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(54) Title: HYDRAULIC UNIT

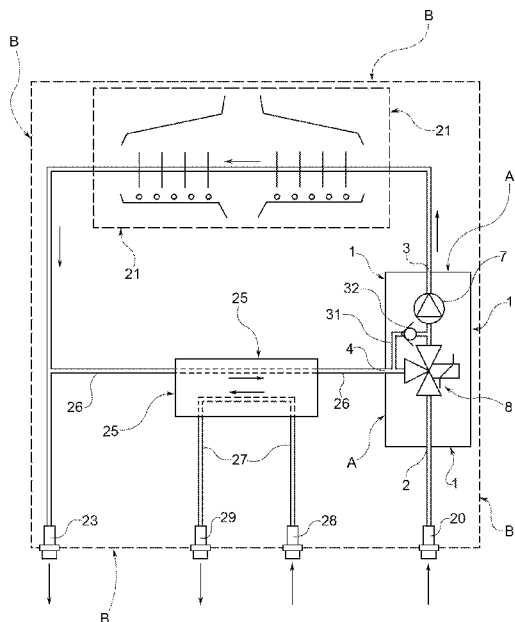


FIG. 3

(57) Abstract: The pumping unit (A) is intended for a boiler (B) comprising a primary heat exchanger (21) for heating a flow of water for use in a heating circuit (22, 24), a secondary heat exchanger (25) for transferring heat from a flow of water coming from the primary heat exchanger (21) to a flow of domestic water, and a by-pass conduit (31) for protecting the primary heat exchanger (21). The pumping unit (A) comprises a body (1) with an outlet (3) and a first inlet (2), for connection to the primary heat exchanger (21) and to a return pipe of the heating circuit (22, 24), respectively, and with a second inlet (4) intended to receive a flow of heating water from the secondary heat exchanger (25). A circulation pump (7) and a three-way solenoid valve (8), in series with one another, are provided between the outlet (3) and the first inlet (2) in the body (1), the valve being further connected to the second inlet (4). The by-pass conduit (31) is formed inside the body (1).

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**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *of inventorship (Rule 4.17(iv))*

**Published:**

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

## HYDRAULIC UNIT

The present invention relates to a pumping unit for a boiler of an installation for heating and for generating domestic hot water, of the type defined in the preamble of the appended Claim 1.

Figure 1 of the appended drawings schematically illustrates a boiler B of a known type, which comprises a pumping unit indicated as a whole by A. This unit A is connected between an inlet connector 20 and a primary heat exchanger 21 intended to heat a flow of water for use in a heating circuit comprising (for example) piping 22 which extends between an outlet connector 23 and the inlet connector 20, and along which one or more radiators 24 are interposed. The boiler B further comprises a secondary heat exchanger 25, of the liquid/liquid type, for example a plate heat exchanger, for transferring heat from a water flow coming from the primary heat exchanger 21, and flowing in a pipe 26, to a flow of domestic water in piping 27 which extends between two connectors 28, 29 of the boiler. The connector 28 is intended to be connected to a source of supply for the plumbing system, for example the mains supply, and the connector 29 can be connected to a tap 30 for supplying heated domestic water.

The pumping unit A comprises, in a known way, a body 1, made of moulded plastic material for example, having a first inlet 2 and an outlet 3, for connection to the connector 20 (and therefore to the return pipe of the heating circuit 22, 24) and to the inlet of the primary heat exchanger 21, respectively. The body 1 also has two further inlets 4 and 5, connected, respectively, to the secondary heat exchanger 25 and to a by-pass conduit 31 in which a one-way valve 32 can be interposed. This by-pass conduit extends essentially in parallel with the primary heat exchanger 21, between the outlet of the latter and the inlet 5 of the pumping unit A.

A circulation pump 7 and a three-way solenoid valve indicated as a whole by 8 are provided, in series with each other, between the outlet 3 and the inlet 2 of the body 1 of the pumping unit A. This solenoid valve 8 has an inlet connected to the inlet connectors 2 and

5 of the body 1, and a further inlet connected to the inlet connector 4 of this body, and thus to the secondary heat exchanger 25.

In the prior art solution shown in Figure 1, if the connectors 20 and 23 are both closed while the three-way solenoid valve 8 is in the "heating position" (in which it connects the inlet 2 to the pump 7, while it disconnects the inlet 4 from this pump), the circulation of the heating water inside the primary heat exchanger 21 continues to be provided through the by-pass conduit 31 and the one-way valve 32, if present, associated therewith. This provides effective protection of the primary heat exchanger 21.

However, the prior art solution described above has a number of drawbacks. In the first place, it requires the interconnection of a large number of components, using a considerable number of plumbing connections. It therefore gives rise to risks of leakage, and has excessive overall dimensions and cost.

One object of the present invention is to provide a pumping unit for a boiler of an installation for heating and for generating domestic hot water, which can overcome the aforementioned drawbacks of the prior art solutions.

This and other objects are achieved according to the invention with a pumping unit whose principal characteristics are defined in the appended Claim 1.

Further features and advantages of the invention will become clear from the following detailed description which is given, purely by way of non-limiting example, with reference to the appended drawings, in which:

Figure 1, described above, is a partial schematic illustration of a boiler for an installation for heating and for generating domestic hot water, including a pumping unit according to the prior art;

Figure 2 is a perspective view of a pumping unit according to the present invention;

Figure 3 is a diagram similar to that of Figure 1, and represents in a schematic and partial way a boiler for an installation for heating and for generating domestic hot water, including a pumping unit according to the present invention; and

Figure 4 is a partial perspective view, partially in a section taken along the line IV-IV of Figure 2.

In Figures 2 to 4, parts and elements described previously with respect to Figure 1 have been given the same alphabetic symbols and reference numerals as those used previously.

With reference to Figure 3 in particular, a pumping unit A according to the invention is primarily characterized in that the by-pass conduit 31 is also formed inside its body 1, and in that a one-way valve 32 can also be provided (if required) on the by-pass conduit and still inside the body 1. The by-pass conduit 31 is substantially in series with the primary pipe 26 of the secondary heat exchanger 25.

Because of this feature, the body 1 of the pumping unit A can have a smaller number of inlet connectors, since it is no longer necessary, in particular, to have the connector indicated by 5 in Figure 1. A further advantage of the solution according to the invention lies in the fact that the by-pass conduit 31 and the one-way valve 32, if present, are incorporated and pre-assembled in the pumping unit A. Consequently there is an appreciable reduction in the number of plumbing connections required for the assembly of the boiler B, and therefore a reduction in the risk of leakage.

The overall dimensions and cost are also substantially reduced.

As is apparent in the schematic illustration of Figure 3, the by-pass conduit 31 is formed in the body 1 between the second inlet 4 of this body and the inlet (pumping chamber) of the pump 7. The inlet 4 of the body 1 is coupled to the primary side of the secondary heat exchanger 25, not in a direct manner, but through a length of pipe 26. This arrangement can also be clearly seen in the detail shown in Figure 4, where the inlet (pumping chamber) of the pump 7 is indicated by 33.

It can be seen in Figures 2 and 4 that the solution according to the invention can be used to produce an extremely compact pumping unit A, with dimensions no greater than those of a similar pumping unit according to the prior art.

As an alternative to the embodiment described above, the by-pass conduit 31 can be formed in the body 1 between the inlets 2 and 4 of the solenoid valve 8, once again with or without the non-return valve 32.

As a further alternative, the by-pass conduit can be made in the form of a calibrated passage which passes through the plug of the solenoid valve 8 to allow a controlled trickle of liquid.

In a further variant, in place of a special by-pass conduit, the by-pass function for the protection of the primary heat exchanger 21 can be provided by the (forced) energization of the solenoid valve 8 by an associated control unit EU, such that the inlet 4 is put into communication with the inlet of the pump 7, still inside the body 1.

Clearly, provided that the principle of the invention is retained, the forms of application and the details of construction can be varied widely from what has been described and illustrated purely by way of non-limiting example, without thereby departing from the scope of protection of the invention as defined by the attached claims.

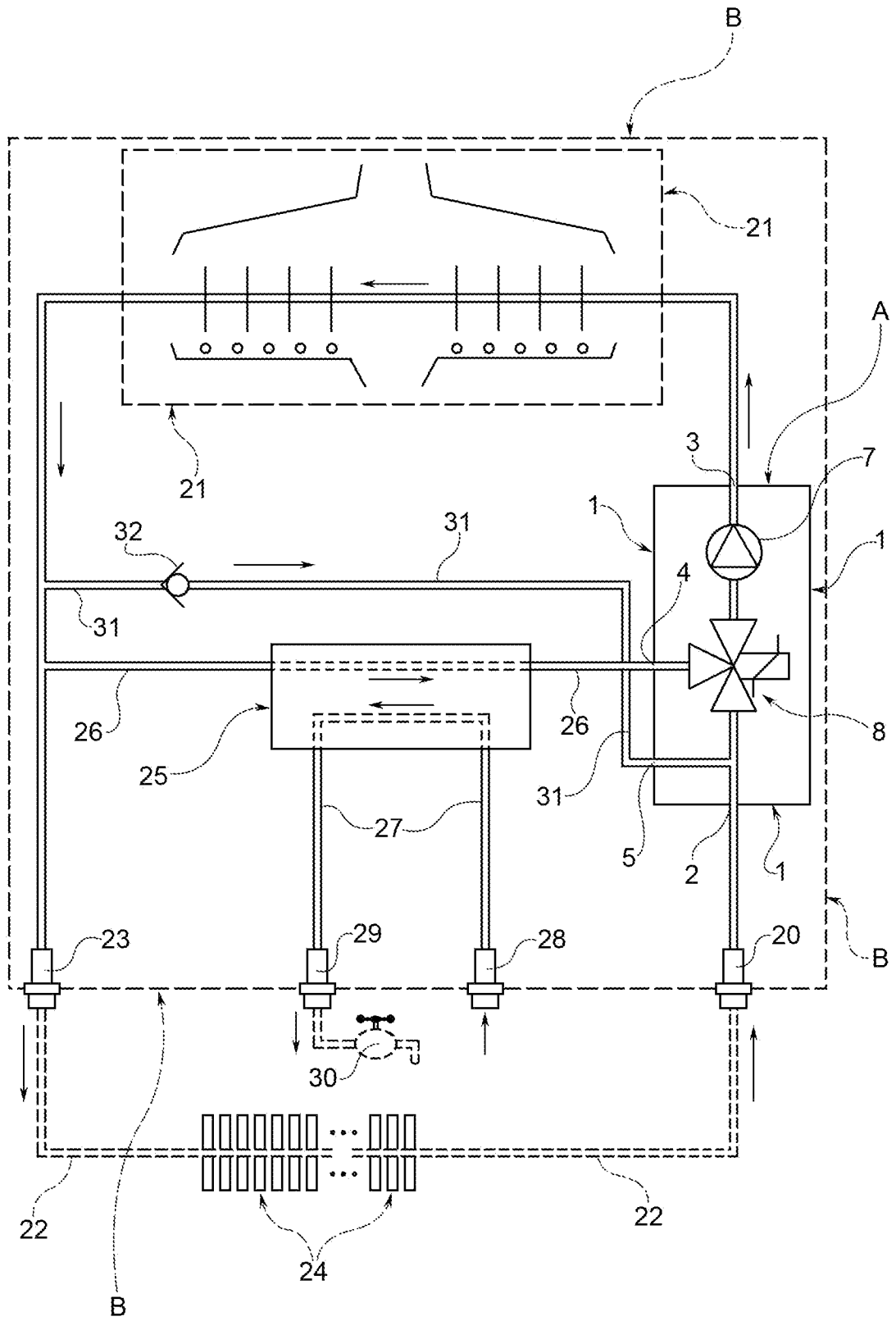
CLAIMS

1. Hydraulic pumping assembly (A) for a boiler (B) of an installation for heating and for the generation of warm sanitary water, the boiler (B) comprising
  - a primary heat exchanger (21) for heating a flow of water for use in a hydraulic heating circuit (22, 24);
  - a secondary heat exchanger (25) for transferring heat from a flow of water coming from the primary heat exchanger (21) to a flow of sanitary water; and
  - a by-pass conduit (31) for the protection of the primary heat exchanger (21);the hydraulic pumping assembly (A) comprising a body (1) with an outlet (3) and a first inlet (2), for connection to the primary heat exchanger (21) and to a return pipe of said heating circuit (22, 24), respectively, and with second inlet (4) intended to receive a flow of heating water from the secondary heat exchanger (25);
  - between the outlet (3) and the first inlet (2), in the body (1) there being provided a circulation pump (7) and a three-way electric valve (8), hydraulically in series with one another, said three-way electrical valve (8) being further connected to said second inlet (4);
  - the pumping assembly (A) being characterized in that said by-pass conduit (31) is provided inside said body (1).
2. Hydraulic pumping group according to Claim 1, characterized in that the by-pass conduit (31) is provided between the second inlet (4) of said body (1) and the pumping chamber (33) of said circulation pump (7).
3. Pumping assembly according to Claim 1, characterized in that said by-pass conduit (31) is provided between the first inlet (2) and the second inlet (4) of said body (1).
4. Pumping assembly according to Claim 1, characterized in that said by-pass conduit (31) is provided as a seeping conduit in the obturator or shutter of said electric valve (8).
5. Pumping assembly according to Claim 1, characterized in that the by-pass conduit is provided by causing a forced energization of said electrovalve (8) such as to put said first inlet (4) of the body (1) in communication with the inlet of the circulation pump (7).

6. Pumping assembly according to any of the preceding claims, characterized in that in said by-pass conduit (31) there is provided a one-direction hydraulic valve (32), equally provided inside said body (1).

7. Boiler (B) for an installation for heating and generating hot sanitary water, comprising a hydraulic pumping assembly (A) according to any of the preceding claims.

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**FIG. 1**  
(PRIOR ART)

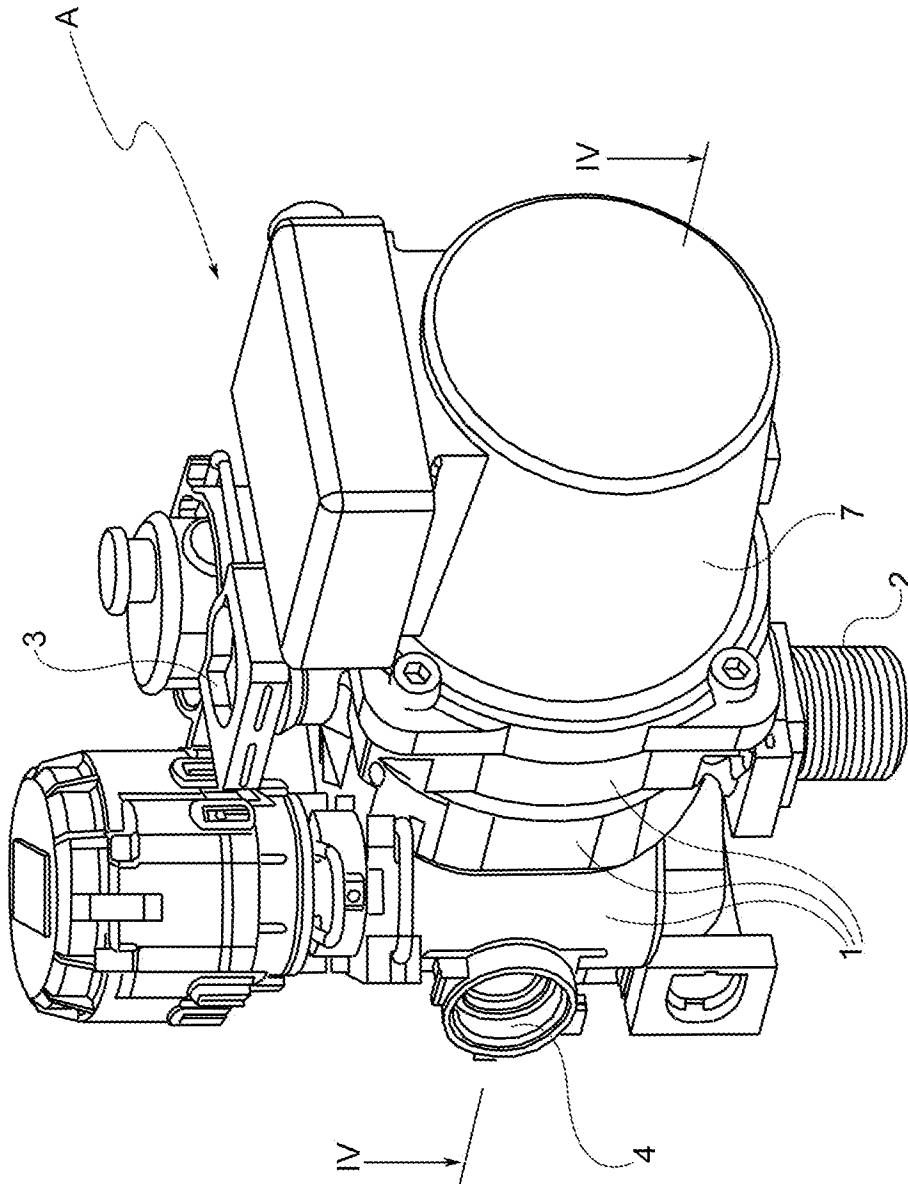


FIG. 2

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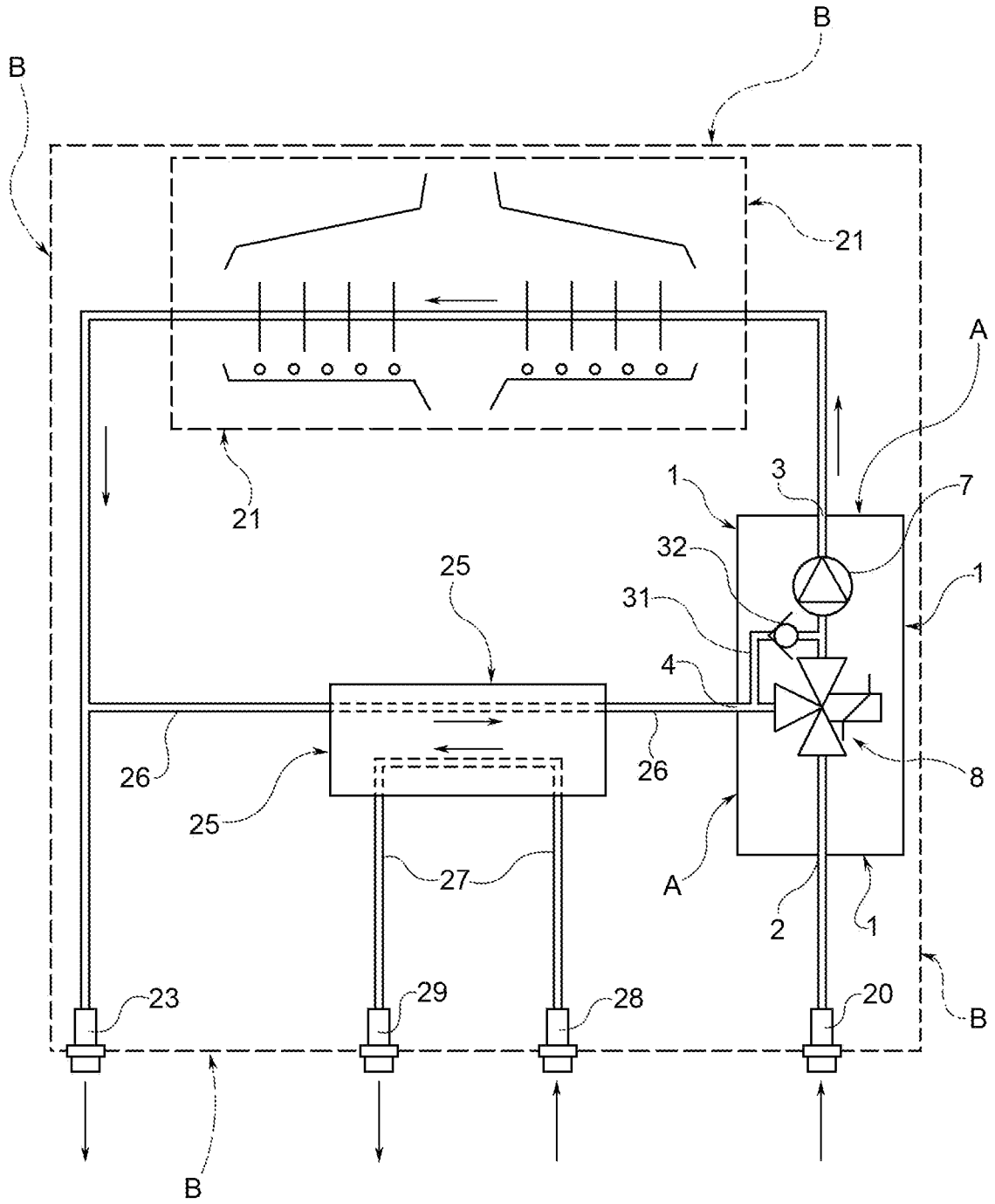


FIG. 3

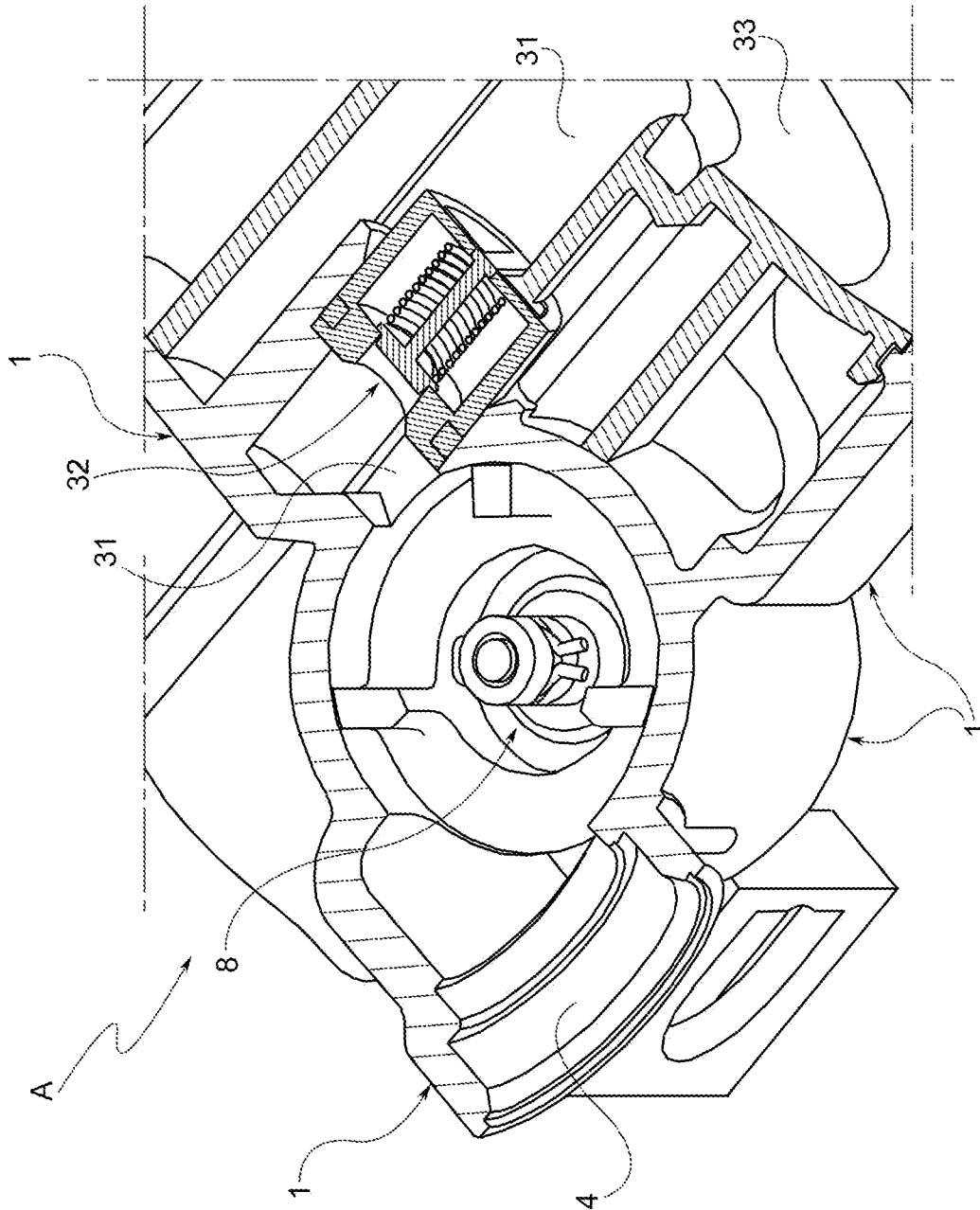


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No  
PCT/IB2012/051778

A. CLASSIFICATION OF SUBJECT MATTER  
INV. F24D3/08 F24D3/10 F24D19/10 F24H9/14  
ADD.  
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED  
Minimum documentation searched (classification system followed by classification symbols)  
F24D F24H  
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 866 280 A2 (WILO GMBH [DE] WILO AG [DE]) 23 September 1998 (1998-09-23) pages 2-3; figures 1-2	1-4,6,7
X	FR 2 211 109 A2 (MATERIEL TELEPHONIQUE [FR]) 12 July 1974 (1974-07-12) pages 3-6; figure 1	1

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "P" document published prior to the international filing date but later than the priority date claimed

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- "&" document member of the same patent family

Date of the actual completion of the international search <b>1 August 2012</b>	Date of mailing of the international search report <b>14/08/2012</b>
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer <b>Blot, Pierre-Edouard</b>

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2012/051778

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
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