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

(11) EP 1 277 873 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.01.2003 Bulletin 2003/04

(51) Int Cl.[7]: **D06F 81/08**

(21) Application number: **02014511.6**

(22) Date of filing: **01.07.2002**

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

(30) Priority: **19.07.2001 IT PN20010027 U**

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(54) Steam ironing apparatus

(57) The present patent application refers to a steam ironing apparatus for steam-assisted ironing of garments and clothing items, which comprises a board provided with a plurality of through-perforations, and constituting the ironing top, as well as a chamber situated below said ironing board and fluid-dynamic means adapted to generate a forced air flow to and from said ironing board, thereby determining a negative or positive pressure value inside the chamber.

The fluid-dynamic means are constituted by a first and a second motor, adapted to rotate in opposite directions, and a single fan that is adapted to be selectively driven by said first or said second motor.

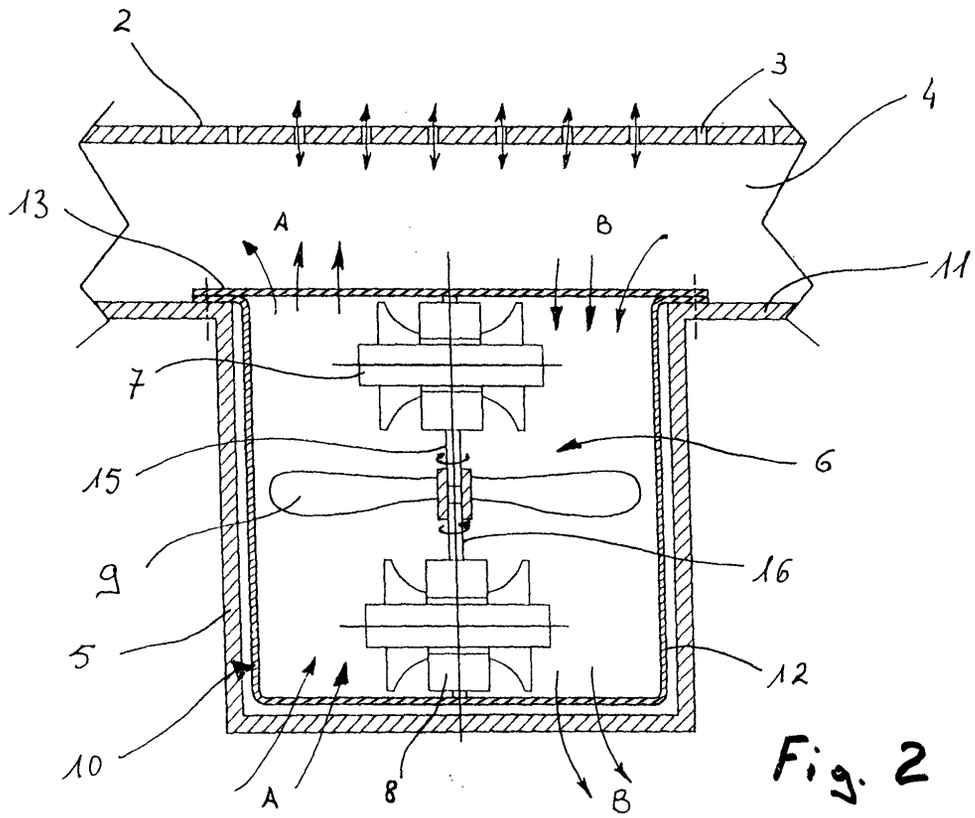

Fig. 2

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Description

[0001] The present patent application refers to a steam ironing apparatus for steam-assisted ironing of garments and clothing items, which comprises a board provided with a plurality of through-perforations, and constituting the ironing top, as well as a chamber situated below said ironing board and fluid-dynamic means adapted to generate a forced air flow to and from said ironing board, thereby determining a negative or positive pressure value inside the chamber.

[0002] The steam-assisted clothing ironing method is generally known to require the generation of steam by means of a boiler that may be either integrated inside the smoothing iron itself or be provided separately from and independently of the same iron, wherein the water contained in such a boiler is generally heated by means of electric heating elements.

[0003] In view of improving ironing of garments in general and also making it quicker to carry out, apparatuses have been implemented which are provided with a chamber located below the ironing top which features a perforated surface. Inside such a chamber it is possible to obtain either a pressure value that is higher than the atmospheric pressure value, hereinafter referred to as positive pressure, or a pressure value that is lower than the atmospheric value one, hereinafter referred to as negative pressure. Such pressure variations can be obtained by means of one or more fans, each one of which is usually driven by its own motor; these fans are arranged below the ironing top and in communication with the above mentioned chamber.

[0004] The variation in the value of the pressure prevailing inside the chamber brings about a flow of forced air, which may possibly be mixed with steam and causes the garment lying on the ironing top to correspondingly adhere thereto or separate, i.e. move away therefrom: in the first case, in which said flow of air is oriented downwards owing to its being determined by a negative pressure prevailing underneath the ironing top, the passage of the steam from the smoothing iron through the fabrics being ironed is facilitated, thereby reducing the time required by the garment to be dried favouring a better adherence of the same garment; in the second case, in which said flow of air is on the contrary oriented upwards owing to its being originated by a positive pressure prevailing underneath the ironing top, the garment being ironed is so-to-say "swelled out" in view of spreading it out and laying it down properly on the ironing top for the subsequent ironing operation, thereby preventing the fabrics from possibly forming creases that might impair the final result of the same ironing operation.

[0005] Apparatuses of the above described kind are particularly used in professional ironing applications: in general, there are provided two fans, i.e. a blowing or pressure-type fan and a suction-type fan, in which each one of such fans is driven by an independent motor of its own: the perforated ironing table is possibly provided with one or more shutters adapted to slide in a direction parallel to the same board either by manual operation or by electromechanical actuator means. The task performed by such sliding shutters is to occlude the aperture or the apertures, as the case may be, corresponding to the fan which is not operating, so as to improve the effectiveness of the blowing or intaking, i.e. sucking action of the fan being operated.

[0006] Although quite effective, the cost, the complex construction and the bulk, in terms of both weight and space requirements, of these apparatuses have made their use scarcely practicable in household, i.e. consumer applications.

[0007] Known, as a partial solution to the above mentioned drawbacks, is the disclosure in the European patent application no. 0 750 066 filed on March 3, 1996 with a claimed priority date of June 19, 1995, which refers to a household garment ironing apparatus comprising a perforated board featuring, underneath the worktop, a chamber associated with means for the generation of a negative pressure and means for the generation of a positive pressure, wherein said apparatus further comprises a steam-assisted smoothing iron equipped with a control device for the steam. The peculiarity of this solution lies in the fact that the means that generate the pressure variations are constituted by a single axial-flow fan, comprising its own impeller and driving motor, wherein further means are provided as well, which enable the direction of rotation of the motor to be selected and, therefore, the fan to be controlled so as to let it generate a positive pressure or a negative one. These further means comprise an electronic circuit controlling the power supply to the fan, which is capable of being actuated through the steam control device provided on the smoothing iron: a pressure exerted manually by the user on such a device for a period of time in excess of a predetermined time t_0 will cause the fan to rotate in such a direction as to generate a negative pressure, whereas a pressure exerted on such a device for a shorter period of time than said pre-determined time t_0 will cause the fan to rotate in the opposite direction, thereby generating a positive pressure.

[0008] While proving expedient dimensionally, the above described solution is nevertheless rather complex as far as the electronic circuit that it requires to control and govern the fan, owing to such a circuit reducing the overall reliability of the apparatus do to an increased likeliness of malfunction or break-down events.

[0009] Furthermore, such a way of operating the fan by means of a single multipurpose control may prove rather awkward for a user to readily get familiar with it for a proper use thereof.

[0010] A further reason owing to which the above cited solution may be considered as being scarcely advantageous is the high cost of the single motor with a bidirectional rotation capability, owing to the double winding required and the design and construction complications that is usually implies.

[0011] Finally, the possibility for the fan driving motor to rotate in both directions causes the same motor to undergo stresses of a certain extent which may lead to a quick wear-down or even a break-down of the component parts thereof: be it sufficient to remind here the torsional stresses that are brought about when the motor is caused to abruptly change from a direction of rotation to the opposite one owing to an error in the actuation time by the user when, for instance, the pressure exerted on the control device is erroneously protracted beyond the pre-determined time t_0.

[0012] A solution that seems effective in partially doing away with the above-mentioned drawbacks is described in the European patent application no. 0 976 864 filed on July 8, 1999 with a claimed priority date of July 31, 1998. This patent application refers to an ironing apparatus comprising a perforated board that features, underneath the worktop, a chamber in communication with the perforated area and fluid-dynamic means adapted to selectively generate a positive pressure and a negative pressure, said means being constituted by a pair of independent fans, the first one of which is adapted to generate a positive pressure and the second one is adapted to generate a negative pressure. The impellers of said first and said second fan, respectively, are provided in a mutually facing arrangement and are both contained in a single conduit communicating with the above cited chamber.

[0013] However, even this solution has a number of drawbacks, a major one of which is the considerable space required by it owing to the presence of two separate and distinct fans, each one of them including its own impeller and driving motor. Furthermore, the efficiency of the system constituted by said two fans is not an optimum one: in fact, when one of the two fans is rotating, the remaining one is also caused to somehow rotate by the effect of the fluid-dynamic interference created by the operating fan, thereby partially reducing the actual effect of the latter.

[0014] It therefore is a main purpose of the present invention to do away with all of the above mentioned drawbacks of the prior-art solutions by providing a steam ironing apparatus, in particular intended for use in household applications, which is most convenient and ready to use.

[0015] Another purpose of the present invention, within the scope of the above cited main one, is to provide a steam ironing apparatus which is fully reliable in its operation, while limiting component wear or breakdown over time.

[0016] Another purpose yet of the present invention is to provide a steam ironing apparatus which is suitably compact in size and lightweight, these features being fully essential for the apparatus to be capable of being used in household and similar applications.

[0017] A further purpose of the present invention is to provide a steam ironing apparatus which is most efficient in its operation.

[0018] A last, but not least purpose of the present invention is to provide a steam ironing apparatus which is low in cost and capable of being manufactured using readily available, generally known tools, machinery and techniques.

[0019] According to the present invention, these aims, along with further advantageous features that will become apparent in the following description, are reached in a steam ironing apparatus comprising:

- a worktop formed by a board provided with a plurality of through-perforations distributed all over the surface thereof;
- a chamber communicating with said through-perforations and associated to said board in a position therebelow;
- fluid-dynamic means adapted to generate a positive pressure and a negative pressure within said chamber;
- a seat or housing accommodating said fluid-dynamic means, communicating with said chamber,

characterized in that said fluid-dynamic means are constituted by a first motor and a second motor, which are adapted to rotate in respective opposite directions, and in that said fluid-dynamic means are constituted by a single fan adapted to be selectively driven by said first motor to generate said positive pressure, and by said second motor to generate said negative pressure.

[0020] Anyway, features and advantages of the present invention may be more readily understood from the description that is given below of some preferred, although not sole embodiments that are illustrated by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a perspective view of the apparatus according to the present invention;
- Figure 2 is a cross-sectional view of the apparatus along the longitudinal plane II-II thereof;
- Figure 3 is a view similar to the one shown in Figure 2, of a second embodiment of the present invention.

[0021] With reference to the above cited Figures, the reference numeral 1 is used to generally indicate a steam ironing apparatus. Such an apparatus comprises a worktop constituted by a board 2 provided with a plurality of through-perforations 3 distributed over the surface thereof, and a chamber 4 communicating with said through-perforations 3; the chamber 4 is obtained by means of an appropriately shaped plate 11 that is associated to the board 2 in correspondence of the lower surface of the latter.

[0022] The chamber 4 is provided with a ventilation conduit 5 which, as connected to said plate 11 or integrally provided therein, constitutes a seat or housing to accommodate fluid-dynamic means, generally indicated at 6, that are adapted to generate a positive pressure or a negative pressure inside said conduit 5 and the chamber 4.

[0023] These fluid-dynamic means 6 are constituted by a first motor 7, a second motor 8, which is separate and distinct from said first motor 7, and a single fan 9 that is adapted to be driven selectively by said first motor 7 or said second motor 8.

[0024] The first motor 7 and the second motor 8 are adapted to rotate in an opposite direction with respect to each other; they are housed inside the conduit 5 along a same vertical axis and on opposite sides with respect to the fan 9, which therefore turns out to be arranged centrally and coaxially with respect to said first and said second motor 7 and 8, the respective drive shafts 15 and 16 of which are oriented towards the fan 9. The latter is in turn coupled with both said drive shafts 15, 16 so that, if the first motor 7 is for instance operated, the second motor 8 will be idling, and vice-versa. As an alternate solution, there may be provided means for selectively coupling the fan 9 to either one of the two motors 7 or 8. These means may for instance include a user-actuatable slider that causes the fan 9 to displace, i.e. translate vertically so as to be selectively coupled to a selected one of the two drive shafts 15 or 16, while disengaging it from the other one.

[0025] The selective operation of the motors 7 and 8 is obtained through any suitable means of a per se known type, such as for instance a foot-pedal control provided on the floor and adapted to act on either one of a pair of switches according to the desired direction of rotation.

[0026] The whole assembly formed by the first motor 7, the second motor 8 and the fan 9 is contained within a structure 10 that supports such assembly and secures it to the plate 11; in an advantageous manner, said support and securing structure 10 is constituted by a first bracket 12 to which a second bracket 13 is connected, the second motor 8 and the first motor 7 being associated to these brackets, respectively. Preferably, said structure 10 is connected to the plate 11 in correspondence of the second bracket 13.

[0027] The conduit 5 is advantageously closed at its bottom by means of a protective covering made of a grid-like or perforated material.

[0028] The operation is as follows: the fan 9, as driven by means of either the first motor 7 or the second motor 8, generates an air flow whose direction depends on the direction of rotation of the driving motor selected; so, for instance, the first motor 7 would cause the fan 9 to rotate in such a direction as to bring about an air flow which, as generally indicated at A, enters the conduit 5 and, therefore, moves from the bottom of the conduit 5 towards the perforations 3; accordingly, the air being sucked, i.e. taken in by the fan 9 will generate a positive pressure inside the chamber 4, thereby causing the air flow A to exit through the perforations 3 and, therefore, the fabric of the garment being to be ironed to be appropriately swelled up and spread out.

[0029] On the contrary, if the second motor 8 is selected, the fan 9 will be caused to rotate in the opposite direction with respect to the one imposed in the above considered case. Accordingly, an air flow will be generated which, as indicated at B, moves out of the conduit 5 and is therefore oriented from the perforations 3 towards the bottom of the conduit 5. The air being so exhausted by the fan 9, in this case possibly mixed with steam taken in from the ironing top, will therefore bring about a negative pressure inside the chamber 4, thereby giving rise to a suck-in effect that draws in both air and steam from the ironing top through the perforations 3 and, accordingly, improves the adherence of the fabric onto the ironing top.

[0030] The function of the two motors may of course be reversed, in that the first motor 7 may be arranged to generate a negative pressure and the second motor 8 may on the contrary be arranged to generate a positive pressure, without implying any departure from the scope of the present invention.

[0031] From the above description it can be most clearly inferred how the steam ironing apparatus according to the present invention is actually capable of reaching afore indicated aims and ensuring all of the advantages deriving therefrom. First of all, the emphasis should in this connection be placed on the reduction in both the size and the weight of the whole arrangement, which is obtained thanks to the compact construction of the assembly constituted by the two counter-rotating motors 7 and 8 and the single fan 9, without thereby making the use of the same apparatus any difficult or awkward; in fact, the presence of two separate and mutually independent motors, and therefore of respective separate and properly distinct controls, enables the user to readily and intuitively understand how the whole system works, and makes it most easy and convenient for the apparatus itself to be properly used.

[0032] Furthermore, the presence of two distinct motors selectively driving a single fan ensures a greater reliability of the whole apparatus, since the electronic control circuitry used is much simpler and the motors are not exposed to any particularly heavy stress, all this translating of course into a far lower wear and/or failure rate of the component parts involved.

[0033] A further quite important advantage derives from an improved operating efficiency of the fluid-dynamic means: in fact, the presence of a single fan 9 that is capable of rotating in both directions, thereby acting as a pressure fan or as a suction fan according to the direction of rotation, does not imply any fluid-dynamic interference with other adjacent fans.

[0034] It will be readily appreciated that the steam ironing apparatus that has been described above by

mere way of example may be the subject of a number of modifications and different embodiments without departing from the scope of the present invention.

[0035] For instance, Figure 3 can be noticed to illustrate a second embodiment of the present invention which, as generally indicated at 101, is shown to comprise a worktop constituted by a board 102 provided with a plurality of through-perforations 103 distributed over the surface thereof, and a chamber 104 which communicates with said through-perforations 103 and is obtained by means of an appropriately shaped plate 111 associated to the board 102.

[0036] The chamber 104 is provided with a ventilation conduit 105 which constitutes a seat or housing to accommodate the fluid-dynamic means that are generally indicated at 106 and are adapted to generate a positive pressure or a negative pressure inside said conduit 105 and the chamber 104.

[0037] These fluid-dynamic means 106 are constituted by a first motor 107, a second motor 108, which is separate and distinct from said first motor 107 and rotates in the opposite direction with respect to the latter, and a single fan 109 that is adapted to be driven selectively by said first motor 107 or said second motor 108 via driving means that may for instance be constituted by a gear train 112, 113, 114, 115.

[0038] The first motor 107, the second motor 108 and the fan 109 are housed inside the conduit 105 along mutually parallel vertical axes by means of a support and securing structure 110 to which said first and said second motor 107, 108 are secured, and to which the fan 109 is connected rotatably.

[0039] The conduit 105 is advantageously closed at its bottom by means of a protective covering made of a grid-like or perforated material.

[0040] It should be noticed that the materials used to implement the present invention, as well as the shapes and the size of the individual component parts, may each time be selected so as to most appropriately fit any particular need or comply with any application-related requirement, without this implying any departure from the scope of the present invention.

Claims

1. Steam ironing apparatus comprising

   - a worktop formed by a board provided with a plurality of through-perforations distributed over the surface thereof;
   - a chamber communicating with said through-perforations and associated to said board in a position therebelow;
   - fluid-dynamic means adapted to generate a positive pressure and a negative pressure within said chamber;
   - a seat or housing to accommodate said fluid-dynamic means, communicating with said chamber,

   characterized in that said fluid-dynamic means are constituted by a first motor and a second motor, which are adapted to rotate in respective opposite directions, and a single fan adapted to be selectively driven by said first motor to generate said positive pressure and by said second motor to generate said negative pressure.

2. Steam ironing apparatus according to claim 1, **characterized in that** said chamber is provided with a ventilation conduit constituting said seat or housing to accommodate said fluid-dynamic means.

3. Steam ironing apparatus according to claim 1, **characterized in that** said first motor is separate and distinct from said second motor.

4. Steam ironing apparatus according to claim 3, **characterized in that** said first and second motors are housed within said conduit along a same vertical axis on mutually opposite sides with respect to said fan.

5. Steam ironing apparatus according to claim 4, **characterized in that** said fan is arranged centrally between said first and said second motor and coaxially therewith, and the respective drive shafts of said first and said second motor are oriented towards said fan.

6. Steam ironing apparatus according to one or more of the preceding claims, **characterized in that** said chamber is obtained by means of an appropriately shaped plate that is associated to said board in correspondence of the lower surface of said same board.

7. Steam ironing apparatus according to claim 6, **characterized in that** said ventilation conduit is connected to said plate or integrally provided therein

8. Steam ironing apparatus according to claim 7, **characterized in that** said fluid-dynamic means are contained within a structure for both supporting said fluid-dynamic means and securing them to said plate.

9. Steam ironing apparatus according to one or more of the preceding claims, **characterized in that** said first motor, said second motor and said fan are housed inside said conduit along mutually parallel vertical axes, in which said fan is adapted to be driven selectively by said first motor or said second motor via drive, i.e. motion-transmission means.

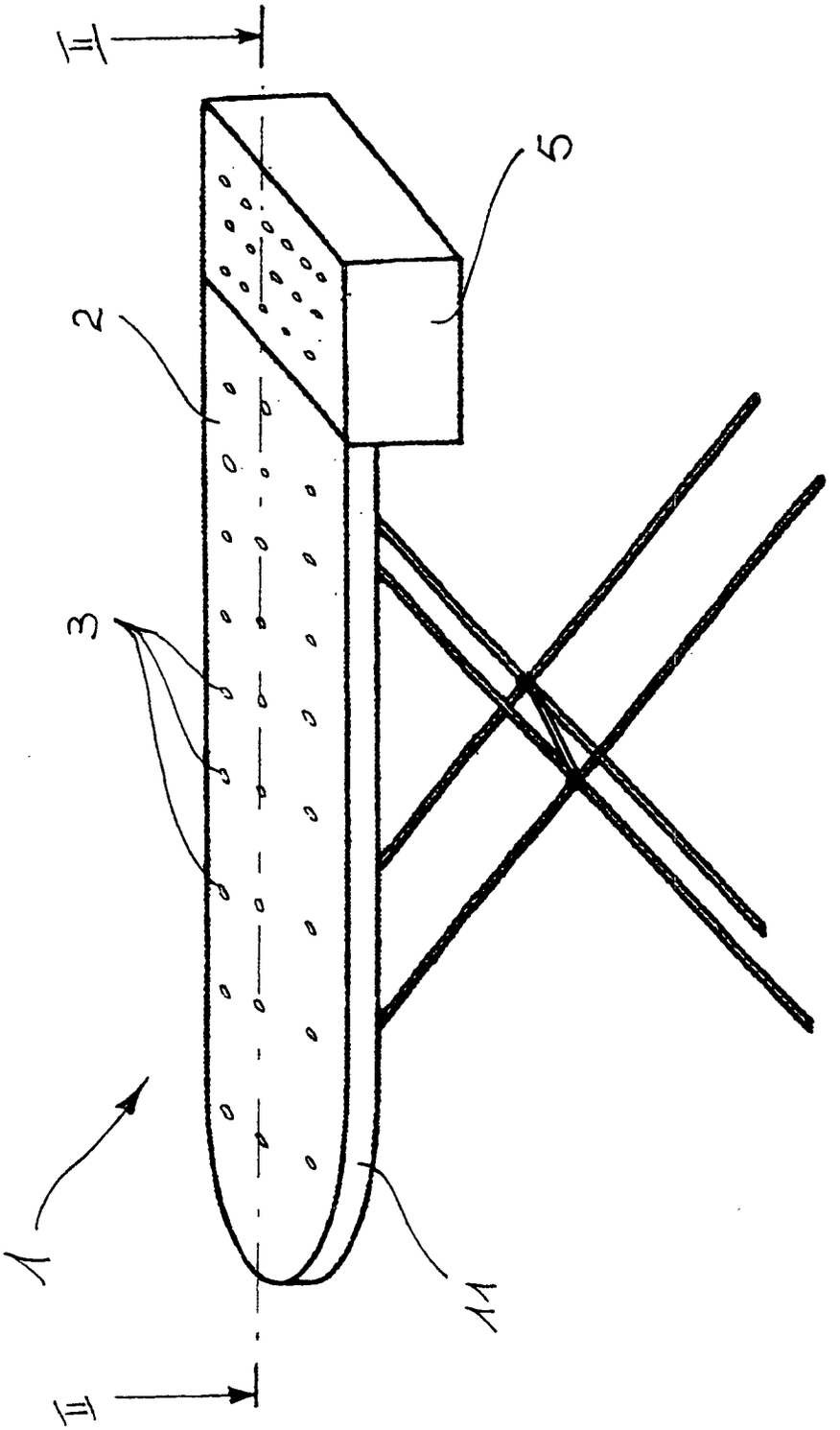

Fig. 1

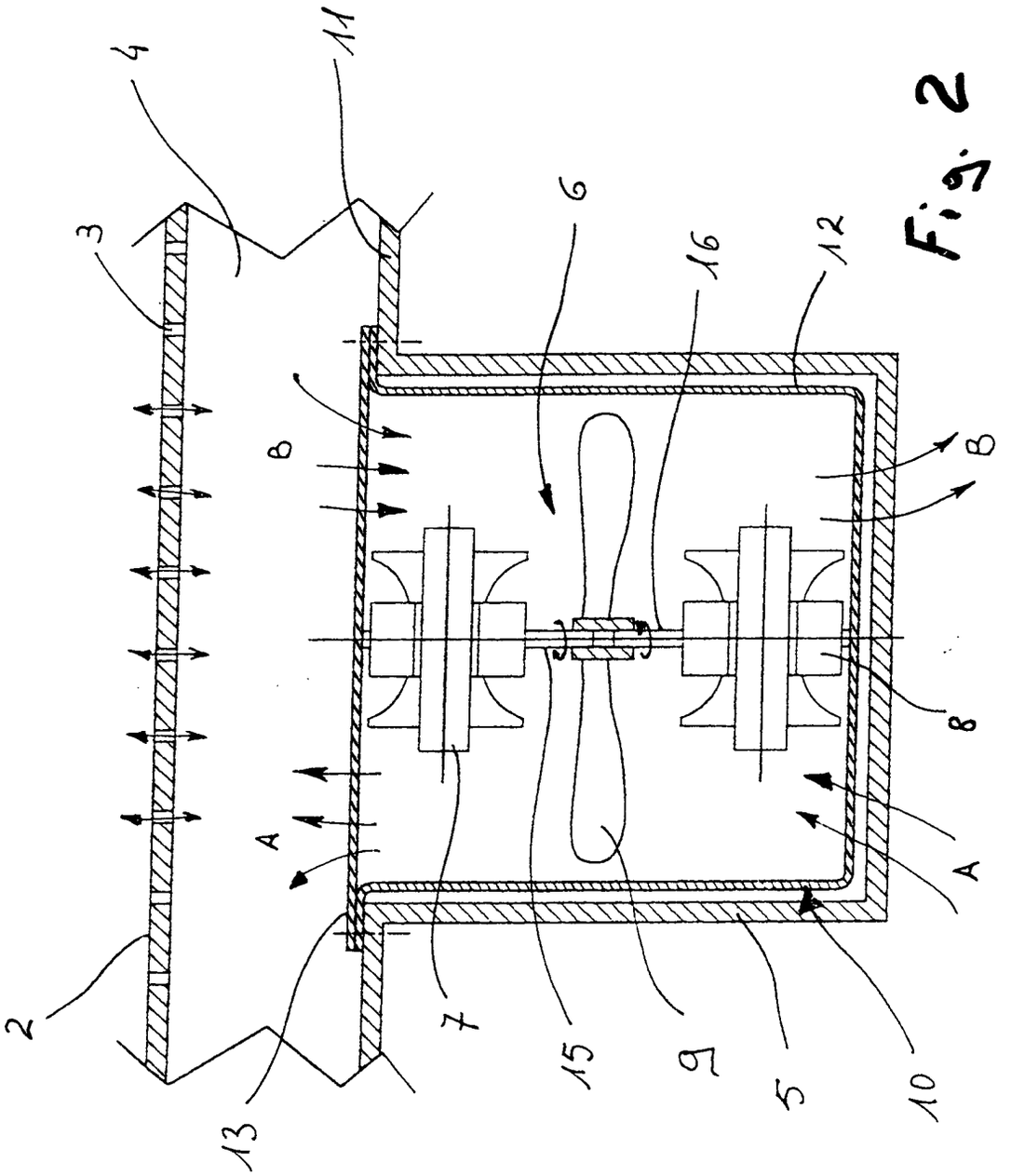

Fig. 2

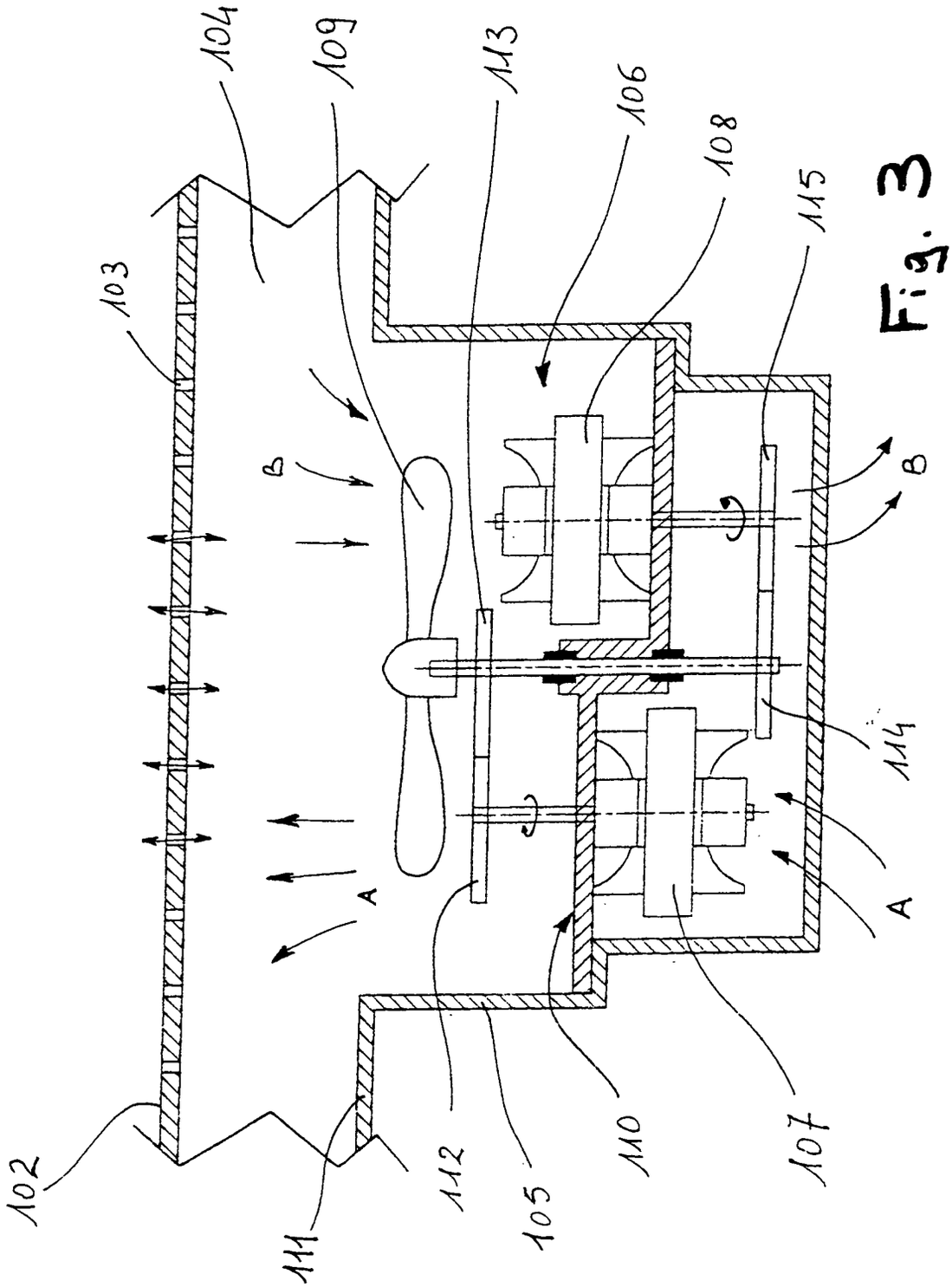

Fig. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 01 4511

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)
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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
THE HAGUE	7 October 2002	Norman, P

CATEGORY OF CITED DOCUMENTS

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