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(71) Applicant: **The Smiley Company SPRL**
1050 Brussels (BE)

(72) Inventor: **LOUFRANI, Nicolas David Yves**
London, SE1 3ER (GB)

(74) Representative: **Boult Wade Tennant LLP**
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT (GB)

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(54) CONSTRUCTION SYSTEM

(57) A construction system comprising a plurality of frames (10). Each frame (10) has a plurality of sides (20), each side (20) comprising integral frame connecting means (30) for interconnecting a plurality of frames (10)

to form a unit cell (12). Each frame (10) further comprises integral cell connecting means (40) for interconnecting adjacent frames (10) of two adjacent unit cells (12).

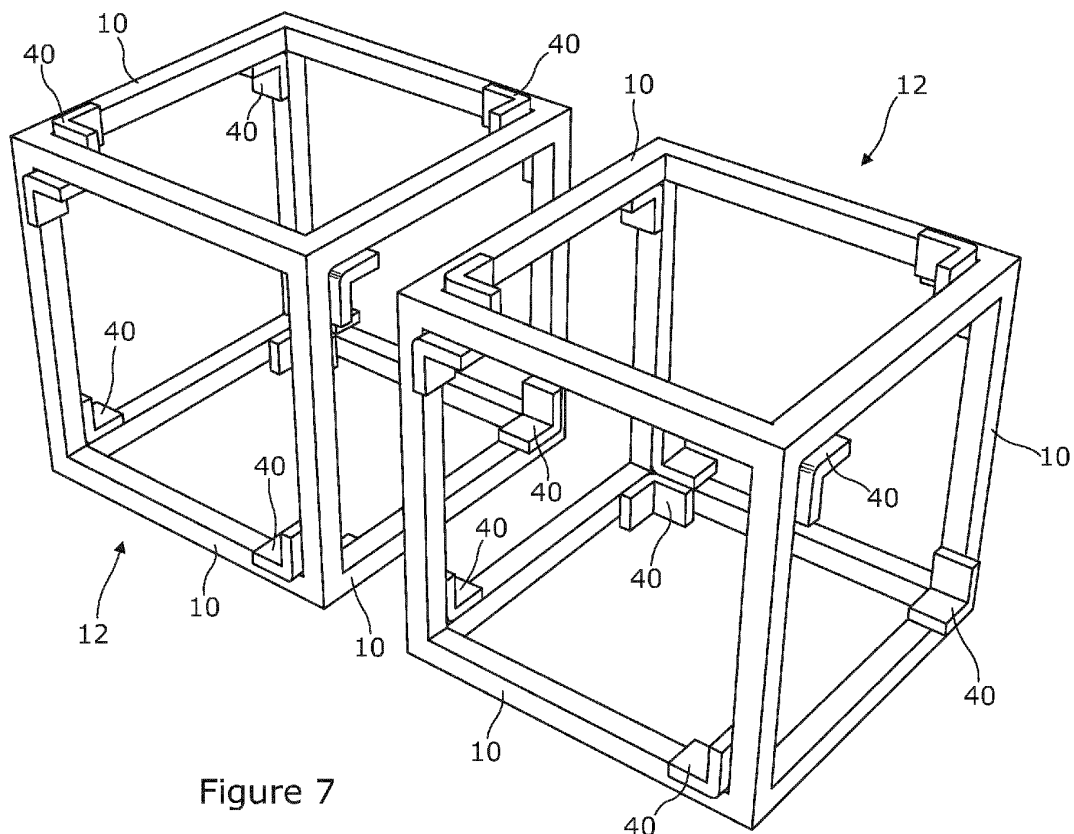


Figure 7

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Description

Technical Field

[0001] The present invention relates to a construction system.

Background

[0002] It is widely known to use simple construction systems to enable the construction of a wide range of structures for a variety of purposes. For example, simple construction systems are frequently used as toys. As a further example, simple construction systems may be used to provide a flexible system for adaptable furniture.

[0003] GB-A-1566598 discloses a construction system comprising building units comprising a four-sided frame surrounding a frame opening. The building units may be interconnected to form a three-dimensional cube. Two cubes may be connected to each other by means of fasteners. Covers are provided for closing the frame opening of the building unit.

Summary

[0004] According to the invention, there is provided a construction system comprising: a plurality of frames, each frame having a plurality of sides, each side comprising integral frame connecting means for interconnecting a plurality of frames to form a unit cell; each frame further comprising integral cell connecting means for interconnecting adjacent frames of two adjacent unit cells.

[0005] Preferably, the construction system comprises a plurality of identical frames, each side comprising integral frame connecting means for interconnecting a plurality of such frames to form a unit cell.

[0006] Preferably, each side comprises integral frame connecting means for interconnecting a plurality of identical frames to form a unit cell.

[0007] Preferably, the unit cell comprises a number of sides, wherein each frame forms one side of the unit cell.

[0008] Preferably, the frame connecting means comprises one or more plates configured such that the plates of adjacent frames achieve an interference fit with each other.

[0009] Preferably, the frame connecting means comprises a first frame connecting means comprising two plates and a second frame connecting means comprising three plates.

[0010] Preferably, one or more pairs of corresponding mating surfaces of the plates of the first and second frame connecting means may comprise a complementary protrusion and groove.

[0011] Preferably, the cell connecting means comprises a corner piece in at least two diametrically opposing corners of each frame, the corner pieces configured to extend out of a unit cell and to provide an interference fit between two adjacent unit cells.

[0012] Preferably, the construction system further comprises one or more panels comprising panel connecting means configured for attaching the panel to a frame.

[0013] Preferably, the panel connecting means is configured for engaging with the cell connecting means of a frame to provide an interference fit.

[0014] Preferably, the one or more panels further comprises a further panel connecting means configured for engaging a frame at a location other than the cell connecting means.

[0015] Preferably, the one of more panels further comprises a lip at a periphery of the one or more panels to facilitate removing a panel from a frame.

[0016] Preferably, the construction system further comprises secondary cell connecting means.

[0017] Preferably, the secondary cell connecting means comprises a connector, and at least one corner of each frame comprises a complementary connector aperture.

[0018] Preferably, the construction system is a toy construction system.

[0019] Preferably, an external length of the sides of the frame may be less than 300mm.

[0020] Preferably, an external length of the sides of the frame may be more than 200mm.

Brief Description of the Drawings

[0021] A preferred embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a construction system according to the present invention;

Figure 2 is a perspective view of a frame for use with the construction system of Figure 1;

Figure 3 is a bottom plan view of the frame of Figure 2;

Figure 4 is a perspective view of a panel for use with the construction system of Figure 1;

Figure 5 is a bottom plan view of the panel of Figure 4;

Figures 6 to 8 show construction steps for the construction system of Figure 1;

Figure 9 is a perspective view of a preferred form of the construction system of Figures 1 to 8, where there is additionally provided a secondary cell connecting means; and

Figure 10 is a perspective view of the secondary cell connecting means of Figure 9.

Detailed Description

[0022] Figure 1 illustrates a construction system according to the present invention. The construction system comprises two types of building element: frames 10 and panels 11. Frames 10 may be interconnected to form unit cells 12, which may in turn be interconnected in any number of possible ways to form a structure 13. Panels 11 may be applied to any outwardly facing frames 10 of the unit cells 12 on the structure 13.

[0023] Each frame 10 (illustrated in further detail in Figures 2 and 3) may be in the form of a square having four sides 20 defining an aperture 21. The frame 10 may comprise a right-angled section having a first flat 22 in the plane of the frame 10 and a second flat 23, perpendicular to the first flat 22, extending in a first direction from an inner edge of the first flat 22. As can be seen in Figure 2, an outer edge of the first and second flats 22,23 may be bevelled such that the bevels 24 are coplanar at an angle of substantially 45°.

[0024] Each side 20 of the frame 10 may be provided with one or more integral frame connecting means 30 for interconnecting the frames 10 to form a unit cell 12. The frame connecting means 30 may comprise one or more plates 31 extending between the first flat 22 and the second flat 23, and standing perpendicular to both the first flat 22 and the second flat 23. In the embodiment shown in Figures 2 and 3, each side 20 of the frame 10 is provided with a first frame connecting means 32, comprising two plates 31, and a second frame connecting means 33, comprising three plates 31. The distance between the plates 31 of the first frame connecting means 32 may be substantially equal to or slightly smaller than a width of the plates 31 of the second frame connecting means 33. The distance between the plates 31 of the second frame connecting means 33 may be substantially equal to or slightly smaller than a width of the plates 31 of the first frame connecting means 32. Thus the plates of the first and second frame connecting means 32,33 may slot between each other with an interference fit (also known as a friction fit).

[0025] Although not essential, in alternative embodiments (not shown), a different number of frame connecting means 30 may be provided on each side 20 of the frame 10. Additionally or alternatively, the frame connecting means 30 may comprise a different number of plates 31. In one embodiment, the first frame connecting means 32 may comprise n plates 31, where n is greater than or equal to one, and the second frame connecting means 33 may comprise $n+1$ plates 31. In an alternative embodiment, each side 20 of the frame 10 may be provided with one or more identical frame connecting means 30, again positioned such that any two sides 20 of two frames 10 may be connected to each other.

[0026] In all embodiments, the frame connecting means 30 are positioned on each side 20 of the frame 10 such that any one side 20 of one frame 10 may be connected to any one side 20 of another frame 10, e.g.

via complementary connecting means 30 on abutting frames 10. In particular, two sides 20 may be connected such that they extend in parallel over the same longitudinal length and fully overlap. To achieve this, each side 20 of the frame 10 may be identical to each other and collectively may have rotational symmetry about a centre-point of the frame 10. Additionally, the positioning of the plates 31 of the connecting means 30 on each side 20 may be asymmetric about a transverse central axis of the side 20.

[0027] One or more pairs of corresponding mating surfaces of the plates 31 of the first and second frame connecting means 32,33 may comprise a complementary protrusion 34 and groove 35, to improve the connection between the first and second frame connecting means 32,33. In the embodiment of the frame 10 illustrated in Figures 2 and 3, the external surface of each of the two plates 31 of the first frame connecting means 32 are provided with a protrusion 34, and the internal surface of each of the outer two plates 31 of the female frame connecting means 32 are provided with a complementary groove 35.

[0028] As shown in Figures 2 and 3, an integrally formed cell connecting means 40 may be provided in each of two diametrically opposing internal corners of the frame 10. The cell connecting means 40 may function to interconnect two adjacent unit cells 12, or to attach a panel 11 to the outside of a frame 10. Each cell connecting means 40 may comprise a corner-piece having an L-shaped cross-section having two arms. The corner-piece may abut the second flat 23 of two adjacent sides 20 of the frame 10, and may extend out of the frame 10 in a second direction that opposes the first direction. Each arm of the cell connecting means 40 may not overlap a transverse central axis of the corresponding side 20 of the frame 10.

[0029] In an alternative embodiment (not shown), the cell connecting means 40 may comprise a flat-piece abutting the second flat 23 of each of the four sides 20 of the frame 10, extending out of the frame 10 in a second direction that opposes the first direction. In this embodiment, the positioning of the cell connecting means 40 on each side 20 may be asymmetric about a transverse central axis of the side 20 and may not overlap the transverse central axis.

[0030] Each panel 11 (illustrated in further detail in Figures 4 and 5) may comprise a planar element 50 for covering the aperture 21. The planar element 50 may have substantially the same shape as the aperture 21. In the embodiment shown in the figures, the planar element 50 is substantially square shaped. The dimensions of the planar element 50 may be substantially equal to or greater than the dimensions of the aperture 21, but less than the external dimensions of the frame 10.

[0031] A first panel connecting means 51, comprising an L-shaped section extending out of a first face of the planar element 50, may be provided at each of two diametrically opposing corners of the planar element 50.

The two first panel connecting means 51 may be diametrically spaced from each other to provide an interference fit with the two opposing internal corners of a frame 10 that do not contain the cell connecting means 40. A second panel connecting means 52 may be provided at each of the remaining two diametrically opposing corners of the planar element 50. Each second panel connecting means 52 may comprise a panel protrusion 53 which may be shaped, dimensioned, and positioned to provide an interference fit between the diametrically opposed cell connecting means 40 of a frame 10. If the dimensions of the planar element 50 are greater than the dimensions of the aperture 21, a lip 54 may be between the first panel connecting means 51 and a periphery of the panel 11, for facilitating removal of the panel 11 from a frame 10.

[0032] The planar element 50 may have a thickness greater than a depth by which the cell connecting means 40 extends out of the frame 10. The planar element 50 may comprise a recess 55 between the second panel connecting means 52 and a periphery of the panel 11, for receiving a cell connecting means 40 of the frame 10. The depth of the recess 55 may be substantially equal to the depth by which the cell connecting means 40 extends out of the frame 10, such that there is substantially no visible gap between a panel 11 and a frame 10 when they are connected to each other.

[0033] Panels 11 may be available in a variety of colours and/or patterns. The panels 11 may be opaque, translucent, or transparent. The panels 11 may have a reflective external surface.

[0034] The construction system may further comprise secondary cell connecting means 60 for interconnecting adjacent unit cells 12, in addition to the integral cell connecting means 40. The secondary cell connecting means 60 may comprise a connector 61. The connector 61 may comprise an elongate body 62 having an outwardly projecting flange 63 positioned substantially centrally along a length of the body 62. The flange 63 may act as an abutment. A longitudinal cross-section of the body 62 (i.e. perpendicular to a longitudinal axis of the body 62) may be of any shape, for example circular, square, or triangular. At least one corner of the first flat 22 of each frame 10 may be provided with a connector aperture 64 having a complementary shape to the longitudinal cross-section of the body 62, and may be sized to achieve an interference fit with the body 62. Preferably, all corners of the first flat 22 of each frame 10 may be provided with a connector aperture 64.

[0035] The frame 10 and the panel 11 may be manufactured from any suitable material, such as a plastic. A non-limiting example of a suitable plastic is acrylonitrile butadiene styrene (ABS).

[0036] Figures 6 to 8 illustrate how a structure 13 may be formed from the construction system. In use, a plurality of frames 10 may be interconnected via the frame connecting means 30 to form a unit cell 12. Each frame 10 forms one side of the unit cell 12, such that each side of the unit cell 12 comprises cell connecting means 40. Unit

cells 12 may then be connected to each other via the cell connecting means 40, such that the cell connecting means 40 provided in each of two diametrically opposing internal corners of a frame 10 of one unit cell 12 provide an interference fit with the two diametrically opposing internal corners not having cell connecting means 40 on an adjacent frame 10 of an adjacent unit cell 12 (and vice versa). Where secondary cell connecting means 60 are provided, a connector 61 may be inserted into one or more of the connector apertures 64 prior to connecting adjacent unit cells 12, to provide a further connection between adjacent unit cells 12. Any number of unit cells 12 may be connected in this manner to form a wide variety of structures 13. Finally, panels 11 of varying colours and designs may be connected to the outwardly facing frames 10 of the unit cells 12 to provide a skin to the structure 13. The panels 11 connect to the frames 10 via the engagement of the cell connecting means 40 with the second panel connecting means 52, as well as the engagement of the first panel connecting means 51 with the two opposing internal corners of a frame 10 that do not contain the cell connecting means 40.

[0037] Although it is presented in all of the illustrated embodiments that the construction system comprises a plurality of identical frames 10, it is not essential that the frames be identical. For example, the construction system may comprise a plurality of square frames 10 and a plurality of rectangular frames having a corresponding dimension to the square frames 10. In such a system, a unit cell 12 may be formed by interconnecting six square frames, or by interconnecting four rectangular frames with two square frames.

[0038] The construction system may have a number of uses, with the intended use of the construction system determining the dimensions of the frames 10 and panels 11. For example, the construction system may be a toy construction system. Alternatively, the construction system may be used to construct room furniture, such as a desk, table, room divider, or playhouse. The furniture may be intended for use by adults or children. The use of translucent panels 11 may enable the construction system to be used to create light features.

[0039] In the case of a toy construction system, an external length of the sides 20 of the frame 10 (i.e. a length of a side of the unit cell 12) may be less than 300mm, more preferably less than 150mm, more preferably less than 100mm. For example, the length of the side 20 may be selected from a range of from 55mm to 65mm, more preferably 58mm.

[0040] In the case of a furniture construction system, an external length of the sides 20 of the frame 10 (i.e. a length of a side of the unit cell 12) may be more than 150mm. For example, the length of the side may be 200mm. The use of secondary cell connecting means 60 may be particularly advantageous in the case of a furniture construction system, to reinforce the connection between adjacent unit cells 12.

[0041] Although the illustrated embodiment of the con-

struction system comprises substantially square-shaped frames 10 and panels 11, frames 10 and panels 11 having the form of other regular polygons are also envisaged.

Claims

1. A construction system comprising:

a plurality of frames (10), each frame (10) having a plurality of sides (20), each side (20) comprising integral frame connecting means (30) for interconnecting a plurality of frames (10) to form a unit cell (12);
each frame (10) further comprising integral cell connecting means (40) for interconnecting adjacent frames (10) of two adjacent unit cells (12).

2. A construction system according to claim 1, wherein the construction system comprises a plurality of identical frames (10).

3. A construction system according to claim 1 or claim 2, wherein the unit cell (12) comprises a number of sides, and wherein each frame (10) forms one side of the unit cell (12).

4. A construction system according to any one of the preceding claims, wherein the frame connecting means (30) comprises one or more plates (31) configured such that the plates (31) of adjacent frames (10) achieve an interference fit with each other.

5. A construction system according to claim 4, wherein the frame connecting means (30) comprises a first frame connecting means (32) comprising two plates (31) and a second frame connecting means (33) comprising three plates (31).

6. A construction system according to claim 5, wherein one or more pairs of corresponding mating surfaces of the plates of the first and second frame connecting means (32,33) may comprise a complementary protrusion (34) and groove (35).

7. A construction system according to any one of the preceding claims, wherein the cell connecting means (40) comprises a corner piece in at least two diametrically opposing corners of each frame (10), the corner pieces configured to extend out of a unit cell (12) and to provide an interference fit between two adjacent unit cells (12).

8. A construction system according to any one of the preceding claims, further comprising one or more panels (11) comprising panel connecting means (51,52) configured for attaching the panel (11) to a frame (10).

9. A construction system according to claim 8, wherein the panel connecting means (52) is configured for engaging with the cell connecting means (40) of a frame (10) to provide an interference fit.

10. A construction system according to claim 8 or claim 9, wherein the one or more panels (11) further comprises a further panel connecting means (51) configured for engaging a frame (10) at a location other than the cell connecting means (40).

11. A construction system according to any one of claims 8 to 10, wherein the one of more panels (11) further comprises a lip (54) at a periphery of the one or more panels (11) to facilitate removing a panel (11) from a frame (10).

12. A construction system according to any one of the preceding claims, further comprising secondary cell connecting means (60).

13. A construction system according to claim 12, wherein the secondary cell connecting means (60) comprises a connector (61), and wherein at least one corner of each frame (10) comprises a complementary connector aperture (63).

14. A construction system according to any one of the preceding claims, wherein the construction system is a toy construction system.

15. A construction system according to any one of the preceding claims, wherein an external length of the sides (20) of the frame (10) may be less than 300mm.

16. A construction system according to any one of the preceding claims, wherein an external length of the sides (20) of the frame (10) may be more than 200mm.

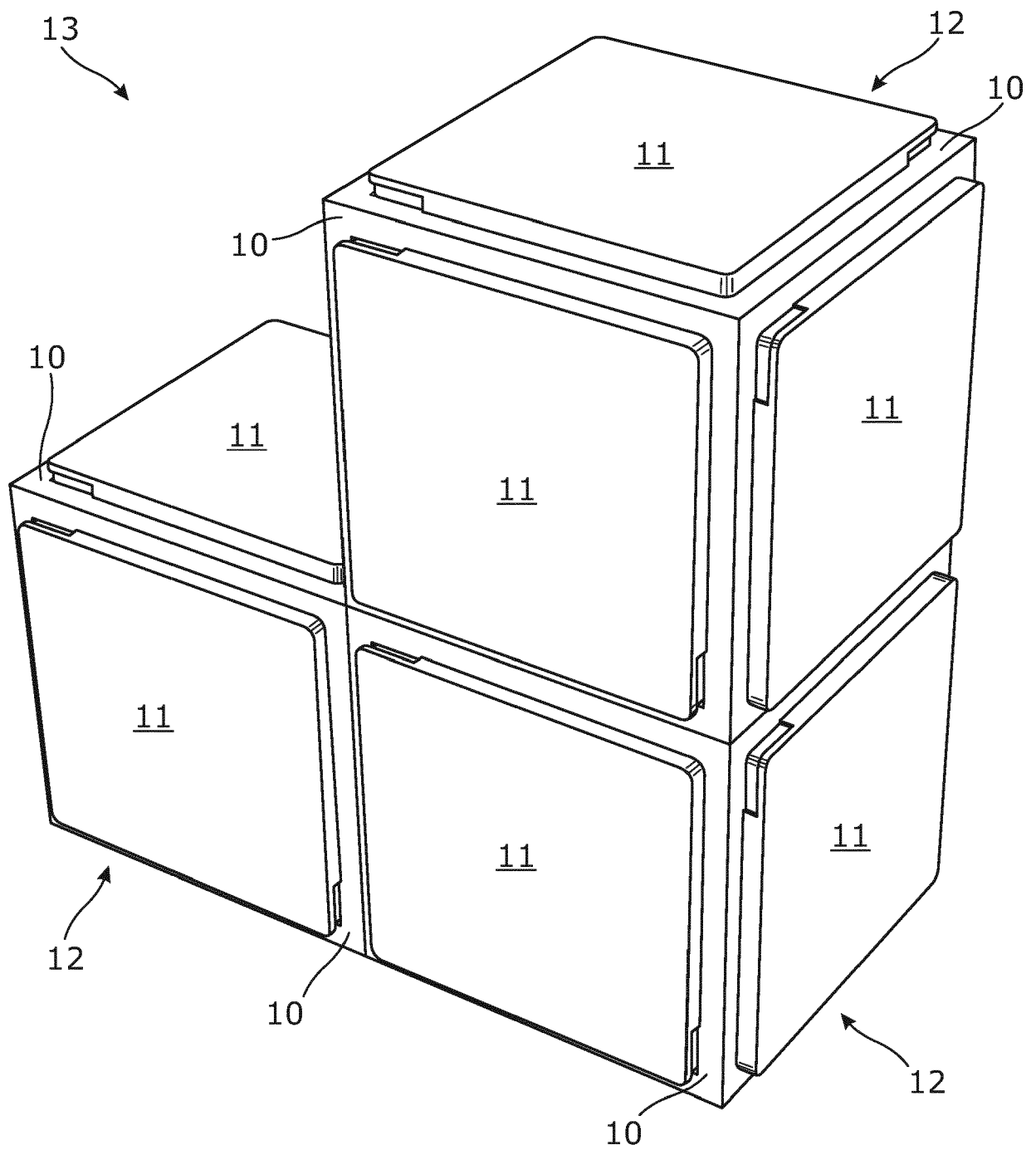


Figure 1

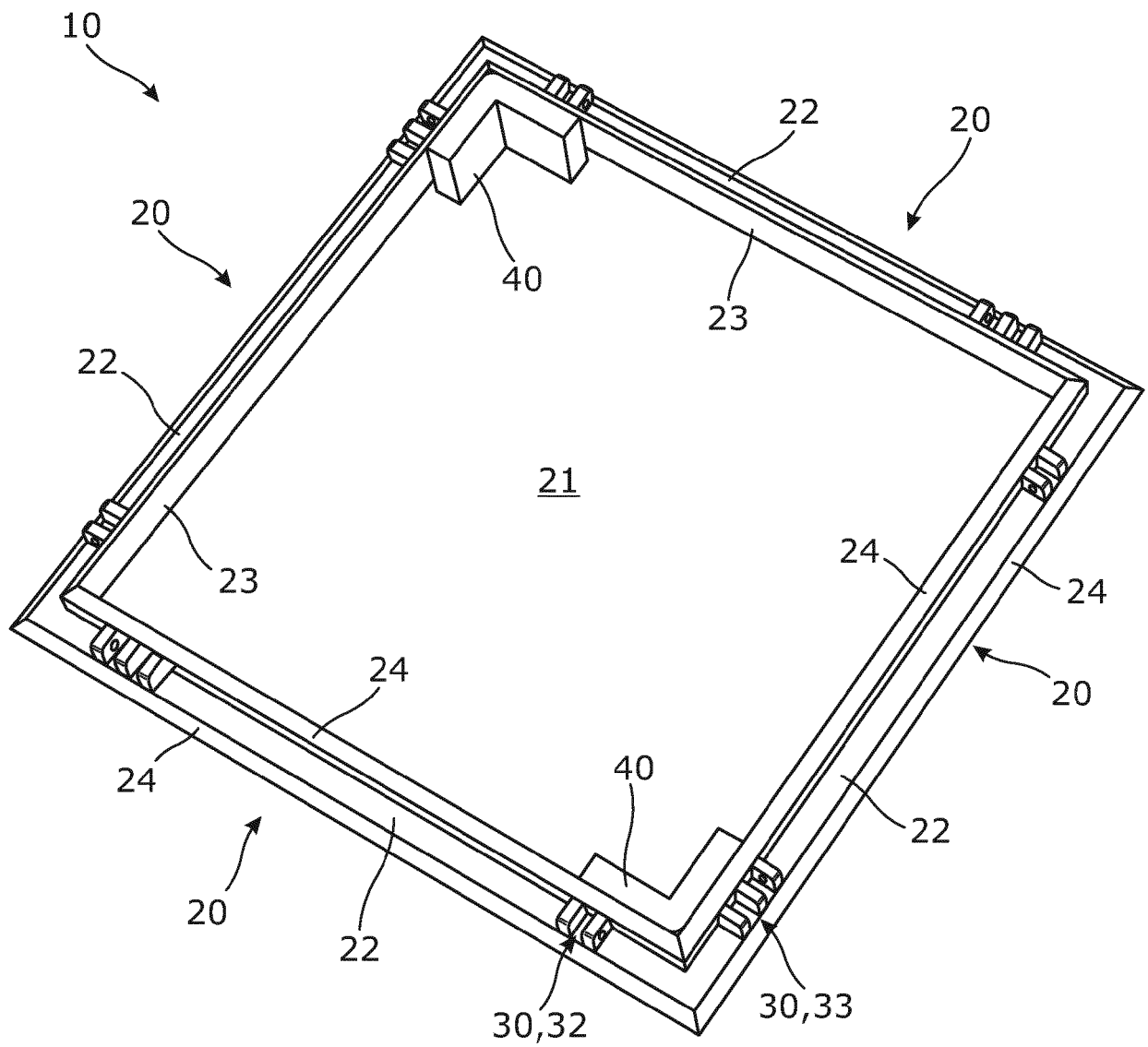


Figure 2

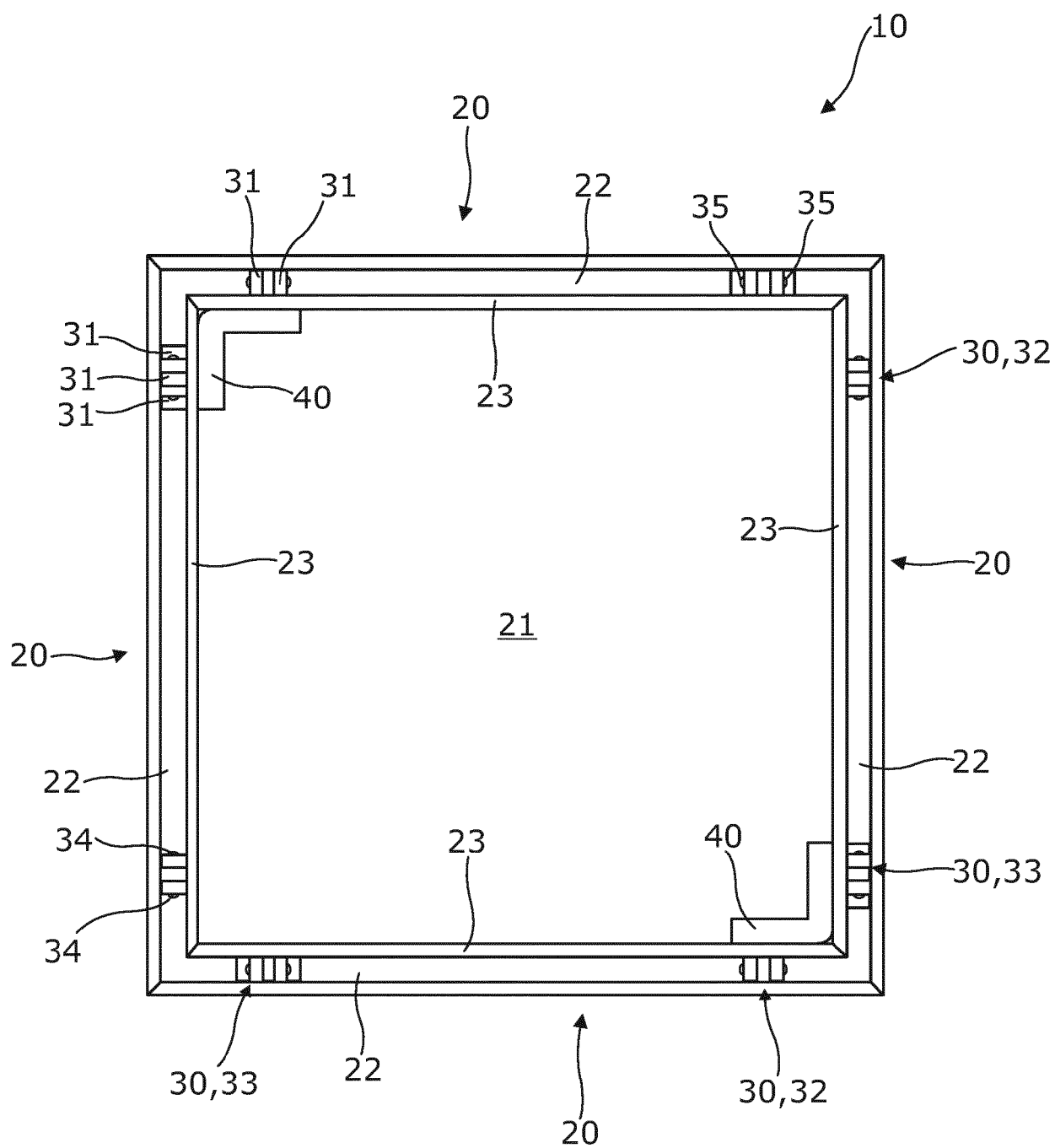


Figure 3

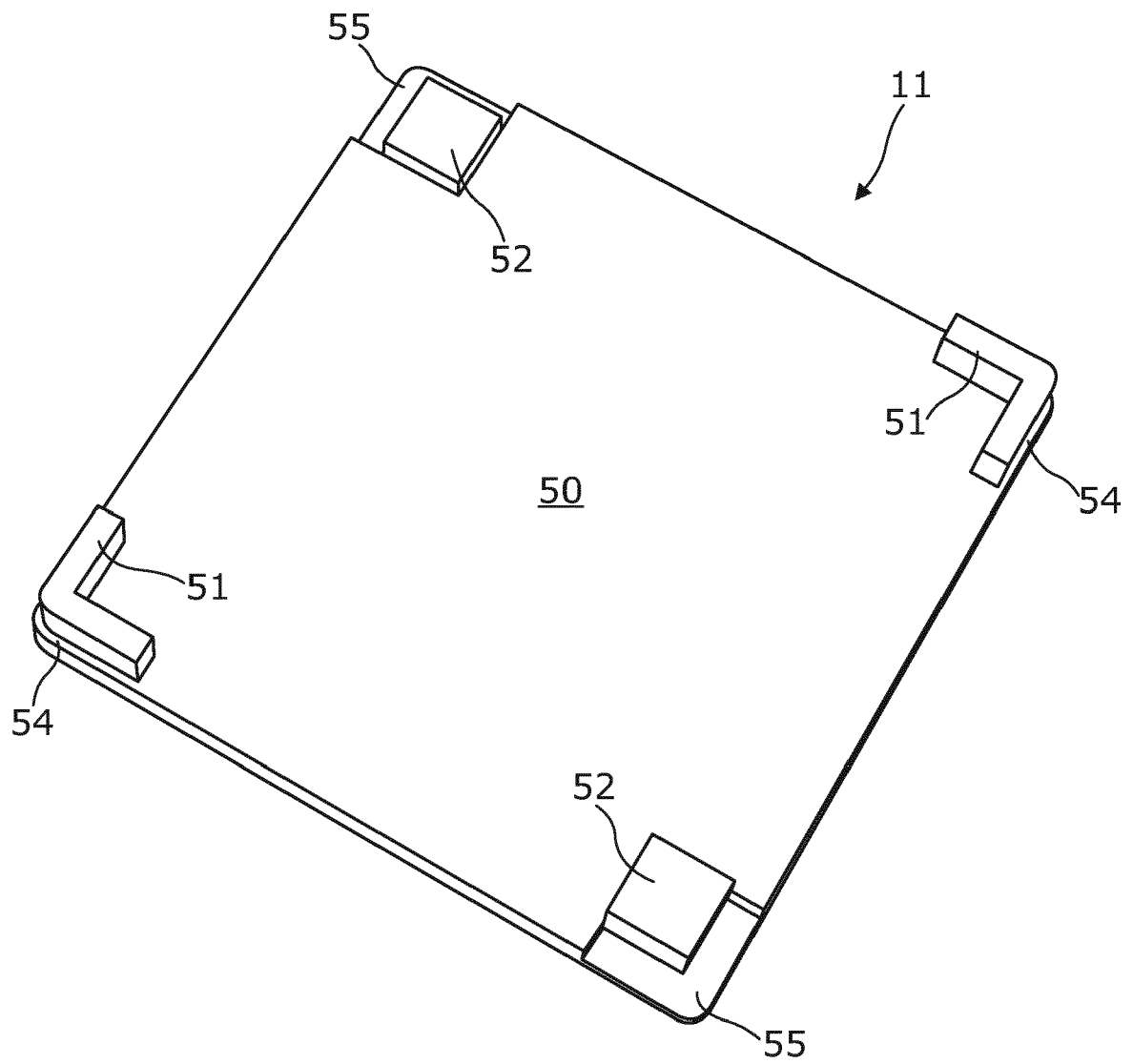


Figure 4

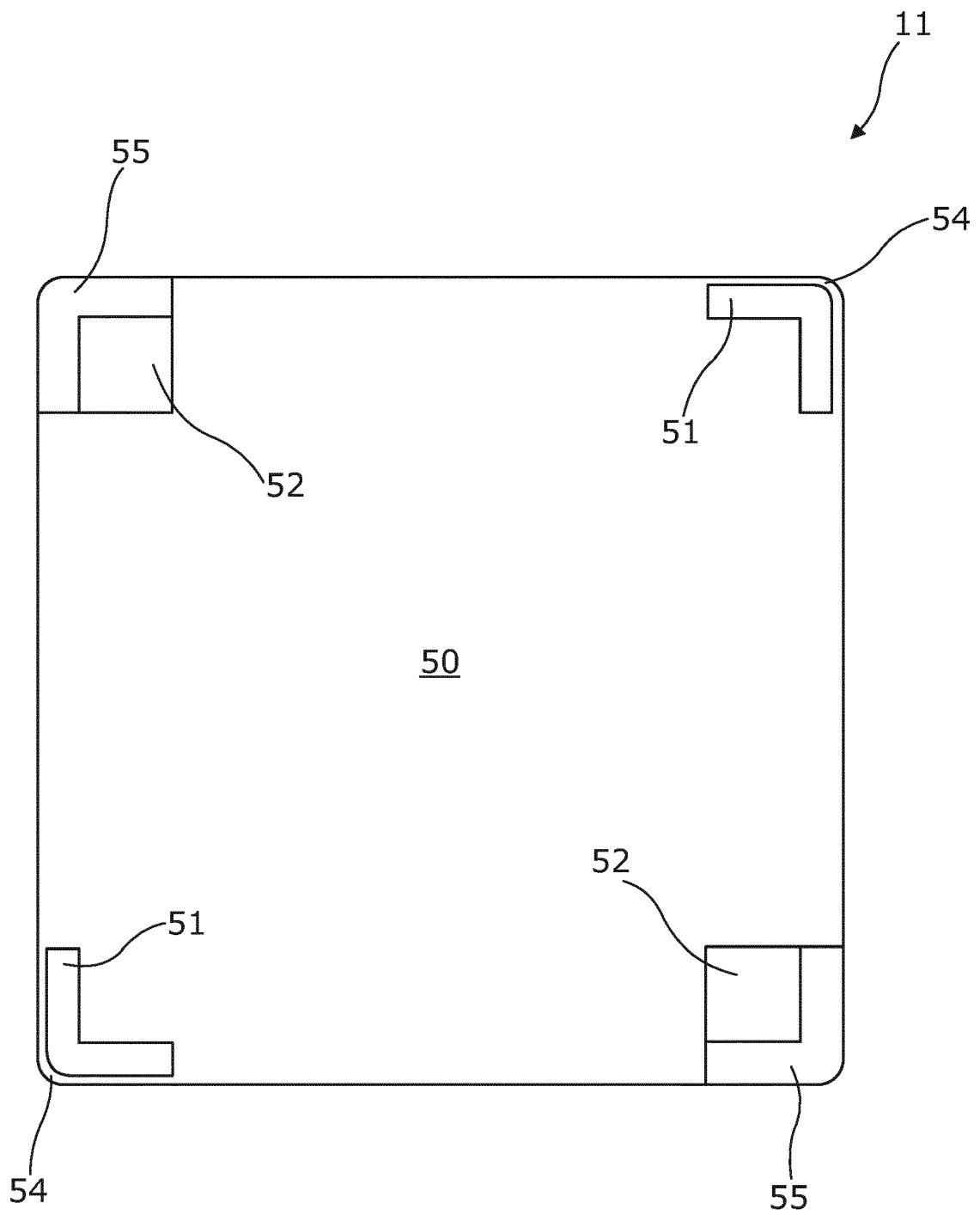


Figure 5

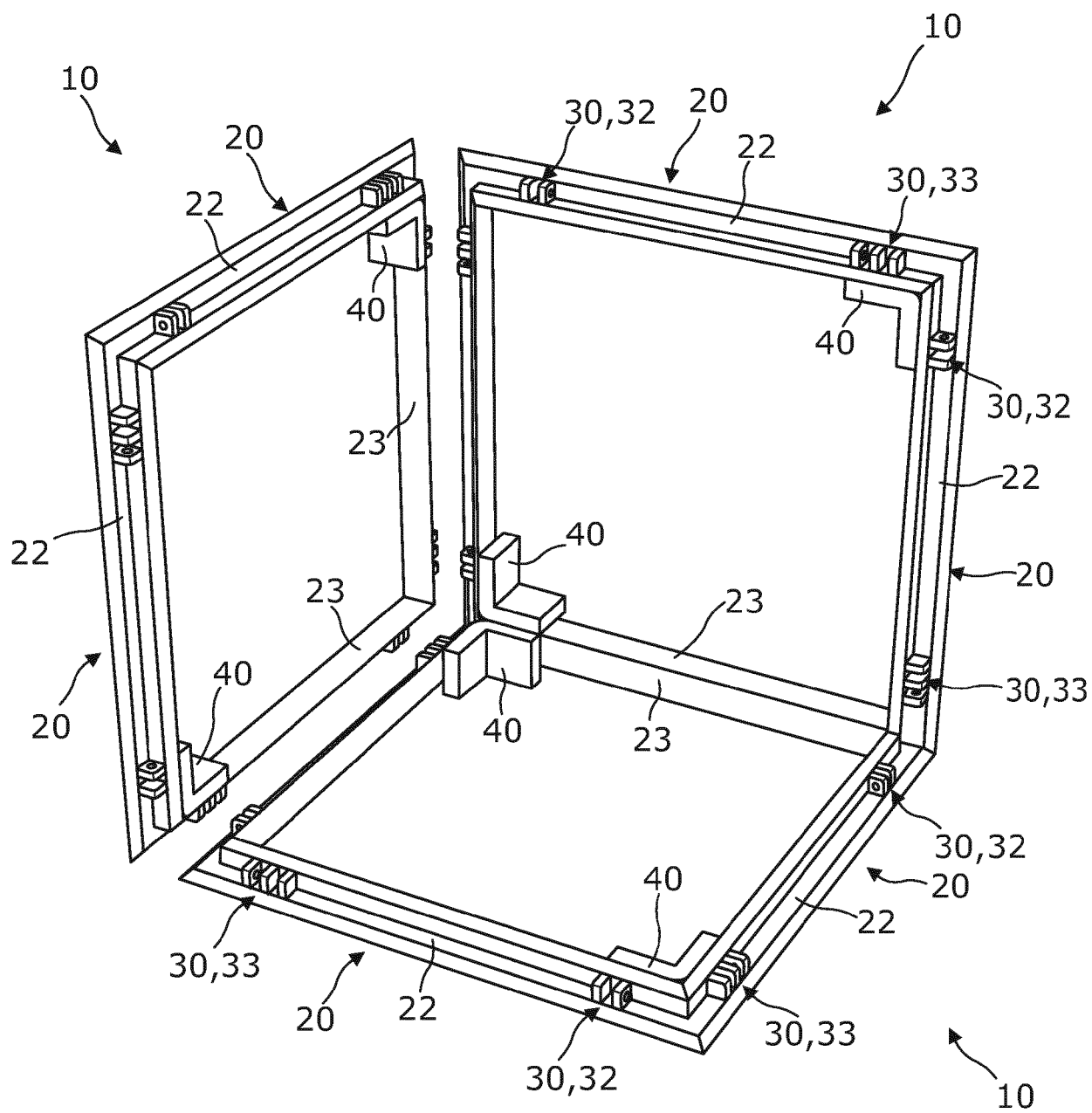


Figure 6

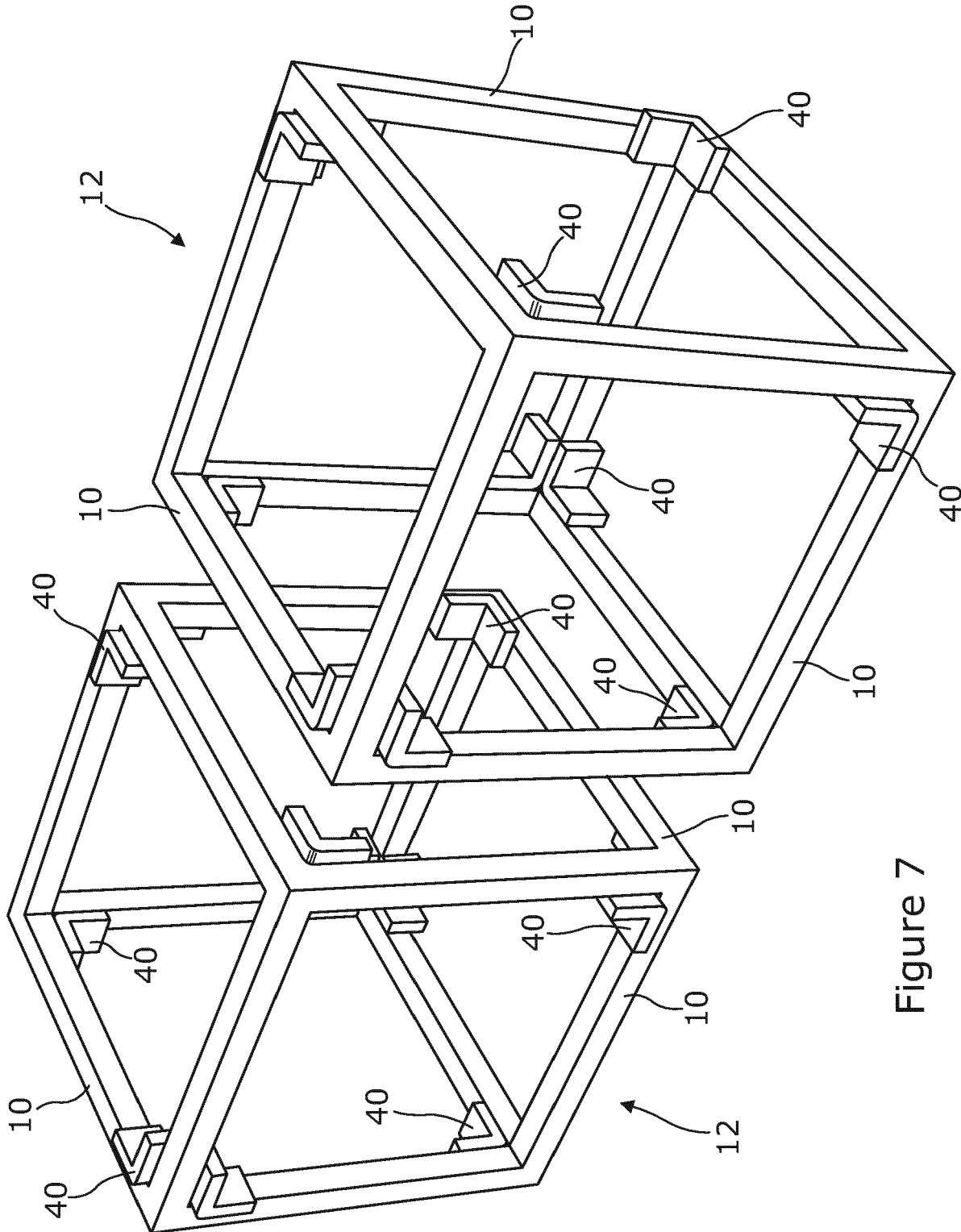


Figure 7

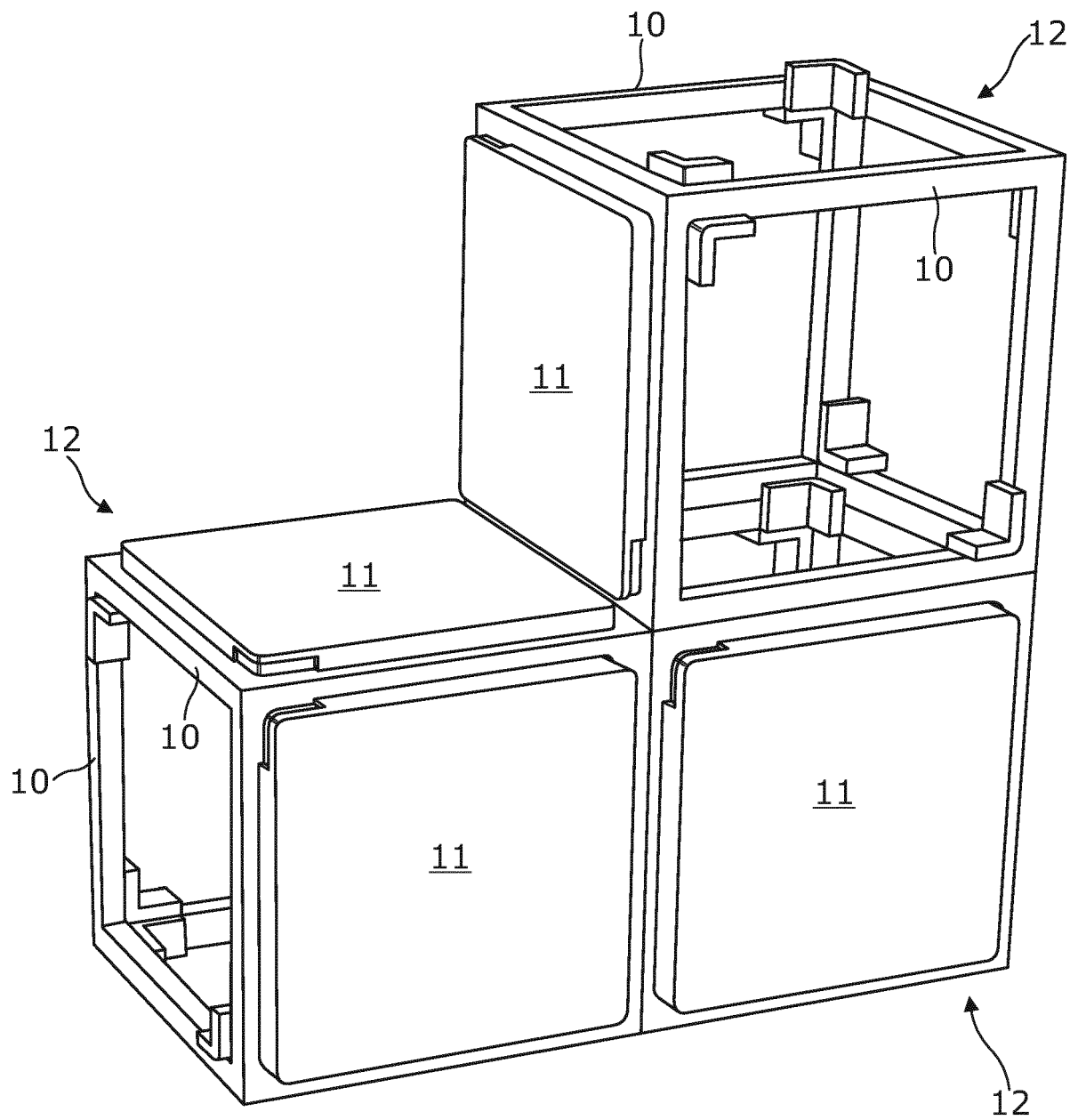


Figure 8

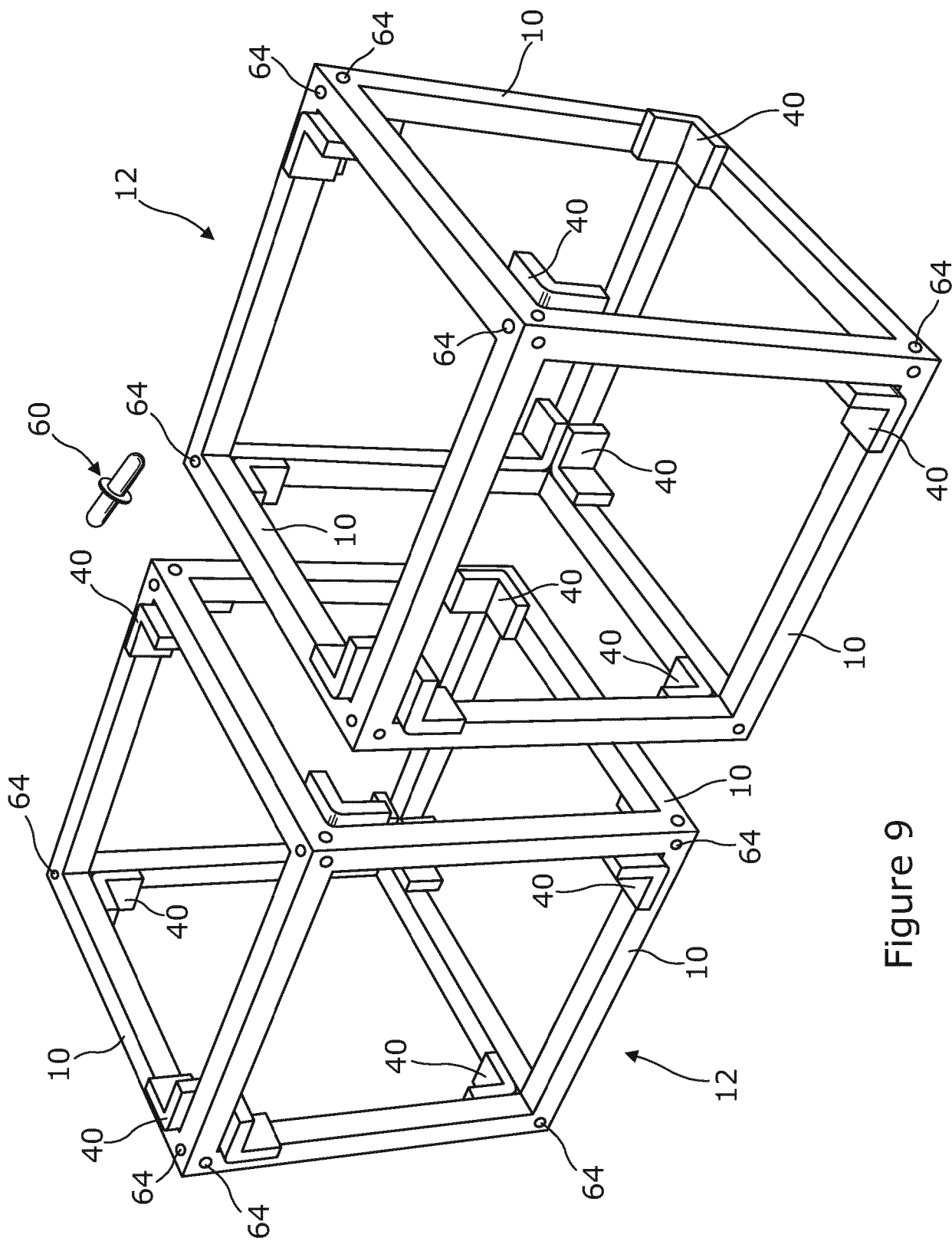


Figure 9

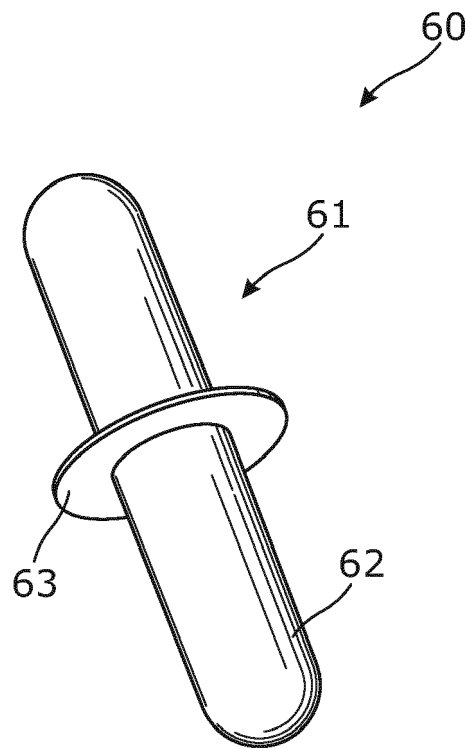


Figure 10



EUROPEAN SEARCH REPORT

Application Number
EP 18 15 7019

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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 2015/321113 A1 (GRAUBE AUGUST [US]) 12 November 2015 (2015-11-12) * claims 1-15; figures 1-16b *	1-16	INV. A63H33/06 A63H33/08
X	WO 2008/061359 A1 (JOUETS BRIK A BLOK INC BRIK A [CA]; MICHALK VINCENT [CA]; KATZ ROBERT) 29 May 2008 (2008-05-29) * claims 1-40; figures 1-13c *	1-16	
X	EP 0 121 433 A1 (ZIEGLER JAMES THEODORE) 10 October 1984 (1984-10-10) * claims 1-14; figures 1-16 *	1-16	
X	WO 2009/097666 A2 (DSHABRAILOV MAGOMED-ALI [BE]) 13 August 2009 (2009-08-13) * claims 1-19; figures 1-10 *	1-16	
X	US 2012/015583 A1 (CHEN YING-JEN [TW]) 19 January 2012 (2012-01-19) * claims 1-5; figures 1-4 *	1-11, 14-16	
X	US 2016/114255 A1 (JAZOULI TAOUFIK [US]) 28 April 2016 (2016-04-28) * claims 1-16; figures 1-20 *	1-11, 14-16	TECHNICAL FIELDS SEARCHED (IPC) A63H
X,D	GB 1 566 598 A (PANTON V) 8 May 1980 (1980-05-08) * claims 1-13; figures 1-21 *	1-11, 14-16	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 June 2018	Examiner Shmonin, Vladimir
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

EP 18 15 7019

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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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015321113 A1	12-11-2015	NONE	
WO 2008061359 A1	29-05-2008	CA 2670298 A1 CN 101627168 A EP 2089589 A1 US 2010130094 A1 US 2011294390 A1 WO 2008061359 A1	29-05-2008 13-01-2010 19-08-2009 27-05-2010 01-12-2011 29-05-2008
EP 0121433 A1	10-10-1984	AU 571207 B2 CA 1222869 A DE 3468178 D1 EP 0121433 A1 JP S59183783 A US 4731041 A US 4886477 A US 4902259 A	14-04-1988 16-06-1987 04-02-1988 10-10-1984 18-10-1984 15-03-1988 12-12-1989 20-02-1990
WO 2009097666 A2	13-08-2009	BE 1017985 A6 WO 2009097666 A2	02-03-2010 13-08-2009
US 2012015583 A1	19-01-2012	NONE	
US 2016114255 A1	28-04-2016	CA 2909830 A1 US 2016114255 A1	25-04-2016 28-04-2016
GB 1566598 A	08-05-1980	DE 2636990 A1 GB 1566598 A JP S5349547 A	23-02-1978 08-05-1980 06-05-1978

EPO FORM P0459

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

- GB 1566598 A [0003]