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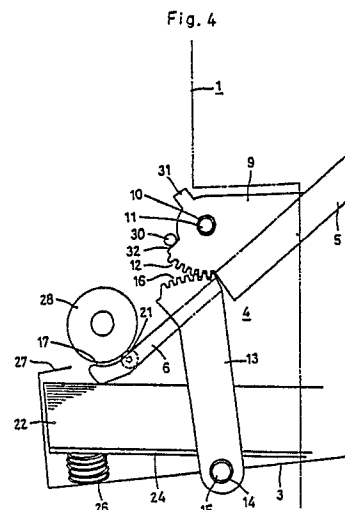
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54 **Manual sheet sending apparatus.**

57 An apparatus for manually sending a sheet of paper to a sheet feed roller (28) of sheet feeding mechanism of a copying machine equipped with a sheet cassette (3) for automatically sending sheets of paper to the sheet feeding mechanism. The sheet sending apparatus is composed of an upper chute (5) and a lower chute (6) articulated by gears. When the apparatus is used, the chutes (5, 6) are lying substantially in the same plane to smoothly pass a sheet to the feed roller (28) and the lower chute (6) presses down the stacked sheets of the sheet cassette. When the apparatus is not used, the chutes rotate and the lower chute (6) leaves the feed roller (28).

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MANUAL SHEET SENDING APPARATUS

The present invention relates to an apparatus for manually sending a sheet (of paper) to a sheet feeder 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 Laid-open Utility Model Application No. S63-4034 discloses a sheet feeding 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 remote 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

The present invention is achieved to solve various problems accompanying a conventional manual sheet-sending chute used with an automatically sheet-feeding sheet cassette. One of the object of the invention is to reduce the stroke and space needed to move the sheet-sending chute between the operable position and the retired position, and to facilitate the exact positioning of the chute at the operable position. Another object is to provide a smooth sheet sending through the chute even when an automatically sheet-feeding cassette is installed proximate to the manual sheet-sending chute. A further object of the present invention is to provide an engaging mechanism to the sheet-sending chute to retain it at the retired position even when a housing of a copying machine equipped with the chute is swung up.

Those and other objects are achieved by the apparatus of the present invention for sending a sheet of paper to a sheet feeder comprising an upper chute plate and a lower chute plate articulated to each other, each chute plate having an axis of rotation different from that of the other, with the apparatus fixable at two positions, one being 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 being 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.

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 EXPLANATION OF THE ATTACHED DRAWINGS

Fig. 1 is a perspective view of a copying machine equipped with the manual sheet-sending apparatus 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.

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 projection 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.

Claims

1. An apparatus for sending a sheet to a sheet feeder comprising an upper chute plate (5) and a lower chute plate (6) articulated to each other, each chute plate having an axis of rotation different from that of the other, with the apparatus fixable at two

positions, one being an operating position where the upper chute plate (5) and the lower chute plate (6) are aligned substantially in the same plane and an end (17) of the lower chute plate (6) is proximate to the sheet feeder (28) and the other being a retired position where the upper chute plate (5) and the lower chute plate (6) are lying in different planes having an angle therebetween and the end (17) of the lower chute plate (6) is distant from the sheet feeder (28).

2. The sheet sending apparatus according to claim 1, where the upper chute plate and the lower chute plate are joined by gears.

3. The sheet sending apparatus according to claim 2, where the apparatus is fixed at the two positions by fixing the angle between the upper chute plate and the lower chute plate with stoppers provided for the upper chute plate.

4. The sheet sending apparatus according to claim 3, where a sheet cassette (3) containing a plurality of stacked sheets (22) is also provided proximate to the sheet feeder (28) along with the sheet sending apparatus when the sheet sending apparatus is at the retired position, while the stacked sheets (22) are pushed away from the sheet feeder (28) by the lower chute plate (6) when the sheet sending apparatus is at the operating position.

5. The sheet sending apparatus according to claim 4, where the lower chute plate (6) keeps clear above the stacked sheets (22) working as a sheet guide when the sheet sending apparatus is at the retired position and a sheet in the sheet cassette (3) is fed by the sheet feeder (28).

6. The sheet sending apparatus according to claim 5, where the sheet cassette (3) is provided under the sheet sending apparatus, and the lower end (17) of the lower chute plate (6) bends slightly upward, whereby a sheet sent through the sheet sending apparatus is assuredly overpass the sheet cassette (3) when the sheet sending apparatus is at the operating position and a sheet in the sheet cassette (3) is properly guided by the lower end (17) of the lower chute plate when the sheet sending apparatus is at the retired position.

7. The sheet sending apparatus according to claim 1, where the sheet feeder comprises a sheet feed roller (28) and the lower chute plate (6) is provided with a roller (21) for contacting the sheet feed roller (28) when the sheet sending apparatus is at the operating position.

8. A copying machine comprising a machine housing including a swing-up upper half (7), the sheet feeder and the sheet sending apparatus according to claim 1, where the upper chute plate (5) is provided with a protrusion at its side edge, the upper half (7) of the machine housing is provided with a stretched bump and a spring presses the

upper chute plate toward the side for retaining the protrusion on the stretched bump when the sheet sending apparatus is at the retired position and while the upper half (7) of the machine housing is swung down and swung up. (Fig. 6)

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Fig. 1

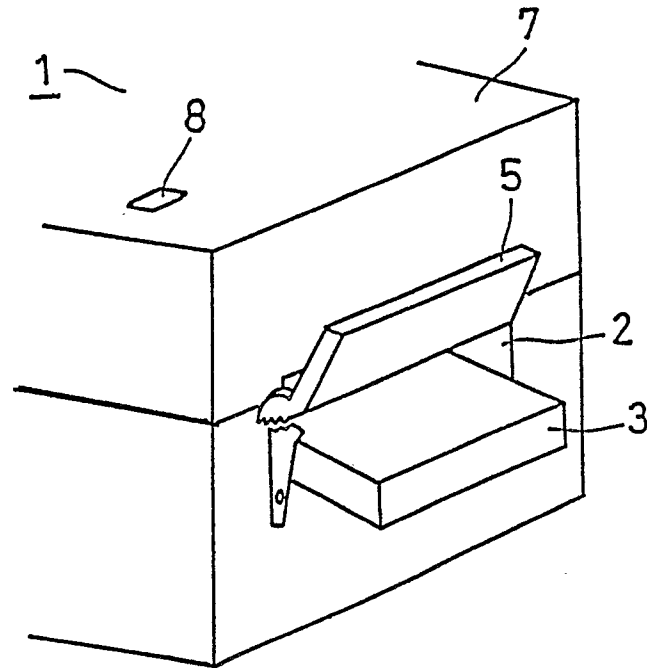


Fig. 5

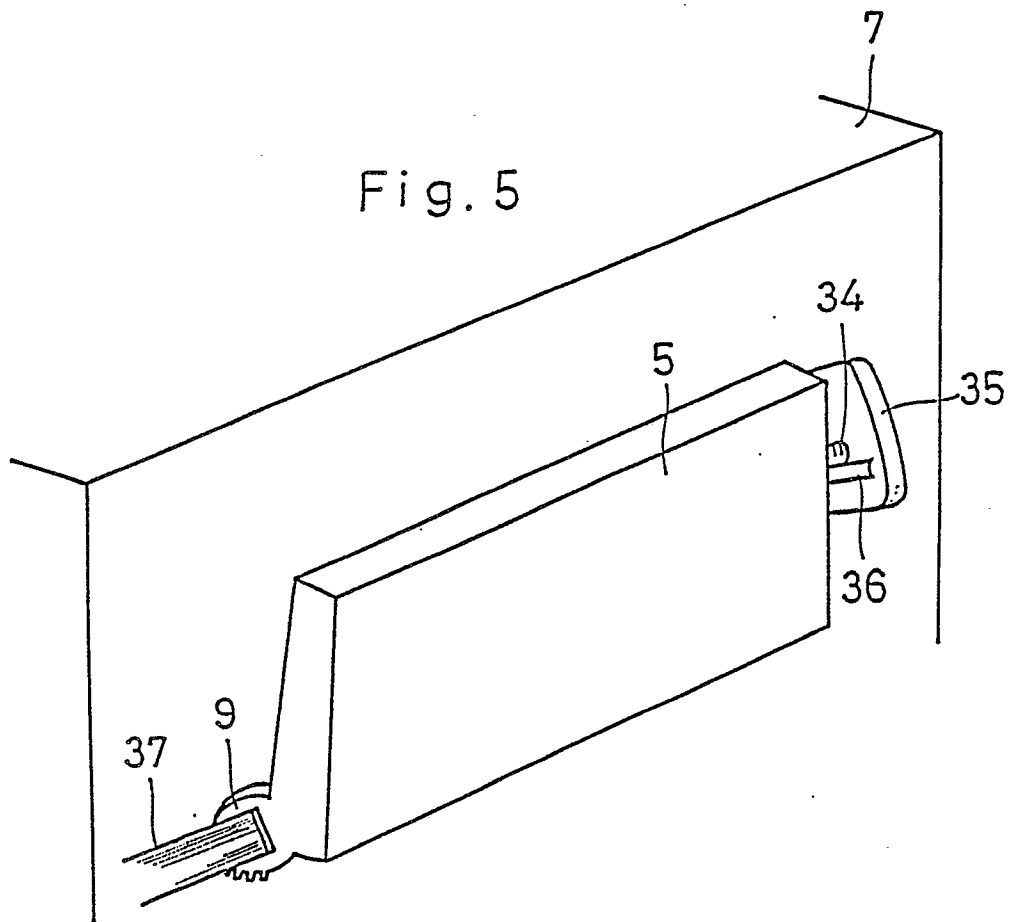


Fig. 2

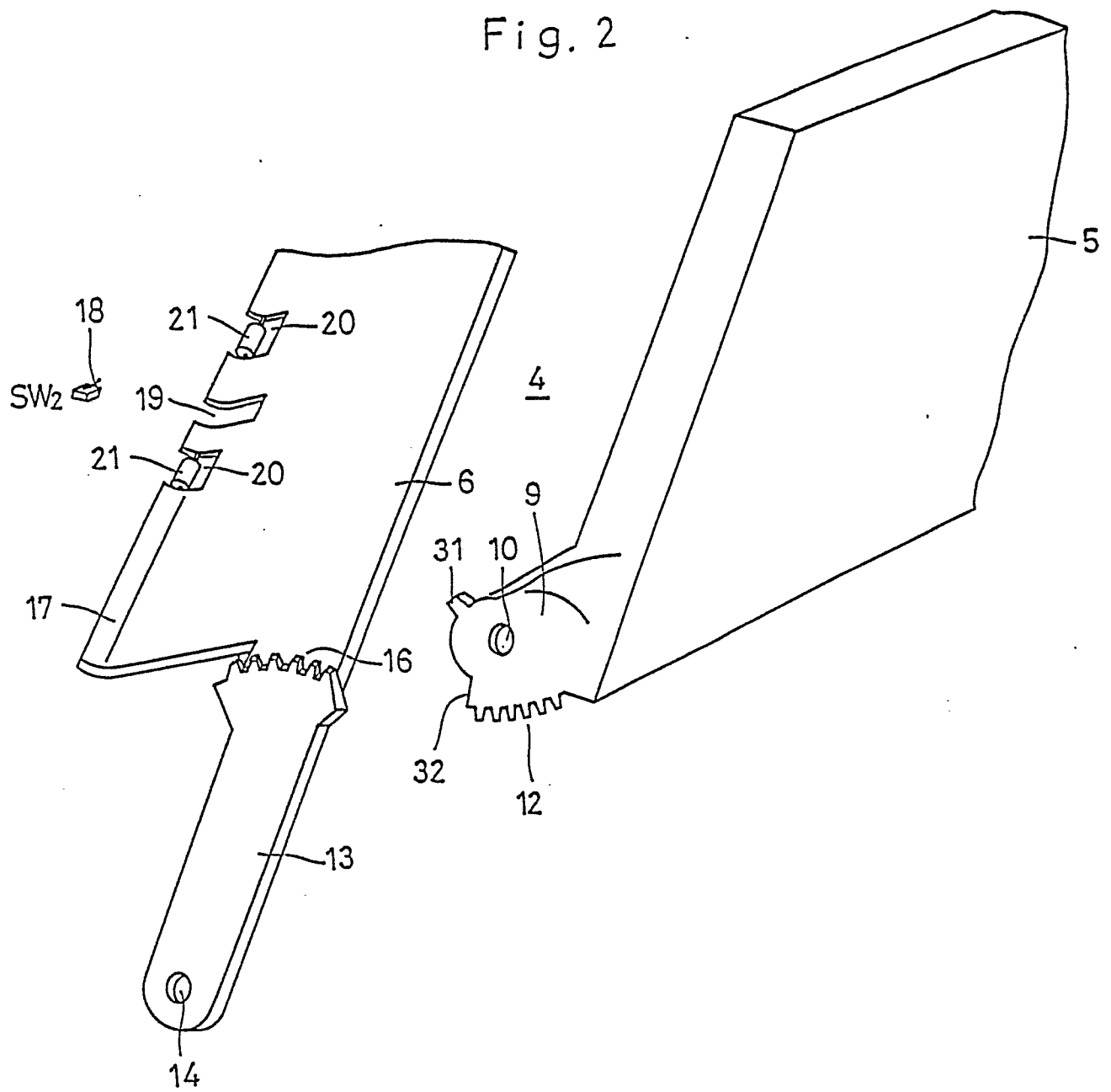


Fig. 3

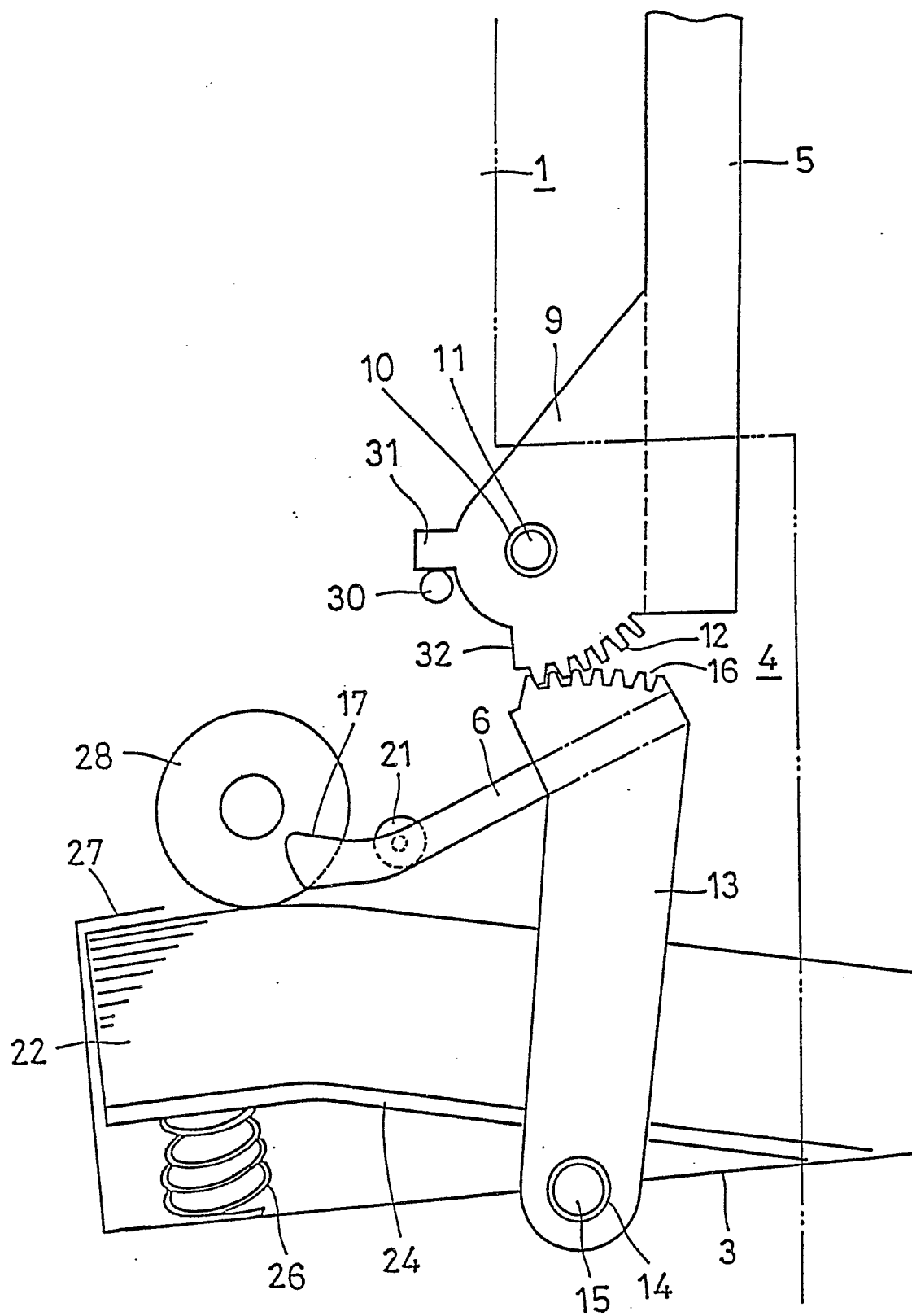


Fig. 4

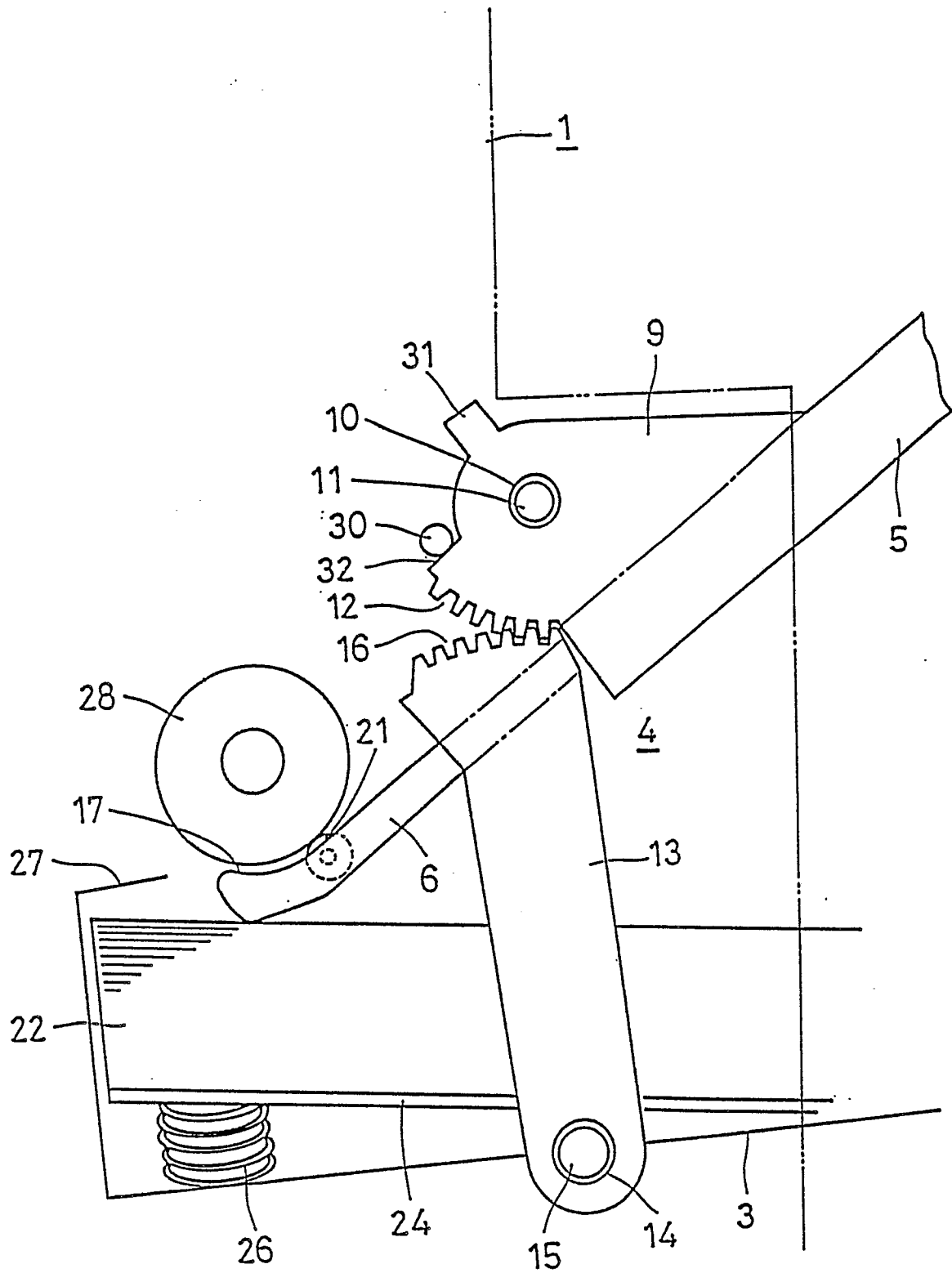


Fig. 6

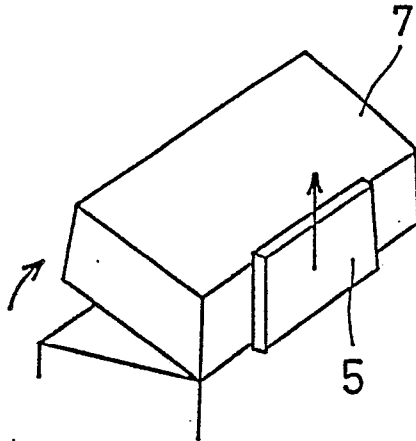


Fig. 7

Prior Art

