April 23, 1968 K. J. STALLER ET AL 3,379,126

CLOSED LOOP PRINTING MACHINE AND TYPE SLUG SUPPORTING MEANS

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Fig. 3

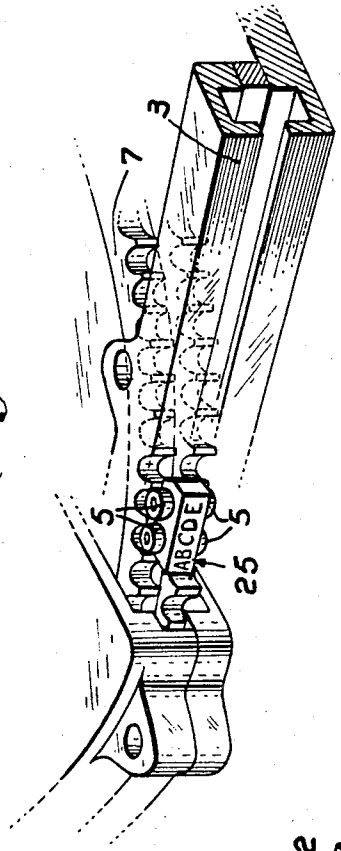
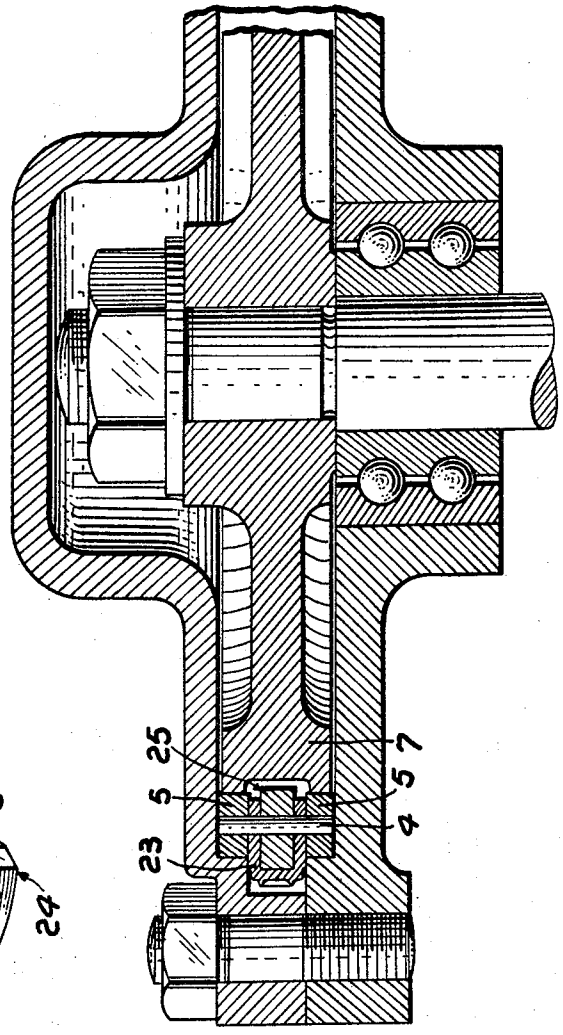


Fig. 4



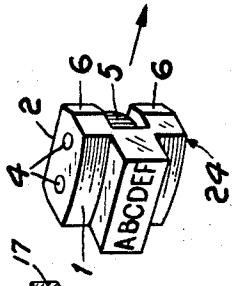


Fig. 1

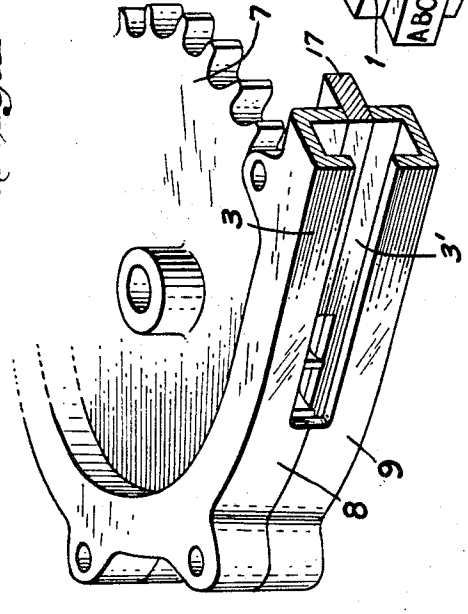
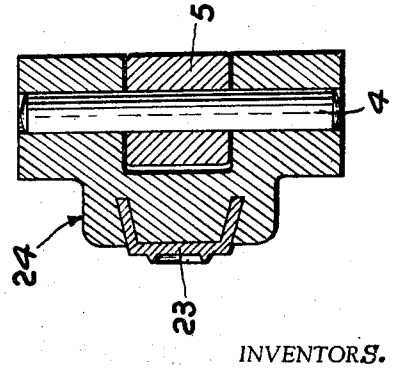


Fig. 2



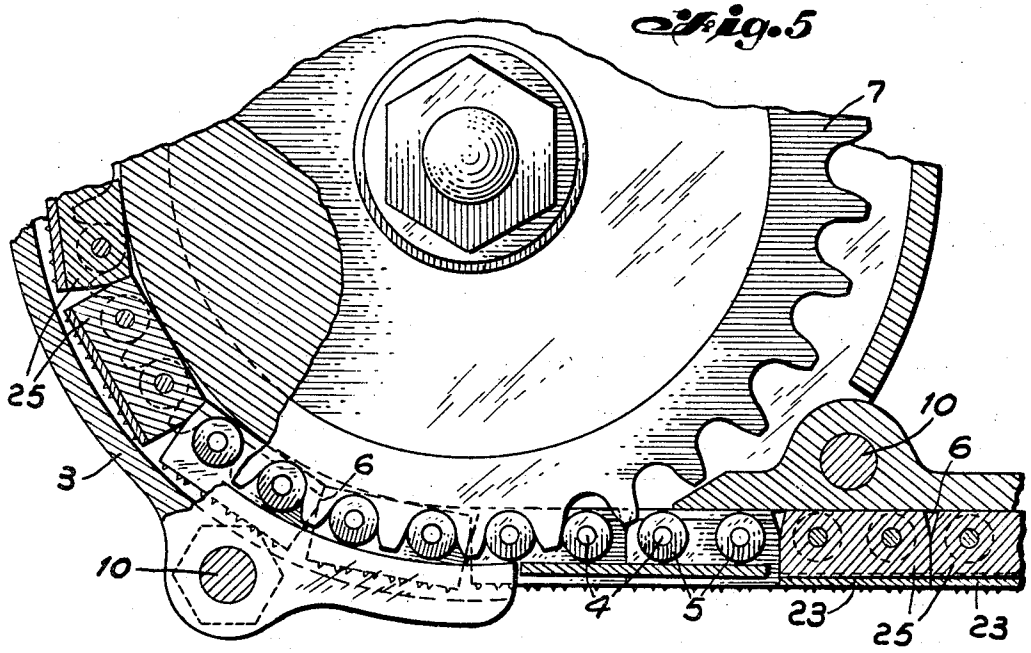
INVENTORS.
KAREL J. STALLER
BY PREBEN GOMARD
Charles L. Johnson Jr.
ATTORNEY

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CLOSED LOOP PRINTING MACHINE AND TYPE SLUG SUPPORTING MEANS

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Fig. 5



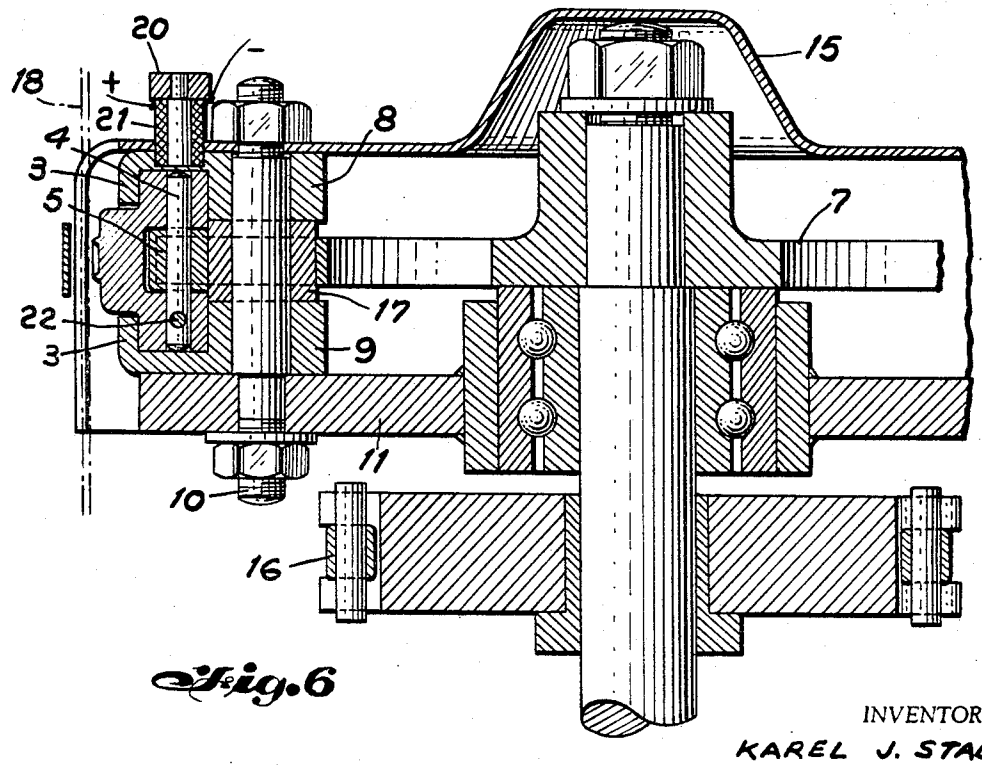


Fig. 6

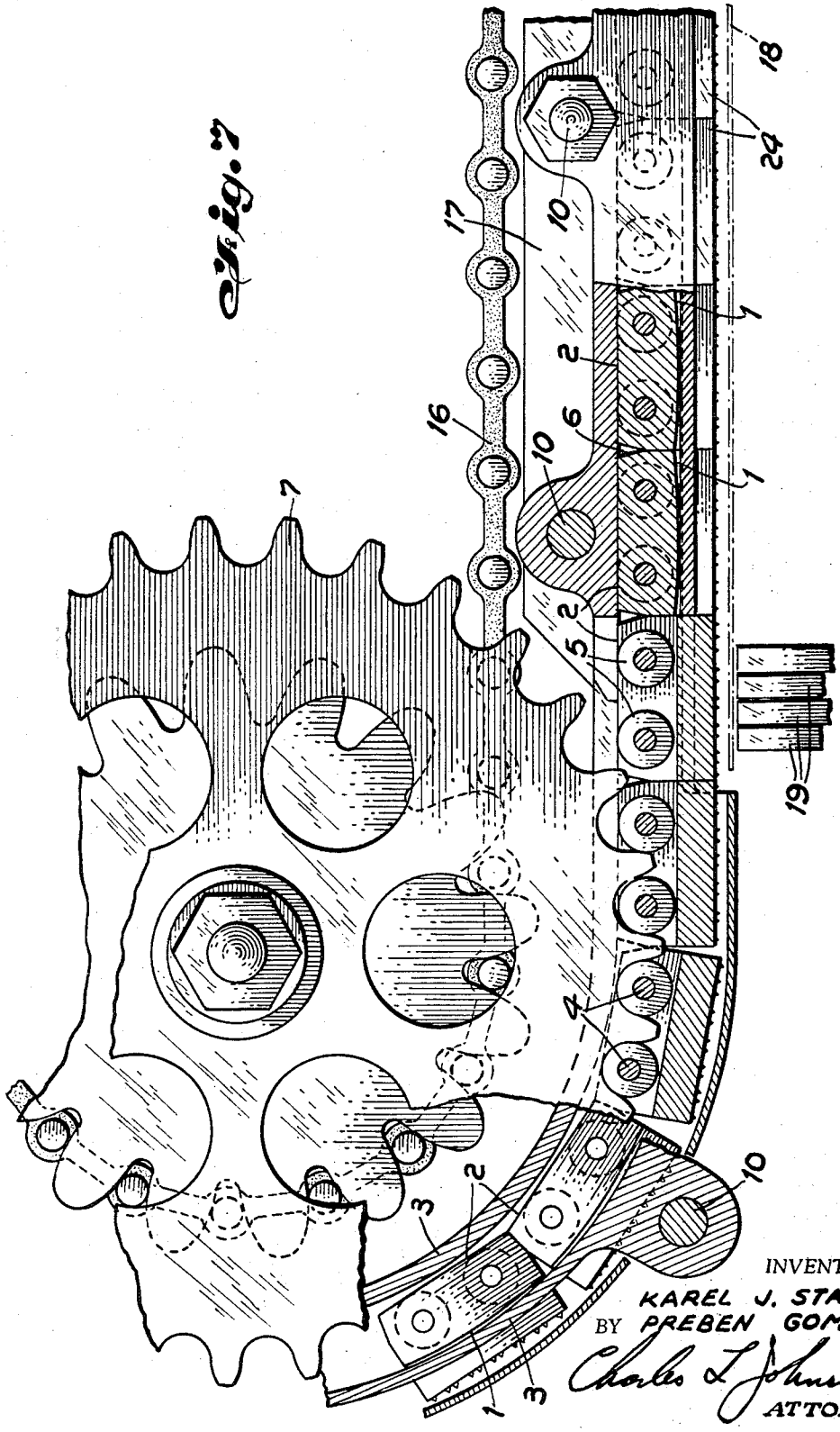
INVENTORS.
KAREL J. STALLER
PREBEN GOMARD
BY Charles L. Johnson Jr.
ATTORNEY

April 23, 1968 K. J. STALLER ETAL 3,379,126

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Fig. 7



INVENTORS.
KAREL J. STALLER
BY PREBEN GOMARD
Charles L. Johnson
ATTORNEY

April 23, 1968 K. J. STALLER ETAL 3,379,126

CLOSED LOOP PRINTING MACHINE AND TYPE SLUG SUPPORTING MEANS

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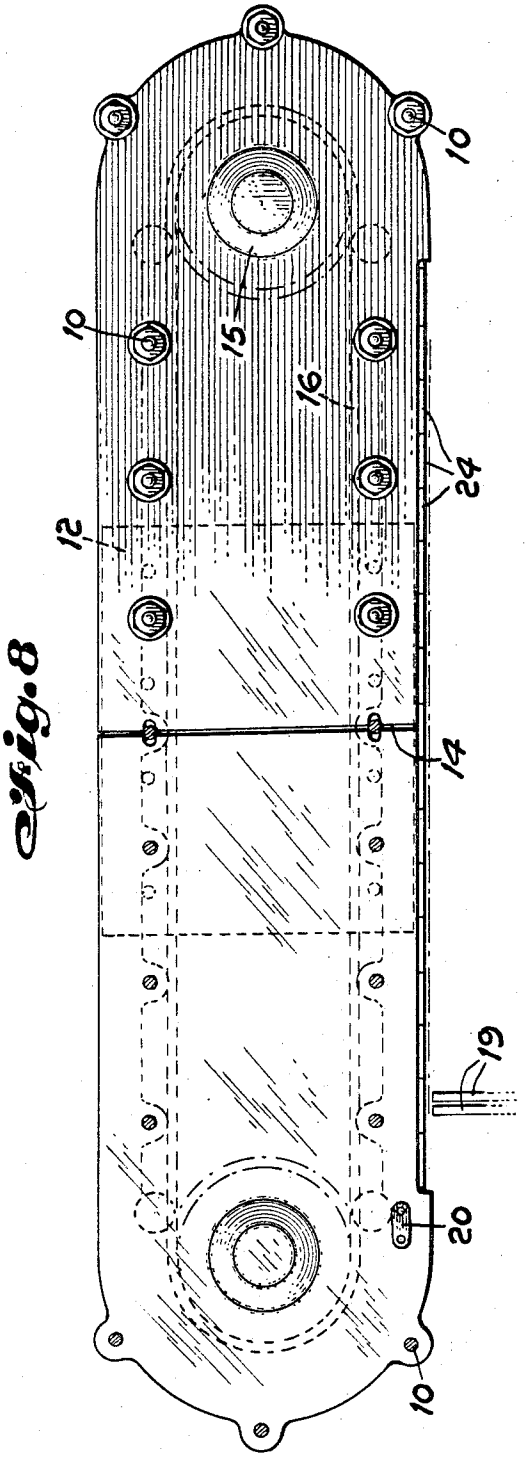


Fig. 8

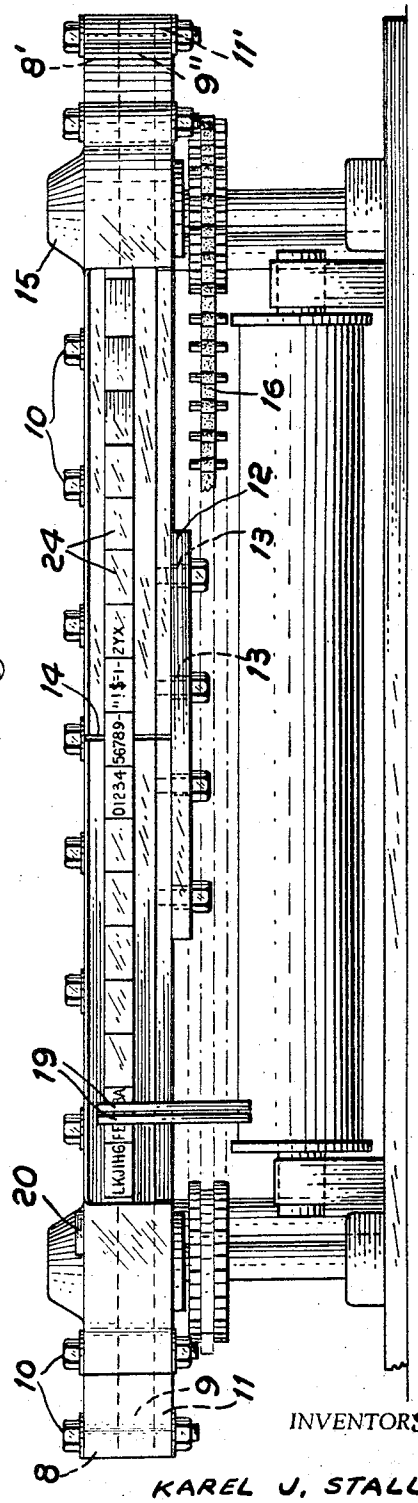


Fig. 9

INVENTORS.

KAREL J. STALLER

PREBEN GOMARD

Charles L. Johnson Jr.

ATTORNEY

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Patented Apr. 23, 1968

3,379,126

CLOSED LOOP PRINTING MACHINE AND TYPE SLUG SUPPORTING MEANS

Karel J. Staller, Rutherford, and Preben Gomard, Montclair, N.J., assignors to International Telephone and Telegraph Corporation, Nutley, N.J., a corporation of Delaware

Filed July 8, 1966, Ser. No. 563,786
8 Claims. (Cl. 101—111)

ABSTRACT OF THE DISCLOSURE

A printing device was provided in which a plurality of print slugs are pushed around a closed loop past a print position. The loop conveyor in the print position has a magnetic portion for attracting the print slug to provide a secure backing during the print stroke so that the print slug will not vibrate and smear the printed character. The slugs are provided with a pair of rollers to provide free movement around the loop conveyor.

This invention relates generally to printing devices and more particularly to a serial printer.

Many forms of printing devices, both parallel and serial, are being used for the printout from computers and other devices. A continuing problem in the development of printing devices is to provide an arrangement by which the proper or desired speed of printing may be acquired at the minimum cost and in the most efficient manner. Accuracy of print position is extremely important for the quality of the printed material.

The prior art printing devices include both drum and belt arrangements which have certain limitations as far as their accuracy of print position is concerned. In a belt or chain type printer the cumulative expansion or contraction due to temperature, vibration or other effects cause misalignment or misposition of the printed characters during operation.

It is therefore a primary object of this invention to provide a serial type printer having reduced errors in the placement of the printed character on a record member.

It is a feature of this invention that individual type members or slugs are conveyed or pushed around a guide channel past a printing position.

It is another feature of the invention to detect magnetically the first printing member of a column of printing members being pushed through a guide channel.

It is a further feature of this invention to provide magnetic means for attracting the printing members so as to establish a solid backing to thereby prevent vibration or chatter during printing.

These and other objects and features of the invention will become apparent from the following description which includes the drawings which are hereby made a prat of the specification and in which:

FIG. 1 is a perspective exploded view of the printing member, channel and drive sprocket with a print slug having two roller members;

FIG. 2 is a cross sectional view of one embodiment of the printing slug having a coined type character insert;

FIG. 3 is an exploded view of the printing apparatus having a print slug with two pairs of drive rollers;

FIG. 4 is a cross sectional view of the conveyor drive for print slugs having two pairs of rollers;

FIG. 5 is a top cross sectional view of the conveyor sprocket drive for print slugs having two pairs of rollers;

FIG. 6 is a partial cross sectional view of the conveyor sprocket drive for print slugs having one or two rollers;

FIG. 7 is a top view of the drive apparatus with a portion of the channel;

FIG. 8 is a top view of the printer apparatus; and

FIG. 9 is a front elevation of the printing apparatus.

The invention basically relates to a printing device whose print or characters are fixed on blocks which are horizontally driven in a channel without interconnection or other mutual connection links. A drive arrangement is provided pushing the print members or type slugs around a loop-shaped channel, much like a conveyor, past a printing position, where impact members contact the print member to accomplish the printing operation. The push of the print slugs eliminates the print position errors which occur with interlocking chain or belt-like printing drives.

A magnet is provided, in one embodiment, to attract the type slugs so as to provide a solid backing to absorb the impact of print hammers without undue vibration of the type slugs within the channel. The print slugs are so formed with radius curvatures on the two front ends and bevelled portions along the rear sides that the type slugs move smoothly around the curvature of the loop channel.

Magnetic detector means are provided for detecting when the first type slug passes a given position, for control of the print hammers. Type slugs having one or two pairs of rollers are described. These rollers mate with the conveyor drive teeth to push the print slugs.

A specific embodiment for type slug drive is proposed wherein a row of coils, alternately energized, sequentially attract and repel small magnets located in the type slugs.

The above aspects of the serial printer of this invention will now be described more fully by reference to the drawings.

The characters can be molded directly in the front face of the block, as in FIG. 1, or can be coined on a metalic U shaped part **23** of FIG. 2 which is molded in the block. The type blocks or print slugs **24** and **25** act as carriers for the type characters placed thereon. The slugs **24** and **25** have their surfaces **1** and **2** formed with a radius surface so as to move freely in the loop shaped channel **3**. One or more pins **4** are pressed into the slugs **24** and **25** around which can freely rotate a steel roller **5**. Slug **24** has one pair of rollers **5** while print slug **25** has two pairs of rollers. Bevelled corners **6** permit the slugs to fold in on each other as they traverse the curved portion of the channel.

The guiding channel **3** having a longitudinal window **3'** consists of four quarters **8**, **8'**, **9** and **9''** held together by screws **10**. The channel is fixed on plates **11** and **11'** by screws. The plate **12** has elongated holes **13** in order to permit slight adjustment of the gap **14** to compensate for tolerances in the production of the letter carriers. To avoid the contamination of the moving parts, the mechanism is covered by sheet part **15** fixed with screws **10** to the channels.

The sprockets **7** and **7'** are connected with a timing belt **16** driven by the main motor (not shown). The sprockets at least partially enclose the print slug rollers so as to push the slugs through the channel like a conveyor. The blocks are held against the supporting straight part of the channel **3** by a magnet **17** to avoid undue motion or chatter during printing. The magnet also gives to the print blocks a certain braking action. Thus the print slug blocks will be pushed together during the motion of the drive chain thus eliminating the gaps between print blocks.

The channel **3** is closed almost along its whole length by spacers or by cover **15**. In front there is a longitudinal window in the channel **3** at portions **8'** and **9** and in the closing cover **15** as well. The length of this window is a

little more than the width of standard sheet of paper, i.e., 8½ inches. Its purpose is to give the paper **18** free access to the characters, when the hammers **19** of the print station hit the paper.

The permanent magnet **20** with two coils **21** detects the first letter of the alphabet by means of cross pin **22** which is located in the first block as it passes under the detector. This detection is required to set the timing and functioning of the hammers, which can be controlled in a well known manner by electronic circuitry. The magnetic detector **20–21** is responsive to the passage of the magnetizable material **22** of the print slug under the magnet and coils.

The source of power driving the row of blocks along the closed path inside the channel may take any one of several forms, one possibility being the use of a row of coils, energized alternately and thus attracting and repulsing small magnets located in the print blocks. These driving coils would be preferably placed in the rear, where the blocks are returned to the starting position.

It is thus seen that a printing apparatus has been devised wherein, in one embodiment, print slugs having type characters formed therein are pushed around a closed loop channel in a conveyor-like manner by a sprocket drive, past a printing station which includes hammers which selectively impact upon portions of the print slugs so as to print. Magnet means are used to stabilize the print slugs and detect portions of one or more print slugs. Two embodiments of print slugs have been illustrated, one with a single pair of rollers and one with two pairs of rollers, the rollers acting to matingly receive the spaced sprocket curvatures so the print slugs may be pushed in a conveyor-like manner around the closed-loop channel.

It should be understood that many variations may be devised without departing from the spirit of the invention which is described in the accompany claims.

What is claimed is:

1. Printing apparatus including at least one printing station comprising a plurality of printing slugs and channel conveyor means for guiding within said channel the printing slugs past a printing station, the channel conveyor means including drive apparatus for pushing the printing slugs through the channel conveyor past a printing station and including at said station magnetic means forming a portion of the rear wall of said channel for attracting the printing slugs so as to provide a solid backing for the printing slugs during the print operation.

2. Printing apparatus including at least one printing station comprising a plurality of print slugs each having a pair of rollers and channel conveyor means for guiding within said channel the printing slugs past a printing station, the channel conveyor means including drive apparatus for pushing the printing slugs through the channel conveyor past a printing station, said drive apparatus including spaced teeth for at least partially enclosing the print slug rollers during at least a portion of the conveyor guidance operation, and said channel conveyor including at said station magnetic means forming a portion of the rear wall of said channel for attracting the printing slug so as to provide a solid backing for the printing slug during the print operation.

3. Apparatus according to claim **2** wherein the print slugs include at least two pairs of rollers for mating with at least a portion of the channel conveyor means.

4. Apparatus according to claim **2** wherein the channel conveyor means includes detecting means for detecting the passage of at least one of the print slugs.

5. Apparatus according to claim **4** wherein the print slug detecting means includes magnetically responsive means for detecting a magnetic property of at least one print slug.

6. Apparatus according to claim **1** wherein the channel conveyor means is formed in the shape of a closed loop.

7. Apparatus according to claim **1** wherein printing slugs have a plurality of type characters formed thereon at least one of which print slugs has a magnetically detectable portion associated therewith, the said channel conveyor means being formed with removable, adjustable covers for the insertion and removal of print slugs from a loop shaped channel, at least a portion of the rear wall of said loop shaped channel has magnetic backing means associated therewith for holding the print slug during the print operation and including magnetic print slug detecting means for detecting when print slugs having a magnetically detectable portion associated therewith passes the detecting means.

8. Apparatus according to claim **1** wherein the print slugs include a plurality of type characters formed thereon.

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WILLIAM B. PENN, *Primary Examiner.*