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(54) **Automatic or semiautomatic machine for storage, selection and distribution of insulating glass spacer profiles to a processing machine and automatic or semiautomatic procedure for storage, selection and distribution of insulating glass spacer profiles to a processing machine**

(57) Automatic or semi-automatic machine for the storage, selection and distribution to an operating machine (11) of spacer profiles (1) for insulating glass, whereby the operating machine (11) has at its disposal

a range and quantity of profiles (1) (semi-finished material which, after being bent and other treatments applied, obtains the spacer frame required for insulating glass) made up of the entire general storage system (5), instead of a limited provider (10).

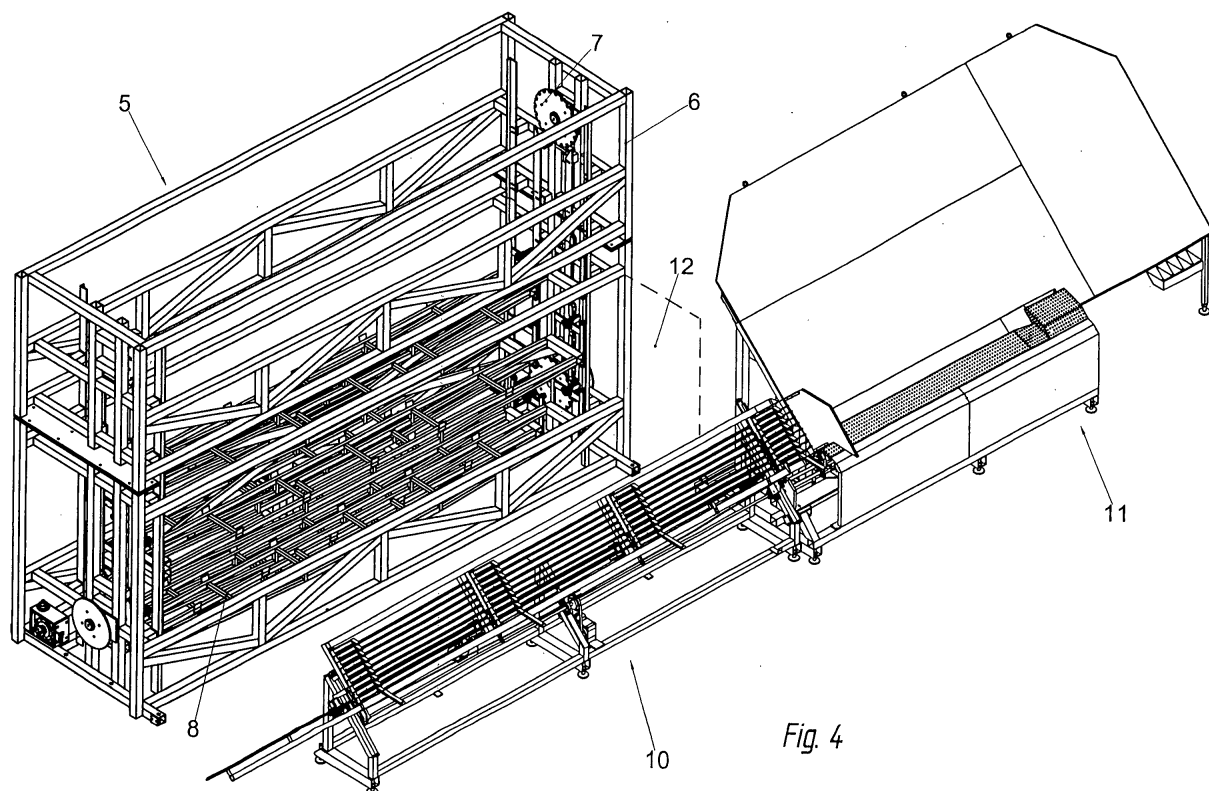


Fig. 4

Description

[0001] It is nowadays well known carrying out the so-called bending of the "spacer frame profiles" to obtain finished spacer frames for insulating glass either with semi-automatic procedures (one corner is bent at a time and between one bend and another, the advancement of the profile is done manually by the operator) or with automatic procedures (the operator's intervention is no longer required during the entire process, except in those cases where loading the "profiles" in the modest provider quarters and unloading the spacer frame once it has been bent). It is in this area that the machine and the procedure, which are the subject of this application find their just location, however without leaving out their location to other operating machines which carry out work on the "spacer frame profile".

[0002] To better understand the aspects and functions of the spacer frame and its semi-finished form which is at the origin i.e. the "spacer frame profile", a few notions are hereby summarised with a view to the semi-finished item, namely, the "spacer profile" and the final product, basically the insulating glass, deeming any further use of insulating glass as a component of the window frame as a known factor to everyone.

[0003] The insulating glass is formed by combining two or more sheets of glass separated by one or more hollow-core spacer frames, with a micro-perforated surface facing the inside of the frame, both spacer frames containing desiccating material inside their hollow parts and the chamber (or chambers) thus obtained, separated by the glass sheets and by the frame(s) containing either air or gas or a blend of gases which attribute particular properties to the insulating glass, for example: thermo-insulating and/or soundproofing properties. The bonding between glass sheets and frame(s) is obtained by means of two levels of sealing, the first level having the aim of obtaining airtight qualities and involving the side faces of the spacer frame and the adjacent part of the glass sheet, the second that of obtaining the cohesion between the components and mechanical resistance of the joint between the same materials as well as involving the area formed by the external face of the spacer frame, including the diversely shaped parts that join the lateral sides, and by the glass sheet faces as far as the edge of the same (see fig. 1).

[0004] The glass sheets employed in the composition of insulating glass can be of different types according to the use of the same, for example the external pane (external intended in respect to the building) can be either standard or reflective glass (to limit thermal transmission during the Summer months) or laminated/armoured glass (for cases such as smash-proof or anti-vandalism) or laminated/tempered glass (for safety use) or a combination (for example, reflective and laminated glass to obtain a combination of properties), the internal glass (internal intended in respect of the building) can be either standard or low-emissive glass (to limit heat

loss during the Winter months) or laminated/tempered glass (for safety reasons) or a combination (for example low-emissive and laminated to obtain a combination of properties).

[0005] From the simple summary presently expressed it is already evident that a manufacturing line for the production of insulating glass requires a series of sequential process to be done and that productivity increases if these process occur automatically and in particular if the entire storage system for the semi-finished materials, in particular for the spacer profiles which is the subject of this invention, is interfaced with the machine that transforms the same into a spacer frame automatically.

[0006] The working stages required for producing insulating glass, each one of which requires an appropriate and particular machine to be placed in-line with respect to other complementary machinery are, in an exemplary yet not exhaustive layout and at the same not all totally necessary, the following:

EDGE-DELETION of eventual coatings along the perimeter of the glass sheet, to gain and maintain the bonding properties of the sealant in time to come.

WASHING of every single glass sheet, alternating the internal/external glass (the type of glass and position of which has been defined earlier on)

QUALITY CONTROL carried out automatically (electronically) or semi-automatically (visually).

SPACER FRAME APPLICATION: the frame which has been prepared in a previous stage, filled with desiccant material and treated to its outer faces with adhesive sealant which will have airtight properties, on other machines with respect to the insulating glass production line (and in fact is the expression of a procedure and a machine which supplies the first of these machines which is the reason for presenting this request for industrial patent-right) is applied to one of the glass sheets forming the insulating unit on a purposefully-built application station on the insulating glass production line.

COUPLING AND PRESSING of the combination of glass and frame(s).

GAS FILLING of the chamber(s) thus obtained.

SHIM PAD APPLICATION (packing components).

SECONDARY SEALING

[0007] Each machine can carry out, the above-mentioned procedures either automatically or semi-automatically.

[0008] The research of patent precedence deposited in pertinent or similar sectors has brought to the following patent in the domain of automatic machinery for producing spacer frames for insulating glass and its relative supply provider: the Italian patent 1 190 950 with Austrian priority 216-82 dated 21.01.82 with Lisec Peter as

applicant and numerous other similarities with the same applicant. This invention and those connected, as well as the machines constructed by the same Lisec Peter and by all the competition, neither teach nor anticipate the inventive idea which has been presented with this request, if anything, the teaching is positively opposed or better still, is that of limiting the supply chamber of the spacer bending machine so as to contain the size of the machine and resign oneself to changing the contents of the supply chamber whenever a different type of profile should be necessary.

[0009] The principal problems inherent to the state of the art described above are the following:

Interruptions in the regular operation of the spacer bending machine during the profile changing manoeuvres (emptying of the existing profiles and loading those required for the new operation) with consequent loss in productivity.

High use of labour due to the fact that the changing operations require two operators.

Damage to the "profiles", due to the fact that these are sensitive to scratching in the stages of unloading and loading, as the facing which remains in view when the insulating unit is completed has a specular finish.

Hazard for the operator during the unloading and loading stages particularly due to the lack of safety measures as a complete interlocking protection would create costs far beyond the value of the machine.

[0010] Moreover: due to the noteworthy developments that insulating glass has gone through, including the "spacer profiles", in the past limited to a few units, have now become ten-fold. It is sufficient to understand that, further to the increase in width, once confined to 6, 9, 12, 15 mm, and which are now 6, 9, 12, 14, 15, 16, 18, 20, 24, 25, 32 mm, there is also a difference in material, once solely in pickled aluminium whereas there have now been further additions: anodised aluminium in various colours, painted aluminium in various colours, screen-printed aluminium, plastic-coated aluminium, plastic-coated iron, stainless steel, plastic in all colours. It is further known that the quantities and types have increased exponentially in combination, produced by the quantity of widths available, quantity of types and also of colours.

[0011] The principle aim of this application is that of resolving the technical problems highlighted by getting rid of all the inconveniences included in the state of the art mentioned and therefore finding out a procedure and a machine which will be able to feed a spacer bending machine either automatically or semi-automatically with the great and varied types of profiles required by a producer of insulating glass.

DESCRIPTION OF THE INVENTION

[0012] The summarised description of the drawings and the detailed description of a way of achieving the invention will explain how it is possible to make all, or almost all of the series of "spacer profiles" which a company has at its disposal available for the spacer bending machine, without the operator intervening or limiting his intervention to simple stages by no means hazardous for the safety of the same, without interrupting the running of the spacer bending machine.

BRIEF DESCRIPTION OF THE FIGURES

[0013]

FIGURE 1 schematically represents the peripheral part of the insulating unit in an exemplary yet not exhaustive series of possible combinations: 1A normal, 1B triple glass, 1C stepped glass, 1D external laminate glass and internal low-emissive glass, 1E external reflective tempered glass and internal low-emissive laminate glass. The two types of sealants used are highlighted: in black the butyl sealant which acts as a tightness means (primary sealant) applied to the lateral sides of the spacer frame and the glass sheets, the dotted line on the other hand indicating the polysulphide, polyurethane or silicone sealant which presents qualities of mechanical resistance (secondary sealant) applied along the external face of the frame, including the shaped part joining the lateral faces, and the glass facings as far as the edge of the same. The internal/external facing of the unit is clearly stated with the icons representing by the Sun (external side) and the radiator (internal side).

FIGURE 2 represents the principal types of packaging for the "spacer profiles".

FIGURE 3 represents a spacer frame for insulating glass once the spacer-bending machine has processed it.

FIGURE 4 represents the operating machine's combination of both general "profile" storage assembly / "profile" provider (as for example a spacer bending machine) in a front axonometric view.

FIGURES 5, 6, 7, 8 represent (in a back view) a possible solution with the general storage assembly placed to the rear with respect to the operating machine.

FIGURES 9, 10, 11, 12 represent (in a back view) a possible solution with the general storage assembly placed to the front with respect to the operating machine.

FIGURES 13, 14, 15 represent (in a back view) a possible solution whereby the general storage assembly is placed to one side in respect of the machine.

FIGURE 16 shows an improved inventive detail to

a component of the general storage assembly.
FIGURE 17 (plan view) shows a possible solution of using the machine in a full insulating glass production line layout.

WAYS OF ACHIEVING THE INVENTION

[0014] Let us now come to the detailed description of how to achieve the invention.

[0015] To better describe a way of implementing this invention, including all the equivalents, reference is made to the figures referring to three essential conformations already listed previously, mentioning possible alternative configurations which will be better defined in the claims and laying out the stages in the working cycles and the mechanisms employed.

[0016] With reference to the group of figures, we hereby anticipate the following identifications:

Numbering starting off from [1], for those elements and principal groups in order to obtain a global outlook;

Numbering starting off from [x01], whose first number is that of the group it belongs to, relevant to details and constructive mechanisms.

[0017] With [1] the single "spacer profile" is identified, with [2] reference is made to the packed product, generally in cardboard boxes (containing, as approx. quantity, hundreds of "profile" bars), with [3] packing in metallic containers (containing, as approx. quantity, thousands of "profile" bars).

[0018] With [4] the spacer frame for insulating glass is identified, briefly known as frame, as prepared by the spacer bending machine; it is represented in the rectangular shape and provided with drill holes for the subsequent filling with desiccant material, its shape other than rectangular can also include rounded parts.

[0019] The following numbers identify the following respectively:

- [5] the general storage assembly
- [6] its chassis type structure
- [7] the rotating distributor including suspended compartments
- [8] the suspended compartment
- [9] the extracting feed slide
- [10] the operating machine's feed provider
- [11] the operating machine (the most important of which has been considered as an example, i.e. the spacer-bending machine: machine, which transforms the spacer profile (linear bar) into a spacer frame (rectangular or polygonal or curved or mixed shape).

[0020] With [12] the safety structures are indicated, whether these are the mechanical type, optical or laser barriers which can be formed according to the area

which has to be protected or by electro-sensitive mats, etc., because particular attention is dedicated, besides the functional, economical and ergonomic aspects, which belong to this invention, also to aspects concerning accident-prevention.

[0021] Three ways of actuating the invention are those described as follows, one in detailed form (figures from 5 to 8), and two in brief (figures from 9 to 15). For an easier comprehension it will be sufficient to follow the figures in parallel as the numbering corresponding to each component is quoted in the same sequence with which they appear in the figures. A further version, furthermore developed, is the one incorporating many providers in the general storage assembly's [5] rotating distributor [7] (no longer belonging to the operating machine [11], but to the general storage assembly [5], each one housing a large capacity) in quantities corresponding to the quantity of suspended compartment [8]. In this way the operating machine [11] can recall the desired station from the general storage assembly [5] and automatically have the type of profile [1] available to be processed, no longer in a limited amount but in a quantity made up of the amount remaining in the general storage assembly's [5] compartment [8].

[0022] In detail the first of the three ways of actuation (figure group 5, 6, 7, 8 and, in axonometric view, figure 4 even if this is referred to another example which is not identical to the "general storage assembly" [5]) is made up of the stages described as follows, activated with the help of relative mechanisms.

[0023] The rotating distributor [7] holds (by means of the chain [701] which is run, by a well-known kinematics mechanism, formed by gear motors [702a], [702b], by the motor [703] and by other transmission components) the supported compartments [8], by means of the pivoting side elements [801a] and [801b] on the axles [802a] and [802b] by means of the bearings [803a] and [803b] (visible components in figure 16). These compartments [8] are equipped with reference plates [807] for centring and for the containment of the load. When the operating machine [11] requires replenishment of a type of "profile" [1] or when it has been decided to load the provider [10], the interfacing system between operating machine [11] and general storage assembly [5] and the relative known automation locates, by completing the shortest run, the compartment [8], containing the desired profile [1] packages [2], [3], in correspondence to the aligning platform with the operating machine's [11] provider [10]. An extracting slide [9] which moves along guiding tracks [901a] and [901b] allows the transfer of profiles [1] from the general storage assembly [5] to the operating machine's [11] provider [10]. This extracting slide [9] includes elements [902] (placed on axis [903] in this version) for withholding the profiles [1]. In the version represented in the drawings, the operator's intervention is necessary to move the profiles [1] from the compartment [8] of the general storage assembly [5] to the slide [9], which moves automatically towards the operating ma-

chine's [11] provider [10] and from the slide [9] to the operating machine's [11] provider [10].

[0024] In an advanced version, the complete cycle of collecting the profiles [1] from the compartment [8] of the general storage assembly [5], transfer of the same towards the operating machine's [11] provider [10] and depositing them in the operating machine's [11] provider [10], occurs automatically. There is no protection right required in the automation of this procedure, in that it can be practiced with known mechanisms, as far as the present part of the description should establish precedence.

[0025] The second and third way of actuating the invention (figure group 9, 10, 11, 12 and figure group 13, 14, 15) are nothing other than ways of actuation by using the same principle and way described above, only that, considering the different reciprocal arrangement of the general storage assembly [5] and of the operating machine's [11] provider [10], transfers occur in a specular or orthogonal manner and the element [902], included with the slide [9] that contains the profiles [1] no longer needs a hub [903].

[0026] A fourth way of achieving the invention, as anticipated above, is that of installing the operating machine's [11] provider [10] in the supported compartment [8] which can therefore increase the number of providers in order to reach a quantity corresponding to that of the supported compartments [8]. The provider for each compartment [8] will therefore contain a considerable amount of profiles [1] all of the same type (or a few different types if required) and the operating machine [11] engages the provider required for each process that has to be carried out. Transfer to the operating machine can involve either the entire provider, which is picked out transversally from the compartment [8] or the single profile [1] (or groups of profiles), preferably drawn out lengthwise. Providers and containers of the types [2] and/or [3] can coexist, either in the same compartment [8] or alternatively in different compartments.

[0027] A further inventive configuration is made up of the following two possibilities:

1) The pitch between the two side elements [801a] and [801b] where the general storage assembly's [5] suspended compartments [8] are fixed to the supporting/transmission chain [701] can be varied so as to optimise the use of the same storage assembly also with different types and dimensions of containers [2] and [3] for profiles [1] and allow the rotation of the rotating distributor [7] without interfering with the inferior part of the same distributor and the top part of the loaded material.

2) The pitch between the side elements [801a] and [801b] for the general storage assembly's [5] fixing of compartments [8] to the transmission and supporting chain [701] is constant but the position of uniting the elements [804] of the suspended compartments [8] to the side elements [801a] and [801b]

can be adjusted by means of linkages [805], for example with the use of bolts, foreseen at different heights [806] on the side elements [801a] and [801b] thus creating a more flexible use of the same storage assembly, adapting it to the variety of types and dimensions of the containers [2] and [3] for the profiles [1] and offering a more compact machine, which in turn supplies an optimised and regular distribution of the suspended compartments [8] so as to avoid any empty spaces and at the same time permitting the rotation of the rotating distributor [7] without interfering with the inferior part of the same distributor and the top part of the loaded material.

[0028] The above-mentioned description is referred to a machine in which the receiving machine is placed to the right of the storage assembly and it is easy to imagine a description and relative figures for a mirror-version or other array.

[0029] All movements connected to the cycle stages are naturally interlocked between themselves, through an active parallel logic, so as to avoid conditions of interference with the spacer "profiles" and parts of the machine or even parts of the machine with each other during any movement.

[0030] This invention is subject to numerous embodiment variations (in respect to what can be deduced from the designs, details of which are both evident and eloquent) all of which take part in the field of equivalency with the inventive idea, as for example in the mechanical solutions for the transfer of the profile compartments [8], the running means which can be electric, electro-electronic, pneumatic, hydraulic and/or combined, etc., control measures which can be either electronic or fluidic and/or a combination of the same, etc.

[0031] The constructive details can also be substituted by any other, which can be technically equivalent. The materials and dimensions can be of any type according to the requirements in particular deriving from the dimensions (length) of the "profiles" [1].

[0032] It goes without saying that the industrial application is of certain success in that the machines which carry out the bending of the "spacer profiles" [1] have been consolidated on the market for over twenty years and now, the types of "profiles" [1] continue to increase with new types, as for example those in stainless steel, subject to great development due to the low thermal conductivity factor. Furthermore, the "insulating glass" market is in continuous expansion, having been increased in these last years by all those applications which require a different form from a rectangular shape and is evident that new investments will be addressed to the most recent and innovative technology which, in turn applies to the spacer bending machine as this machine is also able to turn out spacer frames [4] having shapes other than rectangular and even curved shapes.

[0033] The application of this invention to the insulating glass production line is shown in figure 17 (plan

view), and is an evident confirmation of its positive industrial application.

Claims

1. Automatic or semi-automatic machine for the storage, selection and distribution to an operating machine [11] of spacer profiles [1] for insulating glass **characterised by** the fact that the operating machine [11] has at its disposal a range and quantity of profiles [1] (semi-finished material which, after being bent and other treatments applied, obtains the spacer frame required for insulating glass) made up of the entire general storage system [5], instead of a limited provider [10].
2. Machine as per claim 1 **characterised by** the fact that the general storage assembly [5] is placed to the front with respect to the operating machine [11] so that it can be interfaced with the same.
3. Machine as per claim 1 **characterised by** the fact that the general storage assembly [5] is placed behind with respect to the operating machine [11] so that it can be interfaced with the same.
4. Machine as per claim 1 **characterised by** the fact that the general storage assembly [5] is placed to one side with respect to the operating machine [11] so that it can be interfaced with the same.
5. Machine as per claim 1 **characterised by** the fact that the general storage assembly [5] is an integral part of the same operating machine [11] in that it takes the place of the operating machine's [11] provider [10].
6. Automatic or semi-automatic procedure for the storage, selection and distribution to an operating machine [11] of spacer profiles [1] for insulating glass **characterised by** the fact that the operating machine [11] has at its disposal, a range and quantity of profiles [1] (semi-finished material which, after being bent and other treatments applied, obtains the spacer frame for insulating glass) made up of the entire general storage assembly [5], instead of a limited provider [10].
7. Procedure as per claim 6 **characterised by** the fact that the general storage assembly [5] is placed in front with respect to the operating machine [11] so that it can be interfaced with the same.
8. Procedure as per claim 6 **characterised by** the fact that the general storage assembly [5] is placed behind with respect to the operating machine [11] so that it can be interfaced with the same.
9. Procedure as per claim 6 **characterised by** the fact that the general storage assembly [5] is placed to one side with respect to the operating machine [11] so that it can be interfaced with the same.
10. Procedure as per claim 6 **characterised by** the fact that the general storage assembly [5] is an integral part of the same operating machine [11] in that it takes the place of the operating machine's [11] provider [10].
11. Machine as per one or more of the previous claims **characterised by** the fact that the steps between the side elements [801a] and [801b] where the general storage assembly's [5] suspended compartments [8] are fixed to the supporting and transmission chain [701] is variable so as to optimise the replenishment of the same storage assembly [5] even with different types and dimensions of containers [2] and [3] for the profiles [1].
12. Machine as per one or more of the previous claims **characterised by** the fact that the step between the side elements [801a] and [801b] where the general storage assembly's [5] suspended compartments [8] are fixed to the transmission and supporting chain [701] is constant yet the positions of fixing of the supported compartment [8] base elements [804] to the side elements [801a] and [801b] is adjustable so as to render the use of the same storage assembly as flexible as possible and in order to adapt it to the variety of the types and dimensions of containers [2] and [3] of the profiles [1] and therefore presenting a more compact machine, allowing for the optimised and regular distribution of the suspended compartments [8] to avoid empty spaces and interference during the rotation of the rotating distributor [7].
13. Machine and procedure as per one or more of the previous claims **characterised** as per description and illustrations of the drawings.

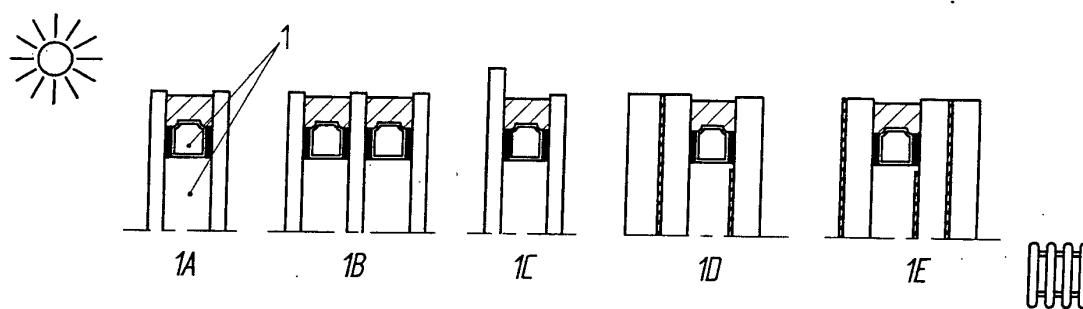


Fig. 1

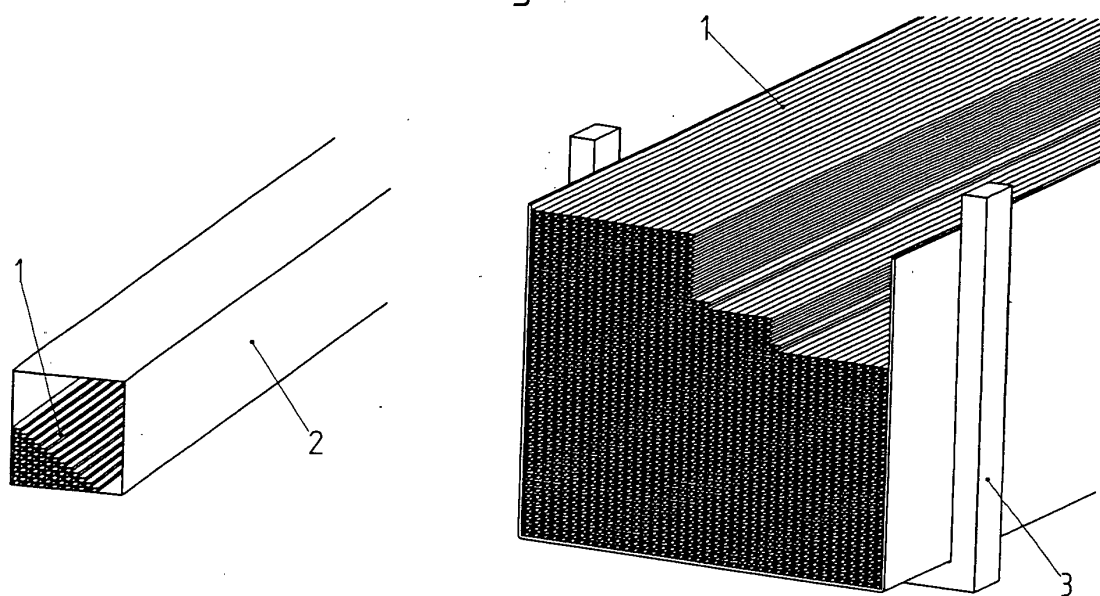


Fig. 2

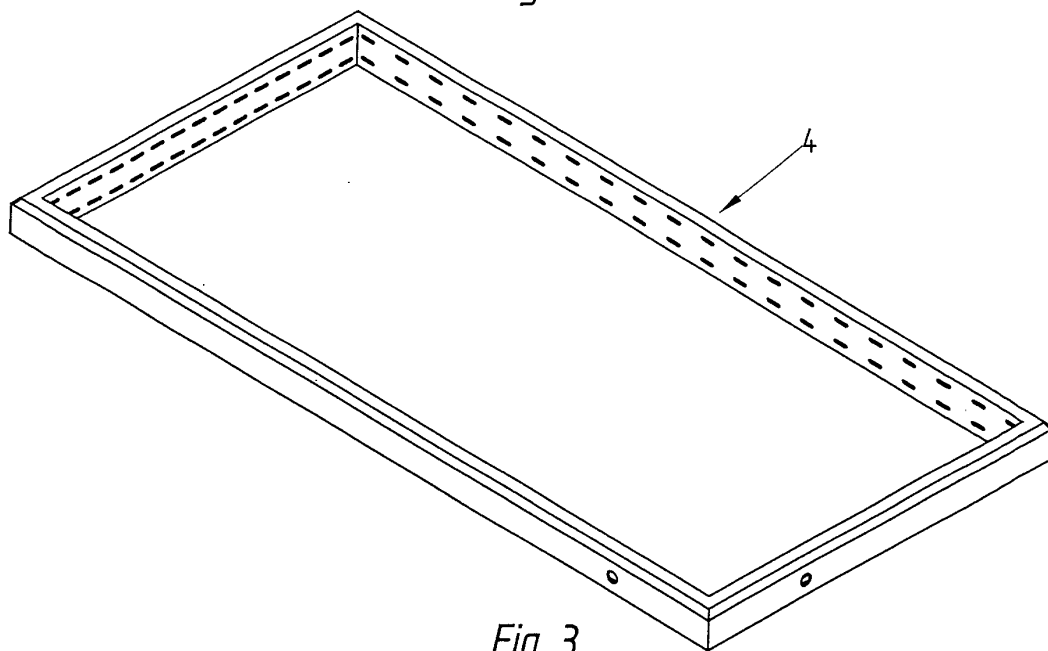
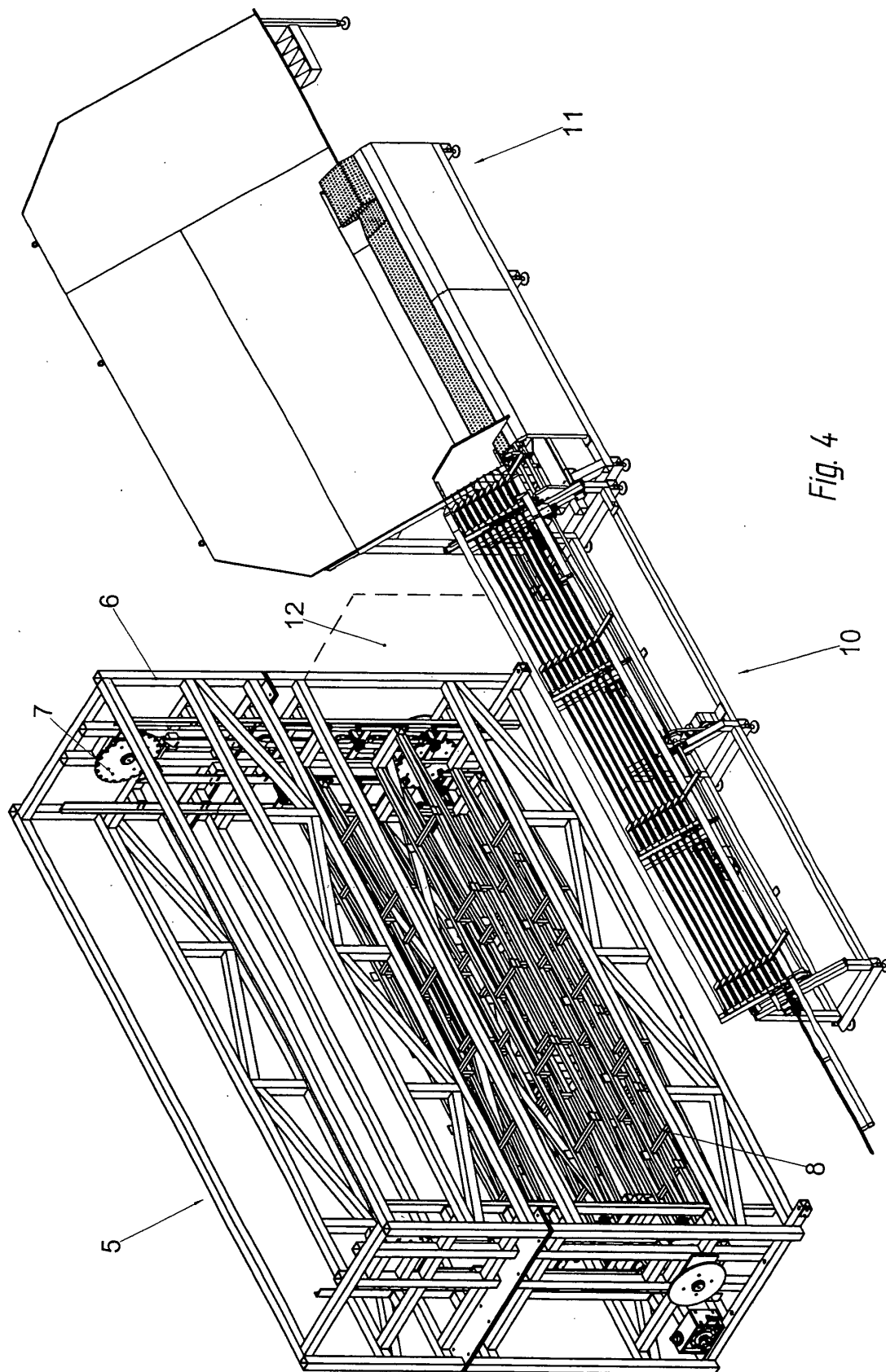


Fig. 3



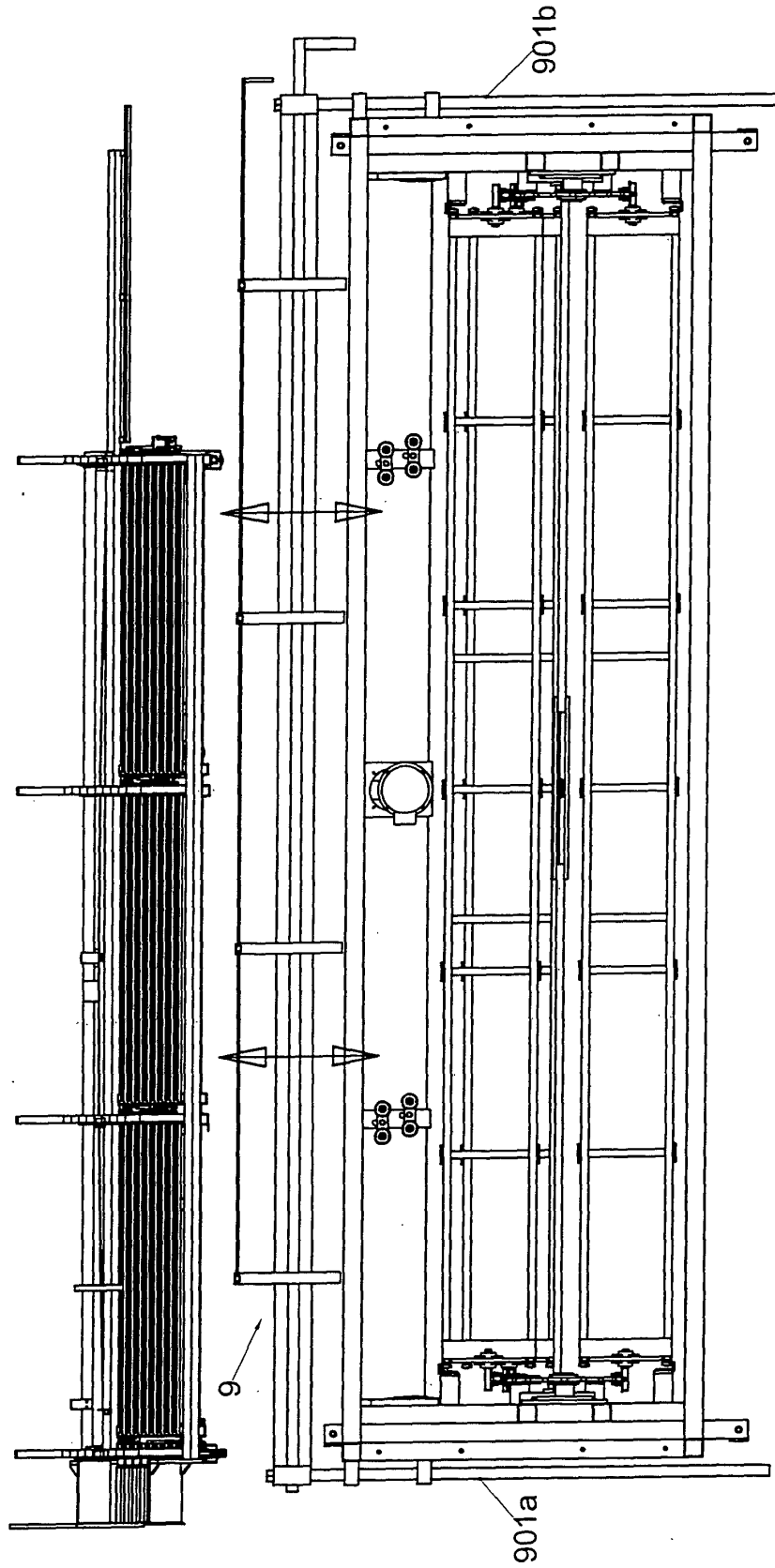
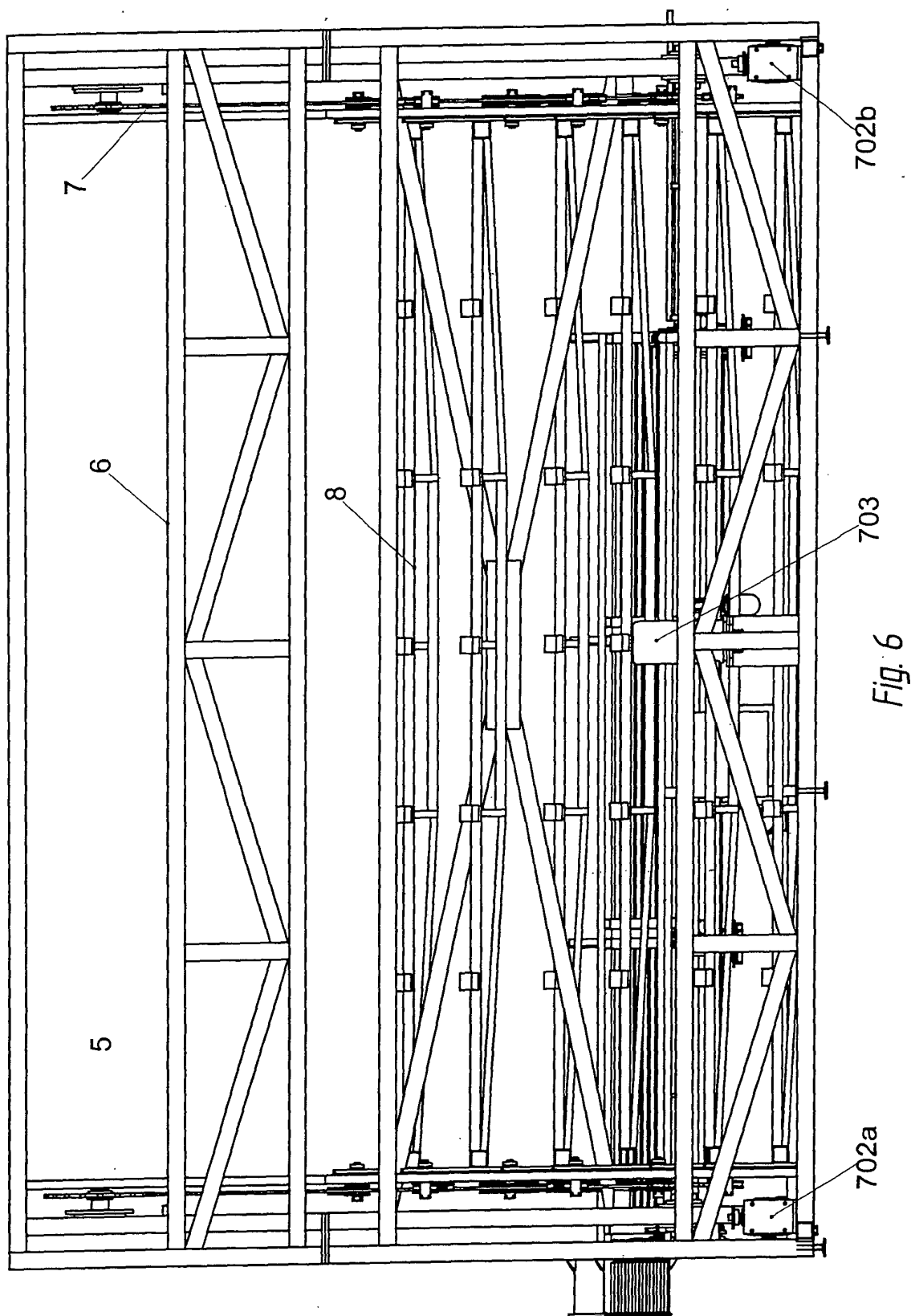
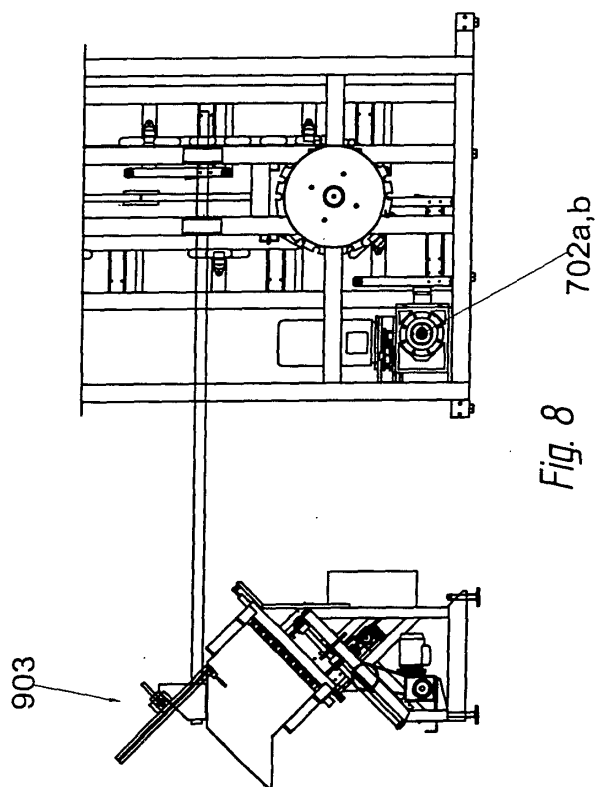
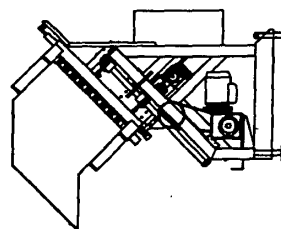
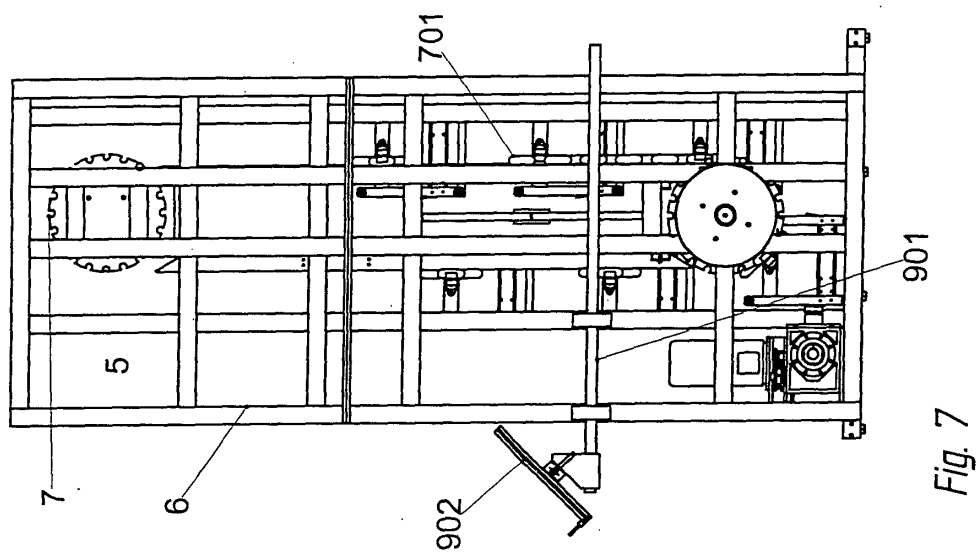


Fig. 5





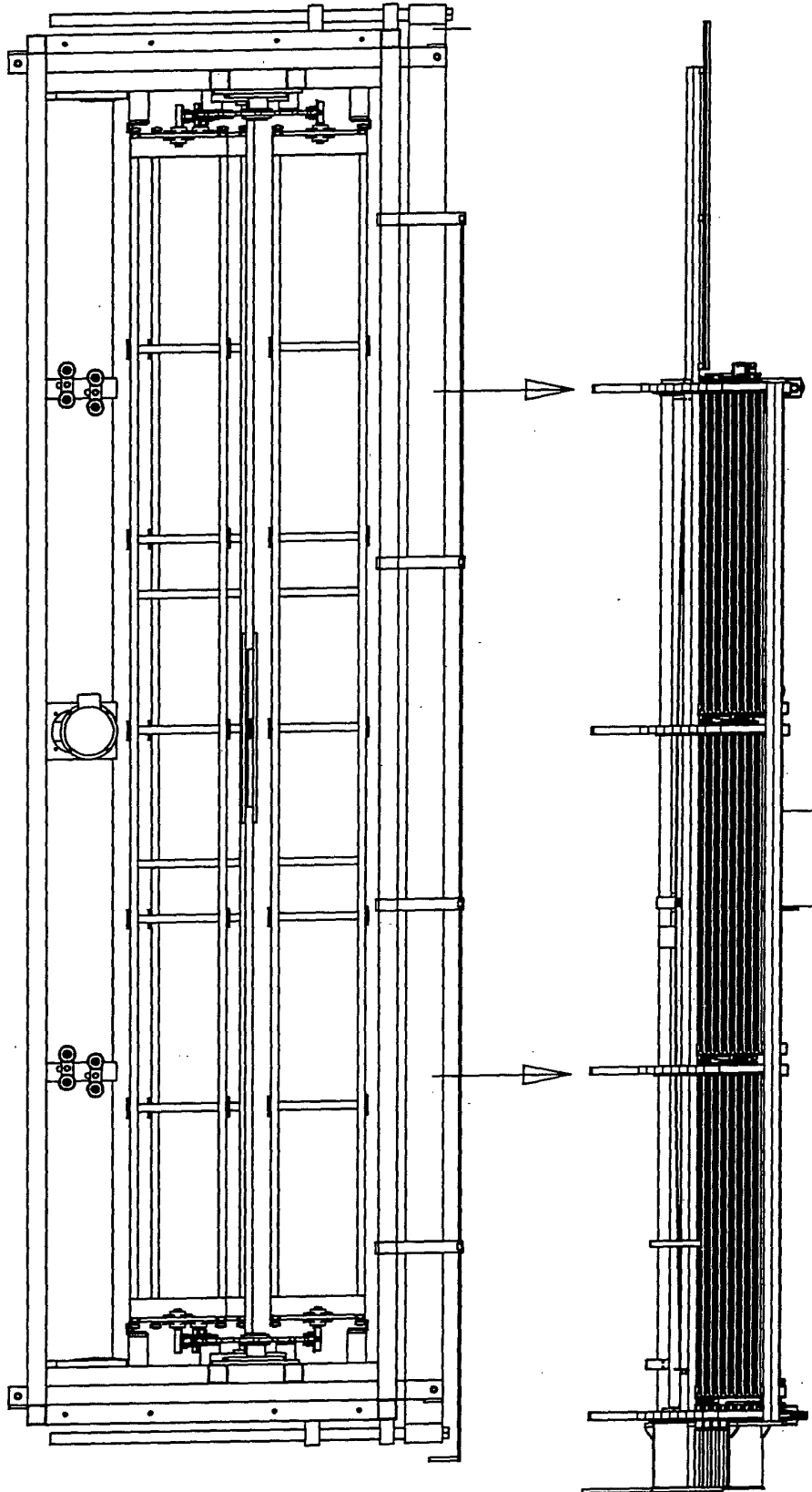


Fig. 9

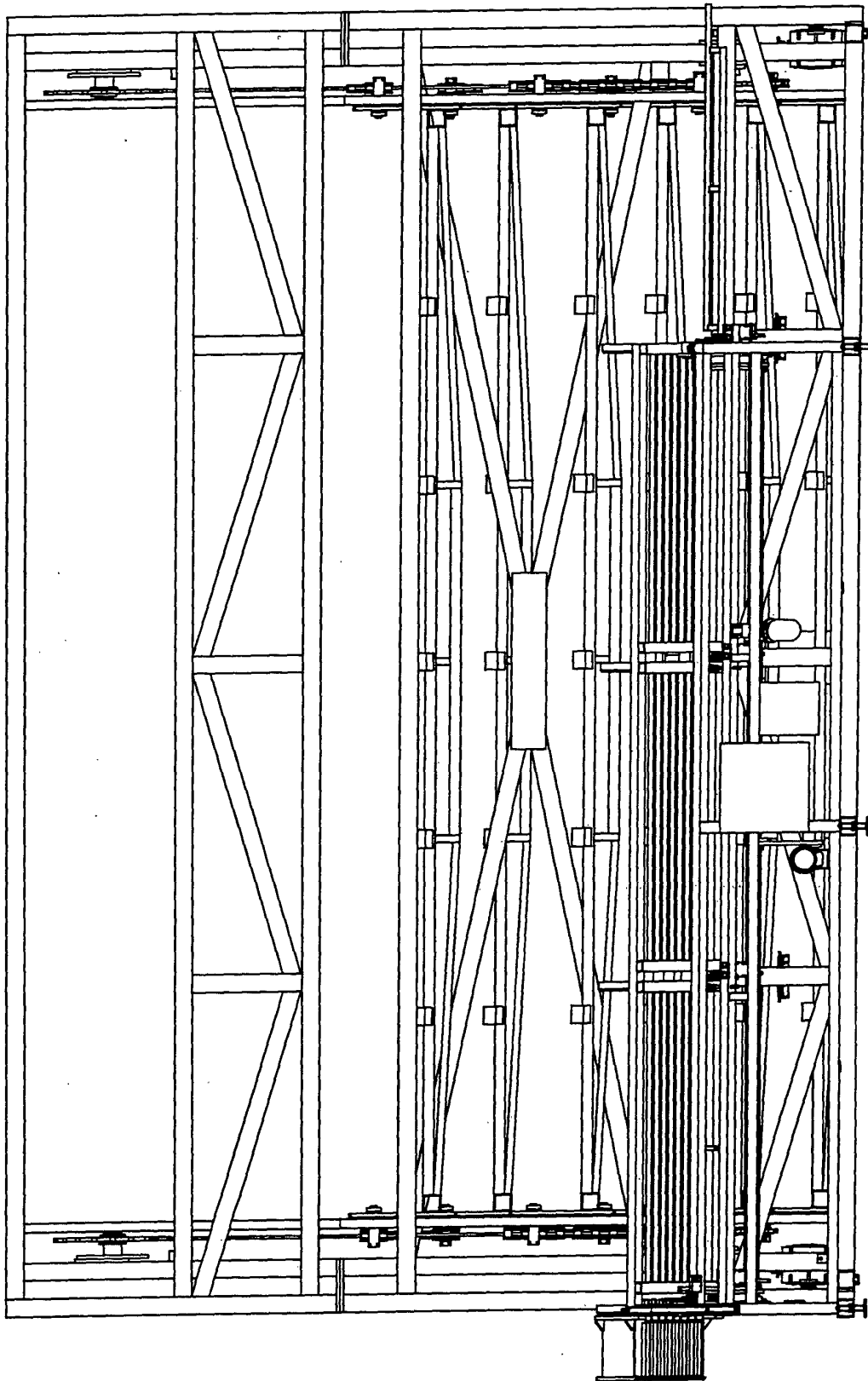


Fig. 10

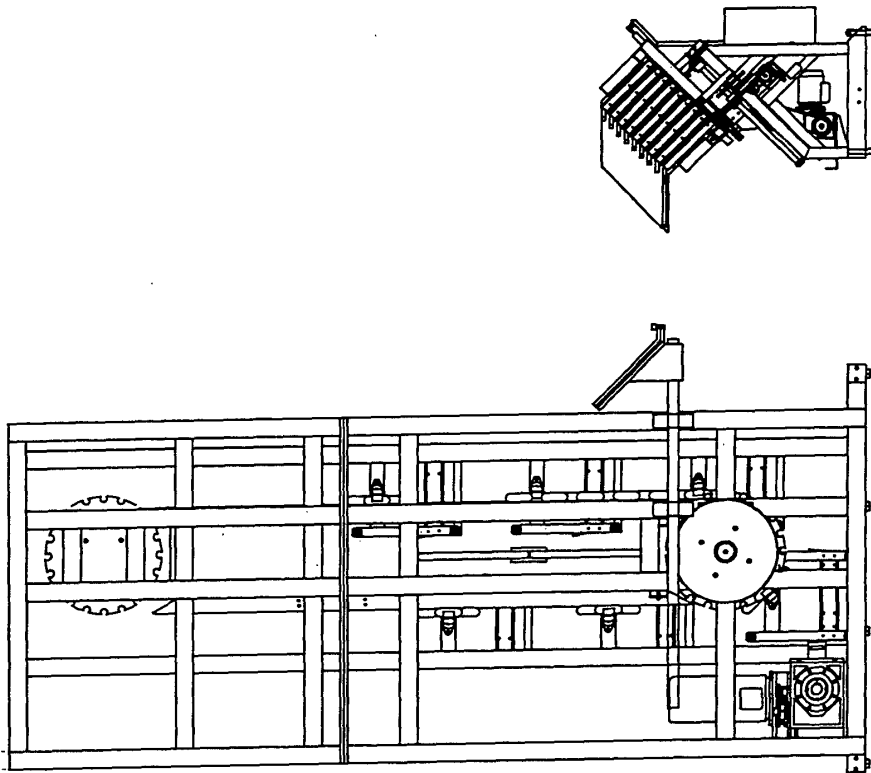


Fig. 11

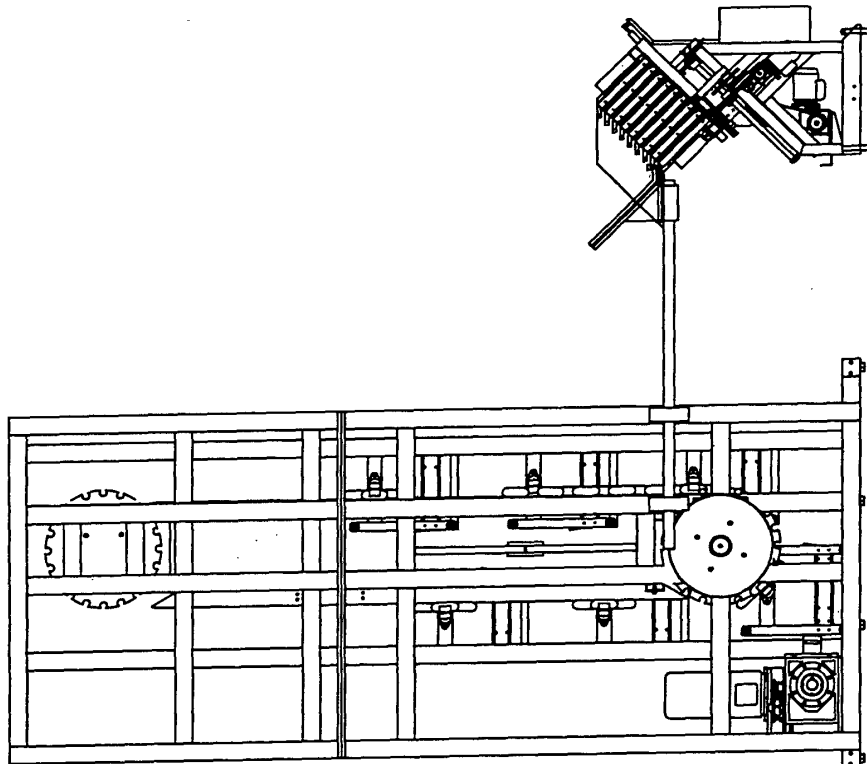


Fig. 12

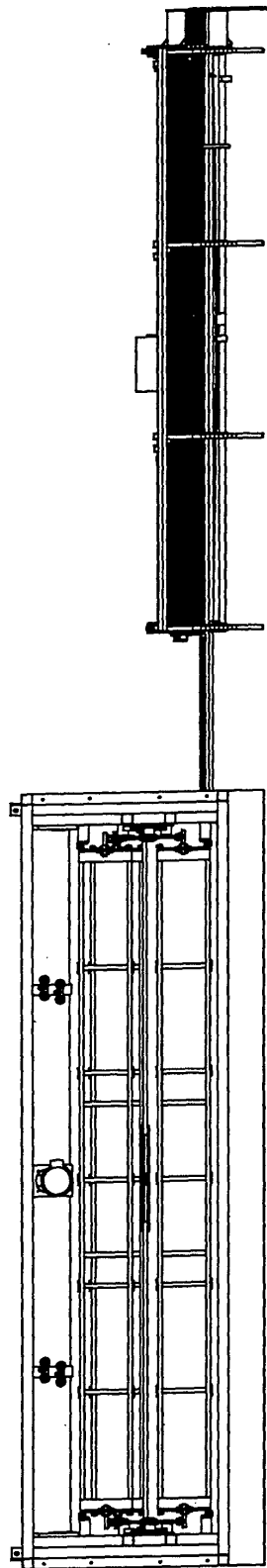


Fig. 13

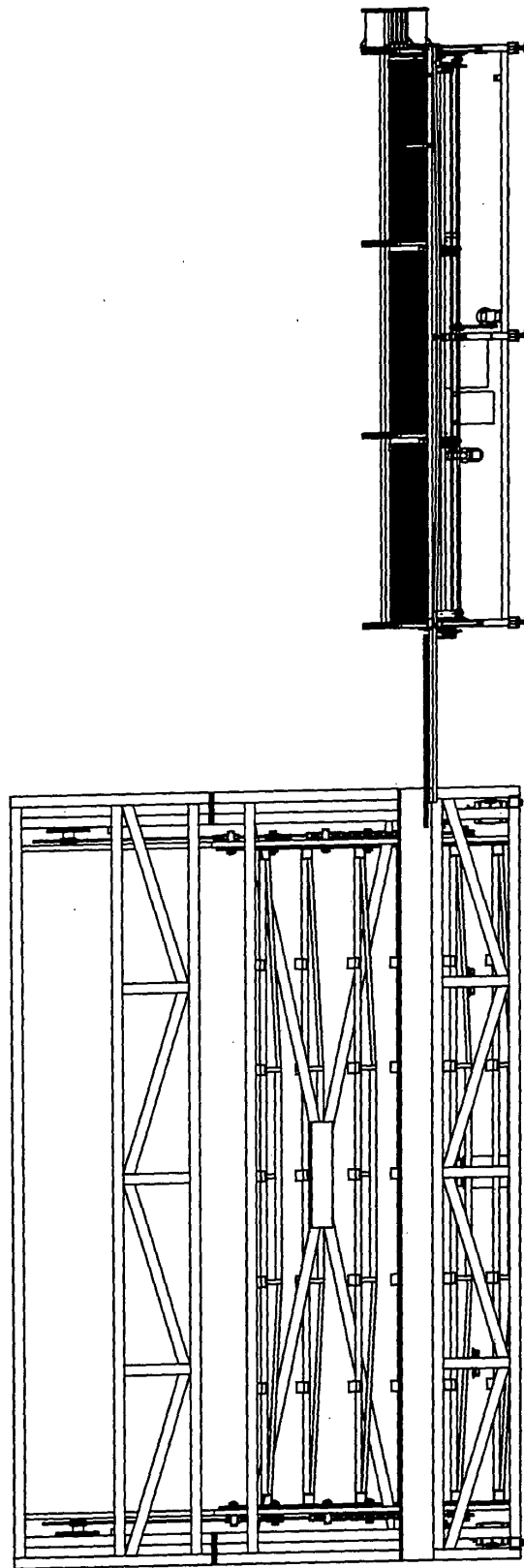


Fig. 14

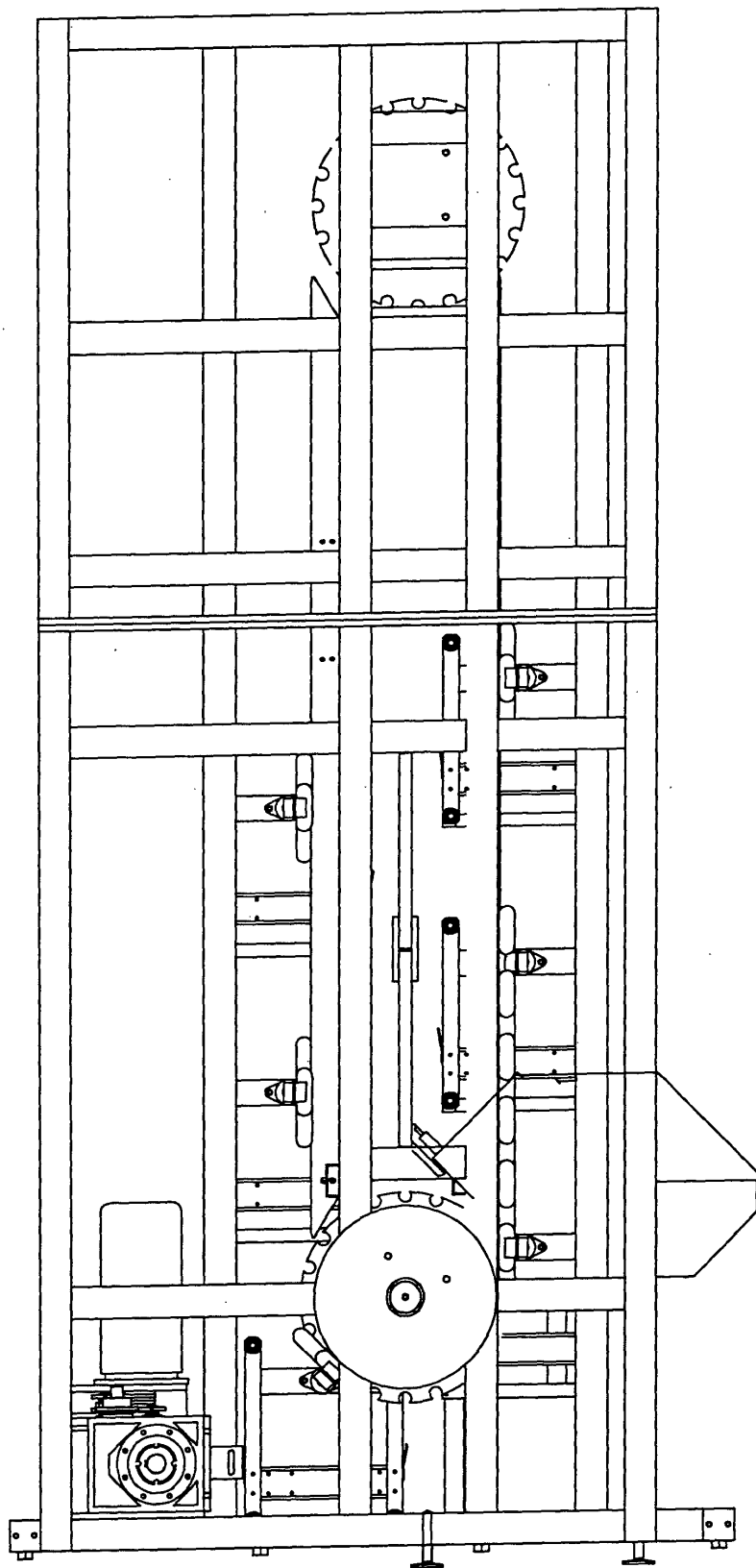


Fig. 15

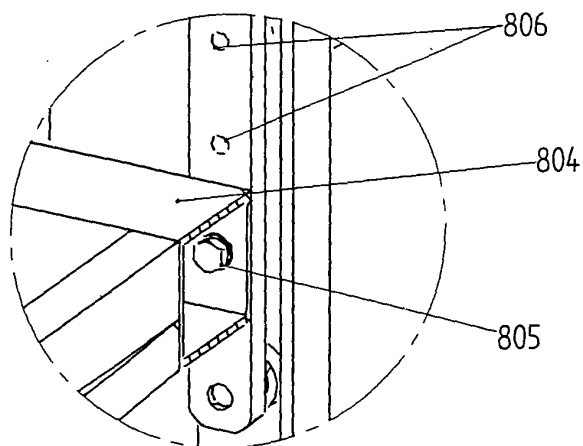
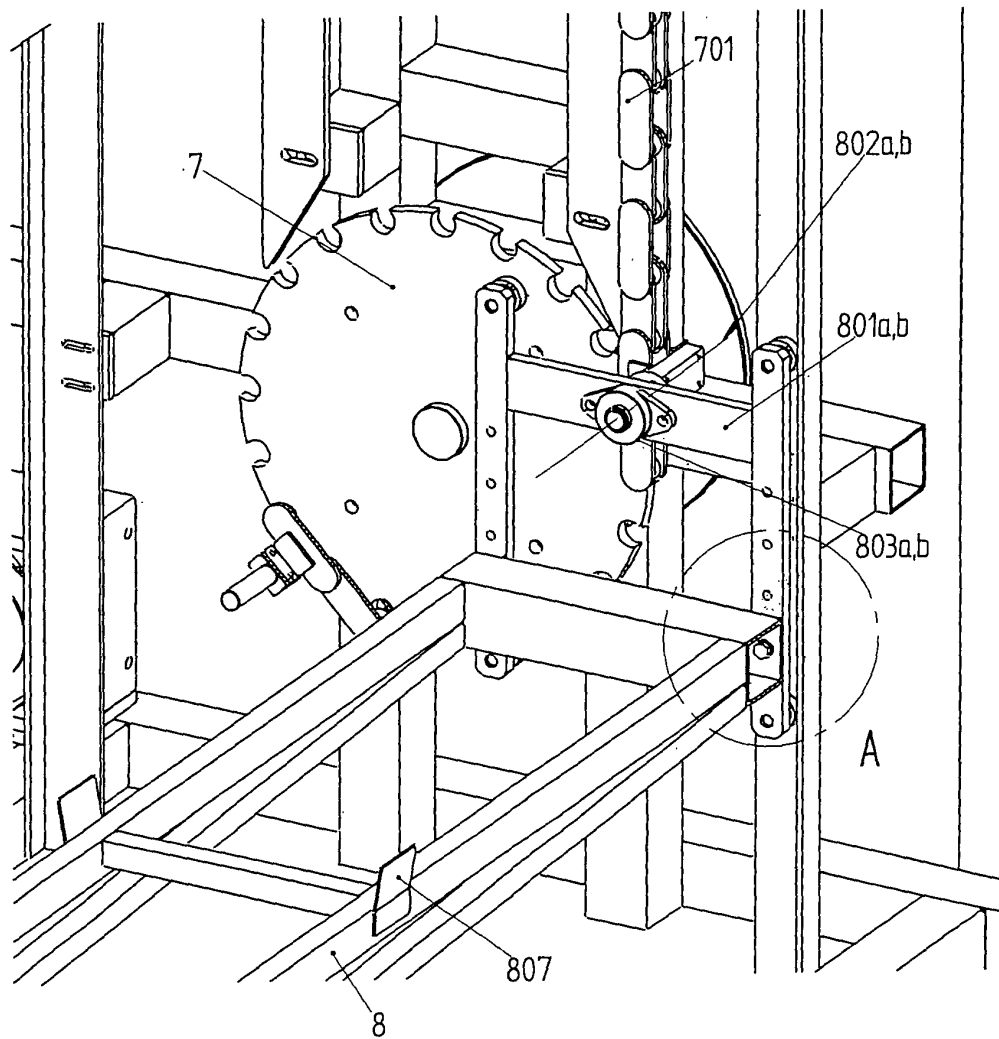


Fig. 16

Dettaglio A

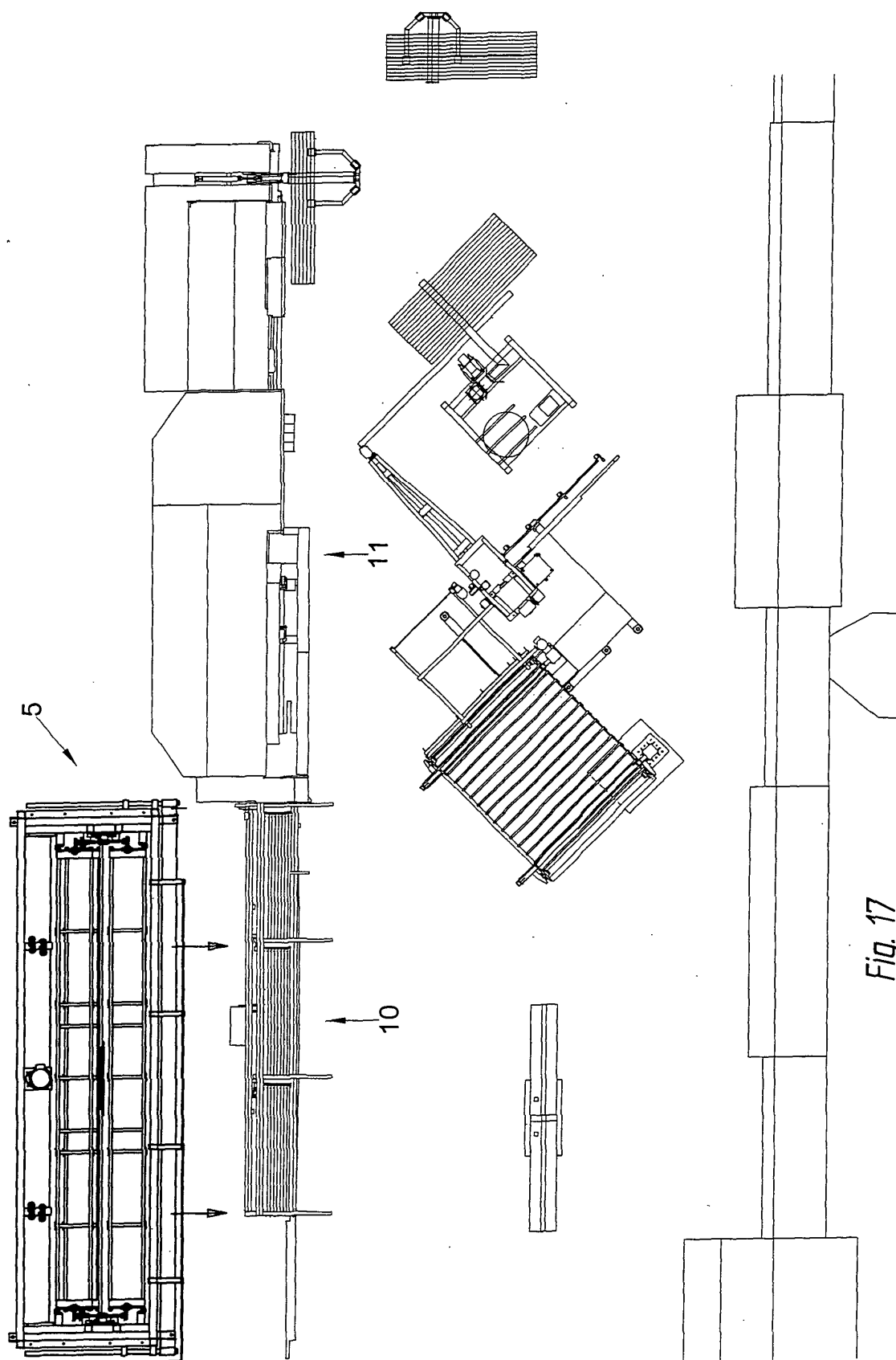


Fig. 17