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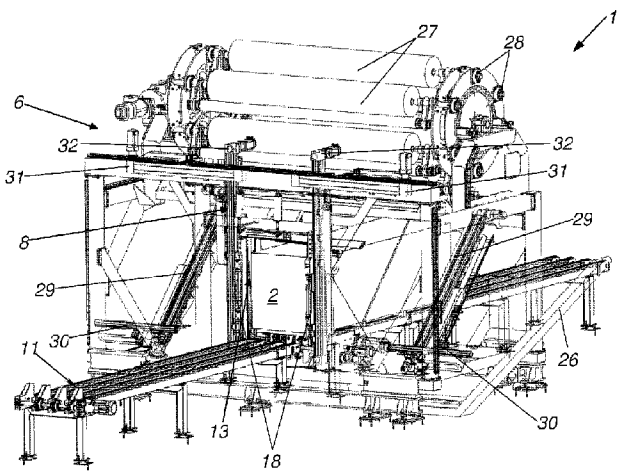
(54) Titre : DISPOSITIF D'EMBALLAGE DANS UNE FEUILLE
(54) Title: FILM-WRAPPING APPARATUS



(57) Abrégé/Abstract:
For a film-wrapping apparatus (1) for the automatic film-wrapping of articles (2), comprising a conveying device (3) for conveying an article (2) through a film-wrapping channel (4) of the film-wrapping apparatus (1), wherein, for the purpose of supplying film material (5) for the film-wrapping of the article (2), the film-wrapping apparatus (1) has a film-supply device (6) which - as seen in the operating position - is arranged above the film-wrapping channel (4), the film-wrapping apparatus (1) also comprising at least two movably arranged grippers (7) and a sealing device (8), according to the invention, the at least two grippers (7) are predefinably movably arranged between a supply position (9) and a sealing position (10), the grippers (7) being designed so that, in the supply position (9), they grip two opposite corners of the film material (5) supplied by the film-supply device (6) and pull said film material from the supply position (9) into the sealing position (10) and hold the material, and, in the sealing position (10), said grippers (7) are arranged in a sealing plane (12) and substantially level with an upper side (11) of the conveying device (3); and the sealing device (8) is designed to seal the two side edges (13) of the article (2) which are arranged in the sealing plane (12) and are sheathed by film material (5).

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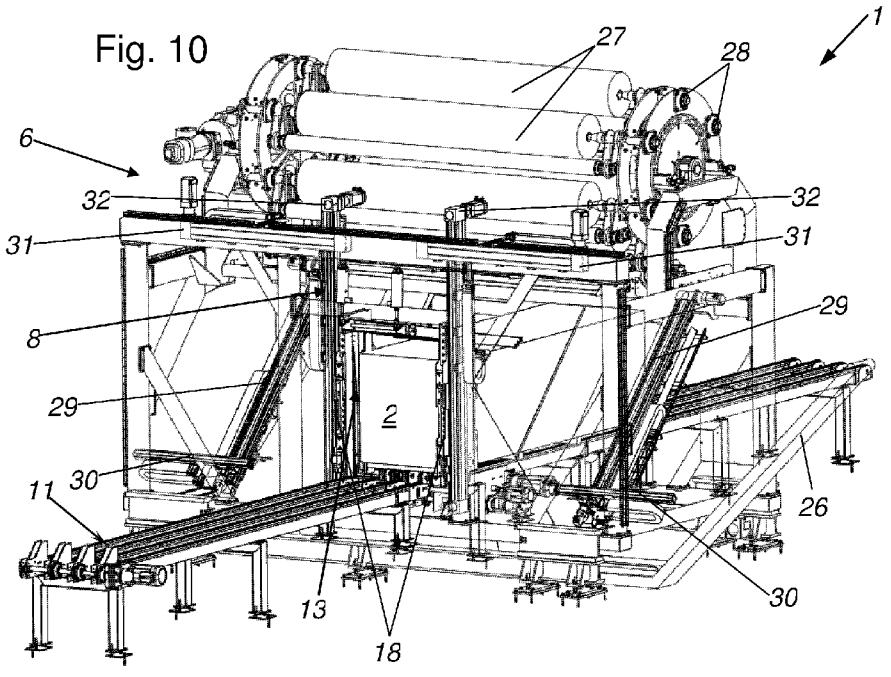
Fig. 10



(57) **Abstract:** For a film-wrapping apparatus (1) for the automatic film-wrapping of articles (2), comprising a conveying device (3) for conveying an article (2) through a film-wrapping channel (4) of the film-wrapping apparatus (1), wherein, for the purpose of supplying film material (5) for the film-wrapping of the article (2), the film-wrapping apparatus (1) has a film-supply device (6) which - as seen in the operating position - is arranged above the film-wrapping channel (4), the film-wrapping apparatus (1) also comprising at least two movably arranged grippers (7) and a sealing device (8), according to the invention, the at least two grippers (7) are predefinably movably arranged between a supply position (9) and a sealing position (10), the grippers (7) being designed so that, in the supply position (9), they grip two opposite corners of the film material (5) supplied by the film-supply device (6) and pull said film material from the supply

WO 2019/211228 A1

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WO 2019/211228 A1

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position (9) into the sealing position (10) and hold the material, and, in the sealing position (10), said grippers (7) are arranged in a sealing plane (12) and substantially level with an upper side (11) of the conveying device (3); and the sealing device (8) is designed to seal the two side edges (13) of the article (2) which are arranged in the sealing plane (12) and are sheathed by film material (5).

(57) Zusammenfassung: Bei einer Folierungsvorrichtung (1) zum automatischen Folieren von Gütern (2) umfassend eine Fördereinrichtung (3), zur Beförderung eines Guts (2) durch einen Folierungskanal (4) der Folierungsvorrichtung (1), wobei die Folierungsvorrichtung (1) zum Bereitstellen von Folie (5) zum Folieren des Guts (2) eine – in Betriebsposition betrachtet – oberhalb des Folierungskanals (4) angeordnete Folienbereitstellungseinrichtung (6) aufweist, wobei die Folierungsvorrichtung (1) weiters wenigstens zwei beweglich angeordnete Greifer (7) und eine Schweißeinrichtung (8) umfasst, wird vorgeschlagen, dass die wenigstens zwei Greifer (7) zwischen einer Bereitstellungsposition (9) und einer Schweißposition (10) vorgebbar beweglich angeordnet sind, wobei die Greifer (7) ausgebildet sind, die von der Folienbereitstellungeinrichtung (6) bereitgestellte Folie (5) in der Bereitstellungsposition (9) an zwei gegenüberliegenden Ecken zu greifen und von der Bereitstellungsposition (9) in die Schweißposition (10) zu ziehen und zu halten, wobei die Greifer (7) in der Schweißposition (10) in einer Schweißebene (12) und im Wesentlichen auf der Höhe einer Oberseite (11) der Fördereinrichtung (3) angeordnet sind, und dass die Schweißeinrichtung (8) ausgebildet ist, beide in der Schweißebene (12) angeordneten und mit Folie (5) ummantelten Seitenkanten (13) des Guts (2) zu verschweißen.

Film-wrapping apparatus

The invention relates to a film-wrapping apparatus for fully automatic film-wrapping of articles.

Film-wrapping apparatuses are used to cover or wrap articles with a film. In sawn timber production plants, for example, the articles are mainly packed manually or semi-automatically, wherein plastic or light-metal staples or nails for positioning or fixing the film are usually used as aids. Automatic film-wrapping apparatuses often use film hoods to film-wrap articles.

Usually, the film is applied to the articles to be film-wrapped and provided with a strapping or placed over the articles as a prefabricated film hood and then fixed with staples or nails or an additional strapping band. The adaptation of the film to the different dimensions of the articles is usually carried out by changing the film in a film dispenser.

The disadvantage of such film-wrapping apparatuses is that prefabricated film hoods always require the same dimensions of the articles, which is why film hoods do not allow flexibility with regard to the dimensions of the articles. In order to adapt the film to the respective dimensions of the articles, the film dispenser has to be converted in a time-consuming way. Furthermore, automatic film-wrapping apparatuses usually require a large amount of space and/or they require complicated and elaborate mechanics as well as increased processing times. Manual and semi-automatic film-wrapping processes are not only cumbersome and tedious, but due to various steps requiring the use of personnel, they are

Date Reçue/Date Received 2020-10-30

also correspondingly labor-, cost- and time-intensive.

It is therefore the object of the invention to specify a film-wrapping apparatus of the type mentioned above, with which the disadvantages mentioned can be avoided, with which a simple, space-saving and fully automatic film-wrapping of articles can be accomplished.

According to an aspect of the present invention, there is provided a film-wrapping apparatus for the automatic film-wrapping of articles, comprising a conveying device for conveying an article through a film-wrapping channel of the film-wrapping apparatus, wherein the film-wrapping apparatus has a film-supply device for supplying film for film-wrapping the article, which film-supply device is arranged above the film-wrapping channel when viewed in the operating position, wherein the film-wrapping apparatus further comprises at least two movably arranged grippers and a sealing device, wherein the at least two grippers are arranged so as to be predeterminably movable between a supply position and a sealing position, wherein the grippers are designed to grip the film supplied by the film-supply device in the supply position at two opposite corners and to pull the film from the supply position to the sealing position and hold said film, wherein the grippers in the sealing position are arranged in a sealing plane and substantially at the height of an upper side of the conveying device, and in that the sealing device is designed to seal both side edges of the article arranged in the sealing plane and sheathed by the film.

This has the advantage that the film-wrapping process is uncomplicated and is carried out in a fully automatic manner. This relieves the operating

personnel, since no human work steps are necessary for the film-wrapping of the articles and correspondingly, staff costs can be saved. Furthermore, a simple, reliable and fully continuous operation of the film-wrapping apparatus is possible. Due to the automation the efficiency of the film-wrapping apparatus is also increased. Furthermore, there is the advantage that no fixing elements such as staples or nails are needed to position and/or fix the film on the article, which enables optically appealing results of high quality. As the available space in various plants and production rooms is often very limited, another advantage of the film-wrapping apparatus is that the film-wrapping apparatus can be designed shorter than the articles to be film-wrapped. Due to its space-saving design, the film-wrapping apparatus is therefore also suitable for production rooms with limited space. The sealing of both film-wrapped side edges of the article by the sealing device in the sealing plane keeps on the one hand the processing time and on the other hand the space requirement of the film-wrapping apparatus low, as the article does not have to be turned or lifted for one or more sealing steps. As the grippers only grip the film at its opposite corners and pull and hold it from the supply position to the sealing position, there is no need for a complex and space-consuming mechanism as used for example with articulated robot arms. Furthermore, a certain amount of tightening of the film takes place, thus preventing kinks and folds of the film in the article arranged in the sealing position. Another advantage of the simple design of the grippers and the sealing device is that these components require little maintenance due to their simplicity. Due to the sealing of the side edges of the article, multiple layers of the film on the article are avoided, since protruding portions of the film do not have to be turned over. Since the

respective article is precisely film-wrapped, additional positioning or fixing devices are not required.

According to another aspect of the present invention, there is provided the film-wrapping apparatus as defined herein, wherein the sealing device has at least one or two, spaced-apart sealing bars.

According to another aspect of the present invention, there is provided the film-wrapping apparatus as defined herein, wherein at least a part of one of the sealing bars is arranged to be predeterminably movable in the sealing plane.

According to another aspect of the present invention, there is provided the film-wrapping apparatus as defined herein, wherein the film-wrapping apparatus comprises air nozzles for pressing the film onto an upper side of the article.

According to another aspect of the present invention, there is provided the film-wrapping apparatus as defined herein, wherein at least one gripper is arranged on a moving device, wherein the moving device comprises at least one linear guide.

According to another aspect of the present invention, there is provided the film-wrapping apparatus as defined herein, wherein the grippers, in the operating position, are arranged to be predeterminably movable horizontally to the conveying direction.

According to another aspect of the present invention, there is provided

the film-wrapping apparatus as defined herein, wherein the film-supply device comprises at least one vertical cutting device for cutting the film

According to another aspect of the present invention, there is provided the film-wrapping apparatus as defined herein, wherein the film-wrapping apparatus has a film turret comprising a plurality of film holders and a pivotable roll-off drive.

According to another aspect of the present invention, there is provided the film-wrapping apparatus as defined herein, wherein the film-wrapping apparatus has a film disposal device.

It is therefore the further object of the invention to specify a method by which the disadvantages mentioned can be avoided, by which a simple, space-saving and fully automatic film-wrapping of articles can be achieved.

According to another aspect of the present invention, there is provided a method for operating a film-wrapping apparatus wherein an article to be film-wrapped is conveyed by means of a conveying device through a film-wrapping channel of the film-wrapping apparatus, wherein film for film-wrapping the article is provided by a film-supply device arranged above the film-wrapping channel, wherein at least two movably arranged grippers in a supply position grip the film supplied by the film-supply device at two opposite corners, wherein the grippers holding the film are moved from the supply position into a sealing position, wherein the grippers in the sealing position are arranged in a sealing plane and

substantially at the height of an upper side of the conveying device, wherein the article to be film-wrapped is moved by means of the conveying device until a first end face of the article is arranged in the sealing plane, wherein the film is folded at side edges of the first end face of the article by the grippers arranged in sealing position and holding the film, and film projections are produced, wherein the film is sealed in a first sealing step by means of a sealing device at both side edges of the article in the sealing plane.

According to another aspect of the present invention, there is provided the method as defined herein, wherein the film is folded at the first end face of the article by the movement of the article into the sealing plane.

According to another aspect of the present invention, there is provided the method as defined herein, wherein the grippers release the film after the first sealing step and the article is moved on in the conveying direction until a second end face of the article is arranged in the sealing plane, wherein the grippers grip the film at opposite edges and the grippers holding the film are moved into the sealing position, wherein the grippers arranged in the sealing position fold the film at the side edges of the second end face of the article and film projections are produced, wherein the film is sealed in a second sealing step by means of the sealing device at both side edges of the second end face of the article in the sealing plane.

According to another aspect of the present invention, there is provided the method as defined herein, wherein in the first and/or in the second sealing step the film projections are separated from the film.

Date reçue / Date received 2021-11-08

According to another aspect of the present invention, there is provided the method as defined herein, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at least 20° with the conveying device.

According to another aspect of the present invention, there is provided the method as defined herein, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at least 30° with the conveying device.

According to another aspect of the present invention, there is provided the method as defined herein, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at least 45° with the conveying device.

According to another aspect of the present invention, there is provided the method as defined herein, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at most 70° with the conveying device.

According to another aspect of the present invention, there is provided the method as defined herein, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at most 60° with the conveying device.

According to another aspect of the present invention, there is provided the method as defined herein, wherein the film pulled by the grippers

from the supply position into the sealing position encloses an angle of at most 50º with the conveying device.

According to another aspect of the present invention, there is provided the method as defined herein, wherein the distance between the grippers in the sealing position corresponds to the width of the film.

According to another aspect of the present invention, there is provided the method as defined herein, wherein the distance between the grippers in the sealing position corresponds to the sum of the lengths of the upper edge and both side edges of the article.

The advantages of the method correspond to the advantages of the apparatus.

The invention is described in more detail with reference to the enclosed drawings, in which only preferred embodiments are shown by way of example, wherein:

Fig. 1a-1e show a schematic representation of individual method steps in side view;

Fig. 2 shows a preferred embodiment of the film-wrapping apparatus in axonometric view;

Fig. 3 shows a preferred embodiment of the film-wrapping apparatus in front view;

Fig. 4 shows the section along the line A-A in Fig. 3;

Fig. 5 shows the detail B of Fig. 4 in enlarged view;

Fig. 6 shows the section along the line C-C in Fig. 3;

Fig. 7 shows a preferred embodiment of the film-wrapping apparatus in side view;

Fig. 8 shows the section along line A-A in Fig. 3 with an article disposed on

the conveyor;

Fig. 9 shows a preferred embodiment of the film-wrapping apparatus with an article disposed on the conveyor in front view;

Fig. 10 shows a preferred embodiment of the film-wrapping apparatus with an article disposed on the conveyor in axonometric view;

Fig. 11 shows another preferred embodiment of the film-wrapping apparatus in axonometric view;

Fig. 12 shows the further preferred embodiment of the film-wrapping apparatus in side view, and

Fig. 13 shows the further preferred embodiment of the film-wrapping apparatus with an article disposed on the conveyor in axonometric view.

Figs. 1a to 13 show at least parts of preferred embodiments of a film-wrapping apparatus 1 for the automatic film-wrapping of articles 2 comprising a conveying device 3, for conveying an article 2 through a film-wrapping channel 4 of the film-wrapping apparatus 1, wherein the film-wrapping apparatus 1 has a film-supply device 6 arranged above the film-wrapping channel 4 – as seen in the operating position - for supplying film 5 for film-wrapping the article 2, wherein the film-wrapping apparatus 1 further comprises at least two movably arranged grippers 7 and a sealing device 8. In Figs. 2 to 10, not all features are provided with reference numerals.

The film-wrapping apparatus 1 is used to cover or sheath articles 2 with film 5 in order to protect the articles 2 from external environmental influences. The word articles 2 refers to any kind of piece goods, but in particular to stacks of articles 2 and especially preferably to sawn timber stacks. The conveying device 3 conveys an article 2 through the film-wrapping channel 4 of film-wrapping apparatus 1 in a conveying direction 14. The speed of conveying the article 2 is adjustable. The film-wrapping channel 4 is the

Date Reçue/Date Received 2020-10-30

area where the articles 2 are film-wrapped. The film-wrapping channel 4 can also be seen as the volume which is limited by the conveying device 3 and the film-supply device 6. The film 5 can be made of a plastic such as polyethylene or a tear-resistant fabric. In the operating position, the film-supply device 6 is located above the film-wrapping channel 4, as shown in Fig. 8 by way of example. The article 2 is wrapped with the film 5, in particular on five sides. More precisely, the article 2 is wrapped with the film 5, in particular on the two side faces, on the two end faces 15, 17 and on the upper side 20. The term operating position means that the film-wrapping apparatus 1 is set up ready for operation and is not tilted at an angle, as might be the case, for example, in a transport condition during transport.

Figs. 1a-1e show a schematic exemplary representation of individual method steps, wherein an article 2 is moved through the film-wrapping channel 4 in conveying direction 14 and film-wrapped. In the sealing plane 12, a film projection 16, in particular triangular and double-layer film projection 16, is respectively sealed at the side edges of the respective two end faces 15, 17 of the article 2 by the sealing device 8, as shown by way of example in the highlighted front views of the respective end faces 15, 17 of the article 2 in Fig. 1c and Fig. 1e.

The film-wrapping apparatus 1 comprises at least two movably arranged grippers 7. The grippers 7 can have at least one, preferably more than one clamping device or tongs for gripping the film 5. At least one gripper 7 can also have a clamping bar for gripping the film. The film-supply device 6 provides the film 5 for the film-wrapping of the articles 2. The sealing device 8 seals the film 5 to the article 2. The grippers 7 grip the film 5 at opposite corners in the supply position 9. The supply position 9 can be seen in relation to the grippers 7 as the position in which the grippers 7 are spatially closest to the film-supply device 6 and in which the film-supply device 6 prepares the film 5 for the grippers 7 ready for transfer, as shown in Fig. 4 and Fig. 5 as an example. Fig. 5 also shows an example of how a gripper 7

Date reçue / Date received 2021-11-08

grips the film 5 provided by the film-supply device 6. In this case, the gripper 7 is arranged on a moving device 21.

The grippers 7 are designed to pull the film 5 from the supply position 9 to a sealing position 10. In sealing position 10, the grippers 7 are spatially the farthest away from the film-supply device 6. In sealing position 10, the grippers 7 are further arranged in the sealing plane 12 and essentially at the height of an upper side 11 of the conveying device 3, which is illustrated as an example in Fig. 8. The sealing plane 12 is the level in which the film 5 is sealed to the article 2 at, in particular, two side edges 13 of the article 2 covered with film 5. The sealing plane 12 can be regarded as an imaginary plane which is arranged parallel to the front face 13 of the article 2, in particular in a fixed position. The upper side 11 of the conveying device 3 is defined as that side of the conveying device 3 on which the article 2 is arranged in the operating condition, which can be seen as an example in Fig. 10.

It is provided that the at least two grippers 7 are arranged so as to be predeterminably movable between the supply position 9 and the sealing position 10, wherein the grippers 7 are designed to grip the film supplied by the film-supply device 6 at two opposite corners in the supply position 9 and to pull it from the supply position 9 to the sealing position 10 and hold it, wherein the grippers 7 in the sealing position 10 are arranged in a sealing plane 12 and essentially at the height of the upper side 11 of the conveying device 3, and that the sealing device 8 is designed to seal both side edges 13 of the article 2 arranged in the sealing plane 12 and covered with film 5.

For cuboid article 2, the sealing plane 12 is essentially normal to the conveying device 3 and transverse to the conveying direction 14. The grippers 7 are arranged in the sealing position 10 in the sealing plane 12 and essentially at the height of the upper side 11 of the conveying device 3 to ensure that the film 5 essentially reaches a lower edge of the article 2 during sealing.

Furthermore, a method is provided for operating a film-wrapping apparatus 1, wherein article 2 to be film-wrapped is conveyed by means of a conveying device 3 through a film-wrapping channel 4 of the film-wrapping apparatus 1, wherein film 5 for film-wrapping the article 2 is provided by a film-supply device 6 arranged above the film-wrapping channel 4, wherein at least two movably arranged grippers 7 in a supply position 9 grip the film 5 supplied by the film-supply device 6 at two opposite corners, wherein the grippers 7 holding the film 5 are moved from the supply position 9 to a sealing position 10, wherein the grippers 7 are arranged in the sealing position 10 in a sealing plane 12 and essentially at the height of an upper side 11 of the conveying device 3, wherein the article to be film-wrapped 2 is moved by means of the conveying device 3 until a first front face 14 of the article 2 is arranged in the sealing plane 12, wherein the film 5 is folded at side edges 13 of the first end face 15 of the article 2 by the grippers 7, which are arranged in sealing position 10 and hold the film, and film projections 16 are produced, wherein the film 5 is sealed in a first sealing step by means of a sealing device 8 at both side edges 13 of the article 2 in the sealing plane 12.

The conveying device 3 extends in particular over the length of the film-wrapping channel 4 and conveys the article 2 through the film-wrapping channel 4. The conveying device 3 can preferably be designed as a conveyor belt, especially preferably as a roller conveyor or as a longitudinal conveyor with telescopic conveyor and can extend over the length of the film-wrapping channel 4. The film-wrapping apparatus 1 can preferably have means for variable height adjustment of the conveying device 3, so that variable staggered timber dimensions or transport without staggered timber can be taken into account. The article 2 is moved by means of the conveying device 3 until the first front face 14 of the article 2 is located in the sealing plane 12. In the case of a cube-shaped or cuboid article 2, both side edges 13 of the first front face 14 of the article 2 are correspondingly arranged in the sealing plane 12. In particular, both side edges 13 can be sealed simultaneously in the sealing plane 12 by means of the sealing

Date reçue / Date received 2021-11-08

device 8.

This has the advantage that the entire film-wrapping process proceeds in an uncomplicated and fully automatic manner. This relieves the operating personnel, as no human work steps are required for the film-wrapping of articles 2 and correspondingly, personnel costs can be saved. Furthermore, a simple, reliable and fully continuous operation of the film-wrapping apparatus 1 is made possible. Due to the automation, the efficiency of the film-wrapping apparatus 1 is also increased. Another advantage is that no fixing elements such as staples or nails are required to position and/or fix the film 5 to the article, which results in optically appealing results of high quality. Since the available space in various plants and production rooms is often very limited, another advantage of the film-wrapping apparatus 1 is that the film-wrapping apparatus 1 can be shorter in its dimensions than the article 2 to be film-wrapped. Due to the space-saving design, the film-wrapping apparatus 1 is therefore also suitable for production rooms with limited space. By sealing both side edges 13 of the article 2 sheathed by film 5 by the sealing device 8 in the sealing plane 12, the processing time on the one hand and the space requirement of the film-wrapping apparatus 1 on the other hand are kept low, as the article and/or the sealing device 8 does not have to be turned or lifted for one or more sealing steps. As the grippers 7 only grip the film 5 at its opposite corners and pull and hold it from the supply position 9 to the sealing position 10, a complex and space-consuming mechanism, as it is used for example with articulated robot arms, can be dispensed with and a certain amount of tightening of the film 5 is also automatically achieved, thus avoiding kinks and folds of the film on the article 2 arranged in the sealing position 10. Another advantage of the simple design of the grippers 7 and the sealing device 8 is that these components require little maintenance due to their simplicity. Due to the sealing of the side edges 13 of the article 2, a multiple layer of the film 5 on the article 2 is avoided, since film projections 16 do not have to be folded over. Since the respective article 2 is precisely film-wrapped, additional positioning or fixing devices are not required.

By arranging the first front face 14 of the article 2 in the sealing plane 12 and by the grippers 7 arranged in the sealing position 10 and holding the film, the film 5 is folded at the side edges 13 of the first end face 15 of the article 2. These especially triangular-shaped film projections 16 can be sealed off during the first sealing step by means of the sealing device 8 and thus removed, which is shown by way of example in Fig. 1c.

It may be provided that the film 5 is folded at the side edges 13 of the second end face 17 of the article 2 by the movement of the second end face 17 into the sealing plane 12 and by the movement of the grippers 7 holding the film 5 into the sealing position 10, and the sealing device 8 seals off the film projections 16, in particular triangular projections 16 resulting from the folding of the film 5, thus ensuring a uniform film-wrapping of the article 2, which can be seen as an example in Fig. 1e. Preferably, the sealing device 8 seals both film projections 16 simultaneously.

It may be provided that the film-wrapping apparatus 1 comprises at least one sensor that determines the dimensions of the article 2, thus eliminating the need for manual input of the dimensions of the article 2. The dimensions of the article 2 to be film-wrapped are important information regarding the length and width of the required film 5 to film-wrap the article 2 on five sides, in particular on the upper side 20, on both side faces and on both end faces 15, 17.

In order to further reduce the space requirement of the film-wrapping apparatus 1, it can be provided that the film-supply device 6 and the grippers 7 are arranged on a common frame. The frame itself can be arranged on an alignment unit that can be moved normally to the conveying direction 14, whereby the frame can be aligned or centered with respect to the respective position of the article 2 on the conveying device 3.

It may also be provided that the film-wrapping apparatus 1 comprises at least one horizontal positioning element 31 and/or at least one vertical positioning element 32 in order to position the sealing device 8 in the

Date reçue / Date received 2021-11-08

sealing plane 12 according to the dimensions of the article 2, in particular the dimensions of the end faces 15, 17 of the article 2, which can be seen as an example in Fig. 6. The at least one horizontal positioning element 31 positions the sealing device 8 according to the width of the article 2. The at least one vertical positioning element 32 positions the sealing device 8 according to the height of the article 2. The at least one horizontal positioning element 31 and the at least one vertical positioning element 32 are shown by way of example in Fig. 10.

Preferably, it may be provided that the sealing device 8 has at least one, in particular two, mutually spaced apart sealing bars 18, which is shown as an example in Fig. 9. Thus, the sealing device 8 can simultaneously seal both side edges 13 of the first end face 15 of the article 2, which on the one hand saves processing time and on the other hand enables reliable and uniform sealing results due to the simple design.

It may be provided that the grippers 7 in sealing position 10 are arranged in a sealing plane 12 that is essentially normal to the conveying direction 14. The sealing plane 12 can also be defined essentially as the plane which is defined by the grippers 7 in sealing position 10 and the end faces 15, 17 of the article 2 when they are arranged in a line.

In particular, it may be provided that the film-wrapping apparatus 1 has a single sealing device 8 which is movably arranged in the sealing plane 12. It may also be provided that the film-wrapping apparatus 1 comprises two or more than two sealing devices 8. The advantage of having only one sealing device 8 is that the film-wrapping apparatus 1 requires only a simple control system to control the one sealing device 8.

However, it may also be provided that the at least one sealing device 8 has at least one, in particular several, movable parts for sealing the film 5, which is held in sealing position 10 by the grippers 7, on the article 2 to be film-wrapped. Thus, the sealing plane 12 can be selectively adjusted with respect to the inclination of the end face 15, 17 of the article in case of an

Date reçue / Date received 2021-11-08

article 2 which is not cuboid, for example. It may be especially preferably provided that at least one sealing bar 18 is arranged in sealing plane 12 so that it can be moved in a predetermined way.

It may also be preferably provided that the at least one, in particular at least two, sealing bars 18 are provided with a film clamp to reduce the tension in the film during the sealing process. The clamping is located in particular between the at least one sealing bar 18 and the transported articles 2.

Furthermore, it may preferably be provided that the film-wrapping apparatus 1 comprises at least one movably mounted hold-down device 19, in particular a hold-down roller, in order to press the film 5 onto an upper side 20 of the article 2, thus achieving a smoother and more even surface on the upper side 20 of the article 2. Furthermore, pressing the film down on the surface of the article 2 creates a certain tension in the film 5, which keeps the kinks and edges of the film 5 on the article 2 at a low level.

In another preferred embodiment it may be provided that the film-wrapping apparatus may comprise air nozzles 34 to press the film 5 onto the upper side 20 of the article 2 using air pressure. The other preferred embodiment is shown as an example in Figs. 11 to 13.

In particular, the air nozzles 34 can be designed as alignable air nozzles 34, whereby the respective air flow of the respective air nozzle 34 can be easily adapted to the geometric shape of the article 2 in order to effectively press the film 5 onto the upper side 20 of the article 2.

It may also preferably be provided that the air flow generated by the air nozzles 34 and/or the outlet speed of the air is/are adjustable, in particular infinitely variable.

The air nozzles 34 can preferably be arranged in the area of the sealing device 8, in particular thereon.

However, it may also be preferably provided that the film-wrapping apparatus 1 comprises at least one side holder for pressing the film 5 laterally against the article 2, thus achieving a smoother and more uniform surface of the film 5 on the side faces of the articles 2.

It may be preferably provided that at least one gripper 7 is arranged at a moving device 21. The moving device 21 can preferably comprise at least one linear guide, which runs along a longitudinal axis 29, which extends from the supply position 9 to the sealing position 10. Accordingly, it may be provided that the grippers 7 - in operating position - are arranged on the longitudinal axis 29 at an angle to the conveying direction 14 so as to be predeterminably movable by linear guides and that the grippers 7 are guided linearly between the supply position 9 and the sealing position 10.

It may also be provided that the moving device 21 has at least one transverse axis 30, which may preferably be designed as a belt axis with linear guides, as shown as an example in Fig. 10. Particularly preferably, the moving device 21 has at least one linear guide along the longitudinal axis 29 and one belt axis with linear guides along the transverse axis 30.

A linear guide is preferably arranged in each case along one longitudinal axis 29 on each side of the film-wrapping channel 4. It is particularly preferred to have one moving device 21 on each side of the film-wrapping channel 4.

Furthermore, it may be provided that the moving device 21 comprises a drive, preferably a linear motor or a toothed belt drive.

The grippers 7 are particularly designed to grip the film 5 in the supply position 9 and to hold the film 5 in the sealing position 10. A gripper 7 can have two or more clamping elements, such as clamps, which it can open and close, or it can be designed as a clamping rail or a clamping bar which can be opened and closed.

However, it may also be preferably provided that the grippers 7 are pivoted

Date Reçue/Date Received 2020-10-30

between the supply position 9 and the sealing position 10. For this purpose, the grippers 7 can be pivotably mounted.

It may be provided that the film-supply device 6 comprises at least one horizontal cutting device 25 for cutting the film 5. By cutting the film 5 horizontally, the length of the film 5 can be adapted to the length of the article 2.

Furthermore, it can be preferably provided that the film-supply device 6 comprises at least one vertical cutting device 22 for cutting the film 5. Due to the vertical cutting of the film 5, many different films 5 can be used, as they can be exactly adapted to the dimensions of the article 2. This enables the film 5 to be cut exactly to the dimensions of the article 2.

It may be particularly preferably provided that the film-wrapping apparatus 1 has a film turret 23, which comprises a plurality of film holders 28 and a pivotable roll-off drive 24. Preferably, the film turret 23 has at least four, in particular at least six, preferably six, film holders 28 for at least four, in particular at least six, preferably six, films 5, as shown in Fig. 2 and Fig. 7 as examples. Films 5, in particular film rolls 27, can thus be stored in the film holders 28 of the film turret 23, which saves space on the one hand and enables fully automatic changing between different films 5 of different materials, thicknesses or basic dimensions on the other hand. Thus, for example, films 5 of different widths can be stored in the film turret 23, which can be selected selectively for articles 2 of different dimensions, thus reducing film waste and saving costs.

It may be preferably provided that the positioning of the film 5 in the film turret 23 into a roll-off position 33 and the clamping of the film 5 from the film turret 23 to the film-supply device 6 takes place automatically by means of an inwardly pivotable roll-off drive 24. Furthermore, it may be provided that the film-wrapping apparatus 1 comprises a crane for loading the film turret 23 with films 5.

Furthermore, it may be preferably provided that the film-wrapping apparatus 1 has a film disposal device 26, which enables a fully automatic disposal of the sealed-off or cut-off excess film 16. The film disposal device 26 is preferably designed as a conveyor belt or as a movable holder and serves to automatically dispose of the excess film 16 which is sealed off or cut off in the first and/or second sealing step, as shown in Fig. 3 and in Fig. 9 as an example.

For the purpose of automation, it can be provided that the film-wrapping apparatus 1 comprises means for attaching a parcel label to the film-wrapped article 2.

It is particularly preferably provided that the film 5 is folded by the movement of the article 2 into the sealing plane 12 at the first end face 15 of the article 2. The grippers 7 hold the film 5 in the sealing position 10. When the article 2, or more precisely a first end face 15 of the article 2 is moved to the sealing position 10, the film 5 is tensioned, resulting in the particularly triangular folding of the film 5 with a double projection on the side edges 13 of the first end face 15 of the article 2.

In order to seal the film 5 at the second end face 17 of the article 2, it may be provided that the grippers 7 release the film 5 after the first sealing step and the article 2 is moved on in conveying direction 14 until a second end face 17 of the article 2 is arranged in the sealing plane 12, wherein the grippers 7 grip the film 5 in particular at the film-supply device 6 at opposite edges and the grippers 7 holding the film 5 are moved into the sealing position 10, wherein the grippers 7 arranged in sealing position 10 fold the film 5 at the side edges of the second end face 17 of the article 2 and produce film projections 16, wherein the film 5 is sealed in a second sealing step by means of the sealing device 8 at both side edges 13 of the second end face 17 of the article 2 in the sealing plane 12, as shown in the Figs. 1d and 1e as an example. The film projections 16 are usually triangular and double-layered and they are preferably sealed simultaneously by the sealing

Date reçue / Date received 2021-11-08

device 8, in particular by two sealing bars 18, which saves time.

In order to achieve an optically appealing film-wrapping, it is also preferred that in the first and/or second sealing step the film projections 16 are separated from the film 5. It may be particularly preferably provided that the gripper arms 7 transfer the film projections 16 that accumulate in the first and/or second sealing step to the film disposal device 26.

In order to tension the film 5 at the article 2 accordingly and to avoid folds, it is preferably provided that the film 5 pulled by the grippers 7 from the supply position 9 to the sealing position 10 encloses with the conveying device 3 an angle of a minimum of 20°, in particular a minimum of 30°, preferably a minimum of 45°, and a maximum of 70°, in particular a maximum of 60° and particularly preferably a maximum of 50°.

It may also be provided that the longitudinal axis 29 preferably encloses an angle of a minimum of 20° and a maximum of 90°, particularly preferably between 30° and 60°, between the conveying device 3 and the film-supply device 6, or between the sealing position 10 and the supply position 9.

In order to achieve precise dimensioning of the film and correspondingly evenly shaped right-angled triangles of the film projections 16, which can be sealed off with corresponding accuracy by the sealing device 8, it is provided that the distance of the grippers 7 in the sealing position 10 to each other corresponds to the width of the film 5, in particular the sum of the lengths of the upper edge and both side edges of the article 2.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A film-wrapping apparatus for the automatic film-wrapping of articles, comprising a conveying device for conveying an article through a film-wrapping channel of the film-wrapping apparatus, wherein the film-wrapping apparatus has a film-supply device for supplying film for film-wrapping the article, which film-supply device is arranged above the film-wrapping channel when viewed in the operating position, wherein the film-wrapping apparatus further comprises at least two movably arranged grippers and a sealing device, wherein the at least two grippers are arranged so as to be predeterminably movable between a supply position and a sealing position, wherein the grippers are designed to grip the film supplied by the film-supply device in the supply position at two opposite corners and to pull the film from the supply position to the sealing position and hold said film, wherein the grippers in the sealing position are arranged in a sealing plane and substantially at the height of an upper side of the conveying device, and in that the sealing device is designed to seal both side edges of the article arranged in the sealing plane and sheathed by the film.

2. The film-wrapping apparatus according to claim 1, wherein the sealing device has at least one or two, spaced-apart sealing bars.

3. The film-wrapping apparatus according to claim 2, wherein at least a part of one of the sealing bars is arranged to be predeterminably movable in the sealing plane.

Date reçue / Date received 2021-11-08

4. The film-wrapping apparatus according to any one of claims 1 to 3, wherein the film-wrapping apparatus comprises air nozzles for pressing the film onto an upper side of the article.

5. The film-wrapping apparatus according to any one of claims 1 to 4, wherein at least one gripper is arranged on a moving device, wherein the moving device comprises at least one linear guide.

6. The film-wrapping apparatus according to any one of claims 1 to 5, wherein the grippers, in the operating position, are arranged to be predeterminably movable horizontally to the conveying direction.

7. The film-wrapping apparatus according to any one of claims 1 to 6, wherein the film-supply device comprises at least one vertical cutting device for cutting the film.

8. The film-wrapping apparatus according to any one of claims 1 to 7, wherein the film-wrapping apparatus has a film turret comprising a plurality of film holders and a pivotable roll-off drive.

9. The film-wrapping apparatus according to any one of claims 1 to 8, wherein the film-wrapping apparatus has a film disposal device.

10. A method for operating a film-wrapping apparatus wherein an article to be film-wrapped is conveyed by means of a conveying device through a film-wrapping channel of the film-wrapping apparatus, wherein film for film-wrapping the article is provided by a film-supply device arranged above the film-wrapping channel, wherein at least two movably

Date reçue / Date received 2021-11-08

arranged grippers in a supply position grip the film supplied by the film-supply device at two opposite corners, wherein the grippers holding the film are moved from the supply position into a sealing position, wherein the grippers in the sealing position are arranged in a sealing plane and substantially at the height of an upper side of the conveying device, wherein the article to be film-wrapped is moved by means of the conveying device until a first end face of the article is arranged in the sealing plane, wherein the film is folded at side edges of the first end face of the article by the grippers arranged in the sealing position and holding the film, and film projections are produced, wherein the film is sealed in a first sealing step by means of a sealing device at both side edges of the article in the sealing plane.

11. The method according to claim 10, wherein the film is folded at the first end face of the article by the movement of the article into the sealing plane.

12. The method according to claim 10 or 11, wherein the grippers release the film after the first sealing step and the article is moved on in the conveying direction until a second end face of the article is arranged in the sealing plane, wherein the grippers grip the film at opposite edges and the grippers holding the film are moved into the sealing position, wherein the grippers arranged in the sealing position fold the film at the side edges of the second end face of the article and the film projections are produced, wherein the film is sealed in a second sealing step by means of the sealing device at both side edges of the second end face of the article in the sealing plane.

Date reçue / Date received 2021-11-08

13. The method according to any one of claims 10 to 12, wherein in at least one of the first and the second sealing step the film projections are separated from the film.

14. The method according to any one of claims 10 to 13, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at least 20° with the conveying device.

15. The method according to any one of claims 10 to 13, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at least 30° with the conveying device.

16. The method according to any one of claims 10 to 13, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at least 45° with the conveying device.

17. The method according to any one of claims 10 to 13, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at most 70° with the conveying device.

18. The method according to any one of claims 10 to 13, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at most 60° with the conveying device.

19. The method according to any one of claims 10 to 13, wherein the film pulled by the grippers from the supply position into the sealing position encloses an angle of at most 50° with the conveying device.

Date reçue / Date received 2021-11-08

20. The method according to any one of claims 10 to 19, wherein the distance between the grippers in the sealing position corresponds to the width of the film.

21. The method according to claim 20, wherein the distance between the grippers in the sealing position corresponds to the sum of the lengths of the upper edge and both side edges of the article.

Date reçue / Date received 2021-11-08

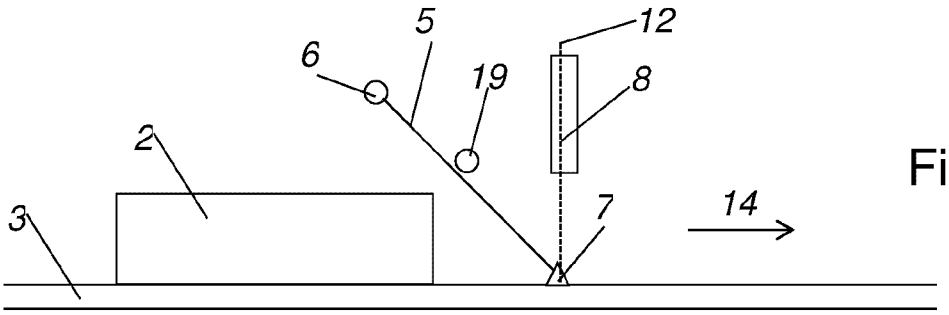

Fig. 1a

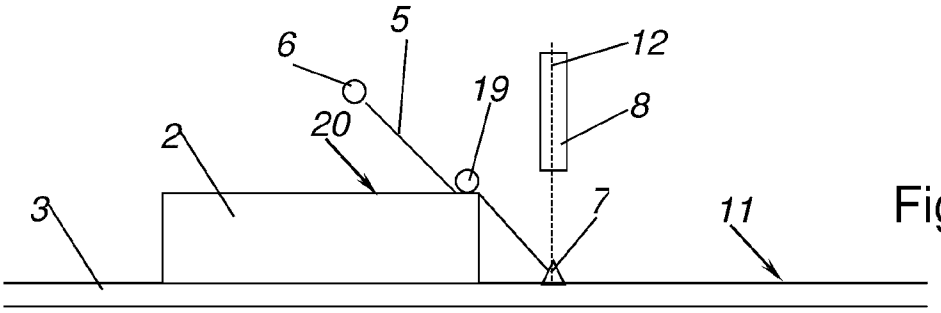

Fig. 1b

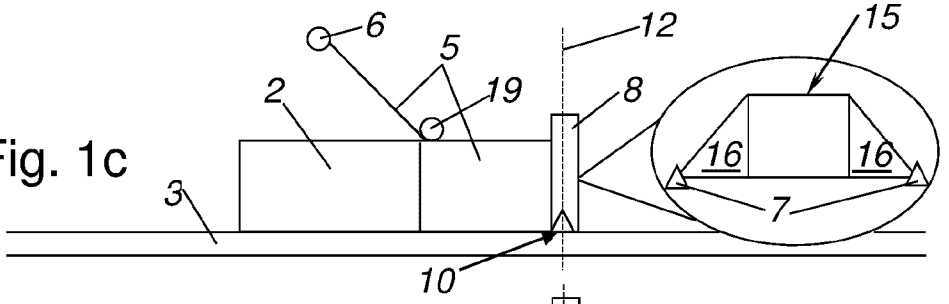

Fig. 1c

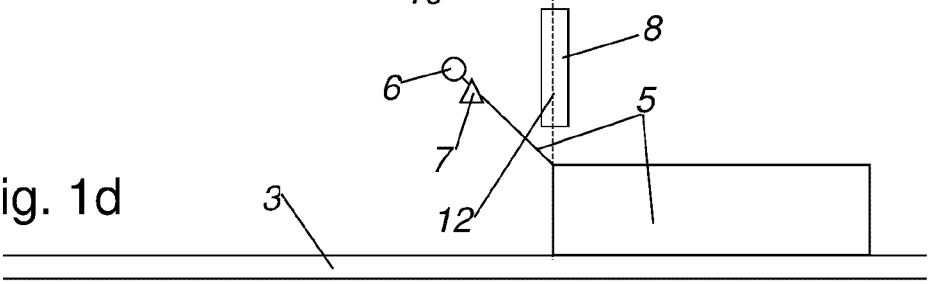

Fig. 1d

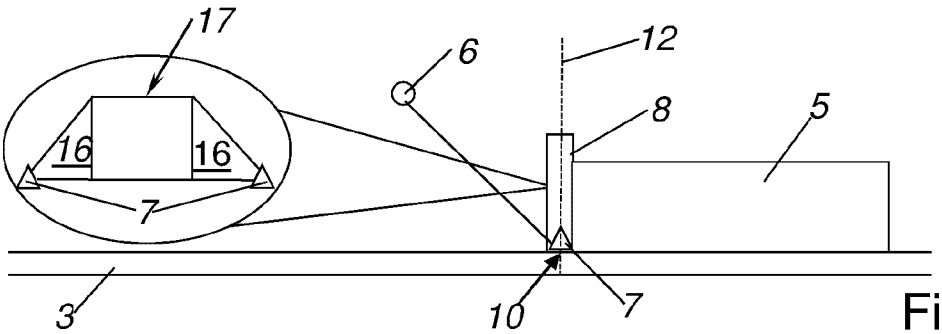

Fig. 1e

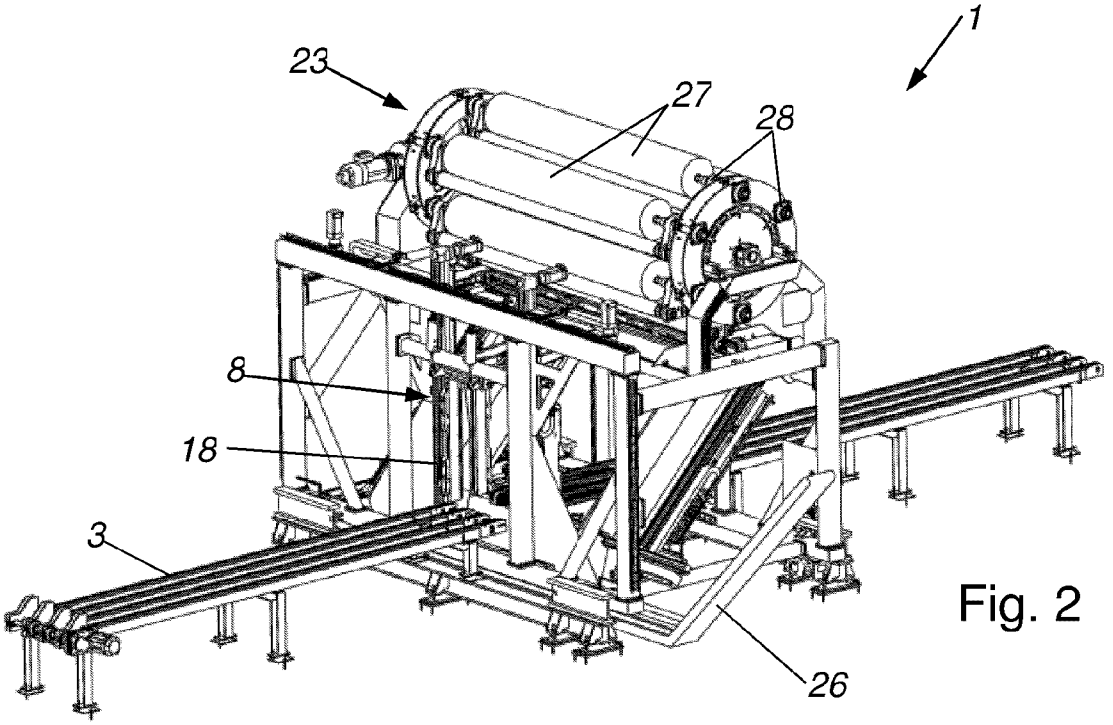

Fig. 2

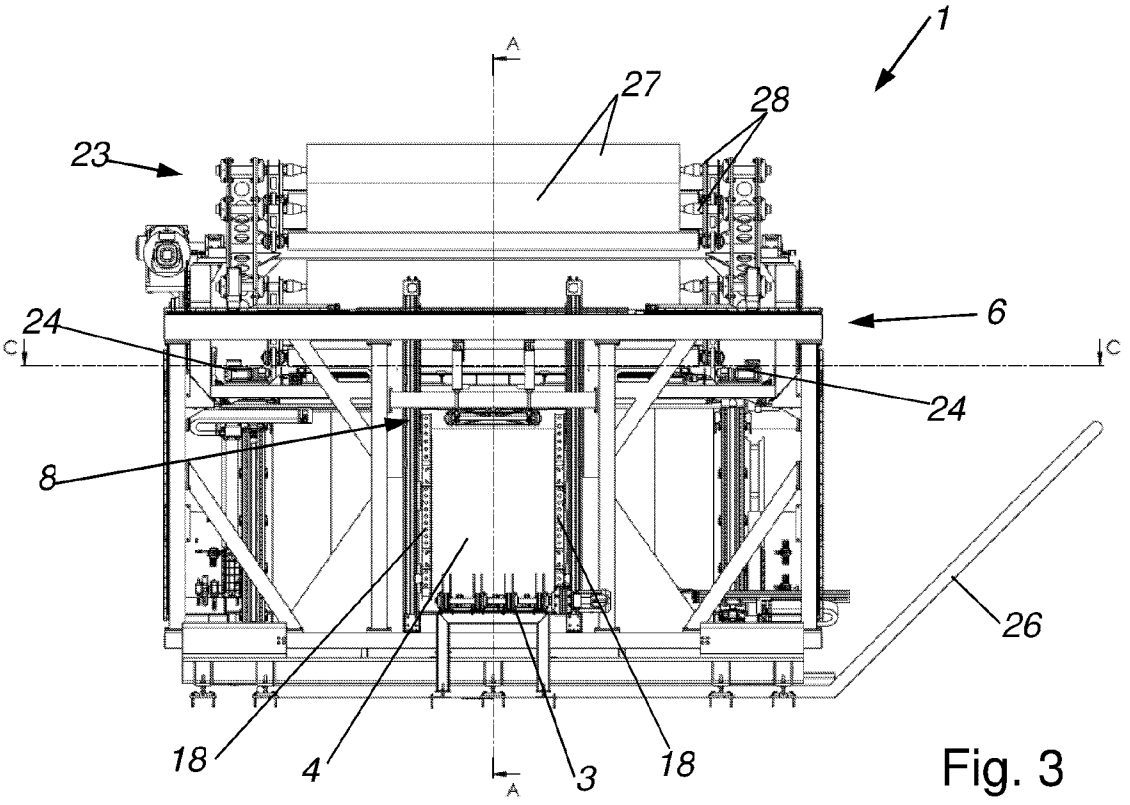

Fig. 3

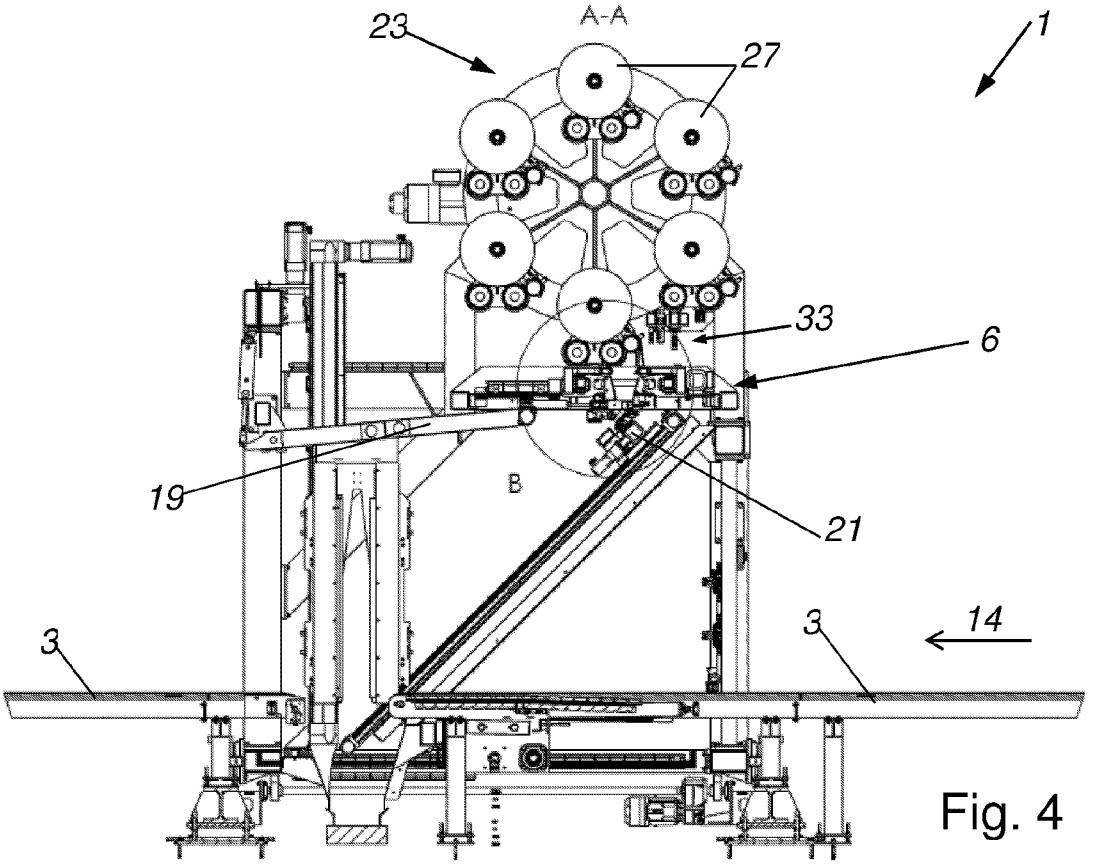

Fig. 4

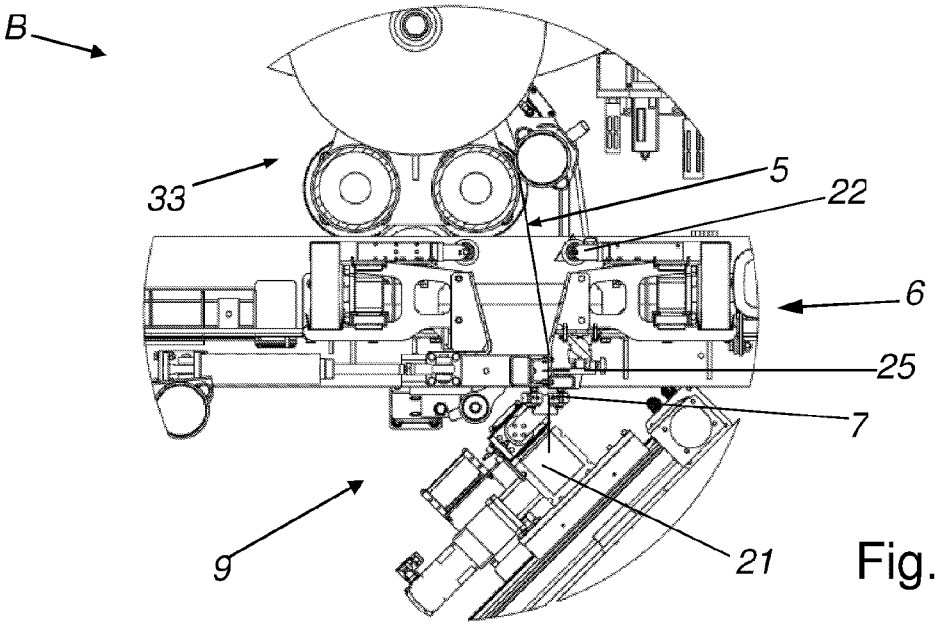

Fig. 5

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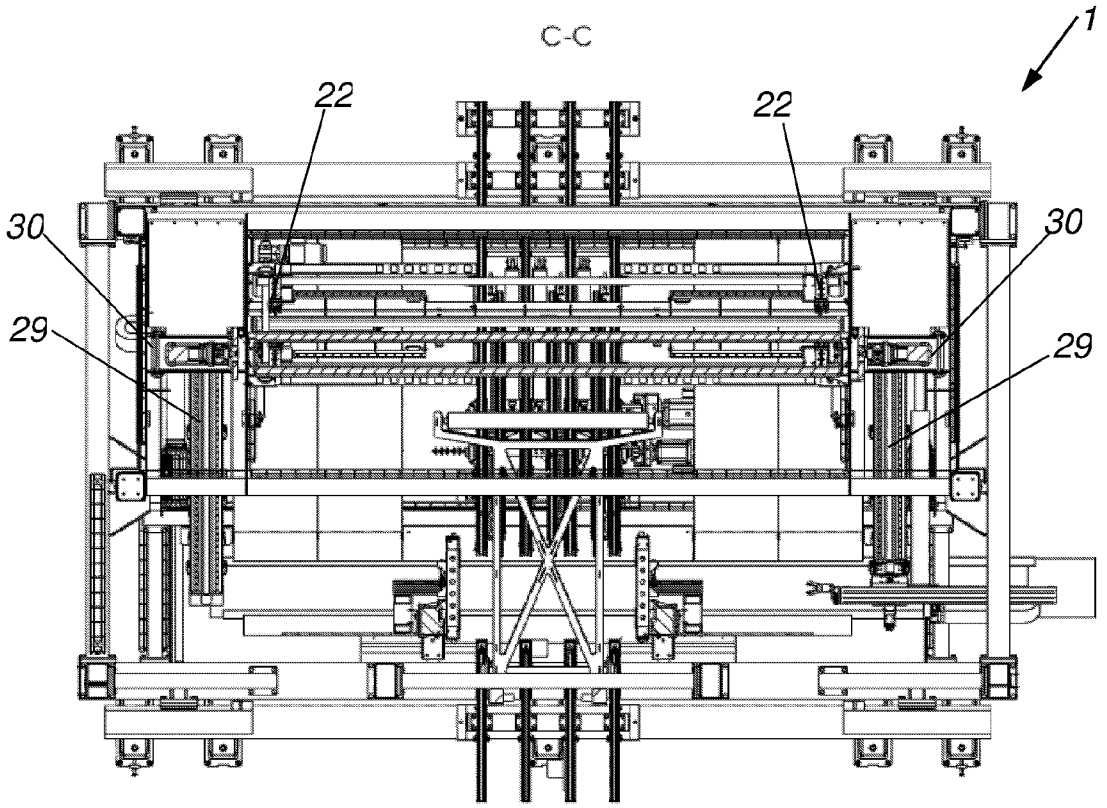


Fig. 6

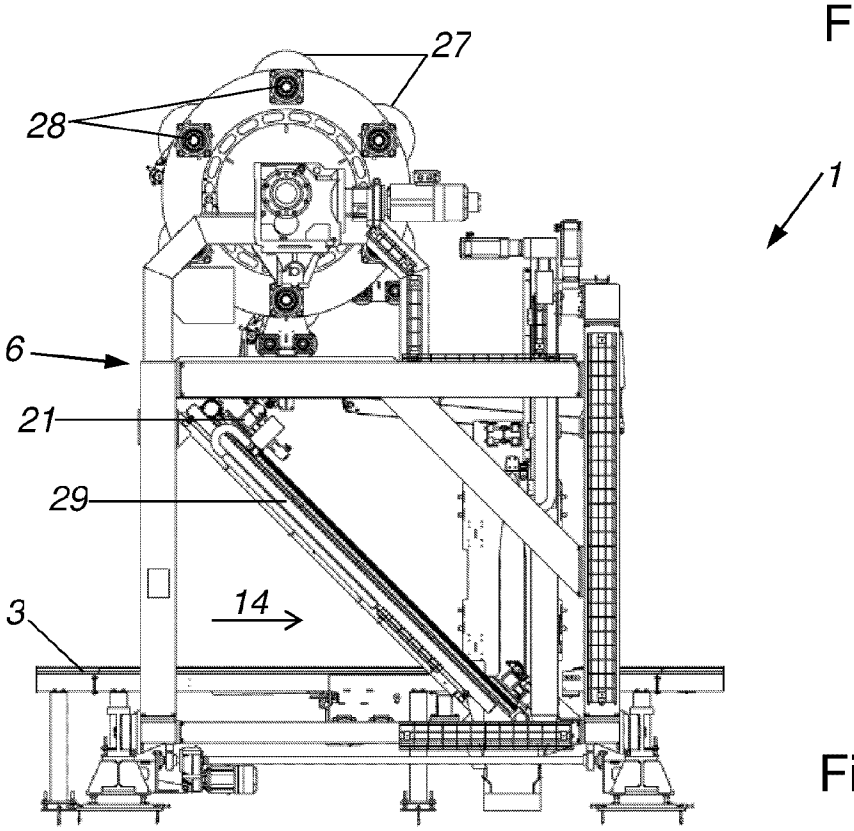


Fig. 7

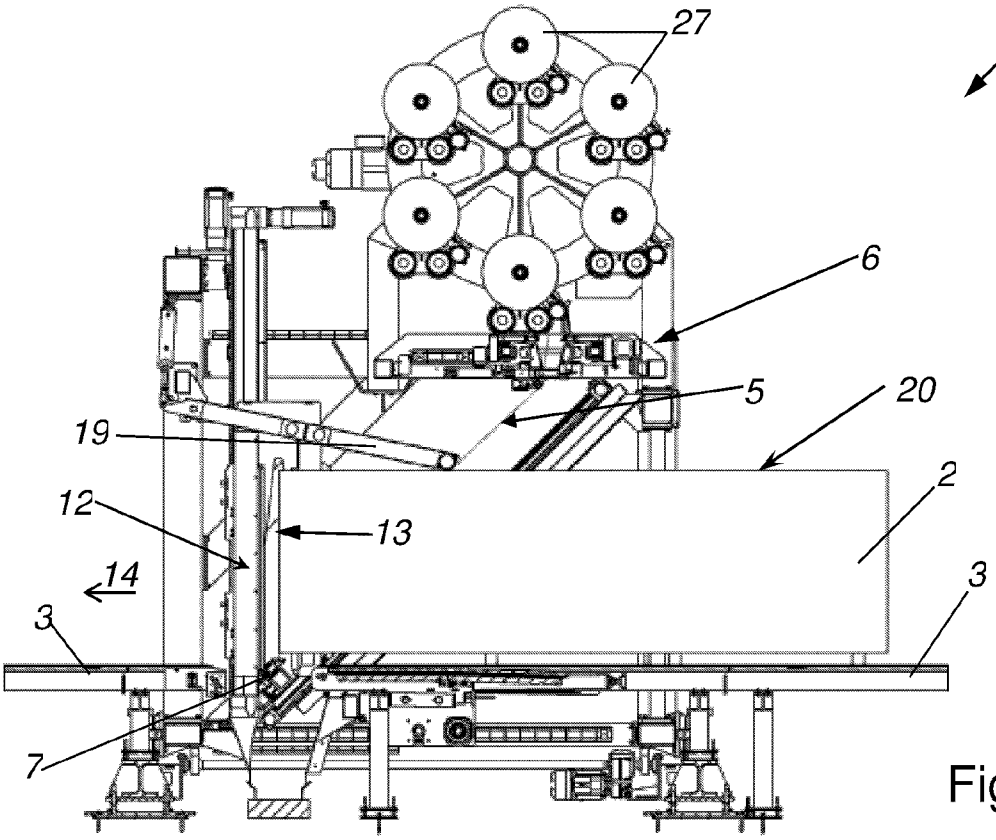


Fig. 8

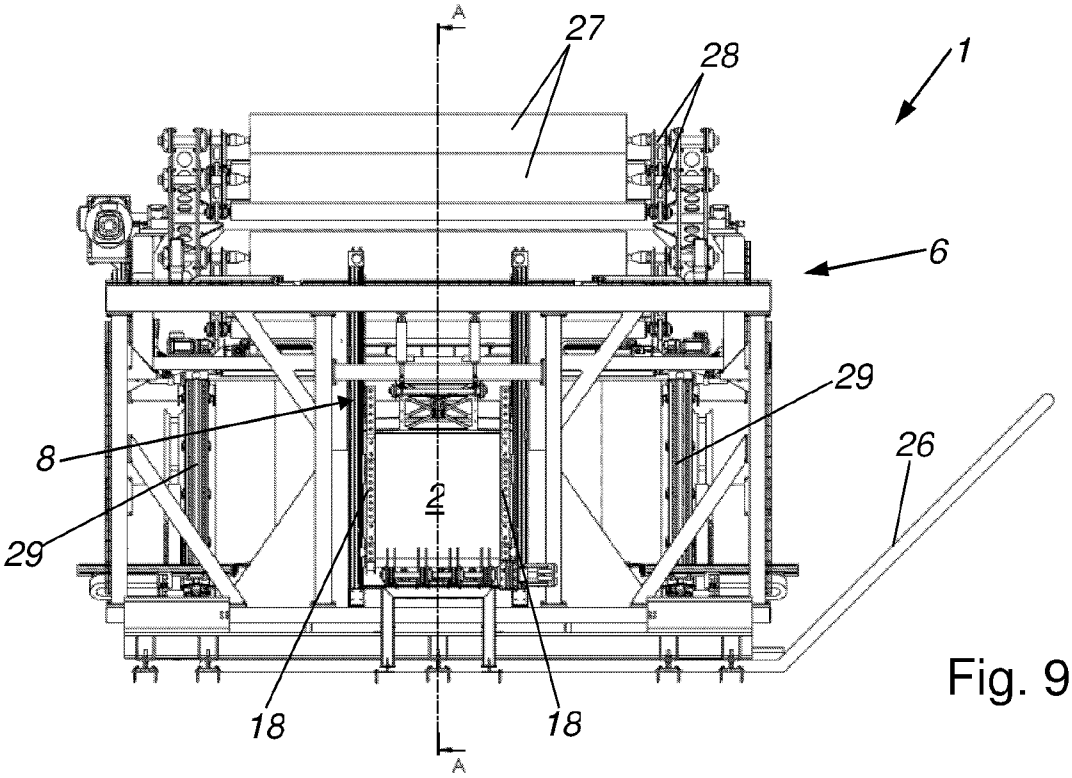
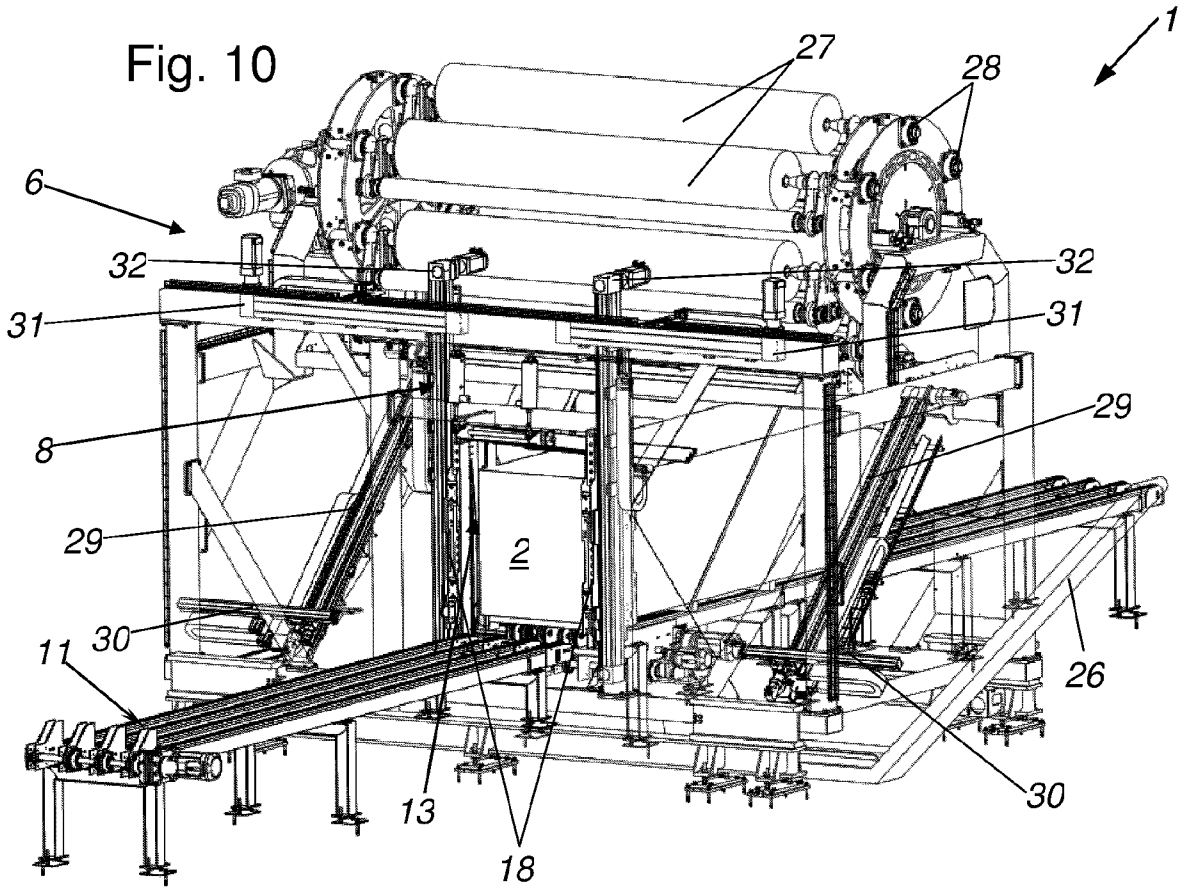


Fig. 9

Fig. 10



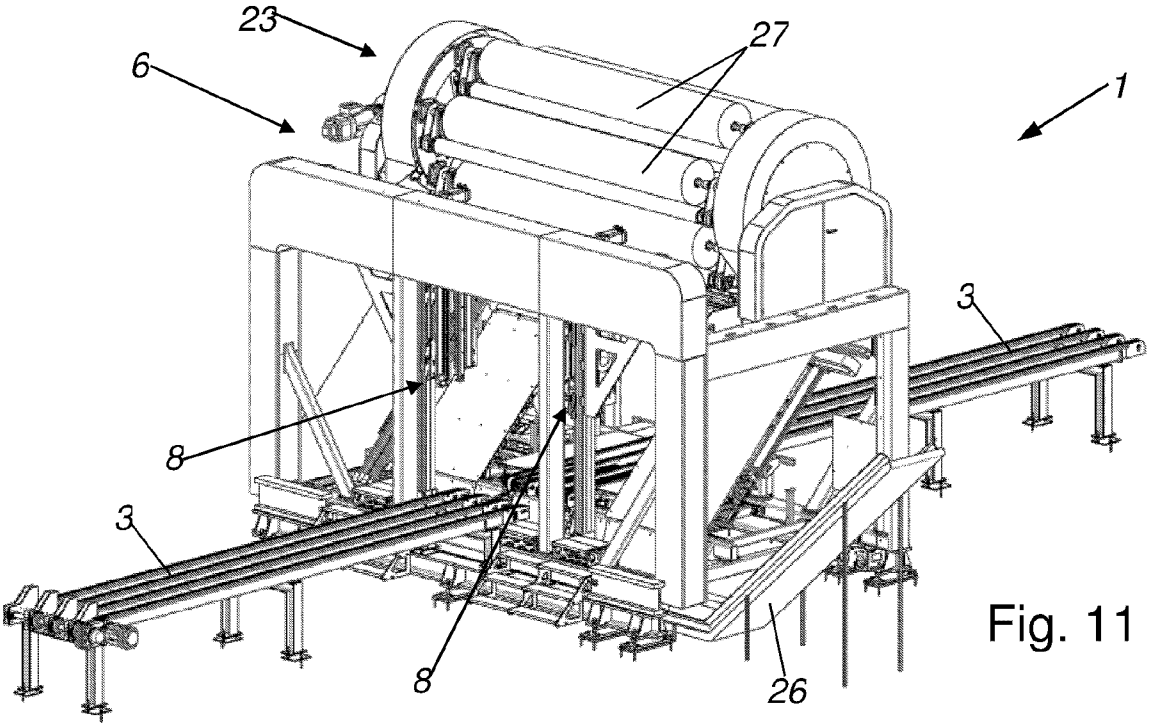


Fig. 11

Fig. 12

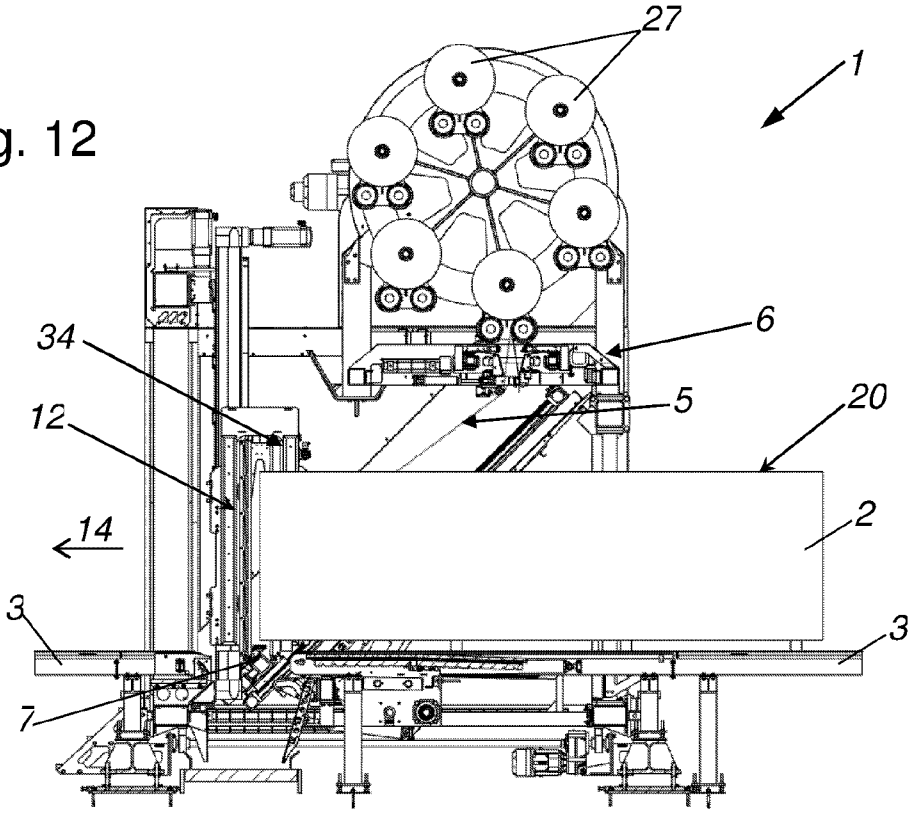
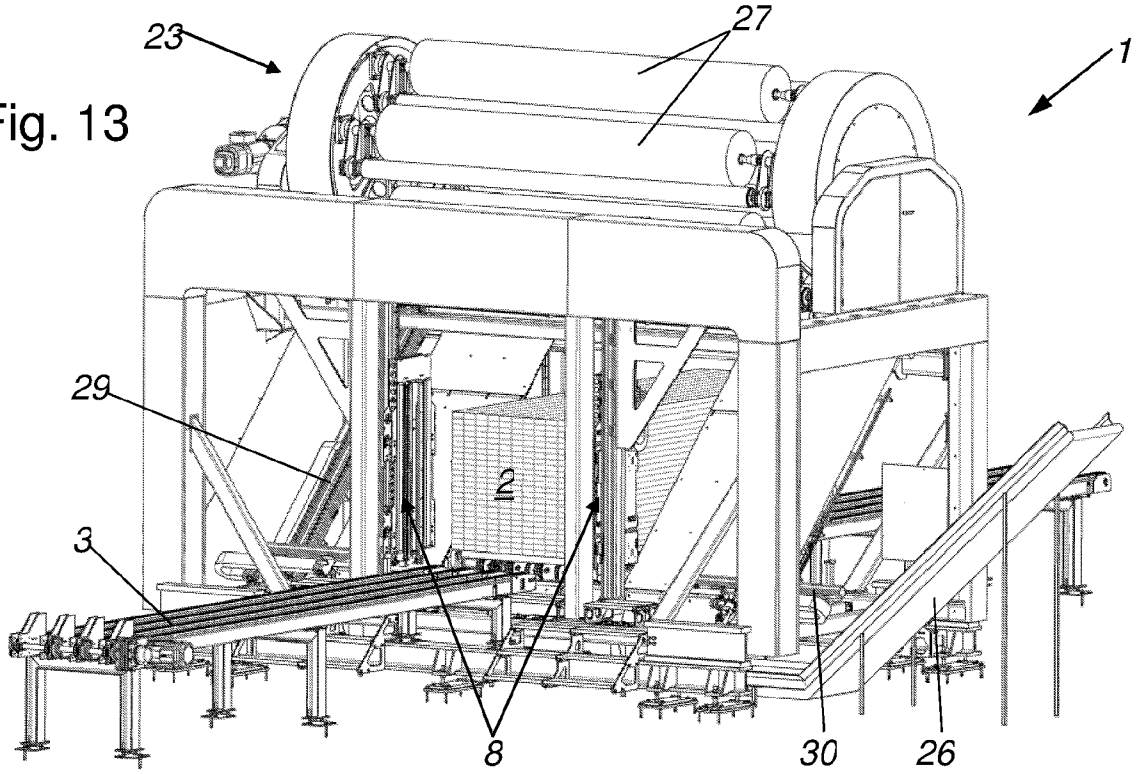
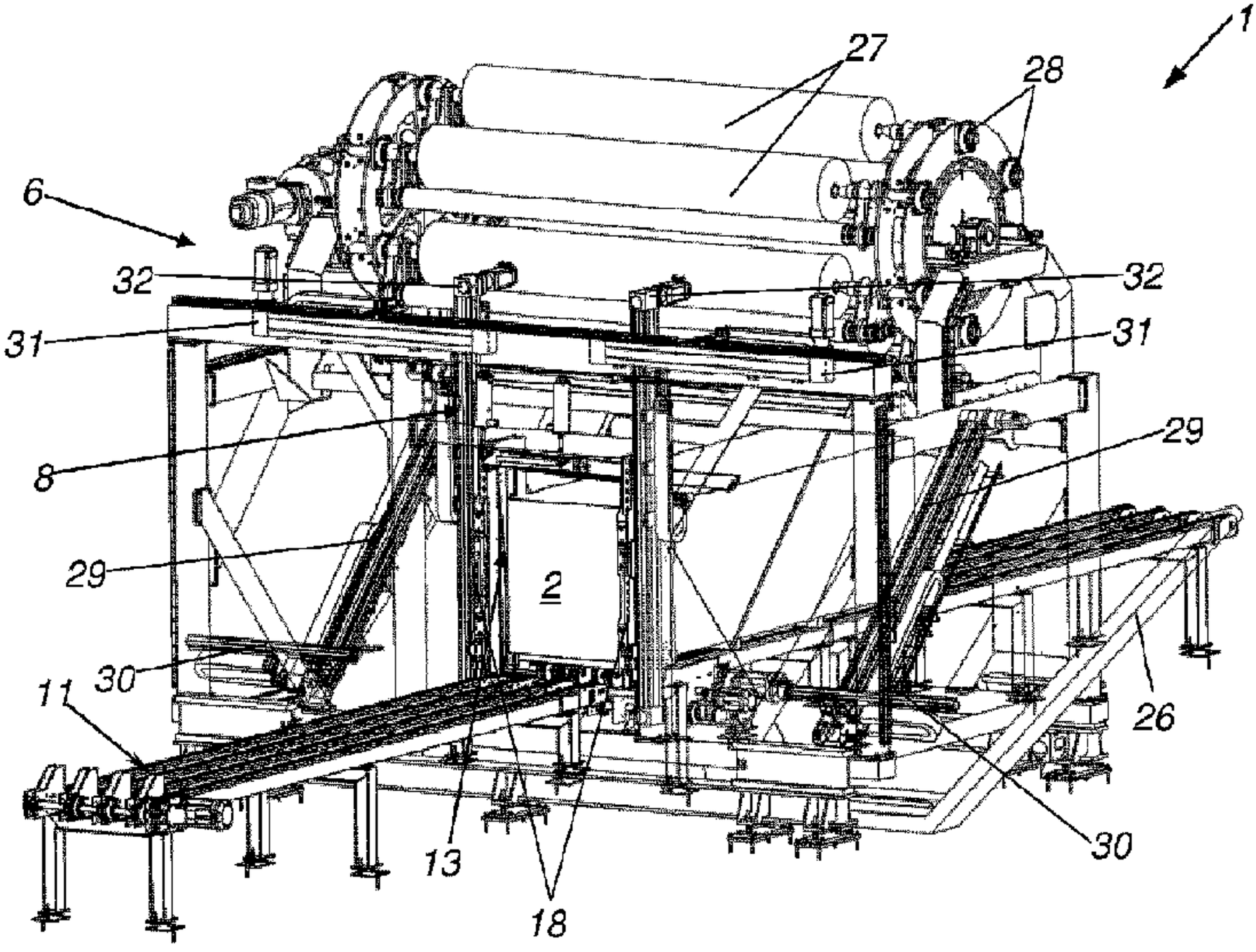


Fig. 13

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