

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 600 514 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
12.11.1997 Bulletin 1997/46

(51) Int. Cl.⁶: **B65H 19/18**

(21) Application number: **93119550.7**

(22) Date of filing: **03.12.1993**

(54) Apparatus for butt splicing webs

Apparat zum Stossverbinden von Bahnen

Appareil pour raccorder bout à bout des bandes

(84) Designated Contracting States:
DE NL

(30) Priority: **03.12.1992 JP 324323/92**

(43) Date of publication of application:
08.06.1994 Bulletin 1994/23

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• **PATENT ABSTRACTS OF JAPAN vol. 010 no. 307**
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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an apparatus for butt splicing webs, more precisely, to an apparatus for butt splicing webs in the state that ends of old and new rolls of a belt-like materials such as plastic, paper, metallic foil and the like are butted.

2. Description of the Related Art

In the conventional apparatus for butt splicing webs, in order to splice webs accurately in the state that the end of an old web and the forward end of a new web are butted, the webs are spliced in the state that the line of the spreading machine or the processing machine which has the splicing apparatus is stopped, or the webs are fed at low speed by using an accumulator. However, there is a problem in that the production efficiency deteriorates by stopping the line or slowing down whenever webs are spliced.

Moreover, when the webs are fed without stopping or slowing down the line to be spliced, the web conveying is performed at high speed (more than 100 m/min). Therefore, when the web conveying at high speed is performed in the conventional apparatus for butt splicing webs, there are problems in that a high-power motor is needed for the rapid speed-up of the new roll and side-weaving is generated on the new roll by a rapid torque.

In the apparatus for splicing webs of Japanese Patent Application Laid-open No. 55-74940, before splicing webs, the draw-out member for drawing out the forward end of the new roll is sped up until corresponding with the conveying speed of the old web, then, the new roll and the draw-out member are relatively approached to draw out the forward end of the new roll, and further, the drawn forward end is fed to the splicing unit at the same speed as the conveying speed of the old web to thereby supply to the cutting drum and the splicing drum, whereby the webs are spliced.

In the apparatus for splicing webs of Japanese Patent Application Laid-open No. 61-119555, before splicing webs, the web forward end of the new roll is sucked and held by the holding arm of the new roll supported with the turret arm and the holding arm and the new roll is rotated previously until the speed becomes equal to the web conveying speed. Then, in splicing the webs, the tail end of the old roll and the forward end of the new roll are held between the holding arm and the cut drum and the splice drum of the splicing unit in the state that the rotating speed of the holding arm and the web conveying speed are kept, whereby the webs are cut and spliced.

In the apparatus for splicing webs of Japanese Patent Application Laid-open No. 63-31963, the guide web is previously rolled at the web forward end of the new

roll and fed, whereby the rotation of the new roll is speeded up gradually so as to rotate the new web lead by the guide web at the same speed as the conveying speed of the old web, thereafter, the old web and the new web are spliced.

However, the apparatus for splicing webs of Japanese Patent Application Laid-open No. 55-74940 has disadvantages in that the mechanism is complicated since an apparatus for drawing out and conveying the forward end of the new roll to the splicing unit at the same speed as the web conveying speed must be provided between the new roll and the splicing unit, and the splicing accuracy deteriorates by the difference between the conveying speeds of the old web and the new web since the forward end of the new roll is sent out to the splicing unit by the conveying apparatus.

Moreover, in the apparatus for splicing webs of Japanese Patent Application Laid-open No. 61-119555, the webs are spliced on the splicing unit by the holding arm wherein the turret arm is rotating, therefore, respective mechanisms rotating at high speed are made to be simultaneous so as to obtain the most suitable timing for splicing, so that high accuracy is required. Thus, there is a disadvantage in that the apparatus becomes expensive.

The apparatus for splicing webs of Japanese Patent Application Laid-open No. 63-31963 has a disadvantages in that the arrangement becomes troublesome since a guide web must be used repeatedly by every new roll to avoid higher cost by throwing away guide webs.

According to EP-A-0 060 450 a device for butt splicing webs is known comprising a first roll and a second roll. Both rolls are relatively supported by turret arms with the turret axis supported by a post. The rotational speed of the first roll is measured; when the speed is higher than a predetermined value the second roll is accelerated. The position of the forward end of the web on the second roll is indicated by a tape and its position is detected by a sensor.

In the case that the two webs should be butt spliced a carriage with a number of cylinders is moved toward the second roll and one of the cylinders is lowered to clamp the webs between it and the other cylinders.

The first of these cylinders has a cutting groove and a suction groove for inserting a cutting element provided on the second of these cylinders and for holding the web of the second roll, respectively. When first cylinder approaches the second roll the tape is torn to the periphery of the first cylinder. Moreover, all the cylinders are rotated with the same speed as the second roll. A third and a fourth cylinder carries strips for connecting the upper and lower surfaces of the two webs with one another.

In view of the prior art disclosed by EP-A-0 060 450 it is an object of the invention to simplify the mechanism in the apparatus and to more exactly draw-out forward end portion of the new web and to deliver it for splicing in the splicing unit.

This object is solved by an apparatus as outlined in the pre-characterising part of claim 1 with the additional features of the characterising part.

According to the invention an expander roller made of rotatable and diameter-extendible elastic material such as rubbers is provided in the splicing unit, and the diameter of the expander roll is expanded so as to be abutted to the outer peripheral surface of the new roll when splicing, then, the forward end of the new roll is drawn out and delivered to the draw-out member of the cutting drum in the state that it rotates in accordance with the rotating new roll. With this arrangement, the expander roller rotates in accordance with a new roll, therefore, the forward end of the new roll can be drawn out more smoothly.

Moreover, the outer diameter of the new roll supported with the turret arm is measured by the outer diameter measuring means and the moving distance that the splicing unit approaches the outer peripheral surface of the new roll is decided based on the measured result. Therefore, though the distance to the outer peripheral surface varies depending on the winding times, the positional and relation between the outer peripheral surface of the new roll and the splicing unit can be kept constant.

Further, a tail end mark in forming that the wound value becomes under a predetermined value is made on the old roll supported by the turret arm, and when the tail end mark is detected by the sensing means, the new roll supported by the turret arm has begun to rotate at the same speed as the conveying speed of the web whereby the timing of the rotation beginning of the new roll is determined.

And, the web remainder of the old roll which had been cut when splicing is removed from the splicing unit by the removing means.

BRIEF DESCRIPTION OF THE DRAWINGS

The exact nature of this invention, as well as other objects and advantages thereof, will be readily apparent from the consideration of the following specification relating to the accompanying drawings, in which like reference characters designate the same or similar parts throughout the figures thereof and wherein:

Fig. 1 is a constitutional view of an apparatus for butt splicing webs for illustration;

Fig. 2 is an essential constitutional view of a splicing unit in the apparatus according to Fig. 1;

Fig. 3 is structural view of a removing unit which removes the cut remainder of the old roll according to Fig. 1;

Figure 4 is a state view showing the state immediately before the splicing in the apparatus according to Fig. 1;

Fig. 5 is an explanatory view explaining the draw-out of the forward end of the new roll in the apparatus according to Fig. 1;

Fig. 6 is a graph explaining the draw-out of the forward end of the new roll in the apparatus according to Fig. 1;

Fig. 7 is an essential enlarged view explaining the cut of the web in the apparatus according to Fig. 1; Fig. 8 is an essential enlarged view explaining the splicing of the webs in the apparatus according to Fig. 1;

Fig. 9 is a constitutional view of an embodiment of an apparatus for butt splicing webs according to this invention;

Fig. 10 is a schematic sectional view showing the structure of an expander roller;

Fig. 11 is an essential enlarged view explaining the draw-out of a forward end of a new roll in the embodiment according to this invention;

and,

Fig. 12 is an essential enlarged view explaining that the forward end of the new roll is delivered from the expander roller to a cutting drum in the embodiment according to this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Detailed description will hereunder be given of the preferred embodiment of the apparatus for butt splicing webs according to the present invention with reference to the accompanying drawings.

Fig. 1 shows an apparatus for butt splicing webs similar to the embodiment of the invention, but without an expander roller. A post 14 is set up on a base and three-forked turret arm 18 is supported rotatably by a turret axis 16 at the upper position of the post 14. And, the turret arm 18 can be rotated intermittently every 120° about the turret axis 16. And, roll axes 20, 22, 24 are rotatably supported at the respective front portion of the turret arm 18, and an old roll 28 wound with an old web 26 to being conveyed and a new roll 30 wound with a new web are supported by two roll axes 22, 24, respectively and rewindably. Another new roll which is used next to the roll 30 is supported at the roll axis 20 which is not used. Further, each axis 20, 22, 24 is connected with the motor, not shown, and the new roll 30 can be rotated at the same speed as the conveying speed of the old web 26 when the old and new webs are spliced as described later. Moreover, the forward end of the new roll 30 is temporarily put on with the adhesive tape so that the forward end should not come off from the wind-beginning of the web while rotating the new roll 30 and is put on with a forward end mark 32.

And, a guide rail 34 is constructed on the base 12 in the conveying direction of the web, and a splicing unit 36 is provided so as to be movable on the guide rail 34. Therefore, the splicing unit 36 is linearly movable in the direction of an arrow 38 in Fig. 1 concerning the turret arm 18.

Moreover, a cutting drum 42, a cutting-splicing drum 44 and a splicing drum 46 are rotatably supported by respective rotational axes 42A, 44A, and 46A so as

to rotate freely thereabout in a casing 40 of the splicing unit 36. And, the respective rotational axes 42A, 44A and 46A are connected with the motor, not shown, so that the drums 42, 44 and 46 can be rotated in the respective directions of arrows 48, 50 and 52 at the same speed as the conveying speed of the old web 26 when splicing webs.

Moreover, as shown in Fig. 2, the outer peripheral portion of the cutting drum 42 is formed with the elastic material such as rubber, a cutter 42B is provided at the middle of the outer peripheral portion and a suction pad 42C is formed on the front portion of the outer peripheral surface about the rotating direction, whereby the cutting drum 42 is connected with a suck apparatus not shown through a hollow shaft 42D. And, the cutting and splicing drum 44 has an abutting plate 44B on the front portion of the outer peripheral portion about the rotational direction thereof, and the abutting plate 44B and the cutter 42B of the cutting drum 42 are abutted, whereby the shearing force is acted so as to cut the web. Further, a suction pad 44C is located on the rear portion of the outer peripheral surface about the rotational direction of the cutting-splicing drum 44 and connected the suck apparatus not shown through an hollow shaft portion 44D. Moreover, the splicing drum 46 has a suction pad 46B for sucking the back of a splicing tape 47 such that can be taken off about the middle of the outer peripheral portion thereof, and is connected with the suck apparatus, not shown, through an hollow shaft portion 46C. And, rollers 42E and 44E are attached to the cutting drum 42 and the cutting-splicing drum 44, whereby the web between the old roll 28 and a pass roller 60 is supported. Further, a sectional-triangle-shaped guide member 54, which guides the web to be spliced so as not to stray from the web conveying route, is provided with the casing 40 at the triangle-shaped space enclosed by each drum 42, 44 and 46.

And, a removing unit 56 for removing the remainder of the old web 26 to be cut when splicing from the web conveying route is arranged in the upper vicinity of the cutting-splicing drum 44 as shown in Fig. 3. The removing unit 56 has an interval slightly thicker than the web along the circular-arc-shaped guide board 56A and a plurality of rotating rolls 56B, 56B... are located, whereby a removing route 58 is formed between the guide board 56A and the rotating rolls 56B, 56B.... And, a plurality of the rotating rolls are connected with the motor, not shown, and is rotated faster than the cutting-splicing drum 44 in the opposite rotating direction thereof. Therefore, the remainder of the old web 26, which has been cut is held by the suction pad 44C, is put in between the cutting-splicing drum 44 and the rotating roll 56B and fed to the removing path 58, to thereby be removed from the web conveying route.

Further, as shown in Fig. 1, a sensor 64 for measuring the outer diameter of the new roll 30 is attached on a wall 62 located above the new roll 30. Then, a light beam 66 from the sensor 64 is reflected with the outer peripheral surface and the distance to the outer periph-

ery of the new roll 30 is measured, whereby the outer diameter of the new roll 30 can be measured. Moreover, a sensor 68 is placed at the end of the guide rail 34 on side of the turret arm 18. And, the sensor 68 detects the forward end mark of the new roll 30 when the turret arm 18 rotates about 120° to thereby move the new roll 30 to the position shown in Fig. 4. Moreover, a sensor 74, which detects the tail end mark 72 put on the tail end of the old roll 28, is attached on a wall 70 above the old roll 28 which moves to the position shown in Fig. 4. And, signals of the respective sensors 64, 68 and 74 are input to a controller not shown, whereby the moving distance of the splicing unit and the rotation timings of the respective drums 42, 44 and 46 are controlled.

Next, the explanation will be given of the action of the apparatus 10 for butt splicing webs constructed like the above-mentioned.

As shown in Fig. 1, the old web 26 rewound from the old roll 28 is supported by the pass roller so as to be fed through the cutting-splicing drum 42, the cutting drum 42 and the splicing drum 46, and passed to the spreading process or processing process, not shown. At this time, the old web 26 is supported by the guide rollers 42E and 44E of the cutting drum 42 and the cutting-splicing drum 44 to prevent it from bending.

While rewinding the old web 26 in the state of Fig. 1, the outer diameter of the new roll 30 is measured by the sensor 64 and signals thereof are input to the controller not shown. And, when the outer diameter of the new roll is measured, the turret arm 18 is rotated by 120° so that the old roll 28 and the new roll 30 are moved to the position shown in Fig. 4, and the splicing unit 36 is moved on the guide rail 34 in the direction of the arrow 78 based on the moving distance calculated from the outer diameter of the new roll input to the controller and stopped at the position adjacent to the outer peripheral surface of the new roll 30. Next, the tail end mark 72 on the old roll 28 is detected by the sensor 74 and signals of informing that the web length of the old roll 28 decreased to a value less than the predetermined value. And, in the controller, the instruction is given to the motor for driving the rotational axis 22 of the new roll 30, so that the new roll 30 is rotated counter-clockwise and accelerated to the same speed as the conveying speed of the old web 26 (for instance, more than 100m/minute).

Next, when the sensor 68 detects the forward end mark 32 of the new roll 30 and the signals are input to the controller, the controller instructs the motor to rotate the rotational axes 42A, 44A and 46A of the drums 42, 44 and 46 so as to rotate the respective drums 42, 44 and 46 at the same speed as the conveying speed of the old web 26, and to make the suction pads 42C, 44C and 46B of the respective drums 42, 44 and 46 in the sucking state. At this time, the cutting drum 42 begins to rotate so as to be the same speed as the conveying speed of the old web 26 at the draw-out position where the forward end of the new roll 30 is drawn out, and the forward end of the new roll 30 is held by the suction pad

42C of the cutting drum 42 and drawn out. That is, as shown in Fig. 5, when the outer peripheral speed of the new roll 30 is represented by V and the time for moving the distance A from the forward end sensing position B to the draw-out position C of the new roll 30 is represented by t, as shown in Fig. 6, the cutting drum 42 is driven to be rotated, such that the rotation speed becomes the same as the outer peripheral speed V of the new roll 30 after seconds from starting the rotation. Therefore, the web forward end of the new roll 30 can be certainly drawn out by the suction pad 42C of the cutting drum 44. Similarly, the rotations of the cutting-splicing drum 44 and the cutting drum 42 are started according to the timing for the web cutting and splicing which will be described later. And, when each drum 42, 44 and 46 is rotated by the angle shown in Fig. 7, the old web 26 and the new web 80 are piled and held by the cutting drum 42 and the cutting-splicing drum 44, and the old and new webs 26, 80 are cut with the cutter 42B and abutting plate 44B of the cutting-splicing drum 44. At this time, the web forward end of the new web 80 after cutting is quickly put into the space between the cutting drum 42 and the cutting-splicing drum 44 which rotate opposite to each other and held, then moved in the conveying direction by guiding with the guide member 54. Further, the forward end of the new web 80 is fed to the forward end portion side by rotating the new roll 30, therefore, it never strays off from the cutting part. On the other hand, the tail end of the old web 26 after cutting is held by the cutting-splicing drum 44 and the splicing drum 46 to be moved in the web conveying direction. Therefore, the tail end of the old web 26 after cutting and the forward end of the new web 80 after cutting are conveyed certainly to the splicing position in the state of being butted with each other.

Next, when the respective drums 42, 44 and 46 are rotated by the angle shown in Fig. 8, the butting positions of the old and new webs 26 and 80 are spliced with the splicing tape 47 sucked and held by the suction pad 46B of the splicing drum in the state that the old and new webs 26 and 80 are held by the cutting-splicing drum 44 and the splicing drum 46. Then, after splicing, each drum 42, 44 and 46 is rotated to the former position and stopped, and the pull of the suction pad 42C, 44C and 46B of each drum 42, 44 and 46 is released. And, the splicing unit 36 is moved on the guide rail 34 and extracted to the former position, and the web conveying of the new roll 30 is begun again in the state of Fig. 1. Moreover, while the cut remainder of old web 26 which has been cut when cutting is removed from the conveying route by the removing unit 56 shown in Fig. 3, the cut remainder of the new web 80 is pulled and held by the suction pad 42C of the cut drum 42 and moved to the stopping position of the cutting drum 42, and then the pull of the suction pad 42C is released, whereby it falls from the cutting drum 42 by the deadweight. Therefore, the butt splicing of the old and new webs 26 and 80 is completed.

In the apparatus 10 for butt splicing webs, the splic-

ing unit 36 is approached to the outer periphery of the new roll 30 based on the signals from the sensor 64 for detecting the outer diameter of the new roll 30, and the new roll 30 is previously rotated so as to be at the same speed as the conveying speed of the old web 26, and then the forward end of the new roll 30 is drawn out by the suction pad 42C of the cutting drum 42 in the splicing unit 36 and the ends of the old and new webs 26, 80 are butt spliced with the cutting drum 42, the cutting-splicing drum 44 and the splicing drum. With this arrangement, webs can be spliced without decreasing the rewinding speed of the old web 26, therefore, an accumulator is not needed. Further, there is no need to stop or slow down a production line when splicing, therefore, the productivity can be improved.

Moreover, the splicing unit 36 is provided linearly movable and the forward end of the rotating new roll 30 is drawn out directly by the cutting drum 42, therefore, it is unnecessary that the forward end of the new roll is fed to the splicing unit. With this arrangement, the splicing mechanism can be simplified, therefore, the splicing accuracy can be improved and the cost of the apparatus can be decreased.

Moreover, the outer peripheral portion of the cutting drum 42 is formed with the elastic material such as rubber, whereby the web can be drawn out without damage when the forward end of the new roll 30 is drawn out.

Next, an embodiment of the apparatus for butt splicing webs according to this invention is explained with Fig. 9. Same members as in the apparatus according to the previous Fig. 1-8 are applied with the same numerals and explained.

As shown in Fig. 9 (corresponding to Fig. 4), an expander roller 82 is supported rotatably by the rotational axis 84 in the vicinity of the cutting drum 42 and can be rotated according to a rotor when touching thereto. And, as shown Fig. 10, the expander roller 82 is fitted to the rotational axis 84 and formed with an almost cylinder-shaped the metallic frame 88 having an air ventilation path 86 and a rubber film 90 which can expand and contract and covers the metallic frame 88 in the sealing state. With this arrangement, a space part 92 which leads to the ventilation path 86 can be formed between the metallic frame 88 and the rubber film 90. And, when air from the air supply apparatus not shown is injected into the space part 92 through the ventilation path 86, the rubber film expands in the directions of the arrow 94. Incidentally, members and devices except the expander roller 82 are similar to the apparatus according to previous Fig. 1-8.

Next, the explanation will be given of the action of the apparatus for butt splicing webs provided with the expander roller 82 according to this invention.

When the remainder of the old roll 28 becomes under a predetermined value the new roll 30 is rotated to be at the same speed as the conveying speed of the old web 26 and the splicing unit 36 becomes adjacent to the new roll 30 to stop, as well as the apparatus according to Fig. 1-8. In this case, the new roll 30 is rotated

clockwise contrary to the apparatus according to Fig. 1-8. Moreover, an adhesive tape is temporarily adhered so as not to come off from a wind-beginning of the web on the back of the forward end of the new roll 30, and an adhesive tape 32, which is used as the forward end mark and has much stronger adhesive force than that of the back, is attached on the surface thereof.

Next, as shown in Fig. 11, when the sensor 68 detects the forward end mark 32 of the new roll 30, the expander roller 82 is injected with air and expanded, then it is abutted to the outer peripheral surface of the new roll 30 and rotated in accordance with the rotation of the new roll 30. And, when the forward end of the new roll 30 is moved to the expander roller 82, the adhesive tape 32 is stuck on the expander roller 82, whereby the forward end of the new roll 30 is drawn out. Then, the web forward end of the new roll 30 drawn out with the expander roller 82, as shown in Fig. 12, is pulled and held by the suction pad 42C of the cutting drum 42 and delivered to the cutting drum 42. At this time, the adhesive force of the suction pad 42C of the cutting drum 42 is made stronger than that of the adhesive tape 32, whereby the web forward end of the new roll 30 can be easily delivered from the expander roller 82 to the cutting drum 42. Moreover, the timing of the rotation beginning for the cutting drum 42, as well as the first embodiment, is controlled by the controller based on the signals from the sensor 68. Then, the new web 80 received by the cutting drum 42 is spliced with the old web 26, as well as the apparatus according to Fig. 1-8.

In this way, the splicing unit 36 is provided with the expander roller 82 which can rotate and expand the diameter thereof, and the diameter of the expander roller 82 is expanded so as to be in contact with the outer peripheral surface of the new roll 30 when splicing and the web forward end of the new roll 30 is drawn out and delivered to the cutting drum 42 in the state that the expander roller 82 is rotated in accordance with the rotating new roll 30. Therefore, in this embodiment, the same effect as the apparatus according to Fig. 1-8 can be obtained, and the expander roller 82 rotate in accordance with the new roll 30, so that the web forward end of the new roll 30 can be drawn out more smoothly.

Incidentally, the forward end of the new roll 30 is drawn out by the cutting drum 42 with the holding force in the first embodiment, however, an adhesion may be used as the draw-out member of the cutting drum 42.

As has been described hereinabove, in the apparatus for butt splicing webs according to this invention, webs can be spliced without decelerating the rewinding speed of the old web, therefore an accumulator is not needed. And, there is no need that the line should be stopped or slowed down when splicing, therefore, the production efficiency can be improved.

Further, the splicing unit is provided linearly movable and the forward end of the rotating new roll is drawn out by the cutting drum directly, therefore, there is no need that the forward end of the new roll is fed to the splicing unit. Therefore, the splicing mechanism can be

simplified, therefore, the splicing accuracy can be improved and the cost of the apparatus can be decreased.

Moreover, the splicing unit is provided with the expander roller formed with elastic material such as rubber, which can rotate and expand in diameter, and the forward end of the new roll is drawn out once by the expander roller in the state that the expander roller rotates in accordance with the new roll and delivered to the cutting drum, therefore, the forward end of the new roll can be drawn out more smoothly.

And, the outer diameter of the new roll supported by the turret arm is measured by the outer diameter measuring means and the moving distance that the splicing unit becomes adjacent to the outer peripheral surface of the new roll is decided based on the measured result. Therefore, the positional relation of the outer peripheral surface of the new roll and the splicing unit can always be kept constant though there are differences in the outer diameter depending on the winding strength of the new roll, thus, the forward end of the new roll can be surely drawn out.

Moreover, the tail end mark for informing that the wound length becomes under the predetermined value is made on the old roll supported by the turret arm, and when the tail end mark is detected by the tail end mark sensing means, the new roll supported by the turret arm begins to rotate at the same speed as the conveying speed of the web. Therefore, since the timing for starting the rotation of the new roll can be decided more efficiently, the waste of the power expense by useless rotation can be avoided and the winding strength of the roll is never lost.

Further, since the web remainder of the old roll cut at splicing is removed from the splicing unit by the removing means, the web remainder never obstructs the splicing of webs and never causes it to stop the web conveying line, therefore, the webs can surely be spliced.

It should be understood, however, that there is no intention to limit the invention to specific forms disclosed, but on the contrary, the invention is to cover all modifications, alternate constructions and equivalents falling within the scope of the invention as expressed in the appended claims.

Claims

1. An apparatus (10) for butt splicing webs (26, 80) comprising

a turret arm (18) rotatably through a predetermined angle for rewindably supporting an old roll (28) and a new roll (30) wound with an old web (26) and a new web (80), respectively;

a splicing unit (36) linearly movable to an outer peripheral surface of the new roll (30) including a cutting drum (42) having a cutting member

(42B), a cutting-splicing drum (44) having an abutting plate (44B), a splicing drum (46) peelably holding a splicing tape (47), all drums (42, 44, 46) being rotatable at a speed equal to the speed for conveying the webs (26, 80) at the time of splicing the old web (26) to the new web (80), and a sensing means (68) for sensing a forward end portion of the new web of the new roll (30) previously rotated at a speed equal to the speed for conveying the webs (26, 80) and for outputting a sensing signal in response of which said respective drums (42, 44, 46) are rotated at the speed equal to the conveying speed of the webs **characterized in that** said splicing unit (36) further includes a rotatable and diameter-expandable expander roller (82) which is expandable to abut against the outer peripheral surface of the new roll (30) and said cutting drum (42) further includes a draw-out member (42C) for drawing out a forward end portion of the new web (80), wherein in response to the sensing signal of said sensing means (68) said expander roller (82) expands to draw out the forward end portion of the new web (80) and to deliver it to the drawn-out member (42C) of said cutting drum (42) while said expander roller (82) is rotated in accordance with the new roll (30).

2. Apparatus according to claim 1, **characterized in that** said draw-out member (42C) of said cutting drum (42) includes a suction pad connected to a suck apparatus for holding said forward end portion of the new web (80).
3. Apparatus according to claims 1 or 2 **characterized by** a sensor (64) for determining an outer diameter of the new roll (30) supported by said turret arm (18) and for determining a moving distance for said splicing unit (36) to approach the outer peripheral surface of the new roll (30).
4. Apparatus according to one of the previous claims, **characterized by** a tail end mark (72) marked on the old roll (28) supported by said turret arm (18) for informing about the residual length of the old web (26) less than a predetermined value and a tail end mark detecting means (74) for detecting said tail end mark (72) and for initializing rotation of the new roll until it is rotated at a speed equal to the speed for conveying the webs.
5. Apparatus according to one of the previous claims, **characterized by** a removing means (56) for removing a remaining part of the old web to the outside of said splicing unit (36), which remaining part has been cut at the time of splicing, which removing means (56) is provided in the vicinity of said cutting-splicing drum (44).

Patentansprüche

1. Apparat (10) zum Stoßverbinden von Bahnen (26,80) mit:

einem Drehkopfarm (18), der um einen vorbestimmten Winkel zur wickelbaren Lagerung einer alten Rolle (28) und einer neuen Rolle (30) drehbar ist, auf denen entsprechend eine alte Bahn (26) und eine neue Bahn (80) aufgewickelt sind;

einer Verbindungseinheit (36), die linear zu einer Außenumfangsfläche der neuen Rolle (30) bewegbar ist und eine Schneidtrommel (42) mit einem Schneidteil (42B), eine Schneid-Verbindungstrommel (44) mit einer Anlageplatte (44B), eine Verbindungstrommel (46) zum lösbaren Halten eines Verbindungsbandes (47), wobei alle Trommeln (42,44,46) mit einer Geschwindigkeit gleich der Geschwindigkeit des Transports der Bahnen (26,80) zum Zeitpunkt des Verbindens der alten Bahn (26) mit der neuen Bahn (80) drehbar sind, und eine Erfassungseinrichtung (68) zum Erfassen eines Vorderendbereichs der neuen Bahn auf der neuen Rolle (30) vor Drehen mit einer Geschwindigkeit gleich der Geschwindigkeit des Transports der Bahn (26,80) aufweist, wobei die Erfassungseinrichtung ein Erfassungssignal ausgibt, in dessen Abhängigkeit die entsprechenden Trommeln (42,44,46) mit einer Geschwindigkeit gleich der Transportgeschwindigkeit der Bahnen gedreht werden, **dadurch gekennzeichnet**, daß die Verbindungseinheit (36) weiterhin eine drehbare und durchmesserexpandierbare Expansionsrolle (82) aufweist, die expandierbar zur Anlage gegen die äußere Umfangsfläche der neuen Rolle (30) ist, und daß die Schneidtrommel (42) weiterhin ein Ausziehbauteil (42C) zum Ausziehen eines Vorderendbereichs der neuen Bahn (80) aufweist, wobei in Abhängigkeit von dem Erfassungssignal der Erfassungseinrichtung (68) die Expansionsrolle (82) zum Ausziehen des Vorderendbereichs der neuen Bahn (80) expandiert und diesen dem Ausziehbauteil (42C) der Schneidtrommel (42) zuführt, während die Expansionsrolle (82) entsprechend zur neuen Rolle (30) dreht.

2. Apparat nach Anspruch 1, **dadurch gekennzeichnet**, daß das Ausziehbauteil (42C) der Schneidtrommel (42) einen Ansaugpuffer aufweist, der mit einer Ansaugvorrichtung in Verbindung steht und zum Halten des Vorderendbereichs der neuen Bahn (80).
3. Apparat nach Ansprüchen 1 oder 2, **gekennzeichnet**

net durch einen Sensor (64) zur Bestimmung eines Außendurchmessers der neuen Rolle (30), die am Drehkopfarm (18) gelagert ist, und zur Bestimmung eines Bewegungsabstandes für die Verbindungseinheit (36) zur Annäherung an die äußere Umfangsfläche der neuen Rolle (30). 5

4. Apparat nach einem der vorangehenden Ansprüche, **gekennzeichnet durch** eine Hinterendmarkierung (72) auf der alten Rolle (28), welche am Drehkopfarm (18) gelagert ist, zur Information über eine Restlänge der alten Bahn (26) geringer als ein vorbestimmter Wert, und durch eine Hinterendmarkierungs-Erfassungseinrichtung (74) zum Erfassen der Hinterendmarkierung (72) und zur Initialisierung einer Drehung der neuen Rolle, bis diese mit gleicher Geschwindigkeit wie die Geschwindigkeit zum Transport der Bahnen dreht. 10 15

5. Apparat nach wenigstens einem der vorangehenden Ansprüche, **gekennzeichnet durch** eine Entfernungseinrichtung (56) zum Entfernen eines Restteils der alten Bahn nach außen von der Verbindungseinheit (36), welcher Restteil zum Zeitpunkt des Verbindens abgeschnitten wurde, welche Entfernungseinrichtung (56) in Nachbarschaft zu der Schneid-Verbindungsstrommel (44) angeordnet ist. 20 25

Revendications 30

1. Appareil (10) pour raccorder bout à bout des bandes (26, 80) comportant

un bras de tourelle (18) pouvant tourner sur un angle prédéterminé afin de supporter pour rembobinage un ancien rouleau (28) et un nouveau rouleau (30) enroulés avec une ancienne bande (26) et une nouvelle bande (80) respectivement; 35
une unité de raccordement (36) linéairement mobile vers une surface périphérique extérieure du nouveau rouleau (30) comprenant un tambour de coupe (42) ayant un élément de coupe (42B), un tambour de coupe-raccordement (44) ayant une plaque d'aboutement (44B), un tambour de raccordement (46) maintenant de façon à être décollée une bande de raccordement (47), tous les tambours (42, 44, 46) pouvant tourner à une vitesse égale à la vitesse de transport des bandes (26, 80) au moment du raccordement de l'ancienne bande (26) avec la nouvelle bande (80), et des moyens de détection (68) destinés à détecter une partie d'extrémité avant de la nouvelle bande du nouveau rouleau (30) entraîné en rotation au préalable à une vitesse égale à la vitesse de transport des bandes (26, 80) et destinés à délivrer un signal de détection auquel en réponse lesdits tambours respectifs 40 45 50 55

sont entraînés en rotation à la vitesse égale à la vitesse de transport des bandes, caractérisé en ce que ladite unité de raccordement (36) comprend en outre un rouleau rotatif et à diamètre expansible (82) qui est expansible afin de venir en butée contre la surface périphérique extérieure du nouveau rouleau (30) et ledit tambour de coupe (42) comprend en outre un élément d'extraction (42C) destiné à extraire une partie d'extrémité avant de la nouvelle bande (80), dans lequel, en réponse au signal de détection desdits moyens de détection (68), ledit rouleau expansible (82) subit une expansion afin d'extraire la partie d'extrémité avant de la nouvelle bande (80) et afin de la délivrer à l'élément d'extraction (42C) dudit tambour de coupe (42) alors que ledit rouleau expansible (82) est entraîné en rotation en fonction du nouveau rouleau (30).

2. Appareil selon la revendication 1, caractérisé en ce que ledit élément d'extraction (42C) dudit tambour de coupe (42) comprend une ventouse reliée à un appareil d'aspiration afin de maintenir ladite partie d'extrémité avant de la nouvelle bande (80).

3. Appareil selon la revendication 1 ou 2, caractérisé par un capteur (64) destiné à déterminer un diamètre externe du nouveau rouleau (30) supporté par ledit bras de tourelle (18) et destiné à déterminer une distance de déplacement de ladite unité de raccordement (36) afin de s'approcher de la surface périphérique externe du nouveau rouleau (30).

4. Appareil selon l'une des revendications précédentes, caractérisé par une marque d'extrémité terminale (72) marquée sur l'ancien rouleau (28) supporté par ledit bras de tourelle (18) afin d'informer de la longueur résiduelle de l'ancienne bande (26) inférieure à une valeur prédéterminée et des moyens de détection de marque d'extrémité terminale (74) destinés à détecter ladite marque d'extrémité terminale (72) et destinés à initialiser la rotation du nouveau rouleau jusqu'à ce qu'il soit entraîné en rotation à une vitesse égale à la vitesse de transport des bandes.

5. Appareil selon l'une des revendications précédentes, caractérisé par des moyens d'enlèvement (56) destinés à enlever une partie restante de la vieille bande vers l'extérieur de ladite unité de raccordement (36), laquelle partie restante a été découpée au moment du raccordement, lesquels moyens d'enlèvement (56) sont prévus au voisinage dudit tambour de coupe-raccordement (44).

FIG. 1

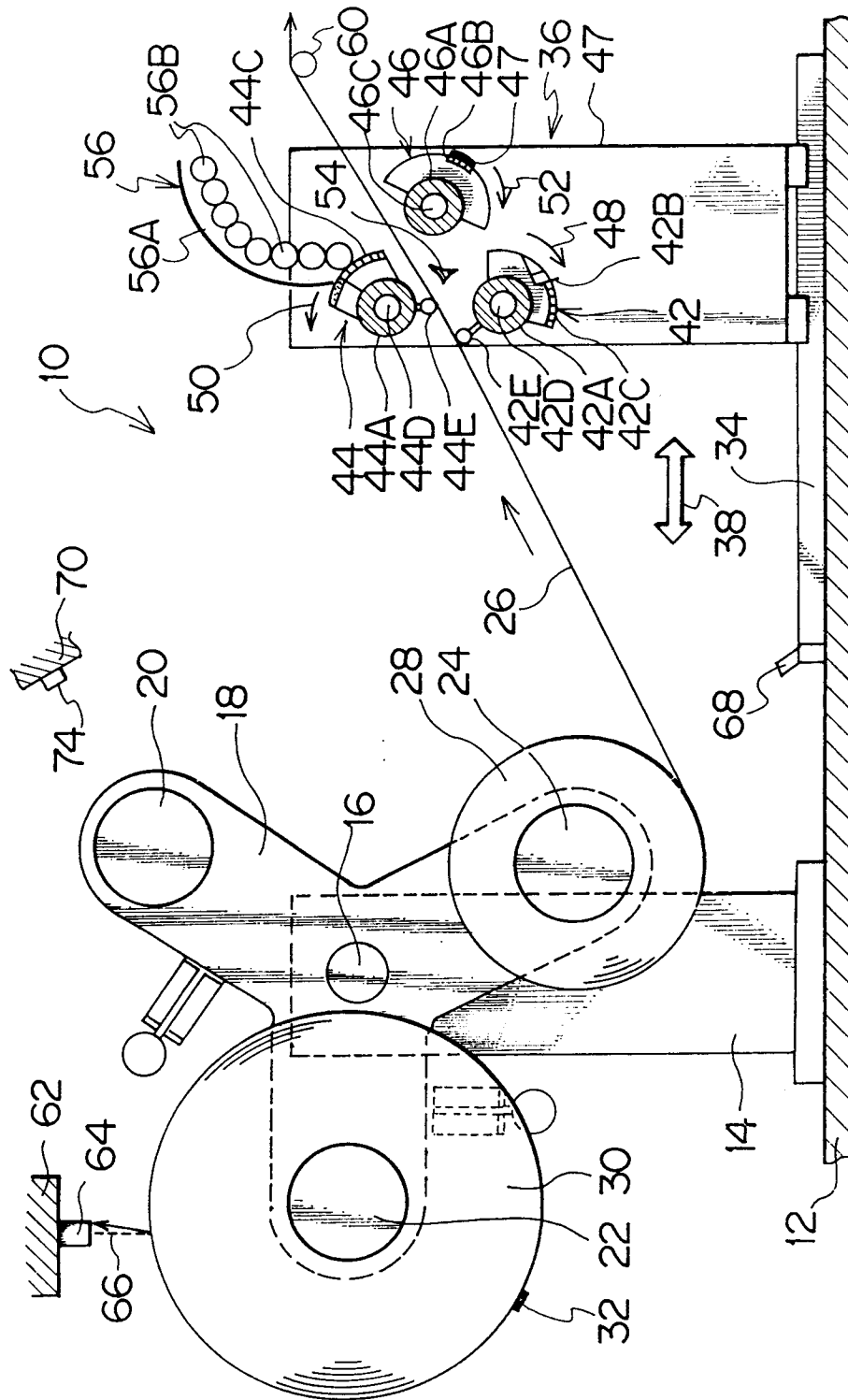


FIG. 2

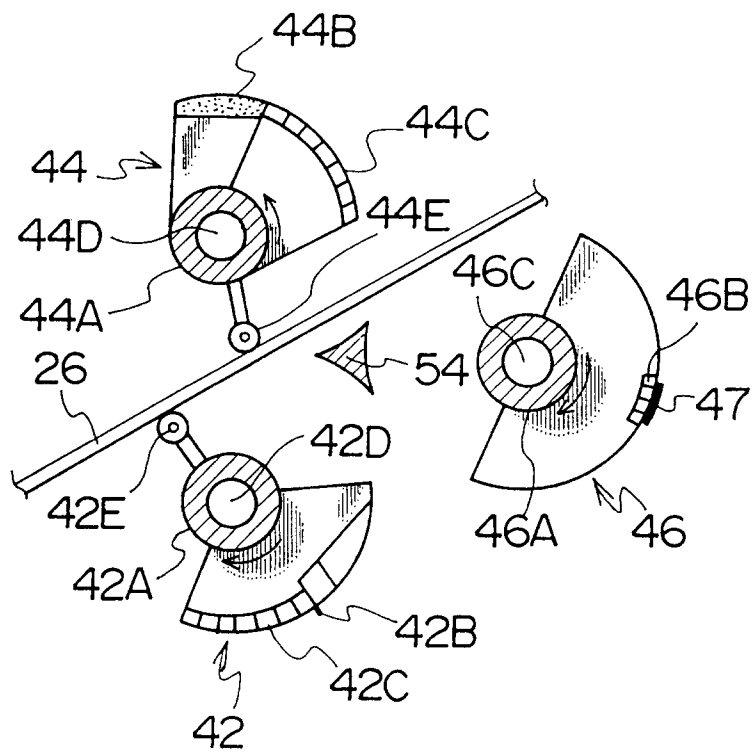


FIG. 3

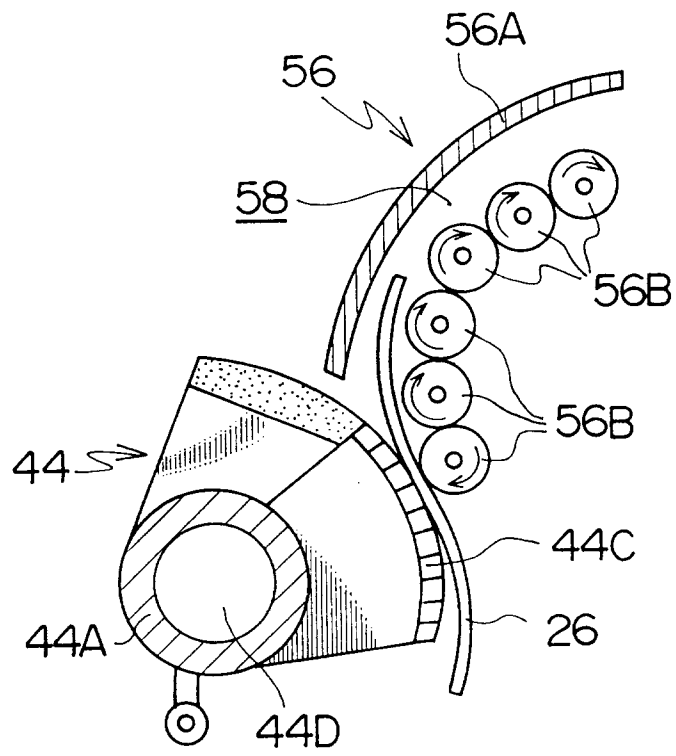


FIG. 4

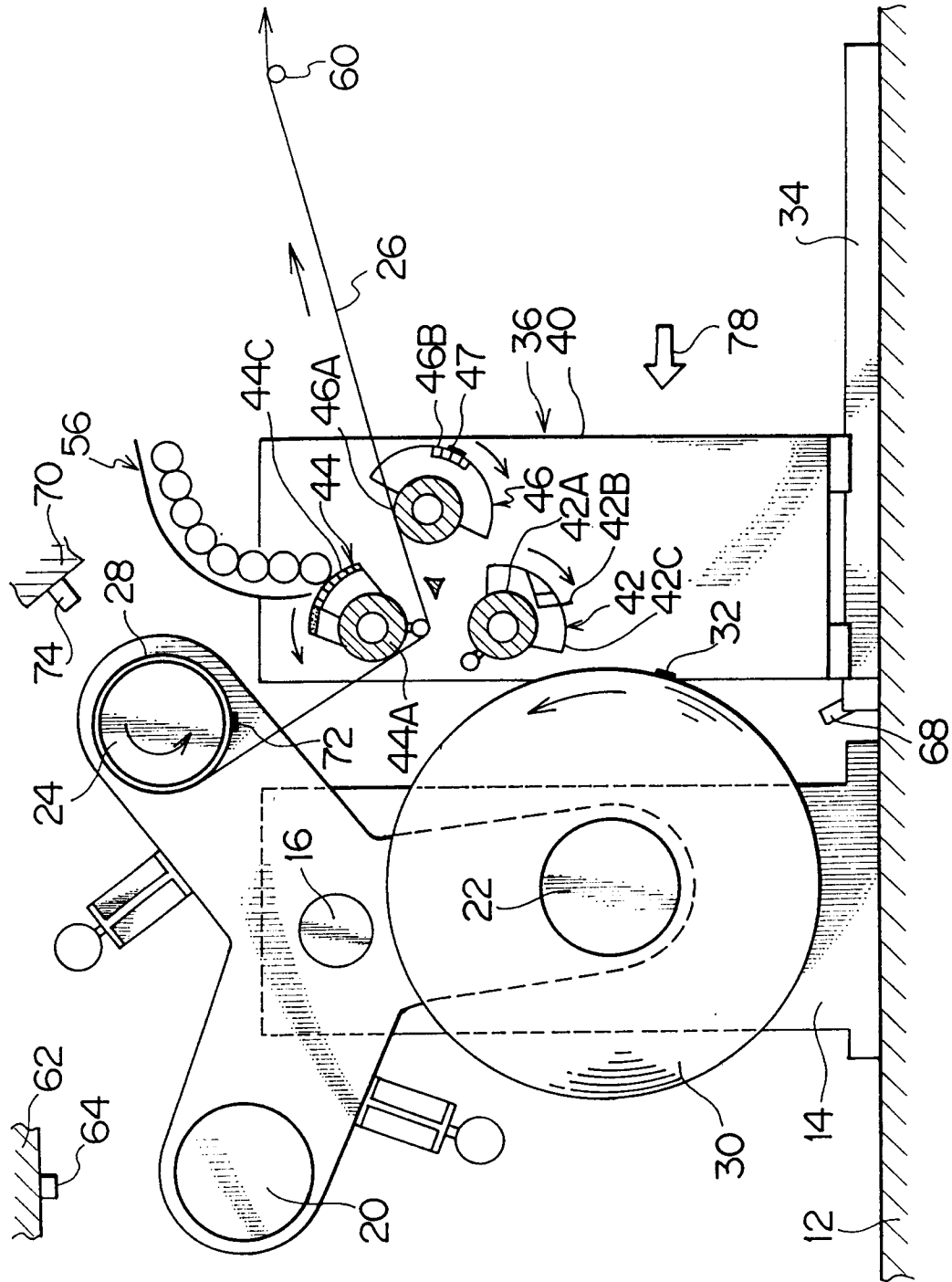


FIG.5

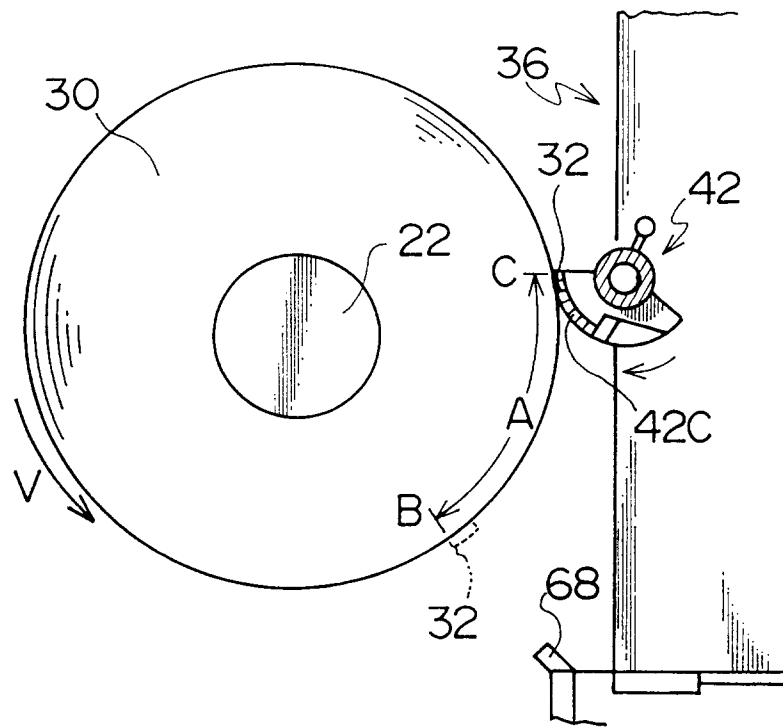


FIG.6

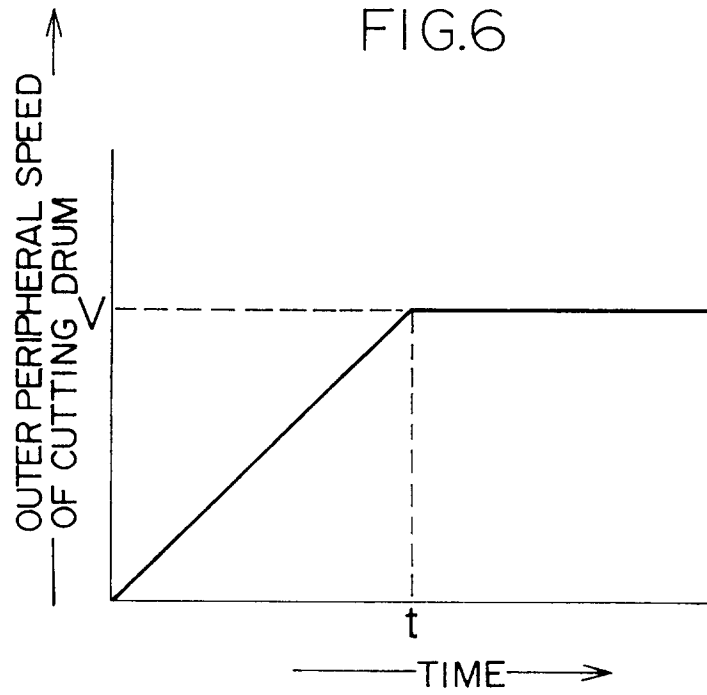


FIG. 7

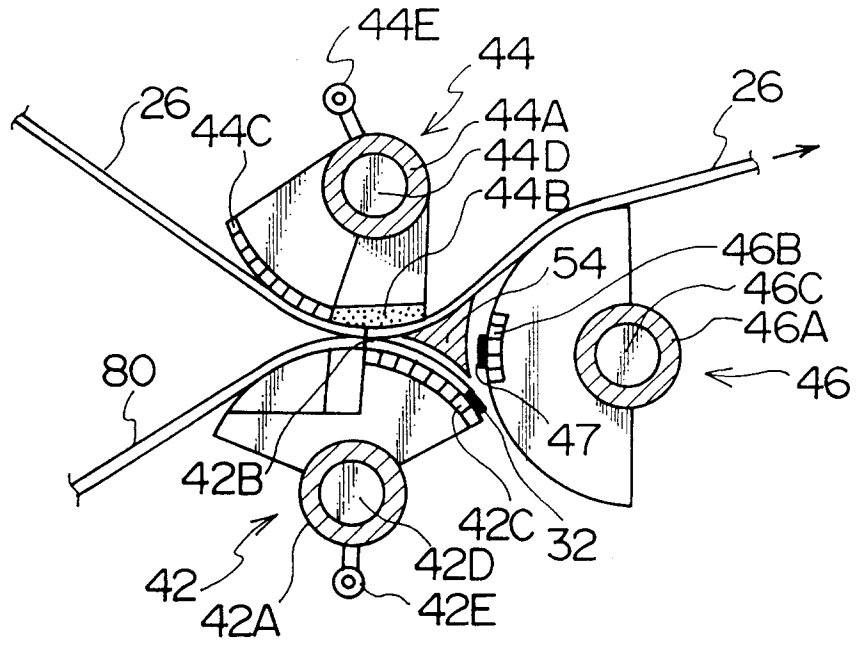


FIG. 8

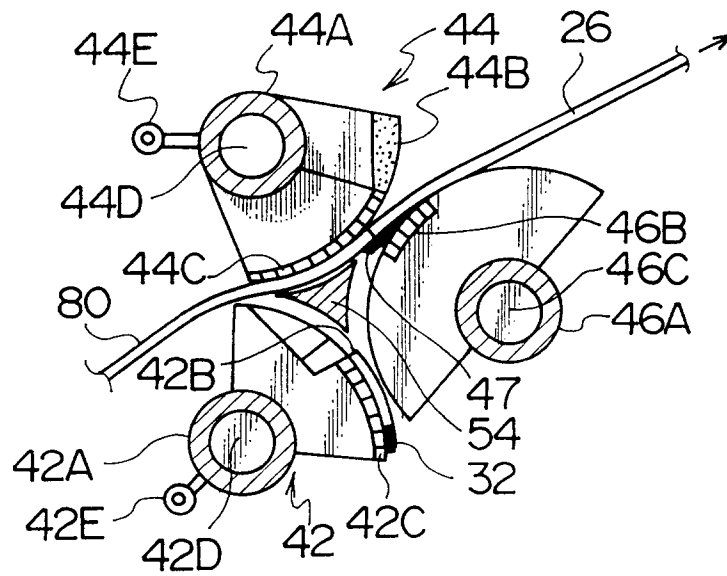


FIG. 9

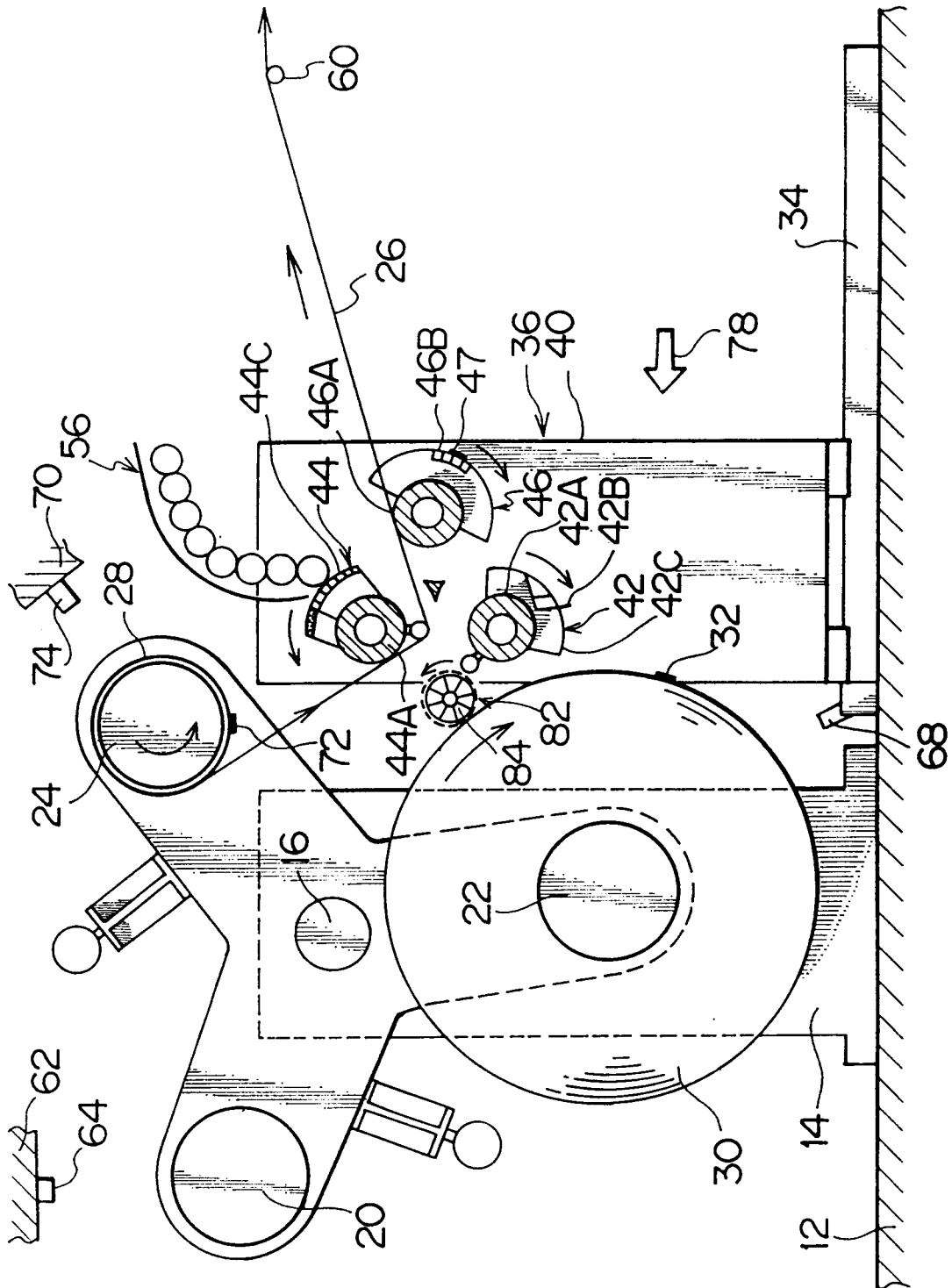


FIG. 10

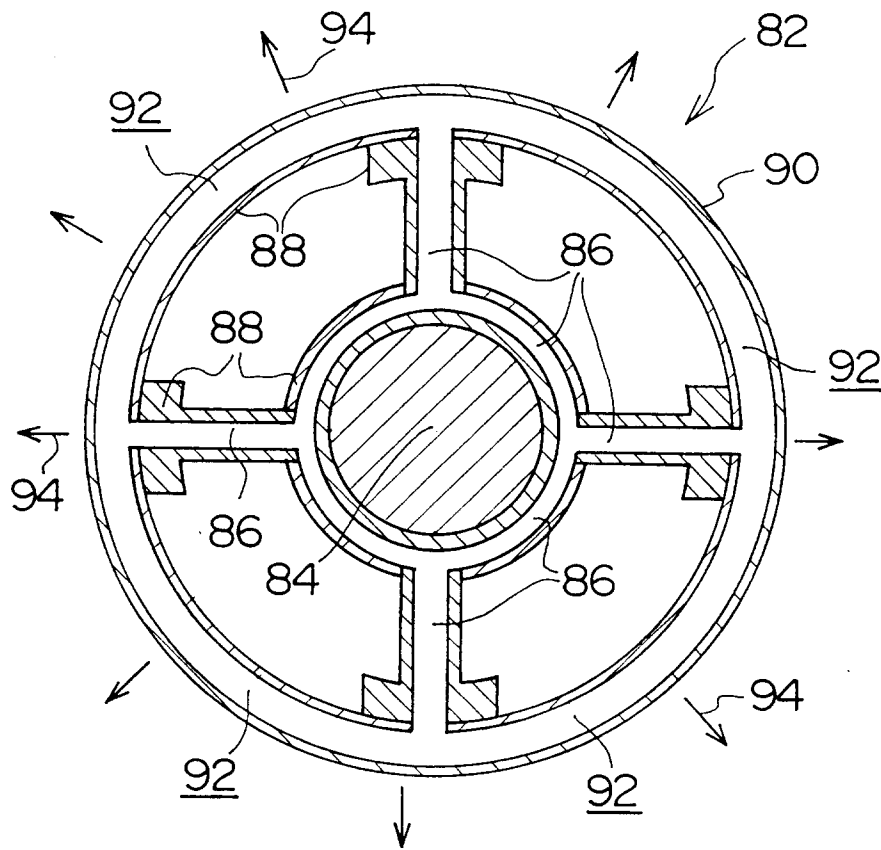


FIG. 11

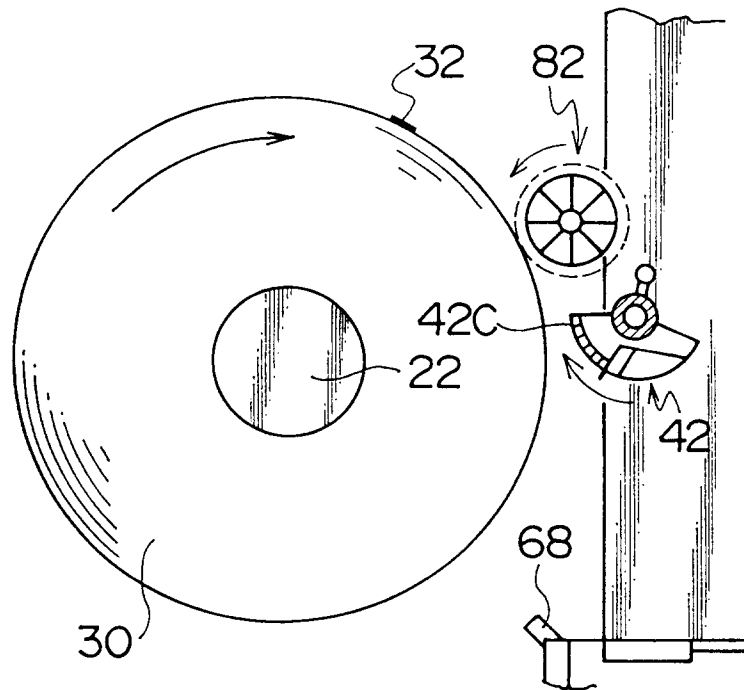


FIG. 12

