Fire door with improved fire resistance

A fire door (1) with improved fire resistance comprising a fixed frame (2) couplable to a fixed structure (4), and at least one movable frame (10) defining a movable leaf (10) of a door hinged to the fixed frame (2), on the edge of the movable leaf (10), at least on one side that is different from the pivoting side, a locking body (20, 40) being provided that is engageable to the fixed frame (2) in the presence of generation of heat, means being further provided for the actuation of the locking body (20, 40) which are constituted by a heat-expanding body (25).
Description

[0001] The present invention relates to a fire door with improved fire resistance.

[0002] In Italian patent 1,386,951 by the same Applicant, which is intended included herein for reference purpose, a fire door is disclosed in which, in order to increase the fire resistance, on the upper side of the edge of the leaf, in a position that is distanced from the hinged side, a coupling element is provided which is constituted by a plate that defines engaging teeth which are positioned in such a way as to achieve the coupling with a seat that is especially provided on the profile of a fixed frame in order to prevent, if a fire breaks out, the flames that propagate at the opposite face of the door from the face provided with the abutting edge, from being able to create a deformation of the frame which produces gaps to be opened with resulting propagation of fire.

[0003] The adopted solution, which is effective from many aspects, has been shown to be susceptible of improvements, especially with regard to the necessity to carry out a precise adjustment of positioning between leaf and frame, so as to prevent undue interference between the teeth connected to the movable leaf and the engagement seat provided on the fixed frame.

[0004] The aim of the present invention is to provide a fire door with improved fire resistance in which it is possible to achieve a secure engagement of the movable leaf to the fixed frame when the fire propagates, while at the same time having a high degree of play between the engagement element and the fixed leaf whereby accidental interference cannot occur during the normal steps of using the door.

[0005] Within this aim, an object of the invention is to provide a fire door in which the coupling element, although being structurally very simple, is capable of being moved automatically, so as to come into immediate engagement with the fixed frame, thus rendering any dangerous deformation of the leaf practically impossible.

[0006] Another object of the present invention is to provide a fire door that, thanks to its distinctive implementation features, is capable of offering the widest guarantees of reliability and safety in use.

[0007] A further object of the present invention is to provide a fire door with improved fire resistance that can be easily implemented using elements and materials that are readily available on the market and which, moreover, is competitive also from a merely economical viewpoint.

[0008] This aim and these and other objects, which will become better apparent hereinafter, are achieved by a fire door with improved fire resistance, illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is a schematic front elevation view of the fire door, according to the invention;
Figure 2 is a sectional view along the line II-II in Figure 1 of the fire door according to a first embodiment of the invention;
Figure 3 is an exploded perspective view of the locking body of the fire door according to the first embodiment of the invention;
Figure 4 is a partially sectional view of a detail of the locking body of the fire door according to the first embodiment of the invention;
Figure 5 is a sectional view of the step of actuating the locking body of the fire door according to the first embodiment of the invention;
Figure 6 is an exploded perspective view of the locking body of the fire door according to a second embodiment of the invention;
Figure 7 is a sectional view along the line II-II in Figure 1 of the fire door according to the second embodiment of the invention;
Figure 8 is a sectional view of the step of actuating the locking body of the fire door according to the second embodiment of the invention.

[0009] Further characteristics and advantages of the invention will become better apparent from the description of a preferred, but not exclusive, embodiment of a fire door with improved fire resistance, illustrated by way of non-limiting example in the accompanying drawings.

[0010] With reference to both of the embodiments shown in the figures, the fire door with improved fire resistance, generally designated with the reference numeral 1, comprises a fixed frame generally designated with 2, which is constituted by a profile that has a front flange 3, which can be superimposed on a fixed structure 4, and an abutting edge 5 provided on the opposite side.

[0011] In the join portion of the profile, a hollow 6 is defined for accommodating a sealing gasket with respect to a movable leaf 10 which is connected to the fixed frame by means of ordinary hinges 11.

[0012] The movable leaf has a first face 12 that terminates with an abutting edge 13 engageable with the profile 3 and a second face 14 that is positioned on the opposite side, in order to define a box-like body with the introduction of thermally insulating material, generally designated with 15.

[0013] A locking body is provided which is implement-ed by means of an oscillating locking plate that can be positioned on the edge of the movable leaf 10, preferably at an upper edge 21, on the opposite side from the side on which the movable leaf is hinged to the frame.

[0014] In the first embodiment of the invention the oscillating locking plate is designated with the reference
A fire door (1) with improved fire resistance, comprising a fixed frame (2) couplable to a fixed structure (4), and at least one movable frame (10) defining a movable leaf of a door hinged to said fixed frame (2), on the edge of said movable leaf (10), at least on one side that is different from the pivoting side, a locking body (20, 40) being provided that is engageable with said fixed frame (2) in the presence of generation of heat, characterized in that it comprises means (25) for the actuation of said at least one lock-

[0024] Similarly to what is described in the first embodiment, in the second embodiment means are also provided for actuating the plate 40 which are obtained by means of the heat-expanding body 25, which is provided on the face of the plate 40 that is directed toward the edge of the movable leaf, and preferably integral with this face of the plate 40, and in a region that is laterally distanced from its pivot point defined by the engagement of the plate 40 with the screw 41. The expansion of the heat-expanding body 25 produces the rotation of the plate 40 along the plane of the door, so that its end comes to engage the locking seat 26.

[0025] From the foregoing explanation it can be seen that the invention achieves the intended aim and objects, and in particular attention is drawn to the fact that the use of a heat-expanding body ensures that the coupling body is securely moved and actuated so as to be inserted in the locking seat, thus simplifying all the adjustment operations since it is not necessary to arrange an exact play between movable leaf and fixed frame, given that the actuation of the locking body makes it possible to arrange a relatively ample movement, by immediately effecting the locking.

[0026] Moreover, the solution as described above can be rapidly applied to existing doors as well.

[0027] The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0028] Moreover, all the details may be replaced by other, technically equivalent elements.

[0029] In practice the materials employed, provided that they are compatible with the specific use, as well as the contingent dimensions and shapes, may be any according to requirements.


[0031] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims
1. A fire door (1) with improved fire resistance, comprising a fixed frame (2) couplable to a fixed structure (4), and at least one movable frame (10) defining a movable leaf of a door hinged to said fixed frame (2), on the edge of said movable leaf (10), at least on one side that is different from the pivoting side, a locking body (20, 40) being provided that is engageable with said fixed frame (2) in the presence of generation of heat, characterized in that it comprises means (25) for the actuation of said at least one lock-
ing body (20, 40) constituted by a heat-expanding body (25).

2. The fire door according to claim 1, characterized in that said locking body is provided by an oscillating plate (20, 40), whose free end is engageable with a locking seat (26) defined correspondingly on said fixed frame (2).

3. The fire door according to claim 2, characterized in that it comprises a connecting bracket (30), which is jointly associable with said movable leaf (10) and defines an engagement portion for providing a pivoting point of said oscillating plate (20).

4. The fire door according to claim 2, characterized in that it comprises a screw (41) that is jointly associable with said movable leaf (10) and defines an engagement point for providing a pivoting point of said oscillating plate (40).

5. The fire door according to one or more of the preceding claims, characterized in that said locking body (20) is arranged at the upper edge (21) of said movable leaf (10) in a spaced position with respect to the pivoting side of said movable leaf (10).

6. The fire door according to one or more of the preceding claims, characterized in that said heat-expanding body (25) is integral with the face of the plate (20, 40) which is directed toward the edge of the movable leaf (10).

7. The fire door according to one or more of the preceding claims, characterized in that it comprises, on said connecting bracket, a raised tooth (31) at least partially superimposed on said heat-expanding body (25).

8. The fire door according to one or more of the preceding claims, characterized in that said heat-expanding material (25) is constituted by a graphite-based flexible material that is entirely asbestos-free and is adapted to become a foam with high thermal insulation power if flames develop.

9. The fire door according to claim 4, characterized in that said screw (41) has a head (43) that protrudes axially from the edge (21) of said movable leaf (10).

10. The fire door according to claim 4, characterized in that said screw (41) is self-tapping.

11. The fire door according to claim 9, characterized in that said head (43) of said screw (41) is countersunk.

12. The fire door according to claim 4, characterized in that said oscillating plate (40) has a hole (44) that is adapted to allow the passage of said screw (41) with the exception of the head (43).

13. The fire door according to claims 11 and 12, characterized in that said hole (44) is smaller than the diameter of an upper portion (45) of said protruding head (43).

14. The fire door according to one or more of claims 11, 12 and 13, characterized in that said hole (44) is bigger than the diameter of a lower portion (47) of said protruding head (43) in direct contact with the surface of the edge (21) of said movable leaf (10).
Fig. 2
DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Category</th>
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The present search report has been drawn up for all claims

Place of search: The Hague
Date of completion of the search: 28 October 2011
Examiner: Verdonck, Benoit

CATEGORY OF CITED DOCUMENTS
X: particularly relevant if taken alone
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ON EUROPEAN PATENT APPLICATION NO. EP 2395193 A1

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 28-10-2011.

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For more details about this annex: see Official Journal of the European Patent Office, No. 12/82
REFERENCES CITED IN THE DESCRIPTION

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- IT MI20101026 A [0030]