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(54) System for opening a door

(57) Foot operated door opening device for opening a hinged door, comprising a foot pedal, pivotally connected to mounting means and an actuator rod, rigidly

connected to the foot pedal. The actuator rod is mounted parallel to a swingable edge of the door, and contacts in operation a catching pin, mounted onto and protruding from the door.

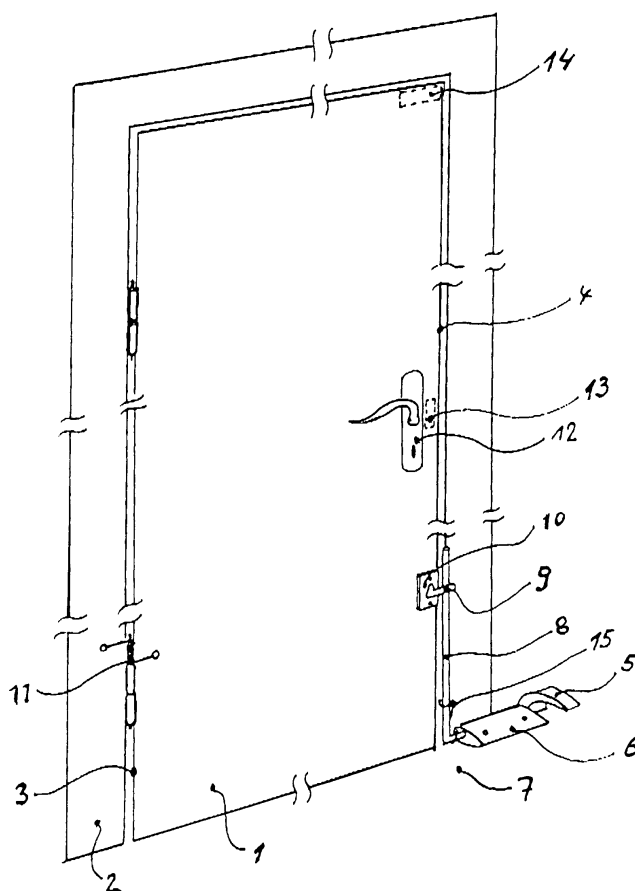


FIG.1

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Description

[0001] The invention relates to a system for opening a door having a hinged edge and a swingable edge; comprising a foot pedal, connected to mounting means for mounting the foot pedal near the swingable edge, actuator means connected to the foot pedal, and catching means, for mounting onto the door, such that the catching means protrude beyond the swingable edge and operationally are caught by the actuator means.

[0002] Doors that can be opened by a foot pedal are very advantageous in situations where a person is unable to open the door with his hands, a situation which regularly occurs in hotels, hospitals, offices and in homes. For this purpose special doors exist, which are swingable to two sides. The present invention solves a different problem and specifically aims at situations in which an ordinary door should be modified such that it can be opened without a person using his hands. By arresting the door catch inside the door lock this is easily realized for one direction. For the other direction use should be made of a mechanism operated by a foot pedal. The modification should be easily made and preferably easily be removed as well, substantially without leaving traces. Moreover the modification should be safe and be acceptable from an aesthetic point of view and preferably be relatively cheap. The present invention substantially provides these features and is characterized in that the foot pedal is pivotally connected to the mounting means, the actuator means comprise an actuator rod, rigidly connected to the foot pedal and arranged for mounting substantially parallel to the swingable edge, and the catching means comprise a pin, for mounting onto the door, such that the pin protrudes from the swingable edge for catching the actuator rod when the foot pedal is operated.

[0003] A system for opening doors with a foot pedal is known from US-A-1,611,386. This known system has a considerable number of components which are all hingedly connected, and the assembly is time consuming. This makes the system difficult to produce and therefore expensive.

[0004] A system for opening the doors of a cabinet is known from US-A-5,622,416. In this known system the actuator rod is rigidly connected to a foot pedal, but the actuator rod acts directly onto one of the doors, which is possible because the system is located underneath the cabinet.

[0005] An advantageous embodiment according to an aspect of the invention is characterized in that the actuator rod is substantially L-shaped, with a first leg for mounting substantially vertical when the foot pedal is not operated and a second leg for connecting to a left side or a right side of the foot pedal. Thanks to this L-shape the foot pedal may be mounted at some distance from the door for a left-opening door as well as for a right-opening door. This provides a possibility of standing substantially aside the door when operating the pedal,

which reduces a risk involved in a door suddenly swinging open. It moreover gives an easy access to the pathway, without the foot pedal being in the way.

[0006] An advantageous embodiment according to another aspect of the invention is characterized in that the second leg is provided with connecting means for rigidly connecting to the foot pedal with the first leg in a selectable angular relationship. The angular position may for example depend on the location of the foot pedal and on the type of door in combination with the thickness and construction of the wall or on the door frame surrounding the door.

[0007] An advantageous embodiment according to another aspect of the invention is characterized in that the pin is provided with fixing means for fixing the pin onto the door, such that the pin protrudes between 1 and 3,5 cm from the swingable edge. The shortness of the pin substantially excludes the possibility of a person inadvertently coming into contact with it.

[0008] An advantageous embodiment according to another aspect of the invention is characterized in that the fixing means are arranged for fixing the pin at a distance of between 0,5 and 2 cm from the door. This distance leaves enough room for the actuator rod to pass behind the pin. The advantage is that the system may be placed without making modifications to the door frame.

[0009] Another advantageous embodiment of the invention is characterized in that the system comprises spring means, for returning the actuator rod to the substantially vertical position when no forces are acting onto the pedal or the actuator rod. With the actuator rod in this vertical position it is impossible for a person to inadvertently come into contact with it.

[0010] Another advantageous embodiment of the invention is characterized in that the system comprises door closing means for closing the door when substantially no forces are acting on it. More precisely the function of the door closing means is to gently close the door after it has been opened.

[0011] Another advantageous embodiment of the invention is characterized in that the system comprises permanent magnetic door holding means. They prevent the door from flapping and from remaining slightly open, for example due to draught. An additional advantage is that the permanent magnetic door holding means deliver a force which acts contrary to a force that a foot may exercise on the pedal, until the permanent magnetic door holding means suddenly give up. At that moment the door swings open in a predictable fashion.

[0012] In order to virtually eliminate any possibility for a person to inadvertently contact the pin, a further advantageous embodiment according to an aspect of the invention is characterized in that the system comprises a cover plate, for substantially embedding the pin; made of a flexible material and provided with a slot for centring the actuator rod and for enabling it to contact the pin.

[0013] The invention will now be explained in more

detail with reference to the following figures, in which:

- Fig. 1 shows in a perspective view a door with the inventive door opening system installed;
- Fig. 2 shows a first embodiment of adjustable connecting means;
- Fig. 3 shows a second embodiment of the adjustable connecting means;
- Fig. 4 shows a third embodiment of the adjustable connecting means;
- Fig. 5 shows a cross section of an embodiment having a cover plate;
- Fig. 6 shows in side view an embodiment with a bent actuator rod;
- Fig. 7 shows in cross section a door lock, provided with arresting means for arresting a door catch.

[0014] Fig. 1 shows a perspective view of a door 1, mounted in a door frame 2 and provided with a hinged edge 3 and a swingable edge 4. Next to swingable edge 4, a foot pedal 5 is mounted with a mounting plate 6 to a floor 7. Moreover an L-shaped actuator rod 8 is provided, a first leg of which is positioned substantially vertical and parallel to swingable edge 4 and a second leg of which is rigidly connected to foot pedal 5. Door 1 is provided with a catching pin 9, which is in this embodiment screwed to door 1 with the aid of a fixing plate 10.

[0015] Normally the door is kept closed by a spring loaded hinge 11, or any other door closing mechanism known in the art. When pedal 5 is operated the door obviously will swing open, provided that a door lock 12 has been adapted such that a door catch 13 is inoperative. Door 1 may be opened sufficiently, by firmly operating pedal 5, but door 1 may also be opened only partly, after which a person may use his foot for entirely open the door. After having been opened, door 1 remains open for a short period and will then be closed gently by spring loaded hinge 11. According to this embodiment, door 1 is moreover provided with magnetic door holding means 14, for preventing door 1 from flapping due to draft. Magnetic door holding means 14 are known as such, and consist for example of a permanent magnet, mounted onto door frame 2 and an iron strip, mounted onto door 1.

[0016] In the present embodiment an additional spring 15 is mounted between actuator rod 8 and mounting plate 6, which has the advantage that actuator rod 8 returns to its substantially vertical position as soon as a persons foot is taken off pedal 5.

[0017] Fig. 2 shows a first embodiment of adjustable connecting means 16, which provide a rigid connection between pedal 5 and the second leg of actuator rod 8. In this embodiment connecting means 16 consists of a complementary splined coupling, where actuator rod 8 forms a male part and foot pedal 5 a female part. The very end of actuator rod 8 is moreover provided with a screw-thread 17 for accommodating a nut, once the

coupling has been established.

[0018] Fig. 3 shows a second embodiment of adjustable connecting means 16, in which embodiment foot pedal 5 has been made symmetrically, with a split 18 between an upper half and a lower half. Bolt 19, which can pull both halves together, easily fixes foot pedal 5 onto rod 8 in a predefined angular relationship. Foot pedal 5 can be made of a metal or of a synthetic material. In the last case the end of rod 8 is preferably provided with grooves in order to improve the grip.

[0019] Fig. 4 shows a third embodiment of adjustable connecting means 16, which are now connecting the first leg and the second leg of actuator rod 8 with a conical shaped end on rod 8 and a corresponding conical shaped hole in foot pedal 5. A bolt 20 is used for pulling foot pedal 5 onto the conical end and for securing it. Foot pedal 5 is preferably made symmetrically, as shown in Fig. 3, such that the door opener can be mounted on a left side or on a right side of a door. The conical shaped end of actuator rod 8 is preferably provided with grooves in order to improve the grip.

[0020] Fig. 5 shows in cross section door 1, door frame 2, actuator rod 8, catching pin 9, fixing plate 10 and a cover plate 21, for covering catching pin 9. Cover plate 21 is preferably made of a flexible material, like plastic, and it eliminates the possibility for a person to inadvertently contact catching pin 9.

[0021] Fig. 6 shows in side view an embodiment having an actuator rod 8 of which the first leg is bent near its top, such that it ends substantially parallel to the swingable edge 4 of door 1. The bending of actuator rod 8 can be achieved, prior to installation, without special tools.

[0022] Fig. 7 shows in cross section the door lock 12 with door catch 13, provided with arresting means, in this embodiment in the form of one or more removable sharp pins 22, for arresting door catch 13.

Claims

1. System for opening a door having a hinged edge and a swingable edge; comprising a foot pedal, connected to mounting means for mounting the foot pedal near the swingable edge, actuator means connected to the foot pedal, and catching means, for mounting onto the door, such that the catching means protrude beyond the swingable edge and operationally are caught by the actuator means, characterized in that the foot pedal is pivotally connected to the mounting means, the actuator means comprise an actuator rod, rigidly connected to the foot pedal and arranged for mounting substantially parallel to the swingable edge, and the catching means comprise a pin, for mounting onto the door, such that the pin protrudes from the swingable edge for catching the actuator rod when the foot pedal is operated.

2. System according to claim 1, characterized in that the actuator rod is substantially L-shaped, with a first leg for mounting substantially vertical when the foot pedal is not operated and a second leg for connecting to a left side or a right side of the foot pedal. 5
3. System according to claim 2, characterized in that the second leg is provided with connecting means for rigidly connecting to the foot pedal with the first leg in a selectable angular relationship. 10
4. System according to claim 1, characterized in that the pin is provided with fixing means for fixing the pin onto the door, such that the pin protrudes between 1 and 3,5 cm from the swingable edge. 15
5. System according to claim 4, characterized in that the fixing means are arranged for fixing the pin at a distance of between 0,5 and 2 cm from the door. 20
6. System according to claim 2, characterized in that the system comprises spring means, for returning the actuator rod to the substantially vertical position when no forces are acting onto the pedal or the actuator rod. 25
7. System according to claim 1, characterized that the system comprises door closing means, for closing the door when substantially no forces are acting on it. 30
8. System according to claim 7, characterized in that the system comprises permanent magnetic door holding means. 35
9. System according to claim 1, characterized in that the system comprises arresting means for keeping a door catch inside a door lock. 40
10. System according to claim 1, characterized in that the system comprises a cover plate for substantially embedding the pin, made of a flexible material. 45

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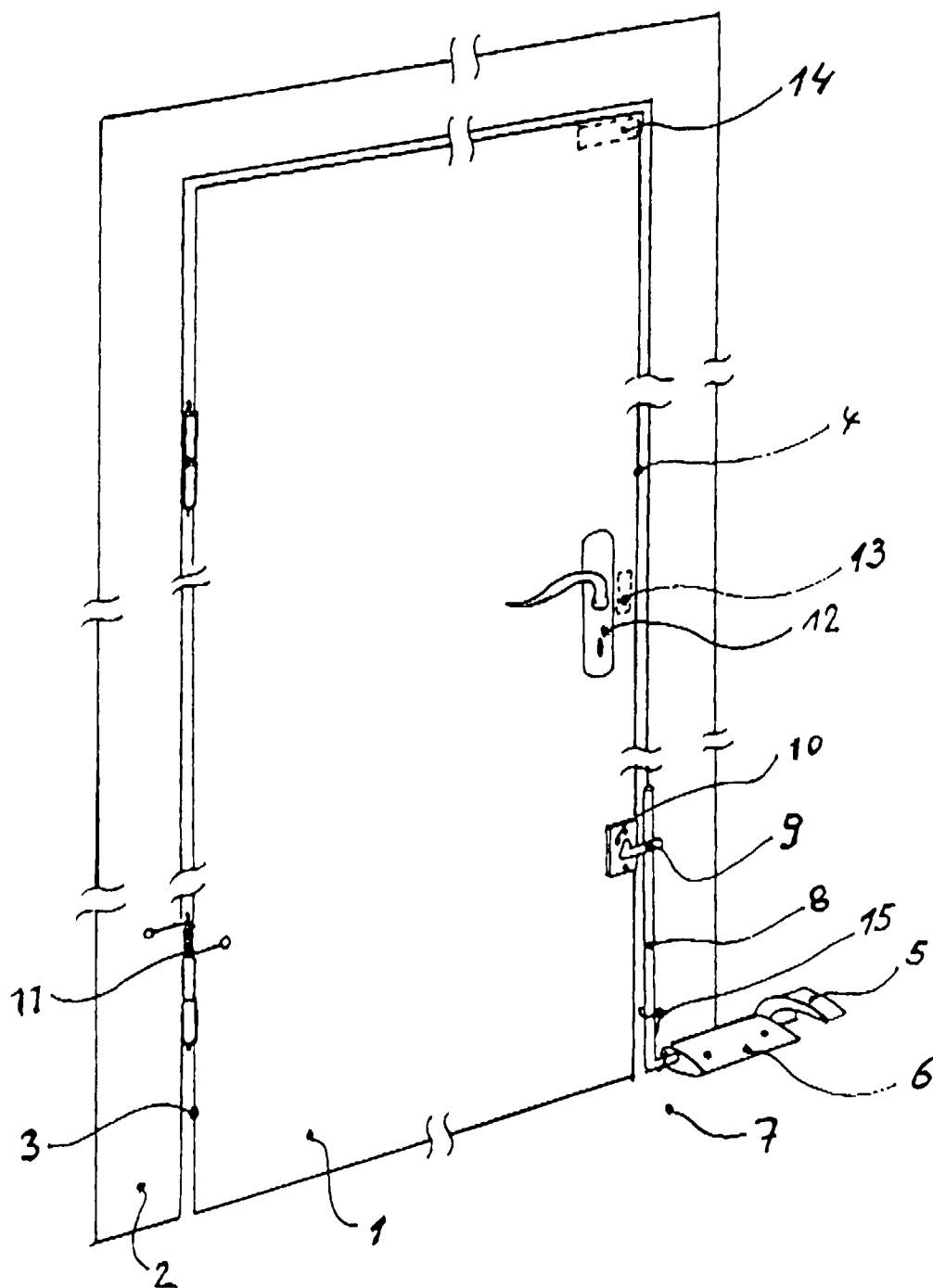
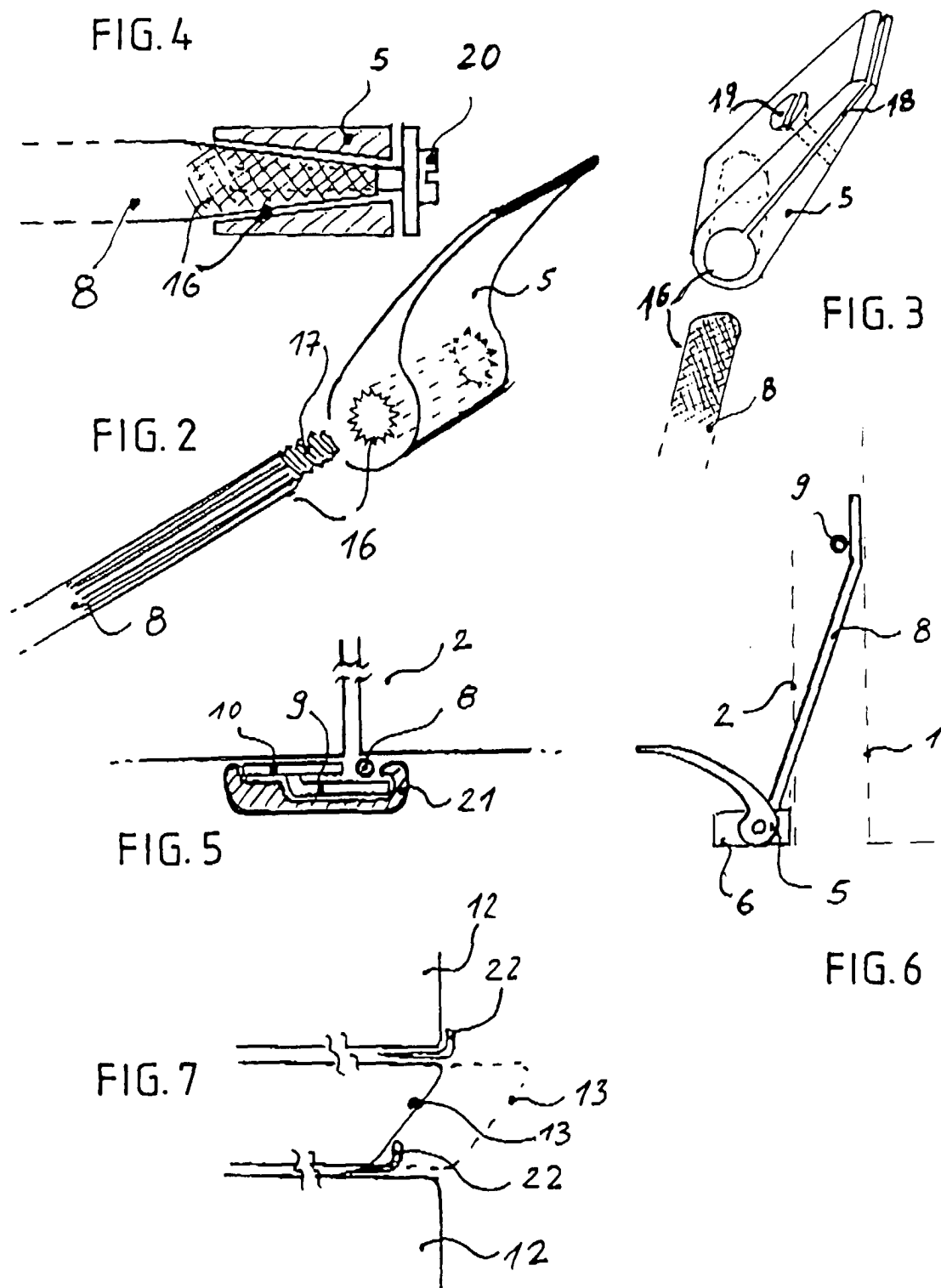


FIG.1





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EUROPEAN SEARCH REPORT

Application Number
EP 99 20 3135

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		20 June 2000	Van Kessel, J
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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