



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.08.2023 Bulletin 2023/32

(51) International Patent Classification (IPC):
A62C 2/16 (2006.01)

(21) Application number: **22155694.7**

(52) Cooperative Patent Classification (CPC):
A62C 2/16; F24F 11/33

(22) Date of filing: **08.02.2022**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) **SMOKE EVACUATION SHUTTER OR FIRE DAMPER WITH A ROLLER SHUTTER**

(57) A safety device selected from a smoke evacuation shutter or a fire damper, comprising:

- a frame defining a passage;
- a roller shutter mounted on said frame and configured move between an open position allowing an air flow through said passage and a closed position shutting of the passage,

wherein the roller shutter is biased by a spring to - in case of a smoke evacuation shutter - the open position, and - in case of a fire damper - the closed position, characterized in that the safety device comprises an electrical drive means configured to move the roller shutter against the force of said spring and in that the safety device comprises means for maintaining the roller shutter in a pre-determined intermediated position between the open position and the closed position, the intermediate position not coinciding with either the open or the closed position.

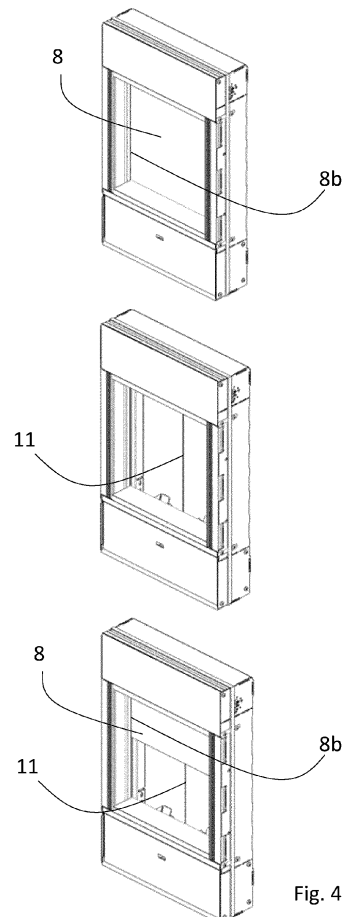


Fig. 4

Description

Field of the Invention

[0001] The present invention concerns a smoke evacuation shutter or fire damper with a roller shutter valve, comprising:

- a frame defining a passage;
- a roller shutter mounted on said frame and configured move between an open position allowing an air flow through said passage and a closed position shutting of the passage,

wherein the roller shutter is biased by a spring to - in case of a smoke evacuation shutter - the open position, and - in case of a fire damper - the closed position.

Background to the Invention

[0002] Smoke evacuation shutters and fire dampers are fire safety devices designed to respectively prevent the spreading of a fire through a building, and evacuate smoke at the fire scene. Both safety devices comprise a frame defining a passage and a valve allowing regulate the opening of the passage in the frame, whereby the valve is connected to a spring that, in case of an alarm, moves the valve from an armed position to an alarm position. Fire valves are usually open in normal conditions (armed position) as they are installed in ventilation ducts. Smoke evacuation shutters are usually kept closed in normal conditions (armed position).

[0003] Depending on the building and a corresponding fire fighting plan, smoke evacuation shutters are configured to fully open or fully close in case of a fire. Usually, the smoke evacuation shutter(s) on the floor where a fire rages are set to open, thereby allowing evacuating the smoke produced through the corresponding passage into a smoke evacuation shaft that is maintained at a pressure below the pressure in the living quarters of the building. On all other floors of the building, the smoke evacuation shutters remain closed. In some cases however, the fire plan requires the smoke evacuation shutter to open to an intermediate position wherein the passage through the corresponding frame is restricted in view of an open position of the valve, yet not fully closed. In order to position a valve to a predetermined intermediate position, it is known to provide physical stopping means in the frame that limit movement of the valve - in a sense from the armed position to the alarm position- to the predetermined intermediate position.

[0004] Roller shutter types of valves are one of the types of valves that can be used in fire dampers or smoke evacuation shutters and have the advantage of a limited depth dimension (dimension in the direction of the air flow through the passage when the valve is open) versus other types of valve such as pivoting blade valves. For that reason, roller shutter types of valves are beneficial

for use when renovating buildings where space restrictions often apply.

Summary of the Invention

[0005] The present invention is defined in the appended independent claims. Preferred embodiments are defined in the dependent claims. In particular, the present invention concerns a smoke evacuation shutter or fire damper with a roller shutter valve, comprising:

- a frame defining a passage;
- a roller shutter mounted on said frame and configured move between an open position allowing an air flow through said passage and a closed position shutting of the passage,

wherein the roller shutter is biased by a spring to - in case of a smoke evacuation shutter - the open position, and - in case of a fire damper - the closed position, characterized in that the safety device comprises an electric drive means configured to move the roller shutter against the force of said spring and in that the safety device comprises means for maintaining the roller shutter in a predetermined intermediated position between the open position and the closed position, the intermediate position not coinciding with either the open or the closed position.

[0006] The present invention thereby allows automation of the opening/closing of the valve to a predetermined intermediate position by programming or steering the electric drive means and hence no longer requires the use of physical stopping means mounted in the frame of the safety device.

[0007] The present invention also concerns a method of controlling a safety device selected from a smoke evacuation shutter or a fire damper, said safety device comprising:

- a frame defining a passage;
- a roller shutter mounted on said frame and configured move between an open position allowing an air flow through said passage and a closed position shutting of the passage,

wherein the roller shutter is biased by a spring to - in case of a smoke evacuation shutter - the open position, and - in case of a fire damper - the closed position, characterized in that the safety device comprises an electric drive means configured to move the roller shutter against the force of said spring and in that the safety device comprises means for maintaining the roller shutter in a predetermined intermediated position between the open position and the closed position, the intermediate position not coinciding with either the open or the closed position, and in that said whereby the method comprises the steps of:

- maintaining the roller shutter in an armed position

being open for a fire damper and closed for a smoke evacuation shutter by means of a lock;

- upon an alarm signal consecutively:
 - releasing the lock and as such moving the roller shutter under impulse of said spring to an open or closed position;
 - activating said electric drive system to partially re-close or re-open the roller shutter to the pre-determined intermediate position.

Description of the appended Figures

[0008]

Fig. 1a, 1b & 1c respectively represent a front, side and top view of a smoke evacuation shutter according to the present invention;

Fig. 2 represents a perspective view of the smoke evacuation shutter of Fig. 1;

Fig. 3 schematically represents slats of a roller shutter applicable in a smoke evacuation shutter of the invention;

Fig. 4 schematically represents the method of opening the smoke evacuation shutter according to the present invention.

Detailed Description

[0009] As shown in Figure 1a-c a smoke evacuation shutter according to the present invention comprises a frame defining a passage and a roller shutter configured to move between an open position allowing an air flow through said passage and a closed position shutting of the passage.

[0010] The frame 1 is in this case made of two upright guides 2, a top profile 3 and a bottom profile 4 that define a rectangular passage 5 in between them. The dimensions of the passage 5 depend on the specific requirements of the building wherein the smoke evacuation shutter is applied. The frame 1 is preferably manufactured in a heat resistant material such as aluminium.

[0011] The top profile 3 is in this case configured as a shutter box with therein two end plates 6 suspending an axle 7 that carries the roller shutter 8. Internally in the shutter box or externally thereof a spring is provided acting on the axle 7 through a transmission (not shown). Further a lock acts on either the transmission or directly on the axle 7 and, when in an active position, prevents rotation of the axle 7. The lock is preferably coupled to a fuse and configured such that when the fuse melts, the lock disengages the transmission or axle 7. Optionally other release mechanisms for the lock can be provided.

[0012] The bottom profile in this case comprises an inner cavity wherein an electric drive means, in particular an electric motor 9 such as a stepper motor or a geared DC motor, is provided. This electric motor 9 drives a winch axle 10 for winding and unwinding a cable 11. The

cable 11 is on the one hand fixed to the winch axle 10 and on the other hand connected to the roller shutter 8, preferably a bottom portion thereof as shown in Fig. 3.

[0013] The upright guides 2 are configured as U-shaped guides bordering two opposed sides of the passage 5 and cooperate with two opposed edges 8b of the roller shutter 8 for guiding a movement thereof between an open and closed position.

[0014] The roller shutter 8 is preferably manufactured of two superimposed sheets 12 & 13 of heat resistant material such as aluminium, with in between these layers 12 & 13 strips or pockets of intumescent material 14.

[0015] Intumescent materials are materials that swell (expands) as a result of heat exposure, thus increasing in volume. More particular an intumescent material undergoes a chemical change when exposed to heat or flames, becoming viscous then forming expanding bubbles that harden into a dense, heat insulating multicellular char. Intumescent materials are well known in the field of smoke evacuation dampers and will not be discussed in further detail. Examples of intumescent materials can be found in US 4,273,879.

[0016] The thickness of the slats roller shutter 8, measured in a direction perpendicular to the plane of the superimposed sheets 12 & 13 at the location of an intumescent stroke or pocket is configured to fit in the U-shaped guides 2, but once the intumescent material has expanded, the thickness of the roller shutter 8 preferably increases to an extent wherein the roller shutter become blocked the U-shaped guides and a friction fit is established between the roller shutter 8 and the U-shaped guides 2, thereby immobilizing the roller shutter 8 in place. The cable 11 is preferably manufactured in steel or stainless steel. Depending on the dimensions of the smoke evacuation shutter and, in particular on the width W of the roller shutter 8, a number of parallel extending cables 11 can be used, each connected on the one hand to the winch axle 10 and on the other hand to the roller shutter.

[0017] In normal conditions, ie. no emergency or fire test, the roller shutter 8 is in a closed state shutting of the passage 5 in the frame 1. The spring is loaded and acts on the roller shutter axle 7 biasing the roller shutter 8 to an open position. The lock maintains the roller shutter 8 in its closed position against the force of the spring. This closed state of the roller shutter 8 with the spring loaded is also referred to as the armed state of the smoke evacuation shutter.

[0018] In case of a fire or another trigger of the release mechanism of the lock, the lock disengages the transmission or shutter axle 7 upon which the roller shutter starts moving towards an open position under impulse of the spring. This movement continuous until the roller shutter opens the passage 5 in the frame 1. As the spring is preferably relatively strong for the dimensions and weight of the roller shutter, this opening of the roller shutter happens relatively fast. The opening of the roller shutter involves an unwinding of the cable 11. Simultaneously with the disengagement of the lock or shortly thereafter,

the electric motor is activated and starts rewinding the cable 11 to a predetermined extent, such that the roller shutter is partially reclosed to an intermediate position not coinciding with either the open or the closed position.

[0019] In case of exposure of the roller shutter to heat of a fire or fire generated smoke, the intumescent material of the slats will expand and a friction fit between the roller shutter 8 and the U-shaped guides 2 is established thereby locking the roller shutter in place, irrespective of the state of the spring, the electric motor 12 or the cable 11.

[0020] Although the above description is made with reference to the smoke evacuation shutter as shown in the figures, the smoke evacuation shutter can be rotated over 90° (or any other angle) such that the upright guides extend in a horizontal longitudinal direction.

[0021] The present invention does not only concern a roller shutter, but also addresses fire dampers. Although the parts of a fire damper according to the invention are in general the same as the parts of the roller shutter described supra, the special organization of these parts will vary. Contrary to what is the case for the roller shutter, the electric drive means are, in case of a fire damper, to be provided at the same side of the passage as the roller shutter.

Claims

1. A safety device selected from a smoke evacuation shutter or a fire damper, comprising:

- a frame defining a passage;
- a roller shutter mounted on said frame and configured move between an open position allowing an air flow through said passage and a closed position shutting of the passage,

wherein the roller shutter is biased by a spring to - in case of a smoke evacuation shutter - the open position, and - in case of a fire damper - the closed position, **characterized in that** the safety device comprises an electrical drive means configured to move the roller shutter against the force of said spring and **in that** the safety device comprises means for maintaining the roller shutter in a predetermined intermediated position between the open position and the closed position, the intermediate position not coinciding with either the open or the closed position.

2. The safety device according to claim 1, the electric drive means comprising a motor driving an axle mounted in said frame for winding or unwinding a cable connected to the roller shutter or vice versa.
3. The safety device according to claim 1 or 2, said roller shutter configured as a sandwich structure with two outer layers and an intermediate layer is an in-

tumescent material.

4. The safety device according to any of the preceding claims, said frame comprising at least two U-shaped guides bordering two opposed sides of the passage, whereby two opposed edges of the roller shutter are guided in said U-shaped guides when moving the roller shutter between the open and closed positions, said U-shaped guides dimensioned such as to obtain a friction fit of the roller shutter in the U-shaped guides upon expansion of the intumescent material.
5. The safety device according to any of the preceding claims, said roller shutter maintained in an armed position, ie. open for a fire damper and closed for a smoke evacuation shutter by means of a lock.
6. The safety device according to claim 5, said lock comprising an actuator comprising a fuse.
7. The safety device according to any of the preceding claims, said electric drive means lodged in a housing mounted in or on the frame, wherein said housing is manufactured in a heat resistant material.
8. A method of controlling a safety device selected from a smoke evacuation shutter or a fire damper, said safety device comprising:

- a frame defining a passage;
- a roller shutter mounted on said frame and configured move between an open position allowing an air flow through said passage and a closed position shutting of the passage,

wherein the roller shutter is biased by a spring to - in case of a smoke evacuation shutter - the open position, and - in case of a fire damper - the closed position, **characterized in that** the safety device comprises an electric drive means configured to move the roller shutter against the force of said spring and **in that** the safety device comprises means for maintaining the roller shutter in a predetermined intermediated position between the open position and the closed position, the intermediate position not coinciding with either the open or the closed position, and **in that** said whereby the method comprises the steps of:

- maintaining the roller shutter in an armed position being open for a fire damper and closed for a smoke evacuation shutter by means of a lock; upon an alarm signal:
- releasing the lock and as such moving the roller shutter under impulse of said spring to an open or closed position;
- activating said electric drive system to par-

tially re-close or re-open the roller shutter
to the predetermined intermediate position.

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Fig. 1c

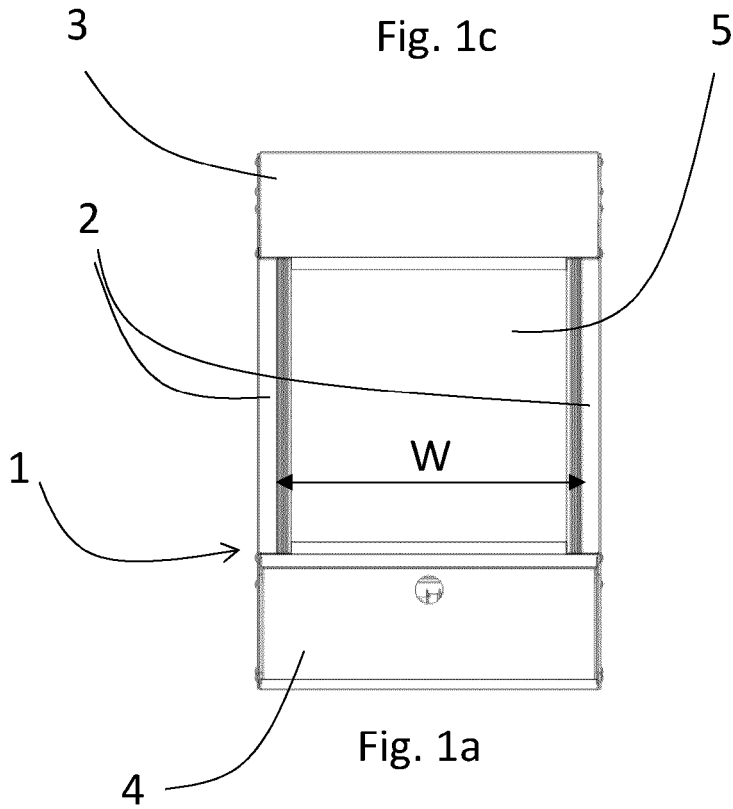


Fig. 1a

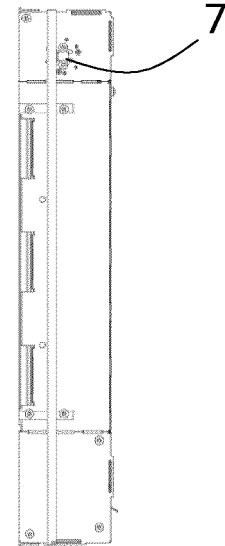


Fig. 1b

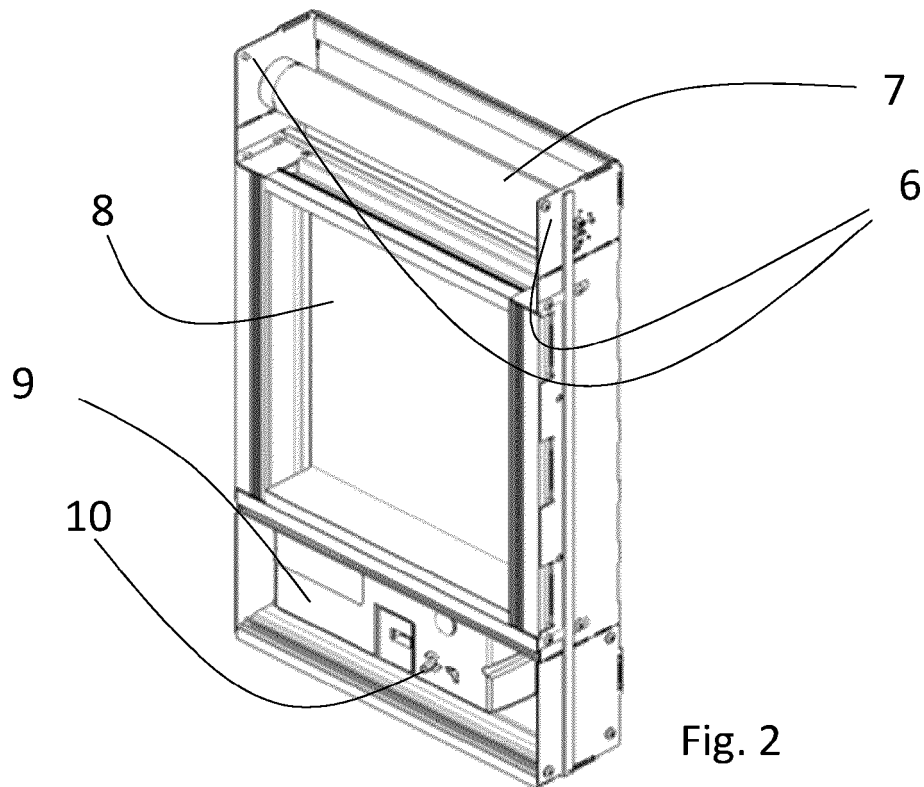


Fig. 2

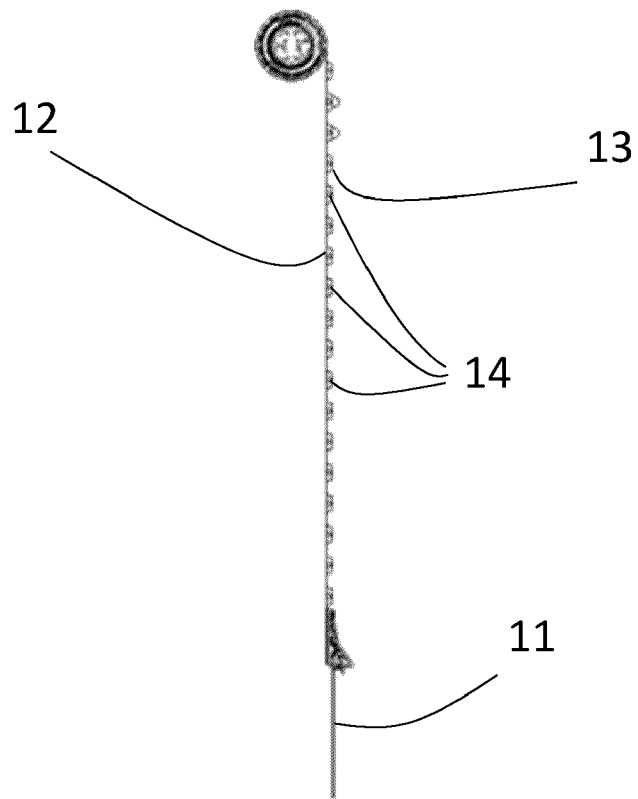


Fig. 3

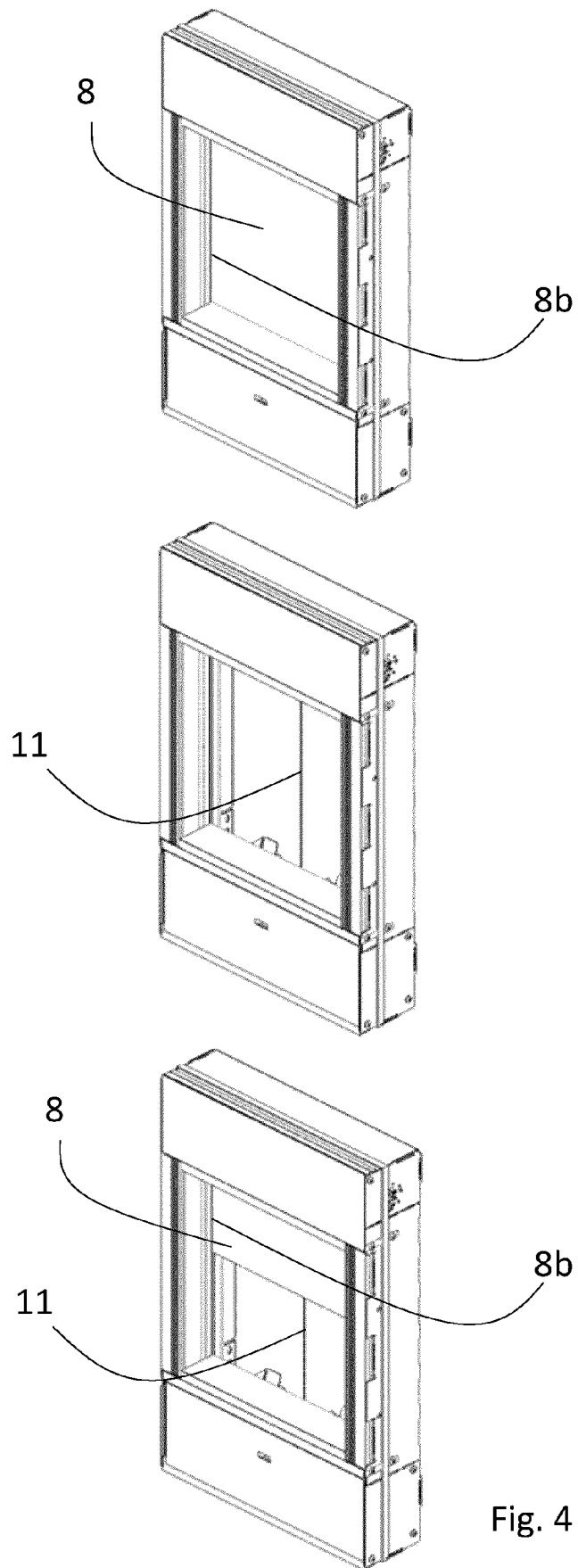


Fig. 4



EUROPEAN SEARCH REPORT

Application Number

EP 22 15 5694

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 1 594 721 A (MILLARD GILMORE) 3 August 1926 (1926-08-03) * page 2, line 107 - line 112; figures * -----	1-8	INV. A62C2/16
A	AU 501 115 B2 (WORMALD INT) 14 June 1979 (1979-06-14) * page 5, line 14 - line 27; figures * -----	1-8	
A	WO 03/095781 A1 (OZROLL IP PTY LTD [AU]; VAN DE LOO PAUL [AU]) 20 November 2003 (2003-11-20) * page 13, line 1 - line 10; figures * -----	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			A62C

The present search report has been drawn up for all claims

Place of search

The Hague

Date of completion of the search

21 July 2022

Examiner

Vervenne, Koen

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 22 15 5694

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The members are as contained in the European Patent Office EDP file on
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21-07-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1594721 A	03-08-1926	NONE	
AU 501115 B2	14-06-1979	NONE	
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REFERENCES CITED IN THE DESCRIPTION

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- US 4273879 A [0015]