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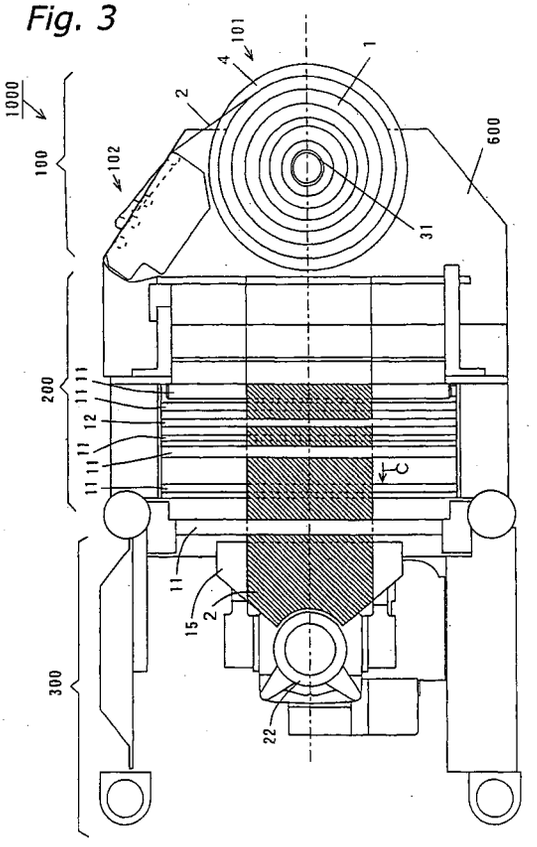
(54) BAG−MAKING AND PACKAGING MACHINE

(57) When replacing film rolls, a film holding mechanism fixedly holds a film of a pre-replacement film roll. At the same time, a film suction mechanism holds a film by suction. A film storing mechanism pulls the end of the film up to the film suction mechanism. Furthermore, the end of the film that is held by the film suction mechanism by suction and the head of the film of the post-replacement film roll are joined using an adhesive tape. Also, once it is detected based on the output from the load cell that the film has been entirely unrolled, the control device stops the operations of an items supply portion and motor. Accordingly, the items that have been supplied to a bag-manufacturing and packaging portion from the items supply portion at the time the items supply portion is stopped are packaged using film stored in a film storing mechanism. Then, the control device stops the operation of the bag-manufacturing and packaging portion.

Fig. 3



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Description

Field of the Invention

[0001] The present invention relates to a film pulling device and a bag-manufacturing and packaging apparatus having the film pulling device.

Background Information

[0002] Conventionally, a bag-manufacturing and packaging apparatus, which fills and packages items while manufacturing bags, utilizes as packaging material a film roll, in which an elongated film is wound around a roll core.

[0003] A film is pulled out as a motor rotates a supporting shaft that supports the film roll. The film is then sent to a bag-manufacturing and packaging portion. Once the film that is wound about the roll core of the film roll is pulled out through the end, the film is severed with a knife at a film joining portion that is furnished at a position apart from the film roll by a predetermined distance. Then, the finished film roll is replaced with a new film roll. Thereafter, a predetermined length of film is pulled out from the new film roll. The end of the severed film left in a film joining portion and the head of the film pulled out of the new film roll are joined using an adhesive tape. Alternatively, the end of the severed film and the head of the film of the new film roll are joined by heat fusion.

[0004] In this manner, the end of the film that is left in the film joining portion and the film that is pulled out of a new film roll can be joined together and conveyed to the bag-manufacturing and packaging portion.

[0005] However, since the film joining portion and the installation position of the film roll are separated, when the film is severed at the film joining portion, the portion of the film in between the roll core and the film joining portion is discarded.

[0006] The length of the unused portion of the film varies depending on the size of bags. Normally, such an unused portion is about the size of three to five bags. The accumulated amount of such unused portions represents a large amount of waste. Furthermore, since such unused portions are discarded, they also cause an increase in the amount of trash, which must be disposed.

[0007] Furthermore, when the film that is rolled in a film roll is entirely unrolled, it is necessary to stop the operation of the bag-manufacturing and packaging apparatus. In that case, even when releasing items from the items supplying portion is stopped at the same time, items that have been released reach the bag-manufacturing and packaging portion only after a predetermined period of time passes. Therefore, when they reach the bag-manufacturing and packaging portion, the bag-manufacturing and packaging apparatus has already stopped, and accordingly, these items cannot be packaged. As a result, such packages are wasted.

Disclosure of the Invention

[0008] A purpose of the present invention is to provide a bag-manufacturing and packaging apparatus that allows film rolled in a film roll to be entirely unraveled without having to waste any of the film, and that allows easy replacement of film rolls and easy joining of film.

[0009] Another purpose of the present invention is to provide a bag-manufacturing and packaging apparatus that can securely package items that have been released from the items supplying portion, even when the film can no longer be unrolled from the film roll.

[0010] The bag-manufacturing apparatus in accordance with a first aspect of the invention is a bag-manufacturing apparatus that packages items while manufacturing bags from a film roll in which an elongated film is wound in a roll shape. The bag-manufacturing apparatus includes a film roll support portion that supports the film roll; a film conveyance mechanism that conveys the film sent from the film roll; and a film joining device that is disposed between the film roll support portion and the film conveyer mechanism, the film joining device being provided to, at the time of replacement of the film roll, join an end of the film conveyor mechanism side film and a head of the film of a post-replacement film roll. The film joining device has a film storing mechanism for pulling in the film that is disposed on an upstream side relative to a film joining position.

[0011] In the bag-manufacturing and packaging apparatus of the present invention, the film sent from the film roll is conveyed by the film conveyer mechanism. At the time of replacement of the film roll, after the film sent from the pre-replacement film roll is severed at a portion near the film roll, the end of the severed film is pulled toward the film storing mechanism. In this manner, the severed end of the film can be guided onto the film joining device. Therefore, the end of the film conveyance mechanism side film roll and the head of the film of the post-replacement film roll can be joined at the film joining device.

[0012] Accordingly, it is possible to use the film of the pre-replacement film roll up to the roll core, and use the film through the end. Also, since the film that is discarded as a reject is eliminated, the amount of trash can be reduced. Accordingly, the cost of bag-manufacturing and packaging can be reduced.

[0013] The film storing mechanism can include a fixed roller that guides the conveyed film, a movable roller that changes a running distance of the conveyed film, and a moving mechanism that moves the movable roller toward and away from the fixed roller.

[0014] Accordingly, at the time of replacement of film roll, the moving mechanism moves the movable roller relative to the fixed roller, such that the severed end can be guided onto the film storing mechanism.

[0015] The film storing mechanism can have a plural-

ity of pairs of the fixed and movable rollers that are disposed alternately. In this case, the film storing mechanism can be made small. Accordingly, the film storing mechanism can be stored in a smaller space.

[0016] Furthermore, at the time of joining the films, the plurality of fixed rollers and movable rollers contact different surfaces of the film alternately. Accordingly, it is possible to minimize the change in the tensile force of the film when the operation is resumed after film replacement. It is also possible to prevent the film from becoming loose and snaking. As a result, it is possible to prevent malfunctioning from happening at the time of bag manufacturing.

[0017] The moving mechanism can include a fixed frame for supporting both ends of the fixed roller, a movable frame for supporting both ends of the movable roller, and a rotational axis supported in parallel with the fixed roller to support an end of the movable roller such that the movable roller is rotatable about the fixed frame. The movable roller moves relative to the fixed roller by allowing the movable frame to rotate about the rotational axis relative to the fixed frame.

[0018] Furthermore, by allowing the movable frame to pivot relative to the fixed frame about the rotational axis, the movable roller moves relative to the fixed roller. Accordingly, the severed end of the film can be guided onto the film storing mechanism. In this manner, the film storing mechanism can be embodied with a simple structure.

[0019] Particularly, where there is a plurality of pairs of the movable rollers and the fixed rollers, by pivoting the movable frame relative to the fixed frame about the rotational axis, it is possible to make the amount of displacement of the movable roller that is on the downstream side in the conveyance direction greater than the amount of displacement of the movable roller on the upstream side. As a result, there is smaller resistance in conveyance of the film to the downstream side, while there is greater resistance in conveyance in the reverse direction.

[0020] The film joining device further includes a film suction retaining mechanism that is disposed on an upstream side from the film storing mechanism in the film conveyance direction. The film suction retaining mechanism retains by suction the film that is severed from a pre-replacement film roll at a time of film joining.

[0021] In this manner, the end of the film can be retained by suction. Accordingly, the film on the downstream side can be stored in the film storing mechanism.

[0022] At this time, the severed end of the film can be guided onto the film joining device, such that the end of the film can be joined with the head of the post-replacement film easily without letting it loose. As a result, it is possible to reduce the amount of change in the tensile force of the film after the joining of the films.

[0023] The film joining device includes a film fixedly holding mechanism disposed on a downstream side from the film storing mechanism in the film conveyance direction. The film fixedly holding mechanism is provided to fixedly hold the film of the pre-replacement film roll at the time of joining the films.

[0024] As discussed above, according to the present invention, the film sent from the film roll is conveyed by the film conveyer mechanism. At the time of replacing the film roll, the film on the film conveyance mechanism side is severed at a portion near the film roll. Then, the severed film is stored in the film storing mechanism. Accordingly, it is possible to guide the end of the severed film onto the film joining device. Therefore, it is possible to join the end of the film conveyance mechanism side film with the head of the post-replacement film roll at the film joining device.

[0025] Accordingly, it is possible to use the film of the pre-replacement film roll up to the roll core, and use the film through the end. Also, since the film that is discarded as a reject is eliminated, the amount of trash can be reduced. Accordingly, the cost of bag-manufacturing and packaging can be reduced.

[0026] The bag-manufacturing and packaging apparatus in accordance with another aspect of the present invention is a bag-manufacturing and packaging apparatus that packages items while manufacturing bags from a film roll in which an elongated film is wound in a roll shape. The bag-manufacturing and packaging apparatus includes a bag-manufacturing and packaging portion for manufacturing bags while packaging items, an items supply portion for supplying the items to the bag-manufacturing and packaging portion, a film roll support portion for supporting the film roll, a driving device for sending out the film from the film roll that is supported by the film roll support portion, a film conveyance mechanism for conveying the film that is sent out from the film roll to the bag-manufacturing and packaging portion, a film storing mechanism for sending out film while storing the film that is conveyed by the film conveyance mechanism, a detecting device for detecting that the film of a film roll is consumed through an end, and a control portion for stopping operations of the items supply portion and the driving device in response to an output from the detecting device, and for stopping an operation of the bag-manufacturing and packaging portion after a film stored in the film storing mechanism is sent out by an amount that corresponds to a predetermined numbers of bags.

[0027] In the bag-manufacturing and packaging apparatus of the present invention, the film is sent out from the film roll to be conveyed to the bag-manufacturing and packaging portion by the film conveyer mechanism. At this time, the film is sent out while a portion of the film is stored in the film storing mechanism. Furthermore, every time the items supply portion supplies items to the bag-manufacturing and packaging portion, the bag-manufacturing and packaging portion packages the items.

[0028] Then the film of the film roll is entirely used. In response, the control portion stops the operations of the

items supply portion and the driving device.

[0029] At this point, however, a few items that are conveyed are in between the items supply portion and the bag-manufacturing and packaging portion. Accordingly, the bag-manufacturing and packaging portion packages the items that are conveyed, using the film stored in the film storing mechanism. In this manner, even when the film roll cannot send out the film, the items that are being conveyed can be packaged by the bag-manufacturing and packaging portion. Then, once the packaging is conducted for these items and the packaging is finished, the control portion stops the operation of the bag-manufacturing and packaging portion.

[0030] In this manner, it is possible to package the items that are supplied to the bag-manufacturing and packaging portion from the items supply portion even when the items supply portion is stopped, using the film stored in the film storing mechanism.

[0031] The detecting device can include a tension detecting device that detects a tensile force of the film. The control portion can stop the operations of the items supply portion and the driving device when the output from the tension detecting device exceeds a predetermined value.

[0032] With this structure, since the tensile force of the film always exceeds the predetermined value when the film of the film roll is exhausted, it is possible to stop the operations of the items supply portion and the driving device.

[0033] The control portion controls the driving device such that the tensile force of the film is constant when the output from the tension detecting device is below the predetermined value.

[0034] With this structure, the tensile force of the film can be maintained at a constant level during the normal operation based on the output from the tension detecting device.

[0035] Preferably, the length of the film stored in the film storing portion should be the length of film necessary to package the items that are already supplied to the bag-manufacturing and packaging portion from the items supply portion when the operation of the items supply portion is stopped.

[0036] Accordingly, it is possible to package securely the items that are supplied to the bag-manufacturing and packaging portion from the items supply portion when the operation of the items supply portion is stopped.

[0037] The film storing mechanism includes a fixed roller for guiding the conveyed film, a movable roller for changing a running distance of the conveyed film, and a moving mechanism that moves the movable roller close to and away from the fixed roller.

[0038] With this structure, since the movable roller moves relative to the fixed roller based on the tensile force of the film, it is possible to send film to the bag-manufacturing and packaging portion while adjusting the tensile force of the film and storing an adequate amount of film at the same time.

[0039] Also, when the items supply portion is stopped, the moving mechanism moves the movable roller relative to the fixed roller, such that the film stored in the film storing mechanism can be sent to the bag-manufacturing and packaging portion. At the time of replacement of film roll, the severed end of the film can be guided onto the film storing mechanism, which no longer has as much film stored, such that the film storing portion can store more film. In this manner, the film storing mechanism can supply the film after the items supply portion has stopped, and store film in the film storing portion when the film is replaced.

[0040] The bag-manufacturing and packaging apparatus can further include a film joining device disposed between the film roll support portion and the film conveyance mechanism, the film joining device joining, at the time of replacing the film roll, an end of the film on the film conveyance mechanisms side and a head of a post-replacement film roll. The film storing mechanism can be disposed on a downstream side from a film joining position of the film joining device.

[0041] In this case, at the time of replacement of the film roll, after the film sent from the pre-replacement film roll is severed at a portion near the film roll, the end of the severed film is pulled toward the film storing mechanism. In this manner, the severed end of the film can be guided onto the film joining device. Therefore, the end of the film conveyance mechanism side film roll and the head of the film of the post-replacement film roll can be joined at the film joining device.

[0042] Accordingly, it is possible to use the film through the end, and reduce the waste of the film. Also, since the film that is discarded as a reject is eliminated, the amount of trash can be reduced. Accordingly, the cost of bag-manufacturing and packaging can be reduced.

[0043] Furthermore, the items that are being supplied to the bag-manufacturing and packaging portion from the items supply portion when the items supply portion is stopped can be packaged using the film stored in the film storing mechanism, which is provided with the film joining device.

[0044] The film storing mechanism can include a fixed roller that guides the conveyed film, a movable roller that changes a running distance of the conveyed film, a moving mechanism that moves the movable roller toward and away from the fixed roller.

[0045] Accordingly, since the movable roller moves relative to the fixed roller based on the tensile force of the film, it is possible to send the film to the bag-manufacturing and packaging portion, while at the same time adjusting the tensile force of the film and storing an adequate amount of the film.

[0046] When the items supply portion is stopped, the moving mechanism moves the movable roller relative to the fixed roller, such that the film stored in the film storing mechanism can be sent to the bag-manufacturing and

packaging portion. Furthermore, at the time of replacing the film roll, the severed end of the film can be pulled toward the film storing mechanism. In this manner, the film storing mechanism can send out the film after the items supply portion is stopped, and stored the film at the time of film replacement.

[0047] The movable frame can have at least one movable roller. The fixed frame can have at least one fixed roller. The movable roller and the fixed roller can be disposed alternately in the film conveyance direction.

[0048] With this structure, when the items supply portion is stopped, the moving mechanism moves the movable roller relative to the fixed roller, such that the film stored in the film storing mechanism can be sent to the bag-manufacturing and packaging portion. Furthermore, at the time of replacing the film roll, the severed end of the film can be pulled toward the film storing mechanism. In this manner, the film storing mechanism can send out the film after the items supply portion is stopped, and store the film at the time of film replacement.

[0049] The moving mechanism can include a fixed frame for supporting both ends of the fixed roller, a movable frame for supporting both ends of the movable roller, and a rotational axis supported in parallel with the fixed roller for supporting an end of the movable roller such that the movable roller is rotatable about the fixed frame. The movable roller moves relative to the fixed roller by allowing the movable frame to rotate about the rotational axis relative to the fixed frame.

[0050] With this structure, when the items supply portion is stopped, the movable frame moves about the rotational axis away from and closed to the fixed frame. Accordingly, it is possible to send the film stored in the film storing mechanism to the bag-manufacturing and packaging portion. Also, at the time of replacing the film roll, the movable frame pivots about the rotational axis relative to the fixed frame. Accordingly, the severed end of the film can be pulled toward the film storing mechanism.

[0051] The film joining device can further include a film suction retaining mechanism that is disposed on an upstream side from the film storing mechanism in the film conveyance direction. The film suction retaining mechanism retains by suction the film that is severed from a pre-replacement film roll at a time of film joining.

[0052] In this case, the end of the film can be retained by suction by the film suction retaining mechanism which is disposed on the upstream side from the film storing mechanism in the film conveyance direction. At the same time, the severed end of the film can be stored in the film storing mechanism.

[0053] In this manner, it is possible to maintain the posture of the severed film and guide the end of the film onto the film joining device. Accordingly, it is possible to join easily the end of the film with the head of the post-replacement film roll without letting loose the end of the film.

[0054] The control portion can activate the film suction retaining mechanism during the film joining operation. Accordingly, it is possible to prevent securely misalignment of the films at the time of film joining.

[0055] The film joining.device includes a film fixedly holding mechanism disposed on an upstream side from the film storing mechanism in the film conveyance direction, the film fixedly holding mechanism being for fixedly holding the film of the pre-replacement film roll at the time of joining the films.

[0056] With this structure, it is possible to supply the film stored in the film storing mechanism to the bag-manufacturing portion without imposing a tensile burden on the film roll. As a result, it is possible to prevent breakage of the film due to the tensile burden imposed on the film roll.

[0057] The control portion may operate the film fixedly holding mechanism in response to the output from the detecting device. Accordingly, it is possible to prevent breakage of the film due to the tensile burden imposed on the film roll.

[0058] As discussed above, with the present invention, it is possible to package items that are being supplied to the bag-manufacturing and packaging portion from the items supply portion when the items supply portion is stopped, using the film stored in the film storing mechanism. Therefore, there is no waste of items.

Brief Description of Drawings

[0059]

Figure 1 is a schematic lateral view showing a bag-manufacturing and packaging apparatus in accordance with the first embodiment of the present invention.

Figure 2 is a schematic rear view showing the structure of the bag-manufacturing and packaging apparatus of Figure 1, viewed from the film roll portion side.

Figure 3 is a schematic plan view showing the structure of the bag-manufacturing and packaging apparatus of Figure 1, viewed from above.

Figure 4 is a schematic perspective view showing the schematic conveyance path of the film shown in Figure 1.

Figure 5 is a perspective view showing the structure of the bag-manufacturing and packaging portion of Figure 1.

Figure 6 is a schematic lateral view showing the detailed structure of the film roll portion of the bag-manufacturing and packaging apparatus of Figure 3.

Figure 7is a schematic cross-sectional view showing the first process in the replacement of film roll.

Figure 8is a schematic cross-sectional view showing the second process in the replacement of film roll.

Figure 9 is a schematic cross-sectional view showing the third process in the replacement of film roll.
Figure 10 is a schematic cross-sectional view showing the fourth process in the replacement of film roll.
Figure 11 is a schematic cross-sectional view showing the fifth process in the replacement of film roll.
Figure 12 is an enlarged view of the portion X in Figure 10.
Figure 13 is a schematic view showing the structure of the film storing mechanism in accordance with another embodiment of the present invention.
Figure 14 is a schematic view showing the structure of the film storing mechanism in accordance with still another embodiment of the present invention.
Figure 15 is a schematic view showing the structure of the film storing mechanism in accordance with still another embodiment of the present invention.
Figure 16 is a block view showing the control of the bag-manufacturing and packaging portion in accordance with the embodiment of the present invention.
Figure 17 is a flow chart showing the operation of the control device where the film stored in the dancer roller is used to package the items at the time of replacing a film roll.
Figure 18 is a flow chart showing the operation of the control device where the film stored in the dancer roller is used to package the items at the time of replacing the film roll.
Figure 19 is a schematic view of the operation of the dancer roller during normal operation and at the time of replacing film roll exchange.
Figure 20 is a flow chart of the operation of the control device where the film stored in the film storing mechanism of the film joining device is used to package the items at the time of film roll exchange.
Figure 21 is a flow chart of the operation of the control device where the film stored in the film storing mechanism of the film joining device is used to package the items at the time of the film roll exchange.
Figure 22 is a schematic cross-sectional view of the operation of the film storing mechanism of the film joining device at the time of normal operation and the film roll exchange.
Figure 23 is a schematic cross-sectional view of the operation of the film storing mechanism of the film joining device at the time of normal operation and the film roll exchange.
Figure 24 is a schematic cross-sectional view of the operation of the film storing mechanism of the film joining device during normal operation and at the time of the film roll exchange.
Figure 25 is a schematic cross-sectional view of the operation of the film storing mechanism of the film joining device during normal operation and at the time of replacing the film roll.
Figure 26 is a schematic cross-sectional view of the operation of the film storing mechanism of the film joining device during normal operation and at the time of the film roll exchange.

Detailed Description of Embodiment

[0060] Figure 1 is a schematic side view showing the structure of a bag-manufacturing and packaging apparatus in accordance with a first embodiment of the present invention. Figure 2 is a schematic rear view showing the structure the bag-manufacturing and packaging apparatus of Figure 1 viewed from the film roll portion side. Figure 3 is a schematic plan view showing the structure of the bag-manufacturing and packaging apparatus of Figure 1 viewed from above. Figure 4 is a schematic perspective view showing a conveyance path of film 2.

[0061] In Figure 1, a bag-manufacturing and packaging apparatus 1000 includes a film roll portion 100, a film conveyer portion, and a bag-manufacturing and packaging portion 300.

[0062] As shown in Figure 3, the film roll portion 100 includes a film roll support portion 101 and a film joining device 102. The film roll support portion 101 includes a support shaft 3, a disk-shaped roll stopper 4, and a motor 6.

[0063] The support shaft 3 is supported on a rear portion of the bag-manufacturing and packaging apparatus 1000 by a support mechanism 50 shown in Figure 2, such that the support shaft 3 is pivotable between directions parallel to and perpendicular to an installation surface E of the bag-manufacturing and packaging apparatus 1000. The roll stopper 4 is fixed to an end portion of the support shaft 3 that is closer to the support mechanism 50 such that the roll stopper 4 is perpendicular to the support shaft 3.

[0064] The support shaft 3 is rotationally driven by the motor 6 via a timing belt (not shown in Figures). The support mechanism 50 includes stoppers (not shown in Figures) that support the support shaft 3 in the parallel and perpendicular directions as described above.

[0065] To attach a film roll 1, the support shaft 3 needs to be inserted into the roll core 31 of the film roll 1 while the support shaft 3 is positioned parallel to the installation surface E of the bag-manufacturing and packaging apparatus 1000. The film roll 1 needs to be pushed in until an end surface of the film roll 1 touches the roll stopper 4. Then, by a locking operation, stoppers 5 are made to protrude from the peripheral surface of the shaft 3, such that the roll core 31 of the film roll engages these stoppers 5. In this manner, the film roll 1 is fixed to the support shaft 3.

[0066] Then, the support shaft 3 is rotated in a direction of an arrow A. The support shaft 3 and the film roll 1 are fixated in a position where the support shaft 3 is perpendicular to the installation surface E of the bag-manufacturing and packaging apparatus 1000. At this time, the roll stopper 4 is parallel to the installation sur-

face E, and the film roll 1 is supported by the roll stopper 4.

[0067] During the bag-manufacturing packaging operation, the film 2 is pulled out of the film roll 1 as the motor 6 rotates the support shaft 3 and the roll stopper 4.

[0068] The film 2 pulled out of the film roll support portion 101 is conveyed to the film conveyer portion through the film joining device 102 shown in Figure 3.

[0069] As seen in Figures 2 and 3, the film conveyer portion includes a first guide roller 7, a second guide roller 8, a turn bar 9, a turn bar up-down mechanism 10, a plurality of roll bars 11, and a dancer roller 12. The first guide roller 7 and the second guide roller 8 are disposed vertically, while the plurality of roll bars 11 and the dancer roller 12 are disposed horizontally. The turn bar 9 is disposed so as to intersect with the first guide roller 7 and the guide roll 8 at a 45° angle.

[0070] When the film 2 passes through the bag-manufacturing and packaging portion 300, which will be described later, the inner surface of the film 2 has to face upward, since the film 2 is formed into a tubular shape to fill items therein. Therefore, the film 2, which is wound with its outer surface outside, needs to be conveyed through the bag-manufacturing and packaging apparatus with its inner surface facing upward.

[0071] This reversing of the film is effected by letting the film through the first and second guide rolls 7 and 8, and the turn bar 9.

[0072] As seen in Figure 4, the film 2, after passing the first guide roller 7, is bent at the second guide roller 8. Thus, the direction of conveyance of the film 2 is turned by 180°, leading the film 2 to the turn bar 9. The film 2 is further bent at the turn bar 9. This turns the conveyance direction of the film 2 by 90°, and flips the film 2 upside down. In this way, the film 2 is conveyed upward with its width direction being horizontal. Thereafter, as shown in Figure 3, the film 2 is conveyed into the bag-manufacturing and packaging portion 300 with its inner surface upward.

[0073] The turn bar 9 is shiftable up and down by the turn bar up-down mechanism 10 shown in Figure 2, as seen in an arrow B. By shifting the turn bar 9 up and down, it is possible to adjust the width direction position of the film 2. For example, when the width of the film 2 changes, the film 2 that is conveyed into the bag-manufacturing and packaging portion 300 needs to be conveyed with the width-direction center portion being aligned with the center portion of a hopper 22. The hopper 22 will be described later. In the bag-manufacturing and packaging apparatus 1000, since the height direction position of the lower end surface of the film roll 1 from which the film 2 is conveyed is fixated, the film 2 is centered by moving the turn bar 9 upward or downward.

[0074] The dancer roller 12 shown in Figures 1 and 3 detects the tension of the film 2 in the following manner. The film 2 is always conveyed at a controlled speed by a pull down belt 19 of the bag-manufacturing and packaging portion 300, which will be described below.

[0075] When the tension of the film 2 fluctuates, the position of the dancer roller 12, which is urged downward, shifts upward and downward from a reference position. The dancer roller 12 is coupled to a load cell, which is fixed to the frame of the film conveyer portion 200 via a tension spring. This load cell detects the displacement of the dancer roller 12 from the reference position, in other words the tension of the film 2, based on the tensile force of the spring. The above-described motor 6, which unrolls the film 2, is controlled based on the detected tensile force. In other words, when the tensile force is large, the rotational speed of the motor 6 increases. When the tensile force is small, the rotational speed of the motor 6 decreases. In this manner, a feed back control is performed to keep the dancer roller 12 at the reference position.

[0076] The film 2 that passed through the dancer roller 12 is guided horizontally by a plurality of roll bars 11 that extends horizontally. As shown in Figure 3, the film 2 is conveyed in the direction of arrow C on the upper portion of the bag-manufacturing and packaging apparatus 1000 up to the bag-manufacturing and packaging portion 300, with the inner surface (the surface that will be an inner side of the bag) up.

[0077] Figure 5 is a perspective view showing the detailed structure of the bag-manufacturing and packaging portion shown in Figure 1.

[0078] In Figure 5, the bag-manufacturing and packaging portion 300 includes a former 15, a tube 16, a longitudinal sealing mechanism 18, a pair of pull down belts 19, a lateral sealing mechanism 20, and a hopper 22. In the bag-manufacturing and packaging portion 300, the film 2 is formed into a tubular shape by passing through a gap 'between the former 15 and the tube 16. The tubularly-shaped film 2 is by the pull down belts 19conveyed between the tube 16 and the pair of pull down belts 19, while keeping the tubular shape. In the mean time, overlapping side edges 17 of the film 2 are sealed longitudinally by the longitudinal sealing mechanism 18.

[0079] Furthermore, items that are supplied to the hopper 22 from an items supply portion above (not shown in Figures) pass through the inner side of the tube 16, and are inserted into the film 2 that is shaped in the tubular form. The film 2 with the items filled therein is sealed and severed laterally by the lateral sealing mechanism 20. A bag 21 with items filled therein is thus manufactured.

[0080] Figure 6 is a lateral view showing a detailed structure of the film pulling device in the bag-manufacturing and packaging apparatus shown in Figure 3. Figures 7-11 are schematic cross-sectional views showing the first through fifth processes performed by the film pulling device at the time of film roll replacement. Figure 12 is an enlarged view of portion X in Figure 10.

[0081] Further, Figures 13-14 are schematic structural views showing structures of the film storing mechanism in accordance with other embodiments of the

present invention.

[0082] As shown in Figures 6 and 7, the film joining device 102 has a film holding mechanism 60 that holds and fixates the films when films are joined, a film suction mechanism 70 that holds the film 2 by suction, and a film storing mechanism 80.

[0083] The film storing mechanism 80 includes three fixed rollers 25, two movable rollers 26, a pair of fixed frames 27, a pair of movable frames 28, a rotational axis 29, and a guide roller 30.

[0084] The three fixed rollers 25, two movable rollers 26, the rotational axis 29, and the guide roller 30 are disposed vertically, so as to be perpendicular to the direction of conveyance of the film 2. The three fixed rollers 25, two movable rollers 26, the rotational axis 29, and the guide roller 30 are also disposed so as to be parallel to each other. The pair of fixed frames 27 is disposed with a predetermined gap therebetween and in parallel with the conveyance direction of the film 2. The pair of fixed frames 27 is fixed to the main frame 600.

[0085] The pair of movable frames 28 is disposed with a predetermined gap therebetween, and in parallel with the conveyance direction of the film 2. The pair of movable frames 28 is supported by the rotational axis 29 so as to be pivotable about the rotational axis 29 relative to the pair of fixed frames 27.

[0086] Both ends of the three fixed rollers 25 and the guide roller 30 are axially supported by the pair of fixed frames 27 such that each of the three fixed rollers 25 and the guide roller 30 is rotatable. Both ends of the two movable rollers 26 are attached to the pair of movable frames 28, such that each of the movable rollers 26 is rotatable relative to the movable frames 28. Also, the two movable rollers 26 are rotationally movable about the rotational axis 29 in synchronization with the movement of the pair of movable frames 28.

[0087] The film 2 is guided by the rotational axis 29, passes through the film suction mechanism 70, and is further guided through the outer surface of the first fixed roller 25, the inner surface of the first movable roller 26, the outer surface of the second fixed roller 25, and the inner surface of the second movable roller 26. Then, the conveyance direction of the film 2 is changed by the outer surface of the third fixed roller 25. Thereafter, the film 2 is guided to the film conveyer portion.

[0088] The processes in which the film 2 is pulled out of the film roll 1 through the end, the film roll 1 is replaced, and the film 2 is joined with a new one are explained referring to Figures 7-12. In Figures 8-12, the film 2 of the old film roll 1 before the replacement is referred to as film 2a, while the film of the film roll 1 after the replacement is referred to as film 2b, in order to distinguish them from each other.

[0089] At the time of bag-manufacturing and packaging, as seen in Figure 7, the film 2 which is conveyed from the film roll 1 in the direction of an arrow Y passes through the fixed rollers 25 and the movable rollers 26 of the film storing mechanism 80 of the film joining device 102, and is conveyed to the film conveyer portion. At this time, the film holding mechanism 60 and the film suction mechanism 70 are not activated.

[0090] As shown in Figure 8, once the film 2a of the film 1 is pulled out through the end, the film 2a is fixedly held to the film joining device 102 by the film holding mechanism 60. In the mean time, the film suction mechanism 70 holds the film 2a by suction. Furthermore, the film 2a is severed at the end as shown in an arrow D. In this manner, the film 2a and the roll core 31 of the film roll 1 are severed.

[0091] Next, as seen in Figure 9, the pair of movable frames 28, along with the movable rollers 26, is pivoted in the direction of an arrow F relative to the pair of fixed frames 27 of the film storing mechanism 80. In this way, the two movable rollers 26 are separated from the three fixed rollers 25. At this time, the film 2a is fixedly held by the film holding mechanism 60. Therefore, as the two movable rollers 26 move, a portion of the film 2a that has not entered the film holding mechanism 60 is pulled in the film joining device 102. Accordingly, the severed end of the film 2a is guided toward the film suction mechanism 70.

[0092] In this case, since the film holding mechanism 60 fixedly holds the film 2a, the film 2a will not be conveyed in the conveyance direction of the film 2a toward the film conveyer portion. Therefore, when the conveyance of the film 2a is resumed, the film 2a can be conveyed smoothly.

[0093] Also, since the suction mechanism 70 holds the whole width of the film 2a by suction, the meandering of the film can be prevented when the film storing mechanism 80 pulls the film 2a. Instead, the film can be pulled in while maintaining the tension of the film. Therefore, it is possible to prevent the end of the film 2a from getting jammed inside the film storing mechanism 80.

[0094] Subsequently, the support shaft 3 shown in Figure 1 is pivoted into the direction parallel to the installation surface E of the bag-manufacturing and packaging apparatus 1000. The stoppers 5 that engage the roll core 31 of the film roll 1 are disengaged. Then, the roll core 31 is taken out of the support shaft 3.

[0095] Furthermore, the new film roll 1 is coupled to the support shaft 3. The roll core 31 of the new film roll 1 is engaged with the stoppers 5, thereby engaging the roll core 31 with the support shaft 3. The support shaft 3 is pivoted into and fixated at the direction perpendicular to the installation surface E of the bag-manufacturing and packaging apparatus 1000.

[0096] As shown in Figures 10 and 12, after the new film roll 1 is put in the upright position, the head of the film 2b which is wound about the new film roll 1 is pulled out until the head reaches the film suction mechanism 70. The head of the film 2b is overlapped with the end of the film 2a that is held by suction by the film suction mechanism 70. The head of the film 2b and the end of the film 2a are joined by an adhesive tape 24 as shown in Figure 12. Thereafter, as shown in Figure 11, the film

holding mechanism 60 and the film suction mechanism 70 are inactivated.

[0097] After the film 2a and film 2b are thus joined, the support shaft 3 and the roll stopper 4 are again rotated by the motor 6. The film is pulled out in the direction of the arrow Y. In this way, the bag-manufacturing packaging is resumed. At this time, the film 2b that is joined with the film 2a is conveyed. The pair of movable frames 28 along with the movable rollers 26 is moved in the direction of an arrow G due to the tension of the film 2b, which is pulled by the film 2a.

[0098] As described above, the end of the film 2a can be pulled up to the film suction mechanism 70 at the time of replacement of film roll 1, while the film 2a of the pre-replacement film roll 1 is fixedly held by the film holding mechanism 60 and by the film suction mechanism 70 by suction.

[0099] In this manner, the end of the film 2a held by the film suction mechanism 70 by suction and the head of the film 2b of the post-replacement film roll 1 can be joined easily by the adhesive tape 24.

[0100] Consequently, the film 2a of the pre-replacement film 1 can be used through the end. Therefore, the waste of films can be prevented. Also, since there will be no film that is discarded as a reject, the amount of trash can be reduced.

[0101] Furthermore, since the end of the film 2a and the head of the film 2b can be joined while the film 2a is fixedly held by the film holding mechanism 60 and the film suction mechanism 70, the film 2a and the film 2b can be joined easily and securely without causing loosening of the films.

[0102] In the present embodiment, the films 2 are joined by using the adhesive tape 24. However, the films 2 can also be joined by heat fusion. For instance, the film suction mechanism 70 applies heat fusion, instead of the adhesive tape 24, in the width direction at the overlapping portion of the film 2a and the film 2b.

[0103] In the present embodiment, the film is pulled in by moving the two movable rollers 26 relative to the three fixed rollers 25 in the direction of the arrow H. Alternatively, the film can be pulled in by moving one movable roller 26 relative to two fixed rollers 25, as shown in Figure 13.

[0104] Nonetheless, when two movable rollers 26 are moved relative to three fixed rollers 26, as in the present invention, more film can be pulled in with a small amount of movement of each of the two movable rollers 26. Therefore, it is more preferable to have a plurality of fixed rollers 25 and movable rollers 26, and move the plurality of movable rollers 26 relative to the plurality of fixed rollers 25.

[0105] Furthermore, as shown in Figure 14, it is possible to place a suction mechanism in between the two fixed rollers 25 that guide the film, such that the film can be pulled in when the suction mechanism sucks the film in the direction of an arrow I.

[0106] Still furthermore, the film 2 that passes through the three fixed rollers 25 and the two movable rollers 26 as shown in Figure 15 (a) can be pulled in by shifting the two film rollers 26 in parallel in the direction of an arrow J, as shown in Figure 15(b).

[0107] The embodiments described above pertain to cases that utilize a longitudinal pillow packaging apparatus, in which a film is moved vertically while bags are manufactured. The present invention can be similarly applied to a latitudinal pillow packaging apparatus, in which the film is moved horizontally while bags are manufactured.

[0108] In the bag-manufacturing and packaging apparatus 1000 of the present embodiment, when the film is entirely unrolled, as shown in Figure 8, the film 2 can no longer be unrolled. Therefore, it is necessary to stop the entire apparatus. However, even when the operation of supplying items from the items supply portion to the bag-manufacturing and packaging portion 300 is stopped, several items 23 (see Figure 5) have already been released from the items supply portion at that point. Unless these items 23 that are falling can be packaged, these items will have to be collected as unpackaged items.

[0109] In view of this, the bag-manufacturing and packaging apparatus 1000 of the present embodiment uses a method of packaging with a film stored in the dancer roller 12 shown in Figure 1, and a method of packaging with a film stored in the film storing mechanism 80 of the film joining device 102, such that the falling items can be packaged even after the items supply portion is stopped.

[0110] Below, the control of the bag-manufacturing and packaging apparatus 1000 of the present embodiment will be explained. Then, the control for packaging items with the film 2 stored in the dancer roller 12 at the time of exchanging the film roll 1, and the control for packaging items with the film 2 stored in the film storing mechanism 80 at the time of exchanging the film roll 1 will be explained in this order.

[0111] Figure 16 is a block view showing the control system of the bag-manufacturing and packaging apparatus 1000 in accordance with the present embodiment. In Figure 16, the items supply portion 700 is disposed above the bag-manufacturing and packaging portion 300 shown in Figure 1, and supplies a predetermined amount items 23 (Figure 5) to the bag-manufacturing and packaging portion 300. The items supply portion 700 is, for instance, an automatic weighing device that weighs a predetermined weight of items and discharges the predetermined weight of items to the bag-manufacturing and packaging portion 300.

[0112] As describe above, a load cell 210 is coupled to the dancer roller 12 shown in Figure 1 via a tensile spring 12. The load cell 210 detects the amount of displacement of the dancer roller 12 from the reference position. This amount of displacement corresponds to the tensile force of the film 2.

[0113] A control device 500 includes elements such

as a CPU (Central Processing Unit). The control device 500 controls the rotations of the motor 6 based on the output from the load cell 210, such that the tensile force of film 2 is constant. The control device 500 also controls the operations of the items supply portion 700, the bag-manufacturing and packaging portion 300, the film holding mechanism 60, and the film suction mechanism 70, as discussed below.

[0114] The operation of packaging items using the film 2 stored in the dancer roller 12 at the time of replacing film roll 1 will now be explained.

[0115] Figures 17 and 18 are flow charts showing the operation of the control device 500 where the film 2 stored in the dancer roller 12 is used to package the items at the time of replacing the film roll 1. Figure 19 is schematic views of the operations of the dancer roller 12 during normal operation and at the time of replacing film roll 1.

[0116] During normal operation (step S1), the control device 500 controls the rotations of the motor 6 based on the output of the load cell 210 as described above, such that the tension of the film 2 is constant.

[0117] As shown in Figure 19, the dancer roller 12 is urged downward by the tension spring 220. During the normal operation, as shown in Figure 19(a), the dancer roller 12 shifts upward and downward as indicated by the arrow H, according to the tensile force of the film 2. The output value of the load cell 210 changes accordingly. In this case, since the dancer roller 12 is separated from the roll bars 11 in a downward direction, the dancer roller 12 stores a portion of the film 2.

[0118] The control device 500 determines whether or not the film 2 is entirely pulled out from the film roll 1 (step S2). If the film 2 is entirely pulled out, the tensile force of the film 2 exceeds the predetermined value. Accordingly, the control device 500 determines that the film 2 has been exhausted when the output value from the load cell 210 exceeds the predetermined value.

[0119] As shown in Figure 19(b), when the film 2 is exhausted, the dancer roller 12 moves upward beyond a predetermined position P0 against the urging force of the tension spring 220 due to an increase in the tensile force of the film 2. Then, the output value from the load cell 210 exceeds the predetermined value.

[0120] When the film 2 is exhausted, the control device 500 stops the items supply portion 700 and the motor 6 (step S3). Accordingly, the supply of items from the items supply portion 700 to the bag-manufacturing and packaging portion 300 stops. At this point, some of the items 23 have already been released in the air.

[0121] The control device 500 activates the film holding mechanism 60 of the film joining device 102 (step S4). The control device 500 activates the film suction mechanism 70 of the film joining device 102 (step S5).

[0122] At this time, the operation of the bag-manufacturing and packaging portion 300 is continuing. In other words, the longitudinal sealing mechanism 18, the pull down belts 19, and the lateral sealing mechanism 20 shown in Figure 5 are in operation. Accordingly, the film 2 stored in the dancer roller 12 is conveyed to the bag-manufacturing and packaging portion 300 by the pull down belts 19.

[0123] As shown in Figure 19 (c) , as the dancer roller 12 moves upward past the position between the roll bars 11 against the urging force of the tension spring 220, the film 2 stored in the dancer roller 12 is conveyed to the bag-manufacturing and packaging portion 300. Accordingly, the items 23 that have been released to the air from the items supply portion 700 are packaged at the bag-manufacturing and packaging portion 300.

[0124] The control device 500 determines whether each of the items that have been falling is packaged (step S6). The number of items that are falling is determined by the operational speed and the distance between the items supply portion 700 and the lateral sealing mechanism 20. For instance, when the operational speed is 200 times per minute, two bags worth of items are falling. The length of film to be used varies depending on the size of the bags. In the above-described embodiment, the dancer roller 12 is preconfigured such that the film 2 stored in the dancer roller 12 is sufficient. In this case, the control device 500 keeps count of every release of items from the items supply portion 700. The count is decreased when packaging for the items is finished. The packaging operation is maintained until the count of items released becomes zero. Once the count reaches zero, it is determined that all the items that have been falling are packaged. Accordingly, the operation of the bag-manufacturing and packaging portion 300 is stopped (step S7).

[0125] On the other hand, at the end of step S5, the operator can perform the replacement operation of the film roll 1 shown in Figures 7-11, using the film joining device 102. Once the joining of the film 2 shown in Figure 10 is finished, the operator notifies the control device 500 that the joining of the film 2 has been finished, using devices such as an operational switch (not shown in figures) .

[0126] Once the control device 500 acknowledges that the joining of the film 2 has been finished (step S8), the control device 500 deactivates the film holding mechanism 60 of the film joining device 102 (step S9). The control device 500 also deactivates the film suction mechanism 70 of the film joining device 102 (step S10). Accordingly, the operation can now be resumed using the replaced film roll 1.

[0127] The operator, using the operational switch (not shown in figures), sends a command to the control device 500 to resume the operation. The control device 500 determines whether the operation can be performed (step S11). If the operation can be performed, the control returns to step S1 to perform normal operation.

[0128] In this manner, the items 23 that had been falling when the end of the film 2 is detected can be packaged using the film 2 that is stored in the dancer roller 12.

[0129] Next, operation of each portion at the time when items that have been falling are packaged using the film 2 stored in the film storing mechanism 80 of the film joining mechanism 102 is explained.

[0130] Figures 20 and 21 are flow charts showing the operation of the control device 500 at the time when items that have been falling are packaged using the film 2 stored in the film storing mechanism 80 of the film joining mechanism 102. Figures 22-26 are schematic cross-sectional views showing the operation of the film storing mechanism 80 of the film joining device 102 during the normal operation and at the time when the film roll 1 is replaced. In Figures 22-26 also, the film of the pre-replacement film roll 1 is referred to as 2a, while the film of the post-replacement film roll 1 is referred to as 2b.

[0131] In this example, as shown in Figure 22, the film holding mechanism 60 is attached to the position of the upstream side fixed roller 25. The load cell 210 is coupled to the movable frame 28 of the film storing mechanism 80 via the tension spring 220. The load cell 210 detects the amount of displacement of the movable frames 28 from the reference positions. This amount of displacement corresponds to the tensile force of the film 2. The control device 500 of Figure 16 controls the rotations of the motor 6 based on the output from the load cell 210, such that the tensile force of the film 2a is constant.

[0132] In this embodiment, the film storing mechanism 80 also functions as the dancer roller. Accordingly, the dancer roller 12 shown in Figure 1 is not necessary.. Also in this embodiment, the film roll 1 is supported such that the roll core 31 extends in the horizontal direction. Also, the film joining device 102 is installed such that the fixed rollers 25, the movable rollers 26, the rotational axis 29, and the guide roller 30 extend in horizontal directions. Accordingly, the movable frame 28 pivots upward and downward about the rotational axis 29. In this case, the first guide roller 7, the second guide roller 8, the turn bar 9, and the turn bar up-down mechanism 10 shown in Figure 4 are not necessary.

[0133] During the normal operation (step S21), the control device 500 controls the rotations of the motor 6 based on the output from the load cell 210, such that the tensile force of the film 2a is constant.

[0134] As shown in Figure 22, while the operation is stopped, the movable frame 28 is positioned at the most bottom end due to its own weight and the downward urging force of the tension spring 220. During normal operation, as shown in Figure 22, the movable frame 28 pivots up and down as shown in the arrow h, due to the tensile force of the film 2a. The output from the load cell 210 changes accordingly. In this case, since the movable rollers 26 are separated from the fixed rollers 25 in the downward direction, the film storing mechanism 80 stores a portion of the film 2a.

[0135] The control device 500 determines based on the output from the load cell 210 whether or not the film 2a has been pulled out from the film roll 1 (step S22). If the film 2a is exhausted, the tensile force of the film 2a exceeds the predetermined value. Therefore, the control device 500 determines that the film 2a is exhausted when the output from the load cell 210 exceeds the predetermined value.

[0136] Figure 23 shows the situation where the output from the load cell 210 exceeds the predetermined value.

[0137] Once the film 2a is exhausted, the control device 500 stops the items supply portion 700 and the motor 6 (step S23). Accordingly, the supply of items from the items supply portion 700 to the bag-manufacturing and packaging portion 300 stops. However, at this point, a few items 23 have already been release from the items supply portion 700, and are now falling.

[0138] Next, the control device 500 activates the film holding mechanism 60 of the film joining device 102 (step S24).

[0139] At this time, the operation of the bag-manufacturing and packaging portion 300 is not stopped. The longitudinal sealing mechanism 18, the pull down belts 19, and the lateral sealing mechanism 20 shown in Figure 5 are in operation. The film 2 stored in the film storing mechanism 80 is conveyed to the bag-manufacturing and packaging portion 300 via the pull down belts 19.

[0140] At this point, as shown in Figure 24, because the movable frame 28 having the movable roller 26 move upward about the rotational axis 29 against the urging force of the tension spring 220, the film 2a stored in the film storing mechanism 80 is conveyed to the bag-manufacturing and packaging portion 300 as shown in the arrow z. The bag-manufacturing and packaging portion 300 packages the items 23, which are falling, using this film.

[0141] The control device 500 determines whether or not all of the items that have been falling are packaged, by reducing the count of the releases of the items as described above (step S25).

[0142] Once all the items that have been falling are packaged, the control device 500 stops the operation of the bag-manufacturing and packaging portion 300 (step S26). Then, the control device 500 activates the film suction mechanism 70 of the film joining device 102 (step S27). The operator cuts the film 2a at the end position shown in the arrow D, and severs the film 2a from the roll core 31.

[0143] The control device 500 deactivates the film holding mechanism 60 of the film joining device 102 (step S28). Accordingly, as shown in Figure 25, the movable rollers 26 and the movable frame 28 rotate downward about the rotational axis 29 as shown in the arrow F, due to their own weights and the urging force of the tension spring 220. Accordingly, the movable rollers 26 become separated from the fixed rollers 25 in the downward direction. The film 2a on the upstream side of the film joining device 102 is pulled toward the film joining device 102 to be stored in the film storing mechanism 80. As a result, the end of the severed film 2a is guided toward the film suction mechanism 70.

[0144] As shown in Figure 26, after installing a new film roll 1 to the support shaft, the operator pulls out the head of the film 2b of the new film roll 1 up to the film suction mechanism 70. The head of the film 2b is attached to the rear end of the film 2a, which is sucked into the film suction mechanism 70. Then the rear end of the film 2a and the head of the film 2b are joined.

[0145] Once the joining of the film 2 is finished, the operator notifies the controller 500 that the joining of the films 2a and 2b is finished, using the operational switch (not shown in figures).

[0146] Once the control device 500 confirms that the joining of the film 2 has been finished (step S29), the control device 500 deactivates the film suction mechanism 70 of the film joining device 102 (step S30). Accordingly, operation can be resumed with the replaced film roll 1.

[0147] The operator, using the operational switch (not shown in figures), sends a command to the control device 500 to start the operation. The control device 500 determines whether the operation can be performed (step S31). If the operation can be performed, the control returns to step S21 to perform normal operation.

[0148] In this manner, the items 23 that have been falling when the end of the film 2 is detected can be packaged using the film 2 that is stored in the film storing mechanism 80.

[0149] In this embodiment, the support shaft 3 corresponds to the film roll support portion, the film conveyer portion 200 corresponds to the film conveyance mechanism, and the film joining device 102 corresponds to the film joining device. The film storing mechanism 80 and the dancer roller 12 correspond to the film storing mechanism. Furthermore, the film suction mechanism 70 corresponds to the film suction retaining mechanism. The film holding mechanism 60 corresponds to the film fixedly holding mechanism. The motor 6 corresponds to the driving device. The load cell 210 corresponds to the detecting device and tension detecting device. The control device 500 corresponds to the control portion.

[0150] Since this embodiment has a mechanism that retains the movable rollers 26 such that the movable rollers 26 project upward from the fixed rollers 25, when the film is installed through each of the rollers 25 and 26, it is only necessary to insert the film between the rollers 26 and the rollers 25. Therefore, the present embodiment is meritorious in that it has better operability.

Claims

1. A bag-manufacturing and packaging apparatus that packages items while manufacturing bags from a film roll in which an elongated film is wound in a roll shape, said bag-manufacturing and packaging apparatus comprising:

   a film roll support portion that supports the film roll;

   a film conveyance mechanism that conveys film sent from the film roll; and

   a film joining device that is disposed between said film roll support portion and said film conveyance mechanism, said film joining device being for, at the time of replacement of the film roll, joining an end of a film conveyance mechanism side film and a head of the film of a post-replacement film roll;

   said film joining device having a film storing mechanism for pulling in the film that is disposed on an upstream side relative to a film joining position.

2. The bag-manufacturing and packaging apparatus as set forth in claim 1, wherein

   said film storing mechanism includes

   a fixed roller that guides the conveyed film,

   a movable roller that changes a running distance of the conveyed film, and

   a moving mechanism that moves said movable roller toward and away from said fixed roller.

3. The bag-manufacturing and packaging apparatus as set forth in claim 2, wherein

   said film storing mechanism has a plurality of pairs of said fixed and movable rollers that are disposed alternately.

4. The bag-manufacturing and packaging apparatus as set forth in claim 2, wherein

   said moving mechanism includes

   a fixed frame for supporting both ends of said fixed roller,

   a movable frame for supporting both ends of said movable roller, and

   a rotational axis supported in parallel with said fixed-roller for supporting an end of said movable roller such that said movable roller is rotatable about said fixed frame, and

   said movable roller moves relative to said fixed roller by allowing said movable frame to rotate about said rotational axis relative to said fixed frame.

5. The bag-manufacturing and packaging apparatus as set forth in claim 1, wherein

   said film joining device further includes a film suction retaining mechanism that is disposed on an upstream side from said film storing mechanism in a film conveyance direction, said film suction retaining mechanism retaining by suction the film that is severed from a pre-replacement film roll at a time of film joining.

6. The bag-manufacturing and packaging apparatus as set forth in claim 1, wherein

said film joining device further includes a film fixedly holding mechanism disposed on a downstream side from said film storing mechanism in the film conveyance direction, said film fixedly holding mechanism being for fixedly holding the film conveyance mechanism side film at the time of joining the films.

7. A bag-manufacturing and packaging apparatus that packages items while manufacturing bags from a film roll in which an elongated film is wound in a roll shape, said bag-manufacturing and packaging apparatus comprising:

a bag-manufacturing and packaging portion for manufacturing bags while packaging items;
an items supply portion for supplying the items to said bag-manufacturing and packaging portion;
a film roll support portion for supporting the film roll;
a driving device for sending out the film from the film roll that is supported by said film roll support portion;
a film conveyer mechanism for conveying the film that is sent out from the film roll to said bag-manufacturing and packaging portion;
a film storing mechanism for sending out film while storing the film that is to be conveyed by said film conveyance mechanism;
a detecting device for detecting that the film of the film roll is exhausted; and
a control portion for stopping operations of said items supply portion and said driving device in response to an output from said detecting device, and for stopping an operation of said bag-manufacturing and packaging portion after the film stored in said film storing mechanism is sent out by an amount that corresponds to a predetermined numbers of bags.

8. The bag-manufacturing and packaging apparatus as set forth in claim 7, wherein

said detecting device includes a tension detecting device that detects a tensile force of the film, and

said control portion stops the operations of said items supply portion and said driving device when the output from said tension detecting device exceeds a predetermined value.

9. The bag-manufacturing and packaging apparatus as set forth in claim 8, wherein

said control portion controls said driving device such that the tensile force of the film is constant when the output from said tension detecting device is below the predetermined value.

10. The bag-manufacturing and packaging apparatus as set forth in claim 7, wherein

said film storing mechanism includes

a fixed roller for guiding the conveyed film,

a movable roller for changing a running distance of the conveyed film, and

a moving mechanism that moves said movable roller toward and away from said fixed roller.

11. The bag-manufacturing and packaging apparatus as set forth in claim 7, further comprising

a film joining device disposed between said film roll support portion and said film conveyance mechanism, said film joining device joining, at the time of replacing the film roll, an end of the film on the film conveyance mechanisms side and a head of a post-replacement film roll,

said film storing mechanism being disposed on a downstream side from a film joining position of said film joining device.

12. The bag-manufacturing and packaging apparatus as set forth in claim 11, wherein

said film storing mechanism includes

a fixed roller for guiding the conveyed film,

a movable roller for changing a running distance of the conveyed film, and

a moving mechanism that moves said movable roller close to and away from said fixed roller.

13. The bag-manufacturing and packaging apparatus as set forth in claim 12, wherein

said moving mechanism includes

a fixed frame for supporting both ends of said fixed roller,

a movable frame for supporting both ends of said movable roller, and

a rotational axis supported in parallel with said fixed roller for supporting an end of said movable roller such that said movable roller is rotatable about said fixed frame, and

said movable roller moves relative to said fixed roller by allowing said movable frame to rotate about said rotational axis relative to said fixed frame.

14. The bag-manufacturing and packaging apparatus as set forth in claim 12, wherein

said film joining device further includes a film suction retaining mechanism that is disposed on an upstream side from said film storing mechanism in the film conveyance direction, said film suction re-

taining mechanism retaining by suction the film that is severed from the pre-replacement film roll at a time of film joining.

15. The bag-manufacturing and packaging apparatus as set forth in claim 14, wherein

said control portion activates said film suction retaining mechanism during the film joining.

16. The bag-manufacturing and packaging apparatus as set forth in claim 11, wherein

said film joining device further includes a film fixedly holding mechanism disposed on an upstream side from said film storing mechanism in the film conveyance direction, said film fixedly holding mechanism being for fixedly holding a film-conveyance-mechanism-side film at the time of joining the films.

17. The bag-manufacturing and packaging apparatus as set forth in claim 16, wherein

said control portion activates said film fixedly holding mechanism in response to an output from said detecting device.

Fig. 1

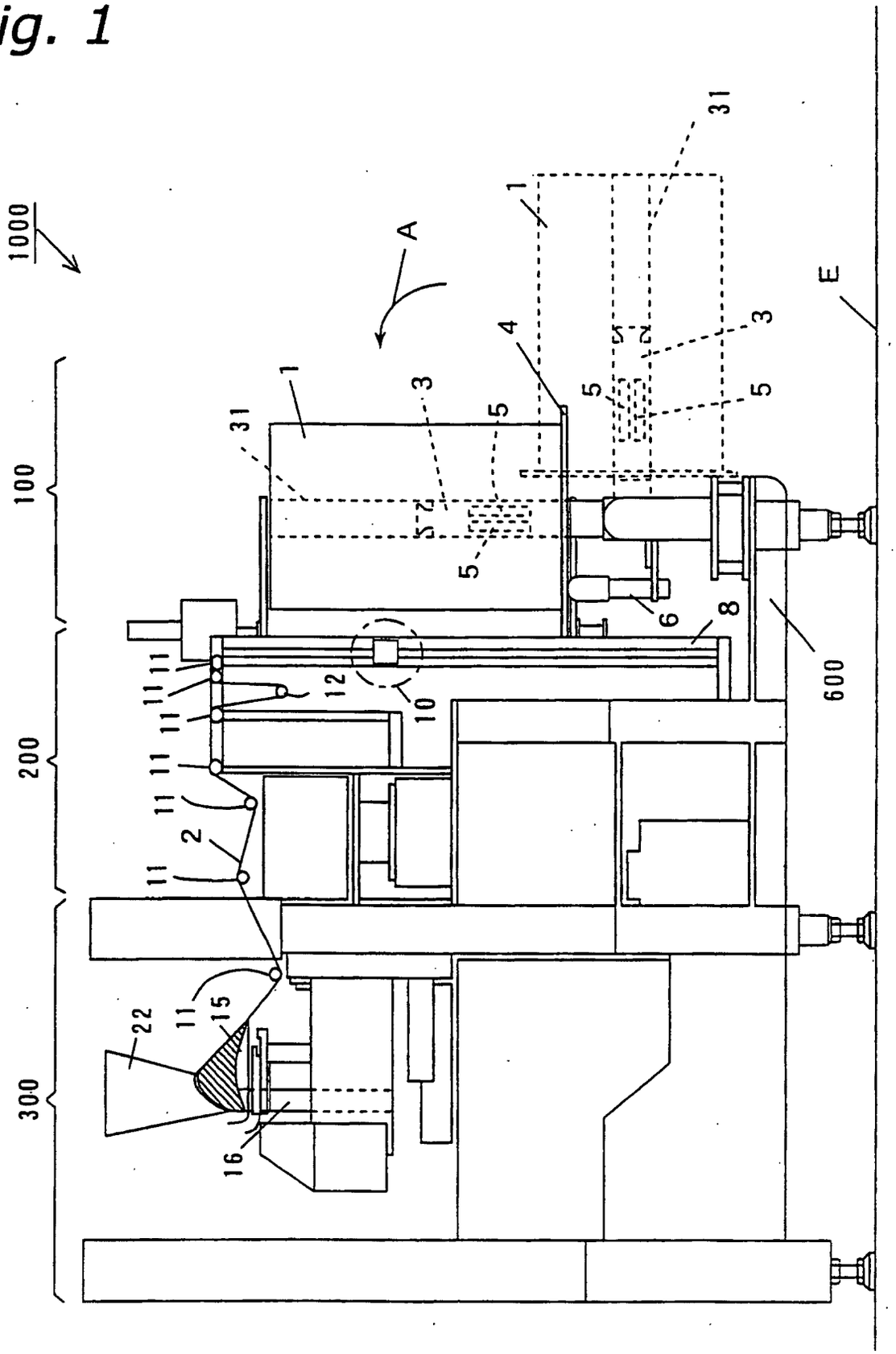


Fig. 2

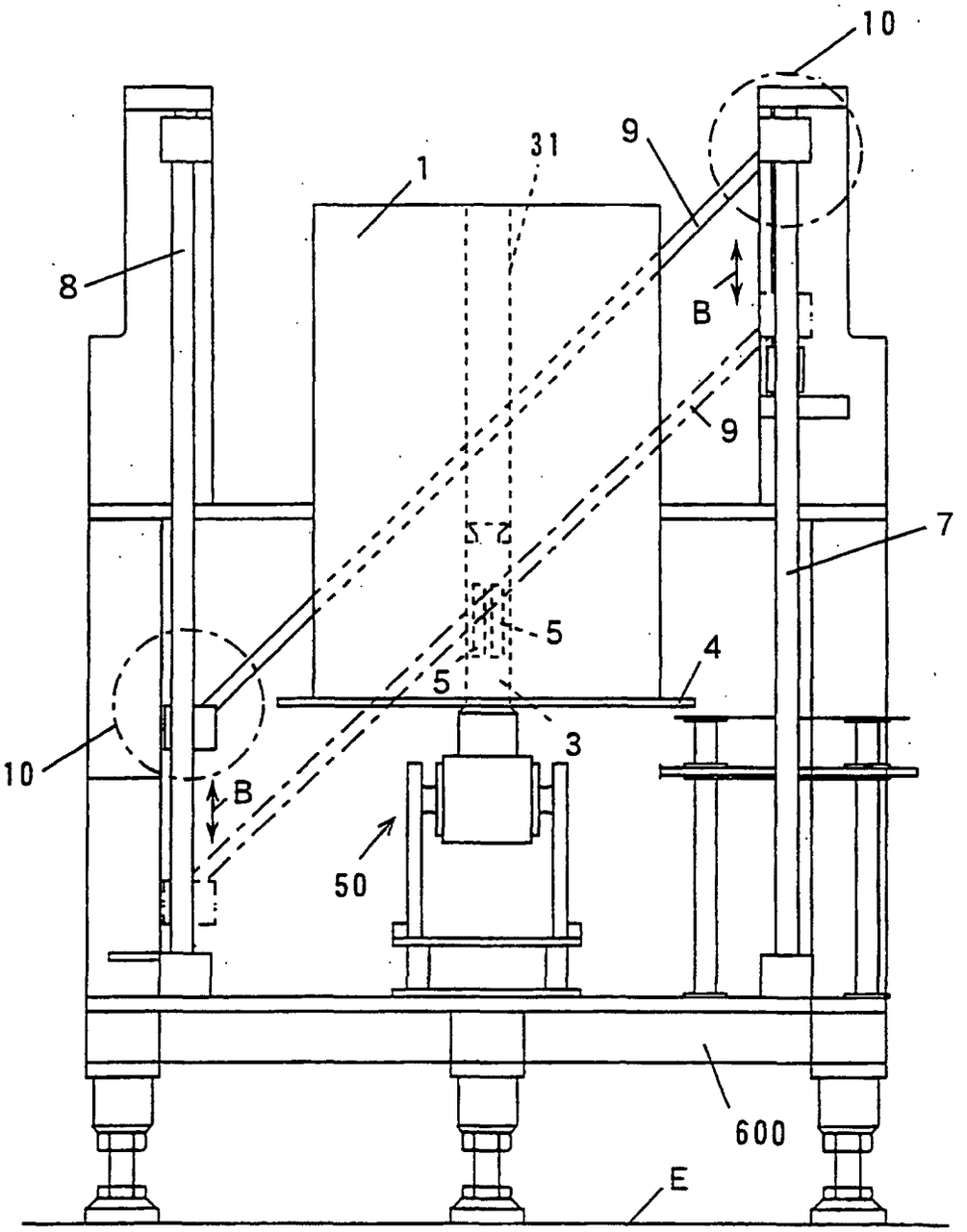


Fig. 3

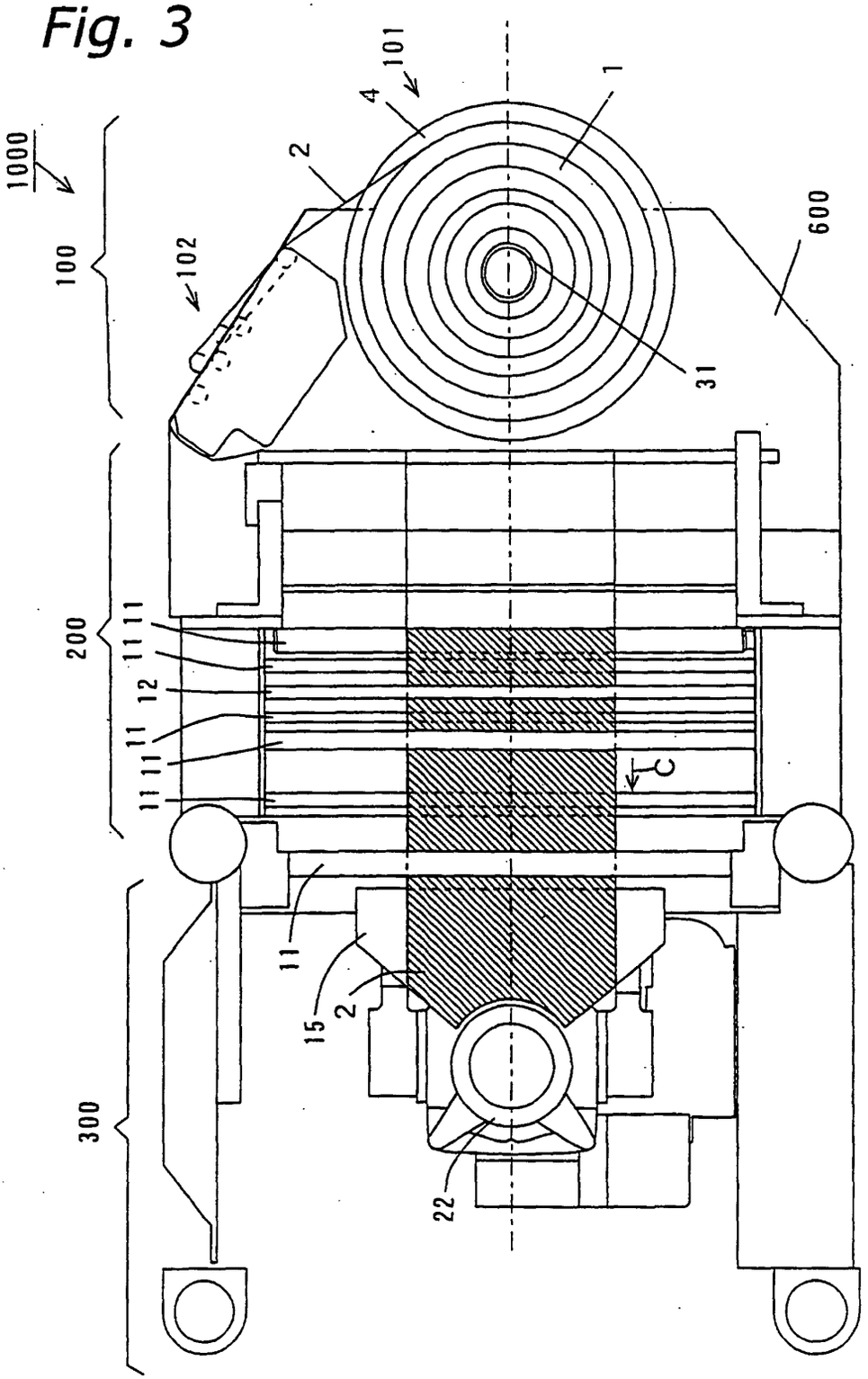


Fig. 4

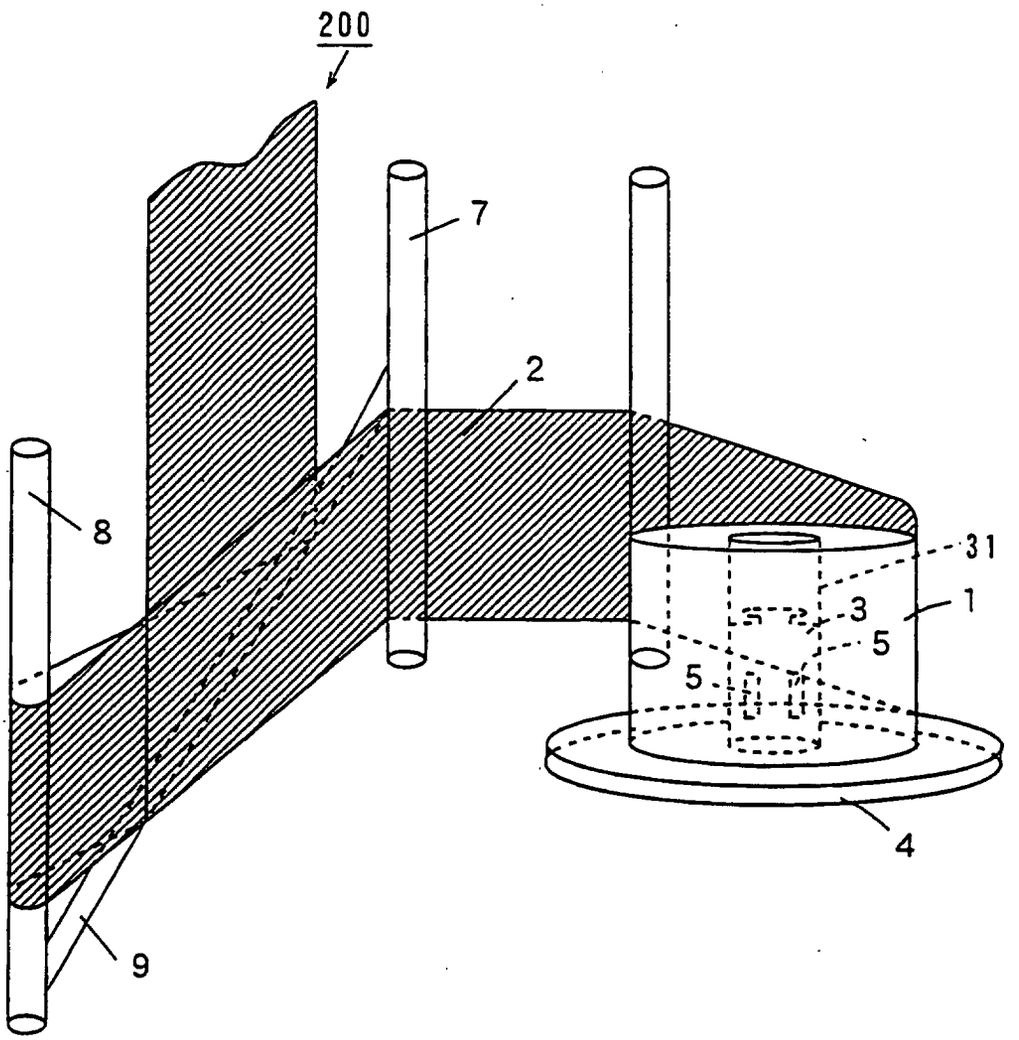


Fig. 5

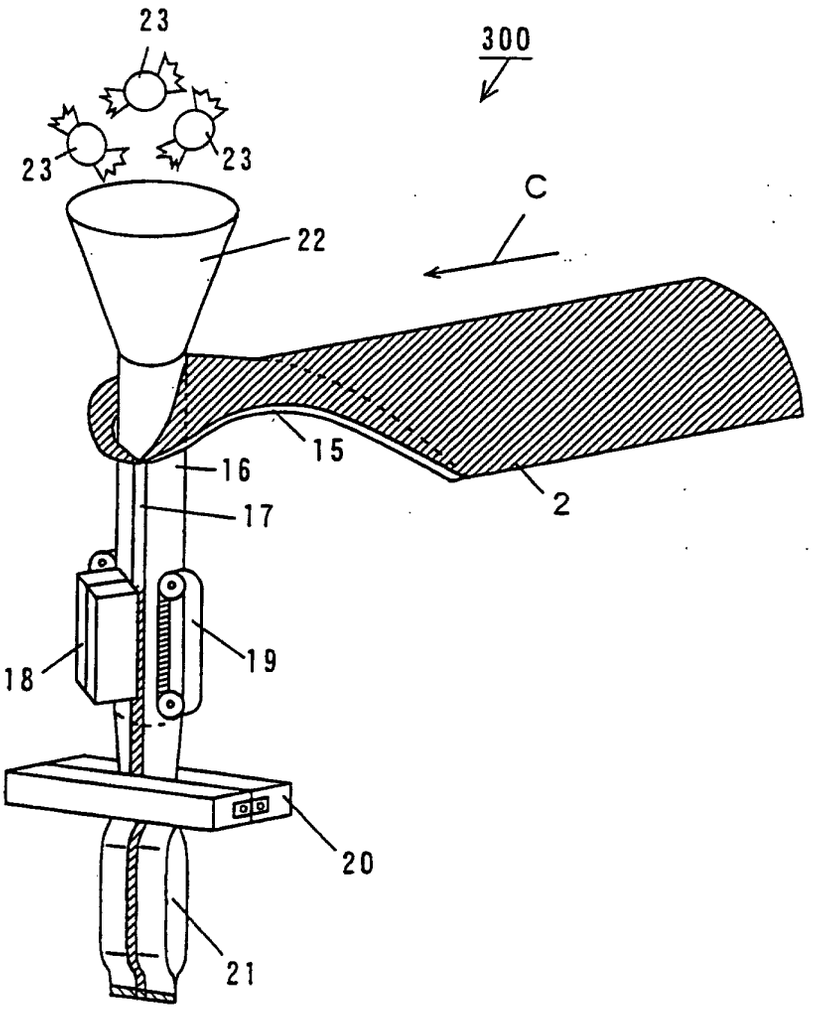


Fig. 6

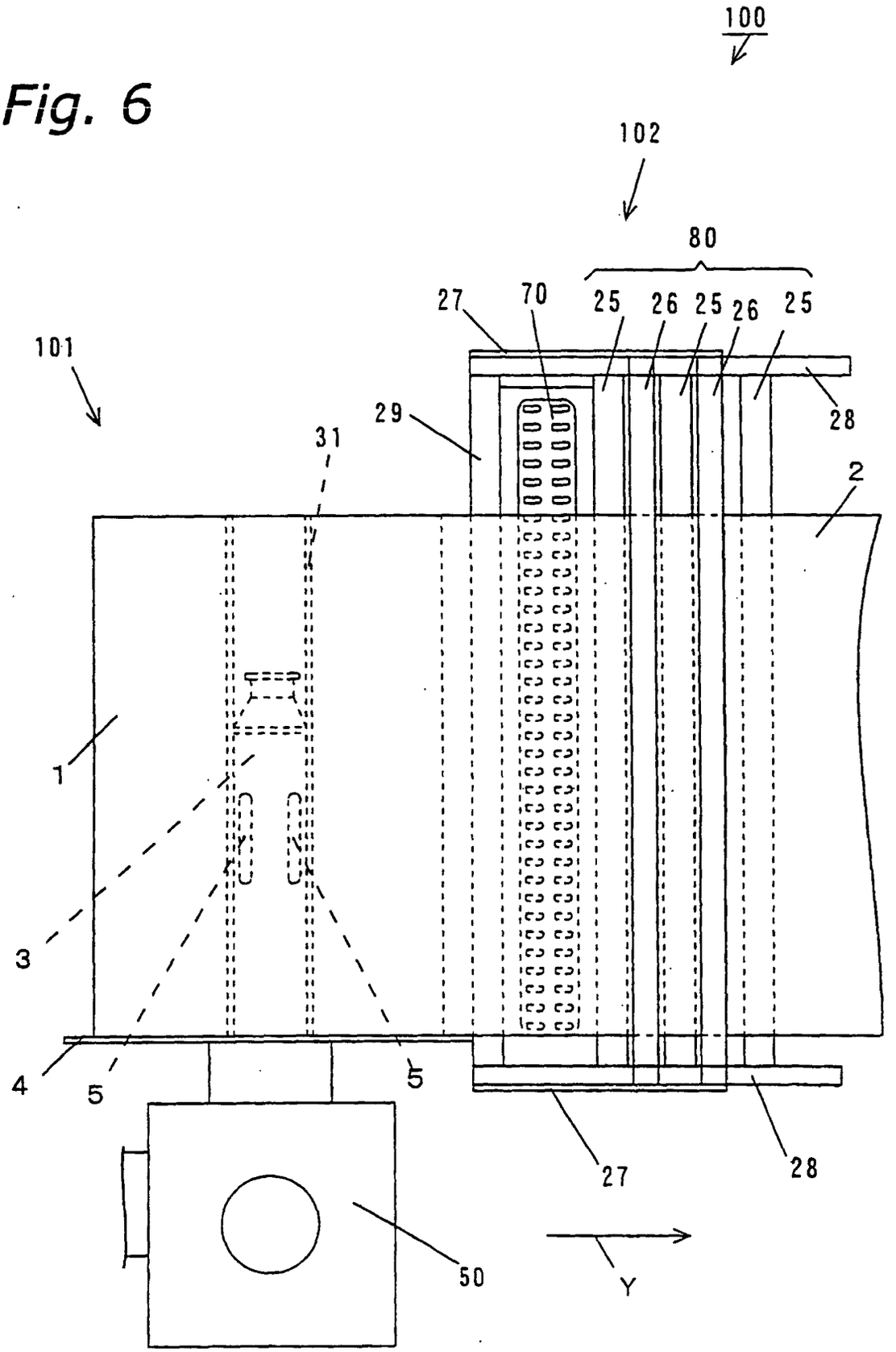


Fig. 7

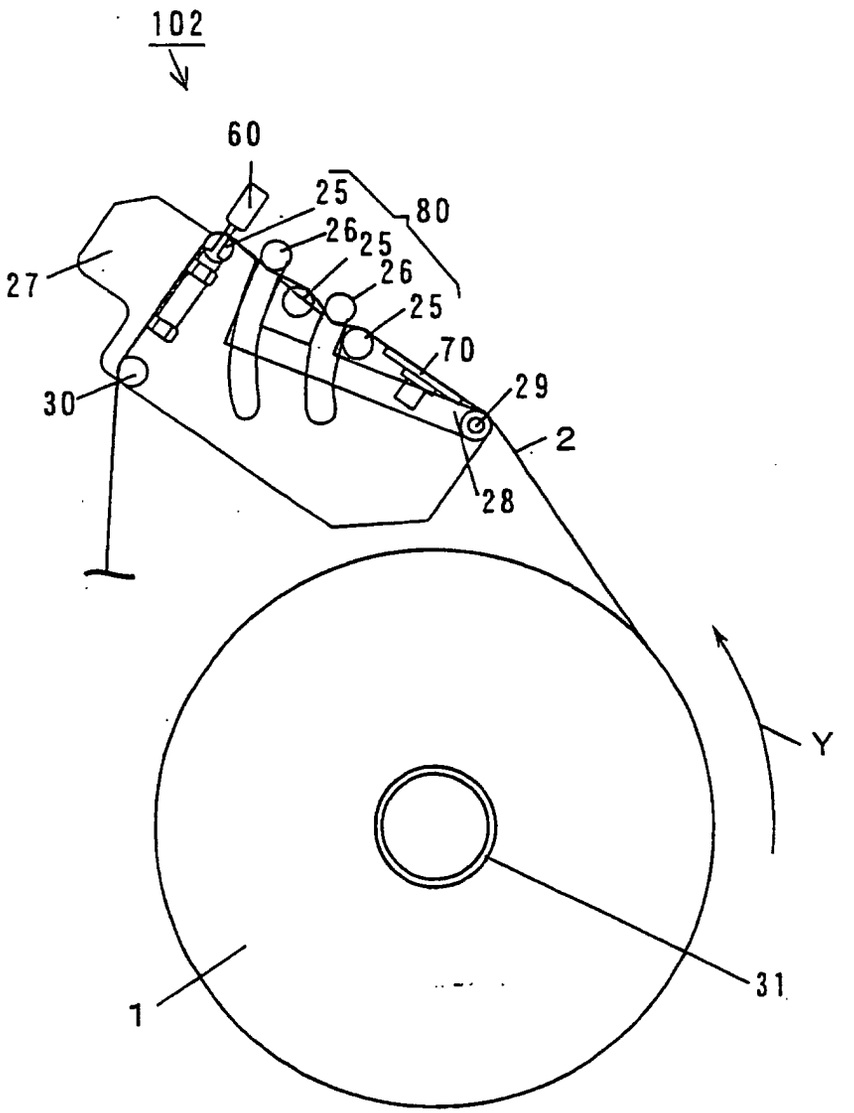


Fig. 8

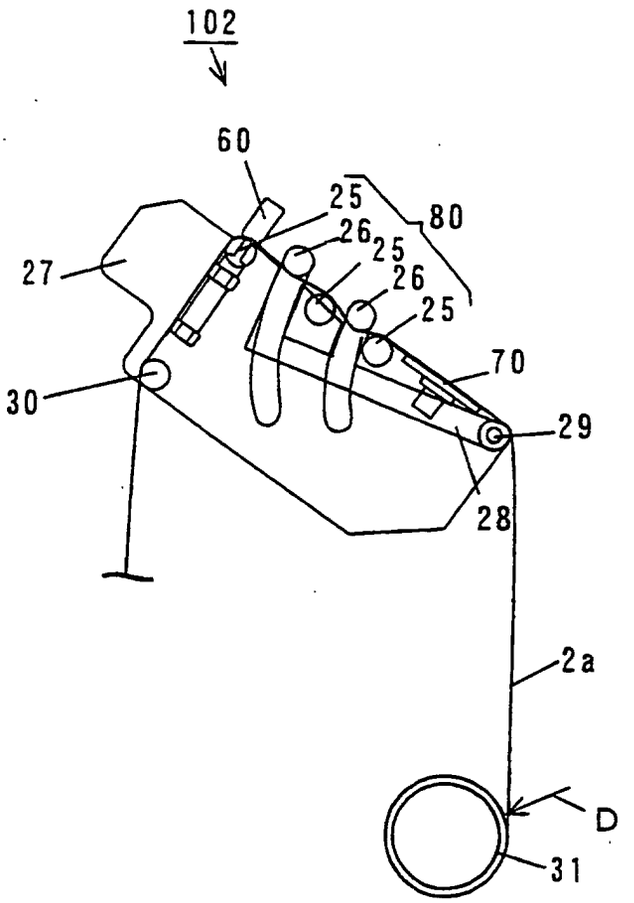
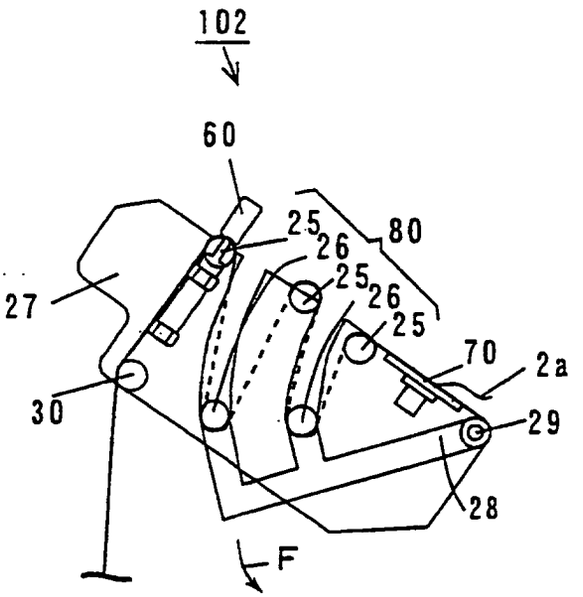


Fig. 9



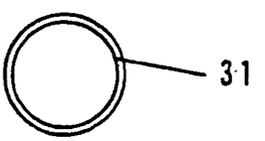


Fig. 10

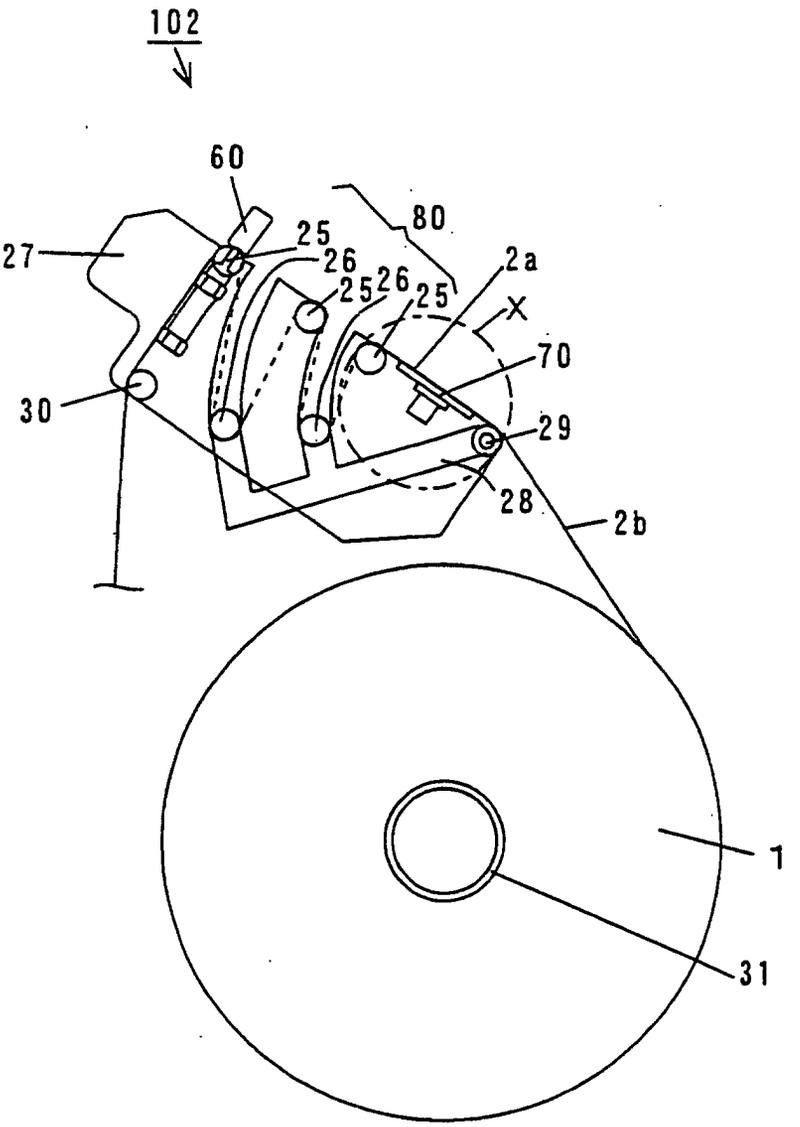


Fig. 11

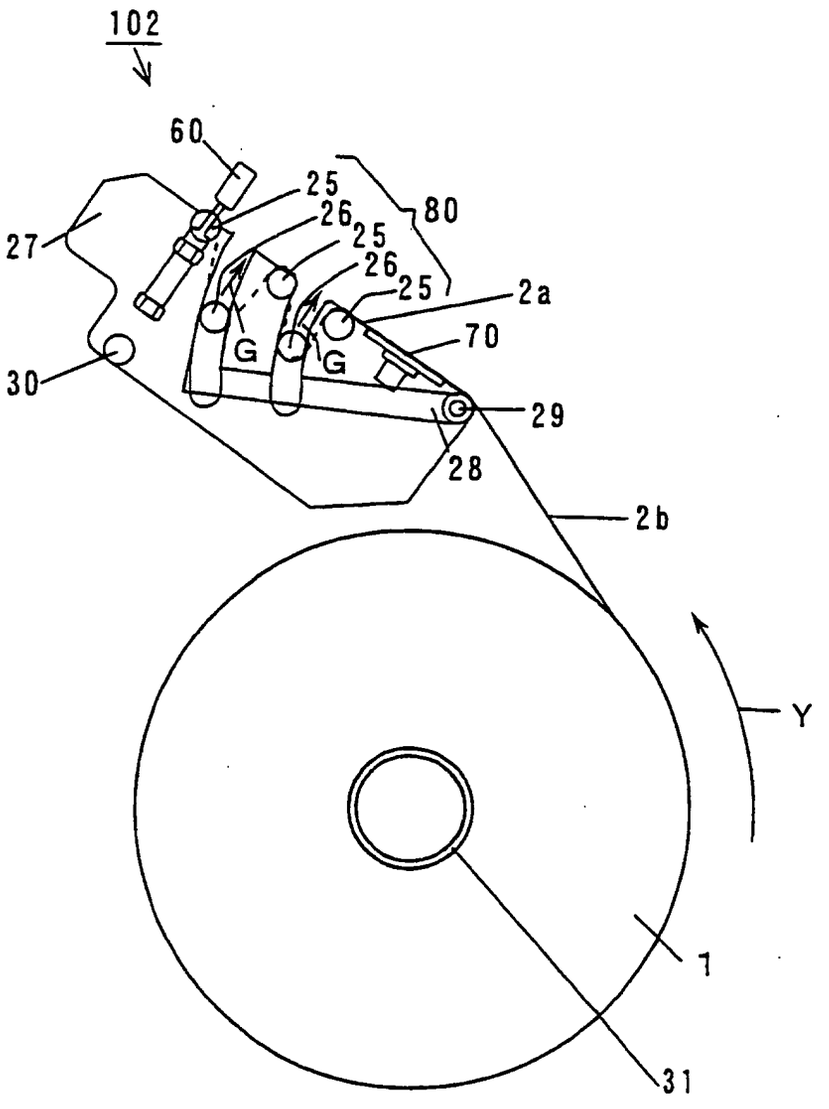


Fig. 12

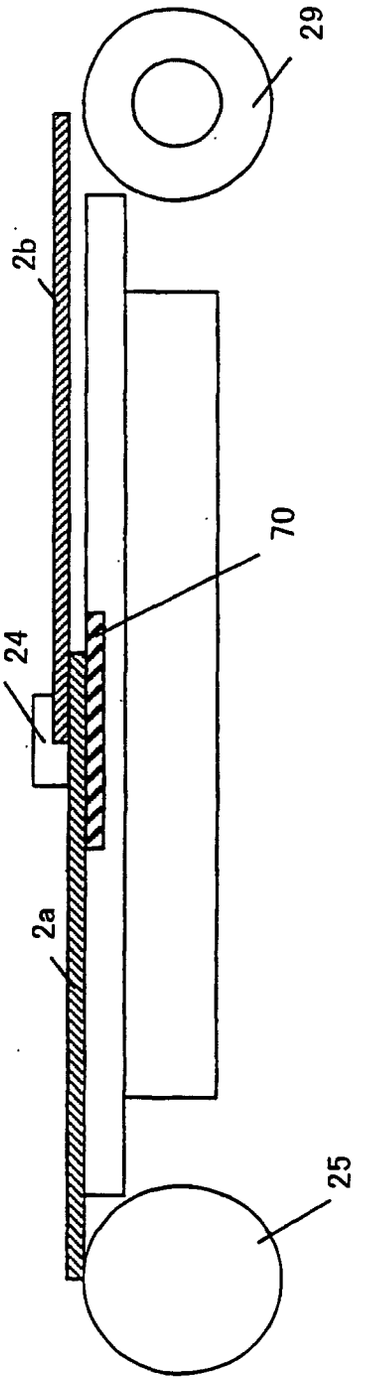


Fig. 13

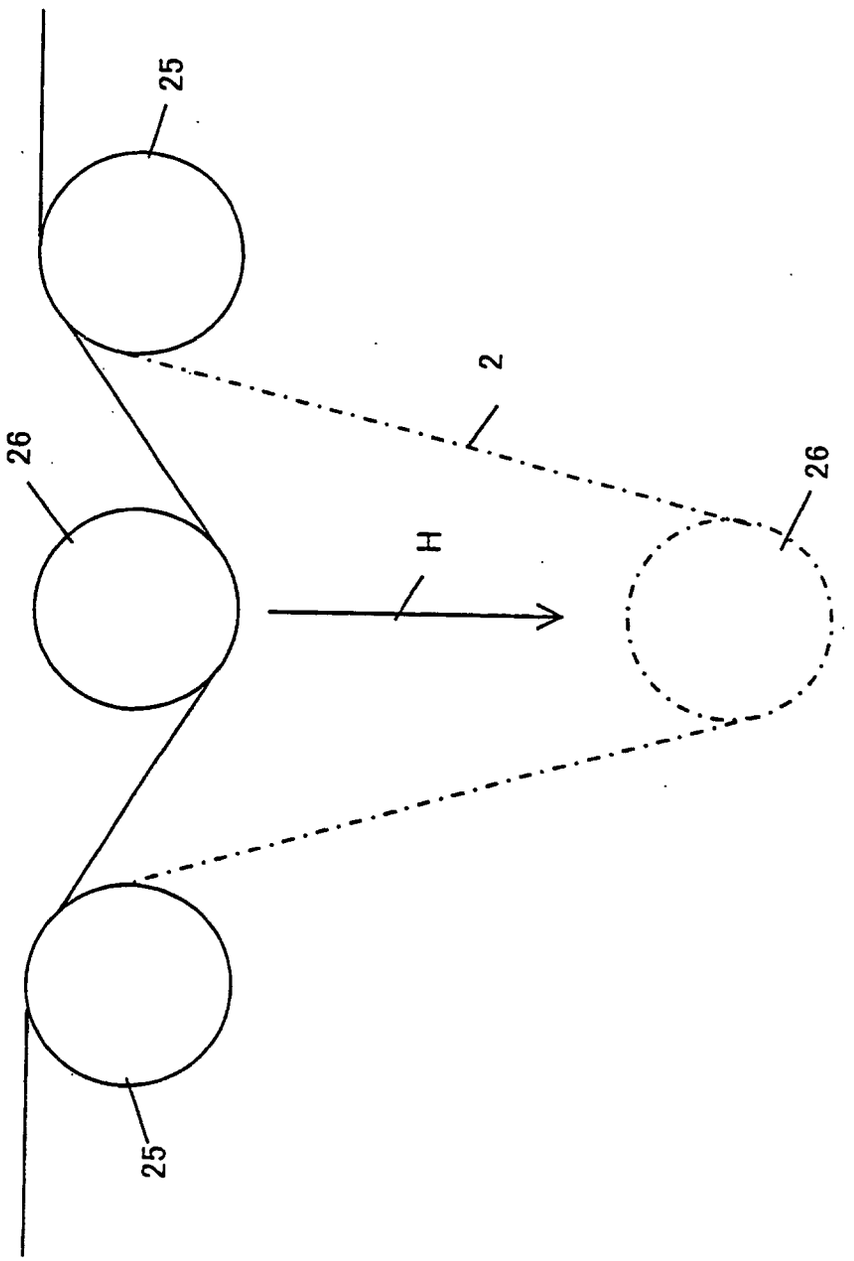


Fig. 14

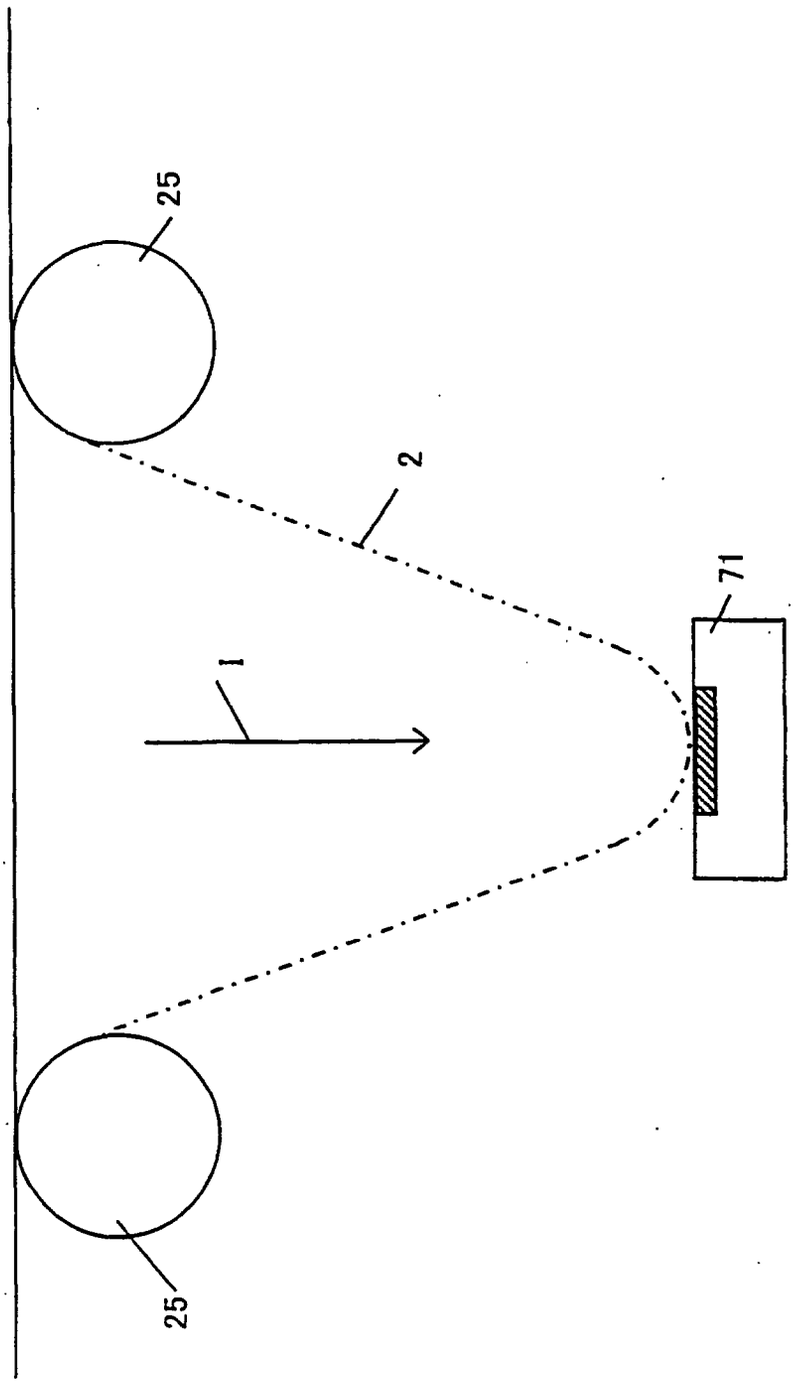


Fig. 15

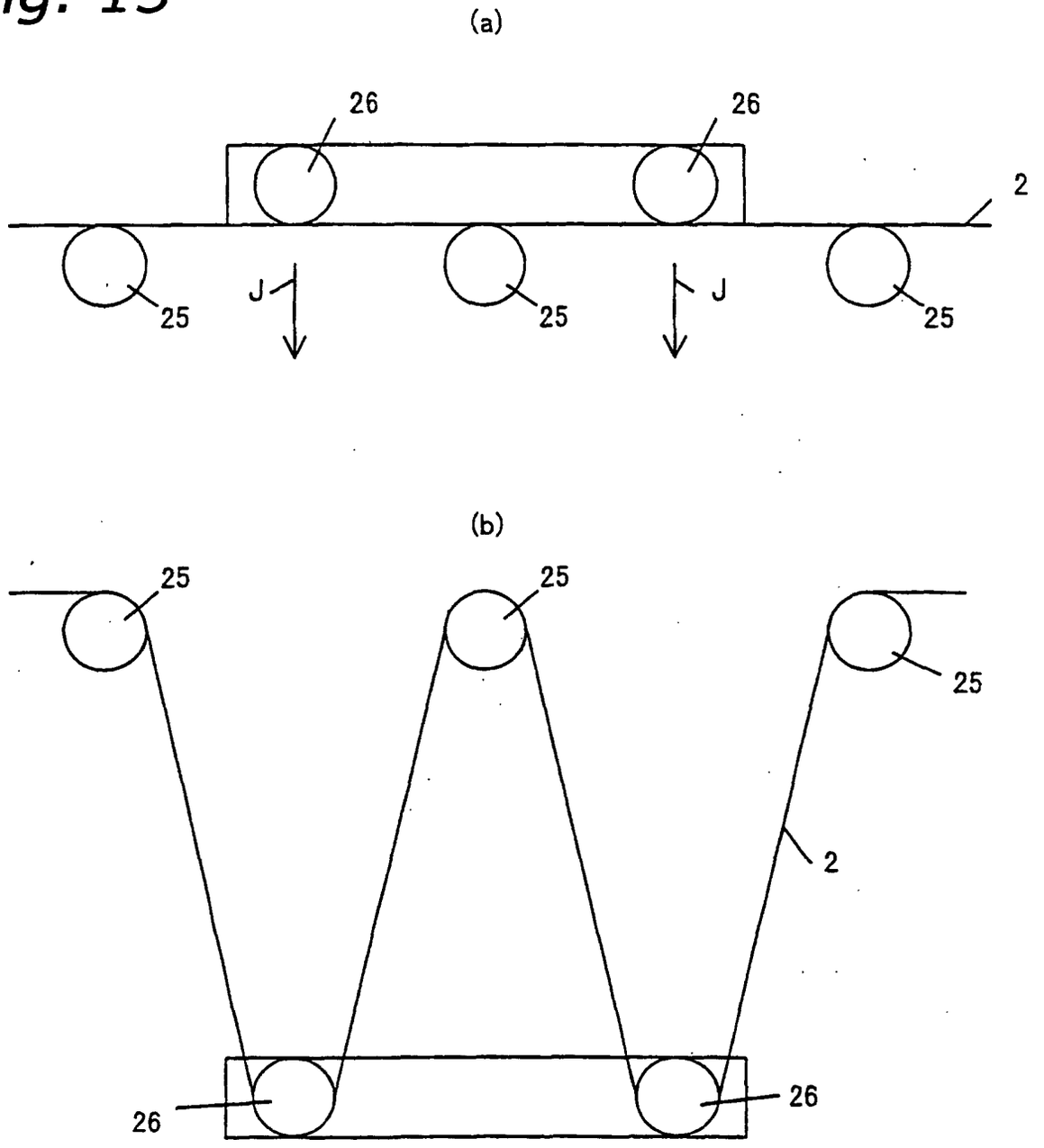


Fig. 16

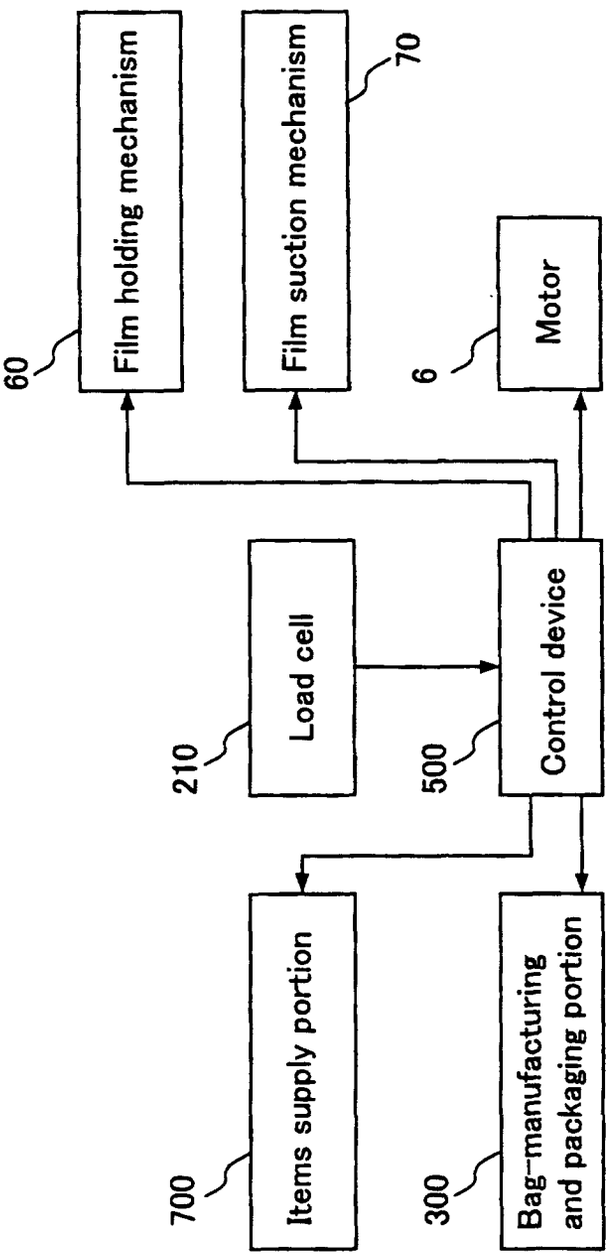

Film holding mechanism
60
Film suction mechanism
70
Motor
6
Load cell
210
Control device
500
Items supply portion
700
Bag-manufacturing and packaging portion
300

Fig. 17

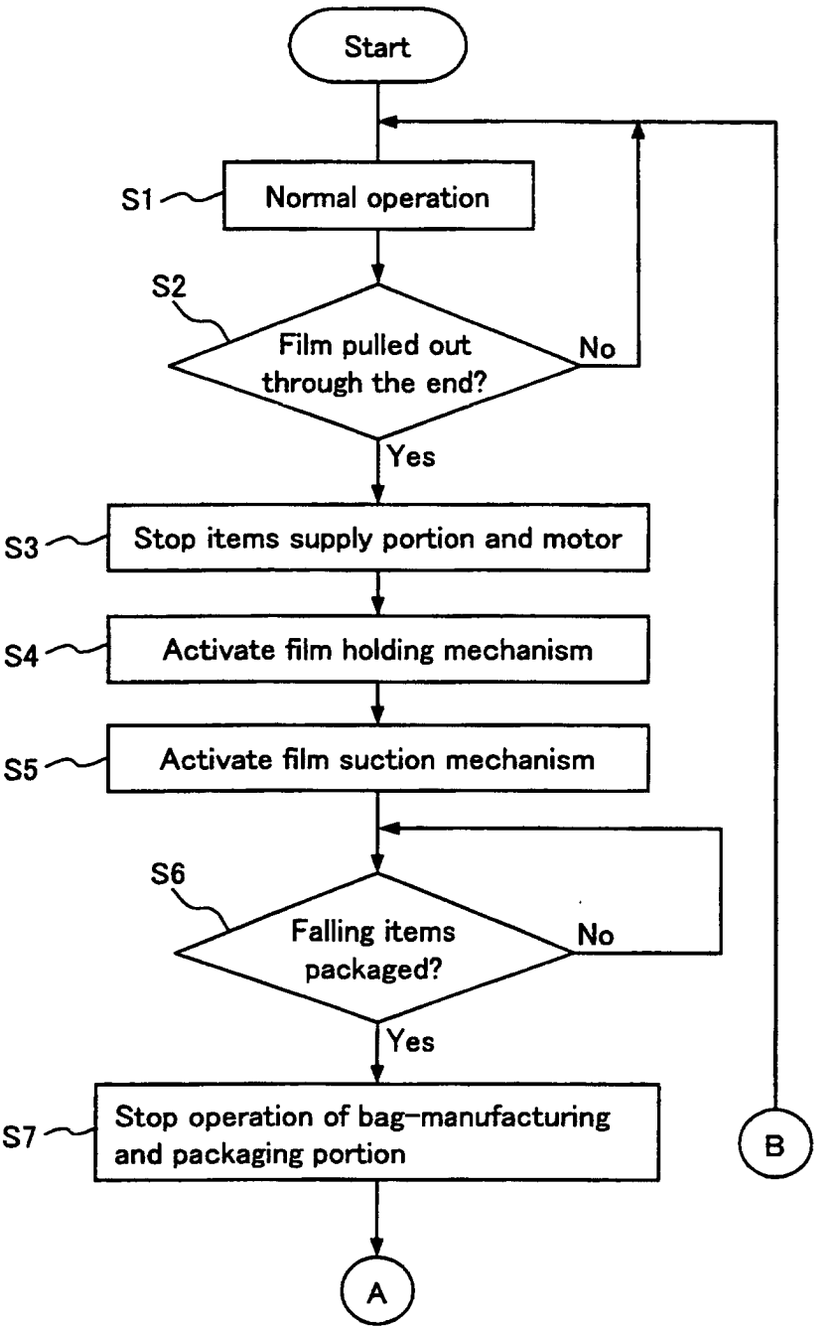

Start
S1
Normal operation
S2
Film pulled out through the end?
No
Yes
S3
Stop items supply portion and motor
S4
Activate film holding mechanism
S5
Activate film suction mechanism
S6
Falling items packaged?
No
Yes
S7
Stop operation of bag-manufacturing and packaging portion
A
B

Fig. 18

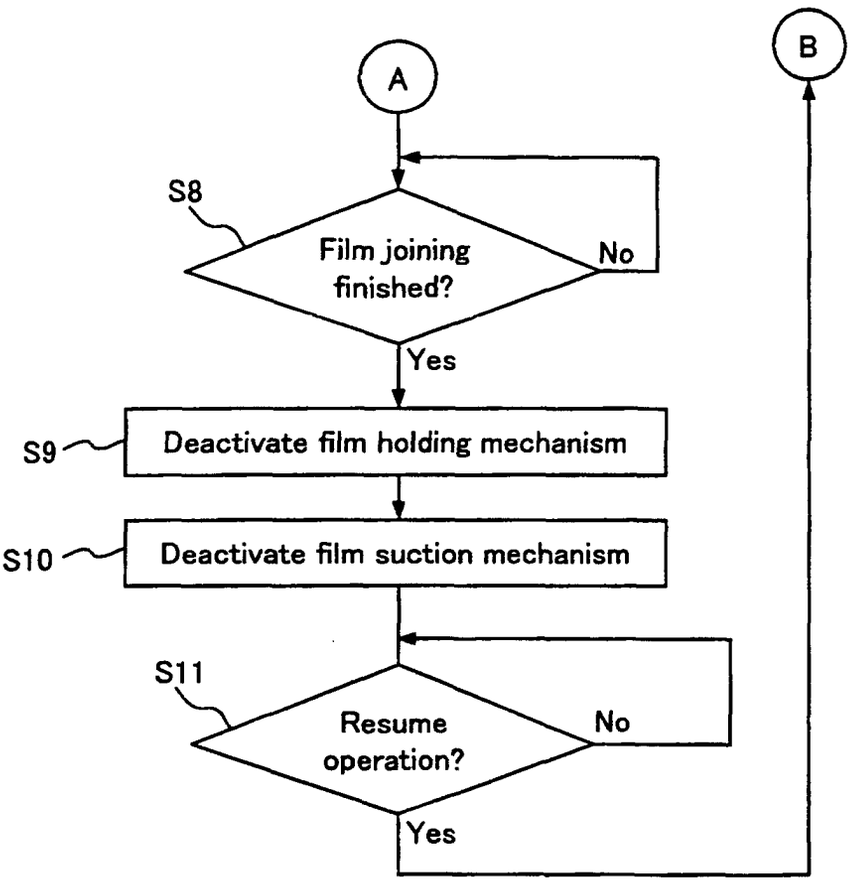

A
B
S8
Film joining finished?
No
Yes
S9
Deactivate film holding mechanism
S10
Deactivate film suction mechanism
S11
Resume operation?
No
Yes

Fig. 19

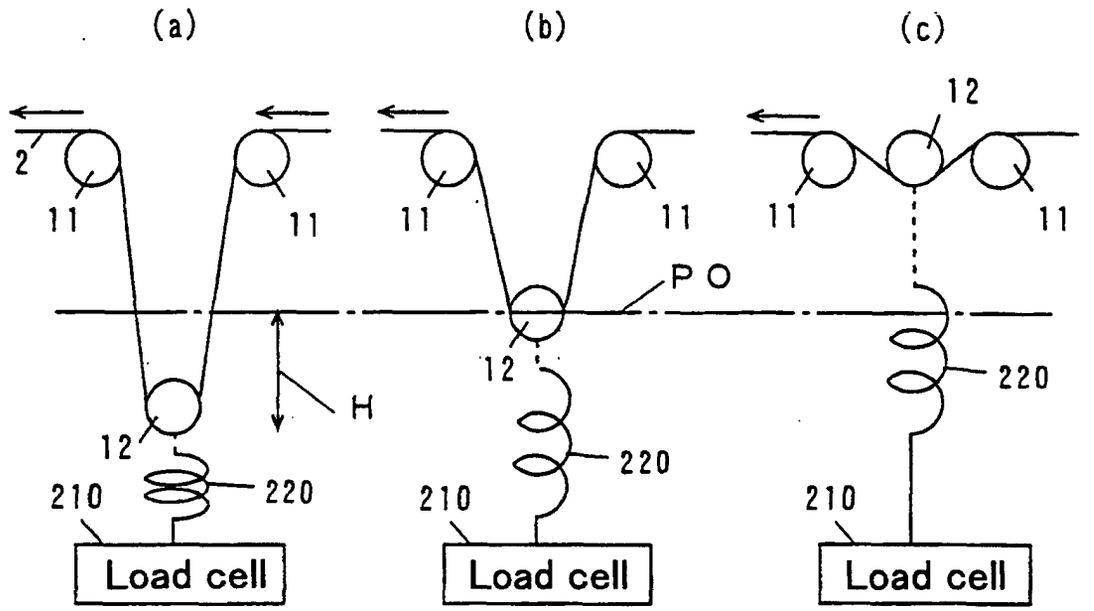

(a)
(b)
(c)
2
11
11
11
11
11
11
12
PO
H
12
12
220
220
220
210
210
210
Load cell
Load cell
Load cell

Fig. 20

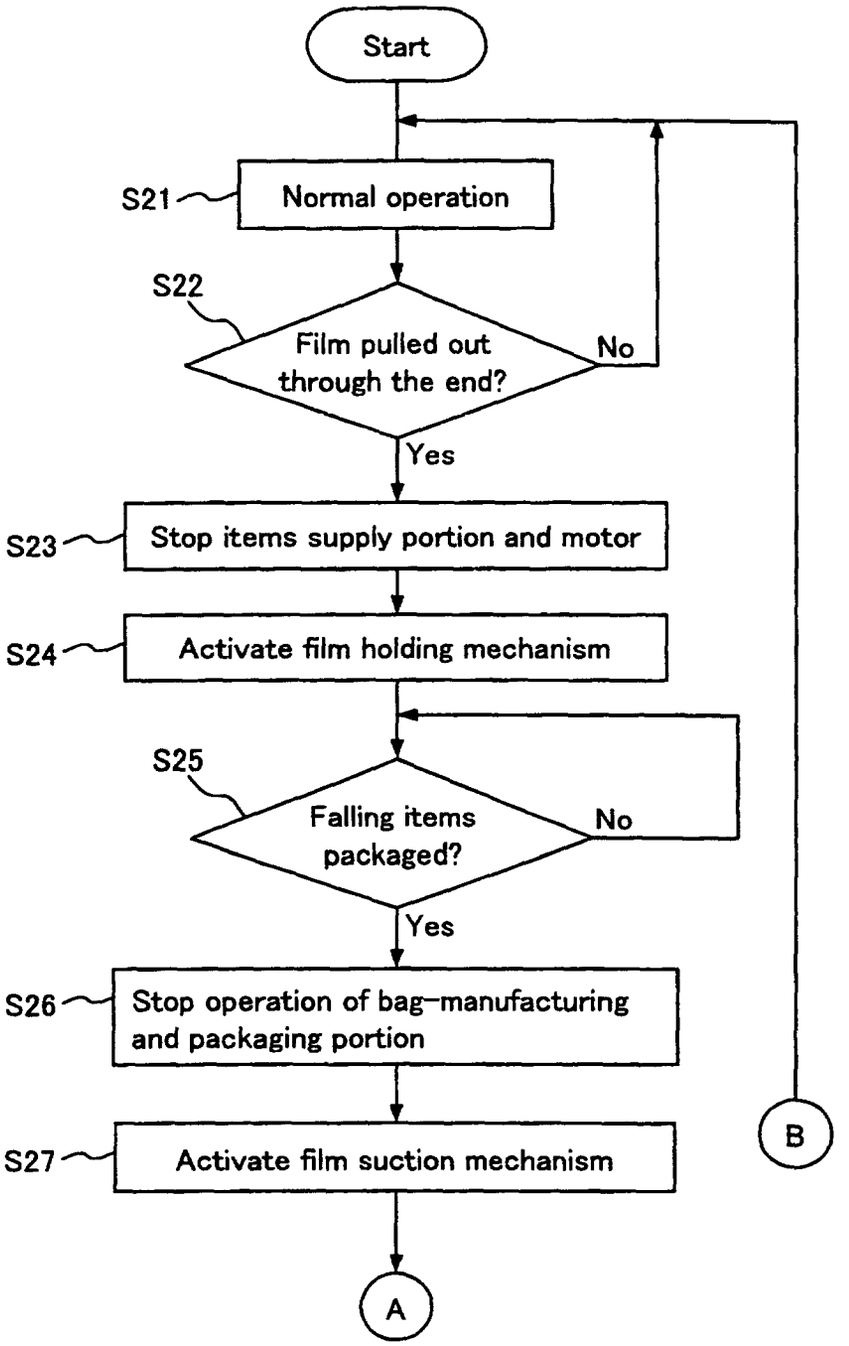

Start
S21
Normal operation
S22
Film pulled out through the end?
No
Yes
S23
Stop items supply portion and motor
S24
Activate film holding mechanism
S25
Falling items packaged?
No
Yes
S26
Stop operation of bag-manufacturing and packaging portion
S27
Activate film suction mechanism
A
B

Fig. 21

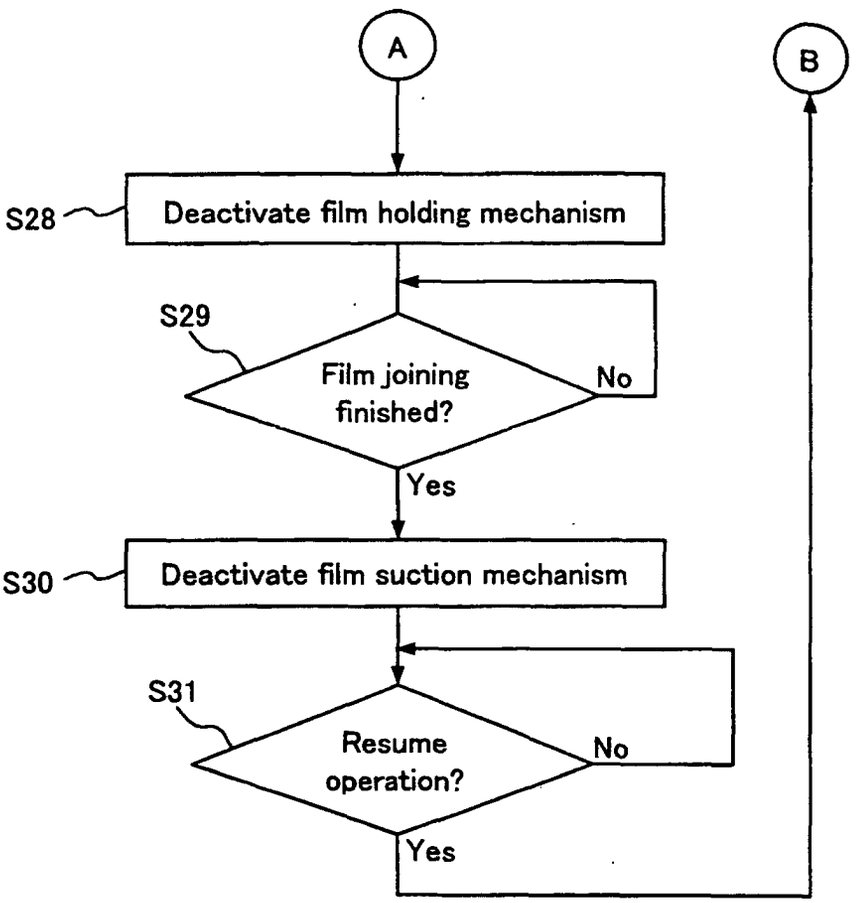

A
B
S28
Deactivate film holding mechanism
S29
Film joining finished?
No
Yes
S30
Deactivate film suction mechanism
S31
Resume operation?
No
Yes

Fig. 22

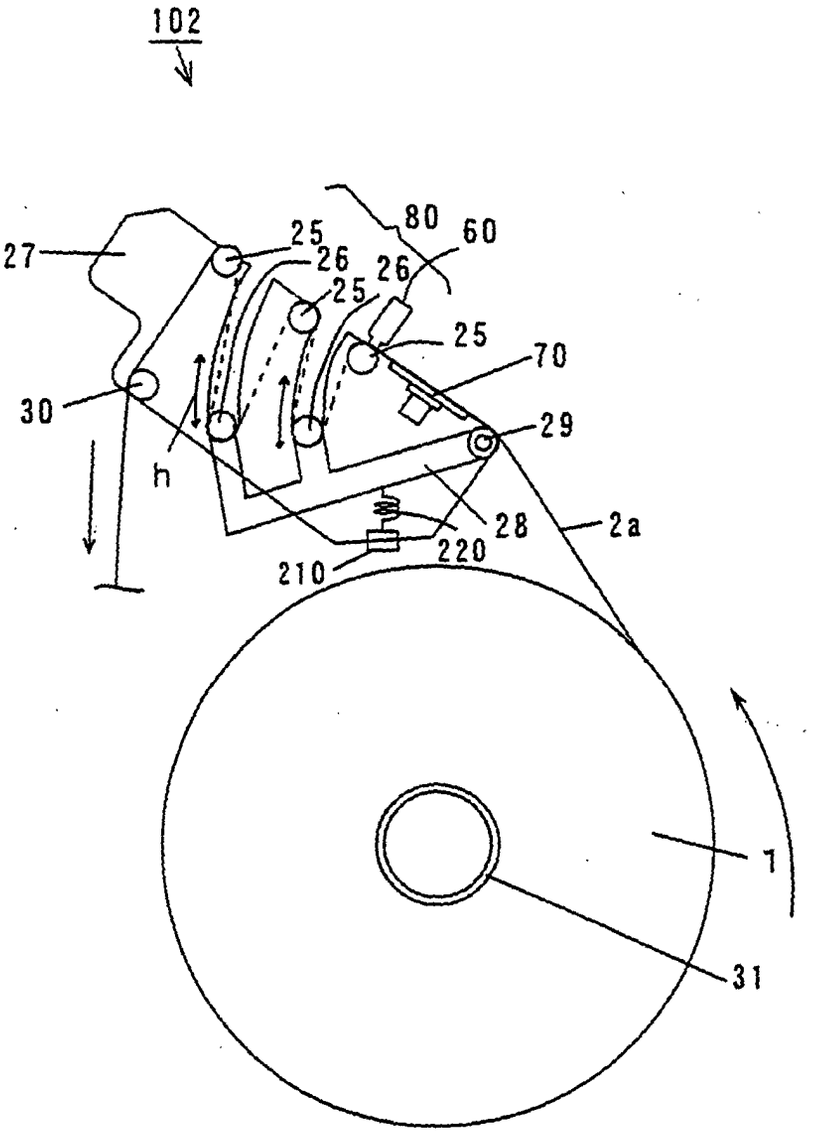


Fig. 23

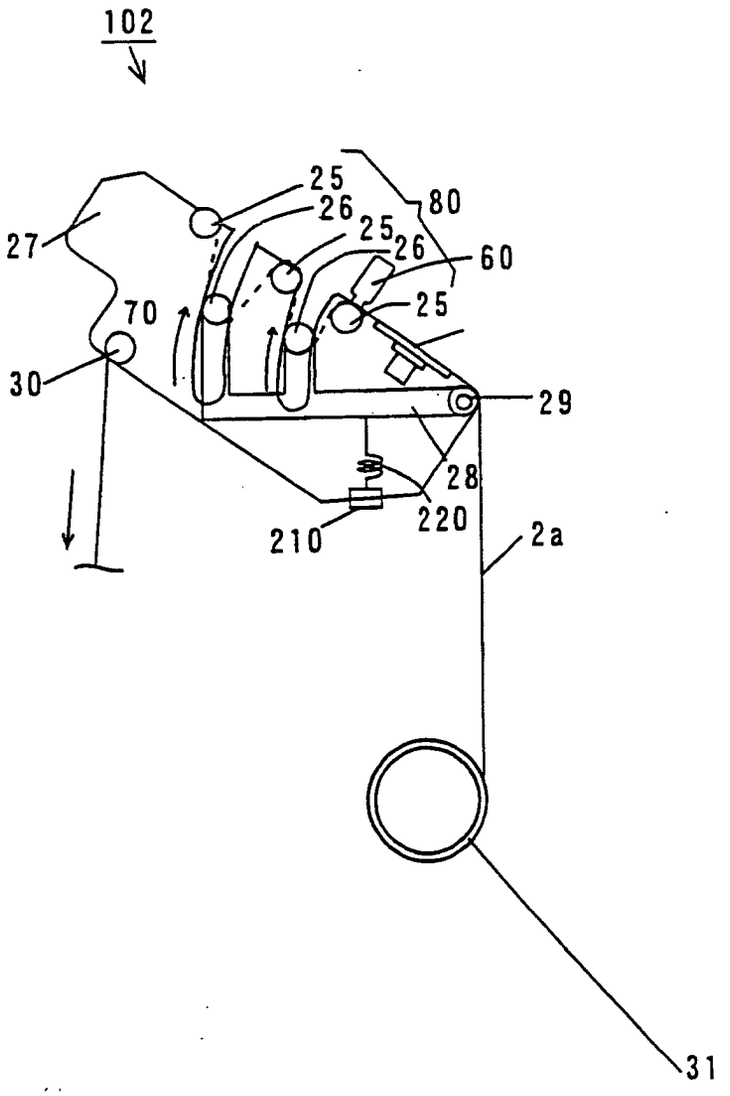


Fig. 24

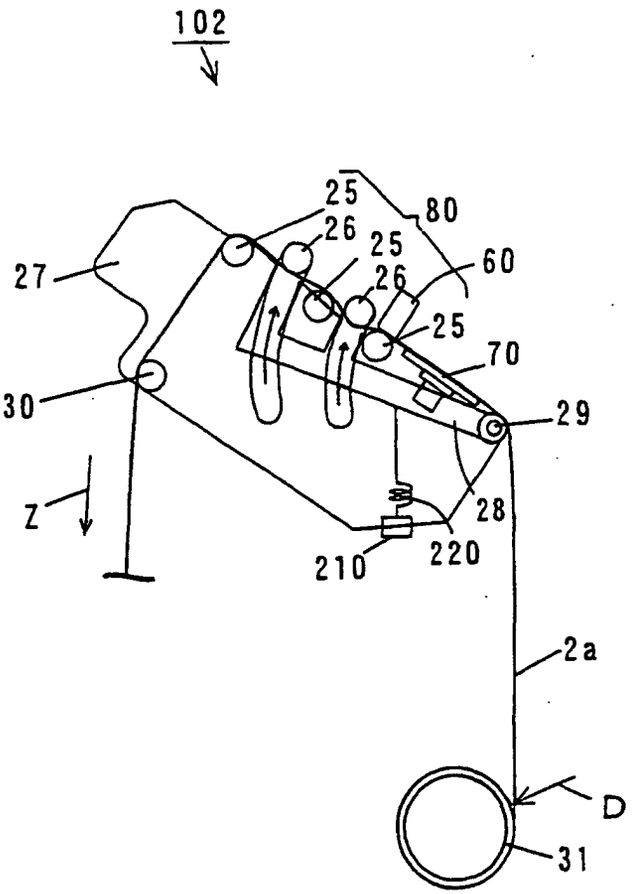


Fig. 25

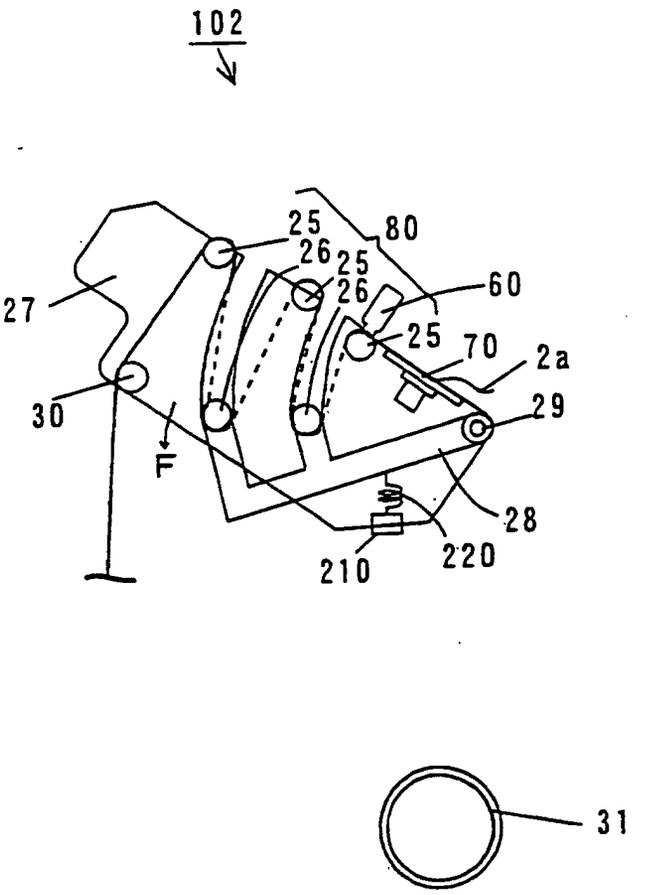
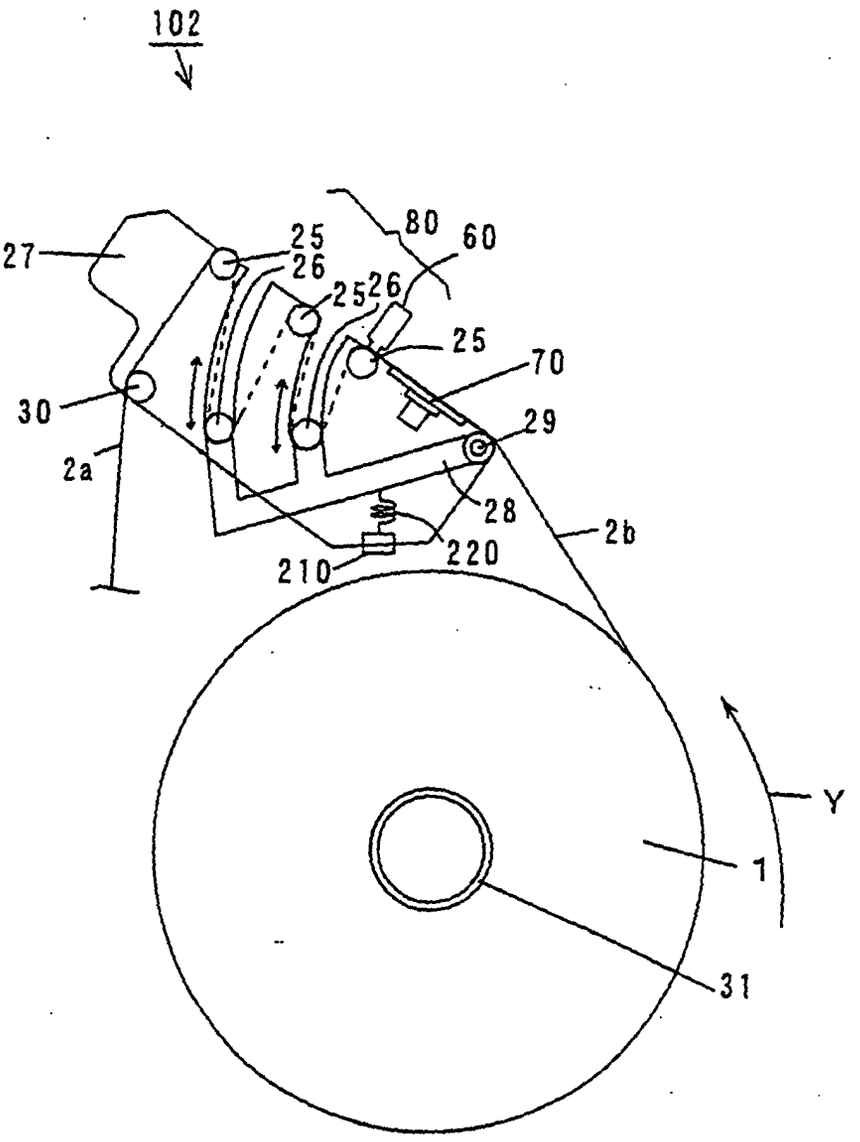


Fig. 26



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/05463

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B65B41/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] B65B41/12, B65H21/00-21/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1996 Jitsuyo Shinan Toroku Koho 1996-2002
Kokai Jitsuyo Shinan Koho 1971-2002 Toroku Jitsuyo Shinan Koho 1994-2002

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 2-163253 A (SIG Schweizerische Industrie-Gesellschaft), 22 June, 1990 (22.06.90), Fig. 1 & EP 365470 A1 & US 5045134 A	1-4 5,6 7-17
Y	JP 8-26222 A (Taisei Ramikku Kabushiki Kaisha), 30 January, 1996 (30.01.96), Fig. 1; Par. Nos. [0031] to [0032] (Family: none)	5,6

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance
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"O" document referring to an oral disclosure, use, exhibition or other means
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 August, 2002 (15.08.02)	27 August, 2002 (27.08.02)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)