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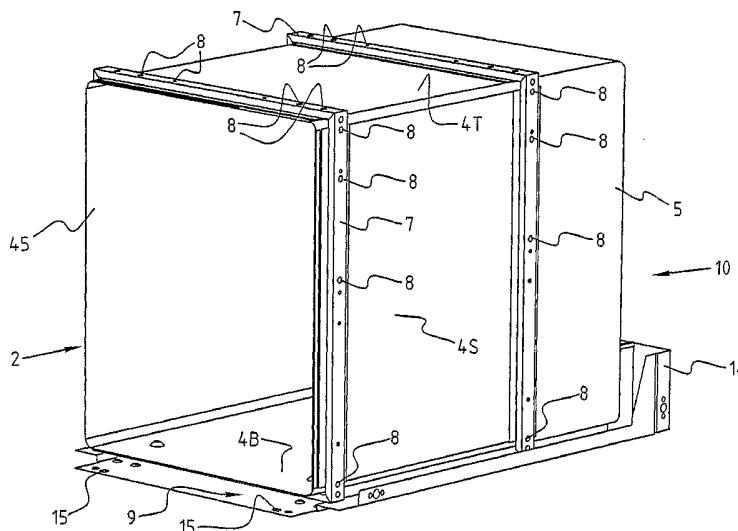
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(54) Title: FRAME FOR AN OVEN



(57) Abstract: The invention relates to a frame for an aircraft oven, which oven comprises a preparation space suspended in the frame and bounded by a peripheral wall, an end wall and a door placed opposite the end wall, wherein the peripheral wall of the preparation space is self-supporting and the frame comprises force-transmitting members connected to the preparation space between the door and the end wall. Each force-transmitting member can take the form of a portal which at least partly encloses the preparation space and which can be fixed to a plate-like sub-frame which extends on the underside of the preparation space. The invention also relates to an oven with a selfsupporting preparation space which is suspended in such a frame.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

FRAME FOR AN OVEN

The invention relates to a frame for an oven, in particular for use in an aircraft, which oven comprises at least one preparation space suspended in the frame and bounded by a peripheral wall, an end wall and a door placed
5 opposite the end wall. Such an oven frame is known.

Very strict and often conflicting requirements are set for ovens which are used in means of transport, and particularly ovens for aircraft. It must therefore be possible to anchor such ovens firmly in the surrounding
10 construction in order to prevent them from becoming detached under the influence of movements of the aircraft, which could result in damage and/or injury. It should be borne in mind here that the accelerations occurring in the different directions can amount to many times the acceleration of
15 gravity (g).

In addition, such ovens must have a relatively light construction. Firstly because, in aircraft, the weight of the aircraft construction and all accessories reduces the cargo carrying capacity, thus the amount of payload which can
20 be transported, but also in order to limit the load on the surrounding construction as much as possible. In addition, the construction of an oven must of course be able to withstand the high temperatures occurring therein. Finally, the capacity of aircraft ovens must be such that the meals
25 for all passengers can in principle be prepared simultaneously. This therefore requires compact ovens with a relatively large preparation space.

Oven frames have been formed heretofore by two

rigid and relatively heavy frameworks on the front and rear side of the oven, between which relatively thick, supporting peripheral walls, generally therefore side walls, an upper wall and a lower wall are fixed. The assembly of frameworks
5 and peripheral walls thus forms a housing in which the preparation space is suspended. The space between the peripheral walls of the preparation space and those of the housing is here generally filled with insulating material. The door is suspended hingedly in the framework on the front
10 side of the oven, while a control panel will usually also be mounted on this framework. The actual device for heating the food present in the preparation space is fixed to the rear side of the framework.

The conventional oven frame has the drawback that
15 it is relatively heavy and bulky. In the case of an oven for use in an aircraft, cargo carrying capacity is hereby lost, while the loads on the surrounding construction are also considerable. Nor is it easy, because of the voluminous construction, to accommodate sufficient ovens in the limited
20 space of an on-board kitchen.

The invention therefore has for its object to provide an oven frame of the above described type, wherein these problems do not occur. According to the invention this is achieved with such a frame in that at least the peripheral
25 wall of the preparation space is self-supporting and the frame comprises at least one force-transmitting member connected to the preparation space between the door and the end wall. By giving the preparation space or inner oven a self-supporting form and connecting it to one or more force-
30 transmitting members it is possible to dispense with the use of a heavy, voluminous, supporting housing. A very efficient construction is thus obtained, which can be given a relatively light and compact form.

For a good transfer of the loads, the at least one force-transmitting member preferably takes the form of a portal at least partly enclosing the preparation space. A uniform distribution of the loads is obtained here when the
5 portal extends substantially round the whole peripheral wall of the preparation space and is connected thereto at a plurality of locations.

In order to enable further transmission of the loads in longitudinal direction of the inner oven, the oven
10 frame preferably has a sub-frame which extends substantially parallel to a part of the peripheral wall and to which the at least one force-transmitting member is fixed. In this case a good distribution of the forces is achieved when the sub-frame extends over at least the whole length of the
15 preparation space, and at least two force-transmitting members connected to the preparation space are fixed to the sub-frame at a distance from the door respectively the end wall.

In order to obtain a compact construction with low
20 overall height, it is recommended that the sub-frame is plate-like and extends on the underside of the preparation space.

The oven frame according to the invention is advantageously further provided with means for fixing the
25 frame to a surrounding construction. When these fixing means comprise at least one opening formed in the sub-frame for receiving a fixing bolt, loads can be transmitted directly from the sub-frame into the surrounding construction. In addition or instead, it is also possible for the fixing means
30 to comprise at least one strengthening element connected to the at least one force-transmitting member and having an opening for receiving a fixing bolt. Loads can thus be transferred directly from the force-transmitting member to

the surrounding construction. These two forms can be combined in effective manner when the receiving openings in the sub-frame and in the strengthening element are in register with each other.

5 The strengthening element is preferably adapted to receive a hinge of the door of the preparation space, so that loads on the door can also be transmitted directly into the frame.

 The at least one force-transmitting member and/or
10 the sub-frame can further be adapted in advantageous manner to receive a finishing wall in releasable manner. The decorative function of the conventional housing is emulated in this manner.

 It is finally also recommended that at least one of
15 the walls of the preparation space is adapted for mounting thereon a device for heating the contents of the preparation space. A further function of the conventional housing is thus taken on by the self-supporting inner oven.

 The invention further relates to an oven,
20 comprising at least one preparation space bounded by a peripheral wall, an end wall and a door placed opposite the end wall, as well as a device for heating the contents of the preparation space. Such an oven is also known. The invention now has for its object to give an oven of this type a lighter
25 and more compact form. This is achieved according to the invention in that the peripheral wall of the preparation space is self-supporting, and the preparation space is suspended in a frame as described above.

 The heating device is here advantageously suspended
30 from the preparation space, while in preference the door is suspended hingedly from the frame.

 In preference the oven according to the invention further has at least one finishing wall connected releasably

to the frame, wherein one of the finishing walls can form a front wall with an opening for receiving the door and a recess for receiving a control panel. In addition, at least one of the finishing walls advantageously has an opening
5 which provides access to a handgrip connected to the frame, so that the oven can be handled easily.

The invention is now elucidated on the basis of an exemplary embodiment, wherein reference is made to the annexed drawing, in which:

10 Fig. 1 is a perspective front view of an oven according to the invention,

Fig. 2 is a view corresponding with fig. 1 of the most important components of an oven frame according to the invention,

15 Fig. 3 is a perspective detail view of the front side of the oven frame of fig. 2 and a front wall for releasable mounting thereon, and

Fig. 4 is a perspective rear view of the oven of fig. 1, wherein a part of the frame and of the finishing
20 walls is omitted.

An oven 1 comprises a preparation space 2 in which food can be prepared, and a device 3 for heating the contents of preparation space 2. Preparation space 2, which is also referred to as "inner oven", is bounded by a peripheral wall
25 4, an end wall 5 and a door 6 placed opposite end wall 5. In the shown embodiment the preparation space 2 is of rectangular cross-section and peripheral wall 4 is formed by two parallel side walls 4S, an upper wall 4T and a lower wall 4B.

30 According to the invention the preparation space 2 is not suspended, as in conventional ovens of this type, in a heavily constructed housing which absorbs the loads which occur, but itself forms a supporting part of the oven

construction. For this purpose the preparation space is connected to two force-transmitting members 7, which here take the form of portals extending over practically the whole periphery of preparation space 2. These portals 7 are fixed
5 at different positions to peripheral wall 4, for instance by means of screws 8.

The force-transmitting members 7 are further fixed to a sub-frame 9 extending parallel to peripheral wall 4 of preparation space 2. In the shown embodiment sub-frame 9 is
10 embodied as a plate which extends under preparation space 2 over the whole length thereof. Sub-frame 9, force-transmitting members 7 and walls 4, 5 of preparation space 2 thus form a frame 10 on which all other components of oven 1 can be mounted.

15 Oven frame 10 can be fixed to a surrounding construction, for instance the galley of an aircraft. Provided for this purpose are fastening means 11, which are formed here by vertical bolt connections 12 on the front side of oven 1 and horizontal positioning pins 13 on the rear
20 side. Positioning pins 13, which co-act with openings in the surrounding construction, are fastened to an upright part 14 of sub-frame 9. Connecting bolts 12 co-act directly with both sub-frame 9 and the foremost force-transmitting portal 7. Two openings 15 are formed for this purpose at the front in sub-
25 frame 9, while mounting units 16, which are likewise provided with openings 17, are also attached on either side to portal 7. These mounting units 16 are placed such that their openings 17 are in register with openings 15 in sub-frame 9. Loads from sub-frame 9 and from the foremost portal 7 are
30 thus transferred directly to the surrounding construction.

Door 6 is mounted hingedly in oven frame 10. Fixed for this purpose to each mounting unit 16 is a corner piece 18, one of which is provided with a bottom hinge pin 35 for

door 6. On the upper side two similar mounting units 26 are fixed to the foremost portal 7 in readily releasable manner, for instance by means of snapping or with a single screw. These serve, among other things, for mounting of an

5 electronic control system 31 or OCM (Oven Control Module) to be discussed hereinbelow. At least one of the mounting units 26 (but, from considerations relating to production engineering, perhaps both) here has an opening (not shown here) on the underside for receiving an upper hinge pin (not

10 shown here either) which is fixed to the door. Because corner pieces 18 are fastened from the front side to mounting units 16 on either side of oven 1 using a single screw 36, they can be released quickly and easily, whereafter the upper hinge pin of door 6 can drop out of the opening into the upper

15 mounting unit 26 and be removed from oven frame 10. By exchanging corner pieces 18 the door 6 can furthermore be suspended for rotation to both the left and right.

Heating device 3, the fan motor 19 of which is particularly shown here, is also mounted on oven frame 10. In

20 the shown embodiment use is made of the supporting end wall 5 of preparation space 2 for mounting of this heating device 3.

To allow handling thereof, oven 1 is further provided with a fold-out handgrip 20. In the shown embodiment this handgrip 20 is fixed to a rectangular protruding part 33

25 of a supporting bracket 21, which is attached to the rear force-transmitting portal 7.

Because the oven frame 10 according to the invention is formed by the supporting walls 4, 5 of the preparation space or inner oven 2 and a number of members or

30 sub-frames 7, 9 connected thereto, it is possible, as mentioned, to dispense with a supporting housing. However, since oven 1 is in any case partially visible, it is provided with a number of finishing walls 22, 23, 24 whereby the

components thereof can be concealed from view. These finishing walls 22, 23, 24 can further serve to enclose insulating material arranged around inner oven 2. Because they do not bear any loads, finishing walls 22, 23, 24 can be
5 given a relatively light form, for instance in plastic or thin metal.

They can also be connected to oven frame 10 for simple release. In the shown embodiment the front wall 22 is attached to oven frame 10 by means of a snap connection,
10 while a number of light screws will suffice to fasten side walls 23 and upper wall 24. Front wall 22 therefore has distributed over its periphery a number of resiliently flexible snap fingers 25 which engage behind the foremost portal 7 of frame 10. In order to secure front wall 22
15 relative to oven frame 10, several more light screws can be screwed into the foremost portal 7 through openings 34 in snap fingers 25. Front wall 22 can thus be mounted in simple manner in that it is fixed directly at the correct position by snap fingers 25, whereafter the locking screws can be
20 placed and tightened. Release of front wall 22, for instance in respect of maintenance operations, can thus also be carried out quickly and easily.

An opening 27 for door 6 is also formed in front wall 22. In addition, space is left clear in front wall 22
25 for accommodating a control panel 28 which is provided with a number of buttons 29 and a display screen 30. Control panel 28 is connected to an electronic control system 31, also referred to as OCM, which is here accommodated in the space between upper wall 4T of preparation space 2 and the upper
30 finishing wall 24. A rotatable blocking member 32 is further also arranged on front wall 22, whereby oven 1 is secured against unintentional opening of door 6.

In upper wall 24 is formed another opening 33

through which the handgrip 20 fixed to oven frame 10 can be reached.

By thus making the inner oven 2 structurally a part of oven frame 10 in the above described manner, and not making use of a supporting housing, oven 1 can have a lighter and more compact form than conventional ovens. The surrounding construction can hereby also be given a lighter form, so that in all a considerable weight-saving is achieved. Owing to the more compact construction more ovens can moreover be accommodated in the same space, or a larger preparation space can be formed with the same outer dimension.

Although the invention is elucidated above with reference to one embodiment, it will be apparent that it is not limited thereto but can be modified in many ways. The number of force-transmitting members could thus be varied, while the form thereof could also be chosen differently. The embodiment of the sub-frame could also be modified. Instead of a plate-like sub-frame, a lattice structure or other construction could also be envisaged. The connection of the oven frame to the surrounding construction can also be embodied differently, for instance with differently oriented bolts or other fastening elements. Finally, the oven can of course also be used in other environments than in an aircraft, while the principle of a self-supporting internal structure could also be applied to devices other than ovens.

The scope of the invention is therefore defined solely by the appended claims.

Claims

1. Frame for an oven, in particular for use in an aircraft, which oven comprises at least one preparation space suspended in the frame and bounded by a peripheral wall, an end wall and a door placed opposite the end wall,

5 **characterized in that** at least the peripheral wall of the preparation space is self-supporting and the frame comprises at least one force-transmitting member connected to the preparation space between the door and the end wall.

2. Oven frame as claimed in claim 1, **characterized**
10 **in that** the at least one force-transmitting member takes the form of a portal at least partly enclosing the preparation space.

3. Oven frame as claimed in claim 2, **characterized**
15 **in that** the portal extends substantially round the whole peripheral wall of the preparation space and is connected thereto at a plurality of locations.

4. Oven frame as claimed in any of the foregoing claims, **characterized by** a sub-frame which extends substantially parallel to a part of the peripheral wall and
20 to which the at least one force-transmitting member is fixed.

5. Oven frame as claimed in claim 4, **characterized**
in that the sub-frame extends over at least the whole length of the preparation space, and at least two force-transmitting members connected to the preparation space are fixed thereto
25 at a distance from the door respectively the end wall.

6. Oven frame as claimed in claim 4 or 5,
characterized in that the sub-frame is plate-like and extends on the underside of the preparation space.

7. Oven frame as claimed in any of the foregoing
30 claims, **characterized by** means for fixing the frame to a surrounding construction.

8. Oven frame as claimed in claims 6 and 7,
characterized in that the fixing means comprise at least one opening formed in the sub-frame for receiving a fixing bolt.

9. Oven frame as claimed in claim 7 or 8,
5 **characterized in that** the fixing means comprise at least one strengthening element connected to the at least one force-transmitting member and having an opening for receiving a fixing bolt.

10. Oven frame as claimed in claims 8 and 9,
10 **characterized in that** the receiving openings in the sub-frame and in the strengthening element are in register with each other.

11. Oven frame as claimed in claim 9 or 10,
characterized in that the strengthening element is adapted to
15 receive a hinge of the door of the preparation space.

12. Oven frame as claimed in any of the foregoing claims, **characterized in that** the at least one force-transmitting member and/or the sub-frame is adapted to receive a finishing wall in releasable manner.

20 13. Oven frame as claimed in any of the foregoing claims, **characterized in that** at least one of the walls of the preparation space is adapted for mounting thereon a device for heating the contents of the preparation space.

14. Oven, comprising at least one preparation space
25 bounded by a peripheral wall, an end wall and a door placed opposite the end wall, as well as a device for heating the contents of the preparation space, **characterized in that** at least the peripheral wall of the preparation space is self-supporting, and the preparation space is suspended in a frame
30 as claimed in any of the foregoing claims.

15. Oven as claimed in claim 14, **characterized in that** the heating device is suspended from the preparation space.

16. Oven as claimed in claim 14 or 15,
characterized in that the door is suspended hingedly from the frame.

17. Oven as claimed in any of the claims 14-16,
5 **characterized by** at least one finishing wall connected releasably to the frame.

18. Oven as claimed in claim 17, **characterized in that** one of the finishing walls forms a front wall with an opening for receiving the door and a recess for receiving a
10 control panel.

19. Oven as claimed in claim 18 or 19,
characterized in that at least one of the finishing walls has an opening which provides access to a handgrip connected to the frame.

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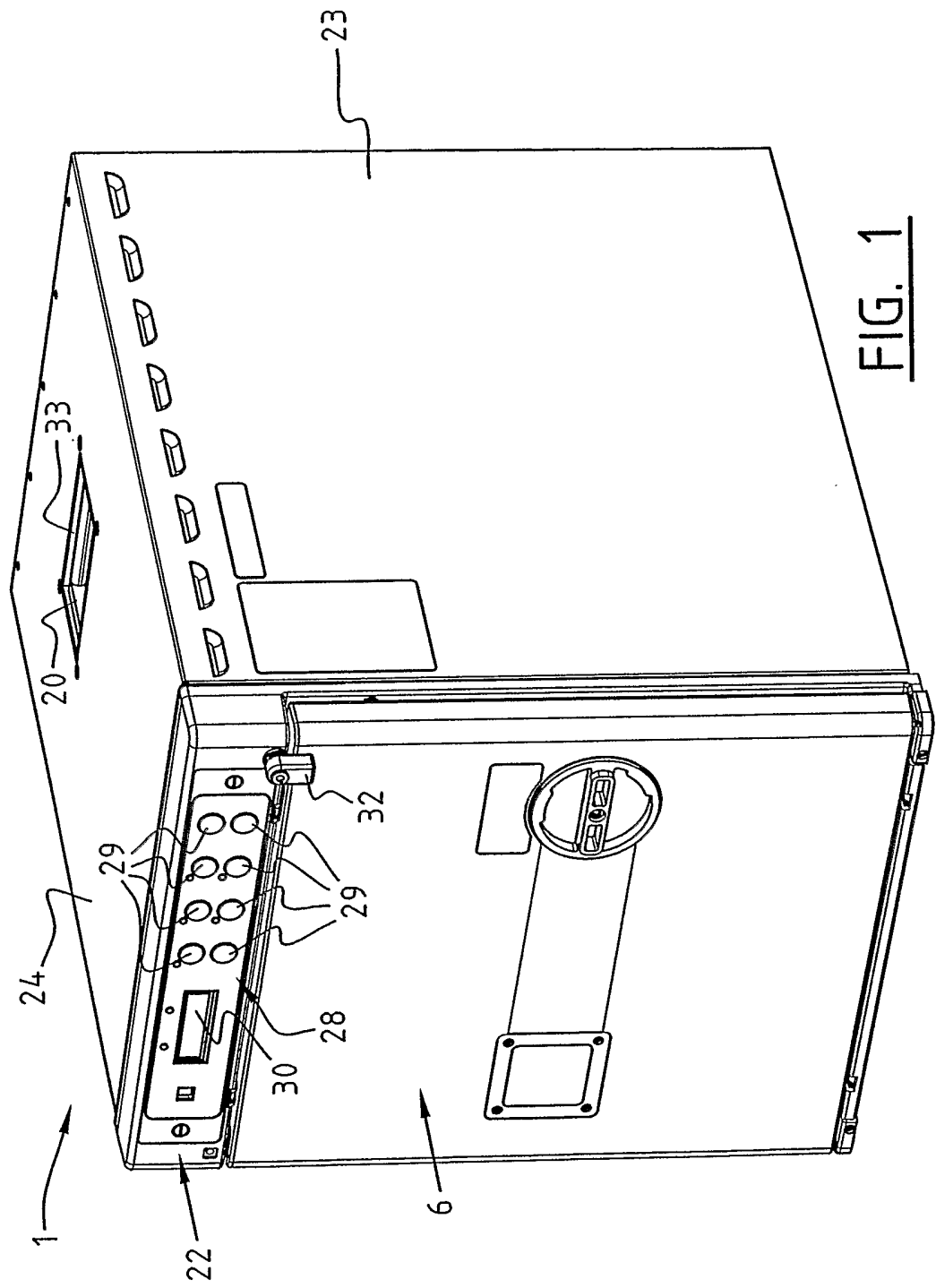


FIG. 1

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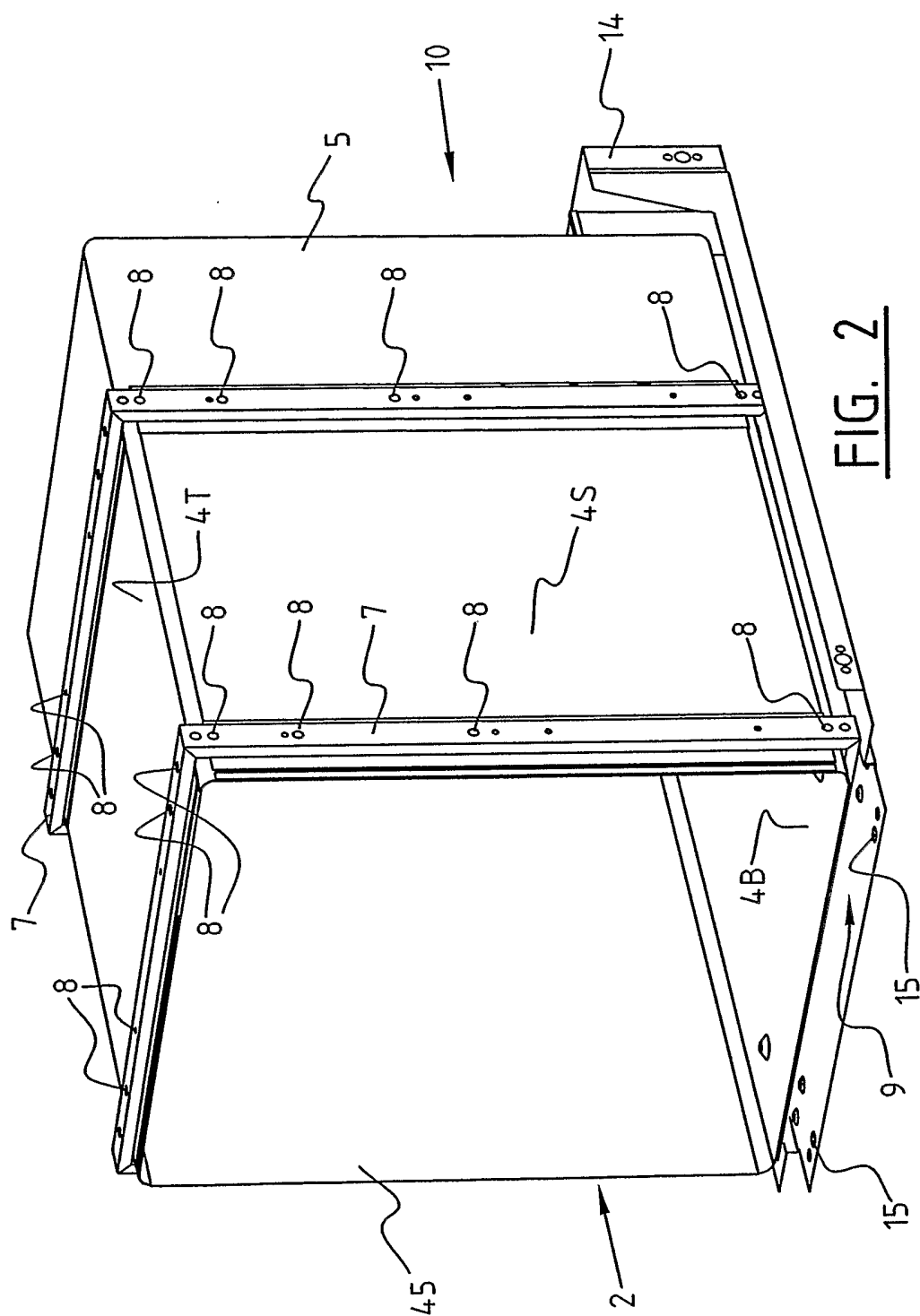
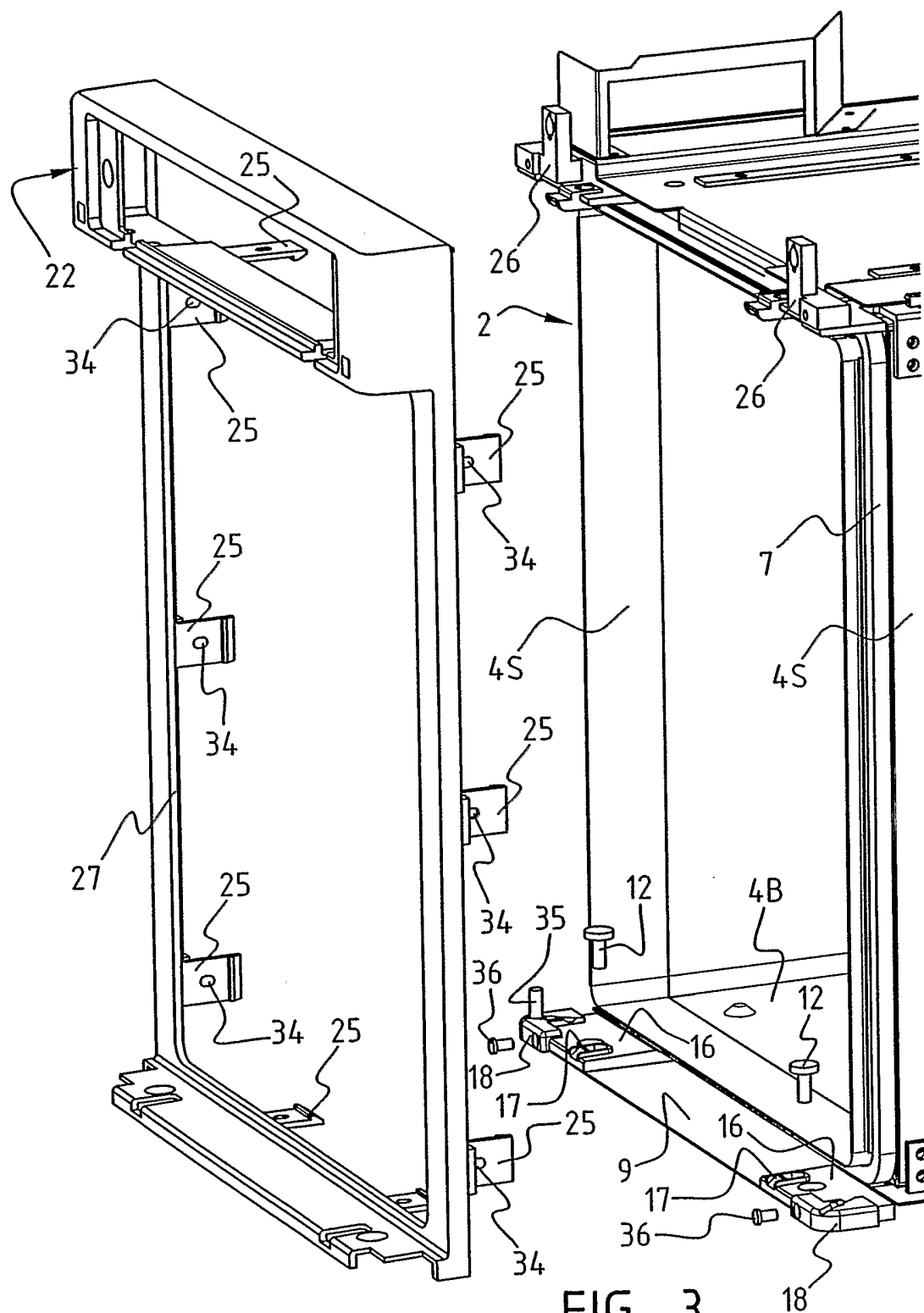
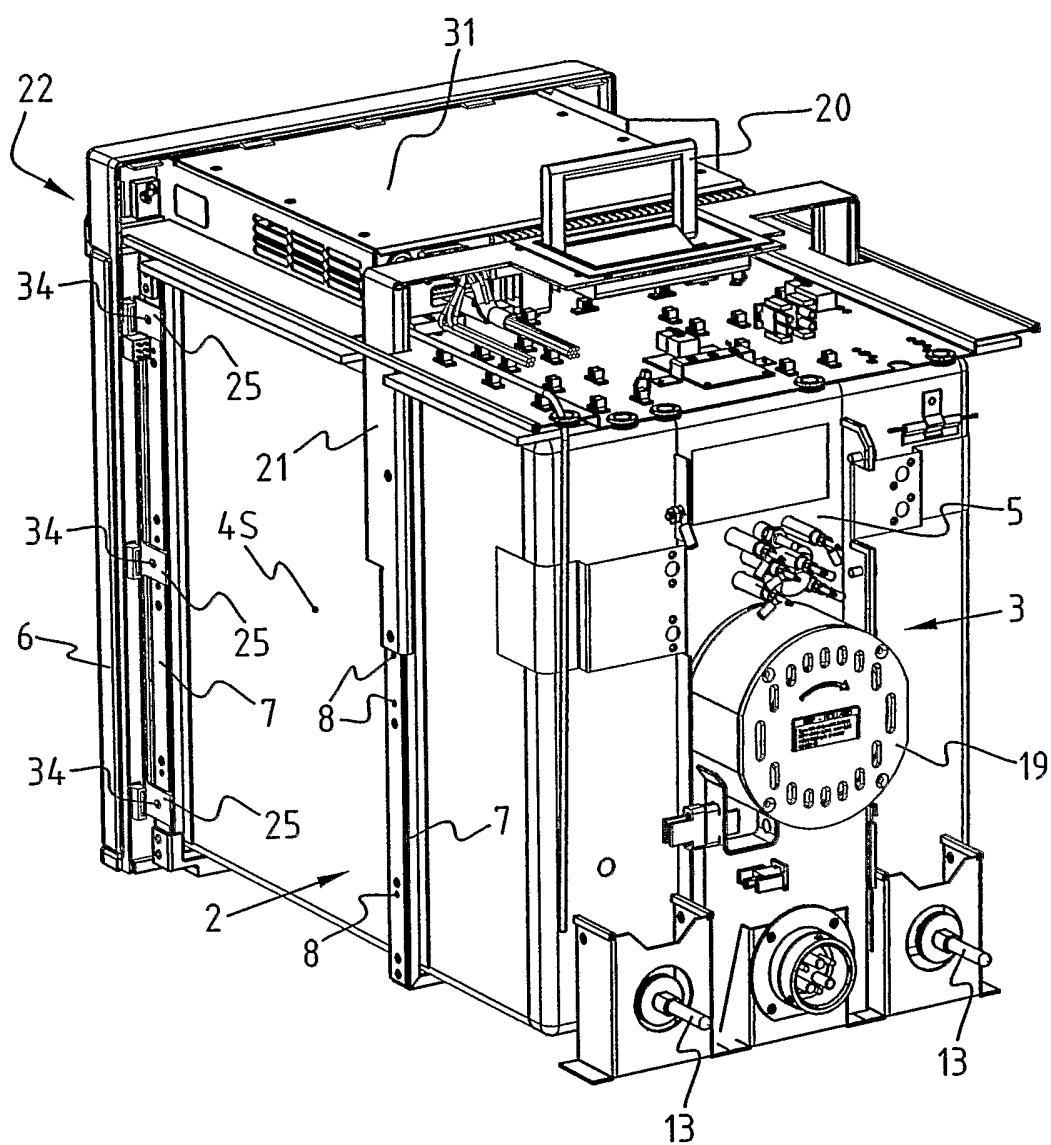


FIG. 2

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FIG. 3

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FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL2004/000527

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F24C15/08 A21B1/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1 324 940 A (INVENTUM KONINKLIJKE FAB) 25 July 1973 (1973-07-25) figures	1, 14
A	DE 198 48 875 A (BSH BOSCH SIEMENS HAUSGERAETE) 27 April 2000 (2000-04-27) claim 1; figure 1	1-3, 13, 15, 16
A	US 6 054 686 A (BRACONNIER PHILIPPE ET AL) 25 April 2000 (2000-04-25) column 3, line 10 - line 50; figures	1-3, 13, 15, 16
A	US 4 886 042 A (BESSLER WARREN F) 12 December 1989 (1989-12-12) column 2, line 45 - line 55; figure 1	1

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

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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