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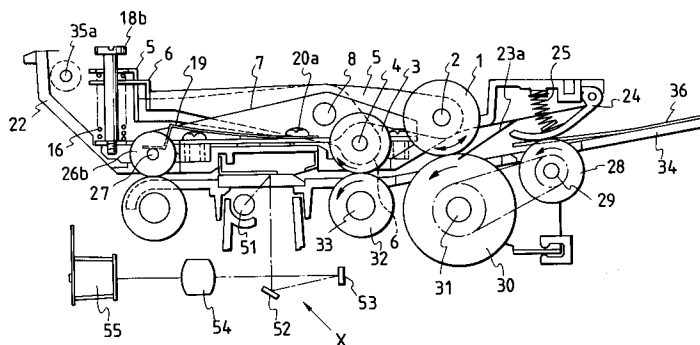
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D-80336 München (DE)(54) **Sheet feeding apparatus.**

(57) A sheet feeding apparatus comprises sheet supporting means for supporting a plurality of sheets, sheet feeding means (29) for feeding the sheets (36) from the sheet supporting means, and sheet separating means (1,30) for separating the sheets (36) fed by the sheet feeding means (29) one by one. The sheet separating means (1,30) is provided with a separating roller (30) rotated in a direction for feeding the sheets (36), and a reversely rotatable roller (1) provided so as to bear against the separating roller (30) and rotatable in the direction opposite to the direction for feeding the sheets (36). The hardness of the reversely rotatable roller (1) is set to a level equal to or lower than the hardness of the separating roller (30), and the axial length of the reversely rotatable roller (1) is made shorter than the axial length of the separating roller (30).

FIG. 2**EP 0 569 967 A1**

BACKGROUND OF THE INVENTION

Field of the Invention

5 This invention relates to a sheet feeding apparatus for separating and feeding originals or recording sheets one by one in a facsimile apparatus, a copying apparatus, a printer or the like.

Related Background Art

10 A reversely rotatable roller type sheet feeding apparatus using a reversely rotatable roller is widely known as a separating system for separating and feeding sheets one by one in a sheet feeding apparatus. This is provided with a separating roller rotated in the same direction as the direction of feed of the sheets, and a reversely rotatable roller urged against the separating roller and rotatable in the direction opposite to the direction of feed of the sheets, and separates and feeds the sheets one by one between the separating
15 roller and the reversely rotatable roller. Drive force transmitting means for driving the reversely rotatable roller is provided with a torque limiter for interrupting the transmission of any torque exceeding a predetermined torque value.

In such a sheet feeding apparatus, when there is no sheet between the separating roller and the reversely rotatable roller and when there is only one sheet between these two rollers, the reversely rotatable
20 roller receives from the separating roller side a torque greater than the predetermined torque value and therefore, the torque limiter operates and the reversely rotatable roller is rotated with the separating roller.

Also, when a plurality of sheets come into between the separating roller and the reversely rotatable roller, the reversely rotatable roller is reversely rotated, whereby the sheets on the reversely rotatable roller side are successively returned and only one sheet is fed toward the downstream side.

25 In such a reversely rotatable type sheet feeding apparatus, the axial length (width) of the reversely rotatable roller and the axial length (width) of the separating roller are usually set so as to be equal to each other. However, even if like this, an attempt is made to set the widths of the reversely rotatable roller and the separating roller so as to be equal to each other, there is a case where the irregularity or the like in manufacturing prevents the widths of the reversely rotatable roller and the separating roller from being
30 made equal to each other or the reversely rotatable roller and the separating roller are brought into contact with each other in a horizontally deviated state when they are mounted on the apparatus, and in such case, the following problems arise:

(1) Usually, the reversely rotatable roller repeats reverse rotation and forward rotation and therefore suffers more from abrasion than the separating roller. Therefore, as shown in Figure 10 of the
35 accompanying drawings, the amount of abrasion is greater on that portion of the reversely rotatable roller R which is urged against the separating roller F, whereas that portion of the former roller which is not urged against the latter roller is not abraded and thus, a level difference is created in the boundary between these portions. As a result, unsatisfactory separation of sheets such as unsuccessful feed or double feed is caused or the sheets are streaked by the level difference.

40 (2) If in order to decrease the amount of abrasion of the reversely rotatable roller R, the hardness of the reversely rotatable roller R is made higher than the hardness of the separating roller F, the separating roller F will become partly depressed as shown in Figure 11 of the accompanying drawings and a level difference will be created in the boundary, and the same problem as that noted above will arise.

45 SUMMARY OF THE INVENTION

The present invention has been made in view of the above-noted problems and the object thereof is to provide a reversely rotatable roller type sheet feeding apparatus improved in sheet separating performance.

50 The present invention has sheet supporting means for supporting a plurality of sheets, sheet feeding means for feeding the sheets from said sheet supporting means, and sheet separating means for separating the sheets fed by said sheet feeding means one by one. Said sheet separating means is provided with a separating roller rotated in a direction for feeding the sheets, and a reversely rotatable roller provided so as to be urged against said separating roller and rotatable in the direction opposite to the direction for feeding the sheets, and is characterized in that the hardness of said reversely rotatable roller is set to a level equal
55 to or lower than the hardness of said separating roller and the axial length of said reversely rotatable roller is made shorter than the axial length of said separating roller.

Also, the coefficient of friction of the reversely rotatable roller relative to the sheets may preferably be set to a level equal to or lower than the coefficient of friction of the separating roller relative to the sheets.

With such a construction, even if the widthwise positions of the two rollers deviate more or less, the reversely rotatable roller will not come out to the outside of the separating roller and the reversely rotatable roller will not be partially abraded. Therefore, the reversely rotatable roller will be uniformly abraded and thus, a reduction in the separating performance can be prevented.

Also, if the coefficient of friction of the reversely rotatable roller is made lower than the coefficient of friction of the separating roller, it can be prevented that a bundle of sheets is jammed this side of the nip between the two rollers and the feeding of the sheets fails.

Like this, the creation of the partial abrasion of the reversely rotatable roller and separating roller and the jamming of the bundle of sheets can be reliably prevented and therefore, the sheet separating and conveying performance can be improved, and this leads to an improvement in the durability of the apparatus and the prevention of the sheets from being injured.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a plan view of the automatic original feeding apparatus of a facsimile apparatus which embodies the present invention;

Figure 2 is a cross-sectional view taken along the line A-A of Figure 1;

Figure 3 is a view taken along the arrow B of Figure 1;

Figure 4 is a view taken along the arrow C of Figure 1;

Figure 5 shows an upper original guide unit in the apparatus shown in Figure 1 as it is raised;

Figure 6 is a plan view showing a reversely rotatable roller and a separating roller in the apparatus shown in Figure 1 as they are brought into contact with each other;

Figure 7 shows the states of forces during the separation and conveyance by the reversely rotatable roller and separating roller in the apparatus shown in Figure 1;

Figure 8 shows the tip clog phenomenon of sheets between the reversely rotatable roller and the separating roller;

Figure 9 shows the states of forces when the lowermost sheet is separated from the tip dog phenomenon of Figure 8;

Figure 10 shows an example of the abraded state between a reversely rotatable roller and a separating roller according to the prior art; and

Figure 11 shows another example of the abraded state between the reversely rotatable roller and the separating roller according to the prior art.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 is a plan view showing a case where the present invention is applied to a facsimile apparatus and the epitome of a region for feeding sheet originals to an image reading portion x, Figure 2 is a cross-sectional view taken along the line A-A of Figure 1, Figure 3 is a view of essential portions taken along the arrow B of Figure 1, and Figure 4 is a view of essential portions taken along the line C of Figure 1.

In these figures, the reference numeral 1 designates a reversely rotatable roller, 2 denotes the shaft of the reversely rotatable roller, 3 designates a pinch roller, 4 denotes the shaft of the pinch roller, 5 designates a reversely rotatable roller holder for holding the shaft 2 of the reversely rotatable roller through a bearing, 6 denotes a pinch roller holder for holding the shaft 4 of the pinch roller through a bearing, 7 designates a frame, 8 denotes a support shaft for rotatably supporting the reversely rotatable roller holder 5, the pinch roller holder 6 and the frame 7, and 9, 10, 11, 12a, 12b and 13 designate gears for transmitting drive from the shaft 4 of the pinch roller to the shaft 2 of the reversely rotatable roller. The numbers of the teeth of these gears are set to 16, 33, 22, 47-29 and 27, respectively.

The reference numeral 14 denotes a torque limiter, 15 designates the rotational support shaft of the gears 12a and 12b, 16 denotes a reversely rotatable roller spring for biasing the reversely rotatable roller 1 through the reversely rotatable roller holder 5, 17a and 17b designate pinch roller springs for biasing the pinch roller 3 through the pinch roller holder 6, 18a, 18b and 18c denote stoppers for regulating the rotation of the reversely rotatable roller holder 5 and pinch roller holder 6, and 19 designates a leaf spring attached to the frame 7 by means of screws 20a and 20b and biasing rollers 26a, 26b and 26c through a roller shaft 27.

The above-described parts 1 - 20 together constitute an independent unit (hereinafter referred to as a "reversely rotatable roller unit") which is mounted on an upper original guide 22 by means of screws 21a, 21b, 21c and 21d.

Further, the reference characters 23a and 23b denote guides of a low rigidity material disposed at the right and left of the reversely rotatable roller 1, 24 designates an urging arm, and 25 denotes an urging arm spring for biasing the urging arm against a preliminary conveying roller 28. The above-described parts 1 - 27 together constitute a unit (hereinafter referred to as an "upper original guide unit") in which the reversely rotatable roller unit is mounted on the upper original guide 22.

In Figure 2, the reference numeral 29 designates a preliminary conveying roller shaft for rotatably supporting the preliminary conveying roller 28, 30 denotes a separating roller, 31 designates the shaft of the separating roller, 32 denotes a feed roller, 33 designates the shaft of the feed roller, and 34 denotes a lower original guide which is a sheet stand. The upper original guide unit is pivotably supported on the body frame, not shown, of the facsimile apparatus by fulcrums 35a and 35b provided on a portion of the upper original guide 22, and is held at a predetermined level relative to the lower original guide 34 by lock means (not shown).

Design is made such that when the lock means (not shown) is unlocked, the upper original guide unit can be raised as shown in Figure 5. When conversely, the upper original guide unit is lowered and the lock means (not shown) is locked, the reversely rotatable roller 1 and the pinch roller 3 bear against the separating roller 30 and the feed roller 32, respectively, thereby constituting a reversely rotatable roller type sheet feeding apparatus. The reference numeral 36 designates a sheet original.

The separating roller 30 and the feed roller 32 are driven in the direction of arrow in Figure 2 by a drive source, not shown. Also, the torque limiter 14 is set so as to slip when a load torque of a certain set value TR or greater is applied to the reversely rotatable roller 1.

Further, when the frictional forces between the rollers or between the rollers and the sheet are defined as follows:

friction between the reversely rotatable roller 1 and the separating roller 30	F1
friction between the pinch roller 3 and the feed roller 32	F2
friction between the reversely rotatable roller 1 and the sheet 36	F3
friction between the separating roller 30 and the sheet 36	F4
friction between two sheets 36	F5
friction between the pinch roller 3 and the sheet 36	F6
friction between the feed roller 32 and the sheet 36	F7

and the radii of the reversely rotatable roller 1 and the pinch roller 3 are r1 and r2, respectively, and the speed reduction ratio of the gear train from the pinch roller 3 to the reversely rotatable roller 1 is η , the above-mentioned values are set by the pinch roller springs 17a and 17b so as to be

$$F1r1 > TR \quad (i)$$

$$F3r1 > TR > F5r1 \quad (ii)$$

$$F4 > F5 \quad (iii)$$

$$\eta F2r2 > TR \quad (iv)$$

$$\eta F6r2 > TR \quad (v)$$

$$nF7r2 > TR \quad (vi)$$

and therefore, the present reversely rotatable roller type sheet feeding apparatus with the torque limiter operates as follows in conformity with the setting of the sheet original 36 onto the lower original guide 34.

(1) When there is no sheet:

By (i) and (iv), the reversely rotatable roller 1 and the pinch roller 3 are rotated with the separating roller 30 and the feed roller 32, respectively, and the torque limiter 14 slips.

(2) When there is one sheet:

By (ii) ($F3r1 > TR$), (v) and (vi), the reversely rotatable roller 1 and the pinch roller 3 are rotated with the separating roller 30 and the feed roller 32, respectively, through the sheet, and the torque limiter 14 slips (performs the same operation as (1)).

(3) When there are two or more sheets:

By (ii), (iii), (v) and (vi), the pinch roller 3 is rotated with the feed roller 32 through the sheets and the reversely rotatable roller 1 is reversely rotated to return the other sheet or sheets than the lowermost sheet upstream with respect to the direction of sheet conveyance. The torque limiter 14 does not slip.

In item (3) above, it has been described that when there are two or more sheets, the reversely rotatable roller 1 is reversely rotated to return the other sheet or sheets than the lowermost sheet, but thereafter, the reversely rotatable roller is stopped when it has returned the other sheet or sheets than the lowermost sheet.

This is because as shown in Figure 7, a torque $(F3' + F5')r1$ created by the resultant force $(F3' + F5')$ of the frictional force $F3'$ between the sheet 36 and the reversely rotatable roller 1 and a frictional force $F5'$ created against the reversely rotatable roller 1 by a waiting sheet 37 due to its friction with the sheet 36 becomes balanced with the torque TR biased by the reversely rotatable roller 1 ($F3'$ is small as compared with $F3$ when there is not the sheet 37, because the area of contact with the reversely rotatable roller 1 becomes small due to the waiting sheet 37).

If the waiting sheet 37 eats more into the downstream direction than the state shown in Figure 7, $F3'$ will become small to provide $(F3' + F5')r1 < TR$ and therefore, the reversely rotatable roller 1 will be reversely rotated to return the sheet 37, and if conversely, the sheet 37 is too much returned, $F3'$ will become great to provide $(F3' + F5')r1 > TR$ and therefore, the reversely rotatable roller 1 will be rotated with the sheet 36-(37) and the sheet 37 will advance in the downstream direction. Between these two states, there is a point at which the forces are balanced with each other, and the reversely rotatable roller 1 becomes stopped.

The peripheral surface of the reversely rotatable roller 1 being stopped rubs against the sheet 36 being conveyed and is abraded thereby. If sheet conveyance is repeated many times, the point at which the roller 1 is abraded will change variously and after all, the roller 1 will be abraded over its full periphery.

Let it now be assumed that the reversely rotatable roller 1 is lower in hardness than the separating roller and has the same width as that of the latter roller. Although the reversely rotatable roller has the same width as that of the separating roller, the two rollers hardly fit exactly to each other because of the irregularity of individual parts during manufacture and the back-lash of the parts in assembly and more or less deviation occurs actually. Thus, abrasion is great in the portions of the rollers which are in contact with each other due to the pressure of the contact and the portions of the rollers which are not in contact with each other are scarcely abraded. As a result, as shown in Figure 10, the reversely rotatable roller R will be partially abraded with an increase in the number of sheets fed and bad separation will be caused. Also, if conversely the reversely rotatable roller R is higher in hardness than the separating roller, a depression will be formed on the separating roller S as shown in Figure 11 and bad separation will be caused or the original will be injured.

However, in the present embodiment, the reversely rotatable roller 1 and the separating roller 30 are made of the same material to thereby equalize their hardnesses and moreover, as shown in Figure 6, the width of the reversely rotatable roller is made smaller than the width of the separating roller and therefore, it never happens that the reversely rotatable roller is partially abraded or the separating roller becomes depressed. Again in the present embodiment, the reversely rotatable roller is abraded, but the abrasion takes place uniformly over the full width of the reversely rotatable roller and therefore, any trouble such as bad separation does not arise and the durability of the device is remarkably improved.

In the present embodiment, the reversely rotatable roller 1 and the separating roller 30 are formed of the same kind of silicone rubber and therefore, the fluctuation of $F1$ is small and the control of condition (i) is easy, and $F3 = F4$ and the control of conditions (ii) and (iii) is easy.

Further, silicone rubber has the characteristic that the reduction in the coefficient of friction relative to silicone oil adhering to copying paper or the like is small, and as there is the effect that copying paper or the like to which silicone oil adheres can also be fed stably. Also, even a curled sheet can be fed by the guides 23a and 23b without its leading end being turned over. Also, the driving of the reversely rotatable roller 1 is provided by the pinch roller 3 and the construction thereof is made independent as the reversely rotatable roller unit and therefore, as previously described, the liberation of the upper original guide unit becomes easy, and its simple mechanism leads to low manufacturing costs and a low failure rate as well as good interchangeability of the unit.

The construction of the image reading portion x in the present embodiment, as shown in Figure 1, comprises a light source 51, reflecting mirrors 52 and 53, a lens 54, a photoelectric conversion element 55 such as a CCD, etc.

(Other Embodiment)

While in the previous embodiment, the materials of the reversely rotatable roller 1 and the separating roller 30 are the same silicone, for example, the reversely rotatable roller 1 can be formed of silicone of rubber hardness 30° and the separating roller 30 can be formed of EPDM (ethylene-propylene-diene-rubber) of rubber hardness 40°.

Generally, in the same kinds of rubber, lower hardness results in a higher coefficient of friction, but by changing the kind of the rubber, the hardness of the reversely rotatable roller 1 can be made low and yet the coefficient of friction of the roller 1 can be made lower than that of the separating roller 30. This combination of silicone and EPDM utilizes the nature that the coefficient of friction of silicone rubber is lower than that of EPDM.

The reason why it is preferable that the coefficient of friction of the reversely rotatable roller 1 be lower than that of the separating roller 30 is that the failure in feeding by the "tip clog" of sheets when a number of sheets are placed on the sheet stand and are fed can be prevented. The "tip clog" of a number of sheets is the phenomenon that the sheets placed on the sheet stand become stagnant this side of the nip formed between the reversely rotatable roller 1 and the separating roller 30 and the attendant rotation of the reversely rotatable roller 1 is stopped thereby.

This will now be described with reference to Figure 8. A frictional force $F1'$ received from the separating roller 30 by the reversely rotatable roller 1 and a frictional force $F5''$ received from a sheet bundle 38 are balanced with a torque TR biased by the reversely rotatable roller 1 like $(F1' + F5'')r1 = TR$. At this time, the reversely rotatable roller 1 is subjected to a force f in a direction in which its pressure force against the separating roller 30 is decreased by the sheet bundle 38, and the frictional force $F1'$ received from the separating roller 30 is smaller than a frictional force $F1$ received from the separating roller 30 when the sheet bundle 38 is absent.

The sheet bundle herein referred to means that a number of sheets placed on the sheet stand become stagnant this side of the nip formed between the reversely rotatable roller 1 and the separating roller 30, and this is because the contact pressure between the sheets in the leading end portions thereof becomes great (the reaction of f) and the frictional force between the sheets becomes great and the sheets behave as if they were a lump. This tendency becomes stronger as the surfaces of the sheets are rougher and as the environment becomes higher in humidity.

Now, whether it is possible to feed out the lowermost sheet in such "tip clog" state will hereinafter be examined. In Figure 9, considering the balance between forces acting on the lowermost sheet 36, the force in the direction of feeding with this direction as positive is

$$F = (F4 - F3) + (F4' - F5'') + Fp,$$

where Fp is the conveying force by a preliminary conveying roller (not shown) provided upstream of the separating roller 30 for feeding out the lowermost sheet in the downstream direction while being in contact with the lowermost sheet, and $F4'$ is the conveying force by the separating roller created at the "tip clog" position.

As can be immediately seen, $(F4' - F5'') > 0$ (the coefficient of friction of the separating roller relative to the sheet is greater than the coefficient of friction between the sheets) and $Fp > 0$. If $(F4 - F3) > 0$, F will become positive after all and the lowermost sheet will be safely fed out, but since in the present invention, the coefficient of friction of the reversely rotatable roller 1 is made equal to or lower than the coefficient of friction of the separating roller 30, $(F4 - F3) \geq 0$ is established. Particularly in the present embodiment 2, $(F4 - F3) > 0$ and the feeding-out force increases and the performance becomes more stabilized.

Even if $(F4 - F3) < 0$, if the total of F becomes positive, the lowermost sheet ought to be fed out, but actually the balance between the forces is subtle and therefore, the performance is not stabilized, and this is not preferable.

The present embodiment is an example in which the present invention is applied to the automatic original feeding apparatus of a facsimile apparatus, and the present invention is not restricted thereto, but may be applied to the original feeding apparatus of an electronic copying apparatus and the image recording sheet supplying apparatus of a facsimile apparatus, an electronic copying apparatus, a printer or the like.

A sheet feeding apparatus comprises sheet supporting means for supporting a plurality of sheets, sheet feeding means for feeding the sheets from the sheet supporting means, and sheet separating means for separating the sheets fed by the sheet feeding means one by one. The sheet separating means is provided with a separating roller rotated in a direction for feeding the sheets, and a reversely rotatable roller provided

so as to bear against the separating roller and rotatable in the direction opposite to the direction for feeding the sheets. The hardness of the reversely rotatable roller is set to a level equal to or lower than the hardness of the separating roller, and the axial length of the reversely rotatable roller is made shorter than the axial length of the separating roller.

Claims

1. A sheet feeding apparatus, comprising:
 - sheet supporting means for supporting a plurality of sheets;
 - sheet feeding means for feeding the sheets from said sheet supporting means; and
 - sheet separating means for separating the sheets fed by said sheet feeding means one by one;
 - wherein said sheet separating means is provided with a separating roller rotated in a direction for feeding the sheets, and a reversely rotatable roller provided so as to bear against said separating roller and rotatable in the direction opposite to the direction for feeding the sheets, the hardness of said reversely rotatable roller being set to a level equal to or lower than the hardness of said separating roller, the axial length of said reversely rotatable roller being made shorter than the axial length of said separating roller.
2. A sheet feeding apparatus according to Claim 1, wherein the materials of said reversely rotatable roller and said separating roller are the same to thereby set the hardness thereof to the same level.
3. A sheet feeding apparatus according to Claim 1, wherein the coefficient of friction of said reversely rotatable roller relative to the sheets is equal to or lower than the coefficient of friction of said separating roller relative to the sheets.
4. A sheet feeding apparatus according to Claim 3, wherein the materials of said reversely rotatable roller and said separating roller are the same to thereby set the coefficients of friction thereof to the same level.
5. A sheet feeding apparatus according to any of Claims 1 to 4, further comprising drive force transmitting means for driving said separating roller, said drive force transmitting means being provided with a torque limiter for cutting off the transmission of any torque of a predetermined torque value or greater.
6. A sheet feeding apparatus according to Claim 5, wherein said reversely rotatable roller is supported by a rockable arm, and said arm is biased toward said separating roller by biasing means, whereby said reversely rotatable roller is urged against said separating roller.
7. A sheet feeding apparatus according to Claim 1, wherein the material of said reversely rotatable roller is silicone rubber of rubber hardness 30° and the material of said separating roller is EPDM of rubber hardness 40°.
8. An image reading apparatus comprising:
 - sheet supporting means for supporting a plurality of sheets;
 - sheet feeding means for feeding the sheets from said sheet supporting means; and
 - sheet separating means for separating the sheets fed by said sheet feeding means one by one and feeding the sheets to an image reading portion;
 - wherein said sheet separating means is provided with a separating roller rotated in a direction for feeding the sheets, and a reversely rotatable roller provided so as to bear against said separating roller and rotatable in the direction opposite to the direction for feeding the sheets, the hardness of said reversely rotatable roller being set to a level equal to or lower than the hardness of said separating roller, the axial length of said reversely rotatable roller being made shorter than the axial length of said separating roller.
9. An image reading apparatus according to Claim 8, wherein the coefficient of friction of said reversely rotatable roller relative to the sheets is equal to or lower than the coefficient of friction of said separating roller relative to the sheets.

FIG. 1

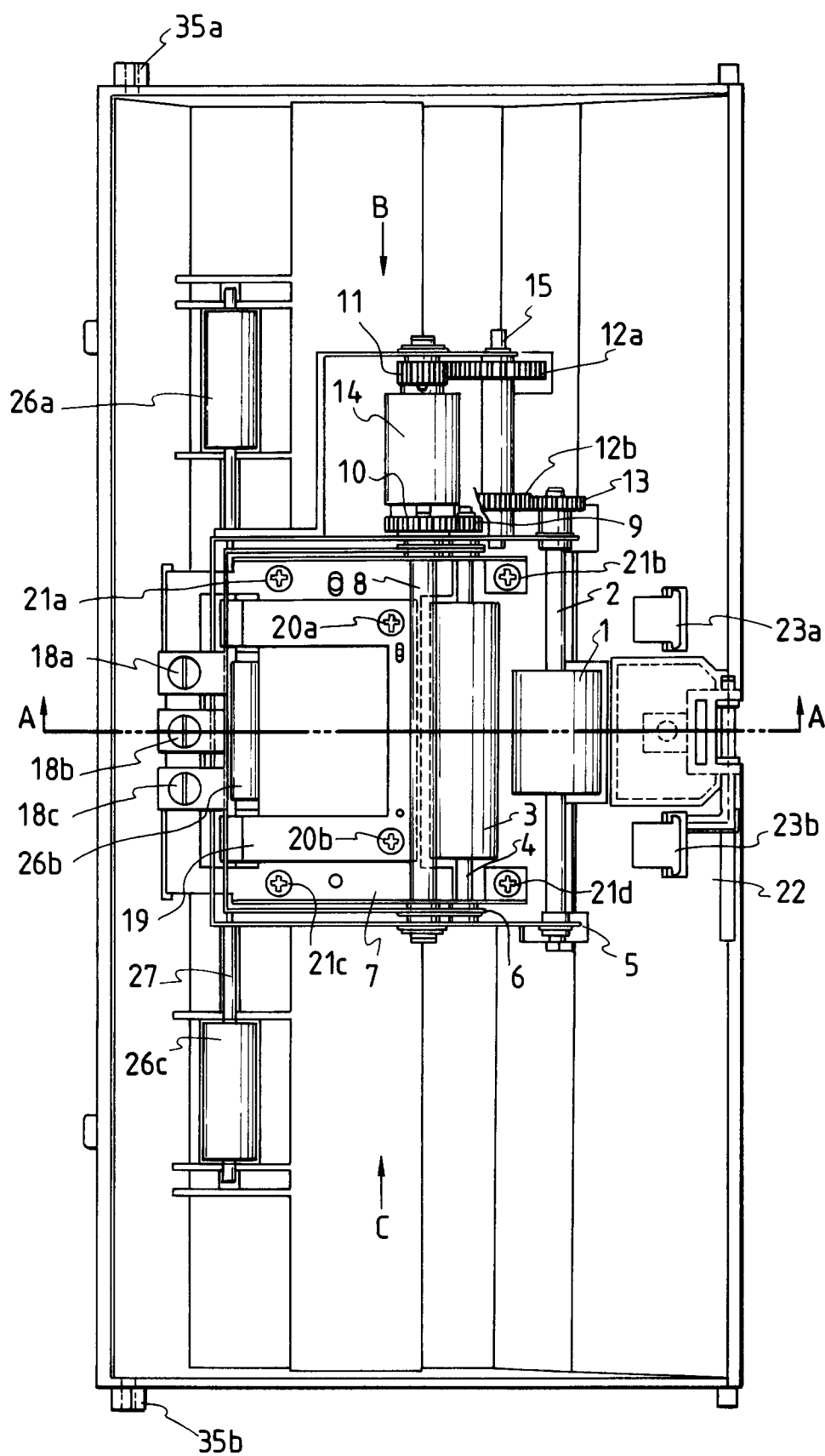


FIG. 2

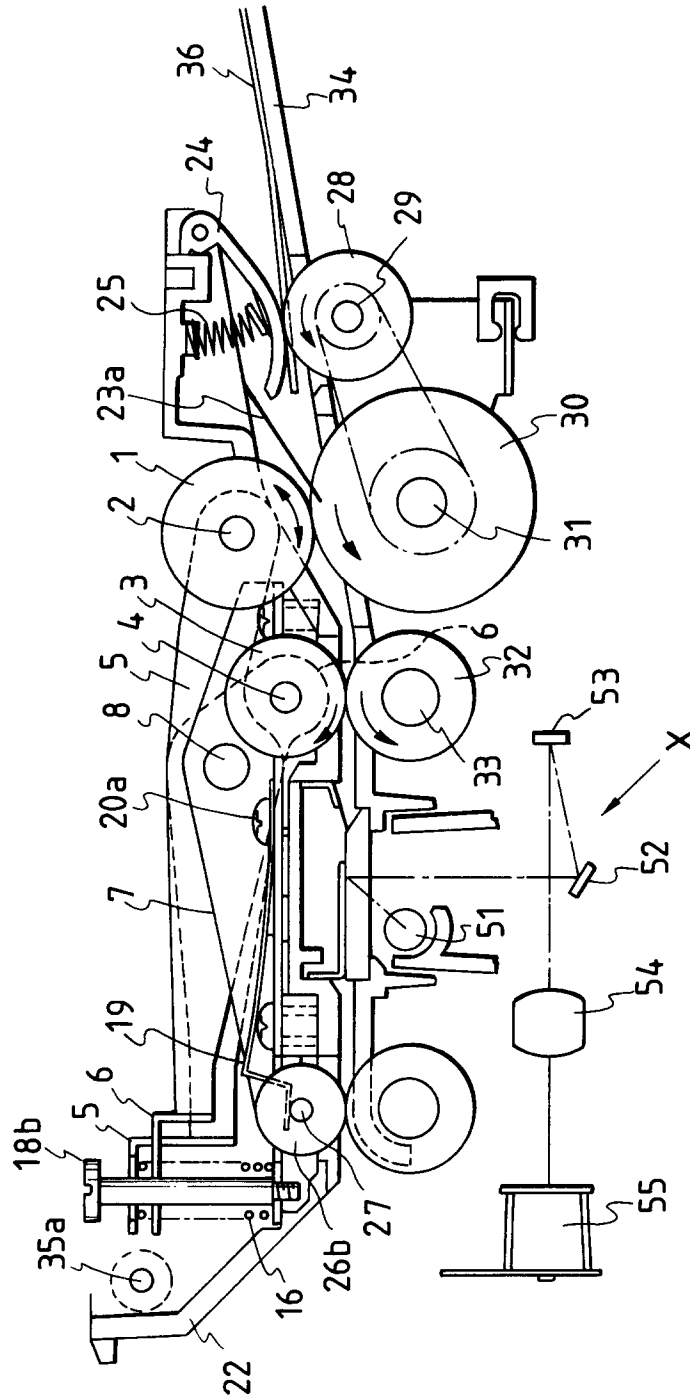


FIG. 3

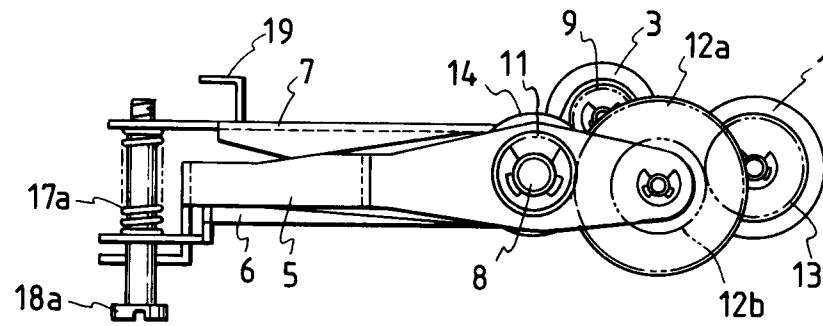


FIG. 4

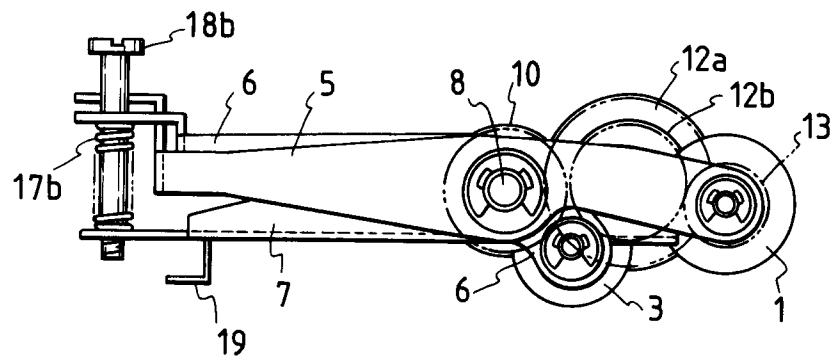


FIG. 5

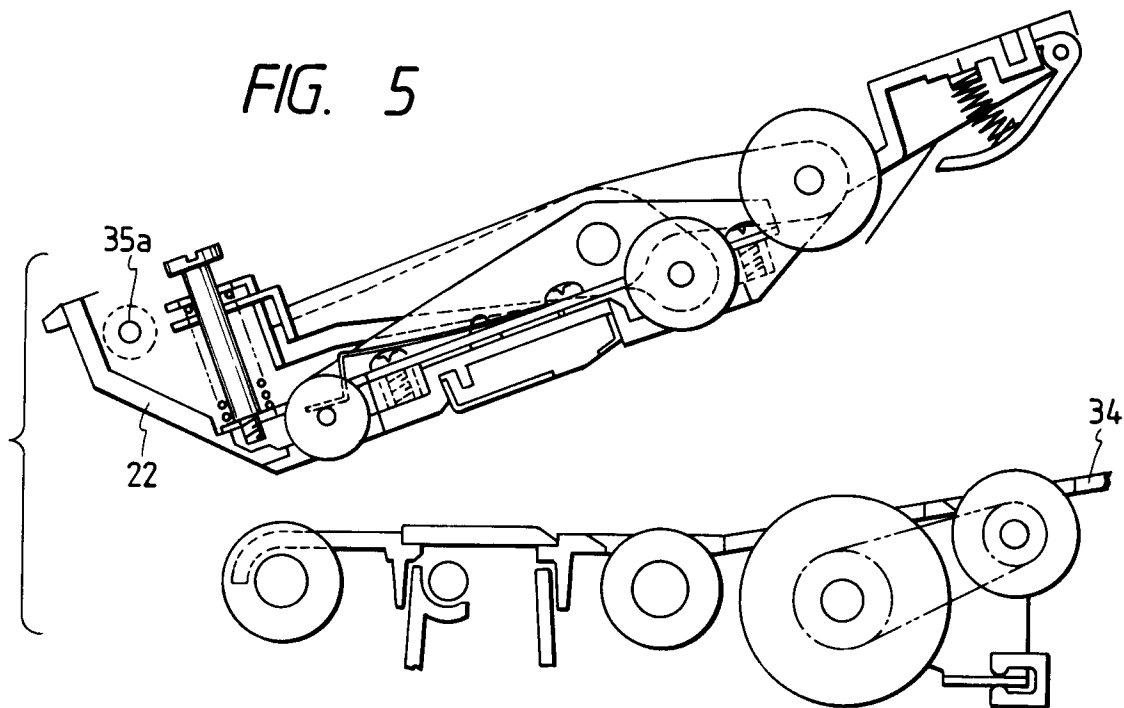


FIG. 6

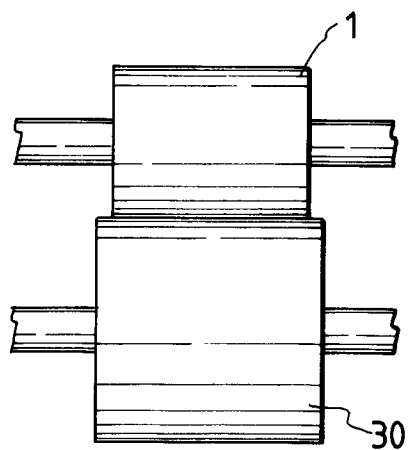


FIG. 7

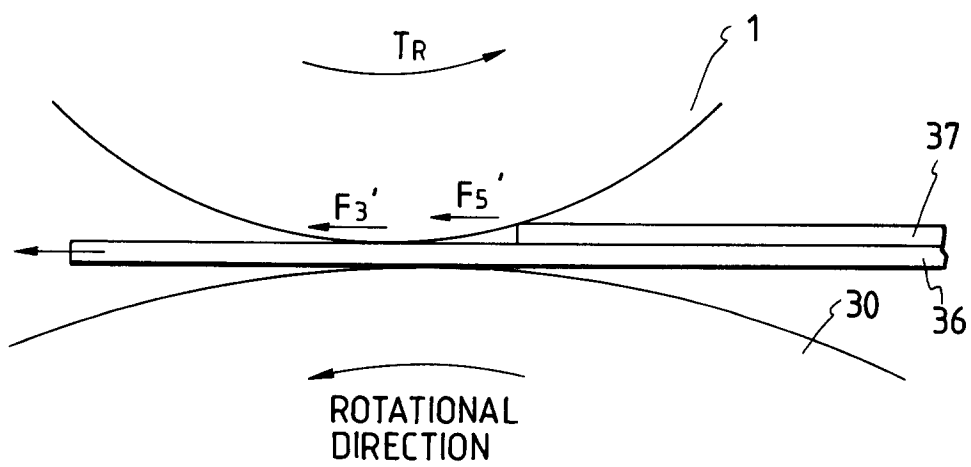


FIG. 8

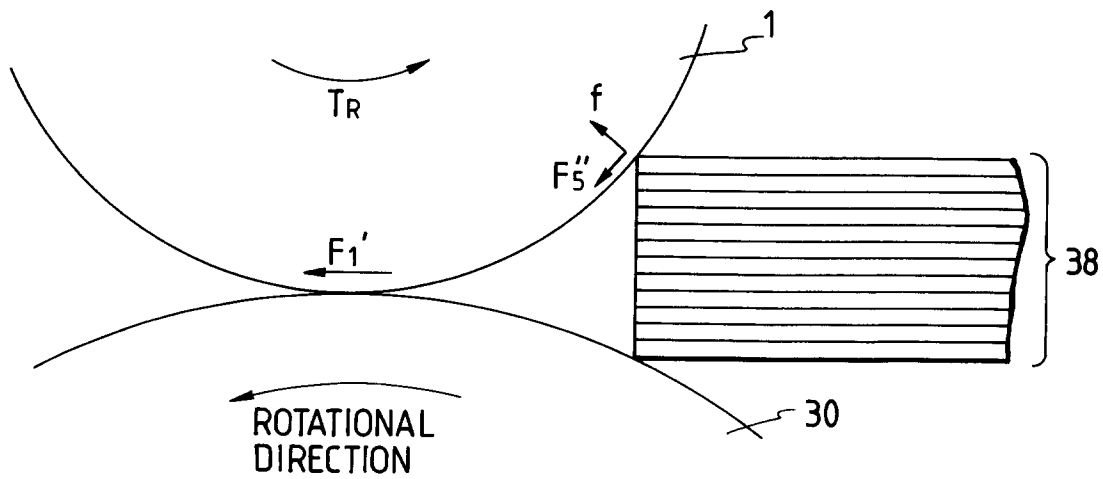


FIG. 9

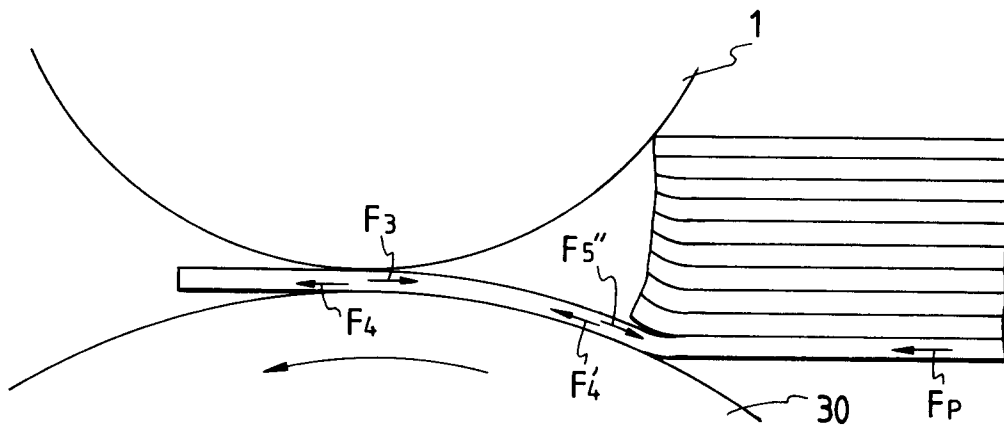


FIG. 10
PRIOR ART

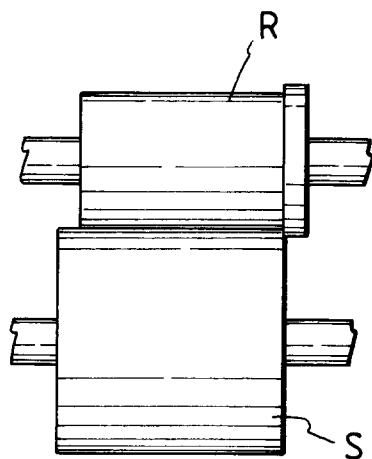
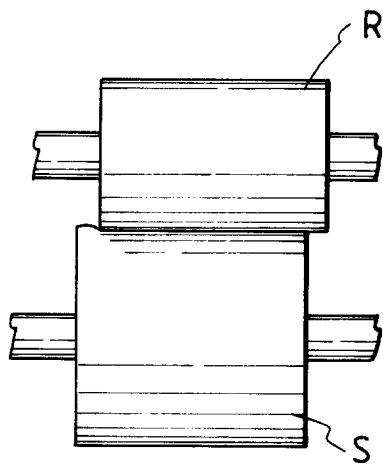


FIG. 11
PRIOR ART





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 10 7742

Page 1

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 496 145 (K. FUKUI) * figures 1,3,4 * * column 1, line 5 - line 32 * * column 3, line 19 - line 23 * * column 5, line 42 - line 63 * ---	1,3,6,8,9	B65H3/52 B65H27/00
X	EP-A-0 116 895 (HITACHI, LTD.) * figure 2 * * page 10, line 28 - page 11, line 8 *	1,3,5,8,9	
Y	---	2,4	
Y	EP-A-0 038 901 (INTERNATIONAL BUSINESS MACHINES CORPORATION) * abstract; claim 1; figure 1 * * page 12, line 15 - line 19 *	2,4	
A	---	1,5,8,9	
A	US-A-4 801 134 (C. YOKOYAMA) * figures 1,2 * * column 9, line 46 - line 65 * ---	1-6,8,9	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	MACHINE DESIGN vol. 57, no. 10, May 1985, CLEVELAND US pages 54 - 58 M.D. BESSETTE 'Designing reliable paper-handling systems' * the whole document * ---	1,3,8,9	B65H
A	US-A-2 140 171 (F.J. ROUAN) * figures 1-3 * ---	1,6,8	
A	US-A-4 515 358 (K. FUKUI) * claims 4,5; figures 1,2 * * column 1, line 6 - line 10 * * column 2, line 62 - line 68 * * column 6, line 3 - line 9 * --- -/--	1,2,5-8	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 24 AUGUST 1993	Examiner HAEUSLER F.U.
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EP 93 10 7742

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4 192 497 (W.D. PERUN ET AL.) * claims 1,9 * -----	7	
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