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(54) Device for regulating and controlling the flow of gas to burners of domestic boilers.

(57) A device for regulating and controlling the flow of gas comprises in a single body (2) through which a gas passage passes an ON-OFF interception valve (7, 8) and a control valve (14) modulating the gas flow rate.

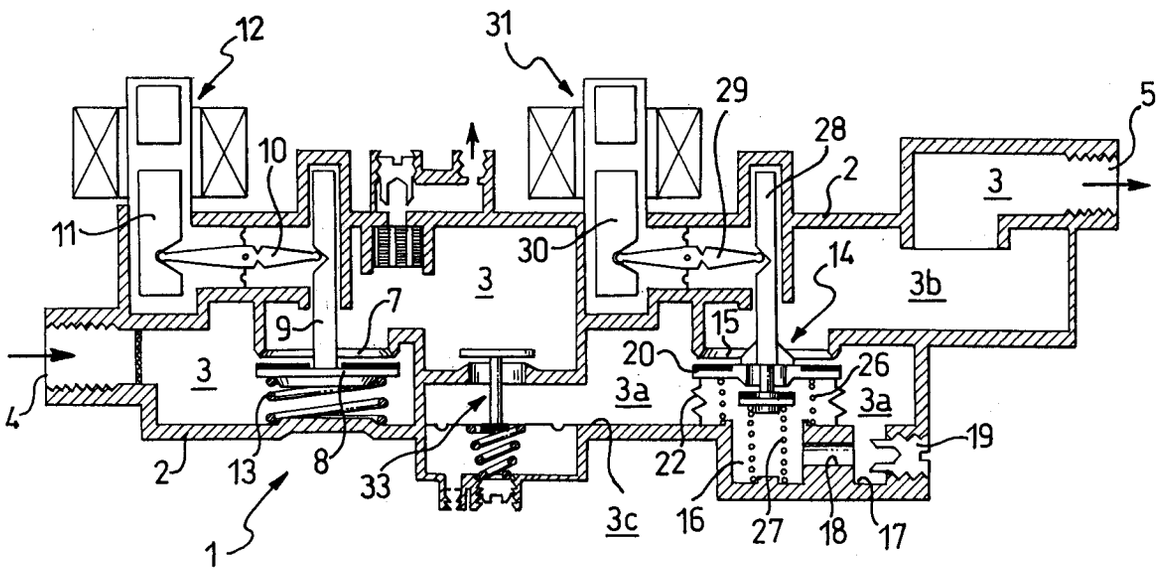


FIG.1

EP 0 669 499 A1

The present invention relates to a device for controlling and regulating the flow of gas to domestic gas-operated apparatus such as stoves, boilers, water heaters and the like.

The principal aim of the present invention is to produce a device of the above-mentioned type having structural and functional features such that it can provide the dual possibility of acting on the flow of gas to the burners of domestic boilers and, more particularly, such that it can make available the further function of modulating the gas flow rate between two levels, MIN and MAX, in addition to the well-known ON-OFF function for intercepting all the valves actually in use.

A further object is to provide a device of this type with particularly compact dimensions so as to render it manageable, such that it can be rapidly installed in positions which are always accessible to the user, evidently without decreasing its efficiency and reliability.

These and other objects which will become clearer from the following description are found in a device for controlling and regulating the flow of gas to burners of domestic gas-operated apparatus, which comprises a valve body, a gas passage which passes through the valve body from an inlet aperture to an outlet aperture, at least one interception valve in the passage and controlled by a respective electromagnet, characterized in that it comprises in the gas passage and downstream of the at least one interception valve:

- a first valve seat;
- an obturator cooperating with the first valve seat;
- an axial through-hole extending through the obturator;
- a second valve seat defined in the through-hole;
- a plate-type obturator movably guided in the through-hole so as to cooperate with the second valve seat;
- a rod for actuating the plate-type obturator, mechanically interlocked to the rotor of an electromagnet; and
- thrust means integral with the rod and acting on the obturator of the first valve seat in order to urge it open at a predetermined delay relative to the movement of the plate-type obturator opening the second valve seat.

The characteristics and advantages of a regulating device according to the invention will become clearer from the following description of an embodiment thereof with reference to the appended drawings, which are given solely by way of non-limiting example and in which:

- Figure 1 shows schematically and in section a regulating device according to the invention; and
- Figure 2 shows, on an enlarged scale, a detail of the regulating device of Figure 1.

With reference to the above Figures, a device according to the invention for regulating and controlling the flow of gas to gas burners of domestic gas-operated apparatus is generally designated 1.

This device 1 comprises a valve body 2 through which passes a passage 3, having a particularly sinuous profile and consisting of a plurality of successive portions of different sections, the passage forming a gas path extending through the body 1 from a gas inlet aperture 4 to an outlet aperture 5.

This gas path 3 contains an interception valve of the type commonly known as an ON-OFF valve, comprising a valve seat 7 and a plate-type obturator 8, provided with a rod 9 which is mechanically interlocked, by means of a lever 10, to the rotor 11 (or armature) of a control electromagnet 12.

A spring 13 constantly stresses the plate-type obturator 8 towards the respective valve seat 7.

Downstream of the interception valve 7-8, in the above-mentioned gas passage 3, is a control valve generally designated 14 and shown in greater detail in Figure 2.

With reference to this Figure 2, the control valve 14 comprises a valve seat 15 which divides the gas passage 3 into two successive chambers 3a, 3b. In the base 3c of the chamber 3a is provided or formed in some other way a first sump 16, coaxial to the valve seat 15, and a second sump 17 lateral and parallel to the sump 16.

The two sumps 16, 17 communicate with one another through a passage 18 cooperating with a screw 19 for regulating the gas flow and accessible from the exterior of the valve body 1.

The valve seat 15 cooperates with an obturator 20 which comprises a head 21, for detachably engaging the valve seat 15, and a bellows pipe 22, extending coaxially to the valve seat 15.

Passing axially through the head 21 is a through-hole, consisting of two coaxial successive portions, a first portion 23a of smaller diameter and a second portion 23b of larger diameter, defining therebetween an annular shoulder 24, inside the head 21 of the obturator 20.

This shoulder 24 forms a valve seat for a plate-type obturator 25, coaxially supported and guided in the head 21.

The bellows pipe 22 has one end portion which is fitted, in a manner such that it is tight with respect to compressed gas, on the head 21 and is secured at the other end, still in a manner such that it is tight with respect to pressurized fluid, on the base 3c of the chamber 3a, the assembly being disposed around the mouth of the sump 16. The bellows pipe 22 thus communicates with the gas

passage 3 upstream of the valve seat 15 and with the through-hole 23a-23b of the head 21.

Two springs which stress the head 21 of the obturator 20 and the plate-type obturator 25 respectively such that they close the corresponding valve seats 15 and 24 are indicated 26 and 27.

A rod 28, extending axially through the valve seat 24, has one end secured to the plate-type obturator 25 for supporting and actuating the latter and the other end mechanically interlocked by a lever 29 to the movements of the rotor 30 of an electromagnet 31.

Two or more stops 32 for engaging the body of the obturator 20 are secured on the rod 28 and at a predetermined distance from the plate-type obturator 25, in order to urge the obturator 20 to open relative to the valve seat 15. It should, however, be mentioned that this movement is delayed relative to the movement of the plate-type obturator 25 with respect to the valve seat 24 and a delay of this type is directly proportional to the distance between the stops 32 and the plate-type obturator 25.

In Figure 1, a pressure regulator acting in a gas passage 3 in an intermediate position between the ON-OFF valve 7-8 and the control valve 14 is schematically indicated 33.

The operation of the device of this invention will be described solely with reference to the regulating or control valve 14 since the operation of the ON-OFF valve 7-8 is known and conventional.

By supplying the electromagnet 31 with minimum current, a minimum angular movement of the lever 29 is brought about which is translated into a corresponding minimum axial movement of the rod 28.

This movement is sufficient to determine the opening of the plate-type obturator 25 against the spring 27. However, it is not sufficient to push the obturator 20 against the stops 32.

The gas arriving in the chamber 3a of the gas passage 3 can flow through the sumps 16, 17 and the respective passage 18, inside the bellows 22 and from there, through the valve seat 24, to the burner (not shown) which is thus supplied with the MINIMUM FLOW RATE.

This flow rate is calibrated by acting on the regulating screw 19.

By supplying maximum current to the electromagnet 31, a maximum angular movement of the lever 29, a maximum axial movement of the rod 28 and, owing to the engagement of the stops 32 of the rod with the obturator 20, a maximum movement of the latter is brought about such that the respective valve seat 15 opens.

The gas can then flow to the burner at MAXIMUM FLOW RATE.

By providing current proportionally to the electromagnet 31, the obturator 20 can be gradually opened, thus bringing about a corresponding modulation of the gas flow rate.

Claims

1. Device for controlling and regulating the flow of gas to burners of domestic gas-operated apparatus, comprising a valve body (2), a gas passage (3) which passes through the valve body (2) from an inlet aperture (4) to an outlet aperture (5), at least one ON-OFF interception valve (7, 8) disposed in the gas passage (3) and controlled by a respective electromagnet (12), characterised in that it comprises in the gas passage (3) and downstream of the at least one interception valve (7-8):
- a first valve seat (15);
- an obturator (20) cooperating with the first valve seat (15);
- a through-hole (23a, 23b) extending axially through the obturator (20);
- a second valve seat (24) defined in the through-hole (23a, 23b);
- a plate-type obturator (25) movably guided in the through-hole (23a, 23b) so as to cooperate with the second valve seat (24);
- a rod (28) for actuating the plate-type obturator (25), mechanically interlocked to the rotor (30) of an electromagnet (31); and
- thrust means (32) integral with the rod (28) and acting on the obturator (20) of the first valve seat (15) in order to urge it open at a predetermined delay relative to the movement of the plate-type obturator (25) opening the second valve seat (24).

2. Device according to Claim 1, characterized in that the obturator (20) cooperating with the first valve seat (15) comprises a shutter head (21) through which the through-hole (23a, 23b) passes axially and a bellows pipe (22) extending in the gas passage coaxially to the valve seat (15) and having one end fitted on the shutter head (21) and the other end secured to the valve body (2), the bellows pipe (22) being in fluid communication, on one side, with the gas passage (3) upstream of the valve seat (15) and, on the other side, with the through-hole (23a, 23b) of the obturator (20).

3. Device according to Claim 2, characterized in that the valve body (2) has a first sump (16) extending coaxially to the first valve seat (15) and communicating, on the one side, with the interior of the bellows pipe (22) and, on the other, with the gas passage (3) upstream of the

valve seat (15).

4. Device according to Claim 3, characterized in that the sump (16) communicates with the gas passage (3) by means of a passage (18) in the valve body with which a gas flow regulating screw (19) cooperates.

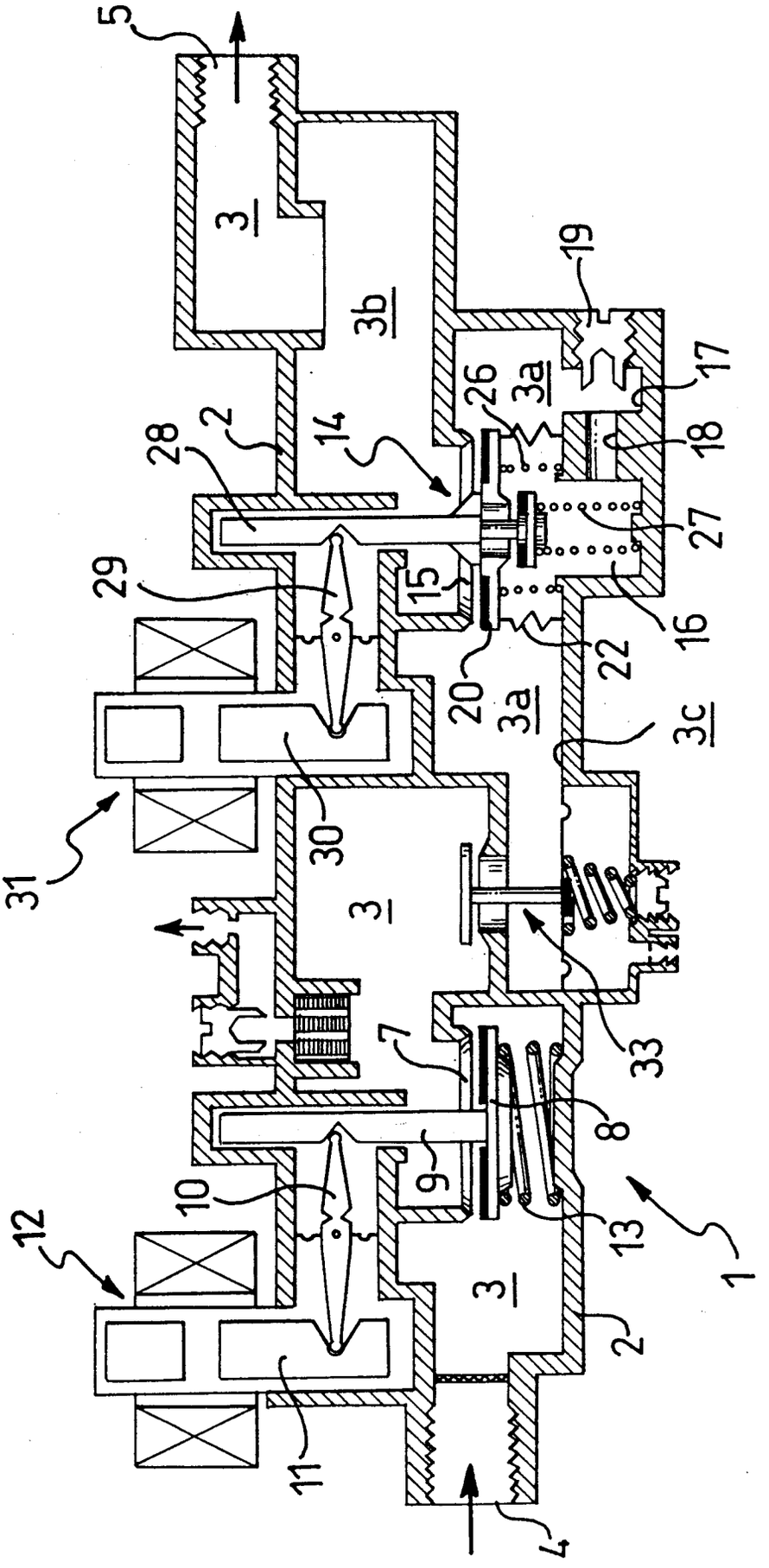

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3b
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FIG.1

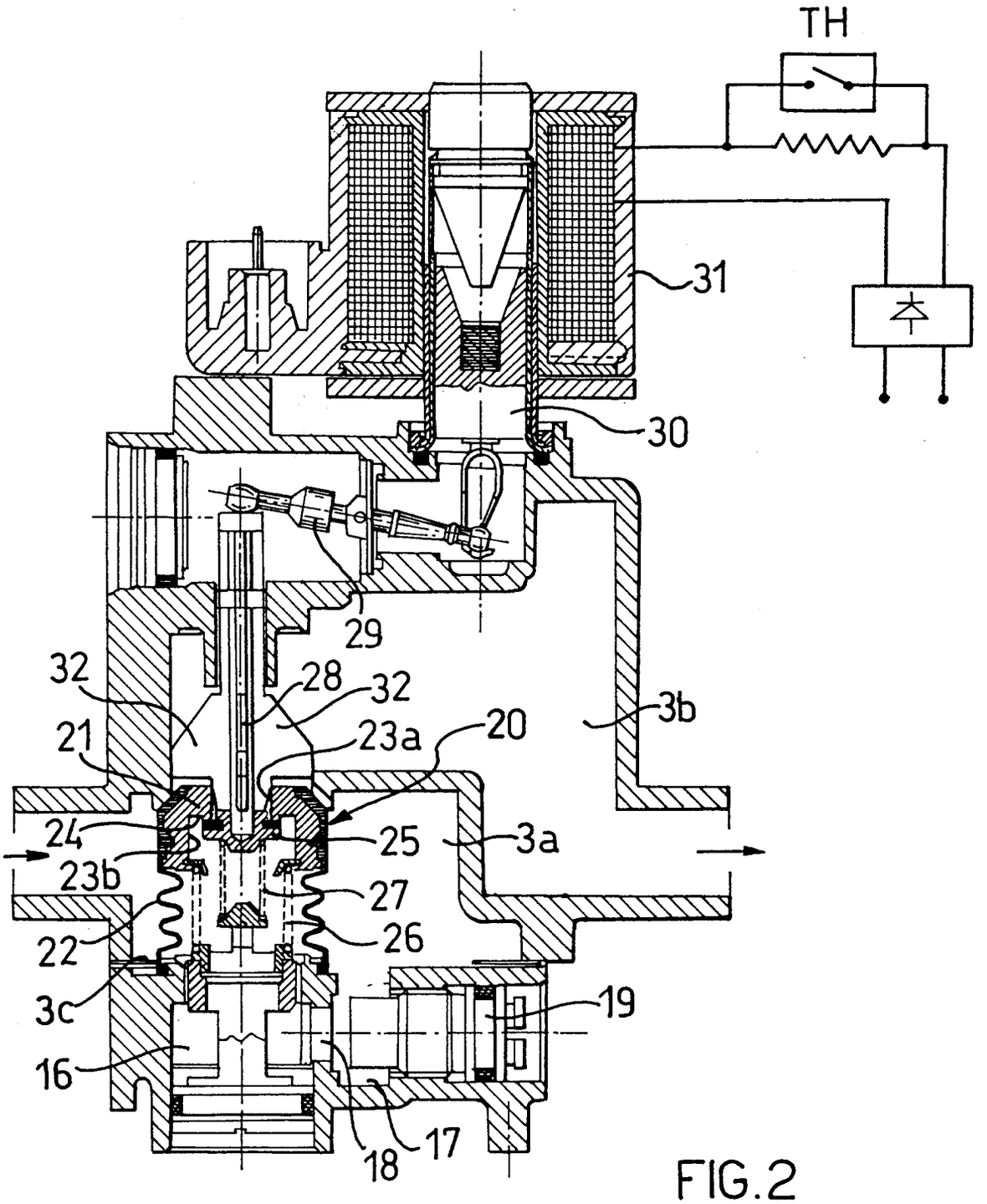


FIG.2

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EUROPEAN SEARCH REPORT

Application Number
EP 94 20 2584

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	FR-A-2 426 863 (SAUNIER - DUVAL) * the whole document *	1,4	F23N1/00
A	GB-A-2 210 155 (JOHNSON SERVICE COMPANY) * abstract; figures *	1	
A	US-A-3 279 498 (MCKINLEY) * figures *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F23N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 May 1995	Kooijman, F

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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