

Description

The present invention generally relates to an electromagnetic powder coupling device, and more particularly to a cooling system applicable to electromagnetic powder coupling devices including a clutch and/or a brake.

Major components of the general type industrial electromagnetic powder coupling device consist of, a field assembly incorporating therein a magnetic coil, a driving clutch referred to as a cylinder, a rotor as a driven clutch member and magnetic powder, merely referred to as "powder" being filled in a gap defined between the cylinder as a driving clutch and a driven clutch, which gap is usually referred to an actuating gap.

We will now explain, with reference to Fig 1, the general function of an electromagnetic powder coupling device.

When a cylinder 5 is rotated by being driven by an external driving shaft or by an attached driving shaft 4, with the coil 8 of a field member 9 not being excited, the powder in the gap is urged by centrifugal force against the inner wall of the cylinder 5, and thus an annular space is formed between the coalesced surface of the magnetic powder and a rotor 10. Therefore no appreciable amount of torque can be transmitted from the cylinder to the rotor, in this state of no contact between the powder and the rotor 10.

On the other hand, when the field coil 8 is excited, a closed path of magnetic flux ϕ is established as shown by a dash line in Fig 1.

Field member - Cylinder - Rotor - Cylinder - Field member

Then the magnetic powder aligns in the gap along the path of the magnetic flux ϕ in the assembly and couples the cylinder 5 with the rotor 10, thereby the driving force can be transmitted from the cylinder 5 to the rotor by virtue of the shear resistance of the magnetic powder.

Since Fig 1 is shown as an electromagnetic powder brake the rotor 10 is held stationary by a fixed rotor boss 10c, however, if this coupling device is to be used as a clutch, the rotor 10 is connected to an output shaft (not shown) which can be rotatable integrally with the rotor 10.

Because of the fact that they use magnetic powder as a power transmitting medium, the coupling devices of this kind are capable of imparting constant torque even under slipping conditions which other coupling means cannot achieve. They can be operated with stable control under conditions of continuous slip. However, the most important problem to be solved is how to cool and remove the heat generated by the aforesaid continuous slip, which is not encountered in any other friction disc type coupling means.

In view of the above-mentioned problem, there have been proposed a number of cooling systems up

to the present, such as water cooled, natural cooling and forced draft air cooling using an air blower or blowers, among which water cooling has been found to be satisfactory so far as its cooling efficiency is concerned. However, water cooling has been found to have several drawbacks, such as the troublesome work involved in the provision of piping, leakage of water in use, and the related parts of the device becoming liable to be dewed.

To solve the drawbacks encountered in the water cooling system of the prior art, as mentioned above, a natural cooling means typically as shown in Fig 1 has been proposed, which radiates both frictional heat and Joule heat generated by a rotor 10 and a cylinder 5 through the surface of a bracket 2 and a bracket 3 contacting the surrounding atmosphere. It also dissipates the Joule heat generated by the field member 9 through the surface of the field member 9.

US-A-4085344 discloses a forced air draft cooling system for an electromagnetic clutch in which the air flow is provided by a fan attached to the input shaft, and forms the basis of the pre-characterising part of claim 1.

Shown in Fig 2 is a forced air draft type cooling means adopted in an electromagnetic powder brake capable of cooling its field member 9 and brackets 22 for holding the field member 9 and having no such appreciable drawbacks as found in the water cooling system as mentioned above.

As shown in Fig 2, the cooling means comprises, a blower 1 attached to the bracket 22 disposed at the output side of the coupling device, and a cooling fin 5a supported by a bracket 26 rotatable integral with the input shaft 4 and positioned axially outside the cylinder 5 and at the portion between the blower 1 and the cylinder 5.

The cooling means further comprises a heat pipe 20a of high heat conductive material and including a cooling fin 20b which is secured to and being in tight contact with the rotor 20 at its axially central portion and axially extends toward the outlet of aforesaid blower 1.

Provided at the input side is an input shaft 4, which is usually an external driving shaft to be connected at the user's site.

The cylinder 5 is fixed to the input shaft 4 through a side plate 7, and is spaced apart by the outer periphery of the rotor 20 by a gap of a specified size.

As can be seen from Fig 1, such a cooling system which dissipates heat generated by means of heat conduction through the contact with air at the surface or surfaces of the brackets at both axial ends and the surface of the field member, amounts to no more than a natural cooling system. As a consequence, the cooling effect of such a cooling system cannot be expected to be enough, and the efficiency in slippage also becomes low, which gives rise to a lower allowable work capacity than that of a water cooled system.

As to the forced draft cooling system shown in Fig 2, the parts which are effective for cooling are the heat pipe 20a and fin 20b for cooling the cylinder 5. Therefore, the cooling air from the blower 1 flows as a uniform stream K, passing through the fin 20b and then flows somewhat slantedly in a radial direction outwards. As a consequence, the heat generated at the actuating part of the coupling device is transmitted to the field member 9 through the bracket 22. In addition, Joule heat generated in the coil is also passed to the field member 9, and so the cooling power becomes insufficient. This results in lower slip efficiency as compared with that obtainable by the water cooled system.

The present invention provides an electromagnetic powder coupling device to be used either as a clutch or a brake for transmitting or braking the torque imparted by an external drive shaft which comprises, a pair of brackets each rotatably receiving said drive shaft at input side and output side, respectively, a field member consisting of a yoke and a coil assembly and being tightly received by said brackets, a hollow cylinder of magnetic material being coaxially disposed in the inner space of said field member and supported by a pair of side plates each being disposed, respectively, at its input side and output side so as to be integrally rotatable with said drive shaft, a rotor disposed coaxially around the axis of rotation and axially between said side plates, an annular magnetic flux shielding ring of non-magnetic material inserted through the central part of said cylinder for shielding magnetic flux from by-passing the rotor through said cylinder, magnetic powder, being filled in a space between said cylinder and said rotor for effecting magnetic coupling between said cylinder and said rotor when said field member is excited and releasing said magnetic coupling when said field member is not excited; and a blower for blowing cooling air to cool the field member, wherein: the blower is at said output side axial end for blowing cooling air radially and slantedly outward to cool the periphery of said field member, a heat pipe axially laid adjacent to the output of said blower and radially at the inner side of said bracket at the output side and being provided with a plurality of fins attached on the outer surface of said heat pipe, a plurality of cooling fins disposed along the side wall of said side plate, a vent gate slantedly opened through the wall of said bracket at the output side, and a plurality of vent passages formed inside the radially outermost end of said output side bracket;

wherein:

said bracket at the output side is formed as a double-walled type having an outer wall and an inner wall and the bracket at the input side is formed to have a plurality of exit vents at positions radially corresponding to said cylinder at the outer part of said rotor, and

the forced draft of air blown by said blower is introduced in and discharged outside by passing through three kinds of paths (C,D,E), a first path (C) passing radially and slantedly outwards through the space between the outer wall and the inner wall of said double-walled bracket at the output side, a second path (D) passing radially and slantedly outwards along the inner face of said double-walled bracket, and a third path (E) which separates from the downstream part of the second path (D) and passing axially through the vent passage defined between the inner surface of the field member and the outer surface of the cylinder and then flows outside through said exit vents.

Thus the present invention may provide an improved cooling system for an electromagnetic powder coupling device.

An embodiment of the present invention will be described in more detail below, by way of example, and with reference to the accompanying drawings in which:

Fig 1 is a half cut cross-sectional front view showing an electromagnetic powder brake of a prior art type which uses a natural cooling system;

Fig 2 is a half cut cross-sectional front view showing an electromagnetic powder brake of another type of prior art which uses a forced draft cooling system;

Fig 3 is a half cut sectional front view showing an embodiment of an electromagnetic powder coupling device of this invention, and Fig 4 is an enlarged cross-sectional view taken along arrow lines VI-VI of Fig 3.

A bracket 52 disposed at the output side is formed as a double-walled bracket having a slantedly extending annular outer wall 52a and a slantedly extending annular inner wall 52b parallel to the outer wall 52a. At least an annular air passage 52c is defined between the outer wall 52a and inner wall 52b, which forms a path for a branch stream C for the air blown by the blower 1 and allows it to flow slantedly and radially out of the coupling device.

The outlet opening 52d of the air passage is turned parallel to the axis line X-X so that the flow of the cooling air as the stream C is directed to the outer surface of the field member 59 of the electromagnetic powder coupling device.

Another stream D of the cooling air passes through a radially intermediate path along the cooling fins 20b and the next fin 5a, wherein the stream D is divided into two streams, that is, the main original stream D having slantedly passed through the space between the inner surface of the inner wall 52b and the outer surface of the field member 59, and a branch stream E which axially flows in parallel with the axis X-X passing mainly through grooves 59c cut on the inner surface 59b of the yoke 59e and partly through the fine gaps between the lands 59a and the

cylinder 5 as shown in more detail in Fig 4.

The branch stream E, having passed through the grooves 59c and the fine gaps, flows further to exit vent 53e opened through a bracket 53 at the input side at a portion corresponding to the grooves 59c and the cylinder 5 of the coupling device, and then flows out. Thus the branch stream E, can effectively cool the inner part of the field member 59, the outer part of the cylinder 5 and the bracket 53 during its flow, while the main stream D flows radially and slantedly outward and cools the fin 5a after having cooled the rotor 20 through the heat pipe 20a and fins 20b, and then cools the outer part of the field member 59.

By virtue of the structural feature of this embodiment of the present invention, cooling for the electromagnetic powder coupling device can be applied not only to the outer part of the field member, but also to the radially inner part of the field member and the outer surface of the cylinder. Thereby it becomes possible to obtain high slip efficiency, equivalent to that which can be attained by a water cooling system, and thus to increase the limit of the allowable work. A wider range of use can be expected due to the fact that this is not accompanied by the troublesome piping work, water leakage or dew formation found in a water cooling system.

Claims

1. An electromagnetic powder coupling device to be used either as a clutch or a brake for transmitting or braking the torque imparted by an external drive shaft (2) which comprises:

a pair of brackets (53,52) each rotatably receiving said drive shaft at input side and output side, respectively;

a field member (59) consisting of a yoke (59e) and a coil assembly (8) and being tightly received by said brackets;

a hollow cylinder (5) of magnetic material being coaxially disposed in the inner space of said field member (59) and supported by a pair of side plates (7,26) each being disposed, respectively, at its input side and output side so as to be integrally rotatable with said drive shaft;

a rotor (20) disposed coaxially around the axis of rotation and axially between said side plates (7,26);

an annular magnetic flux shielding ring (5') of non-magnetic material inserted through the central part of said cylinder (5) for shielding magnetic flux from by-passing the rotor through said cylinder (5), magnetic powder (5b), being filled in a space between said cylinder (5) and said rotor (20) for effecting magnetic coupling between said cylinder (5) and said rotor (20) when said field member (59) is excited and releasing said

magnetic coupling when said field member (59) is not excited; and

a blower (1) for blowing cooling air to cool the field member (59);

characterised in that:

the blower (1) is at said output side axial end for blowing cooling air radially and slantedly outward to cool the periphery of said field member (59), a heat pipe (20a) axially laid adjacent to the output side of said blower (1) and radially at the inner side of said bracket (52) at the output side and being provided with a plurality of fins (20b) attached on the outer surface of said heat pipe (20a), a plurality of cooling fins (5a) disposed along the side wall of said side plate (26), a vent gate (52d) slantedly opened through the wall of said bracket (52) at the output side, and a plurality of vent passages formed inside the radially outermost end of said output side bracket;

wherein:

said bracket (52) at the output side is formed as a double-walled type having an outer wall (52a) and an inner wall (52b) and the bracket (53) at the input side is formed to have a plurality of exit vents (53e) at positions radially corresponding to said cylinder (5) at the outer part of said rotor (20); and

the forced draft of air blown by said blower (1) is introduced in and discharged outside by passing through three kinds of paths (C,D,E), a first path (C) passing radially and slantedly outwards through the space between the outer wall and the inner wall of said double-walled bracket (52) at the output side, a second path (D) passing radially and slantedly outwards along the inner face of said double-walled bracket (52), and a third path (E) which separates from the downstream part of the second path (D) and passing axially through the vent passage defined between the inner surface of the field member (59) and the outer surface of the cylinder (5) and then flows outside through said exit vents (53e).

2. An electromagnetic powder coupling device according to claim 1, wherein:

said outer wall (52a) and said inner wall (52b) of said double-walled bracket (52) at the output side are both formed as walls slantedly extending radially outwards and parallel to each other, and the outermost peripheral end of said outer wall (52a) is axially bent inward so as to be laid over the outlet of said inner wall (52b) so that an annular outlet opening (52d) defined therebetween can be directed to the radially outer part of said field member (59); and

the inner surface (59b) of said field member (59) is formed to have a plurality of axially extending vent grooves (59c) passing from the out-

cylinder 5 as shown in more detail in Fig 4.

The branch stream E, having passed through the grooves 59c and the fine gaps, flows further to exit vent 53e opened through a bracket 53 at the input side at a portion corresponding to the grooves 59c and the cylinder 5 of the coupling device, and then flows out. Thus the branch stream E, can effectively cool the inner part of the field member 59, the outer part of the cylinder 5 and the bracket 53 during its flow, while the main stream D flows radially and slantedly outward and cools the fin 5a after having cooled the rotor 20 through the heat pipe 20a and fins 20b, and then cools the outer part of the field member 59.

By virtue of the structural feature of this embodiment of the present invention, cooling for the electromagnetic powder coupling device can be applied not only to the outer part of the field member, but also to the radially inner part of the field member and the outer surface of the cylinder. Thereby it becomes possible to obtain high slip efficiency, equivalent to that which can be attained by a water cooling system, and thus to increase the limit of the allowable work. A wider range of use can be expected due to the fact that this is not accompanied by the troublesome piping work, water leakage or dew formation found in a water cooling system.

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 - a pair of brackets (53,52) each rotatably receiving said drive shaft at input side and output side, respectively;
 - a field member (59) consisting of a yoke (59e) and a coil assembly (8) and being tightly received by said brackets;
 - a hollow cylinder (5) of magnetic material being coaxially disposed in the inner space of said field member (59) and supported by a pair of side plates (7,26) each being disposed, respectively, at its input side and output side so as to be integrally rotatable with said drive shaft;
 - a rotor (20) disposed coaxially around the axis of rotation and axially between said side plates (7,26);
 - an annular magnetic flux shielding ring (5') of non-magnetic material inserted through the central part of said cylinder (5) for shielding magnetic flux from by-passing the rotor through said cylinder (5), magnetic powder (5b), being filled in a space between said cylinder (5) and said rotor (20) for effecting magnetic coupling between said cylinder (5) and said rotor (20) when said field member (59) is excited and releasing said

magnetic coupling when said field member (59) is not excited; and

a blower (1) for blowing cooling air to cool the field member (59);

characterised in that:

the blower (1) is at said output side axial end for blowing cooling air radially and slantedly outward to cool the periphery of said field member (59), a heat pipe (20a) axially laid adjacent to the output side of said blower (1) and radially at the inner side of said bracket (52) at the output side and being provided with a plurality of fins (20b) attached on the outer surface of said heat pipe (20a), a plurality of cooling fins (5a) disposed along the side wall of said side plate (26), a vent gate (52d) slantedly opened through the wall of said bracket (52) at the output side, and a plurality of vent passages formed inside the radially outermost end of said output side bracket;

wherein:

said bracket (52) at the output side is formed as a double-walled type having an outer wall (52a) and an inner wall (52b) and the bracket (53) at the input side is formed to have a plurality of exit vents (53e) at positions radially corresponding to said cylinder (5) at the outer part of said rotor (20); and

the forced draft of air blown by said blower (1) is introduced in and discharged outside by passing through three kinds of paths (C,D,E), a first path (C) passing radially and slantedly outwards through the space between the outer wall and the inner wall of said double-walled bracket (52) at the output side, a second path (D) passing radially and slantedly outwards along the inner face of said double-walled bracket (52), and a third path (E) which separates from the downstream part of the second path (D) and passing axially through the vent passage defined between the inner surface of the field member (59) and the outer surface of the cylinder (5) and then flows outside through said exit vents (53e).

2. An electromagnetic powder coupling device according to claim 1, wherein:

said outer wall (52a) and said inner wall (52b) of said double-walled bracket (52) at the output side are both formed as walls slantedly extending radially outwards and parallel to each other, and the outermost peripheral end of said outer wall (52a) is axially bent inward so as to be laid over the outlet of said inner wall (52b) so that an annular outlet opening (52d) defined therebetween can be directed to the radially outer part of said field member (59); and

the inner surface (59b) of said field member (59) is formed to have a plurality of axially extending vent grooves (59c) passing from the out-



put side to the input side to constitute said third path (E) for said forced draft of the cooling air.

Patentansprüche

1. Kupplungsvorrichtung mit elektromagnetischem Pulver, die entweder als Kupplung oder Bremse zur Übertragung oder zum Bremsen des durch eine äußere Antriebswelle (2) ausgeübten Drehmoments verwendet werden kann, umfassend:
ein Paar Träger (53, 52), von denen jeder die genannte Antriebswelle an der Eingangsseite bzw. an der Ausgangsseite drehbar aufnimmt;
ein Feldelement (59), das aus einem Joch (59e) und einer Spulenordnung (8) besteht und fest durch genannte Träger aufgenommen ist;
einen Hohlzylinder (5) aus magnetischem Material, der im Innenraum des genannten Feldelements (59) koaxial angeordnet und durch ein Paar Seitenplatten (7, 26) gestützt ist, von denen jede an der Eingangsseite bzw. der Ausgangsseite angeordnet ist, um mit der genannten Antriebswelle einstückig drehbar zu sein;
einen Rotor (20), der koaxial um die Rotationsachse und axial zwischen den genannten Seitenplatten (7, 26) angeordnet ist;
einen ringförmigen Magnetflußabschirmungsring (5') aus nichtmagnetischem Material, der durch den Mitteltell des genannten Zylinders (5) eingesetzt ist, um den Magnetfluß davon abzuschirmen, den Rotor durch den genannten Zylinder (5) zu umströmen, Magnetpulver (5b), das in einen Zwischenraum zwischen dem genannten Zylinder (5) und genanntem Rotor (20) eingefüllt ist, um magnetische Kupplung zwischen dem genannten Zylinder (5) und genanntem Rotor (20) zu bewirken, wenn das genannte Feldelement (59) erregt ist, und zum Lösen der genannten magnetischen Kupplung, wenn das genannte Feldelement (59) nicht erregt ist; und
ein Gebläse (1) zum Blasen von Kühlluft zum Kühlen des Feldelements (59);
dadurch gekennzeichnet, daß:
sich das Gebläse (1) am genannten Ausgangsseiten-Axialende zum radialen und schrägen Blasen von Kühlluft befindet, um die Peripherie des genannten Feldelements (59) zu kühlen, ein Wärmerohr (20a) axial angrenzend zur Ausgangsseite des genannten Gebläses (1) und radial an der Innenseite des genannten Trägers (52) an der Ausgangsseite gelegt ist und mit einer Vielzahl an Rippen (20b) versehen ist, die an der Außenfläche des genannten Wärmerohrs (20a) befestigt sind, eine Vielzahl an Kühlrippen (5a) entlang der Seitenwand der genannten Seitenplatte (26) angeordnet ist, ein Entlüftungsschieber (52d) durch die Wand des genannten Trägers

(52) an der Ausgangsseite schräg geöffnet ist und eine Vielzahl an Entlüftungsdurchgängen innerhalb des radial äußersten Endes des genannten Ausgangsseitenträgers ausgebildet ist; worin:

genannter Träger (52) an der Ausgangsseite als doppelwandiger Typ mit einer Außenwand (52a) und einer Innenwand (52b) und der Träger (53) an der Eingangsseite mit einer Vielzahl an Auslaßentlüftungen (53e) an Positionen ausgebildet ist, die radial dem genannten Zylinder (5) im äußeren Teil des genannten Rotors (20) entsprechen; und der durch das genannte Gebläse (1) geblasene erzwungene Luftzug durch Hindurchströmen durch drei Arten von Wegen (C, D, E) eingeleitet und abgeführt wird, einen ersten Weg (C), der durch den Raum zwischen der Außenwand und der Innenwand des genannten doppelwandigen Trägers (52) an der Ausgangsseite radial und schräg nach außen führt, einen zweiten Weg (D), der entlang der Innenfläche des genannten doppelwandigen Trägers (52) radial und schräg nach außen führt, und einen dritten Weg (E), der vom stromabwärtigen Teil des zweiten Wegs (D) abzweigt und durch den Entlüftungsdurchgang führt, der zwischen der Innenfläche des Feldelements (59) und der Außenfläche des Zylinders (5) definiert ist, und dann durch die genannten Auslaßöffnungen (53e) nach außen strömt.

2. Kupplungsvorrichtung mit elektromagnetischem Pulver nach Anspruch 1, worin:
genannte Außenwand (52a) und genannte Innenwand (52b) des genannten doppelwandigen Trägers (52) an der Ausgangsseite beide als Wände ausgebildet sind, die sich schräg radial nach außen und parallel zueinander erstrecken, und das äußerste periphere Ende der genannten Außenwand (52a) axial nach innen gebogen ist, um über den Auslaß der genannten Innenwand (52b) gelegt zu werden, sodaß eine dazwischen definierte ringförmige Auslaßöffnung (52d) zum radial äußeren Teil des genannten Feldelements (59) gerichtet sein kann; und
die Innenfläche (59b) des genannten Feldelements (59) ausgebildet ist, eine Vielzahl an sich axial erstreckenden Entlüftungsrillen (59c) aufzuweisen, die von der Ausgangsseite zur Eingangsseite führen, um den genannten dritten Weg (E) für den genannten erzwungenen Luftzug der Kühlluft zu bilden.

Revendications

1. Dispositif d'accouplement à poudre électromagnétique destiné à être utilisé soit comme embrayage, soit comme frein pour transmettre ou



freiner le couple communiqué par un arbre menant externe (2) qui comprend :

une paire de supports (53,52), chacun recevant à rotation ledit arbre menant à un côté entrée et un côté sortie, respectivement;

un élément de champ (59) constitué d'une culasse (59e) et d'un ensemble de bobine (8) et étant reçu de manière serrée par lesdits supports ;

un cylindre creux (5) en matériau magnétique étant disposé coaxialement dans l'espace intérieur dudit élément de champ (59) et supporté par une paire de plaques latérales (7,26) dont chacune est disposée, respectivement, à son côté entrée et son côté sortie de façon à pouvoir tourner intégralement avec ledit arbre menant;

un rotor (20) disposé coaxialement autour de l'axe de rotation et axialement entre lesdites plaques latérales (7,26);

un anneau annulaire (5') formant écran au flux magnétique en un matériau non magnétique inséré à travers la partie centrale dudit cylindre (5) pour empêcher ledit flux magnétique de contourner le rotor à travers ledit cylindre (5), de la poudre magnétique (5b) étant insérée dans un espace entre ledit cylindre (5) et ledit rotor (20) pour réaliser un accouplement magnétique entre ledit cylindre (5) et ledit rotor (20) lorsque ledit élément de champ (59) est excité et afin de relâcher ledit accouplement magnétique lorsque ledit élément de champ (59) n'est pas excité; et

un souffleur (1) pour souffler de l'air de refroidissement afin de refroidir l'élément de champ (59);

caractérisé en ce que :

le souffleur (1) se trouve à ladite extrémité axiale côté sortie pour souffler de l'air de refroidissement radialement et en biais vers l'extérieur pour refroidir la périphérie dudit élément de champ (59), un tube de chaleur (20a) posé axialement adjacent au côté sortie dudit souffleur (1) et radialement au côté intérieur dudit support (52) au côté sortie et étant pourvu d'une pluralité d'ailettes (20b) attachées à la surface extérieure dudit tube de chaleur (20a), une pluralité d'ailettes de refroidissement (5a) disposées le long de la paroi latérale de ladite plaque latérale (26), une porte d'évent (52d) ouverte en biais à travers la paroi dudit support (52) au côté sortie, et une pluralité de passages d'aération formés à l'intérieur de l'extrémité radialement la plus extérieure dudit support côté sortie;

dans lequel :

ledit support (52) au côté sortie est réalisé sous forme d'un type à paroi double présentant une paroi externe (52a) et une paroi interne (52b), et le support (53) au côté entrée est formé pour avoir une pluralité d'évents de sortie (53e)

à des positions correspondant radialement audit cylindre (5) à la partie extérieure dudit rotor (20); et

le courant d'air forcé soufflé par ledit souffleur (1) est introduit dans et évacué vers l'extérieur en passant par trois types de trajets (C,D,E), un premier trajet (C) passant radialement et en biais vers l'extérieur à travers l'espace entre la paroi extérieure et la paroi intérieure dudit support à paroi double (52) au côté sortie, un deuxième trajet (D) passant radialement et en biais vers l'extérieur le long de la face intérieure dudit support à paroi double (52), et un troisième trajet (E) qui se sépare de la partie aval du deuxième trajet (D) et passe axialement à travers le passage d'aération défini entre la surface interne de l'élément de champ (59) et la surface externe du cylindre (5) et passe ensuite à l'extérieur à travers lesdits événements de sortie (53e).

2. Dispositif d'accouplement à poudre électromagnétique selon la revendication 1, dans lequel :

ladite paroi externe (52a) et ladite paroi interne (52b) dudit support à paroi double (52) au côté sortie sont toutes les deux formées comme des parois s'étendant en biais radialement vers l'extérieur et parallèlement l'une à l'autre, et l'extrémité périphérique la plus extérieure de ladite paroi externe (52a) est courbée axialement vers l'intérieur de façon à être placée sur la sortie de ladite paroi interne (52b) de façon qu'une ouverture annulaire de sortie (52d) définie entre celles-ci puisse être dirigée sur la partie radialement externe dudit élément de champ (59); et

la surface interne (59b) dudit élément de champ (59) est formée pour avoir une pluralité de rainures d'aération s'étendant axialement (59c) passant du côté sortie au côté entrée pour constituer ledit troisième trajet (E) pour ledit courant forcé de l'air de refroidissement.

