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(73) Patenthaver:
VKR Holding A/S, Breeltevej 18, 2970 Hørsholm, Danmark

(72) Opfinder:
Christian Munk Mikkelsen, c/o VKR Holding A/S, Breeltevej 18, 2970 Hørsholm, Danmark

(74) Fuldmægtig:
AWA Denmark A/S, Strandgade 56, 1401 København K, Danmark

(54) Titel: **A roof window with an improved lock casing**

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EP 3269902 A1
EP 2607578 A1
WO 2012/034558 A1
EP 1873336 A1
EP 2620580 A1
EP 3091150 A1

(57) Sammendrag:
In a roof window comprising a frame, a sash, and a locking assembly (10) connecting the sash with the frame, the locking assembly (10) is provided with at least one deformation section (31, 32, 33, 34) configured to allow the locking assembly (10) to undergo plastic deformation when the roof window is subjected to a sudden, severe load change such as an impact. The deformation sections are provided as deformation slits (31, 32, 33, 34) in the lock casing (20) of the locking assembly (10).

Fortsættes...

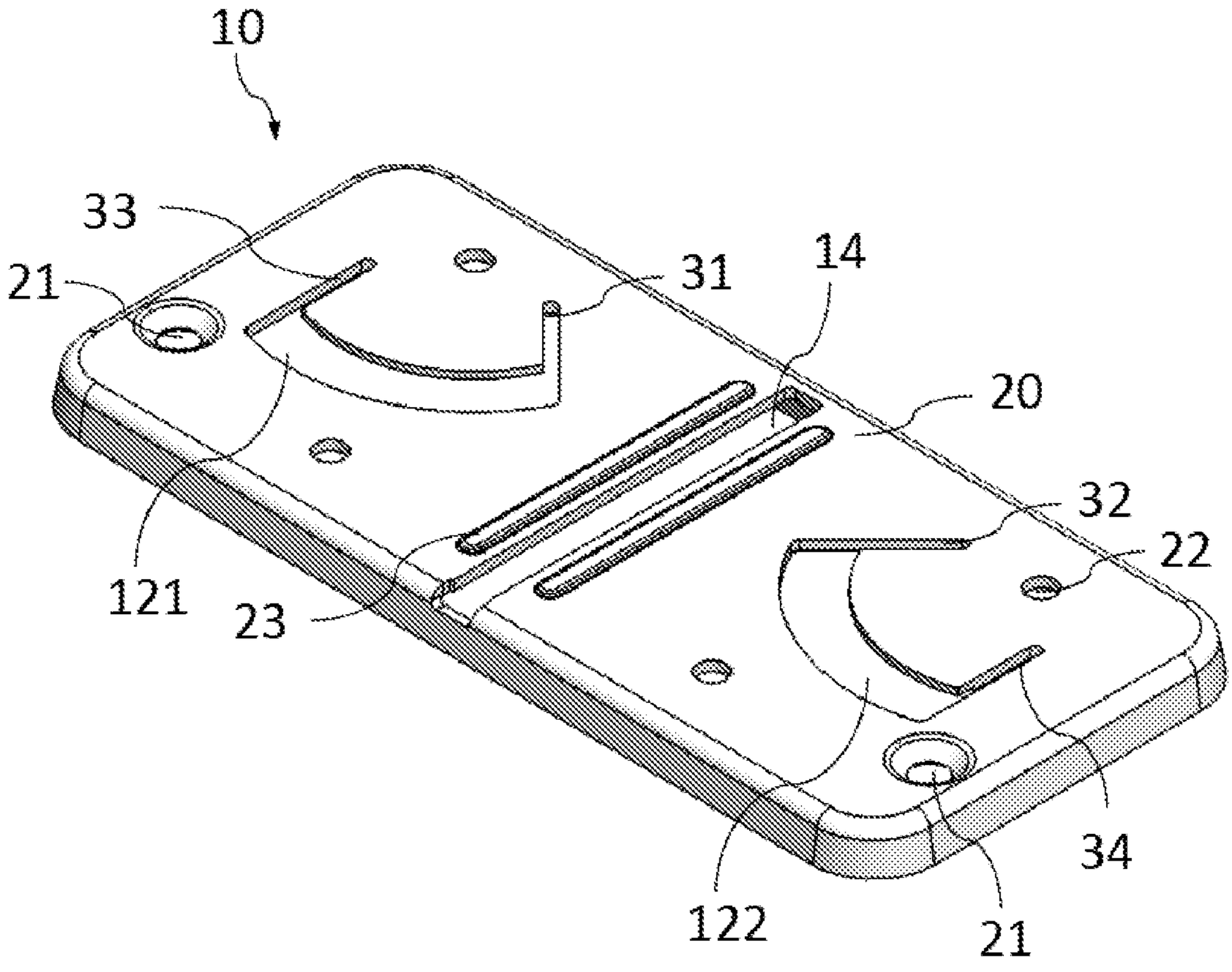


Fig. 3

Title of Invention

A roof window with a lock casing.

Technical Field

The present invention relates to a roof window comprising a frame, a sash, and a locking assembly connecting the sash with the frame, in which the locking assembly is provided with at least one deformation section configured to allow the locking assembly to undergo plastic deformation when the roof window is subjected to a sudden, severe load change such as an impact, said at least one deformation section being provided in a lock casing of the locking assembly.

Background Art

Windows installed in a roof are subjected to a number of varying load conditions over time. This is most often due to severe weather conditions, but may also be the result of incidents when people are working on the roof surface, e.g. fall accidents. Several efforts have been made to mitigate adverse effects on the roof window in the case of excess loads emanating for instance from impacts or other sudden changes of the load conditions have been suggested in the prior art, including the ones described and shown in published applications Nos EP 1 361 331 A2, US 2008/086960 A1 and KR 20120089053 A.

A further example is shown in WO 2010/009727 A1, in which the mounting brackets fastening the frame to the roof structure have been made amply stiff so as to be able to hold the window in place even under severe circumstances, such as tough weather. One downside is, however, that when the window is subjected to for instance an impact, the mounting brackets hold, but other parts of the window break and there is a risk that the window is inadvertently opened. This makes the above-described mounting bracket disadvantageous with respect to protection against sudden impacts following for instance a strong wind or incidents when people are working on the roof surface, e.g. fall accidents.

To address these problems, Applicant's published international application WO 2017/144064 A1 suggests a modified mounting bracket to absorb the forces during certain load conditions. While this solution has proven to function well, there is still room for improvement.

Another example of a prior art roof window is found in EP 3 269 902 A1.

Summary of Invention

With this background, it is therefore an object of the invention to provide a roof window by which it is possible to improve the security against damage of parts of the roof window and inadvertent opening of the sash.

This and further objects are achieved with a roof window of the kind mentioned in the introduction which is furthermore characterised in that said at least one deformation section includes a deformation slit adjoining an arcuate track in the lock casing.

The invention is based on the recognition that the undesired breaking of parts occurs at intersections between the sash and the frame in those cases in which the window is subjected to a sudden, severe load change, typically in the form of an impact. By the provision of predefined deformation sections in the locking assembly, it is ensured that the lock casing is able to yield in a controlled manner while maintaining the structural integrity of the window. The plastic deformation that the locking assembly undergoes in the case of a sudden, severe load change will absorb a major part of the energy. Thereby less strain is put on the remaining window structure, which in turn prevents the window from flying open and also protects other parts of the window structure. Forming the deformation section(s) in the lock casing entails a number of advantages; first, the lock casing is traditionally made of a sturdy material such as steel and of sufficient dimensions such as to allow even substantial deformation without breaking. Second, the lock casing is easily replaceable as it is immediately accessible when opening the window. Providing the deformation section as a deformation slit adjoining an arcuate track in the lock casing provides for a mechanically reliable and simple solution which renders

the locking assembly easy to manufacture and functions well in use.

Other presently preferred embodiments and further advantages will be apparent from the subsequent detailed description, dependent claims and drawings.

Brief Description of Drawings

In the following description embodiments of the invention will be described with reference to the schematic drawings, in which

Fig. 1 is a perspective view of a prior art roof window;

Fig. 2 is a perspective view, on a larger scale, of a detail of a locking assembly of the prior art roof window of Fig. 1;

Fig. 3 is a perspective view of a detail of the roof window in an embodiment of the invention; and

Fig. 4 is a plan view of the detail of Fig. 3.

Description of Embodiments

Fig. 1 shows a prior art roof window 1' adapted to be installed in a roof structure (not shown) by means of its stationary frame 2'. The roof window 1' is shown in an open position in which sash 3' forms an angle relative to the frame 2'. The sash 3' is hinged in the frame 2' by means of a set of hinges 6' and operated by means of an operating device 4' which in a manner known *per se* comprises a ventilation flap with a handle (not shown in detail). Fastening of the roof window 1' to the roof structure is carried out by means of a number of mounting brackets, here represented by mounting brackets 5' on the left-hand side as seen from the inside. Details regarding the mounting bracket 5' and the installation thereof may be found in Applicant's European patent application with the publication No. 2 578 763 A1. The mounting brackets 5' may also be formed as in the above-mentioned WO 2017/144064 A1. Finally, it is seen how the sash 3' is provided with a locking assembly generally designated 10' connected to the operating device 4' and configured to interact with a striking plate (not shown) provided on the frame 2' opposite to the locking assembly 10'.

The fundamental principles underlying the locking assembly and its interaction with the striking plate of the frame are well known in the art, and the configuration of such a locking assembly is for instance shown in Applicant's published European patent applications EP 1 873 336 A1, EP 2 607 578 A1, and EP 3 091 150 A1. With reference to the embodiments of these documents, Fig. 2 shows the prior art locking assembly 10' of the roof window 1' of Fig. 1 as comprising a set of pawl elements 11' movable in a respective arcuate track 12' in a casing 20' when an actuator slide 13' is moved in straight track 14' provided in the casing 20'. The actuator slide 13' is connected to operator arm 15' and operator hinge 16' which in turn is connected to the operating device 4' of the roof window 1'. A lock mechanism generally designated 17' is accommodated within the casing 20' and comprises a number of spring wires connected to the pawl elements 11'. Handling the operating device 4' will move the actuator slide 13' in its track 14' and in turn the pawl elements 11' in arcuate tracks 12' between a closed position, a ventilating position and an open position in which pawl elements 11' are released from engagement with the striking plate on the frame.

In the below description of presently preferred embodiments of the invention, it is thus foreseen that a locking assembly 10 according to the invention is mounted in a roof window corresponding to the prior art roof window 1' such that the locking assembly 10 is mounted on the sash 3' to replace the prior art locking assembly 10' and to interact with the striking plate on the frame 2' in substantially the manner described in the above. Parts of the lock mechanism are not indicated in Figs 3 and 4 for reasons of ease of readability.

Thus, according to the invention the locking assembly 10 is provided with at least one deformation section configured to allow the locking assembly 10 to undergo plastic deformation when the roof window is subjected to a sudden, severe load change such as an impact.

In the embodiment shown, a total of four deformation sections is provided in the lock casing 20 of the locking assembly 10. However, the invention is applicable to only a single deformation section, just as two, three

or more than four deformation sections are conceivable as well. Here, each deformation section includes one deformation slit 31, 32, 33, 34 adjoining an arcuate track 121, 122 in the lock casing 20.

In the inventive locking assembly 10, two arcuate tracks 121, 122 are provided in the lock casing 20. In principle, the arcuate tracks 121, 122 may be of any configuration and have any suitable general dimensions, either the same as or different from the prior art counterparts 12'. Here, each arcuate track 121, 122 has an outer radius R and an inner radius r measured from an aperture 22 for a lock mechanism of the locking assembly 10 and extends over an arc length with a central angle of approximately 45°.

In addition to the arcuate tracks 121, 122 and the deformation slits 31, 32, 33, 34, the lock casing 20 is provided with two mounting holes 21 for fastening the lock casing 20 to the sash of the roof window and four apertures for the lock mechanism, here represented by the above-mentioned aperture 22 located in proximity to right-hand arcuate track 122. As in the prior art, a straight track 14 is provided to receive the not-shown actuator slide, surrounded by a reinforcing rib 23 on either side.

As indicated, the first deformation slit 31 is provided adjoining a first end 121a of the left-hand arcuate track 121. Correspondingly, the second deformation slit 32 is provided adjoining the counterpart first end of the right-hand arcuate track 122.

In one conceivable configuration, the first and second deformation slits 31, 32 could form the deformation sections of the lock assembly 10. However, in the embodiment shown, two deformation slits 31, 33; 32, 34 are provided adjoining the first end 121a and a second end 121b, respectively, of a respective one of said two arcuate tracks 121, 122.

Although any shape of the deformation slit or slits could in principle fulfil the requirements of allowing deformation of the lock casing of the lock assembly, just as not all deformation slits are necessarily of similar configuration, each deformation slit 31, 32, 33, 34 is here substantially linear and has a predefined length L and a predefined width W.

The exact measures of the dimensions of the deformation slits depend

on a number of parameters, including the overall dimensions of the lock casing 20. Here, the predefined length L of each deformation slit 31, 32, 33, 34 is in the range 5 to 15 mm, here specifically about 10 mm. The predefined width W of each deformation slit 31, 32, 33, 34 is in the range 1 to 3 mm, preferably 1.5 to 2 mm, here specifically about 1.75 mm. In comparison, the overall dimensions of the lock casing 20 are about 130 mm by 59 mm, with a material thickness of about 1.5 mm. Typically, the lock casing 20 and the other parts of the locking assembly 10 are made of steel and pressed into shape by any suitable technique such that the height of the lock casing 20 is sufficient to accommodate the lock mechanism, here about 6.5 mm. The radii, viz. outer radius R is about 28 mm and inner radius r is about 21 mm, of the arcuate tracks 121 and 122 allow for movement of the pawl elements to attain the positions as described in the above.

In the embodiment shown, the deformation slits 31, 33; 32, 34 at a respective one of said two arcuate tracks 121, 122 extend at an angle Θ relative to each other substantially corresponding to the central angle of approximately 45° of the arcuate track 121, 122 in question, thus ending in origin point O.

The invention is not limited to the embodiments shown and described in the above, but various modifications and combinations may be carried out without departing from the scope of the appended claims.

P A T E N T K R A V

1. Ovenlysvindue (1') omfattende en karm (2'), en ramme (3'), og et låseaggregat (10) som forbinder rammen (3') med karmen (2'), hvor låseaggregatet (10) er forsynet med mindst én deformationssektion (31, 32, 33, 34) konfigureret til at tillade låseaggregatet (10) at undergå plastisk deformation når ovenlysvinduet udsættes for en pludselig, kraftig belastningsændring såsom et stød, hvor den mindst ene deformationssektion (31, 32, 33, 34) er tilvejebragt i et låsehus (20) af låseaggregatet (10)

k e n d e t e g n e t ved, at

den mindst ene deformationssektion indbefatter mindst én deformationsslids (31, 32, 33, 34) som tilstøder et bueformet spor (121, 122) i låsehuset (20).

2. Ovenlysvindue ifølge krav 1, hvor to bueformede spor (121, 122) er tilvejebragt og mindst én deformationsslids (31, 32) er tilvejebragt tilstødende en første ende (121a) af ét af de to bueformede spor (121, 122).

3. Ovenlysvindue ifølge krav 2, hvor to deformationslidser (31, 33; 32, 34) er tilvejebragt tilstødende henholdsvis en første ende (121a) og en anden ende (121b) af én af de to bueformede spor (121, 122).

4. Ovenlysvindue ifølge et hvilket som helst af kravene 1 til 3, hvor hver deformationsslids (31, 32, 33, 34) er i det væsentligste lineær og har en foruddefineret længde (L) og en foruddefineret bredde (W).

5. Ovenlysvindue ifølge krav 4, hvor den foruddefinerede længde (L) af hver deformationsslids (31, 32, 33, 34) er i intervallet 5 til 15 mm, fortrinsvis omkring 10 mm.

6. Ovenlysvindue ifølge krav 5, hvor den foruddefinerede bredde (W) af hver deformationsslids (31, 32, 33, 34) er i intervallet 1 til 3 mm, fortrinsvis 1,5 til 2 mm, mere fortrinsvis 1,75 mm.

7. Ovenlysvindue ifølge et hvilket som helst af kravene 1 til 6, hvor hvert bueformet spor (121, 122) har en ydre radius (R) og en indre radius (r) målt fra en åbning (22) til en låsemekanisme af låseaggregatet (10) og strækker sig over en buelængde med en central vinkel på omkring 45°.

8. Ovenlysvindue ifølge et hvilket som helst af kravene 3 til 6 og 7, hvor

deformationsslidserne (31, 33; 32, 34) ved én af de to bueformede spor (121, 122) strækker sig med en vinkel (Θ) i forhold til hinanden, som i det væsentligste svarer til den centrale vinkel på omkring 45° for det pågældende bueformede spor (121, 122).

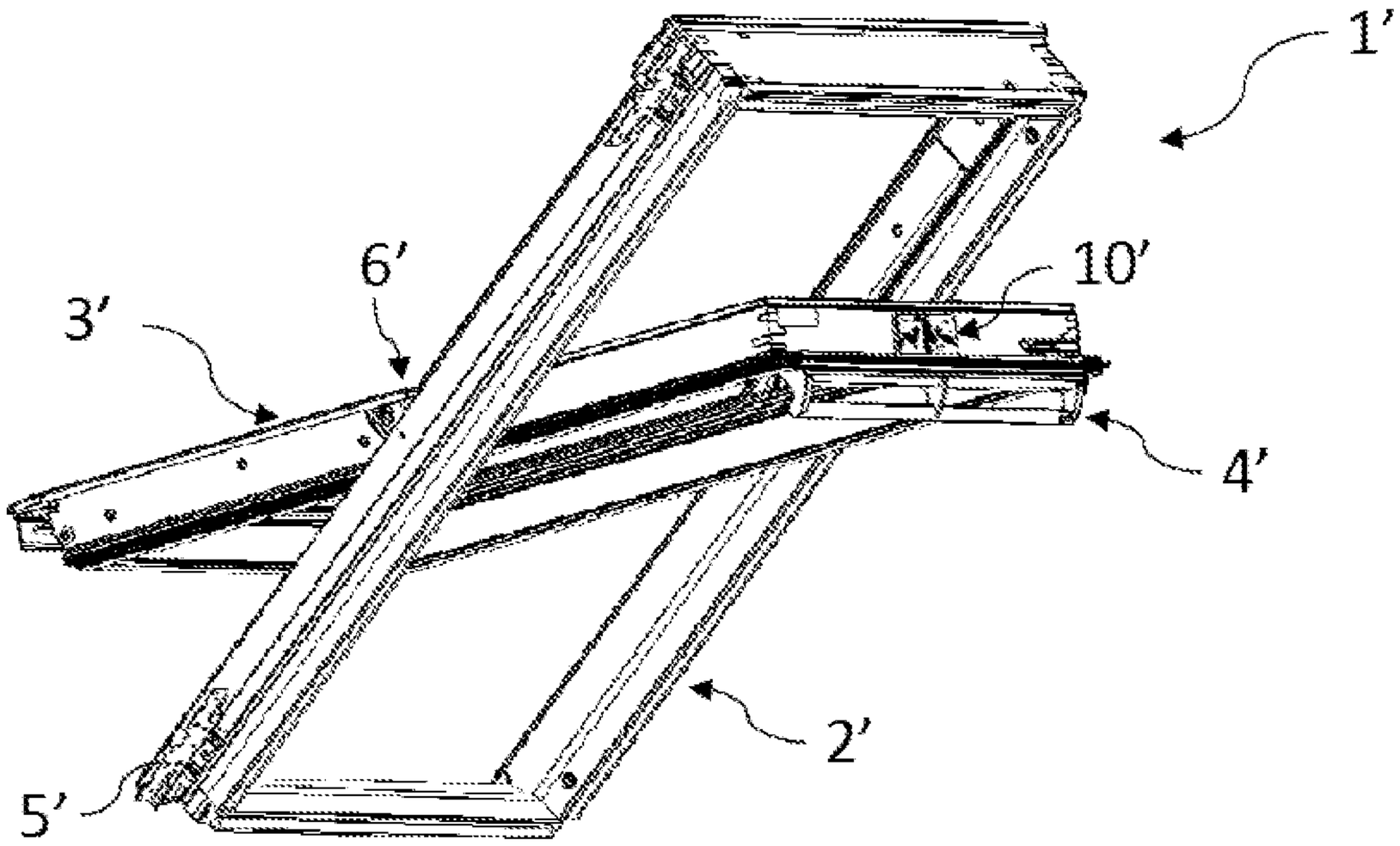


Fig. 1 (PRIOR ART)

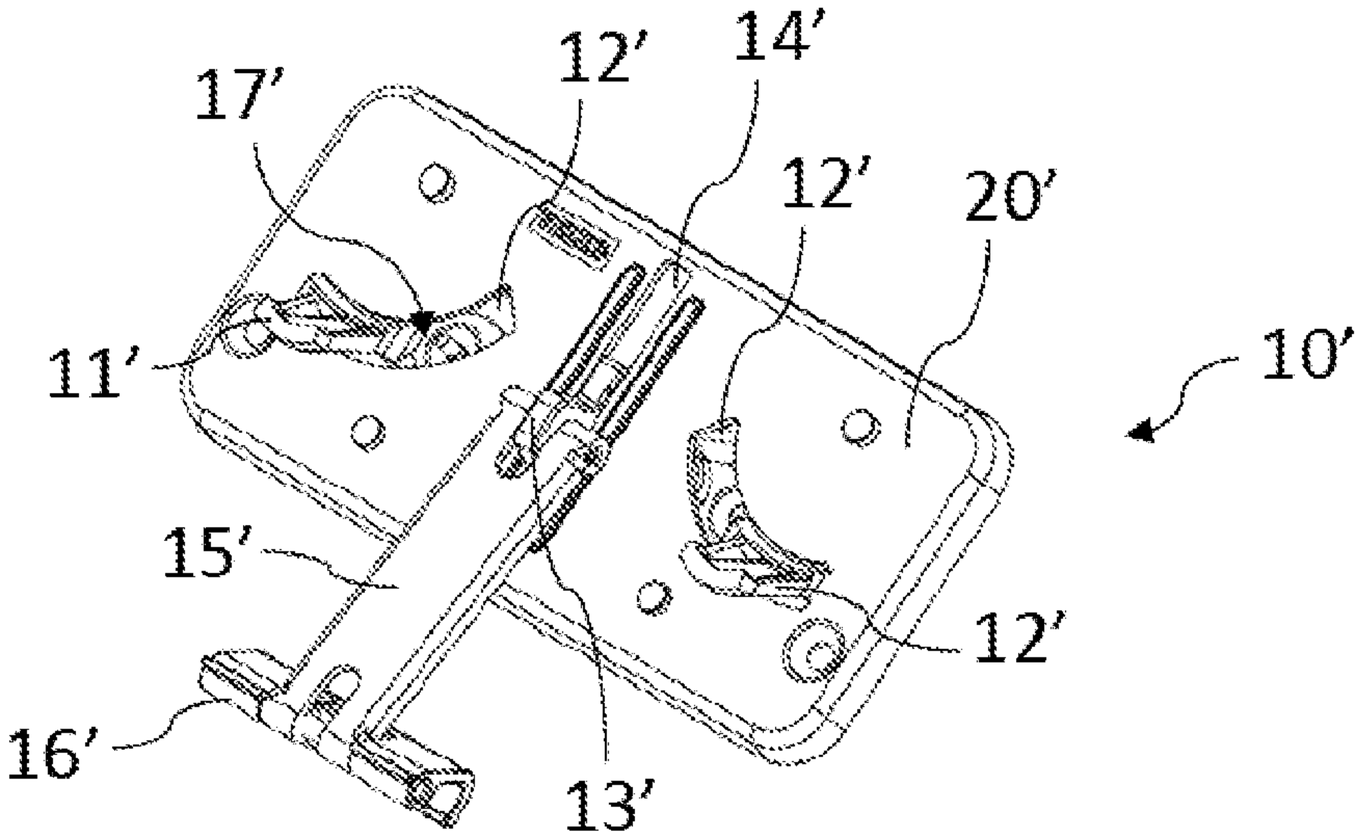
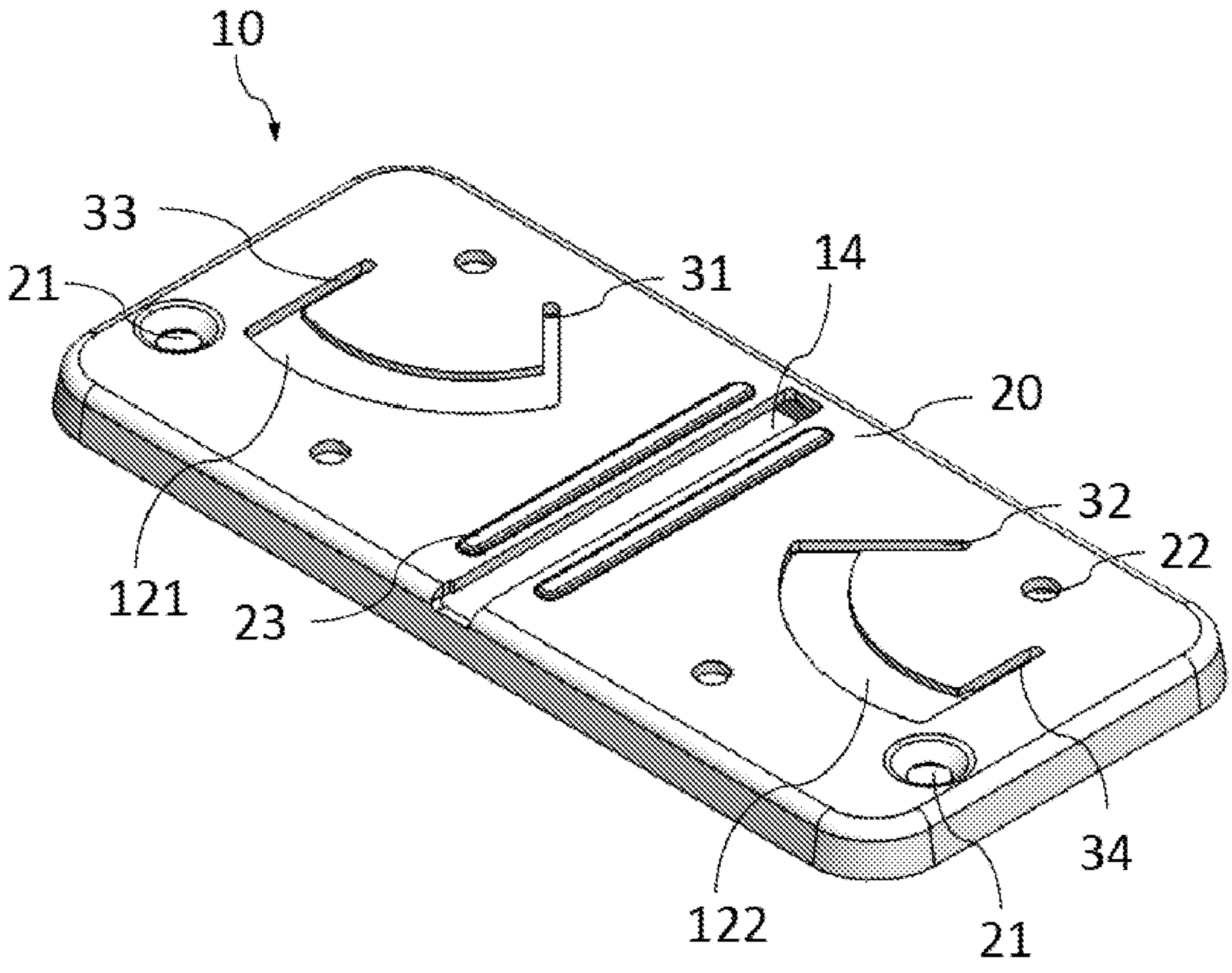


Fig. 2 (PRIOR ART)


10
33
21
31
14
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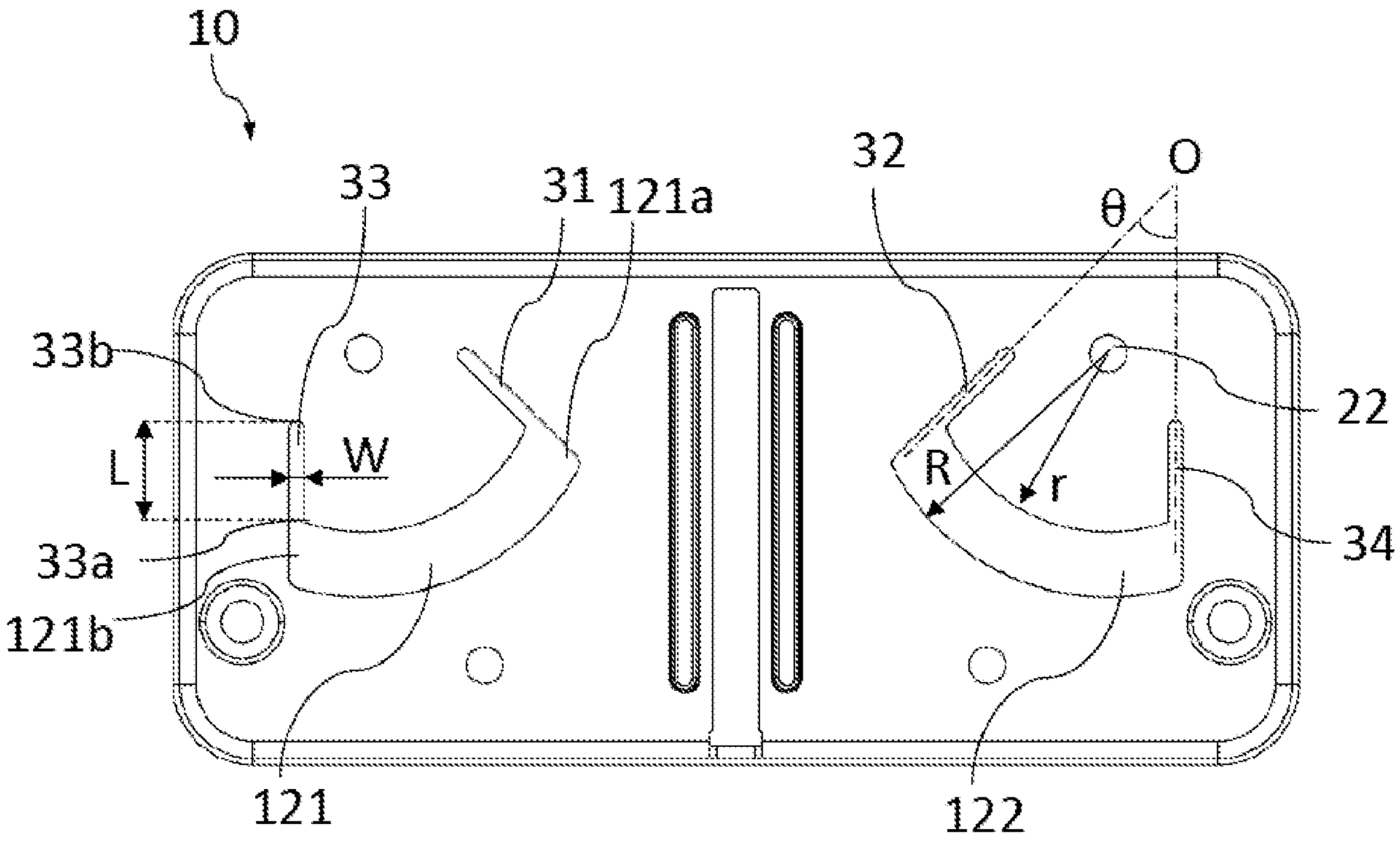
34
122
21

Fig. 3


10
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31
121a
32
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θ
33b
L
W
22
R
r
33a
34
121b
121
122

Fig. 4

DANISH PATENT AND TRADEMARK OFFICE

SUPPLEMENTAL SEARCH REPORT - PATENT	Application No. PA 2018 70622

A. CLASSIFICATION OF SUBJECT MATTER

E04D 13/035 (2006.01); E05C 3/08 (2006.01) & F16F 7/12 (2006.01).

According to International Patent Classification (IPC)

B. FIELDS SEARCHED

PCT-minimum documentation searched (classification system followed by classification symbols)

CPC: E04D, E04B, E05Y, E06B, E05C & F16F.

IPC: E04D, E04B, E06B, E05C & F16F.

Documentation searched other than PCT-minimum documentation

DK, NO, SE, FI: IPC classes: E04D, E04B, E06B, E05C & F16F.

Electronic database consulted during the search (name of database and, where practicable, search terms used)

EPODOC, WPI, FULL TEXT: English & German.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant for claim No.
-	No further documents have been retrieved during the supplemental search.	-

☐ Further documents are listed in the continuation of Box C.

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Danish Patent and Trademark Office
Helgeshøj Allé 81
2630 Taastrup
Denmark

Tel.: +45 4350 8000
Fax: +45 4350 8001

Date of completion of the search report

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Authorized officer

Henrik Mensing

Telefon nr. +45 43 50 85 47