(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 039 223 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.09.2000 Bulletin 2000/39

(51) Int. Cl.[7]: **F23L 3/00**

(21) Application number: **00105382.6**

(22) Date of filing: **21.03.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **23.03.1999 IT VI990055**

(71) Applicant:
R.B.L. RIELLO BRUCIATORI LEGNAGO SPA
I-37045 Legnago (VR) (IT)

(72) Inventor: **Bianchini, Luciano**
37045 Legnago (VR) (IT)

(74) Representative: **Bonini, Ercole**
c/o STUDIO ING. E. BONINI SRL
Corso Fogazzaro 8
36100 Vicenza (IT)

(54) Antivibration control device for the flow regulator damper of combustion air in a burner

(57) The invention produces a device for regulating the flow of combustion air supplied by a fan to a burner connected to a boiler, comprising: a damper (3) hinged to the body of said burner on the inlet of said combustion air; means of regulating connected to said burner and working together with said damper suited to varying its position to regulate the degree of opening of said inlet. Said means of regulating comprises at least one metal rod (5) whose end (51) presses against the damper (3) and that a given section of said rod is wound by an electric coil (9) powered by electric current when the combustion air fan is in operation, said rod (5) being magnetised so that the tip (51) of said rod ensures its contact with the damper by magnetic attraction.

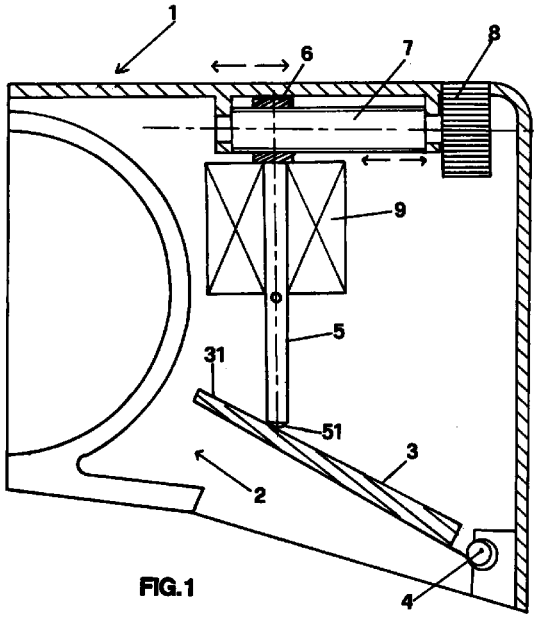

FIG.1

EP 1 039 223 A1

Description

[0001] The invention concerns an antivibration device for the flow regulator damper of combustion air in a burner.

[0002] It is known that the optimum efficiency of a burner is obtained when the quantity of oxygen introduced by air is constant and for this to occur the airflow has to be governed by a means of control.

[0003] For this reason known types of burners are provided with air flow regulator devices that usually comprise a mobile damper, whose opening is adjusted by a control rod, mounted on the inlet that channels the combustion air from the fan scroll to the feed duct of the fire pot.

[0004] While the burner is operating the damper, pushed by the pressure created by the fan, opens the inlet to the angle allowed by the control rod, so that the air flow entering is suited to achieving an optimum combustion.

[0005] When the burner stops, as the fan gradually reduces speed, the damper tends to drop and closes the inlet until, when the fan has come to a standstill, the damper completely closes the inlet preventing the fire pot from cooling.

[0006] What happens in certain situations and especially when lighting the burner is that the damper undergoes flapping and hammering.

[0007] In fact, on lighting the burner the fumes inside the fire pot increase, which come against a resistance to their evacuation. This increase in resistance changes the pressure, which creates a reduction in air flow that weakens the oxygen content in the fire pot and consequently makes it difficult to develop a flame. The damper tends to drop under gravity and a hammering mechanism is thereby created between fire pot and fan that makes the damper rock repeatedly between its open and closed positions and vice-versa.

[0008] In some, particularly unstable operating conditions, the hammering effect can continue for quite a long time or may even never stop.

[0009] What's more, it has to be considered that when the damper is regulated towards its minimum opening, it may arise that the combustion conditions vary during operation so that the air required for combustion changes and the damper consequently tends to open and close to follow precisely these variations in air flow requirement. Even in this case the damper undergoes flapping and hammering against the stay rod that is set to prevent the damper from opening beyond a certain limit.

[0010] Another inconvenience has been noted in regulating the damper opening, being that if the rod controlling the damper opening works in proximity of the dampers hinge, any regulations towards the minimum opening are very difficult to achieve since even the smallest adjustment in regulation on the damper stay device results in large changes in the damper's opening.

[0011] This invention intends to overcome the aforementioned inconveniences.

[0012] In particular, a scope of this invention is to produce a damper device for regulating the flow of combustion air in a burner, where the damper does not undergo flapping or vibrations during the burner's operation and above all on lighting.

[0013] Another scope the device invention intends to achieve is to obtain a precise control of the damper opening even when it is set near its minimum opening.

[0014] The aforementioned scopes and others that shall be better explained below are achieved by a device for regulating the combustion air flow supplied by a fan to a burner connected to a boiler comprising:

- a damper hinged to the body of said burner on the inlet of said combustion air;
- means of regulating connected to said burner and working together with said damper, suited to varying its position to adjust the degree of opening on said inlet, said device in accordance with the contents of the main claim, being characterised in that said means of regulating comprises at least one metal rod whose end presses against the damper and that a given section of said rod is wound by an electric coil, being powered by electric current when the combustion air fan is in operation, said rod being magnetised so that the tip of said rod ensures its contact with the damper by magnetic attraction.

[0015] One advantage of the invention is that when the fan supplying combustion air to the burner is in operation, even the coil is energised by electric current and magnetises the damper's control rod, thereby permitting that the damper, once it comes into contact with the tip of the rod, remains attached to it without any possibility of undergoing flapping or vibrations during operation. It is clear that once the burner has stopped, the fan also stops and the coil on the rod is de-energised since the power to the coil follows the behaviour of the power to the fan. As a consequence this interrupts the magnetic attraction in the rod with respect to the damper and so the damper is left to close by gravity.

[0016] Another advantage of the invention is the possibility of fine adjustment in the position of the stay controlling the dampers opening, this adjustment, as will be described below, being obtained by turning a knob and a threaded shaft that holds the solid box that holds the control rod.

[0017] Other characteristics and details of the invention shall be better explained in the description of a preferred form of execution of the invention given as a guideline but not a limitation and illustrated in the attached diagrams, where:

- fig. 1 shows a cross-section of the device invention;
- fig. 2 has an overhead view showing the possibility

of adjusting the device by a turn knob.

[0018] With reference to the above figures, in fig. 1 it can be seen that the burner, generally indicated by 1, has an opening 2 for the passage of combustion air regulated by the damper 3 that is hinged at 4 and can therefore be raised and lowered according to the volume of air that is supplied to burner. The clearance for the combustion air to pass through is controlled by a stay consisting of a rod 5 connected to a solid box 6 which is threaded and screws onto the thread of the horizontal shaft 7. This horizontal shaft is held in a seat made in the burner and has a knob 8 on its end that, when suitably turned, moves the solid box 6 and thereby the rod 5 in the direction of the arrows, both backwards and forwards. It is clear that the movement of the solid box 6 causes the movement of the tip 51 of the rod 5 and therefore the position of said tip 51 even in proximity of the edge 31 of the damper 3 conditions the possibility of adjusting with great precision the opening of the damper. Since the thread on the shaft 7 has a small pitch, several turns of the knob 8 are required to achieve even a small movement forward or backwards of the solid box 6 and consequently the tip 51 of the rod 5.

[0019] In addition to the possibility of fine adjustments as described above, the device invention creates, as mentioned earlier, the possibility of completely eliminating the flapping and vibrations or hammering in the damper 3 due to variations in flow of the combustion air during the actual combustion. This is achieved with the aid of the coil 9, which is electrically powered in conjunction with the electrical powering of the fan and in simple terms, basically only when air passes through the clearance left open by the gate. In these conditions the gate 3 presses against the tip 51 of the rod 5 but, since the rod 5 is embedded in the coil 9, which has current running through it, said rod, being made of metal, is magnetised by the magnetic field generated by the actual coil so that the tip 51 magnetically attracts the metal gate 3 and keeps it firmly in contact, without vibrations and without flapping, while the fan motor, not illustrated, is operating. Once the burner goes out and therefore the fan stops operating, power to the coil 9 is shut-off and this thereby excludes the magnetic field responsible for magnetising the rod 5. In this way the damper 3, no longer being held in position neither by the combustion air nor by magnetic attraction, falls due to gravity closing over the air passage.

[0020] In fig. 2 it can be seen that the adjustment knob 8 is connected to a scale 9 that tracks the position of the solid box 6 in order to control the position of the rod 5 and consequently the damper 3 opening.

[0021] It should be noted that the coil 9 can be connected to any kind of rod controlling the position of the air gate 3, which can even operate by a different method to the description given in the example of execution of the invention. In fact the antivibration and anti-hammering effects can be placed in direct relationship to the existence of the coil on the rod and therefore to its magnetisation, so the method of adjusting the rod's position that regulates the opening of the gate is entirely ineffectual.

Claims

1. Device for regulating the flow of combustion air supplied by a fan to a burner connected to a boiler comprising:

   - a damper (3) hinged to the body of said burner on the inlet of said combustion air;
   - means of regulating connected to said burner and working together with said damper suited to varying its position to adjust the degree of opening on said inlet,

   characterised in that said means of regulating comprises at least one metal rod (5) whose end (51) presses against the damper (3) and that a given section of said rod is wound by an electric coil (9) being powered by electric current when the combustion air fan is in operation, said rod (5) being magnetised so that the tip (51) of said rod ensures its contact with the damper (3) by magnetic attraction.

2. Device according to claim 1) **characterised in that** said metal rod (5) has on the opposite end to the tip in contact with the damper a threaded solid box (6) interacting with a threaded shaft (7) held on said burner, so that said solid box moves forward and backwards according to the direction of rotation given to the shaft through a knob (8) fixed to one end of said shaft.

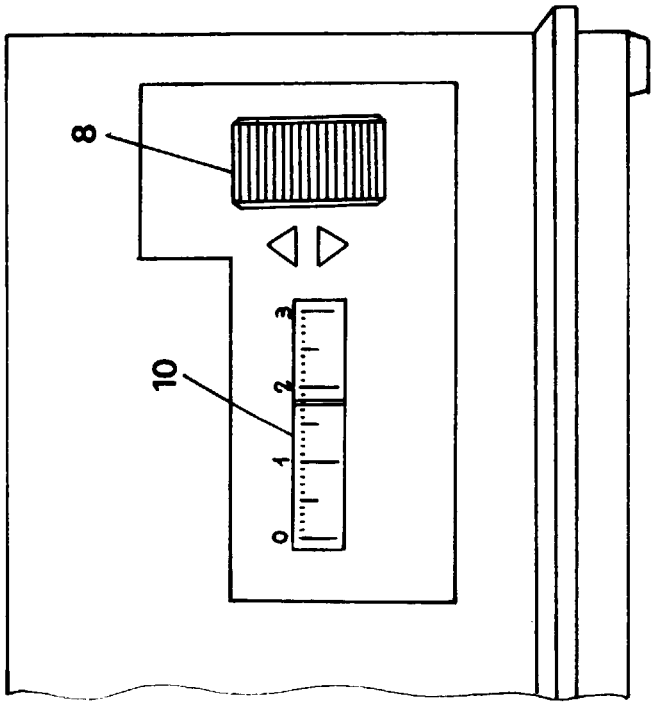

FIG.2

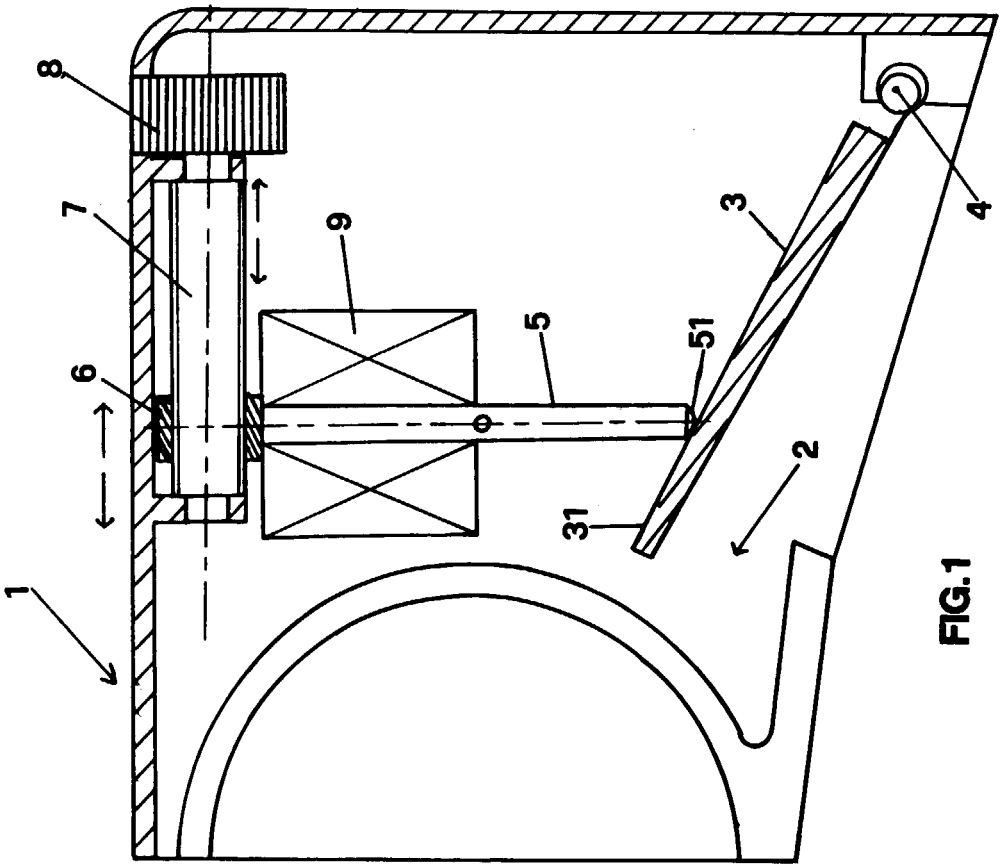

FIG.1

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 10 5382

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.7)
A	GB 2 098 709 A (THORN HEATING LTD) 24 November 1982 (1982-11-24) * the whole document *	1	F23L3/00
A	DE 26 01 166 A (HEEGE BERNHARD;HEEGE GUENTER; HEEGE RUDOLF; TONK KURT) 28 July 1977 (1977-07-28) * the whole document *	1	
A	EP 0 022 599 A (THERMOROSSI SPA) 21 January 1981 (1981-01-21) * the whole document *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F23L
F23C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15 June 2000	Coquau, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 10 5382

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-06-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2098709 A	24-11-1982	NONE	
DE 2601166 A	28-07-1977	NONE	
EP 0022599 A	21-01-1981	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82