

(19) **DANMARK**

(10) **DK/EP 3615757 T3**



Patent- og
Varemærkestyrelsen

(12) Oversættelse af
europæisk patentskrift

-
- (51) Int.Cl.: **E 06 B 3/677 (2006.01)** **E 06 B 9/264 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2023-05-08**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2023-03-01**
- (86) Europæisk ansøgning nr.: **18707146.9**
- (86) Europæisk indleveringsdag: **2018-01-29**
- (87) Den europæiske ansøgnings publiceringsdag: **2020-03-04**
- (86) International ansøgning nr.: **IB2018050521**
- (87) Internationalt publikationsnr.: **WO2018197955**
- (30) Prioritet: **2017-04-24 IT 201700044591**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
- (73) Patenthaver: **Pellini S.p.A., Via Angelo Fusari, 19, 26845 Codogno (Lodi), Italien**
- (72) Opfinder: **PASSONI, Marco, Via Papa Giovanni 30, 27010 Copiano (PV), Italien**
PELLINI, Alessandro, c/o Pellini S.p.A., Via Angelo Fusari 19, 26845 Codogno (LO), Italien
PAPAIZ, Luca, c/o Pellini S.p.A., Via Angelo Fusari 19, 26845 Codogno (LO), Italien
- (74) Fuldmægtig i Danmark: **Plougmann Vingtoft A/S, Strandvejen 70, 2900 Hellerup, Danmark**
- (54) Benævnelse: **AVANCERET ISOLERINGSGLASENHED**
- (56) Fremdragne publikationer:
DE-A1- 10 317 914
US-A1- 2007 188 094

DESCRIPTION

Technical field

[0001] The present invention relates to an improved insulated glazing unit as defined in the preamble of claim 1.

Background art

[0002] Insulated glass units are widely used in the field of building and typically have the function of allowing the passage of light while thermally insulating the two environments delimited by the insulated glazing unit.

[0003] A known insulated glazing unit comprises an outer frame, which is usually made of metal or plastic sections, to be fitted into a specially designed door or window.

[0004] Two parallel panes of glass are sealed to the frame, thereby defining a gap therebetween. Therefore, this gap forms an environment that is separate from both environments external to the insulated glazing unit.

[0005] A screening element, namely a blind, e.g. A Venetian blind, is placed within the gap. This screening element may be switched between an open configuration and a closed configuration. In the open configuration light may freely pass through the gap, and in the closed configuration the screening element occupies the gap and blocks light. Various intermediate configurations are also possible, i.e. partially open/closed configurations.

[0006] In the known insulated glazing units, the blind is driven by a series of cords wound on a roller. Such roller is typically driven by an electric motor. A control unit is connected to the electric motor to control its operation for deployment of the blind in the insulated glazing unit.

[0007] In insulated glazing units exposed to the outside environment air temperature in the gap varies in a rather wide range throughout the year, season after season. Such temperature change results in a corresponding pressure change. Generally, this change is different from that occurring outside the insulated glazing unit, whereby the panes of glass are exposed to a significant differential pressure, which may lead them to bend either inwards or outwards relative to the gap. It will be understood that, in case of inward bending, the useful space for blind movement is considerably reduced and in certain extreme cases may be insufficient. As a result, the blind or the mechanism that controls its movement may be jammed and/or damaged, and damages may also occur to the glass or surface treatments thereof, due to the blind rubbing against the glass.

[0008] US 2007/188094 A1 discloses an insulated glazing unit according to the preamble of claim 1.

[0009] US 2007/188094 discloses a pressure regulating system for preventing the aforementioned problem in an insulated glazing unit. Special valves are placed on channels that provide communication between the gap of the insulated glazing unit and the outside environment. Pressure sensors are placed in the gap and outside it to allow valve control based on the differential pressure being sensed. The passage of air re-establishes substantial pressure equality between the inside and the outside, thereby preventing glass bending.

The problem of the prior art

[0010] The insulated glazing unit of US 2007/188094 is not permanently hermetically sealed relative to the outside environment, and the valves periodically allow the passage of air withdrawn from the exterior of the insulated glazing unit into the gap of the insulated glazing unit.

[0011] Furthermore, a large number of cables are arranged through suitable passages formed in the frame to supply power and/or control the pressure sensor, and such passages do not ensure the seal of the insulated glazing unit.

[0012] As a result, moisture and other undesired weather agents may be introduced into the insulated glazing unit, and the smaller thickness of the gap prevents them from escaping out of it. This may lead to fogging and early aging of the screening element and the controls therefor.

[0013] Finally, the European standard EN 1279 currently in force and its 2010 release requires insulating glass units (IGUs) to include at least two panes of glass separated by one or more spacers, to be hermetically sealed along its periphery, to be mechanically stable and durable.

[0014] The insulated glazing unit of US 2007/188094 does not meet the tightness requirements of this standard.

Object of the present invention

[0015] Therefore, the object of the present invention is to provide an insulated glazing unit that can obviate the above mentioned prior art drawbacks.

[0016] The aforementioned technical purpose and objects are substantially fulfilled by an insulated glazing unit that comprises the technical features as disclosed in one or more of the accompanying claims.

Advantages of the Invention

[0017] The present invention can provide a hermetically sealed insulated glazing unit that can prevent jamming or malfunctioning of the blind due to weather changes.

[0018] Namely, an insulated glazing unit of the present invention comprises a support frame. The insulated glazing unit comprises a pair of panes (or even three, four or more panes of glass), which are at least partially transparent and are sealingly fixed to the frame to define a gap.

[0019] The panes and the glass are configured to permanently seal the gap, preferably in compliance with the standard EN 1279, to prevent penetration of moisture and escape of inert gases other than air, which are used to improve the insulating qualities of the insulated glazing unit.

[0020] A screening element is adapted to be deployed within the gap.

[0021] This screening element may be switched between an open configuration and at least one closed configuration. In the open configuration light may pass through the gap. In the closed configuration the screening element at least partially blocks light in the gap.

[0022] The insulated glazing unit further comprises a control unit, having an actuation module associated with the screening element to control deployment thereof.

[0023] A box for housing the control unit is integrated in the frame.

[0024] A pressure sensor is configured to send a signal representative of an internal pressure value to the control unit. The pressure sensor is placed in the box.

[0025] Such device can prevent jamming and failures, like in the insulated glazing unit of US 2007/188094. Based on the pressure value sensed by the sensor the control unit can inhibit actuation of the screening element. It shall be noted that this feature may be obtained without requiring fluid communication of the gap with the outside environment.

[0026] Since the sensor is placed in the box, the power cables therefor can be also passed in the same hermetically sealed passages that may be provided for the control unit and for the means for driving the screening element. No additional dedicated passages are provided for the sensor cables through the frame or the panes of glass.

[0027] Therefore, the device solves the intended technical problem, thereby ensuring compliance with the standards concerning air tightness while also avoiding the movement of the screening element when the pressure values indicate a risk of jamming.

LIST OF DRAWINGS

[0028] Further features and advantages of the present invention will result more clearly from the illustrative, non-limiting description of a preferred, non-exclusive embodiment of an insulated glazing unit as shown in the annexed drawings, in which:

- Figure 1 is a partially exploded perspective view of an insulated glazing unit of the present invention; and
- Figure 2 is a block diagram that shows the operation of the insulated glazing unit of Figure 1.

DETAILED DESCRIPTION

[0029] Even when this is not expressly stated, the individual features as described with reference to the particular embodiments shall be intended as auxiliary to and/or interchangeable with other features described with reference to other exemplary embodiments.

[0030] Referring to the annexed figures, numeral 1 generally designates an insulated glazing unit of the present invention. The insulated glazing unit 1 comprises a support frame 2. Two at least partially transparent panes 3, preferably made of glass, are sealingly fixed to the frame 2. Thus, the panes 3 define a gap 4.

[0031] The panes 3 and the frame 2 are configured to permanently seal the gap 4, i.e. to prevent air from flowing between the gap 4 and the outside environment while preventing any inert gases other than air, introduced into the gap to improve heat insulation properties, from escaping from the gap. In other words, no channels for access to the gap 4 are provided through neither the panes nor the frame 2 for the passage of air. Since the panes 3 are sealingly installed on the frame 2, the gap 4 is insulated relative to the outside environment.

[0032] Preferably, the panes 3 and the frame 2 are configured to hermetically seal the gap 4 in compliance with the European Standard EN 1279. More in detail, the panes 3 and the frame 2 define an insulating glass unit (IGU) according to such standard.

[0033] Namely, the hermetic seal of the insulated glazing unit is permanent and is not subjected to any fluid exchange with the outside environment.

[0034] The structure of the frame 2 and the panes 3 is known in the art and will not be further described herein.

[0035] A screening element 5 is adapted to be deployed in the gap 4 to change the amount of light that passes through the insulated glazing unit 1. Such screening element 5 may comprise,

for example, a Venetian blind, that is designed to have gathering slats or other.

[0036] Namely, the screening element 5 may be switched between an open configuration and at least one closed configuration. In the open configuration, the blind 6 is entirely lifted to allow light radiation to pass through the gap 4 without being hindered. In the possible closed configurations, the screening element 5 at least partially blocks light radiation in the gap 4. Here, the blind 6 is partially or entirely lowered.

[0037] The insulated glazing unit 1 comprises drive means 7 for lifting and lowering the blind 6. These drive means 7 may comprise, for instance, a roller and an electric motor (not shown).

[0038] The insulated glazing unit 1 comprises a box 8 for housing the aforementioned drive means 7 for the screening element 5. Particularly, the box 8 defines a chamber that houses the drive unit 7. Such box 8 is preferably integrated in the upper portion of the frame 2, to form a single environment with the gap 4.

[0039] In other words, the pressure of the box 8 and particularly in the chamber is the same as the pressure in the gap 4. This is because the chamber is permanently sealed with respect to the outside environment by the frame 2.

[0040] The insulated glazing unit 1 also comprises a control unit 9. Such control unit 9 is particularly configured to communicate with the drive means 7 of the blind 6 to control them. Preferably, the control unit 9 is housed in the box 8 and particularly in its chamber.

[0041] In order to control the drive means 7 for driving the blind 6, the control unit 9 comprises a plurality of functional modules, as described below. This depiction of the control unit 9 is given for the sake of a better description of its operation. The actual implementation of the control unit 9 shall not be intended to be limited by this description but may be provided in any manner that is known to the skilled person and may comprise hardware and/or software means.

[0042] The control unit 9 may be provided as a single device or may be divided into distinct functional parts, each comprising one or more of the aforementioned modules. The parts that compose the control unit 9 may be integrated into a single circuit or may communicate with each other through wired and/or wireless connections and/or via a local area network and/or via the Internet.

[0043] The control unit 9 comprises an actuator module 10 associated with the screening element 5 to control deployment thereof. Namely, the control unit is operable on the drive means 7. In normal operating conditions, the user sends an appropriately encoded actuation signal "AS" to the control unit 9 through a controller (not shown) and, in response to such signal, the control unit 9 controls the drive means 7 to deploy or retract the screening element 5.

[0044] The insulated glazing unit also comprises a plurality of cables to supply power to the control unit 9 and/or the drive means 7.

[0045] It shall be noted that the frame 2 has one or more hermetically sealed cable raceways (also known as corner raceways) for the passage of such cables (not shown). The power cables extend from the box 8 and more in detail from its chamber, to the outside environment, through respective cable raceways. Each cable raceway may house one or more cables, e.g. In the case of multipolar cables.

[0046] Each cable raceway may be implemented, for example, as disclosed in EP2551437 by the Applicant hereof, whose teachings are intended to be incorporated herein in their entirety.

[0047] The insulated glazing unit 1 also comprises a pressure sensor 11. The pressure sensor 11 is particularly placed within the gap 4 or, preferably, in the box 8 and particularly in its chamber.

[0048] According to a preferred embodiment of the invention, the pressure sensor 11 is integrated in the circuit of the control unit 9.

[0049] Since the pressure sensor 11 is accommodated in the box 8, it may be advantageously powered through the power cables. Advantageously, one sealed cable raceway may be sufficient for cables that simultaneously power the pressure sensor 11, the control unit 9 and the drive means 7, whereby the number of openings for the passage of the cables may be restricted, and the insulated glazing unit may be ensured, in compliance with EN1279.

[0050] The pressure sensor 11 has the purpose of sensing the internal pressure "Pi".

[0051] Therefore, the pressure sensor 11 is configured to send 9 a signal representative of an internal pressure value "Pi" to the control unit 9.

[0052] The control unit 9 also comprises an acquisition module 12 which is interfaced with the pressure sensor 11 to receive the signal "Pi".

[0053] The control unit 9 further comprises a comparison module 13, which is namely interfaced with the acquisition module 12. Such comparison module 13 is configured to compare the internal pressure value "Pi" as sensed, and a minimum reference pressure value "Pmin".

[0054] In accordance with the result of such comparison, the actuation module 10 allows or prevents the action of the drive means 7 and, as a result, the deployment for the screening element 5. Particularly, the comparison module 13 is configured to actuator module (13 is configured to prevent deployment of the screening element 5 if the internal pressure value "Pi" is smaller than the minimum reference pressure value "Pmin".

[0055] The comparison module 13 is configured to compare the internal pressure value "Pi" with a maximum reference pressure value "Pmax".

[0056] Here, the actuation module 10 is configured to prevent deployment of the screening element 5 if the internal pressure value "Pi" is greater than the maximum reference pressure value "Pmin". In other words, if the control unit 9 detects that the pressure conditions do not allow deployment of the screening element 5, it does not perform this operation even once it has received the signal "Sa" as mentioned above.

[0057] In a first embodiment of the invention, the reference values "Pmax" and "Pmin" are preset in a memory module 14 and are retrieved into the comparison module 13 as needed.

[0058] Particularly, these reference pressure values "Pmax" and "Pmin" represent the maximum and minimum internal pressure values that the manufacturer has determined for that type of insulated glazing unit according to the thicknesses of the pans of sheet 3, the width and height dimensions of the insulated glazing unit, environmental conditions of productions (pressure, temperature and humidity of the establishment of production), as well as the assumed values or the average of the environmental conditions in which it will be installed the insulated glazing unit 1.

[0059] The comparison of the internal pressure P1 as sensed with the ideal internal pressure values "Pmin" and "Pmax" provides great advantages because, since the insulated glazing unit is sealed, the amount of air in the gap is decided during assembly, and hence represents a sort of historical memory of pressure.

[0060] Thus, considering the problem of preventing jamming of the screening element 5 if the panes 3 bend inwards, the value of the internal pressure as measured Pi may be compared with the only stored value of the ideal internal minimum pressure P1, as the latter is the pressure that is found when the insulated glazing unit has been sealed, i.e. when the panes were necessarily parallel.

[0061] Therefore, if the control unit 9 detects a negative differential pressure (between the internal pressure as measured Pi and the ideal Pmin) this implies there is most likely bending toward the interior of the glass.

[0062] Here, the insulating glazing unit will not necessarily include a pressure sensor dedicated to sensing of the pressure outside the insulated glazing unit, which will reduce the number of sensors and especially limit the number of cables that must be led to the control unit.

[0063] In a second embodiment of the invention, the insulated glazing unit 1 comprises an additional pressure sensor 15.

[0064] The additional pressure sensor 15 is placed outside the gap 4, to sense a pressure outside the insulated glazing unit 1.

[0065] Therefore, the additional pressure sensor 15 is configured to send 9 a signal representative of an external pressure value "Pe" to the control unit 9. Particularly, the external pressure value "Pe" represents the value of the pressure of the environment in which the insulated glazing unit 1 is installed.

[0066] In this case, the insulated glazing unit 9 comprises a computing module 16 which is configured to compute the reference minimum pressure value "Pmin" according to the external pressure value "Pe". The computing module 16 may calculate the maximum reference pressure value "Pmax" according to the external pressure value "Pe". By way of mere example, the minimum and maximum reference pressure values "Pmin" and "Pmax" may be obtained by summing and subtracting a predetermined tolerance value "T", saved in the memory module "T" to and from the external pressure "Pe". The computed "Pmax" and "Pmin" may be saved in the memory module 14.

[0067] It shall further noted that the computing module 9 can save a plurality of measured external and internal values, "Pe" and "Pi", in the aforementioned memory module 14.

[0068] Advantageously, these values are useful in troubleshooting step of glazing unit 1 both as regards the operation of the drive means 7 that for the screening element 5. Additionally, since pressure may be used to calculate the internal temperature of the insulated glazing unit 1, the save values are also useful to assess the thermal insulation performance of the insulated glazing unit 1, as well as its behavior in response to solar radiation.

[0069] Those skilled in the art will obviously appreciate that a number of changes and variants as described above may be made to fulfill particular requirements, without departure from the scope of the invention, as defined in the following claims.

REFERENCES CITED IN THE DESCRIPTION

Cited references

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US2007188094A1 [0008]
- US2007188094A [0009] [0010] [0014] [0025]
- EP2551437A [0046]

Patentkrav**1. Isoleringsglasenhed (1) omfattende:**

- en støtteramme (2);
- et par mindst delvist transparente ruder (3) tætnende fastgjort til nævnte ramme (2) for at definere et mellemrum (4) derimellem;
- et afskærmningselement (5) som er indrettet til at blive udfoldet i nævnte mellemrum (4) for at skifte mellem en åben konfiguration, i hvilken lysstråling kan passere gennem nævnte mellemrum (4) og mindst en lukkekonfiguration, i hvilken nævnte afskærmningselement (5) mindst delvist blokerer nævnte lysstråling i nævnte mellemrum (4);
- en styreenhed (9) omfattende et aktuatormodul (10) forbundet med nævnte afskærmningselement (5) for at styre udfoldning af nævnte afskærmningselement (5);
- en boks integreret i nævnte ramme (2), idet nævnte styreenhed (9) er placeret i nævnte boks (8);
- en tryksensor (11) som er konfigureret til at sende et signal, som angiver en trykværdi (Pi) i nævnte mellemrum (4), til nævnte styreenhed (9);
- ruderne (3) og rammen (2) er konfigureret til at forsegle mellemrummet (4) hermetisk i overensstemmelse med den europæiske standard EN 1279;
- tryksensoren (11) er placeret i boksen (8);

kendetegnet ved, at:

der ikke er tilvejebragt nogen kanaler med adgang til mellemrummet (4) gennem hverken ruderne (3) eller rammen (2) til passage af luft, og nævnte boks (8) definerer et kammer, som er permanent tætnet i forhold til de udvendige omgivelser via rammen (2), idet tryksensoren (11) er installeret i nævnte kammer.

2. Isoleringsglasenhed (1) ifølge krav 1, omfattende en flerhed af kabler til tilførsel af strøm til styreenheden (9) og tryksensoren (11), hvor rammen (2) har en eller flere hermetisk tætnede kabelkanaler til passagen af nævnte kabler.

3. Isoleringsglasenhed (1) ifølge krav 1, hvor nævnte tryksensor (11) er integreret i nævnte styreenhed (9).

4. Isoleringsglasenhed (1) ifølge krav 1, **kendetegnet ved, at** den omfatter drivorganer (7) til drift af nævnte afskærmningselement (5), idet nævnte drivorganer (7) er forbundet med nævnte aktuatormodul (10), som skal styres af nævnte styreenhed (9).

5

5. Isoleringsglasenhed (1) ifølge krav 4, hvor nævnte drivorganer (7) er placeret i nævnte boks (8).

6. Isoleringsglasenhed (1) ifølge krav 1, hvor nævnte styreenhed (9) omfatter et
10 sammenligningsmodul (13), som er konfigureret til at sammenligne nævnte interne trykværdi (P_i) og en ideal minimumsreferencetrykværdi (P_{min}).

7. Isoleringsglasenhed (1) ifølge krav 6, hvor nævnte aktuatormodul (10) er konfigureret til at forhindre udfoldning af nævnte afskærmningselement (5), hvis
15 nævnte interne trykværdi (P_i) er mindre end nævnte ideale minimumsreferencetrykværdi (P_{min}).

8. Isoleringsglasenhed (1) ifølge krav 6 eller 7, hvor nævnte sammenligningsmodul (13) er konfigureret til at sammenligne nævnte interne trykværdi (P_i) og
20 en maksimumreferencetrykværdi (P_{max}).

9. Isoleringsglasenhed (1) ifølge det foregående krav 8, hvor nævnte aktuatormodul (10) er konfigureret til at forhindre udfoldning af nævnte afskærmningselement (5), hvis nævnte interne trykværdi (P_i) er større end nævnte maksimumreferencetrykværdi (P_{max}).
25

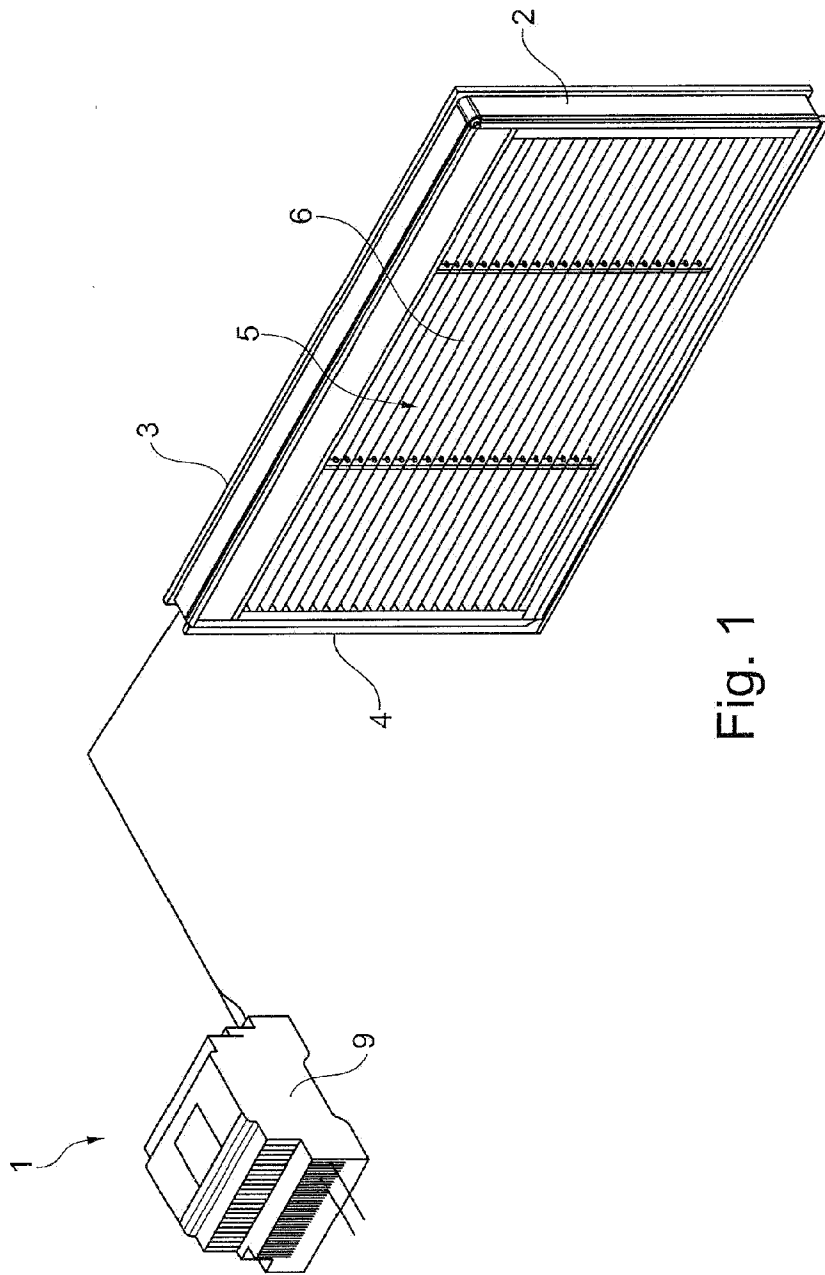
10. Isoleringsglasenhed (1) ifølge krav 1, **kendetegnet ved, at** den omfatter en yderligere tryksensor (15), som er placeret uden for nævnte mellemrum (4) og er konfigureret til at sende et signal, som angiver en ekstern trykværdi (P_e) til
30 nævnte styreenhed (9).

11. Isoleringsglasenhed (1) ifølge krav 10, hvor nævnte styreenhed (9) omfatter et beregningsmodul (16), som er konfigureret til at beregne nævnte referenceminimumstrykværdi (P_{min}) i overensstemmelse med nævnte eksterne

trykværdi (P_e).

- 12.** Isoleringsglasenhed (1) ifølge krav 1, hvor nævnte styreenhed (9) omfatter et hukommelsesmodul (14) til lagring af referencemaksimumtrykværdien (P_{max})
5 og/eller referenceminimumtrykværdien (P_{min}) og/eller en flerhed af eksterne trykværdier (P_e) og/eller en flerhed af interne trykværdier (P_i).

DRAWINGS



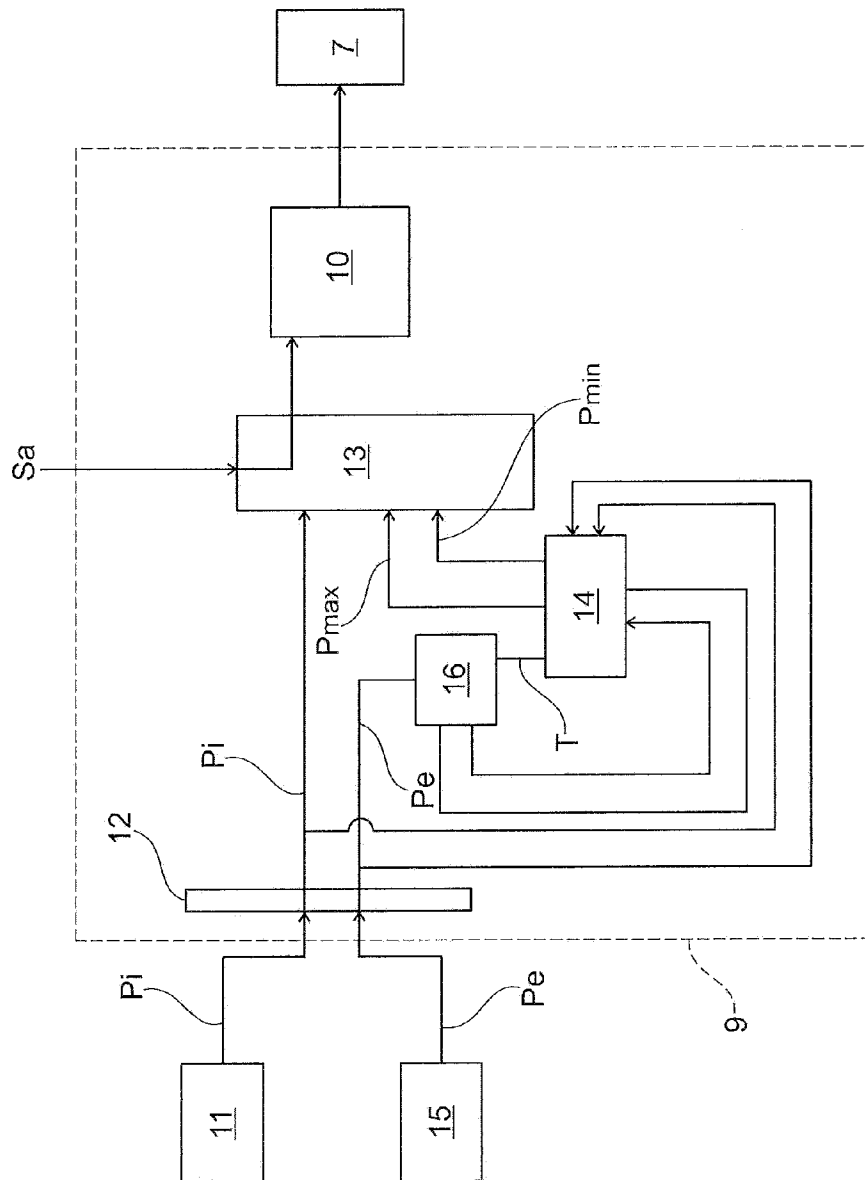


Fig. 2