

(19)



(11)

EP 4 574 693 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
25.06.2025 Bulletin 2025/26

(51) International Patent Classification (IPC):
B65B 53/06 ^(2006.01) **B65B 9/13** ^(2006.01)

(21) Application number: **24209528.9**

(52) Cooperative Patent Classification (CPC):
B65B 53/066; B65B 9/135

(22) Date of filing: **29.10.2024**

(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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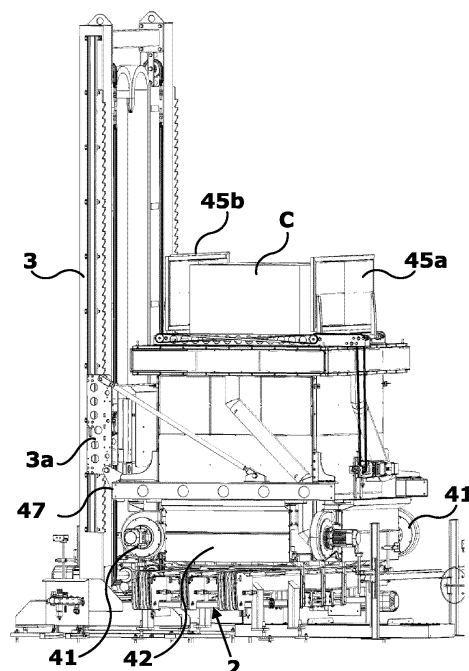
(30) Priority: **06.12.2023 IT 202300026064**

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(54) HEAT-SHRINKING OVEN WITH IMPROVED ENERGY EFFICIENCY

(57) A shrinking oven (1) for shrinking a shrinkable film on a load to be wrapped (C) is disclosed, comprising a frame (3) on which is mounted vertically movable support frame (43) to which is attached a heating oven (4) equipped with
at least a heat generator,
at least a blower (41) to convey hot air,
at least a distribution lung (42) equipped with a slot to direct hot air to a resting area of said load (C)

in which a box-type cabinet open downwards and equipped with side (44) and top (45) closing walls is also mounted on said support frame (43), above said distribution lung (42),
in which said upper closing wall (45) has opening elements obstructing a top opening and wherein said top opening is larger than a plan dimension of said load (C) and is arranged to be passed through by a portion of said load (C).

**Fig. 5****EP 4 574 693 A1**

Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of equipment for wrapping loads with heat shrinkable plastic material, for example with shrinkable hoods. In particular, the invention relates to a shrinking oven to be used downstream of the application of the shrinkable film to the load to be wrapped and arranged on a relevant pallet.

BACKGROUND ART

[0002] As is well known, a palletised load is typically consolidated, protected and attached to a pallet by means of plastic, stretchable film or shrinkable film. In the context of this specification, we will only deal with wrapping methods using shrinkable film.

[0003] Shrinkable film can be applied to the load in various ways, but preferably in the form of a hood that is slipped over the load using a hooding machine, for example as illustrated in EP-B1-0.395.919, EP-B1-1.086.893.

[0004] The heat-shrinkable film cover, however it is applied, is then subjected to shrinkage by heating means, so that it partially shrinks, causing it to adhere tightly to the load and thus leading to consolidation, even with the underlying pallet.

[0005] The heating means consist of heat shrinking ovens essentially in the form of hot air generators (such as gas burners, or electric generators) mounted around the perimeter of an annular quadrilateral structure; this structure is configured to embrace the load to be packaged and to run vertically along it, so as to uniformly provide sufficient heat to cause the shrinking of the hood or the shrinkable film applied thereto.

[0006] Examples of these ovens mounted on hooding machines are described in DE 60024523 and EP 2431280.

[0007] Known equipment of this type has always given and continues to give satisfactory results. However, common heating means produce very hot air (e.g. up to 300°C) - in order to carry out an effective shrinking of the film adhering to the load, thus producing a wrapping that is able to keep the products of the load stationary - which requires a considerable use of energy, most of which is dispersed into the environment. In fact, since the heating means are installed on structures that are necessarily open to surround the load, much of the heat is released into the environment, which spontaneously rises upwards. The upward ascent of the hot air has a twofold drawback: on the one hand, in combined hooding machines, there is a risk of damaging the film that is in the upper part of the machine waiting to be lowered onto the next load; on the other hand, there is a significant heat loss, with inefficient energy results.

[0008] For the first problem, movable screens have already been proposed to protect the film at the top of

the equipment, while for the second problem, no satisfactory solution has yet been found, except at the expense of the heat produced and thus the quality and/or speed of the shrinkage operation.

[0009] A solution that partially reduces heat loss implies to configure the oven as an enclosure that defines a compartment open only downwards: the load to which the heat is to be applied is thus introduced into the oven from below. An example of such a solution is described in US2014/0366488. As can be easily understood, an enclosed oven is, however, limited to accommodating loads with a height less than the vertical dimension of the inner compartment.

PROBLEM AND SOLUTION

[0010] The problem at the basis of the invention is therefore to provide a shrinking oven that overcomes the aforementioned drawbacks, in particular one that allows the energy efficiency of the shrinking procedure to be decisively increased, without having to compromise on the quality of the shrinking process and without limits with respect to the height of the load to be processed.

[0011] This is achieved through the features mentioned in claim 1. Dependent claims disclose preferential features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Further features and advantages of the invention will, however, be best illustrated by the following detailed description of a preferred embodiment, given purely as an example and not as a limitation, and illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a heat shrinking oven according to the invention, with the burner unit at the top of a load;

Fig. 2 is an enlarged perspective view of the upper portion of the oven in Fig. 1;

fig. 3 is a similar view to fig. 2 from a different perspective; and

Figs. 4-5 are views from two different perspectives of a heat shrinking oven according to the present invention, with the burner unit at the bottom of the load.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0013] Fig. 1 illustrates a heat-shrinking machine 1, arranged astride a conveyor line 2 - e.g. an array of motorised conveyor rollers - at a heat-shrinking station where a load C resting on pallet B is intended to stand for the shrinking phase of the wrapping film.

[0014] The heat-shrinking machine has, as known per se, a frame equipped with a lifting frame 3 along which a sliding carriage 3a to which a heating oven 4 is attached is mounted vertically movable.

[0015] The heating oven 4 has a number of burners or electric heat generators which, by means of fans or blowers 41, feed hot air into distribution lungs 42, arranged in an annular path around a working area corresponding to the perimeter footprint of a load C. The distribution lungs 42 also have appropriate louvers facing inwards in the annular path, so as to direct the hot air towards the load C provided with the plastic film to be heat-shrunk.

[0016] These components, known per se, are attached to a support frame 43 which is in turn attached to the sliding carriage 3a.

[0017] According to the invention, a box-shaped cabinet is installed above the distribution lungs 42, which has closing side walls 44 and upper wall 45, while being open downwards.

[0018] Furthermore, according to a feature peculiar to the invention, the upper closure wall 45 is provided with an top opening which is closed by opening elements. When the opening elements do not occupy the area of the top opening, they allow the load C to pass through the upper wall 45 in a phase of relative movement between the two. The opening elements may be in the form of flexible brushes or flaps, which are simply pushed apart by the same pressure exerted by the load as it passes through the top opening, or preferably they are in the form of one or more tilting flaps, as will be better shown below. As a further alternative, the top opening can be equipped with either opening flaps or flexible sealing elements (e.g. brushes or rubber lips) arranged along its perimeter edge: when the flaps are open, the top opening remains partially occupied by the flexible sealing elements, which are easily dislodged by the load as it passes through the opening.

[0019] Preferably, hot air transfer ducts 46 are also provided, which have an inlet end arranged inside the box cabinet at the top (in the vicinity of the top closing part 45) and an outlet end at a fan or blower inlet 41. In this way, the hot air that remains trapped inside the box cabinet - which, by its nature, tends to rise in the upper part of the box cabinet - is taken by the transfer ducts 46 and reused in the distribution lungs 41, thus leading to a recirculation of the hot air inside the box cabinet.

[0020] Fig. 2 provides a detailed look at the components of a preferred embodiment of heating oven 4.

[0021] As can be seen, the side walls 44 are flat and enclose the sides of a rectangular box cabinet. The walls 44 are preferably of a material and thickness that provides good thermal insulation. The side walls 44 are preferably installed on the inner side of the frame 43. The ducts 46 are located on the outside of the walls 44, within the cross-sectional area of the frame 43. A frame 47 protruding outwards is provided in the upper part of the box cabinet, thus defining a lower step portion 47a in which the inlet ends of the ducts 46 are engaged.

[0022] A side surface of the frame 47 is flush with the same vertical plane where a side surface of the frame 43 is located. In this way, it is possible to provide closing

plates (not illustrated) resting on the frame 47 and the frame 43, which conceal the ducts 46 from view, resulting in an external finishing body of the oven 4.

[0023] To better support the weight of the box cabinet, preferably the frame 43 is connected to the carriage 3a via a bracket 43a.

[0024] According to the preferred embodiment of the invention illustrated in the figures, the upper closing wall 45 comprises at least one upwardly opening overhead door. Preferably, the upper closure wall 45 comprises two pivoting doors 45a and 45b, hinged along two parallel hinge axes X' and X'' and arranged in proximity to two opposing sides of the upper closure wall 45.

[0025] According to a particularly preferred variant, the doors 45a and 45b are motorised in such a way as to execute on command a rotation of 90°, between 'a horizontal closing attitude (figs. 2 and 3) and a vertical opening attitude (figs. 4 and 5) and vice versa. Drive means may comprise a drive motor M connected by means of a transmission chain 48 to one of the two rotation axes, for example the axis X', which in turn is connected by means of a transmission chain 49 to the other rotation axis X''.

[0026] The drive motor M is controlled by a control logic that provides a command to open the upper closing wall 45, by rotating the doors 45a and 45b upwards, when it is detected that load C is entering the inside of the box cabinet of oven 4. In fact - except in those (residual) cases in which the load C is so low that it can be accommodated for the entire height inside the box cabinet - in order to transfer the oven 4 over the entire height of the load C, thus bringing heat over the entire film to be heat-shrunk, it is necessary for the load C to be able to pass through the upper closing wall 45 so that the distribution lungs 42 can descend to the lower part of the load C.

[0027] For this purpose, a load height detection sensor is provided, by means of which the control logic can determine the moment when the load C enters the box cabinet with its top part. The sensor (not shown) may be fixed to the frame structure 3 and detect an absolute height of a load entering the heat-shrinking station. Alternatively, it is preferable for the sensor to be mounted movably integral with the oven 4, for example immediately below the lungs 42 or - more preferably, because it is less exposed to heat - at a certain height of the side walls 46 so as to horizontally sight the top of the load C through a hole (not shown) pierced in the same side wall 46.

[0028] In order to optimise operation, the doors 45a and 45b should only be opened for the time strictly necessary to allow the load C to pass through, which, moreover, by its presence prevents excessive hot air escaping from the opening of the upper wall 45. As soon as the oven 4 rises upwards and the top of the load C returns below the upper wall 45, the doors are closed again by the intervention of motor M, so that no hot air escapes upwards.

[0029] Fig. 4 shows the condition of doors 45a and 45b at a phase when oven 4 is fully lowered and the top portion of load C protrudes from the top opening of upper

wall 45.

[0030] In operation, once the shrinkable film has been positioned on the load C and the latter transferred to the shrinking station, the oven 4 is moved along the support frame 3, progressively lowering from the position illustrated in fig. 2 to the position illustrated in fig. 4, to the bottom of load C. At the same time as it descends, when the top of load C enters the box cabinet, the doors 45a and 45b are controlled to open, thus allowing oven 4 to reach the bottom base of load C.

[0031] Hot air generation can take place during the lowering phase of oven 4 as just described, or it can take place only during a rising phase from the bottom of load C, or in both directions. The hot air generation system exerts its heating action (e.g. expulsion of hot air at 300°C) while the oven 4 moves slowly vertically along the load.

[0032] The procedure in which hot air is produced during the rising phase yields the best results: in fact, at first the lower free edge of the film is heated, which, as it shrinks, adheres strongly to the pallet underneath the load, creating a film or hood attachment point; subsequently, the upper portion of the hood also shrinks progressively around the load and consolidates it evenly.

[0033] As can be understood from the description provided, the oven according to the invention advantageously achieves the purposes set out in the introduction. Indeed, on the one hand, by means of the upper wall provided with a closable opening, the dispersion of hot air upwards is limited to the minimum possible and, on the other hand, by means of the recirculation of air from the upper to the lower part of the box cabinet, the energy efficiency of the oven is further improved.

[0034] It is understood, however, that the invention is not to be considered limited to the particular arrangement illustrated above, which is only an exemplary embodiment of it, but that several variants are possible, all within the reach of a person skilled in the art, without thereby going beyond the scope of protection of the invention itself, as defined by the following claims.

[0035] For example, although the box cabinet has been illustrated as rectangular in shape, any other shape can be equivalently used, provided that it defines a suitable perimeter to enclose the load to be heat-shrunk and that the upper closing wall can be opened only when the load must pass through it.

[0036] The height of the box cabinet is not strictly decisive for the operation of the oven, although obviously too low a height would not allow sufficient volume to store the hot air produced in excess during shrinking. The ideal height also depends on the other plan dimensions of the oven, but indicatively a height of 1500-1800 mm is considered appropriate.

[0037] The presence of two hinged doors on the openable upper wall is a preferable solution because it allows for smaller doors and therefore less inertia to rotational movements. However, the possibility of using just one door or more than two is not excluded.

[0038] Finally, it is not ruled out that this type of oven

could also be combined with a hooding machine, so that the load can be hooded and then shrink-wrapped in the same station.

Claims

1. Shrinking oven (1) for shrinking a shrinkable film on a load to be wrapped (C), comprising

a frame (3) on which is mounted vertically movable a support frame (43) to which is attached a heating oven (4) equipped with at least a heat generator, at least a blower (41) to convey hot air, at least a distribution lung (42) equipped with a slot to direct hot air to a resting area of said load (C)

in which a box-shaped cabinet open downwards and provided with side (44) and top (45) closing walls, said top wall (45) being provided with a top opening, is also mounted on said support frame (43), above said distribution lung (42)

characterised by that said top closing wall (45) has opening elements obstructing said top opening and wherein

said top opening is larger than a plan dimension of said load (C) and is arranged to be passed through by a portion of said load (C).

2. Heat shrinking oven (1) as in claim 1, further comprising heat recirculation means (41, 46, 47) for drawing hot air from a top part of said box cabinet and introducing it into said distribution lungs (42).

3. Shrinking oven (1) as in claim 2, wherein said recirculation means comprise ducts (46) connecting an inlet port, arranged in a top portion of said box cabinet, to an outlet port at said blowers (41).

4. Shrinking oven (1) as in claim 3, wherein said inlet port is located in a protruding frame portion (47) of said box cabinet.

5. Shrinking oven (1) as in any one of the preceding claims, wherein said opening elements comprise at least a door (45a, 45b) pivoting between a horizontally closed position and a vertically open position.

6. Shrinking oven (1) as in any one of the preceding claims, wherein said top opening has an edge provided with flexible sealing means.

7. Shrinking oven (1) as in any one of the preceding claims, further comprising a load (C) presence detecting sensor apt to trigger an opening signal activating a driven transmission (M, 49) controlling the rotation of said at least a door (45a, 45b).

8. Shrinking oven (1) as in claim 7, wherein said detecting sensor is mounted integral in movement to said support frame (43).

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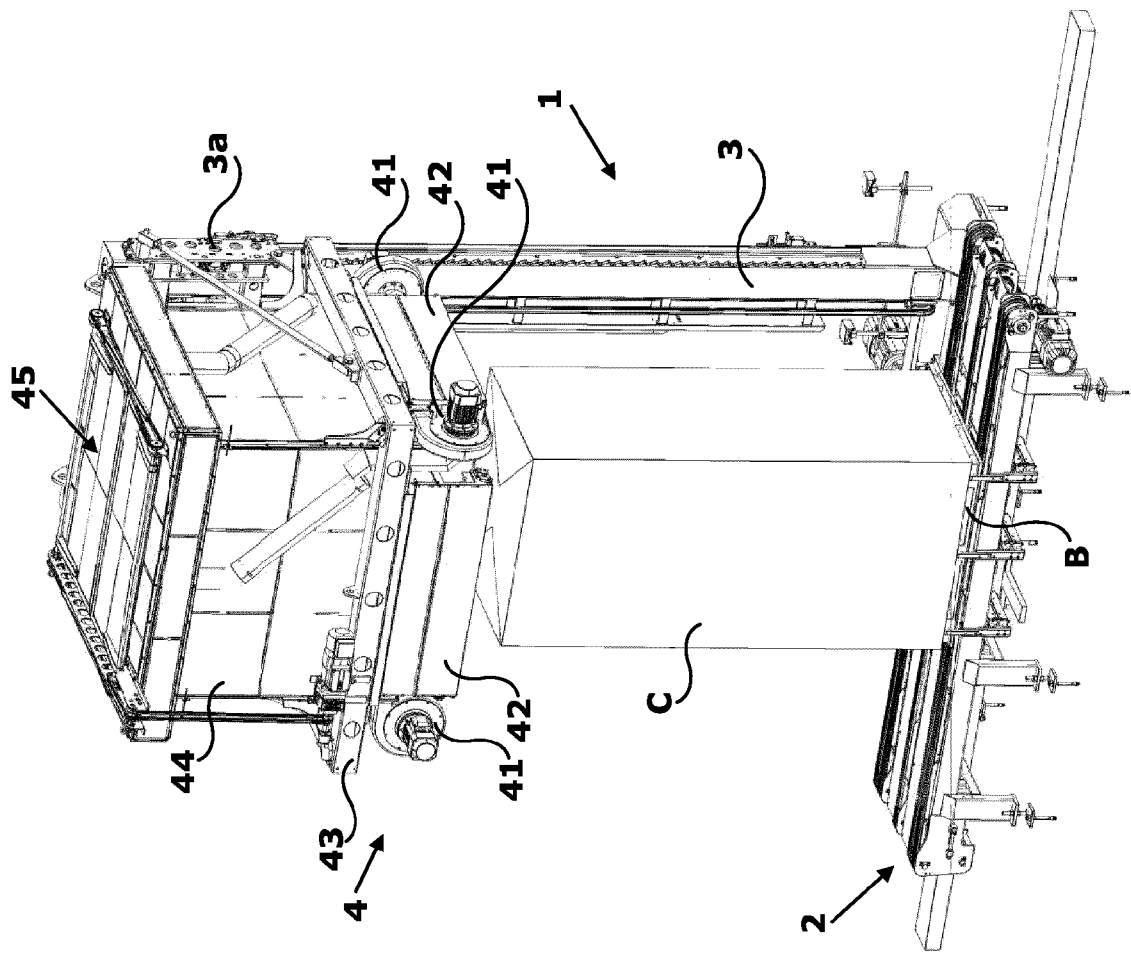


Fig. 1

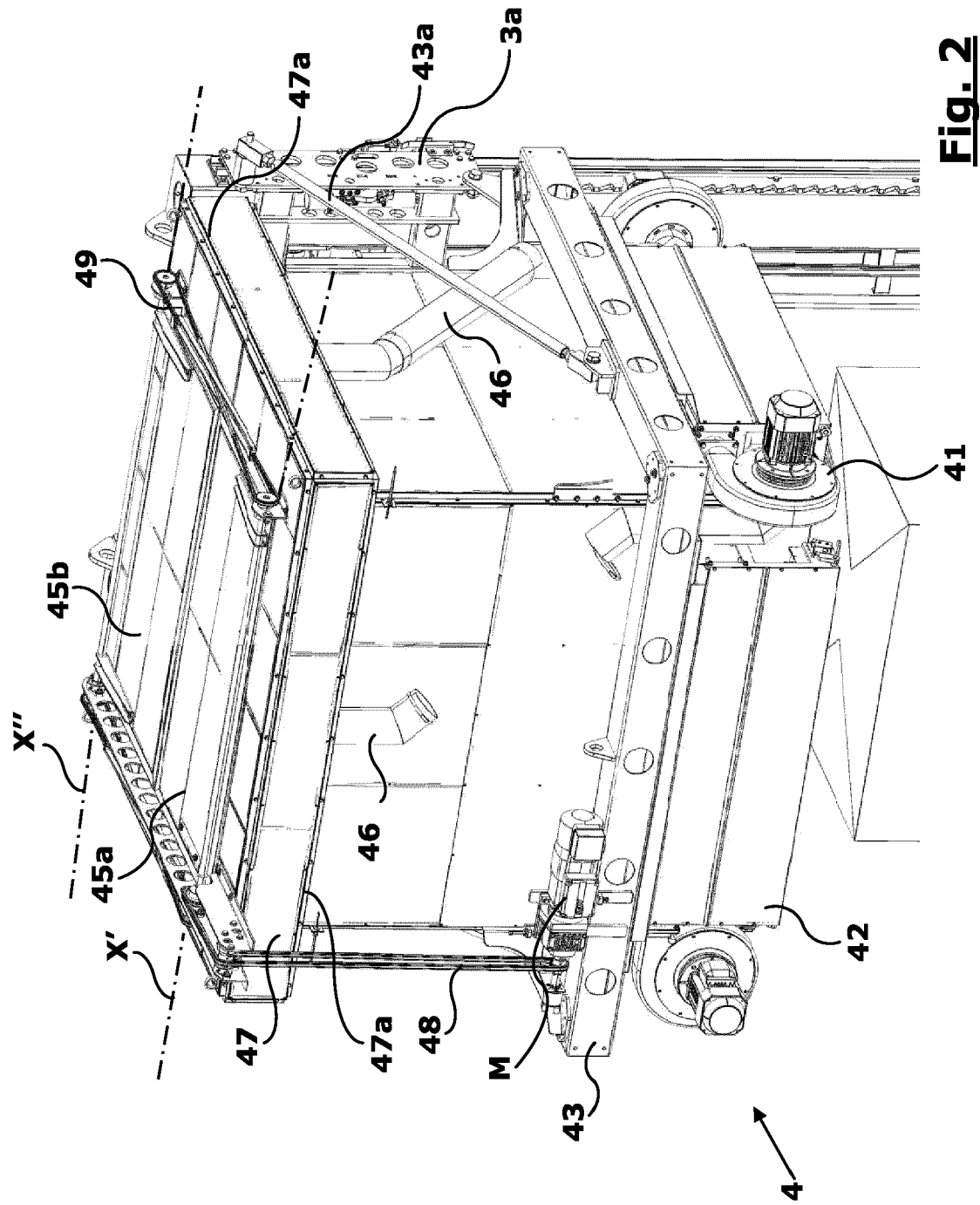


Fig. 2

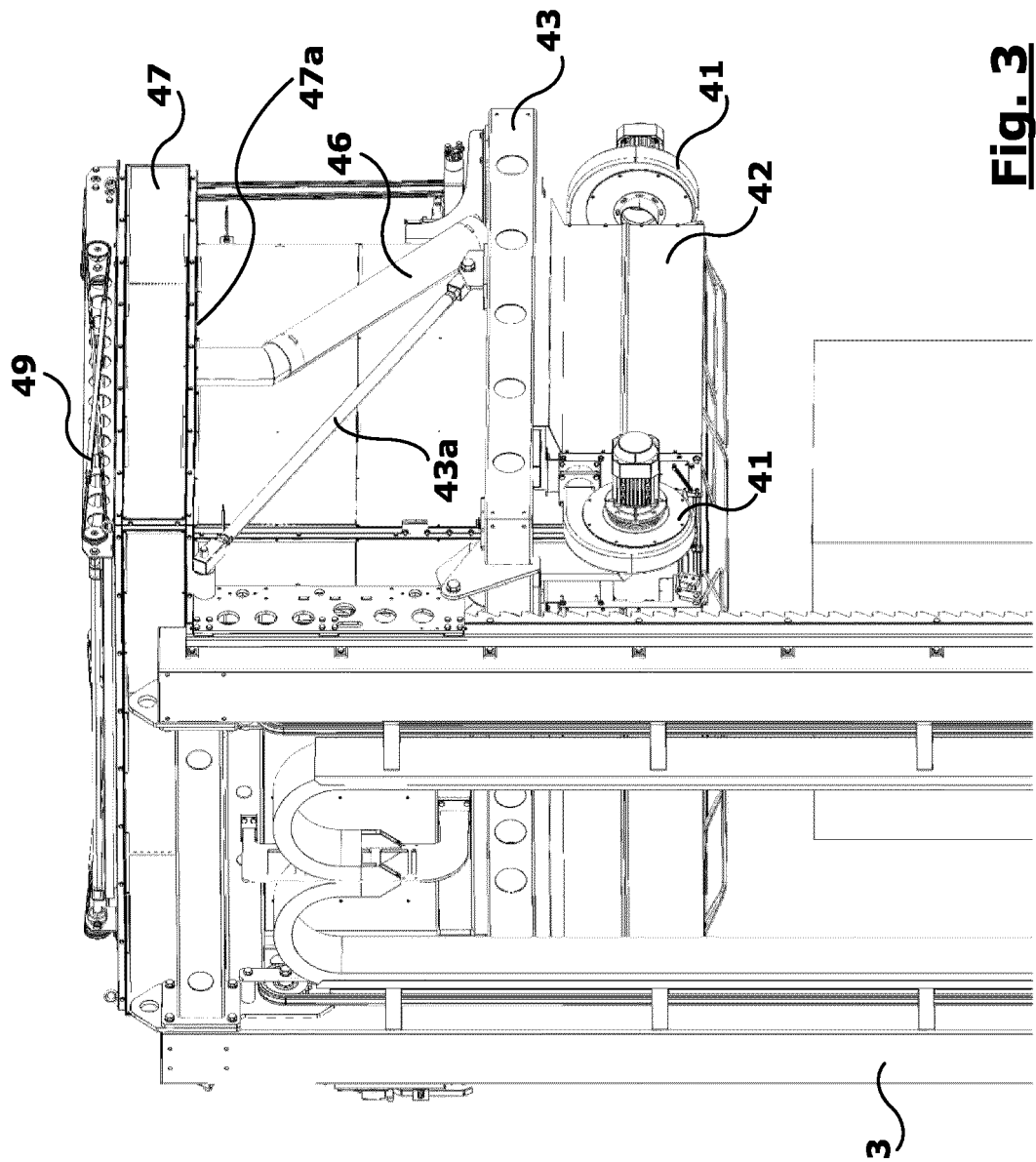


Fig. 3

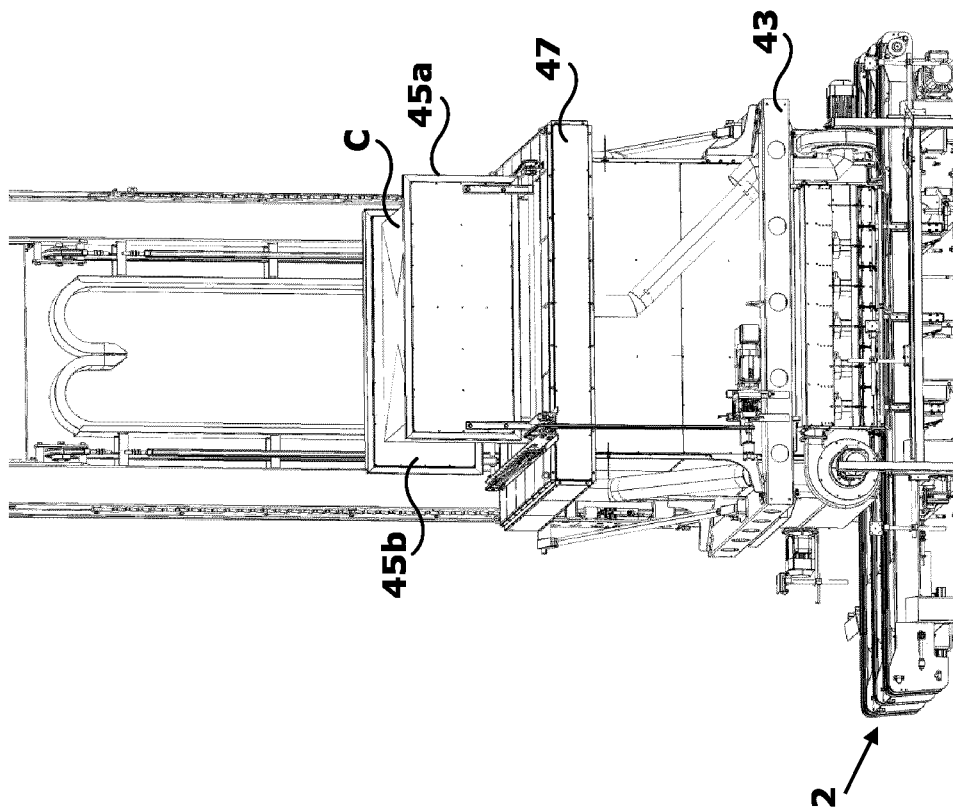


Fig. 4

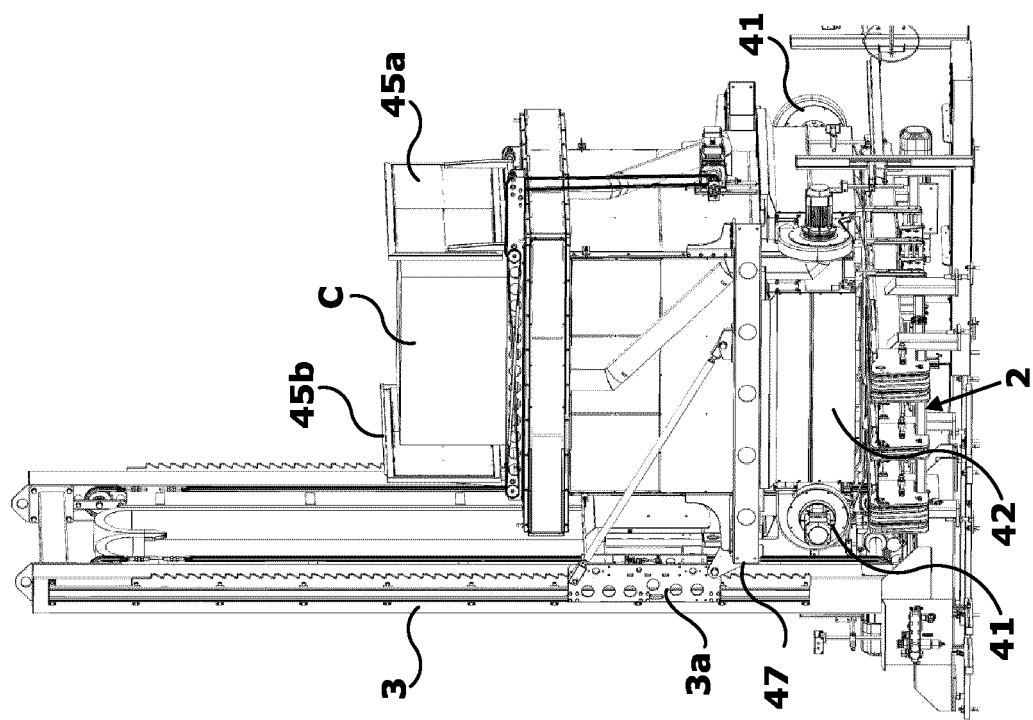


Fig. 5



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Application Number

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Place of search Munich		Date of completion of the search 8 May 2025	Examiner Dick, Birgit
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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