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(54) **Door provided with at least one latch arranged at a distance from a door top, system of two doors arranged next to each other, and assembly provided with at least one door**

(57) A door, provided with at least one latch (2) arranged at a distance from a door top (T), the door (1) being provided with latch moving means (5, 6, 7, 8, 11) activated by fire detecting means (3) for moving the at least one latch (2) automatically from a door releasing position to a door locking position, wherein the fire detecting means (3) are arranged for detecting fire at or near the door top (T) for the purpose of activating said latch moving means (5, 6, 7, 8, 11).

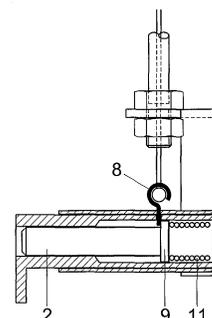
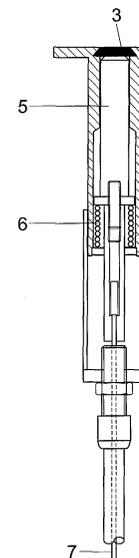


Fig. 4

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Description

[0001] The invention relates to a door which is provided with at least one latch arranged at a distance from a door top, the door being provided with latch moving means activated by fire detecting means for automatically moving the at least one latch from a door releasing position to a door locking position.

[0002] Such a door is known from European patent application EP 0 156 044. The known door comprises a fire door provided with a latch arranged near half the height of the door, which latch is retained in a door-releasing position by a fusible material. With the latch in this position, the door is released by the latch for normal use. When, under the influence of a relatively high ambient temperature, for instance the relatively high temperature of a fire, the fusible material is melted, the latch is automatically moved by a spring to the above-mentioned locking position for interlocking the door with a door post.

[0003] An advantage of such a door is that it can be automatically fixed by the latch during a fire for preventing the fire from rapidly spreading further.

[0004] A drawback of the known door is that, as a rule, in practice, the automatic locking occurs too late. For instance, it appears that in only a few minutes, an opening can occur between the door and a door post through deformation of the door under the influence of fire, depending on the design of the door, before the automatic locking of the door has come into action. As a result, the door cannot form a good barrier for preventing the fire from spreading further.

[0005] The object of the invention is to solve these problems of the known door. In particular, the invention contemplates a relatively reliable and safe door which, under the influence of fire, is automatically locked relatively rapidly.

[0006] To this end, the door according to the invention is characterized in that the fire detecting means are arranged for detecting fire at or near the door top for the purpose of activating the latch moving means.

[0007] The invention is based on the insight that in case of fire, heat and/or smoke are generated, which heat and/or smoke rise up and can thus be detected in an early stage at and/or near the door top relative to a lower part of the door. Since the fire detecting means according to the invention are expressly designed for detecting fire at or near that door top, the fire is rapidly detected for the purpose of activating the latch moving means. In this manner, the door can be automatically locked in time to restrain the fire from spreading further. These fire detecting means can, for instance, comprise temperature detecting means for detecting an ambient temperature at or near the door top. In addition, these fire detecting means can, for instance, be designed for detecting smoke at or near the door top. As a rule, smoke caused by fire can be detected faster and sooner than a rise in temperature caused by a fire. Therefore,

by using smoke detecting means, preferably at or near the door top of the space, a desired rapid automatic locking of the door can be obtained. In addition, the fire detecting means can, for instance, comprise one or more infrared detectors, odor detectors or the like.

[0008] According to a preferred embodiment of the invention, the detecting means comprise a top latch of the door, activated under the influence of fire, provided at or near the door top.

[0009] In this manner, due to, on the one side, the top latch and, on the other side, the at least one latch located at a distance below it, the door can automatically be locked under the influence of the detecting means. Such a locking is very advantageous, since the door can thus be secured to surroundings relatively robustly and in a form-retaining manner. The spaced apart latches can prevent undesired bending of the door which can occur under the influence of fire, so that the door can block further spreading of the fire well.

[0010] Preferably, the at least one latch is located at or near the lower side of the door. Due to the above-mentioned design of the detecting means, this bottom latch arranged at or near the bottom of the door can automatically be moved to a respective locking position. Through the use of, for instance, a top and bottom latch, the door can be firmly and automatically secured by the two latches for keeping the door closed.

[0011] The invention further provides a system of at least two doors arranged next to each other, while at least one of the doors comprises a door according to at least claim 1. In that case, the doors can, for instance, be secured to each other by the at least one latch under the influence of the detecting means, so that, simultaneously, the doors are held in a closed position.

[0012] Further elaborations of the invention are described in the subclaims. The invention will presently be elucidated with reference to two exemplary embodiments and the drawing. In the drawing:

Fig. 1 shows a front view of a first exemplary embodiment of the invention;

Fig. 2 shows a similar view to Fig. 1 of a second exemplary embodiment;

Fig. 3 shows a cross-sectional view along line III-III of the exemplary embodiment represented in Fig. 1, with the top latch moved to a locking position;

Fig. 4 shows a cutaway detail Q of the door of the front view represented in Fig. 1, representing a releasing position of the door locking mechanism; and

Fig. 5 shows a similar view to Fig. 4, representing a locking position of the door locking mechanism.

[0013] Fig. 1 shows a front view of a door 1 pivotally arranged in a door post 10. At a top side T, the door 1 is provided with a top latch 5 activated under the influence of fire. As shown in Fig. 3, the top latch 5 is located near a vertical surface S of the door 1, represented on the right-hand side in Fig. 3. The door 1 is further pro-

vided, in a longitudinal side near a bottom side B, with a bottom latch 2.

[0014] Under the influence of fire detecting means 3 arranged at the door top T, the door 1 can be automatically interlocked with the post 10 by the two latches 2, 5. As shown in Fig. 4, to this end, the detecting means comprise a material 3, fusible at a particular temperature, which has been applied to the top latch 5 for retaining this top latch in a door-releasing position. It is self-evident that the fire detecting means can be designed in various other manners, and can comprise, for instance, smoke detectors or the like.

[0015] The top latch 5 is further provided with a spring 6 for moving the top latch 5 upwards, at least to the door-locking position represented in Figs. 3 and 5 after the fusible material 3 has melted under the influence of heat, in particular coming from a fire prevailing in the surroundings. The movement of the top latch 5 can be effected in various other ways or be initiated without coupling the top latch 5 to the door with fusible material, for instance by using actuators, electric locks or the like. An actuator can for instance be provided which, in a first actuator position, engages the top latch 5 for retaining that latch 5 in the door-releasing position. Under the influence of the fire detecting means, the actuator can release the top latch 5, so that the spring 6 moves the latch 5 to the door-locking position. In addition, the latch 5 can for instance be directly moveable by an actuator without use of the spring 6.

[0016] In its door-releasing position, the bottom latch 2 is coupled to the door 1 through a disconnectable connection, which is shown in Fig. 4. Under the influence of the detecting means 3, this disconnectable connection can be disconnected. In the present exemplary embodiment, the disconnectable connection comprises a moveable securing pin 8 which engages a flange 9 of the bottom post 2. For the purpose of disconnecting this connection, the securing pin 8 is coupled to the top latch 5 by means of a cable 7. The bottom latch 2 is further provided with a spring 11 for moving this latch 2 in horizontal direction from the door 1 to a door locking position after the securing pin 8 has been pulled from the locking flange 9. The locking position of the bottom latch 2 is represented in Fig. 5. The movement of the bottom latch can also be effected in various other manners, for instance by using an actuator or the like.

[0017] When a fire starts near the door 1, in particular in the space S adjoining the door surface S, the fusible material 3 present at the door top T located near the door surface S will melt relatively rapidly. This is effected in particular by the hot air caused by the fire, present at the door top T. After the material 3 has melted, the top latch 5 is moved by the spring 6 to the locking position represented in Fig. 5, so that this latch 5 secures the door 1 at the top side T to the post. Due to the movement of the top latch 5, the securing pin 8 is pulled via the cable 7 from the flange 9 of the bottom latch 2, so that then, the bottom latch 2 too is brought to the locking po-

sition by spring 11 for interlocking the door 1 with the post at the bottom side B. In this manner, the door 1 is automatically interlocked with the post 10 both at the top side T and near the bottom side B, so that deformation of the door 1 relative to the post can be well prevented.

[0018] When using the alternative fire detecting means mentioned, for instance one or more smoke detectors, the at least one latch is simply moved to the locking position under the influence of those detecting means when these detecting means detect a fire. As has already been noted, the locking movement can be achieved in various manners, with various means.

[0019] In a different elaboration (not represented), the fire detecting means are designed for detecting fire, in particular an ambient temperature, at at least one vertical door surface S of the door 1. To this end, the fire detecting means 3 can be entirely or partly located at the at least one door surface S, or extend at least partly in that door surface S and/or the like. In this manner, fire in the space adjoining the door surface S can be detected relatively rapidly in order that the latch moving means are activated in time for the purpose of locking the door. It is particularly advantageous when, in that case, the fire detecting means are designed for detecting fire, in particular the ambient temperature, at both vertical door surfaces of the door 1, so that fire can be detected rapidly at both sides.

[0020] Fig. 2 shows an alternative elaboration of the invention, provided with two doors 1, 12 arranged next to each other in a post 10. The one door 1 is designed substantially in the same manner as the exemplary embodiment represented in Fig. 1. This first door 1 is therefore provided with a top latch 5 activated under the influence of fire, for instance the ambient temperature and/or smoke, and arranged at or near the door top, as well as with a bottom latch 2 which, under the influence of the movement of the top latch 5, can be brought to a locking position. In the present, second exemplary embodiment, the bottom latch 2 of the first door 1 is intended to effect an interlocking with the second door 12, arranged next to it. Both doors 1, 12 can be automatically secured to the post 10 and/or to each other, for instance in the event of fire.

[0021] A door according to the invention can be provided and/or manufactured in a simple manner from an assembly, at least provided with:

- at least one door 1;
- at least one latch 2 to be fitted at a distance from a top side T of the at least one door 1; and
- means 3, 5, 6, 7, 8, 11 for automatically moving the at least one latch 2, at least after fitting, from a releasing position to a locking position upon detection of fire at or near the door top.

[0022] The assembly can be sold as, for instance, an assembly kit. In addition, an existing door, already being or not being provided with at least one latch, can simply

be provided with the means mentioned for obtaining the advantages of the invention. To this end, the detecting means 3 can for instance be arranged at or near the door top T.

[0023] Preferably, the assembly is also provided with at least one top latch 5 which can be fitted on or near the door top T, in order that the latches 2, 5 can protect the door 1 well from bending during, for instance, fire.

[0024] It is self-evident that the invention is not limited to the exemplary embodiment described. Various modifications are possible within the framework of the invention as outlined by the following claims.

[0025] For instance, each door 1, 12 can be designed in different manners and comprise, for instance, a horizontal sliding door, vertical sliding door, push door, swinging door, swiveling door, pivot door, saloon door, revolving door, overhead door, prison door or the like. The door can be manufactured from various materials and, for instance, be built up from various elements and/or profiles. Further, the door is provided with at least one latch 2 arranged at a distance from the door top T. The door can also be provided with more of these latches, arranged, for instance, at different heights, which, in particular with relatively large doors, is advantageous for providing a good locking of the door. Further, each latch 2, 5 can, for instance, be arranged in the door and/or the post 10.

[0026] The coupling between the at least one latch 2 located at a distance from the door top T and the fire detecting means, in particular the top latch, can be effected in various manners, for instance mechanically, via one or more cords, rods, chains, a sprocket transmission and/or electromagnetically, electronically or the like or by means of a combination of these and/or other means.

[0027] The fire detecting means can be designed in various manners and comprise, for instance, fusible material, material changing length-wise due to heat, bimetal, a temperature sensitive memory metal, a temperature sensor, a thermocouple, a smoke detector and/or other means. The detecting means can be designed for activating the latch moving means at or above a particular value of the ambient temperature, for instance in the range of approximately 50 - 70°C, or at a different temperature, so that the door is not automatically locked at, for instance, a normal ambient temperature, for instance at room temperature. Further, fire detecting means can be provided in and/or on the door 1 in different manners. The detecting means can for instance be integrated in a top latch. In addition, the fire detecting means can be arranged at a distance from each latch. In that case, the fire detecting means can be coupled to the latch in various manners, for instance mechanically, electrically, electronically, via communication means and/or the like. These communication means can for instance comprise optical, radiographic, electrical, digital and/or analog communication means or the like. The door can for instance be provided with one or more top

latches which are arranged at a distance from the fire detecting means.

[0028] In addition, the fire detecting means can for instance, be provided in different ways on or near the door top, for instance on and/or in the door, on and/or in the post 10 or the like. The fire detecting means can for instance be located on or near a surface S of the door 1, on or near a surface of the post 10 and the like.

[0029] The fire detecting means can further be designed for, for instance, detecting fire continuously, periodically and/or otherwise.

[0030] The automatic movement of each latch can further be effected in various manners, for instance under the influence of electric means, an electromagnet, an actuator, an electromotor, spring means, gravity, memory metal, and a combination of these possibilities and/or other options.

[0031] For the purpose of movement of the latch and/or use of electric means, for instance an electromagnet, an actuator, sensor or the like, the door can furthermore be provided with a voltage source, for instance with one or more batteries and/or accumulators.

[0032] Further, the spring means for bringing a latch to the locking position can be designed in various manners.

[0033] Further, the door can comprise one or more normal latching means, in particular door locks, door-springs, electric openers, electric door locks, emergency locks, keycard controls and the like and/or normal door operating means for the normal use of the door. With such normal locking means, the door can be locked during normal use, in particular independently of the fire detecting means mentioned. With the latter mentioned normal door operating means, the door can be operated during normal use. Such door operating means can for instance comprise one or more door latches, door pushers, operating handles, keys, key-cards and/or a combination of these or other operating means.

[0034] The latter mentioned "normal" locking means and/or door operating means can further comprise, for instance, one or more electric locks of a door, in particular a prison door, which electric locks are connected to a central alarm system to be operated centrally during an emergency, such as a fire.

[0035] The normal locking means and/or normal operating means can be arranged at various positions, for instance on or near the height of a user, the middle of the door 1 and/or on one or more other positions.

[0036] In addition, each latch can be designed to have various shapes and be made of various materials.

[0037] Further, the door can for instance comprise a control, in particular control- and/or micro-electronics or the like, for treating and/or processing signals coming from the detecting means and/or for controlling desired locking movements and the like. Such a control can for instance be arranged for allowing locking of the door 1, 12 only when the door is in a closed position, extending in the post 10.

[0038] In addition, the disconnectable connection mentioned between the bottom post 2 and the door 1 can be designed in various manners.

Claims

1. A door, provided with at least one latch (2) arranged at a distance from a door top (T), the door (1) being provided with latch moving means (5, 6, 7, 8, 11) activated by fire detecting means (3) for moving the at least one latch (2) automatically from a door releasing position to a door locking position, **characterized in that** the fire detecting means (3) are arranged for detecting fire at or near the door top (T) for the purpose of activating said latch moving means (5, 6, 7, 8, 11). 5
2. A door according to claim 1, wherein the detecting means comprise a top latch (5) of the door (1) activated under the influence of fire, in particular an ambient temperature and/or smoke and arranged on or near the door top (T). 10
3. A door according to claim 2, wherein the top latch (5) is mechanically coupled to the latch moving means (5, 6, 7, 8, 11). 15
4. A door according to claim 2 or 3, wherein the top latch is coupled to the latch moving means by means of electronic and/or electromagnetic means. 20
5. A door according to any one of the preceding claims, wherein the at least one latch (2), arranged at a distance from the door top (T), in a locking position, is coupled to the door via a disconnectable connection (8, 9) which disconnectable connection can be disconnected under the influence of said detecting means (3). 25
6. A door according to at least claim 1, wherein the at least one latch (2) is located near the middle of the door (1). 30
7. A door according to at least claim 1, wherein the at least one latch (2) is located near a lower side (B) of the door (1). 35
8. A door according to any one of the preceding claims, wherein the fire detecting means (3) comprise a material (3), fusible at a particular value of said ambient temperature. 40
9. A door according to any one of the preceding claims, wherein the detecting means are of electronic design. 45
10. A door according to any one of the preceding claims, wherein said latch moving means comprise a drive, for instance an electromotor, electromagnet and/or actuator. 50
11. A door according to any one of the preceding claims, wherein the fire detecting means are arranged to detect fire, in particular an ambient temperature, at at least one vertical door surface (S) of the door (1). 55
12. A door according to any one of the preceding claims, wherein said detecting means (3) are located substantially on or near the door top (T). 60
13. A door according to any one of the preceding claims, provided with one or more normal latching means, in particular door locks, door springs, electric openers, electric door locks, emergency locks, keycard controls and the like and/or normal door operating means for the normal use of the door. 65
14. A door according to any one of the preceding claims, wherein the fire detecting means are temperature detecting means arranged for detecting an ambient temperature at or near the door top (T). 70
15. A system of at least two doors arranged next to each other, wherein at least one of the doors comprises a door (1) according to any one of the preceding claims. 75
16. A system according to claim 16, wherein at least one latch (2) arranged at a distance from a door top (T) of at least the one door (1) is arranged such that the doors (1, 12) can be interlocked with at least that latch (2). 80
17. An assembly, at least provided with:
 - at least one door (1);
 - at least one latch (2) to be fitted to a top side (T) of the at least one door (1); and
 - means (3, 5, 6, 7, 8, 11) for automatically moving the at least one latch (2), at least after fitting, from a releasing position to a locking position upon detection of fire on or near said door top (T).85
18. An assembly according to claim 18, also provided with: at least one top latch (5) which can be fitted on or near the door top (T). 90
19. An assembly according to claim 18 or 19, wherein said means comprise fire detecting means, in par-

ticular temperature and/or smoke detecting means
(3) which are evidently destined to be fitted on or
near the door top (T).

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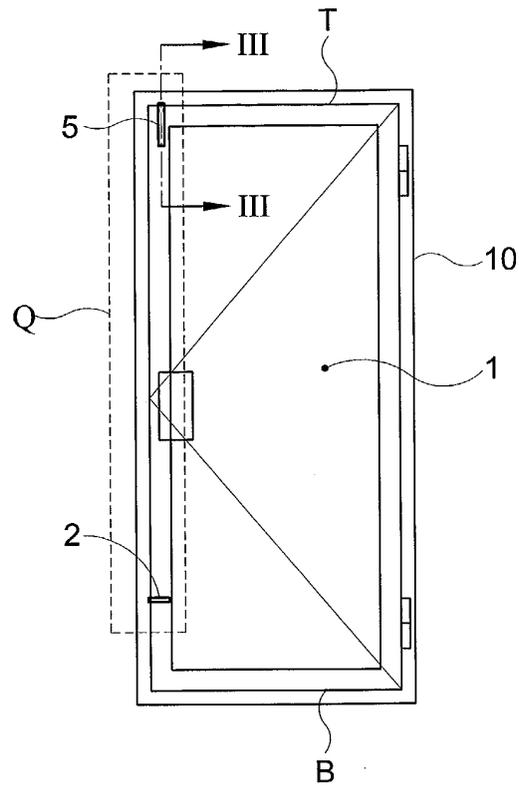


Fig. 1

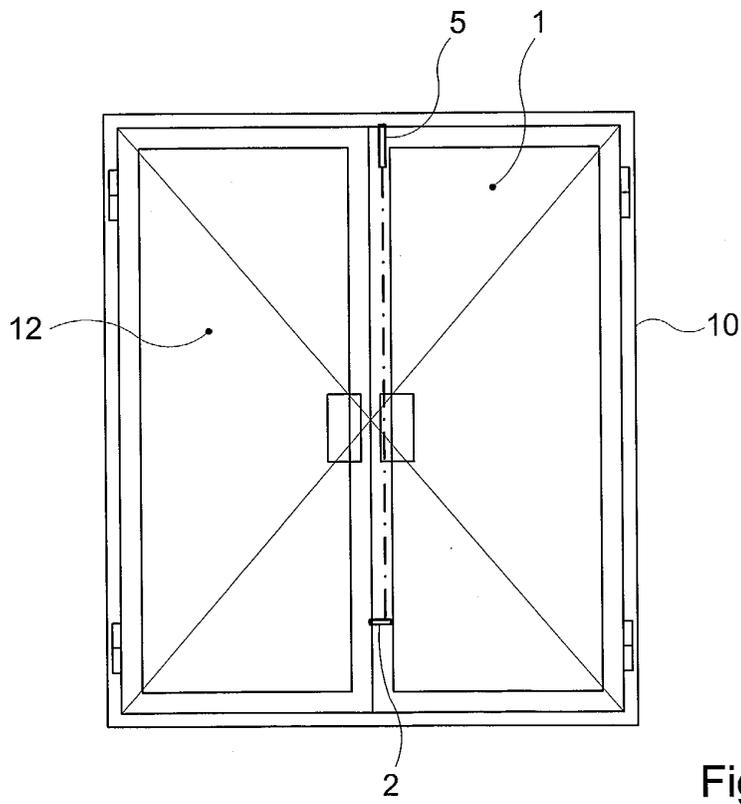


Fig. 2

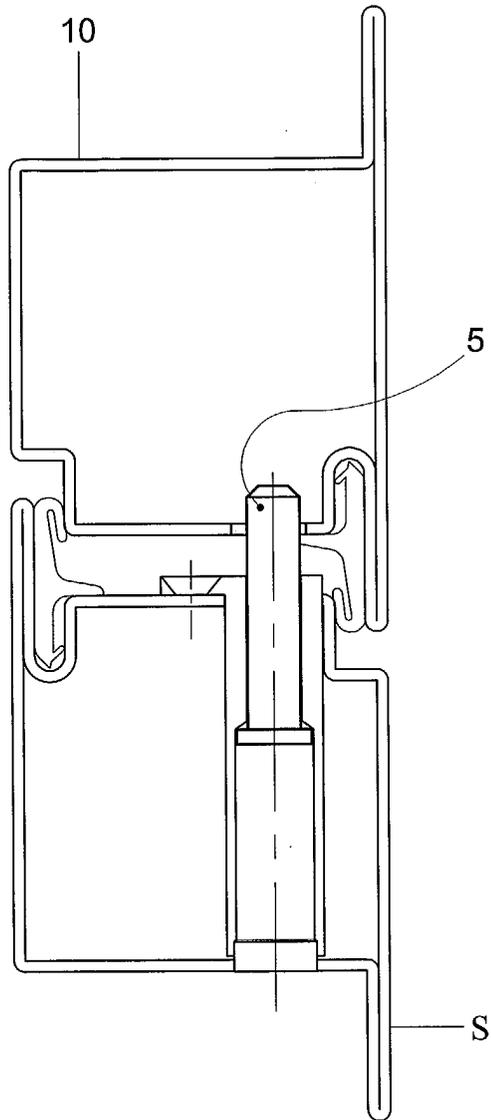


Fig. 3

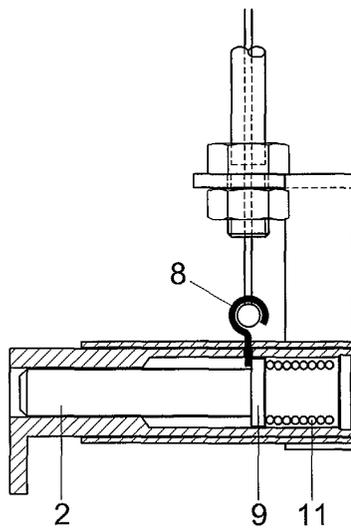
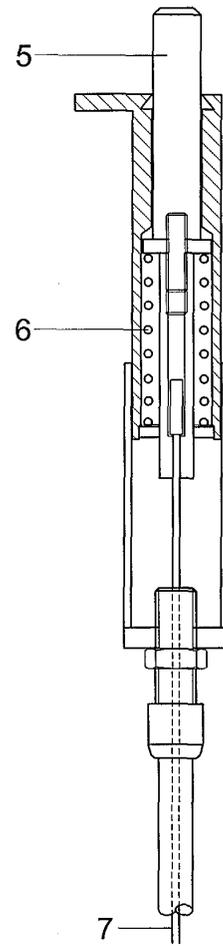
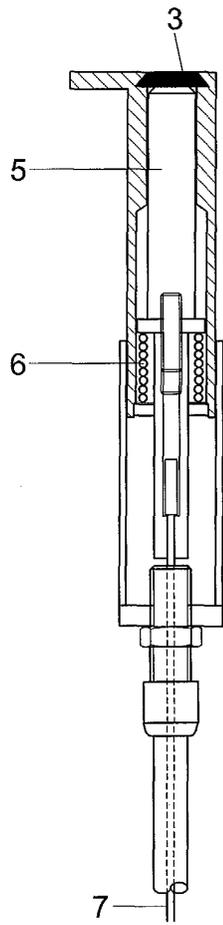


Fig. 4

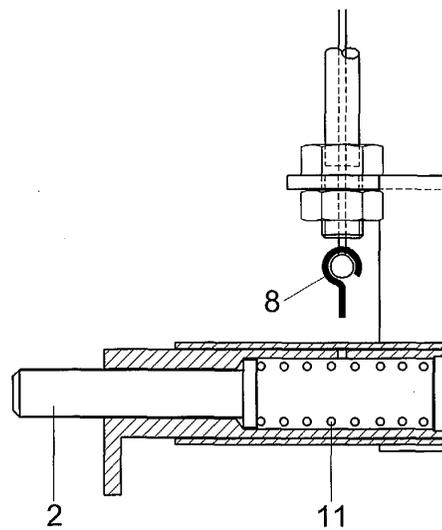


Fig. 5



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 07 8461

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 03 07 8461

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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