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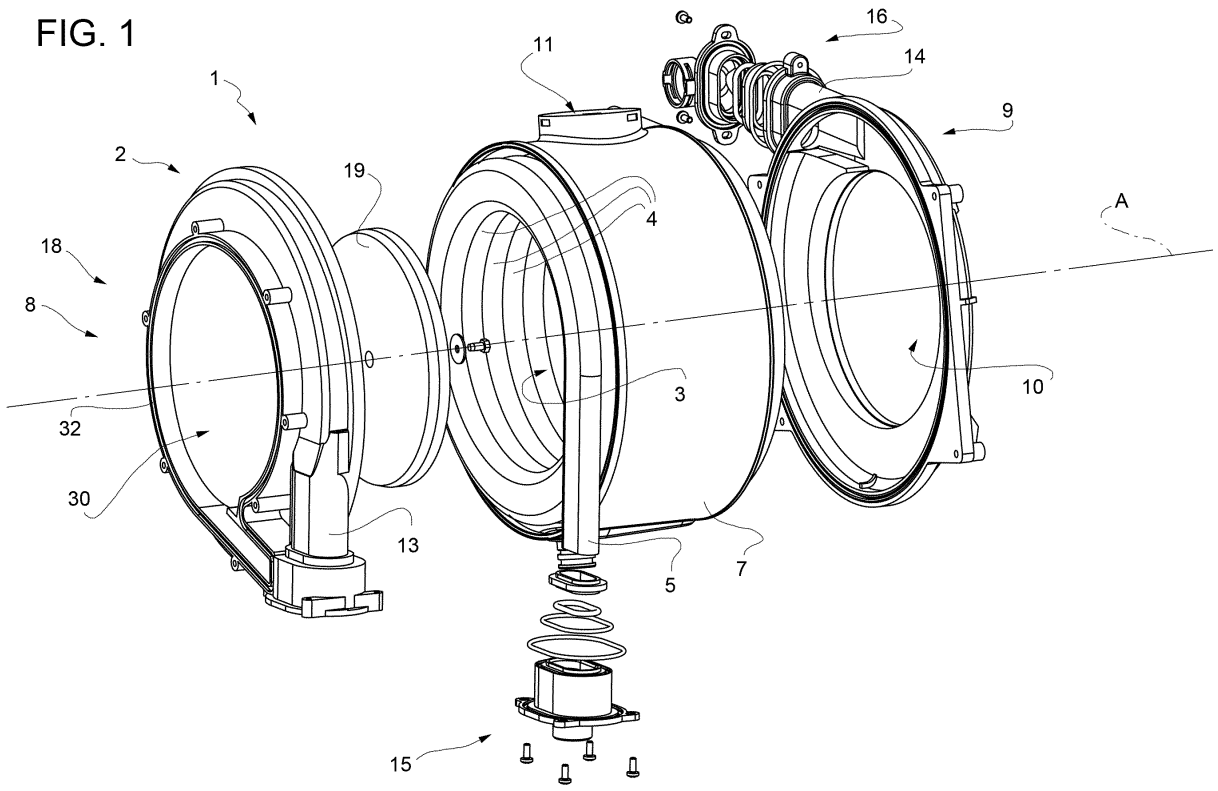
(54) HEAT EXCHANGER FOR HEATING WATER IN A DOMESTIC BOILER OR A WATER HEATER

(57) A heat exchanger (1) for heating water in a domestic boiler or a water heater has a casing (2); and a tubular member (3), which is configured for conveying water, is wound in a helix about a given axis (A) for forming a plurality of adjacent coils (4) housed in the casing (2), wherein the casing (2) comprises an end wall (8), which has a inner face (17) and an outer face (18); and is configured for supporting a thermally insulating device (19) along the inner face (17), and for defining an auxiliary heat exchanger (20) along the outer face (18).

FIG. 1



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Description

[0001] The invention relates to a heat exchanger for heating water in a domestic boiler or a water heater.

[0002] In particular, the invention relates to a heat exchanger comprising a casing; and a tubular member, which is wound, in a spiral shape, about a given axis, so as to form a plurality of adjacent loops, which are housed inside the casing. The tubular member, wound in a helix shape, is flown through by water, while combustion fumes or, more generically, hot gases containing water vapour flow in the casing. The loops are spaced apart from one another so as to form an empty space where the combustion fumes can flow. In particular, the heat exchanger described above is configured for defining a path for the hot gases extending between the adjacent loops, so as to optimize the heat exchange between the hot gases and the water flowing in the tubular member. To this regard, the dimensions of the tubular member, the shape of the cross section of the tubular member and the dimensions of the empty space between the adjacent coils are very relevant parameters in order to optimize the heat exchange.

[0003] Documents EP 1,627,190 B1; EP 1,600,708 A1; EP 1,750,070 A1; EP 1,750,069 A1; EP 1,752,718 A1 show some significant examples of heat exchangers for domestic boilers.

[0004] Document EP 1,627,190 B1 discloses how to produce a heat exchanger by means of a method comprising the steps of producing a straight tubular member, made of aluminium, by means of an extrusion process; winding the tubular member in a helix shape about a given axis so as for form a plurality of adjacent coils; arranging spacers between the adjacent coils; and closing the tubular member, wound in a helix shape, in a casing. The casing of the heat exchanger has a lateral wall, generally having a substantially cylindrical shape; and two end walls. One of the two end walls has a substantially annular shape and is configured for housing a burner, while the other end wall has a substantially disc-like shape and is generally subjected to a strong heating. Therefore, there is the problem of limiting the transmission of heat to the outside through this end wall.

[0005] The object of the invention is to provide a heat exchanger configured for limiting heat losses to the outside.

[0006] According to the invention there is provided a heat exchanger for producing hot water, the heat exchanger comprising a casing; and a tubular member, which is configured for being flown through water to be heated, and is wound in a helix about a given axis for forming a plurality of adjacent coils housed in the casing, wherein the casing comprises an end wall, which has a inner face and an outer face; and is configured for supporting a thermally insulating device along the inner face, and for defining an auxiliary heat exchanger along the outer face.

[0007] In other words, the end wall is designed for being equipped with a thermally insulating device or with an auxiliary heat exchanger. The choice between the thermally insulating device and the heat exchanger is made based on the layout, the dimensions of the heat exchanger, and the desired degree of efficiency of the heat exchange. Therefore, the invention allows you to produce a heat exchanger that is highly versatile and capable of equipping domestic boilers of different ranges.

[0008] In particular, the end wall comprises mounting members for mounting the thermally insulating device, said mounting member being arranged along the inner face.

[0009] Basically, the end wall has an inner face configured for mounting and housing the thermally insulating device.

[0010] In this specific case, the end wall has a central seat along the inner face for housing the thermally insulating device and a further seat along the inner face for housing an end coil, in particular the further seat extends about the central seat, has an annular shape, and is divided from the central seat by an annular partition.

[0011] In particular, the thermally insulating device is a panel of insulting material, which preferably has the shape of a disc having a through hole for fixing it to the end wall.

[0012] In particular, the end wall has a looped rib, which defines a space along the outer face, the rib is configured for being joined to a flange so that the space can convey water.

[0013] The heat exchanger, besides limiting heat losses towards the outside, can be configured for increasing thermal efficiency.

[0014] In particular, the auxiliary heat exchanger is hydraulically connectable to an end section of the tubular member. In this case, water flows from the space to the tubular member after having received heat through the end wall.

[0015] In particular, the end wall comprises a tubular body, which is in communication with the space and is configured for housing an end section of the tubular member and a first hydraulic fitting for hydraulically connecting the tubular member with a conduit of a hydraulic circuit or a second hydraulic fitting for hydraulically connecting the tubular member to the auxiliary heat exchanger.

[0016] Basically, the water path is pre-selected based on the presence of the auxiliary heat exchanger in the end wall, simply using the first or the second hydraulic fitting.

[0017] In particular, the flange has an opening configured for hydraulically connecting the auxiliary heat exchanger to a conduit of a hydraulic circuit.

[0018] In particular, the flange comprises a partition configured to define a given path for the water to be heated in said space; in particular, the partition is spiral-shaped for defining a spiral-shaped path.

[0019] The spiral-shaped path optimizes the heat exchange between the water to be heated and the end wall.

[0020] Further features and advantages of the inven-

tion will be best understood upon perusal of the following description of a non-limiting embodiment thereof, with reference to the accompanying drawing, wherein:

- Figures 1 and 2 are perspective views, partly exploded and with parts removed for greater clarity, of the heat exchanger according to the invention in a first arrangement;
- Figure 3 is a perspective view, partly exploded and with parts removed for greater clarity, of the heat exchanger of Figures 1 and 2 in a second arrangement; and
- Figure 4 is a perspective view, with parts removed for greater clarity, of a detail of Figure 3.

[0021] With reference to Figure 1, number 1 indicates, as a whole, a heat exchanger, which, in this specific case, is a condensing heat exchanger for heating water in a domestic boiler or in a water heater. In the case shown, the heat exchanger 1 comprises a casing 2 with a cylindrical shape; and a tubular member 3, which is partly wound, in a helix shape, about an axis A so as to form coils 4 and two straight end sections 5 and 6 and is housed in the casing 2.

[0022] The casing 2 comprises a lateral wall 7, which has a substantially cylindrical shape and is preferably made of a metal material, such as for example aluminium, or of a plastic material; an end wall 8 substantially shaped like a disc; and an end wall 9 with a substantially annular shape. The end walls 8 and 9 are coupled to the lateral wall 7 so as to form the casing 2, which delimits a combustion fumes circulation chamber. In this specific case, the end wall 9 has a central opening 10 for housing a burner with a cylindrical shape, not shown in the accompanying Figures, which is partly arranged inside the combustion fumes circulation chamber. Alternatively, the hot fumes are conveyed through the central opening 19 by means of channels that are not shown in the accompanying Figures. The lateral wall 7 comprises an opening 11 for the extraction of the combustion fumes and an opening 12 for the extraction of the condensate (Figure 2).

[0023] The end sections 5 and 6 are partly housed inside tubular bodies 13 and 14, which are an integral part of the casing, are respectively obtained in the end wall 8 and in the end wall 9, and are configured for being coupled to respective hydraulic fittings 15 and 16 so as to adjust and hydraulically connect the tubular member 3 to conduits of the hydraulic circuit, which is not shown in the accompanying Figures.

[0024] More in detail, the end wall 8 has an inner face 17 and an outer face 18, and is configured for supporting a thermally insulating device 19 along the inner face 17 and for defining an auxiliary heat exchanger 20 along the outer face 18. The end wall 8 comprises mounting elements 3 for fixing the thermally insulating device 19 to the end wall 8. In this specific case, the mounting elements comprise a pin 21, which is integral to the end wall 8 and is arranged centrally relative to the end wall 8 along the inner face 17; a screw 22, which can be coupled to the pin 21; and a washer 23. In this specific case, the thermally insulating device 19 is a panel of thermally insulating material, which has a central hole 24 designed to house the pin 21. In this specific case, the panel of thermally insulating material has a circular shape and has a diameter that is slightly smaller than the inner diameter of the coils 4.

[0025] The end wall 8 has a central seat 25 along the inner face 17 for housing the thermally insulating device 19 and radial ribs 26 for avoiding an extended contact between the thermally insulating device 19 and the end wall 8. The end wall 8 has a seat 27 along the inner face 17 for housing, at least partly, an end coil. The seat 27 has an annular shape, extends about the central seat 25, and is divided from the central seat 25 by an annular partition 28. The seat 27 leads into the tubular body 13, which forms one single piece together with the end wall 8.

[0026] In Figures 1 and 2 and in the relative description there is disclosed an arrangement of the heat exchanger 1 provided with the thermally insulating material 19. In Figures 3 and 4 and in the relative description below there is disclosed an arrangement of the heat exchanger 1 equipped with the auxiliary heat exchanger 20 instead of the thermally insulating device 19, and with a hydraulic fitting 29 instead of the hydraulic fitting 15.

[0027] Basically, the auxiliary heat exchanger 20 transfers, to the water flowing into the heat exchanger 1, heat that would otherwise be released to the outside of the heat exchanger 1. In order to define the auxiliary heat exchanger 20, the end wall 8 has a space 30 along the outer face 18, which is configured for being enclosed by a flange 31 and for being flown through by water. In this specific case, the space 30 is laterally delimited by a looped rib 32, which is integral to the end wall 8, projects parallel to the axis A, and has seats for fixing elements 33, which are configured for mounting the flange 31 on the rib 32. The space 30 leads into the tubular body 13. The hydraulic connection between the space 30 and the tubular member 3 is made possible by the hydraulic fitting 29, which has a blind flange 34 mounted on the tubular body 13 and a conveying portion 35 integral to the blind flange 34 and having a lateral opening 36 facing the space 30.

[0028] The flange 31 comprises an opening 37 configured for hydraulically connecting the space 30 to a conduit of the hydraulic circuit, not shown herein and on the outside of the heat exchanger 1.

[0029] The flange 31 comprises a partition 38, which is configured to define a given path for the water in said space 30. In particular, the partition 38 is spiral-shaped for defining a spiral-shaped path between the tubular body 13 and the opening 37.

[0030] Finally, it is clear that the invention described herein can be subjected to changes and variations, without for this reason going beyond the scope of protection of the appended claims.

Claims

1. A heat exchanger for heating water in a domestic boiler or a water heater, the heat exchanger (1) comprising a casing (2); and a tubular member (3), which is configured for conveying water, is wound in a helix about a given axis (A) for forming a plurality of adjacent coils (4) housed in the casing (2), wherein the casing (2) comprises an end wall (8), which has a inner face (17) and an outer face (18); and is configured for supporting a thermally insulating device (19) along the inner face (17), and for defining an auxiliary heat exchanger (20) along the outer face (18).

2. The heat exchanger as claimed in Claim 1, wherein the end wall (8) comprises mounting members (21, 22, 23) for mounting the thermally insulating device (19), said mounting member being arranged along the inner face(17).

3. The heat exchanger as claimed in Claim 1 or 2, wherein the end wall (8) has a central seat (25) along the inner face (17) for housing the thermally insulating device (19).

4. The heat exchanger as claimed in any one of the foregoing Claims, wherein the end wall (8) has a further seat (27) along the inner face (17) for housing an end coil (4), in particular the further seat (27) extends about the central seat (25), has an annular shape, and is divided from the central seat (25) by an annular partition (28).

5. The heat exchanger as claimed in any one of the foregoing Claims, wherein the thermally insulating device (19) is a panel of insulting material.

6. The heat exchanger as claimed in any one of the foregoing Claims, wherein the end wall (8) has a looped rib (32), which defines a space (30) along the outer face (18), the rib (32) is configured for being joined to a flange (31) so that the space (30) can convey water.

7. The heat exchanger as claimed in any one of the foregoing Claims, wherein the auxiliary heat exchanger (20) is hydraulically connectable to an end section (5) of the tubular member (3).

8. The heat exchanger as claimed in any one of the foregoing Claims, wherein the end wall (8) comprises a tubular body (13), which is configured for housing the end section (5) of the tubular member (3) and a first hydraulic fitting (15) for hydraulically connecting the tubular member (3) with a conduit of a hydraulic circuit or a second hydraulic fitting (29) for hydraulically connecting the tubular member (3) to the auxiliary heat exchanger (20).

9. The heat exchanger as claimed in any one of the Claims from 6 to 8, wherein the flange (30) has an opening (37) configured for hydraulically connecting the auxiliary heat exchanger (20) to a conduit of a hydraulic circuit.

10. The heat exchanger as claimed in any one of the Claims from 6 to 9, wherein the flange (31) comprises a partition (38) configured to define a given path for the water in said space (30); in particular the partition (38) is spiral-shaped for defining a spiral-shaped path.

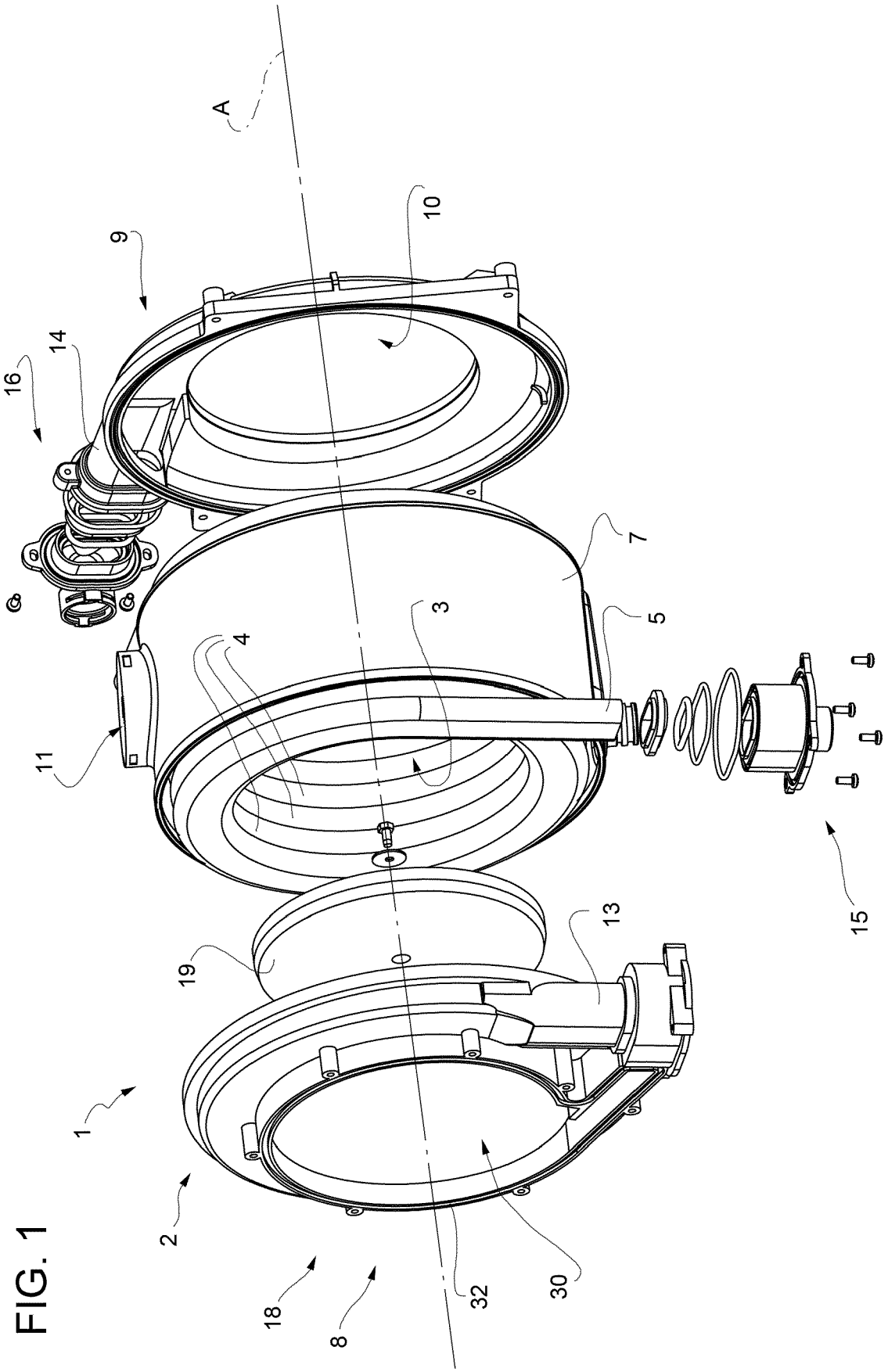


FIG. 1

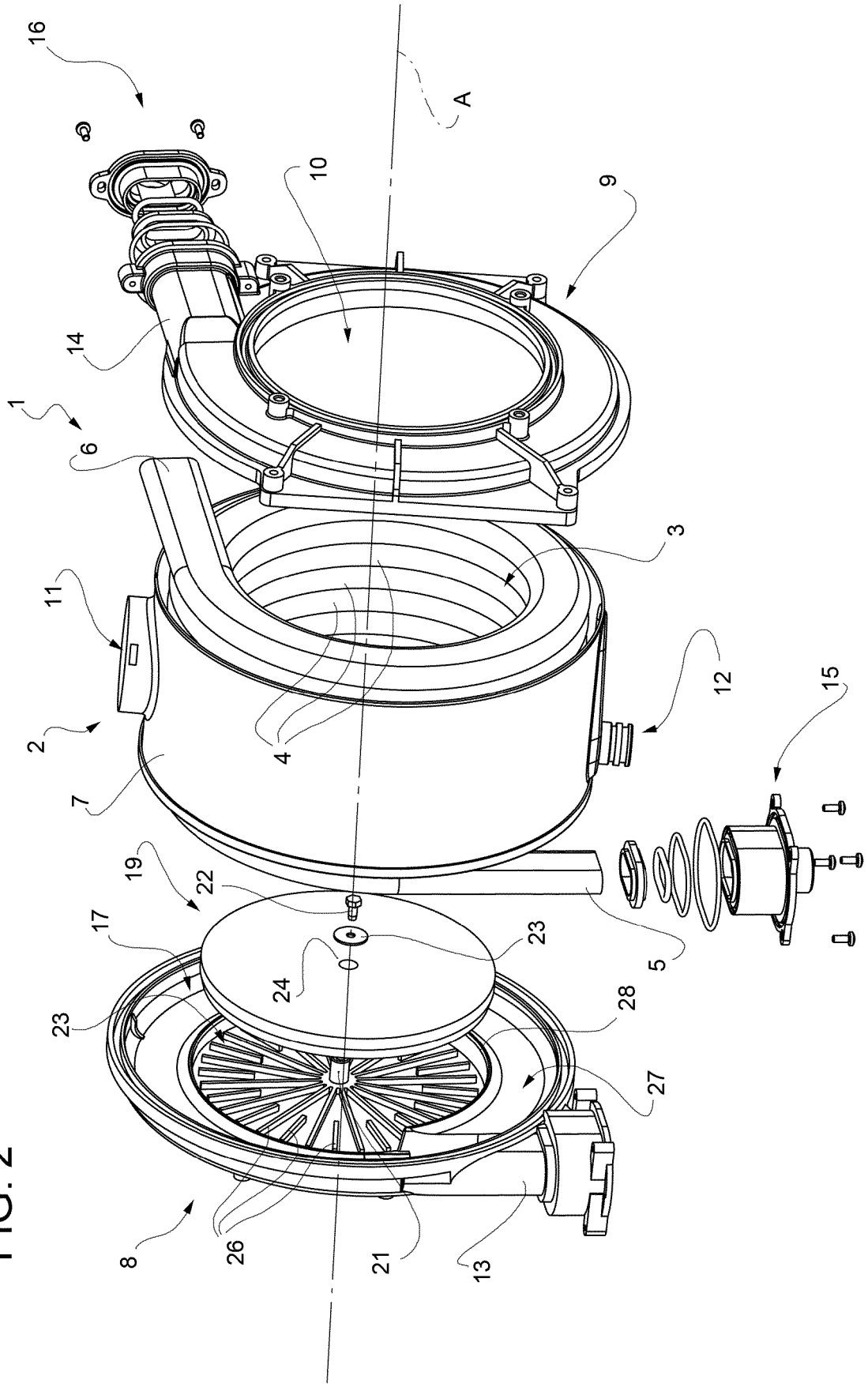


FIG. 2

FIG. 3

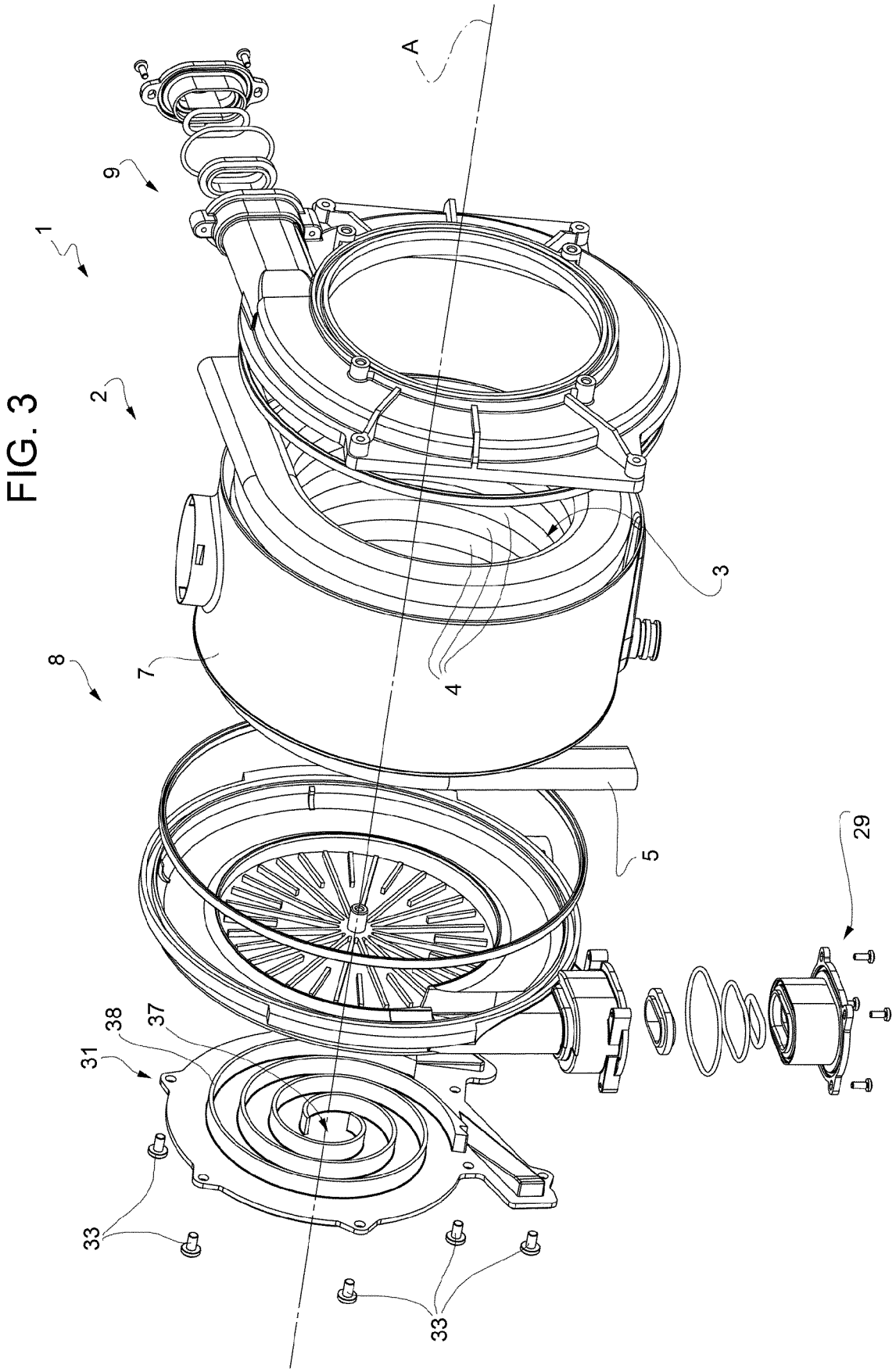
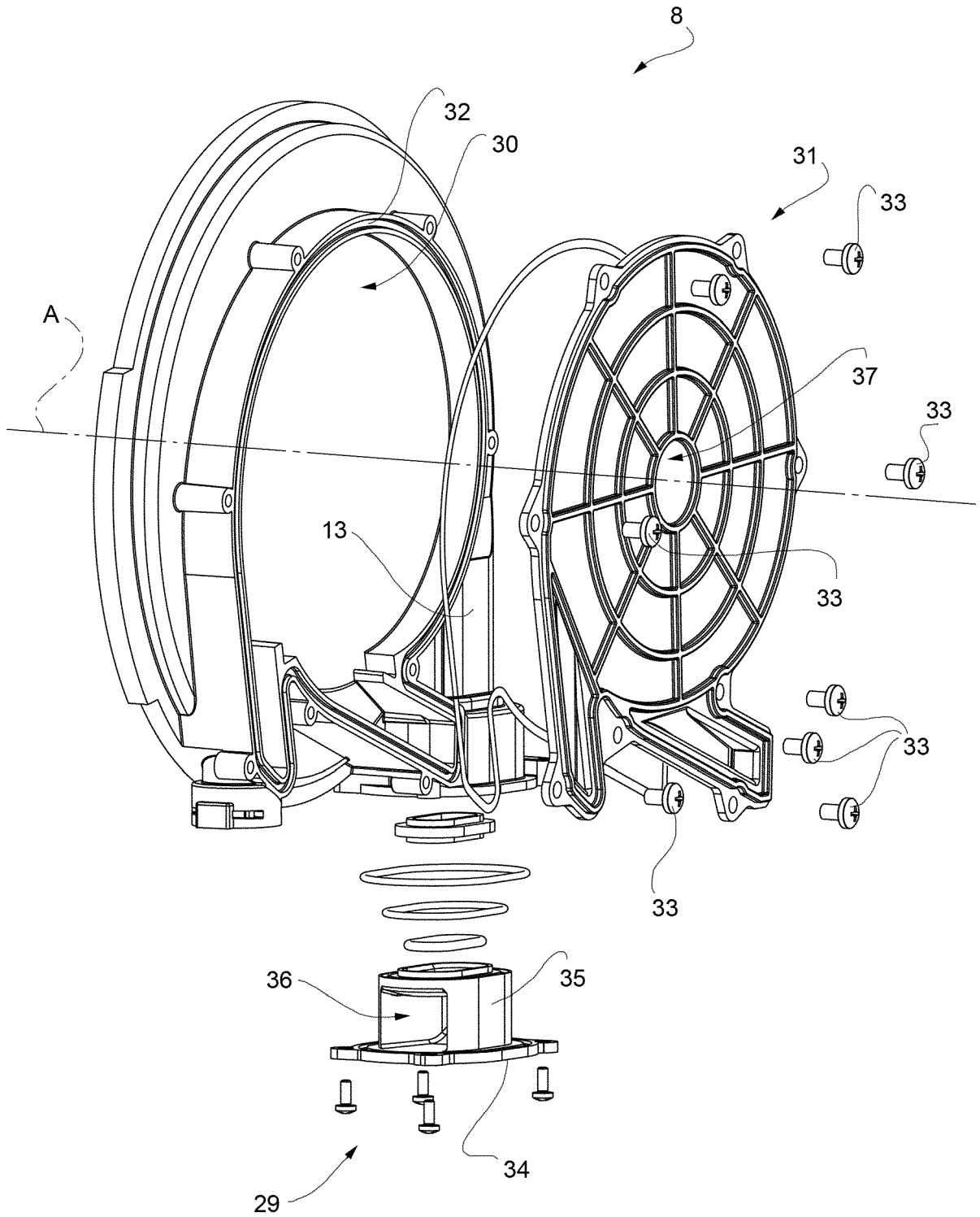


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 16 18 7766

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F24H
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 January 2017	García Moncayo, O

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