

[72] Inventor **Paul H. Hamisch, Sr.**
Dayton, Ohio
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[73] Assignee **The Monarch Marking System Company**
Dayton, Ohio

Primary Examiner—William B. Penn
Assistant Examiner—E. M. Coven
Attorney—Wood, Herron and Evans

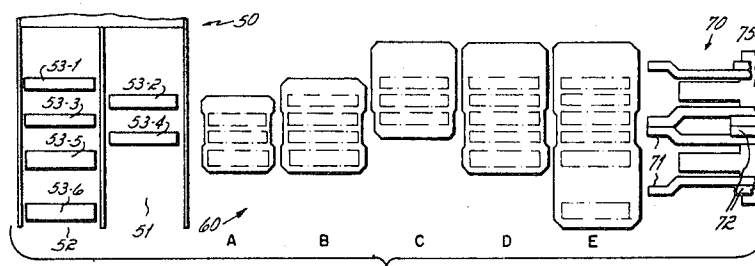
[54] **METHOD AND APPARATUS FOR PRINTING TAGS**
41 Claims, 44 Drawing Figs.

[52] **U.S. Cl.**..... **101/69,**
101/19
[51] **Int. Cl.**..... **B41l 15/14**
[50] **Field of Search**..... 101/19,
67-69, 45, 90, 66

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ABSTRACT: A method and apparatus for printing closely spaced lines of characters on a series of tag parts, with a minimum of printing strokes and without the printing of extra tag parts, using a two section printhead having a plurality of band-set lines staggered between the two sections. Each tag part is fed part each printhead section and is partially printed by each section to be completed in two printing strokes. Adjacent tag parts are printed simultaneously by different sections of the printhead. One print stroke more than the total number of tag parts is employed. The feeding of blanks is inhibited during the last feed cycle. Counters control the printing of a selected number of single or multiple part tags through solid-state circuitry, and control the printing, feeding and cutting of tags, and the starting and stopping of the machine which prints them. The controls employ a combination of electrical and mechanical signals for driving, synchronizing, conditioning and enabling the various operations. A portion of the guideway is depressible to expose a cutting edge of the platen, a two section printhead structure with telescoping dials, and selective tag guides which retract into the guideway for accommodating various tag sizes are also provided.



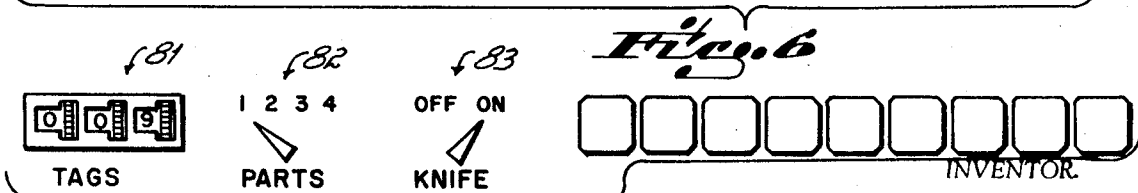
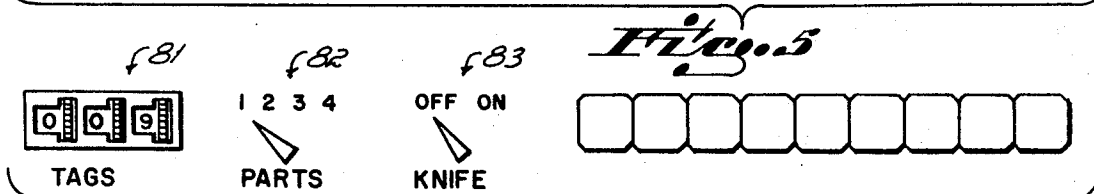
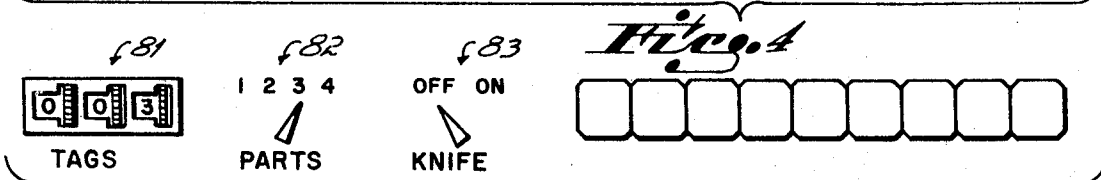
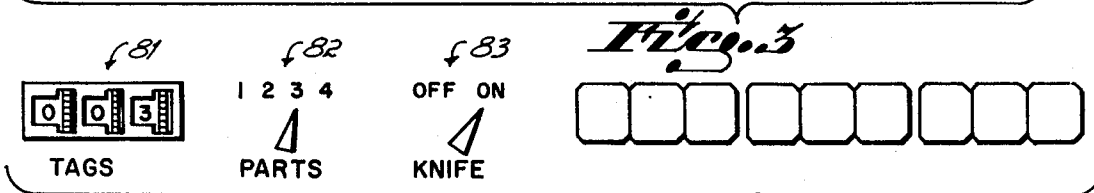
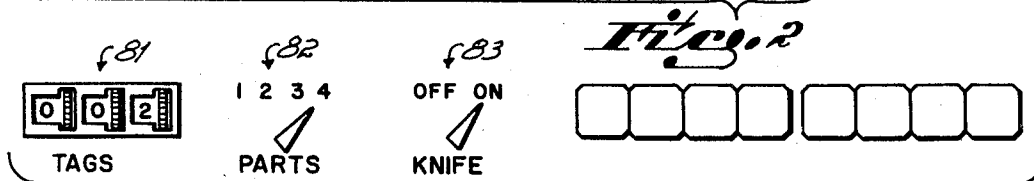
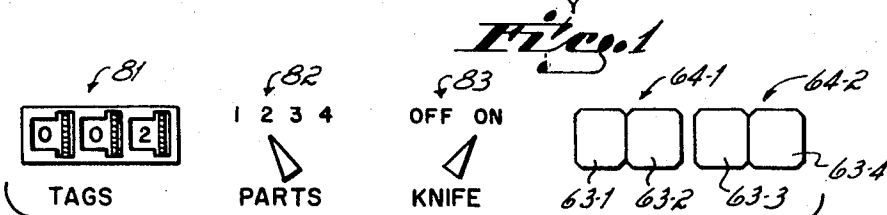
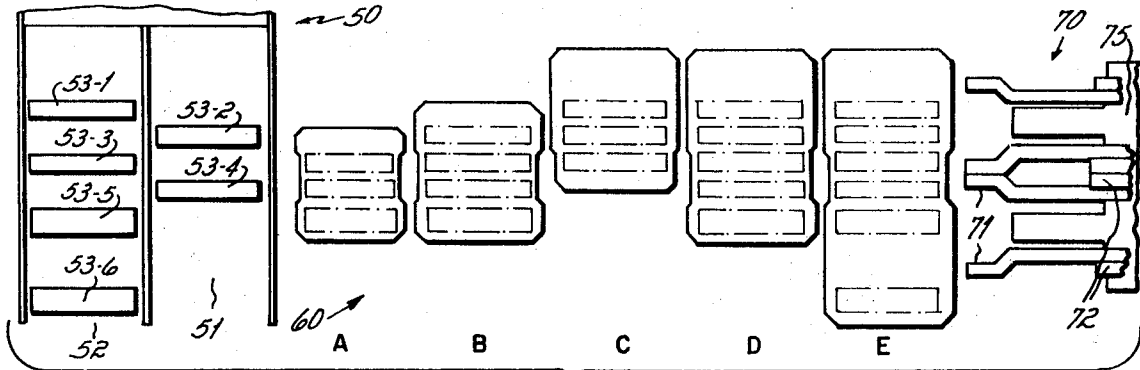


Fig. 7

INVENTOR.
Paul H. Hamisch, Sr.
BY
Wood, Herron & Evans
ATTORNEYS

Fig. 8

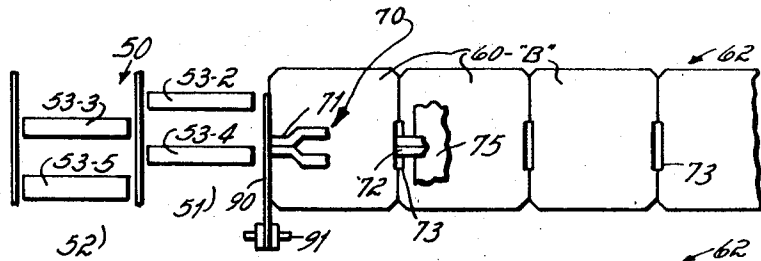


Fig. 9

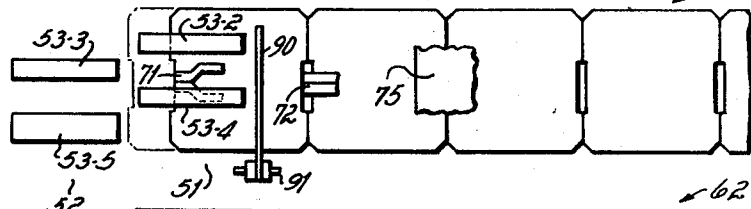


Fig. 10

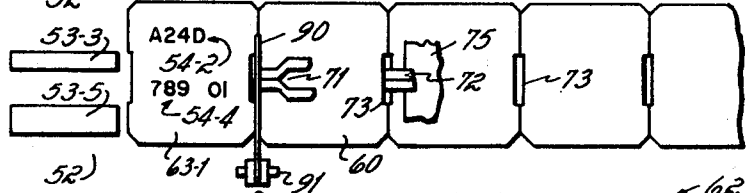


Fig. 11

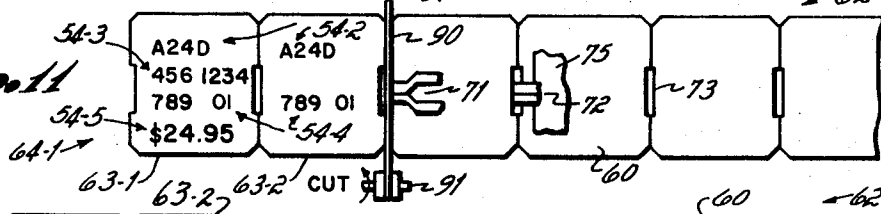


Fig. 12

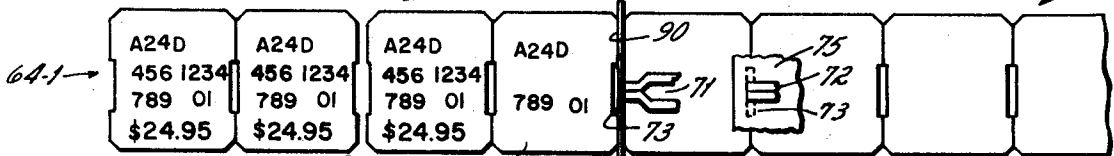
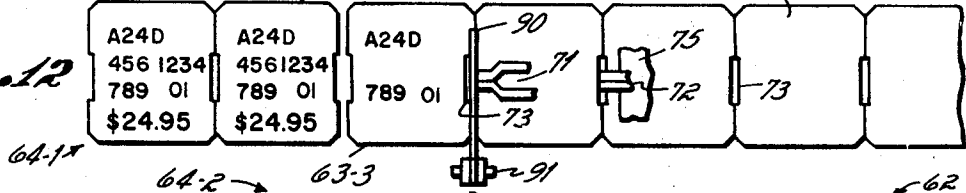


Fig. 13

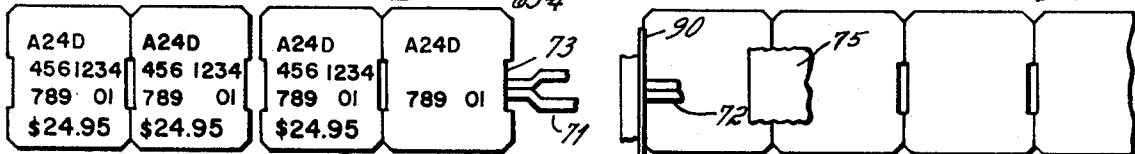


Fig. 14

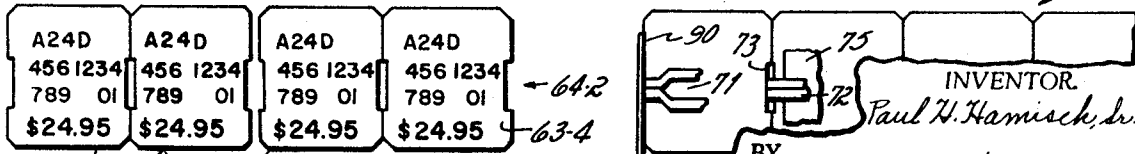


Fig. 15

INVENTOR
Paul H. Hamisch, Jr.
BY
Wood, Herron & Evans
ATTORNEYS

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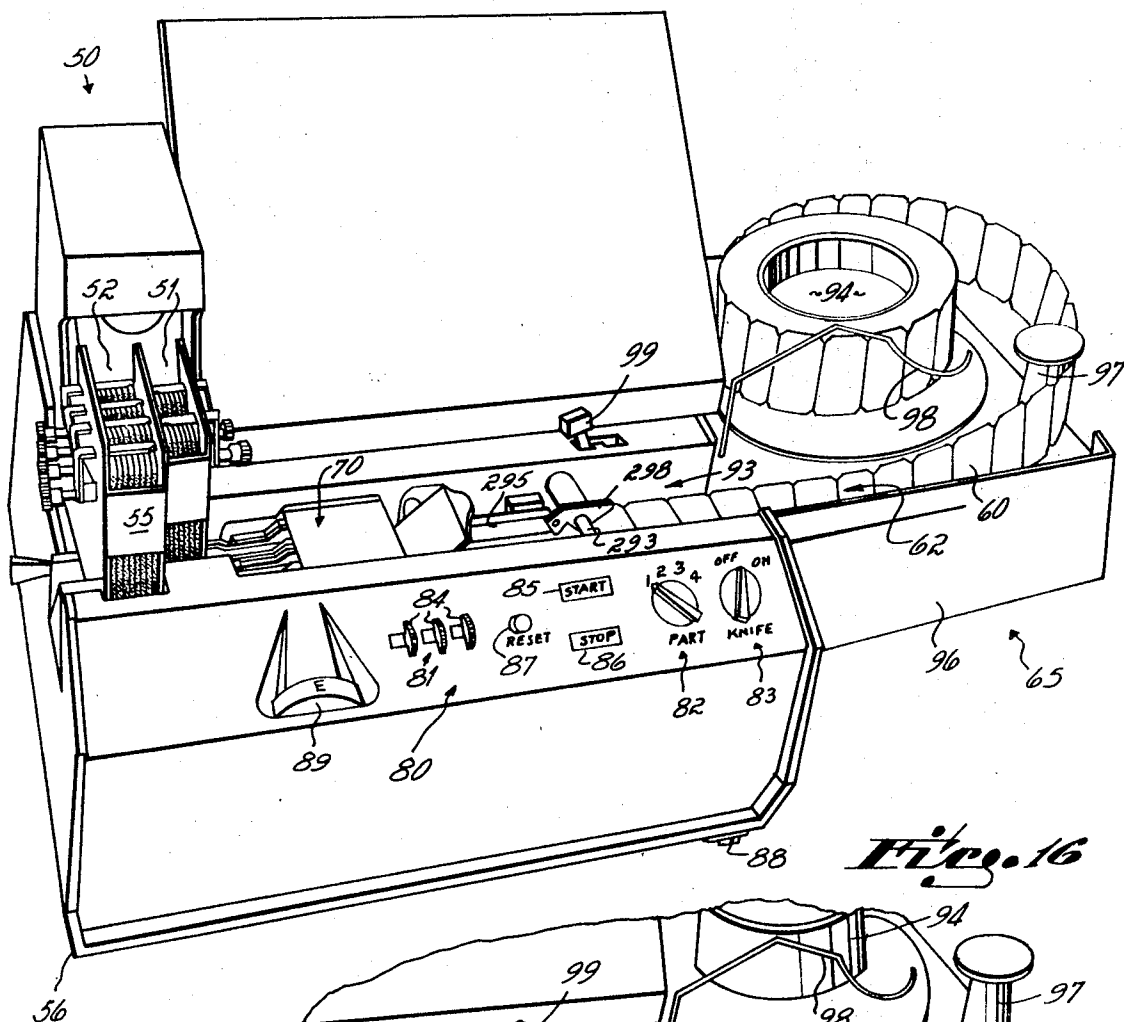


Fig. 16

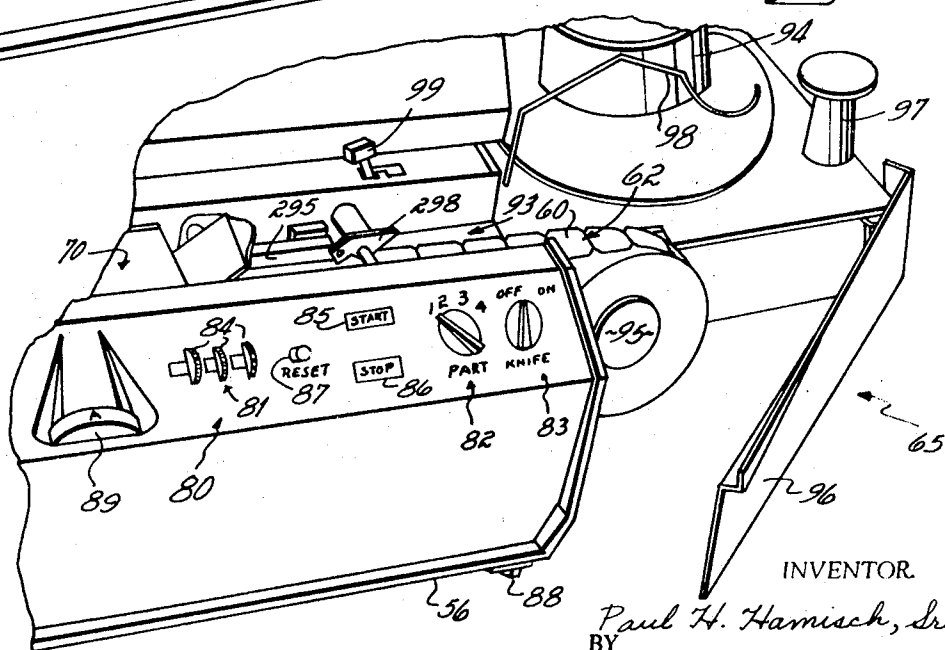


Fig. 17

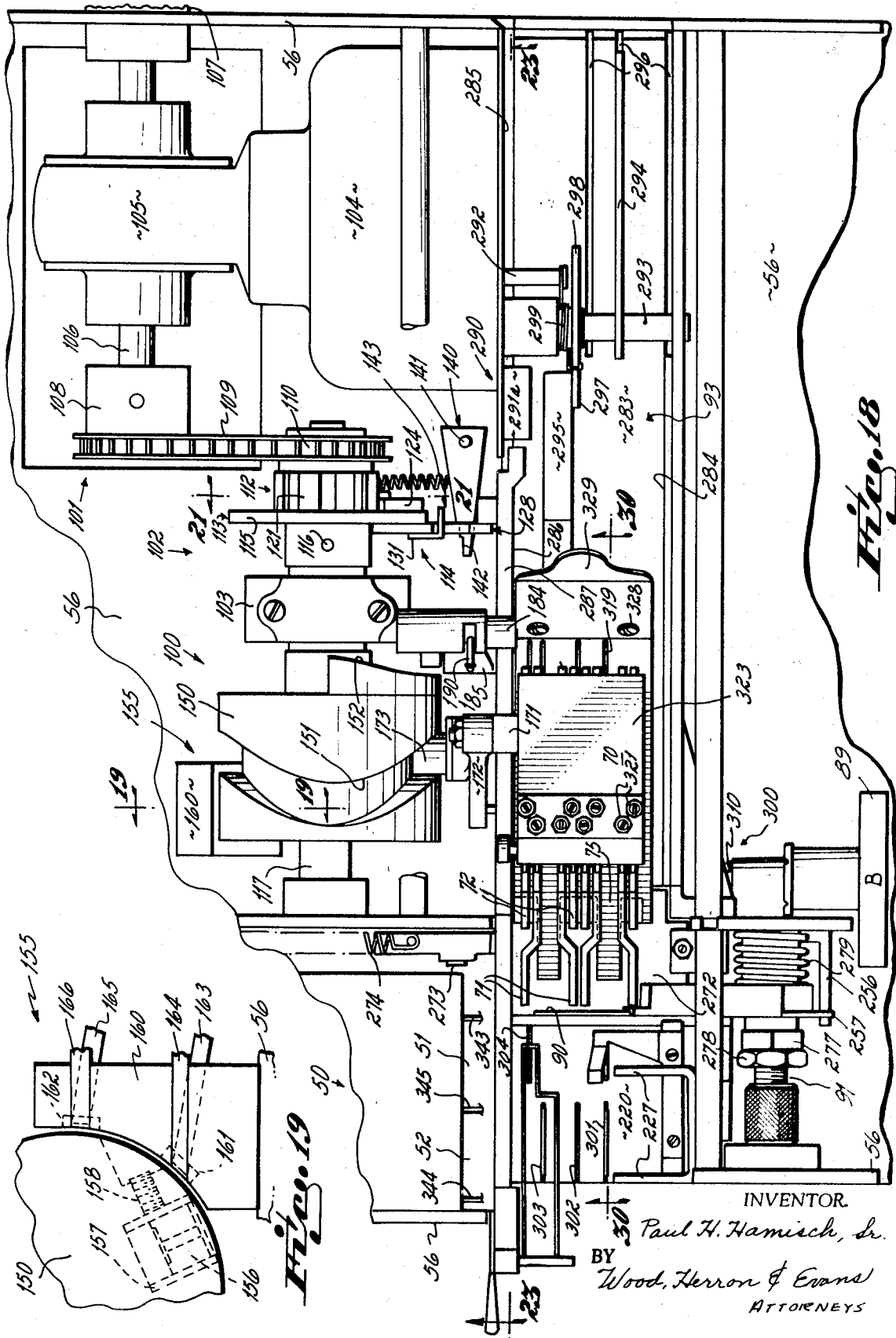
INVENTOR.

Paul H. Hamisch, Jr.
BY
Wood, Herron & Evans
ATTORNEYS

Patented Aug. 24, 1971

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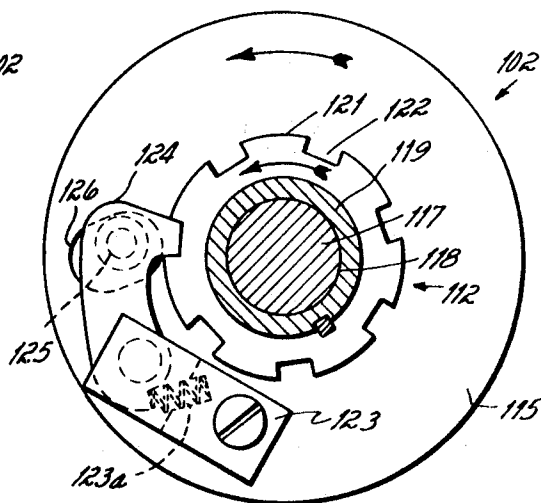
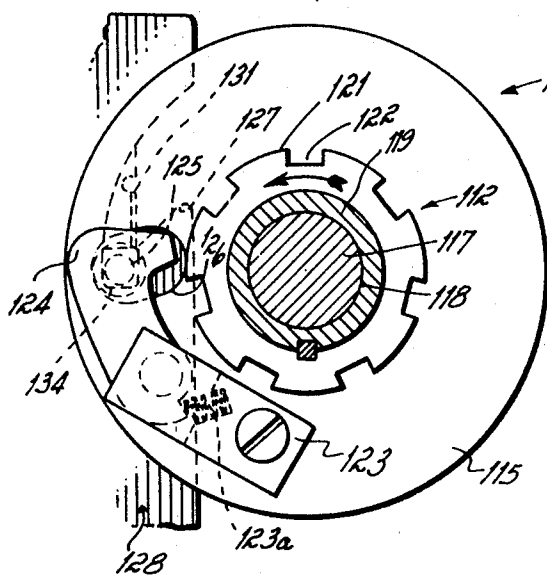
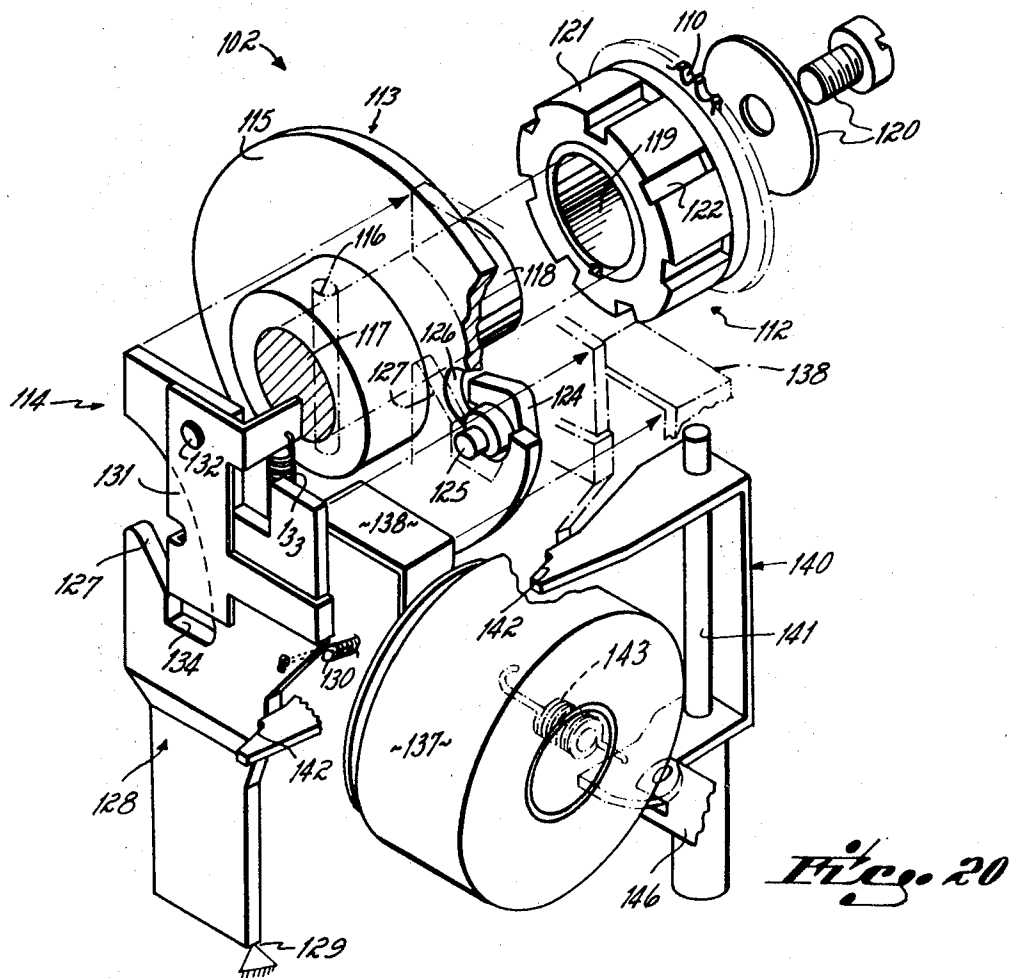
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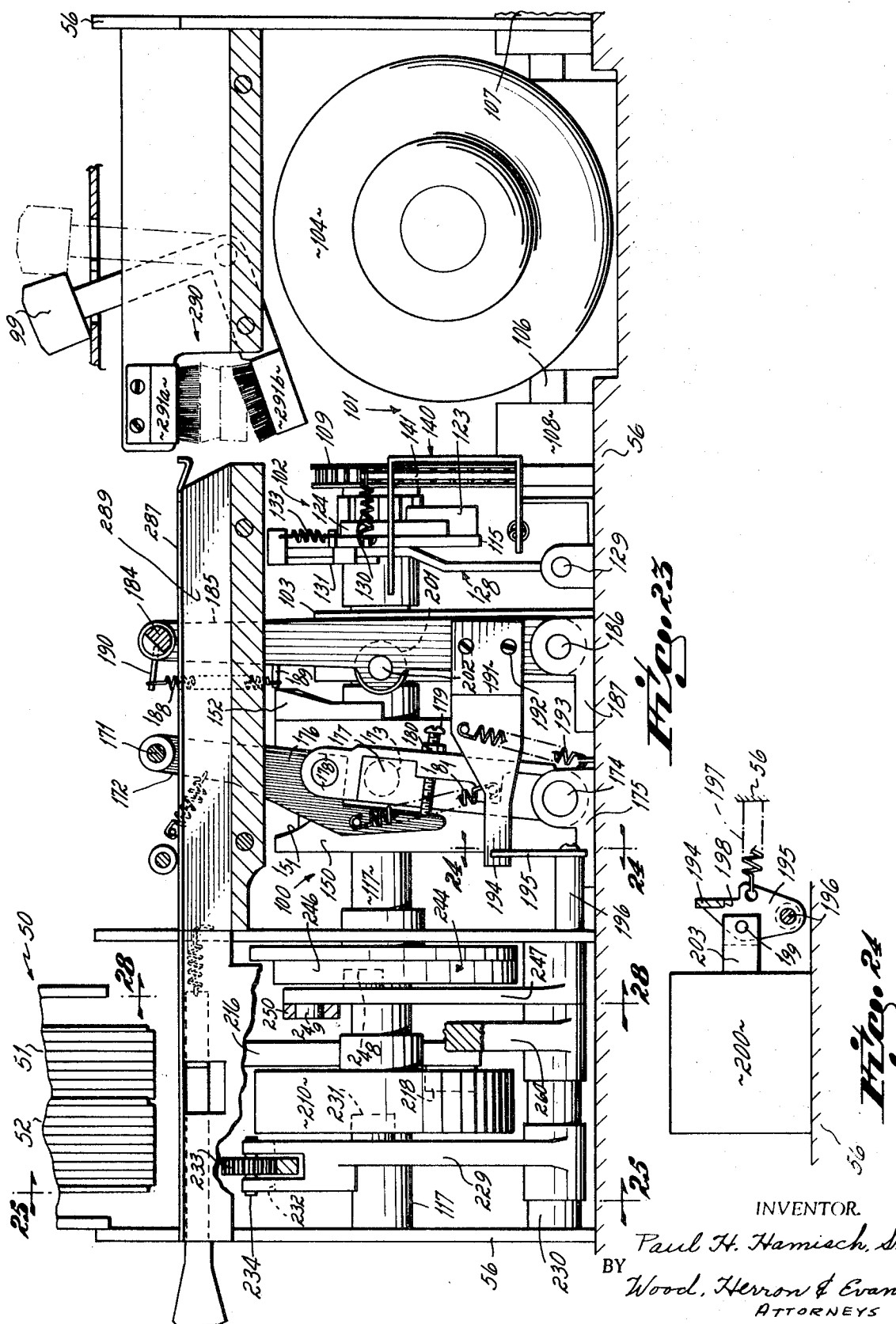


INVENTOR.

Paul H. Hamisch, Jr.

BY

BY
Wood, Herron & Evans
ATTORNEYS



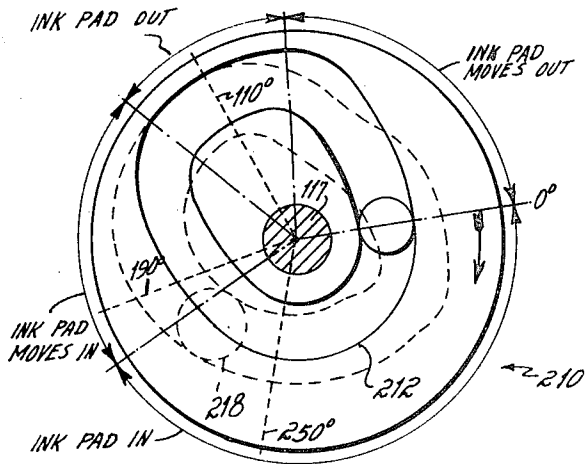


Fig. 26

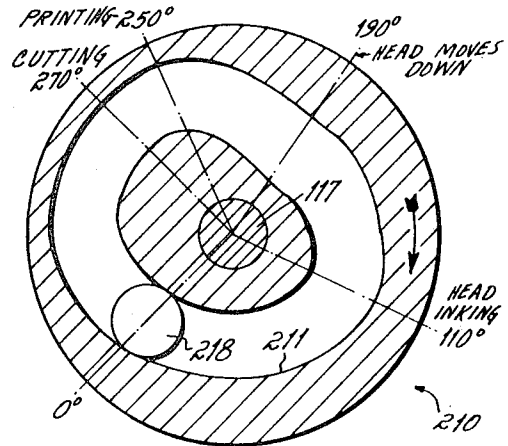


Fig. 27

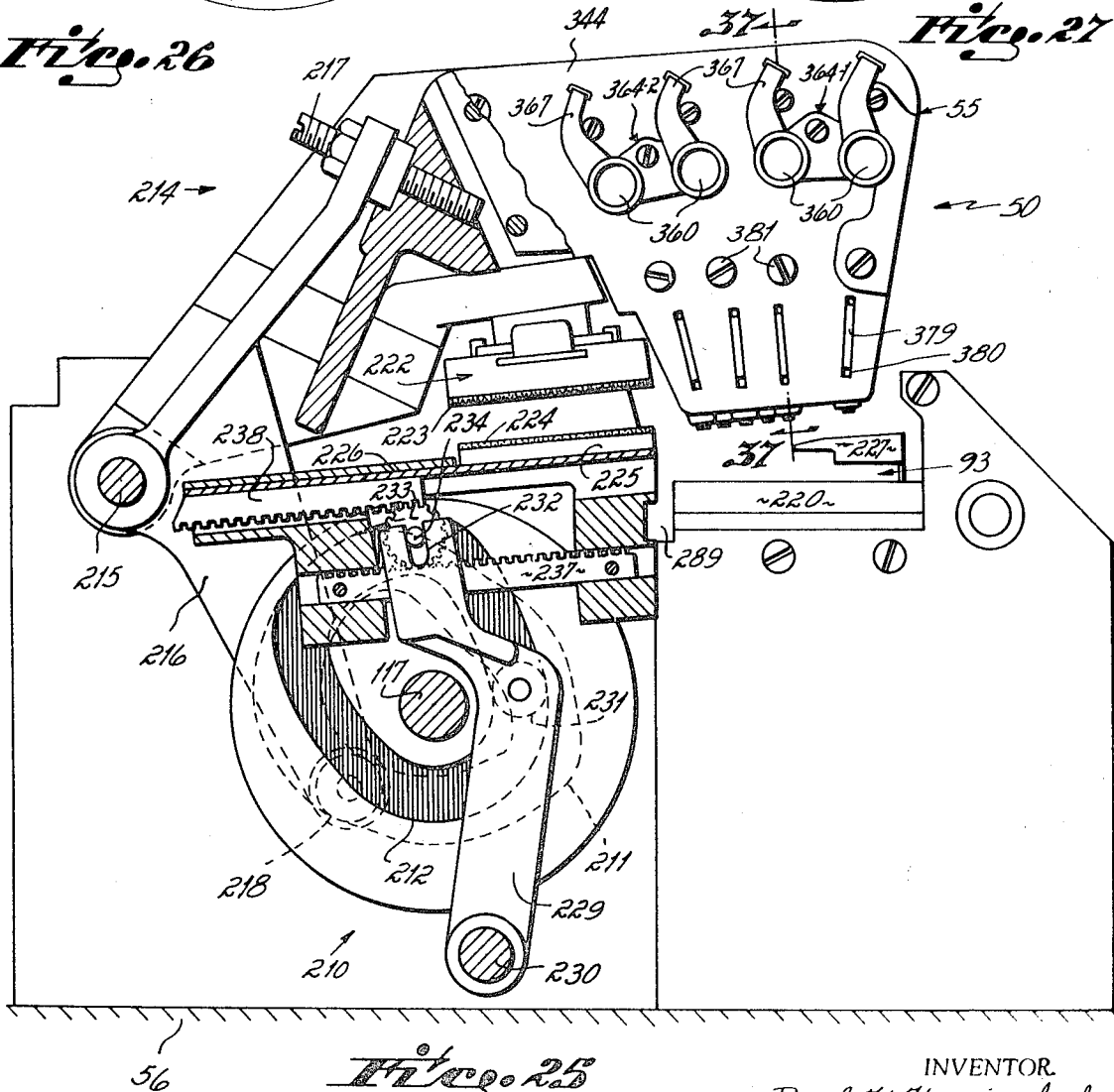


Fig. 25

INVENTOR.
Paul H. Hamisch, Jr.
BY
Wood, Herron & Evans
ATTORNEYS

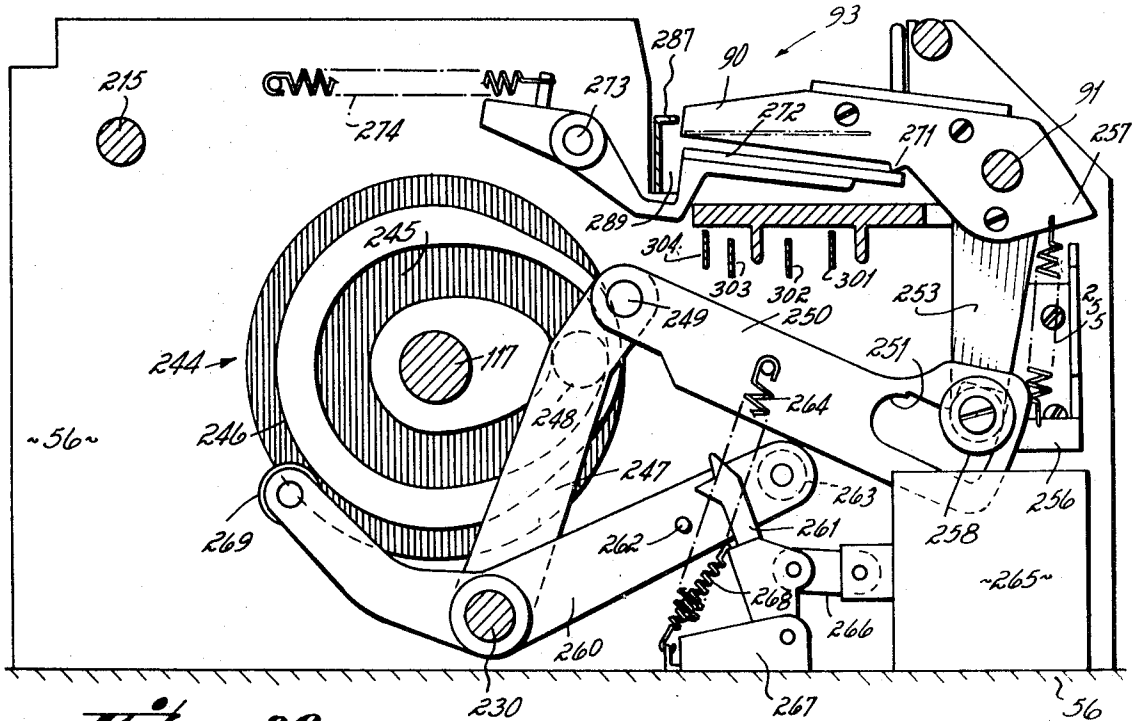


Fig. 29

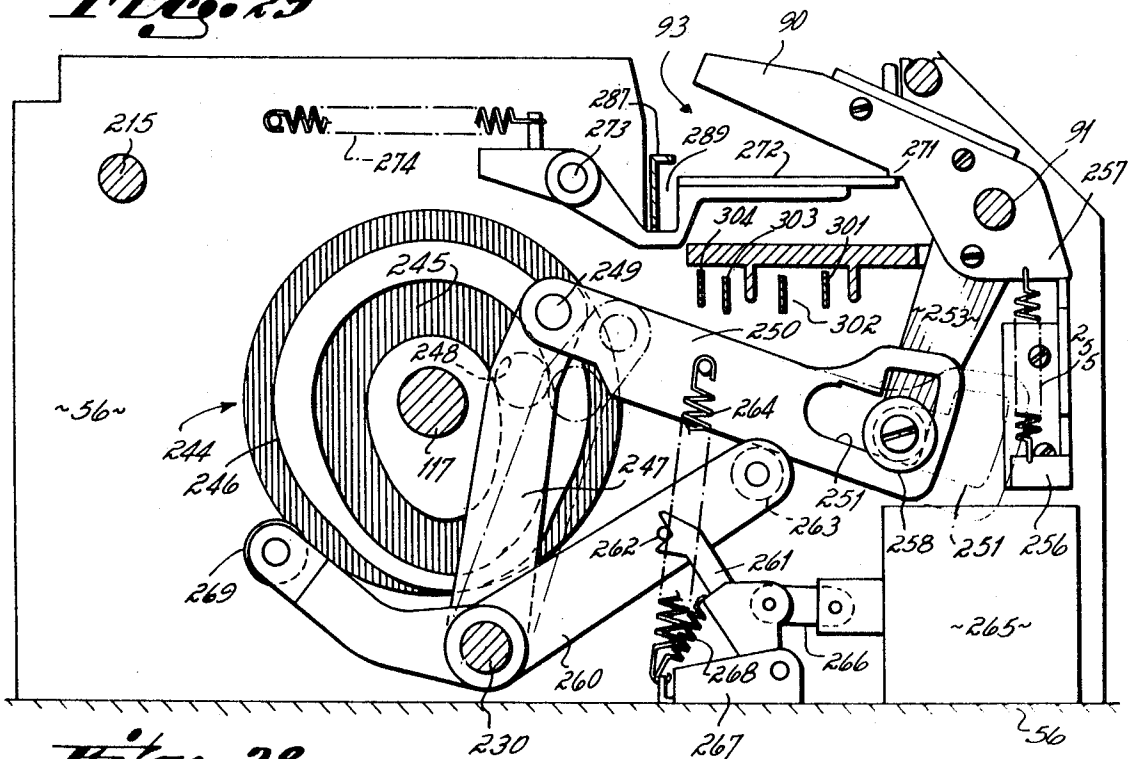


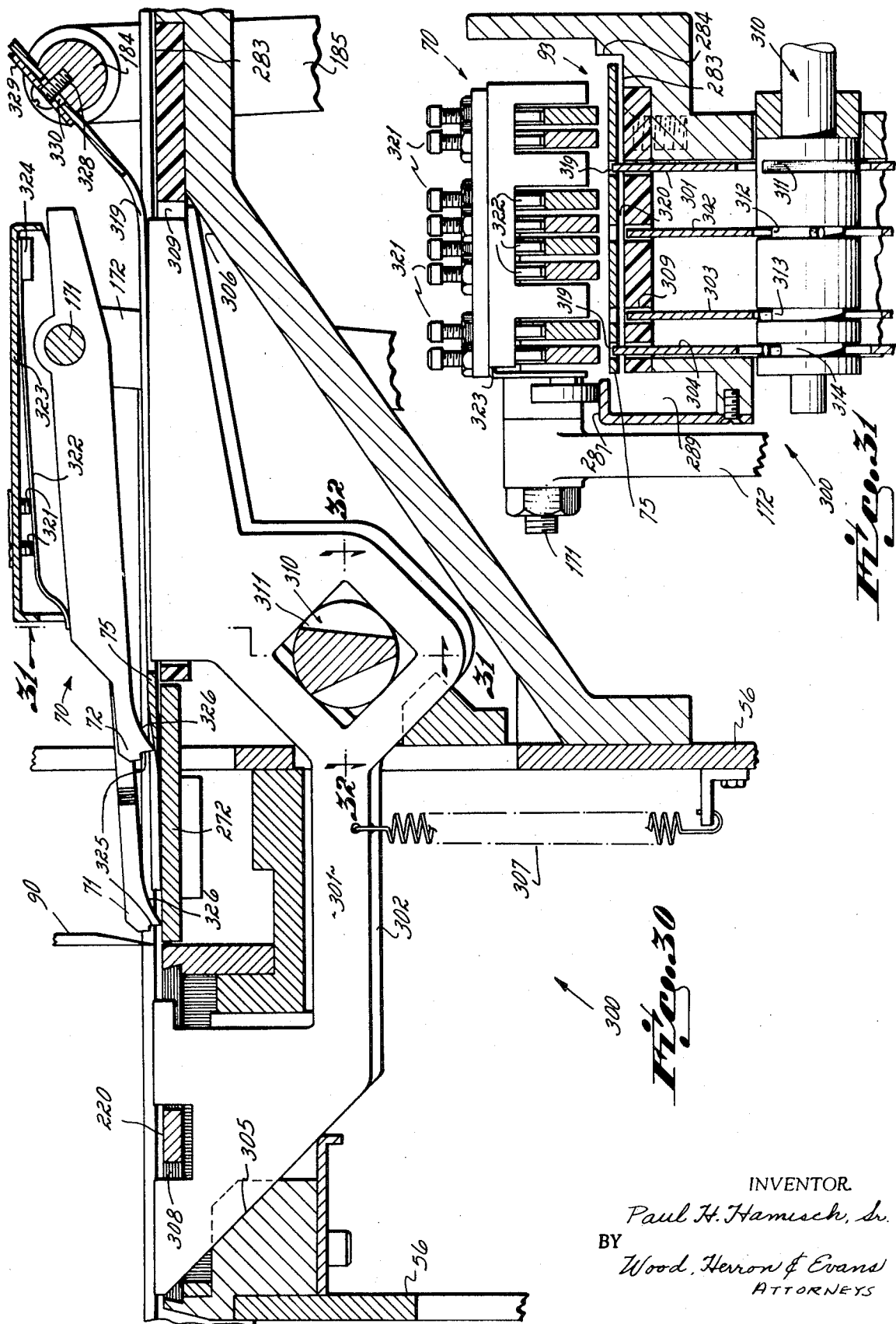
Fig. 28

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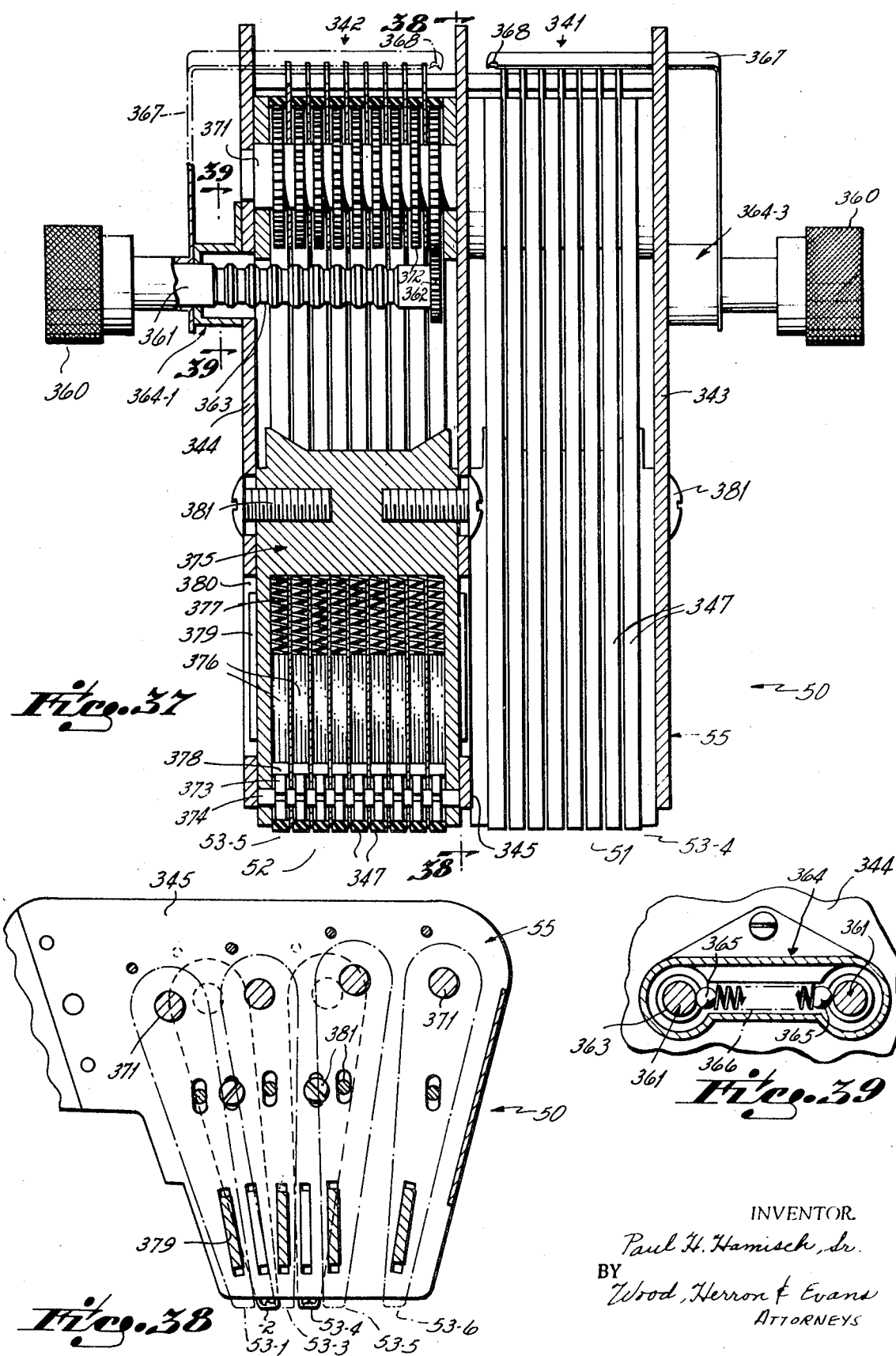
Paul H. Hamisch, Jr.

BY

Wood, Herron & Evans
ATTORNEYS



INVENTOR
Paul H. Harnisch, Sr.
BY
Wood, Herron & Evans
ATTORNEYS



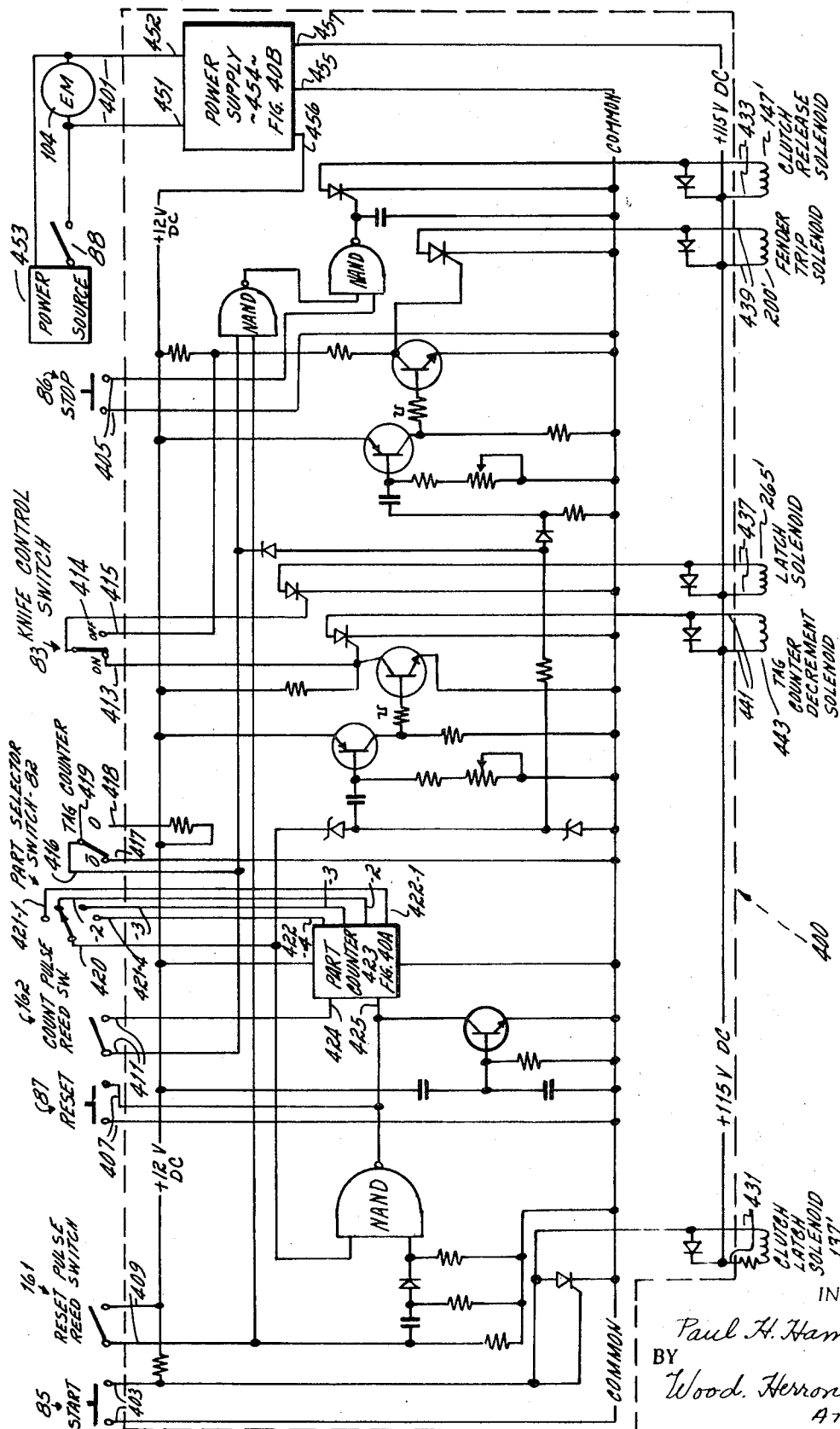


Fig. 40

INVENTOR
 Paul H. Hamisch, Jr.
 BY Wood, Herron & Evans
 ATTORNEYS

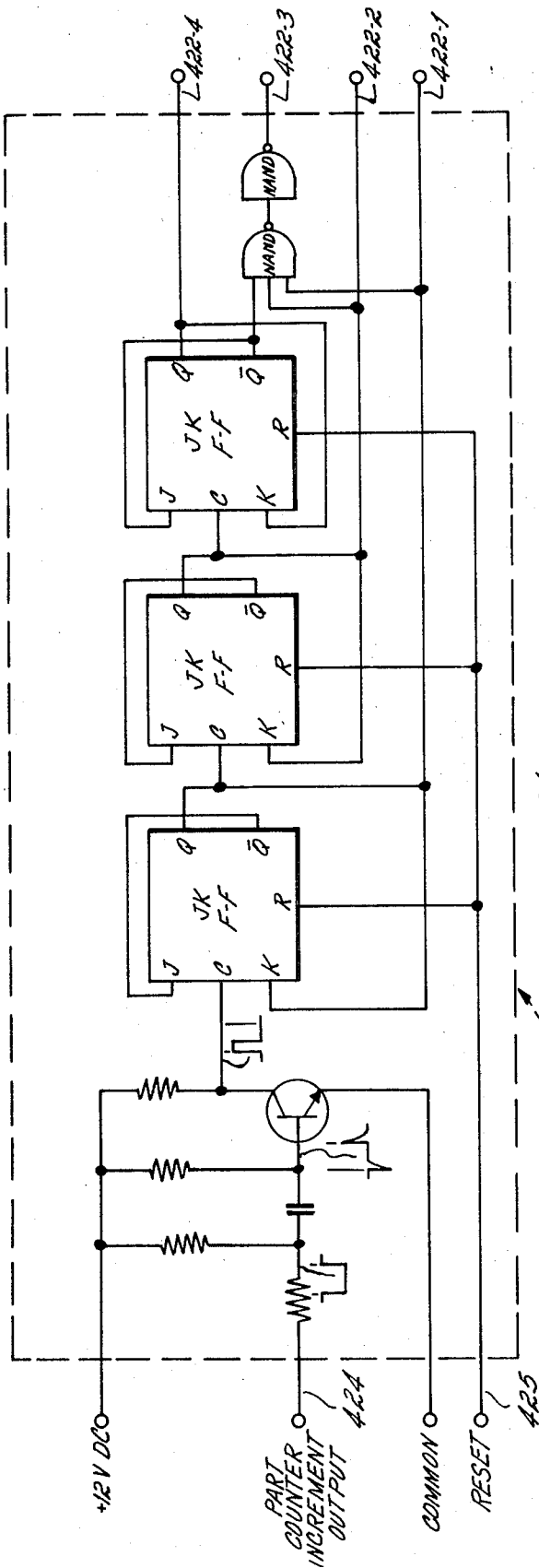
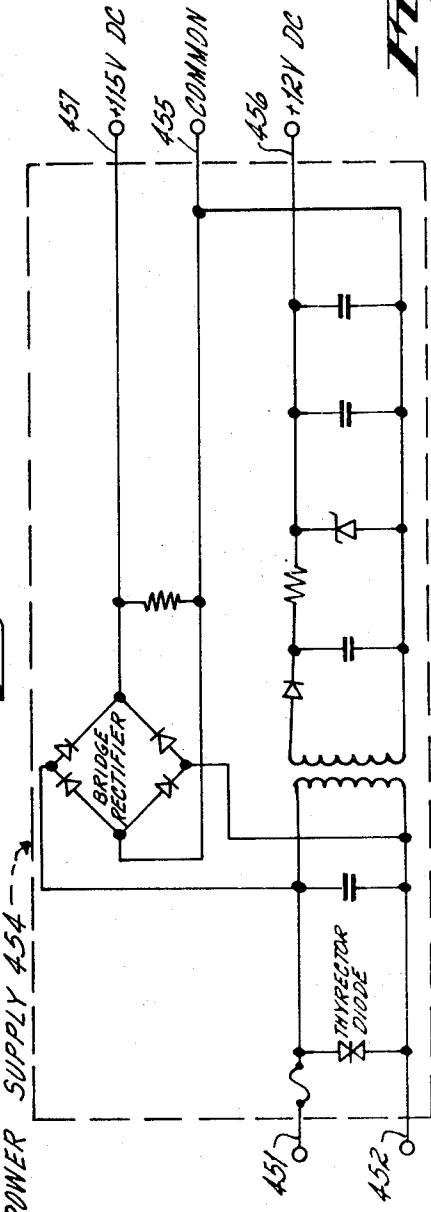


Fig. 40A



INVENTOR.
Paul H. Hamisch, Jr.
BY
Wood, Herron & Evans
ATTORNEYS

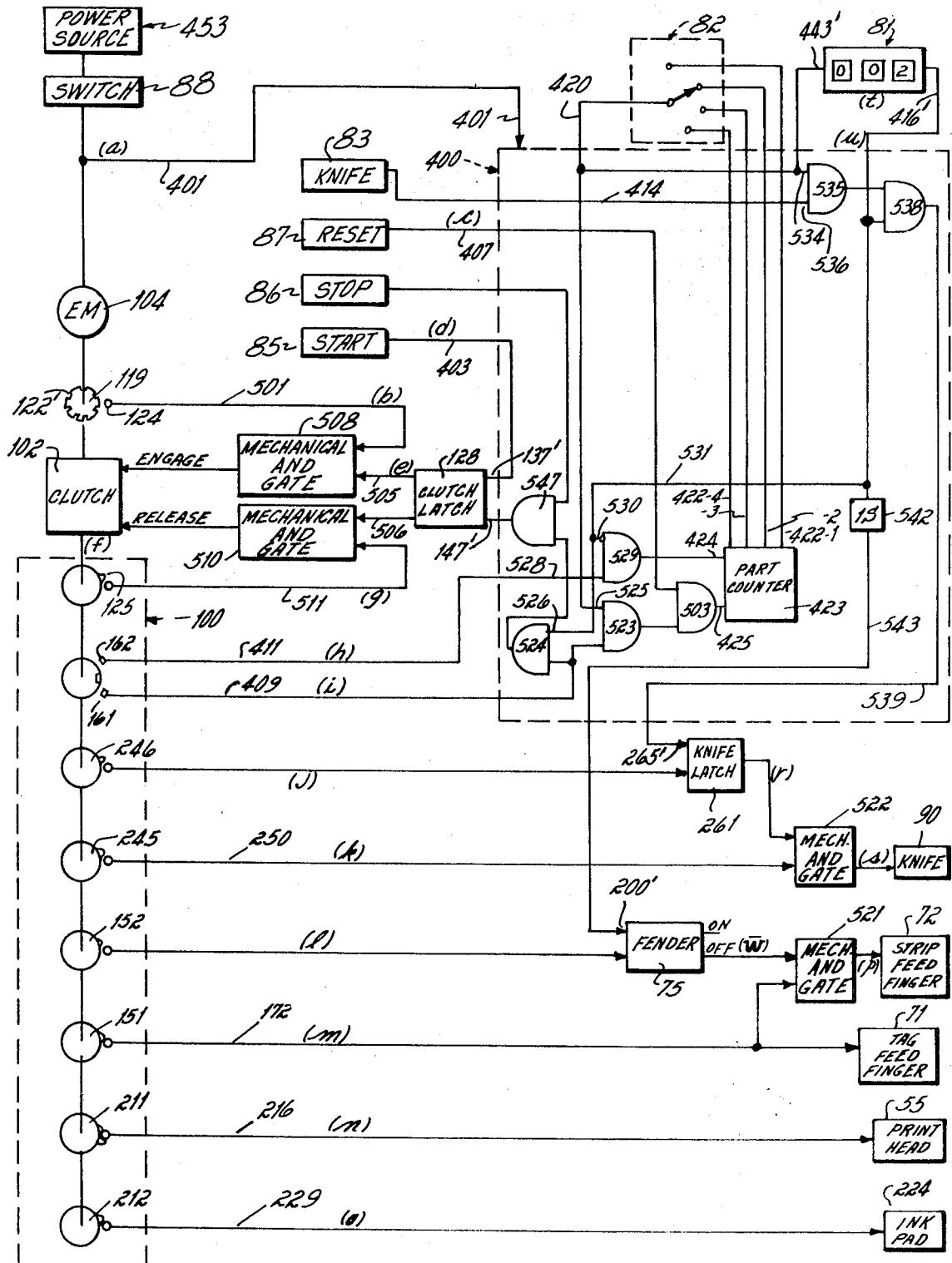


Fig. 41

INVENTOR.
Paul H. Hamisch, Jr.
BY
Wood, Herron & Evans
ATTORNEYS

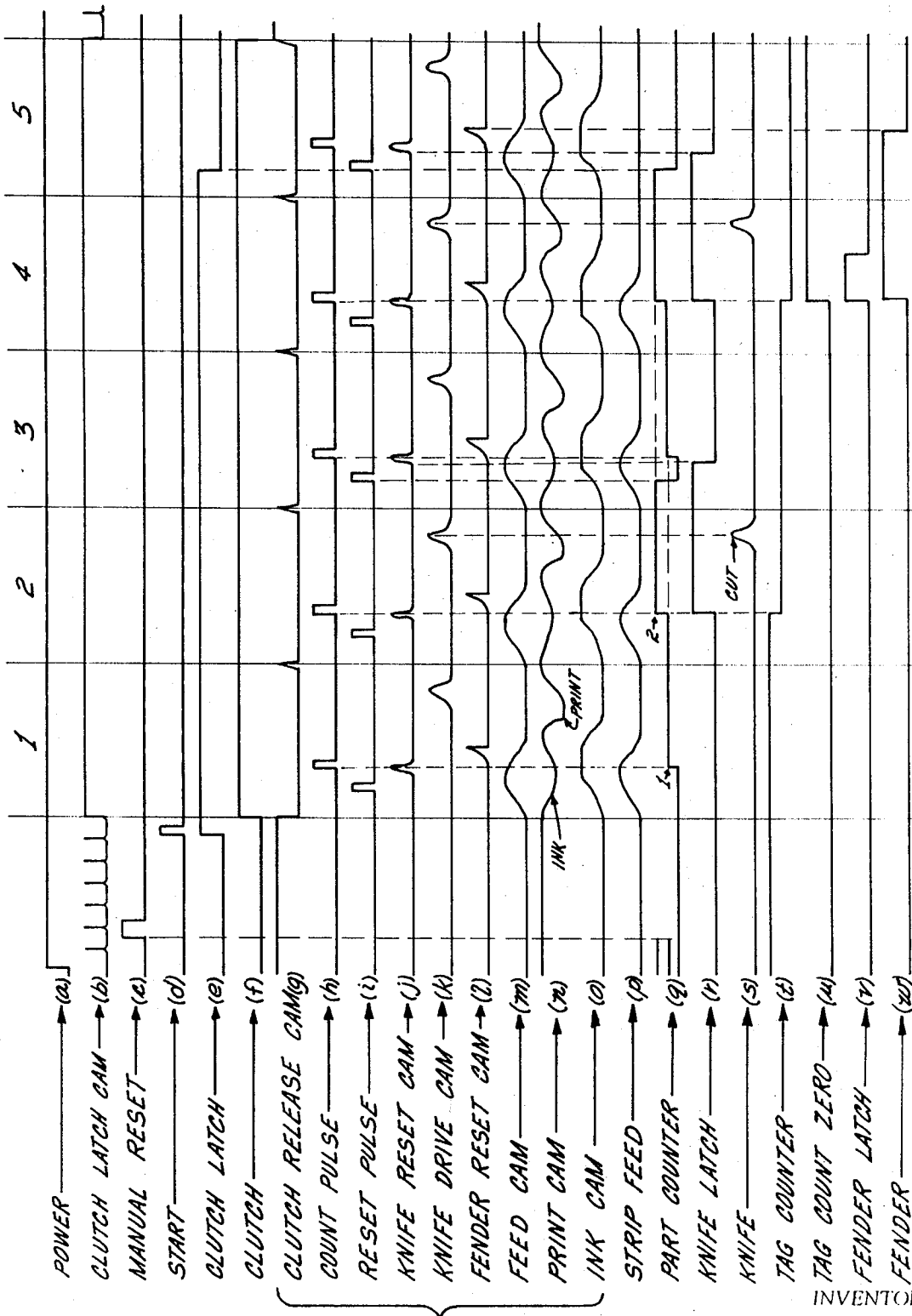


Fig. 42

INVENTOR

Paul H. Hamisch, Jr.

BY
Wood, Herron & Evans
ATTORNEYS

METHOD AND APPARATUS FOR PRINTING TAGS

This invention relates to the printing of tickets, tags and labels. More particularly, this invention relates to a novel and highly efficient method and apparatus for printing high-density information upon a series of tags or tag parts with a minimum number of printing strokes and without the wasting of tags.

The increased use of sophisticated inventory systems in stores has led to a great reliance on tags bearing a large amount of information required for inventory. Such tags are attached to merchandise, particularly garment merchandise and may comprise several identical separable tag parts which can be distributed to various departments of the store. The information on these tags usually includes humanly intelligible printed information such as the price, a description of the merchandise, etc. In some instances, machine-readable coded data may also be printed on the tag to facilitate its use with automatic data-processing equipment.

A major consideration in the printing of these tags is that the procedure may be simple and fast to set up, the operation be speedy and efficient, and that both set up and operation be reliable. Because stores require tags in a wide variety of types and numbers with each batch or run requiring different printed information devices such as that disclosed in U.S. Pat. No. 3,180,254 of Hamisch, Apr. 27, 1965 have been employed. This device includes a multiline printhead wherein each line comprises a plurality of characters, each carried by a different one of a plurality of endless bands arranged in side-by-side relation. These bands were quickly and easily settable to a desired character. This device also includes simple to use controls for selecting the number of tags to be printed per run, and the number of parts to be printed per tag. This machine operates efficiently with one printing stroke for each tag part printed and results in no printing of unusable tag parts.

The multiline band-set printhead has one inherent limitation and that is in the density of information which can be printed by it. This is due to the limited closeness of spacing of the band-set lines of type. An approach to solving this problem has been to employ a two-section multiline printhead for printing alternate lines upon each tag part in a two-step process. Where employed in prior art devices, this approach has resulted in the sacrifice of either operator efficiency, machine efficiency, or both. For example, a shifting two-section printhead, imprinting each tag part with two impressions of the printhead, one with each printing section, doubles the number of operating strokes required and cuts in half the optimal speed of the machine. On the other hand, printing with a two-section printhead simultaneously on two adjacent tag parts has, in the prior art devices which employ this method, generated extra half-printed tags or tag parts at either the beginning or end of each run or both. This not only results in a waste of tag stock, but more importantly, results in a waste in operator time in removing and discarding these unusable tags, and is further a source of operator error in failing to remove these tags and including them in one of the batches. Since the information to be printed on successive batches is usually different, corresponding to two different items of merchandise, an extra tag, printed partially with one batch, and partially with the next batch, carries meaningless information which could jeopardize the whole inventory system.

Accordingly, it is a general objective of the present invention to provide a highly flexible and efficient method and apparatus for printing tags, tickets or labels which is simple and reliable in operation and speedy and efficient in use, and more particularly, utilizing a two-section multiple-line printhead wherein two sets of lines are successively printed in alternate relation upon a tag or tag part.

Another objective of the present invention is to provide a novel method and apparatus for controlling such a printing of tags with a minimum of printing strokes and without the generation of extra partially or completely printed tags or tag

parts, and more particularly, to provide a method and apparatus employing an improved combination of electrical and mechanical operations to effectively achieve the above objectives.

A further objective of the present invention is to provide a novel two-section printhead and selective tag guide means which can be quickly and easily set.

The present invention is predicated in part upon the concept of printing a plurality of alternately spaced lines simultaneously upon adjacent tag parts of single or multiple part tags from a strip of tag blanks with different sections of a two-section printhead, each section defining a different printing stage and feeding relative to the printhead, each tag part successively to each of the stages, and printing upon each tag part at each stage, but while disabling the feed of an additional tag blank to the first stage while the last tag part of a run is being fed to the second stage, to thereby print with only one printing stroke more than the total number of tag parts to be printed without generating extra or partially printed tags. This invention is also predicated in part upon the concept of electrically and mechanically conditioning, under the selective control of a counter, the feeding, cutting, and drive functions for printing a given number of multiple part tags.

The invention further provides a two-section staggered line printhead with each section supported at a common spacing plane and each stage having a plurality of rows of characters each carried by endless bands and selectively settable by telescopically mounted dials on opposite sides of the printhead.

A variable width channel is provided on the tag guideway to accommodate tags of different widths and at different transverse positions relative to the printhead. The guideway is also provided with a depressible portion which moves with the cutting knife to facilitate the severing of tags from the strip.

The important advantages of the present invention are in overcoming the problems of excessive printing strokes and wasted tags in using a two-section band-set printhead in printing high-density information upon tags, and in providing an improved and simplified method and apparatus for controlling such a tag-printing operation.

These and other objects and advantages of the present invention will be more readily apparent from consideration of the following detailed description of the drawings illustrating one preferred form of tag printing apparatus and method embodying principles of the present invention, in which:

FIG. 1 is a diagram illustrating various shapes and sizes of tags labeled types "A" through "E" which can be printed on one form of tag-printing apparatus according to the present invention;

FIGS. 2-7 are diagrammatic illustrations of selected completed sample runs of tags and the corresponding control settings which generated them;

FIGS. 8-15 diagrammatically illustrate a sequence of operations performed in printing the selected sample run of FIG. 2;

FIG. 16 is a perspective view of a tag-printing machine, in accordance with principles of the present invention, set up for the printing of the "E" type tags of FIG. 1;

FIG. 17 is a perspective view, partially broken away, of the apparatus of FIG. 16 showing the alternate ticket stock-mounting set up for the printing of "A" type gummed labels;

FIG. 18 is a top plan view, partially broken away, of the apparatus of FIG. 16 with the cover removed except that the apparatus is set for "B" type tags;

FIG. 19 is a cross-sectional view taken along lines 19-19 of FIG. 18 illustrating the magnetic switch structure;

FIG. 20 is an exploded diagrammatic perspective view, partially broken away for purposes of clarity, of the clutch mechanism and associated actuating solenoids;

FIG. 21 is a cross-sectional view taken along lines 21-21 of FIG. 18 further illustrating the clutch mechanism in a disengaged condition;

FIG. 22 is a view similar to FIG. 21 except with the clutch mechanism engaged;

FIG. 23 is a cross-sectional view taken along lines 23—23 of FIG. 18 illustrating the arms for actuating the various components of the apparatus;

FIG. 24 is a cross-sectional view taken along lines 24—24 of FIG. 23 illustrating the fender releasing mechanism;

FIG. 25 is a cross-sectional view taken along lines 25—25 of FIG. 23 illustrating the ink pad and printhead-operating cam and mechanism;

FIG. 26 is a diagrammatic view of the ink pad and printhead cams of FIG. 25;

FIG. 27 is a view similar to FIG. 26, but of the printhead cam of FIG. 25 only;

FIG. 28 is a cross-sectional view taken along lines 28—28 of FIG. 23 illustrating the knife-driving cam and associated linkage in the knife unlatched or inoperative condition;

FIG. 29 is a view similar to FIG. 28 except illustrating the mechanism in a knife-latched or operative condition;

FIG. 30 is a cross-sectional view taken along lines 30—30 of FIG. 18 illustrating the selectable ticket guides and associated mechanism;

FIG. 31 is a cross-sectional view taken along lines 31—31 of FIG. 30 further illustrating the ticket guides;

FIG. 32 is a cross-sectional view taken along lines 32—32 of FIG. 30;

FIGS. 33 through 36 are diagrammatic cross-sectional views taken along lines 33—33 through 36—36 respectively of FIG. 32, with the guide selector set for tags of types A through E respectively, the B row in the figures corresponding to the setting illustrated in FIG. 32;

FIG. 37 is a cross-sectional view taken along lines 37—37 of FIG. 25 illustrating the staggered two-section printhead;

FIG. 38 is a cross-sectional view taken along lines 38—38 of FIG. 37;

FIG. 39 is a cross-sectional view taken along lines 39—39 of FIG. 37 illustrating the detent mechanism for controlling the setting mechanism of the printhead;

FIG. 40 is a schematic diagram of the electrical circuit of the machine, including the solid-state control circuitry;

FIGS. 40A and 40B are schematic diagrams of the part counter and power supply portions of the solid-state control circuitry;

FIG. 41 is a logic diagram relating the mechanical and electrical functions of the machine; and

FIG. 42 is a timing diagram illustrating the functions of the machine and the sequence of steps performed in the operation illustrated in FIGS. 8—15.

MACHINE CAPABILITIES

The description of the invention will be better understood if first the general capabilities of the tag-printing machine according to the present invention are briefly described. The capabilities include those of printing on one machine, tags of differing sizes, having differing numbers of printed lines, and comprising a differing number of identical attached tag parts. FIG. 1 illustrates tag part blanks of five different tag types labeled "A" through "E." These blanks are shown in their positions of alignment with the printing station and feed fingers, a relationship which will be more fully appreciated in connection with the discussion of the printhead structure and selective guides below.

FIG. 1 shows a print station 50, blanks 60 to be printed at the station 50, and a feed finger assembly 70 for advancing the tag 60 through the printing station 50. The feed finger assembly 70 advances blanks 60 from the right to the left of FIG. 1, along a path defining the longitudinal coordinate of the machine. The dimension of a blank 60 or tag part in this direction is referred to as the tag part length. A dimension in the direction transverse the direction of feed is referred to as the tag width or the tag strip width.

The printing station 50 consists of two print stages 51 and 52 spaced longitudinally apart one tag part length. At the two printing stages 51 and 52, a printhead carrying six rows of type

53-1 to 53-6, imprints up to six rows of printed characters on each tag blank 60 to form a printed tag part. The six rows of type, 53-1 to 53-6, are oriented longitudinally and are spaced transversely, in numerical order, across the width of the print station 50. The lines are distributed in staggered fashion between the two stages 51 and 52 with the lines 53-2 and 53-4 located at the first stage 51, and the lines 53-1 and 53-3, and 53-5 53-6 located at the second stage 52. The lines of the different stages are imprinted simultaneously upon adjacent tag parts, and successively upon the same tag part, first at stage 51 then at stage 52. This two-stage printing operation allows the rows 53 to be printed closer together than the rows of type can be placed on a printhead when in convenient resettable type-band form.

From FIG. 1 it can be seen that the blanks 60 are of varying widths and differ in the combination of lines which can be imprinted on them. For example, the "A" type blank spans three rows of type and is so aligned with the printing station 50 that it will be imprinted by rows of type 53-3, 53-4 and 53-5. The "C" type blank also carries three lines of characters but is so aligned with the printing station 50 that it will be imprinted by rows of type 53-1, 53-2 and 53-3, while the "E" type blank is of maximum width and will be imprinted by all six rows of type 53-1 to 53-6.

While FIG. 1 illustrates the versatility of the machine in printing blanks of various sizes and shapes and with various combinations of printed rows of characters, FIGS. 2-7 illustrate the versatility of the machine in the printing and cutting of a selected number of multiple-part tags in a tag-printing run. This selectivity feature is provided by three controls: a tag counter 81 presettable to the total number of tags to be printed in the printing run, a part selector 82 settable to the total number of tag parts of which each completed multiple-part tag will consist, and a knife selector switch 83 which selectively controls the condition of a knife for severing individual multiple part tags from each other during the run. Each of the FIGS. 2-7 illustrates the results of a different tag-printing run, together with the presettings of the controls required to achieve these results.

FIG. 2 illustrates a run of two two-part tags with the knife selector ON, and shows also how the controls are set to achieve this. In this run, four tag parts 63-1 through 63-4 are printed and cut into two two-part tags 64-1 and 64-2. Similarly, FIG. 3 shows a run of two four-part tags with the knife selector ON, and FIG. 4 shows a run of three three-part tags with the knife ON. FIG. 5 also shows a run of three three-part tags but with the knife selector OFF, which in fact, results in nine tag parts connected together. FIG. 6 shows a run of nine one-part tags with the knife selector OFF, and in the result, this run is identical to that shown in FIG. 5. FIG. 7 shows a run of nine one-part tags, but with the knife ON, also producing nine tag parts but severed into nine one-part tags.

GENERAL OPERATION

Before describing in detail the structure of the machine according to the present invention, a general sequence of operation will be described in conjunction with FIGS. 8-15. These Figures show the step-by-step printing operation for the printing of two two-part tags with the knife selector ON as illustrated in FIG. 2. The four tag parts of this run are printed in five machine cycles including only five strokes of the printhead, and in addition, no extra tag or tag part, is produced either completely or partially printed, at either the beginning or end of the run.

FIG. 8 shows diagrammatically the tag-printing machine set up for a run. A continuous strip 62 of blanks 60 of the "B" type is shown with its end blank adjacent the printing station 50. During the printing run illustrated, each blank 60 will be imprinted with four rows 53 of characters in two successive multiple line printing operations, with rows 53-2, and 53-4 at stage 51, and then with rows 53-3 and 53-5 at stage 52.

A cutting knife 90, mounted transverse the path of strip 62 on the entry side of the printing stage 51 is normally maintained just above the tag strip 62 and is pivotally mounted, about the shaft 91 which is parallel to the strip 62, to move downwardly to sever tags from the strip 62. The feed finger assembly 70 includes two sets of feed fingers, a first set of tag-advancing fingers 71, and a second set of strip-advancing fingers 72 spaced one tag part length behind the tag-advancing fingers 71. The fingers engage notches 73 between the blanks 60 of the strip 62 to advance the tag or the strip one tag part length in each cycle of operation of the feed fingers. A fender 75 underlies the strip feed fingers 72 and overlies the strip 62. The fender 75 is normally inactive in the position shown in FIG. 8. When the fender 75 is activated, it is interposed between the finger 72 and the corresponding notch 73 of the strip 62 to prevent the fingers 72 from engaging, and thereby advancing, the strip 62 as the fingers 72 advance in a feed cycle. This is shown in FIGS. 13 and 14. The tag-advancing fingers 71 advance either severed or unsevered partially printed tag parts from stage 51 to stage 52. The strip-advancing fingers 72, when not disabled by the activated fender 75, advance the strip 62 one tag part length to bring a blank tag 60 to station 51. When the controls have been preset as illustrated in FIG. 2, the operation proceeds as follows:

As shown in FIG. 9, the strip feed fingers 72, by engagement of the underlying slot 73 of the strip 62, begin to advance the strip 62 to bring the first of the blanks 60 to the first print stage 51. After the feed fingers 71 and 72 have so advanced the strip, they retract, and with one stroke of the printhead, the rows 53-2 and 53-4 of type imprint lines of printed characters 54-2 and 54-4 upon the first of the blanks 60 to partially form a tag part 63-1 as shown in FIG. 10. This completes the first machine cycle.

A second cycle of operation completes the first tag part 63-1 and partially forms a second tag part 63-2 as shown in FIG. 11. The tag part 63-1 is advanced from stage 51 to stage 52 where the lines of characters 54-3 and 54-5 are printed upon it by rows of type 53-3 and 53-4 in a second stroke of the printhead, while simultaneously a new tag blank 60 of the strip 62 is advanced into the stage 51 where the lines of characters 54-2 and 54-4 are imprinted upon it to partially form the second tag part 63-2. During this cycle, since the second part of a two-part tag is being formed because two-part tags are to be printed, and since the knife control is set for the severing of these tags from each other, the knife 90 is actuated to sever the tag part 63-2 from the strip 62, to form a two-part tag 64-1 of tag parts 63-1 and 63-2.

In the third cycle of operation, both sets of feed fingers 71 and 72 are operative to advance both the severed tag 64-1 and the strip 62. The tag feed fingers 71 advance the severed tag 64-1 to carry the tag part 63-2 from stage 51 to stage 52, while the strip feed fingers 72 similarly engage and advance the leading blank tag part 60 of the strip 62 into stage 51. The feed fingers then retract and, with a single stroke of the printhead, tag part 63-2 is completed at stage 52 with lines 54-3 and 54-5 being imprinted upon it by rows of type 53-3 and 53-5, and lines 54-2 and 54-4 being simultaneously imprinted upon tag part 63-3 at stage 51. This third cycle results in the completion of the two-part tag 64-1 as shown in FIG. 12.

The fourth cycle for arriving at the condition shown in FIG. 13. The knife blade 90 actuates to sever a fourth partially completed tag part 63-4 from the blank strip 62 to form a partially completed two-part tag 64-2. In addition, the completed tag 64-1 is forced from the print station 50. However, now, since four tag blanks have been fed to the printing station 50, which is all that is necessary to form the four tag parts which make up the two two-part tags to be printed in this run, it is desired to stop the feed of blanks 60 from the strip 62 to the printing station 50. But since the last tag part 63-4 is only partially completed, one addition machine cycle must be executed in which the tag part 63-4 is advanced from stage 51 to stage 52, where with one more stroke of the printhead, lines 54-3 and 54-5 are imprinted upon it. These functions are

achieved by conditioning the machine, for executing one more cycle with the strip feed fingers 72 disabled, by the interposing of the fender 75 between the strip feed fingers 72 and the strip 62 thereby covering slot 73 at the end of the fourth cycle of operation. This conditioning occurs generally whenever the machine has executed a number of cycles equal to the product of the number of tags to be printed times the number of tag parts per tag, as is set by controls 81 and 82 at the beginning of the run. Also, the actuation of the knife 90 occurs at this time regardless of whether or not the knife control switch 83 is set to ON. The fifth cycle proceeds as illustrated in FIG. 14, wherein only the severed tags are advanced by the tag feed fingers 71 to bring tag part 63-4 to stage 52. FIG. 15 illustrates the completion of the fifth cycle of operation where the feed fingers have retracted and a fifth printhead stroke has completed the second two-part tag 64-2, and restored fender 75 to its original position and thereby completed the run. Two two-part tags 64-1 and 64-2 have been printed, but no partially printed tags or tag parts have been printed either at the beginning or the end of the run. In the above sequence of operation, four tag parts have been printed in a two-stage plural line process, and in five cycles of machine operation, including only five printhead strokes, only one cycle more than the number of tag parts that are printed in the run.

DETAILED DESCRIPTION OF THE APPARATUS

The apparatus according to the present invention is best described by reference to the tag-printing machine illustrated in FIG. 16. The tag-printing machine comprises the printing station 50 which includes a two-stage printhead 55 reciprocable with respect to a frame 56. (Reference to the frame 56 is made whenever it is necessary to refer to the frame 56 or to a structure or support rigidly secured to the frame or closing of the machine.) The machine also includes a supply station 65 for supplying the blank tag parts 60 in the form of a continuous strip 62 and a guideway 93 forming a path connecting the tag supply station 65 with the printing station 50. The strip 62 of blank tags 60 is threaded from the supply station 65 along the guideway 93 and into the printing station 50. Overlying the strip 62 on the guideway 93 is the feed finger assembly 70 mounted to reciprocate longitudinally along the guideway 93. The strip 62 may be either supplied from the spool 94 or from the alternate spool 95 (FIG. 17) behind the door 96. The spool 94 is used for supplying relatively stiff paper tags and string tags illustrated in FIG. 16 as the "E" type blanks of FIG. 1, while the spool 95 is of smaller diameter and suitable for relatively thin flexible tags such as gummed labels of the size illustrated in FIG. 1 as "A" type blanks. In the initial threading of the machine, the strip 62 from the spool 94 is brought around a tapered pulley 97 which aids in twisting the strip from a vertical to a horizontal orientation. When string tags are used, a short length of string will trail from each of the blanks 60 and to insure that these strings are separated or untangled, the strings of the unwound portion of the tag strip 62 are combed over a string bar 98 which is pivotally mounted about an axis parallel to the axis of the spool 94 and spring urged against the spool 94. The strings of tag blanks proceeding through the guideway 93 are further passed between opposing brushes actuated by a brush lever 99 as will be shown more clearly in FIG. 23.

The controls of the machine are mounted on a switch panel 80. These controls include the tag counter 81 having three presettable digit wheels 84, the four position rotary part selector switch 82, and the two position rotary knife control switch 83. The controls 81, 82 and 83 are preset before each run. The panel 80 also includes a momentary pushbutton start switch 85 which is used to initiate a run of tags, a momentary pushbutton stop switch 86 which is used to interrupt the normal run under the control of the counter, and a momentary pushbutton reset switch 87 which is used only to reset the solid-state controls of the machine after power has been interrupted or after it has been necessary to terminate a run by depression

of the stop button 86. A power switch 88 is provided at the base of the panel 80. A rotary size control dial 89 is provided on the panel 80 to selectively set guides within the guideway 93 to provide means for aligning tags 60 of the various sizes or types "A" through "E" illustrated in FIG. 1. This dial 89 should be preset prior to the threading of the machine.

CYCLIC DRIVE SYSTEM

All of the functions of the tag-marking machine of the present invention are driven in a timed relationship by a rotating shaft, one rotation of which defines an operating cycle of the machine. The machine functions are considered to comprise unconditional functions and conditional functions. The unconditional functions are those which occur or are performed in each cycle of rotation of the shaft. The conditional functions, although driven by and timed in response to rotation of the shaft, will only be performed when they are conditioned or enabled by the controls of the machine. The unconditional functions include the printing, inking, and feeding functions, while the conditional functions include the cutting function performed by the interposing function performed by the knife 90, fender 75 and the automatic stopping of the machine at the end of a cycle.

The drive system of the machine is best understood by reference first to FIG. 18. The drive system includes a cyclic drive assembly 100, a motor assembly 101, and a clutch 102 connected between the cyclic drive assembly 100 and the motor 101. The cyclic drive assembly 100 is primarily a series of cams concentrically mounted upon a camshaft 117 which is rotatably mounted near the central portion of frame 56 by a camshaft bearing support assembly 103 and is suitably journaled at its other end by a bearing (not shown) support in the left-hand portion of the frame 56 (See FIG. 24).

The motor assembly 101 includes an electric motor 104 which is coupled to a gear reduction unit 105 having a double-ended rotary output shaft 106. A knob 107 is secured to one end of the shaft 106 and is accessible from the outside of the machine to provide means for manually rotating the output shaft 106 for the purpose of servicing and the like. A toothed output shaft sprocket 108 secured to the shaft 106 is linked by a chain 109 to a toothed camshaft sprocket 110 of the clutch assembly 102.

The clutch assembly 102 is a pawl and ratchet-type clutch assembly and is best illustrated by reference to FIGS. 20, 21 and 22. The clutch 102 includes a driving portion 112 of which the camshaft sprocket 110 is a part, a driven portion 113 which is locked to the camshaft 117, and a clutch latch 114 which conditions the clutch 102 for engagement and disengagement between the clutch portions 112 and 113. The clutch driven portion 113 includes clutch flange 115 fixably held by a pin 116 to the camshaft 117 of the cyclic drive assembly 100. The shaft 117 has a stub end or sleeve bearing portion 118 at its outer end. The clutch driving portion 112 includes the camshaft sprocket 110 which is rigidly attached to an inner sleeve-bearing portion 119. The sleeve-bearing portion 119 is rotatably received about the stub end 118 of the driven portion 113. The driving portion 112 is retained on the stub end 118 by a screw and washer 120. A clutch ratchet 121 forms the outer surface of the driving clutch portion 112. The ratchet 121 rotates together with the inner sleeve 119 and has seven squared notches 122 evenly spaced about its circumference. A clutch pawl 124 is pivotally mounted to the clutch flange 115 of the driven clutch portion 113 by a pawl support 123 and is spring biased toward the ratchet 121 by spring 123a contained in the pawl support 123 (FIG. 22). The clutch pawl 124 is adapted to engage one of the notches 122 of the clutch ratchet 121 to make a driving connection between the two portions 112 and 113 of the clutch 102 as shown in FIG. 22. To maintain the drive assembly 100 in a normal idling condition, the clutch is disengaged by maintaining the pawl 124 out of engagement with the notches 122 as illustrated in FIG. 21. The pawl 124 is so held by the clutch latch assembly 114.

Referring again to FIG. 20, the pawl 124 is provided with a cam follower 125 which projects through a slot 126 in the clutch flange 115 to engage a camming surface 127 presented by a clutch lever 128 of the clutch latch 114. The clutch lever 128 is pivotally mounted to the frame 56 of the machine at point 129 and is biased toward the clutch flange 115 by a spring 130. When the clutch lever 128 is in the clutch unlatch position against the flange 115, the clutch pawl 124 will be disengaged from the ratchet 121 on its next passing of the camming surface 127. The pawl 124 will be held out of engagement, and the flange 115 will be held against rotation until the clutch lever 128 is moved to the clutch latch position away from the flange 115. When the lever 128 is in this latch position, the pawl 124 drops against ratchet 121 to engage the next notch 122 to pass the pawl 124.

A pawl arrester link 131 is pivotally mounted to the clutch lever 128 at point 132. The link 131 is biased by a spring 133 toward the cam follower 125 and serves to lock the pawl 124 out of engagement with the ratchet 121 when the cam follower 125 is on a step portion 134 of the camming surface 127. Thus, the cam follower 125 can move to step 134 along cam surface 127, but can move from the step 134 only by a pivoting of the lever 128 away from flange 115 when clutch engagement is desired.

The engagement of the clutch 102 is accomplished by the energizing of a rotary solenoid 137. The output shaft (not shown) of the solenoid 137 is connected to an arm 138. When the solenoid 137 is energized, the arm rotates to a position against the clutch lever 128 deflecting it away from the clutch flange 115 and releasing the cam follower 125, thereby allowing the clutch pawl 124 to drop into one of the notches 122 which next passes the pawl as the driving clutch portion 112 rotates. A trip lever 140 holds the clutch lever 128 away from the clutch flange 115 until an appropriate command to stop the machine is given. The trip lever 140 is pivotally mounted to the shaft 141 which is fixed to the frame 56 of the machine. At the free end of the trip lever 140 is a detent notch 142. The trip lever 140 is biased by spring 143 toward the lever 128. When the solenoid 137 is energized, the lever 128 is pivoted beyond the step of the detent 142, and the lever 140 pivots to latch the lever 128 away from the clutch flange 115. In stopping the machine a trip solenoid (not shown) having an output shaft 146 linked to the trip lever 140, is energized causing the trip lever 140 to move away from the lever 128 to remove the notch 142 from behind the clutch lever 128 and to allow the spring 130 to move the lever 128 toward the clutch flange 115 where the camming surface 127 is positioned in the path of the cam follower 125. During the next revolution of the clutch flange 115, the cam follower 125 is caught by the camming surface 127 and cammed into the notch 134 of the clutch lever 128, thereby lifting the pawl 124 out of engagement with the notch 122 and disengaging the clutch 102. This action stops the camshaft 117 of the cyclic drive assembly 100 in a specific angular orientation referred to henceforth as the 0° position of the cyclic drive assembly 100.

As mentioned above, the cyclic drive 100 has conditional and unconditional periodic output functions. These output functions are in the form of either mechanical signals produced generally by cams, or electrical signals produced by the magnetic actuation of switches.

The general timing of these functions will be described in more detail below in connection with FIGS. 41 and 42. The structure for performing these functions is shown in FIG. 18.

Concentrically mounted on the camshaft 117 is a barrel cam assembly 150. The cam assembly 150 includes a feed cam groove 151 for driving the feed finger assembly 70, a fender reset cam 152 which resets the fender 75, and a portion of electric pulse generating means 155 which drive the electronic counter and synchronize the conditional functions to the operation of the cyclic drive 100.

The electric pulse-generating means 155 is better illustrated in FIG. 19. This means 155 includes a permanent magnet 156 set into a recess in the circumference of the cam 150. The

magnet 156 is encased in an epoxy magnet-insulating cup 157 which insulates the magnet from the cam 150. The magnet 156 and cup 157 are retained in the cam 150 by a setscrew 158. Positioned adjacent the cam 150 is a plastic switch holder 160 mounted to the frame 56. The switch holder 160 supports a pair of magnetically actuatable reed switches 161 and 162. The switches 161 and 162 are normally open. The switches 161 and 162 momentarily close as the magnet 156 passes them during rotation of the cam 150 generating an electric signal coinciding with an angular position of the cyclic drive 100. Switch 161 is connected in series between the leads 163 and 164 and when closed generate a counter reset pulse on the leads 163 and 164. Similarly, switch 162 is connected in series between the leads 165 and 166, and when closed generates a counter increment pulse on the leads 165 and 166. The magnet 156 is shown in the FIG. 19 with the cam 150 of the cyclic drive assembly 100 in the 0° position.

Referring to FIGS. 18 and 23, the feed finger assembly 70 is linked pivotally about a transverse axis 171 to a feed arm 172. A cam roller 173 rotatably mounted to the feed arm 172 rides in the feed cam groove 151 to cause the arm 172 to reciprocatably drive the feed finger assembly 70 longitudinally along the guideway 93 a distance of slightly greater than the length of one tag part. As shown in FIG. 23, the feed arm 172 is pivotally mounted about a transverse axis 174 to an arm-mounting bracket 175 rigidly mounted on the frame 56. The feed arm 172 has an upper portion 176 and a lower portion 177 pivotally joined together at a point 178 to provide an adjustable link between the feed finger assembly 70 and the feed cam 151. The adjustment is provided by a screw 179 lockable through a lock nut 180 to the lower arm portion 177. The screw 179 provides an abutment against which the lower end of the upper feed arm 176 rests under the force of spring 181 connected in tension between the upper and lower arm portions 176 and 177 respectively.

The mechanism responsible for the fender operation can also best be described by referring to FIG. 18 and FIG. 23. The fender 75 is pivotally linked by shaft 184 to a fender arm 185. As shown in FIG. 23, the fender arm 185 is mounted to pivot about a lateral axis 186 on a fender arm mounting bracket 187 which is rigidly secured to the base of the frame 56. Spring 188 is connected in tension between a pin 189 on the fender arm 185 and a pin 190 on the shaft 184 of the fender plate 75 to apply a torque which urges the fender plate against the ticket strip on the guideway 93. A fender latch bar 191 is rigidly mounted to the fender arm 185 by screws 192. A spring 193 is connected in tension between the latch bar 191 and the base of the frame 56. The spring 193 normally biases the fender to its functional position beneath the strip feed fingers 72. However, the end 194 of the latch bar 191 is normally held by a fender latch 195 in an elevated position against the force of spring 193. The fender latch 195 is pivoted about a longitudinal axis 196, and, as shown in FIG. 24, is urged by a spring 197, connected in tension between the latch 195 and the frame 56, to hold the latch bar end 194 in an elevated position upon the abutting step 198 of the latch 195. A linearly actuatable fender solenoid 200 is mounted on the frame 56 with its output shaft 203 linked to the latch 195 by a pin 199. When energized, the solenoid 200 withdraws the latch 195 against the spring 197 allowing the end 194 of the latch bar 191 to drop from the step 198 of the latch 195, and thus permit the spring 193 to move the fender to its functional position; i.e., interposed between the strip feed fingers 72 and the strip of tags. A cam roller 201 is rotatably mounted upon a lateral shaft 202 to the fender arm 185. The roller 201 is positioned so that, when the fender is in its functional position, the roller 201 will be engaged by the fender reset cam 152. Thus when the solenoid 200 is deenergized, the fender arm 185 is rocked back to its inactive position as the cam 152 passes the roller 201 during its normal rotation upon shaft 117.

Other functions of the cyclic drive assembly 100 are the printhead drive and timing, the ink pad drive and timing, the knife blade drive and timing, and the knife reset. These func-

tions are generally provided through cams on the shaft 117 in a position beneath the printing station 50.

The print and inking functions are controlled by the print and ink cam 210 best shown in FIG. 25. The print and ink cam 210 is provided with a print cam groove 211 and an ink cam groove 212 on the opposite axial faces thereof.

The printhead 55 is rigidly mounted to a printing arm assembly 214 which is in turn pivotally mounted to the frame 56 by the longitudinally oriented print arm shaft 215. Specifically, a printing head lever 216 of the arm assembly 214 is pivotally mounted at its center to the print arm shaft 215 and at its upper end is rigidly but adjustably secured by an arm adjusting screw 217 to the printing head 55. A printing lever roller 218 is rotatably attached to the lower end of the printing head lever 216 and positioned to ride in the print cam groove 211 of the printhead ink cam 210. The print cam groove 211 is so contoured to rock the printhead 55 through the roller 218 and lever 216, up and down in each cycle of the cam 210. A first slight depression of the printhead 55 brings the head down only a short distance in an inking stroke and then a second complete stroke of the printhead brings the head down into engagement with an underlying printing platen 220 which forms a portion of the guideway 93.

The inking mechanism includes an ink cartridge assembly 222 mounted to the underside of the printing arm 214. The ink cartridge assembly 222 has a downwardly facing ink delivery surface 223 for transferring ink to an ink pad 224 which will in turn transfer ink to the printhead 55. The ink pad 224 is mounted to an upwardly facing surface of an ink cup, or pad, 225 positioned on an ink cup slide assembly 226. The ink cup slide assembly 226 is movable to transfer the ink cup 225 and pad 224 from an ink receiving position beneath the ink cartridge 222 to an ink delivery position beneath the printhead 55. When the ink pad 224 is positioned beneath the ink surface 223 of the ink cup assembly 222, it will contact the ink surface 223 as the printing arm 214 descends during the print stroke of the printhead 55, to transfer just enough ink to the ink pad 224 for one inking of the printhead 55. The slide assembly 226 is slideably movable to carry the ink pad 224 from its position beneath the cartridge 222 to a position immediately beneath the printhead 55 for contact with the printhead 55 during the inking portion of the print stroke. During this inking portion, the ink cup slide assembly 226 rests upon an ink cup support 227 mounted adjacent the guideway 93 and extending over the platen 220. To drive the ink cup slide assembly a drive lever 229 is provided having a pivotal mounting about a longitudinal axis 230 to the frame 56 of the machine. A cam roller 231 is rotatably mounted to the center of the arm 229 and positioned to ride within the ink cam groove 212 of the printhead cam 210.

As can best be seen in FIG. 25, the upper end of the ink drive lever 229 is bifurcated, each of the fork tips having an elongated notch 232 therein. Positioned between these bifurcations is a movable pinion 233 rotatable on an axis 234, the opposite ends of which ride loosely in each of the notches 232. A pair of opposing racks engage the pinion 233 on opposite sides thereof. A first rack 237 is rigidly mounted to the frame 56 of the machine and beneath the pinion 233, and has upwardly facing teeth over which the pinion 233 rides. A second moveable rack 238 is mounted on the under surface of the ink cup slide assembly 226 and has downwardly facing teeth which engage the pinion 233. As the cam 210 rotates, the roller 231 follows the groove 212, rocking the lever 229 and moving the pinion 233 along the rack 237. The movement of the pinion 233 causes the moveable rack 238, and thus the ink cup slide assembly 226, to move laterally twice the distance of the pinion's 233 travel. The details of the cam 210 are better shown in FIGS. 26 and 27.

The knife drive mechanism is best shown in FIG. 28. A knife cam 244 having a radial knife drive cam groove 245 and an external radial knife reset camming surface 246 is mounted upon the camshaft 117. A knife drive lever 247 is pivotally mounted at its lower end on the shaft 230. A cam roller 248 is rotatably

mounted to the side of lever 247 and is positioned to ride in the knife drive cam groove 245. The upper end of the lever 247 is pivotally mounted by pin 249 to one end of a knife drive link 250. An L-shaped groove 251 is provided in the other end of the link 250. The knife blade 90 is rigidly mounted to a knife arm 253 which is pivotally mounted to a longitudinal shaft 91. The knife blade 90 is biased in its normally upward position by a spring 255 connected in tension between the knife blade 90 and a bracket 256. The upper end of the bracket 256 is positioned to abut an extension 257 of the knife blade 90 to limit its motion under the force of the spring 255 and to define its normal rest position. The lower end of the knife arm 253 is provided with a link-retaining flange 258. The flange 258 extends through the L-shaped groove 251 in the knife drive link 250. A knife control lever 260 is pivotally mounted at its center on the shaft 230 and is normally supported by a knife control latch 261 against which a pin 262 projecting from the lever 260 rests. A link guide roller 263 is rotatably mounted at one end of the lever 260. The knife drive link 250 normally rides upon the roller 263 under the pressure of a spring 264 connected in tension between the midpoint of the lever 250 and the base of the frame 56. As the cam 244 rotates, the roller 248 rides in the groove 245, rocking the knife drive link back and forth on the roller 263 of the knife control lever 260. In this normal state the groove 251 of the link 250 reciprocates freely with respect to the flange 258 and the knife arm 253 and thus the knife 90 is not moved.

The knife 90 is conditioned by causing the link 250 to drop under the influence of the spring 264 so that the flange 258 engages in the vertical leg of the L-shaped groove 251 of the link 250. This is done by energizing a knife solenoid 265 which is pivotally connected through a knife solenoid link 266 to the midpoint of the knife solenoid latch 261. The latch 261 is pivotally mounted at its lower end to a control latch bracket 267 rigidly attached to the frame 56. The energizing of the solenoid 265 pulls the knife control latch 261 against the force of a spring 268 which is connected between the midpoint of the latch 261 and the bracket 267. Upon this motion the latch 261 ceases to support the knife control lever 260 and the link 250 drops under the force of spring 264 causing the flange 258 on the arm 253 to be engaged in the vertical portion of the L-shaped slot 251. This condition is shown in FIG. 29. In this condition, as the cam 244 rotates, the roller 248 riding in the groove 245 rocks the lever 247 and consequently the link 250, but instead of the flange 258 sliding through the horizontal portion of the groove 251, it is driven by the vertical portion of slot 251, rotating the arm 253 and driving the knife blade 90 downward against the edge of the platen. As the cam 244 further rotates, a knife lever roller 269 rotatably mounted at one end of the lever 260, rides on the reset cam surface 246 lifting the roller 263 at the other end of the lever 260 pushing the link 250 upwardly and causing the flange 258 to fall out of the vertical portion of the groove 251 disabling the knife 90. As the lever 260 so moves to disable the knife 90 the link 261, pulled under the influence of spring 268, reengages the pin 262 and latches the lever 260 in the upward position. The mechanism again attains the position illustrated in FIG. 28.

The descending of the knife blade during its cutting stroke causes the cutting edge of the blade to cut against the edge of the lower knife 92. In so doing a portion 272 of the guideway 93 is depressed upon contact with a projection 271 of the knife blade 90. This portion 272 is pivotally mounted on about the longitudinal axis 273 and is normally urged to its upward position by a spring 274 connected in tension between the table 272 and the frame 56.

Referring again to FIG. 18, the knife blade 90 is adjustable axially upon the shaft 91 by an adjustment nut 277 provided with a locknut 278 which holds the knife blade 90 against a compressed spring 279. The spring 279 is positioned about the shaft 91 and between the knife arm 253 and a portion of the frame 56.

Referring to FIGS. 18 and 23, the guideway 93 includes a table 283 having a horizontal surface for supporting the tag

strip 62. The table 283 is channel shaped, having a pair of upwardly projecting longitudinal guide surfaces. A first guide surface 284 is integrally formed of the table 283. A second guide surface is formed of two parts, an upstream guide plate 285 rigidly fastened to the side of the table 283 near the entry end of the guideway 93 and a downstream guide plate 283 adjacent the feed finger assembly 70 and having a horizontal upper lip 287 overlying the table 283. The table 283 is provided with a trough 289 adjacent the plate 285. This trough 289 is provided for the strings of a strip of string tags which will trail from the upper edges of the tags. A brush station 290 contains a pair of opposing brushes 291a and 291b (FIG. 23) which comb the strings parallel to the advancing strip. The brush 291a is mounted fixedly to the guide plate 285 and overlies the trough 289 with its bristles facing downwardly. The brush 291b is mounted, with its bristles opposing those of brush 291a, to the movable brush lever 99, and is positionable by the lever 99 so that their bristles mesh for string tag operation (see line position). The lip 287 of the guide plate 286 forms a channel under which the strings ride as the strip advances through the feed and printing stations.

Mounted transversely of the guideway 93 between first guide 284 and the guide plate 285 is a guide shaft 293. This shaft pivotally supports a manually movable guide 294 and an antibackup finger assembly 295. The movable guide 294 is in the form of an elongated plate pivotally mounted to the shaft 293 and transversely slideable on the shaft. Three longitudinal slots 296 are provided in the surface of the table 283. The manual guide 294 slides transversely on the shaft 293 to rest by its own weight in any one of the three slots 296 to provide an alternative guide to the guide 284 when a tag strip of lesser width than the table 283 is used.

The antibackup finger assembly 295 is pivotally mounted at one end 297 to a link 298 which is in turn pivotally mounted upon the shaft 293. An antibackup spring 299 is coiled about the shaft 293 and hooked at one end to a post 292 rigidly fastened to the guide plate 285 and at the other end is hooked to the link 298. The spring 299 applies a torque to the link 298 to urge the antibackup finger 295 against the table 283 to engage the notches in the tag strip to prevent backward movement of the strip along the table 283. Manual pivoting of the link 298 against the force of the spring 299 lifts the antibackup finger 295 to permit manual withdrawal of the tag strip backward along the table 283.

SELECTIVE GUIDE ASSEMBLY

In the vicinity of the feed fingers and printhead, the guideway 93 is provided with a selective guide assembly 300 (FIGS. 30 and 31). The assembly 300 comprises a set of longitudinal guides which are selectively elevatable from the table 283 by selective setting of the size control dial 89.

The selective guide assembly 300 includes a set of four size-selecting guides 301-304. The guides 301-304 are thin vertical plates aligned longitudinally beneath the table 283 of the guideway 93. The guides 301-304 are supported by front and rear inclined surfaces 305 and 306 mounted upon the frame 56. Each of the guides 301-304 is urged downwardly by a different one of four springs 307 connected in tension between a point on its respectively associated guide intermediate its point of engagement with the surfaces 305 and 306 and the frame 56. Under the influence of one of the springs 307, the selective guide 304 is urged to slide downwardly and rearwardly along the surface 305 so that the rear edge rests on surface 306. Moving a guide 301-304 upwardly and forwardly against the force of a spring 307 causes the upper edge of the guide to project through a corresponding slot in each of sets of slots 308 at the front and slots 309 at the rear in the surface of the table 283. A side-selecting shaft assembly 310 has four concentric cams 311-314, one associated with each of the guides 301-304. These cams 311-314 selectively elevate guides 301-304 against the forces of the springs 307 as the shaft 310 is rotated to selected positions. The shaft 310 is con-

centric, and actuated by, the size-selecting dial 89 shown in FIG. 18.

As shown in FIG. 31, the shaft 310, when in a given angular position, elevates for example, guides 301 and 304 by cams 311 and 314, respectively, causing the guides 301 and 304 to project through the slots 308 and 309 in the table 283. The guides also project above the table into slots 319 in the fender 75. The slots 319 are aligned with the slots 308 and 309 of the table 283. The fender 75, the table 283, and the two guides 301 and 304 completely surround the tag strip 62 which lies in the chamber 320 formed thereby.

Referring to FIG. 32, which shows the knob or dial 89 mounted upon the shaft 310, there is shown a detent mechanism to latch the dial in the various selected positions. This detent mechanism includes a simple ball 331 and spring 332 mounted within a recess 333 in the frame 56.

FIG. 33 shows the various positions of the cam 311 in controlling the position of the size-selecting guide 301 for tags of those sizes illustrated A through E in FIG. 1. The cam 311, which is a wedge-shaped cam, operates in the square-shaped hole of the guide 301 to elevate the guide when dial 89 is set for tags of types "A," "B," and "D." FIG. 34 shows the various positions of the cam 312 in elevating the guide 302. The cam 312 is generally circular with a projecting lug 336 on one point on the periphery thereof. As shown in FIG. 34, the guide 302 is in its elevated position for "C" type tags only. FIG. 35 shows the various positions of cam 313 in controlling the position of the guide 303 which is in its elevated position for "A" type tags only. Similarly, FIG. 36 shows the various positions of the cam 314 in controlling the position of guide 304 which is elevated for "B" size tags only. It can be seen that the cams are so designed to lift the respective guides to the elevated positions by moving the square hole of the guides to a position concentric with that of the shaft 310.

FEED FINGER ASSEMBLY

The feed finger assembly 70 includes a set of four tag advancing fingers 71 and four strip advancing fingers 72. These fingers are laterally spaced at various positions across the table 70 to engage tags of any of the varieties of sizes shown in FIG. 1. Each of the fingers is provided with an adjustment screw 321 to control the pressure of the feed finger against the table. This pressure is maintained, as shown in FIG. 30, by a set of leaf springs 322, one for each one of the fingers. The springs 322 are fixed at one end to a cover 323 of the feed finger assembly 70 at point 324. These springs 322 bear down upon the tops of the respective fingers in accordance with the settings of the screws 321. The tips of the fingers 71 and 72 are each provided with a vertical forward abutting surface 325 and a rearward tapered surface 326 so that upon advancement of the fingers, the tags will be pushed forward, but upon the retraction of the fingers, the fingers will ride up on top of the tags.

The fender 75 is mounted on the shaft 184 by screws 328 which are threaded into the shaft 184. A fender lifter 329 overlies the fender 75 on the shaft 184, and is used to manually lift the fender from the table 283. The fender is provided with slots 330 through which the screws 328 are inserted to provide adjustable mounting on the shaft 184 to correlate the position of the fender in relation to the feed fingers.

Printhead

The printhead 55 is best shown in FIG. 37, and is positioned at the print station 50. The printhead 55 comprises two sections 341 and 342. Section 341 prints at print stage 51 and section 342 prints at stage 52 of the print station 50. Each of the printhead sections includes a plurality of transversely spaced longitudinally oriented rows of type 53. The printhead sections 341 and 342 are mounted side by side longitudinally.

Each of the rows of type 53 of the printhead 50 is similarly constructed. FIG. 37 is a cross section view through line 37-37 of FIG. 25 showing the row of type 53-4 of section 341 in

elevation and the row of type 53-5 of section 342 in cross section.

The printhead sections 341 and 342 are enclosed between a pair of external side plates 343 and 344 and separated by a center plate 345. The rows of characters 53 includes a plurality of longitudinally spaced bands 347 of characters. Each row 53 comprises a plurality of bands 347 longitudinally aligned and each independently settable to a selected character carried by the band. As shown by the cutaway of row 53-5 of section 342, the bands of each row are settable by a single knob 360 mounted on a telescopically movable indexing shaft 361 having a toothed wheel 362 mounted on the shaft 361 on the end opposite the knob 360. The indexing shaft 361 is provided with a plurality of axially spaced circumferential grooves 363 which are axially spaced at intervals equal to the spacing of the bands 347 of the type row 53-5. The shaft 361 is telescopically mounted to slide in a detent retainer 364. The detent retainer 364 telescopically supports adjacent shafts 361 of adjacent rows 53. Three detent retainers 364-1, 364-2 and 364-3 support the pairs of shafts 361 of rows 63-1, 63-3, 63-5 and 63-6, and 63-2 and 63-4 respectively. As shown in FIG. 39, the detent mechanism includes a pair of balls 365 which fit into one of the grooves 363 on the shafts 361. The balls 365 of the adjacent shafts 361 within a detent retainer 364, are urged into the notches 363 by a common compression spring 366. Mounted on the shaft 361 of each row 63 is a line indicator 367 which moves axially with the knob 360 to carry a pointer 368 on its remote end to indicate the type band which is being engaged by the toothed wheel or gear 362. Each character of type on a band has an image which will appear beneath the pointer when that character is in position for printing.

The type bands 347 are supported at the upper end of the printhead upon a shaft 371 mounted between the center plate 345 and the respective side plate 343 or 344. Upon the shaft 371 a plurality of toothed wheels 372 are rotatably mounted, one corresponding to each one of the bands 347. The interior surface of the bands 347 are provided with corresponding teeth which mesh with the teeth of the wheel 372. The teeth of the movable wheel 362 also mesh with the teeth of a selected one of the toothed wheels 372. Thus, rotation of the knobs 360 rotates the respective toothed wheels 362 and 372 to move the corresponding type band 347.

At the lower end of the printhead 55, the bands 347 are supported by square wheels 373 independently rotatably upon shaft 374 of a printing block assembly 375. The square wheels are idler wheels driven by the bands 347 and provide a flat supporting or backing surface for the characters on the bands 347 as they print. Each of the wheels 373 is held in one of four stable positions by a plunger 376 carried within the printing block assembly 375. The plungers 376 are biased by a compression springs 377 toward or against the square wheels 373. For this purpose, the lower surface 378 of the plunger 376 is inclined at some angle which defines the plane of the characters of type being printed. This plane is parallel to the platen surface of the table 383. As shown in FIG. 38, each of the rows of type 53 carried by the printhead 55 is disposed at a different angle with relation to the underlying platen. It is therefore necessary that each of the rows of characters employ an angular orientation of the plungers surfaces which compensates for the orientation of the particular row assembly and thus provides that all the characters lie in the same plane. To bring all of the rows 53 of type into the same plane, each printing block assembly 375 is slidably mounted within the printhead for vertical adjustment of the respective row of type. For this purpose, the tongue 379 of the printing block assembly 375 slides in the groove 380 of the center plate 345 and similarly the respective side plate 343 or 344. A lock screw 381 is provided to lock the printing block assembly 375 in its adjusted position.

FIG. 40 is a schematic diagram of the electrical circuitry of the tag-printing machine of the present invention. The electrical circuitry includes a solid-state Logic Board Assembly 400 which controls the logical operation of the electrical components of the machine, and which have been previously described in their mechanical aspects. The electrical circuitry of the Logic Board 400 can be built in various standard forms, utilizing well-known components and techniques as is readily apparent from the foregoing and present description and from the discussion of the general operation and timing set forth below. For the purposes of the general description, the Logic Board 400 will be described by reference to its various interface connections with the other components of the machine, and with reference to the signals on these interfaces. Exact circuitry of the Logic Board can be constructed from information set forth in the drawings.

The Logic Board 400 has a pair of power input terminals 401, a set of input terminals connected with each of the various control switches of the machine, and a set of output terminals connected with the various control solenoids to be operated by Logic Board 400. The input terminals includes a pair of terminals 403 connected across the start pushbutton switch 85, a pair of terminals 405 connected across the stop pushbutton switch 86, and a pair of terminals 407 connected across the reset pushbutton switch 87. These switches 85, 86 and 87 are normally open, momentary, pushbutton switches connected so as to close a circuit between the respective terminals connecting them to the Logic Board 400. The first set of terminals also includes a pair of terminals 409 connected across the reset pulse reed switch 161, and a pair of terminals 411 connected across the count pulse reed switch 162. These switches are normally open, magnetically operated reed switches which are connected so as to close circuits between their respective terminals of the Logic Board 400 when they are actuated, to generate timing pulses to control the counting function of the Logic Board 400 and to synchronize the various logical functions of the machine. The set of input terminals also includes terminals 413, 414 and 415 which connect to the single-pole, double-throw, knife control switch 83, in such a manner that, when the switch is off, a circuit between terminals 414 and 415 is closed, while when the switch 83 is on, a circuit between terminals 413 and 414 is closed. Similarly, terminals 416, 417 and 418 connect to a single-pole, double-throw switch 419 of the tag counter 81, in such a manner that when the counter 81 does not read zero, a circuit is closed between terminals 416 and 417, and when counter 81 does read zero, a circuit is closed between terminals 416 and 418. The part selector switch 82 is a four-position rotary switch having a common terminal 420 and four switch terminals 421-1 through 421-4. The switch 82 closes a circuit between the terminal 420 and a selected one of the terminals 421-1 through 421-4 corresponding to the selected number of tag parts to be printed per tag.

Each of these terminals 421-1 through 421-4 connects to a respective one of the outputs 422-1 through 422-4 of an electronic part counter 423 within the Logic Board 400. This part counter produces output signal on one of these lines corresponding to the number of tag parts which have currently been printed. The part counter 423 also includes: a counter increment input 424 which connects to the count pulse read switch 162, and a counter reset input 425. A detailed schematic of a part counter suitable for the purposes of the present invention and compatible with the circuit of FIG. 40 is shown in FIG. 40A.

The second set of terminals for the Logic Board 400 includes five pairs of terminals for connection to the windings of the control solenoids of the tag-printing machine. These terminals include: a pair of terminals 431 connected across the winding 137 of the clutch latch solenoid 137, and a pair of terminals 433 for connection across the winding 147 of the clutch release solenoid (not shown). Similarly, pairs of ter-

minals 437, and 439 are connected across the winding 265 of the knife latch solenoid 265, and the winding 200 of the fender trip solenoid 200 respectively. The pair of terminals 441 is provided for connection across a winding 443 of a solenoid contained within the tag counter 81. The counter 81 decrements or subtracts one from its reading automatically when the winding 443 of this solenoid is energized upon the completion of each multipart tag.

Logic Board 400 also includes a power supply 454 having a pair of input terminals 451 and 452 for connection to the terminals 401 of the Logic Board 400. (The schematic diagram of a suitable power supply is illustrated in FIG. 40B.) The terminals 401 are connected in parallel with the electric motor 104, which is in turn, connected in a series with the power switch 88, and a 115-volt AC power source 453. The power supply 454 has a common output lead 455, a low-voltage DC output lead 456, capable of supplying power to operate the logic within the Logic Board 400, and a high-voltage DC output lead 457 capable of supplying power for driving the control solenoids. Generally, each of the solenoids is connected in series with a solid state switch contained within the Logic Board 400, across the leads 455-457 of the power supply 454.

OPERATION IN DETAIL

The operation of the machine is explained in detail in connection with the execution of the run for printing two two-part tags as illustrated in FIGS. 8 through 15. This explanation is set forth along with a description of the logic diagram of FIG. 41 and the timing diagram of FIG. 42.

Prior to the execution of the run, it is necessary to preset the controls as illustrated in FIG. 2 for the production of two two-part tags. This involves the presetting of the counter 81 to the number "2," indicating that two completed tags are desired, and, the setting of the part selector switch 82 to the "2" position, indicating that two tag parts are desired for each multipart tag. The controls 81 and 82, as so set, indicate a requirement for a total of four tag parts, which require a total of five machine cycles (one for each tag part, plus one extra completion cycle). For the separation of the multipart tags from each other, the knife control switch 83 is set to ON.

FIG. 41 is a summary of the mechanical and electrical functions of the machine set forth in logic diagram form. Where practical, the diagrammatic elements or information paths illustrated in FIG. 41 are given the same number, or a prime of the same number, that has been given the specific element of hardware which performs the function. The letters in parenthesis adjacent the information paths of FIG. 41 refer to curves of the timing diagram of FIG. 42.

To initiate the run, the power switch 88 is switched ON, connecting the electric motor 104 to the power source 453. This causes the motor 104 to begin rotation, driving the clutch ratchet wheel 119 of the clutch-driving portion 112. Since the clutch 102 is at this time disengaged, no other mechanical motion occurs. The signal on path 501 (FIG. 41) is a symbolic representation of the times of radial alignment of one of the seven notches 122 of the clutch-driving portion 112 with the ratchet pawl 124 of the clutch-driving portion 113, and is shown in curve (b) of FIG. 42. The clutch can engage at any one of these seven angular positions.

The closing of the power switch 88 also applies power through path 401 to operate the Logic Board 400 and the electrical controls. Because generally it cannot be assured what the status of the part counter 423 will be upon application of power initially to the Board 400, it is desirable to reset the part counter to zero by a momentary closing of the reset switch 87. A reset signal thereby generated on line 407 illustrated by curve (c) passes through an electrical OR gate 503 of the Logic Board 400 to the reset input 425 of the part counter 423, setting the counter 423 to zero as illustrated by curve (q) in FIG. 42. Thus, at the beginning of a run the electronic part counter 423 reads "zero," and the mechanical tag counter 81 is set to the number "2," as illustrated by curve (t) at FIG. 42.

Closing of the start button 85 produces an electrical signal on line 403 illustrated by curve (d) which causes the clutch latch 128, through actuation of the clutch latch solenoid 137, to assume it's latched condition illustrated by curve (e). The actual engagement of the clutch 102 is caused by the coincidence of signals (b) and (e) on lines 501 and 505 respectively, as represented by a mechanical AND gate 508. The state of the clutch 102 is represented by curve (f) of FIG. 42. The engagement of the clutch 102 causes the rotation of the cyclic drive assembly 100 to commence, initiating the first operational cycle of the machine.

The cyclic drive assembly 100 has nine unconditional outputs. The first is the clutch release output 511 which synchronizes the releasing of the clutch 102 with the 0° position of the cyclic drive 100. This synchronizing signal is shown by curve (g) of FIG. 42, which represents the presence of the cam follower 125 adjacent the cam surface 127 of the clutch latch 128, which is only effective to release the clutch when the clutch latch 128 is "unlatched" as represented by mechanical AND gate 510. A second output is the count pulse reed switch 162 which produces an electrical pulse on line 411, as illustrated in curve (h) of FIG. 42. A third output is the reset pulse reed switch 161 which produces an electrical pulse signal on line 409, as illustrated by curve (i) on FIG. 42. A fourth output is the knife latch reset cam 246, producing a mechanical signal for resetting the knife latch 261, illustrated by curve (j) of FIG. 42. The fifth output is the knife drive cam 245 which rocks the knife drive link 250 in accordance with curve (k) of FIG. 42. The sixth output is the fender reset cam 152 producing a mechanical signal illustrated by curve (l) of FIG. 42. The seventh output is the feed cam 151 producing a mechanical movement of tag feed fingers 71 through the feed arm 172 as illustrated by curve (m) of FIG. 42. The eighth output is the printhead cam 211 for producing a mechanical movement of the printhead 55 through the printhead lever 216 as illustrated by curve (n) of FIG. 42. The ninth output is the ink pad cam 212 for mechanically moving the ink pad 224 through arm 229 as shown in curve (o) of FIG. 42. These are the unconditional functions of the machine which occur in every cycle of operation of the cyclic drive assembly 100.

The machine functions of feeding, inking, printing and cutting are driven by the cyclic drive outputs. As stated above, the motions of the ink pad 224 and of the printhead 55 are directly linked to the outputs 212 and 211 respectively, so that these functions follow curves (o) and (n) respectively in each cycle. Similarly, the tag feed fingers 71 are operable to advance a tag from stage 51 to stage 52 in each cycle whenever a tag is present at stage 51 following curve (m). However, the strip feed fingers 72 are only operable when the fender 75 is OFF, as curve (p) of FIG. 42 shows. This is represented in FIG. 41 by a mechanical AND gate 521 having inputs for curve (m) and the inverse of curve (w), ($\bar{w}$), and illustrating that the operation of the strip feed fingers 72 shown in curve (p) follows curve (m) only when the fender 75 is OFF. Similarly, the knife 90 is only operable when the knife latch is ON. This is represented by mechanical AND gate 522, showing that the operation of the knife 90 shown in curve (s) follows curve (k) only when the knife latch 261, curve (r) is ON.

The first cycle of operation progresses from the condition shown in FIG. 8 to the condition shown in FIG. 10. At the beginning of the first cycle, the fender 75 is initially OFF or in its nonfunctional condition, and the knife latch 261 is also OFF or in the knife disabling condition as illustrated in curves (w) and (r) respectively of FIG. 42. Thus, the knife reset cam 246, curve (j), and the fender reset cam 152, curve (l), having no effect in the first cycle; the knife drive cam 245, curve (k), has no effect in the first cycle, curve (s); but the strip feed finger 72, curve (p), are effective to advance the strip 62 of blanks in the first cycle.

The electrical pulses from reed switches 161 and 162 proceed as follows in the first cycle: the counter reset pulse from reed switch 161 has no effect, since the path 409 terminates in a pair of electrical AND gates 523 and 524 within the Logic Board 400, neither of which gates have signals

present at their other inputs. A signal is only present at the input 525 of gate 523 when the part counter 423 registers the completion of a multipart tag. A signal at the input 526 of gate 524 is present only when the tag counter indicates the completion of a run, that is, reads "zero." The count pulse from reed switch 162 proceeds on path 411, to input 528 of an electrical AND gate 529 within the Logic Board 400. Since the second input 530 of AND gate 529 is a negative, or inverted, input connected to the output 416 of the tag counter 81, the absence of a "zero" signal on line 531 is inverted to a plus signal in the AND gate 529, allowing the count pulse to pass through the AND gate 529, to the input 424 of the part counter 423 to increment the counter to record the number one, which is indicated by the presence of a signal at output 422-1 of the counter 423. However, this signal on line 422-1 has no effect since the part selector switch 82 is set for the number "2," and closes a circuit only with line 422-2. The state of the part counter 423 is represented by curve (q) in FIG. 42 as a step function.

As the cyclic drive 100 approaches the end of its first cycle of rotation, since the clutch latch 128 is in the "latch" rather than the "unlatch" position, the clutch release signal does not pass through the AND gate 510 to disengage the clutch 102, so the cyclic drive 100 continues to rotate in a second cycle of operation.

In the second cycle of operation, the count pulse signal from reed switch 162 passes through AND gate 529 to the increment input 424 of part counter 423, causing the part counter 423 to increment from a value of 1 to the value of 2. This is indicated by a signal which appears on the output 422-2 of the counter 423. In this second cycle, however, since the part selector switch 82 is set for two part tags connecting line 422-2 to line 420, the signal passes along 420 to the input 354 of the AND gate 535. Because the knife selector switch 83, connected through path 414 to the input 536 of the AND gate 535, is set to ON, the signal at input 534 passes through AND gate 535, through the OR gate 538, and along the electrical path 539 to the latch input 265' of the knife latch 261 to energize the knife latch solenoid 265 setting the knife latch 261 to the "knife enable" condition, as illustrated by curve (r) of FIG. 42. Since the knife latch solenoid 265 is energized early in the second cycle, prior to the operation of the knife drive cam 245, the knife drive cam signal through motion of link 250, will pass through the mechanical AND gate 522 to operate the knife 90 during the second cycle as illustrated by curve (s) of FIG. 42. This cutting occurs after the feeding of two tag parts to sever the first two part tag 64-1 from the strip. During the second cycle, an electrical signal from the terminal 420 of switch 82 also passes to the input 443' of the tag counter 81 to decrement the counter from the preset value of 2 to the value of 1 to register the feeding of one completed two part tag. The output 416' of the tag counter 81 remains unchanged indicating a nonzero value of the counter 81. The state of the counter 81 is illustrated in curve (t) of FIG. 42, while the output 416' of the counter 81 is illustrated by curve (u) of FIG. 42. The end of the second cycle of operation is the condition illustrated in FIG. 11.

In the third cycle of operation, the counter reset pulse on line 409 is effective to reset the part counter 423. This is due to the presence of a signal on the output 420 of the part selector switch 82 which is connected to the input 525 of the AND gate 523, to enable the AND gate permitting the counter reset pulse to pass through the AND 523, the OR gate 503, and into the reset input 425 of the part counter 423. This resetting of the part counter 423 occurs just before the count pulse from reed switch 162 again increments the part counter 423 to the "1" state. The knife reset cam 246 resets the knife latch 261 to disable the knife until the knife latch is again enabled. At the end of the third cycle of operation, the condition is essentially as shown in FIG. 12.

The fourth cycle of operation proceeds essentially as the second cycle. However, in this fourth cycle, as the part counter again is incremented to two, the signal from switch 82

on line 420 causes the tag counter 81 to decrement to zero. This causes an output signal to appear on the output 416' of tag counter 81. This signal passes through the OR gate 538, causing the knife latch 261 to latch, whether or not the knife control switch 83 has permitted the signal from line 420 to pass through AND gate 535. The signal from output 416' of tag counter 81 proceeds along electrical path 531 to disable the AND gate 529 and to enable the AND gate 524 for the next cycle of operation. The signal from output 416' of tag counter 81 energizes a one shot pulse generator 542, causing an output pulse of approximately 40 milli seconds duration to appear on line 543 as shown in curve (v) of FIG. 42. This path connects to the fender trip solenoid input 200' to trip the fender to its ON or functional condition. The duration of the pulse on line 543 prevents the fender from being reset by the fender reset cam 152 during the fourth cycle. The completion of the fourth cycle of operation is illustrated by the condition shown in FIG. 13.

The fifth cycle or completion cycle of operation proceeds with the counter reset pulse on line 409 passing through the enabled AND gate 524, through an OR gate 547, to the unlatch input 147' of the clutch latch 128. The reset pulse also passes through AND gate 523 and OR gate 503 to reset the part counter 423 to zero. The count pulse on line 411 will not pass through the disabled AND gate 529 during the fifth cycle, and thus leaves the part counter 423 set at zero. The knife latch 261 is reset by the knife reset cam 246 as it was in the third cycle. The fender, whose operation is illustrated by curve (w) in FIG. 42, disables the strip feed fingers 72 as is represented by the disabling of the mechanical AND gate 521. The inoperability of the strip feed fingers 72 during the fifth cycle is illustrated in curve (p) of FIG. 42. The fender 75 is reset by the fender reset cam 152 as shown in curve (w). The fifth cycle of operation is illustrated by the conditions shown in FIG. 14 and 15. At the end of the fifth cycle, since the clutch latch 128 is in the OFF or "unlatched" condition, the clutch latch cam is operative to release the clutch 102 and stop the cyclic drive assembly 100 in its 0° position.

While the above described operation explains the printing of two two-part tags, it is apparent that the description is applicable generally to the printing of NM-part tags for a total of $N \times M$ tag parts. In general, the operation requires $(N \times M) + 1$ machine cycles or strokes of the printhead.

Furthermore, while all of the features of the present invention cannot be fully appreciated when precut tags are used, some of the broad aspects of this invention are applicable to such use. Also, a blank tag is considered to be blank even if it carries a preprinted store name or trademark or other form of information irrelevant to that toward which the present invention is concerned with printing.

What is claimed is:

1. A method for printing a plurality of tag parts in the form of N tags having M parts each for a total of $(M \times N)$ tag parts, in a minimum of printing strokes and without the printing of extra tag parts, with a printhead having two rigidly interconnected sections including a first section for printing at a first stage and a second section for printing at a second stage, each tag part being printed first at said first stage then at said second stage with a total of at least three lines of which one line printed at one of said stages falls between two lines printed at the other of said stages for a close line spacing, said method comprising, in order, the steps of:

partially printing a tag part at said first stage with said first section of said printhead by a first printing stroke;
performing $(M \times N) - 1$ intermediate operations, each of said intermediate operations comprising the steps of feeding a partially printed tag part from said first stage to said second stage and simultaneously feeding a blank tag part to said first stage, and thereafter printing tag parts simultaneously with a single printing stroke at both said first stage with said first printhead section to partially print a tag part, and at said second stage with said second printhead section to complete a tag part;

feeding the partially printed Mth tag part of the Nth tag from said first stage to said second stage while inhibiting any feeding of blank tag parts to said first stage; and printing said Mth tag part of said Nth tag at said second stage with said second section of said printhead with the last printing stroke to complete a partially printed tag.

2. The method according to claim 1 further comprising the step of:

feeding a blank tag part to said first stage prior to said first printing stroke.

3. A method according to claim 1 for printing N tags having M parts each for a total of $N \times M$ tag parts, in $(M \times N) + 1$ printing strokes, said method comprising the steps of:

generating first signals corresponding one for each one of said printing strokes;

generating second signals corresponding one for each N-th one of said first signals;

counting said second signals, thereby counting the partial printing of the M-th tag parts.

generating a third signal corresponding to the N-th one of said second signals, thereby signaling the at least partial printing of said total number of tag parts; and said inhibiting of any feeding of blank tag parts to said first stage being in response to said third signal.

4. A method according to claim 3 for printing N separate tags of M attached tag parts each, wherein said blank tags are supplied in the form of a continuous strip, said method further comprising the steps of:

severing from said strip each tag part which, during each Mth one of said printing steps, is partially printed at said first stage.

5. A method according to claim 4 further comprising the steps of:

enabling said severing steps in response to each of said second signals.

6. A method according to claim 3 further comprising the steps of:

generating print signals;

generating feed signals;

said print signals and feed signals being synchronized with said first signals;

said printing steps being responsive to said print signals; and said feeding steps being responsive to said feed signals.

7. A method according to claim 6 wherein said print signals and feed signals are mechanical signals.

8. A method according to claim 4 further comprising the steps of:

enabling said severing step in response to said second signals;

generating knife drive signals synchronized with said first signals; and

said severing step being responsive to the coincidence of the enabling of said severing step and any one of said knife drive signals.

9. A method according to claim 8 further comprising the steps of:

generating knife reset signals synchronized with said first signals; and

disabling said severing step in response to said knife reset signals.

10. A method according to claim 9 wherein said knife drive signals and said knife reset signals are mechanical signals.

11. A method according to claim 3 wherein each of said partial printing steps includes cyclically operating a printing drive means which is drivingly connected to the printhead to cyclically move the printhead in imprinting relationship to the tag parts, and wherein said method further includes the steps of:

generating a pulse signal in synchronism with each cycle of operation of said printing drive means;

generating a drive-disabling signal in synchronism with the $(M \times N) + 1$ b-th cycle of said drive means; and

stopping said printing drive means in response to the coincidence of said drive-disabling signal and any one of said pulse signals.

12. A method according to claim 3 further comprising the steps of:

generating blank-feed signals;
said feeding of said blank tags being in response to said blank-feed signals;

generating an inhibit signal in response to the Nth one of said second signals for inhibiting said blank-feed signals, thereby inhibiting any feeding of blank tags to said first stage;

generating inhibit reset signals synchronized with said first signals; and

resetting said inhibit signals in response to any one of said inhibit reset signals.

13. A method according to claim 3:

wherein at least one of said first, second and third signals are electrical signals.

14. An apparatus for printing a plurality of tag parts in the form of N tags having M parts each for a total of (M×N) tag parts, in a minimum of printing strokes and without the printing of extra tag parts, with a printhead having two rigidly interconnected sections including a first section for printing at a first stage and a second section for printing at a second stage, each tag part being printed first at said first stage then at said second stage with a total of at least three lines of which one line printed at one of said stages falls between two lines printed at the other of said stages for close line spacing, said apparatus comprising:

a supply of blank tag parts;

a printing station including said first and said second printing stages;

a guideway extending from said supply through said stages of said printing station;

feeding means positioned adjacent said guideway for feeding tag parts along said guideway from said supply to said first stage and from said first stage to said second stage;

means for inhibiting said feeding means from feeding blank tag parts from said supply to said first stage when said inhibiting means are actuated; and

control means connected to said printing station, said feeding means, and said inhibiting means for operating said printing station through (M×N)+1 printing strokes, for operating said feeding means through a feeding step between each of said printing strokes, and for actuating said inhibiting means during the feeding step which occurs between the (M×N)th and the (M×N)+1th printing stroke.

15. An apparatus according to claim 14 wherein both N and M are numbers greater than one, and wherein said control means comprises:

means for generating first signals corresponding to each of said printing steps;

a part counter having an input connected to said first signal generating means, and having an output;

said part counter generating at its output second signals corresponding to each Mth one of said first signals;

a tag counter having an input connected to the output of said part counter, and having an output;

said tag counter generating at its output a third signal corresponding to the Nth one of said second signals; and

said inhibiting means being connected to the output of said tag counter and being actuated by said third signal.

16. An apparatus according to claim 14 wherein:

said supply comprises a continuous strip of blank tag parts;

said control means comprises a tag counter for generating a signal corresponding to the printing of the Nth tag;

said apparatus further comprises a knife positioned adjacent said guideway and responsive to said signal for severing said Nth tag from strip.

17. An apparatus according to claim 14 for printing N separate tags wherein:

said supply comprises a continuous strip of blank tags;

said control means includes means for generating a signal corresponding to the printing of each tag; and
said apparatus further comprises a knife positioned adjacent said guideway and responsive to said signal for severing each printed tag from said strip of blank tags.

18. An apparatus according to claim 15 for printing N separate tags having M attached tag parts each, wherein:
said supply comprises a continuous strip of blank tags; and
said apparatus further comprises a knife positioned adjacent said guideway and responsive to said second signals for severing each M-part tag from said strip.

19. An apparatus according to claim 14 wherein said feeding means comprises:

a pair of feeding members spaced one tag part length apart along said guideway, said pair including a first member engageable with said supply for said feeding of blank tags to said first stage, and a second member engageable with a tag part at said first stage for said feeding to said second stage; and wherein

said inhibiting means, when actuated, disables said second feeding member and thereby inhibits any feeding of blank tag parts to said first stage.

20. An apparatus according to claim 19 wherein said inhibiting means includes:

a fender movable from an inactive position to a position against said second feed member to prevent engagement of said blank tags by said member.

21. An apparatus according to claim 19 wherein said control means comprises:

a tag counter for generating a signal corresponding to the printing of the Nth tag; and
said inhibiting means being actuated by said signal.

22. An apparatus according to claim 14 wherein said control means further comprises:

a cyclic drive operatively connected to said printing station and to said feeding means;

a motor;

a clutch connected between said motor and said cyclic drive to form a conditional driving engagement therebetween;

a tag counter having an output, said tag counter generating at its output an end-of-run signal corresponding to the printing of the Nth tag; and

means for disengaging said clutch in response to said signal after the (M×N)+1th printing stroke.

23. An apparatus according to claim 22 wherein:

said end-of-run signal is generated by said tag counter in response to the (M×N)th printing stroke; and wherein said control means further comprises:

delay means connected between the output of said tag counter and said disengaging means to permit an additional printing stroke after the occurrence of said end-of-run signal.

24. An apparatus according to claim 23 wherein said delay means comprises:

a clutch latch for conditioning said clutch to engage and release, said latch having alternative latched and unlatched states;

clutch release signal generating means partially carried by said cyclic drive and partially carried by said clutch latch, for generating clutch release signals corresponding to a predetermined cyclic position of said cyclic drive, each of said clutch release signals demarking cycles of said cyclic drive, each cycle including one printing stroke;

a count signal generator carried at least partially by said cyclic drive for generating count signals synchronized to said clutch release signals, said end-of-run signal timed to the count signal of the (M×N)th cycle;

a reset signal generator having an output and carried at least partially by said cyclic drive for generating signals synchronized to said clutch release signals and preceding said count signals in each cycle;

said clutch latch connected to said reset signal generator and responsive to the coincidence of any one of said reset signals and said end-of-run signal for setting said latch to said unlatched state;

said clutch-disengaging means being responsive to the coincidence of the unlatched state of said clutch latch and any one of said clutch release signals.

25. An apparatus according to claim 24 wherein:

said clutch-disengaging means includes a cam member and a cooperating cam follower member, one of said members carried by said cyclic drive and one of said members carried by said clutch latch;

said clutch release signal-generating means including said cam and cam follower members, said clutch release signal being defined by the alignment of said cam follower member with a predetermined position of said cam.

26. An apparatus according to claim 24 wherein said count signal generator and said reset signal generator are electric pulse generators.

27. An apparatus according to claim 26 wherein said control means further comprises an electromagnetic solenoid having a winding connected to the output of said signal generator, said solenoid having an output shaft connected to said clutch for setting said latch to said unlatched state when said solenoid is energized.

28. An apparatus according to claim 24 wherein said control means further comprises:

a start signal generator having an output;

an electromagnetic solenoid having an input connected to the output of said start signal generator, said solenoid having an output shaft connected to said clutch latch, said solenoid being energized by a signal at its input, said solenoid setting said latch to said latched state when energized; and

said clutch being engaged in response to the latched state of said clutch latch,

29. An apparatus according to claim 14 wherein said control means further comprises:

a motor; and

a cyclic drive having an input drivably connected to said motor, said cyclic drive having a plurality of periodic outputs, said outputs including:

a print output directly connected to said printing station to cause the execution of a printing stroke with each cycle of said cyclic drive; and

a feed output directly connected to said feeding means to cause the feeding of a tag part relative to said printhead with each cycle of said cyclic drive.

30. An apparatus according to claim 29 wherein said print output includes a cam member and a cam follower member, one of said cam and follower members carried by said cyclic drive and the other of said cam and follower members linked to said printing station.

31. An apparatus according to claim 30 wherein said other member is linked to said printhead to move said printhead through said printing strokes.

32. An apparatus according to claim 29 wherein said feed output includes a cam member and a cam follower member, one of said cam and follower members carried by said cyclic drive and the other of said cam and follower members linked to said feeding means.

33. An apparatus according to claim 29 wherein said feeding means comprises:

a pair of feeding members spaced one tag part length apart along said guideway, said pair including a first feed member engageable with said supply for said feeding of blank tags to said first stage, and a second feed member engageable with a tag part at said first stage for said feeding to said second stage; and wherein

said inhibiting means, when actuated, disables said first feed member thereby inhibiting any feeding of blank tag parts to said first stage.

34. An apparatus according to claim 33 wherein said inhibiting means includes:

a fender movable from an inactive position to a position against said second feed member to prevent said second feed member from engaging blank tags.

35. An apparatus according to claim 15 wherein said control means further comprises:

a motor;

said first signal-generating means comprising a cyclic drive having an input drivably connected to said motor, said cyclic drive having a periodic output including an electronic circuit for generating said first signals in the form of an electric pulse, one of said first signals occurring with each cycle of said cyclic drive at a predetermined cyclic position of said cyclic drive.

36. An apparatus according to claim 35 wherein:

said third signal is an electrical signal; and

said control means further comprises a solenoid having a winding connected to the output of said tag counter, said solenoid having an output shaft linked to said inhibiting means to actuate said inhibiting means when said solenoid is energized by said third signal.

37. An apparatus according to claim 18 wherein said control means further comprises:

a motor;

a cyclic drive having an input drivably connected to said motor, and having a plurality of synchronized periodic outputs, said outputs including:

said first signal generating means,

a knife drive cam, and

a knife latch reset output; and

a conditional linkage connected between said knife and said knife drive cam, said linkage including a knife latch, said knife latch having a latched condition wherein said knife drive cam is effective to drive said knife through said linkage and an unlatched condition wherein said linkage is disengaged, said knife latch being set to said latched condition in response to said second signal and to said unlatched condition in response to said knife latch reset output.

38. An apparatus according to claim 37 wherein:

said knife latch reset output is a cam mechanically linked to said knife latch; and

said controls further comprising a solenoid having a winding connected to the output of said part counter whereby said solenoid is engaged by said second signal, said solenoid having an output shaft connected to said knife latch for setting said knife latch to said latched condition.

39. An apparatus according to claim 14 wherein:

said supply is in the form of a continuous of blank tags;

said apparatus further comprises a knife pivotally mounted adjacent said guideway and having a mounting shaft parallel to said guideway, said knife movable against said guideway to sever tags from said strip;

said guideway includes a transverse cutting edge and a depressible portion abutting said cutting edge; and said knife includes an abutting surface engageable with said portion when said knife moves against said guideway to depress said portion as said tags are severed from said strip.

40. An apparatus according to claim 14 wherein said printhead comprises:

a center mounting plate;

two external mounting plates, including a first mounting plate and a second mounting plate spaced on opposite sides of said center mounting plate;

a first printhead section and a second printhead section, each of said sections including said center mounting plate, a respective one of said external mounting plates, one of said sections including at least two rows of type, aligned between two of said rows of the other said sections,

each of said rows of type mounted between, and at opposite ends to, said center mounting plate and the respective one of said external mounting plates;

each of said rows including an upper shaft, a lower shaft, and a plurality of type carrying endless bands surrounding both of said upper and lower shafts;

a dial shaft telescopically mounted within said upper shaft and projecting through the respective external plate;

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an indexing wheel mounted to the interior end of said dial shaft and selectively engageable with a selected one of said bands in accordance with the telescopic setting of said dial shaft, for indexing said selected one of said bands to a selected character.

41. An apparatus according to claim 14 wherein said
guideway comprises:
selective guide means for forming a channel of variable size
and position on said guideway, said selective guide means

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comprising:
at least one retractable guide plate, including a first plate,
extending longitudinally of said guideway, said plate
having an operative position projecting from the sur-
face of said guideway and an inoperative position
remote from the surface of said guideway; and
a control element for selectively moving said guide plate
between said operative and inoperative positions.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,601,042

Dated August 24, 1971

Inventor(s) Paul H. Hamisch, Sr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Patent Office Errors

In the Abstract, line 6, "part" second occurrence, should be --past--. Column 18, line 34, after "along" insert --path--; same line, after "input", "354" should be --534--. Column 20, line 20, the period should be a semi-colon --;--; line 75, "lbth" should be --l-th--. Column 22, line 64, "leas" should be --least--. Column 24, line 44, after "continuous" insert --strip--.

Applicant's Errors

Column 3, line 66, "tag" should be --blanks--. Column 5, line 39 "53-4" should be --53-5--; line 62, after "cycle" insert --is--. Column 11, line 56 "link" should be --latch--. Column 12, line 6, "283" should be --286--; line 43, "pivotting" should be --pivoting--. Column 14, lines 22 and 23, "63-1, 63-3, 63-5 and 63-6, and 63-2 and 63-4" should be --53-1, 53-3, 53-5 and 53-6, and 53-2 and 53-4--; line 28, "63" should be --53--; line 64, "plungers" should be --plunger--. Column 15, line 23, "includes" should be --include--. Column 16, line 54, "119" should be --121--. Column 19, line 4, "latch" second occurrence, should be --unlatch--. Column 20, line 17 "N-th" should be --M-th--. Column 21, line 72, after "from" insert --the--.

Signed and sealed this 15th day of August 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents