United States Patent

[11] **3,627,445**

[72] Inventors **Francois Andriussi;**
Pierre Rouques, both of Grenoble, France

[21] Appl. No. **815,975**
[22] Filed **Apr. 14, 1969**
[45] Patented **Dec. 14, 1971**

[73] Assignee **S.E.R.M.A.G. Societe d'Etudes et de Recherches Magnetiques**
St. Martin d'Heres, France

[32] Priority **Apr. 17, 1968**
[33] **France**
[31] **148308**

[54] **VENTILATING DEVICE FOR COOLING A HEAT ENGINE**
3 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **416/170,** 310/103, 310/105
[51] **Int. Cl.** **F04d 25/14,** H02k 49/00
[50] **Field of Search** 230/270, 258, 259; 310/103, 105; 416/170

[56] **References Cited**
UNITED STATES PATENTS

2,053,425	9/1936	Else	230/259
2,527,237	10/1950	Wilcox, Jr.	310/103
3,220,484	11/1965	Elmer	230/270

Primary Examiner—Henry F. Raduazo
Attorney—Zalkind, Horne & Shuster

ABSTRACT: Ventilating device for a heat engine comprising a fan and a driving shaft connected to the fan by a coupling constituting a hysteresis drive coupling designed to slip beyond a given maximum transmissible torque. The part of the device which constitutes the armature and must dissipate the heat is located at the end of the device adjacent the fan, so as to face the stream of air created by the fan, whereby this part is cooled by this stream of air.

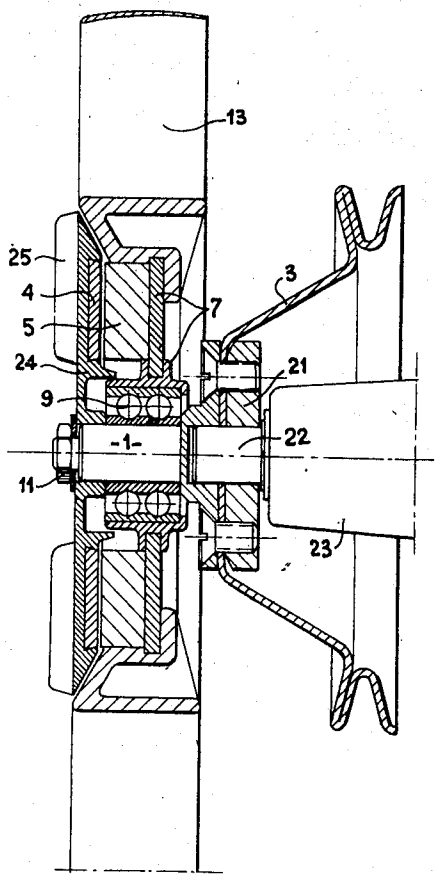
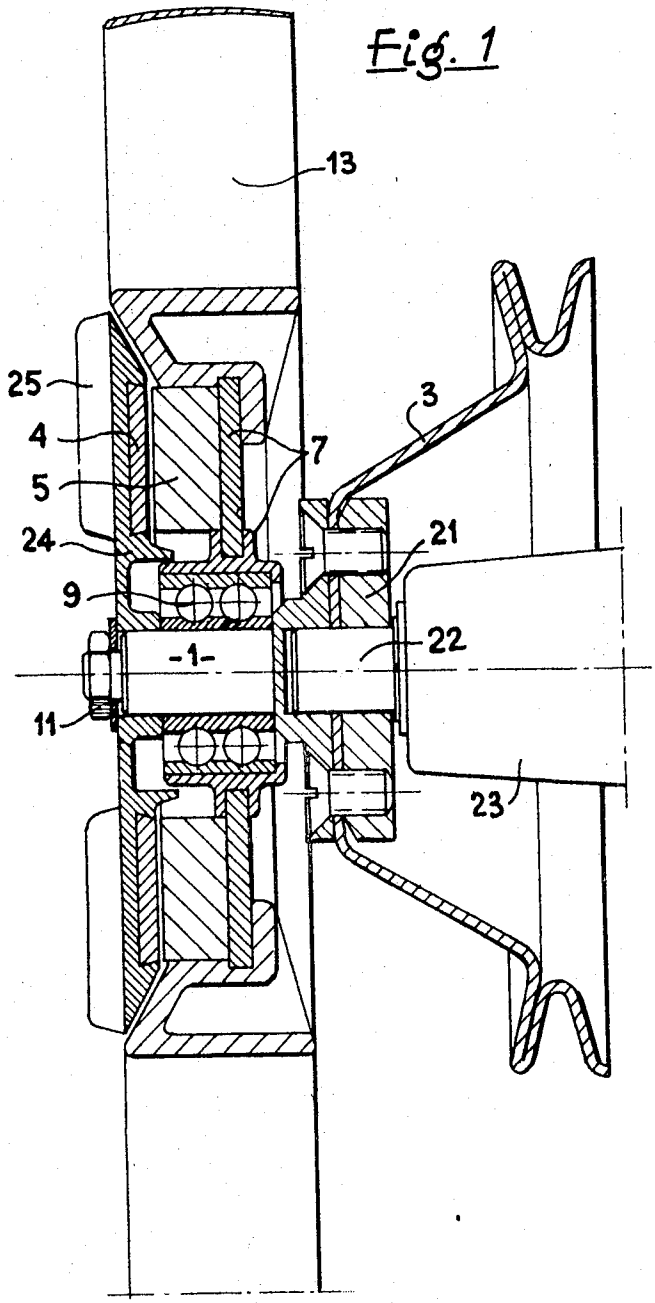


Fig. 1



Inventors:
François Andriussi
Pierre Rougues
Max Wall
Attorney

Fig. 3

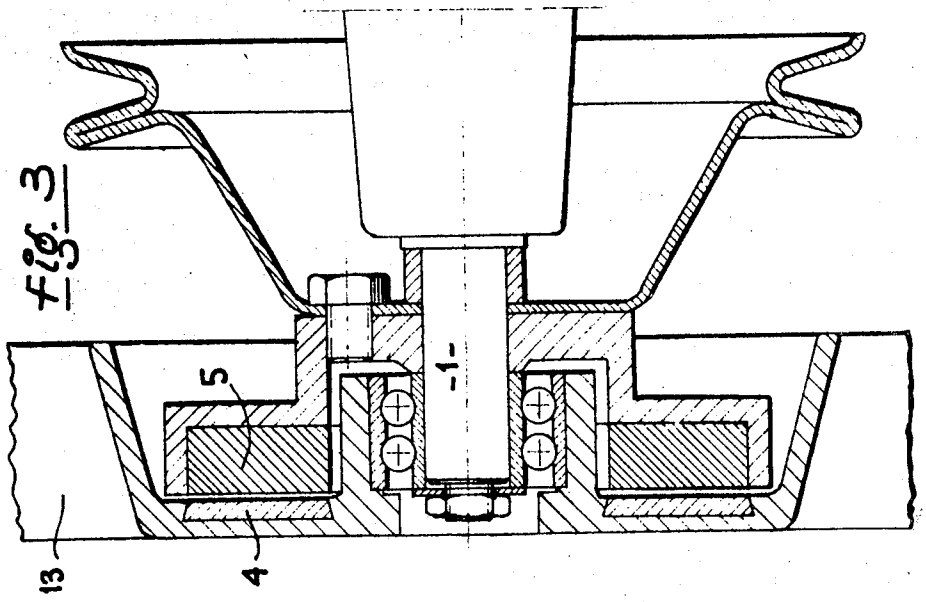
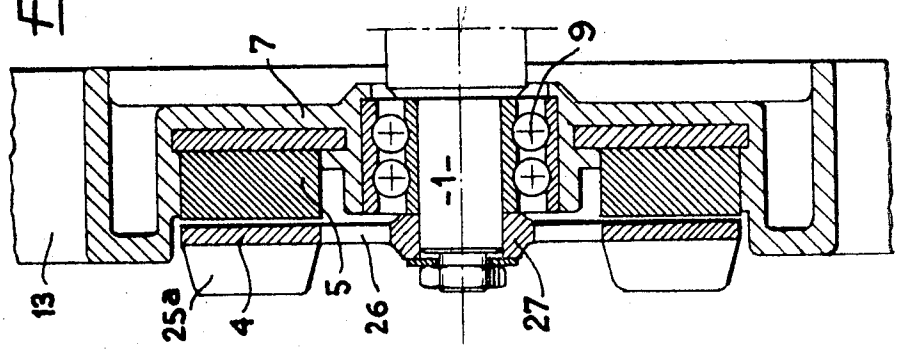


Fig. 2



Inventors:
François Andriussi
Pierre Rouques
Max Wall
Attorney

VENTILATING DEVICE FOR COOLING A HEAT ENGINE

A ventilating device for cooling a heat engine was described in the U.S. Pat. No. 3,458,122 issued on July 29, 1969, this device being adapted to the requirements of good operation of the engine and being applicable to any cooling method with no unnecessary loss of power.

This device comprises in combination with a driven fan rotor and a generally coaxial driving shaft driven by the engine to be cooled, two magnetic elements associated without mechanical contact, one of said elements being integral with the driving shaft and the other with the driven rotor, one of said elements constituting an inductor and the other element an induced element or armature which also has the property of a permanent magnet and is of such shape and size that it is subjected to the magnetization of the inductor.

The drive is through magnetic means whose principle of operation is known as a "hysteresis drive," that is, a drive with an automatic slip beyond a maximum transmissible torque.

The inductor is preferably multipolar and electromagnetic or preferably has a permanent magnet.

As concerns the armature, it is of a permanent magnet material, in particular of the type of those generally known as "hysteretic alloys" in which iron can receive isolated or combined additions of carbon, chromium, tungsten, cobalt etc., or of the nickel-aluminum-iron type. The dimensions and magnetic properties of the armature are so arranged that the armature is subjected to the magnetization of the inductor.

As in slip drives, usually termed couplings, the hysteresis drive must, when slip occurs, dissipate power equal to the torque transmitted multiplied by the relative slip speed.

In a magnetic hysteresis drive, the energy is dissipated exclusively in the hysteretic armature material all the elements of which are, during slip, magnetized alternately in one direction and the other in passing through a hysteresis cycle which is characteristic of the material. The energy lost in each element of the induced material is proportional to the area of the hysteresis cycle.

It will be easily understood that when the power to be dissipated, which is manifested by a flux of heat, reaches high values, it is desirable to favor as much as possible the discharge of heat so as to maintain a temperature which is low enough to ensure correct operation.

In this respect, the object of the invention is to provide a device of the type described in said patent specification which is so improved as to enhance the cooling conditions.

The invention provides a device in which the part which constitutes the armature and must dissipate the heat is located at the end of the device facing the stream of air created by the fan.

According to one embodiment, this part constituting the armature is the driving part of the device and provided with cooling fins whereas the inductor, which is driven, is integral with the fan, which may be of plastics material.

According to another embodiment, the part constituting the armature is driven and integral with the fan, which is of a material which is a good heat conductor, the inductor constituting the driving part and being connected to the drive shaft.

Further features and advantages of the invention will be apparent from the ensuing description with reference to the accompanying drawings.

In the drawings:

FIGS. 1–3 are diametral axial sectional views of three embodiments of the invention.

In the embodiment in FIG. 1, there is shown, as in the above-referred patent application, the shaft 1 integral with the drive pulley 3 and fixed therewith to a plate 21 which is a tight fit on the end of the shaft 22 of the water pump 23. Tightened

onto the end of the shaft 1 by a nut 11 is a part or member 24 carrying the hysteretic driving armature 4 which is thus placed at the front end of the device so that the stream of air of the atmosphere sweeps thereover. In this arrangement, the hysteretic armature 4 has the shape of a flat ring and is incorporated in the part 24, by moulding it therein or mechanically, the part 24 being of a material which is a good conductor of heat and carries projecting portions in the form of fins 25 whose function is to facilitate the heat exchange therewith. This part is advantageously of aluminum alloy. The driving armature 4 cooperates with a driven inductor 5 integral with the hub 7 which is freely mounted on the shaft 1 through a bearing 9 and carries fan blading 13.

FIG. 2 shows a modification of the same arrangement in which the hysteretic armature 4 has its own cooling fins 25^a, the assembly ($4,25^a$) being connected through radial arms 26 to a hub 27 for fixing to the shaft 1.

In the arrangements shown in FIGS. 1 and 2, the driven elements related to the inductor 5 and in particular the fan blading 13, undergo no heating due to the dissipation of energy which occurs entirely in the driving part 4 and are therefore very sensitive to the surrounding temperature. This property enables the driven parts, and mainly the blading 13, to be made of a synthetic material having a low softening temperature such as a thermoplastic material. In particular, for example propylene, polyamide or acetal can be employed.

FIG. 2 shows a blading 13 integral with the hub 7 which is made of synthetic material in the same way as the blading. This results in a remarkably simple, robust and practical construction.

FIG. 3 shows another arrangement in which the hysteretic armature 4 is also located in the front of the device, but is driven as described in the above-referred patent application. It is incorporated with the fan blading 13 by moulding it therein or mechanically; in which case the blading 13 must be of a material which is a good conductor of heat. In this arrangement, the whole of the fan blading performs the function of a radiator by offering a large area of contact with the air of the atmosphere which it puts into motion. The inductor 5 is, in this modification, the driving element and is integral with the shaft 1.

We claim:

1. In a ventilating device for cooling a heat engine, comprising in combination with a driven fan rotor and a generally coaxial driving shaft driven by the engine to be cooled, a coupling comprising two magnetic elements associated to each other without mechanical contact, said elements being fixed to the driving shaft and to the driven rotor respectively and constituting an inductor element and an induced element, the latter being of a ferromagnetic permanent magnet material and subjected the magnetization of the inductor element, said inductor element having at least two complementary poles, thereby to permit an hysteretic slip coupling drive of said driven fan rotor with said driving shaft beyond a maximal predetermined torque, the improvement wherein said induced element which must dissipate heat is located at the end of the device adjacent the fan, the material of said induced element having good heat conducting property and having a surface to be encountered by said air stream created by the driven fan so that heat will dissipate.

2. A device as claimed in claim 1, wherein said induced element is the driving part of the device and is provided with cooling fins whereas the inductor element, which is the driven part, is integral with the fan.

3. A device as claimed in claim 1, wherein said induced element is the driven part and integral with the fan which is of a material which is a good conductor of heat, the inductor element constituting the driving part and being connected to the driving shaft.

* * * * *