Description

Title: Limitation of a machine by a system for capturing braking particles

[1] This invention relates to a system for capturing braking particles from a friction brake system of a machine, 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 devices 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 brake 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 is clogged beyond a predefined acceptable threshold, or the filter clogging detection system does not work, for example because it is disconnected, deliberately or inadvertently. The operation of the machine is inefficient in these situations.

Description of the invention

Summary

[4] The invention aims to remedy these disadvantages.

[4a] In an aspect, the present disclosure refers to a system for capturing braking particles from a friction brake system of a machine, which comprises a vacuum source, a pneumatic circuit which connects said friction brake system to said vacuum source, a filter located on said pneumatic circuit and mounted on a support, characterized in that said capturing system comprises a control unit, a

control device for said machine, and a clogging detection device for said filter which is capable of sending at least one signal to said control unit when the filter is clogged, said control unit being capable of determining the clogging of said filter, on the basis of this signal, and being capable of determining whether said detection device is inoperative, said control unit being capable of activating said control device to limit the operation of the machine when said filter is clogged or when said detection device is inoperative.

[4b] In another aspect, the present disclosure refers to a machine comprising a capturing system according to the above aspect.

[4c] In another aspect, the present disclosure refers to a method for detecting the clogging of a filter in a system for capturing braking particles from a friction brake system of a machine, 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, a control device for said machine, and a clogging detection device for said filter are provided, which are part of said capturing system; (b) said control unit determines if said detection device is inoperative; (c) said detection device sends at least one signal to said control unit when the filter is clogged, if the detection device is operational; (d) said control unit determines whether said filter is clogged, on the basis of said signal; (e) said control unit activates said control device to limit the operation of the machine when said filter is clogged or when said detection device is inoperative.

[5] The aim of the disclosure is to propose a system for capturing braking particles which makes it possible to limit the operation of the vehicle, or of the stationary device, when the filter is clogged or when the filter clogging detection system does not work.

[6] This is achieved due to the fact that the capturing system comprises a control unit, a control device for the machine, and a clogging detection device for the filter which is capable of sending at least one signal to the control unit when the filter is clogged, the control unit being capable of determining the clogging of the

capable of limiting the operation of the machine when the difference ($P_1 - P_2$) between the first measured pressure P_1 and the second measured pressure P_2 is substantially equal to or greater than a threshold pressure difference ΔP which corresponds to a determined clogging threshold of the filter.

[12] Clogging of the filter is thus reliably determined.

[13] The disclosure also relates to a machine comprising a capturing system according to an example.

[14] The disclosure also relates, in an example, to a method for detecting the clogging of a filter in a system for capturing braking particles from a friction brake system of a machine, 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.

[15] According to an example, the method comprises the following steps:

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

(b) The control unit determines if the detection device is inoperative;

(c) The detection device sends at least one signal to the control unit when the filter is clogged, if the detection device is operational;

(d) The control unit determines whether the filter is clogged, on the basis of the signal;

(e) The control unit activates the control device to limit the operation of the machine when the filter is clogged or when the detection device is inoperative.

[16] Advantageously, the method further includes the following step:

(f) The control unit notifies a user of the clogging of the filter or of the malfunction of the detection device.

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

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

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

[20] [Fig. 3] FIG. 3 is a perspective view of a housing carrying a filter, and of an alternative clogging detection device for this filter in the capturing system of FIG. 1.

Detailed description of the invention

[21] FIG. 1 schematically shows a system 1 for capturing particles according to the invention, these particles being emitted by a friction brake system 10.

[22] This friction brake system 10 comprises a brake pad 11 for braking a machine 90. This machine is either a vehicle or a stationary device. 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 11 is viewed from underneath, the backing plate 12 being in the foreground.

[23] The pad 11 (first pad) is facing a disc 9 which is driven in rotation by the machine 90, for example by the wheel of the vehicle when this machine is a 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. The 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.

[24] 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.

[25] In 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 the air which circulates within the circuit 30 passes through the filter. 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