

(19)



(11)

EP 4 488 462 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.01.2025 Bulletin 2025/02

(51) International Patent Classification (IPC):
E04B 1/00^(2006.01) E01C 11/04^(2006.01)
E02D 27/01^(2006.01)

(21) Application number: **24176997.5**

(52) Cooperative Patent Classification (CPC):
E04B 1/0038; E01C 11/04; E02D 27/01

(22) Date of filing: **21.05.2024**

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

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(30) Priority: **03.07.2023 HU 2300229**

(54) **BUILDING STRUCTURAL ELEMENT - THERMAL BREAK**

(57) The invention relates to a building structural element (1), particularly for thermally insulating the thresholds of doors and/or gates of warehouses, industrial halls, and other such buildings.

The building structural element according to the invention is characterised by comprising two mutually parallel lower rails (8) and upper rails (7), a screw spindle (4) that is located in a shifted position and is affixed to the lower rails (8) and to the upper rails (7), side plates (2, 3) that are parallel to the lower (8) and upper rails (7), are provided with bores corresponding to the positions of the screw spindles (4), and are affixed to the screw spindles (4), insulation material (10) adapted to fill the space between the lower (8) and upper rails (7) and the side plates (2, 3), and sealing material (11) adapted for laterally sealing the space between the lower (8) and upper rails (7) and the side plates (2, 3), and an air pocket (9) located between the lower (8) and upper rails (7).

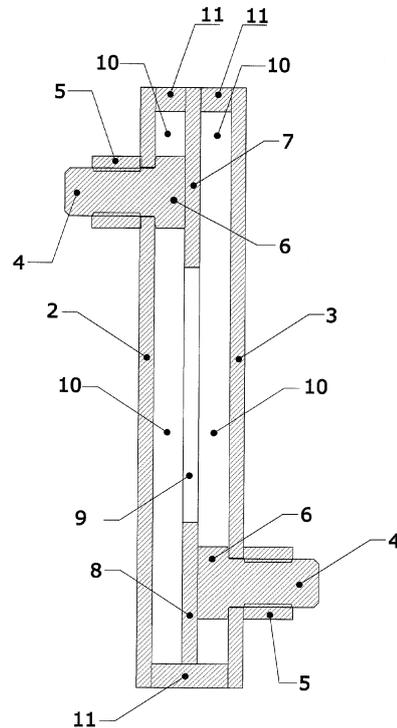


Fig 2

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Description

[0001] The invention relates to a building structural element, particularly for thermally insulating the thresholds of doors and/or gates of warehouses, industrial halls, and other such buildings.

[0002] The rules for constructing buildings and the energy characteristics of new buildings are stipulated in construction regulations. The regulations also lay down the required thermal insulation - heat transmission - characteristics of buildings and separate building units and establish the energy characteristics of newly constructed buildings.

[0003] Thermal insulation and the removal or minimisation of thermal bridges - heat-conducting surfaces - form integral parts of these parameters. The thermal insulation parameters of various components of the building structure - flooring, walls, ceiling, doors, and windows - are stipulated separately in the regulations.

[0004] The prior art contains various technical solutions for providing thermal insulation. Such a method can be learned from the patent description P1900079, wherein a permanent foamwork is applied as a wall base foamwork.

[0005] The patent description P1700513 discloses a building structural element for breaking a thermal bridge, the element being disposed above the wall base of a concrete footing and being provided with a frame partially bounding an inside space and with insulation material disposed in the inside space.

[0006] According to a widely applied solution, the external limiting structure of buildings is provided with active thermal insulation. Such a technical solution disclosed in the patent specification P1100611.

[0007] Active thermal insulation is implemented by means of pipe coils built into the wall. A technical solution applying pipe coils is also disclosed in the document HU 227029.

[0008] The known technical solutions are, however, incapable of providing thermal insulation to threshold sections of building gates.

[0009] In the case of the thresholds installed at gates and entrances to industrial halls, thermal losses are significant due to thermal bridges. The requirements for threshold elements are the following:

- providing thermal insulation between the high load-capacity concrete floor of industrial halls and the environment
- high load capacity, because a rolling load of as high as 25 (metric) tons per day must be considered at the entrances to industrial halls
- low weight
- durability, i.e., resistance to temperature changes, moisture, and wear
- easy cleaning

[0010] The objective of the invention is to provide such

a building structural element that fulfils the above-mentioned requirements and can be easily installed either in newly built or in existing buildings.

[0011] The invention is based on the recognition that by providing a sandwich structure comprising a sealed internal air gap the requirements for the threshold element can be fulfilled.

[0012] The objective according to the invention is achieved by providing such a building structural element that is adapted for providing thermal insulation of the thresholds particularly of doors and/or gates of warehouses, industrial halls and other similar buildings, and that is characterised by comprising two mutually parallel lower rails and upper rails, a screw spindle that is located in a shifted position and is affixed to the lower rails and to the upper rails, side plates that are parallel to the lower and upper rails, are provided with bores corresponding to the positions of the screw spindles, and are affixed to the screw spindles, insulation material adapted to fill the space between the lower and upper rails and the side plates, and sealing material adapted for laterally sealing the space between the lower and upper rails and the side plates, and an air pocket located between the lower and upper rails.

[0013] In a preferred embodiment of the building structural element according to the invention the space between the lower and upper rails and the side plates is defined by the screw head of the screw spindle fixed to the lower and upper rails.

[0014] Another preferred embodiment of the building structural element comprises reinforcement members fixed to the nut on the outside of the side plates, the reinforcement members being U-shaped members.

[0015] In all preferred embodiments of the building structural element according to the invention the insulation material of the building structural element is preferably a flexible, glass-fibre reinforced composite mat material, and the building structural element comprises UV-resistant sealing-insulation material.

[0016] A preferred embodiment of the building structural element - thermal break - according to the invention is described with the help of the accompanying drawings, where

Fig. 1 is a perspective view of the building structural element according to the invention,

Fig. 2 shows, in top plan view, the section taken along the plane A-A of the building structural element according to Fig. 1,

Fig. 3 illustrates by arrows the heat transfer of the building structural element according to Fig. 2, and Fig. 4 is an axonometric view of the building structural element according to the invention provided with reinforcements adapted for attachment.

[0017] The building structural element 1 - thermal break - according to the invention is installed aligned with the plane of doors or gates of larger warehouse

rooms and industrial halls, between the internal and external flooring sections.

[0018] Fig. 1 shows a perspective view of the building structural element implemented as an air-cell sandwich structure that is bounded by two side plates 2 and 3, and is filled up from the top with UV-resistant sealing-insulation material 11 disposed, respectively, between the side plate 2 and the upper support rail 7, and the side plate 3 and the upper support rail 7. The space between the side plate 2 and the side plate 3 is filled with the sealing-insulation material 11 also from the bottom and from the sides. A plurality of screw spindles 4 provided with nuts 5 are disposed on the side plates 2 and 3.

[0019] The configuration of the building structural element according to the invention can be learned from Fig. 2 that is essentially a section taken along section plane A-A of Fig. 1.

[0020] The building structural element 1 comprises two vertical support rails - i.e., an upper support rail 7 and a lower support rail 8 - with the screw heads 6 of a plurality of screw spindles 4 being fixed to the upper support rail 7 and the lower support rail 8.

[0021] The side walls 2 and 3 of the building structural element 1 are disposed parallel to the upper support rail 7 and to the lower support rail 8 such that the screw spindle 4 is passed through the bores formed in the side plates 2 and 3, and the side plates 2 and 3 are fixed to the upper and lower support rails 7, 8 by means of a nut 5 located at the free end of the screw spindle 4. It is noted here that the locations of the screws securing the side plates 2 and 3 are shifted with respect to each other and thus heat transfer between the side plates 2 and 3 is prevented from occurring along a straight line. Thus, a gap having a width corresponding to the width of a screw head 6 is produced between the side walls 2, 3 and the upper and lower support rails 7, 8, with insulation material 10 being filled into the gap.

[0022] An air pocket 9 is located between the upper support rail 7 and the lower support rail 8. The side plates 2 and 3 are bounded laterally by a resilient sealing material 11.

[0023] It is to be noted that the building structural element 1 according to the invention is fully surrounded by the sealing-insulation material.

[0024] Thanks to its configuration, the building structural element 1 has good insulating capacity, and thereby the formation of a continuous thermal bridge in the threshold need not be a consideration.

[0025] Different heat transmission coefficients should be considered for each portion of the building structural element 1 according to the invention, which coefficients can be obtained by the following formulas:

$$U_1 = \frac{1}{\frac{1}{\alpha_i} + \sum_{i=0}^n \frac{d_i}{\lambda_i} + \frac{1}{\alpha_e}} = \left[\frac{W}{m^2 \cdot K} \right]$$

where

α_i : inside heat transfer coefficient $\left[\frac{W}{m^2 \cdot K} \right]$

α_e : outside heat transfer coefficient $\left[\frac{W}{m^2 \cdot K} \right]$
d: material thickness mm

λ : thermal resistance $\left[\frac{W}{m \cdot K} \right]$

[0026] Based on the heat transmission coefficients calculated for surfaces I-VIII indicated in Fig. 3, the resultant heat transmission coefficient of the building structural component 1 according to the invention is

$$U_e = 0,689162 \left[\frac{W}{m^2 \cdot K} \right]$$

and

$$U_e = 0,687964 \left[\frac{W}{m^2 \cdot K} \right]$$

which is the function of the material of the applied support rails 7 and 8 and of the side plates 2 and 3, along a length of 3 metres

[0027] A U-shaped reinforcement is applied for installing the building structural element 1 described in relation to Figs. 1 and 2 (see Fig. 4).

[0028] The U-shaped members of the reinforcement 12 are secured to the screw spindle of the building structural element 1, and are configured in a manner known per se.

[0029] The insulation material of the building structural element 1 is preferably a flexible, glass-fibre reinforced composite mat material that is completely hydrophobic, but has good moisture transmission capacity, and is not prone to mould.

[0030] In the case of the building structural element 1, a UV resistant resilient sealing material is applied that prevents the corrosion of the building structural element 1 and the reduction of thermal insulation capacity due to moisture.

[0031] The building structural element according to the invention has the following advantages:

- good thermal insulation capacity
- it has low mass, is durable, has high load capacity, can be cleaned easily
- it can be installed in the floor of existing buildings with minimal floor breaking.

LIST OF REFERENCE NUMERALS

[0032]

| | | |
|----|---------------------|----|
| 1 | thermal break | |
| 2 | side plate | |
| 3 | side plate | |
| 4 | screw spindle | |
| 5 | nut | 5 |
| 6 | screw head | |
| 7 | upper support rail | |
| 8 | lower support rail | |
| 9 | air pocket | |
| 10 | insulation material | 10 |
| 11 | sealing material | |
| 12 | reinforcement | |

Claims

- 15
1. A building structural element (1) particularly for thermally insulating the thresholds of doors and/or gates of warehouses, industrial halls, and other such buildings, **characterised by** comprising two mutually parallel lower rails (8) and upper rails (7), a screw spindle (4) that is located in a shifted position and is affixed to the lower rails (8) and to the upper rails (7), side plates (2, 3) that are parallel to the lower (8) and upper rails (7), are provided with bores corresponding to the positions of the screw spindles (4), and are affixed to the screw spindles (4), insulation material (10) adapted to fill the space between the lower (8) and upper rails (7) and the side plates (2, 3), and sealing material (11) adapted for laterally sealing the space between the lower (8) and upper rails (7) and the side plates (2, 3), and an air pocket (9) located between the lower (8) and upper rails (7). 20 25 30
 2. The building structural element (1) according to claim 1, **characterised in that** the space between the lower (8) and upper rails (7) and the side plates (2, 3) is defined by the screw head (6) of the screw spindle (4) fixed to the lower (8) and upper rails (7). 35
 3. The building structural element (1) according to claims 1 or 2, **characterised in that** it comprises reinforcement members fixed to the nut (5) on the outside of the side plates (2, 3). 40
 4. The building structural element (1) according to claim 3, **characterised by** comprising a U-shaped reinforcement (12). 45
 5. The building structural element (1) according to any of claims 1-4, **characterised in that** the insulation material (10) is a flexible, glass-fibre reinforced composite material. 50
 6. The building structural element according to any of claims 1-5, **characterised in that** it comprises UV-resistant sealing and insulation material (11). 55

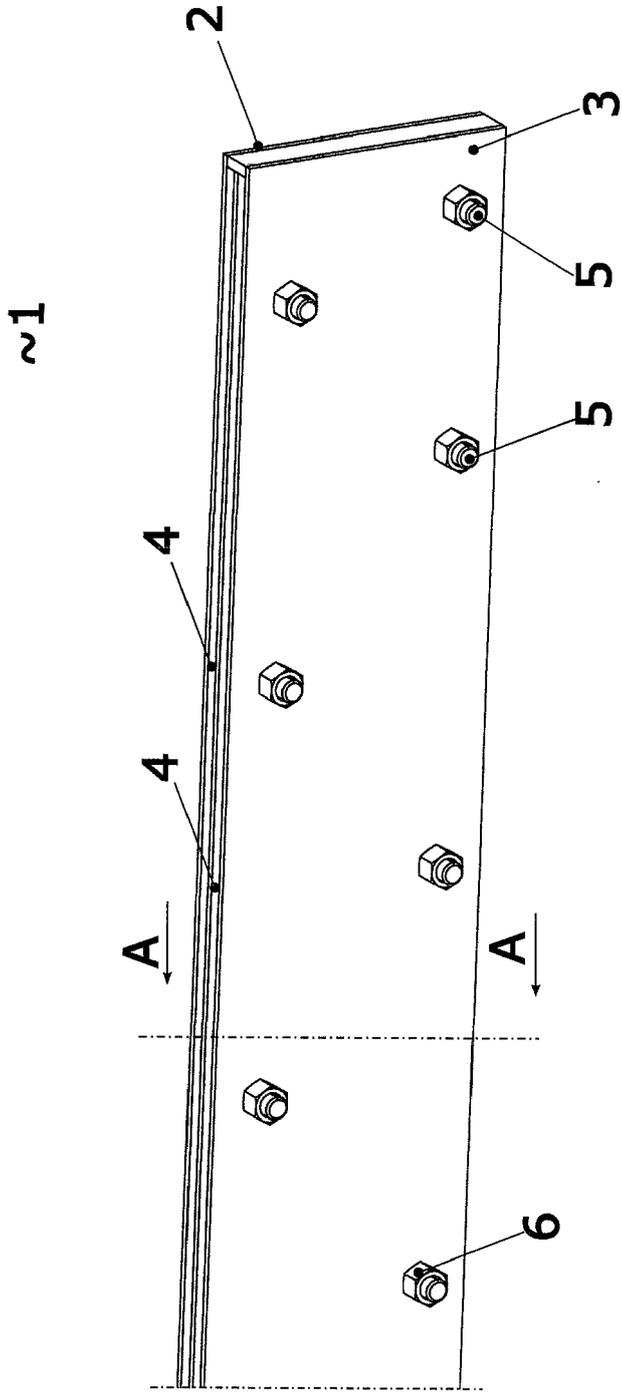


Fig 1

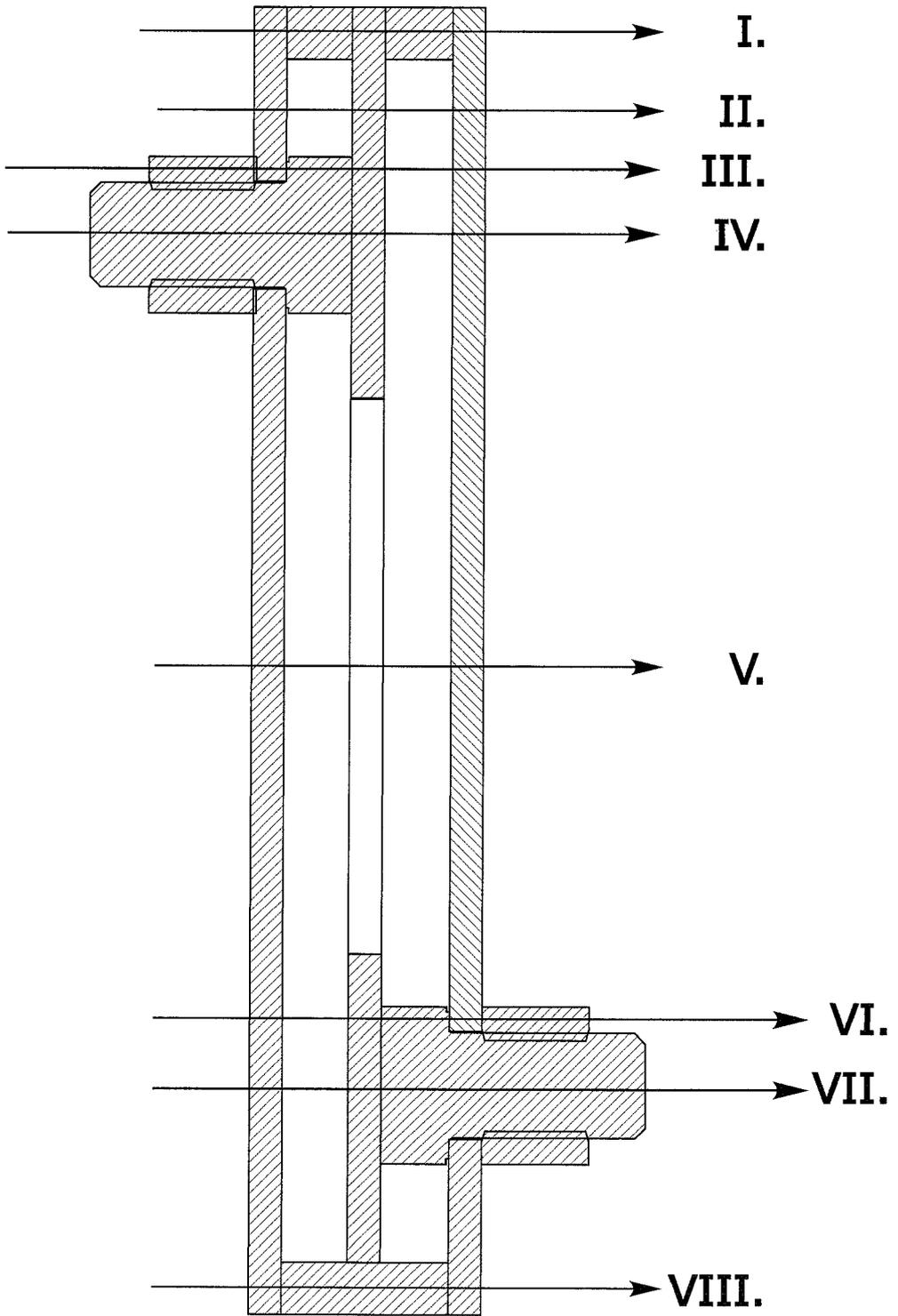


Fig 3

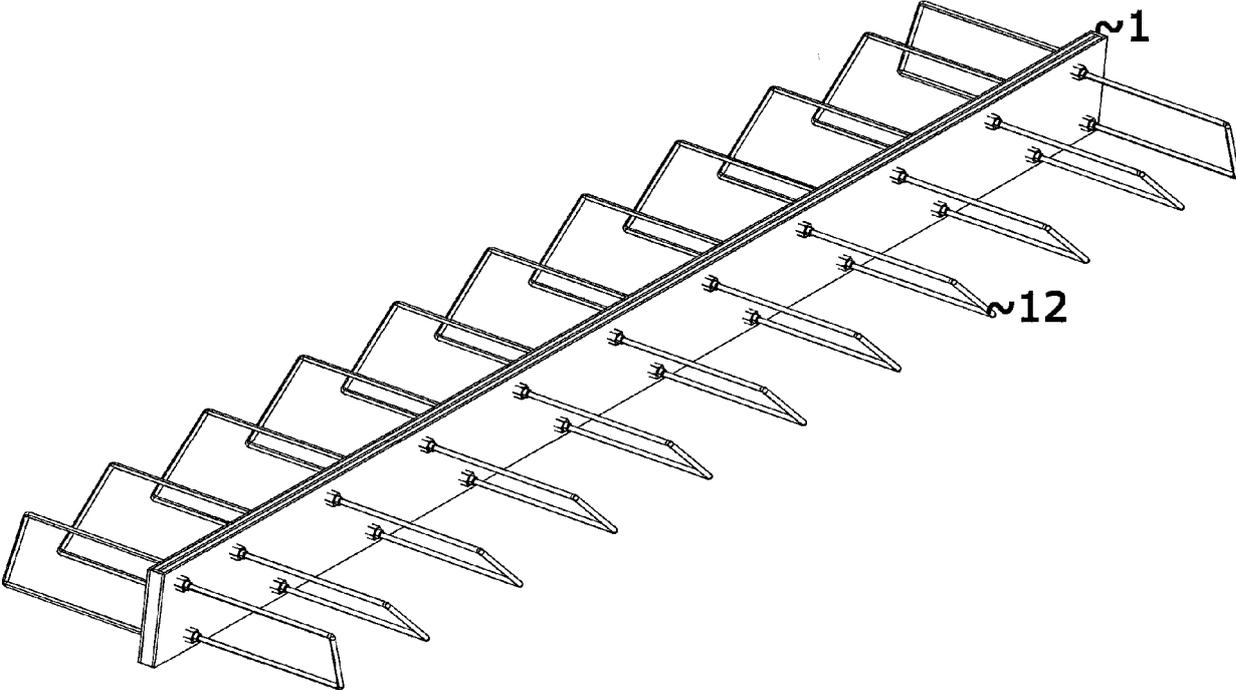


Fig 4



EUROPEAN SEARCH REPORT

Application Number
EP 24 17 6997

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| 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 2021/172240 A1 (KIRSCHNER JIM [CA]) 10 June 2021 (2021-06-10) | 1 | INV. E04B1/00 |
| A | * paragraph [0001] - paragraph [0084]; figures 1-11 * | 2-6 | E01C11/04 E02D27/01 |
| ----- | | | |
| X | US 8 973 317 B2 (LARKIN JAMES [US]) 10 March 2015 (2015-03-10) | 1 | |
| A | * column 1, line 51 - column 8, line 11; figures 1-9 * | 2-6 | |
| ----- | | | |
| X | US 2021/040735 A1 (HASEGAWA TOMOYA [JP] ET AL) 11 February 2021 (2021-02-11) | 1 | |
| | * paragraph [0001] - paragraph [0097]; figures 1-5 * | | |
| ----- | | | |
| | | | TECHNICAL FIELDS SEARCHED (IPC) |
| | | | E04B E06B E01C E02D |
| The present search report has been drawn up for all claims | | | |
| Place of search | | Date of completion of the search | |
| The Hague | | 8 November 2024 | |
| | | Examiner | |
| | | Dieterle, Sibille | |
| CATEGORY OF CITED DOCUMENTS | | | |
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 24 17 6997

5 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
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08-11-2024

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|--|------------------|-------------------------|------------------|
| US 2021172240 A1 | 10-06-2021 | NONE | |
| ----- | | | |
| US 8973317 B2 | 10-03-2015 | NONE | |
| ----- | | | |
| US 2021040735 A1 | 11-02-2021 | CA 3093103 A1 | 12-09-2019 |
| | | EP 3763893 A1 | 13-01-2021 |
| | | JP 7246749 B2 | 28-03-2023 |
| | | JP WO2019172040 A1 | 12-02-2021 |
| | | PH 12020500659 A1 | 07-06-2021 |
| | | SG 11202008445V A | 29-10-2020 |
| | | TW 201938888 A | 01-10-2019 |
| | | US 2021040735 A1 | 11-02-2021 |
| | | WO 2019172040 A1 | 12-09-2019 |
| ----- | | | |

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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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Patent documents cited in the description

- HU 227029 [0007]