

ATTACHING THE PRINTHEAD TO A CARRIAGE IN A PRINTER

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The present invention relates to apparatus for use in a printer and relates more particularly to the mounting of a printing head therein.

A printer is known whose printing head is fixed to an upper surface of a carriage with a screw or screws so as to have a substantially L-like configuration (e.g. as shown in Japanese Patent Laid-Open Specification No. 61-109757).

When a printing operation is initiated, the printing head is subjected to reaction from the platen of the printer and is thereby inclined backwards. For this reason, the printing head is difficult to use and stable printing quality cannot be obtained. In addition, the way in which the printing head is fixed with screws makes it difficult to replace the printing head. It is therefore a common practice to effect the replacement thereof at a workshop, which is not convenient.

Accordingly, it is an object of the present invention to provide apparatus for use in a printer such that stable printing quality can be achieved and the replacement of the printing head is facilitated.

According to the present invention, there is provided apparatus for use in an impact-type printer comprising a printing head member; a carriage member which is adapted to carry the printing head member; at least one spring; and a spring engagement member; one of said printing head and carriage members being provided with at least one engagement projection which is adapted to be introduced into an engagement groove in the other member so as to engage an engagement surface of said groove; the or each engagement surface being disposed substantially orthogonal to the direction of reaction of the carriage member during printing; at least one of said springs pressing the respective engagement projection in the direction of said reaction against its respective engagement surface, and said spring engagement member being movable into and out of a position in which it engages with at least one of said springs so as force the latter to push the respective engagement projection onto the bottom the engagement groove.

The invention also comprises a printer provided with the said apparatus, the or each engagement projection being disposed in its engagement groove.

The or each spring engagement member is preferably a cam carried by a locking lever, the locking lever having a portion which can be engaged with and disengaged from a locking projection on angular movement of the locking lever.

The printing head member is preferably provided with two said engagement projections on opposite sides respectively thereof, the engagement projections being disposed in engagement grooves in the carriage member.

In the preferred embodiment, the engagement projections and the engagement grooves can be readily disengaged from each other and the carriage member is provided with a locking means for preventing separation of the projections from the grooves. Such locking means may comprise a leaf spring having a pressure portion for pressing the engagement projections on the engagement surfaces virtually in the direction of reaction, and a locking portion for fixing the projections to the interiors of the grooves, a locking

lever provided with a locking cam rotatably engaging the locking portion; and a support means for supporting the locking lever in a predetermined position, the locking cam being adapted to cause the locking portion to engage with the engagement projections when the locking portion is moved against the resilient force of the leaf spring, by rotation of the locking cam together with the swinging of the locking lever.

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

Figure 1 is a front elevation partially in section of an apparatus according to the present invention for use in a printer;

Figure 2 is a plan view of a printing head of the apparatus of Figure 1;

Figure 3 is a plan view of a carriage of the apparatus of Figure 1;

Figure 4 is a partially enlarged front elevation of the said carriage without the printing head being present;

Figure 5 is an enlarged front elevation of a leaf spring forming part of the apparatus of Figure 1;

Figure 6 is an enlarged front elevation of a lock lever forming part of the apparatus of Figure 1;

Figure 7 is a sectional view taken along the line A-A of Figure 6, and

Figure 8 is a partially enlarged front elevation of the said carriage with the said printing head mounted thereon.

In Figures 1 and 2 there is shown an apparatus for use in a printer comprising a printing head 1 having engagement projections 11 formed integrally on the opposite side surfaces of the printing head 1. The latter is an impact type head which is formed with a

projection 12 at the centre of its front surface. The projection 12 accommodates printing wires (not shown) which are slidably mounted therein. A central portion of a ribbon guide 3 (Figure 2), which is located in front of the printing head 1, is provided with a through-hole (not shown) in which the projection 12 is positioned. The upper ends of the engagement projections 11 are set at the same level or higher than the printing wires. As is well known, printing is effected by causing the printing wires to strike the ribbon and the paper supported on a platen 4.

A carriage 2 is, as shown in Figures 1 and 3, provided with guide holes 21 and 22 in its front and rear parts and can be reciprocated horizontally on guide shafts 5 mounted in the guide holes 21, 22. Formed integrally on opposite sides of the carriage 2 are side walls 23, the inner surfaces of the side walls 23, as shown in Figure 3, being provided with engagement grooves 24. The engagement grooves 24 are, as indicated by solid lines in Figure 1, adapted to engage the engagement projections 11 of the printing head 1. In this embodiment, the width of each engagement groove 24 is almost twice as great as that of the respective engagement projection 11, while the depth thereof is at least the same or is greater than the length of the respective projection 11.

When the printing head 1 is mounted on the carriage 2, as shown in Figure 1, the engagement projections 11 are inserted in the engagement grooves 24 of the carriage 2 while the head 1 is moved downwards from the position shown in chain lines.

The engagement grooves 24 have engagement surfaces 24a which are engaged by the engagement projections 11. The engagement surfaces 24a are disposed substantially

orthogonal to the direction of reaction a (Figure 1) produced by the platen 4 when the printing head 1 performs the printing operation, i.e. when the printing wires produce impacts on the platen 4. Thus, the engagement surfaces 24a undergo the reaction from the front.

A description will next be provided of a locking means for preventing separation of the printing head 1 from the carriage 2 and for holding the printing head 1 on the carriage 2.

Turning to Figures 1 and 4, the locking means comprises a leaf spring 7 for each of the grooves 24, each leaf spring 7 being secured at one end thereof to the carriage 2 by a screw or screws 9. Each leaf spring 7 has a free end which is inserted into the respective engagement groove 24 of the carriage 2. Each leaf spring 7 is engaged by a locking cam 81 which forms part of a locking lever 8. Each locking lever 8 is adapted to be supported in a predetermined position by engagement of an engagement portion 83 of the locking lever 8 with a locking projection 27.

A step portion 26 of the carriage 2 is, as shown in Figure 4, integrally and continuously formed at the bottom of a wall 25 of the carriage 2 provided with a small step portion 25a. The wall 25 is provided in front of the engagement grooves 24 of the carriage 2 and thus on the side of the grooves 24 adjacent the platen 4.

A screw hole is formed in an end portion 71 of each leaf spring 7. The end portion 71, which is contiguous with an upper surface of the respective step portion 26, is fixed thereto with a screw 9, each leaf spring 7 is bent over the wall 25, in which state an air gap is formed between the leaf spring 7 and the exterior of the wall 25. Inserted into the engagement grooves 24

are the free ends of the respective leaf springs 7 which are formed with pressure portions 72. The latter are provided with locking portions 73 crooked in an L-shape (or alternatively an S-shape). Each pressure portion 72 includes an engagement member 72a (Figure 5) which extends sideways. The engagement members 72a engage in engagement holes 23a (Figure 4) formed in the side walls 23, so that the leaf springs 7 are thereby set and retained in predetermined positions within the engagement grooves 24.

The construction of each locking lever 8 will now be described with reference to Figures 4, 6 and 7.

Referring to Figure 6, one end of each locking lever 8 is formed integrally with locking cam 81 which extends sideways, while the other end thereof is formed with a knob portion 82 on the opposite side to the locking cam 81.

The locking cam 81 is substantially cylindrical but has the outer peripheral portion of the cylinder partly cut away, thus providing a small diameter portion and a large diameter portion.

The support means 27, 83 for supporting the locking lever 8 in a predetermined position will now be explained as follows.

As shown in Figure 4, the engagement portion 83 is formed with an opening at its lower end of circular shape and is integrally formed so as to extend downwardly of an engagement member 82 of the locking lever 8. The engagement portion 83 serves as a part of the said support means 27, 83. Provided on an outer surface of the side wall 23 in the locking projection 27 which serves as the other part of the support means 27, 83 for supporting the locking lever 8 in the predetermined position when the engagement portion 83 is in engagement

therewith. The external configuration of the locking projection 27 corresponds to the internal shape of the engagement portion 83. When the locking lever 8 swings about the respective locking cam 81, the locking projection 27 enters the opening of the engagement portion 83 and resiliently deforms the latter which in turn engages with the locking projection 27 to secure the locking lever 8 in position.

The locking cam 81 includes, as illustrated in Figures 6 and 7, an engagement portion 81a which extends from a part of the end thereof.

The locking cam 81 of each locking lever 8 is disposed in a gap between the locking portion 73 of the respective leaf spring 7 and the wall 25, with the result that the engagement portion 81a of the locking lever 8 engages with the locking portion 73 so that it is not separated therefrom. This situation is illustrated in Figure 4.

The operation of mounting the printing head 1 on the carriage 2 will now be described.

In the position of the parts shown in Figure 4, the printing head 1 has been moved downwards from the position shown in chain lines in Figure 1, and the projections 11 have been fitted into the engagement grooves 24 of the carriage 2.

As a result, the leaf springs 7 are deformed against their resilient force, while the pressure portions 72 act to press the engagement projections 11 against the engagement surfaces 24a of the grooves 24.

When a locking lever 8 is moved clockwise, as shown in Figure 8, its engagement portion 83 is made to engage with the projection 27. At this time, the locking cam 81 of the locking lever 8 rotates in unison with the swinging of the locking lever 8, thereby

causing, as shown in Figure 8, displacement of the locking portion 73 with the aid of the locking cam 81 while resisting the resilient force of the leaf spring 7. The upper ends of the engagement projections 11 are thus engaged by the leaf springs 7 so as to prevent removal of the engagement projections 11.

When the printing process is initiated, the whole of the engagement surfaces 24a of the engagement grooves 24 receive from the front, via the engagement projections 11, the reaction (indicated by the arrow a of Figure 1) which the printing head 1 is caused to undergo as a result of the printing wires hitting the platen 4, whereby the printing head 1 is not inclined at all, in contrast to what occurs in the prior art.

When it is required to separate the printing head 1 from the carriage 2, the engagement portions 83 of the locking levers 8 are separated from the locking projections 27 by rotating them counter-clockwise from the state shown in Figure 8 and pulling up the printing head 1. The parts are thus brought to the positions shown in Figure 4 and the printing head 1 is pulled up from the carriage 2.

In the illustrated embodiment, the engagement surfaces 24a of the engagement grooves 24 with which the engagement projections 11 engage are so formed as to be virtually orthogonal to the direction of reaction a to which the carriage 2 is subjected during printing. The engagement surfaces 24a are adapted to undergo the reaction from the front, and hence the printing head 1 is not inclined backwards by the reaction. For this reason, it is possible to maintain effective printing by the printing head and at the same time obtain stable printing quality. Moreover, the printing head 1 can be demounted from the carriage 2 so that it can be easily

replaced.

Furthermore, the leaf springs 7 press the engagement projections 11 against the engagement surfaces 24a in the direction of the said reaction, and  
5 also the locking portions 73 press the engagement projections 11 towards the bottom of the carriage 2 because of the action of the locking cams 81, thereby causing no backlash between the printing head 1 and the carriage 2.

**CLAIMS:**

1. Apparatus for use in an impact-type printer comprising a printing head member a carriage member which is adapted to carry the printing head member ; at least one spring; and a spring engagement member; one of said printing head and carriage members being provided with at least one engagement projection which is adapted to be introduced into an engagement groove in the other member so as to engage an engagement surface of said groove; the or each engagement surface being disposed substantially orthogonal to the direction of reaction of the carriage member during printing; at least one of said springs pressing the respective engagement projection in the direction of said reaction against its respective engagement surface, and said spring engagement member being movable into and out of a position in which it engages with at least one of said springs so as to force the latter to push the respective engagement projection onto the bottom of the engagement groove.
2. A printer as claimed in claim 1 or 2 in which the or each spring engagement member is a cam carried by a locking lever, the locking lever having a portion which can be engaged with and disengaged from a locking projection on angular movement of the locking lever.
3. A printer as claimed in claim 2 or 3 in which the printing head member is provided with two said engagement projections on opposite sides respectively thereof, the engagement projections being disposed in engagement grooves in the carriage member.
4. Apparatus for use in a printer substantially as hereinbefore described with referenceto and as shown in the accompanying drawings.