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(54) Device for automatically setting the gas flow regulator taps of domestic gas cooker burners.

(57) The device comprises at least one first engagement member (21) possessing at one end an axial cavity (23) able to exactly fit onto the end portion of the stem (6) of the valving member, said first engagement member (21) being mounted idly on a first support plate (31); there is also provided at least one second engagement member (41) having one end (42) shaped to be able to enter the axial hole (61) in the end portion of the stem (6) and rotatably engage the head (7a) of the setting means (7), said second engagement member (41) being mounted idly on a second support plate (32) and passing coaxially through the first engagement member (21), relative to which it is able to rotate and slide; there are also provided first means (51) for rotating said first engagement member (21) and second means (52) for rotating said second engagement member (41); a fixed base (33) supports both the first support plate (31) and the second support plate (32) in a manner independently slidable in the direction defined by the axis of the two engagement members (21) and (41); finally, means (37) and (38) are provided for translationally moving the first support plate (31) and the second support plate (32) relative to the fixed base (33).

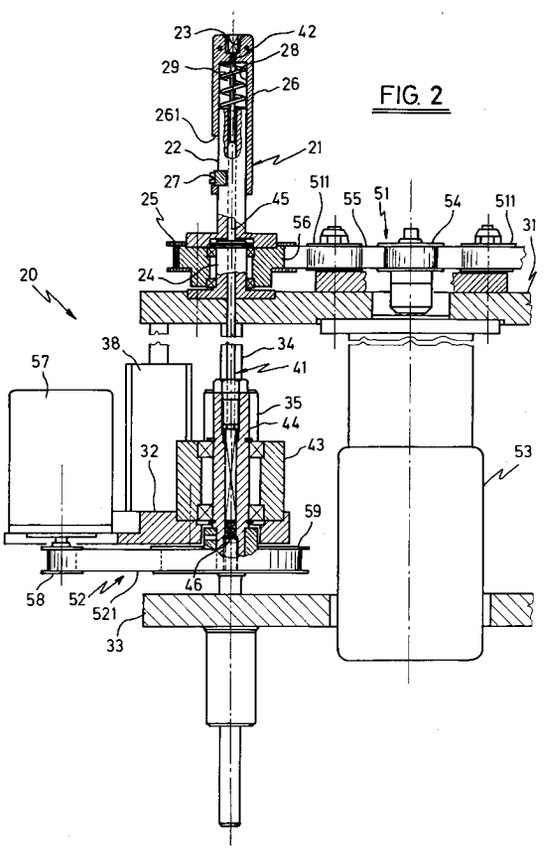

FIG. 2

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This invention relates to a device for automatically setting the gas flow regulator taps of domestic gas cooker burners, in particular for taps comprising a gas inlet, a gas outlet, a valving member operated by a stem acting by rotation, and valving member setting means also acting by rotation.

Currently, to set said taps the gas cooker is adjusted manually when in its completely or nearly completely assembled state. The valving member is firstly put into a constant open position and the setting means are then screwed in or out to set the outlet gas flow by observing the height and characteristics of the flame produced by the gas.

Alternatively, the setting (or preliminary setting) can effected in the same manner on the taps before they are mounted, by passing inert gas (in particular air) through the taps and measuring the flow through the tap with suitable instruments.

The object of the present invention is to provide an automatic tap setting device by which the taps can be set before they are mounted in the gas cooker, and which achieves more rapid and accurate setting without the use of labour.

This and further objects are attained by the present invention as characterised in the claims.

The invention is described in detail hereinafter with the aid of the accompanying figures, which illustrate one embodiment thereof.

Figure 1 is a schematic view of the device of the invention together with other auxiliary means for setting the tap.

Figure 2 is a axial section through part of the setting device 20 of Figure 1.

Figure 2A is an enlarged side view of a detail of Figure 2.

Figure 3A is an enlarged detail of an element of Figure 2 mounted about the end of the stem 6 of the tap 2.

Figure 3B is a section on the plane III – III of Figure 3A.

Figure 4 is a top plan view of Figure 2.

Figure 5 is a section on the plane V – V of Figure 4.

Figure 6 is a section on the plane VI – VI of Figure 4.

The tap to which the invention is applied (indicated by 2 in the figures) is illustrated schematically in Figure 1 and comprises a gas inlet 3, a gas outlet 4, a body 5 containing the valving member, a stem 6 projecting externally from the body 5 and arranged to operate the valving member by rotation, and setting means 7 for the valving member which also operate by rotation.

When the tap 2 is mounted in the gas cooker, the inlet 3 is connected to a fuel gas source, the outlet 4 is connected to a respective burner, and a knob is mounted on the stem 6 to manually rotate the stem 6 and hence adjust the exit gas flow between a maximum value and zero.

The purpose of the means 7 is to set the gas flow in the sense of defining the flow rate of the gas leaving 4 when the stem 6 has been positioned in its stable "minimum" position (ie a stable position in which the gas flow is just sufficient to generate a flame), this position usually being the end of the free opening rotation.

The present invention relates to a setting device (indicated overall by 20) able to independently rotate both the stem 6 and the setting means 7. Said device 20 operates in combination with means 10 for feeding pressurized air (or other gas) into the inlet 3 and with means 11 connected to the inlet 3 to measure the flow rate of the air passing through the tap 2 (see Figure 1). The device of the invention is suitable for operating in combination with transfer means (of any known type, not shown in the figures) for moving each tap, one or more at a time, into a predetermined position in front of the device 20 with the inlet 3 in a position corresponding with the means 10 and means 11.

The means 10 and 11 can be of any known type. In addition, control and operating means of any known type are conveniently provided, for example incorporating a programmable electronic processor, which automatically coordinate and control the operation of the various members of the device of the invention.

This operation comprises for each tap 2 firstly rotating the stem 6 by the device 20 to bring the valving member of the tap 2 into a predetermined constant open position. This is achieved by rotating the stem 6 into said stable "minimum" position at the end of the free opening rotation. The setting means 7 are then rotated by the device 20 until the flow rate of the air passing through the tap 2, as measured by the means 11, reaches a predetermined value.

The stem 6 of the valving member usually has an end portion with at least one flat lateral face 6a for rotatably fitting the respective knob. The setting means 7 possess an end head 7a with a slot to be rotatably engaged by a screwdriver and accessible through an axial hole 61 provided in the end of the stem 6 (see specifically Figures 3A and 3B).

The accompanying Figures 2 – 6 show one embodiment of the setting device 20 for operating on stems 6 of the aforesaid type. The embodiment shown in the figures is of the multiple type for operating on two stems 6 simultaneously. However the invention equally comprises embodiments for operating on a single stem 6 or on three or more stems 6 at a time.

The device 20 comprises two identical engagement members 21 each possessing at one end an axial cavity 23 able to exactly fit onto the end portion of the stem 6. For this purpose the

cavity 23 has a cross-section which is partly circular and partly linear, this latter part being defined by the plate 231 which intersects the circular cross-section (Figure 4). The members 21 are supported rotatable about their axis by a respective first support plate 31 via an upwardly projecting pin 24 fixed to the plate 31, and on which a widened base 25 of the member 21 is mounted via a bearing.

The device 20 also comprises two second identical engagement members 41 each possessing an end 42 shaped to be able to enter the hole 61 in the stem 6 and rotatably engage the head 7a of the means 7. In other words, the end 42 has the shape of a thin screwdriver.

The members 41 are each supported rotatable about their axis by a respective second support plate 32 and are arranged to each pass coaxially through a respective first member 21 and be able to slide and axially rotate relative thereto.

Specifically, each member 41 is supported by a bearing 43 fixed to the respective plate 32, into which the base 44 of the member 41 is inserted. The remaining part 45 of the member 41 is in the form of a thin circular rod which carries the end 42 and passes axially through the plate 31, through the pin 24 and through the entire member 21. Said elements 31, 24 and 21 are provided with corresponding axial cavities for the passage of the rod 45.

The support plate 31 carries means 51 for rotating the first engagement members 21, and each plate 32 carries means 52 for independently rotating the second engagement members 41.

There is also provided a fixed base 33 which supports both the plate 31 and the plates 32 in a manner mutually independently slidable in the direction of the axes of the engagement members 21 and 41.

The plates 31 and 32 and the base 33 are mutually parallel. To the plate 31 there are fixed four perpendicular columns 34 slidable within bushes 35 fixed to the plates 32 and within bushes 36 fixed to the fixed base 33. A hydraulic cylinder-piston unit 37 is connected in a central position between the plate 31 and the base 33, and a respective cylinder-piston unit 38 is connected between the plate 31 and each plate 32. The cylinder-piston unit 37 is arranged to translationally move the plate 31, and with it the plates 32, relative to the fixed base 33. The cylinder-piston units 38 are arranged to translationally move the respective plates 32 relative to the plate 31.

The means 51 comprise a small electric motor 53 which simultaneously rotate the engagement members 21. The motor 53 is fixed to the lower side of the plate 31 and carries on its shaft a pulley 54 with which via a belt 55 it transmits motion to two pulleys 56 each forming part of the base 25 of a respective member 21. Other belt tensioning pulleys 511 are provided on the plate 31.

The means 52 comprise for each member 41 a small electric motor 57 fixed to the upper side of the plate 32 and carrying on its shaft a pulley 58 which via a belt 521 transmits motion to a pulley 59 keyed on the lower end of the member 41.

Each member 21 comprises a cylindrical element 22 which at its lower end carries said widened base 25 by which the member 21 is rotatably coupled to the pin 24. On the upper end of the element 22 there is mounted an outer tubular cylindrical member 26, which projects axially upwards from the element 22 and comprises at its upper end said axial cavity 23 for engaging the stem 6. Below the cavity 23 there is a further cavity 28 into which the top of the element 22 is inserted as an exact fit. The element 26 comprises an axial slot 261 through which there extends a small stop member 27 which is fixed to the element 22, and is of width equal to that of the slot 261 but of smaller height. By means of this restraint, the element 26 can slide axially through a limited distance relative to the element 22, but is rotatably rigid with the element 22.

A helical spring 29 is inserted between the upper end of the element 22 and the upper end of the cavity 28 to constantly urge the cylindrical element 26 upwards.

The elements 22 and 26 comprise suitable axial cavities for passage of the upper part of the member 41.

In operation, the plates 32 are held initially in a position withdrawn from the plate 31 (the cylinder-piston units 38 are in their extended state), while the plate 31 is held close to the fixed base 33 (the cylinder-piston unit 37 is in its retracted state).

The taps 2 advance, conveyed by suitable transfer means, and halt cyclically in pairs at the device of the invention, with their stems 6 coaxial to the engagement members 21 and at a short distance from the ends of these. The cylinder-piston unit 37 is then operated to withdraw the plate 31 from the base 33 and hence move the plate 31 towards the taps 2. Immediately afterwards, the engagement members 21 are rotated by the motor 53 through a predetermined angle. During this stage the members 21 approach the stems 6, the ends of which enter and mate with the cavities 23, to hence rotate through the angle through which the members 21 are rotated. If however one (or both) of the stems 6 is not initially orientated in the same manner as the cavity 23 (ie the flat face 6a not coinciding with the flat face of the plate 231), the end of the element 26 pushes against the end of the stem 6 but without this latter entering the cavity 23, the result being that the

spring 29 is in its compressed state. When during the rotation of the element 26 the flat face of the plate 231 is coplanar with the flat face 6a, the element 26 advances under the thrust of the spring 29, to insert the end of the stem 6 into the cavity 23. From this moment the stem 6 is rotated by the member 21. The result is that again the stems 6 are moved into a predetermined angular position relative to the particular tap 2, this position being the stable "minimum" position at the end of the free opening rotation.

During this stage the ends 42 of the members 21 are maintained sufficiently far from the heads 7a of the setting means 7.

The cylinder – piston units are then operated to move the plates 32 towards the plate 31 and hence move the members 41 towards the taps 2. As a result of this action the ends 42 of the members 41 penetrate through the axial holes 61 until they engage the heads 7a. To ensure this engagement, the lower end of the rod 45 is engaged with the base 44 in such a manner as to be able to slide axially a little relative thereto, while a precompressed spring 46 urges the rod 45 outwards. At the same time the rod 45 rotates rigidly with the base 44.

In the meantime the means 10 and 11 are connected to the inlet 3, and air of predetermined constant inlet pressure is fed through the tap 2, its flow rate through the tap 2 being measured by the means 11.

At this point each motor 57 rotates the respective member 41, to hence rotate the means 7 in one direction or another and hence set the flow rate of the air passing through the tap 2. This rotation is controlled on the basis of the value measured by the means 11 so as to finally obtain a predetermined air exit flow rate. If for example the means 11 indicate a flow rate less than the scheduled value, the motor 57 rotates the member 41 and hence the head 7a in the necessary direction to increase the flow rate, this rotation being halted as soon as the means 11 indicate that the predetermined flow rate has been achieved.

The entire described operation can be coordinated and controlled by the aforesaid control and operating means so as to render it completely automatic.

Claims

1. A device for automatically setting the gas flow regulator taps of domestic gas cooker burners, said taps (2) comprising a valving member operated by a stem (6) acting by rotation, and valving member setting means (7) acting by rotation, said stem (6) possessing an end portion to be rotatably engaged, and said setting means possessing an end head (7a) to be rotatably engaged by a screwdriver accessible through an axial hole (61) provided in the end portion of the stem (6), the device operating in combination with means (11) for measuring the flow rate of the gas passing through the tap, characterised by comprising:
at least one first engagement member (21) possessing at one end an axial cavity (23) able to exactly fit onto the end portion of the stem (6) of the valving member, said first engagement member (21) being supported rotatable about its axis by a first support plate (31);
at least one second engagement member (41) having one end (42) shaped to be able to enter said axial hole (61) provided in the end portion of the stem (6) and rotatably engage the head (7a) of the setting means (7), said second engagement member (41) being supported rotatable about its axis by a second support plate (32) and passing coaxially through the first engagement member (21), relative to which it is able to rotate and slide axially; first means (51) for rotating said first engagement member (21);
second means (52) for rotating said second engagement member (41);
a fixed base (33) for supporting both the first support plate (31) and the second support plate (32) in a manner independently slidable in the direction defined by the axis of the two engagement members (21) and (41);
means (37) and (38) for translationally moving the first support plate (31) and the second support plate (32) relative to the fixed base (33).

2. A setting device as claimed in claim 1, characterised in that said support plates (31) and (32) and said base (33) are mutually parallel, to the first plate (31) there being fixed perpendicular columns (34) slidable within bushes (35) fixed to the second plate (32), and within bushes (36) fixed to the fixed base (33);
between the first support plate (31) and said fixed base (33) there being connected at least one first hydraulic cylinder – piston unit (37) for translationally moving said first plate (31) relative to the fixed base (33), and between the first support plate (31) and the second support plate (32) there being connected at least one second cylinder – piston unit (38) for translationally moving the second plate (32) relative to the first plate (31).

3. A device as claimed in claim 1, characterised in that said first engagement member (21)

comprises:
an inner cylindrical element (22), the lower end of which is rotatably connected to the first support plate (31);
an outer tubular cylindrical element (26) mounted coaxially on the upper end of the inner cylindrical element (22) and projecting axially from this, said outer cylindrical element (26) being provided at its upper end with said axial cavity (23) which can exactly fit onto the stem (6), and being rotatably rigid with but axially slidable to a limited extent on the inner cylindrical element (22);
a spring (29) interposed between said two cylindrical elements (23, 26) to constantly urge the outer cylindrical element (26) upwards.

4. A device as claimed in claim 1, of the type comprising several first engagement members (21) and corresponding second engagement members (41), characterised in that said first rotation means (51) comprise an electric motor (53) for simultaneously rotating said first engagement members (21); said second rotation means (52) comprising, for each second engagement member (41), a respective electric motor (57) for rotating the respective engagement member (41).

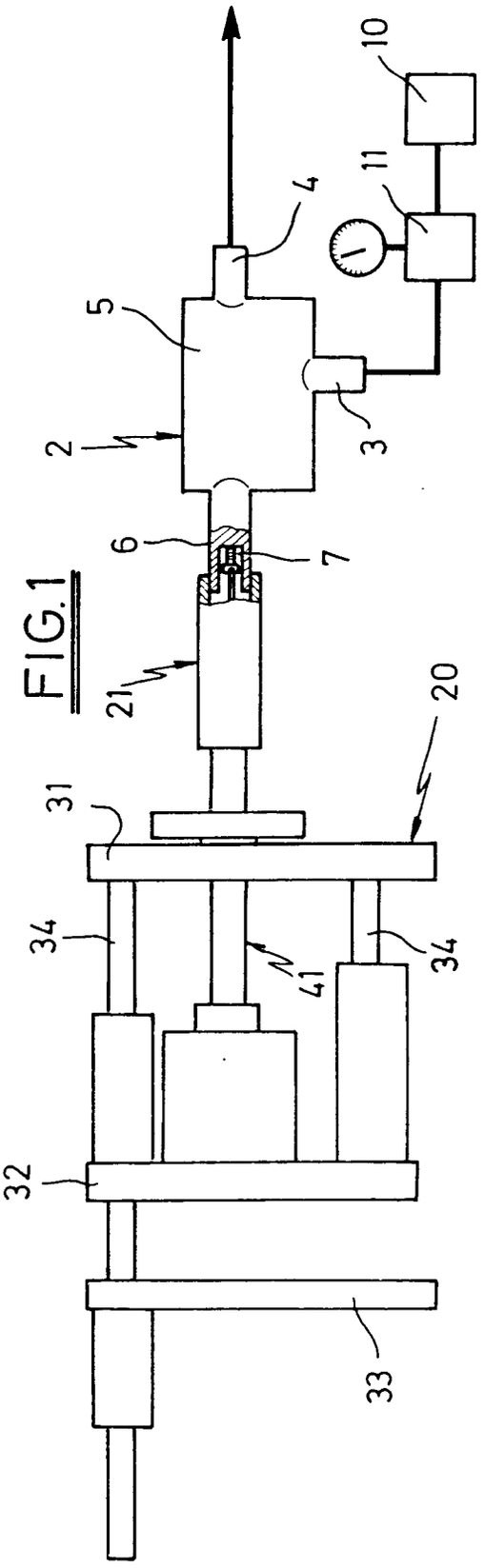

FIG.1

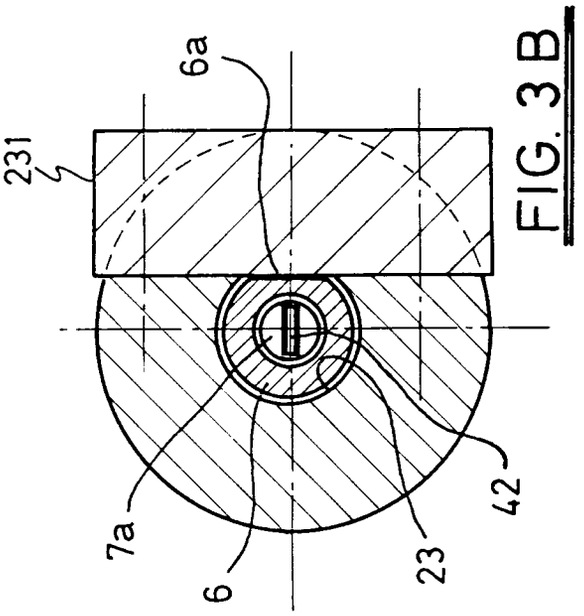

FIG. 3 B

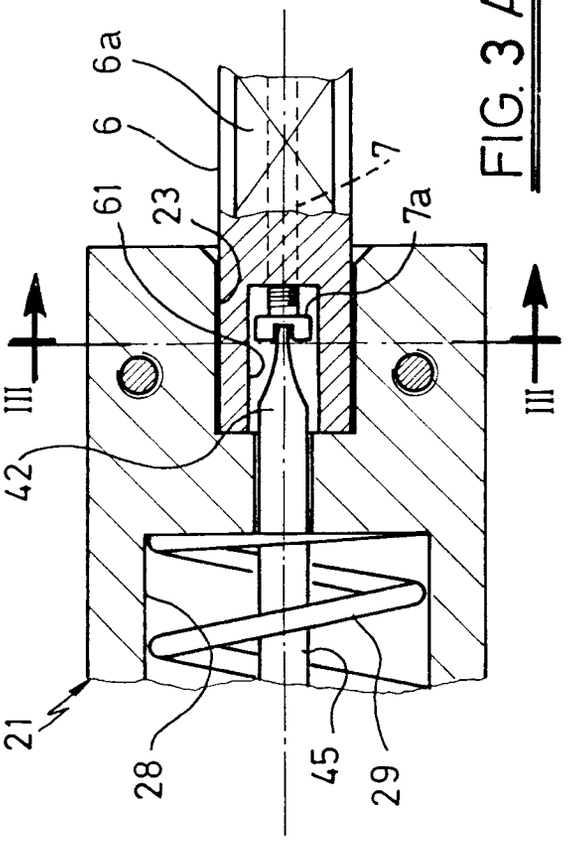

FIG. 3 A

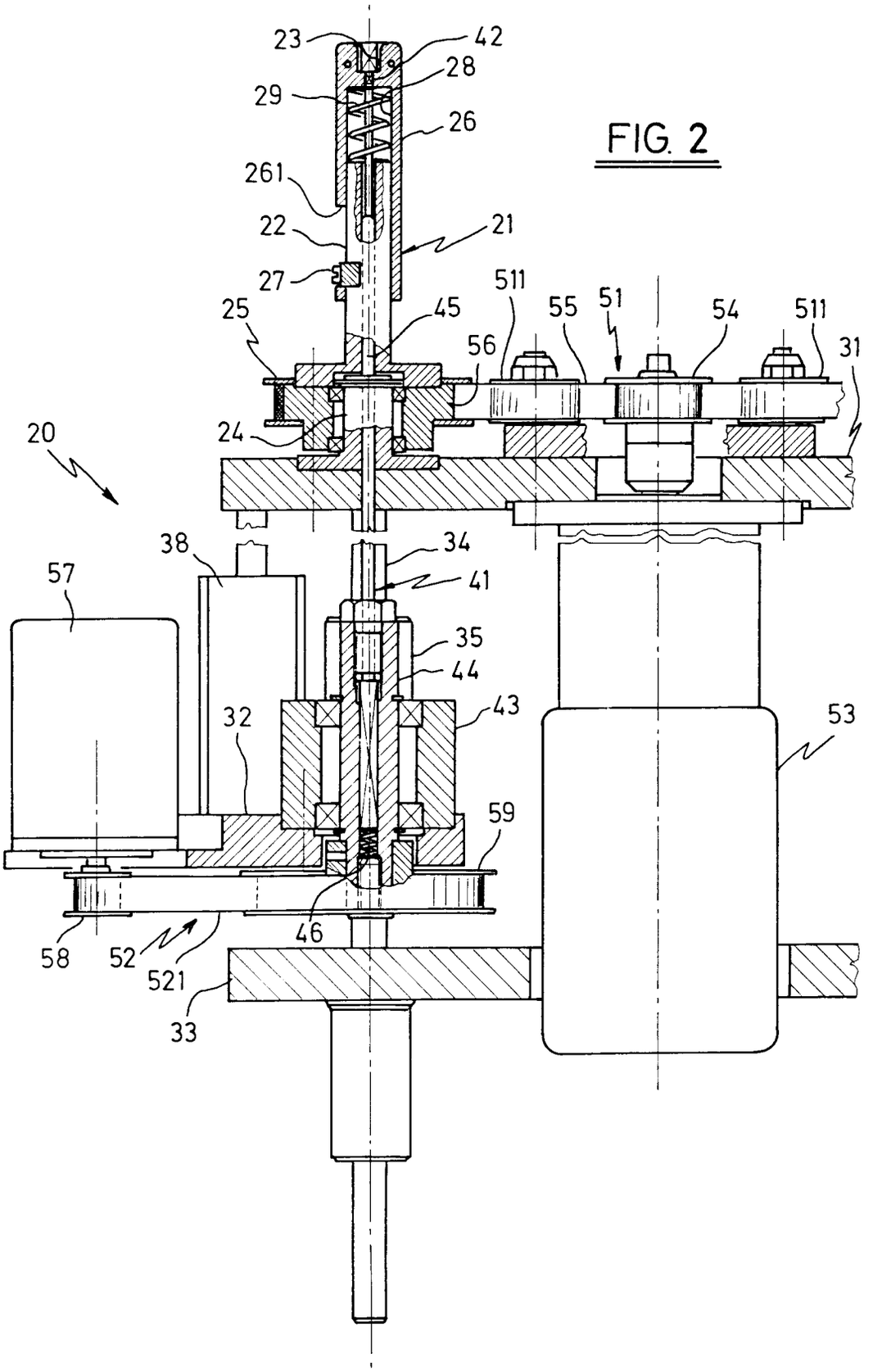
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FIG. 2

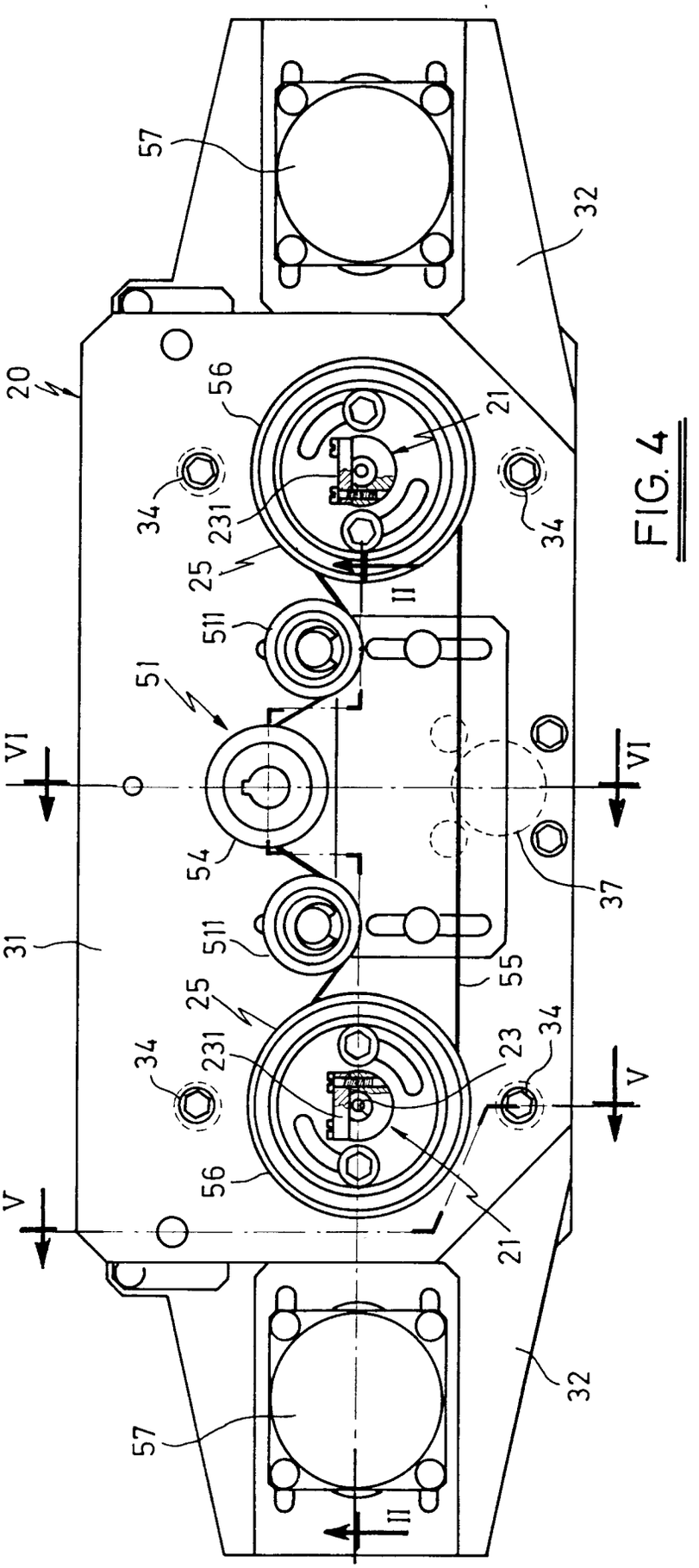
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FIG. 4

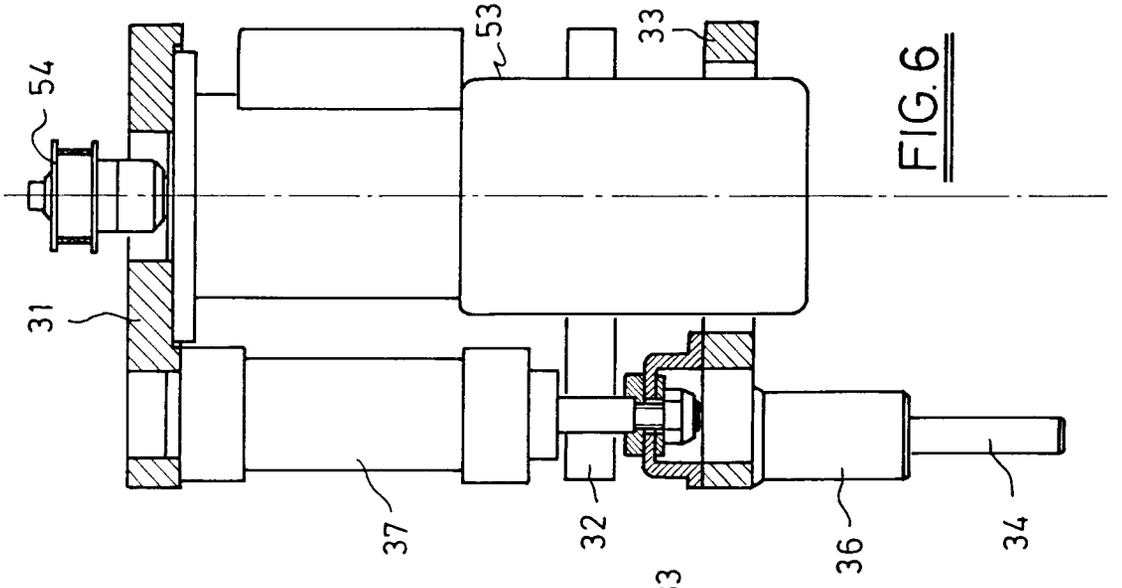

FIG.6

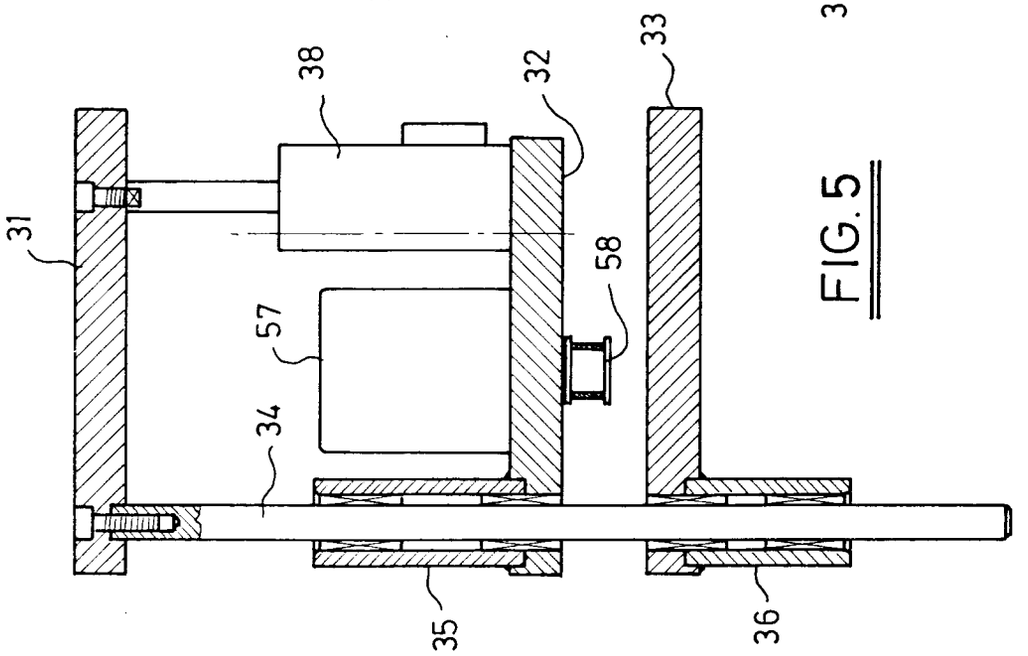

FIG.5

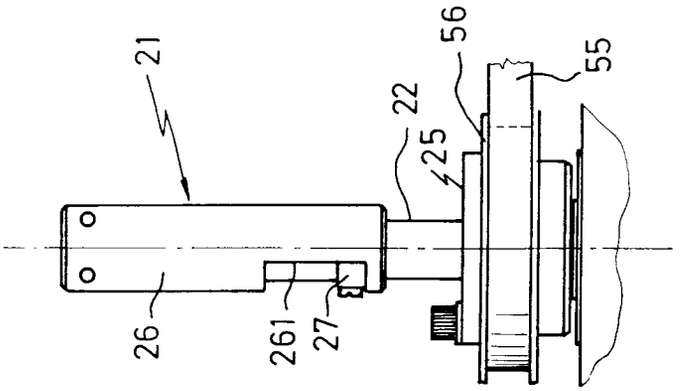

FIG.2A

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EUROPEAN SEARCH REPORT

Application Number

EP 92 20 2666

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.5)
Y	EP-A-0 044 013 (CEPEM) * claims 1-6; figures 1,2 *	1	F23N1/00 F23N1/08
Y	EP-A-0 407 302 (RENAULT AUTOMATION) * the whole document *	1	
A		2-4	
A	FR-A-2 624 586 (VAILLANT) * abstract; figure 1 *	1	
A	DE-A-3 002 015 (TOYOTA JIDOSHA KOGYO K.K.) * the whole document *	1-4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F23N
F01L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 DECEMBER 1992	WASSENAAR G.C.C.

CATEGORY OF CITED DOCUMENTS

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