Nov. 23, 1971 D. J. RIPPLE ET AL 3,621,778

TYPE SLUG MOUNTING FOR HIGH SPEED CHAIN PRINTER

Filed March 10, 1970

FIG. 1

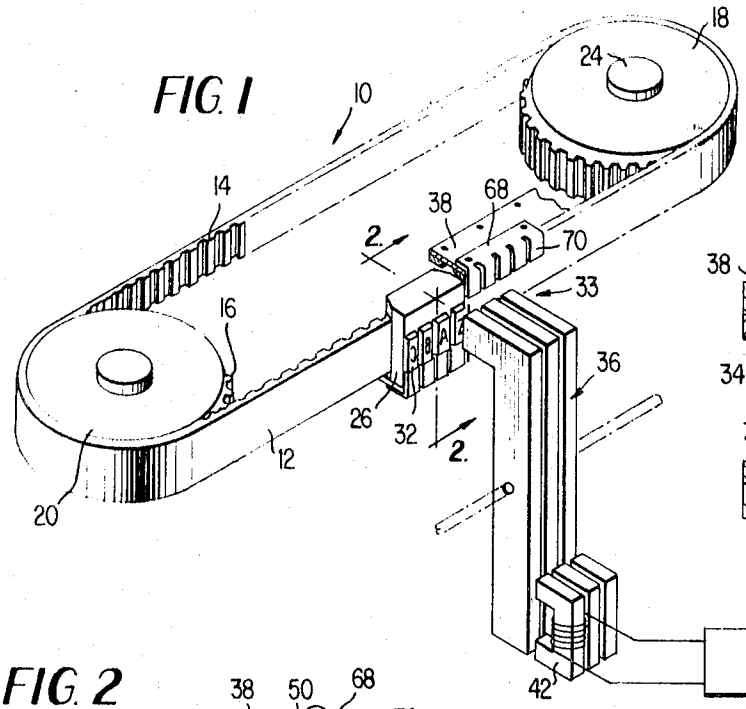


FIG. 6

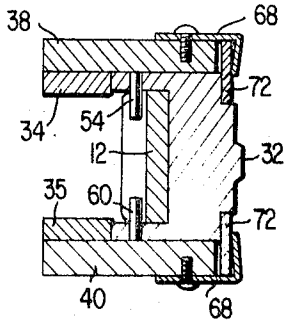
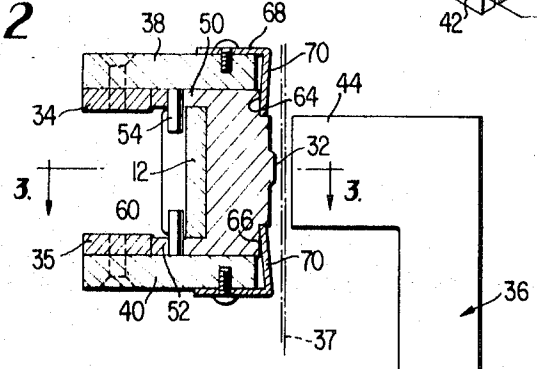


FIG. 2



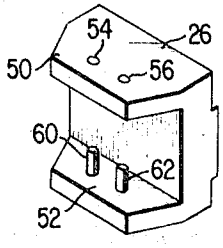


FIG. 5

FIG. 3

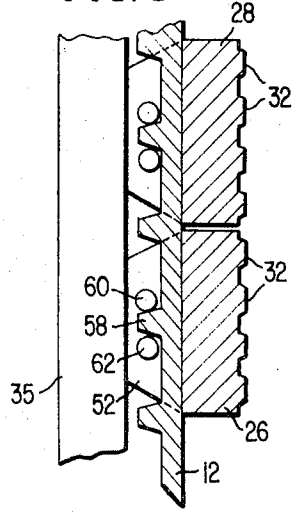
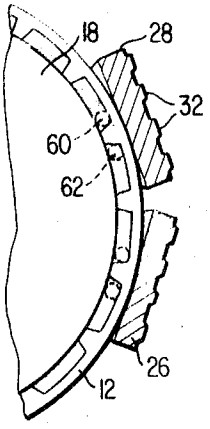
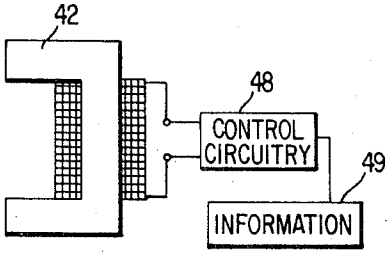


FIG. 4





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TYPE SLUG MOUNTING FOR HIGH SPEED CHAIN PRINTER

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Continuation of application Ser. No. 778,631, Nov. 25, 1968. This application Mar. 10, 1970, Ser. No. 17,043
Int. Cl. B41j 1/20
U.S. Cl. 101—93 15 Claims

ABSTRACT OF THE DISCLOSURE

A high speed chain-type printer having a plurality of relatively wide, multi-character type slugs mounted on the print type carrier in close proximity to each other. The carrier is an endless toothed belt driven by gears in mesh with its teeth. The slugs are mounted on the belt by cylindrical pins straddling selected teeth on the belt. Spring fingers are also provided at the print station to urge the type slugs against a back-up means.

REFERENCE TO RELATED APPLICATION

This application is a continuation of application Ser. No. 778,631, filed Nov. 25, 1968, now abandoned.

BACKGROUND OF THE INVENTION

The present invention generally relates to a chain-type high speed printer, and more particularly to a high speed printer provided with multi-character type slugs.

Chain-type high speed printers are used in the data processing industry to visually reproduce stored information. Examples of such high speed printers are illustrated in U.S. Pats. Nos. 3,353,483; 3,381,611; 3,379,125; and copending patent application Serial No. 509,501, filed Nov. 24, 1965, and assigned to the same assignee of the present invention. In these chain-type printers, a plurality of type slugs are rigidly mounted on an endless, toothed belt driven between a spaced idler and driving gear. A plurality of print hammers positioned adjacent the belt are adapted to be individually actuated by separate electromagnets to drive paper interleaved between the belt and hammers against selected slugs, to imprint a raised character carried by the slug on the paper. Back-up means, such as a back-up bar or a pair of back-up plates are positioned behind the slugs to support them during impact by the print hammer.

The type slugs used in the conventional chain-type high speed printer are narrow in width, permitting them to achieve an arc around the gears driving the belt. A relatively wide slug fixed to the belt would either rigidify the belt so that it could not turn around the gears or it would increase the tension on the belt and cause high local stresses resulting in wear and degradation. On the other hand, by restricting the width of the type slug, only one character can be mounted on it. This necessitates use of a large number of individual, narrow slugs, increasing the cost of the printer.

Furthermore, the narrow slugs must be sufficiently spaced along the belt to provide the necessary turning flexibility, and hence, they are relatively unstable as they pass the print line. Upon impact, the type slugs tend to bounce off the back-up means and turn, causing the paper to be smudged or double characters to be printed, regardless of the proximity of the type slugs and belt to the back-up means.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide a type slug mounting for a high speed, chain-type printer,

which enables a plurality of relatively wide, multi-character type slugs to be mounted on the type carrier in close proximity to each other, reducing the cost of the printer and providing lateral stability of the slugs to minimize their deflection during printing.

Another object of this invention is to provide independent restraining means cooperating with the type slug to urge it against the back-up means during printing as a further aid in minimizing the tendency of the type slug to deflect after impact.

Briefly, these objects are accomplished by mounting the slug about a tooth of a type carrying belt by the use of cylindrical pins inserted through upper and lower backing flanges provided on the slug. Two pins are inserted in each flange equi-distant from the center line of the slug. The pins inserted through each flange are spaced a sufficient distance apart to straddle a tooth on the belt, thereby locking the slug on the belt, but providing rolling contact with the tooth so the belt can turn around the idler and driving gears. Spring fingers are provided for contact with the slug, as they pass through the printing station, to push the slug against the back-up means to aid in minimizing their deflection upon impact.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawing, in which:

BRIEF DESCRIPTION OF DRAWING

FIG. 1 is a perspective view of component parts of a high speed printer as they relate to the structure of this invention, with certain portions broken away for purposes of clarity;

FIG. 2 is a cross-sectional view taken substantially along the plane indicated by line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken substantially along the plane indicated by line 3—3 of FIG. 2;

FIG. 4 is a fragmentary top plan view of one end of the printer structure illustrated in FIG. 1, and illustrating the manner in which a type slug mounted on the type carrier travels around one of the gears driving the carrier;

FIG. 5 is a perspective view of the type slug mounted on the printer structure; and

FIG. 6 is a cross-sectional view of a slightly modified form of one of the component parts of the printer.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawing wherein like numerals indicate like elements throughout the several views, FIG. 1 shows a chain-type high speed printer, generally identified by the numeral **10**. Printer **10** includes an endless timing belt **12**, whose function is described in greater detail in the above-identified copending patent application Ser. No. 509,501. Belt **12** has teeth **14** equally spaced along its back surface. Teeth **14** mesh with teeth **16**, in a non-slipping manner, on both a driven gear **18** and an idler gear **20**. An electric motor (not shown) connected directly to the gear **18** by a shaft **24**, drives the gears.

A plurality of type-carrying slugs, such as illustrated by slugs **26** and **28** provided with raised characters **32**, are supported on belt **12**. The type slugs are carried past a print station **33** and slide along a pair of back-up plates **34**, **35**, which provide support for the slugs during impact by one of a plurality of print hammers, generally indicated by the numeral **36**. Ordinarily, during operation of the printer **10**, a printing medium such as an elongated strip of paper **37** (FIG. 2), usually with interleaved carbon and copysheets, is conveyed in step fashion between the hammers **36** and the type slugs **26** and **28** at print station **33**.

The line traversed by the raised characters **32** between

the hammers **36** and the back-up plates **34, 35**, is commonly referred to as the "printing line." A pair of guide plates **38, 40** (FIGS. 1 and 2) are provided in sliding contact with the top and the bottom of the type slugs, respectively, to maintain the characters **32** centered along the printing line. Plates **38, 40** can be secured to the back-up plates **34, 35**, respectively, by any conventional fastening means.

Each of the printing hammers **36** is actuated individually by separate electromagents **42**. Upon actuation of an electromagnet **42**, its associated printing hammer **36**, having a head **44** pivotal about an axis **46** (FIG. 2), will strike the printing medium **37** driving it against a predetermined one of the raised characters **32** to imprint the character on the printing medium.

Electromagnets **42** are actuated by control circuitry **48** fed information **49** from data processing equipment to actuate a hammer **36** when a desired character **32** is positioned for printing. The circuitry **48** is well known in the art and does not form a part of this invention. Examples of suitable circuitry are disclosed in U.S. Pats. Nos. 3,353,483 and 3,220,343.

Heretofore, only one standard sized character **32** (0.070 inch wide x 0.100 inch high) could be mounted per slug. The slug was rigidly mounted on the belt **12** and consequently had to be extremely narrow in width and sufficiently spaced from an adjacent slug in order to permit belt **12** to achieve an arc around gears **18** and **20**. A relatively wide slug fixed to the belt would either rigidify the belt so it could not turn around the gears or it would increase the tension on the belt and cause high local stresses resulting in wear and degradation. This not only increased the cost of the printer **10**, but rendered the slugs relatively unstable as they passed the printing line, often resulting in smudged or double character printing upon impact of the slugs.

These disadvantages are eliminated by the type slug mounting of this invention. As shown in FIGS. 1, 2, and 5, each of the type slugs **26** and **28** is provided with an upper and lower backing flange **50** and **52**, resectively, overlying opposite edges of belt **12** and terminating in sliding engagement with back-up plates **34, 35**, as the slugs pass along the printing line. A pair of cylindrical pins **54, 56** are inserted through upper flange **50** equi-distant from the vertical center line of the slug to straddle the upper end of a tooth **58** on belt **12**. Pins **54, 56** are in rolling contact with tooth **58**. Similarly, a pair of cylindrical pins **60, 62** are inserted through a lower flange **52** equi-distant from the vertical center line of the slug to straddle the lower end of tooth **58** (FIG. 3). Pins **60, 62** are also in rolling contact with tooth **58**.

The cylindrical pins lock the slug to belt **12**, but allow the slug to roll relative to the belt as the belt turns about gears **18** and **20**, as shown in FIG. 4. Because of this mounting, relatively wide slugs can be supported on selected teeth of belt **12** in close proximity to each other along the length of the belt. The slug-to-slug gap can be minimal, thus minimizing deflection or turning of each slug during impact by a print hammer **36**. The relatively wide character face of each slug enables more than one raised character **32** to be mounted per slug, thereby reducing the cost of the printer. For example, on a one-fifth pitch timing belt, having type slugs mounted on alternate teeth, two standard characters **32** could be mounted along the printing line at 0.200 inch centers or four standard characters could be mounted at 0.100 inch centers. In addition, the loose engagement of the cylindrical pins with the belt teeth enable guide plates **38, 40** to readily center characters **32** along the printing line. Also, only flat or rounded corners contact belt **12**, increasing its life.

While the wide slugs disclosed in this invention are relatively stable and rigidify belt **12**, it may also be desirable to insure that they are held in sliding engagement with the back-up plates **34, 35** during printing. If small spaces develop between the slugs and back-up plates, the slugs will tend to bounce off the back-up bar and turn.

Therefore, shoulders **64, 66** (FIG. 2) are provided adjacent the top and bottom front edges of each type slug. A resilient retaining strip **68**, substantially L-shaped in cross-section, is mounted on each guide plate **38, 40** by conventional fasteners. The vertical legs of strips **68** include spring fingers **70** abutting shoulders **64, 66** to resiliently urge each slug into sliding engagement with back-up plates **34, 35** and retain them against the plates during impact by a print hammer **36**.

Alternatively, as shown in FIG. 6, each resilient retaining strip **68** can urge a bar **72**, carried by springs fingers **70**, into engagement with the slugs to retain them against the back-up plates **34, 35**. Bars **72** can have curved sides to permit easy entrance of the slugs into print station **33**. In either case, the slugs are prevented from rebounding after impact.

I claim:

1. In a high speed printer apparatus, the combination comprising:

a printing type carrier of the chain type adapted to support and to move a plurality of printing type slugs, a plurality of printing type slugs supported on said carrier in close proximity to each other and each having more than one raised print character thereon along a printing line, said printing type carrier including an endless belt having a plurality of spaced teeth along one surface thereof,

gear means having teeth cooperating with the teeth on said endless belt for driving said endless belt past an imprint station positioned at a fixed point relative to said belt, said imprint station including at least one print hammer means having a head for impact with raised print characters on said slugs,

control circuitry to operate said hammer means when a character on a predetermined slug is in a printing position at said imprint station,

back-up means positioned adjacent said type carrier to support each said type slug during impact by said hammer head,

each of said type slugs including an upper flange and a lower flange overlying opposite edges of said belt,

said type characters being in a single row alignment along said printing line on a front face of each respective slug, and

means carried by each of said upper and lower flanges for pivotally retaining each slug on said belt in rolling contact with a tooth thereof and oriented with said front face parallel to the plane in which said belt moves past said imprint station.

2. In a high speed printer apparatus as set forth in claim **1** wherein the raised print characters on each of said type slugs are substantially 0.07 inch wide mounted on centers spaced between 0.1 inch and 0.2 inch.

3. In a high speed printer apparatus having:

a printing type carrier of the chain type adapted to support and move a plurality of printing type slugs having at least one raised print character thereon along a printing line, said type carrier including an endless belt having a plurality of spaced teeth along one surface thereof,

at least one print hammer means having a head for impact with said raised print characters on said slugs,

control circuitry to operate said hammer means when a character on a predetermined slug is in a printing position, and

back-up means positioned adjacent said type carrier to support said type slug during impact by said hammer head, the improvement comprising:

each of said type slugs including an upper flange and a lower flange overlying opposed edges of said belt, and

means carried by each of said upper and lower flanges for locking each slug on said belt in rolling contact

with a tooth, said locking means including a pair of cylindrical pins carried by each of said upper and lower flanges straddling said tooth.

4. In a high speed printer apparatus as set forth in claim 3, wherein each of said type slugs has more than one raised print character mounted thereon along said printing line.

5. In a high speed printer apparatus as set forth in claim 4 wherein each of said pins is equi-distant from the center line of said slug.

6. In a high speed printer apparatus as set forth in claim 5, resilient means for urging each type slug against said back-up means as it passes along said printing line.

7. In a high speed printer apparatus as set forth in claim 6 wherein said resilient means includes a pair of resilient retaining strips, one of said retaining strips having a plurality of spring fingers in contact with the upper surface of each type slug as it passes along said printing line, and the other of said retaining strips having a plurality of spring fingers in contact with the lower surface of each type slug as it passes along said printing line.

8. In a high speed printer apparatus as set forth in claim 3, wherein each of said pins is equi-distant from the center line of said slug.

9. In a high speed printer apparatus as set forth in claim 8, resilient means for urging each type slug against said back-up means as it passes along said printing line.

10. In a high speed printer apparatus as set forth in claim 9 wherein said resilient means includes a pair of resilient retaining strips, one of said retaining strips having a plurality of spring fingers in contact with the upper surface of each type slug as it passes along said printing line, and the other of said retaining strips having a plurality of spring fingers in contact with the lower surface of each type slug as it passes along said printing line.

11. In a high speed printer apparatus having:

a printing type carrier of the chain type adapted to support and move a plurality of printing type slugs having at least one raised print character thereon along a printing line,

at least one print hammer means having a head for impact with said raised print characters on said slugs,

control circuitry to operate said hammer means when a character on a predetermined slug is in a printing position, and

back-up means positioned adjacent said type carrier to support said type slug during impact by said hammer head, the improvement comprising:

a plurality of type slugs supported on said carrier in close proximity to each other, each of said type slugs having more than one raised print character mounted thereon along said printing line, and

resilient means mounted on said back-up means for urging each type slug against said back-up means as the respective slug passes along said printing line.

12. In a high speed printer apparatus as set forth in claim 11 wherein said resilient means includes a pair of resilient retaining strips, one of said retaining strips in contact with the upper surface of each type slug as it passes along said printing line, and the other of said retaining strips in contact with the lower surface of each type slug as it passes along said printing line, said retaining strips mounted to opposite ends of said back-up means above and below said type slugs as they pass said printing position for impact by said hammer head.

13. In a high speed printer in which a hammer impacts a type face as said type faces move along a print line, the combination comprising: an elongated endless belt, a series of uniformly spaced positioning means on said belt distributed longitudinally along at least a portion of said belt, a plurality of type slugs mounted on said belt and movable therewith along said print line, means including a turn-around for driving said endless belt and said slugs in an endless path along said print line and around said turn-around, each of said type slugs being relatively wide in the direction of travel of said belt and having a plurality of discrete type faces formed thereon arranged in a row extending in the direction of travel of said belt, each of said type slugs having means in a central region thereof securing such slug to said belt in a fixed longitudinal position with respect to said positioning means and in cooperative engagement therewith, said central region extending across the middle of said slugs perpendicular to the direction of travel of said belt, said securing means comprising elements lapping over the edges of said belt and extending behind said belt only at said central region so that the outer edges of said type slugs can separate from said belt as said belt passes around said turn-around, at least one print hammer having a head for impacting said print characters on said type slugs, and controller circuitry to operate said hammer when a predetermined character on a slug is in position to be impacted by said hammer head.

14. A high speed printer as recited in claim 13, wherein said elements comprise flanges extending over the edges of said belt and at least one pin extending from one of said flanges behind said belt at said central region.

15. In a high speed printer as recited in claim 13, wherein said positioning means comprises a series of uniformly spaced teeth on said belt distributed longitudinally along at least a portion of said belt.

References Cited

UNITED STATES PATENTS

2,267,661	12/1941	Meyers	101—111
3,041,964	7/1962	Simpson et al.	101—111
3,041,965	7/1962	Sasaki	101—111
3,142,249	7/1964	Sasaki	101—111
3,379,125	4/1968	Antonucci	101—93
3,379,126	4/1968	Staller	101—111
3,399,619	9/1968	Sims	101—93
3,402,657	9/1968	Potter et al.	101—93
3,435,756	4/1969	Martin	101—93
3,379,125	4/1968	Antonucci	101—93
3,379,126	4/1968	Staller et al.	101—111
3,399,619	9/1968	Sims	101—93
3,402,657	9/1968	Potter et al.	101—93

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U.S. Cl. X.R.

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