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Banba

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[54] APPARATUS FOR REPLACING FULL CLOTH ROLL ON WEAVING MACHINE WITH EMPTY CLOTH ROLL

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[5] **D03D 49/20**

[52] **U.S. Cl.** ..... **139/1 R**; 139/291 C

[58] **Field of Search** ..... 242/58.3, 66, 56 R, 242/58, 58.1-58.5; 28/201, 208; 139/1 R, 291 R, 291 C

[56] **References Cited**

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Primary Examiner—Andrew M. Falik

Attorney, Agent, or Firm—Graybeal Jackson Haley & Johnson

[57] **ABSTRACT**

An apparatus for replacing a full cloth roll loaded on a pair of rollers of a weaving machine with an empty cloth roll, which apparatus includes a pair of oscillating members supported by the weaving machine to oscillate about an axis of a rod supported by the weaving machine and cylinders for having both the oscillating members to produce oscillating movement. Each oscillating member includes a contact portion exerting a pressing force to the full cloth roll to roll the full cloth roll while both the oscillating members are oscillating in one direction. Each oscillating member further includes a guide wall disposed behind the contact portion for catching the empty cloth roll in cooperation with the peripheral surface of the textile of the full cloth roll, and for directing, during the oscillating movement of both the oscillating members, the empty cloth roll to the upper position right above both the rollers in cooperation with the peripheral surface of the textile of the full cloth roll.

3 Claims, 11 Drawing Sheets

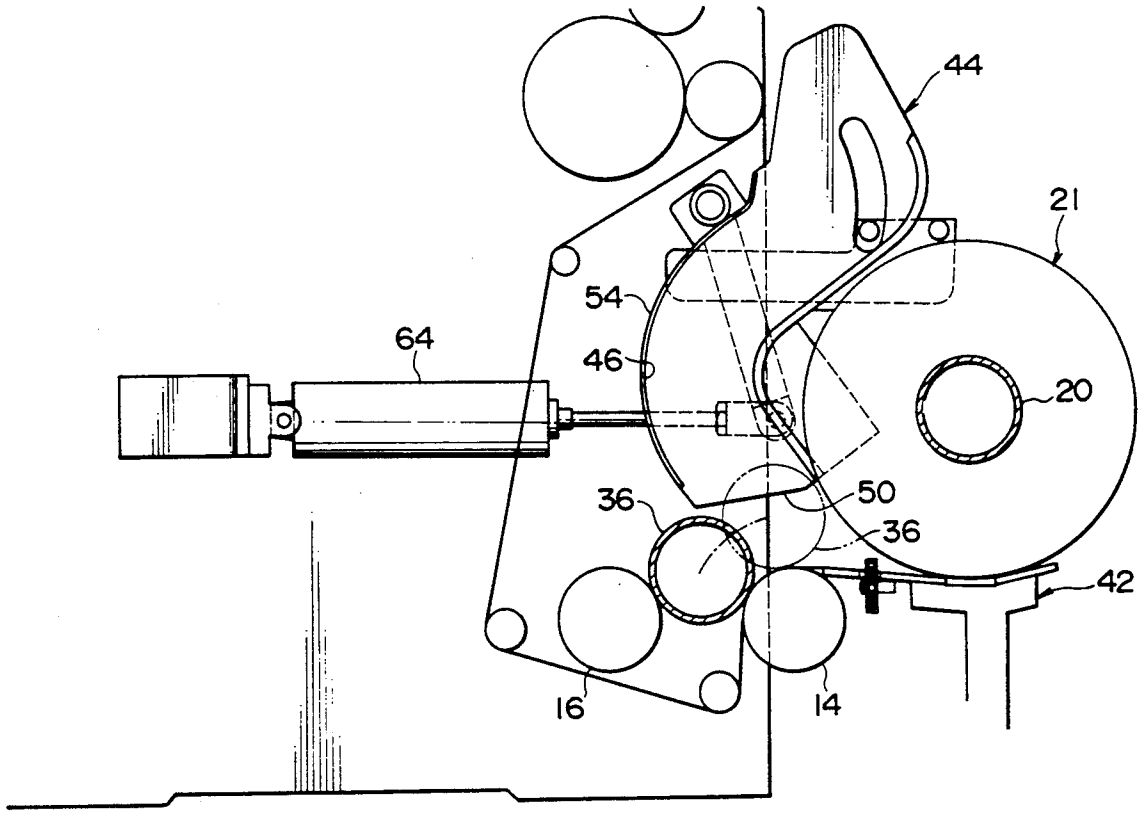
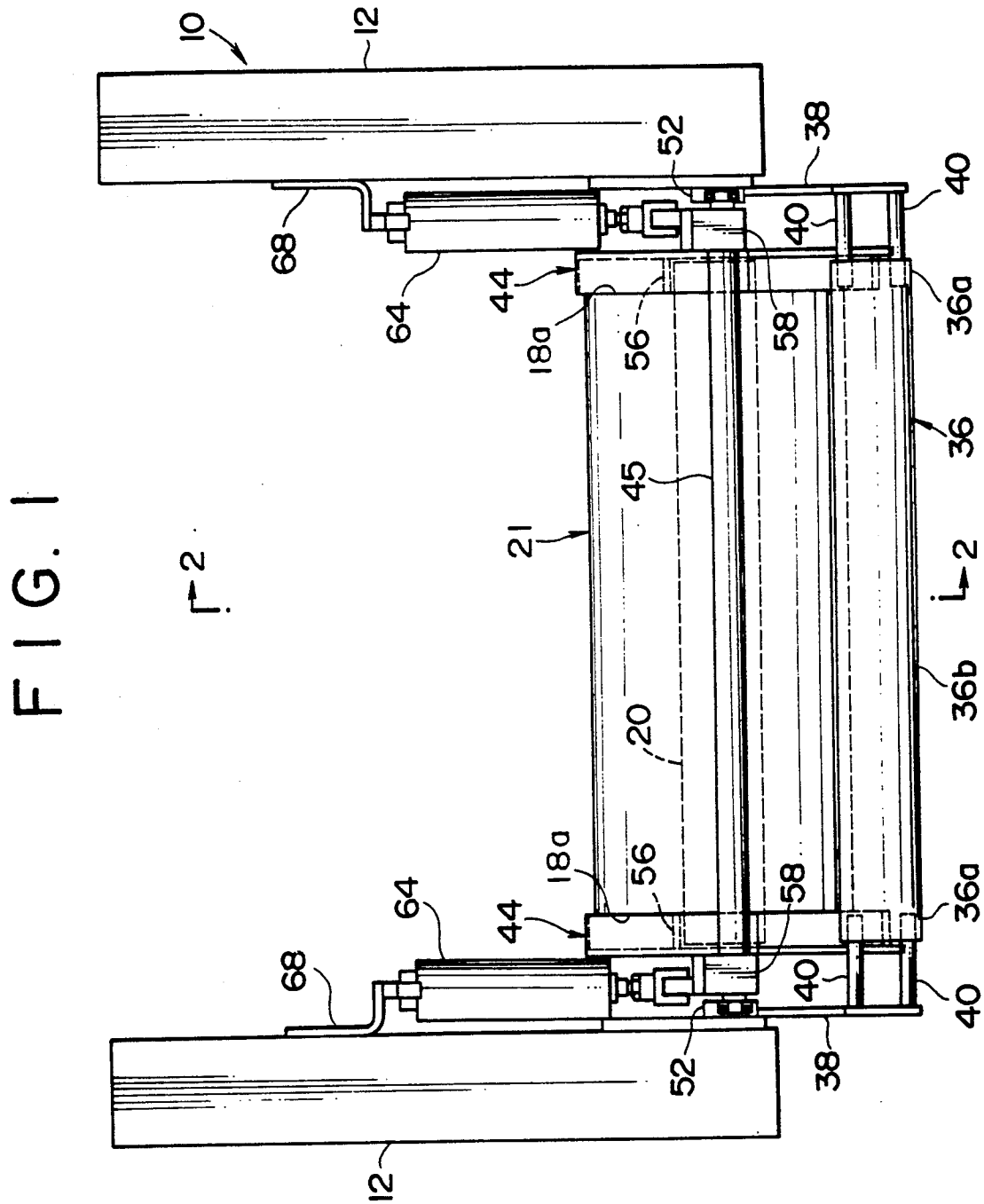


FIG. 1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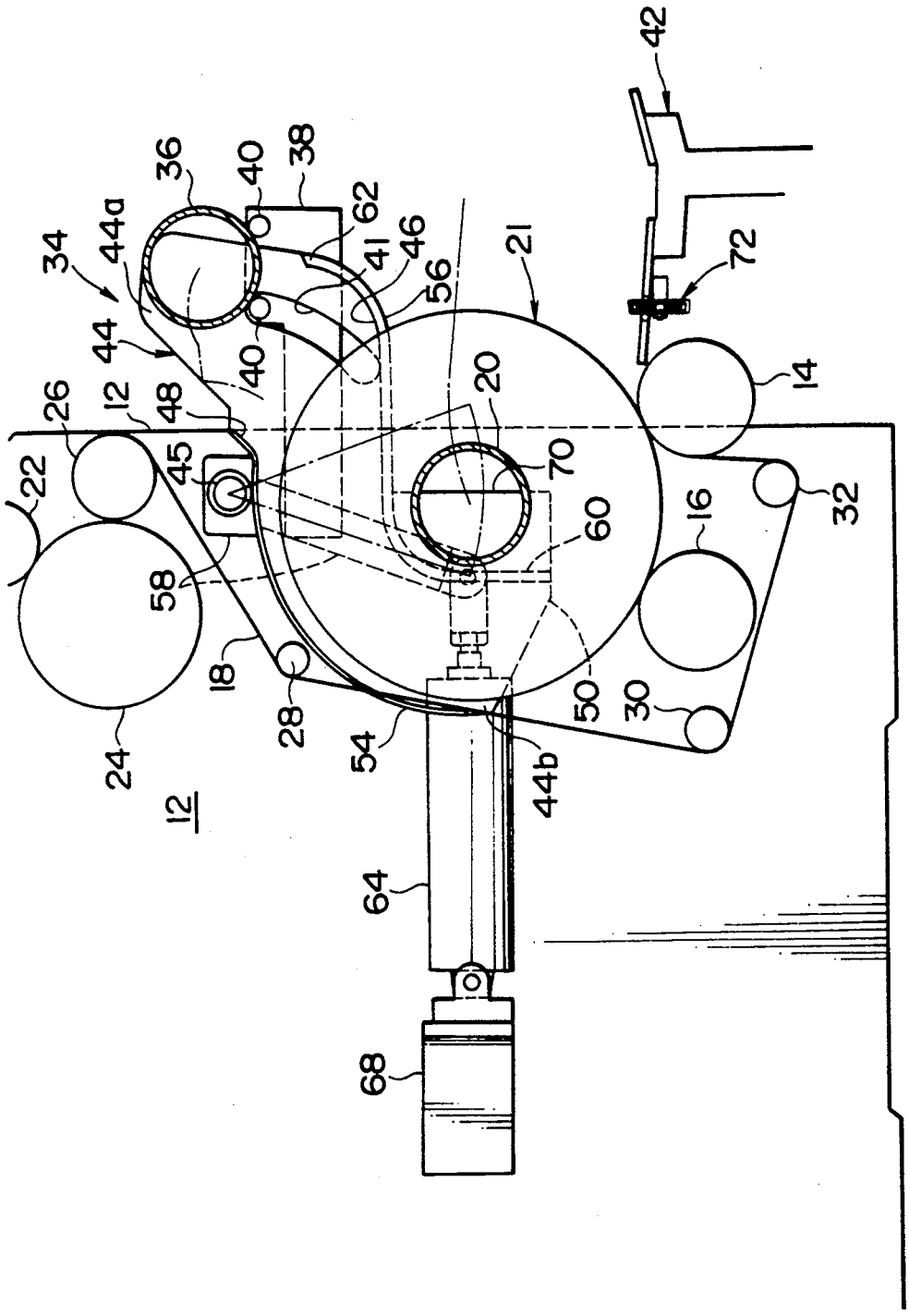
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FIG. 2

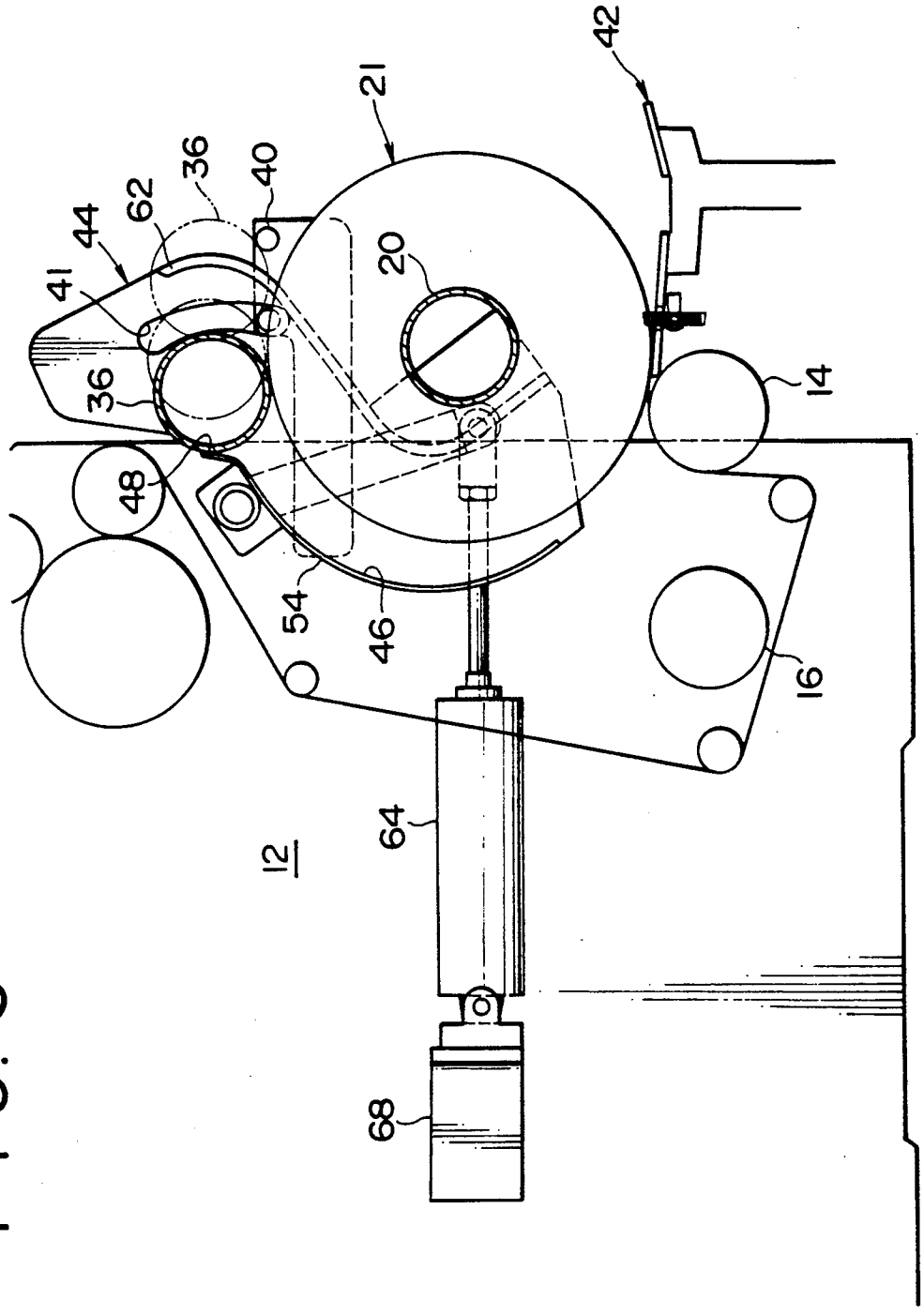

FIG. 3

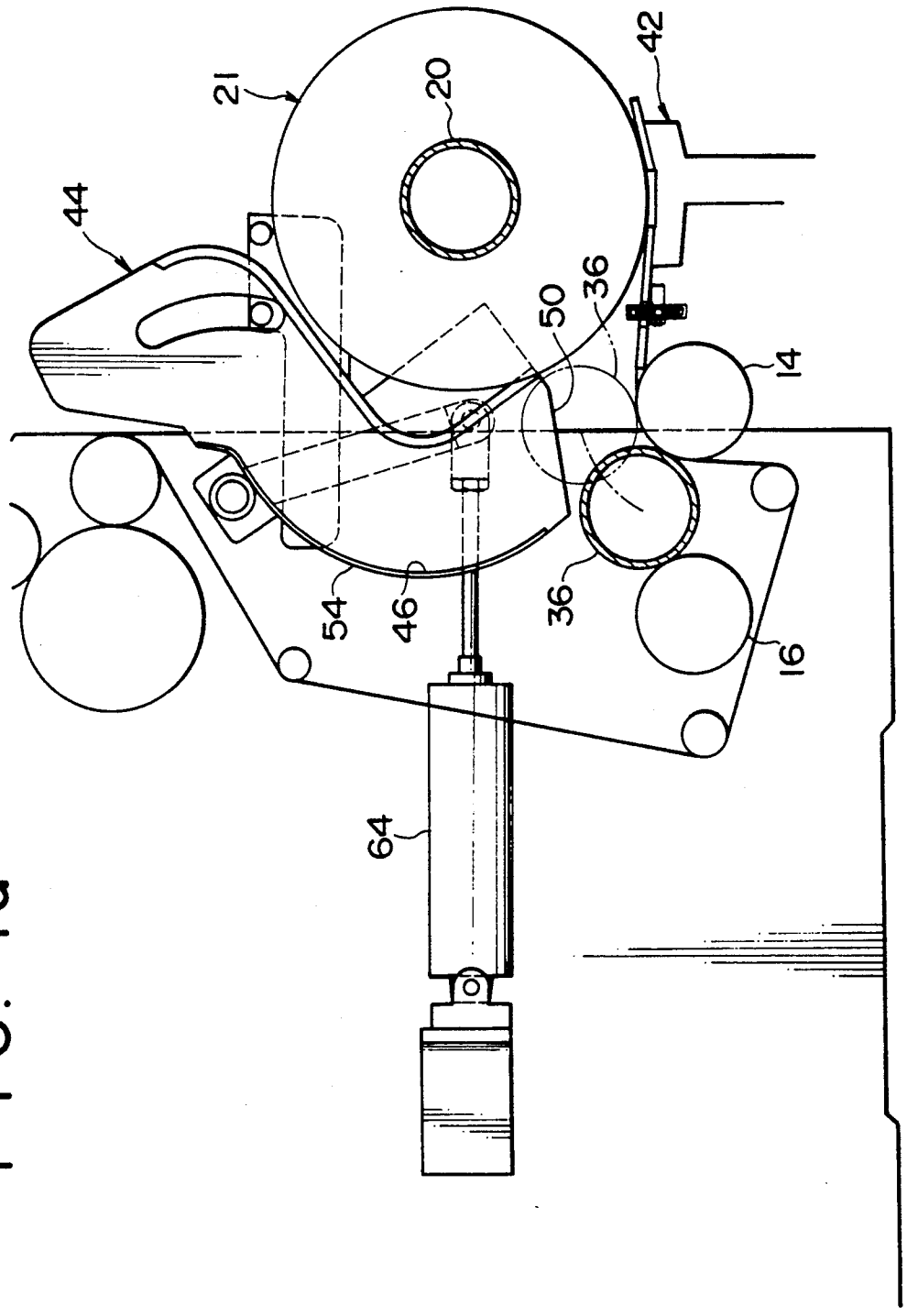

FIG. 4a

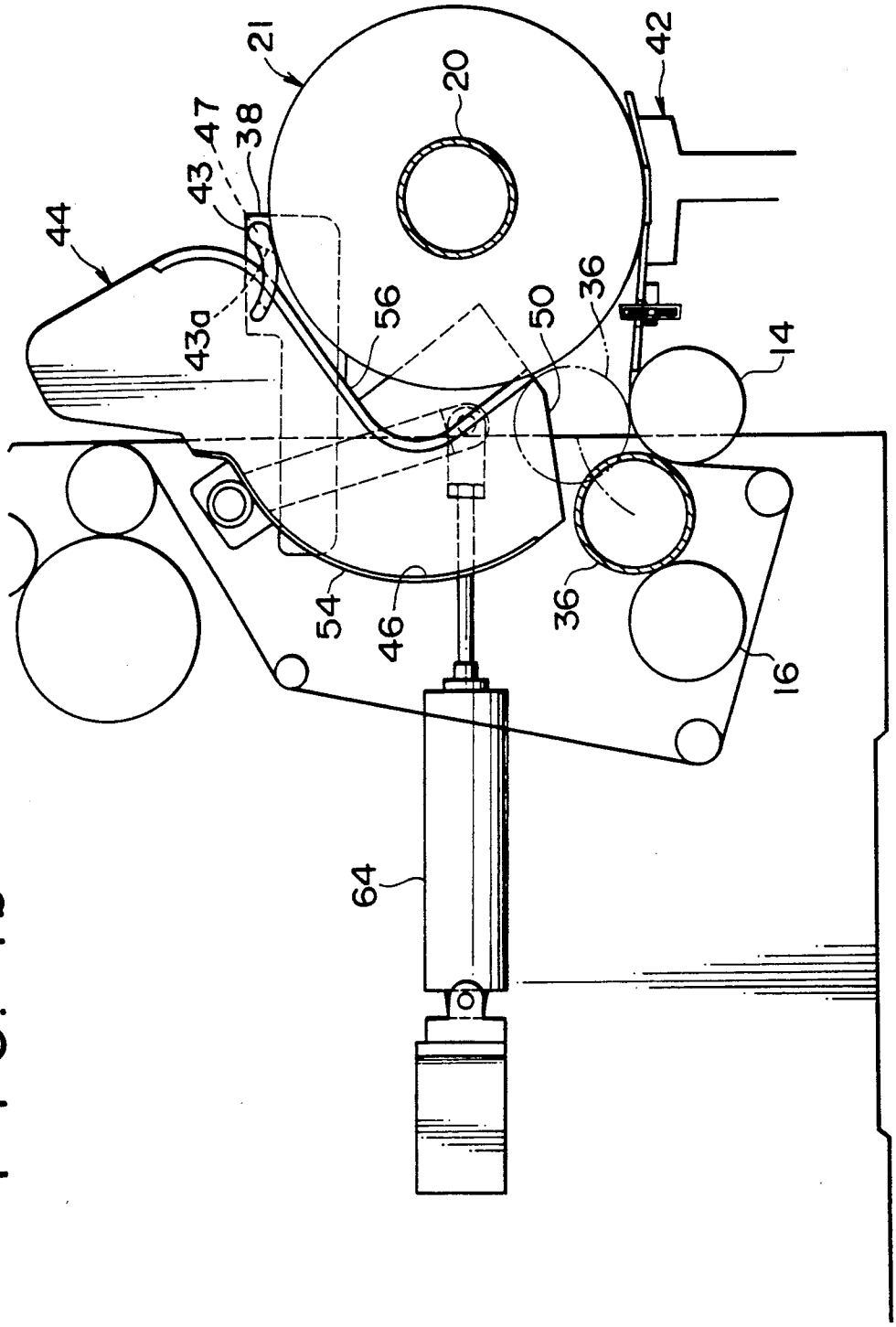

FIG. 4b

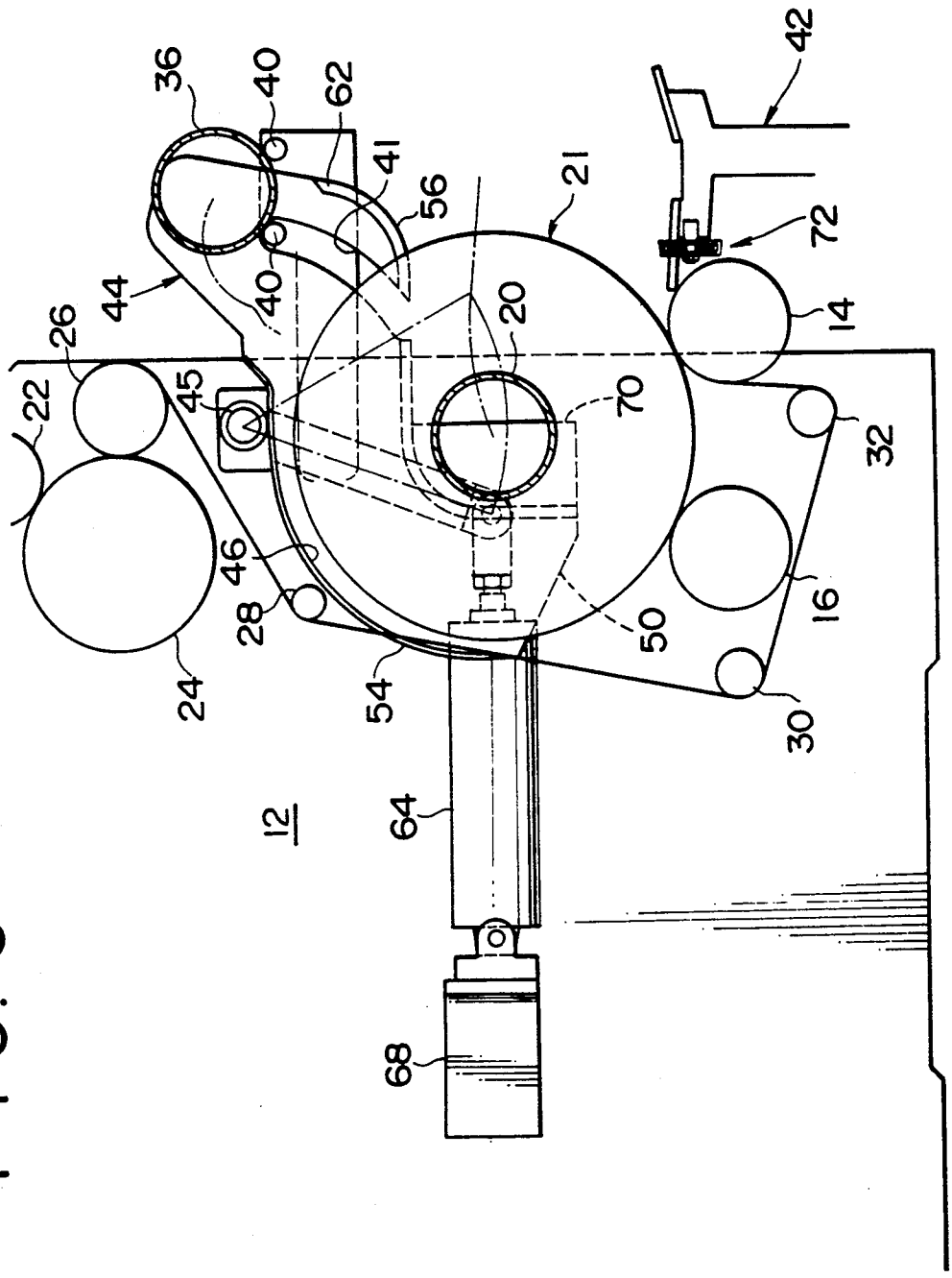
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FIG. 5

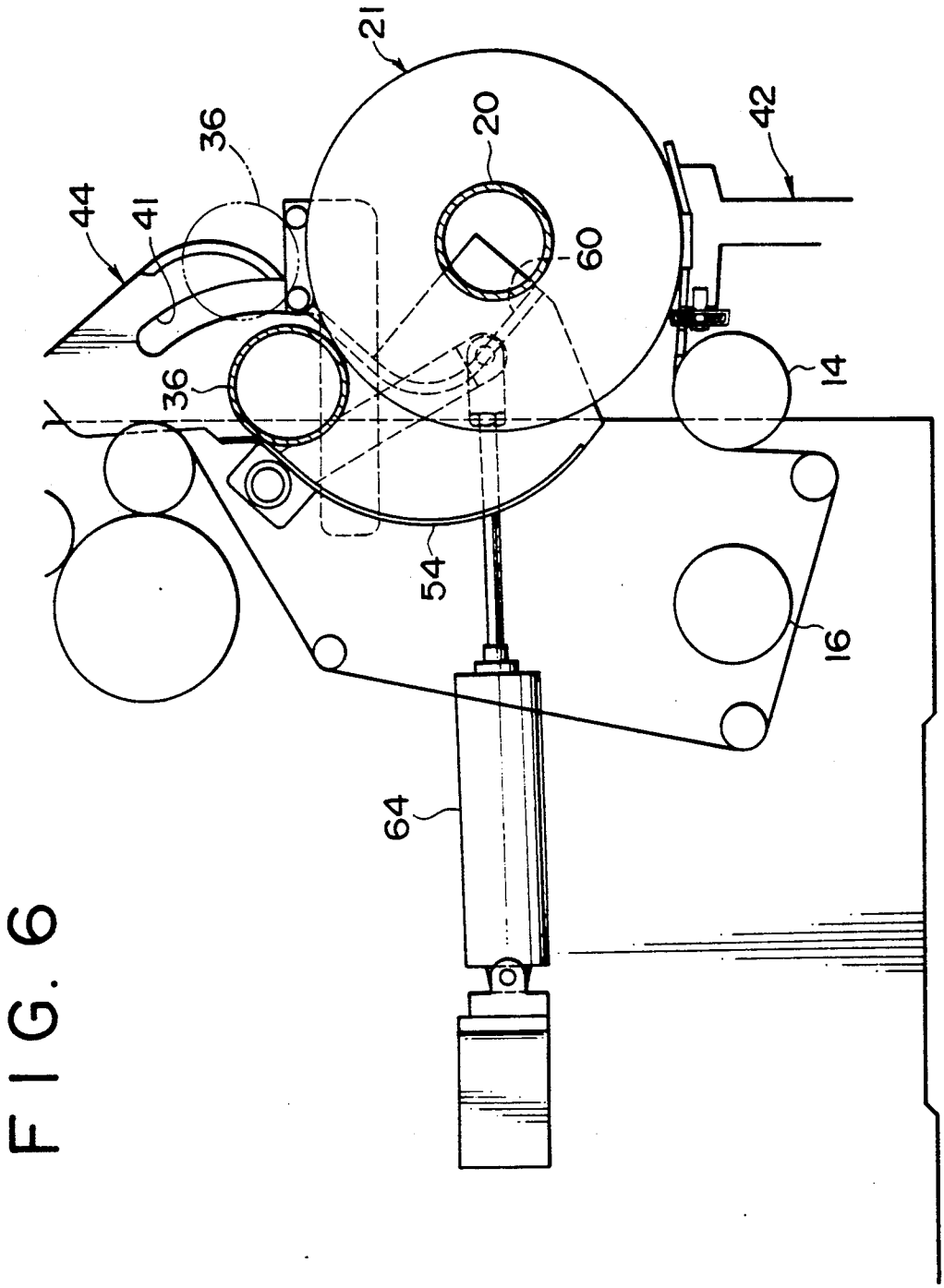

FIG. 6

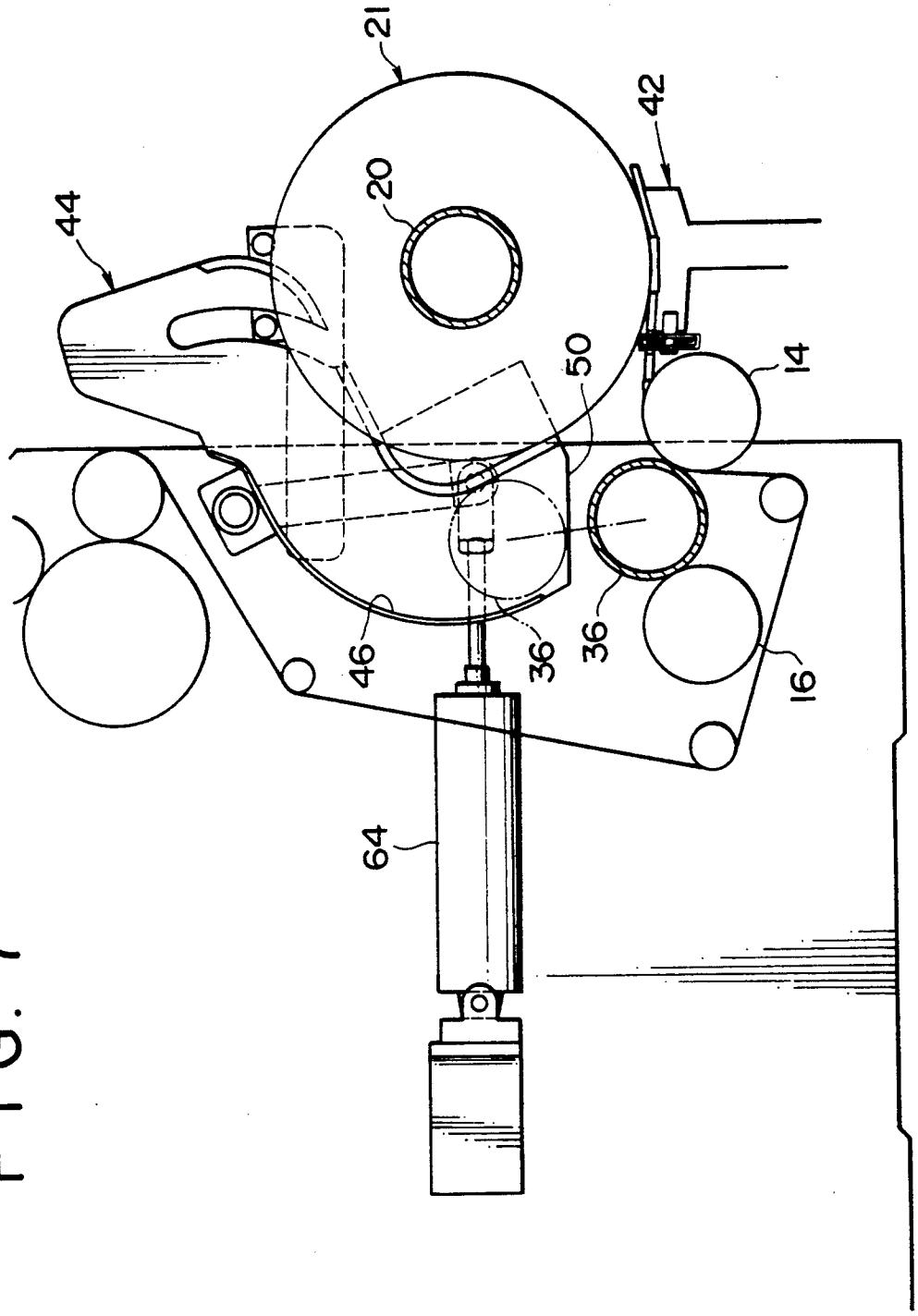

FIG. 7

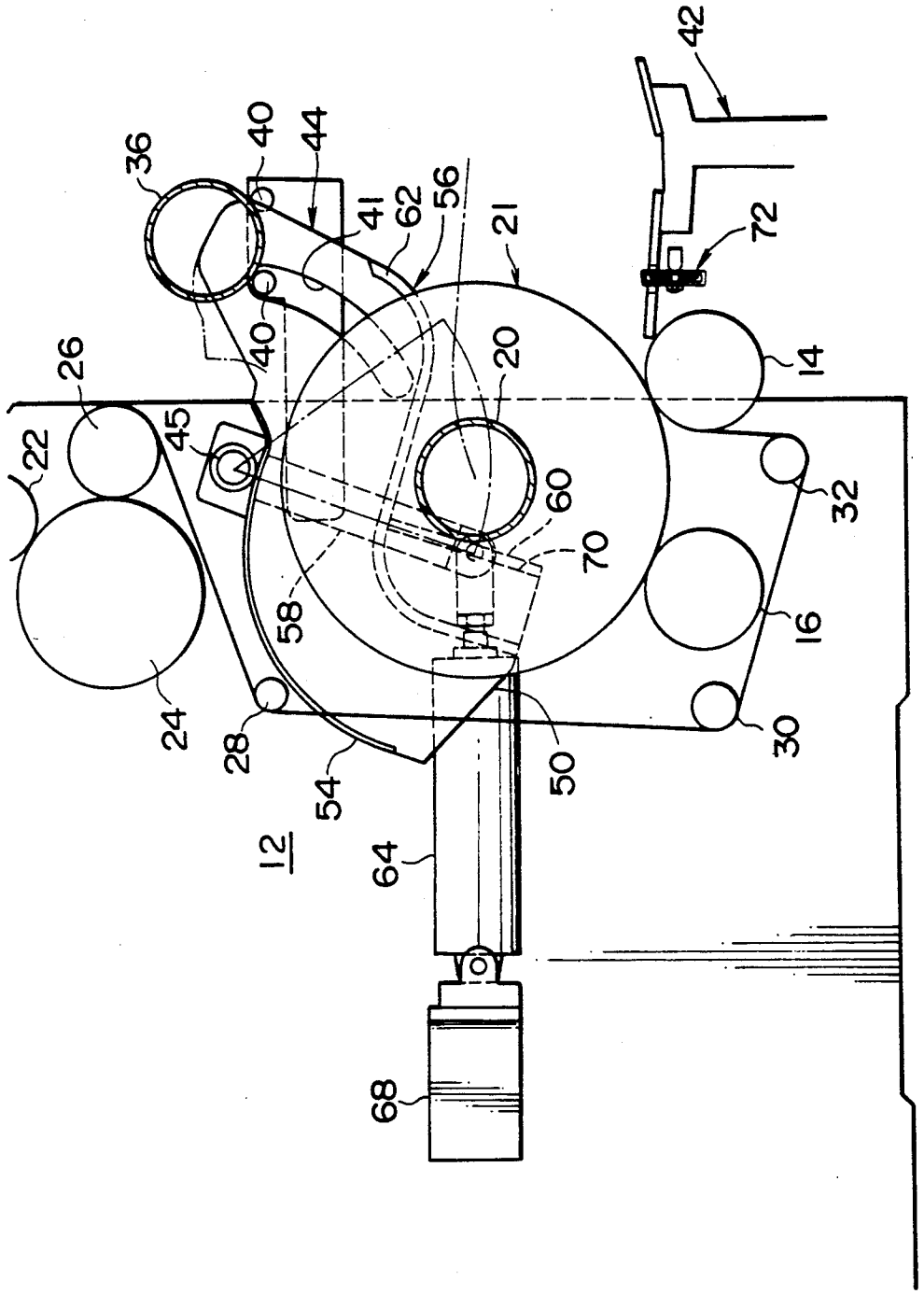
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FIG. 8

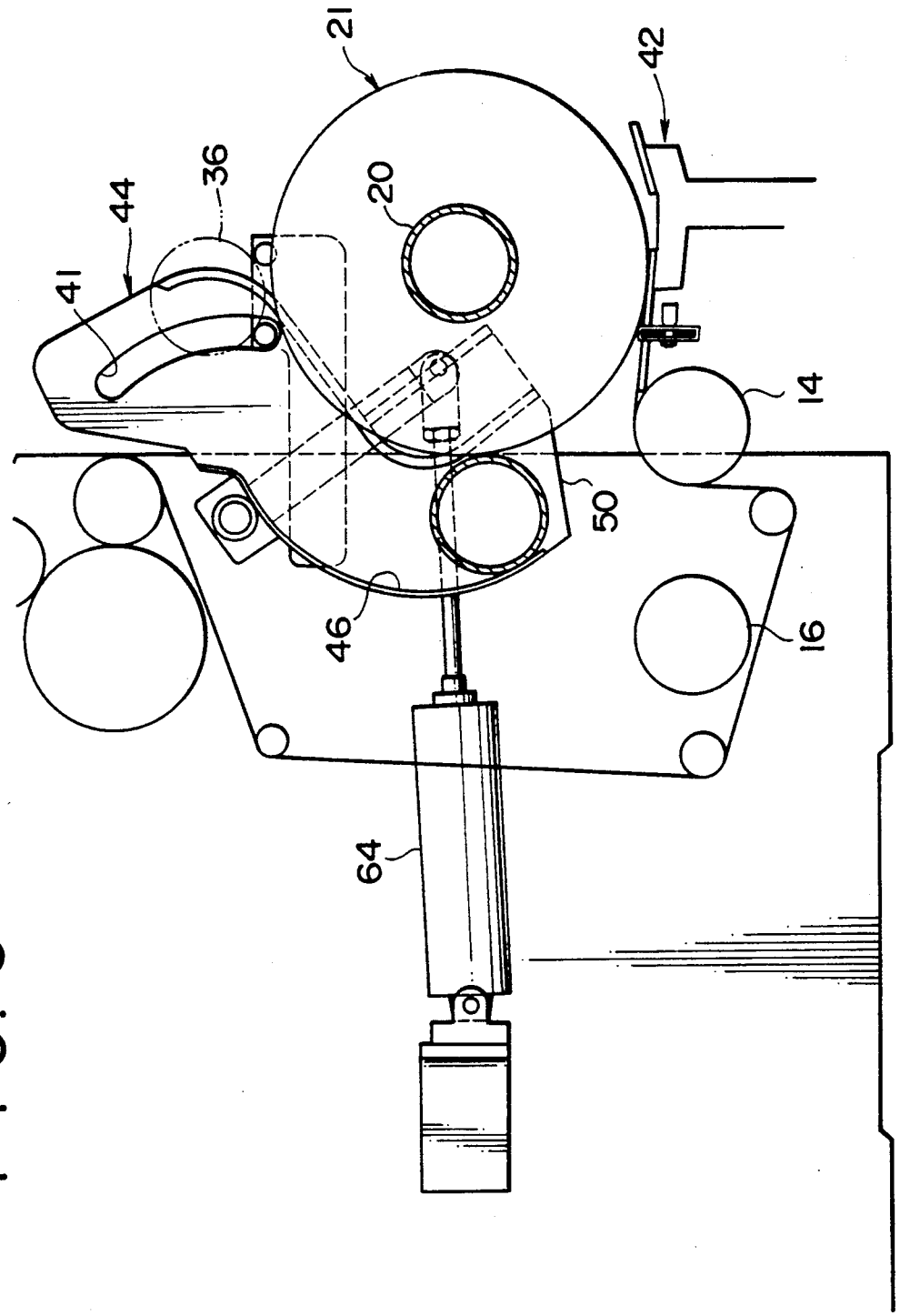

FIG. 9

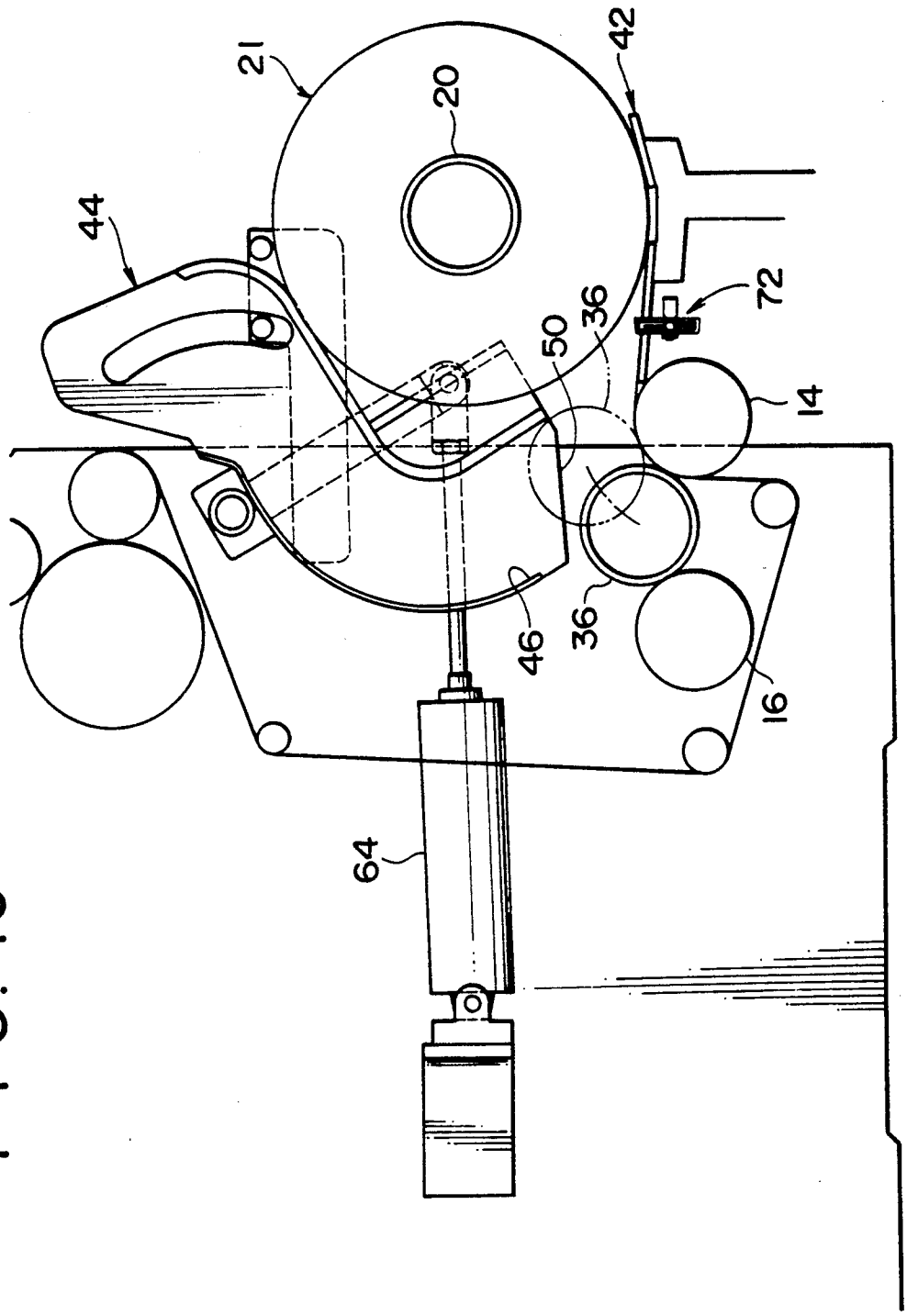

FIG. 10

APPARATUS FOR REPLACING FULL CLOTH ROLL ON WEAVING MACHINE WITH EMPTY CLOTH ROLL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an exchange apparatus for exchanging a full cloth roll with a textile wound thereabout for an empty cloth roll.

2. Description of the Prior Art

There is such a weaving machine as provided in its lower position with an exchange apparatus for exchanging a full cloth roll loaded on a pair of rollers for an empty cloth roll disposed at its upper position (See Japanese Patent Public Disclosure (KOKAI) No. 1-97241 and U.S. Pat. No. 5,063,970).

These exchange apparatuses consist of a reciprocating member for exerting pressing force to both end portions of the full cloth roll on the pair of rollers to deliver the full cloth roll onto a receiving table in front of the weaving machine, and a carrying device for carrying the empty cloth roll from a neighborhood of the position where the empty cloth roll is disposed to a neighborhood above the pair of rollers and then releasing the carried empty cloth roll onto the rollers.

The carrying device described in Japanese Patent Public Disclosure No. 1-97241 consists of a pair of elevating members each having an opening capable of receiving each end portion of the empty cloth roll, and a vertical guide covering the opening during elevating movement of the elevating member. After receiving in its opening the end portion of the empty cloth roll released from the position where the empty cloth roll is disposed at the highest position that the opening of the elevating member is not covered by the vertical guide, the elevating member descends down to the lowest position. During its descent, the each end portion of the empty cloth roll is held by the elevating member, since the opening of the elevating member is covered by the vertical guide. When the opening of the elevating member reaches the lowest position that the opening is not covered by the vertical guide, the empty cloth roll rolls down at a low speed onto the pair of rollers after the end portion thereof passes through the opening.

Also, the carrying device described in U.S. Pat. No. 5,063,970 consists of a damper arm which has one end portion supported oscillatably and provided with a receiving board for loading the empty cloth roll and which oscillates due to the empty weight of the empty cloth roll when the empty cloth roll is loaded on the receiving board, and a cam member fixed on a reciprocating (oscillating) member for regulating the oscillating movement of the damper arm.

When the oscillating member is oscillated forward and the full cloth roll is delivered onto the receiving table, the empty cloth roll released from its loading position is received for the time being by the receiving board of the damper arm waiting in the upper position. Though the damper arm which received the empty cloth roll would oscillate due to the empty weight of the empty cloth roll, the oscillating movement is prevented by the cam member of the oscillating member in the course of moving forward. Subsequently, when the oscillating member is oscillated in the opposite direction, the damper arm gradually oscillates along the cam surface, and when the cloth roll also gradually descends and reaches a neighborhood of the pair of rollers, the inclination of the receiving board becomes steep, so that the empty cloth roll drops from the receiving board onto the pair of rollers.

The vertical guide of the carrying device described in Japanese Patent Public Disclosure No. 1-97241is also used as the reciprocating member for delivering the full cloth roll, but it is difficult to make the exchange apparatus compact, because of the necessity for the elevating member and its drive member.

Also, in the carrying device described in U.S. Pat. No. 5,063,970, the damper arm is made to oscillate by the empty weight of the empty cloth roll because it dispenses with a drive member specific to drive the damper arm. However, since no measures are taken to prevent the empty cloth roll from falling down from the receiving board, it has such a defect as to fall down by vibration or the like before reaching a position right above the pair of rollers. Further, it requires a space for disposing the damper arm, besides that for disposing the oscillating member.

SUMMARY OF THE INVENTION

An object of the present invention is to provide, in light of the defects of foregoing prior art apparatuses, an apparatus for dropping an empty cloth roll surely on a pair of rollers, without taking a space, by sharing a drive member between a carrying device and an oscillating member.

The apparatus of the present invention can move the empty cloth roll slowly toward the pair of rollers, utilizing the peripheral surface of a textile on the full cloth roll delivered onto the receiving table and the guide walls of the oscillating members as the guides.

When released from its location, the empty cloth roll is caught by the peripheral surface of the textile and the guide walls. By oscillating the oscillating members and rolling the full cloth roll from above the pair of rollers, the peripheral surface of the textile on the full cloth roll and the guide walls in cooperation with each other direct the empty cloth roll downward and release it onto the pair of rollers during or after rolling of the full cloth roll. The distance between the extension of the peripheral surface of the textile on the full cloth roll and the guide walls of the oscillating members is preferably set to gradually decrease downward.

Thus, the empty cloth roll is bound by the guide walls of the oscillating members and the peripheral surface of the textile on the full cloth roll until positioned on the pair of rollers, so that delivery of the empty cloth roll onto the pair of rollers is ensured.

According to the present invention, the pair of oscillating members act for both guiding the empty cloth roll and pressing the full cloth roll. As a result, the structure of the exchange apparatus is simple and compact on the whole, compared with the prior art apparatuses in which the two pairs of members are made to take both such actions respectively.

It is possible to direct the empty cloth roll from its support position to the gap between the guide walls of the oscillating members and the peripheral surface of the textile on the full cloth roll, by providing in the oscillating members a push-up portion for exerting a push-up force to the end portions of the empty cloth roll disposed in an upper position during oscillating.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects and features of the invention will become apparent from the following description of preferred embodiments of the invention with reference to the accompanying drawings, in which:

FIG. **1** is a schematic plan view showing a cloth roll exchange apparatus as a preferred embodiment of the present invention;

FIG. **2** is a vertical sectional view taken along a line **2**—**2** in FIG. **1** where hatching for a roller and a shaft member is omitted for simplicity;

FIG. **3** is a vertical sectional view showing the cloth roll exchange apparatus shown in FIG. **1** under the condition that a full cloth roll arrives at the rear end of a receiving table;

FIG. **4***a* is a vertical sectional view showing the cloth roll exchange apparatus shown in FIG. **1** under the condition that the full cloth roll arrives at the center of the receiving table;

FIG. **4***b* is a vertical sectional view similar to FIG. **4***a*, showing a cloth roll exchange apparatus under the condition that an empty cloth roll is supported by a receiving member, not by pins.

FIG. **5** is a vertical sectional view showing a partially modified cloth roll exchange apparatus under the condition that a full cloth roll is positioned on a pair of rollers as another preferred embodiment of the present invention;

FIG. **6** is a vertical sectional view showing the cloth roll exchange apparatus shown in FIG. **5** under the condition that the full cloth roll arrives at the center of the receiving table;

FIG. **7** is a vertical sectional view showing the cloth roll exchange apparatus shown in FIG. **5** under the condition that the oscillating member is oscillated in the reverse direction;

FIG. **8** is a vertical sectional view showing a partially modified cloth roll exchange apparatus under the condition that a full cloth roll is positioned on a pair of rollers as a further preferred embodiment of the present invention;

FIG. **9** is a vertical sectional view showing the cloth roll exchange apparatus shown in FIG. **8** immediately before the full cloth roll arrives at the center of a receiving table; and

FIG. **10** is a vertical sectional view showing the cloth roll exchange apparatus shown in FIG. **8** under the condition that the full cloth roll arrives at the center of the receiving table.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. **1** and **2**, numeral **10** indicates a weaving machine and a pair of parallel rollers **14** and **16** are provided at an interval in the longitudinal direction and rotatably supported to the lower portion of a pair of mutually parallel frames **12** which define the front portion (right side in FIG. **2**) of the weaving machine **10**.

A cloth roll **20** rolled with a textile **18** woven by a weaving portion (not shown) at the rear portion (left side in FIG. **2**) of the weaving machine **10** is loaded on both rollers **14** and **16** in parallel to both rollers **14** and **16**. At least one of both rollers **14** and **16** is driven and rotated around its axis to rotate the cloth roll **20** loaded on both rollers. The textile **18** circulating in turn around a plurality of other rollers **22** through **32** and the roller **14** which are rotatably supported by both frames **12** is rolled up by the rotating cloth roll **20**.

A cloth roll **21**, i.e., a full cloth roll, rolling up the textile **18** having a predetermined length around the cloth roll **20** is exchanged with an empty cloth roll **36**, which is a new cloth roll with no textile wound therearound, through an exchange apparatus **34** described later.

The empty cloth roll **36** is provided at a position above the full cloth roll **21** and in parallel to the full cloth roll. In more detail, the empty cloth roll **36** is loaded on two pairs of pins **40** at both ends thereof. The two pairs of pins **40** extend in parallel to the rollers **14** and **16** and are supported in a cantilever fashion by a pair of arms **38** extending forwardly from the front ends of both frames **12**.

The exchange of the cloth roll is carried out by transferring the full cloth roll **21** from a pair of rollers **14** and **16** to a receiving table **42** provided in front of the weaving machine **10** and by loading the empty cloth roll **36** on both rollers **14** and **16**. The receiving table **42** is located at a position in close proximity to the front roller **14**.

The cloth roll exchange apparatus **34** comprises a pair of oscillating members **44**. Each oscillating member **44** is fixed in the neighborhood of each end of the rod **45** extending in parallel to both rollers **14**, **16** rotatably supported by both frames **12**, and thereby each oscillating member **44** is oscillatably supported by each frame **12**. When both oscillating members **44** are oscillated around the axis of the rod **45** as described in detail later, the full cloth roll **21** is transferred toward the receiving table **42** and the empty cloth roll **36** is guided onto a pair of rollers **14** and **16**.

Each illustrated oscillating member **44** extends so as to be curved in a S-letter shape as a whole, and in FIG. **2**, one end (upper end) **44***a* of each oscillating member partially faces the end face of the empty cloth roll **36**. One of each pair of pins **40** for supporting the empty cloth roll **36** is provided in front of the upper end **44***a* of the oscillating member **44**, and the other pin is passed through an arcuate slot **41** provided with the upper end **44***a* of the oscillating member **44**. When pressing force is exerted rearward to the empty cloth roll **36**, the empty cloth roll **36** can be dropped toward the other end (lower end) **44***b* of the oscillating member **44**.

The lower end **44***b* of the oscillating member is provided at the rear of the cloth roll **20** and located above the roller **16**, as shown in FIG. **2**.

Both oscillating members **44** have respectively guide grooves **46** for guiding the empty cloth roll **36**, and both guide grooves **46** are opened to face each other. Each guide groove **46** extends along a portion of each oscillating member in a curved form from the upper end **44***a* and terminates at the lower end **44***b* of the oscillating member.

Each guide groove **46** has a width slightly larger than the outer diameter of the empty cloth roll **36***a*, and includes an upper end **48** for accepting each end **36***a* of the empty cloth roll **36** and a lower end **50** for permitting the release of each end **36***a* of the empty cloth roll. When the oscillating member **44** is oscillated counterclockwise in FIG. **2**, the lower end **50** of the guide groove **46** is moved from the upper position of the roller **16** to the upper position of the roller **14** so as to cross over these rollers.

When the empty cloth roll **36** is dropped from both pins **40**, the guide groove **46** partially faces to the upper portion of the end face (selvage) **18***a* of the textile of the full cloth roll **20** on a pair of rollers **14** and **16**. From this reason, the distance between the extension of the peripheral surface of the textile on the cloth roll **20** in the axial direction and an upper wall **54** (described later) defining the guide groove **46** is smaller than the outer diameter of the empty cloth roll **36**. Therefore, when the empty cloth roll **36** is dropped from both pins **40**, the empty cloth roll **36** is brought into contact at its both ends **36***a* with the upper walls **54** and at its intermediate portion **36***b* between both ends **36***a* of the empty cloth roll with the peripheral surface (textile surface) of the full cloth roll **21**, thereby the empty cloth roll **36** is supported.

The rod **45** defining the oscillating axis of each oscillating member **44** is located above the full cloth roll **21**. The axis of the rod **45** is positioned slightly ahead of the axis of the full cloth roll **21**. Both ends of the rod **45** are rotatably supported by both frames **12** through a pair of bearings **52**.

The rod **45** passes through an end of a lever **58** fixed to the upper wall (the first guide wall) **54** out of a pair of upper and lower walls **54** and **56** defining the guide groove **46** and is fixed to the end of the lever **58**. The lever **58** crosses over approximately at the center of the oscillating member **44** in the extending direction and extends downward.

In the illustrated embodiment, the upper wall **54** defining the guide groove **46** has a portion curved at the curvature approximately equal to the curvature of the outermost periphery of the textile **18** on the full cloth roll **21**, and the lower wall (the second guide wall) **56** has a portion curved at the curvature approximately equal to the curvature of the cloth roll **20**.

Each oscillating member **44** has a contact portion **60** capable of contacting each end of the cloth roll **20**. In the illustrated embodiment, the lower end of the lower wall **56** defining the guide groove **46** defines the contact portion **60**. When the cloth roll **20** is placed on a pair of rollers **14** and **16** ready to be wound, the contact portion **60** is maintained in a non-contact state relative to each end of the cloth roll **20** so as prevent any disturbance of the rotation of the cloth roll **20**. Furthermore, the upper end of the lower wall **56** defines a push-up portion **62** for exerting push-up force to the end **36***a* of the empty cloth roll **36** when the oscillating member **44** is oscillated counterclockwise.

Drive means, i.e., an air cylinder in the illustrated embodiment is provided to allow each oscillating member **44** to do the oscillating movement. Each air cylinder **64** extends in the longitudinal direction and one end thereof (front end) is pivoted to the lower end of the lever **58**, and the other end (rear end) is pivoted oscillatably to the weaving machine **10** through a pivotal bracket **68**.

When the air cylinder **64** is operated to extend so as to oscillate the oscillating member **44** counterclockwise together with the lever **58** from the condition shown in FIG. **2**, the contact portion **60** of each oscillating member contacts each end of the cloth roll **20** to exert a pressing force to the cloth roll **20**, and causes the full cloth roll to roll toward the receiving table **42** (FIGS. **3** and **4***a*). The resulting rolling locus is shown by one-dotted chain line. On the other hand, the push-up portion **62** during the oscillating movement counterclockwise strikes against each end of the empty cloth roll **36** through the gap between a pair of pins **40**. Incidentally, since the slot **41** is of a circular shape with the rod **45** as its center, the pin **40** in the rearward does not hinder this oscillating movement. As a result, the empty cloth roll **36** is rolled and dropped from two pairs of pins **40**, and each end **36***a* enters the guide groove **46** of each oscillating member **44** from its upper end **48**. The resulting locus of the axis of the empty cloth roll **36** during this time is shown by one-dotted chain line.

As shown in FIG. **3**, the oscillating movement of the oscillating member **44** is carried out until the full cloth roll **21** is loaded on the rear end of the receiving table **42**. In the illustrated embodiment, since the rear end of the receiving table **42** descends forward, the full cloth roll **21** subsequently rolls forwardly on the receiving table **42** to the center portion of the receiving table **42**. As described above, the oscillating range of the oscillating member **44**, a part of the movement locus of the empty cloth roll **36** and the movement locus of the full cloth roll **21** are shown by one-dotted chain lines in FIG. **2**, respectively.

While the full cloth roll **21** is moved to the center portion of the receiving table **42**, the distance between the extension of the peripheral surface of the full cloth roll **21** in the axial direction and the upper wall **54** of the oscillating member is gradually increased. Therefore, each end **36***a* of the empty cloth roll **36** is slowly descended within the guide groove **46** of each oscillating member **44**, while the intermediate portion **36***b* of the empty cloth roll **36** contacts the peripheral surface of the full cloth roll, i.e., the surface of the textile.

As shown in FIG. **4***a*, when the full cloth roll **21** reaches the center of the receiving table **42**, the distance between the extension of the peripheral surface of the textile **18** on the cloth roll and the upper wall **54** defining the guide groove **46** becomes larger than the outer diameters of the empty cloth roll **36**. As a result, the end **36***a* of the empty cloth roll **36** is released from the lower end **50** of the guide groove **46**, and the empty cloth roll **36** is dropped onto the front roller **14**. Subsequently, the empty cloth roll is moved to the gap between both rollers **14** and **16**. Thereafter, the air cylinder **64** is operated to shorten, and the oscillating member **44** is oscillated clockwise (in the other direction) to return to its former position. The lower wall **56** is set to have a dimension such that its lower end does not come into contact with the empty cloth roll **36** at that time.

Also, in place of both pins **40**, it is possible, as shown in FIG. **4***b*, to make a circular supporting member **43** capable of loading the end portion of the empty cloth roll to be supported by a support member **47** projecting from the arm **38**, and further, to provide a notch **43***a* for permitting the upper portion of the lower wall **56** to move while the oscillating members **44** are oscillating. This dispenses with forming of the slot **41** in the oscillating member **44**.

Referring now to FIGS. **5** through **7** which show the second embodiment, the lower end of the slot **41** of the oscillating member **44** for permitting the relative movement of the rear pin **40** for supporting the empty cloth roll **36** is set as an opened end which is made by cutting out a portion of the lower wall **56** defining the guide groove **46**. Accordingly, the oscillatable range (refer to one-dotted chain line shown in FIG. **5**) of the oscillating member **44** is larger than that of the embodiment shown in FIGS. **1** through **4***b*.

In this embodiment, the air cylinder **64** is actuated until the full cloth roll **21** reaches the center portion of

the receiving table **42** from the condition of FIG. **5** showing the condition similar to that of FIG. **2** to maintain the condition of contact between the contact portion **60** of the oscillating member and the end of the cloth roll **20** (FIG. **6**). Therefore, during this time, the distance between the extension of the peripheral surface of the full cloth roll **21** in the axial direction and the upper wall **54** of the oscillating member **44** varies, though not to such an extent as to drop the empty cloth roll **36** downward (FIG. **6**). Thereafter, as shown in FIG. **7**, when the air cylinder **64** is operated to shorten to allow the oscillating member **44** to oscillate in the opposite direction, the lower end **50** of the guide groove **46** reaches the upper position between both rollers **14** and **16**. At that time, the distance described above becomes larger and the empty cloth roll **36** is slowly dropped between both rollers **14** and **16**.

Now, in an embodiment shown in FIGS. **8** through **10**, it is apparent from the comparison between FIG. **2** and FIG. **8** that the oscillating member **44** is preliminarily oscillated clockwise at a slight angle from the condition shown in FIG. **2**. Therefore, the front end of the air cylinder **64** and the lever **58** are connected together in closer proximity to the lower end **50** of guide groove **46** and further forward of the lower wall **56**, in comparison with the embodiment shown in FIG. **2**. The contact portion **60** is mounted further forward and the slot **41** is set to be longer in comparison with the embodiment shown in FIG. **2**.

According to this embodiment, the air cylinder **64** is operated to extend so as to oscillate the oscillating member **44** counterclockwise, until the full cloth roll **21** reaches a position just short of being centered on the receiving table **42** (FIG. **9**). During this time, the end **36***a* of the empty cloth roll **36** is moved to the right above the lower end **50** of the guide groove **46**, and the intermediate portion **36***b* of the empty cloth roll contacts the surface of the textile. Subsequently, the air cylinder **64** is operated to shorten so as to oscillate the oscillating member **44** clockwise. When the lower end **50** of the guide groove **46** is moved to the upper position relative to the front roller **14**, the end **36***a* of the empty cloth roll **36** is released from the lower end **50**, and the empty cloth roll **36** is dropped onto the roller **14** and rolls down between both rollers **14** and **16**.

In this manner, the empty cloth roll **36** is placed on both rollers and the exchange operation for the cloth roll is completed.

Thereafter, a cutter **72** is moved in the axial direction and the textile **18** is cut.

A reference numeral **70** (FIG. **2**) indicates a plate portion provided on each oscillating member **44** so as to prevent the full cloth roll **21** from moving in the axial direction during the oscillating movement of the oscillating member **44**.

What is claimed is:

1. An apparatus for replacing a full cloth roll loaded on a pair of mutually parallel rollers of a weaving machine and with a textile wound therearound, with an empty cloth roll disposed in an upper position above said full cloth roll, comprising:

a pair of oscillating members supported by said weaving machine to oscillate about an axis of a rod supported by said weaving machine, said axis being parallel to the axes of said pair of rollers; and

drive means for having said pair of oscillating members produce oscillating movement;

wherein each oscillating member includes: a contact portion exerting a pressing force to an end portion of said full cloth roll to roll said full cloth roll forward of said weaving machine while both said oscillating members are oscillating in one direction; and a guide wall disposed behind said contact portion for catching said empty cloth roll in cooperation with the peripheral surface of the textile of said full cloth roll, and for directing, during the oscillating movement of both said oscillating members, said empty cloth roll to an upper position right above said pair of rollers in cooperation with the peripheral surface of the textile of said full cloth roll.

2. An apparatus according to claim **1**, wherein each said oscillating member further includes a second guide wall disposed in front of said guide wall at a distance greater than an outer diameter of said empty cloth roll, wherein said second guide wall does not contact said empty cloth roll on the pair of rollers when both said oscillating members are oscillating in the other direction.

3. An apparatus according to claim **1**, wherein each said oscillating member includes a push-up portion for exerting a push-up force to the end portion of said empty cloth roll disposed in said upper position during the oscillating movement of said oscillating members.

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