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(54) **METHOD FOR PRESSURE MONITORING A PRESSURE-DEPENDENT PROCESS AND PRESSURE SENSOR**

VERFAHREN ZUR DRUCKÜBERWACHUNG EINES DRUCKABHÄNGIGEN VERFAHRENS UND DRUCKSENSOR

PROCÉDÉ DE SURVEILLANCE DE LA PRESSION D'UN PROCESSUS DÉPENDANT DE LA PRESSION ET CAPTEUR DE PRESSION

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Description

[0001] The invention relates to a method for pressure monitoring a pressure-dependent process. Further on, the invention relates to a pressure sensor.

[0002] In pressure-dependent processes like combustion processes pressure switches are used to provide pressure monitoring. Several pressure switches are needed to monitor if the pressure to be monitored during operation of the pressure-dependent processes is above or below certain pressure levels. For each pressure level an individual pressure switch is needed. This requires high hardware and installation costs.

[0003] EP 1 000 301 B1, US 5,732,691 A, US 6,006,167 A and US 2009/0104573 A1 show processes using pressure switches. JP H06 229803 A, JP H06 229804 A and EP 3 118 030 A1 disclose further prior art.

[0004] Against this background, a novel method for pressure monitoring a pressure-dependent process and a novel pressure sensor are provided allowing a pressure monitoring with reduced hardware and installation costs.

[0005] The invention provides a method for pressure monitoring a pressure-dependent process according to claim 1.

[0006] The novel method for pressure monitoring a pressure-dependent process comprises the following steps:

Measuring over time a pressure of the pressure-dependent process.

[0007] Processing the measured pressure by determining if the measured pressure or a filtered pressure obtained from the measured pressure is inside or outside defined pressure ranges, each pressure range being defined by a respective lower limit and by a respective upper limit.

[0008] Generating a pressure monitoring signal.

[0009] The pressure monitoring signal has a first value or first status if the measured pressure or the filtered pressure is inside a respective pressure range.

[0010] The pressure monitoring signal has a second value or second status if the measured pressure or the filtered pressure is outside a respective pressure range violating a safety relevant limit.

[0011] The pressure monitoring signal has a third value or third status if the measured pressure or the filtered pressure is outside a respective pressure range violating a non-safety relevant limit.

[0012] The novel method allows a pressure monitoring with reduced hardware and installation costs.

[0013] Preferably, during the processing step it is determined if the measured pressure or the filtered pressure is within defined time intervals inside or outside respective pressure ranges associated with the respective time intervals. Then, the pressure monitoring signal has the first value or first status if the measured or filtered pressure is within a respective time interval inside the respective pressure range. The pressure monitoring signal has the second value or second status if the measured pres-

sure or the filtered pressure is within a respective time interval outside the respective pressure range violating a safety relevant limit. Then, the pressure monitoring signal has the third value or third status if the measured pressure or the filtered pressure is within a respective time interval outside a respective pressure range violating a non-safety relevant limit. This is preferred if a feedback signal of the pressure-dependent process being indicative about operational time intervals of the pressure-dependent process is available when measuring the pressure.

[0014] Preferably, if the pressure monitoring signal has the first value or first status, the pressure dependent process is continued unchanged. Preferably, if the pressure monitoring signal has the second value or second status the pressure dependent process is stopped. Preferably, if the pressure monitoring signal has the third value or third status, the pressure dependent process is continued unchanged or the pressure dependent process is continued by adapting at least one process parameter of the pressure dependent process or the pressure dependent process is stopped. The action to be taken if the if the pressure monitoring signal has the third value or third status may depend on the respective pressure range and/or the respective non-safety relevant limit. This allows a very preferred operation of the pressure-dependent process on basis of the pressure monitoring.

[0015] The pressure sensor for monitoring a pressure dependent process is defined in claim 10 and comprises: A measuring unit being configured to measure over the time a pressure of the pressure-dependent process. A memory unit for storing defined pressure ranges, each pressure range being defined by a respective lower limit and by a respective upper limit. A processing unit being configured to process the measured pressure by determining if the measured pressure or a filtered pressure obtained from the measured pressure is inside or outside defined pressure ranges and to generate a pressure monitoring signal in such a way that the pressure monitoring signal has a first value or first status if the measured pressure or the filtered pressure is inside a respective pressure range, that the pressure monitoring signal has a second value or second status if the measured pressure or the filtered pressure is outside a respective pressure range violating a safety relevant limit, and that the pressure monitoring signal has a third value or third status if the measured pressure or the filtered pressure is outside a respective pressure range violating a non-safety relevant limit. The pressure sensor allows to monitor several pressure levels and eliminates the need of individual pressure switches to monitor the several pressure levels.

[0016] Preferred developments of the invention are provided by the dependent claims and the description which follows. Exemplary embodiments are explained in more detail on the basis of the drawing, in which:

Figure 1 shows a time diagram illustrating of the method for pressure monitoring a pressure-de-

- pendent process,
- Figure 2 shows a time diagram illustrating of a preferred further development of the method for pressure monitoring a pressure-dependent process,
- Figure 3 shows a block diagram illustrating a control system for a pressure-dependent process using a pressure sensor for pressure monitoring the pressure-dependent process.

[0017] The invention relates to a method for pressure monitoring a pressure-dependent process and further to a pressure sensor for pressure monitoring a pressure-dependent process.

[0018] The pressure-dependent process may be a combustion process of a gas burner appliance combusting a gas/air mixture which is provided by mixing gas with air. The pressure to be monitored may be the pressure of the gas or the pressure of the air or the pressure of the gas/air mixture. The gas to be combusted may be natural gas, coal gas, methane, propane, hydrogen or the like. As absolute pressure may be measured as pressure of the pressure-dependent process.

[0019] The invention can be used in connection with other pressure-dependent processes to monitor the pressure of process medium like a gaseous process medium, a liquid process medium, a solid process medium or a plasma process medium.

[0020] The pressure monitoring method comprises the following steps:

A measuring step to measure over time a pressure of the pressure-dependent process.

[0021] A processing step to process the measured pressure by determining if the measured pressure or a filtered pressure obtained from the measured pressure is inside or outside defined pressure ranges, each pressure range being defined by a respective lower limit and by a respective upper limit.

[0022] A generating step to generate a pressure monitoring signal in such a way that i) the pressure monitoring signal has a first value or first status if the measured pressure or the filtered pressure is inside a respective pressure range, that ii) the pressure monitoring signal has a second value or second status if the measured pressure or the filtered pressure is outside a respective pressure range violating a safety relevant limit, and that iii) the pressure monitoring signal has a third value or third status if the measured pressure or the filtered pressure is outside a respective pressure range violating a non-safety relevant limit.

[0023] Further details of the invention will be described with reference to the drawings.

[0024] The curve 10 of Figure 1 shows a pressure signal of a pressure-dependent process measured over time t. Alternatively, curve 10 of Figure 1 may show a filtered pressure signal obtained from the measured pressure signal.

[0025] Figure 1 further shows pressure ranges 11, 12,

13, and 14. The pressure range 11 is defined by a respective lower limit A and by a respective upper limit B. The pressure range 12 is defined by a respective lower limit C and by a respective upper limit D. The pressure range 13 is defined by a respective lower limit E and by a respective upper limit F. The pressure range 14 is defined by a respective lower limit G and by a respective upper limit H.

[0026] If the pressure signal 10, namely either the measured pressure signal or the filtered pressure signal obtained from the measured pressure signal, is inside a respective pressure ranges 11, 12, 13, 14, the pressure monitoring signal has the first value or first status. If the pressure monitoring signal has the first value or first status, the pressure dependent process is continued unchanged.

[0027] If the pressure signal 10, namely either the measured pressure signal or the filtered pressure signal obtained from the measured pressure signal, is outside a respective pressure range 11, 12, 13, 14 and violates a safety relevant limit, the pressure monitoring signal has the second value or second status. If the pressure monitoring signal has the second value or second status, the pressure dependent process is stopped immediately. In Figure 1 such a safety relevant limit is the lower limit A of the pressure range 11. If it would be determined that the pressure signal 10 would be below the safety relevant limit A, the pressure monitoring signal would have the second value or second status and the pressure dependent process would be stopped immediately. The area 15 in Fig. 1 illustrates a safety relevant area. If the pressure signal 10, namely either the measured pressure signal or the filtered pressure signal obtained from the measured pressure signal, would be within this safety relevant area 15, the pressure monitoring signal would have the second value or second status and the pressure dependent process would be stopped.

[0028] If the pressure signal 10, namely either the measured pressure signal or the filtered pressure signal obtained from the measured pressure signal, is outside a respective pressure ranges 11, 12, 13, 14 and violates a non-safety relevant limit, the pressure monitoring signal has the third value or third status. If the pressure monitoring signal has the third value or third status, the pressure dependent process is continued unchanged or by adapting at least one process parameter or the pressure dependent process is stopped. In Figure 1 such a non-safety relevant limit would be the limits B to H. If it would be determined that the pressure signal 10 would be above the limit B and below the limit C, and/or above the limit D and below the limit E, and/or above the limit F and below the limit G, the pressure monitoring signal would have the third value or third status. The pressure dependent process may then be continued unchanged or may then be continued by adapting at least one process parameter or the pressure dependent process is stopped, depending on the respective limit and/or depending on the duration of the violation of the respective limit.

[0029] In Figure 1, e. g. the pressure dependent process may be continued unchanged in view of the brief violation of the limit C in section 16 of the pressure signal 10 and/or the pressure dependent process may be continued by adapting at least one process parameter in view of the long violation of the limits F and G in section 17 of the pressure signal 10.

[0030] The method illustrated in Figure 1 is preferably used if a feedback signal of the pressure-dependent process being indicative about operational time intervals of the pressure-dependent process is not available when measuring the pressure.

[0031] If such a feedback signal of the pressure-dependent process being indicative about operational time intervals of the pressure-dependent process is available, the method illustrated in Figure 2 is preferably used.

[0032] The curve 20 of Figure 12 shows a pressure signal of a pressure-dependent process measured over time t.

[0033] Alternatively, curve 20 of Figure 2 may show a filtered pressure signal obtained from the measured pressure signal.

[0034] Figure 2 further shows pressure ranges 21, 22, 23, and 24. The pressure range 21 is defined by a respective lower limit A and by a respective upper limit B and is valid for time interval between times t1 and t2. The pressure range 22 is defined by a respective lower limit C and by a respective upper limit D and is valid for time interval between times t3 and t4. The pressure range 23 is defined by a respective lower limit E and by a respective upper limit F and is valid for time interval between times t5 and t6. The pressure range 24 is defined by a respective lower limit G and by a respective upper limit H and is valid for time interval between times t7 and t8.

[0035] If the pressure signal 20, namely either the measured pressure signal or the filtered pressure signal obtained from the measured pressure signal, is within a respective time interval t1-t2 and/or t3-t4 and/or t5-t6 and/or t7-t8 inside the respective pressure range 21, 22, 23, 24, the pressure monitoring signal has the first value or first status. If the pressure monitoring signal has the first value or first status, the pressure dependent process is continued unchanged.

[0036] If the pressure signal 20, namely either the measured pressure signal or the filtered pressure signal obtained from the measured pressure signal, is within a respective time interval outside the respective pressure range violating a safety relevant limit, the pressure monitoring signal has the second value or second status and the pressure dependent process is stopped immediately. In Figure 2 such a safety relevant limit would be the lower limit A of the pressure range 21. If it would be determined that the pressure signal 20 would within the time interval t1-t2 or within any other time interval below the safety relevant limit A, the pressure monitoring signal would have the second value or second status and the pressure dependent process would be stopped. The area 25 in Fig. 2 illustrates a safety relevant area. If the pressure

signal 20 would be at any time within this safety relevant area 25, the pressure monitoring signal would have the second value or second status and the pressure dependent process would be stopped immediately.

[0037] If the pressure signal 20, namely either the measured pressure signal or the filtered pressure signal obtained from the measured pressure signal, is within a respective time interval outside the respective pressure range violating a non-safety relevant limit, the pressure monitoring signal has the third value or third status. If the pressure monitoring signal has the third value or third status, the pressure dependent process may be continued unchanged or may be stopped or may be continued by adapting at least one process parameters of the pressure dependent process.

[0038] In Figure 2 such a non-safety relevant limit would be the limits B to H. If it would be determined that the pressure signal 20 would be in time interval t1-t2 above limits B, and/or in time interval t3-t4 the pressure signal 20 would be below limit C or above limit D, and/or in time interval t5-t6 the pressure signal 10 would be below limit D or above limit E, and/or in time interval t7-t8 the pressure signal 10 would be below limit G or above limit H, the pressure monitoring signal would have the third value or third status. The pressure dependent process may then be continued unchanged or may then be continued by adapting at least one process parameter or the pressure dependent process is stopped, depending on the respective limit and/or depending on the duration of the violation of the respective limit.

[0039] In Figure 2, e. g. the pressure dependent process may be continued unchanged in view of the brief violation of the limit C in time interval t3-t4 and/or the pressure dependent process may be continued by adapting at least one process parameter in view of the long violation of the limit E in time-interval t5-t6.

[0040] In Figure 2, no pressure ranges are defined for the transitional time intervals t2-t3, t4-t5 and t6-t7. During such a transitional time interval the pressure signal 20 must be above the limit A but can have any other value to continue with the pressure dependent process.

[0041] As explained above, the pressure of the pressure-dependent process is measuring over the time t. So, the pressure signal 10, 20 is a function of time. This means that the value or status of pressure monitoring signal obtained on basis of the pressure signal 10, 20 may change over the time t because the processing step and generating step are executed over the time on basis of the pressure signal 10, 20.

[0042] The present disclosure provides further a pressure sensor 30 for monitoring a pressure-dependent process.

[0043] The pressure sensor 30 comprises a measuring unit 31 being configured to measure over the time a pressure of the pressure-dependent process. The pressure sensor 30 may comprise one measuring unit 31 or several measuring units 31. If the pressure sensor 30 comprises several measuring units 31, e. g. two measuring

units 31, each measuring unit 31 may measure the pressure to provide redundancy. The measurement values of the measuring units 31 may be used to calculate an average value. The average value may be used in the processing step.

[0044] The pressure sensor 30 further comprises a memory unit 32 for storing at least the defined pressure ranges, each pressure range being defined by a respective lower limit and by a respective upper limit.

[0045] The pressure sensor 30 further comprises a processing unit 33 being configured to process the measured pressure by determining if the measured pressure or a filtered pressure obtained from the measured pressure is inside or outside a respective pressure range and to generate a pressure monitoring signal 34.

[0046] The pressure monitoring signal 34 has a first value or first status if the measured pressure or the filtered pressure is inside a respective pressure range.

[0047] The pressure monitoring signal has a second value or second status if the measured pressure or the filtered pressure is outside a respective pressure range violating a safety relevant limit.

[0048] The pressure monitoring signal has a third value or third status if the measured pressure or the filtered pressure is outside a respective pressure range violating a non-safety relevant limit.

[0049] The pressure monitoring signal 34 is used by a control system 35 to control the pressure-dependent process. If the pressure monitoring signal 34 has the first value or first status, the pressure dependent process is continued unchanged. Preferably, if the pressure monitoring signal 34 has the second value or second status the pressure dependent process is stopped immediately. Preferably, if the pressure monitoring signal 34 has the third value or third status, the pressure dependent process is continued unchanged or the pressure dependent process 35 is continued by adapting at least one process parameter of the pressure dependent process or the pressure dependent process 35 is stopped.

[0050] If a feedback signal 36 of the pressure-dependent process being indicative about operational time intervals of the pressure-dependent process 25 is available, the method illustrated in Figure 2 is preferably used. If the feedback signal 36 is not available, the method illustrated in Figure 1 is preferably used.

[0051] The basic concept of the invention is to provide a pressure monitoring which allows to replace several pressure switches with one pressure sensor. The pressure sensor provides as output the pressure monitoring signal 34 indicating a valid or invalid pressure state. Pressure monitoring can be provided at reduced hardware and installation costs. State conditions for the pressure sensor output, namely for the pressure monitoring signal 34, are defined by parameters to be stored in memory unit 35. At least defined pressure ranges and preferably also time intervals associated with the pressure ranges are stored in memory unit 35. There are defined reactions depending on the pressure sensor output, namely de-

pending on the value or status of the pressure monitoring signal 34. With one intelligent pressure sensor 30 the function of many pressure switches can be covered. With one intelligent pressure sensor 30 a pressure can be measured and it can be verified that the measured pressure is in expected pressure ranges in expected time intervals. By the changing the of parameters stored in the non-volatile memory unit, the sensor 30 can be easily configured to different applications.

List of reference signs

[0052]

10	pressure signal
11	pressure range
12	pressure range
13	pressure range
14	pressure range
15	safety relevant area
16	section
17	section
20	pressure signal
21	pressure range
22	pressure range
23	pressure range
24	pressure range
25	safety relevant area
30	pressure sensor
31	measuring unit
32	memory unit
33	processing unit
34	pressure monitoring signal
35	control system
36	feedback signal

Claims

1. Method for pressure monitoring a pressure-dependent process comprising the following steps:

measuring over time a pressure of the pressure-dependent process,
processing the measured pressure by determining if the measured pressure (10, 20) or a filtered pressure obtained from the measured pressure is inside or outside defined pressure ranges (11, 12, 13, 14; 21, 22, 23, 24), each pressure range being defined by a respective lower limit (A, C, E, G) and by a respective upper limit (B, D, F, H), generating a pressure monitoring signal (34) in such a way that

the pressure monitoring signal (34) has a first value or first status if the measured

pressure or the filtered pressure is inside a respective pressure range (11, 12, 13, 14; 21, 22, 23, 24),

the pressure monitoring signal (34) has a second value or second status if the measured pressure or the filtered pressure is outside a respective pressure range (11, 12, 13, 14; 21, 22, 23, 24) violating a safety relevant limit (A),

the pressure monitoring signal (34) has a third value or third status if the measured pressure or the filtered pressure is outside a respective pressure range violating a non-safety relevant limit (B, C, D, E, F, G, H).

2. Method of claim 1, wherein

during the processing step it is determined if the measured pressure (10, 20) or the filtered pressure is within defined time intervals inside or outside respective pressure ranges (21, 22, 23, 24) associated with the respective time intervals, the pressure monitoring signal (34) is generated in such a way that

the pressure monitoring signal (34) has the first value or first status if the measured or filtered pressure is within a respective time interval inside the respective pressure range (21, 22, 23, 24),

the pressure monitoring signal (34) has the second value or second status if the measured or the filtered pressure is within a respective time interval outside the respective pressure range (21, 22, 23, 24) violating a safety relevant limit (A),

the pressure monitoring signal (34) has the third value or third status if the measured or filtered pressure is within a respective time interval outside the respective pressure range (21, 22, 23, 24) violating a non-safety relevant limit (B, C, D, E, F, G, H).

3. Method of claim 1 or 2, wherein

the measuring step is executed by a measuring unit (31) of an electrical or electronic pressure sensor (30),

the processing step and generating step are executed by a processing unit (33) of the electrical or electronic pressure sensor (30) on basis of the measured pressure provided by the measuring unit (31) and on basis of the defined pressure ranges stored in a memory unit (32) of the electrical or electronic pressure sensor (30).

4. Method of claim 3, wherein in that the processing step and generating step are executed also on basis

of the defined time intervals stored in the memory unit (32) of the pressure sensor (30).

5. Method of one of claims 1 to 4, wherein in that an absolute pressure is measured as pressure of the pressure-dependent process.

6. Method of one of claims 1 to 5, wherein if the pressure monitoring signal (34) has the first value or first status, the pressure dependent process is continued unchanged.

7. Method of one of claims 1 to 6, wherein if the pressure monitoring signal (34) has the second value or second status the pressure dependent process is stopped.

8. Method of one of claims 1 to 7, wherein that if pressure monitoring signal (34) has the third value or third status, the pressure dependent process is continued unchanged or the pressure dependent process is continued by adapting at least one process parameter of the pressure dependent process or the pressure dependent process is stopped.

9. Method of one of claims 1 to 8, wherein a combustion process of a gas burner appliance is controlled as pressure-dependent process.

10. Pressure sensor (30) for monitoring a pressure-dependent process comprising:

a measuring unit (31) being configured to measure over the time a pressure of the pressure-dependent process,

a memory unit (32) for storing defined pressure ranges (11, 12, 13, 14; 21, 22, 23, 24), each pressure range being defined by a respective lower limit (A, C, E, G) and by a respective upper limit (B, D, F, H),

a processing unit (33) being configured to process the measured pressure by determining if the measured pressure or a filtered pressure obtained from the measured pressure is inside or outside the defined pressure ranges (11, 12, 13, 14; 21, 22, 23, 24) and to generate a pressure monitoring (34) signal in such a way that the pressure monitoring signal (34)

has a first value or first status if the measured pressure or the filtered pressure is inside a respective pressure range (11, 12, 13, 14; 21, 22, 23, 24),

has a second value or second status if the measured pressure or the filtered pressure is outside a respective pressure range (11, 12, 13, 14; 21, 22, 23, 24) violating a safety relevant limit (A),

has a third value or third status if the measured pressure or the filtered pressure is outside a respective pressure range (11, 12, 13, 14; 21, 22, 23, 24) violating a non-safety relevant limit (B, C, D, E, F, G, H).

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11. Pressure sensor of claim 10, wherein the processing unit (33) is configured to determine if the measured pressure or the filtered pressure is within defined time intervals inside or outside respective pressure ranges (21, 22, 23, 24) associated with the respective time intervals and to generate a pressure monitoring signal (34) in such a way that

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the pressure monitoring signal (34) has the first value or first status if the measured or filtered pressure is within a respective time interval inside the respective pressure range (21, 22, 23, 24),

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the pressure monitoring signal (34) has the second value or second status if the measured pressure or the filtered pressure is within a respective time interval outside the respective pressure range (21, 22, 23, 24) violating a safety relevant limit (A),

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the pressure monitoring signal (34) has the third value or third status if the measured pressure or the filtered pressure is within a respective time interval outside the respective pressure range (21, 22, 23, 24) violating a non-safety relevant limit (B, C, D, E, F, G, H).

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Patentansprüche

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1. Verfahren zur Drucküberwachung in einem druckabhängigen Prozess, die folgenden Schritte aufweisend:

Messen eines Drucks des druckabhängigen Prozesses im Zeitverlauf,

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Verarbeiten des gemessenen Drucks durch Bestimmen, ob der gemessene Druck (10, 20) oder ein gefilterter Druck, der aus dem gemessenen Druck gewonnen wird, innerhalb oder außerhalb definierter Druckbereiche (11, 12, 13, 14; 21, 22, 23, 24) liegt, wobei jeder Druckbereich durch eine entsprechende Untergrenze (A, C, E, G) und durch eine entsprechende Obergrenze (B, D, F, H) definiert ist,

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Erzeugen eines Drucküberwachungssignals (34) derart, dass:

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das Drucküberwachungssignal (34) einen ersten Wert oder ersten Zustand aufweist, wenn der gemessene Druck oder der gefilterte Druck innerhalb eines entsprechenden Druckbereichs (11, 12, 13, 14; 21, 22,

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23, 24) liegt,

das Drucküberwachungssignal (34) einen zweiten Wert oder zweiten Zustand aufweist, wenn der gemessene Druck oder der gefilterte Druck außerhalb eines entsprechenden Druckbereichs (11, 12, 13, 14; 21, 22, 23, 24) liegt und eine sicherheitsrelevante Grenze (A) überschreitet, das Drucküberwachungssignal (34) einen dritten Wert oder dritten Zustand aufweist, wenn der gemessene Druck oder der gefilterte Druck außerhalb eines entsprechenden Druckbereichs liegt und eine nicht-sicherheitsrelevante Grenze (B, C, D, E, F, G, H) überschreitet.

2. Verfahren nach Anspruch 1, wobei

während des Verarbeitungsschrittes bestimmt wird, ob der gemessene Druck (10, 20) oder der gefilterte Druck innerhalb definierter Zeitintervalle innerhalb oder außerhalb entsprechender Druckbereiche (21, 22, 23, 24) liegt, die den entsprechenden Zeitintervallen zugeordnet sind, das Drucküberwachungssignal (34) derart erzeugt wird, dass:

das Drucküberwachungssignal (34) den ersten Wert oder ersten Zustand aufweist, wenn der gemessene oder gefilterte Druck innerhalb eines entsprechenden Zeitintervalls innerhalb des entsprechenden Druckbereichs (21, 22, 23, 24) liegt, das Drucküberwachungssignal (34) den zweiten Wert oder zweiten Zustand aufweist, wenn der gemessene oder gefilterte Druck innerhalb eines entsprechenden Zeitintervalls außerhalb des entsprechenden Druckbereichs (21, 22, 23, 24) liegt und eine sicherheitsrelevante Grenze (A) überschreitet, das Drucküberwachungssignal (34) den dritten Wert oder dritten Zustand aufweist, wenn der gemessene oder gefilterte Druck innerhalb eines entsprechenden Zeitintervalls außerhalb des entsprechenden Druckbereichs (21, 22, 23, 24) liegt und eine nicht-sicherheitsrelevante Grenze (B, C, D, E, F, G, H) überschreitet.

3. Verfahren nach Anspruch 1 oder 2, wobei:

der Messschritt durch eine Messeinheit (31) eines elektrischen oder elektronischen Drucksensors (30) ausgeführt wird, der Verarbeitungsschritt und der Erzeugungsschritt von einer Verarbeitungseinheit (33) des elektrischen oder elektronischen Drucksensors

- (30) auf der Grundlage des von der Messeinheit (31) bereitgestellten gemessenen Drucks und auf der Grundlage der definierten Druckbereiche ausgeführt werden, die in einer Speichereinheit (32) des elektrischen oder elektronischen Drucksensors (30) gespeichert sind. 5
4. Verfahren nach Anspruch 3, wobei der Verarbeitungsschritt und der Erzeugungsschritt außerdem auf der Grundlage der definierten Zeitintervalle ausgeführt werden, die in der Speichereinheit (32) des Drucksensors (30) gespeichert sind. 10
5. Verfahren nach einem der Ansprüche 1 bis 4, wobei ein absoluter Druck als Druck des druckabhängigen Prozesses gemessen wird. 15
6. Verfahren nach einem der Ansprüche 1 bis 5, wobei der druckabhängige Prozess unverändert fortgesetzt wird, wenn das Drucküberwachungssignal (34) den ersten Wert oder ersten Zustand aufweist. 20
7. Verfahren nach einem der Ansprüche 1 bis 6, wobei der druckabhängige Prozess angehalten wird, wenn das Drucküberwachungssignal (34) den zweiten Wert oder zweiten Zustand aufweist. 25
8. Verfahren nach einem der Ansprüche 1 bis 7, wobei der druckabhängige Prozess unverändert fortgesetzt wird oder der druckabhängige Prozess durch Anpassen zumindest eines Prozessparameters des druckabhängigen Prozesses fortgesetzt wird oder der druckabhängige Prozess angehalten wird, wenn das Drucküberwachungssignal (34) den dritten Wert oder dritten Zustand aufweist. 30 35
9. Verfahren nach einem der Ansprüche 1 bis 8, wobei ein Verbrennungsprozess eines Gasbrenners als ein druckabhängiger Prozess gesteuert wird. 40
10. Drucksensor (30) zum Überwachen eines druckabhängigen Prozesses, Folgendes aufweisend:
- eine Messeinheit (31), die ausgestaltet ist, um einen Druck des druckabhängigen Prozesses im Zeitverlauf zu messen, 45
- eine Speichereinheit (32), zum Speichern definierter Druckbereiche (11, 12, 13, 14; 21, 22, 23, 24), wobei jeder Druckbereich durch eine entsprechende Untergrenze (A, C, E, G) und durch eine entsprechende Obergrenze (B, D, F, H) definiert ist, 50
- eine Verarbeitungseinheit (33), die ausgestaltet ist, um den gemessenen Druck durch Bestimmen zu verarbeiten, ob der gemessene Druck oder ein gefilterter Druck, der aus dem gemessenen Druck gewonnen wird, innerhalb oder außerhalb definierter Druckbereiche (11, 12, 13, 55

14; 21, 22, 23, 24) liegt, und ein Drucküberwachungssignal (34) derart zu erzeugen, dass das Drucküberwachungssignal (34):

einen ersten Wert oder ersten Zustand aufweist, wenn der gemessene Druck oder der gefilterte Druck innerhalb eines entsprechenden Druckbereichs (11, 12, 13, 14; 21, 22, 23, 24) liegt, einen zweiten Wert oder zweiten Zustand aufweist, wenn der gemessene Druck oder der gefilterte Druck außerhalb eines entsprechenden Druckbereichs (11, 12, 13, 14; 21, 22, 23, 24) liegt und eine sicherheitsrelevante Grenze (A) überschreitet, einen dritten Wert oder dritten Zustand aufweist, wenn der gemessene Druck oder der gefilterte Druck außerhalb eines entsprechenden Druckbereichs (11, 12, 13, 14; 21, 22, 23, 24) liegt und eine nicht-sicherheitsrelevante Grenze (B, C, D, E, F, G, H) überschreitet.

11. Drucksensor nach Anspruch 10, wobei die Verarbeitungseinheit (33) ausgestaltet ist zu bestimmen, ob der gemessene Druck oder der gefilterte Druck innerhalb definierter Zeitintervalle innerhalb oder außerhalb entsprechender Druckbereiche (21, 22, 23, 24) liegt, die den entsprechenden Zeitintervallen zugeordnet sind, und ein Drucküberwachungssignal (34) derart zu erzeugen, dass:

das Drucküberwachungssignal (34) den ersten Wert oder ersten Zustand aufweist, wenn der gemessene oder gefilterte Druck innerhalb eines entsprechenden Zeitintervalls innerhalb des entsprechenden Druckbereichs (21, 22, 23, 24) liegt, das Drucküberwachungssignal (34) den zweiten Wert oder zweiten Zustand aufweist, wenn der gemessene Druck oder der gefilterte Druck innerhalb eines entsprechenden Zeitintervalls außerhalb des entsprechenden Druckbereichs (21, 22, 23, 24) liegt und eine sicherheitsrelevante Grenze (A) überschreitet, das Drucküberwachungssignal (34) den dritten Wert oder dritten Zustand aufweist, wenn der gemessene Druck oder der gefilterte Druck innerhalb eines entsprechenden Zeitintervalls außerhalb des entsprechenden Druckbereichs (21, 22, 23, 24) liegt und eine nicht-sicherheitsrelevante Grenze (B, C, D, E, F, G, H) überschreitet.

Revendications

1. Procédé de surveillance de pression d'un processus

dépendant de la pression comprenant les étapes suivantes :

la mesure dans le temps d'une pression du processus dépendant de la pression, 5
le traitement de la pression mesurée en déterminant si la pression mesurée (10, 20) ou une pression filtrée obtenue à partir de la pression mesurée se trouve à l'intérieur ou à l'extérieur de plages de pression définies (11, 12, 13, 14 ; 21, 22, 23, 24), chaque plage de pression étant définie par une limite inférieure respective (A, C, E, G) et par une limite supérieure respective (B, D, F, H), 10
la génération d'un signal de surveillance de pression (34) de telle manière que 15

le signal de surveillance de pression (34) a une première valeur ou un premier état si la pression mesurée ou la pression filtrée se trouve à l'intérieur d'une plage de pression respective (11, 12, 13, 14 ; 21, 22, 23, 24), 20

le signal de surveillance de pression (34) a une seconde valeur ou un second état si la pression mesurée ou la pression filtrée se trouve à l'extérieur d'une plage de pression respective (11, 12, 13, 14 ; 21, 22, 23, 24) violant une limite pertinente de sécurité (A), le signal de surveillance de pression (34) a une troisième valeur ou un troisième état si la pression mesurée ou la pression filtrée se trouve à l'extérieur d'une plage de pression respective violant une limite pertinente de non-sécurité (B, C, D, E, F, G, H). 25 30 35

2. Procédé selon la revendication 1, dans lequel

pendant l'étape de traitement, il est déterminé si la pression mesurée (10, 20) de la pression filtrée se trouve à l'intérieur d'intervalles de temps définis à l'intérieur ou à l'extérieur de plages de pression respectives (21, 22, 23, 24) associées aux intervalles de temps respectifs, le signal de surveillance de pression (34) est généré de telle manière que 40 45

le signal de surveillance de pression (34) a la première valeur ou le premier état si la pression mesurée ou filtrée se trouve à l'intérieur d'un intervalle de temps respectif à l'intérieur de la plage de pression respective (21, 22, 23, 24), 50

le signal de surveillance de pression (34) a la seconde valeur ou le second état si la pression mesurée ou filtrée se trouve à l'intérieur d'un intervalle de temps respectif à l'extérieur de la plage de pression respec- 55

tive (21, 22, 23, 24) violant une limite pertinente de sécurité (A),

le signal de surveillance de pression (34) a la troisième valeur ou le troisième état si la pression mesurée ou filtrée se trouve à l'intérieur d'un intervalle de temps respectif à l'extérieur de la plage de pression respective (21, 22, 23, 24) violant une limite pertinente de non-sécurité (B, C, D, E, F, G, H).

3. Procédé selon la revendication 1 ou 2, dans lequel

l'étape de mesure est exécutée par une unité de mesure (31) d'un capteur de pression électrique ou électronique (30), l'étape de traitement et l'étape de génération sont exécutées par une unité de traitement (33) du capteur de pression électrique ou électronique (30) sur la base de la pression mesurée fournie par l'unité de mesure (31) et sur la base des plages de pression définies stockées dans une unité de mémoire (32) du capteur de pression électrique ou électronique (30).

4. Procédé selon la revendication 3, dans lequel l'étape de traitement et l'étape de génération sont exécutées également sur la base des intervalles de temps définis stockés dans l'unité de mémoire (32) du capteur de pression (30).

5. Procédé selon l'une des revendications 1 à 4, dans lequel une pression absolue est mesurée en tant que pression du processus dépendant de la pression.

6. Procédé selon l'une des revendications 1 à 5, dans lequel si le signal de surveillance de pression (34) a la première valeur ou le premier état, le processus dépendant de la pression est continué de manière inchangée.

7. Procédé selon l'une des revendications 1 à 6, dans lequel si le signal de surveillance de pression (34) a la seconde valeur ou le second état, le processus dépendant de la pression est arrêté.

8. Procédé selon l'une des revendications 1 à 7, dans lequel si le signal de surveillance de pression (34) a la troisième valeur ou le troisième état, le processus dépendant de la pression est continué de manière inchangée ou le processus dépendant de la pression est continué en adaptant au moins un paramètre de processus du processus dépendant de la pression ou le processus dépendant de la pression est arrêté.

9. Procédé selon l'une des revendications 1 à 8, dans lequel un processus de combustion d'un appareil de combustion à gaz est commandé en tant que processus dépendant de la pression.

10. Capteur de pression (30) pour surveiller un processus dépendant de la pression comprenant :

une unité de mesure (31) étant configurée pour mesurer dans le temps une pression du processus dépendant de la pression, 5
 une unité de mémoire (32) pour stocker des plages de pression définies (11, 12, 13, 14 ; 21, 22, 23, 24), chaque plage de pression étant définie par une limite inférieure respective (A, C, E, G) et par une limite supérieure respective (B, D, F, H), 10
 une unité de traitement (33) étant configurée pour traiter la pression mesurée en déterminant si la pression mesurée ou une pression filtrée obtenue à partir de la pression mesurée se trouve à l'intérieur ou à l'extérieur des plages de pression définies (11, 12, 13, 14 ; 21, 22, 23, 24) et pour générer un signal de surveillance de pression (34) de telle manière que le signal de surveillance de pression (34) 20

a une première valeur ou un premier état si la pression mesurée ou la pression filtrée se trouve à l'intérieur d'une plage de pression respective (11, 12, 13, 14 ; 21, 22, 23, 24), 25

a une seconde valeur ou un second état si la pression mesurée ou la pression filtrée se trouve à l'extérieur d'une plage de pression respective (11, 12, 13, 14 ; 21, 22, 23, 24) violant une limite pertinente de sécurité (A), 30

a une troisième valeur ou un troisième état si la pression mesurée ou la pression filtrée se trouve à l'extérieur d'une plage de pression respective (11, 12, 13, 14 ; 21, 22, 23, 24) violant une limite pertinente de non-sécurité (B, C, D, E, F, G, H). 35

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11. Capteur de pression selon la revendication 10, dans lequel

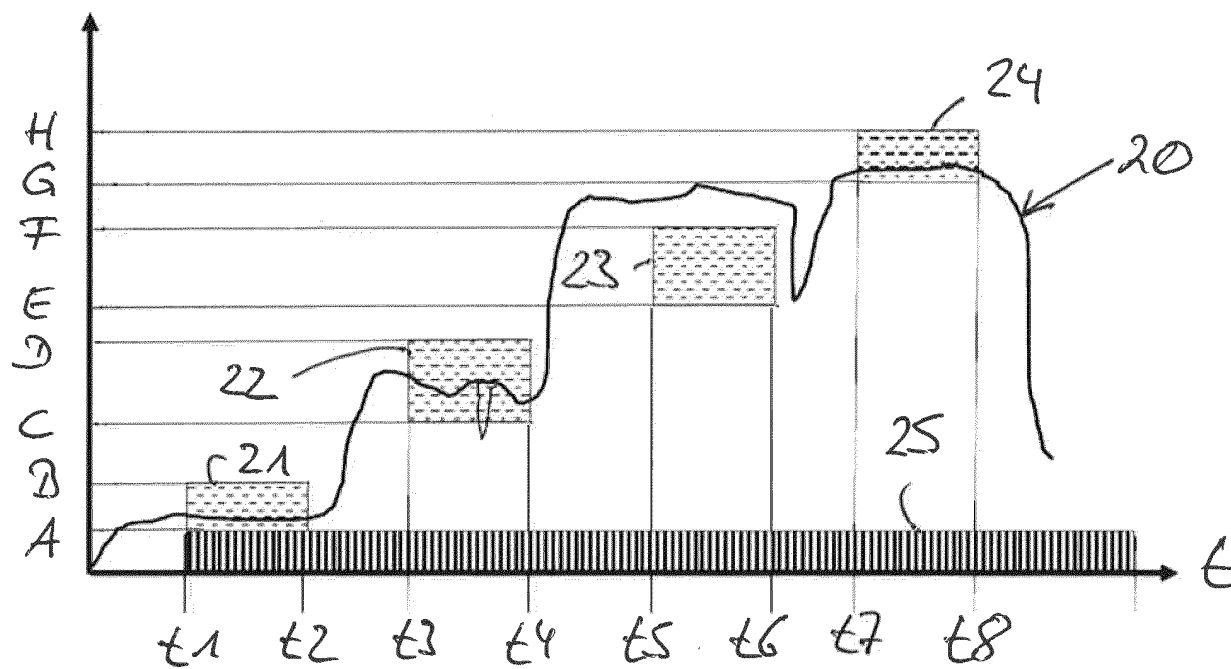
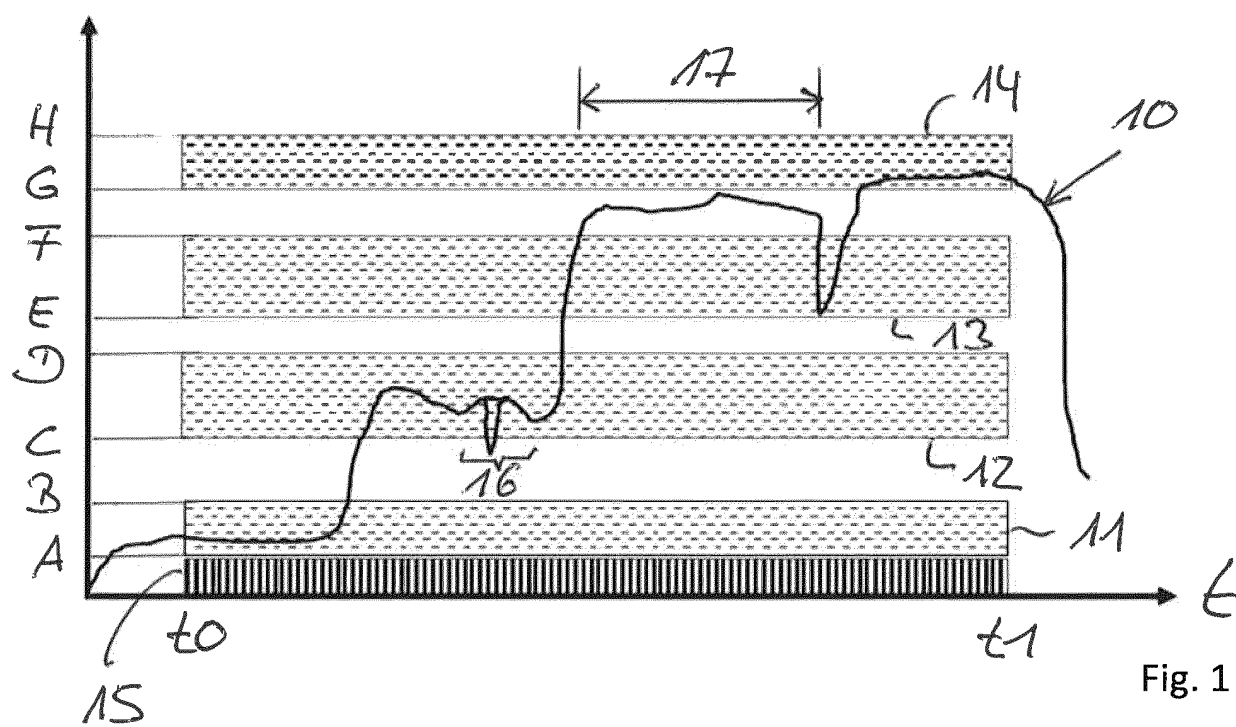
l'unité de traitement (33) est configurée pour déterminer si la pression mesurée ou la pression filtrée se trouve à l'intérieur d'intervalles de temps définis à l'intérieur ou à l'extérieur de plages de pression respectives (21, 22, 23, 24) associées aux intervalles de temps respectifs et pour générer un signal de surveillance de pression (34) de telle manière que 45

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le signal de surveillance de pression (34) a la première valeur ou le premier état si la pression mesurée ou filtrée se trouve à l'intérieur d'un intervalle de temps respectif à l'intérieur de la plage de pression respective (21, 22, 23, 24), 55
 le signal de surveillance de pression (34) a la seconde valeur ou le second état si la pression mesurée ou la pression filtrée se trouve à l'inté-

rieur d'un intervalle de temps respectif à l'extérieur de la plage de pression respective (21, 22, 23, 24) violant une limite pertinente de sécurité (A),

le signal de surveillance de pression (34) a la troisième valeur ou le troisième état si la pression mesurée ou la pression filtrée se trouve à l'intérieur d'un intervalle de temps respectif à l'extérieur de la plage de pression respective (21, 22, 23, 24) violant une limite pertinente de non-sécurité (B, C, D, E, F, G, H).



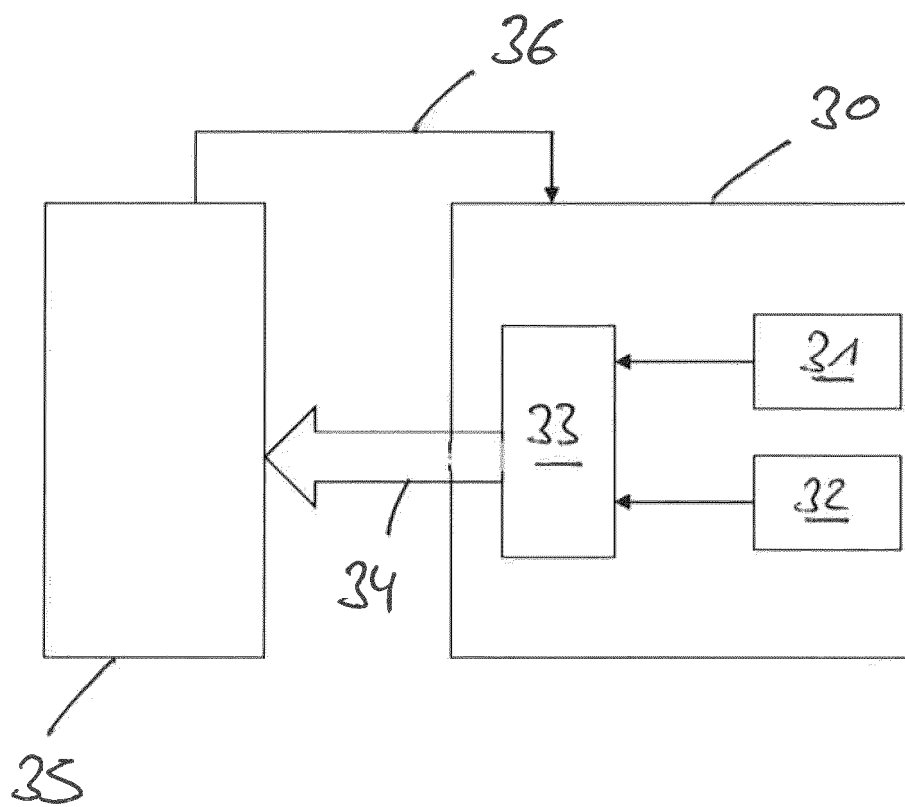


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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