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(54) **Underground garage including an improved ventilating system**

Unterirdische Garage mit Belüftungssystem

Garage souterrain avec un système de ventilation

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EP 1 548 208 B1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an underground or basement garage construction including an improved ventilating system.

[0002] Prior underground or basement garages conventionally comprise a ventilating system having a double function: that of assuring a circulation of the inside air under normal operating conditions, and that of evacuating fumes, in a fire event.

[0003] To that end, suitable cross-section chimneys are usually included, which have a cross-section proportioned to the underground garage area.

[0004] In a case of multiple floor underground garages, to reduce the total cross-section of the chimneys, which could assume a comparatively large value, a plurality of branched manifolded barrels, also called "shunt barrels" are used, to provide a proper division into compartments of the floors.

[0005] In such an event, the ventilating system comprises a main barrel or shaft, or manifold, to which the secondary channels or barrels are coupled by a so-called deviating or switching system.

[0006] The document US5832680 describe an underground or basement garage construction having a ventilating system with a plurality of ducts being controlled by means of temperature sensors which provide the opening or closing of each duct according to the desired temperature conditions of the different floors of the garage construction.

SUMMARY OF THE INVENTION

[0007] Accordingly, the aim of the present invention is to provide such an underground or basement garage construction, including an improved ventilating system, i.e. a ventilating system which is greatly improved with respect to prior like ventilating systems.

[0008] Within the scope of the above mentioned aim, a main object of the invention is to provide such a ventilating system including a specifically designed type of deviating or switching element.

[0009] Another object if the present invention is to provide such a ventilating system allowing to easily control and adjust the configuration of the switching element, as required, for example in a fire or other dangerous condition.

[0010] Yet another object of the present invention is to provide such an underground or basement garage construction, the ventilating system of which is adapted to operate in a much more efficient manner, both in normal and in emergency conditions.

[0011] According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by an underground or basement

garage construction, including an improved ventilating system, said ventilating system comprises a plurality of recesses or compartments arranged according to a plurality of floors and coupled to one or more ventilating ducts through coupling openings including a switching device, said underground or basement garage construction being characterized in that said switching device comprises a plurality of switching fins, each pivoted at a said opening and being coupled to one another by a coupling element including driving means for driving said fins to a closed position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of the invention which is illustrated, by way of an indicative, but not limitative example in the accompanying drawings, where:

Figure 1 is a schematic elevation cross-sectional view illustrating an underground or basement garage construction including an improved ventilating system according to the present invention, and being shown in a normal condition;

Figure 2 is a schematic view similar to figure 1, but illustrating the garage construction in an emergency condition;

Figure 3 is an enlarged view illustrating in a more detailed manner the deviating or switching device in a normal operation condition thereof; and

Figure 4 is a schematic view, similar to figure 3, but illustrating the deviating or switching device in an emergency condition.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] With reference to the number references of the above mentioned figures, the underground or basement garage construction according to the invention, which has been generally indicated by the reference number 1, comprises a plurality of recesses or compartments 2, arranged on several floors and coupled to one or more shunt barrels or shafts 3, through openings 4 including a deviating or switching device.

[0014] More specifically, said switching device comprises a plurality of switching fins or wings 5 each of which has an end portion 6 pivoted to the bearing framework and a free end portion, coupled to a coupling element including, in the disclosed embodiment, a coupling chain 7.

[0015] In particular, the coupling element 7 comprises a weight element 8 which, in a fire condition, will drive the wings or fins to a vertical position, thereby closing the air and fire fume passage.

[0016] The coupling element comprises an electrically

driven bolt element 8, allowing to hold, in cooperation with the weight element 8, the mentioned fins or wings 5 at an opened position.

[0017] In a normal operation of the underground garage, the fins will be arranged in an opened condition, as is clearly shown in figures 1 and 3.

[0018] In a fire and/or fume condition, on the contrary, the bolt 9 will disengage the chain 7 which, downward driven by the weight element 8, will allow the fins 5 to close the passage at those connections corresponding to the regions in which fumes are not present.

[0019] This is obtained by a command 10 sent from an anti-fire central unit coupled to fume sensors 11 arranged in the recesses or compartments 2.

[0020] In a normal or regular operation condition, the vortex patterns at the two-shaft passage point, i.e. between the main and secondary shafts, are very reduced, because of the configuration of the fins, and the fluid streams will have a great evenness thereby reducing the load loss and providing a very efficient operation.

[0021] In a fire condition, on the contrary, the closure of the secondary shafts, corresponding to the regions not involved by the fumes, will prevent the fumes from cooling, as they are introduced into the manifold shaft, so that said fumes cannot be mixed with the cool air which would exit the other floors.

[0022] Thus, in a fire condition, fumes and flames cannot be propagated to the top floors.

[0023] It has been found that the invention fully achieves the intended aim and objects.

[0024] In fact, the invention provides an underground garage construction including an improved ventilating system which, in the above disclosed condition, is very efficient both in a normal operating condition and in an emergency or fire condition.

[0025] To allow a shaft or barrel to properly operate, it is necessary to meet the condition: T (draught or draft) larger than R (sum of the resistances);

R (sum of the resistances) depending, the cross section being the same, on the shaft shape, in which any sudden direction changes must be prevented, to prevent vortex patterns from being generated;
 T (the draught or draft) depending on the height of the chimney or shaft and the difference of the outside air and fume densities: the higher being the fume temperatures, the larger being said difference and accordingly the draught.

[0026] Moreover, in a fire condition, the fire floor and other floors thereabove are prevented from communicating.

[0027] In practicing the invention, the used materials, as well as the contingent size and shapes, can be any, depending on requirements and status of the art.

Claims

1. An underground or basement garage construction (1), including an improved ventilating system, said ventilating system comprises a plurality of recesses or compartments (2) arranged according to a plurality of floors and coupled to one or more ventilating ducts through coupling openings (4) including a switching device, said underground or basement garage construction being **characterized in that** said switching device comprises a plurality of switching fins (5), each pivoted at a said opening and being coupled to one another by a coupling element (7) including driving means (8) for driving said fins to a closed position.
2. A garage construction according to claim 1, **characterized in that** each said fins (5) comprises an end portion (6) pivoted to a bearing framework and a free end portion coupled to the coupling element (7), said coupling element comprising a connecting chain (7).
3. A garage construction according to claim 1 or 2, **characterized in that** said driving means comprise a weight element (8) associated with said coupling element (7) and an electrically driven bolt (9) allowing, in cooperation with said weight element, to hold said fins (5) in an opening position whereas, in a fire condition, said weight element (8) drives said fins (5) to a vertical position thereby closing the fire air and fume passage.
4. A garage construction, according to one or more of the preceding claims, **characterized in that**, in a normal operation condition of said garage construction, said fins (5) are arranged in an opened condition whereas, in a fire and/or fume condition, said bolt (9) will disengage said chain which, as downwardly driven by said weight element, will cause said fins (5) to close the passage at all the connections corresponding to regions at which fumes are absent.
5. A garage construction, according to one or more of the preceding claims, **characterized in that** said garage construction further comprises an anti-fire central unit coupled to fume sensors (11), arranged in said recesses unit coupled to fume adapted arranged in said recesses or compartments (2), and adapted to control said electrically operated bolt (9).
6. A garage construction, according to one or more of the preceding claims, **characterized in that**, in a normal operation condition, said garage construction is so designed to reduce to a minimum vortex patterns at passage regions between the two shafts, i.e. a main and secondary shaft, which reduction is obtained by said specifically designed thins allowing to reduce the load loss thereby allowing said construc-

tion to operate in a very efficient operating condition.

Patentansprüche

1. Unterirdischer oder Tiefgaragenbau (1) mit einem verbesserten Belüftungssystem, wobei das Belüftungssystem mehrere Aussparungen oder Abteilungen (2) umfasst, die entsprechend mehreren Stockwerken angeordnet und durch Kupplungsöffnungen (4) mit einem Schaltgerät mit einem oder mehreren Belüftungsrohren verkuppelt sind, wobei der unterirdische oder Tiefgaragenbau **dadurch gekennzeichnet ist, dass** das Schaltgerät mehrere Schaltstege (5) umfasst, die jeder an der Öffnung schwenkbar verbunden sind und miteinander durch ein Kupplungselement (7) mit Antriebsmitteln (8) zum Antreiben der Stege in eine geschlossene Position verkuppelt sind.
2. Garagenbau nach Anspruch 1, **dadurch gekennzeichnet, dass** jeder der Stege (5) einen Endabschnitt (6), der schwenkbar mit einem Lagerrahmenwerk verbunden ist, und einen freien Endabschnitt umfasst, der an das Kupplungselement (7) gekuppelt ist, wobei das Kupplungselement eine Verbindungskette (7) umfasst.
3. Garagenbau nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, dass** die Antriebsmittel ein Gewichtselement (8), das dem Kupplungselement (7) zugeordnet ist, und einen elektrisch betriebenen Bolzen (9) umfassen, der es in Zusammenwirkung mit dem Gewichtselement ermöglicht, die Stege (5) in einer Öffnungsposition zu halten, während das Gewichtselement (8) bei Feuer die Stege (5) in eine vertikale Position treibt, wodurch der Feuerluft- und Rauchdurchgang geschlossen ist.
4. Garagenbau nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** in einem normalen Betriebszustand des Garagenbaus die Stege (5) in einem geöffneten Zustand angeordnet sind, während in einem Flammen- und/oder Rauchzustand der Bolzen (9) die Kette auskuppelt, die bewirkt, da sie durch das Gewichtselement nach unten getrieben ist, dass die Stege (5) den Durchgang aller der Verbindungen schließt, die den Bereichen entsprechen, in denen kein Rauch vorkommt.
5. Garagenbau nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Garagenbau ferner eine Feuerschutzzentraleinheit umfasst, die an Rauchsensoren (11) gekoppelt ist, in den Aussparungen oder Abteilungen (2) angeordnet ist und dazu geeignet ist, den elektrisch beschriebenen Bolzen (9) zu steuern.

6. Garagenbau nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Garagenbau in einem normalen Betriebszustand zum Reduzieren von Wirbelmustern in Durchgangsbereichen zwischen den zwei Schächten, d.h. einem Haupt- und einem Nebenschacht, auf ein Mindestmaß ausgelegt ist, wobei die Reduzierung durch die besonders gestalteten Stege erzielt ist, die den Lastwegfall ermöglichen, wodurch ermöglicht ist, dass der Bau in einem sehr effizienten Betriebszustand funktioniert.

Revendications

1. Construction de garage (1) souterrain ou en sous-sol incluant un système de ventilation amélioré, ledit système de ventilation comprend une pluralité d'évidements ou compartiments (2) agencés selon une pluralité d'étages et couplés à un ou plusieurs conduits d'air par l'intermédiaire d'ouvertures de couplage (4) incluant un dispositif de commutation, ladite construction de garage souterrain ou en sous-sol étant **caractérisée en ce que** ledit dispositif de commutation comprend une pluralité d'ailettes de commutation (5), chacune étant pivotée au niveau d'une dite ouverture et étant couplée à l'autre par un élément de couplage (7) incluant des moyens d'entraînement (8) permettant d'entraîner lesdites ailettes vers une position fermée.
2. Construction de garage selon la revendication 1, **caractérisée en ce que** chacune desdites ailettes (5) comprend une section d'extrémité (6) amenée à pivoter par rapport à un bâti de soutien et une section d'extrémité libre couplée à l'élément de couplage (7), et ledit élément de couplage comprenant une chaîne de raccordement (7).
3. Construction de garage selon la revendication 1 ou 2, **caractérisée en ce que** lesdits moyens d'entraînement comprennent un élément de poids (8) associé audit élément de couplage (7) et un boulon (9) entraîné par voie électrique permettant, en coopération avec ledit élément de poids, de maintenir lesdites ailettes (5) dans une position d'ouverture tandis que, dans un état d'incendie, ledit élément de poids (8) entraîne lesdites ailettes (5) vers une position verticale, ce qui ferme le passage destiné aux fumées et à l'air lors d'un incendie.
4. Construction de garage selon une ou plusieurs des revendications précédentes, **caractérisée en ce que**, dans un état de fonctionnement normal de ladite construction de garage, lesdites ailettes (5) sont agencées dans un état ouvert tandis que, dans un état de fumée et/ou d'incendie, ledit boulon (9) se dégage de ladite chaîne qui, en étant entraînée vers

le bas par ledit élément de poids, amène lesdites ailettes (5) à fermer le passage au niveau de tous les raccordements correspondant aux régions dans lesquelles les fumées sont absentes.

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5. Construction de garage, selon une ou plusieurs des revendications précédentes, **caractérisée en ce que** la construction de garage comprend en outre une unité centrale anti-incendie couplée à des capteurs de fumée (11), agencés dans lesdits évidements ou compartiments (2), et conçus afin de commander ledit boulon (9) actionné par voie électrique. 10
6. Construction de garage, selon une ou plusieurs des revendications précédentes, **caractérisée en ce que**, dans un état de fonctionnement normal, ladite construction de garage est conçue afin de réduire au minimum les motifs de tourbillons au niveau des régions de passage entre les deux arbres, à savoir un arbre principal et secondaire, laquelle réduction est obtenue par lesdites ailettes conçues d'une manière spécifique, ce qui permet de réduire la perte de charge, et permet ainsi à ladite construction de fonctionner dans un état de fonctionnement très efficace. 15 20 25

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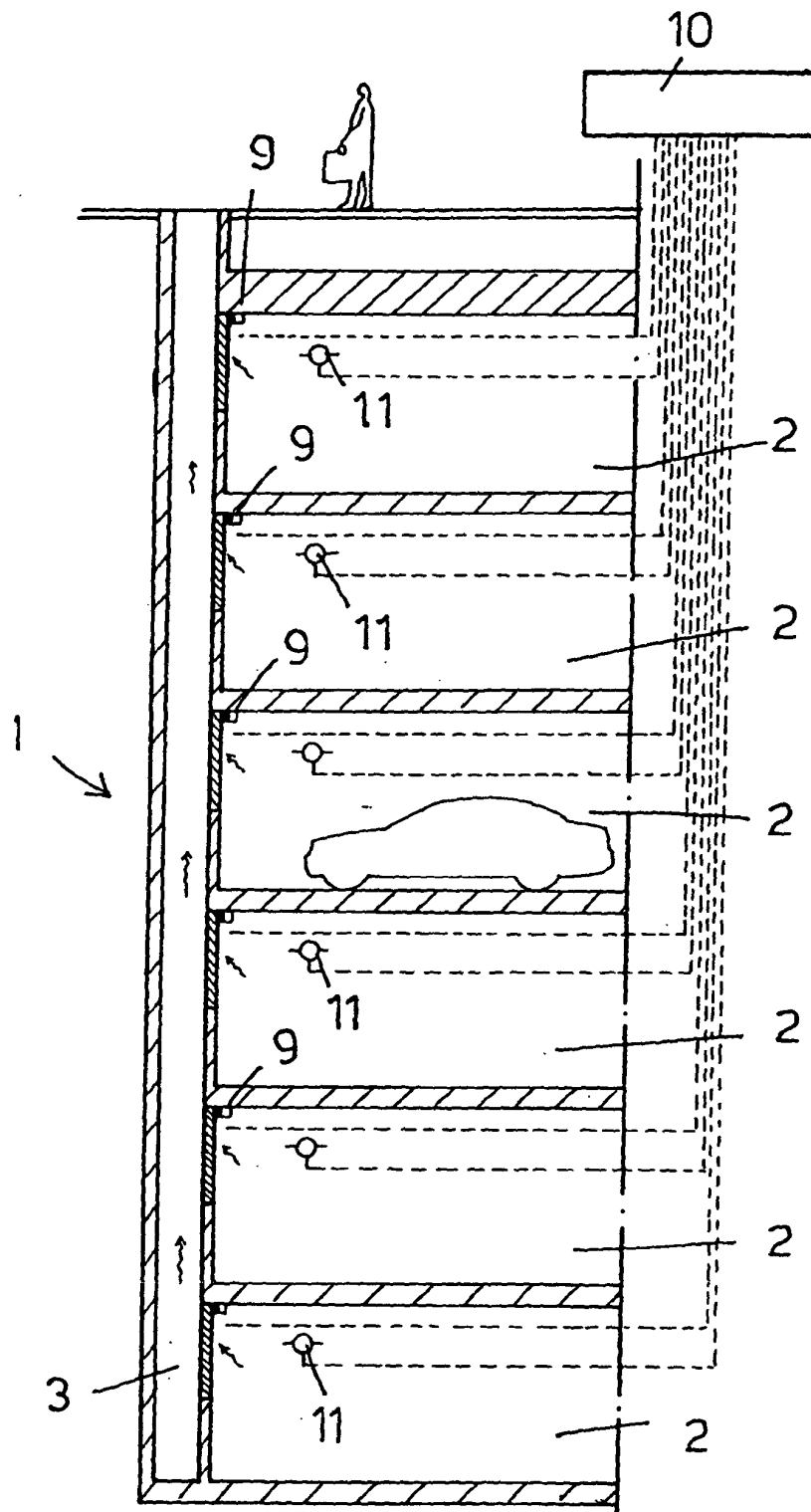


FIG 1

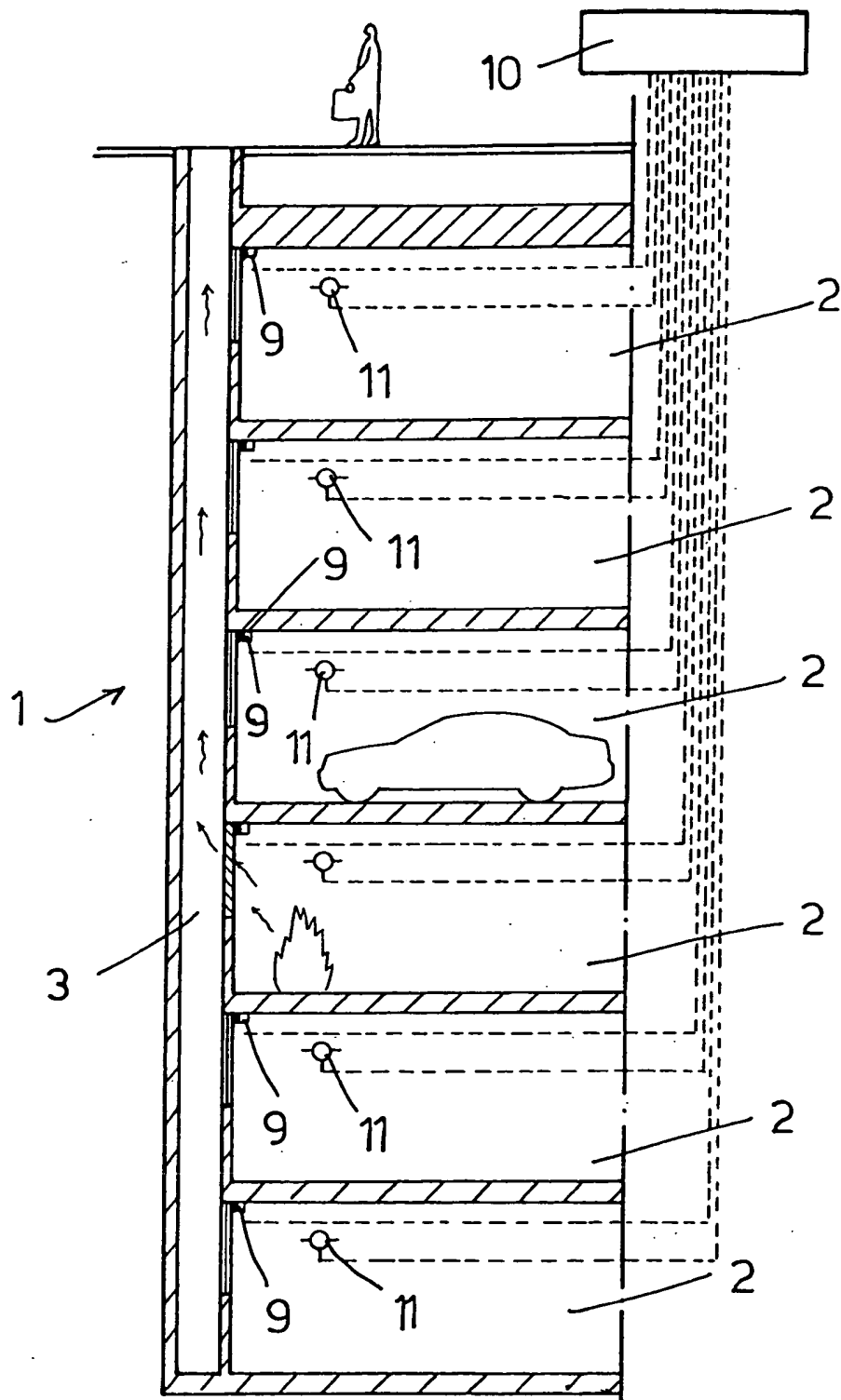


FIG 2

