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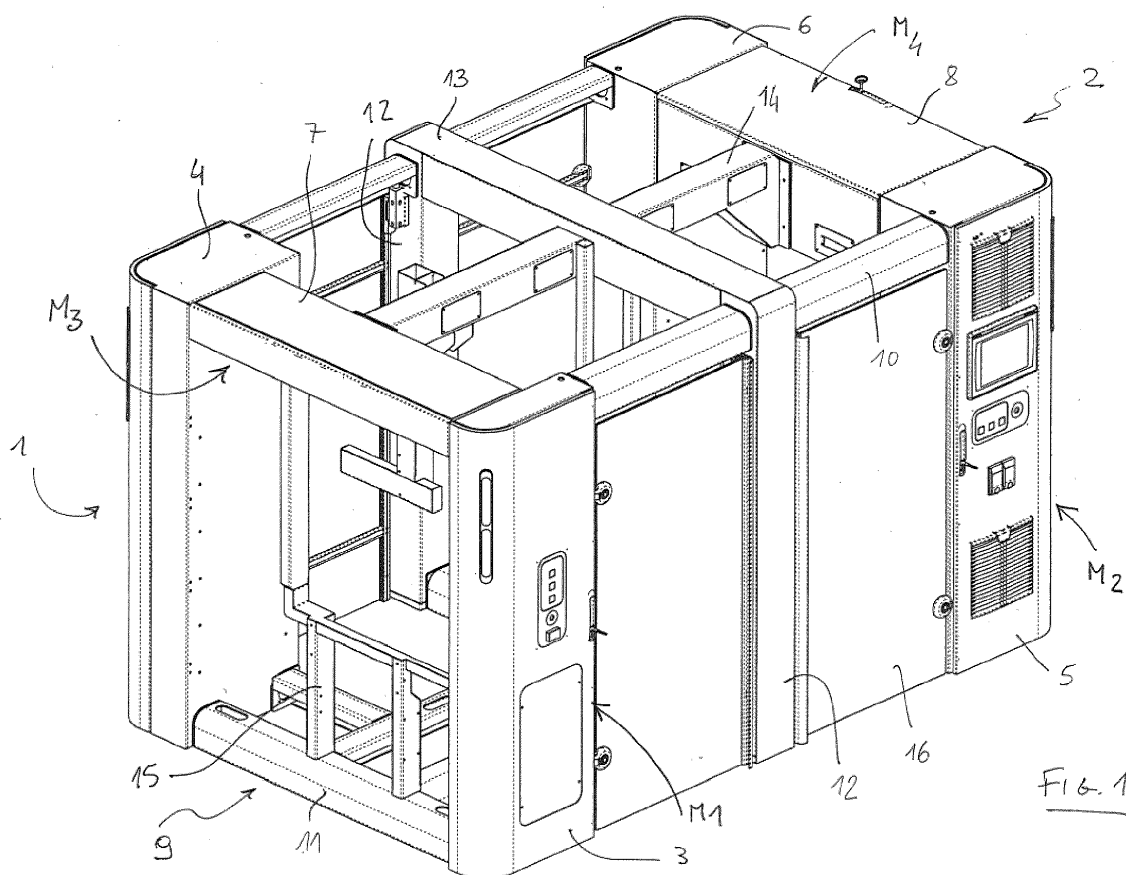
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(54) **Supporting structure for packaging machines**

(57) Packaging machine, in particular for the secondary packaging of articles inside containers, comprising an essentially lattice-like supporting structure, said supporting structure comprising corner members (3-6)

formed as a column and at least one of said corner members being configured as a closed cabinet and internally containing pneumatic and/or electrical components of said packaging machine.



## Description

### Field of the invention

**[0001]** The present invention relates to the field of packaging machines. The invention in particular relates to the construction of the supporting structure of said machines.

### Prior art

**[0002]** A packaging machine typically comprises a certain number of sections which are dedicated to specific operations. For example the main operations in a secondary packaging machine comprise the formation of containers from punched elements, the loading of articles into the containers and the closing of the containers. Other sections may be dedicated for example to phasing of the products, to their alignment, etc. The sections are generally arranged according to the container formation flow, i.e. according to the production process; for example, in some embodiments the sections are aligned in a longitudinal direction of the machine, but they may have different arrangements (for example L-shaped) depending on the requirements. Each of these sections may comprise so-called "mechatronic" units or pneumatically driven units which are monitored by sensors and managed by dedicated motion control systems.

**[0003]** Therefore it can be understood that the electrical and electronic parts are assuming a growing importance, especially in robotized machines. The frame of the machine not only must support the mechanical components and the associated motors, but must also convey the relevant electrical and/or pneumatic connections; moreover, it must support the necessary protective elements for accident prevention.

**[0004]** In the old-generation machines the frame was often designed as a single-piece structure, specifically designed for a given application, for example with full-length main beams (longitudinal members) or with a platform corresponding to the entire footprint of the machine, to which the necessary structures for supporting the various sub-systems and components were fixed. These frames were the result of an approach where all the components of the packaging machines were designed specifically, but they had the disadvantage of little or no adaptability or modular capacity.

**[0005]** In more recent times, the market demand has been for more diversified packaging machines, and designers have attempted to provide modular supporting frames in order to reduce the costs and react in a flexible and rapid manner to these requirements. For example, a frame made with this modular approach is formed by modules which can be assembled together, and each module essentially comprises a rectangular or square shaped base frame with associated uprights and upper bracing crossbeams. The base frame, the uprights and the crossbeams may be made for example using square

tubular members, thus forming a structure which can be easily assembled and adapted to various machine layouts, by simply arranging the various modules alongside each other. The inside of the tubular members may be used for housing the electrical or pneumatic connections. In these embodiments, each module generally corresponds to a functional section of the machine: for example, considering a machine comprising three sections respectively for forming, loading and closing cardboard boxes, a module is provided for each of said sections.

**[0006]** Nowadays this modular design is widely used and is satisfactory; however it still poses a number of unsolved problems and has room for improvement. The modular nature is in fact substantially limited to the "skeleton" of the machine formed by linear members, i.e. the beams of the base frame, the uprights and any bracing crossbeams. A certain amount of specific design work is therefore still required depending on the type of machine.

**[0007]** Some manufacturers have developed modular frame solutions which, however, are intended for a very specific type of machine, for example robotic packaging lines with a top-loading robot; the frame modules are consequently designed: for example they have an upper box-shaped body for receiving the electronics of the top-loading robots and are designed to be arranged alongside each other in the longitudinal direction, as occurs precisely along the said packaging lines; this approach is clearly acceptable for as long as it is used for a specific type of catalog-listed machine, but has proved to be of limited flexibility and therefore not very suitable in a market where the packaging machines must be produced according to client specifications, but at the same time with great rapidity and flexibility.

### Summary of the invention

**[0008]** The object of the invention is to solve the problems and overcome the drawbacks of the prior art. One object of the invention, in particular, is to provide a frame structure for packaging machines able to meet the following requirements: flexibility and adaptability to different types of machine, including conventional machines and robotized machines, constructional modularity based on a limited number of basic members, integration of mechanical, electronic and pneumatic systems, easy cleaning and sanitization.

**[0009]** The object is achieved with a packaging machine, in particular for the secondary packaging of articles inside containers, comprising an essentially lattice-like supporting structure, and characterized in that said supporting structure comprises corner members formed as columns, and in that at least one of said corner members is configured as a closed cabinet and contains internally pneumatic and/or electrical components of said packaging machine.

**[0010]** Further features are defined in the accompanying claims. The invention also relates to a method according to claim 11.

**[0011]** One aspect of the invention consists in assigning to the electrical and pneumatic panels the function of supporting members which are integrated in the structure itself, contrary to the approach of the prior art which considers them as external members.

**[0012]** Another aspect of the invention is to realize the frame with a structure based on the combination of a limited number of base modules which may be differently configured depending on the type of machine. Such a supporting structure may be made with a limited number of base modules, typically a few units (for example 4 or 5). For example it is possible to provide some module types for the column-like cabinets, and other module types for the crossbeams and the members which form the lattice structure. Typically the invention provides a limited number, advantageously for example one or two, of module types for each of said components.

**[0013]** In greater detail, one aspect of the invention provides that the machine is characterized by a modular structure in which said corner members are made according to a predefined form or several predefined forms, and each corner member consists of a frame module designed in accordance with said predefined form or in accordance with one of said predefined forms. In some embodiments, the machine comprises at least crossbeams for connecting together facing corner elements, and said crossbeams consist of frame modules designed in accordance with one or more predefined forms.

**[0014]** The structure is preferably made of metal, more preferably of steel.

**[0015]** The advantages of the invention may be summarised as follows.

**[0016]** The electric and pneumatic cabinets form the corner members of the front and end section of a module; they are therefore supporting members forming part of the modular structure of the machine, contrary to the prior art where the cabinets and electric panels are regarded as "external" or "remoted" members which are fixed to the frame. Another advantage is that the structure may be applied both to robotized packaging machines and to more conventional machines.

**[0017]** Another advantage is the modularity of the structure which may be based on a limited number of base modules, with advantages in terms of the mechanical design.

**[0018]** A further advantage arises from the members which protect the electrical and pneumatic connections and which are preferably open in order to facilitate cleaning and sanitization; this feature is particularly important for machines which operate in the food sector (packaging of food products).

**[0019]** The features and advantages of the invention will emerge clearly with the aid of the detailed description, provided by way of a non-limiting example, with reference to the accompanying drawings in which:

Fig. 1 shows a first example of a structure according to the invention; and

Fig. 2 shows another example of a structure.

#### Detailed description

**[0020]** Fig. 1 shows an example of a supporting structure of a packaging machine. Said structure essentially comprises a front section 1 and an end section 2 which also constitute the input and output sections of the process. The front section 1 for example houses a conveyor (not shown) for feeding articles, while the end section 2 may form the exit (output) section for the formed boxes filled with said articles, according to a predefined format.

**[0021]** Each of said sections 1, 2 of the structure according to Fig. 1 is formed essentially by a pair of corner members, 3, 4, and 5, 6, respectively, and by an upper crossbeam 7, 8, respectively.

**[0022]** Said corner members consist of closed cabinets which are formed substantially as columns and contain the electrical and/or pneumatic subsystems for the operation of the machine. The crossbeams 7, 8 preferably consist of a box-shaped body which may contain further components of the electrical and/or pneumatic section, or the main connections to/from the cabinets 3, 4 or 5, 6, respectively.

**[0023]** The remaining part of the structure comprises longitudinal linear members 10, transversal members 11 and vertical members 12 which form a lattice structure 9. Therefore, said members confer structural integrity, they provide support for the devices of the machine (conveyor belts, robots, ancillary devices, etc.) either directly or by means of auxiliary frame-pieces which are designed as required, and they convey the electrical and pneumatic connections. It should be noted that the corner cabinets 3, 4 and 5, 6 also cooperate in the supporting function.

**[0024]** More advantageously, one or more pairs of intermediate supporting columns are provided between the sections 1 and 2; optionally one or more pairs of said columns are connected by a crossbeam forming an intermediate gantry structure.

**[0025]** At least some of said longitudinal members 10, transversal members 11 and vertical members 12 advantageously are formed by a component with a standard shape.

**[0026]** For example in Fig. 1 the members 10 and 11 are formed by open profiled sections which are advantageously L-shaped or C-shaped, instead of being closed tubular members. In this way the electrical and pneumatic connections, although being protected, are accessible for maintenance and cleaning.

**[0027]** The vertical members 12 with the respective crossbeam 13 form instead an intermediate gantry between the two sections 1, 2 of the structure. Said gantry 13 for example supports a top-loading robot.

**[0028]** The top part of the structure preferably comprises at least one main stringer 14 which houses the electrical or pneumatic lines (for example extending from the body 7 or 8) and from which the connections for powering the various subsystems may be taken.

[0029] The reference number 15 indicates an example of an auxiliary frame-piece for the components of the machine, for example for a section for forming the cardboard boxes, located close to the entry of the articles. One or more auxiliary frames are provided depending on the requirements inside the structure.

[0030] The figure also shows the protective elements 16 for accident prevention which are hinged to the cabinets 3, 4, 5, 6 and can be opened for maintenance operations.

[0031] In Fig. 1 it can be seen that the structure is formed essentially by a combination of a limited number of base modules. The base modules follow certain forms and sizes. For example with reference to Fig. 1, the corner members 3-6 are realized with modules of a first type M1 and of a second type M2. The module M1 is used for the corner member 3, while the module M2, which has larger dimensions, is used for the remaining corner members 4, 5 and 6. The crossbeam 7 is realized with a module of a third type M3 and the crossbeam 8 is realized with a module of a fourth type M4.

[0032] The members which form the lattice structure 9 advantageously also have the same form or a limited number of standard and modular forms, for example the members 10, 11 are identical profiled sections.

[0033] Figure 2 shows a different machine structure, of greater length, realized using the same principle as in Fig. 1. In the case of Fig. 2 the column-like cabinets are all formed with the module of the type M1 and therefore they have an identical form.

[0034] Fig. 2 also shows a preferred embodiment, according to the invention, of the ceiling of the structure, said embodiment being applicable in general and not limited to the example of Fig. 2. The ceiling of the structure comprises a main stringer 14 with crossbeams 17 extending from said stringer to protect the various electrical and pneumatic lines, which can be configured according to design requirements. The crossbeams 17 are fixed by means of brackets 18 to the members 10, thus forming a modular covering structure which can be assembled according to the needs, in particular depending on the position of the user devices.

[0035] The structure of Fig. 2 is more extended lengthwise and comprises two pairs of intermediate supporting columns 12 between the main sections 1 and 2. The distance between said columns 12, and between them and the corner pieces, is advantageously a standard measure such that machines of various lengths may be realized by a repetition of standard frame blocks, for example three blocks as in Fig. 2.

[0036] Figs. 1 and 2 illustrate the modular approach of the present invention: with a limited number of elementary frame modules indicated as M1-M4 and the addition of components which are also standardized such as the intermediate columns 12, and the stringers and crossbeams 10, 11, different structures such as those of Figs. 1 and 2 are provided, and it is clear to the person skilled in the art that various other configurations are possible

according to requirements.

[0037] The incorporation of the electrical section and the pneumatic section in the column-like cabinets, which also have a supporting function, reduces the number and the length of the cables. Further advantages are the improved accessibility to the interior for cleaning and/or maintenance and the smaller footprint. The invention therefore achieves the objects as above illustrated.

## Claims

1. Packaging machine, in particular for the secondary packaging of articles inside containers, comprising an essentially lattice-like supporting structure and **characterized in that** said supporting structure comprises corner members (3-6) formed as columns, and **in that** at least one of said corner members is configured as a closed cabinet and contains internally pneumatic and/or electrical components of said packaging machine.
2. Machine according to claim 1, having a footprint of rectangular or polygonal form and wherein said corner members are arranged at the vertices of said rectangular or polygonal form.
3. Machine according to any one of the preceding claims, wherein said corner members have a structural and supporting function.
4. Machine according to any one of the preceding claims, **characterized in that** at least one pair of said corner members, facing each other, are connected by means of a respective crossbeam (7, 8) and said crossbeam also contains internally pneumatic and/or electrical components and/or respective connections.
5. Machine according to any one of the preceding claims, **characterized by** a modular structure in which said corner members are made according to a predefined form or a plurality predefined forms, and each corner member (3-6) consists of a frame module (M1, M2) designed in accordance with said predefined form or in accordance with one of said predefined forms.
6. Machine according to claims 4 and 5, wherein the crossbeam or crossbeams (7, 8) of connection between facing corner members (3, 4; 5, 6) are also made according to a predefined form or a plurality of predefined forms, and each crossbeam consists of a frame module (M3, M4) designed in accordance with said predefined form or in accordance with one of said predefined forms.
7. Machine according to any one of the preceding

claims, wherein the top part or ceiling of said structure comprises at least one main stringer (14) from which crossbeams (17) protecting respective electrical and pneumatic lines extend.

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8. Machine according to any one of the preceding claims, further comprising a plurality of linear members (10, 11, 12) which form a lattice structure and define passages for electrical and/or pneumatic connections.

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9. Machine according to claim 8, wherein at least some of said linear members consist of open tubular members (11).

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10. Machine according to claim 9, said open tubular members (11) having a substantially C-shaped or L-shaped profile.

11. Method for the construction of a supporting structure of a packaging machine, in particular for secondary packaging of articles inside containers, the method comprising the use of frame modules (M1, M2) of one or more types, each type corresponding to a predefined form and size of the module, and wherein:

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said modules are used to form corner members of the structure (3-6), configured as closed cabinets and internally containing pneumatic and/or electrical components of said packaging machine, each corner member consisting of one of said modules.

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12. Method according to claim 11, comprising also the use of further frame modules, which are also of one or more types and in which each type corresponds to a predefined form and size of the module, and wherein said further modules are used to:

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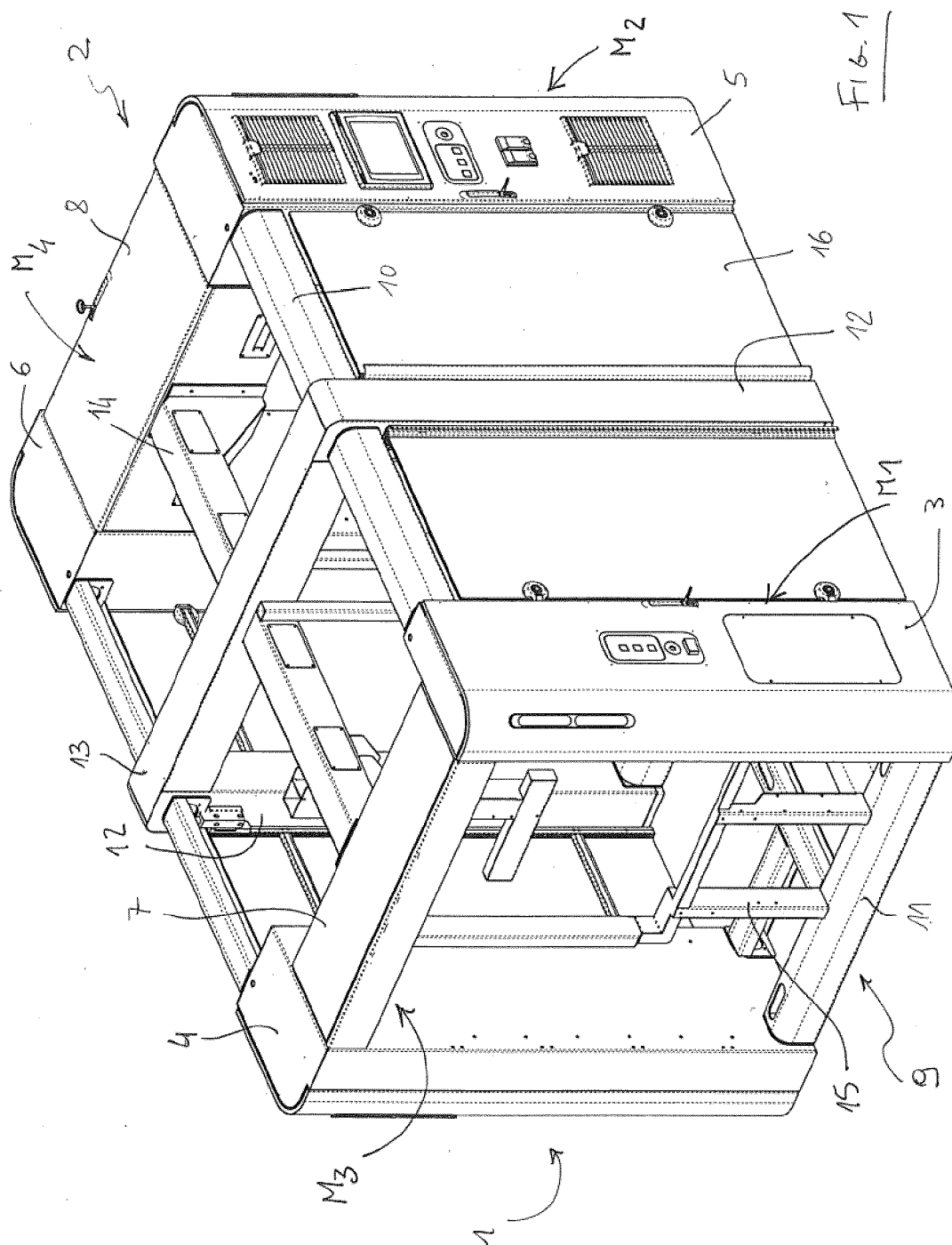
realize crossbeams arranged between pairs of said corner members facing each other, and/or realize linear members (10, 11, 12) which form a lattice structure and define passages for electrical and/or pneumatic connections of said machine.

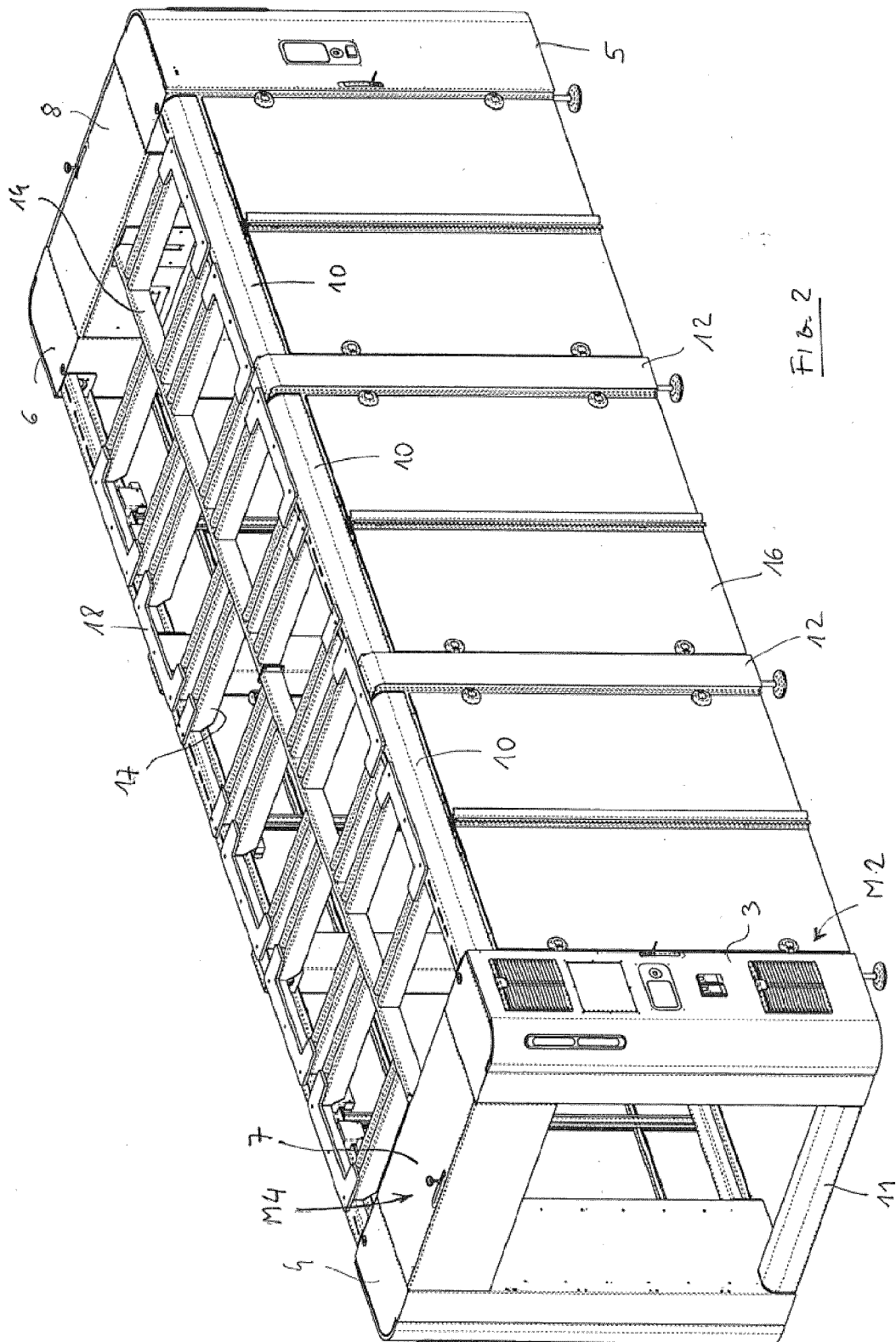
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Application Number  
EP 14 16 7537

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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