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(54) Window construction

(57) A window construction comprises an outer frame (1) which can be mounted in a casing (3) by means of hinges (2) to swing on a substantially vertical axis, and a number of inner frames (4,5) which are arranged to slide back and forth within the outer frame (1). The outer frame (1) is made of steel or a material with which an approximately equal rigidity can be obtained in the window construction. The outer frame (1) is formed by a U-section, each of the legs of which U-section defines the plane in which an inner frame (4,5) is slidable, and with a preposition which depends on the dimensions and the weight of the window construction.

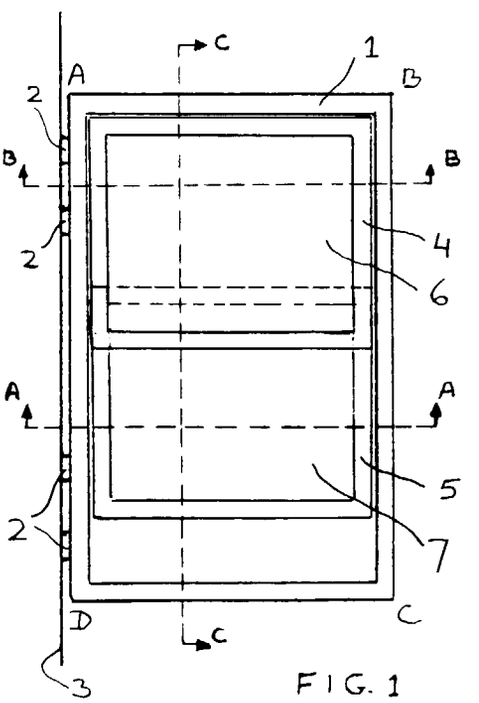

FIG. 1

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Description

[0001] The present invention relates to a window construction comprising an outer frame which can be mounted in a casing by means of hinges to swing on a substantially vertical axis, and a number of inner frames which are arranged to slide back and forth within the outer frame.

[0002] Such a window construction, in which, however, only two inner frames are arranged to move back and forth within the outer frame, is known from GB-A-2190414, in particular from Fig. 15 and page 2, lines 118-128. When realizing this window construction, problems occur because here, contrary to a fixed frame with a window mounted therein swinging on a vertical axis, no coupling is present between the top corner on the side of the outer frame remote from the hinged side and the bottom corner on the hinged side, which, certainly when the window construction is relatively large and therefore heavy, results in a slightly crooked window construction, namely in the sense that the side of the window construction remote from the hinged side will sag down a little so that the window construction slightly deforms from the pure rectangular form into a parallelogram form, with the result that the window construction is jammed and does not close very well anymore. Although the above-mentioned corners of the window construction could be strengthened, it has been found in practice, in view of the esthetic requirements imposed on window constructions, that this solution is not acceptable for very large window constructions, such as those occurring in many old buildings. In this connection it should be realized that, just because of the esthetic requirements, aluminum frames are often used which, in actual fact, readily deform in the absence of the coupling between the above-mentioned corners in a window construction as defined in the opening paragraph. For smaller window constructions aluminum can therefore be used without any inconvenience.

[0003] Such a problem occurs both with window constructions for window frames or double window frames, in which the inner frames can be slid up and down in the outer frame, and with window constructions for, e.g., large sun-lounge doors, in which the inner frames can be moved in the outer frame from left to right, and conversely.

[0004] It is an object of the invention to solve the above-mentioned problems at least substantially and to provide a window construction which, also when it is relatively large and heavy, can be swingingly suspended with a proper fit, with no deformation occurring, while at the same time the requirements of esthetics are fully satisfied.

[0005] According to the invention the window construction as defined in the opening paragraph is therefore characterized in that the outer frame is made of steel or a material with which an approximately equal rigidity can be obtained in the window construction, and that the outer frame is formed with a pre-position which depends on the dimensions and the weight of the window construction.

[0006] As used herein, pre-position refers to the degree in which the outer frame is preformed such, i.e. is given such a parallelogram structure, that under the weight of the window the outer frame assumes a rectangular form again; the preposition is expressed by the degree in which the top corner of the outer frame remote from the hinged side is located higher than the top corner located on the hinged side. In a simple embodiment the pre-position (h) is defined by the relation: $h = f \times B$, in which B is the width of the window construction and f a factor of the order of from 0.01 to 0.025, subject to the height of the window construction. For windows up to about 2.5 to 3 m this factor will be about 0.01; for windows of the order of 3 m or a little above it will be about 0.015. For still higher window constructions even values of 0.02 or possibly 0.025 may be necessary for the factor f.

[0007] Both in connection with the rigidity of the window construction and in view of the slidability of the inner frames it is to be preferred that the outer frame is formed by a rectangular U-section, W-section or a similar section, over or between the legs of which section an inner frame is slidable. In a concrete embodiment an inner frame is slidable by means of runners arranged therein over or between the legs of the section. The inner frames are therefore readily slidable one behind and along the other over or between the relevant legs of the section. Arranged between the legs of the section are known per se equalizer springs to support each of the inner frames.

[0008] To give the outer frame the required esthetic appearance, it may be provided with a surface layer, e.g. of plastic. The inner frames may then, of course, also be made of the same material.

[0009] The invention will hereinafter be explained in more detail with reference to the accompanying drawings in which:

Fig. 1 is diagrammatic view of a window construction according to the invention comprising two inner frames;
Fig. 2 is a horizontal cross section taken along the line A-A in Fig. 1;
Fig. 3 is a horizontal cross section taken along the line B-B in Fig. 1;
Fig. 4 is a vertical cross section taken along the line C-C in Fig. 1;
Fig. 5 is a diagrammatic view of a window construction comprising three inner frames;
Fig. 6 is a diagrammatic view of a window construction comprising four inner frames; while
Fig. 7 shows the use of a W-section for the outer frame.

[0010] The window construction diagrammatically

shown in Fig. 1 comprises an outer frame 1 which can be mounted in a casing 3 for swinging on a substantially vertical axis by means of hinges 2. Arranged within the outer frame 1 are two inner frames 4 and 5 for up and down movement. Window panes 6 and 7, respectively, are inserted into these inner frames. The inner frames, together with the window panes, form window frames. Both window frames can be slid along each other up and down over the entire height, so that for a desired air circulation or for cleaning the window panes any desired position of the window frames can be obtained. In Fig. 1, the inner frame 5 is pushed up with respect to the inner frame 4, so that on the lower side a space is cleared for passing air.

[0011] The outer frame 1 is formed by a steel U-section 8 which, during manufacture, is made, somewhat departing from the rectangular form, in some form of parallelogram, namely in the sense that of the corners A, B, C and D the corner B is located a little higher than the corner A and the corner C equally higher than the corner D. The distance h over which, during the manufacture of the outer frame 1, the corners B and C are located higher than the respective corners A and D is chosen such that, when the entire window construction is suspended in the hinges 2, the outer frame 1 deforms under its weight to such a degree as to assume such an accurate rectangular form that it is impossible almost for certain that the window construction is jammed in the casing. The distance h will therefore depend on the dimensions and the weight of the window construction. In practice, it has been found that a distance h satisfying the relation: $h = f \times B$, in which B is the width of the window construction and f a factor of the order of from 0.01 to 0.025, subject to the height of the window construction. For windows up to about 2.5 to 3 m this factor will be about 0.01; for windows of the order of 3 m or a little above it will be about 0.015. For still higher window constructions even values of 0.02 or possibly 0.025 may be necessary for the factor f.

[0012] Certainly for large windows it will rather often be necessary that the outer frame 1 is hinged with respect to a steel strip which can be fixed in the casing. The hinges may then be fixed to this steel strip by welding. In the present embodiment such a steel strip 9 is fixed in the casing 3, between which strip 9 and casing 3 a bent sealing plate 10 is arranged which connects by means of a sealing strip 11 to the U-section 8 when it is moved to the closed position. Such a sealing plate with sealing strip is also present on the side of the window construction remote from the hinges 2, as well as on the upper and lower sides thereof. Located on the lower side between the sealing plate 10 and the lower edge of the U-section 8 is, moreover, a run-on block 12 fixed in the casing together with the sealing plate, which run-on block cooperates with a run-on edge portion 13 fixed to the lower side of the U-section 8.

[0013] Each of the legs of the surrounding U-section 8 defines a plane in which the respective inner frames 4 and 5 are slidable. These inner frames have a H-shaped section. On the side facing inwards, the inner frames 4 and 5 enclose the window panes 6 and 7 by means of surrounding sealing strips 14. On the side facing outwards, they enclose a space which contains runners (not shown in the figures) supported on the edges of the legs of the U-section 8. By means of these runners an inner frame is slidable over opposite edges of a relevant leg of the U-section. The upright edges of these legs are therefore provided with a sliding layer 15. The inner frames further comprise sealing elements 16 which, during up and down movement of the inner frames, move along this sliding layer and, in their extreme position, immediately bear against the upper and lower legs of the U-section 8.

[0014] The inner frames are further connected by means of plate pieces 17 with equalizer springs 18 arranged between the vertically extending legs of the U-section 8. The equalizer springs are of the known type and are adjusted to the weight of the load to be carried, namely the relevant inner frames with window panes.

[0015] When the inner frames are in their extreme position, the upper edge 19 of the lower inner frame engages the lower edge 20 of the upper inner frame, while, furthermore, additional sealing elements 21 of the same type as the sealing elements 16 are present to enable proper sealing of the space between the two inner frames in this position.

[0016] Both inner frames further comprise engagement means 22 and 23 to enable up and down movement of the respective inner frames. The engagement means 22 of the upper inner frame are provided with an eye to enable engagement of this inner frame by means of an operating rod. The engagement means 23 of the lower inner frame further comprise locking means 24 for cooperation with a locking plate 25 fixed at the bottom of the lower inner frame.

[0017] In the present case the outer frame is made of steel. However, other materials which ensure an approximately equal rigidity in the window construction, in particular in that of the outer frame 1, may also be used. Moreover, it is possible from an esthetic viewpoint to provide the outer frame 1 with a surface layer, e.g. of plastic. This is particularly attractive when the inner frames are also made of this material.

[0018] The invention is in no way limited to the exemplary embodiment described above with reference to the accompanying drawings but comprises all kinds of modifications, of course as far as falling within the scope of protection of the annexed claims. Thus, for instance, the invention is not limited to an outer frame with only two inner frames slidable therein. It is possible to arrange several inner frames. Fig. 5 shows an outer frame 1 in which three inner frames 26-28 are slidably arranged, while Fig. 6 shows an outer frame with even four inner frames 29-32. The invention may further be used for casement windows, which are windows having two wings hingedly fixed in a casing on opposite sides

and closed in the middle by a so-called closing stile; similarly, it can be used for double doors, in particular double sun-lounge doors. Furthermore, the invention is not limited to the use of U-sections; W-sections or other sections are possible, over or between the legs of which an inner frame is slidable. Thus, Fig. 7 shows a lateral cross section of an obviously surrounding W-section 33, which may be used instead of a U-section. The inner frames 4 and 5 are then movable between the legs of the W-section. Furthermore, instead of the sealing plate 10 in Figs. 2 and 3, a sealing section 34 may be arranged. This sealing section may be necessary if a relatively heavy window construction is to be placed in a relatively weak casing. It is further observed that, apart from the outer frame, the other parts may be made of any possible material, such as steel, aluminum, plastics, etc.

Claims

1. A window construction comprising an outer frame which can be mounted in a casing by means of hinges to swing on a substantially vertical axis, and a number of inner frames which are arranged to slide back and forth within the outer frame, characterized in that the outer frame is made of steel or a material with which an approximately equal rigidity can be obtained in the window construction, and that the outer frame is formed with a pre-position which depends on the dimensions and the weight of the window construction.

2. A window construction according to claim 1, characterized in that the pre-position (h) is defined by the relation: $h = f \times B$, in which B is the width of the window construction and f a factor of the order of from 0.01 to 0.025, subject to the height of the window construction.

3. A window construction according to claim 1 or 2, characterized in that the outer frame is formed by a rectangular U-section, W-section or a similar section, over or between the legs of which section an inner frame is slidable.

4. A window construction according to claim 3, characterized in that an inner frame is slidable by means of runners arranged therein over or between the legs of the section.

5. A window construction according to claim 3 or 4, characterized in that equalizer springs are arranged between the legs of the U-section to support each of the inner frames.

6. A window construction according to any one of the preceding claims, characterized in that the outer frame is provided with a surface layer, e.g. of plastic.

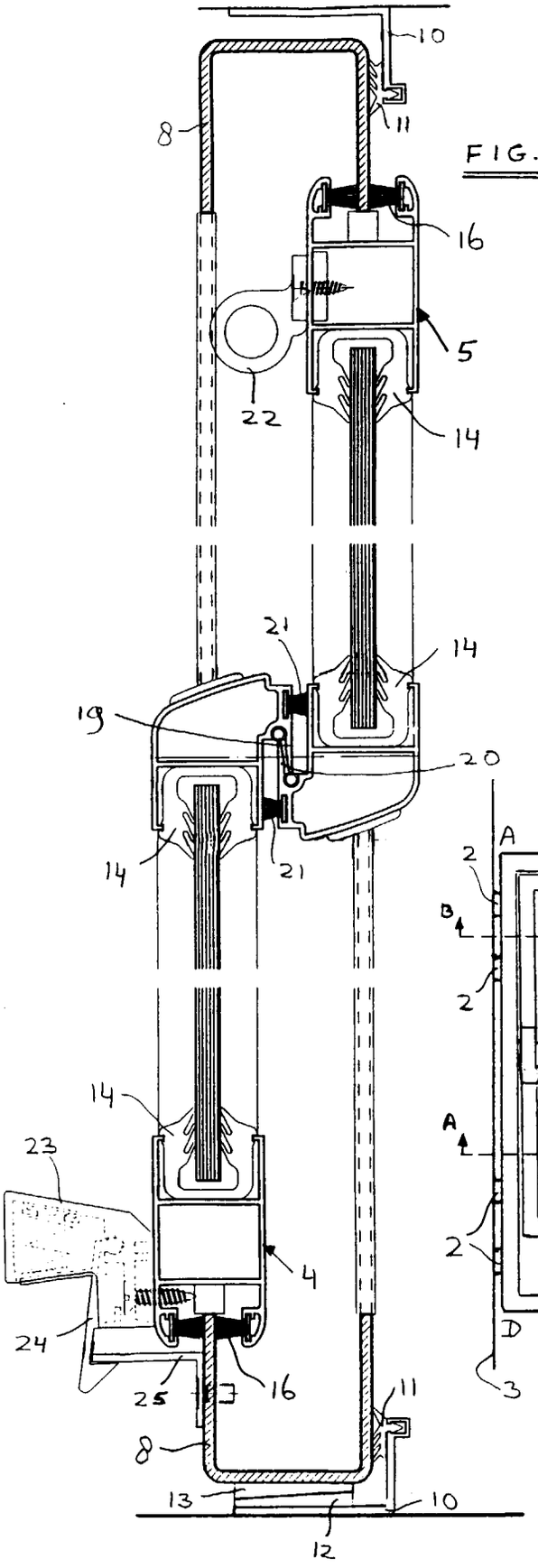
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FIG. 4

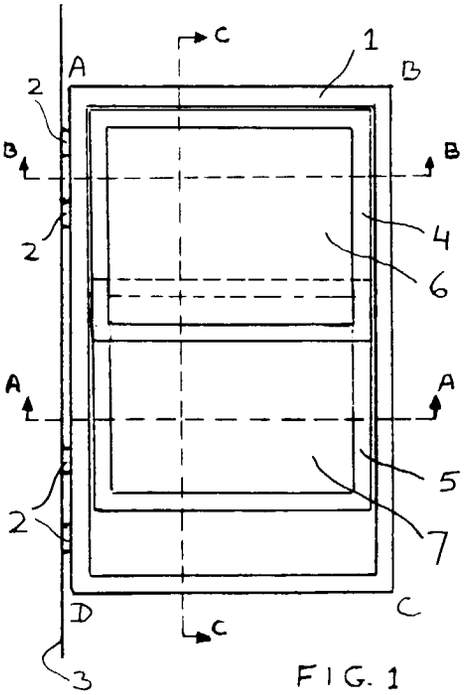
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FIG. 1

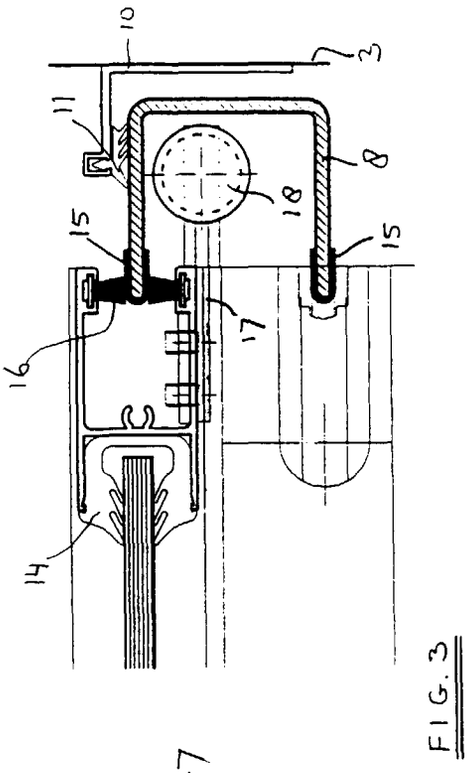
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FIG. 3

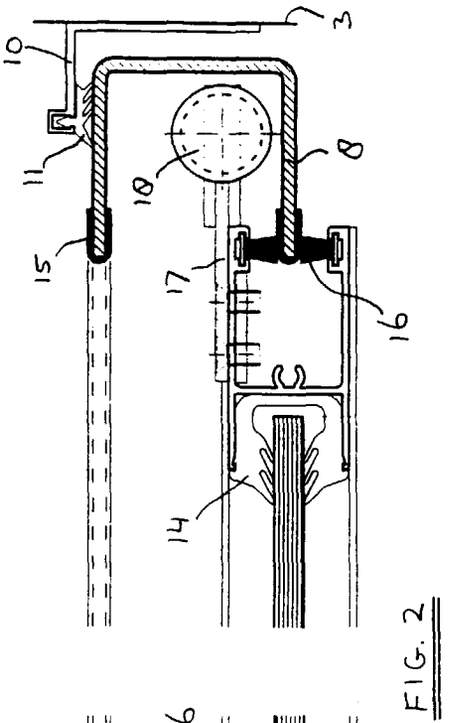
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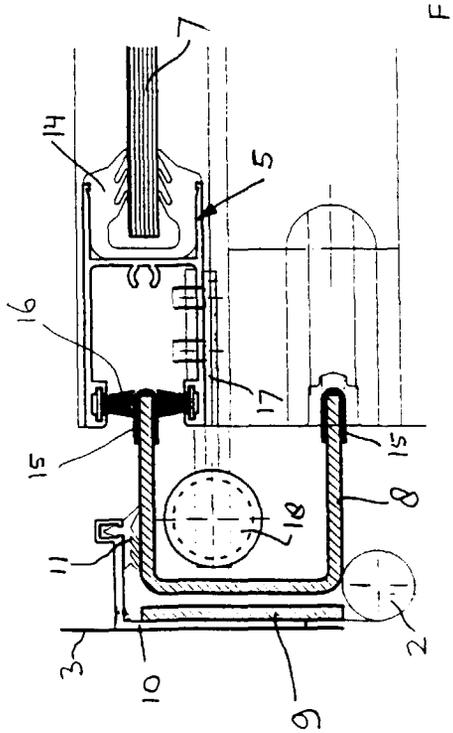
FIG. 2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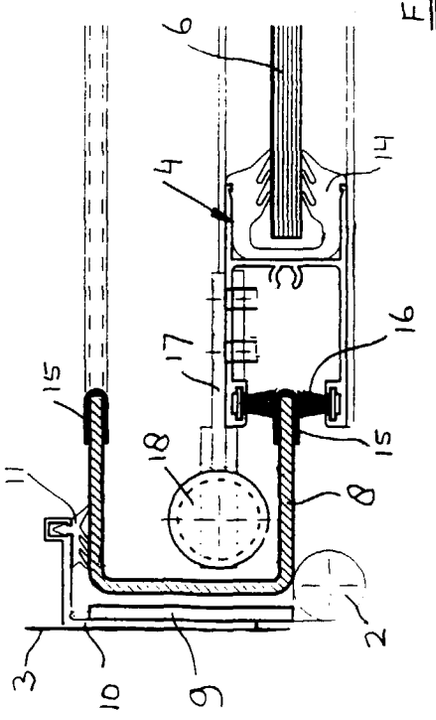
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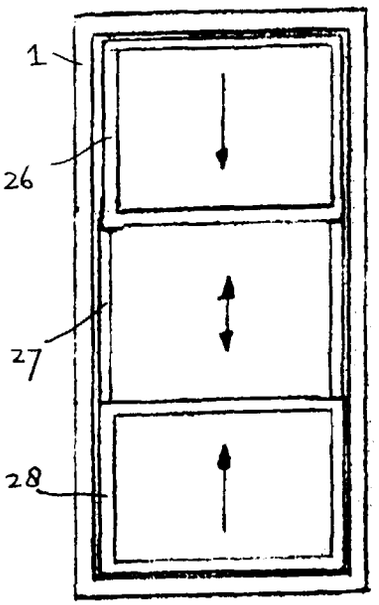

FIG. 5

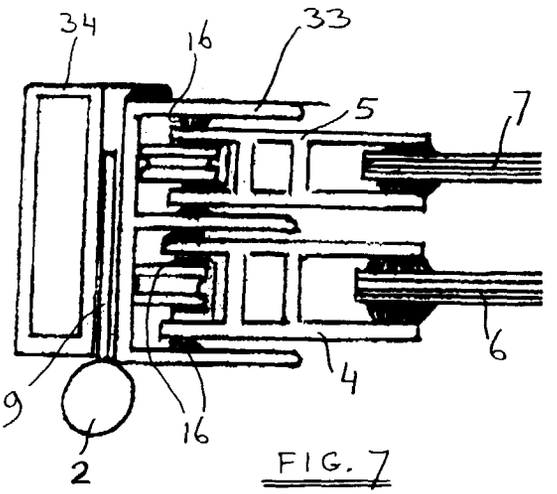

FIG. 7

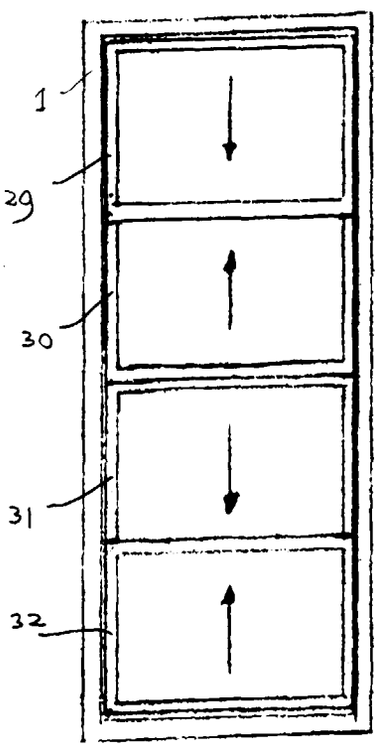

FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 20 1914

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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A	US 5 012 616 A (MARTIN WILLIAM D) 7 May 1991 (1991-05-07) * column 3, line 17 - column 5, line 32; figures *	1,6	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E06B
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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	21 September 1999	Depoorter, F

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21-09-1999

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