

[54] **REEL BRAKE DEVICE FOR TAPE RECORDER**

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[51] Int. Cl.....B11b 15/32, G03b 1/04

[58] Field of Search.....242/201-204, 75.4, 242/75.43, 75.44, 156, 156.2; 188/206

[56]

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[57]

ABSTRACT

A brake device used with tape recorders or the like of this invention includes a first brake member acting in the cut-in direction and a second brake member acting in the escape direction, the first and second brake members being disposed adjacent to braked members provided on the take-up and supply sides, respectively. Two brake members are selectively operable so that the selected brake member may act solely in the escape direction irrespective of the rotational direction of the braked members, whereby brake force can be exerted solely in the escape direction without erroneously breaking or severing a tape or the like running between the supply and take-up sides.

13 Claims, 18 Drawing Figures

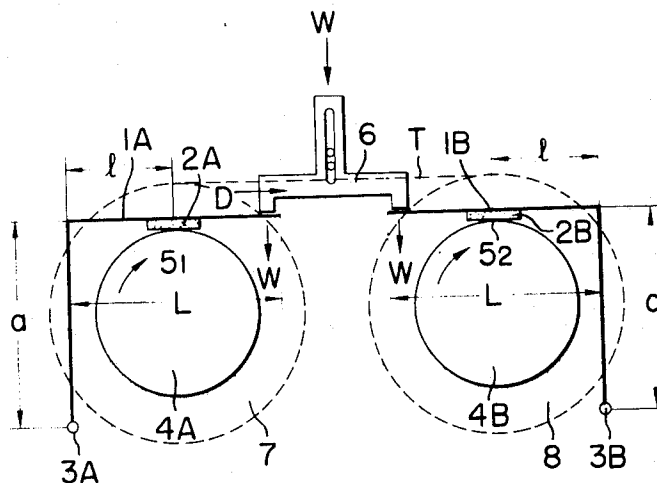


FIG. 2B

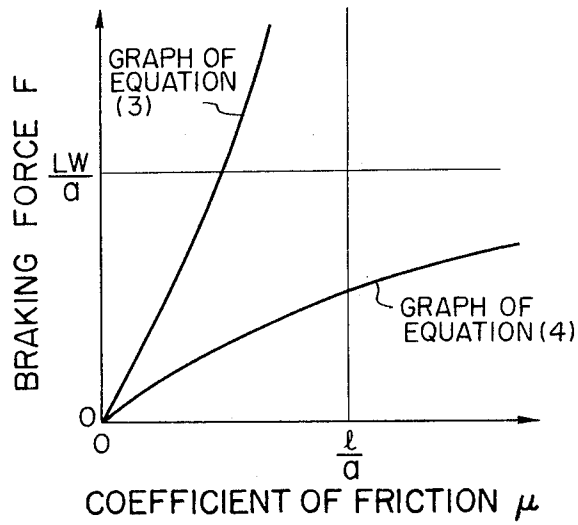


FIG. 3

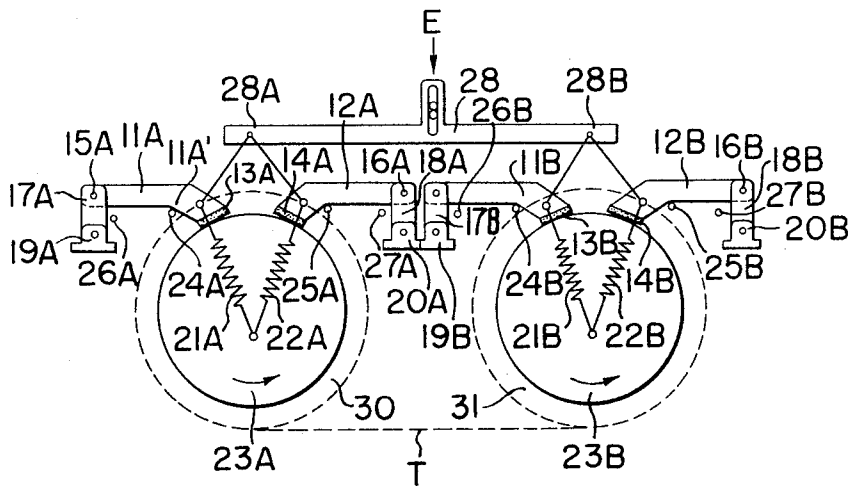


FIG. 4

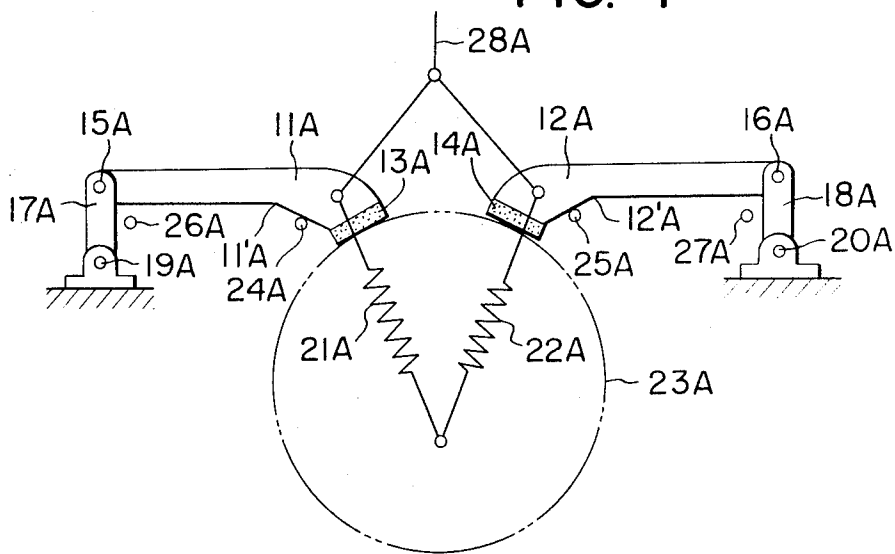


FIG. 5

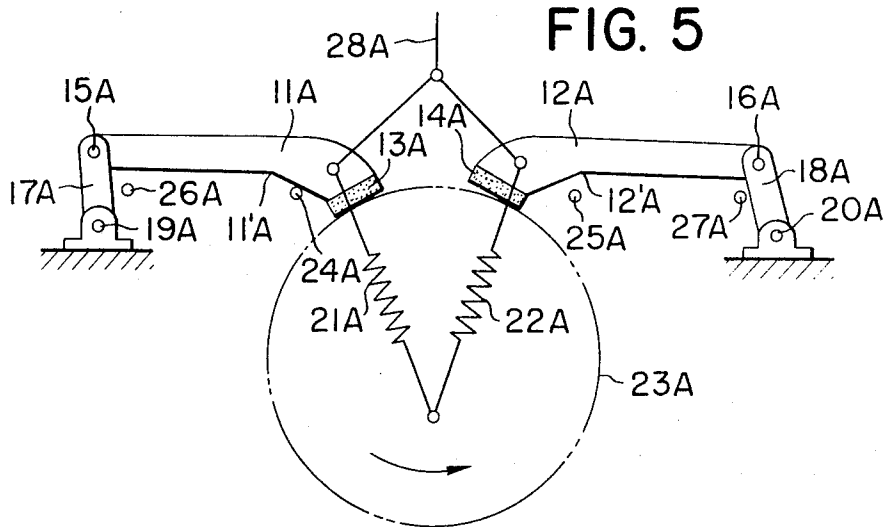


FIG. 6

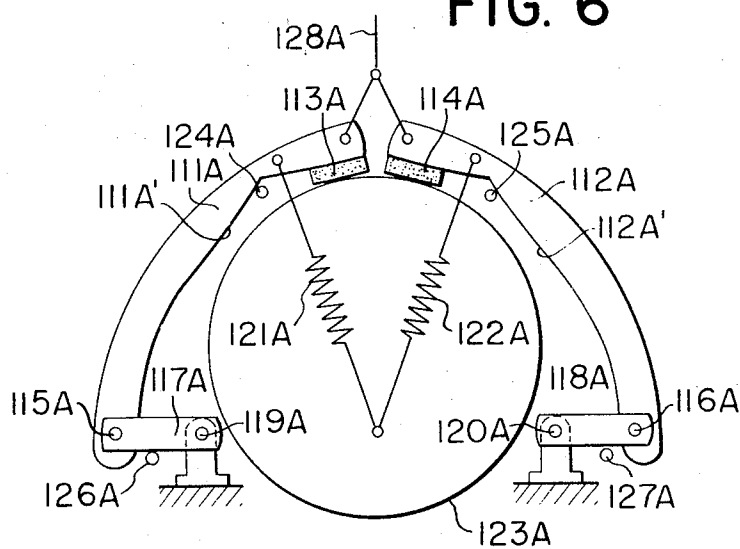


FIG. 7

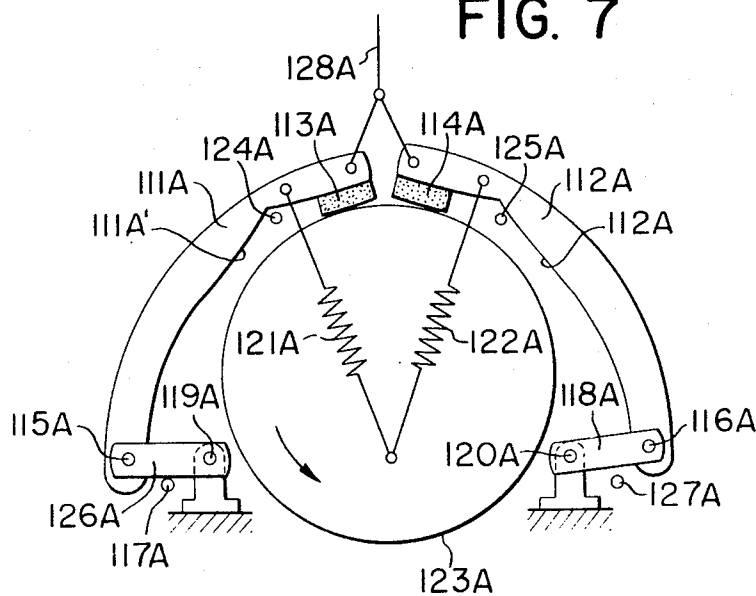


FIG. 8

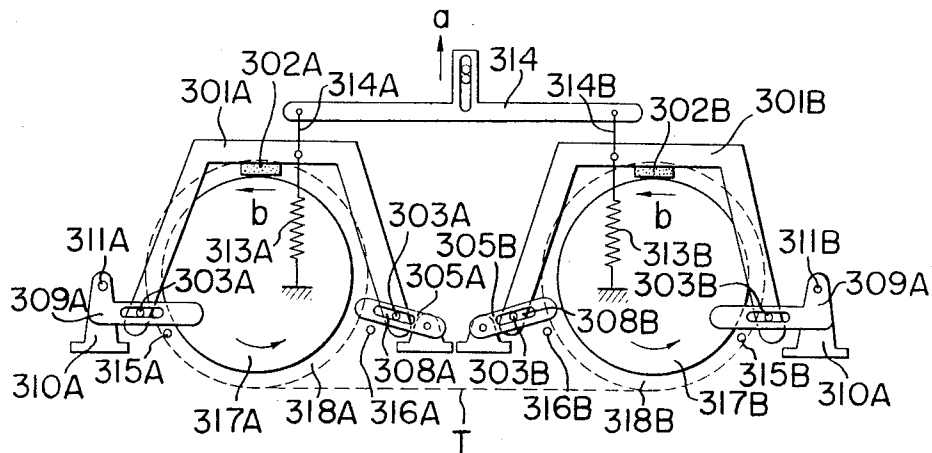


FIG. 9

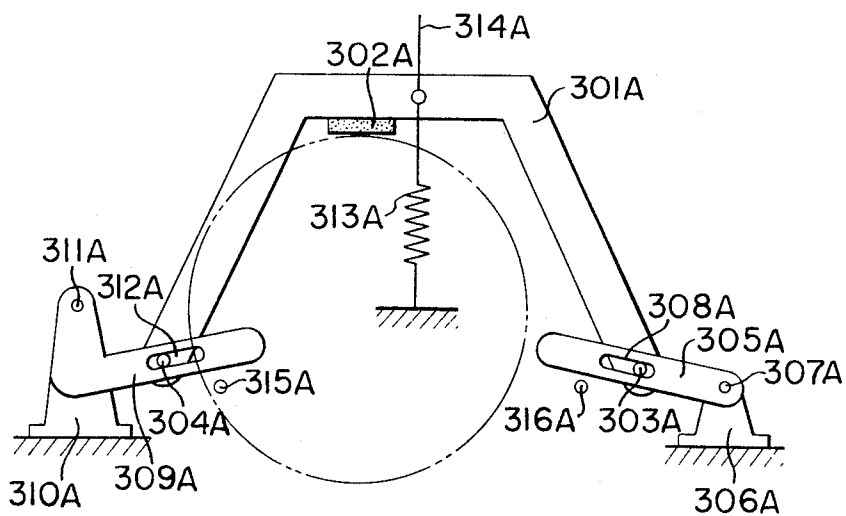


FIG. 10

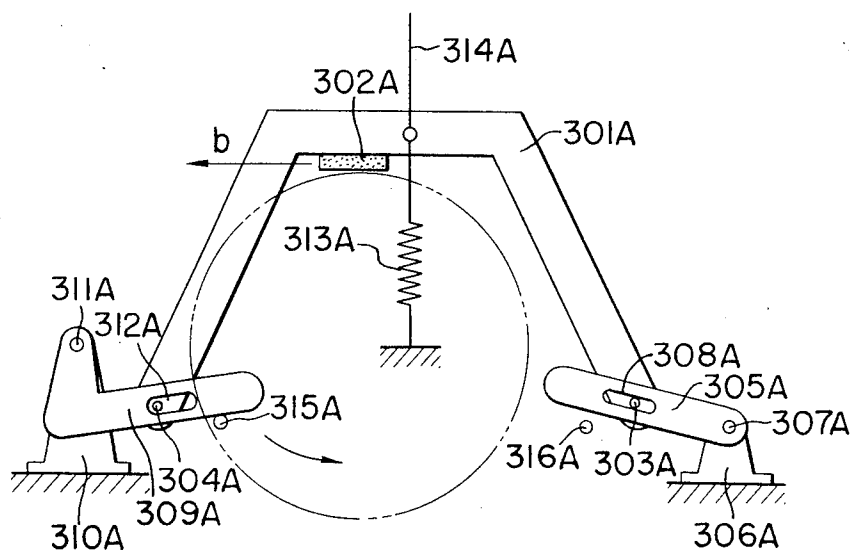


FIG. 11

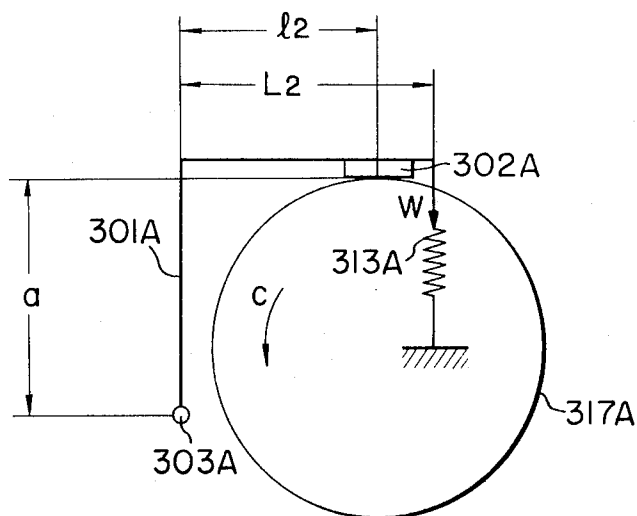


FIG. 12

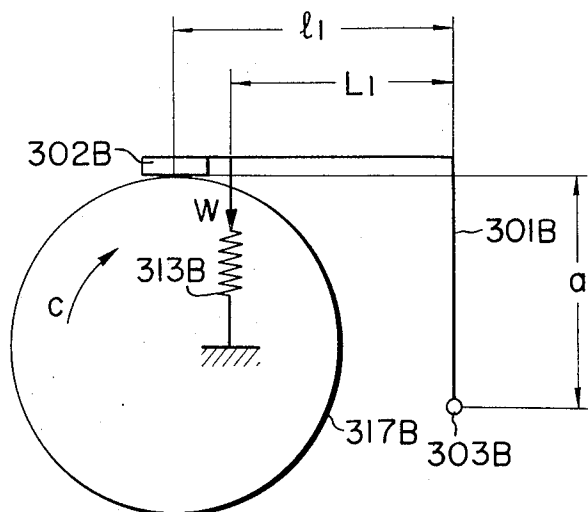


FIG. 13

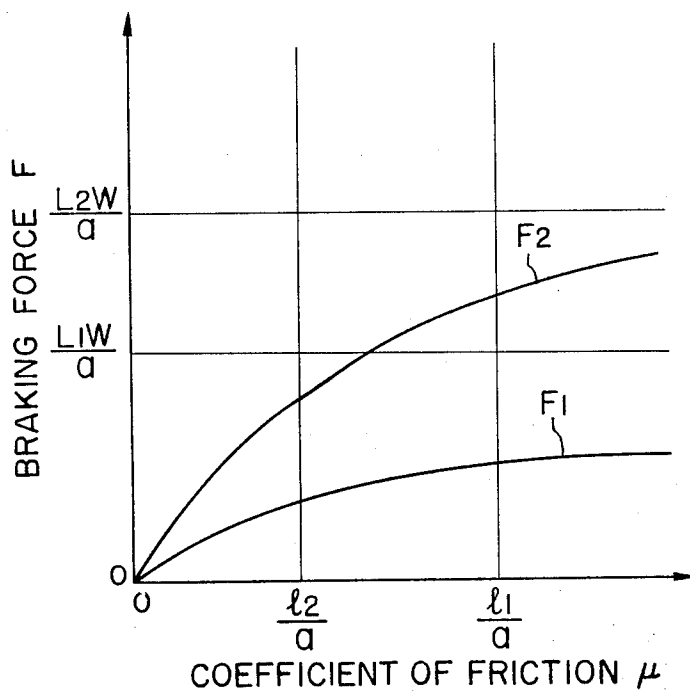


FIG. 14

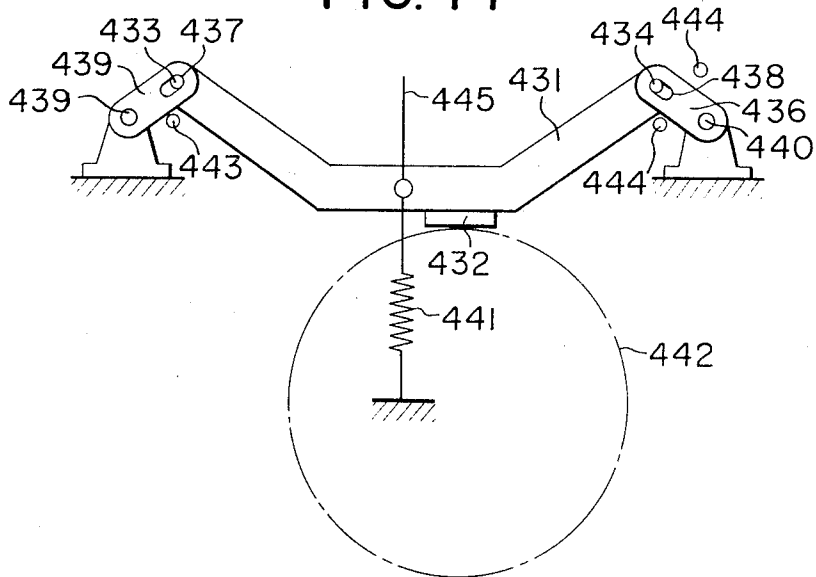


FIG. 15

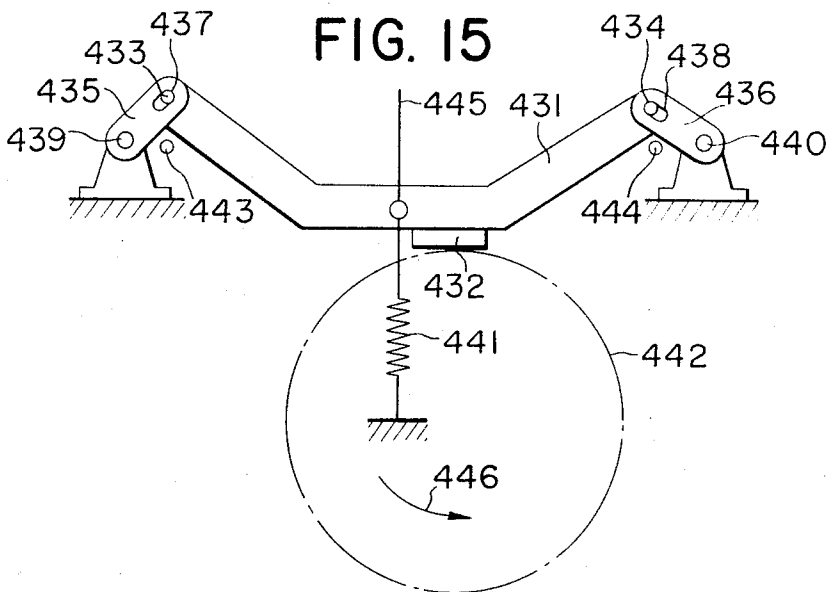


FIG. 16

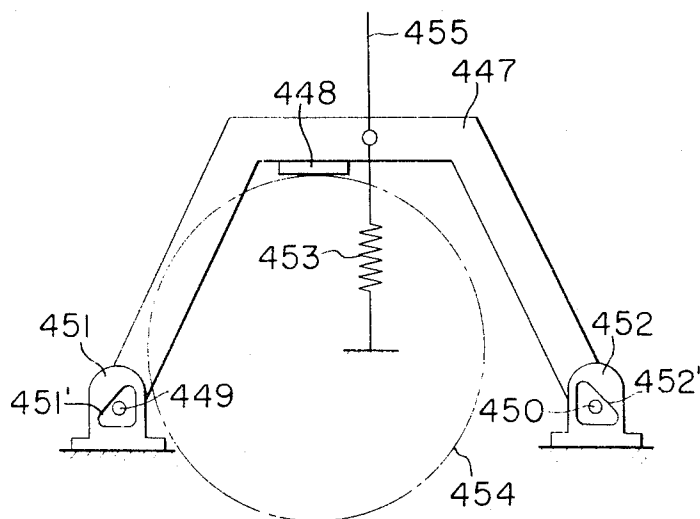
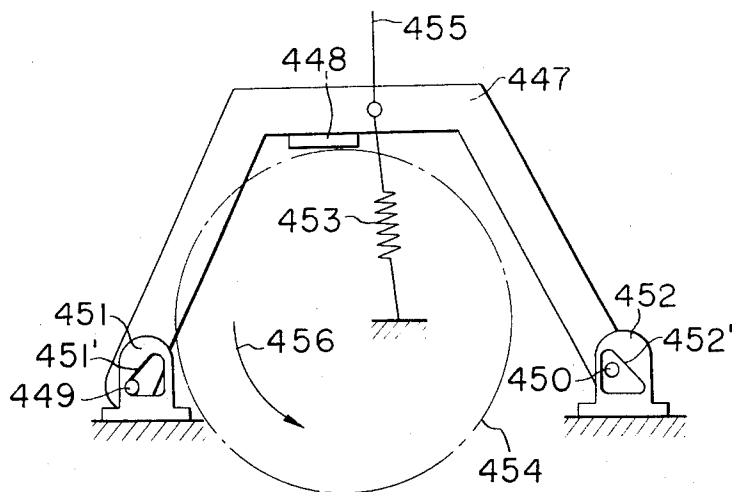


FIG. 17



REEL BRAKE DEVICE FOR TAPE RECORDER

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

This invention generally relates to a brake device, and more particularly to a reel brake device for tape recorders or the like.

2. DESCRIPTION OF THE PRIOR ART

In the brake devices heretofore used with tape recorders, it has been required that brake force be greater for a supply reel than for a take-up reel so as to prevent the tape from slackening between the two reels during the braking operation. To solve such a requirement, various brake devices have been proposed which can provide a differential brake force in accordance with the direction of movement of the tape.

In the known brake device, as will be fully described later, brake shoes are urged into contact with the circumferences of corresponding braked wheels integral with reel beds so as to brake the wheels with the aid of the friction produced between the shoes and wheels. The friction providing a brake force is selected to be different in magnitude between the take-up and supply sides, to thereby eliminate any possible slack of a tape running between the take-up and supply reels. Means used for providing such differential friction for the brake shoes is generally of the following type.

Such means is most often arranged so that the brake shoe cooperating with the braked wheel connected to the supply reel is urged into contact with that wheel in the "cut-in direction" while the other brake shoe cooperating with the braked wheel connected to the take-up reel is urged into contact with that wheel in the "escape direction", whereby a difference in brake force may be provided between the two braked wheels. The "cut-in direction" referred to above is the direction in which some of the frictional force derived from the contact between a brake shoe and a braked wheel causes the brake shoe to "cut into" the braked wheel, and the "escape direction" means the direction in which some of the friction force causes the brake shoe to "escape" or go away from the braked wheel. The brake force exerted in the cut-in direction on the braked wheel by the brake shoe is much greater than that exerted in the escape direction, and this difference in the magnitude of the brake force is provided between the take-up and supply sides.

However, in the known brake device wherein the brake shoe on the take-up side brakes in the escape direction and that on the supply side brakes in the cut-in direction, dust or similar foreign particles accumulated on the brake shoes or aging of the brake shoes may vary the friction coefficient of the brake shoes to provide an extremely increased brake force which would result in the so-called "bite" effect of the brake shoe on the supply side, and thus that brake shoe exerts too great a brake force which would sever the tape or the like running between the supply and take-up sides.

SUMMARY OF THE INVENTION

It is an object of the present invention to eliminate the described disadvantages encountered by the prior art brake devices.

It is another object of the present invention to provide a brake device with which brake force can be exerted only in the escape direction.

It is still another object of the present invention to provide a brake device which comprises a first brake member acting in the cut-in direction and a second brake member acting in the escape direction, the first and second brake members being disposed adjacent to braked members provided on the take-up and supply sides, respectively, and being selectively operable so that the selected brake member may act solely in the escape direction irrespective of the direction in which the braked members are rotated.

These and other objects and features of the present invention will become fully apparent from the following illustrative description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic plan view of a brake device according to the prior art.

FIG. 2A is a schematic plan view for illustrating the operating principle of the brake shoe and braked wheel in the brake device of FIG. 1.

FIG. 2B is a graph illustrating the relation of the friction coefficient between the brake shoe and braked wheel of FIG. 2A and the brake force provided by the friction.

FIG. 3 is a view which illustrates the construction of a brake device according to the present invention.

FIGS. 4 and 5 are plan views for illustrating the manner in which the brake device of FIG. 3 is operated.

FIGS. 6 and 7 are views which illustrate a modified form of the brake arms and the operation thereof.

FIG. 8 is a view which shows another arrangement for the brake device according to the present invention.

FIGS. 9 and 10 are plan views for illustrating the manner in which the device of FIG. 8 is operated.

FIGS. 11, 12 and 13 are views which illustrate the operating principle of the brake device shown in FIG. 8.

FIGS. 14 and 15 are views which show a modified form of the brake arm used with the device of FIG. 8.

FIGS. 16 and 17 are views which show another form of the brake arm.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before discussing the present invention, description will first be made of the problems encountered by the prior art brake device shown in FIGS. 1 and 2.

Referring to FIG. 1, the known brake device comprises a pair of L-shaped brake levers 1A and 1B, brake shoes 2A and 2B formed of felt, rubber or similar material and attached to the brake levers 1 substantially centrally of one arm thereof, pivot pins 3A and 3B for pivotally mounting the brake levers 1A and 1B, and braked wheels 4A and 4B which are braked by the brake shoes 2A and 2B when the latter are urged into contact with the circumferential edges of the former. Letter *a* represents the vertical distance from the pivot pin 3A or 3B to the tangential line passing the point of contact *S*₁ or *S*₂ between the brake shoe 2A or 2B and the braked wheel 4A or 4B. Letter *l* represents the horizontal distance between the pivot pin 3A or 3B and the point of contact *S*₁ or *S*₂. An actuator member 6 is provided to impart a vertical force *W* to the brake levers 1A and 1B, which are thereby provided with a vertical brake force *W*. Letter *L* represents the horizontal distance between the vertical line passing the pivot pin 3A or 3B and the line along which the vertical brake force *W* is imparted. The braked wheels 4A and 4B are respectively provided with concentric take-up and supply reel beds as indicated by imaginary circles, and reels 7 and 8 carrying a tape *T* thereon are mounted on these reel beds.

Operation of the above-described arrangement will now be described. It is assumed that the reel 7 supplies the tape and the reel 8 takes up the tape, that is, the tape is supplied from the reel 7 in the direction indicated by an arrow *D* and taken up by the reel 8. If a brake force *W* is imparted to the brake levers 1A and 1B after the tape *T* is taken up on the reel 8, then the levers 1A and 1B will be turned clockwise and counter-clockwise respectively so that the brake shoes 2A and 2B thereon are urged into contact with the respective braked wheels 4A and 4B. The transmission of the brake force from the brake shoes 2A, 2B to the brake wheels 4A, 4B will be described hereunder by reference to FIGS. 2A and 2B.

When brake force *W* is exerted upon the brake shoe 4A to thereby urge the shoe against the braked wheel 4A, which is then rotating in the clockwise direction, the brake shoe 2A will receive a force μP_n from the braked wheel 4A, where *P_n* is the vertical reaction of the braked wheel 4A and μ is the friction coefficient between the brake shoe 2A and the wheel 4A.

In this case, the equilibrium of the moment about the pivot pin 3A may be expressed as:

$$a\mu P_n + LW = lP_n$$

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$$Pn = LW/(l - a\mu) \quad (1)$$

For the other braked wheel 4B which is also rotating in the clockwise direction, the vertical reaction Pn' imparted therefrom to the brake shoe 2B can be derived in the similar manner:

$$Pn' = LW/(l + a\mu) \quad (2)$$

The brake force is the result of the vertical reaction Pn or Pn' multiplied by the friction coefficient μ , and the direction of the brake force is opposite to the direction in which the braked wheels 4A and 4B are rotated. Thus, when the braked wheel 4A is rotating clockwise, the brake force F therefor is expressed as:

$$F = \mu Pn = \mu LW/(l - a\mu) \quad (3)$$

and when the braked wheel 4B is rotating clockwise, the brake force F' therefore is expressed thus:

$$F' = \mu Pn' = \mu LW/(l + a\mu) \quad (4)$$

If these equations 3 and 4 are graphically represented with the friction coefficient as the abscissa and the brake force as the ordinate, then the equation 3 will take the form of a rectangular hyperbola in which $\mu = l/a$ and $F = -LW/a$ are asymptote, as shown in FIG. 2B, which shows only a first quadrant of the graph. In FIG. 2B, the curve representing the equation 3 shows the variation arising in the brake force F with the variation in the coefficient of friction μ between the brake shoe 2A and the braked wheel 4A during the braking in the cut-in direction, while the curve representing the equation 4 shows the similar relation between the brake shoe 2B and the braked wheel 4B during the braking in the escape direction. As will be seen from the curve for the equation 3, the brake force F will be greatly varied for a minute variation in the friction coefficient μ when the brake is actuated in the cut-in direction. Such a great variation in the brake force, together with an increased friction coefficient resulting from accumulation of dust or other foreign matters between the brake shoe and the braked wheel, would increase the brake force to such an abnormally great degree that may be called a "bite" effect, and as a result the supply reel 7 is subjected to an extremely great brake force which might sever the tape.

The present invention seeks to prevent the occurrence of such "bite" effect, and for this purpose the brake device of the present invention is so arranged that the brake force is exerted only in the escape direction irrespective of the rotational direction of the braked wheels, as shown by the curve for the equation 4 in FIG. 2B.

Referring now to FIGS. 3 to 5, there is shown an example of the brake device constructed according to the present invention. In FIG. 3, there is provided a pair of brake arms 11A and 12A having brake shoes of felt 13A and 14A attached thereto at one end. The brake arms 11A and 12A at the other end are pivotally connected through pins 15A and 16A to a pair of holding levers 17A and 18A, respectively, which are pivotally mounted on pivot pins 19A and 20A. Springs 21A and 22A secured at one end to a base plate (not shown) are connected at the other end to the brake arms 11A and 12A so as to urge the brake shoes on the brake arms into contact with the circumference of a braked wheel 23A.

It should be noted that the brake arms 11A and 12A are crooked to provide sloped surfaces 11A' and 12A' respectively, and in opposed relationship with these sloped surfaces there are provided pins 24A and 25A fixed to the base plate to guide the movement of the brake arms. Stopper pins 26A and 27A are provided on the base plate to stop the holding levers 17A and 18A respectively. A brake release member 28A is provided to rotate the brake arms 11A and 12A against the force of the springs 21A and 22A to thereby bring the brake shoes 13A and 14A out of engagement with the braked wheel 23A.

Members indicated by 11B to 27B are similar to the described members 11A to 27A, and thus the members 11A, 11B to 27A, 27B and 28 together constitute an entire brake device.

A pair of reels 30 and 31 having a tape T wound thereon are mounted on unshown reel beds provided on the braked wheels 23A and 23B. The springs 21A and 22A connected to the

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brake arms 11A and 12A are greater in spring force than the springs 21B and 22B connected to the brake arms 11B and 12B, respectively.

In the device of FIG. 3, when the reels 30 and 31 are rotating counter-clockwise to transport the tape T from the reel 30 to the reel 31, if the brake release members 28 are released to displace in the direction E, the brake arms 11A, 12A and 11B, 12B are pulled by the associated springs 21A, 22A and 21B, 22B so that the brake shoes 13A, 14A and 13B, 14B are urged into contact with the braked wheels 23A and 23B respectively. Thus, the braked wheels 23A and 23B are subjected to a brake force.

At the same time, the brake arms 11A, 12A and 11B, 12B are displaced leftwardly as viewed in FIG. 3 due to the friction between the brake shoes and the braked wheels. Such leftward displacement of the brake arms 11A, 12A is shown in FIGS. 4 and 5. Upon release of the brake release members 28, the brake arms 11A and 12A are displaced leftwardly from the position of FIG. 4 to the position of FIG. 5 due to the friction between the brake shoes 13A, 14A and the braked wheel 23A. Thus, the sloped surface 11A' of the arm 11A is leftwardly guided by the fixed pin 24A to swing the holding lever 17A counter-clockwise about the pin 19A, so that the brake shoe 13A is raised from the brake wheel against the force of the spring 21A and accordingly the brake arms 11A is moved until the component of the friction force of the shoe 13A which is along the sloped surface 11A' is balanced with the component of the resiliency of the spring 21A which is along the sloped surface 11A'. For this reason, the brake force of the brake shoe 13A can be made very small by arranging the spring 21A so as to provide a smaller component of resiliency along the sloped surface 11A'.

As shown in FIG. 5, the other brake arm 12A is also moved leftwardly until the holding lever 18A is stopped by the pin 27A. Thus, the sloped surface 12A' of the brake arm 12A is disengaged from the pin 25A to allow the brake shoe 14A to be urged against the braked wheel 23A by the spring 22A to thereby brake the wheel 23A. Thus, the braked wheel 23A is braked chiefly by the brake shoe 14A.

The braking operation described just above is also the case with the other braked wheel 23B, which is braked chiefly by the brake shoe 14B in the similar manner.

When braked, the braked wheel 23A is subjected to a greater brake force than the other wheel 23B because the spring 22A has a greater spring force than the spring 22B as mentioned previously. As a result, the tape T is maintained taut without any slack during the braking operation. In addition, both brake shoes 14A and 14B brake the respective braked wheels 23A and 23B always in the escape direction, and this entirely eliminates the undesirable possibility that the tape may be adversely affected by the displacement of the brake shoes.

In case where the braked wheels 23A and 23B are rotating in the opposite or clockwise direction to take up the tape T on the reel 30, the main braking role is played by the brake shoes 13A and 13B, while the brake shoes 14A and 14B are now almost idle in the same way as the shoes 13A and 13B were in the preceding case.

FIGS. 6 and 7 show a modified form of the brake device although only one-half thereof is shown to explain the relation between the braked wheel and the brake arms. This modified form differs from the previous embodiment in that brake arms 111A and 112A spring-loaded by springs 121A and 122A play the opposite roles to the above-described brake arms 11A and 12A of FIG. 3. More particularly, when the braked wheel 123A is rotating counter-clockwise, for example, if the brake release member 128A is released, then the brake arm 112A acts in the cut-in direction while the brake arm 111A brakes in the escape direction. This is because the sloped surface 112A' of the brake arm 112A is guided by the fixed pin 125A and the arm 112A is moved due to the friction between the brake shoe 114A and the braked wheel 123A until the component of the frictional force of the braked wheel 123A which is along the

sloped surface 112A' is balanced with the component of the resiliency of the spring 122A which is along the sloped surface 112A'. Thus, the brake arm 112A remains almost idle, whereas the other brake arm 111A acts to brake the wheel 123A in the escape direction with the aid of the spring 121A. The above-described operation also holds true of an unshown half of the brake device, in which a brake arm 111B (not shown) brakes a braked wheel 123B (not shown) in the escape direction.

FIGS. 8 to 10 show a further embodiment of the present invention, in which a pair of unitary brake arms have a single brake shoe corresponding to each braked wheel, although FIGS. 9 and 10 only show a half of such device. As shown in FIG. 8, unitary brake arms 301A and 301B are bifurcated, and single brake shoes 302A and 302B are attached to the respective brake arms substantially centrally of the bridge portions thereof. The brake arms 301A and 301B have pins 303A, 304A and 303B, 304B studded at the ends of the leg portions thereof. Holding levers 305A and 305B for holding the brake arms 301A and 301B are pivotally mounted on mount plates 306A and 306B by means of pins 307A and 307B, respectively (FIGS. 9 and 10). The holding levers 305A and 305B are formed with slots 308A and 308B for slidably receiving therein the pins 303A and 303B studded in the brake arms 301A and 301B.

Holding levers 309A and 309B are pivotally mounted on mount plates 310A and 310B by means of pins 311A and 311B, and these levers are formed with slots 312A and 312B. Brake springs 313A and 313B are connected to the base plate and to brake arms 301A, 301B. Wires 314A and 314B connect the brake springs 313A and 313B to a brake release member 314. Stopper pins 315A, 316A and 315B, 316B are provided on the base plate in opposed relationship with the inner ends of the holding levers 309A, 305A and 309B, 305B. Braked wheels 317A and 317B have reel beds on which are placed reels 318A and 318B having a magnetic tape T wound thereon.

With this arrangement, the brake release member 314 is normally urged in the direction *a* against the force of springs 313A and 313B, so that the brake shoes 302A and 302B on the brake arms 301A and 301B are maintained out of engagement with the braked wheels 317A and 317B. When the braked wheels 317A and 317B are rotating in the counter-clockwise direction to take up the magnetic tape T from the reel 317A onto the reel 317B, if the brake release member 314 is released in the direction opposite to the direction *a*, then the brake arms 301A and 301B will be pulled by the springs 313A and 313B to urge the brake shoes 312A and 302B into engagement with the respective braked wheels 317A and 317B. Thus, the braked wheel 317A displaces the brake shoe 302A against the force of the spring 313A from the position of FIG. 9 in the direction *b* shown in FIG. 10, whereby the pin 304A on the brake arm 301A slides in the slot 312A and the holding lever 309A is rotated clockwise until it is stopped by the stopper pin 315A. The other brake shoe 302B is also displaced against the force of the spring 313B by the braked wheel 317B in the same direction *b*, so that the pin 303B on the brake arm 301B slides in the slot 308B of the holding lever 305B from the position of FIG. 8, to thereby rotate the lever 305B in the clockwise direction until the lever 305B is stopped by the stopper pin 316B.

The operating principle of the brake arms 301A and 301B is illustrated in FIGS. 11 and 12, wherein the braked wheels 317A and 317B are shown as if they were rotating in opposite directions, but it is assumed that both wheels are rotating in one direction *c* (counter-clockwise). In other words, the wheels 317A and 317B are braked by the brake shoes 302A and 302B engaging the wheels in the escape direction.

In FIGS. 11 and 12, *a* represents the vertical distance from the points of contact between the brake shoes 302A, 302B and the braked wheels 317A, 317B to the pivot pins 303A, 303B of the brake arms 301A, 301B. Suffixed letters *l*₁ and *l*₂ represent the horizontal distances from the points of contact

between the brake shoes 302, 302A and the wheels 317B, 317A to the respective pivot pins 303B, 303A, and *L*₁ and *L*₂ the horizontal distances from the lines of the brake force imparted by the springs 31B, 313A to the vertical line passing the pivot pins 303B, 303A.

Where the brake shoes 302A, 302B are located substantially centrally of the brake arms 301A, 301B, the relation that *l*₁ - *L*₁ = *l*₂ - *L*₂ will be satisfied and at the same time, the relation that *l*₁ > *l*₂ and *L*₁ < *L*₂ will be established because the points of contact between the brake shoes 301B, 301A and the braked wheels 317B, 317A are displaced rightwardly as viewed in FIG. 8. Therefore, as shown in FIG. 13, the brake force *F*₁ of the braked wheel 317B imparted by the brake shoe 302B is given as

$$F_1 = \mu L_1 W / (l_1 + a \mu)$$

by the aforesaid equation 4, which means a rectangular hyperbola in which

$$\mu = -l_1 / a$$

and

$$F = L_1 W / a$$

are asymptote. Similarly, the brake force *F*₂ of the other braked wheel 317A imparted by the brake shoe 302A takes the form of a rectangular hyperbola in which

$$\mu = -l_2 / a$$

and

F = *L*₂ *W* / *a* are asymptote. Such rectangular hyperbolas are partly shown in FIG. 13.

It will be seen from FIG. 13 that the brake force *F*₂ exerted on the braked wheel 317A is greater than *F*₁, whereby the tape T is maintained taut between the reels 318A and 318B. Also, both brake forces *F*₁ and *F*₂ are exerted in the escape direction and this eliminates the previously described drawbacks.

It will further be noted that the brake device of FIG. 8 achieves the same result as described above even if the braking operation takes place when the braked wheels are rotating in the opposite direction to take up the tape T onto the reel 318A.

FIGS. 14 and 15 shows a modified form of the brake arm which constitutes a half of the brake device. The brake arm indicated by 431 has a brake shoe 432 attached thereto substantially centrally thereof, and pins 433 and 434 studded at the opposite ends. Connecting levers 435 and 436 formed with slots 437 and 438 are connected to the brake arm 431 by means of the pins 433 and 434 received in the slots 437 and 438, so that the brake arm 431 is axially movable within the limit defined by the slots. The connecting levers 435 and 436 are pivotally connected to fixed mounts 439 and 440, respectively. The brake arm 431 is urged toward a braked wheel 442 by a spring 441 so as to bring the brake shoe 432 on the brake arm into contact with the braked wheel. Stopper pins 443 and 444 are provided to restrict the movement of the connecting levers 435 and 436. A brake release bar 445 is connected to the brake arm 431.

With this arrangement, when the braked wheel is rotating in the direction indicated by an arrow 446 in FIG. 15, an exerted force will cause the brake arm 431 to be displaced leftwardly as viewed in the figure due to the friction between the brake shoe 432 and the braked wheel 442, whereby the pin 434 strikes the left end of the slot 438 and the connecting lever 436 strikes the pin 444, thus restricting the pin 434. On the other hand, the pin 433 at the left end of the arm 431 moves in the slot 437 approximately to the center thereof and the connecting lever 435 is disengaged from the pin 443, whereby the pin 433 takes an unrestricted position. This means that the braking operation takes place in the escape direction with the pin 434 as the pivot. Similarly, when the braked wheel 442 is rotating in the opposite direction to that indicated by the arrow 446, the brake force will occur in the escape direction with the opposite pin 433 as the pivot.

FIG. 16 illustrates a further modification of the brake arm used with the brake device of FIG. 8. The brake arm 447 has a brake shoe 448 attached thereto substantially centrally thereof, and pins 449 and 450 studded at the opposite ends.

These pins 449 and 450 are loosely received in slots 451' and 452' formed in mount plates 451 and 452.

The brake arm 447 is urged toward a braked wheel 454 by a spring 453 so as to bring the brake shoe 448 on the arm into contact with the braked wheel. A brake release bar 455 is connected to the brake arm.

In this example, if the braked wheel is rotating in the direction indicated by an arrow 456 in FIG. 17, the brake arm 431 will be displaced leftwardly as viewed in the figure, due to the friction between the brake shoe 448 and the braked wheel 454, whereby the pin 449 strikes the left end of the slot 451' to thereby restrict the pin 449. The pin 450 moves leftwardly in the slot 452' to take an unrestricted position. This means that the brake force takes place in the escape direction with the pin 449 as the pivot. Similarly, the brake force will occur in the escape direction with the pin 450 as the pivot when the braked wheel 454 is rotating in the opposite direction to that indicated by the arrow 456.

In the various embodiments described above, the brake unit shown in FIG. 4 or 9 is provided in a pair to form an entire brake device as shown in FIG. 3 or 8, whereas the brake units constituting the device need not to be identical and it is of course possible to employ a combination of different brake units such as those shown in FIGS. 4 and 9 to attain the same result.

According to the present invention, as described hitherto, the brake shoes act in the escape direction irrespective of the direction in which the braked wheels are rotating, and therefore, the brake force will never develop to an abnormally great degree even if the coefficient of friction between the brake shoes and the braked wheels should be increased by aging of the brake shoes or by dust or other foreign particles accumulating thereon. Furthermore, the ratio and magnitude of the braking forces during the reversal of the rotation of the braked wheels can be set as desired by suitably selecting the points of contact of brake shoes, the pivots about which the brake arms are moved, and the position for applying pressure to the brake shoes. Thus, there is provided a highly safe brake device which will never injure or break the tape.

While the present invention has been shown and described as applied to an apparatus for transporting a magnetic tape, it is to be understood that the invention may also be applicable to other machines for transporting strips such as cinefilms, wires, etc.

It is also to be understood that various modifications and changes may be made without departing from the scope of the present invention which is restricted only by the appended claims.

What is claimed is:

1. A brake device applied to a reel for taking up a fine strip comprising a wheel to be braked, at least one brake shoe member to be press contacted with said wheel when the wheel is braked, at least one brake shoe retainer for retaining said brake shoe member, said retainer being shiftable in the tangential direction of the braked wheel at the contact point between said brake shoe member and said braked wheel when they are operated to be press contacted and thereby the brake shoe member substantially works as an escape direction brake shoe regardless of the rotational direction of the wheel; and brake operating means coupled to said retainer for shifting the retainer to press contact the brake shoe to the wheel to be braked.

2. A brake device according to claim 1, in which at least one pair of the retainers are provided for the wheel and each brake shoe is provided for each of the retainers, one brake shoe imparts a brake force to the wheel in the escape direction relative to the rotational direction while the other brake shoe imparts cut-in direction brake force, and said brake operating means has means to move the brake shoe retainer, which engages with the retainer, when the brake shoe brakes the wheel, so that the brake shoe retainer having braking force in the cut-in direction is moved to shift the brake shoe away from the wheel to substantially eliminate the braking force in the cut-in

direction so as to brake the wheel by the brake shoe having the braking force in the escape direction.

3. A brake device according to claim 1, in which said brake shoe retainer has two pivots not becoming effective simultaneously, said pivots being convertible when the retainer shifts as the brake shoe on the retainer receives the frictional force from the braked wheel so that the brake shoe imparts brake force in the escape direction regardless of the rotational direction of the wheel.

4. A brake device according to claim 2, in which said brake shoe moving means comprises a cam portion formed on the brake shoe retainer and a guide member contacting with the cam portion, the cam portion having a cam to move the retainer having the brake shoe to brake the wheel in the cut-in direction away from the wheel.

5. A brake device according to claim 2, in which said brake operating means has an elastic member coupled with the brake shoe retainer and moved to the shoe mounted position to give an elastic force for braking to the brake shoe.

6. A brake device according to claim 2, in which said brake shoe retainers are symmetrically arranged relative to the wheel, one end of the retainer is pivotally fixed and the other end of the retainer provides with the brake shoe opposed to the wheel and the middle of the retainer provides with a portion cooperative with said retainer moving means.

7. A brake device according to claim 1, in which said wheels to be braked are provided on rotating means for rotating the take up reel and supply reel, respectively, and brake shoes are moved in the tangential direction of the wheel due to the frictional force of the wheel so as to give the wheel the braking force in the escape direction.

8. A brake device according to claim 7, in which at least one pair of the brake shoe retainers is provided for each wheel to be braked, one brake shoe imparting a brake force to the wheel in the escape direction and the other brake shoe imparting a brake force to the wheel in the cut-in direction, and said brake operating means has means to move each of the brake shoe retainers, which engages with the retainer and the brake shoe imparting braking force in the cut-in direction is moved by receiving the frictional force of the wheel when the shoe brakes the wheel so as to move the brake shoe away from the wheel, so that the brake force of the brake shoe giving the braking force in the cut-in direction is eliminated and the brake force is given to the wheel only by the brake shoe giving the braking force.

9. A brake device according to claim 8, in which said retainer moving means comprises a cam portion formed on the brake shoe retainer and a guide member contacting with the cam portion, the cam portion being shaped in such a manner that, when the brake shoe to brake in the cut-in direction shifts by the frictional force of the wheel, the retainer is moved to the direction out of the tangential line of the brake shoe to move the brake shoe away from the wheel.

10. A brake device according to claim 8, in which said brake operating means has elastic members coupled with each of the brake shoe retainers, respectively, and the oppression force of the elastic member of the brake shoe retainer to brake the wheel of the supply reel is larger than that of the elastic member of the brake shoe retainer to brake the wheel of the take-up reel, so that the brake force imparted to the wheel of the supply side is larger than that imparted to the wheel of the take up side, and the fine strip is braked and stopped without slack between the supply and take up reels.

11. A brake device according to claim 10, in which said elastic members are coupled to each of the retainer symmetrically with the bisecting vertical line of the line connecting the rotational centers of the wheels, and the brake shoes are provided externally of each of the elastic members.

12. A brake device according to claim 7, in which said each brake shoe retainer is provided for each wheel, and said brake operating means has at least one elastic member corresponding to each retainer and the elastic member is symmetrically coupled to the brake shoe deviated position, and each brake

shoe imparts different braking force in the escape direction to the wheel and the brake force for the supply side becomes larger.

13. A brake device according to claim 12, in which said brake shoe retainer has two pivots not becoming effective simultaneously, said pivots being convertible when the retainer shifts as the brake shoe on the retainer receives the

frictional force from the braked wheel so that the brake shoe imparts brake force in the escape direction regardless of the rotational direction of the wheel and the brake force of the brake shoe at the supply reel becomes larger than that of the brake shoe at the take up reel.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,670,992 : Dated June 20, 1972

Inventor(s) TAKESHI GOSHIMA

It is certified that error appears in the above-identified patent
and that said Letters Patent are hereby corrected as shown below:

Col. 2, line 55, after the word "tape" insert --T--;
Col. 3, line 16, formula should read --F' = $\mu P_n = \mu LW / (l + ap)$ --;
Col. 4, line 26, "arms" should read --arm--;

Signed and sealed this 31st day of October 1972.

.(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents