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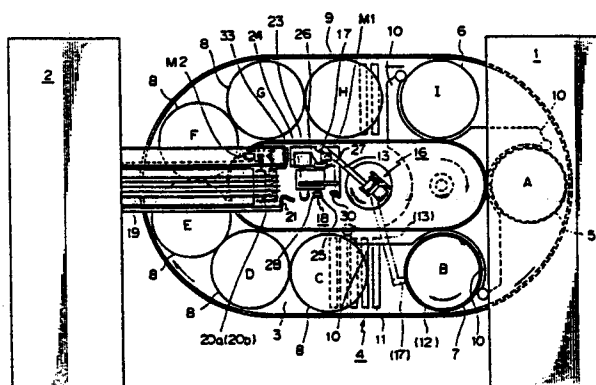
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㉙ **Method and apparatus for sequentially feeding sliver to drawing frame from fresh full can in continuous spinning system.**

㉚ A system for sequentially feeding a fresh sliver in a can delivered from a first drawing frame (1) to a second drawing frame (2), both of which frames (1, 2) are connected by an automatic can-exchanger (4). When a full can (7) is doffed from the first drawing frame (1), a front end of a sliver (31) is searched and held by a suction nozzle (13) and transferred to a pair of nip rollers (25, 28). The nip rollers (25, 28) are reversely rotated so that the nipped length of the sliver (31) becomes short and, then, are displaced toward a pair of feed roller (29A, 20B) of the second drawing frame (2) while nipping the sliver (31) therebetween. An auto-leveler is incorporated in the second drawing frame (2) for equalizing a pieced portion between fresh and old slivers.



METHOD AND APPARATUS FOR SEQUENTIALLY FEEDING SLIVER
TO DRAWING FRAME FROM FRESH FULL CAN IN
CONTINUOUS SPINNING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a system for sequentially feeding a sliver in a can delivered from a first drawing frame to a second drawing frame disposed downstream of the former, the two frames having arranged therebetween an automatic can-exchanger which carries a full can from a delivery position of the first drawing frame to a supply position of the second drawing frame, and, in turn, brings back a empty can from the supply position of the second drawing frame toward the first drawing frame.

2. Description of the Prior Art

In the conventional system of this kind, such as disclosed in Japanese Examined Patent Publication (Kokoku) No. 39-27913, when a front end of a fresh sliver in a full can delivered from the first drawing frame is fed to the second drawing frame, the end of the sliver is carried above a conveyor for the second drawing frame by a nipping element of a rotating arm, then released from the catch of the nipping element. The sliver dropping on the conveyor is pressed onto the conveyor, whereby the sliver is forwarded with the running conveyor and finally is sucked by a suction nozzle. On the other hand, when a detector detects that a tail end of a sliver in a exhausting can drops down from the conveyor and arrives in the vicinity of the above suction nozzle, a signal is generated from the detector, whereby the front end of the fresh sliver held in the suction nozzle is cut, which front end is forwarded together with the tail end of the preceding sliver to a feed roller means of the second drawing frame.

According to the above system, there is a serious problem of increased waste since the front end of the fresh sliver is held in the suction nozzle until the tail end of the preceding sliver arrives thereat.

5 Further, there is needed a complicated device for handling the sucked sliver as well as difficult steps of cutting the front end of the fresh sliver and of matching the phase thereof with the tail end of the exhausting sliver. As a result, a sliver delivered from the second
10 drawing frame is liable to vary in thickness.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide a novel sliver feeding system between first and second drawing frames connected by an automatic can-
15 exchanger without the above drawbacks according to the conventional system.

In a first aspect of the present invention, there is provided a method for sequentially feeding a fresh sliver in a can delivered from a first drawing frame to
20 a feed roller means of a second drawing frame disposed downstream of the former and provided with an auto-leveler for controlling a thickness unevenness of shorter and longer period in a sliver processed thereby, the two frames having arranged therebetween an automatic can-
25 exchanger which carries a full can from a delivery position of the first drawing frame to the second drawing frame, and, in turn, brings back an empty can from a supply position of the second drawing frame to the first drawing frame, comprising the steps of: holding a first
30 portion of a front end of a fresh sliver up from a full can doffed from the delivery position of the first drawing frame; nipping a second portion of the end of the sliver beneath the first portion by means of a pair of nip rollers; reversely rotating the nip rollers to back
35 the sliver toward the can after releasing the holding of the sliver at the first portion so that a length of the end of the sliver projected out from a nip zone of the

nip rollers is shortened; normally rotating the nip roller to forward the sliver to the second drawing frame, while directing the front end of the sliver to a feed roller means of the second drawing frame, a lapped length
5 of both the slivers being drafted to be equalized with the other normal portion of the sliver by means of the auto-leveler.

In a second aspect of the present invention, there is provided an apparatus for sequentially feeding a
10 fresh sliver in a can delivered from a first drawing frame to a feed roller means of a second drawing frame disposed downstream of the former and provided with an auto-leveler for controlling a thickness unevenness of shorter and longer periods in a sliver processed thereby,
15 the two frames having arranged therebetween an automatic can-exchanger which carries a full can from a delivery position of the first drawing frame to the second drawing frame, and, in turn, brings back a empty can from a supply position of the second drawing frame to
20 the first drawing frame, the apparatus comprising a turn-table arranged midway of a path for conveying a can doffed from the delivery position of the first drawing frame to the supply position of the second drawing frame; a suction nozzle for holding a front end of the
25 fresh sliver dropping down from a periphery of the can and for lifting the same up to a sliver-transferring position; a pair of nip rollers displaceable between the sliver-transferring position and a sliver-feeding position immediately upstream of the feed roller means of
30 the second drawing frame, one of the nip rollers being movable away from and close to the other for releaseably nipping the front end of the fresh sliver; a first driving means for reversely rotating the nip rollers to back the sliver toward the can and a second driving means
35 for normally rotating the nip rollers to forward the sliver toward the feed roller means; and a means for detecting the front end of the sliver.

The nip rollers comprises a first roller rotatably mounted directly at an end of a swing arm pivoted on a stand and a second roller mounted at an end of a swing lever pivoted on the swing arm; the swing arm being
5 rotatable so that the first roller is displaceable between the sliver-transferring position and the sliver-feeding position, and the swing lever being rotatable relative to the swing arm so that the second roller is displaceable between a position engageable with the first
10 roller and a position releaseable from the same. The first driving means for reversely rotating the first roller is provided on the stand so that first roller is driven when the same is in the sliver-transferring position.

15 BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the present invention will be apparent from the following description with reference to the drawings illustrating the preferred embodiments:

20 Fig. 1 is a plan view of an apparatus according to the present invention;

Fig. 2 is a side view of the apparatus shown in Fig. 1;

25 Fig. 3 is a sectional view of a suction nozzle utilized in the above apparatus;

Fig. 4 is a sectional view of a turning and a swinging mechanisms utilized in the above apparatus;

Fig. 5 is a plan view of the mechanisms shown in Fig. 4;

30 Fig. 6 is an partially enlarged plan view of Fig. 1, illustrating a main parts of the apparatus;

Fig. 7 is a side view of the part shown in Fig. 6; and

35 Fig. 8 is an enlarged view of a nip roller mean of another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to Figs. 1 and 2, a first drawing

frame 1 of one head and one delivery type is arranged upstream of a second drawing frame 2 of the same type at a suitable distance therebetween. Between the two drawing frames 1 and 2, an automatic can-exchanger 4 having an oval can path 3 is arranged. The second drawing frame 2 is provided with an auto-leveler (not shown) for leveling a thickness unevenness of sliver of both short and long periods. This type of auto-leveler is well-known in the art, such as disclosed in Japanese Examined Patent Publication (Kokoku) No. 60-12447 and, therefore, the description thereof is eliminated in this specification. On the can path 3 on the side near the first drawing frame 1, a can 5 deposited at a delivery position A and now accommodating a sliver delivered from the first drawing frame 1, an empty can 6 deposited at a waiting position I for the next can exchange, and a full can 7 pushed out from the delivery position A to a push-out position B are arranged along a semi-circular path. On the can path 3 on the side near the second drawing frame, a predetermined number of supply cans 8 are deposited at supply positions C through G and at least one empty can 9 is disposed at a reserve position H prior to the waiting position I. The number of the supply cans 8 at the supply positions C through G corresponds to a doubling number of slivers processed in the second drawing frame 2. Since the amounts of sliver stored in the supply cans 8 initially differ from each other in such a manner that the last can 8 at the position C closest to the full can 7 is 100% full of sliver and the top can 8 at the position G has the least amount of sliver while the middle cans 8 at the positions D through G have, in order, a gradually decreased amount of sliver so that a so-called "tapered operation" can be carried out, the content in the supply can 8 occupying the position G is exhausted one by one as the sliver processing in the second drawing frame 2 is continued, if the respective can 8 is forwarded to

the succeeding position in the clockwise direction in Fig. 1 when one of the supply cans 8 is exhausted.

A plurality of can-exchanging arms 10 are provided in front of the can 5 at the delivery position A of the first drawing frame 1, each of which arms 10 is rotatable in the clockwise direction at a predetermined angle when the can 5 is full with sliver so as to push the empty can 6 at the waiting position I in to the delivery position A and push out the full can 5 to the push-out position B, which, in turn, causes the preceding full can 7 to displace from the push-out position B where search of a sliver end is carried out, as stated later, to the supply position C, as well as causes a newly generated empty can 9 to back toward the first drawing frame 1 to a reserve position H. A positively driven roller-conveyor 11 is arranged in a region of the can path 3 near the supply position C. With cooperation of the roller-conveyor 11 and the can-exchanging arms 10, the supply can 8 is successively forwarded in the direction shown by an arrow at a time when the can 5 at the delivery position A has been full.

A turn-table 12 is arranged at the push-out position B of the preceding doffed full can 7, which is slowly rotatable in the arrowed direction in accordance with a signal indicating the completion of the doffing operation of the first drawing frame 1. The search for a free end of a sliver dropping down from the periphery of the can 7 is carried out with the cooperation of a detecting means 50, such as a photoelectric tube, attached to a suction nozzle 17 of a suction arm 13 (see Fig. 3) while the can 7 is rotated by means of the turning table 12, whereby the sliver end is positioned at a predetermined suction position.

The suction arm 13 movable up and down is provided so as to face the front side of the full can 7, which lifts up the sliver end positioned at the suction position and withdraws the sliver from the can 7 while

sucking the sliver end thereby. The root portion of the suction nozzle 13 connected to a suction source (not shown) is related to a turning mechanism 15 and a swinging mechanism 16 mounted on a base 14. The suction arm 13 is turnable at a predetermined angle substantially in the horizontal plane passing through an upper position thereof by means of the turning mechanism 15. Further, the suction arm 13 is swingable at a predetermined angle substantially in the vertical plane between the lower position corresponding to the suction position and the upper position. More specifically, as illustrated in Figs. 4 and 5, the turning mechanism 15 comprises a disc 101 rotatably mounted on a stand 22 and a motor 104 for driving the disc 101 through gears 102 and 103. The swinging mechanism 16 comprises a shaft 106 rotatably held by a pair of supports 105, 105 and a motor 109 for driving the shaft 106 through gears 107 and 108, on which shaft 106 is fixedly secured the root of the suction arm 13.

As shown in Fig. 3, a suction nozzle 17 is pivoted at the tip end of the suction nozzle 13 and rotatable axially by means of a motor 53. A mouth of the suction nozzle 17 is covered with a wire mesh 52, on which the sliver end is held by suction and lifted to to a sliver-transferring position disposed above the supply position C.

A sliver nipping and supplying device 18 for receiving a fresh sliver 31 withdrawn from the full can 7 and supplying the same to the second drawing frame 2 is provided immediately upstream of a pair of feed rollers 20a, 20b and a screw guide 21, both of which are secured on a frame of a sliver conveyor 19 extending backward from the back side of the second drawing frame 2. The sliver nipping and supplying device 18 is mounted on a stand 22 installed on a basement 14 in the central region of the can-exchanger 4. Inside of the upper portion of the stand 22, a swing arm 24 is pivoted

and rotated back and forth, by a motor 23, at a predetermined angle in a vertical plane. A nip roller 25 of a fixed position is rotatably secured at the upper end of the swing arm 24. To an opposite end of a shaft of the nip roller 25 is integrally fixed a friction roller 26 which, in turn, is engageable with another friction roller 27 fixedly mounted to an output shaft of a motor M1 when the swing arm 24 is in the sliver nip position shown in Fig. 2. This nip roller 25 is mated with a displaceable nip roller 28 rotatably mounted at the end of a swing lever 29 pivoted on the swing arm 24 as stated before. The swing lever 29 is made to reversibly rotate at a predetermined angle about a pivot thereof by a motor (not shown) connected thereto, whereby the displaceable nip roller 28 is engageable with and disengageable from the nip roller 25 of the fixed position.

A detector 30 such as a photoelectric tube is provided for detecting the front end of the sliver 31 lifted up from the full can 7 by the suction arm 13 on the stand 22 at a position above the nip roller 25 when the swing arm 24 occupies the sliver transferring position as shown in Fig. 2. On the upper surface of the stand 22, a V-shaped guide 32 is secured for smoothly guiding the sliver 31 during the reversing operation thereof to the can 7. A receiving plate (not shown) for the sliver 31 which is released from the suction arm 13 may be provided between the V-shaped guide 32 and the suction arm 13. As illustrated in Fig. 1, a friction roller 33 is arranged immediately upstream of the pair of feed rollers 20a, 20b provided on the rear side of the second drawing frame 2 and is driven by the feed roller 20a through the conventional pulley and belt means. The sliver 31 nipped by the pair of nip rollers 25 and 28 is forwarded by the normal rotation of the latter with the friction roller 26 coaxially fixed with the nip roller 25 being pressed onto the friction

roller 33 when the nip roller 25 is moved to the sliver feeding position shown by an imaginary line in Fig. 2 according to rotation of the swing arm 24. On the other hand, the screw guide 21 is connected to a motor M2
5 through the conventional pulley and belt means so that the screw guide 21 makes one rotation as the fresh sliver 31 is supplied between the feed rollers 20a, 20b, whereby the old slivers precedingly supplied to the feed roller 20a, 20b are transversely shifted by one pitch of
10 the screw guide 21.

The operation of the aforesaid apparatus of the present invention will be described below.

When a full can signal is generated from an auto-counter (not shown), the first drawing frame 1 is made
15 to stop. Thereafter, the can-exchanging arm 10 and the roller conveyor 11 start to rotate at substantially the same time, whereby the doffing operation of the full can 5 at the delivery position A and the donning operation of the empty can 6 at the waiting position I
20 are carried out. Simultaneously therewith, the pushing-out operation of the preceding full can 7 from the push-out position B and the pushing-in operation of the empty can 9 from the reserve position H to the waiting position I are also completed. After the completion of
25 can-exchanging, the searching operation for the sliver end is carried out on the as-doffed can 7 deposited on the turn table 12. That is, according to a signal indicating the completion of the can-exchanging operation from a limit switch (not shown), the turning mechanism 15
30 is operated so that the suction arm 13 waiting at a waiting position shown by a solid line in Fig. 1 turns counter-clockwise to an operating position shown by an imaginary line in Fig. 1. Then, the suction arm 13 is lowered down from an upper position to a lower position
35 shown by an imaginary line in Fig. 2 by means of the swinging mechanism 16. When the suction nozzle 17 of the suction arm 13 reaches the vicinity of the periphery

of the can 7 at the push-out position B, suction of the suction nozzle 17 is commenced. When the suction arm 13 arrives at the lower position to operate a limit switch (not shown), the turn- table 12 is made to turn, which, in turn, rotates the full can 7 in the arrowed direction so that the front end of the sliver dropping down from the periphery of the can 7 is sucked and held on a wire mesh 52 covering a mouth of the suction nozzle 17. Upon the detection of the sliver end by a detector 50 incorporated in the suction nozzle 17, the turn-table 12 is made to stop, and, simultaneously therewith, the swinging mechanism 16 is operated so that the suction arm 13 is displaced from the lower position to the upper position, whereby the sliver 31 is withdrawn from the full can 7. When the suction arm 13 reaches the upper position, the turning mechanism 15 is again operated to make the suction arm 13 rotate in the clockwise direction in Fig. 1 and retreat to the position of a solid line. According to this operation, the sliver 31 lifted up from the can 7 can be introduced between the pair of nip rollers 25 and 28 of the sliver nipping and supplying device 18 waiting with both the rollers 25, 28 being separated from each other to form an opening therebetween, as shown in Fig. 2. Next, when a detector 30 such as a photoelectric tube detects the sliver 31 introduced between the nip rollers 25 and 28, a signal is generated therefrom to start a motor (not shown) to displace the nip roller 28 in the clockwise direction as shown in Fig. 2, whereby the rollers 25 and 28 engage with each other and nip the sliver 31 therebetween. Upon the completion of the nipping of the sliver by the nip rollers 25, 28, suction transmitted to the suction nozzle 17 is interrupted, and the end portion of the sliver 31 lifted by the suction nozzle 17 is dropped down on the protector (not shown). After releasing of the sliver end from the suction nozzle, the motor M1 is made to start to cause the reversing of the nip

rollers 25, 28 through the friction rollers 27 and 26, whereby the sliver 31 is backed to the full can 7. The motor M1 is made to stop immediately before the sliver end passes through the nip zone between the nip rollers
5 25, 28 by the action of the detector 30. According to this reversing of the nip rollers 25, 28, a length of the free end of the sliver 31 extending out from the nip zone of the nip rollers 25, 28 becomes very short. The sliver nipping and supplying device 18 is maintained in
10 the state with the nip rollers 25, 28 holding the sliver end until the next doffing of the first drawing frame 1 and the next can supply for the second drawing frame 2 are completed.

When the supply can 8 in the most preceding
15 position G has become nearly empty and a tail end of the sliver is close to the feed rollers 20a and 20b, a signal is generated from a detector (not shown) for supplying a fresh sliver. According to this signal, the motor 23 is made to start to cause the swing arm 24 together with
20 the nip rollers 25, 28 to displace forward from above said nip position to a feed position. Because the length of the sliver end projected out from the nip rollers 25, 28 is very short, this portion of the sliver is kept straight without bending during the displacement. Upon
25 arrival of the nip rollers 25, 28 at the sliver-feeding position, the friction roller 26 coaxially fixed with the nip roller 25 is pressed onto the rotating friction roller 33, whereby the nip rollers 25, 28 are rotated in the normal direction so that the front end of the fresh
30 sliver 31 held thereby is forwarded between the feed rollers 20a, 20b. As the fresh sliver 31 is nipped between the feed rollers 20a, 20b, the screw guide 21 arranged upstream thereof is caused to make one rotation by means of the motor M2 so that the older slivers now
35 being processed are transversely displaced by one pitch of the screw guide 21.

Generally speaking, since it is difficult to

precisely match the front end of the fresh sliver with the tail end of the exhausting sliver, there may be a small gap or a lap between the two ends during the above operation, whereby the resultant sliver delivered from the second drawing frame 2 is liable to include a thicker or thinner portion corresponding to the lapped ends or the gap in the case of the conventional system. Such unevenness of the resultant sliver, however, can be avoided according to the present invention due to the provision of the auto-leveler.

Once the sliver 31 is caught between the nip of the feed rollers of 20a and 20b, the sliver 31 is released from the nip zone between the nip rollers 25 and 28 through the backward swing motion of the swing lever 29 caused by the motor (not shown), because this motion of the lever 29 causes, in turn, the disengagement of the nip roller 28 from the nip roller 25. Thus, the fresh sliver 31 is continuously supplied to a space of the screw guide 21 prepared by the transverse displacement of the older slivers.

After the release of the fresh sliver 31 from the nip rollers 25, 28, the swing arm 24 together with the nip rollers 25 and 28 is made to reverse from the feed position to the nip position through the action of the motor 23 and maintained in the latter position while the nip rollers 25 and 28 are separated from each other until the next sliver supply is needed.

The abovesaid operations are repeated as the doffing of the full can from the first drawing frame is completed and one of the supply can for the second drawing frame is exhausted.

In Fig. 8, another embodiment of the sliver nipping and feeding device 18 is illustrated, in which, instead of a pair of simple nip rollers 25 and 28 of the above embodiment, a pair of nip rollers with aprons 25A and 28A, such as a tensor bar type, are utilized. Because the nip zone of the aproned nip rollers 25A and 28A is

longer than that of the former embodiment, the sliver end waiting in the nip position while held between the pair of rollers can be perfectly concealed within the nip zone of the aproned nip rollers 25A and 28A so as
5 not to damage the sliver end.

Also, instead of the motor M1 and the friction roller 27 for the reversing of the nip roller 25, and the friction roller 26 associated with the nip roller 25 and the friction roller 33 provided on the second drawing
10 frame for the forwarding of the nip roller 25, it may be possible to provide a reversible motor (not shown) on the swing arm 24, by which the nip rollers 25 and 28 are rotatable in both of the normal and reverse directions through the usual pulley and belt means. Further, an
15 element movable in a straight path may be utilized for carrying the nip rollers in place of the swing arm 24 of the preceding embodiment.

As described above, according to the present invention, since the front end of the fresh sliver is
20 held between the nip rollers in such a state that the end is projected as short as possible from the nip zone, the bending of the sliver end is avoidable during the displacement thereof from the nip position to the feed position, whereby the sliver end is smoothly supplied to
25 the feed system of the second drawing frame, which, in turn, eliminates the thickness variance of the resultant sliver and the blockage of a trumpet provided on a coiler motion of the second drawing frame. In addition, since the step for breaking the front end of the sliver is
30 eliminated during the feeding operation, means for collecting the waste sliver, such as a filter box, is unnecessary, and, of course, waste is decreased to a great extent. Provision of the auto-leveler improves the variance of the sliver thickness even though the
35 front end of the fresh sliver and the tail end of the exhausting sliver is somewhat separated from or lapped with each other.

CLAIMS

1. A method for sequentially feeding a fresh
sliver in a can delivered from a first drawing frame to
a feed roller means of a second drawing frame disposed
downstream of the former and provided with an auto-
5 leveler for controlling a thickness unevenness of shorter
and longer periods in a sliver processed thereby, the
two frames having arranged therebetween an automatic
can-exchanger which carries a full can from a delivery
position of the first drawing frame to the second drawing
10 frame, and, in turn, brings back an empty can from a
supply position of the second drawing frame to the first
drawing frame, characterized in that the method comprises
steps of:

holding a first portion a front end of a
15 fresh sliver up from a full can doffed from the delivery
position of the first drawing frame;

nipping a second portion of the end of
the sliver beneath the first portion by means of a pair
of nip rollers;

20 reversely rotating the nip rollers to
back the sliver toward the can after releasing the
holding of the sliver at the first portion so that an
end of the sliver projected out from a nip zone of the
nip rollers is shortened;

25 normally rotating the nip roller to
forward the sliver to the second drawing frame, while
directing the front end of the sliver to a feed roller
means of the second drawing frame, a lapped length of
the two slivers portion being drafted to be equalized
30 with the other normal portion of the sliver by means of
the auto-leveler.

2. An apparatus for sequentially feeding a fresh
sliver in a can delivered from a first drawing frame to
a feed roller means of a second drawing frame disposed
35 downstream of the former and provided with an auto-
leveler for controlling a thickness unevenness of shorter

and longer periods in a sliver processed thereby, the two frames having arranged therebetween an automatic can-exchanger which carries a full can from a delivery position of the first drawing frame to the second drawing
5 frame, and, in turn, brings back an empty can from a supply position of the second drawing frame to the first drawing frame, characterized in that the apparatus comprises

a turn-table arranged midway of a path
10 for conveying a can transferred from the delivery position of the first drawing frame to the supply position of the second drawing frame;

a suction nozzle for holding a front end of the fresh sliver dropping down from a periphery of the
15 can and for lifting the same up to a sliver-transferring position;

a pair of nip rollers displaceable between the sliver-transferring position and a sliver-feeding position immediately upstream of the feed roller means
20 of the second drawing frame, one of the nip roller being movable away from and close to the other for releaseably nipping the front end of the fresh sliver;

a first driving means for reversely rotating the nip rollers to back the sliver toward the
25 can and a second driving means for normally rotating the nip rollers to forward the sliver toward the feed roller means; and

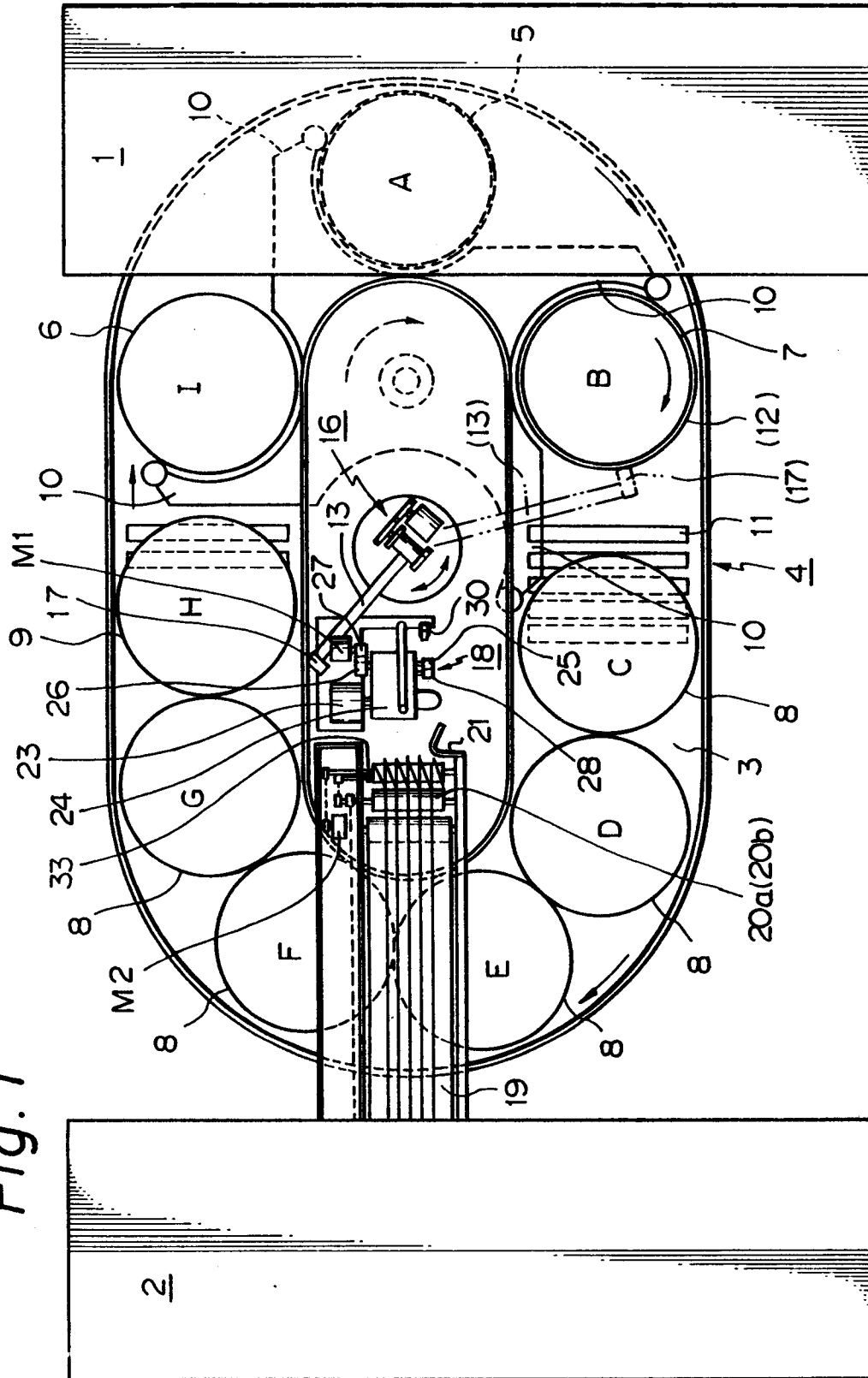
a means for detecting the front end of the sliver.

30 3. An apparatus as defined by claim 2, characterized in that the nip rollers comprise a first roller rotatably mounted directly at an end of a swing arm pivoted on a stand and a second roller mounted at an end of a swing lever pivoted on the swing arm; the swing arm
35 being rotatable so that the first roller is displaceable between the sliver-transferring position and the sliver-feeding position, and the swing lever being rotatable

relative to the swing arm so that the second roller is
displaceable between a position engageable with the first
roller and a position releaseable from the same; and the
first driving means for reversely rotating the first
5 roller is provided on the stand so that first roller is
driven when the same is in the sliver-transferring
position.

4. An apparatus as defined by claim 2, character-
ized in that the first and second driving means for
10 reversely and normally rotating the nip rollers are a
common reversible motor provided on the swingable arm.

Fig. 1



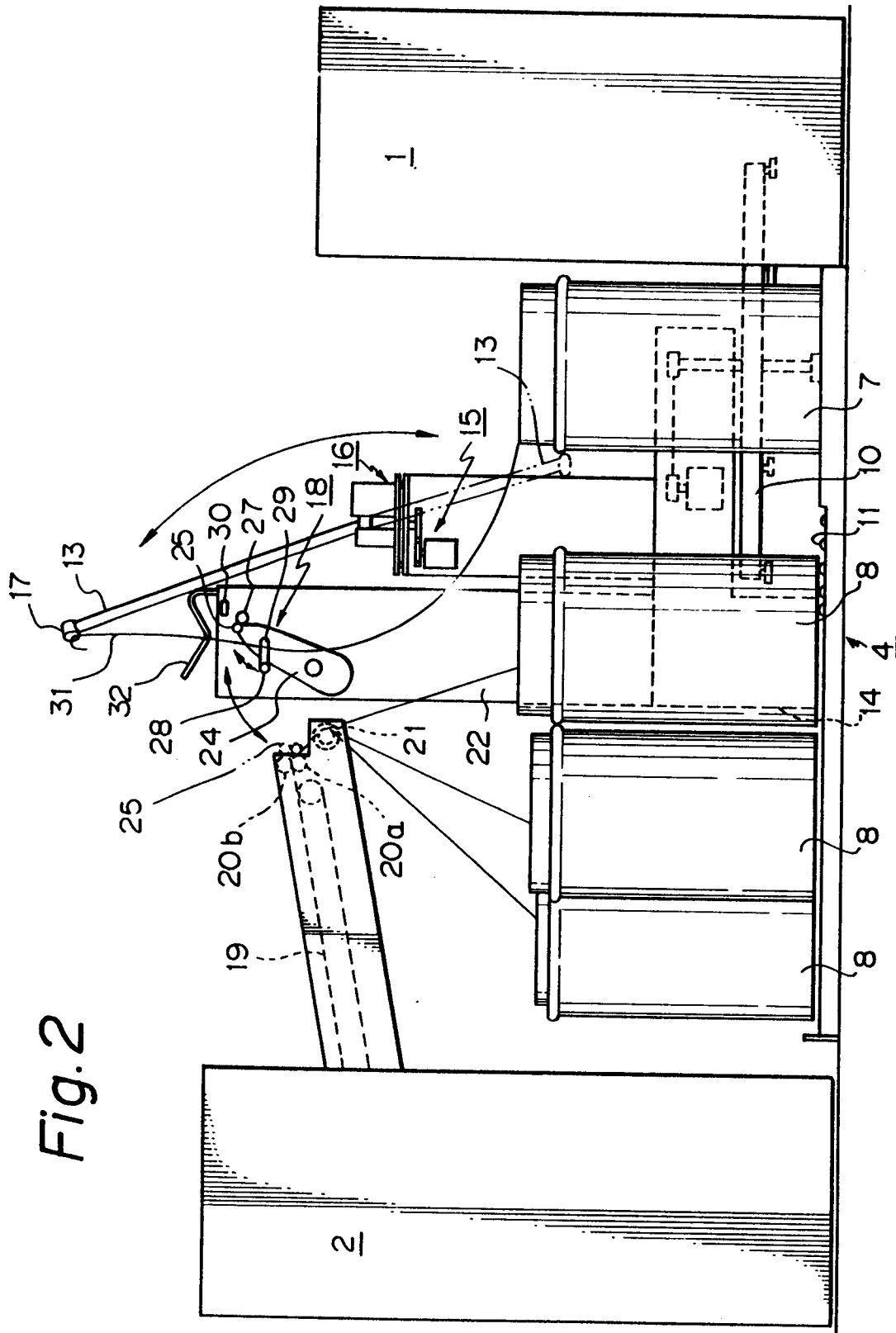
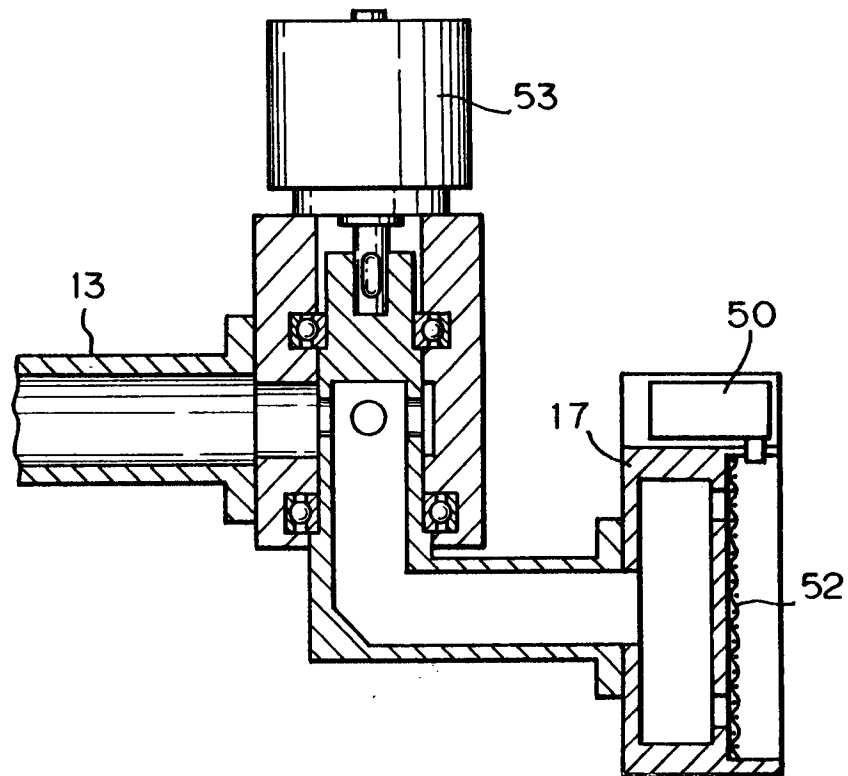


Fig. 3

13

16

105

106

107

15

103

101

22

102

104

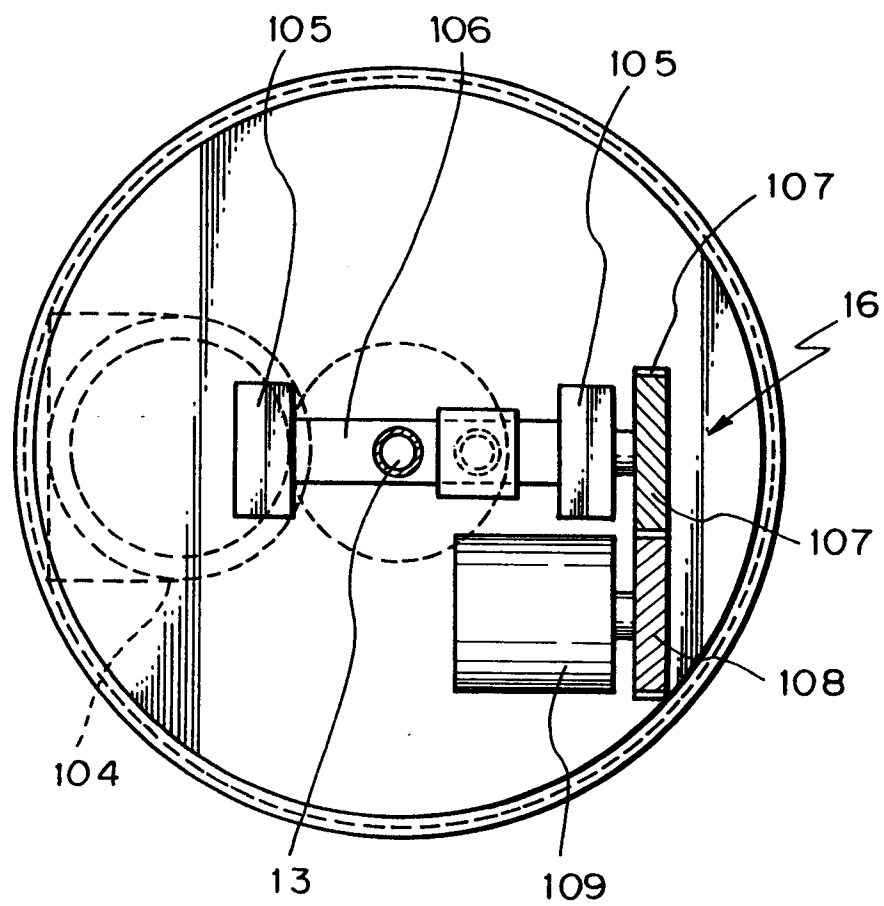
Fig. 5

Fig. 6

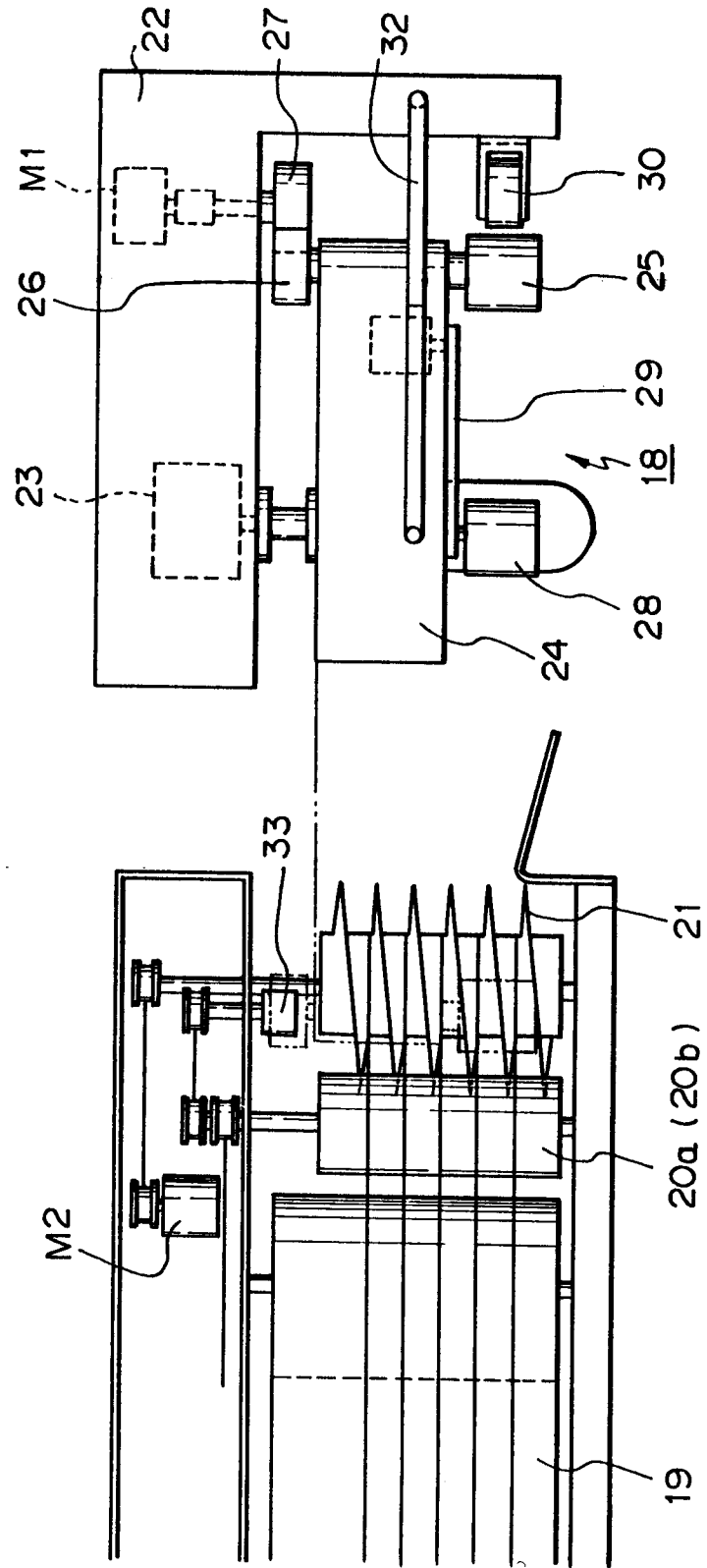


Fig. 7

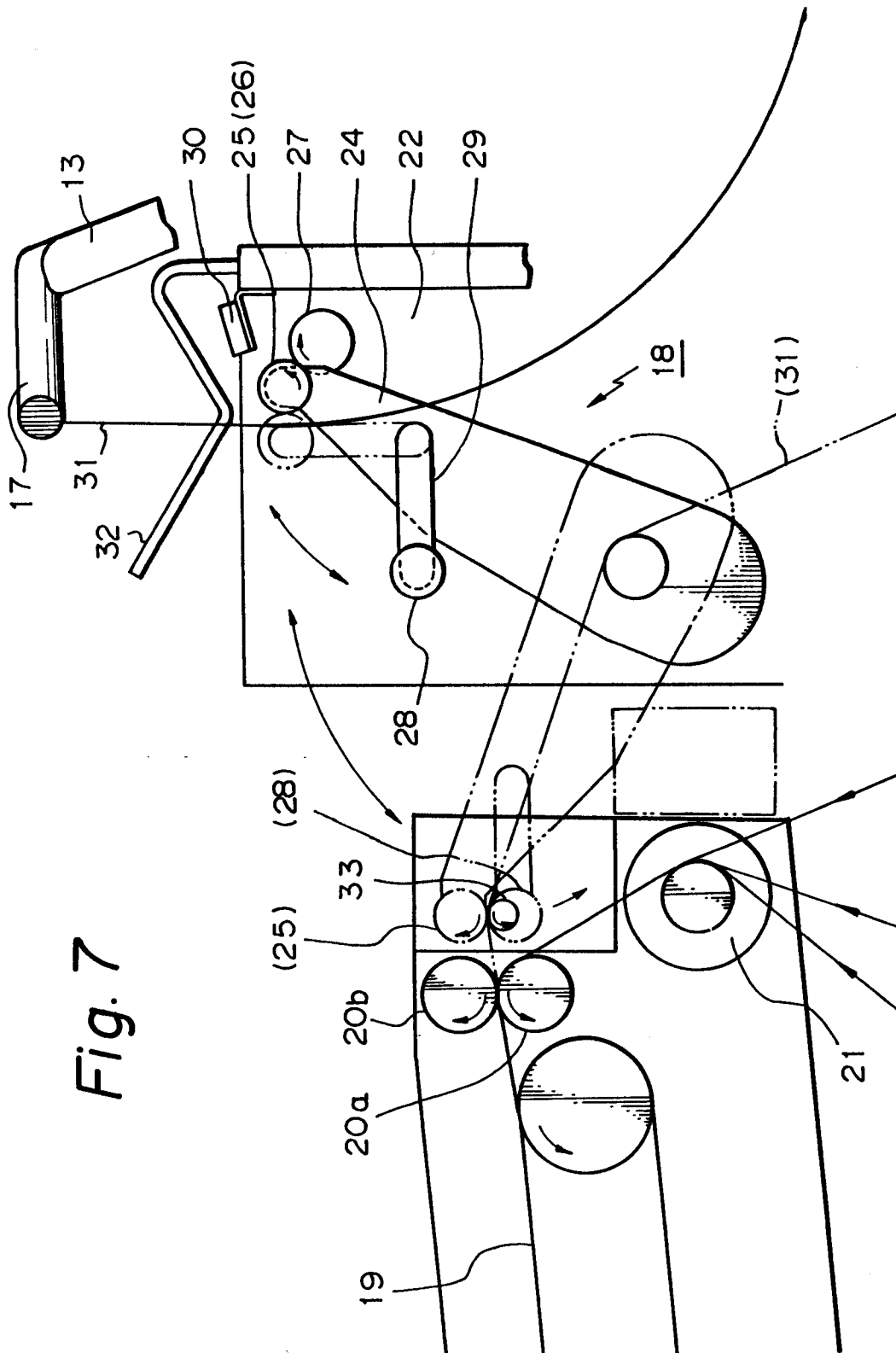


Fig. 8

