

"SHEET FEEDING DEVICE"

This invention relates to a sheet feeding device, e.g. for feeding cut sheets to a position at which printing can be performed in a printer.

5 A known printer provided with a paper feeding device for cut sheets uses the same motor both for feeding the cut sheets and for driving the platen of the printer. Therefore switching means such as an electromagnetic clutch, an electromagnetic solenoid or a complicated mechanical clutch has to be interposed at an intermediate position of
10 a drive transmission which is drivingly connected to the paper feeding device.

The necessity of providing such a switch means in an intermediate position of the said drive transmission, however, causes various problems such as the fact that the
15 design becomes very complicated.

According to the present invention, there is provided a sheet feeding device comprising two cartridge holders in each of which there may be mounted a cartridge containing a plurality of sheets; a motor which may be driven forwardly
20 or in reverse; two sheet feeding means for feeding sheets from cartridges mounted respectively in the cartridge holders; two drive transmissions for respectively transmitting drive

from the motor to the two sheet feeding means; and one-way clutch means between each drive transmission and the corresponding sheet feeding means such when the motor is driven forwardly one only of the sheet feeding means is driven thereby, and when the motor is driven in reverse, only the other sheet feeding means is driven thereby.

Preferably, one of the cartridge holders is detachably secured to a part of the device.

A cartridge is preferably mounted in each of the cartridge holders.

Each cartridge may be provided at its rear end with a projection which is engageable with a sheet separation lever so that, when each cartridge is fully introduced into its respective cartridge holder, it moves the respective sheet separation lever into a sheet separation position adjacent to a respective pick-up roller forming part of the respective sheet feeding means, and when the cartridge is removed from its respective cartridge holder, the respective sheet separation lever moves to a position in which it is spaced from the respective pick-up roller.

Each cartridge may be provided with a pivotally mounted plate which is engageable with the bottom sheet of a stack of sheets in the cartridge, and means for urging the plate upwardly so as to urge the topmost sheet of the

said stack into contact with the respective sheet feeding means.

The invention also comprises a printer provided with a sheet feeding device as set forth above, the sheet feeding device being arranged to feed a plurality of sheets to a platen of the printer, and the platen being arranged to be driven by means other than the motor of the sheet feeding device.

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

Figure 1 is a cross-sectional view of a portion of a printer provided with a sheet feeding device according to the present invention; and

Figure 2 is an enlarged schematic diagram illustrating part of the said sheet feeding device.

An embodiment of the present invention will now be described with reference to the accompanying drawings.

Figure 1 shows the inside of an outer case 1 of a printing device when viewed from a left side-plate 3 of two side-plates which are disposed on opposite sides of the outer case 1 of the printing device. Two cartridge holders 4, 5 in which two cut-sheet cartridges 9 can be respectively mounted are so disposed that the cartridge holder 5 is above the cartridge holder 4. Openings 4a and 5a in the cartridge holders 4, 5 are disposed so as to form two vertical stages

in the front surface of the printing device, that is, the openings 4a and 5a face to the left as seen in Figure 1.

The cartridge holder 4 is secured to the side plate 3, while the cartridge holder 5 is detachably fitted to the side plate 3 by means of mounting means to be described hereinafter.

Figure 2 shows drive transmissions of the paper feeding device. A drive motor 6 is exclusively used for feeding cut sheets P and is not employed for driving a platen 18 of the printer. The drive motor 6 is a reversible motor which can rotate in both forward and reverse directions. Two drive transmissions 7, 8 are arranged to be rotated in unison with the drive motor 6. That is, gears 71, 72, 73 and 74 of the drive transmission 7 constitute a gear train driven by a pinion 61 of the motor 6. A feed roller 76 and a pick-up roller 77, which serve as means for feeding the cut sheets, are respectively secured to shafts 72a and 74a of the gears 72 and 74. Between the gear 72 and the shaft 72a and between the gear 74 and the shaft 74a there is respectively provided a one-way clutch (not shown). Gears 81, 82, 83, 84 and 85 of the other drive wheel configuration 8 constitute another gear train driven by the pinion 61 of the motor 6. A feed roller 86 and a pick-up roller 87, which serve as means for feeding cut sheets, are respectively secured to shafts 85a and 83a of the corresponding gears 85 and 83. Between the gear 85 and the shaft 85a, and between the gear 83 and the shaft

83a, there is respectively provided a one-way clutch (not shown).

As a result of the above described construction, when the motor 6 is started, and the pinion 61 is thereby rotated counter-clockwise, the rotation is transmitted to the drive transmissions 7 and 8. When the pinion 61 is rotated counter-clockwise, the one-way clutches (not shown) respectively disposed between the gear 72 and the shaft 72a and between the gear 74 and the shaft 74a are engaged. Therefore, the rotation of the drive motor 6 is transmitted to the feed roller 76 and to the pick-up roller 77. When the drive motor 6 is rotated in this rotational direction, the one-way clutches (not shown) respectively disposed between the gear 85 and the shaft 85a, and between gear 83 and the shaft 83a are disengaged. Therefore, the rotation of the drive motor 6 is not transmitted to the feed roller 86 and the pick-up roller 87. As a result of this, when the pinion 61 rotates counter-clockwise, the rollers 76 and 77, which are means for feeding the paper, are rotated, whereby the cut sheets P disposed in the cartridge 9 in the cartridge holder 4 are supplied to the platen 18.

On the other hand, when the pinion 61 rotates clockwise, the rotation of the drive motor 6 is transmitted to the drive transmissions 7 and 8. When the rotational direction is as described above, each of the one-way clutches (not shown)

disposed between the gear 85 and the shaft 85a, and between the gear 83 and the shaft 83a, is engaged. Therefore, the rotation of the drive motor 6 is transmitted to the feed roller 86 and to the pick-up roller 87. However, when the pinion 61 rotates clockwise, each of the one-way clutches (not shown) disposed between the gear 72 and the shaft 72a, and between the gear 74 and the shaft 74a, is disengaged, as a result of which the rotation of the drive motor 6 is not transmitted to the feed roller 76 and to the pick-up roller 77. Therefore, when the pinion 61 rotates clockwise, the rollers 86 and 87, which are means for feeding the paper, are rotated, whereby the cut sheets P in the cartridge 9 in the cartridge holder 5 are supplied to the platen 18.

As described above, the cartridge holder 5 is arranged detachably. The construction thereof will now be described.

The cartridge holder 5 forms a box shape having a front opening 5a, and two sides thereof which are secured to a support plate 57, whereby a unit is formed. The gears 82 to 85 are journaled on the outer surface of the support plate 57. On the inner surface of the support plate 57, the rollers 86 and 87 are disposed. A shaft 81a of the gear 81 is fitted in a recess 57a at the rear end of the support plate 57, whereby the advance of the support plate 57 is restricted. A paper feed passage 5b is provided at the rear end of the cartridge holder 5. A separation lever 51 is

movably mounted at the rear by means of a shaft 52,
so that it can be moved into and out of a position
immediately adjacent to the pick-up roller 87. On the top
surface of the separating lever 51 there is provided a
resilient member 53 having a large coefficient of friction,
and the separating lever 51 also has a guide member 51a
made of plastics. In the position shown in Figure 1, the
separating lever 51 is spaced from the pick-up roller 87.
On the outer surface of the support plate 57 there is
provided a lock lever 55 mounted on a shaft 56 in such a
way that the lock lever 55 can move freely. A hook 55a
is provided at the rear end of the lock lever 55 in such a way
that it can be engaged with the shaft 81a. A manually operable
portion 55b is provided at the front end of the lock lever
55. When the cartridge holder 5 with the support plate 57
are removed, the manually operable portion 55b must be
pressed down so as to release the engagement between the
hook 55a and the shaft 81a. A spring 58 is fitted to the
lock lever 55 so that a resilient force is applied so as to
urge the hook 55a into engagement with the shaft 81a at all
times.

At the rear end surface of the cartridge holder 4,
there is provided a separation lever 41 which is substantially
the same as that described above and which is movably mounted
on a shaft 42. A resilient member 43 and a guide member 41a,
which are similar to those described above, are secured to

the separation lever 41.

The space which is left when the cartridge holder 5 has been removed serves as a manual record paper feeding port. A roller 24 is provided on a shaft 20, as a result of which, insertion of the cartridge holder 5 is facilitated, the cartridge holder 5 being supported by the roller 24.

The cartridge 9 for the cut sheets will now be described.

The same cartridge 9 can be used for either of the cartridge holders 4 and 5. The cartridge 9 has a box shape which has an opening on the top surface thereof. A hole 9a is provided at the bottom of the cartridge 9 adjacent to the rear end thereof. A hopper plate 91, which is adapted to close the hole 9a, is supported at the front end thereof by a shaft 92 for pivotal and longitudinal sliding movement. On the rear end surface of the cartridge 9 there is provided a projection 93 which is adapted to engage and move the separation lever 41 or 51. The projection 93 projects rearwardly through a window 4c or 5c in the corresponding cartridge holder 4 or 5 so that the separation lever 41 or 51 can be moved thereby. On each of the side surfaces of the cartridge 9 there is provided a guide hole 9b which extends vertically at a position adjacent to the rear end of the cartridge 9, and a guide hole 9c extends longitudinally at a position adjacent to the front end of the cartridge 9. On the outer

side of the cartridge 9 there is provided a movable push-up lever 94 which is pivotally mounted on a shaft 95. At a position adjacent to the rear end of the push-up lever 94 there is provided a guide pin 96 which can be freely moved vertically within the guide hole 9b beneath the hopper plate 91. A guide pin 97 is movable longitudinally in the guide hole 9c so that it cannot be removed from the guide hole 9c. A spring 98 extends between the front end of the push-up lever 94 and the guide pin 97. As a result of this, a resilient force is applied to the push-up lever 94 in the direction in which the guide pin 96 is moved upwardly, whereby the guide pin 96 is resiliently urged into contact with the lower surface of the hopper plate 91.

Since the cartridge 9 is constituted as described above, the guide pin 97 is moved to the rear end of the guide hole 9c when the cartridge 9 is withdrawn, causing the tension of the spring 98 to be decreased. As a result of the construction described above, when the cut sheets P are inserted into the cartridge 9 through the opening in the top surface thereof, the hopper plate 91 is lowered due to the weight of the cut sheets P, whereby the cut sheets P are accommodated in the cartridge 9. When the cartridge 9 is inserted into the cartridge holder 4 or 5, further advance of the cartridge 9 is prevented by engagement between the guide pin 97 by a stop member a provided on the side plate 3

or on the outer case 1. By further inserting the cartridge 9 up to a predetermined position, the spring 98 is extended, and the tension becomes considerable. As a result of this, the push-up lever 94 is moved, the guide pin 96 is raised, and the hopper plate 91 is moved, whereby the cut sheets P are resiliently urged into contact with the feed rollers 76 and 86.

Reference numeral 4b represents a passage for the paper which is supplied from the cartridge holder 4. The paper passes through a passage 17 which communicates with a passage 5b from the cartridge holder 5 or with a paper passage 15 for the paper supplied by hand and a passage 16 for the continuous paper. The paper which has passed through the passage 17 travels to the printing portion formed between the platen 18 and a printing head 19.

The operation of feeding the cut sheets P from a cartridge 9 positioned in a cartridge holder 4 or 5 will now be described.

When the paper P is fed from a cartridge 9 in the cartridge holder 4, the drive motor 6 is driven so as to cause counter-clockwise (i.e. forward direction) rotation of the pinion 61 as shown in Figure 2. As described above, only the feed roller 76 and the pick-up roller 77 rotate in unison with this counter-clockwise rotation. When the feed

roller 76 is rotated, two or three sheets which are positioned at the top of the stacked cut sheets P in the cartridge 9 are fed forward, and the uppermost one is then fed forward by the pick-up roller 77. When the cut sheets P are fed from a cartridge 9 in the cartridge holder 5, the drive motor 6 is driven so as to cause clockwise (i.e. reverse direction) rotation of the pinion 61 as shown in Figure 2. As described above, only the feed roller 86 and the pick-up roller 87 rotate in unison with this clockwise rotation. In a similar manner to that described above, the upper two or three sheets of the cut sheets P in the cartridge 9 are fed forward by means of the rotation of the feed roller 86, and the uppermost one is fed forward by the pick-up roller 87.

In the embodiment described above, since a reversible drive-motor 6 is employed which is exclusively used for feeding a paper sheet and is not used for driving the platen 18, no switch means such as an electromagnetic clutch or the like is needed, whereby freedom of design is facilitated and the construction can be simplified. Furthermore, since one-way clutches are respectively provided between the two drive transmissions 7, 8 which are drivingly connected to one drive motor 6 and two cut sheet feeding means 76, 77, 86, 87, the latter can be selectively rotated, whereby feeding of the cut sheets can be effected individually.



C L A I M S

1. A sheet feeding device comprising two cartridge holders in each of which there may be mounted a cartridge containing a plurality of sheets; a motor which may be driven forwardly or in reverse; two sheet feeding means for feeding sheets from cartridges mounted respectively in the cartridge holders; two drive transmissions for respectively transmitting drive from the motor to the two sheet feeding means; and one-way clutch means between each drive transmission and the corresponding sheet feeding means such when the motor is driven forwardly one only of the sheet feeding means is driven thereby, and when the motor is driven in reverse, only the other sheet feeding means is driven thereby.
2. A sheet feeding device as claimed in claim 1 in which one of the cartridge holders is detachably secured to a part of the device.
3. A sheet feeding device as claimed in claim 1 or 2 in which a cartridge is mounted in each of the cartridge holders.
4. A sheet feeding device as claimed in claim 3 in which each cartridge is provided at its rear end with a projection which is engageable with a sheet separation lever



so that, when each cartridge is fully introduced into its respective cartridge holder, it moves the respective sheet separation lever into a sheet separation position adjacent to a respective pick-up roller forming part of the respective sheet feeding means, and when the cartridge is removed from its respective cartridge holder, the respective sheet separation lever moves to a position in which it is spaced from the respective pick-up roller.

5. A sheet feeding device as claimed in claim 3 or 4 in which each cartridge is provided with a pivotally mounted plate which is engageable with the bottom sheet of a stack of sheets in the cartridge, and means for urging the plate upwardly so as to urge the topmost sheet of the said stack into contact with the respective sheet feeding means.

6. A sheet feeding device substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

7. A printer provided with a sheet feeding device as claimed in any preceding claim, the sheet feeding device being arranged to feed a plurality of sheets to a platen of the printer, and the platen being arranged to be driven by means other than the motor of the sheet feeding device.