

"FEED DEVICE FOR FEEDING PAPER OR OTHER RECORD
MATERIAL"

This invention relates to a feed device for feeding paper or other record material, e.g. to a printer provided, for example, with both a tractor feed mechanism and a friction feed mechanism, the latter being constituted by the said feed device.

In known printers provided with a tractor feed mechanism and a friction feed mechanism, there is provided means for changing the resilient contact force of a friction roller against a platen of the printer in accordance with the mode of paper feed being employed. When such force changing means are employed, the friction roller is forced to make strong resilient contact with the platen in a friction feed mode and weak resilient contact therewith in a tractor feed mode. For example, Japanese Patent Application No. 60-243323 filed by the present Applicants discloses a mechanism for changing the resilient contact force of a friction roller with the platen, the mechanism comprising a cam of complicated shape, a cam follower following the cam, several levers, and a biasing spring.

Such a mechanism is used to regulate the frictional force between the record paper and the platen in both the tractor feed mode and the friction feed mode. The known mechanism, however, is complicated in construction, takes a long time to assemble, and is not very satisfactory in setting the frictional force between the record paper and the platen to a proper level in accordance with the mode of paper feed.

According to the present invention, there is

provided a feed device for feeding paper or other record material comprising a material support roller; a movable support member which carries friction roller means which are resiliently engageable with the material support roller with the said record material therebetween; a spring which urges the support member towards the material support roller, different parts of the spring engaging or being engageable with respective parts of the support member; and spring deflector means movable into and out of a spring deflecting position in which it moves at least one but not all of said spring parts out of contact with the respective support member part or parts so as to remove a part only of the resilient force with which the spring urges the support member towards the material support roller.

Thus in its preferred form, the feed device according to the present invention is such as to make it easy to set the frictional force between a record paper and a platen of a printer to a proper level both in a tractor feed mode and in a friction feed mode while using a simplified construction whose parts are easy to assemble.

Preferably, the spring has at least one tongue portion which is integral with the remaining portion of the spring, the tongue and remaining portions respectively engaging or being engageable with different support member parts.

Preferably the spring deflector means, when in the spring deflecting position, engages the said remaining portion of the spring so as to deflect it away from the respective support member part or parts.

The or each tongue portion preferably engages a respective leg portion of the support member, the remaining portion of the spring being engageable with an outwardly

extending abutment portion or portions of the support member.

The or each leg portion may be engaged by the respective tongue portion at a region which is more distant from the material support roller than the region or regions of the outwardly extending abutment portion or portions which are engageable by the remaining portion of the spring.

Preferably, the spring deflector means comprises a rotatable cam which is rotatable between a first rotational position, in which it engages the spring so as to deflect the latter away from a support member part or parts, and a second rotational position in which it is disengaged from the spring so as to allow the latter to contact the last-mentioned support member part or parts.

Thus at the first rotational position, the cam may be arranged to separate the spring from the outwardly extending or contact portions of the support member, so that the friction roller means are pressed against the material support roller by the relatively weak spring force of only the tongue portions. At the second rotational position, however, the cam may be arranged to allow the spring to engage the said contact portions of the support member so that the friction roller means are pressed against the material support roller by the relatively strong spring force of the whole spring.

An operation lever may be provided which is drivingly connected to the cam so that the latter may be moved between the first and second rotational positions by effecting angular movement of the operation lever.

The material support roller may be the platen of a printer.

The invention also comprises a printer provided with such a feed device, the printer being provided with

a tractor feed mechanism having a rotary member provided with projections engageable in holes arranged laterally in the record material so that rotation of the rotary member effects lateral traction of the record material, the spring deflector means being movable out of its spring deflecting position during operation of the tractor feed mechanism.

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

Figure 1 is a front view of a printer provided with a feed device according to the present invention, the printer being shown in a friction feed mode,

Figure 2 is a front view of a mechanism for rotating a cam forming part of the feed device of Figure 1;

Figure 3 is an enlarged front view of part of the structure of Figure 1, Figure 3 showing the position of the parts in the friction feed mode and a tractor feed mode respectively, and

Figure 4 is an enlarged plan view of a biasing spring forming part of the feed device of Figure 1.

In Figure 1 there is shown a printer provided with a feed device according to the present invention. The printer has a platen 1 secured to a shaft 2, opposite end portions of the shaft 2 being rotatably supported by opposite side plates 3 (one of which is shown in Figure 2), the side plates 3 being spaced a given distance from each other. Friction rollers 4 are urged via record paper P into resilient contact with a lower portion of the outer surface of the platen 1. A support member 5 is provided adjacent the outer surface of the platen 1 and is movable towards the latter, the friction rollers 4 being rotatably mounted on the support member 5. The upper surface of the support member 5 is formed with U-

shaped grooves 5a for receiving the shafts 4a of the friction rollers 4. The bottom surface of the support member 5 has leg portions 5b which are connected to a biasing spring 6 described below and contact portions or outwardly extending portions 5c which are engageable by the biasing spring 6. The support member 5 is formed with a recess portion 5d through which extends a rotatable cam 7. It should be noted that the leg portions 5b are longer than the contact portions 5c.

The biasing spring 6 is made of a leaf or plate spring, which urges the friction rollers 4 towards the platen 1 via the support member 5. Specifically, as shown in Figure 4, the biasing spring 6 is formed with four U-shaped slits 6a, these slits forming four tongue portions 6b. A distal end portion of each tongue portion is formed with a coupling hole 6c engageable with the respective leg portion 5b. The tongue portions 6b are integral with the remaining or main portion 6f of the spring 6.

The biasing spring 6 has engagement holes 6d, 6e at its opposite end portions so that, by engaging the engagement holes 6d, 6e with protrusions 8a, 8b of a base plate 8, the biasing spring 6 is supported in place. The contact portions 5c are adapted to be contacted by the main portion 6f of the biasing spring 6. Thus the tongue and main portions 6b, 6f of the biasing spring 6 respectively engage or are engageable with different parts 5b, 5c of the support member 5. As clearly shown in Figure 3, each leg portion 5b is engaged by the respective tongue portion 6b at a region which is more distant from the platen 1 than the regions of the contact portions 5c which are engageable by the main portion 6f of the biasing spring 6.

The cam 7 is mounted above the biasing spring 6

(in the top-to-bottom direction in Figure 3) and extends through the recess portion 5d of the support member 5. The cam 7 is shaped like a rod and is rotatably mounted in the side plates 3 via shafts 7c formed at its opposite end portions. The cam 7 is formed with a first cam surface 7a and a second cam surface 7b. The first cam surface 7a, which is a flat cam surface spaced substantially from the centre of rotation of the cam 7, engages the main portion 6f of the biasing spring 6 to deflect the latter out of contact with the contact portions 5c of the support member 5 when the cam 7 is at a first rotational position or spring deflecting position. The second cam surface 7b is another flat cam surface whose distance from the centre of rotation of the cam 7 is less than that of the first cam surface 7a. The second cam surface 7b is spaced from the biasing spring 6 to allow the biasing spring 6 to contact the contact portions 5c when the cam 7 is at a second rotational position.

Thus different parts 6b, 6f of the biasing spring 6 engage or are engageable with respective parts 5b, 5c of the support member 5, while the cam 7 acts as a spring deflector means which, when in the said spring deflecting position, deflects the part 6f of the biasing spring 6 so as to remove a part only of the resilient force with which the spring 6 urges the support member 5 towards the platen 1.

A print head 9 is mounted on a carriage (not shown) which can be moved parallel to the axis of the platen 1. A tractor feed mechanism 10 is provided on the side of the platen opposite to that of the print head 9. The tractor feed mechanism 10 comprises a rotary member 10a which is relatively non-rotatably but axially shiftably fitted on a rotary shaft 11 both of

whose end portions are rotatably supported by the side plates 3. The rotary member 10a is provided with projections 10b engageable in holes (not shown) arranged laterally in the paper P so that rotation of the rotary member 10a effects lateral traction of the paper P.

Figure 2 shows a mechanism for rotating the cam 7 for switching between a friction feed mode and a tractor feed mode. A distal end portion of the shaft 2 of the platen 1 and a distal end portion of the shaft 7c of the cam means 7 project outwardly from the respective side plate 3. An operation lever is rotatably mounted on the projecting end of the shaft 2. One end portion of the operation lever 12 has an operating portion 12a which can be manually operated from outside, and the other end portion is formed with a sector gear 12b. The projecting end of the shaft 7c of the cam 7 has a pinion 13 secured thereto which is in gear with the sector gear 12b.

In the friction feed mode, the operation lever 12 is at the solid line position shown in Figure 2 and the cam 7 is at the second rotational position. In this state, the second cam surface 7b of the cam 7 is spaced from the biasing spring 6 and is parallel thereto so that they are out of engagement. Therefore, as illustrated by the solid lines in Figure 3, the contact portions 5c are in contact with the main portion 6f of the biasing spring 6, and the spring force of the biasing spring 6 extends via the support member 5 up to the friction rollers 4. That is, as a result of receiving the strong spring force of the whole biasing spring 6, the friction rollers 4 strongly press the record paper P against the platen 1, thereby permitting the friction feed operation to take place.

If the tractor feed mode is to be selected, the operating portion 12a is swung counter-clockwise to the

chain line position in Figure 2. In response to this swinging movement, the pinion 13 is rotated clockwise via the sector gear 12b, the cam 7 is also rotated clockwise to the first rotational position, and the first cam surface 7a comes into engagement with the main portion 6f of the biasing spring 6 as illustrated by chain lines in Figure 3. Since the biasing spring 6 is pushed down and deflected by the first cam surface 7a, the contact portions 5c are not engaged by the biasing spring 6. As a result, the support member 5 is pushed by the spring force of only the tongue portions 6b of the biasing spring 6, so that the friction rollers 4 resiliently contact the platen 1 with a weak force. That is, since the spring force of the tongue portions 6b is weaker than that of the whole biasing spring 6, the friction rollers 4 in the tractor feed mode resiliently press the record paper P against the platen 1 with a weaker spring force than in the case of the friction feed mode, so that the record paper P is fed with a moderate tensile force.

Although in the illustrated embodiment the leg portions 5b are made longer than the contact portions 5c and the tongue portions 6b for receiving the leg portions 5b lie in the same plane as that of the biasing spring 6, the contact portions 5c may be made longer than the leg portions 5b; in this case, the tongue portions 6b are received by the leg portions 5b after being bent toward the support member 5.

In the embodiment described above, the force with which the friction rollers 4 are pressed against the platen 1 is changed in response to the switching between the tractor feed mode and the friction feed mode. Therefore, the frictional force between the record paper P and the platen 1 can be set to a proper level

depending on the mode of paper feed. Further, the device can be readily assembled by stretching the biasing spring 6, and successively mounting the support member 5 and the friction rollers 4. Moreover, the cost of the device can be cut down because the parts thereof, such as the biasing spring 6 and the support member 5, are simplified in configuration, the number of them is small, and the construction of the device is simple.

CLAIMS

1. A feed device for feeding paper or other record material comprising a material support roller; a movable support member which carries friction roller means which are resiliently engageable with the material support roller with the said record material therebetween; a spring which urges the support member towards the material support roller, different parts of the spring engaging or being engageable with respective parts of the support member; and spring deflector means movable into and out of a spring deflecting position in which it moves at least one, but not all, of said spring parts out of contact with the respective support member part or parts so as to remove a part only of the resilient force with which the spring urges the support member towards the material support roller.
2. A feed device as claimed in claim 1 in which the spring has at least one tongue portion which is integral with the remaining portion of the spring, the tongue and remaining portions respectively engaging or being engageable with different support member parts.
3. A feed device as claimed in claim 2 in which the spring deflector means, when in the spring deflecting position, engages the said remaining portion of the spring so as to deflect it away from the respective support member part or parts.
4. A feed device as claimed in claim 2 or 3 in which the or each tongue portion engages a respective leg portion of the support member, the remaining portion of the spring being engageable with an outwardly extending abutment portion or portions of the support member.



5. A feed device as claimed in claim 4 in which the or each leg portion is engaged by the respective tongue portion at a region which is more distant from the material support roller than the region or regions of the outwardly extending abutment portion or portions which are engageable by the remaining portion of the spring.

6. A feed device as claimed in any preceding claim in which the spring deflector means comprises a rotatable cam which is rotatable between a first rotational position, in which it engages the spring so as to deflect the latter away from a support member part or parts, and a second rotational position in which it is disengaged from the spring so as to allow the latter to contact the last-mentioned support member part or parts.

7. A feed device as claimed in claim 6 in which an operation lever is provided which is drivingly connected to the cam so that the latter may be moved between the first and second rotational positions by effecting angular movement of the operation lever.

8. A feed device as claimed in any preceding claim in which the material support roller is the platen of a printer.

9. A feed device substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

10. A printer provided with a feed device as claimed in claim 8, the printer being provided with a tractor feed mechanism having a rotary member provided with projections engageable in holes arranged laterally in the record material so that rotation of the rotary member effects lateral traction of the record material, the spring deflector means being movable out of its spring deflecting position during operation of the



tractor feed mechanism.

11. A paper feed device for a printer comprising a friction roller in resilient contact with the outer surface of a platen, a supporting member provided movably in the direction of confronting the outer surface of said platen for rotatably supporting said friction roller, a biasing spring for urging said friction roller toward said platen via said supporting member, whose tongue portions are connected with respective leg portions of said supporting member and whose portions except for said tongue portions are contactable with abutment portions of said supporting member, and rotatable cam means which at a first rotational position engages with said biasing spring to separate the abutment portions of said supporting member from said biasing spring, and at a second rotational position disengages from said biasing spring to allow said biasing spring to contact with said abutment portions.
