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

(11) **EP 3 203 162 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.08.2017 Bulletin 2017/32

(21) Application number: **17153677.4**

(22) Date of filing: **30.01.2017**

(51) Int Cl.:
F24H 3/04 *(2006.01)* ***F24H 9/00*** *(2006.01)*
H05B 3/40 *(2006.01)* *H05B 3/14* *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **03.02.2016 IT UB20160200**

(71) Applicant: **HT S.p.A.**
31058 Susegana (TV) (IT)

(72) Inventor: **DALL'ANESE, Costante**
31058 SUSEGANA TV (IT)

(74) Representative: **Burchielli, Riccardo et al**
Barzano & Zanardo Roma S.p.A.
Via Piemonte 26
00187 Roma (IT)

(54) HEATING STRUCTURE FOR HOT AIR DISTRIBUTORS

(57) A heating structure for hot air distributors, comprising a tubular element (10) inserted inside a casing (11) of a hot air distributor, wherein said tubular element (10) is engaged in correspondence with a tapered end (12) of said distributor from which a flow of hot air (7) outcomes and said tubular element (10) includes at least one resistor (13) attached to a thermally conductive layer (14), while, at one end opposite to said tapered end (12), an inlet opening (1) is provided where a flow of supply air (F) flows; said flow of supply air (F) is divided, by means of a transverse barrier (2), into two air flows (F1), which flow inside respective cavities (3) and follow a winding path, so that the air flow (F3) conveyed towards the output, by flowing along said resistor (13), is constantly and efficiently heated.

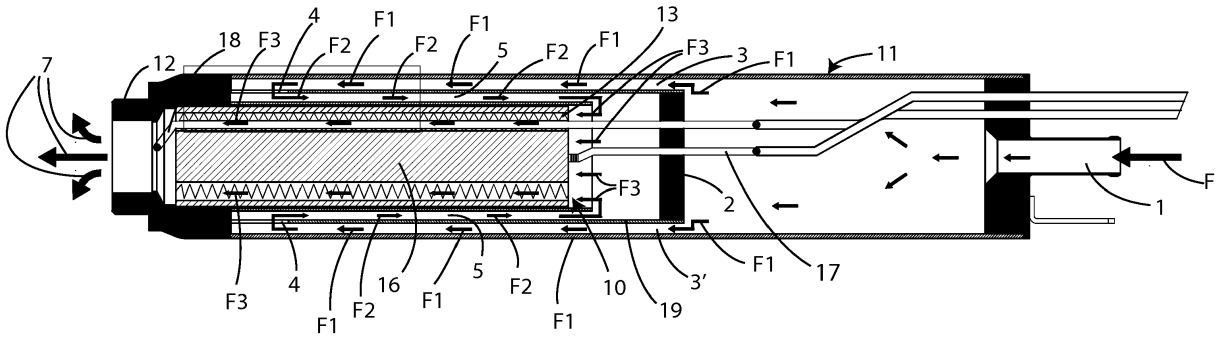

Fig. 1

EP 3 203 162 A1

Description

[0001] The present invention generally relates to a heating structure for hot air distributors.

[0002] More particularly, the invention relates to a heating structure for hot air distributors, in which a resistor is traversed by an air flow and at least one conductor element, which is coupled with a support element made of a stable thermally material, converts electrical energy into heat.

[0003] Known heating elements are normally used for hot air distributors, such as, for example, air heaters for environments, hair dryer, etc.

[0004] Said heating elements, which are traversed by a flow of air or other fluid which is supplied in output, are generally made of ceramic material or another heat resistant material and are inserted inside a tubular element, in which, from one end, air is blown.

[0005] Furthermore, the heating element is connected to a source of electric supply, through a support element which is usually placed at the air inlet. At an output end a further protective disk made of ceramic, which contains the channels within which flows the outgoing hot air, is also placed.

[0006] The heating elements are normally constituted by spiral-shaped electrical conductors, which are insulated and fixed to the support element.

[0007] The above electrical conductors may be positioned within the channels of the support element, which extend from the air inlet up to the air outlet, or can be fitted on an external liner of the support element.

[0008] When electric power is supplied, both the air at the input of the device and the support element of said resistors are instantly heated.

[0009] The present invention is related to an improved heating structure for hot air distributors, which has a greater reliability of the heating elements, a better heat transfer to the output and, consequently, a greater efficiency, with respect to the prior art.

[0010] Another object of the invention is to provide a heating structure for hot air distributors, which is able to obtain a significant and almost immediate thermal exchange of the incoming air flow, also decreasing the overall dimensions of the structure and saving time and/or fluid.

[0011] A further object of the invention is to provide a heating structure for hot air distributors, which is particularly effective, reliable, convenient and cheap, with respect to the prior art, and which can be used for any new or already existing hot air distributor device.

[0012] These and other objects are achieved by a heating structure for hot air distributors according to the appended claim 1.

[0013] Other technical features of the invention can be found in the other dependent claims.

[0014] Advantageously, the structure according to the invention allows to quickly heat the air flowing at the input and instantly to get a homogeneous and controlled temperature of the air at the output, by employing a winding circuit which constitutes a heat exchanger inside a total heat exchange circuit.

[0015] The heat exchange takes place instantaneously and therefore a consequent and significant saving of delivered fluid and time taken for heating a given quantity of fluid, with respect to the prior art, is obtained. Practically, the heating structure is provided with at least two coaxial resistors contained within respective tubular elements, which are placed at a distance from one another in the radial direction and which define relative coaxial channels in which the air to be heated flows; several tubular elements with walls having a minimum thickness or at least two tubular elements having more thick walls can be used.

[0016] Said tubular elements define coaxial air channels and act as supporting elements of the electrical resistors; moreover, internal and external surfaces of said tubular elements have a conductive ceramic layer which behaves as a heat conductor.

[0017] Due to their large surface, said channels have a relevant air flow. Furthermore, the inner and outer surfaces of the channels allow a significant heat exchange before the air flow is sent out.

[0018] Furthermore, the particular structure of the invention allows to simplify the entire manufacturing process and, in particular, allows to reduce time and costs production.

[0019] The fast and uniform heat which is transferred to the air flow through a wide exchange surface, on one hand, decreases the danger of overheating the electrical conductor and, on the other hand, has a positive effect on the output air flow, since the mechanical stresses on the hot air delivery system are minimized.

[0020] Finally, the heating structure according to the invention is particularly used for hot air distributors with an output having a cylindrical section where the heating resistors are placed, with an air blower at the input and a portion in which a drive motor of the blower and a control unit for operating the resistors are housed.

[0021] Further objects and advantages will become more clear from the following description, relating to a preferred embodiment of the heating structure for hot air distributors, which is the object of the invention, and from the attached drawings, in which:

- figure 1 shows a longitudinal section view of the heating structure for hot air distributors, according to the present invention;
- figure 2 shows an enlarged detail of the heating structure of figure 1, according to the invention.

[0022] With reference to the above mentioned figures, the heating structure of the present invention has a tubular element 10, which is inserted inside a casing 11 of the hot air distributor and, in particular, which is engaged in correspondence with a tapered end 12 of the distributor from which the flow of hot air 7 comes out.

[0023] At least one resistor 13 is placed inside the tubular element 10 and said resistor 13 has essentially a tubular shape and is attached to a thermally conductive layer 14; both the tubular element 10 and the conductive layer 14 are made of ceramic material and, in particular, the element 10 has an outer casing 15 and a central body 16 made of electrically conductive ceramic material, to which the electrodes 17, 18 are connected for providing an electrical voltage in order to have electric current in the resistor 13.

[0024] The inlet air flows (arrow F) from the inlet opening 1 and is spread inside the distributor.

[0025] A transverse barrier device 2 then divides the inlet air flow F in two primary flows F1, which are inserted in respective cavities 3 comprised between the housing 11 of the distributor and a further inner tubular wall 19 placed between the housing 11 of the distributor and the casing 15 of the tubular element 10.

[0026] Said inner tubular wall 19 has, towards the tapered end 12 of the distributor, one or more through holes 4, which direct the air flow inside the cavity 5 provided between the inner tubular wall 19 and the casing 15 of the tubular element 10.

[0027] Said air flow F2 is then directed back towards the base of the tubular element 10 and then conveyed again toward the end 12 (flow F3), so as to completely envelope the resistor 13.

[0028] Therefore, while the air flow F runs through the resistor 13 from the inlet opening 1 towards the outlet tapered end 12, said flow is continuously heated.

[0029] Moreover, the particular air flow (which follows a winding path, with a forward flow F1, a return flow F2 and a further forward flow F3, which passes through the resistor 13 until the output of the hot air distributor) causes the heating of the inlet air flow F in a more efficient way and more quickly with respect to the prior art.

[0030] The technical features of the heating structure for hot air distributors, which is the object of the present invention, as well as the related advantages, are clear from the above description.

[0031] It is also clear that other embodiments of the heating structure can be provided, without departing from the novelty principles of the inventive idea as claimed in the appended claims.

[0032] In case of the technical features mentioned in the claims are followed by reference signs or numbers, said reference signs have been introduced with the sole purpose of increasing the intelligibility of the claims and consequently, they have no limiting effect on the interpretation of each element identified by said reference signs.

Claims

1. Heating structure for hot air distributors, comprising a tubular element (10) inserted inside a casing (11) of a hot air distributor, wherein said tubular element (10) is engaged in correspondence with a tapered end (12) of said distributor from which a flow of hot air (7) outcomes and said tubular element (10) includes at least one resistor (13) attached to a thermally conductive layer (14), while, at one end opposite to said tapered output end (12), an inlet opening (1) is provided where a flow of supply air (F) flows, **characterized in that** said flow of supply air (F) is divided, by means of a transverse barrier (2), into two air flows (F1), which flow inside respective cavities (3) comprised between said casing (11) of the distributor and an inner tubular wall (19) placed between said casing (11) of the distributor and an outer casing (15) of said tubular element (10), wherein said inner tubular wall (19) has, toward said tapered end (12) of the distributor, one or more through holes or openings (4), which send said air flows (F1) inside respective cavities (5) placed between said inner tubular wall (19) and said outer casing (15) of said tubular element (10), said air flows (F1) being sent (F2) again towards a base of said tubular element (10) and then conveyed again (F3) toward said tapered end (12), so as to completely envelope said resistor (13) and so that said supply air (F), by flowing along said resistor (13), is constantly heated.

2. Heating structure according to claim 1, **characterized in that** said resistor (13) has a tubular shape.

3. Heating structure according to claim 1, **characterized in that** said tubular element (10) and said thermally conductive layer (14) are made of ceramic material.

4. Heating structure according to claim 1, **characterized in that** said tubular element (10) has an outer casing (15) and a central body (16), made of electrically conductive ceramic material, to which are connected a plurality of electrodes (17, 18) for applying an electric voltage and an electric current at said resistor (13).

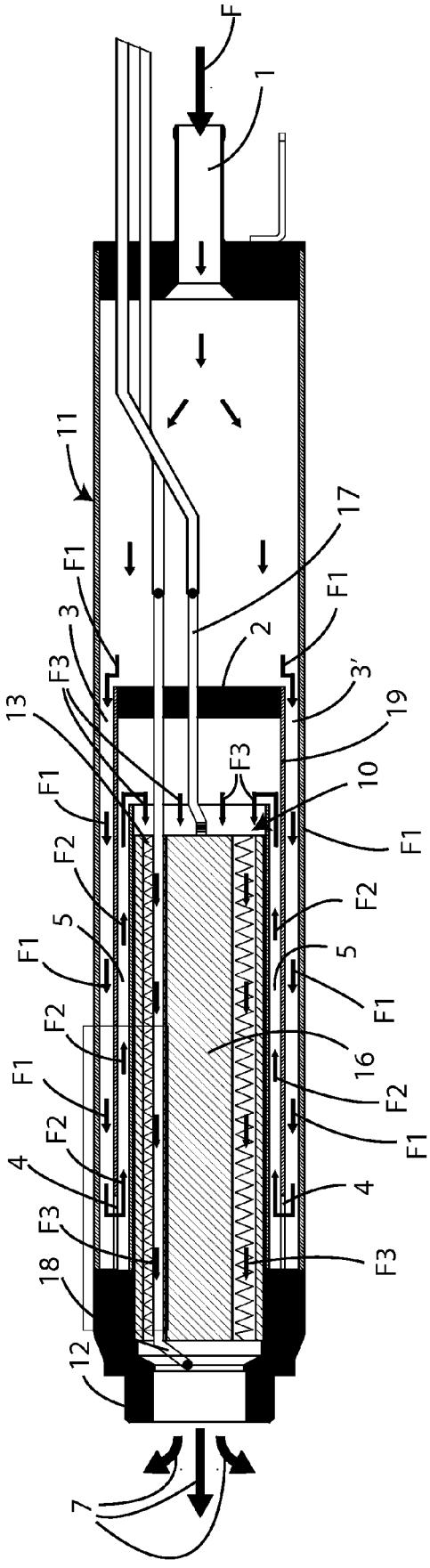

Fig. 1

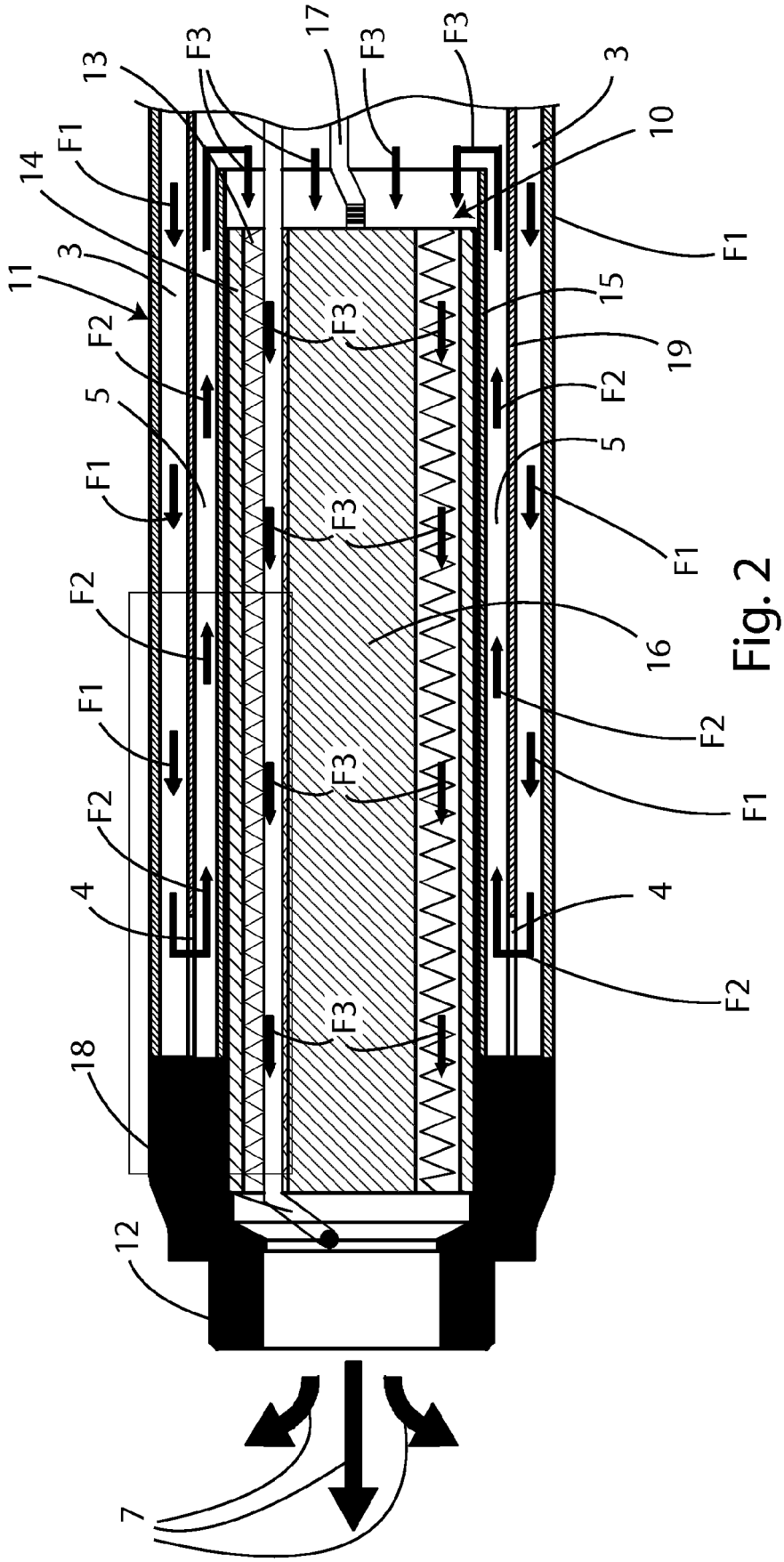
F3
17
F3
F3
3
13
10
F1
14
F1
3
11
15
F2
19
F3
F2
5
5
F1
F1
F3
F2
16
F1
F2
F3
F1
F2
4
4
F2
F3
18
12
7

Fig. 2

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 15 3677

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 109 912 A (CERULLI RALPH G) 5 November 1963 (1963-11-05) * column 1 - column 2; figures 1-6 * -----	1-4	INV. F24H3/04 F24H9/00 H05B3/40
X Y	EP 2 690 374 A1 (HT S P A [IT]) 29 January 2014 (2014-01-29) * abstract; figures 1-4 * * paragraph [0018] - paragraph [0022] * -----	1-3 4	ADD. H05B3/14
Y	US 3 593 498 A (SEMON ALBERT L) 20 July 1971 (1971-07-20) * column 1; figure 2 * -----	4	

TECHNICAL FIELDS SEARCHED (IPC)

F24H
H05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 June 2017	García Moncayo, O

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 17 15 3677

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.

30-06-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3109912 A	05-11-1963	NONE	
EP 2690374 A1	29-01-2014	NONE	
US 3593498 A	20-07-1971	NONE	

EPO FORM P0459

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