

Description

This invention is directed to a paper feeding apparatus, e.g. for use in a printer.

A paper feeding apparatus is known which is driven by a means driving a platen of the apparatus. Such an apparatus is disclosed in Japanese Patent Publication No. 58-6633, published on February 5th 1983, wherein the drive of a printing cylinder is transmitted to a paper separation roll through a transmission mechanism so as to feed paper to the printing cylinder.

In DE-A-3,232,275 and in US-A-4,594,013 there is disclosed a paper feeding apparatus comprising a platen ; hopper means for holding a stack of sheets of paper ; a paper feed roller, engageable with the topmost sheet in the stack, for feeding the latter towards the platen ; auxiliary paper feed rollers for engaging a sheet of paper being fed from the paper feed roller to the platen ; and power transmission means for driving the paper feed roller, the auxiliary paper feed rollers, and the platen.

According to the present invention, there is provided a paper feeding apparatus comprising hopper means for holding a stack of sheets of paper, the hopper means having separation claw means for holding the sheets of the stack and permitting them to be separated one by one from the stack ; paper feed roller means, engageable with the topmost sheet in the stack, for feeding the latter from the stack ; and pressure plate means for pressing said paper against the paper feed roller means characterised in that the hopper means comprises a pair of hopper bodies each of which is provided with a width adjustment plate on its inner wall for adjusting the width of a stack of paper and for holding an end portion thereof ; each hopper body having at least one of said pressure plate means, said separation claw means being arranged at the bottom of each hopper body and extending inwardly of the inner wall thereof, the width of the width adjustment plate in the direction of paper width being greater than the extent to which the separation claw extends from the respective inner wall in the said direction ; each width adjustment plate being movable over the inner wall of the respective hopper body between a first position in which thin sheets of a thin paper stack may contact the inner walls of the hopper bodies and may be engageable with the separation claws, and a second position in which thick sheets of a thick paper stack may contact the inner faces of the width adjustment plates and will not be engageable with the separation claws.

Preferably, an auxiliary paper feed roller is provided for engaging a sheet of paper being fed from the paper feed roller to the platen ; and power transmission means for rotating the paper feed roller means so as to feed the paper to a platen only when the latter is rotating in a predetermined direction, the power

transmission means rotating the auxiliary paper feed roller so as to feed paper to the platen regardless of whether the platen is being rotated in the said predetermined direction or the opposite direction.

Preferably, the power transmission means is arranged to rotate the platen in the said predetermined direction to bend the paper and thereafter to rotate the platen in the said opposite direction so as to feed the paper to a printing position.

The power transmission may comprise a release lever for switching rotational power to a paper tractor ; planet gear means for transmitting rotation from the platen to the paper feed roller and auxiliary paper feed roller when the release lever is positioned so that power is not transmitted to the paper tractor ; the planet gear means effecting rotation of the auxiliary paper feed roller in a given direction regardless of the direction of rotation of the platen ; and an adjusting means, associated with the release lever, for adjusting the position of part of said planet gear means when the release lever is in a position in which the tractor is provided with rotational power.

There may be a paper delivery guide provided with a guide portion at the side for guiding paper outwardly, the guide being holdable in first and second positions, the guide portion guiding the end of a cut sheet to one side of a paper holding portion when in said first position, and guiding the end of fanfold paper to the other side in said second position.

The paper delivery guide may serve as a protection cover when in said first position.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which :

Figure 1 is a perspective view of a paper feeding apparatus in accordance with an embodiment of the present invention,

Figure 2 is a perspective view of the construction of a hopper portion of the apparatus of Figure 1 ; Figure 3 is a cross-sectional view showing the construction of the said hopper portion ;

Figure 4 is a side view of the said apparatus showing a condition wherein a paper feed gear and an auxiliary paper feed gear are driven by planet gearing ;

Figure 5 is a side view of the said apparatus showing a condition wherein the power transmission of Figure 4 is released ;

Figures 6 and 7 are cross-sectional views of the apparatus showing a condition wherein a cut sheet is fed forward ;

Figure 8 is a cross-sectional view of the apparatus showing a condition wherein the cut sheet is delivered ;

Figure 9 is a cross-sectional view of a part of the apparatus showing a delivery guide wherein the paper delivery path is positioned at one side of a holding portion for delivered paper ;

Figure 10 is a cross-sectional view showing the

delivery guide wherein a paper delivery path is positioned to the outside of the paper feeding apparatus ;

Figure 11 is a cross-sectional view of the apparatus showing a condition wherein fanfold paper is fed out ;

Figure 12 is a cross-sectional view showing a known paper feeding apparatus ; and

Figure 13 is a perspective view of the apparatus of Figure 12 showing the construction of a hopper portion thereof.

In Figures 12 and 13, there is shown a known paper feeding apparatus which comprises a pressure plate 103 which is rotatably mounted on a pivot 102 on a hopper body 101. The uppermost sheet of a stack of paper 121 in the hopper body 101 may be fed by a paper feeding roller 105 towards a platen 104 which is driven in unison with the latter. A transmission gear train (not shown) is provided to drive a paper delivery roller 106 for the paper which has been printed, and there is a chamber 107 for holding such paper. The transmission gear train transmits the rotation of the platen 104 so as to rotate the paper feed roller 105 and the paper delivery roller 106.

Only a single sheet of paper in the hopper body 101 passes over a separation claw 108 as a result of the clockwise rotation of the paper feed roller 105 due to the backward (i.e. the counter-clockwise) rotation of the platen 104, and then the end of such paper comes into contact with the platen 104. Next, the paper is fed to a print head 109 for printing as a result of forward (i.e. clockwise) rotation of the platen 104 and is delivered to the chamber 107 by the paper delivery roller 106.

In the apparatus of Figures 12 and 13, comparatively thin paper or thin envelopes or postcards must be used and the apparatus requires respective separation means so that it is necessary to constantly attach and detach respective attachments.

Further, the paper had to have a length at least as great as that from the paper feed roller 105 to the platen 104 so that paper shorter than this length, such as a slip of paper, could not be fed.

Furthermore, when a printing apparatus capable of printing both on a cut sheet which is engageable by a paper feed means and on fanfold paper (i.e. continuous paper) engageable by a tractor 122 is loaded with the paper feed apparatus, it is difficult to transfer and hold the fanfold paper in the holding portion or chamber 107. Thus, the known paper feeding apparatus has had to be detached from the printing apparatus when fanfold paper was being used.

In addition, the pressure plate 103 rotates around the pivot 102 as a support so that the angle at which the paper contacts the separation claw 108 changes according to the amount of paper in the stack 121. When the amount of paper is too little, a space is produced between the separation claw 108 and the

paper, so that sheets of paper are not fed one by one, resulting in inferior separation such as the feeding of the paper in piles.

It is an object of the invention to provide an improved paper feeding apparatus to solve the above problems.

Another object of the invention is to provide an improved paper feeding apparatus which can feed paper which is shorter than usual, for instance, paper having a length of about 80 mm, and can feed thick paper, envelopes and the like without extra parts such as attachments and the like.

A further object of the invention is to provide a paper feeding apparatus which can be used for feeding fanfold paper.

A still further object of the invention is to provide an improved paper feeding apparatus in which the pressure plate is not rotatably mounted so as to reduce the incidence of poor separation.

In the embodiment of the present invention shown in Figures 1-3, a paper is set in a space between pressure plates 3 each of which has a guide shaft 52 and a guide pin 53 supported by a guide groove 51, the pressure plates 3 being respectively provided on a pair of hopper bodies 1. The hopper bodies 1 can be adjusted laterally of the stack of paper and slidably in the direction of paper thickness. Paper feed rollers 5 which are mounted on a shaft 5a are rotated as a result of drive imparted to a platen 4. Each pressure plate 3 is always urged in the direction of the respective paper feed roller 5 by a compression coil spring 50, and the paper is pressed against the paper feed roller 5 by the pressure plate 3.

A separation claw 8, such as may be used in a copier or the like, is provided on each hopper body 1 for separating widely used thin sheets of paper one by one, and a separation means is provided for comparatively thick paper such as envelopes and postcards. An inclined surface 1a is provided on each hopper body 1 for holding the lower end portion of the sheets of paper, as best seen in Figure 2. A width adjusting plate 25 is provided adjacent each hopper body 1 and has a thickness w larger than the width l of the separation claw 8 in the direction of paper width. Each width adjusting plate 25 is provided with a groove 56 in which there is located a pin 55 of a stopper 54. Each width adjusting plate 25 is rotatably mounted in the paper guide surface of the respective hopper body 1. Each stopper 54 is slidably mounted on the respective hopper body 1 for movement in the direction of the paper width. The pin 55 provided on each stopper 54 is urged by a spring (not shown) to project into the rotational locus of the respective width adjusting plate 25 in order to stop the respective width adjusting plate 25 moving into the region of movement of the pressure plate 3 when the pin 55 gets into the groove 56.

In the above construction, when comparatively thin paper is utilized, each width adjusting plate 25 is

rotated to be spaced from its pressure plate 3, and the paper is adjusted transversely, being stopped by the pins 55 of the stoppers 54. Hence a paper adjustment in the transverse direction is performed by the side faces of the hopper bodies 1. In this case, the ends of the paper contact the separation claws 8, the near end portion of the paper is buckled, and the top paper is separated so as to pass over the separation claws 8 and so as to be fed to the platen 4.

When comparatively thick paper such as an envelope or postcard is utilized, separation is carried out by the following method because those papers cannot be separated by the separation claws 8 due to the high buckling load thereof. First, the stoppers 54 are moved in the transverse direction (left in Figure 2) and are rotated so that each width adjusting plate 25 contacts the respective pressure plate 3 by its own weight or by spring force. As a result, the end in the transverse direction of thicker paper such as an envelope or postcard is guided by the inner wall of each width adjusting plate 25 so that it does not strike against the separation claws 8. The paper is separated by an inclined surface, as shown in Figure 6. The pressure plates 3 advance in accordance with a decrease in the amount of paper. However, the width adjusting plates 25 continually move so as to be in contact with the pressure plates 3.

The platen 4 and a platen gear 2 fixed thereto are driven by the motor (not shown) of the printing apparatus body. The platen gear 2 rotates counter-clockwise so as to rotate a gear 59a (Figure 4) fixed to a gear 59, through gears 57, 58, paper delivery gear 26 and gear 23, the gear 57 which engages the platen gear 2 rotating clockwise. The gear 59 is shown by an imaginary line in Figure 4 and is provided on the upper surface of a planet gear 24 or the like. Reference numeral 20 indicates a planet lever which pivots coaxially with the gear 59 with a predetermined frictional torque and planet gears 16 and 18 are rotatably mounted at the ends of the planet lever 20, respectively.

The planet gear 24 is pivotally mounted at an end portion of a planet lever 19. The planet lever 19 is rotatably mounted so as to pivot coaxially with the gear 59 with a predetermined frictional torque. The planet gears 16 and 24 are in mesh with the gear 59a and rotate counter-clockwise, so that the planet gear 24 engages with a paper feed gear 21 which is fixed to the shaft 5a of the paper feed rollers 5 to rotate the latter clockwise. The planet gear 16 moves into engagement with a gear 17 which is in mesh with an auxiliary paper feed gear 15 which is fixed to the same shaft as an auxiliary paper feed roller 10 (Figure 6) so as to rotate the auxiliary paper feed gear 15 counter-clockwise. Thus, as can be seen in Figure 6, the paper feed rollers 5 and the auxiliary paper feed rollers 10 rotate so as to feed paper to the platen 4.

When the platen 4 rotates clockwise, the gear 59a and the planet levers 19 and 20 rotate counterclock-

wise to move the planet gear 24 out of engagement with the paper feed gear 21, as a result of which the planet gear 16 moves out of engagement with the gear 17. Then the planet gear 18 moves into engagement with the auxiliary paper feed gear 15. Rotational force is transmitted to the auxiliary paper feed gear 15 through the gear 59 and the planet gear 18 so as to rotate the auxiliary paper feed rollers 10 counter-clockwise. As described above, the paper feed rollers 5 do not rotate due to the disengagement thereof. Therefore, paper is fed in the direction of the print head 9 in accordance with the rotation of the platen 4 and of the auxiliary paper feed rollers 10. In this case, the paper feed rollers 5 do not rotate so that the next sheet of paper is not fed forward.

Next the paper feeding operation will be described with reference to Figures 6 to 8. First, the platen 4 is rotated backwards to feed a single sheet of the stack of paper by a separation means (for instance, a separation claw used in a copier), and the paper is forwarded to the auxiliary paper feed rollers 10. Then, at this moment, if the platen 4 rotates forwards, the paper feed rollers 5 are no longer driven due to the above-described movements of the planet gears. The sheet of paper is thus drawn from the hopper body so that the end of such paper is fed to just before the contact point of the platen 4 with a feed roller 28 which is pressed against the platen 4. In this case, the next sheet of paper is not fed, because the paper feed rollers 5 are not rotating.

Then the platen 4 is rotated backwards by a very small amount, as shown in Figure 7, whereby the end of the sheet of paper contacts the platen 4 and the feed roller 28 so as to be bent between these members and the auxiliary paper feed rollers 10 which are rotating counter-clockwise. Therefore, the said end of the sheet of paper is properly lined up between the platen 4 and the roller 28. Instead of this operation, the said paper end can be properly lined up by rotating the platen 4 backwards until the paper is bent after contacting the platen 4.

When the platen 4 further rotates forwards through a circumferential distance equal to that between the feed roller 28 and the print head 9 and through a distance corresponding to that from the upper end of the paper to the position where printing is to be started, the paper is properly positioned.

After printing, the platen 4 rotates forwards until the paper is fed out of the paper holding portion of the apparatus by the paper delivery gear 26 and by a paper delivery roller 6 mounted on the same shaft as the paper delivery gear 26. Repeating a sequence controlled by the above described series of movements of the printing apparatus, the papers of the stack are properly fed into the printing apparatus one by one to be delivered one by one after printing.

In this way, short sheets of paper with a large width such as slips of paper (e.g. paper having a

length of about 80 mm in this embodiment) can be supplied automatically to the printing apparatus one by one to the proper predetermined position against the platen 4.

Further, attachments for exclusive use are not necessary when comparatively thicker papers such as an envelope or postcard are utilized. The paper feeding apparatus described above can be suitable for various types of paper.

When a cut sheet is fed by the paper feeding apparatus described above, the paper is held between the platen 4 and the feed roller 28 by pressing the feed roller 28 of the printer body against the platen 4. In this case, a release lever 13 is disposed at the position shown in Figure 4. A tractor 22 (Figure 6) is disconnected from the power transmission when the release lever 13 is disposed at the position shown in Figure 4 by a mechanism (not shown) communicating with the release lever 13. At the same time, the feed roller 28 is pressed against the platen 4.

Next, the operation of the apparatus with fanfold paper will be described. The release lever 13 is brought down so as to separate the feed roller 28 from the platen 4 (Figure 5), whereby driving force is transmitted to the tractor 22 within the printing apparatus. Then, an engagement portion 14b of an adjusting lever 14 which is rotatably mounted on the side face of the printing apparatus by a shaft 14a engages with a pin 13a mounted on the back surface of the release lever 13, and the adjusting lever 14 rotates through the rotational loci of a pin 19a provided on the planet lever 19 and of a pin 20a on the planet lever 20. The pins 19a and 20a then stop at a recess 30a provided on the adjusting lever 14 and at a surface 30b. Thereby, the positions of the planet levers 19 and 20 are adjusted, and planet gears 16, 18 and 24 move out of engagement with the auxiliary paper feed gear 15 and with the paper feed gear 21, respectively. Accordingly, the driving force of the platen gear 2 is not transmitted to the paper feed gear 21 nor to the auxiliary paper feed gear 15. If the platen 4 rotates forwards to feed fanfold paper to print head 9 for printing or rotates backwards to allow the fanfold paper to be disposed outside the path wherein the paper is prepared to be fed from the paper feeding apparatus into the printing apparatus, the paper feed roller 5 of the paper feeding apparatus and the auxiliary paper feed roller 10 do not rotate so that the paper of the paper feeding apparatus which is constituted by fanfold paper is never fed into the printing apparatus.

Next, the case in which cut sheets in the paper feeding apparatus are used again will be described. After shunting the fanfold paper by the above described operations, when the release lever 13 is brought down to press the feed roller 28 against the platen 4, the pin 13a is completely separated from the adjusting lever 14, and the adjusting lever 14 is rotated by a return spring 29 which acts along the loci

of the pin 19a and the pin 20a to the direction in which the groove 30a and the surface 30b are released, not being adjusted by the release lever 13. Then, when the adjusting lever 14 rotates to the position at which the groove 30a and the surface 30b are completely disposed outside of the loci of the pins 19a and 20a, the adjusting lever 14 is stopped by the stopper 30, whereby the planet levers 19 and 20 become rotatable to perform paper feeding operations by the paper feeding apparatus.

In this way, the mechanism for releasing the driving of paper feed roller 5 and of the auxiliary paper feed roller 10 eliminate troublesome operations, such as the need to detach the paper feeding apparatus from the printing apparatus, and the user is able to use properly both fanfold paper and the paper in the paper feeding apparatus, the user being unconscious of the release or driving of the paper feeding apparatus.

It is desirable to switch the paper feeding paths for effecting a change between the paper in the paper feeding apparatus and fanfold paper, and this is achieved by the operation of a paper feeding guide in this embodiment as described hereinafter.

Reference is next made to Figures 8, 9 and 10, illustrating a paper delivery guide 12 and a paper delivery guide lock 65. The paper delivery guide lock 65 is fixed by screws to side frames 11 on both sides having holes corresponding to a projection 66 and a screw fixing hole 67. Holes 69 in which are loosely mounted rotatable shafts 68 are provided on both side faces of the paper delivery guide 12. A projection 70 is mounted on the tip portion of a resilient arm 65a.

The paper delivery guide 12 is provided with a rib 12a along which fanfold paper is fed forwardly of the paper feeding apparatus (Figure 11), the rotatable shaft 68 corresponding to the above-mentioned hole 69 of paper delivery guide lock 65 and the projection 70, and grooves 72 and 73. The paper delivery guide 12 is rotatable with respect to the hole 69 of the guide lock 65. Figure 1 shows a perspective view of the paper delivery guide 12.

As a result of the above structure, when a cut sheet is fed out as shown in Figure 8, the paper delivery guide 12 is rotated to the position (Figure 9) at which the groove 72 is stopped by the projection 70, whereby the cut sheet is fed out to a paper holding portion 7. When fanfold paper which is fed by the tractor 22 as shown in Figure 11 is delivered, the paper feed delivery guide 12 is rotated to the position at which projection 70 abuts the groove 73. Then, the end of the fanfold paper fed out from the paper feed roller 6 is guided in the upper-left direction by an end face 12b of a plurality of ribs 12a provided on the paper delivery guide 12, in order to feed the fanfold paper forwardly of the apparatus. In this manner, the fanfold paper and the cut sheets are held separately.

As shown in Figure 6, when the paper delivery guide 12 is disposed at the position for a cut sheet as

described above, the paper delivery roller 6 is covered by the paper delivery guide 12 which serves as a protection cover for the paper delivery roller 6.

A paper feeding apparatus constructed as described above produces the effects set forth below.

An auxiliary paper feed roller 10 provided between a paper feed roller 5 and the platen 4 rotates so as to feed the paper to the platen 4 irrespective of the direction of the platen, whereby a comparatively short piece of paper can be securely fed to the platen 4.

Further, the platen 4 rotates backwards so as to bend the paper in contact therewith and then rotates forwards to feed the paper to the position at which printing is to be started. As a result, the end of paper is properly fed to a predetermined position parallel to the central axis of the platen 4.

Furthermore, the planet gear mechanism of Figures 4 and 5 is such that the rotational force of the platen 4 is transmitted to the paper feed roller 5 and the auxiliary paper feed roller 10 when the release lever 13 is positioned so that the rotational drive to the tractor 22 is broken off and so as to rotate the auxiliary paper feed roller 10 in one direction irrespective of the direction of the platen 4, and an adjusting means 14 is provided which adjusts the position of the planet gear mechanism associated with the release lever 13 when the release lever 13 is in the position wherein the tractor 22 is provided with rotational force so as to break off the transmission of power to the paper feed roller 5. Therefore, while the paper feeding apparatus for the cut sheets is in position, the cut sheets are not fed from the paper feeding apparatus, and fanfold paper is fed into the printer body, merely by ensuring that the release lever 13 is positioned at the position for fanfold paper (namely, at the position in which rotational force is transmitted to the tractor 22).

In the case of thin paper, both end portions of the paper are guided by the inner walls of the hopper body 1, and the sheets of paper are separated one by one by the separation claws 8 arranged at the bottom of the hopper bodies 1. On the contrary, in the case of thick paper, both ends of a sheet of thick paper are guided by the width adjusting plates 25 which are rotatably mounted on the inner walls of the hopper bodies 1 so as to release the paper from the separation claws 8, whereby the paper can be separated by the inclined surface. Therefore, paper of various thicknesses, from thin to thick, can be separated without other attachments.

Due to the paper delivery guide 12 arranged on one side of the printing apparatus at which the paper is fed out, and which guides the upper end of a cut sheet into the side of the paper holding portion 7 at a first position and guides the upper end of fanfold paper into the other side at a second position, the paper can be fed easily in the proper direction in accordance with the kind of paper involved.

At the said first position, the paper delivery guide

12 also serves as a protection cover.

Claims

1. A paper feeding apparatus comprising hopper means (1) for holding a stack of sheets of paper, the hopper means (1) having separation claw means (8) for holding the sheets of the stack and permitting them to be separated one by one from the stack; paper feed roller means (5), engageable with the topmost sheet in the stack, for feeding the latter from the stack; and pressure plate means (3) for pressing said paper against the paper feed roller means (5) characterised in that the hopper means comprises a pair of hopper bodies (1) each of which is provided with a width adjustment plate (25) on its inner wall for adjusting the width of a stack of paper and for holding an end portion thereof; each hopper body (1) having at least one of said pressure plate means (3), said separation claw means (8) being arranged at the bottom of each hopper body (1) and extending inwardly of the inner wall thereof, the width (W) of the width adjustment plate (25) in the direction of paper width being greater than the extent (L) to which the separation claw (8) extends from the respective inner wall in the said direction; each width adjustment plate (25) being movable over the inner wall of the respective hopper body (1) between a first position in which thin sheets of a thin paper stack may contact the inner walls of the hopper bodies (1) and may be engageable with the separation claws (8), and a second position in which thick sheets of a thick paper stack may contact the inner faces of the width adjustment plates (25) and will not be engageable with the separation claws (8).

2. A paper feeding apparatus as claimed in claim 1 characterised in that an auxiliary paper feed roller (10) is provided for engaging a sheet of paper being fed from the paper feed roller (5) to the platen (4); and power transmission means (Figures 4 and 5) for rotating the paper feed roller means (5) so as to feed the paper to a platen (4) only when the latter is rotating in a predetermined direction, the power transmission means rotating the auxiliary paper feed roller (10) so as to feed paper to the platen (4) regardless of whether the platen (4) is being rotated in the said predetermined direction or the opposite direction.

3. Apparatus as claimed in claim 2 characterised in that the power transmission means is arranged to rotate the platen (4) in the said predetermined direction to bend the paper in contact therewith and thereafter to rotate the platen (4) in the said opposite direction so as to feed the paper to a printing position.

4. Apparatus as claimed in claim 2 or 3 characterised in that the power transmission means comprises a release lever (13) for switching rotational power to a paper tractor (22); planet gear means (15-20) for transmitting rotation from the platen (4) to the paper

described above, the paper delivery roller 6 is covered by the paper delivery guide 12 which serves as a protection cover for the paper delivery roller 6.

A paper feeding apparatus constructed as described above produces the effects set forth below.

An auxiliary paper feed roller 10 provided between a paper feed roller 5 and the platen 4 rotates so as to feed the paper to the platen 4 irrespective of the direction of the platen, whereby a comparatively short piece of paper can be securely fed to the platen 4.

Further, the platen 4 rotates backwards so as to bend the paper in contact therewith and then rotates forwards to feed the paper to the position at which printing is to be started. As a result, the end of paper is properly fed to a predetermined position parallel to the central axis of the platen 4.

Furthermore, the planet gear mechanism of Figures 4 and 5 is such that the rotational force of the platen 4 is transmitted to the paper feed roller 5 and the auxiliary paper feed roller 10 when the release lever 13 is positioned so that the rotational drive to the tractor 22 is broken off and so as to rotate the auxiliary paper feed roller 10 in one direction irrespective of the direction of the platen 4, and an adjusting means 14 is provided which adjusts the position of the planet gear mechanism associated with the release lever 13 when the release lever 13 is in the position wherein the tractor 22 is provided with rotational force so as to break off the transmission of power to the paper feed roller 5. Therefore, while the paper feeding apparatus for the cut sheets is in position, the cut sheets are not fed from the paper feeding apparatus, and fanfold paper is fed into the printer body, merely by ensuring that the release lever 13 is positioned at the position for fanfold paper (namely, at the position in which rotational force is transmitted to the tractor 22).

In the case of thin paper, both end portions of the paper are guided by the inner walls of the hopper body 1, and the sheets of paper are separated one by one by the separation claws 8 arranged at the bottom of the hopper bodies 1. On the contrary, in the case of thick paper, both ends of a sheet of thick paper are guided by the width adjusting plates 25 which are rotatably mounted on the inner walls of the hopper bodies 1 so as to release the paper from the separation claws 8, whereby the paper can be separated by the inclined surface. Therefore, paper of various thicknesses, from thin to thick, can be separated without other attachments.

Due to the paper delivery guide 12 arranged on one side of the printing apparatus at which the paper is fed out, and which guides the upper end of a cut sheet into the side of the paper holding portion 7 at a first position and guides the upper end of fanfold paper into the other side at a second position, the paper can be fed easily in the proper direction in accordance with the kind of paper involved.

At the said first position, the paper delivery guide

12 also serves as a protection cover.

Claims

1. A paper feeding apparatus comprising hopper means (1) for holding a stack of sheets of paper, the hopper means (1) having separation claw means (8) for holding the sheets of the stack and permitting them to be separated one by one from the stack; paper feed roller means (5), engageable with the topmost sheet in the stack, for feeding the latter from the stack; and pressure plate means (3) for pressing said paper against the paper feed roller means (5) characterised in that the hopper means comprises a pair of hopper bodies (1) each of which is provided with a width adjustment plate (25) on its inner wall for adjusting the width of a stack of paper and for holding an end portion thereof; each hopper body (1) having at least one of said pressure plate means (3), said separation claw means (8) being arranged at the bottom of each hopper body (1) and extending inwardly of the inner wall thereof, the width (W) of the width adjustment plate (25) in the direction of paper width being greater than the extent (L) to which the separation claw (8) extends from the respective inner wall in the said direction; each width adjustment plate (25) being movable over the inner wall of the respective hopper body (1) between a first position in which thin sheets of a thin paper stack may contact the inner walls of the hopper bodies (1) and may be engageable with the separation claws (8), and a second position in which thick sheets of a thick paper stack may contact the inner faces of the width adjustment plates (25) and will not be engageable with the separation claws (8).

2. A paper feeding apparatus as claimed in claim 1 characterised in that an auxiliary paper feed roller (10) is provided for engaging a sheet of paper being fed from the paper feed roller (5) to the platen (4); and power transmission means (Figures 4 and 5) for rotating the paper feed roller means (5) so as to feed the paper to a platen (4) only when the latter is rotating in a predetermined direction, the power transmission means rotating the auxiliary paper feed roller (10) so as to feed paper to the platen (4) regardless of whether the platen (4) is being rotated in the said predetermined direction or the opposite direction.

3. Apparatus as claimed in claim 2 characterised in that the power transmission means is arranged to rotate the platen (4) in the said predetermined direction to bend the paper in contact therewith and thereafter to rotate the platen (4) in the said opposite direction so as to feed the paper to a printing position.

4. Apparatus as claimed in claim 2 or 3 characterised in that the power transmission means comprises a release lever (13) for switching rotational power to a paper tractor (22); planet gear means (15-20) for transmitting rotation from the platen (4) to the paper



feed roller (5) and auxiliary paper feed roller (10) when the release lever (13) is positioned so that power is not transmitted to the paper tractor (22); the planet gear means (15-20) effecting rotation of the auxiliary paper feed roller (10) in a given direction regardless of the direction of rotation of the platen (4); and an adjusting means (14), associated with the release lever (13), for adjusting the position of part (19, 20) of said planet gear means (15-20) when the release lever (13) is in a position in which the tractor (22) is provided with rotational power.

5. Apparatus as claimed in any preceding claim characterised by having a paper delivery guide (12) provided with a guide portion (12a) at the side for guiding paper outwardly, the guide (12) being holdable in first and second positions, the guide portion (12a) guiding the end of a cut sheet to one side of a paper holding portion (7) when in said first position, and guiding the end of fanfold paper to the other side in said second position.

6. Apparatus as claimed in claim 5 characterised in that said paper delivery guide (12) serves as a protection cover when in said first position.

Patentansprüche

1. Papierführungseinrichtung mit einem Behälter (1) zur Halterung eines Stapels von Papierblättern, der einen Trenngreifer (8) zur Halterung der Blätter des Stapels sowie zur einzelnen Abnahme der Blätter vom Stapel aufweist, mit einer mit dem obersten Blatt im Stapel in Eingriff tretenden Papierführungs-Rolleneinrichtung (5) zur Führung dieses Blattes vom Stapel und mit einer Druckplatteneinrichtung (3) zum Pressen des Papiers gegen die Papierführungs-Rolleneinrichtung (5), **dadurch gekennzeichnet**, daß der Behälter ein Paar von Behälterkörpern (1) umfaßt, die jeweils mit einer Breitereinstellplatte (25) auf ihrer Innenwand zur Einstellung der Breite eines Papierstapels sowie zur Halterung eines Stapelendteils versehen sind, daß die Behälterkörper (1) wenigstens eine Druckplatteneinrichtung (3) aufweisen, daß die Trennklammern (8) am Boden der Behälterkörper (1) angeordnet sind und zu deren Innenwand nach innen verlaufen, daß die Breite (W) der Breitereinstellplatte (25) in Richtung der Papierbreite größer als die Ausdehnung (l) ist, um welche die Trennklammer (8) von der entsprechenden Innenwand in dieser Richtung weg weist, daß die Breitereinstellplatten (25) über die Innenwand des entsprechenden Behälterkörpers (1) zwischen einer ersten Stellung, in der dünne Blätter eines dünnen Papierstapels mit den Innenwänden der Behälterkörper (1) in Kontakt treten und mit den Trennklammern (8) in Eingriff bringbar sind, und einer zweiten Stellung, in welcher dicke Blätter eines dicken Papierstapels mit den Innenflächen der Breitereinstellplatten (25) in Eingriff treten können und

mit den Trennklammern (8) nicht in Eingriff bringbar sind, bewegbar sind.

2. Papierführungseinrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß eine Hilfs-Papierführungsrolle (10) vorgesehen ist, die mit einem von der Papierführungsrolle (5) zu einer Walze (4) geführten Papierblatt in Eingriff tritt, und daß eine Leistungsübertragungsvorrichtung (Fig. 4 und 5) zur Drehung der Papierführungsrolle (5) derart vorgesehen ist, daß Papier lediglich dann zur Walze (4) geführt wird, wenn diese in einer vorgegebenen Richtung rotiert, wobei die Leistungsübertragungsvorrichtung die Hilfs-Papierführungsrolle (10) so dreht, daß Papier unababhängig davon, ob die Walze (4) in der vorgegebenen Richtung oder in der gegensinnigen Richtung gedreht wird, zu dieser geführt wird.

3. Einrichtung nach Anspruch 2, **dadurch gekennzeichnet**, daß die Leistungsübertragungsvorrichtung die Walze (4) in der vorgegebenen Richtung dreht, um das mit ihr in Kontakt stehende Papier zu biegen, und die Walze (4) danach in der gegensinnigen Richtung dreht, um das Papier in eine Druckstellung zu führen.

4. Einrichtung nach den Ansprüchen 2 oder 3, **dadurch gekennzeichnet**, daß die Leistungsübertragungsvorrichtung einen Freigabehebel (13) zum Schalten von Rotationsenergie auf einen Papierzug (22) umfaßt, daß ein Planetenradgetriebe (15-20) zur Übertragung der Drehung von der Walze (4) auf die Papierführungsrolle (5) und die Hilfspapierführungsrolle (10) vorgesehen ist, wenn der Freigabehebel (13) so eingestellt ist, daß auf den Papierzug (22) keine Energie übertragen wird, daß das Planetenradgetriebe (15-20) unabhängig von der Drehrichtung der Walze (4) eine Drehung der Hilfs-Papierführungsrolle (10) bewirkt, und daß eine dem Freigabehebel (13) zugeordnete Einstellvorrichtung (14) zur Einstellung der Stellung eines Teils des Planetenradgetriebes (15-20) vorgesehen ist, wenn der Freigabehebel (13) in einer Stellung steht, in welcher der Papierzug Drehenergie erhält.

5. Einrichtung nach den vorhergehenden Ansprüchen, gekennzeichnet durch eine einseitige Führungsteil (12a) zur Herausführung von Papier aufweisende Papierspenderführung (12), die in einer ersten und zweiten Stellung gehalten werden kann, und bei der das Führungsteil (12a) das Ende eines geschnittenen Blattes in der ersten Stellung zu einer Seite eines Papierhalterungsteils (7) und in der zweiten Stellung das Ende eines Papierfächers zur anderen Seite führt.

6. Einrichtung nach Anspruch 5, **dadurch gekennzeichnet**, daß die Papierspenderführung (12) in der ersten Stellung als Schutzabdeckung dient.



Revendications

1. Appareil d'alimentation en feuilles de papier comprenant un magasin (1) destiné à contenir une pile de feuilles de papier, le magasin (1) comportant une griffe de séparation (8) destinée à maintenir les feuilles de la pile et à permettre leur séparation de la pile une à une, un dispositif (5) à rouleau d'avance de papier destiné à coopérer avec la feuille supérieure de la pile et à faire avancer celle-ci à partir de la pile, et une plaque (3) de pression destinée à repousser le papier vers le dispositif (5) à rouleau d'avance de feuille de papier, caractérisé en ce que le magasin comporte deux corps (1) de magasin ayant chacun une plaque (25) de réglage de largeur à sa paroi interne afin que la largeur de la pile de feuilles de papier puisse être réglée et qu'une partie d'extrémité de la pile soit supportée, chaque corps (1) de magasin ayant au moins un dispositif (3) à plaque de pression, la griffe de séparation (8) étant placée à la partie inférieure de chaque corps (1) de magasin et vers l'intérieur de sa paroi interne, la largeur (W) de la plaque (25) de réglage en largeur, dans la direction de la largeur des feuilles de papier, étant supérieure à la distance (l) dont dépasse la griffe de séparation (8) de la paroi interne respective dans cette direction, chaque plaque (25) de réglage en largeur étant mobile sur la paroi interne du corps respectif (1) de magasin entre une première position dans laquelle les feuilles minces d'une pile de minces feuilles de papier peuvent être au contact des parois internes des corps (1) de magasin et peuvent coopérer avec les griffes de séparation (8) et une seconde position dans laquelle des feuilles épaisses d'une pile de feuilles de papier épaisses peuvent être au contact des faces internes des plaques (25) de réglage en largeur et ne sont pas au contact des griffes de séparation (8).

2. Appareil d'alimentation en feuilles de papier selon la revendication 1, caractérisé en ce qu'un rouleau auxiliaire (10) d'avance de feuille de papier est destiné à être au contact d'une feuille de papier transmise par le rouleau (5) d'avance vers le support d'impression (4), et une transmission (figures 4 et 5) est destinée à faire tourner le dispositif (5) à rouleau d'avance de feuille de papier de manière que la feuille de papier avance vers un support d'impression (4) uniquement lorsque ce dernier tourne dans un sens prédéterminé, la transmission faisant tourner le rouleau auxiliaire (10) d'avance de feuille de papier de manière qu'il fasse avancer une feuille de papier vers le support d'impression (4) indépendamment du fait que le support d'impression (4) est entraîné en rotation dans le sens prédéterminé ou en sens opposé.

3. Appareil selon la revendication 2, caractérisé en ce que la transmission est destinée à faire tourner le support d'impression (4) dans le sens prédéterminé afin que la feuille de papier soit courbée à son contact, puis à faire tourner le support d'impression (4) dans

le sens opposé de manière que la feuille de papier avance vers une position d'impression.

4. Appareil selon la revendication 2 ou 3, caractérisé en ce que la transmission comporte un levier (13) de libération destiné à commuter l'énergie d'entraînement en rotation vers un organe (22) de traction, un dispositif à pignons satellites (15-20) destiné à transmettre la rotation du support d'impression (4) au rouleau (5) d'avance de feuille de papier et au rouleau auxiliaire (10) d'avance de feuille de papier lorsque le levier (13) de libération est disposé de manière que l'énergie ne soit pas transmise à l'organe de traction (22), le dispositif à pignons satellites (15-20) provoquant la rotation du rouleau auxiliaire (10) d'avance de feuille de papier dans un sens déterminé indépendamment du sens de rotation du support d'impression (4) et un dispositif de réglage (14), associé au levier de libération (13) et destiné à régler la position d'une partie (19, 20) du dispositif à pignons satellites (15-20) lorsque le levier de libération (13) est dans une position dans laquelle l'organe de traction (22) reçoit de l'énergie d'entraînement en rotation.

5. Appareil selon l'une quelconque des revendications précédentes, caractérisé en ce qu'il comporte un guide (12) de distribution de feuille de papier ayant une partie de guidage (12a) du côté de guidage d'une feuille de papier vers l'extérieur, le guide (12) pouvant être maintenu dans une première et dans une seconde position, la partie de guidage (12a) assurant le guidage de l'extrémité d'une feuille coupée de papier vers un côté d'une partie (7) de support de feuille de papier lorsqu'elle est dans la première position et guidant l'extrémité d'une feuille de papier pliée en accordéon vers l'autre côté dans la seconde position.

6. Appareil selon la revendication 5, caractérisé en ce que le guide (12) de distribution de feuille de papier joue le rôle d'un couvercle protecteur lorsqu'il est placé dans la première position.

