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(54) **Machine for packaging by means of a plastic sleeve with an improved system to put on a load said sleeve**

(57) The present invention relates to an apparatus for packaging by means of a plastic sleeve and an associated fitting system, of the type comprising a support structure which can be displaced vertically along a load to be wrapped and on which there is arranged a device for opening and fitting a pleated hood of tubular material supplied by a delivery member located at the top, wherein said opening and fitting device comprises a plurality of gripping arms - one for each folded lip of said tubular material - which are able to transfer said lips from said delivery member into a position underneath said support structure, at the same time opening the mouth of said hood.

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Description

Prior art and field of the invention.

[0001] The present invention relates to a hooding apparatus for packaging by means of a plastic sleeve for wrapping loads with hoods of heat-shrinkable plastic material.

[0002] As is known, a hooding machine is an apparatus which is widely used in specific areas of the wrapping sector and designed to fit bags or hoods of heat-shrinkable plastic material around loads supported on platforms or pallets.

[0003] In a standard hooding machine, after the hood has been fitted, the load is introduced into an oven where heat-shrinking of the said hood is performed so as to obtain a solid and stable wrapping. Alternatively, in combined hooding machines, these two operations are performed in the same apparatus.

[0004] A hooding machine is composed of a support frame on which various movable devices are mounted, said devices being intended to pick up, open and fit a hood of heat-shrinkable plastic material onto the load. In the case where the apparatus is of the combined type, the said frame also has, mounted on it, an annular structure on which there is fixed a circle group of burners which are also arranged in annular fashion or along the perimeter of a square-like structure which circumscribes the load to be wrapped and which is displaced vertically so as to distribute uniformly a heat-shrinking heat around the hood of plastic material.

[0005] Normally, once the hood has been fitted, the circle group of burners lowers to the bottom of the load, where the open portion of the hood is arranged, and starts to exert its heating action (expulsion of hot air at a temperature of up to 300°C) as it gradually rises to the top of the hood. This procedure is able to achieve optimum results: in fact, initially the free open portion of the hood is heated and, as it retracts, firmly adheres to the pallet situated underneath the load, creating a fastening point for the said hood; then, the upper portion of the hood gradually retracts around the load and consolidates it uniformly.

[0006] As may be understood, not only the combined apparatus, but also the ordinary apparatus, involve a certain degree of constructional complexity which makes them costly and of limited application where the productivity of products to be wrapped constitutes a requirement of lesser importance (for example, in the sector of household appliances where there are special lines for occasionally wrapping the products which have been randomly, picked up from the main production lines for the purposes of quality control). At the present time, apparatus which are sufficiently flexible, low-cost and able to meet the requirements of this market sector do not exist for these applications: therefore, very frequently, the operators resort to fitting the hood manually onto the product - with all of the obvious

disadvantages arising therefrom - before introducing the load into a heat-shrinking oven.

[0007] Therefore, a first object of the invention is to provide a hooding apparatus which is conceptually simple, flexible, streamlined and low-cost such as to be able to satisfy also the requirements of the low-productivity sectors.

[0008] However, combined hooding machines, which are intended for a user undoubtedly more demanding from a productivity point of view, because of the operating method described above also pose certain problems.

[0009] First of all, it must be considered that, so as not to overcomplicate the structure of the apparatus, the hood gripping and fitting system is mounted so as to be vertically displaceable on the same movement system which also supports the circle group of burners of the heat-shrinking oven. As can be understood, this results in restrictions as to the freedom of arrangement of the various operating members. Moreover, since the heating action of the burners must take place efficiently over the whole surface of the hood, in particular at the bottom of the open portion thereof (in order to ensure firm fastening of the hood to the pallet), the circle group of burners must be able to reach the bottom part of the pallet.

[0010] Therefore, the architecture of the movable annular structure has hitherto been conceived taking into account two main designs.

[0011] A first solution envisages that the fitting mechanism is arranged above the circle group of burners: in this case, in order to fit the hood onto the load, the annular structure is completely lowered, until the burners are positioned at the lowest possible point, and then the pallet is raised to the height of the fitting mechanism. Of course, this results in problems of a not insignificant nature with regard to raising of the load which, in many cases, is not negligible (such as, for example, in the case of a stack of bricks or tiles).

[0012] A second solution envisages that the fitting mechanism is arranged below the circle group of burners (for example a system of movable vertical pins): in this case, the fitting mechanism is lowered beyond the bottom of the load, so as to bring the burners at the same level of the pallet in order to perform correctly heat-shrinking of the open portion of the hood. However, during the heating process, the fitting mechanism, since it cannot be raised in that obstructed by the overlying circle group of burners, is subject to undesirable heating which, with time, adversely affects operation thereof. Moreover, the fact that the fitting mechanism is arranged in the bottom part of the annular structure, right underneath the burners, makes the operation of gripping and opening the hood, which is instead supplied from the top, more difficult.

[0013] According to a second aspect, therefore, a further object of the present invention is to provide a hood fitting system which, being mounted on the annu-

lar structure of a combined hooding machine, is not subject to the drawbacks arising from the considerable supply of local heat to which it is exposed during the processing cycles and, at the same time, allows an optimum fit to be achieved without wastage of plastic material.

[0014] According to a third aspect, a further object of the invention is to provide a combined hooding apparatus provided with a hood fitting system which has an excellent operating performance, does not require load raising systems and has a long working life despite the adverse environment working conditions.

Summary of the invention

[0015] The abovementioned objects are achieved by means of a fitting system and a hooding apparatus substantially as described in the accompanying claims.

[0016] Namely a hood opening and fitting system which is arranged above a movable annular structure and is able to pick easily the closed mouth of the hood, from a top delivery position, and transfer it, opening it up, into a position underneath the annular structure and therefore also underneath the circle group of burners in the case of a combined hooding machine.

[0017] According to a preferred embodiment of the combined hooding machine, the fitting system, once the hood has been fitted, is able to be arranged outside the operating range of the burners so as not to undergo undesirable heating during the heat-shrinking process.

Brief description of the drawings

[0018] Further characteristic features and advantages of the device according to the invention will appear more clearly from the following detailed description of a preferred embodiment thereof, provided by way of example and illustrated in the accompanying drawings, in which:

Fig. 1 is a front elevation half-view, with parts removed, of a combined hooding machine according to the invention;

Fig. 2 is a view, similar to that of Fig. 1, showing a step where the mouth of the hood is at the delivery point;

Fig. 3 is a view, similar to that of Figs. 1 and 2, showing a step involving delivery and opening of the hood;

Fig. 4 is a front elevation half-view, with parts removed, of the hooding machine during an end step of the hood fitting operation;

Fig. 5 is a top plan view which shows the two positions, i.e. working position (in solid lines) and rest position (in broken lines) of the fitting system according to the invention applied to a combined hooding machine;

Fig. 6 is a side elevation view, with parts removed,

of the hood forming and supplying assembly;

Figs. 7A and 7B are, respectively, partial front elevation and plan views of a detail of the hood forming and supplying assembly;

Fig. 8 is a view, similar to that of Fig. 7B, with the gripping fork in a gripping step; and

Fig. 9 is a view, similar to that of Fig. 6, during cutting and welding of the hood.

10 Detailed description of a preferred embodiment

[0019] The fitting system according to the invention will now be described in detail, by way of example, but without being limited thereto, with reference to its application to a combined hooding machine, in chronological order of the hood processing steps.

[0020] As can be seen in Fig. 1, a support frame 1 (only half of which is shown, the apparatus being symmetrical) supports a supplying and delivering line 2 for a hood C of heat-shrinkable plastic material, an annular structure 3 - supporting a fitting device and a series of burners 4 arranged in a circle and converging towards the centre of the apparatus - which is displaceable vertically on a movement guide which need not be described in detail in the present description.

[0021] The support frame 1 is arranged "astride" a distribution line 5 - or a simple support base - on which a load 100 of varying nature, positioned on a pallet and intended to be wrapped, is transported.

[0022] The hood C is formed from a tubular material T wound on a reel B arranged to one side of the frame 1. The tubular material T is folded in pleated fashion so that unfolding and opening thereof may be easily achieved using automatic systems. The tubular material therefore has at least two pleated lips which extend along each of the two side edges.

[0023] Both a guiding and gripping system and a hood cutting and welding device are provided at the bottom of the frame 1.

[0024] The guiding and gripping system comprises (Figs. 6-9) a guiding assembly, consisting of a pair of rails 10a and 10b with a U-shaped cross-section and a pair of strip-like guides 11, and a gripping assembly consisting of a gripping fork 12. This system is dual so as to be able to act on both edges of the pleated tubular material T, but only half will be shown for the sake of simplicity.

[0025] Preferably, the U-shaped rails 10a and 10b are mounted parallel to each other in a floating manner, so as to be able to move towards and away from each other as required. The two pleated lateral lips T1 and T2 of the tubular material T are inserted inside the U-shaped rails, for example manually (Fig. 7B). The rails 10a and 10b therefore have the function of vertically guiding the pleated tubular material, keeping the two lips T1 and T2 separate and at a distance. In order to force the tubular material to run along a substantially vertical plane, preventing it from collapsing onto itself,

the strip-like guides 11 are arranged in pairs on either side of the tubular material so as to support it in upstanding and guide it at least along a certain initial path. The strip-like guides 11 are also preferably mounted on a floating system 11a (Fig. 6) able to absorb the inevitable irregularities in the travel movement of the tubular material T, without breaking or jamming occurring.

[0026] The gripping fork 12 has three prongs 12a, 12b and 12c. The central prong 12b is designed to be inserted between the two U-shaped rails 10a and 10b, if necessary displacing them and moving them away during insertion. The two external prongs 12a and 12c are intended to be arranged adjacent to the external surfaces of the two rails 10a and 10b, respectively.

[0027] Facing pistons 13a and 13b are also provided between the prongs 12a-12c and are able, by means of a suitable pneumatic or hydraulic circuit (not shown), to protrude towards each other from their seats and grip the lip of tubular material which is arranged between them.

[0028] Therefore, in the rest condition, the fork 12 is displaced laterally, as shown in Figs. 7A and 7B, in a position which does not interfere either with the rails 10a, 10b or with the pleated tubular material T.

[0029] During a gripping operation, the fork 12 is inserted between the rails 10a and 10b so as to be inserted correctly also between the two folds T1 and T2 of the tubular material T. In view of the inherent rigidity of the rails 10a and 10b, the lips of the folds T1 and T2, which by nature are somewhat flimsy, are prevented from being folded over incorrectly, hindering correct gripping by the fork 12. Then, the fork is raised by a sufficient amount to come into direct contact with the lips of the folds T1 and T2 above the rails (position referenced by 12' in Fig. 7A). At this point, the pressure circuit is able to activate the pistons 13a and 13b so as to grip, respectively, the lips T1 and T2 (Fig. 8).

[0030] Once the pleated tubular material T is firmly gripped along both its edges, the two gripping forks 12 (one of which is not shown) are moved upwards, in parallel fashion, by means of a movement system which is schematically illustrated in the form of a chain 14 endlessly mounted around pulleys 15 (Fig. 1).

[0031] During this movement, the gripping forks 12 unwind a section of tubular material T having a predefined length equal to the travel displacement performed by the said forks. Once the gripping forks 12 have reached the desired height on the frame 1, the tubular material is cut and welded at the bottom so as to form a hood C.

[0032] For this purpose a cutting and welding device 16 is provided, said device comprising two oscillating facing blocks 16a and 16b on which mutually interacting cutting blades 17a and 17b and welding bars 18a and 18b are mounted. By performing rotation about respective axes of oscillation from the rest position (Fig. 6), in which there is no interaction with the tubular mate-

rial T, into the working position (Fig. 9), in which the blades 17a and 17b and the welding bars 18a and 18b interact with each other and with the tubular material T, the blocks 16a and 16b cut and weld the tubular material T so as to produce a separate hood C.

[0033] The parts described above together form a system for forming and supplying the hood C.

[0034] All of this first stage of extension of the tubular material and formation of the hood C, since it takes place along the vertical section of the frame 1 which is located laterally with respect to the heat-shrinking zone of a combined hooding machine, may be suitably screened without any difficulty so as not to be affected by the heat generated around the load to be wrapped.

[0035] As soon as the heating step has been completed and most of the heat has now been freely dissipated, the hood C is further conveyed by the gripping forks 12 into the horizontal top section of the frame 1 (Fig. 2) where it is brought to a delivery member with the lips of the folds T1 and T2 fully open and extended, ready to be gripped by another gripping system.

[0036] According to the invention, the movable annular structure 3 had four gripping arms 21, 22, 23 and 24, apt to grip the mouth of the hood and bring it into a position underneath the annular structure.

[0037] According to a preferred embodiment, the arms 21-24 are pivotably hinged about two axes of rotation a-a' and b-b' arranged on two opposite sides of the annular structure 3, as can be seen in Fig. 5. The gripping arms, as well as being able to rotate about the axes a-a' and b-b', are slidably mounted so as to be displaceable between a working position (shown in solid lines in Fig. 5), where they are mainly situated inside the perimeter defined by the circle group of burners 4, and a rest position (shown in the broken lines in Fig. 5), where they are arranged totally outside the circle group of burners 4.

[0038] Each gripping arm 21-24 has a distal end, respectively 21a-24a, equipped with a gripper device of any known type. This gripper end is able to grip a lip of a fold of the hood C: the four gripping arms, therefore, are able to grip precisely the corresponding four lips of the hood C, which are conveniently positioned at the delivery member.

[0039] The axes of rotation a-a' and b-b' are arranged so that, in the working position, the gripping arms are able to pivot and insert inside the annular structure 3, as shown in Fig. 3. Therefore, by means of a rotation into the annular structure 3, the gripping arms 21-24 pull the hood C downwards, at the same time splaying the pleated lips and therefore opening the said hood.

[0040] Advantageously, the length of the arms, from the axis of rotation to the gripper device, is such that not only it is possible to splay the hood by an amount sufficient to fit it onto the selected load, but also ensure that the gripper device can be positioned substantially at the same height or underneath the burners 4. The degree

of rotation which each arm must perform also depends on the dimensions of the hood, i.e. on the cross-section dimensions of the load to be wrapped.

[0041] Once the hood C has been opened, the annular structure 3 is displaced downwards so as to fit the hood itself onto the load, until it is in the position shown in Fig. 4.

[0042] At this point the gripper devices release the lips of the hood and the arms 21-24 are again rotated towards the outside (i.e. towards the top) of the annular structure 3 and the burners 4, until they return into their home position. Once they have reached their rest plane, they are displaced laterally until they are positioned outside the operating range of the burners 4 (position shown in broken lines in Fig. 5).

[0043] Finally, the operation for heating of the heat-shrinkable hood may be started by activating the burners 4 and gradually displacing the annular structure upwards at a speed which depends on the characteristics of the hooding machine and the material of the hood.

[0044] In the meantime, the gripping fork 12 is brought by the chain 14 into its bottom position, where it is ready to perform subsequent gripping and conveying of another section of tubular material T.

[0045] As has been seen, the fitting system according to the invention is very practical, simple and flexible so that it may be adapted to many conditions of use. Moreover, it is able to overcome brilliantly the drawbacks associated with the production of heat in a combined hooding machine since it is conceived so that the operating members are arranged above the circle group of burners and are displaceable laterally, so that they may be arranged outside the operating range of the direct heat.

[0046] Moreover, the mouth of the hood may be transferred as far as the base of the load to be wrapped, within the operating range of the burners, without it being necessary to adopt complicated auxiliary constructional solutions (such as a raising device for the pallet).

[0047] Finally, as already mentioned, the hood is kept, for the most part of the process, in a protected lateral position, inside the vertical portion of the frame 1 so that it is not exposed to the premature effect of the heat, even without the use of top protective screens which would prevent the natural disposal of the heat from the working zone.

[0048] In this sense, the objects stated at the beginning have been fully achieved.

[0049] According to another preferred embodiment of the invention, it is provided more than one guiding assembly for the tubular material, so as to be able to handle simultaneously two or more reels of pleated tubular material which are different, for example, in terms of the material or transverse dimensions.

[0050] As can be seen in Fig. 6, a further assembly of strip-like guides 111, mounted on floating system

111a, and associated U-shaped rails (not shown) are mounted on the same sliding drawer-type support S, in common with the guiding assembly previously described. A second pleated portion of tubular material T' supplied from a second reel B' leads to the strips 111 and to the associated rails.

[0051] The drawer-type support S is slidable horizontally on suitable guides S1. In this way it is possible to position a given guiding assembly, containing the corresponding tubular material which is to be used at that time for the specific wrapping required, along the working plane of the gripping fork 12 and the cutting and welding device.

[0052] It is understood, however, that the invention is not limited to the particular configurations which are illustrated above and which constitute only non-limiting examples of the scope of the invention, but that various modifications are possible, all within the reach of a person skilled in the art, without thereby departing from the scope of the said invention.

[0053] The system for moving the gripping arms, for example, may also be different. The axis of rotation could be four in number, separate and independent. Although shown differently, the axis of rotation and the axis of displacement of the arms could also coincide.

[0054] Alternatively a movement system of another kind could be adopted, provided that it results in a device which achieves the result according to the main teaching of the present invention: i.e. a plurality of gripping arms which, mounted on a vertically movable structure, are able to grip from the top the mouth of a hood from a delivery member and then transfer it downwards, opening it up and fitting it onto the load, so designed that they are also able to operate temporarily inside the circle group of burners, and then move outside of them during the heat-shrinking operation.

Claims

1. Fitting system for a hooding apparatus, of the type comprising a support structure displaceable vertically along a load to be wrapped and on which a device for opening and fitting a pleated hood of tubular material supplied from a top delivery member is mounted, characterized in that said opening and fitting device consists of a plurality of gripping arms - one for each folded lip of said tubular material - apt to transfer said lips from said delivery member into a position underneath said support structure, at the same time opening the mouth of said hood.
2. Fitting system according to Claim 1, in which said arms are mounted slidably and rotatably on respective axes fixed to the support structure.
3. Fitting system according to Claim 2, in which said arms are rotatable about respective horizontal axes

of rotation and a gripping end of said arms is able to move over an arc of a circle, which arc has its centre on said axes of rotation and one end arranged in the vicinity of said delivery member and the other end in said position underneath the support structure, and along which it is able to convey one of said folded lips of the hood.

4. Fitting system according to Claim 3, in which said support structure also comprises a circle group of burners inside which heat-shrinking of the hood around the load is performed and said position underneath is at least at the operating height of said burners. 10
5. Fitting system according to Claim 4, in which said arms are slidable horizontally between a working position, where they are substantially contained with the perimeter of said circle group of burners, and a rest position, where they are substantially outside the perimeter of said circle group of burners. 15 20
6. Hooding apparatus, of the type comprising a support frame, arranged astride a wrapping station, on which there is provided: 25
 - a system for forming a hood of heat-shrinkable plastic material which can be obtained from a tubular material folded in pleated fashion; 30
 - a system for supplying said hood to a delivery member arranged at the top of said support frame;
 - a fitting system, apt to pick up said hood from the delivery member and fit it onto a load to be wrapped, located in said wrapping station, characterized in that said fitting system is as claimed in any one of the preceding claims. 35
7. Combined hooding apparatus according to Claim 6, in which said forming and supplying systems are integrated and comprise: 40
 - at least one short U-shaped rail for each fold of said tubular material folded in pleated fashion, inside which this fold is able to be guided substantially vertically along one side of said support frame, said rails forming a pair of guiding assemblies arranged along the two edges of the tubular material, 45 50
 - a gripping fork for each guiding assembly, having prongs provided with gripping elements and able to be inserted horizontally between and outside said rails, and movable vertically, so as to be positioned at the end of the rails and grip the lips of said folds of tubular material, 55
 - said gripping fork being able to be conveyed, by means of a movement system, so as to transfer

the mouth of said hood into the vicinity of said delivery member.

8. Combined hooding apparatus according to Claim 7, in which the rails in each rail assembly may be moved away from and towards each other.
9. Combined hooding apparatus according to Claim 7 or 8, in which said movement system comprises a chain drive which follows an endless path, said gripping fork being joined to a cross-member integral with said chain drive.
10. Combined hooding apparatus according to any one of Claims 7 to 9, in which said guiding assembly also comprises guiding strips arranged, in pairs, on either side of the pleated tubular material so as to guide the movement thereof.
11. Combined hooding apparatus according to Claim 10, in which said strips are mounted in a floating manner.
12. Combined hooding apparatus according to any one of Claims 7 to 11, in which a cutting and welding device is also provided above said guiding assemblies and is able to close and separate from the tubular material the bottom side of a hood being formed.
13. Combined hooding apparatus according to any one of Claims 7 to 12, in which said pair of guiding assemblies is mounted on a slidable drawer, at least one other pair of guiding assemblies being arranged on the same drawer in order to guide another tubular material folded in pleated fashion, said drawer arranging the desired pair of guiding assemblies along the working plane of said gripping fork.

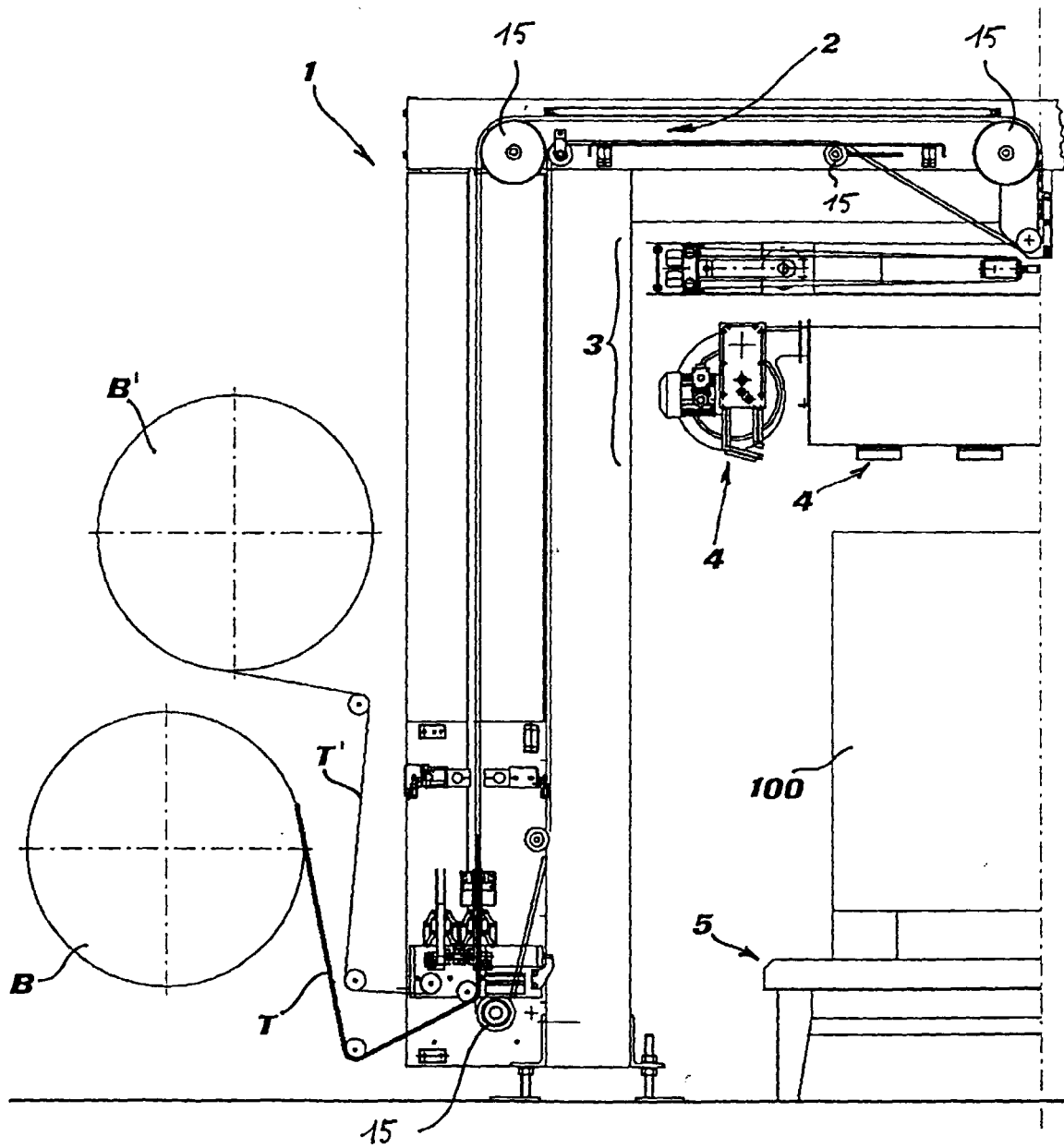


Fig. 1

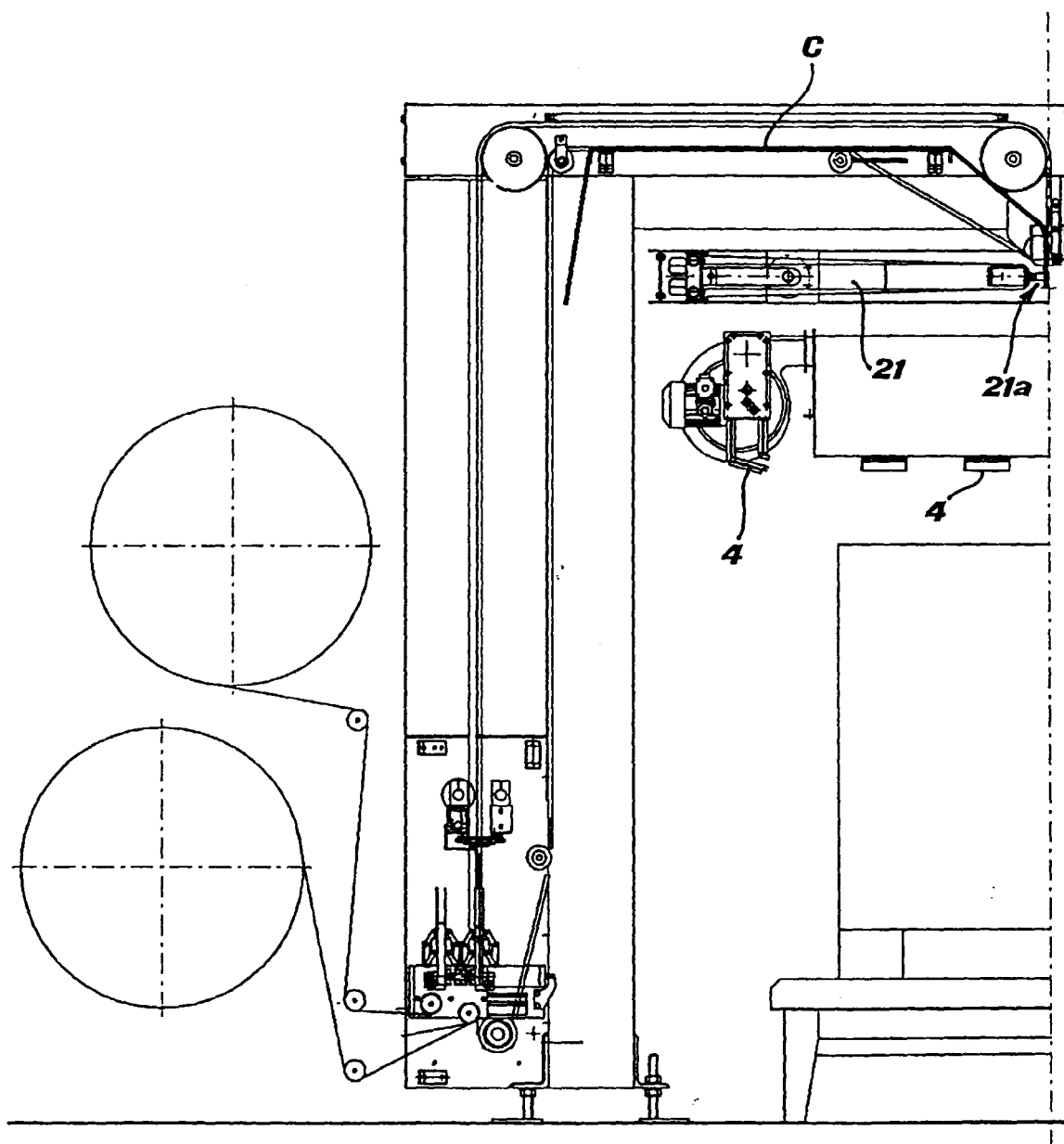


Fig. 2

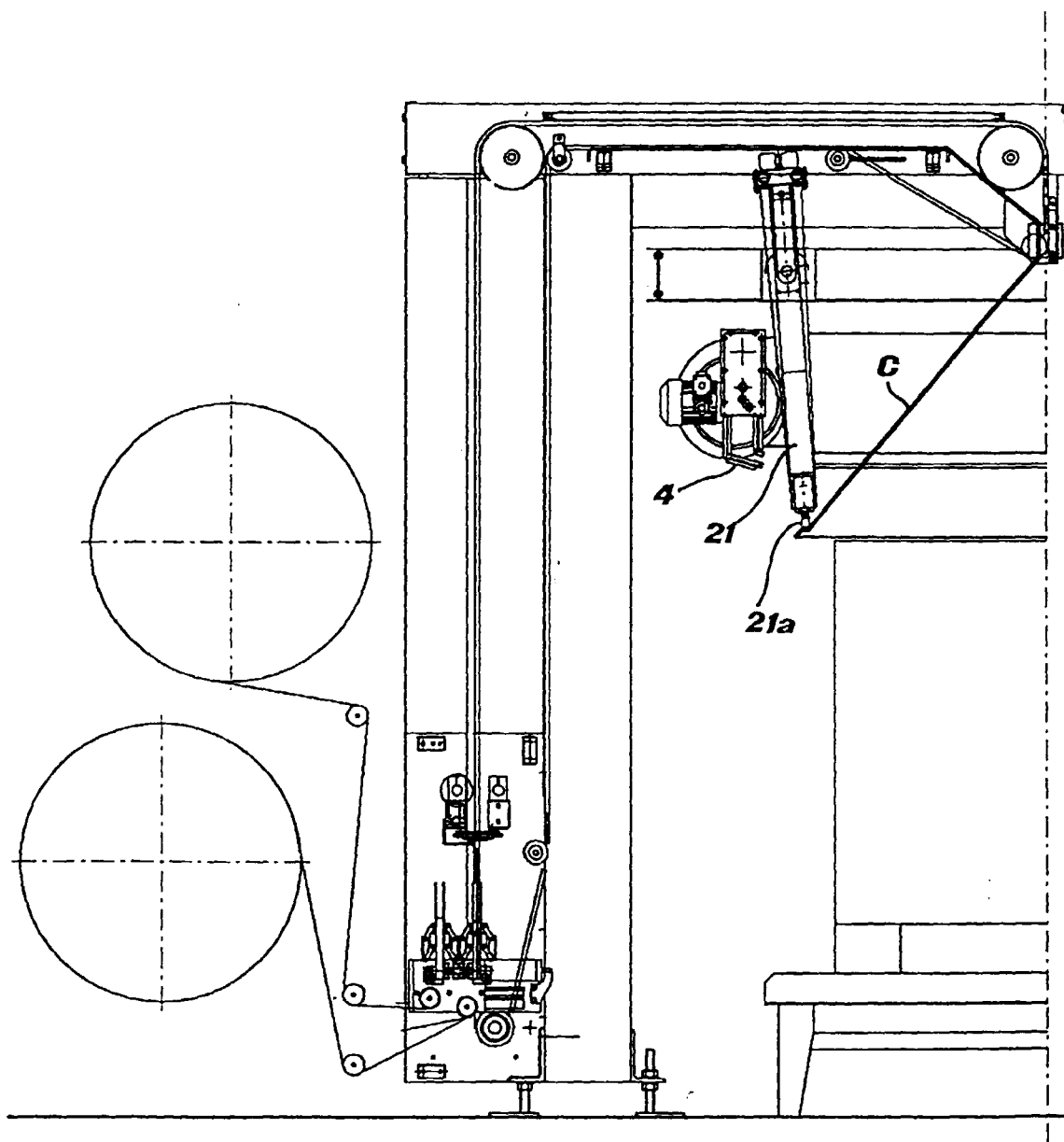


Fig. 3

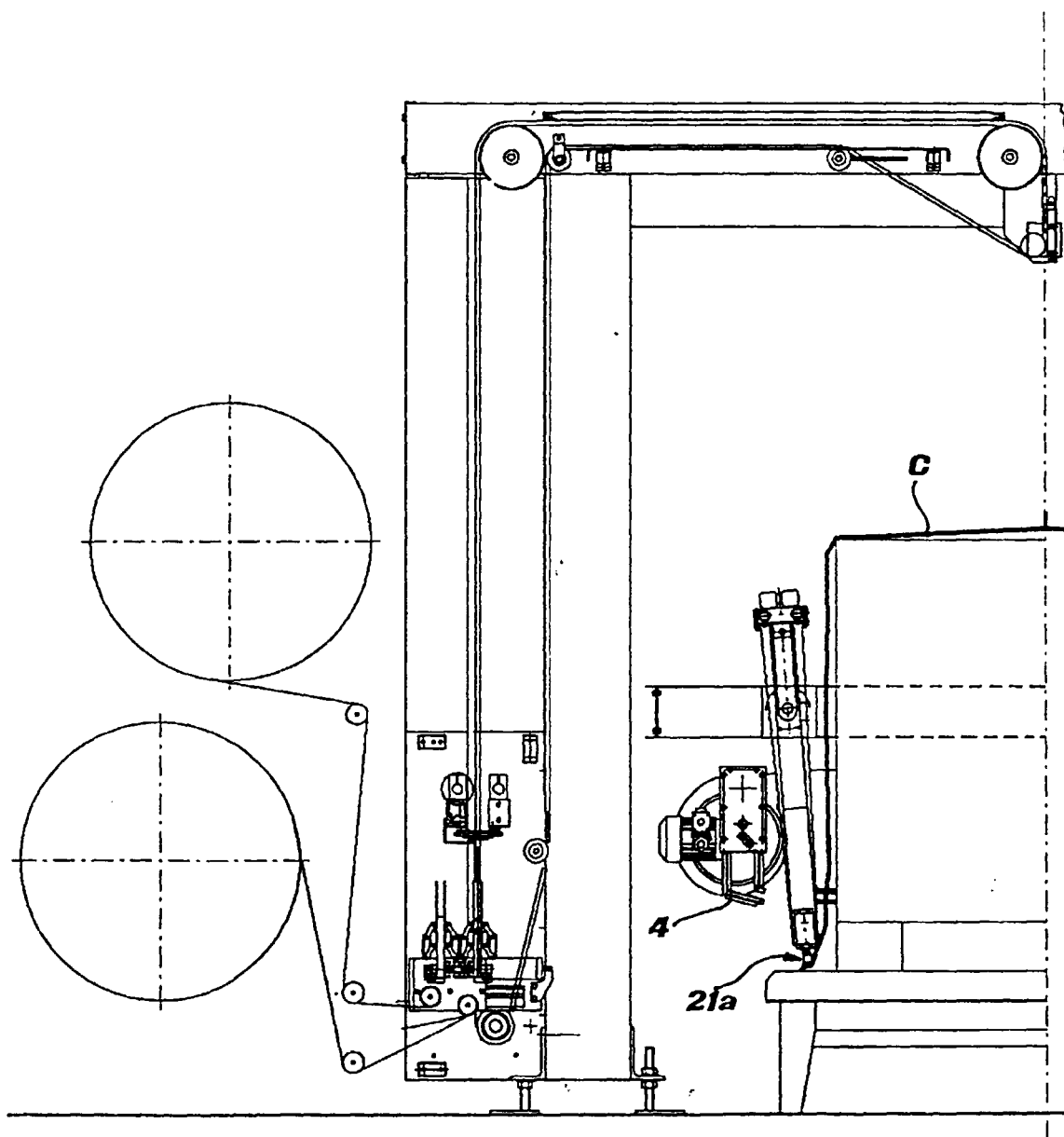


Fig. 4

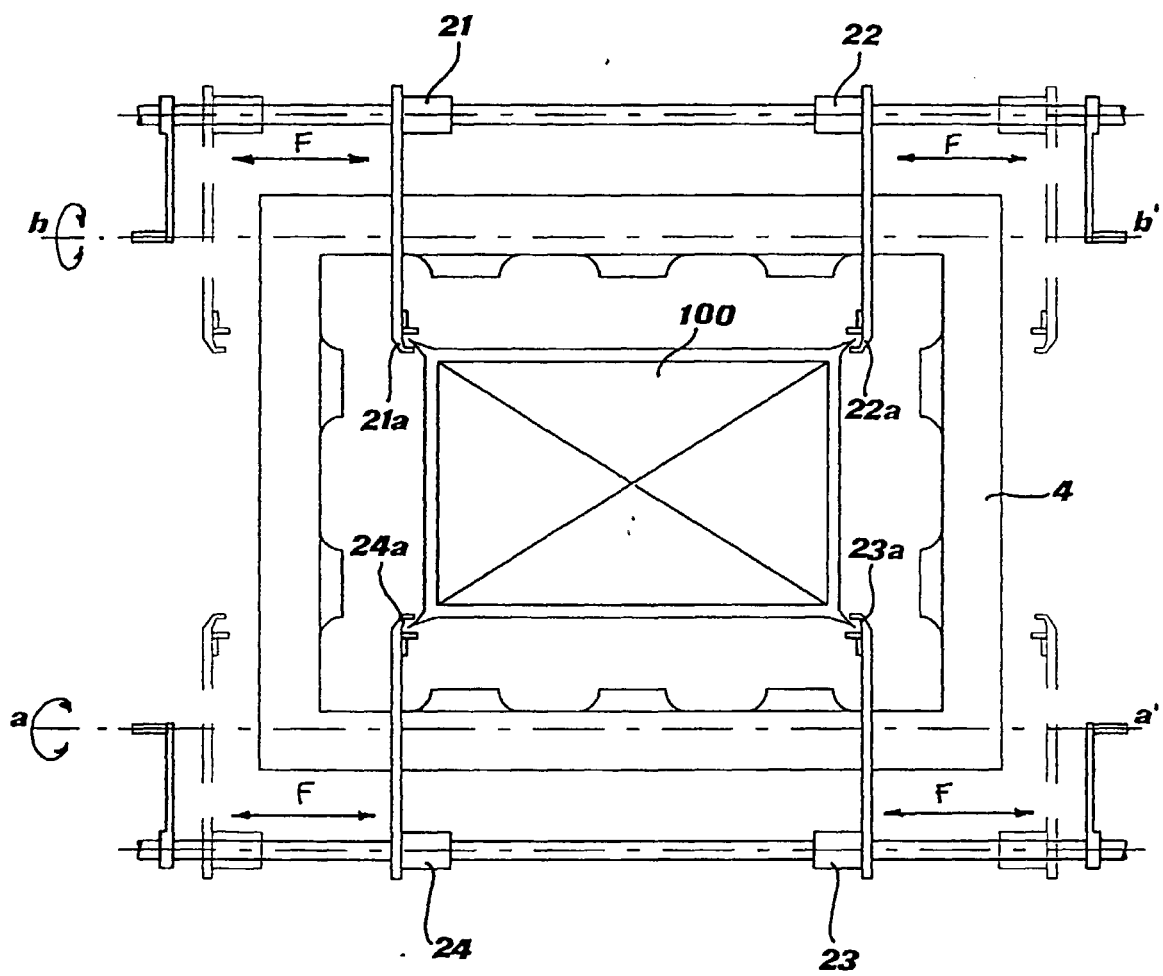
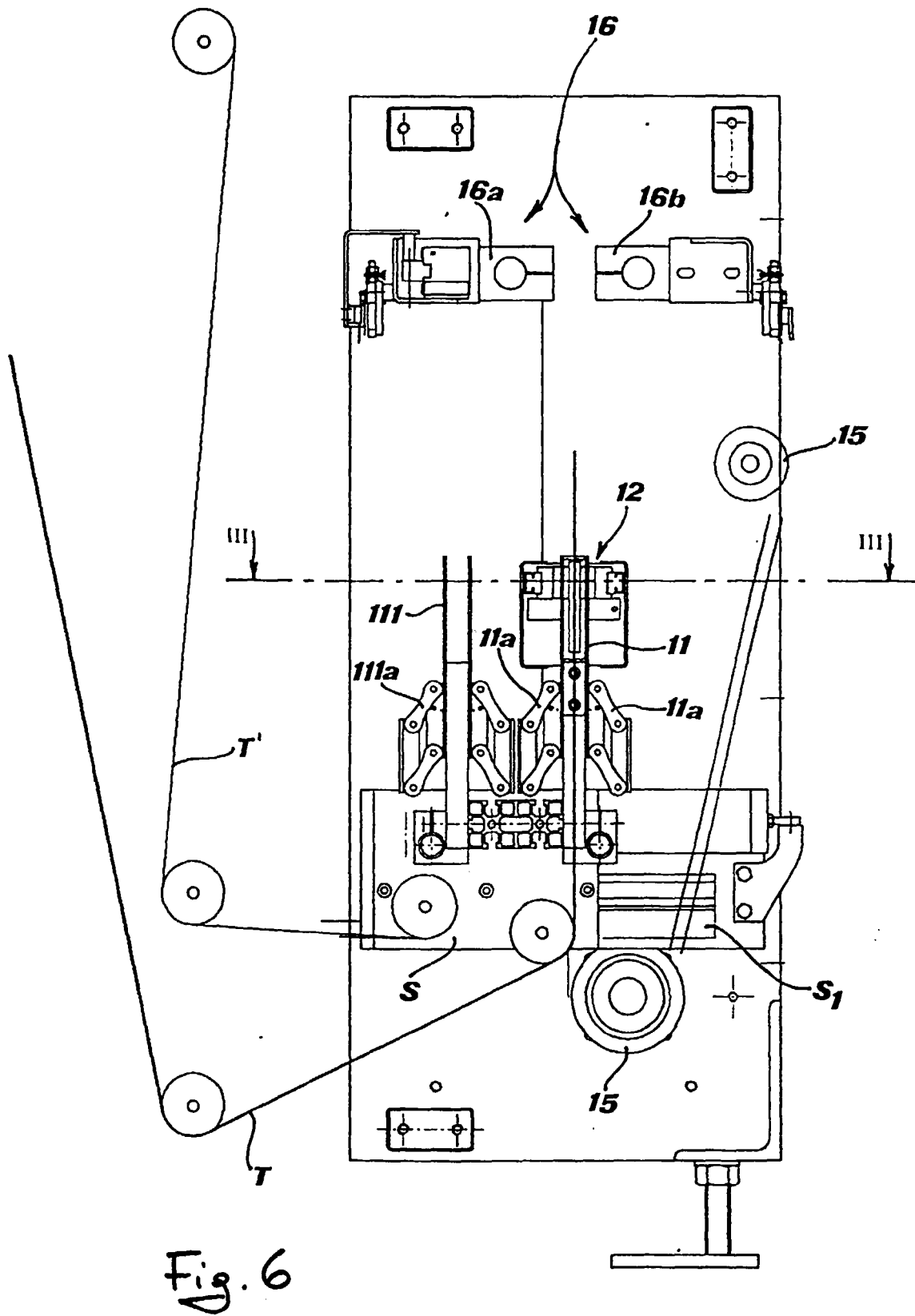


Fig. 5



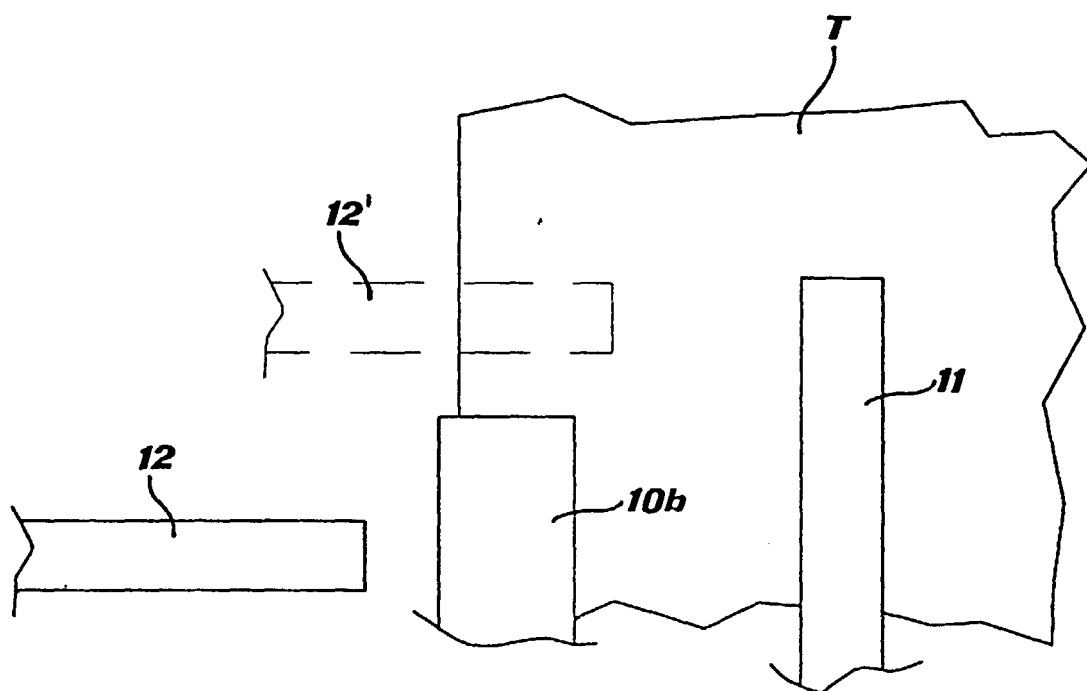


Fig. 7A

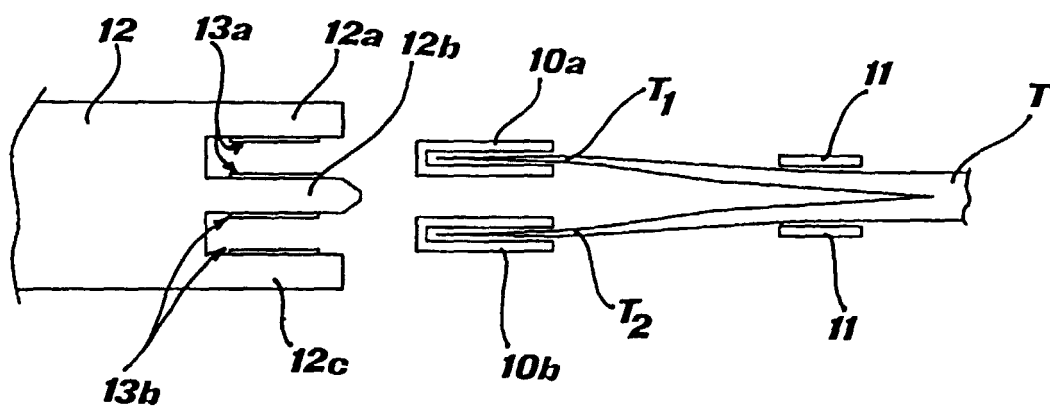


Fig. 7B

