Description

Title: Filter detection in a system for capturing braking particles

[1] This invention relates to a system for capturing the braking particles from a friction brake system, which comprises a vacuum source, a pneumatic circuit which connects the friction brake system to the vacuum source, and a filter located on the pneumatic circuit and mounted on a support.

[2] Such friction brake systems may equip road or rail vehicles. Such friction brake systems may also equip stationary rotor machines such as wind turbines or industrial machines.

[3] In such systems, there is provided a vacuum source (for example a suction turbine driven by a motor) which is connected by a pneumatic circuit to the friction brake system, and a filter for collecting particles emitted by the braking system. This filter is placed upstream of the vacuum source, and prevents the passage of particles through the vacuum source and their release into the atmosphere. However, in certain situations, this filter may be missing, for example because it was not replaced during a vehicle service. Absence of the filter is detrimental, because the particles will then pass into the vacuum source and be released into the atmosphere. The filtering function is then no longer ensured.

Description of the invention

Summary

[4] ~~This invention~~The present disclosure aims to remedy these disadvantages.

[5] The present disclosure ~~invention~~ aims to propose a system for capturing braking particles which makes it possible to inform the user of the vehicle of the absence of the capturing system filter, so that the user can act accordingly, and in particular can place a filter in the system.

[6] This object is achieved due to the fact that the capturing system comprises a control unit and a filter detection device which is capable of sending at least one signal to the control unit, the control unit being capable, on the basis of this signal,

of identifying the absence of the filter on the pneumatic circuit and of informing a user of this absence of the filter.

[7] Due to these arrangements, an absence of the filter on the pneumatic circuit is detected and determined, and the user is immediately informed via the control unit. One will note that the control unit is capable of identifying both an absence of the filter on its support, and an absence of the support (with its filter) on the pipe. Indeed, in some cases it is more practical to change the assembly composed of the support and filter. The user can then act accordingly, and place a filter on its support or place a support (with its filter) on the pipe, in order to prevent the release of harmful particles into the atmosphere.

[7a] According to an aspect, the present disclosure refers to a system for capturing braking particles from a friction brake system, which comprises a vacuum source, a pneumatic circuit which connects said friction brake system to said vacuum source, and a filter located on said pneumatic circuit and mounted on a support, characterized in that said capturing system comprises a control unit and a detection device for said filter which is capable of sending at least one signal to said control unit, said control unit being capable, on the basis of this signal, of identifying the absence of said filter on said pneumatic circuit and of informing a user of this absence of said filter.

[7b] According to another aspect, the present disclosure refers to a method for detecting the absence of a filter in a system for capturing braking particles from a friction brake system, this capturing system comprising a vacuum source, a pneumatic circuit which connects said friction brake system to said vacuum source, and a filter located on said pneumatic circuit and mounted on a support, said method being characterized in that it comprises the following steps: (a) a control unit and a detection device for said filter are provided, which form part of said capturing system;

(b) said detection device sends at least one signal to said control unit; (c) on the basis of said signal, said control unit identifies the absence of said filter on said pneumatic circuit and informs a user of this absence of said filter.

[8] Advantageously, the detection device comprises a pressure sensor which is located on the pneumatic circuit upstream of the filter, the pressure sensor being capable of sending in a signal to the control unit a measurement of the pressure P_1 in the pneumatic circuit upstream of the filter, the control unit, upon receiving this signal, being capable of comparing the measured pressure P_1 with a reference pressure P_R which is the pressure in the pneumatic circuit in the absence of a filter for the reference operating state E_R of the vacuum source during the measurement of pressure P_1 by the pressure sensor, the control unit being capable of informing a user of the absence of the filter on the pneumatic circuit when the measured pressure P_1 is substantially equal to the reference pressure P_R or is substantially equal to the atmospheric pressure.

[9] Thus, in the case where the circuit or the filter support already includes a pressure sensor, it is not necessary to install an additional detection device.

[10] Advantageously, the detection device comprises a first pressure sensor which is located on the pneumatic circuit upstream of the filter, the pressure sensor being capable of sending in a signal to the control unit a measurement of the first pressure P_1 in the pneumatic circuit upstream of the filter, and a second pressure sensor which is located on the pneumatic circuit downstream of the filter and which is capable of sending in a signal to the control unit a measurement of the second pressure P_2 in the pneumatic circuit downstream of the filter, the control unit, upon receiving this at least one signal, being capable of comparing the first measured pressure P_1 and the second measured pressure P_2, the control unit being capable

[20] In an example, ~~The~~ the present disclosure ~~invention~~ also relates to a method for detecting the absence of a filter in a system for capturing braking particles from a friction brake system, this capturing system comprising a vacuum source, a pneumatic circuit which connects the friction brake system to the vacuum source, and a filter located on the pneumatic circuit and mounted on a support.

[21] According to ~~the invention~~an example, the method comprises the following steps

(a) A control unit and a filter detection device are provided, which form part of the capturing system;

(b) The detection device sends at least one signal to the control unit;

(c) On the basis of this signal, the control unit identifies the absence of the filter on the pneumatic circuit and informs a user of this absence of the filter.

[22] The invention will be better understood and its advantages will be more apparent, upon reading the following detailed description of embodiments shown as non-limiting examples. The description refers to the accompanying drawings, in which:

[23] [Fig. 1] FIG. 1 is a schematic view of a capturing system according to the invention,

[24] [Fig. 2] FIG. 2 is a perspective view of a housing carrying a filter, and of a device for detecting this filter in the capturing system of FIG. 1,

[25] [Fig. 3] FIG. 3 is a perspective view of a housing carrying a filter, and of a variant of the embodiment of a device for detecting this filter in the capturing system of FIG. 2,

[26] [Fig. 4] FIG. 4 is a perspective view of a housing carrying a filter, and of a second embodiment of a device for detecting this filter in the capturing system of FIG. 1,

[27] [Fig. 5] FIG. 5 is a perspective view of a housing carrying a filter, and of a variant of the second embodiment of a device for detecting this filter in the capturing system of FIG. 1,

[28] [Fig. 6] FIG. 6 is a perspective view of a housing carrying a filter, and of a third embodiment of a device for detecting this filter in the capturing system of FIG. 1,

[29] [Fig. 7] FIG. 7 is a perspective view of a housing carrying a filter, and of a variant of the third embodiment of a device for detecting this filter in the capturing system of FIG. 1.

Detailed description of the invention

[30] FIG. 1 schematically represents a particle capturing system 1 according to the invention, these particles being emitted by a friction brake system 10.

[31] This friction brake system 10 comprises a brake pad 11 for braking a vehicle. This pad 11 comprises a backing plate 12 and a lining 13 made of friction material fixed to the backing plate 12. In FIG. 1, the pad ~~10~~ 11 is viewed from below, the plate 12 being in the foreground.

[32] The pad 11 (first pad) is facing a disc 9 which is driven by the wheel of the vehicle. A second identical pad (not visible) is located on the other side of the disc 9 and opposite the first pad 11 so that these two pads sandwich the disc 9. Braking of the disc 9 is achieved by friction of the two linings (13) against the disc 9 when these two pads approach the disc 9.

[33] The capturing system 1 comprises a pneumatic circuit 30 and a vacuum source 20. The pad 11 and the second pad are connected to the vacuum source 20 via this pneumatic circuit 30. For example, the vacuum source 20 comprises an electric motor 21 and a suction turbine 22 which is driven by this electric motor 21.

[34] During operation, the vacuum source 20 is capable of suctioning in the particles upon their emission by the linings (13), through the pneumatic circuit 30. The direction of circulation of the air and particles during normal operation is indicated by the arrow F in FIG. 1. The arrow F therefore indicates a flow from upstream to downstream. The capturing system 1 further comprises a filter 40 which is located on the circuit 30, meaning that it is traversed by the air which circulates in the circuit 30. This filter 40 is mounted on a support 41 which is fixed to the pipe 30. For example, the support 41 is a housing which houses the filter 40 therein, as shown in the figures. The filter 40 thus separates the housing 41 into an upstream

Claims

[Claim 1] System (1) for capturing braking particles from a friction brake system (10), which comprises a vacuum source (20), a pneumatic circuit (30) which connects said friction brake system (10) to said vacuum source (20), and a filter (40) located on said pneumatic circuit (30) and mounted on a support (41), characterized in that said capturing system (1) comprises a control unit (60) and a detection device (50) for said filter (40) which is capable of sending at least one signal to said control unit (60), said control unit (60) being capable, on the basis of this signal, of identifying the absence of said filter (40) on said pneumatic circuit (30) and of informing a user of this absence of said filter (40).

[Claim 2] Capturing system (1) according to claim 1, wherein said detection device (50) comprises a pressure sensor (51) which is located on said pneumatic circuit (30) upstream of said filter (40), said pressure sensor (51) being capable of sending in a signal to said control unit (60) a measurement of the pressure P_1 in said pneumatic circuit (30) upstream of said filter (40), said control unit (60), upon receiving said signal, being capable of comparing said measured pressure P_1 with a reference pressure P_R which is the pressure in said pneumatic circuit (30) in the absence of a filter (40) for the reference operating state E_R of said vacuum source (20) during said measurement of pressure P_1 by said pressure sensor (51), said control unit (60) being capable of informing a user of the absence of said filter (40) on said pneumatic circuit (30) when said measured pressure P_1 is substantially equal to said reference pressure P_R or is substantially equal to the atmospheric pressure.

[Claim 3] Capturing system (1) according to claim 1, wherein said detection device (50) comprises a first pressure sensor (51) which is located on said pneumatic circuit (30) upstream of said filter (40), said pressure sensor (51) being capable of sending in a signal to said control unit (60) a measurement of the first pressure P_1 in said pneumatic circuit (30) upstream of said filter (40), and a second pressure sensor (52) which is located on said pneumatic circuit (30) downstream of said filter (40) and which is capable of sending in a signal to said control unit (60) a measurement of the second pressure P_2 in said pneumatic circuit (30) downstream of said filter (40), said control unit (60), upon receiving said at least one signal, being

capable of comparing said first measured pressure P_1 and said second measured pressure P_2, said control unit (60) being capable of informing a user of the absence of said filter (40) on said pneumatic circuit (30) when said first measured pressure P_1 and said second measured pressure P_2 are substantially equal or when said first measured pressure P_1 is substantially equal to the atmospheric pressure.

[Claim 4] Capturing system (1) according to any one of claims 1 to 3, wherein said detection device (50) comprises a contact detector (53) which is capable of detecting contact between said filter (40) and said support (41), said contact detector (53) being capable of sending a signal to said control unit (60) when there is no contact between said filter (40) and said support (41), said control unit (60), upon receiving said signal, being capable of informing a user of the absence of said filter (40).

[Claim 5] Capturing system (1) according to any one of claims 1 to 3, wherein said detection device (50) comprises a contact detector (53) which is capable of detecting contact between said support (41) and said circuit (30), said contact detector (53) being capable of sending a signal to said control unit (60) when there is no contact between said support (41) and said circuit (30), said control unit (60), upon receiving said signal, being capable of informing a user of the absence of said filter (40).

[Claim 6] Capturing system (1) according to any one of claims 1 to 5, wherein said detection device (50) comprises an identifier (42) which is carried by said filter (40) or by said support (41) and a contactless detector (54) which is fixed close to said support (41) and which is capable of detecting the presence of said identifier (42), said contactless detector (54) being capable of sending a signal to said control unit (60) when said identifier (42) is not detected by said contactless detector (43), said control unit (60), upon receiving said signal, being capable of informing a user of the absence of said filter (40).

[Claim 7] Capturing system (1) according to claim 6, wherein said identifier (42) is carried by said support (41) and said contactless detector (54) is fixed to said ~~pipe~~ pneumatic circuit (30).

[Claim 8] Capturing system (1) according to claim 6, wherein said identifier (42) is carried by said filter (40) and said contactless detector (54) is fixed to said support (41).

[Claim 9] Method for detecting the absence of a filter (40) in a system (1) for capturing braking particles from a friction brake system (10), this capturing system (1) comprising a vacuum source (20), a pneumatic circuit (30) which connects said friction brake system (10) to said vacuum source (20), and a filter (40) located on said pneumatic circuit (30) and mounted on a support (41), said method being characterized in that it comprises the following steps:

(a) A control unit (60) and a detection device (50) for said filter (40) are provided, which form part of said capturing system (1);

(b) Said detection device (50) sends at least one signal to said control unit (60);

(c) On the basis of said signal, said control unit (60) identifies the absence of said filter (40) on said pneumatic circuit (30) and informs a user of this absence of said filter (40).