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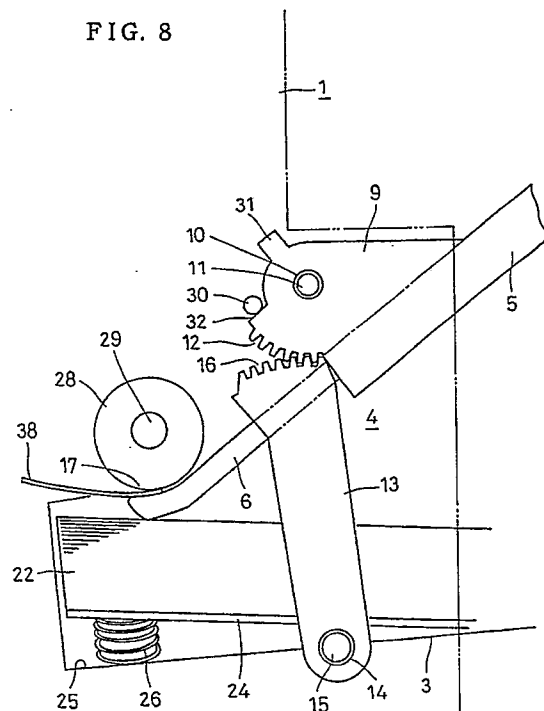
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54 Sheet sending apparatus.

57 An apparatus for sending a sheet of paper to the sheet feeding mechanism of a copying machine or printer. The sheet sending apparatus comprises a manual sheet sending chute including an upper chute (5) and a lower chute (6) articulated by gears (12,16) and an automatic sheet feeding cassette (3). When the chute is used, the upper and lower chutes (5,6) make a flat angle to smoothly pass a sheet to the feed roller (28), and the lower chute (6) press down the stacked sheets of the sheet cassette (3). When the apparatus is not used, the chutes rotate and the lower chute (6) leaves the feed roller. A sheet guide (38) is attached to the lower end of the lower chute (6) to prevent the sheet sliding on the chute from falling in the sheet cassette (3), and the parts (39a,39h) of the sheet guide corresponding to the separator (27a,27b) of the sheet cassette (3) is removed to allow natural flipping action of the sheet when the sheet is drawn out of the sheet cassette (3).

FIG. 8



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The present invention relates to an apparatus for sending a sheet (of paper) to a sheet handling machine (such as a sheet feeding mechanism inside of a copying machine or a printer).

BACKGROUND

A typical copying machine 100 has some sheet cassettes 101 and 102 for different sheet sizes as shown in Fig. 7. Since automatic sheet feeding from the sheet cassettes 101 and 102 is difficult for small and stiff sheets such as post cards or name cards, some copying machines are provided with a manual sheet-sending chute 103. In this case, a sheet feeding roller 104, 105 or 106 is prepared for each sheet cassette or the chute 101, 102 or 103. Since a sheet is handled in only one of those 101, 102 or 103 at one time, the sheet feeding rollers 104, 105 and 106 are redundant.

Japanese Published Examined Utility Model Application No. S63-4034 discloses a sheet sending mechanism including an automatic sheet-feeding cassette, a manual sheet-sending chute and a single sheet feeding roller, where the sheet-sending chute is tiltable. When the sheet-sending chute is used, the end of the chute is brought near to the sheet feeding roller, and when it is not used, the end retires from the sheet feeding roller.

The prior art mechanism, however, needs a large stroke in moving the chute and much space to swing it. The large stroke needed to bring the chute to its operating position may sometimes cause difficulties in fixing it to the exact operable position.

SUMMARY OF THE INVENTION

In order to reduce the stroke and space needed to move the sheet-sending chute between the operable position and the retired position, and in order to facilitate the exact positioning of the chute at the operable position, the sheet sending apparatus according to the present invention for sending a sheet of paper to a sheet handling machine comprises a chute divided into an upper chute plate and a lower chute plate articulated to each other. Each chute plate has an axis of rotation different from that of the other, and the sheet sending apparatus is fixable at two positions: one is an operable position where the upper chute plate and the lower chute plate make a substantially flat angle and an end of the lower chute plate is proximate to the sheet feeder; and the other is a retired position where the upper chute plate and the lower chute plate make a different angle and the end of the lower chute plate is distant from the sheet feeder.

In order to provide smooth sheet sending through the manual sheet-sending chute and from

the automatic sheet-feeding cassette, a sheet guide is attached to the lower end of the lower chute. In this case, further, the part of the sheet guide that corresponds to the sheet separator of the sheet cassette is cut off in order to ensure successful escape of the uppermost sheet from the cassette.

The sheet sending apparatus of the present invention includes some other features which will be shown in the following description of the preferred embodiment and the attached drawings.

BRIEF DESCRIPTION OF THE ATTACHED DRAWINGS

Fig. 1 is a perspective view of a copying machine equipped with the manual sheet-sending chute of the present invention and a sheet cassette.

Fig. 2 is a separate perspective view of the upper chute and the lower chute of the sheet-sending apparatus.

Fig. 3 is a side view of the sheet-sending apparatus and the sheet cassette when the sheet-sending apparatus is at the retired position.

Fig. 4 is a side view of the sheet-sending apparatus and the sheet cassette when the sheet-sending apparatus is at the operable position.

Fig. 5 is a perspective view of the upper chute of the sheet-sending apparatus when it is retained on the upper housing of the copying machine.

Fig. 6 shows the movement of the upper chute while the upper housing is swung up.

Fig. 7 is an explanatory side view of a prior art copying machine equipped with a manual sheet-sending apparatus and two sheet cassettes.

Fig. 8 is a side view of the sheet sending apparatus equipped with a resilient sheet guide at the lower end of the lower chute.

Fig. 9 is a perspective view of the sheet guide.

Fig. 10 is an explanatory view of the movement of the uppermost sheet when it is drawn out of the sheet cassette.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Fig. 1 is a perspective view of a copying machine equipped with a manual sheet-sending apparatus according to the present invention. The manual sheet-sending apparatus (only whose upper chute 5 is shown in Fig. 1) is attached at the entrance 2 of the housing 7 of the copying machine 1. A sheet cassette 3 is also inserted in the entrance 2. The housing 7 is horizontally divided to allow maintenance of the inside. The manual sheet sending mode is indicated by the lamp 8 on the top of the housing 7.

Fig. 2 shows the upper chute 5 and lower

chute 6 of the manual sheet-sending apparatus 4 separately. Normally they engage via gears 12 and 16. The upper chute 5 is made one piece where the side ends 9 of the lower edge rise up from the chute plate to form semicircles with holes 10 at the center. The holes 10 are loosely mounted on an upper axis 11 fixed on the housing 7 (Figs. 3 and 4), thus allowing rotation of the upper chute 5. At the lower part of the periphery of each end 9 is formed a first gear 12.

The lower chute 6 is also formed one piece, including arms 13 (only one of which is shown in Fig. 2) extending downward from both sides of the chute plate. The lower ends of the arms 13 have holes 14 which are also loosely mounted on a lower axis 15 fixed on the housing 7 (Figs. 3 and 4), whereby the lower chute 6 rotates on the axis 15. At the top of each arm 13 is formed a second gear 16 to be engaged with the first gear 12 of the upper chute 5. The chute plate of the lower chute 6 slants downward toward inside of the housing 7, with the lower edge 17 slightly turning upward. A notch 19 is formed at the center of the lower edge 17 for an antenna 18 of a sheet sensing switch SW₂, and at both sides of the central notch 19 are formed side notches 20 for auxiliary sheet rollers 21.

Fig. 3 shows the upper chute 5 and the lower chute 6 of the manual sheet-sending apparatus 4 at their retired positions, and Fig. 4 shows them at their operating positions.

When the manual sheet-sending apparatus 4 is not used, the upper chute 5 is turned up until a tongue 31 on the semicircular end 9 abuts a stopper 30 fixed on the housing 7, when the chute plate is vertical as shown in Fig. 3. At this time, the lower chute 6 engaged with the upper chute 5 by the gears 12 and 16 is rotated clockwise in Fig. 3 on the lower axis 15. No stopper is needed for the lower chute because it is engaged with the upper chute via gears 12 and 16. The sheets of paper 22 stacked on a tray 24 are pushed up by a spring 26 against a sheet feeding roller 28 at the front part of the sheet cassette 3, and only the uppermost sheet in the sheet cassette 3 is assuredly fed by the roller 28 into the copying machine 1 with the aide of the separator 27. The lower chute 6 keeps clear of the sheet stack 22 at this retired position, and works as an upper sheet guide while the sheets in the cassette 3 are fed.

When the upper chute 5 is turned up, it is held there by the engagement mechanism shown in Fig. 5. A small projection 34 on the right edge of the upper chute 5 overrides a stretched bump 36 rising from the engaging plate 35 supported on the housing 7 while the upper chute 5 is pressed rightward by a spring 37. The bump 36 on the engaging plate 35 stretches along the movement of the pro-

jection 34 so that the projection 34 does not fall down even when the upper part of the housing 7 is swung up, as shown in Fig. 6, to deal with sheet jamming (since the rotating axis of the upper housing and that of the upper chute 5 are different, the upper chute 5 moves upward in relation to the upper housing).

When the manual sheet-sending apparatus 4 is to be used, the upper chute 5 is pulled backward disengaging the protrusion 34 from the bump 36 against the spring 37 force (Fig. 5). The upper chute 5 rotates on the upper axis 11 until the edge 32 of the upper gear 12 abuts the stopper 30, as shown in Fig. 4. The lower chute 6 rotates counterclockwise this time and the lower end 17 of the chute plate of the lower chute 6 press down the sheet stack 22 separating it from the sheet feeding roller 28, whereby the sheets 22 in the sheet cassette 3 are not fed. When the upper chute 5 is stopped by the stopper 30, the chute plates of the upper chute 5 and lower chute 6 become flush to smoothly pass a sheet. When the upper chute 5 is tilted down, it turns on a transition switch (not shown) to enter the manual sheet sending mode. The manual sheet sending mode is indicated by the lamp 8 on the housing 7. When the sheet sensing switch SW₂ is turned on by a sheet sliding down the chute plates in the manual sheet sending mode, the sheet feeding roller 28 begins to rotate and the sheet is fed into the copying machine 1. The auxiliary rollers 21 reduce friction between the sheet and the lower chute plate while the sheet is fed, assuring smoother movement of the sheet, and the upturn 17 of the lower edge of the lower chute plate helps the sheet overpassing the separator 27 and prevents it from falling down in the sheet cassette 3.

As described above, the sheet-sending apparatus of the present invention is featured by the separate chutes. Since they rotate on different axes, the tilting stroke and the moving space of the chutes are small.

The second embodiment of the present invention is shown in Fig. 8, in which a sheet guide 38 is attached to the lower edge of the lower chute 6. The sheet guide 38 is made of a thin, resilient sheet of film, such as a polyester film, and is attached to the upturn edge 17 with a two-sided adhesive tape, etc. The sheet guide 38 extends well beyond the front (left in Fig. 8) edge of the sheet cassette 3 in order to prevent the sheet sliding on the chutes 5 and 6 from falling in the cassette 3 and to convey the sheet right to the sheet feeding mechanism inside of the copying machine 1.

The free end of the sheet guide 38 is made further resilient by forming a plurality of tongues 39a-39h as shown in Fig. 9. If the copying machine

1 is adapted to handle a small sized sheet (such as a post card or name card), it is preferable to make the central tongues 39d and 39e thicker to assuredly support such a small sheet.

The side end pieces 39a and 39h of the tongues are made shorter in order to assure the flipping action of the sheet being sent out from the sheet cassette 3. The process is detailed with reference to Fig. 10. When the uppermost sheet of the sheet cassette 3 is to be fed, first the side corners of the sheet is temporarily held by the separators 27a and 27b of the cassette 3 while the sheet itself is being pushed forward. The central part of the front edge of the sheet bends as shown by the solid line 40, which ensures separation of the uppermost sheet from the second sheet on the sheet stack in the cassette 3. When the sheet is further pushed forward, the corners finally flee from the separators 27a and 27b and flip upward as shown by the dashed line 41. The flipping action of the corners is important for the front edge of the sheet to successfully escape from the sheet cassette 3. The end tongues 39a and 39h are made short so that it allows the flipping action of the corners of the sheet being drawn out of the cassette 3.

If the sheet guide 38 is made of a resilient rectangular sheet without the tongues, the corners corresponding to the separators 27a and 27b are to be cut off. Anyway, the important thing is that the part of the sheet guide corresponding to the separator of the sheet cassette is removed to allow the flipping action of the sheet fleeing the separator.

Claims

1. An apparatus for sending a sheet to a sheet handling machine (1) comprising:
 - a chute for manually sending a sheet to the sheet handling machine including an upper chute plate (5) and a lower chute plate (6) articulated to each other;
 - a sheet cassette (3) provided below the chute for automatically sending a sheet to the sheet handling machine including a sheet separator (27a, 27b) at the edge of the sheet cassette nearest to the sheet handling machine for separating a sheet being drawn out of the sheet cassette from the other sheets remaining in the sheet cassette; and
 - a sheet guide (38) attached to the lower end of the lower chute plate (6) and extending toward the sheet handling machine above said edge of the sheet cassette for guiding a sheet being sent from the chute to the sheet handling machine, the part (39a, 39h) of the sheet guide corresponding to the sheet separator being removed.
2. The sheet sending apparatus according to claim 1, where each chute plate (5, 6) has an axis of rotation (11, 15) different from that of the other, whereby the manual sheet sending chute is fixable at two positions, one being an operable position where the upper chute plate (5) and the lower chute plate (6) make a substantially flat angle and an end of the lower chute plate (6) is proximate to the sheet handling machine and the other being a retired position where the upper chute plate (5) and the lower chute plate (6) make a different angle and the end of the lower chute plate (6) is distant from the sheet handling machine.
3. The sheet sending apparatus according to claim 2, where a plurality of tongues (39a-39h) are provided at the free end of the sheet guide (38), and the tongues at both sides are short.
4. The sheet sending apparatus according to claim 3, where central tongues (39d, 39e) are stiffer than the other tongues.
5. The sheet sending apparatus according to claim 4, where the sheet guide (38) is made of a plastic sheet.
6. An apparatus for sending a sheet to a sheet handling machine comprising:
 - a sheet cassette (3) for containing a plurality of stacked sheets (22);
 - a sheet separator (27a, 27b) provided at an edge of the sheet cassette (3) for separating a sheet being drawn out of the sheet cassette from the other sheets remaining in the sheet cassette; and
 - a sheet guide (38) placed above the edge of the sheet cassette with the part corresponding to the sheet separator (27a, 27b) removed.
7. The sheet sending apparatus according to claim 6, where a plurality of tongues (39a-39h) are provided at the free end of the sheet guide (38), and the tongues at both sides are short.
8. The sheet sending apparatus according to claim 7, where central tongues (39d, 39e) are stiffer than the other tongues.

FIG. 1

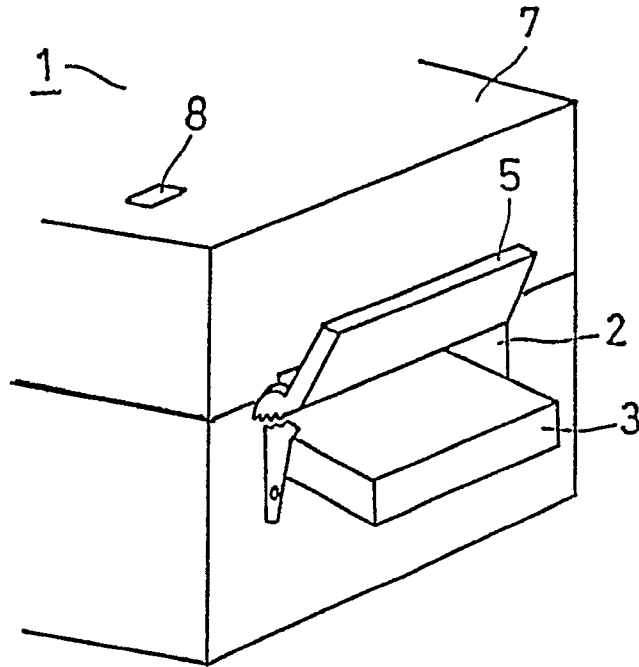


FIG. 5

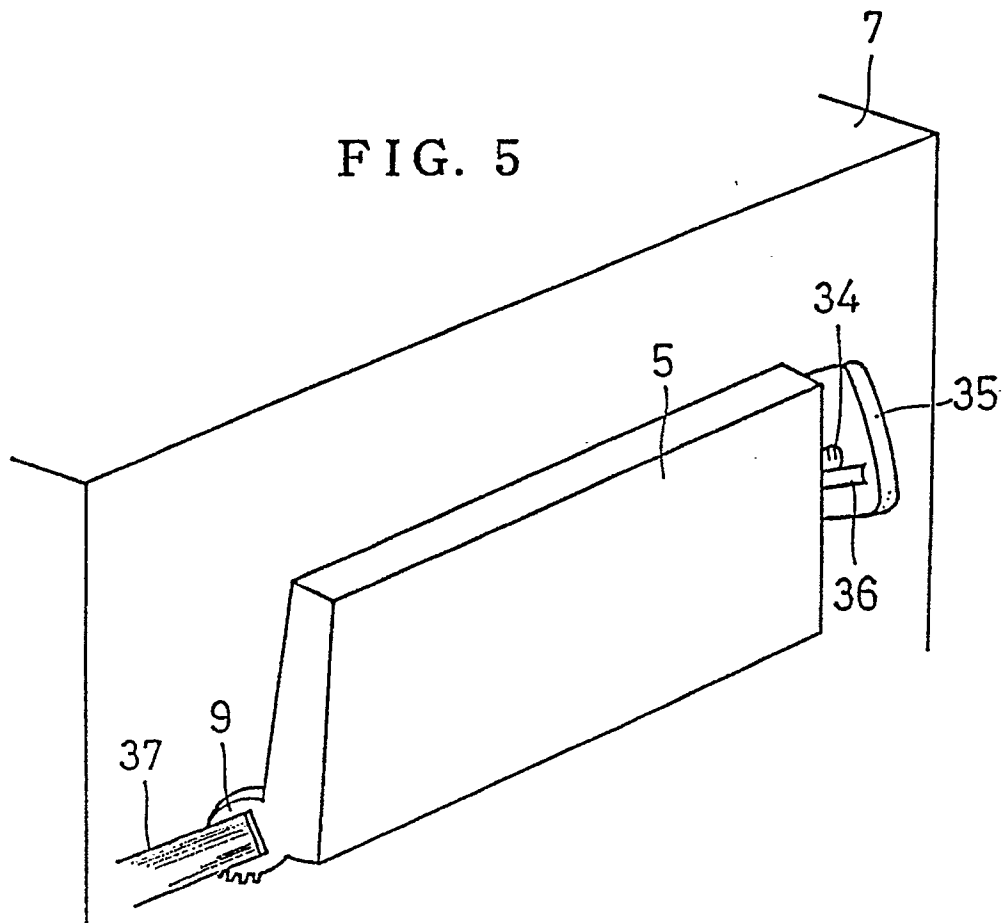


FIG. 2

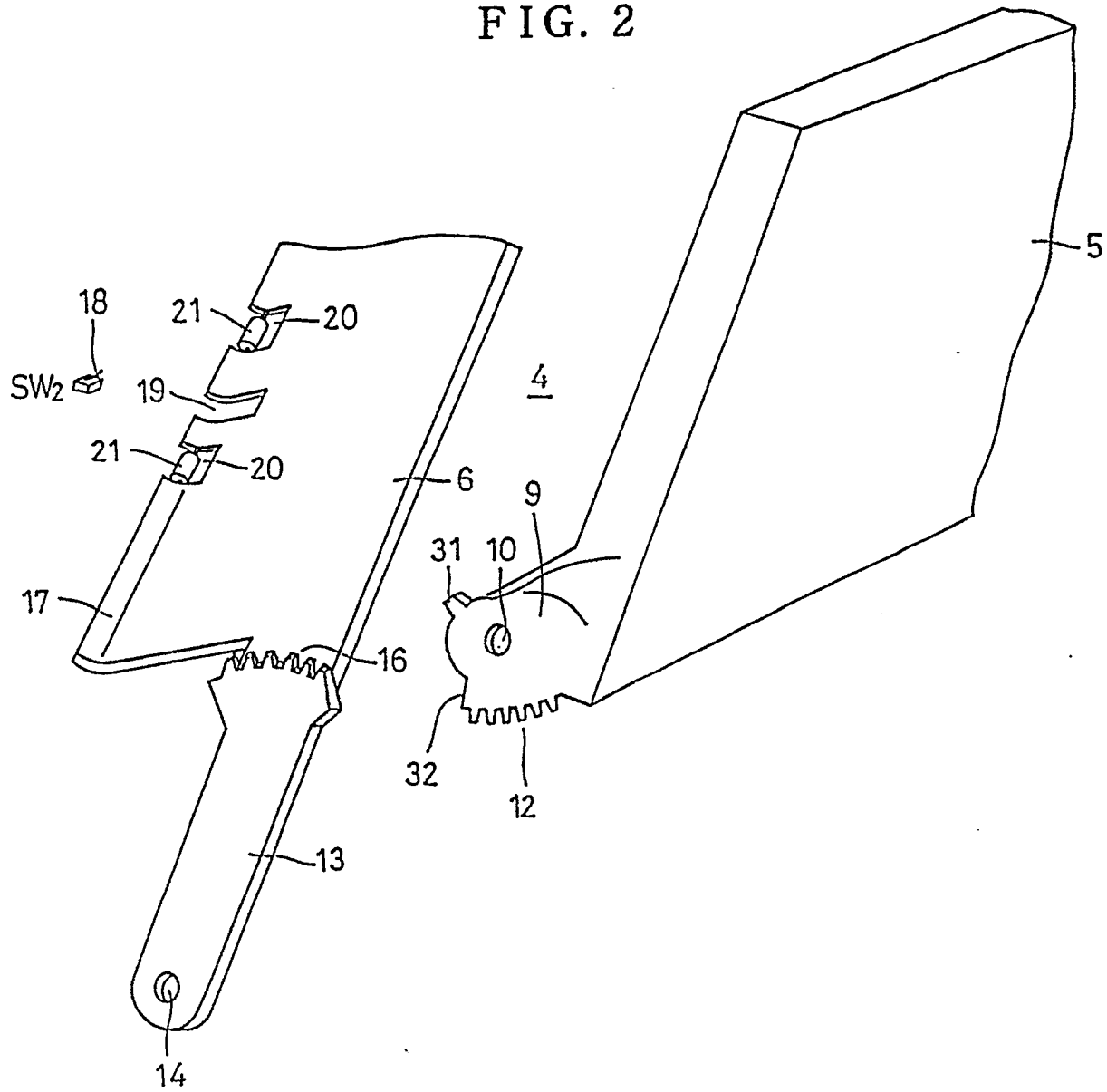


FIG. 3

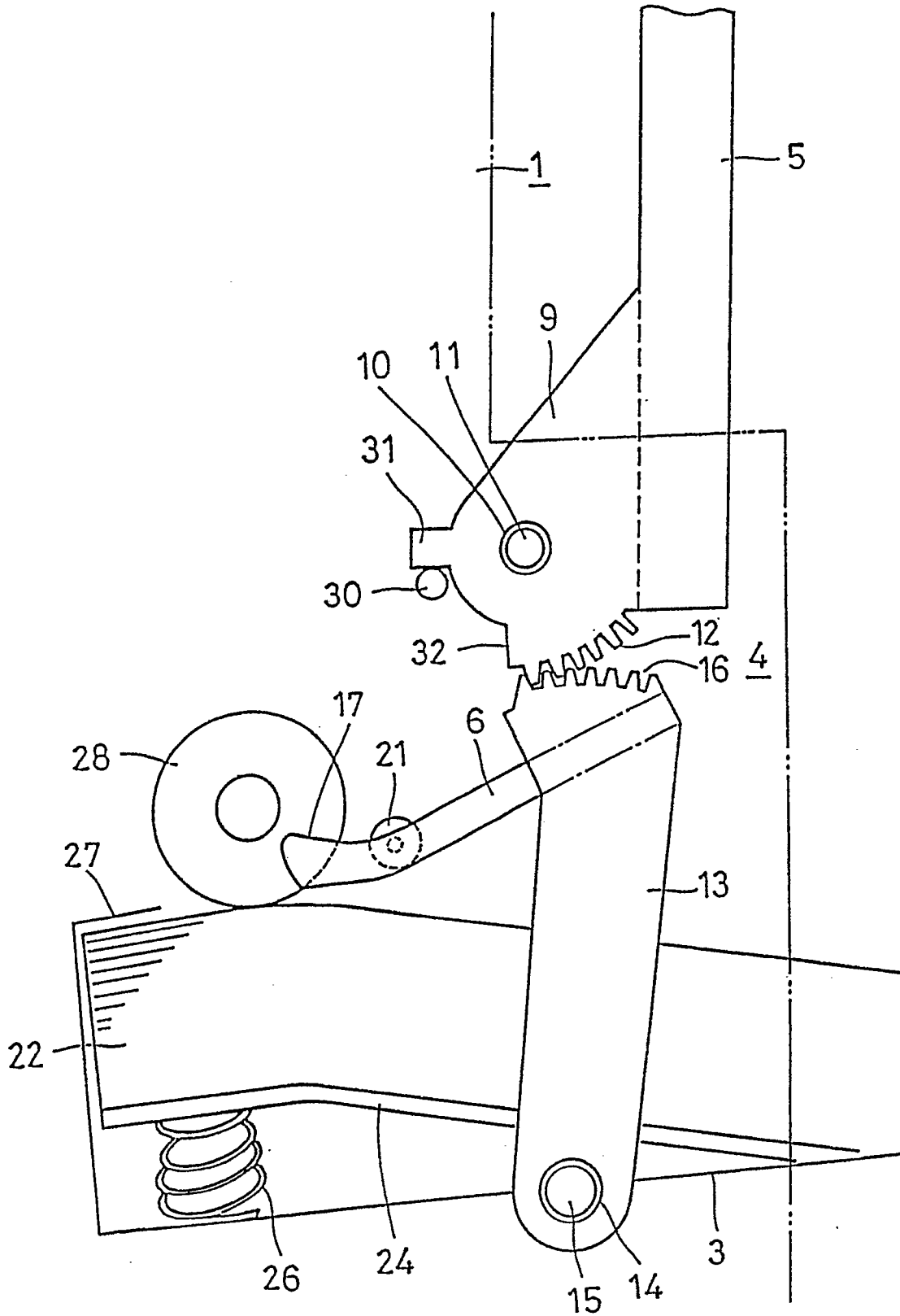


FIG. 4

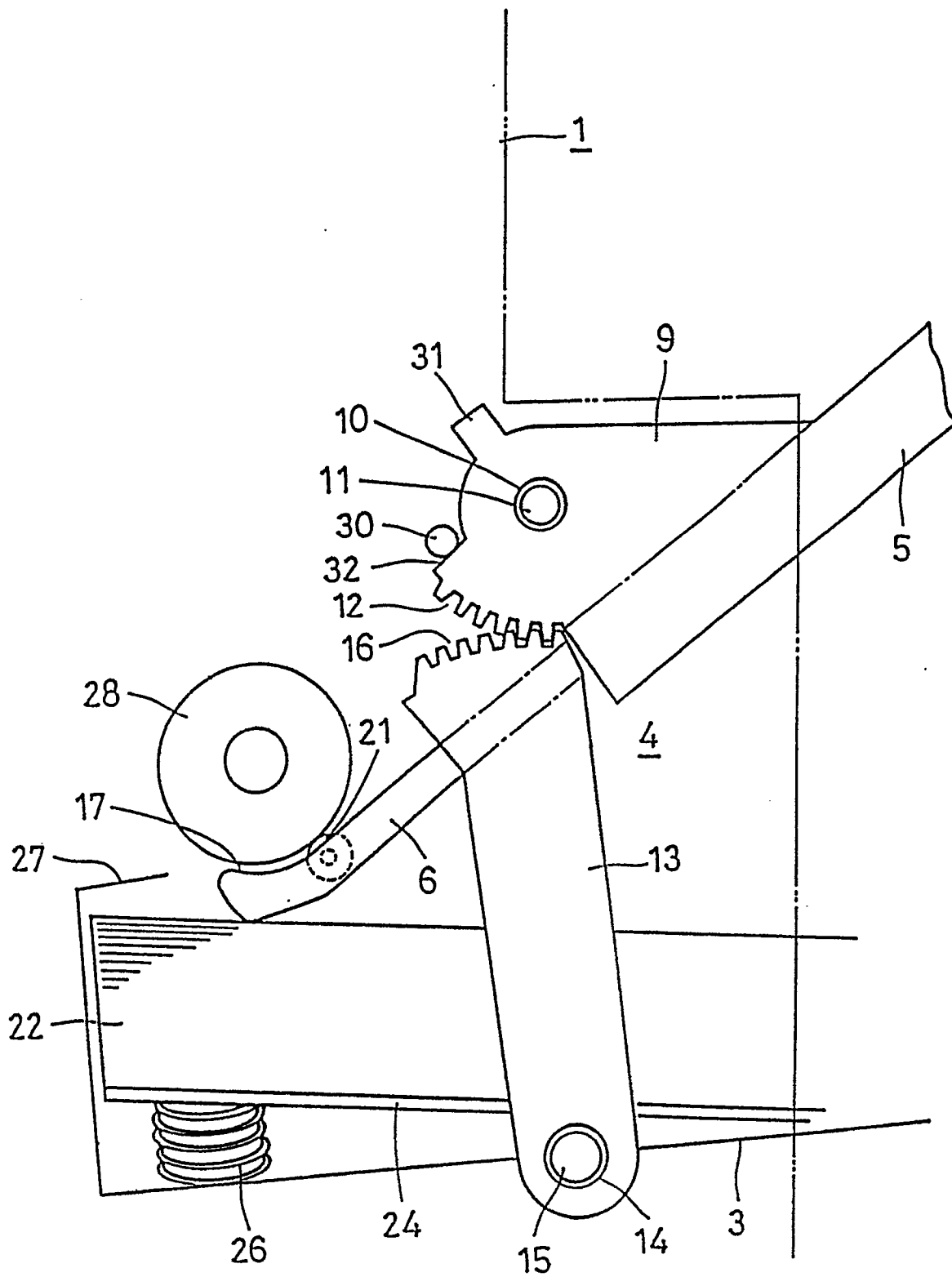


FIG. 6

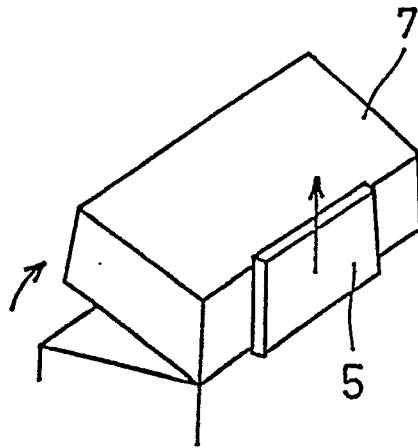


FIG. 7

Prior Art

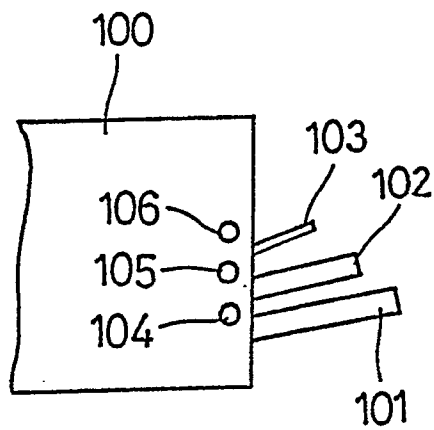


FIG. 8

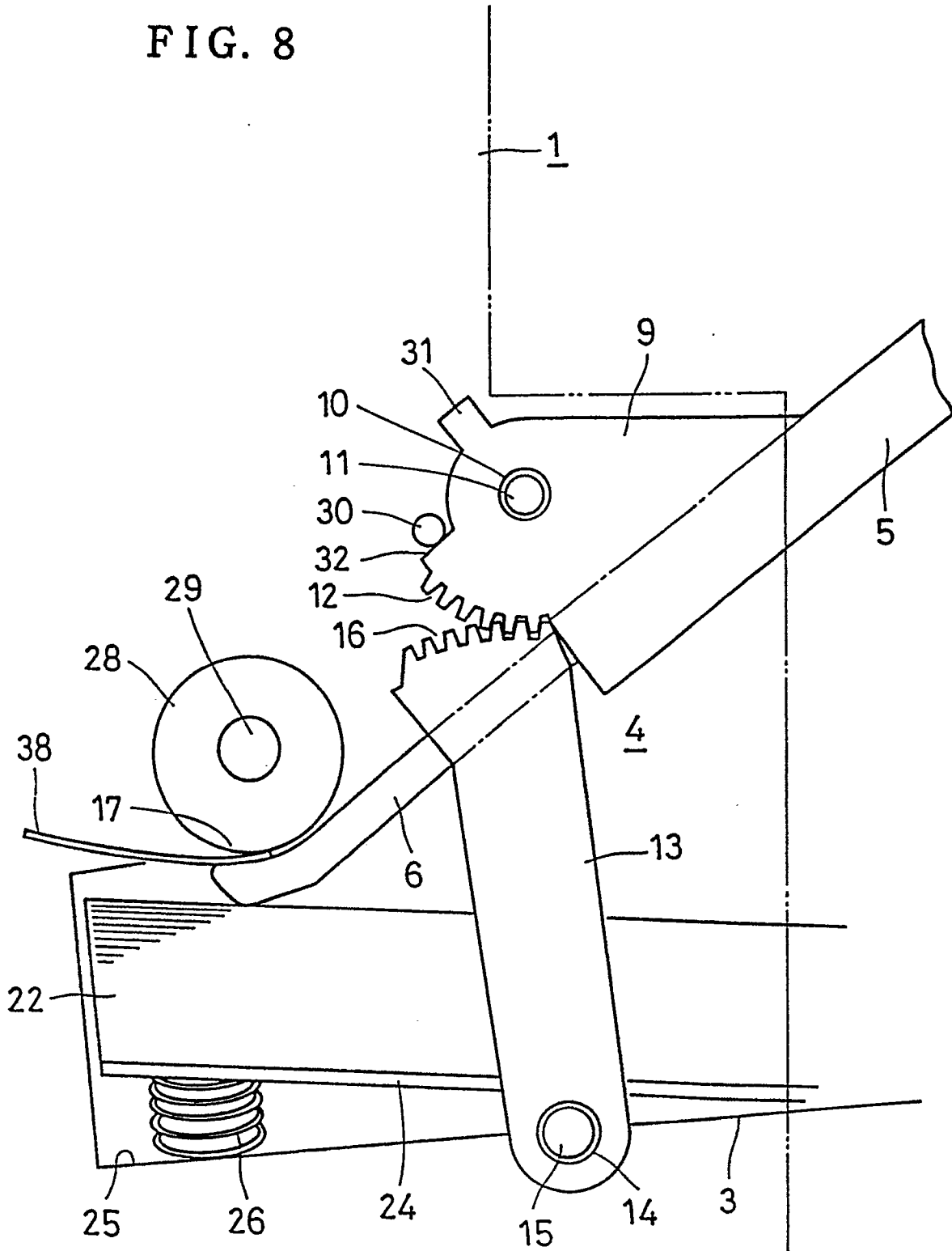


FIG. 9

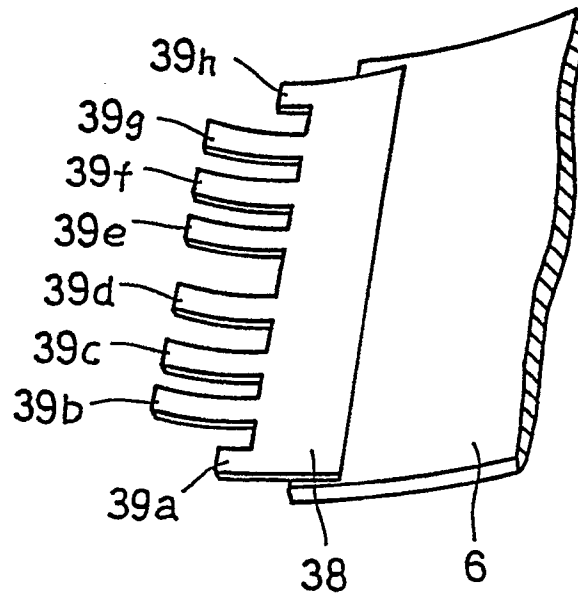
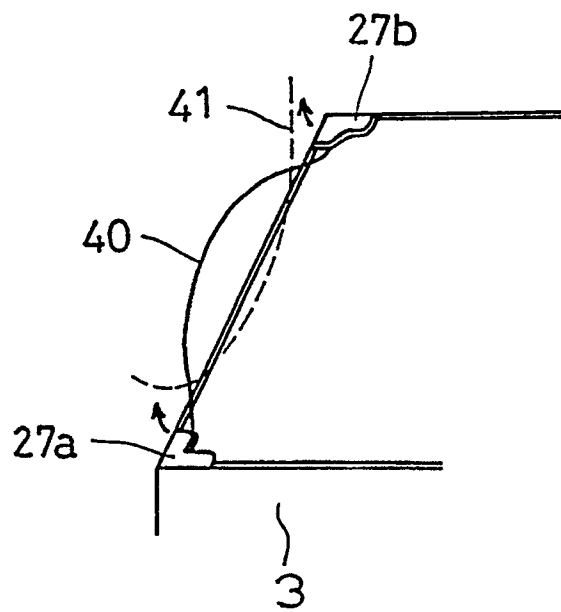


FIG. 10





EUROPEAN SEARCH
REPORT

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)
A	DE-A-3 135 751 (SHARP K.K.) * Page 5, lines 8-27; figures 1,2 * - - - -	1,2,6	G 03 G 15/00 B 65 H 5/36
A	IBM TECHNICAL DISCLOSURE BULLETIN, vol. 31, no. 4, September 1988, pages 344-346, New York, US; "Printer having single sheet bypass" * The whole disclosure * - - - -	1,6	
A	PATENT ABSTRACTS OF JAPAN, vol. 8, no. 175 (P-294)[1612], 11th August 1984; & JP-A-59 68 758 (FUJI XEROX K.K.) 18-04-1984 - - - -	1,6	
D,A	JP-Y-6 300 403 (?) * Figures 1-7 * - - - -	1,6	
A	US-A-4 492 371 (KAN et al.) * Column 1, lines 30-57; figures 3,5 * - - - - -	6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G 03 G 15/00 B 65 H 5/36
The present search report has been drawn up for all claims			
Place of search		Date of completion of search	Examiner
The Hague		18 October 90	CIGOJ P.M.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention</p> <p>E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document</p>			