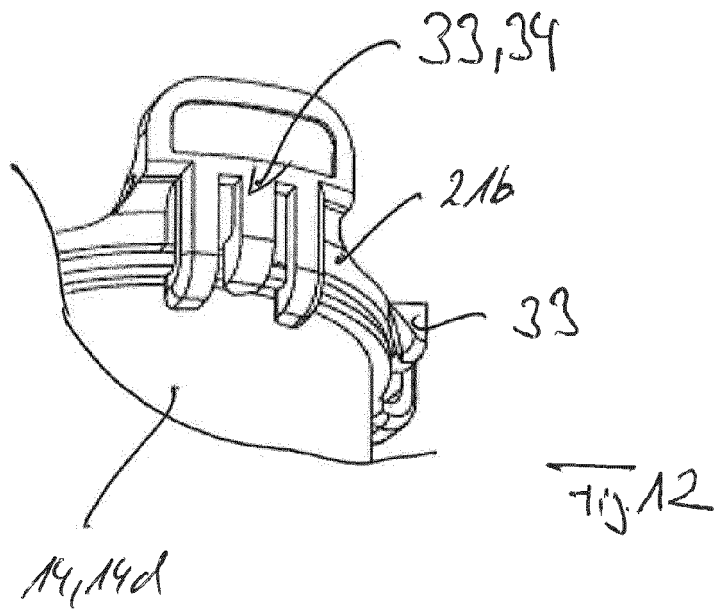
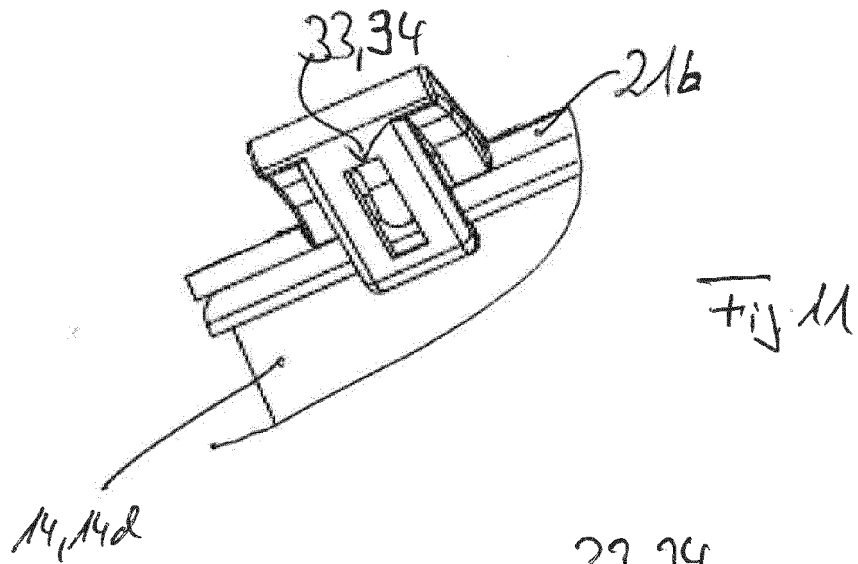
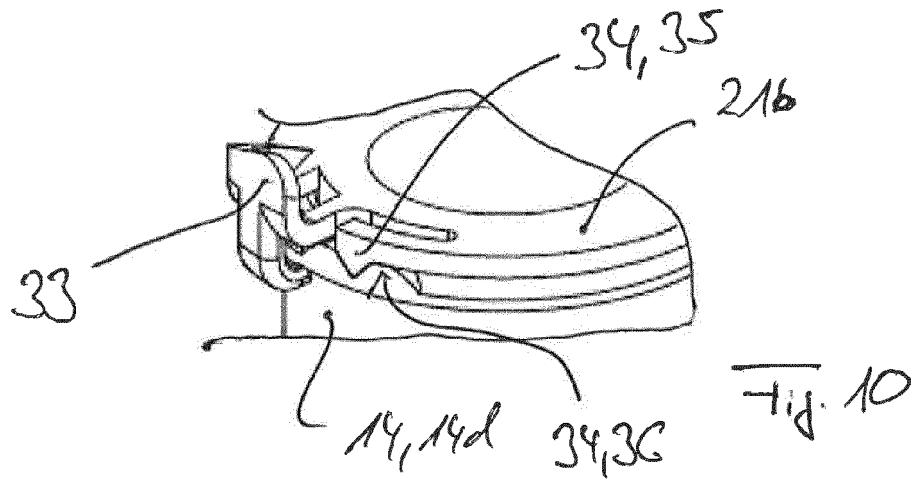
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Fig. 8



21S
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Fig. 9





EUROPEAN SEARCH REPORT

Application Number
EP 14 16 3196

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REFERENCES CITED IN THE DESCRIPTION

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