United States Patent

Drapeau

[15] **3,646,570**

[45] **Feb. 29, 1972**

[54] PRINTING HEAD MECHANISM

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[73] Assignee: **Scope Incorporated,** Reston, Va.

[22] Filed: **Feb. 13, 1970**

[21] Appl. No.: **11,077**

[52] **U.S. Cl.** .....**346/139 R,** 346/74 E
[51] **Int. Cl.** **G01d 15/06**
[58] **Field of Search**.....346/74 ES, 74 E, 74 CH, 139

[56] **References Cited**

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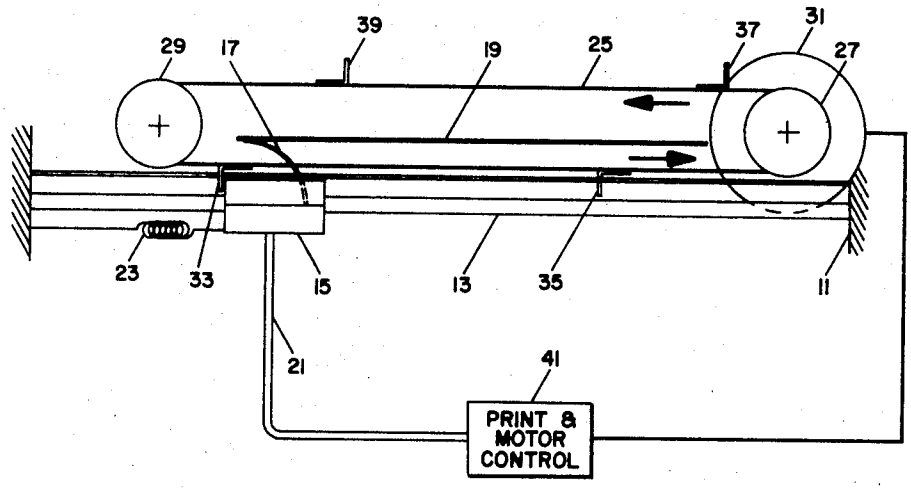
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Primary Examiner—Bernard Konick
Assistant Examiner—Gary M. Hoffman
Attorney—John E. Benoit

[57] **ABSTRACT**

A printing head mechanism for an impactless printer having a printing head which reciprocates across the face of the paper to be printed. The head is biased toward the left-hand side of the paper by a spring. A continuous belt is driven between the head and the paper below the printing stylii. Means are associated with the belt so as to drive the head in a scan manner across the paper against the bias of the spring. At the conclusion of one line of printing, the head is released from the influence of the belt and returns to the left-hand side of the paper.

10 Claims, 9 Drawing Figures



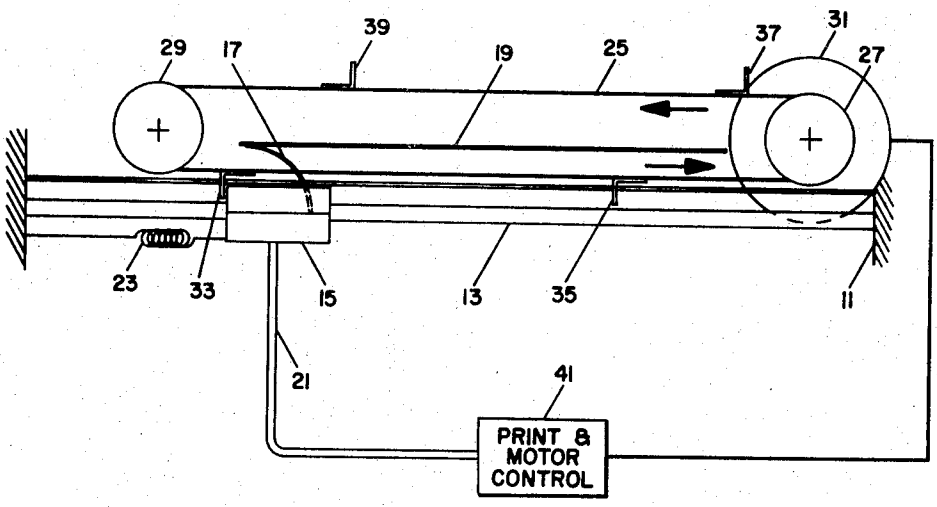


FIG. 1

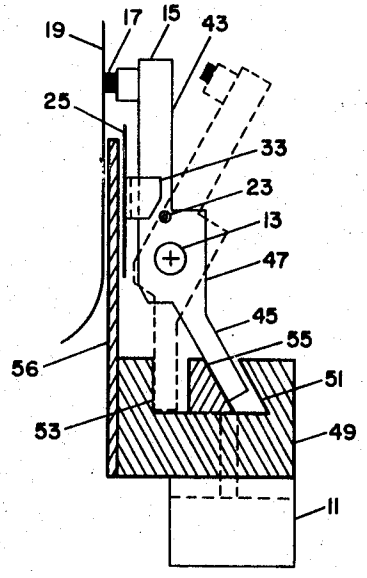


FIG. 2

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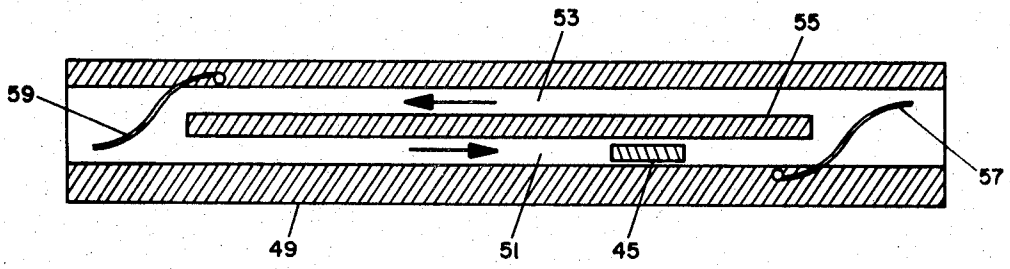


FIG. 3

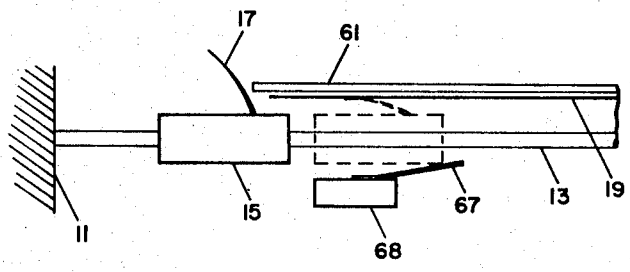


FIG. 4

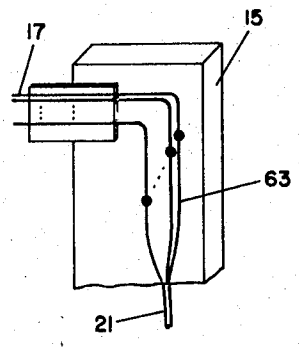


FIG. 5

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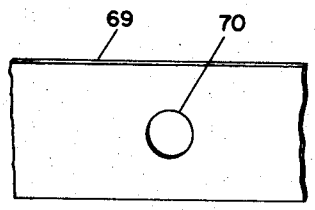


FIG. 6

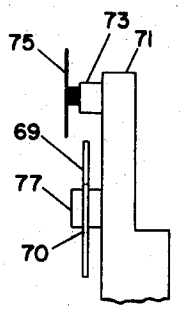


FIG. 7

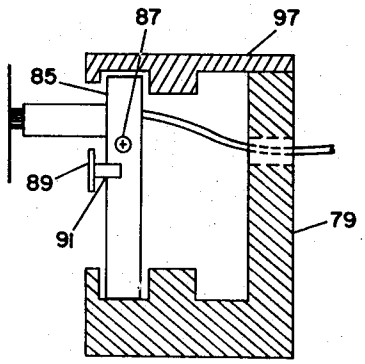


FIG. 8

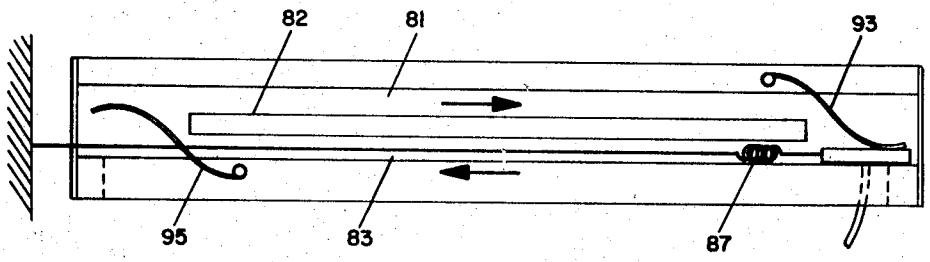


FIG. 9

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PRINTING HEAD MECHANISM

This invention relates generally to printing mechanisms and more specifically to the printing head mechanism for an impactless printer.

In a patent application filed concurrently herewith in the name of the inventor and entitled Impactless Printer, there is disclosed an impactless printer and controls therefor consisting of a plurality of printing heads attached to a continuous belt which moves each of the heads across the paper in sequential order. The electrical impulses for printing are supplied to the print stylii in the heads by linear commutation. This arrangement has some inherent disadvantages. The linear commutation employed is subject to wear, fouling and misalignment. Additionally, the variability between the individual heads themselves and their individual mounting orientations on the belt tend to produce an uneven margin. Further, the use of the belt as both a mechanical drive and support for the print heads make the system subject to mechanical oscillation which results in consistent print quality.

An object of this invention is to provide a printing mechanism which overcomes the above-stated problems.

A further object of the invention is to provide a printing head mechanism which is compatible with the electrical control system of the above-mentioned application.

These and other objects of the invention will become apparent from the following description taken in conjunction with the drawings wherein

FIG. 1 is a plan view of the head and drive mechanism,

FIG. 2 is a side elevation view of the mechanism of FIG. 1,

FIG. 3 is a sectional view taken along the lines 3—3 of FIG. 2,

FIG. 4 is a partial plan view of the head relating to the start position thereof,

FIG. 5 is an elevational view of the head and cable connections,

FIG. 6 is a partial elevational view of a modification of the continuous belt,

FIG. 7 is a side view of a modified head to be used with the belt of FIG. 6,

FIG. 8 is a sectional view of a modification of the head and guide channel structure, and

FIG. 9 is a plan view of the structure of FIG. 8.

Broadly speaking, the invention comprises an impactless printing mechanism having a single reciprocating head which is moved in its printing mode by a plurality of spaced fingers attached to a continuous belt. The head is translateably mounted on a support and biased towards one end of the support. When the head is moved to the opposite end of the support by the fingers, it is moved away from the fingers so as to be returned to said one end of said support. The head is also attached to a flexible multiconductor cable which supplies the pulses to the stylii.

Turning now more specifically to the drawings, there is shown in FIG. 1 a plan view of the essential elements of the present invention.

The printer housing 11 has secured thereto a guide means such as rod 13. A printing head 15 is slidably mounted on rod 13 so that it may reciprocate between the ends thereof. The head 15 has a plurality of stylii 17 extending outwardly therefrom so as to contact the paper 19 which may be any of the known types used with impactless printers. A flexible multiconductor cable 21 is also attached to the head for supplying the required printing pulses to the stylii 17.

A biasing means such as spring 23 is secured between head 15 and housing 11 so as to bias the head towards one end of rod 13.

A continuous belt 25 passes about pulleys 27 and 29 whose axis is substantially parallel to the plane of paper 19. One of the pulleys is mechanically driven by means such as motor 31.

Rigid L-shaped members 33, 35, 37 and 39 are secured to belt 25 at spaced intervals so as to provide extending fingers which contact head 15 when the belt is driven in a direction as indicated by the arrows. The movement of the belt creates a force such that the pressure applied by the fingers is sufficient to overcome the bias of spring 23 and move the head along rod 13.

Turning now to FIGS. 2 and 3, there is shown one illustrative embodiment of the details of the head and associated guide means. FIG. 2 shows the scan or printing position of the head in solid lines and the return position in dotted lines.

Head 15 comprises an upper section 43 which carries the stylii 17, a lower leg 45 and a central section 47 which is slidably and movably mounted on rod 13. As indicated, the entire head may be of an unitary construction.

A guide member 49 is mounted to housing 11 below head 15. Guide member 49 includes a scan channel 51 and a return channel 53 which are separated by a central barrier 55. A vertical plate 56 may also be included with the guide member so as to provide a guide for the belt 25.

As can be seen, when leg 45 rests in and rides along angular scan channel 51, stylii 17 are forced into contact with paper 19. However, when leg 45 rests in and rides along return channel 53, the stylii are removed from contact with the paper.

FIG. 3 more clearly shows the reciprocating mode of operation. As head 45 passes beyond the right end of central barrier 55, a biasing means such as spring 57 exerts a pressure against leg 45 so as to pivot the entire head about rod 13. This moves the upper section 43 out of contact with finger 33 so that head 15 again comes under the influence of the bias of spring 23. The pivoting movement also places leg 45 into alignment with return channel 53 and the head is returned to the left.

As the leg 45 passes the left end of central barrier 55, a similar biasing spring 59 pivots it back into the position shown in solid lines in FIG. 2.

The entire head transport assembly is positioned relative to the paper so that the head is just beyond the left hand edge of the paper when it pivots back into the scan position. Therefore, as the head begins its scan the stylii ride up onto the paper.

The actual printing operation is under the supervision of a print and motor control 41. This system may be substantially the same as that described in the above-mentioned application, the details of which are not part of the present invention.

FIG. 4 relates to the positioning of the head at the left hand margin so that it is ready to start the scan cycle for a particular line.

In normal operation, the head moves across the paper in the scan position printing at any rate up to its maximum useable printing rate until a carriage return is required. Upon receipt of a carriage return command from control 41, printing is disabled and motor 31 goes into "fast forward," i.e., runs at high speed. Head 15 is carried to the right hand end of the guide, pivots and resets itself to the left hand end where it is picked up by a driving finger still moving at a high speed and is carried a short distance to a left-hand margin switch 69. When switch arm 67 is actuated, it stops motor 31 through control 41 so as to establish a left hand margin.

Because of the included hysteresis circuitry, the switch 68, after having been actuated by the head 15, will not again cause the motor to stop until the switch arm 67 has been released to its nonactuated position by the head having moved forward.

The nature of this hysteresis circuit is that the switch actuation "sets" a bistable multivibrator (not shown). This "-setting" generates a pulse that takes the motor out of the "-fast-forward" state. Another such pulse cannot be generated until the head has moved off the switch, and, thus, since the head never moves backwards, the next time the switch arm can be actuated is after flyback at the end of the current print line so as to establish the margin for the next line.

The electrical connections to the head are made by means of a small flexible cable 21 having multiple conductors 63 therein as shown in FIG. 5. This eliminates potential commutation problems.

FIGS. 6 and 7 show a modification of the head driving mechanism. In the previous embodiment, a plurality of fingers were carried by the movable belt for engagement and subsequent scanning of the printing head.

In the modification of FIGS. 6 and 7, the overall head 71 may retain its original configuration so as to have the same relationship with the guide channels as shown in FIGS. 2 and 3. However, in this modification, the movable belt 69 has a plurality of holes or apertures 70, the number of which would be substantially the same as the previously discussed fingers. Again, the head 71 includes an extending section 73 having the stylii which contact paper 75.

A knob 77, having a cross-sectional dimension of a size and configuration to fit within hole 70 of tape 69, extends outwardly from head 71. FIG. 7 shows the head in the scan position with knob 77 engaged in the hole 70. Since the basic guide section is similar to that of FIGS. 2 and 3, it will be seen that the biasing spring will pivot head 71 and remove knob 77 from hole 70, allowing the spring to return the head to the left end of the support. At that point, head 71 comes under the influence of springs 59 (FIG. 3 and the knob will be forced into the next hole in the belt which passes in a scan direction.

It is also noted that the head itself does not need to be pivoted in order to function as set forth in the present invention. However, it must be moved out of contact with the driving means whether such means are fingers attached to the belt or holes therein. FIGS. 8 and 9 show one modification whereby the head is removed from the scanning action in a direction transverse to the plane of the paper.

In this embodiment, the guide member 79 has a scan channel 81 and a return channel 83 which are substantially parallel to each other and which are separated by a central barrier 82. The head 85 comprises a substantially planar body with an extension which carries the stylii. Springs 87, 93 and 95 provide substantially the same function as in the previous embodiment. However, as can be seen, when head 85 passes beyond barrier 82, spring 93 moves it in a direction transverse to the plane of the paper whereby spring 87 returns it to a position such that spring 95 moves into position to resume scanning again. A cover 97 having appropriate matching channels may be used to insure positive control of the head position during scan and return.

The transport mechanism itself is completely passive in that, beyond the motor itself, it requires no further active elements such as solenoids.

The changeover from multiple heads to a single reciprocating head eliminates difficulties arising from head tolerance, commutator unreliability and head instability.

It will be obvious that changes may be made in the various components of the mechanism without departing from the essence of the present invention.

Accordingly, the above description and accompanying drawings are to be considered illustrative only and the invention is to be limited only by the scope of the following claims.

I claim:

1. Printing head apparatus for an impactless printer comprising,
- a printing head including stylii extending outwardly therefrom,
- flexible multiconductor cable means secured to said head and having the conductors therein connected to said stylii for supplying electrical impulses thereto,
- support means secured to said printer for slidably carrying said head in a direction substantially parallel to and across the plane of the paper to be printed,
- means for biasing said head in a direction toward one end of said support means,
- a continuous flexible belt adjacent a portion of said printing head and passing between said head and said paper,
- means on said belt for contacting said printing head and moving said printing head in a direction to overcome said biasing means,
- spring means at the other end of said support means for removing said printing head from contact with said means on said belt whereby said biasing means slidably returns said head to said one end of said support means, and
- means for driving said belt.

2. The apparatus of claim 1 wherein said spring means at the other end of said support means comprises
- a spring for biasing said head in a direction away from the plane of said belt.

3. The apparatus of claim 1 wherein said support means comprises
- a scan channel, and
- a return channel substantially parallel to said scan channel,
- said head having a reciprocating movement in said channels.

4. The apparatus of claim 1 wherein said means for moving said head comprises
- a plurality of spaced fingers attached to said belt.

5. The apparatus of claim 1 wherein said means for moving said head comprises
- a plurality of apertures in said belt, and
- a knob extending outwardly of said head, said knob being of a cross-sectional dimension such as to fit within said apertures.

6. Printing head apparatus for an impactless printer comprising
- a printing head including stylii extending outwardly therefrom,
- flexible multiconductor cable means secured to said head and having the conductors therein connected to said stylii for supplying electrical impulses thereto,
- support means secured to said printer outwardly from and substantially parallel with the plane of the paper to be printed,
- means for mounting said head pivotally and slidably on said support means,
- means for biasing said head in a direction toward one end of said support means,
- a continuous flexible belt adjacent a portion of said printing head and passing between said head and said paper to be printed,
- a plurality of spaced finger means attached to and extending outwardly from said belt, said fingers contacting said head at said one end of said support means and moving said head so as to overcome said biasing means,
- spring means at said other end of said support means for pivoting said head out of contact with said fingers means whereby said biasing means slidably returns said head to said one end of said support means, and
- means for driving said belt.

7. The apparatus of claim 6 wherein said means for mounting said head comprises
- a leg extending in a downward direction from said head,
- a first channel having an axis substantially parallel to said support means for guiding said leg as said fingers move said head, and
- a second channel having an axis substantially parallel to said first channel for guiding said leg when said head is returned to said one end of said support means.

8. The apparatus of claim 6 wherein said spring means for pivoting said head comprises
- a spring at the end of said first channel for contacting said leg and pivoting it to a position so as to mate with said second channel.

9. The apparatus of claim 6 wherein each of said plurality of spaced finger means comprises a rigid plate secured to said belt.

10. The apparatus of claim 6 further comprising control means for temporarily increasing the speed of said driving means so as to cause said head to be reset to said one end of said support means.

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