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(54) **HOODING APPARATUS**

(57) A hooding apparatus is disclosed for the wrapping with plastic film hoods, comprising a support frame (1) whereon a forming system for a hood of plastic material is arranged which comprises gripping and advancing means divided into a first vertical dragging carriage (13), apt to drag a tubular film (P) along a substantially vertical path, and a second horizontal dragging carriage (20), apt to drag said film (P) along a substantially horizontal path, said carriages comprising first clamping members (30') and second clamping members (31'), respectively, distributed on a respective lifting bar (30) and dragging bar (31) arranged in the direction of the width of said plastic film (P), and being apt to mutually cooperate in an exchange station.

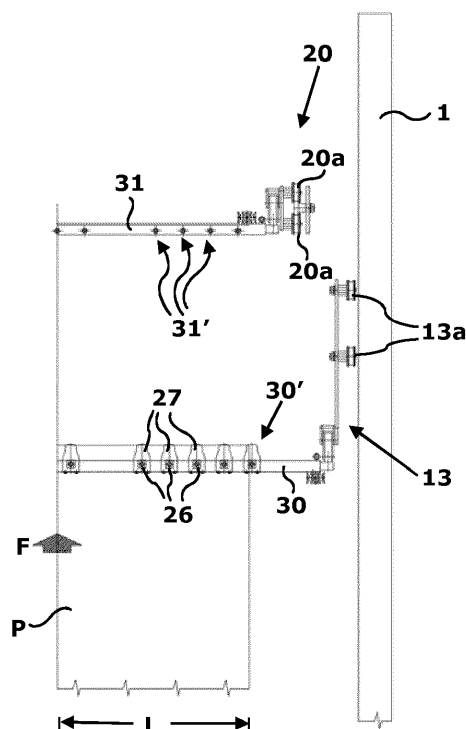


Fig. 5

Description

Field of the invention

[0001] The present invention relates to a wrapping apparatus which uses a hood-shaped film of plastic material, that is, a so-called hooding apparatus. These are machines provided for the wrapping of loads, generally stacked on pallets, with a hood of plastic material, formed starting from a stretchable or heat-shrinkable tubular film folded in a plane in a longitudinal sense, and wound on a supply bobbin.

[0002] In particular, the invention refers to such a wrapping apparatus wherein the hood transfer occurs along two separate pathways.

State of the Prior Art

[0003] The general principle of wrapping apparatuses is the following. A load arranged on a pallet is brought in correspondence of a wrapping position, in the middle of a framework of a wrapping machine. A tubular film, in a flattened state, is taken from a respective bobbin, cut to measure, closed and welded at one end, conventionally called rear end, leaving the other end - conventionally called "mouth" - open to form a bag-like body, called "hood". This hood is then gripped at the mouth end, opened and hence fitted on top to bottom until it wraps the entire load in a hood.

[0004] Machines of this type are largely known. Various types are represented in documents EP 285,855 in the name of Lachenmeier, EP 1,060,988 in the name of Thimon, EP 1,086,893 and EP 1,510,460 both in the name of the same Applicant.

[0005] A first important improvement to these machines, which allows to achieve a series of advantages, is described in EP 2,719,628 in the name of the same Applicant, the content of which is here entirely recomprised for a better understanding of the prior art and of the present invention, representing in fact the closest prior art of the invention.

[0006] As known from these documents, a terminal edge of the tubular film, supplied by the bobbin, is gripped from a position generically at the bottom of said framework and brought - through gripping and dragging means - first vertically, as far as the top of the apparatus framework, and then horizontally as far as a position above the top of the load and centred with respect to the same, where a delivering station is found; from here, the edge of the tubular film is taken in charge by spreading-apart means, which open the mouth thereof and arrange it onto the load.

[0007] The cut to measure (depending on load height) and the welding of the rear end of the hood can occur alternatively at the bottom of the machine, hence in a step which precedes the fitting process, or at the top of the machine, hence in a terminal stage of the fitting process.

[0008] As can be clearly understood, these apparatuses have a significant height dimension: as a matter of fact, sizing is carried out based on the highest loads which the machine must be able to wrap, considering then that above the load height there are furthermore provided the dragging means of the tubular film, the spreading-apart and fitting members and, in some cases, the welding and cutting assembly.

[0009] That implies firstly - as already described in EP 2,719,628 - important maintenance problems. As a matter of fact, the operators, in order to be able to access to all the functional members of the machine, are forced to climb up to be able to operate at the top of the machine. Moreover, in the machines in which the cutting and welding assembly is found at the head of the machine (that is, immediately above the spreading-apart and fitting-on members), the operator must climb up even at each bobbin, because he/she must fit the initial edge of the film into gripping devices arranged immediately downstream of the welding assembly.

[0010] Moreover, the throughput of the apparatus is not optimised if there are significant height changes of the loads to be wrapped. As a matter of fact, the forming and fitting pathway of the hood is always the same (sized for a maximum-height load) even when it is necessary to put a hood on a low load, which would theoretically require a much shorter hood processing pathway. In substance, based on the variability of load height, idle times of the machine arise, both in the lifting step and in the descending step of the hood, which reduce overall throughput.

[0011] These problems have been dealt with and brilliantly solved in EP 2,719,628. The original feature of this machine is given by the fact that the height path of said distribution unit can be determined depending on the load height; for this purpose, gripping and dragging means of the plastic tubular film are provided, which consist of coupled dragging belts, which circulate on closed ring-shaped paths having at least adjacent continuous portions, along which said belts adhere by pressure onto each other, dragging the plastic material film between them; in particular, each of the opposite belts has at least one variable-geometry loop, the size of which is reduced or extended based on the vertical position taken up by the delivering unit which is found at the top of the machine.

[0012] Although this machine has proved to be perfectly functional and apt to carry on fast paces of work, the Applicant has detected that there is room for improving said arrangement, which prove necessary for specific applications.

Summary of Invention

[0013] The problem at the base of the invention is hence to provide a structure of a wrapping machine of the above-mentioned type, which has a construction with more traditional mechanical members, despite preserv-

ing the advantage of allowing the height adjustment of the delivering unit path, allowing to eliminate undesired idle time in processing, as well as the advantage of performing the hood welding and cutting at the bottom of the machine, hence being handier in the maintenance and bobbin change operations, without putting at risk the operator.

[0014] These objects are achieved through the features mentioned in the independent claims herewith enclosed. The dependent claims describe preferred features of the invention.

Brief Description of Drawings

[0015] Further features and advantages of the invention are in any case more evident from the following detailed description of a preferred embodiment, given purely as a non-limiting example and illustrated in the attached drawings, wherein:

fig. 1 is a schematic, front elevation view, of a hooding apparatus according to an embodiment of the invention;

fig. 2 is a schematic front elevation view, enlarged with respect to fig. 1, of the sole cutting and welding station at the bottom of the machine, wherein a carriage for the vertical dragging of the wrapping film is also visible;

fig. 3 is a schematic, interrupted front elevation view, which shows the vertical dragging carriage in a position spaced apart from the cutting and welding station, and a horizontal carriage, which is in the proximity of a release station;

fig. 4 is a schematic, interrupted front elevation view, similar to that of fig. 3 but partly enlarged, of the two dragging carriages in a position of an exchange station;

fig. 5 and 6 are two schematic, interrupted side elevation views, which show the two dragging carriages in the positions corresponding to those taken up in the front views of figures 3 and 4, respectively;

fig. 7 is a fully similar view to that of fig. 3, but with the vertical dragging carriage in a return phase towards the cutting and welding station and the horizontal dragging carriage in an advancing phase towards the release station;

fig. 8 is a view fully similar to that of fig. 7, wherein the horizontal dragging carriage is arranged above the release station; and

fig. 9 is a view fully similar to that of fig. 8, wherein the horizontal dragging carriage has released the film edge.

Detailed Description of a Preferred Embodiment

[0016] As represented in the drawings, a hooding apparatus comprises, in a manner known per se, a main post 1 of a support frame (not better shown overall, being

of a type largely known per se).

[0017] Next to post 1 is arranged a carriage 2 carrying bobbins 3 for the supply of a film P of plastic material, of a tubular shape, but folded on a plane. For the purposes of the present invention the use of a film of heat-shrinkable or stretchable plastic material is indifferent, since the opening/spreading-apart system of the film of plastic material is of no interest to the present invention, concerning a part of the machine, referred to as distribution and fitting-on unit further on, which operates downstream of the gripping and advancing means which make up the object of the invention.

[0018] Equally, the unit of carriage 2 carrying bobbins 3 is not part of the present invention and will hence not be described in further detail. It is sufficient to clarify that it can be a unit for a single bobbin, as schematised in the drawings, or a multiple-bobbin unit, as illustrated in EP 1,086,893 or EP 2,719,629.

[0019] As an example, it is nevertheless pointed out that on post 1 there are exemplifyingly provided control means of the rotation of bobbin 3, consisting of an arm 4, mounted with an end thereof oscillating around a pin 4a and carrying, at the other free end thereof, a motorisation 5 for a rotating cylinder 6, which cylinder rests on the periphery of bobbin 3 and drives it into rotation by friction.

[0020] Tubular film P, supplied by bobbin 3, passes first through a tensioning device 7 and subsequently through a guiding device 8 arranged in the lower part of the bobbin unit, so as to present the edge of film P standing vertically, from bottom to top, to a cutting and welding station 9. In the illustrated embodiment, the cutting and welding unit 9 of the hood is hence arranged in the lower part of the machine.

[0021] The cutting and welding unit 9 (represented in greater detail in fig. 2) comprises, in a way known per se, two opposite welding bars 9a, 9b, which can be mutually brought closer together and spread apart, as well as - upstream of these (in the advancement direction F of wrapping film P), that is, below them - a cutting blade 9c which can be brought closer together cooperating with an opposite cutting abutment 9d. Thereby two opposite assemblies arise, each one comprising a part of the welding means and of the cutting means.

[0022] The two opposite assemblies are normally kept mutually distant (attitude shown in fig. 2), so as to define a running path for film P. When it is necessary to close one end of the tubular film for forming a hood, the two assemblies are provisionally brought closer together for welding and cutting, and then they are brought further apart again.

[0023] Please notice (fig. 3) that the welding means 9a, 9b (which operate in a fixed station, integral with the machine framework) operate at a height X1, while the cutting means operate at a height X2, below height X1. This is essential to obtain that the film severing occurs upstream - with respect to the supply direction - of the welding, so that the hood is finished and welded at the

lower end, before being transferred to the fitting means.

[0024] In this preferred embodiment, in order to guide plastic film P with supply continuity, guiding device 8 furthermore comprises holding and presenting means 8a (shown in greater detail in fig. 2), the function of which is to hold the free edge of film P (separated from the above-lying hood, already closed at the lower end thereof by welding unit 9b, through cutting unit 9c) until the moment of releasing it to gripping and advancing means - better described in the following - which grip it to drag it to and beyond said cutting and welding station 9.

[0025] Holding and presenting means 8a, in particular, can be in the form of coupled flaps between which plastic film P is retained, free to slide, so that it presents the vertical free edge facing upwards.

[0026] Preferably the two coupled flaps 8a have an upper comb-shaped profile, that is, with cut-outs which extend from the terminal edge towards the flaps body. These cut-outs, not visible in the drawings, allow to interact with the plastic film from the outside of flaps 8a, despite preserving good guiding function of the film on the vertical plane. In particular, through these cut-outs, clamping members of the plastic film are introduced, as will be described further on.

[0027] According to a fundamental feature of the invention, the gripping and advancing means are split into two substantially independent sections, and precisely a first section, indicated overall with reference 10, substantially running vertically, and a second section, indicated overall with reference 11, substantially running horizontally.

[0028] In the first section 10 there is provided a vertical dragging carriage 13 slidably mounted from the bottom to the top of the machine and vice versa, while in the second section 11 another horizontal dragging carriage 20 is provided, slidably mounted in a substantially horizontal direction, for example from post 1 of the machine towards a release station 12 and vice versa; below release station 12 there is provided, in a way known per se, a gripping and spreading-apart assembly 12', located on the vertical line of the stationing area of a load C to be wrapped. Such gripping and spreading-apart assembly 12' will not be described in further detail, because generically known to a person skilled in the field and not forming specifically an object of the present invention.

[0029] Vertical dragging carriage 13 is provided with wheels 13a for sliding along a fixed vertical rail (not represented to simplify the drawing). The vertical movement is controlled by a belt or chain 14, sliding on a pair of end pulleys 15 and 16, arranged along a ring-shaped path. With one of the two pulleys, preferably the upper pulley 16, a motorisation 17 is associated. Although in the drawings a single carriage is always represented, preferably a pair of carriages 13 is provided, arranged on the two opposite sides of the frame (of which fig. 5 shows a single one), between which a lifting bar 30 is arranged - as will be described further on - lying according to the width of the plastic film and of a length at least equal to the width

of film P which is unwound off bobbin 3.

[0030] Horizontal dragging carriage 20 is itself provided with guiding wheels 20a (see better in fig. 3) for the sliding along a fixed, horizontal rail (not shown to simplify the drawing). The horizontal movement is controlled by a belt or chain 21, sliding on a pair of pulleys 22 and 23, arranged along a ring-like path. With one of the two pulleys, preferably the outermost pulley 23, a motorisation 24 is associated. In this case too, although in the drawings a single carriage is always shown, preferably a pair of carriages 20 is provided, arranged on the two opposite sides of the upper frame, between which a dragging bar 31 is arranged lying according to the width of the plastic film and of a length at least equal to the width of the film P which is unwound off bobbin 3.

[0031] The vertical rail, along which carriage 13 moves, is fastened on the post 1 of the machine. The horizontal rail, along which carriage 20 moves, is fastened on a crossmember 11a of the upper frame which, according to an arrangement already known from application EP 2,719,629, is capable of being vertically displaced along post 1, to adjust the height thereof to the current requirements, for example for maintenance or for operation start purposes.

[0032] On lifting bar 30 there are arranged first clamping members 30', mutually spaced apart with a suitable pitch to be able to come into cooperation with second clamping members 31' carried on dragging bar 31. As a matter of fact, first clamping members 30' extend upwards, from lifting bar 30, so as to be able to securely hold the free edge of film P' so that it ends slightly above lifting bar 30. Second clamping members 31' are configured to move closer to lifting bar 30 and clamp free edge P' in the gap left free between first clamping members 30'.

[0033] For such purpose, the arrangement of first clamping members 30' provides a pair of small, opposite clamping plungers 26, from which respective retaining lugs 27 extend upwards. In order to simplify the description, in the following reference will be made to a pair of small clamping plungers 26 and relative retaining lugs 27, but it is understood that a plurality thereof arranged with a certain pitch along lifting bar 30 is provided. The pairs of small clamping plungers 26 are carried in the upper part of lifting bar 30'.

[0034] Similarly, second clamping members 31' are equipped with opposite pairs of small plungers 26a, mounted in the lower part of dragging bar 31.

[0035] Opposite plungers 26 and 26a move into opposite directions on aligned and generally horizontal axes, so as to clamp between them the plastic film edge which presents itself always arranged in a vertical plane. Preferably they are maintained closer together (closed clamp) by elastic means, such as a spring 29 for first clamping members 30' and a spring 29a for second clamping members 31'; the moving away of opposite plungers 26 and 26a (clamp opening) is obtained by acting with an active control, for example through a hydraulic or compressed-air circuit.

[0036] The general operation of the machine described so far is the following.

[0037] Vertical dragging carriage 13 is initially arranged in the lower part of the travel thereof, in a position slightly lower than the one illustrated in fig. 2, so that first clamping members 30' may clamp the plastic film sufficiently below the upper terminal edge thereof (cut by blade 9c), for example within the cut-outs provided on flaps 8a.

[0038] In particular, the top of holding and presenting means 8a is found at a height below height X2 at which cutting blade 9c operates, so as not to interfere with the movement thereof. The active part of first clamping members 30' engages with the film at such a height X3 that, between said height and height X2 a free portion of film P remains, sufficient for performing the exchange operation in the way best described in the following.

[0039] First clamping members 30' are opened and then closed onto the film, so as to clamp the free edge of film P. Then vertical dragging carriage 13 is controlled in an upward movement, thereby dragging with itself the free edge of film P as far as a first desired height (which determines the hood length).

[0040] Once arrived at this desired height, it stops and the welding of the lower end of the tubular film is performed, to define a hood of preset dimensions, closed in the lower part thereof. The welding, and the subsequent cut (to separate the hood from the remaining portion of film) occurs by assembly 9 in the lower part of the machine.

[0041] Hence vertical dragging carriage 13 resumes the upward travel (if necessary) to an exchange station, which is found at a height corresponding to the crossing with the travel plane of the horizontal dragging carriage 20; in particular, in this station vertical dragging carriage 13 arranges itself so that retaining lugs 27 end approximately at the same height as the opposite plungers 26a of the second clamping members 31', as represented in fig. 4. The opposite plungers 26a of the horizontal dragging carriage are brought mutually closer together, clamping the film edge in the free gap between retaining lugs 27. Said lugs are instead mutually spaced apart, releasing the free edge of film which is integrally retained to horizontal dragging carriage 20.

[0042] For a better understanding of the cooperation between carriage 13 and carriage 20, in the exchange station, it is necessary to refer to figs. 5 and 6, which show carriages 13 and 20 substantially as in figs. 3 and 4, however, no longer in a front but lateral view, that is, a view in the direction of arrow VL.

[0043] In fig. 5, as in fig. 3, one can see carriage 13 which is found in a position still below the travel plane of carriage 20, in an upward step according to arrow F and moving closer to the level where carriage 20 is found.

[0044] The representation of this carriage 13 is simplified in fig. 5 (for sake of clearness of the drawing): a pair of sliding wheels 13a can be seen, integral with a bracket 13' at the lower end of which lifting bar 30 is attached,

which carries a plurality of pairs of plungers 26 with the relative support lugs 27. As already stated, the length of bar 30 and the number of pairs of plungers 26 and lugs 27 are determined on the basis of the width l of the film supplied by bobbin 3, so as to ensure correct film dragging, with no inflexions.

[0045] It is important to notice here the essential function of lugs 27, which keep lifted the upper edge P' of film P.

[0046] Also carriage 20 is represented in a simplified manner: as a matter of fact, only wheels 20a and dragging bar 31, fully similar to the lifting bar 30 of carriage 13, in turn carrying a plurality of plungers 26a, can be seen.

[0047] Fig. 6 shows carriages 13 and 20 in the position already represented in fig. 4, that is, in the exchange position. From this fig. 6 it can be noticed that plungers 26a retain the upper edge of film P' in the free gap left by lugs 27.

[0048] In the exchange station a synchronised control intervenes which determines the collection and delivery of the film from lifting bar 30 to dragging bar 31.

[0049] As a matter of fact, by this arrangement, as soon as carriage 13 arrives at the exchange position, thus leading the upper edge P' of the film to arrange itself between each pair of open plungers 26a, the synchronised control firstly drives the clamping of these plungers 26a, which thus grip the film edge P'. Immediately afterwards, the opening of plungers 26 and lugs 27 is controlled, which release the grip on film P. The exchange is thus completed.

[0050] Once the exchange has been completed, vertical dragging carriage 13 can descend back towards the lower part of the machine, while horizontal dragging carriage 20 starts moving towards release station 12, also dragging film P which rests on suitable guiding cylinders 40 (fig. 7).

[0051] Please notice that when carriage 13 returns downwards (arrow F1 in fig. 7), first clamping members 30' are open (see the moved-away plungers 26); it can hence reach the position shown in fig. 2, wherein lugs 27 are mutually spaced apart to arrange themselves on the two sides of the edge of film P kept in position by presenting means 8a. While the previous hood is transferred through horizontal dragging carriage 20, in this lower position of the machine the closing of first clamping members 30' can be controlled, so as to grip a new portion of film P and drag it upwards (direction F) up to the preset height for forming a new hood of the desired size.

[0052] Returning to consider the operation of horizontal dragging carriage 20, please notice that in correspondence of the release station there are provided means suitable to guide the edge of film towards gripping and spreading-apart elements 12', through which the hood is opened and fitted onto load C, in either one of the ways already well-known in the art of these wrapping machines.

[0053] Such guiding means, according to a preferred embodiment illustrated in the drawings, consist of a pair

of sliding rollers, an upstream one 41 and a downstream one 42 arranged in the release station. In particular the two rollers 41 and 42, arranged with their rotation axis in the direction of the width of film P (hence orthogonal to the movement of horizontal dragging carriage 20), are maintained at a certain mutual distance (fig. 8) as long as the horizontal dragging carriage 20 carries the free edge of film P in the proximity of downstream roller 42. After which, the opposite plungers 26a of carriage 20 are moved away and the edge of film is released, falling downwards between the two rollers 41 and 42. At this point, downstream roller 42 is moved closer to upstream roller 41 (or in any case a relative moving-closer movement is established), gripping film P therebetween (fig. 9). The edge of film is hence firmly retained and then pushed downwards - where it will be taken by gripping and spreading-apart elements 12' - putting in rotation (in two opposite directions) the two rollers 41 and 42, one of which is necessarily driven into rotation.

[0054] As can be easily understood, the hooding apparatus according to the invention allows to perfectly achieve the objects set forth in the premises. As a matter of fact, the mechanical construction is of the traditional type, wherein the plastic film is always transferred by clamping systems, which guarantees a safe grip regardless of the film thicknesses and material. By this layout it is nevertheless possible to adjust the height of the gripping and spreading-apart assembly 12' and of the relative release station 12 to the current requirements, in particular for maintenance purposes. The separation of the dragging movements on two distinct paths, a substantially vertical one and a substantially horizontal one, allows to control the dragging members independently, so as to be able to produce a hood while the previous hood is delivered onto the load, thereby increasing apparatus productivity.

[0055] However, it is understood that the invention is not limited to the particular embodiments illustrated above, which represent only non-limiting examples of the scope of the invention, but that a number of variants are possible, all within the reach of a person skilled in the field, without necessarily departing from the scope of the invention.

[0056] In particular, the control devices, such as plungers 26, chains 14 and 21, can take up also different shapes, provided the described function thereof is preserved.

Claims

1. Hooding apparatus for wrapping with plastic film hoods, comprising a support frame (1) on which a system for forming a plastic hood is arranged, starting from a tubular film (P) folded on a plane and wound on at least one supply bobbin (3), wherein said forming system comprises presentation means (8a) of an initial edge of said tubular film (P) in the

proximity of the apparatus base

gripping and advancing means which drag said tubular film (P) along a forming path running along a fixed vertical post (1) of the apparatus, from the base to the top, and along a horizontal crossmember (11a) of the apparatus, until above a stationing position of a load (C) to be wrapped, this horizontal crossmember (11a) being mounted height-adjustably along said post (1)

a cutting and welding unit (9), arranged at the bottom of the apparatus, at the beginning of said forming path,

a release station (12), integral with said horizontal crossmember (11a), from which said tubular film (P) is delivered towards a gripping and spreading-apart assembly (12') apt to fit said hood onto said load (C), **characterised in that**

said gripping and advancing means are divided into a first vertical dragging carriage (13), apt to drag said film (P) along said substantially vertical path, and into a second horizontal dragging carriage (20), apt to drag said film (P) along said substantially horizontal path, and

said vertical and horizontal dragging carriages (13, 20) comprise first clamping members (30') and second clamping members (31'), respectively, distributed on a respective lifting bar (30) and dragging bar (31) arranged in the direction of the width of said plastic film (P), said first clamping members (30') and second clamping members (31') mutually cooperating in an exchange station, at the crossing between said substantially vertical and substantially horizontal paths, so that an edge of said film (P) is retained alternatively by said first clamping members (30') or by said second clamping members (31').

2. Apparatus as claimed in claim 1, wherein said first clamping members (30') and said second clamping members (31') comprise a plurality of pairs of holding plungers (26, 26a), movable mutually closer and further apart for clamping said plastic film (P) therebetween.

3. Apparatus as claimed in claim 2, wherein the holding plungers (26) of said lifting bar (30) are also provided with upward extension lugs (27).

4. Apparatus as claimed in claim 2 or 3, wherein said pairs of holding plungers (26, 26a) are maintained closer together by an elastic member (29, 29a) and are moved further apart by an active control.

5. Apparatus as claimed in any one of the preceding claims, wherein said first clamping members (30') are alternately located between said second clamping members (31') when they cooperate in said exchange station.

6. Apparatus as claimed in any one of the preceding claims, wherein said release station (12) comprises two rollers which can be moved closer together (41, 42), with rotation axes arranged according to the width of said plastic film (P), apt to define a gap into which a free edge of said film (P) is caused to drop when it is released by said horizontal dragging carriage (20), said rollers which can be moved closer together (41, 42) being driven into rotation when they are both in contact with said edge of film (P) so as to push it towards said gripping and spreading-apart assembly (12').

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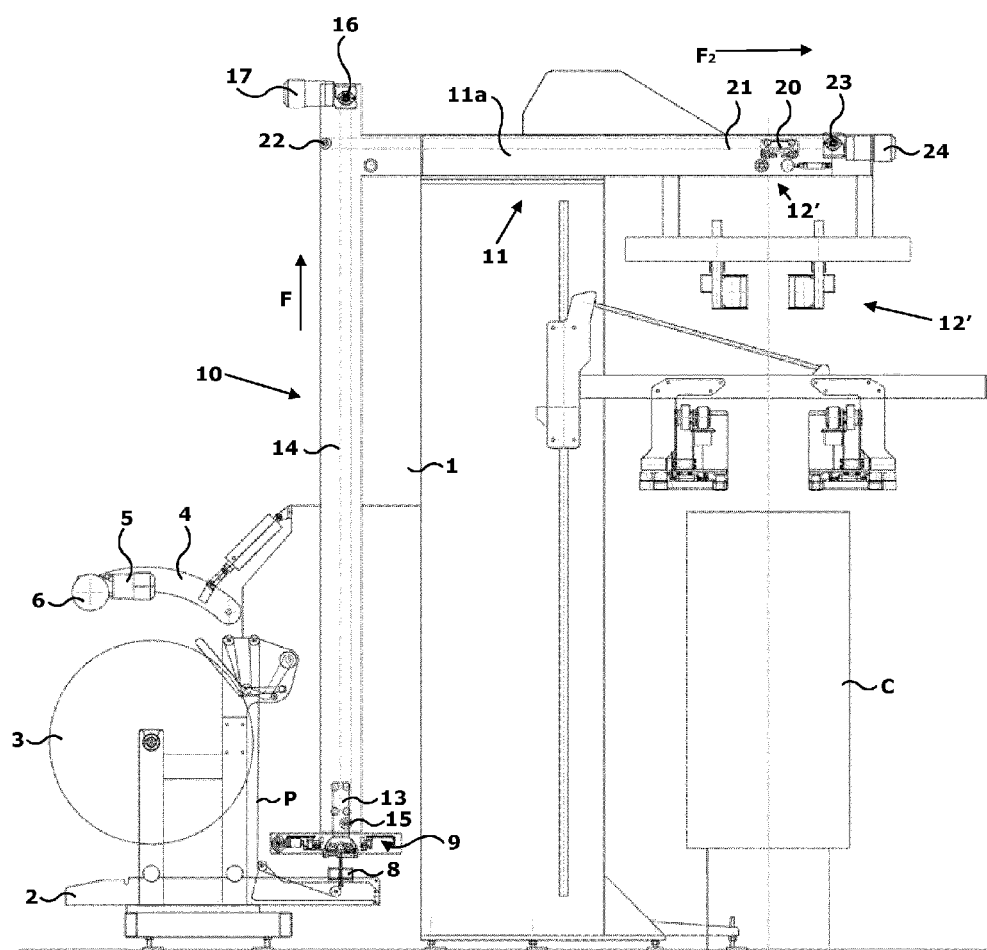


Fig. 1

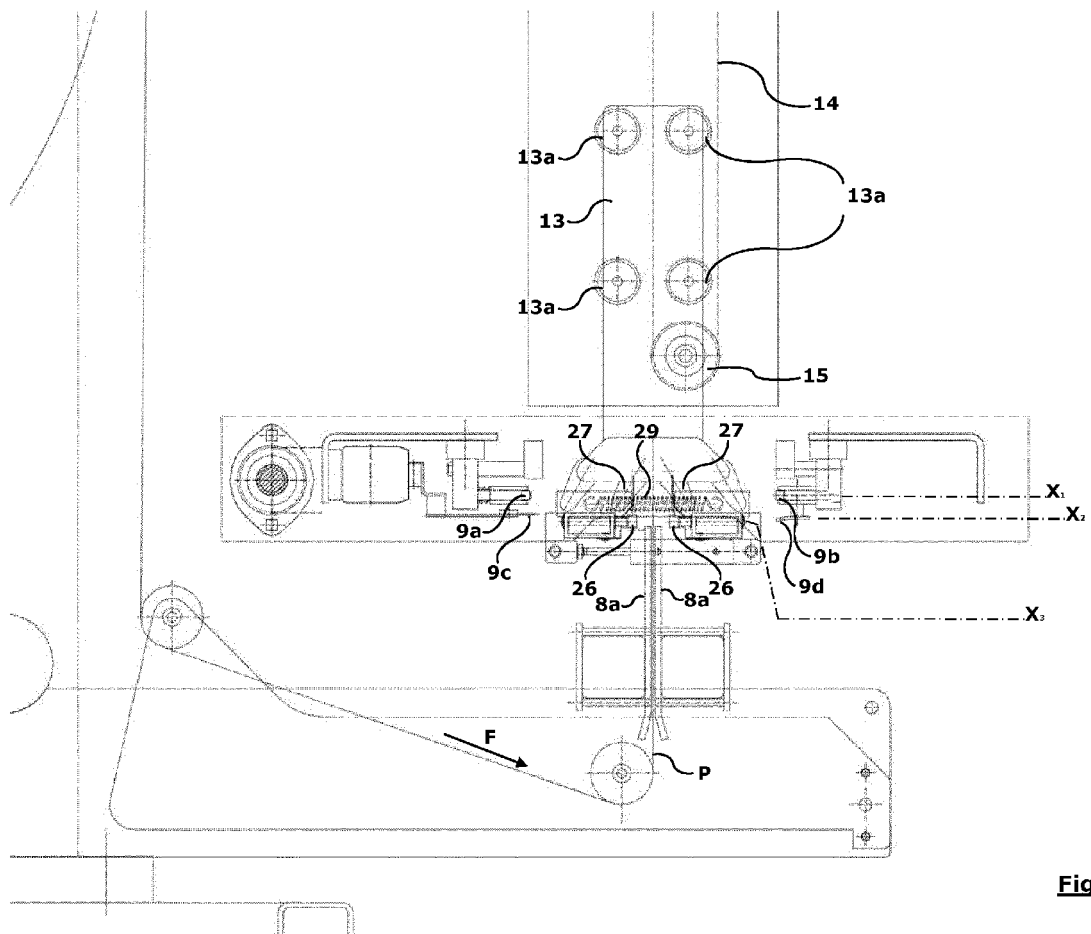


Fig. 2

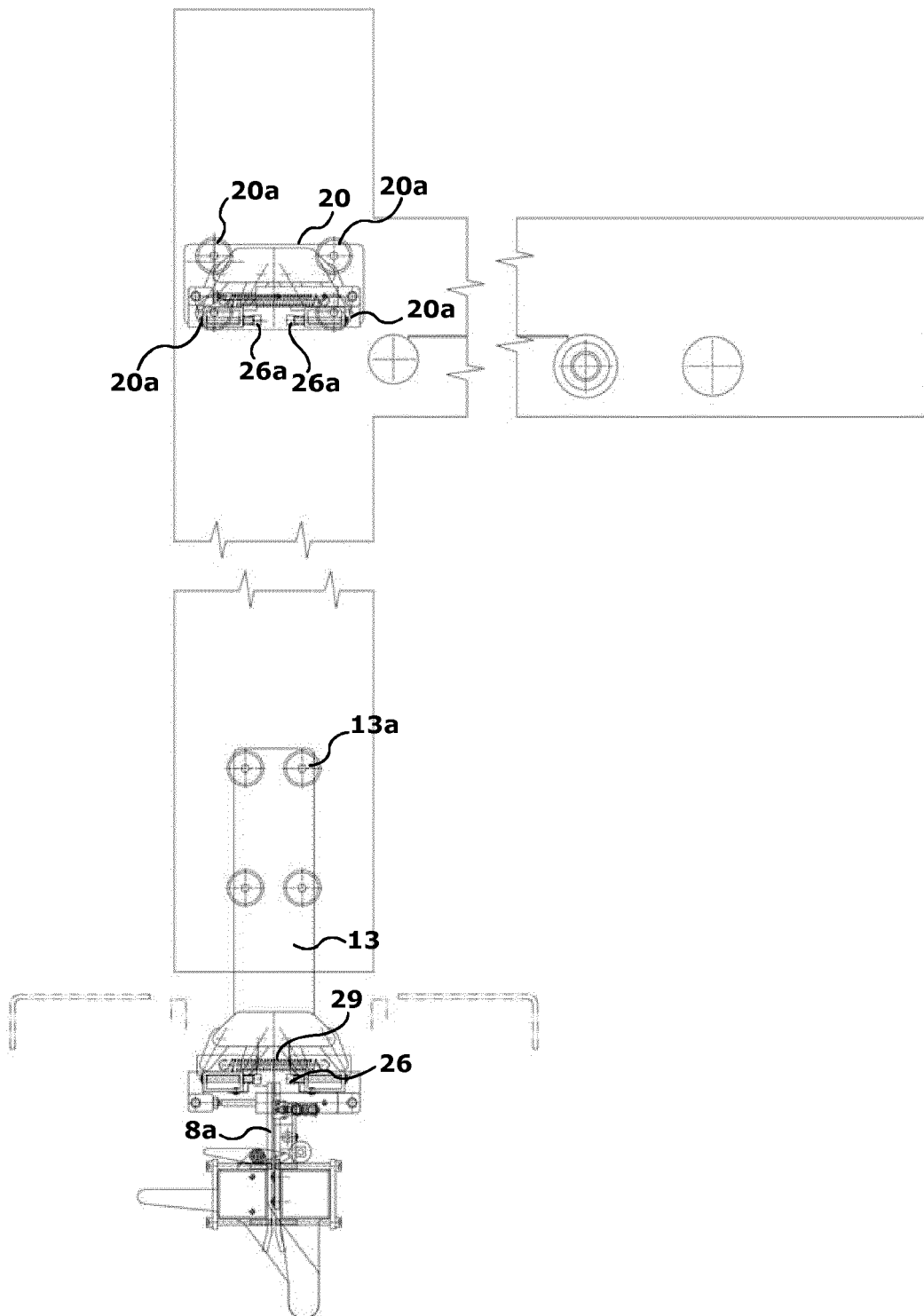


Fig. 3

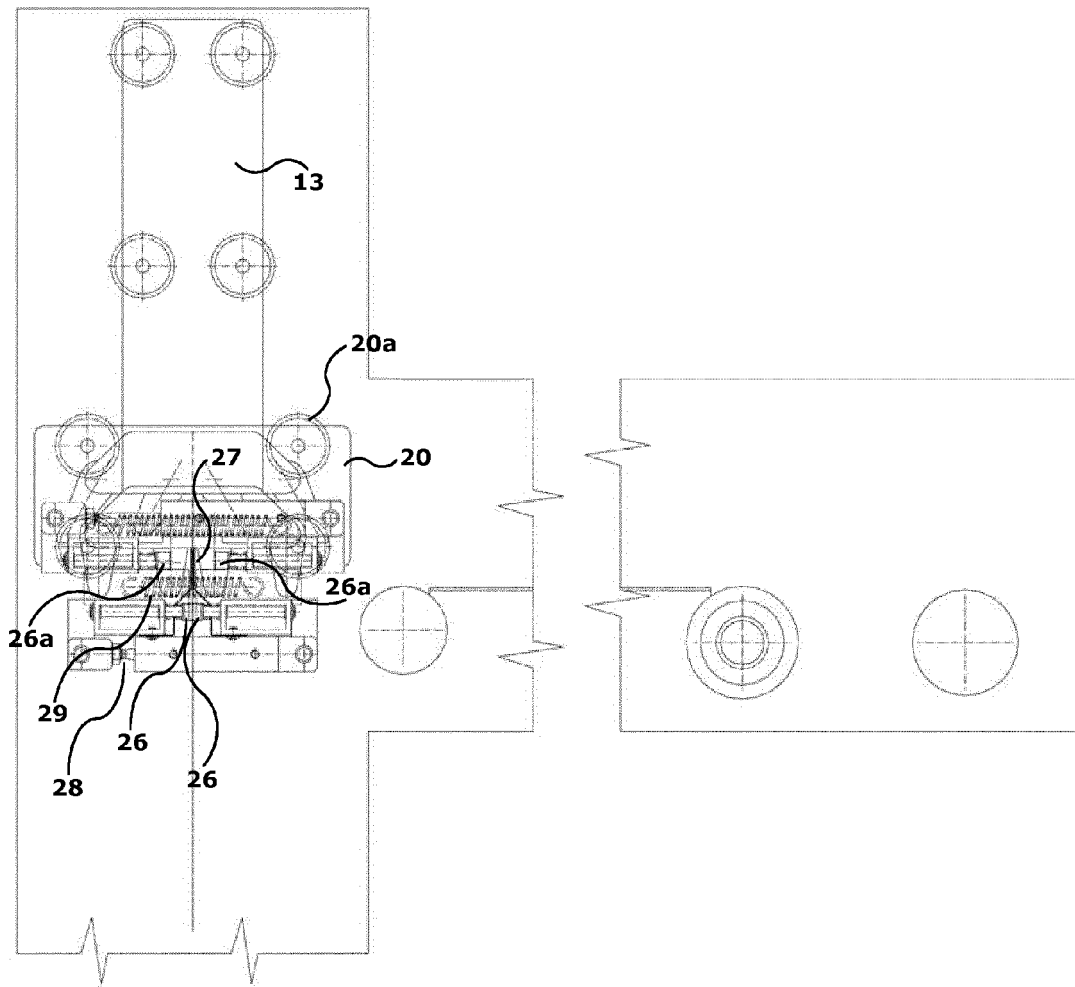


Fig. 4

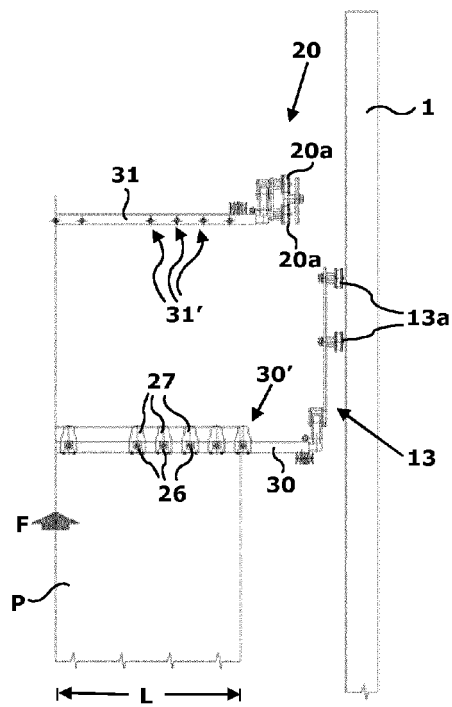


Fig. 5

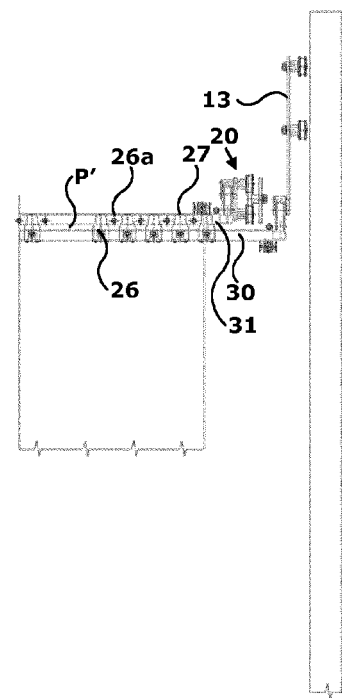


Fig. 6

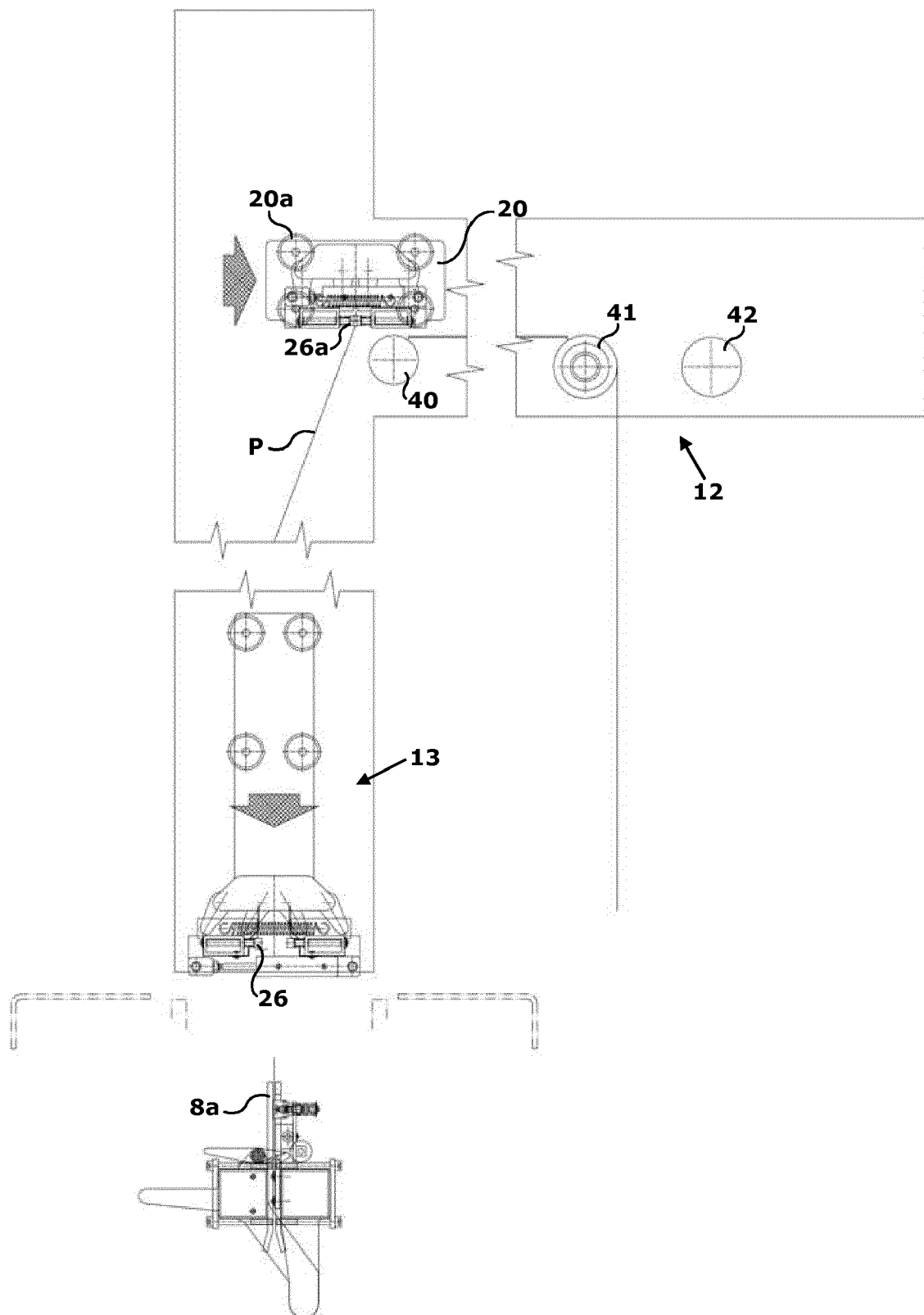


Fig. 7

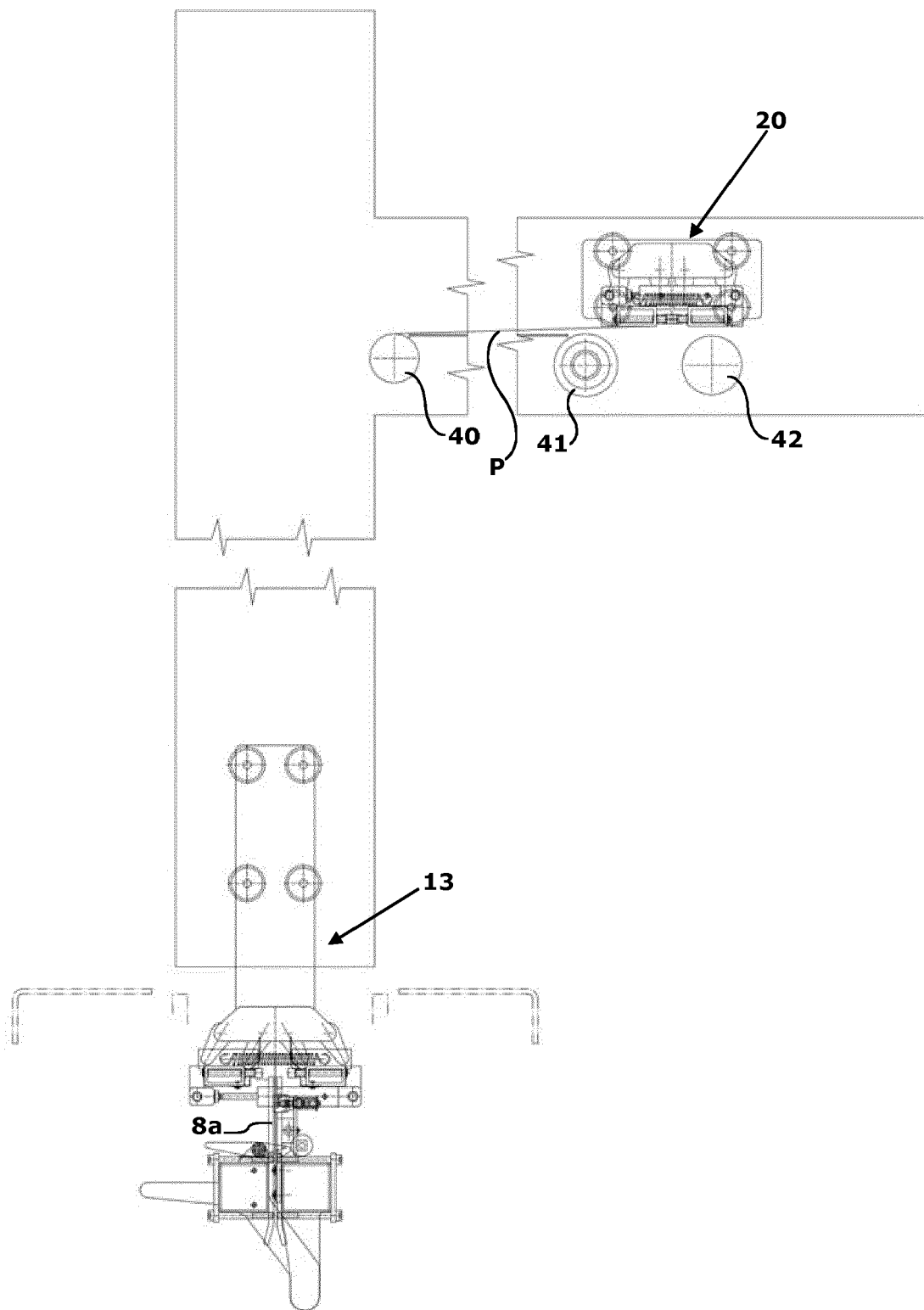


Fig. 8

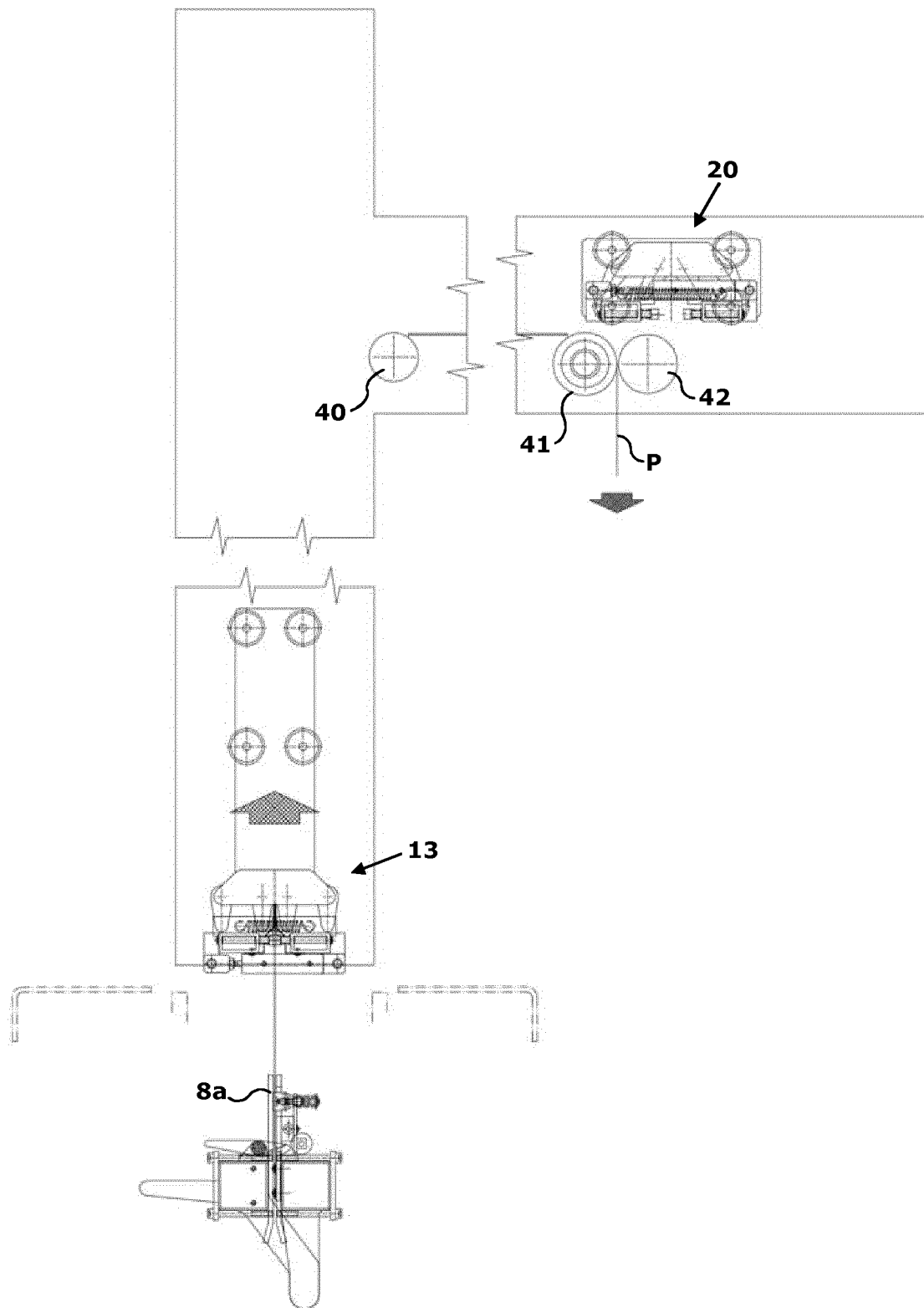


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 15 18 3963

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 1 106 507 A1 (EFFE 3 TL SRL [IT]) 13 June 2001 (2001-06-13) * paragraphs [0034] - [0046]; figures 1,4-8 *	1-6	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 December 2015	Examiner Kulhanek, Peter
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