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(54) Automatic modular packaging machine

(57) The box-filling module (1) is provided, on-board and downstream of the cage conveyor (7) which fills and closes the boxes, with means (8, 9) which stack the said packages and with means (10, 11) which cyclically transfer a predetermined number of stacked boxes from the stacking store (9) to a work-station (12) of a packaging or wrapping module designed such that it can be arranged alongside and fixed with its frame (18) to the frame (15) of the box-filling module, the two modules being provided with means (13, 14, 22) which permit syn-

chronous operation thereof, in phase and with branching-off, where necessary, of the drive power from the motor of the box-filling module. The packages cyclically discharged from the stacking store of the box-filling module are thus supplied directly to the downstream module which can be provided so as to perform, as required, the operations of cartoning, bundling, cellophaning, tray-filling or the like.

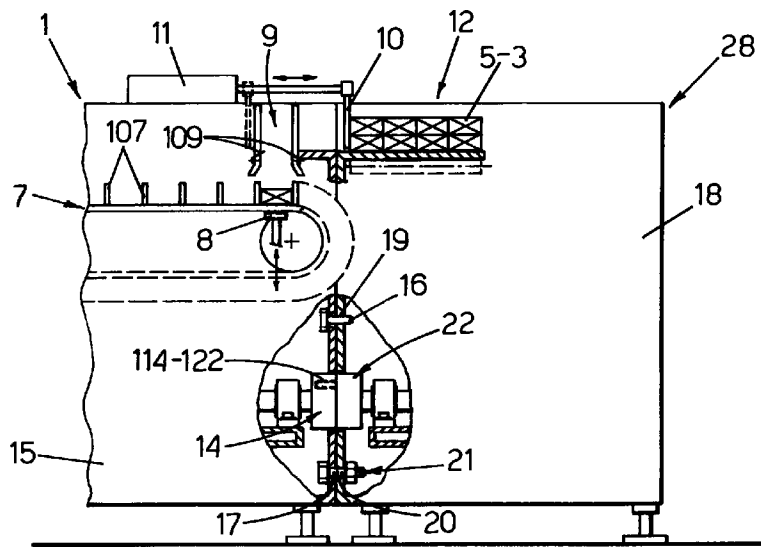


Fig. 3

Description

The invention relates to the packaging systems for articles in which the articles are enclosed inside containers or boxes so as to obtain packaged articles which are arranged in orderly groups which on their turn, are further packaged inside any type of wrapping or packaging.

Presently, the packaging systems of the above mentioned type comprise a box-filling machine which is operatively connected with a packaging machine. The two machines form separate entities with respective drive systems and are interconnected by a conveyor belt having the function of transferring the boxes with the article from one machine to the other, the packaging machine being normally provided with means which form orderly groups of boxes which are then transferred to the packaging or wrapping station. The packaging machine is suitably synchronized with the box filling machine and can be adapted to the operating speed of the latter.

The operative coupling of the two machines has the drawback of presenting large overall dimensions and results in particularly high production costs.

The aim of the invention is to overcome these and other drawbacks of the mentioned known packaging systems and for this purpose it contemplates a modular packaging machine which comprises a box-filling module provided with means for forming orderly groups of boxes and for feeding them to a packaging module arranged directly alongside and operatively in phase. Preferably the two modules are rigidly connected with each other in a removable manner. The packaging module can perform different types of packaging operations, such as cartoning, bundling, cellophaning, tray-filling or other operations.

The packaging machine according to the invention has the advantage of small overall dimensions since the box-filling module and packaging module can be arranged directly alongside one another, without the presence of the conveyor which is currently used. Owing to the absence of this latter component and the possibility of operating the two modules with common driving means, the new solution in question also has the advantage of a limited cost. Moreover, the design phase will be carried out such that packaging modules of different types can be combined with a box-filling module so as to satisfy in each case the different market requirements. This solution is clearly of importance from a commercial point of view, being aimed in particular at small- and medium-sized companies who initially will be able to purchase only the box-filling module with which, in the future, they will be able to combine any suitably designed packaging-machine module, the cost of which, for the aforementioned reasons, will be decidedly competitive compared to that of packaging machines of the known type.

Further characteristic features of the invention and the advantages arising therefrom will emerge more clearly from the following description of a few preferred embodiments thereof illustrated purely by way of a non-

limiting example in the figures of the accompanying drawings in which:

- Figure 1 is a schematic side view, with parts sectioned, of the box-filling module;
- Figure 2 is a top plan view of the box-filling module according to Figure 1;
- Figures 3 and 4 are, respectively, a side elevation view and top plan view of a so-called cartoning module which can be connected to the end part of the box-filling module;
- Figures 5 and 6 are, respectively, a side elevation view and top plan view of a bundling module which can be connected to the end part of the box-filling module;
- Figures 7 and 8 are, respectively, a side elevation view and top plan view of a so-called tray-filling module which can be connected to the end part of the box-filling module.

In Figures 1 and 2, 1 denotes the box-filling module usually consisting of a horizontal-axes conveyor 2 which travels in the direction of the arrows 100 and in the cages 102 of which the products 3 are manually or automatically positioned, said products being then inserted by a known translation device 4 into the respective pre-glued boxes 5 which are extracted by known means from a store 6 and inserted open into the cages 107 of a conveyor 7 which is located alongside and parallel to the preceding conveyor 2 and which travels in the same direction 100 and is synchronized with the latter.

During travel on the conveyor 7 the boxes containing the product and if necessary pre-closed at one end are completely closed by known means (not shown). In the remainder of the description, for the sake of convenience, the term "package" will be used to refer to the closed box containing the product. According to the invention, when the packages 5, 3 reach the end part of the conveyor 7, they are acted upon by a lifting device 8 which inserts them, one at a time and in a predetermined maximum quantity, into an overhead stacking store 9 provided at the bottom with means 109 consisting of any known solution suitable for retaining in said store the package cyclically raised by the said lifting device 8. In the example illustrated in Figures 1 and 2, the cages of the conveyor 7 are provided at the bottom with an opening which, during the cyclical stoppage of this conveyor, stops above the lifting device 8 and has dimensions such as to allow this component to pass through, the latter raising the package by the predetermined amount. If necessary, the lifting device can be provided with suction means so as to prevent any undesired displacement of the package during the raising movement and these means are deactivated automatically prior to the downward movement of the lifting device.

It is understood that, if the box-filling module operates continuously, it may be provided with means different from those illustrated, designed for example to pick up the package cyclically unloaded from the conveyor 7

and stack the packages in the store 9 suitably located in the box-filling module.

The stacking store 9 is, in turn, provided along its height with lateral openings suitable for allowing the through-movement of a pusher 10 connected to a horizontal-alternating translation unit 11. The pusher 10, which is normally in the rest position shown in continuous lines in Figure 1, passes in a synchronized manner through the closely arranged lateral openings of the store 9 which, in turn, is designed to open on the opposite side, for example against the action of resilient means, so as to allow the said pusher to transfer a predetermined quantity of packages from the store 9 to an adjacent station 12 of a packaging module arranged alongside the box-filling module and operated in synchronism with the latter. The pusher 10 thus passes from the position shown in continuous lines in Figure 1 to the position shown in broken lines and then returns immediately into the starting position, while suitable guides, not shown, control the group of packages during transfer into the station 12, and the store 9 prepares itself to receive and stack the following packages.

If unloading of the packages from the store 9 should also involve the package resting on the retaining means 109, it is preferably envisaged that these means are neutralized by the presence, in a raised position, of the lifting device 8 on which the group of packages cyclically unloaded by the pusher 10 is thus able to slide.

If the box-filling module operates continuously, known means may be provided so as to ensure that the pusher 10 performs the return travel to the rest position without passing through the store 9, or the said pusher may be replaced by other means suitable for this purpose, for example by a vertical-axes cage conveyor which cyclically positions itself with each cage in the top end part of the store 9, so as to form three consecutive walls thereof, all of which in a manner which is obvious to and can be easily realized by a person skilled in the art.

The box-filling module 1 is controlled by a control console 13 which also interacts with the packaging module which can be connected to the box-filling module. The drive system of the box-filling module, not shown, is also able to operate a power take-off 14 preferably visibly located on that end of the base 15 of the said box-filling module incorporating at the top the stacking store 9. The power take-off 14 is of any suitable (preferably standardized) type and is for example provided with a front recess 114 useful for synchronized connection to a complementary power take-off (see below).

The same end of the base 15 of the box-filling module on which the power take-off 14 is butt-mounted also has located on it at least one centring pin 16 (or a seat) as well as an appropriate number of suitably distributed holes 17 for receiving bolts useful for fixing the box-filling module to the module of a downstream packaging or wrapping machine, as described in more detail below.

The various types of packaging modules arranged alongside and operationally connected to the box-filling module and have in common the following features illus-

trated in the examples of Figures 3, 5 and 7. The end of the base 18 of these modules, which is in the region of the station 12 receiving groups of packages 5, 3 from the box-filling module, is provided with seats 19 for coupling with the centring pins 16 and is provided with holes 20 which are aligned with those 17 of the base of the box-filling module such that the ends of the bases of the two modules can be firmly fixed together by means of bolts 21. The said end of the base 18 which is provided with the seats 19 and holes 20 is provided with a power take-off 22 which complements the power take-off 14 of the box-filling module and which is coupled in synchronism with the latter, being provided for this purpose for example with an eccentric lug 122 which engages in the recess 114 of the driving power take-off 14. The power take-offs 14 and 22 can also be provided with conical centring parts, known and not illustrated, useful for facilitating synchronized coupling of these power takeoffs.

It is understood that, according to a constructional variant of the invention, the box-filling module 1 may be operated by a motor with electronic control of the speed and phase, for example by a brush-less motor, and the packaging module which can be combined therewith may also be operated by their own brushless motor which can be connected via the "electrical axis" to the motor of the box-filling module. In this case the control console 13 of the box-filling module is provided with an electronic unit able to allow in-phase connection between the motor of the said box-filling module and that of the packaging or wrapping module combined therewith, all of which in a manner which is obvious to and can be easily realized by a person skilled in the art.

Figures 3 and 4 show coupling of a so-called carton-ing module 28 with the box-filling module 1. In addition to the details already considered with regard to the structural and kinematic connection of the two modules, it can be seen how, laterally with respect to the station 12 in which several groups of packages are stored with successive travel movements of the pusher 10, on one side a pusher 23 and on the opposite side a support 24 operate, the latter being able to oscillate about a horizontal axis 25 perpendicular to the direction 26 of alternating displacement of the said pusher 23 and having mounted on it, manually or automatically, a cardboard container 27 which, following oscillation of the said support 24, passes from a vertical position shown in broken lines to the horizontal position shown in continuous lines, in a horizontal arrangement with the opening oriented towards the station 12 and with a wall coplanar with the bottom of this station such that, following the action of the pusher 23, the group of packages stored in said station 12 is introduced into the container 27 which, via the support 24, then returns into the vertical position for the subsequent closing and unloading phases. It is understood that the operating principle of the carton-ing module 28 may be of any type and different from that illustrated.

Figures 5 and 6 show coupling of a so-called bundling module 29 to the box-filling module 1. In addition to the details regarding structural fixing and kinematic

connection of the two modules already considered, it can be noted how the groups of packages 5, 3, unloaded into the station 12, during translation in the direction of the arrows 34 are partially bound with a section of material 30, unwound from the reel 31, the end of which is held by a gripper 32 and which is controlled by opposite means 33. Other known means are provided in order to complete the binding of material around the group of packages, in order to separate this binding arrangement from the said means 32, 33 and from the material supplied by the reel and then in order to translate the bound product in the direction of the arrows 34, while known means perform, in a synchronized manner, transverse closing of the binding arrangement. The gripper 32 takes hold again of the end of the film attached to the means 33, returns into the lowered position shown in Figure 5 and the cycle described is repeated. Using the same principle as the bundling module it is possible to provide a cellophaning module in which the material which wraps the groups of packages projects from both ends of the packages themselves onto which it is then folded over and fixed so as to provide a package closed on all six faces. It is understood that the operating principle of the bundling module or the cellophaning module may also be different from that described and of any known type since the invention does not intend to protect particular methods of packaging or wrapping.

Figures 7 and 8, finally, show coupling of the box-filling module 1 to a so-called tray-filling module 35. The groups of packages which have accumulated in the station 12 are removed in a synchronized manner by a gripper 46 mounted on a manipulator 47 movable along cartesian axes, which inserts this group of packages into a cardboard tray or container 48 extended horizontally on a trap 49 and which pushes this assembly downwards, following which the said manipulator returns open into the raised position in order to repeat a new cycle. When crossing the trap, the side walls of the container or tray are folded upwards and the tray itself is definitively closed during the subsequent horizontal translation movement in the direction indicated by the arrow 50. It is understood that the tray-filling module may also be formed in any other known manner also different from that shown in Figures 7 and 8.

It is understood that some packaging or wrapping modules such as, for example, the cartoning module or the tray-filling module may be operated by fluid-pressure jacks and may not require the presence of the power take-off 22, even though the latter would be desirable for the activation of one or more cams and microcontacts and/or valves which would signal the working phase of the box-filling module.

Claims

1. Automatic packaging machine characterized by the fact that it comprises a box-filling module (1) for inserting and closing inside boxes or containers (5) any article or object(3) so as to obtain filled pack-

ages (5-3), said box-filling module being provided with means (8, 9, 10) for forming orderly groups of the said packages (5-3) and for feeding them to a packaging module (28, 29, 35) which encloses, at least partially each one of the said orderly group of packages (5-3) in a packaging container of any type, said packaging module being arranged directly alongside and operatively in phase with the said box-filling module.

2. Packaging machine according to claim 1, in which the box-filling module (1) and the packaging module (28, 29, 35) are rigidly connected with each other in a removable manner through suitable coupling means.
3. Packaging machine according to claim 2, in which the coupling means comprise fixing bolts (21) and centring pins (16).
4. Packaging machine according to any one of the preceding claims, in which common driving means are provided for the box-filling module and for the packaging module.
5. Packaging machine according to claim 4, in which the drive is transmitted from one module to the other module by means of respective driving shafts through complementary power take-offs (14, 22).
6. Packaging machine according to claims 1 to 3, in which the two modules are provided with separate driving means, preferably consisting of motors of the brushless type or equivalents, controlled by a common control unit.
7. Packaging machine according to the preceding claims, in which the packaging module is provided with operative means so as to perform the functions of a cartoning machine.
8. Packaging machine according to claims 1 to 6, in which the packaging module is provided with operative means so as to perform the functions of a bundling or cellophaning or wrapping machine.
9. Packaging machine according to claims 1 to 6, in which the packaging module (35) is provided with operative means so as to perform the functions of a tray-filling machine.
10. Packaging machine according to the preceding claims, in which the box-filling module (1) comprises a store (6) for supplying the empty and pre-formed boxes (5), means for supplying in synchronism these boxes to a cage conveyor (7) where the boxes themselves are opened and arranged so as to receive the product (3) from transfer means (4) which pick up this product from a cage conveyor (2) which is

located alongside, parallel to and synchronized with the preceding conveyor, and which comprises means for closing the boxes containing the product.

11. Packaging machine according to the preceding claims, in which box-filling module (1) is provided with means (8) which, in a synchronized manner, pick up the unloaded package and raise it into a stacking store (9) where means (109) operate, retaining the cyclically raised package and allowing lowering of the empty lifting device (8) which is able to operate through the opening in the bottom of the cages of the package conveyor (7), during the cyclical stoppages of the latter or which is able to operate outside of this conveyor, in particular in the case where the box-filling module operates continuously. 5 10 15
12. Packaging machine according to the preceding claims, in which the store (9) for stacking the packages is provided laterally with openings which, in a synchronized manner, are passed through by a pusher (10) which is vertically arranged and connected to a suitable horizontal-alternating actuating means (11) in order to unload from the store the predetermined group of packages, while the store itself is formed so as to open on the front side where the packages exit and close again automatically after the passage of the latter. 20 25
13. Packaging machine according to claim 1 to 11, in which the store (9) for stacking the packages is defined all or partly by a vertical-axes cage conveyor which cyclically brings a cage into the package stacking zone and which is then operated so as to transfer the group of stacked packages into the downstream work-station (12) of the attached packaging module and so as to insert a new cage into the said stacking zone of the box-filling machine. 30 35
14. Packaging machine according to the preceding claims, characterized in that unloading of the packages from the stacking store is performed when the lifting device (8) is in the raised position, such that the group of unloaded packages rests and slides on this lifting device and not on the retaining means (109) of the said store. 40 45

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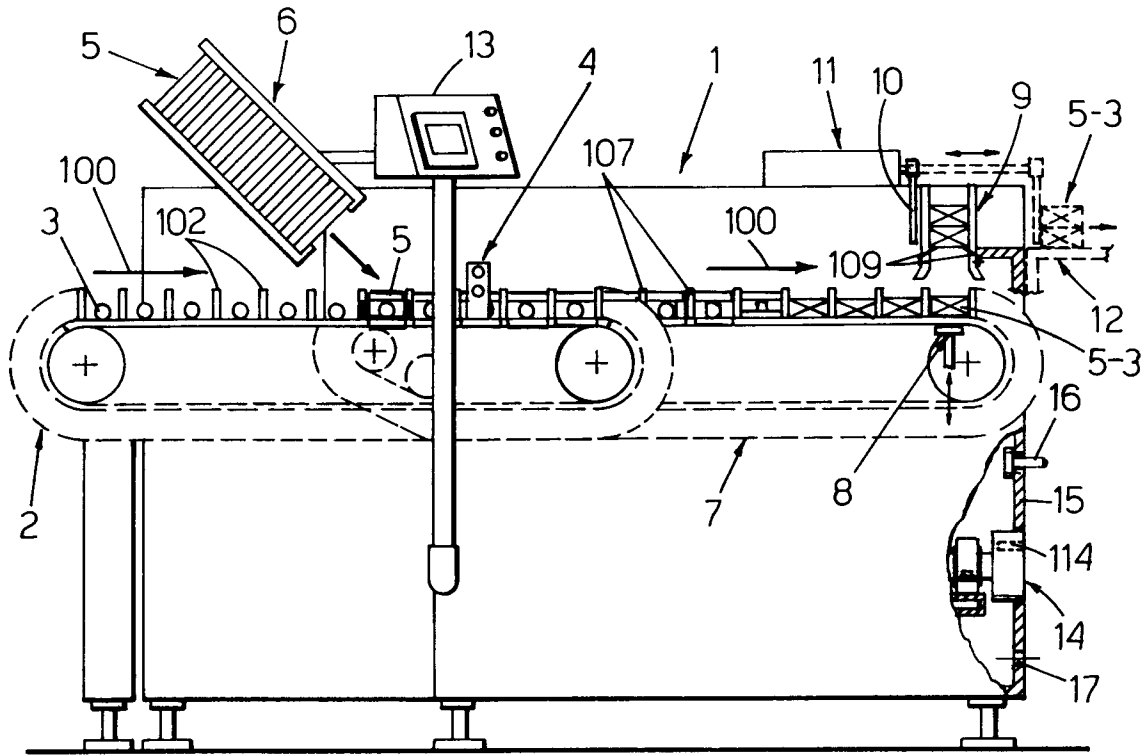


Fig. 1

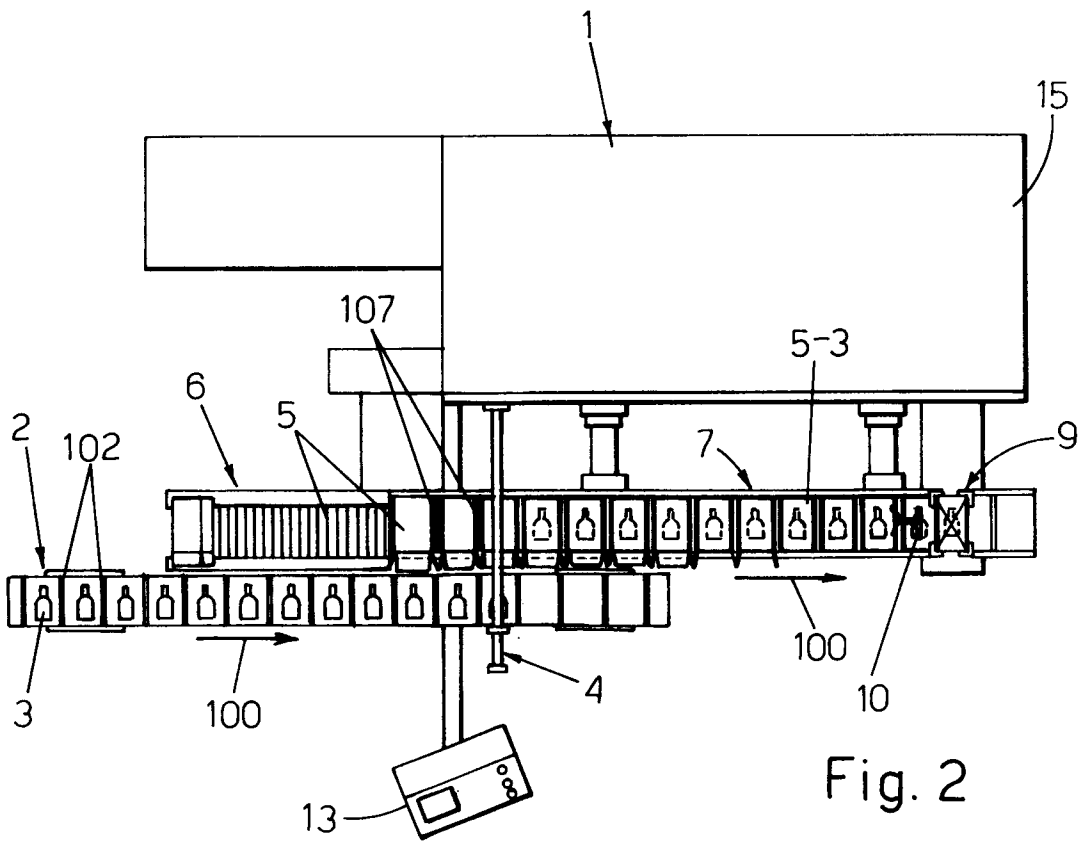


Fig. 2

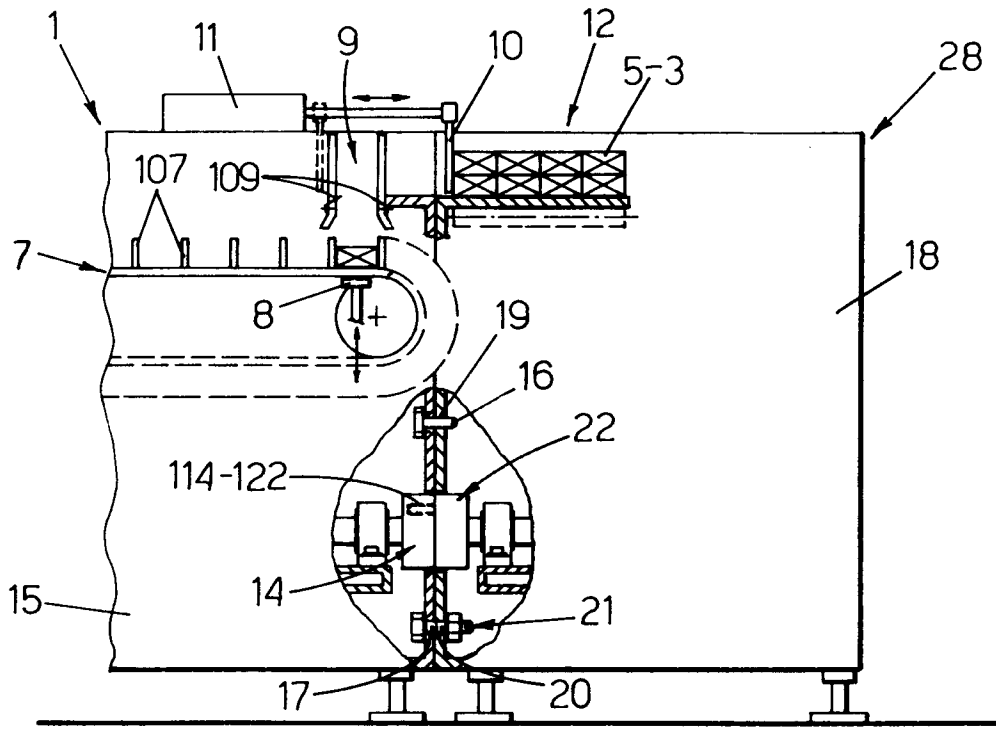


Fig. 3

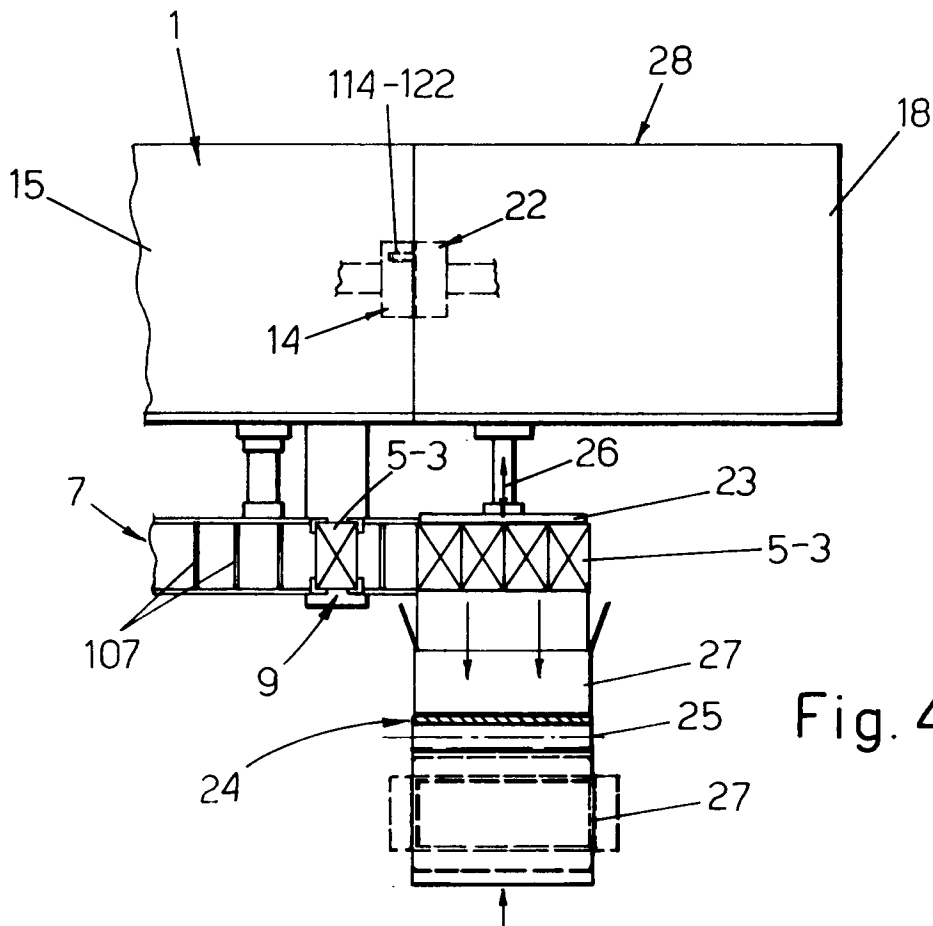


Fig. 4

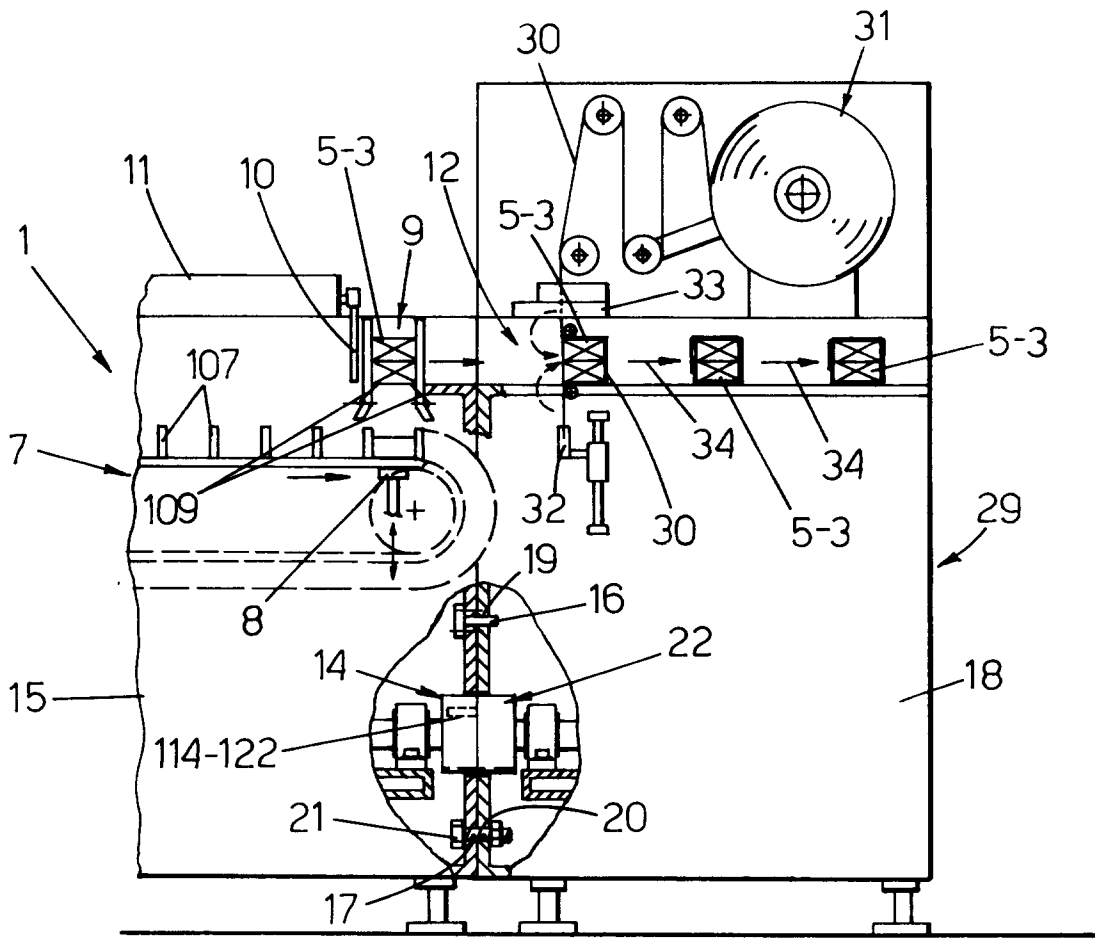


Fig. 5

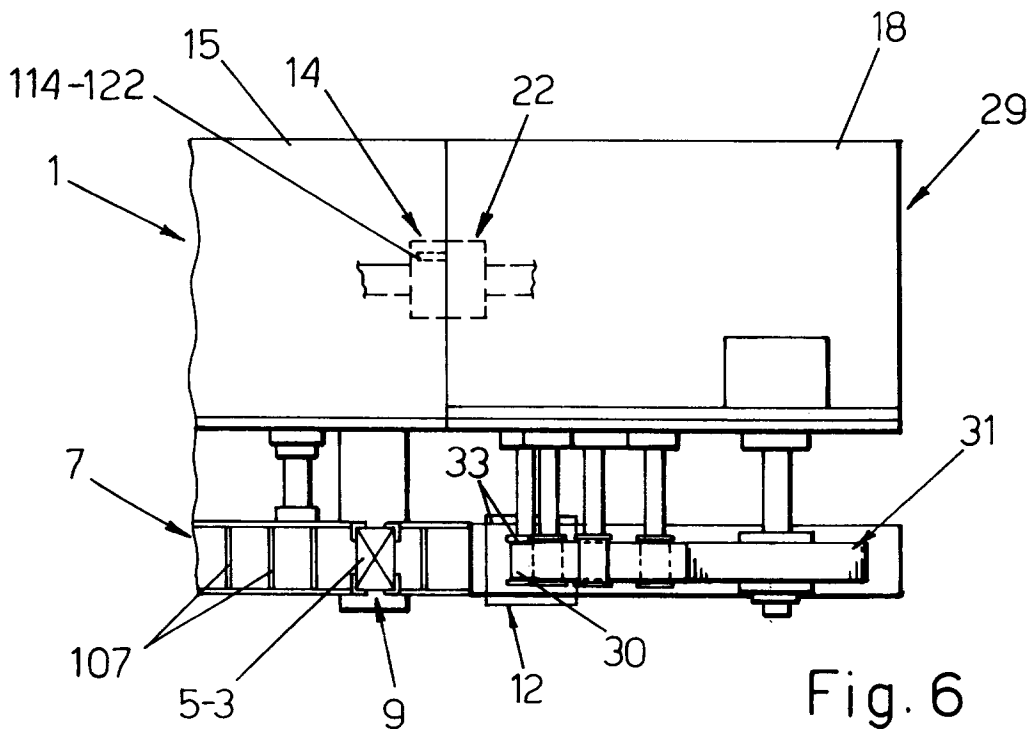


Fig. 6

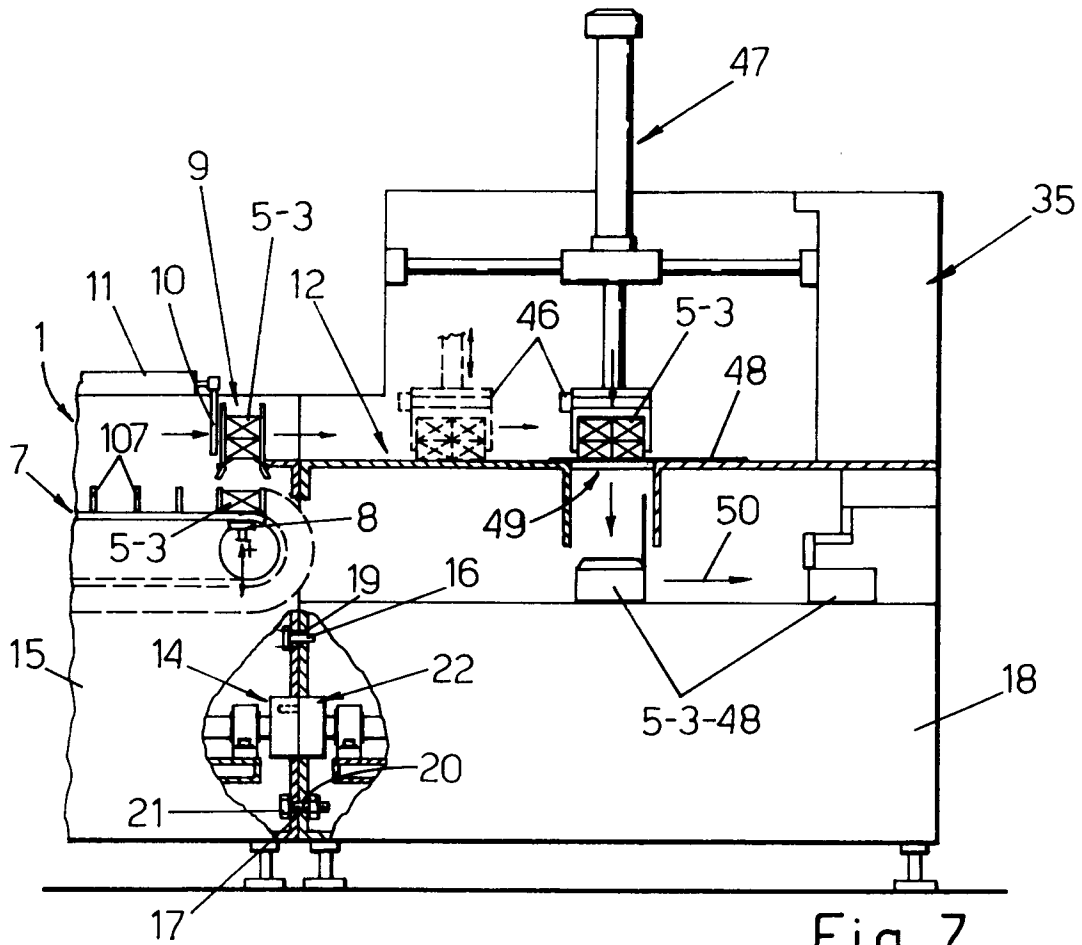


Fig. 7

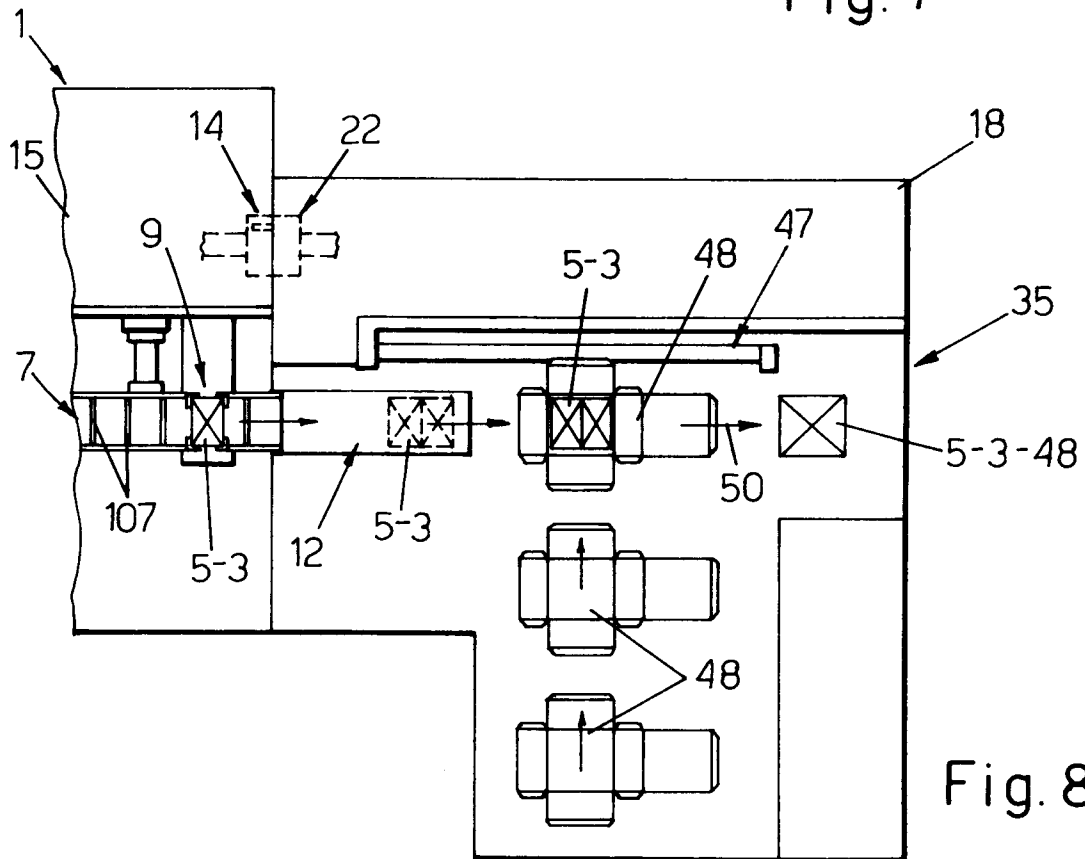


Fig. 8



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 11 7239

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	EP-A-0 294 251 (REMY) * the whole document * ---	1-4,6 10-13	B65B59/04
Y	DE-A-19 51 139 (WIX) * the whole document * ---	10	
Y A	FR-A-2 272 898 (BRODRENE GRAM) * the whole document * ---	11 12	
Y	US-A-3 013 369 (WILSON) * column 7, line 31 - line 71; figures 1,5 *	12	
Y	US-A-4 769 975 (FAVA) * the whole document * -----	13	
The present search report has been drawn up for all claims			
			B65B
Place of search	Date of completion of the search	Examiner	
THE HAGUE	4 March 1996	Claeys, H	
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