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[54] TYPEBAR FOR PRINTING UNIFORM DENSITY CHARACTERS

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[58] **Field of Search** ..... 101/93 C, 93 L, 93 MM, 109, 101/407, 287

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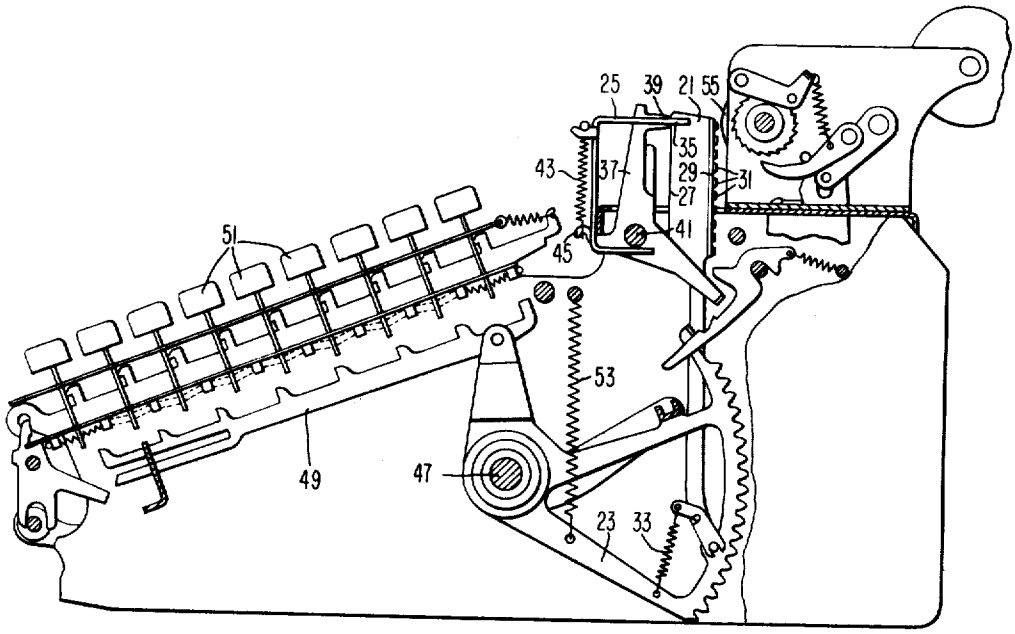
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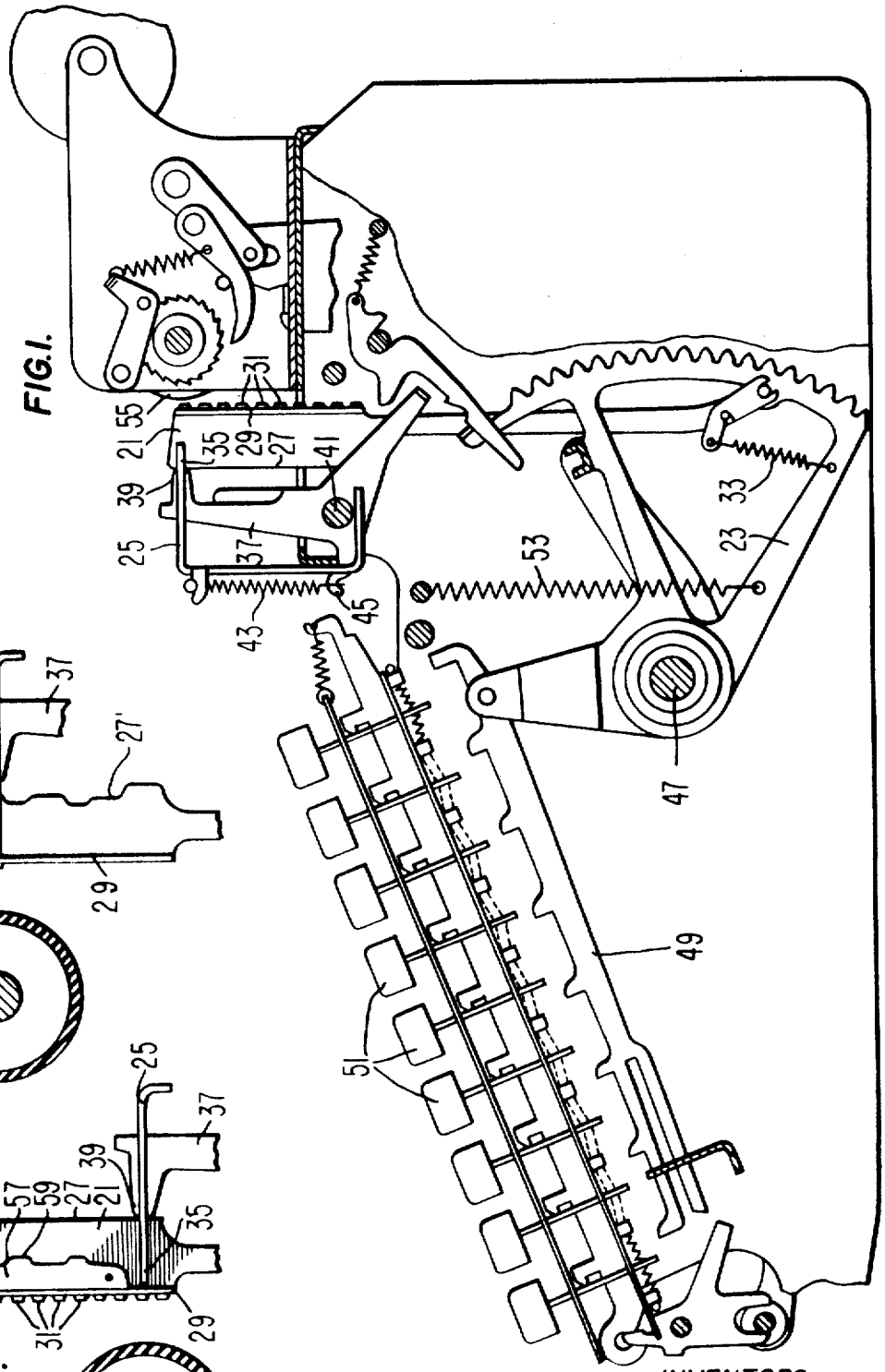
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[57] **ABSTRACT**

A hammer-impactable and differentially indexible typebar comprising a plurality of type characters of variously dimensioned surface areas is provided with impact control means cooperable with the printing means of a calculating machine and effective for regulating the impacting force of the hammer thereof according to the surface area and location of the selected character to be printed, such regulation serving to assure that all character representations printed by the typebar in an alpha or numeric printer are of such uniform density as to permit satisfactory reading thereof by optical machine-reading equipment. The impact control means of the typebar serves to establish a variable clearance between the hammer and the differentially indexed typebar such that the predetermined firing flight of the hammer will impart a variable striking force of the typebar against a ribbon and a record medium interposed between the selected character and a printing platen.

5 Claims, 3 Drawing Figures





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TYPEBAR FOR PRINTING UNIFORM DENSITY CHARACTERS

BACKGROUND OF THE INVENTION

Many well-known alpha-numeric printers are provided with a plurality of ordinally arranged typebars each of which comprises a plurality of integrally fixed and longitudinally disposed type characters of variously dimensioned surface areas. These typebars are differentially elevated in response to key depression and machine cycling to bring selected type characters into printing position relative to a record medium carried by a rotatable platen. Each of the typebars is associated with a separate resiliently biased hammer which is pre-cocked subsequent to the differential elevation of the typebar and then released to impart an impacting arcuate force of the latter against an inked ribbon disposed between the selected type character and the record medium. A common characteristic of these printers is that the hammers and typebars respectively are provided flights of predetermined and uniform distance regardless of the surface areas of the selected type characters and the longitudinal location along the typebar, hammers and typebars being activated from predetermined set positions. In view of this uniform travel of conventional typebars, the printed character representations tend to vary in density in inverse proportion both to the surface areas of the selected characters and to the degree of differential elevation of the typebar prior to its hammer impacted blight. Although such variation in density is generally acceptable when records are produced for human perusal, it cannot be tolerated when the records are to be read optically by machine-reading equipment, as when read as an incident to automatic data processing.

SUMMARY OF THE INVENTION

It is accordingly an object of the present invention to provide an improved typebar for use in these known alpha-numeric printers, such typebar having built-in means for controlling the intensity of the force with which it is impacted against the platen, according to the differential elevation of the typebar and to the surface area of the selected type character, such impacting force being greater when a character of normally low print density is selected, and lesser when a character of normally high print density is selected, such normal densities being dependent upon the surface area of the character and its longitudinal placement on the typebar.

Another object of the invention is to devise means for adapting conventional typebars so that they might be used effectively for producing printed records that may be read later by machine reading equipment.

An important aspect of the invention is the employment of means for variably spacing the differentially elevated typebar from the impacting head of its associated hammer, when the hammer is located in its fully biased and pre-cocked position, such that the predetermined flight of the hammer will impart the required impacting force to the typebar. In a preferred embodiment of the invention this variable spacing is provided by means of a contoured plate fixed to the side surface of the typebar, the limiting contact of this plate against a tine of the guide comb within the slots of which the typebars are translatably and rockably housed serving to define the variable preset position of the typebar from which it is activated into printing contact with the ribbon and record medium. In another embodiment of the invention this variable spacing is provided by means of a predetermined contour formed in the striking surface of the typebar itself, such contour serving to vary the impacting force of the hammer against the typebar as the latter is activated from a predetermined position into such printing contact.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, aspects and advantages of the invention will be more clearly understood from the following description when read in conjunction with the accompanying drawings, in which:

FIG. 1 is a sectional right side elevation of a calculating machine including an alpha-numeric printer wherein the inventive typebar and its associated hammer are shown in their normal home positions;

FIG. 1A is a fragmentary top view of a guide comb within the slots of which the hammers and typebars of the calculating machine are housed;

FIG. 2 is a fragmentary left side view of a typebar equipped with a contoured position-determining plate, the typebar having been elevated to a printing position effective for printing a type character disposed in its eleventh position; and

FIG. 3 is a fragmentary left side view of a typebar having a contoured hammer-striking edge, the typebar having been elevated to a printing position effective for printing the type character disposed in its fourth position.

DETAILED DESCRIPTION OF THE INVENTION

An alpha-numeric printer is shown in FIG. 1 in association with a well-known two function, full keyboard calculating machine of the Burroughs Series P type, as disclosed in U.S. Pat. No. 1,853,050 to Horton. As shown in this figure, typebars **21** are pivotally connected to accumulating sectors **23** and are translatably and rotatably housed within a plurality of longitudinal slots formed in a guide comb **25** which is supported by frame members of the machine.

Each of the typebars **21** is comprised of a head member **19** having a web portion **20** and is provided with a hammer-striking edge **27**, an elongated offset projection **29**, and a plurality of type characters **31** disposed in vertical array on the outer surface **26** of the offset projection **29**. In the calculating machine for which the inventive typebar is particularly adapted, each of such typebars is biased in a counterclockwise direction on its pivot point by a spring **33** connected to the accumulating sector **23** and to a shank member **22** of the typebar **21**, such bias serving to hold the inner surface **24** of the offset projection **29** in contacting relationship with an associated projection or tine **35** of the guide comb **25** when its associated hammer is pre-cocked in a counterclockwise direction during a printing operation. A plurality of projections **35** of the guide comb **25** serve to define longitudinal slots **36** within which the typebars **21** are translatably and rockably housed, as shown in FIG. 2A. Associated with each typebar is a hammer **37** which is also rotatably housed within a corresponding slot **36** of the guide comb **25**. Each of these hammers is provided with an impacting head **39** (also shown in FIGS. **2** and **3**) and a lug arm **45**, the former being cooperably disposed relative to the hammer-striking edge **27** of its associated typebar and the latter serving to anchor one end of a spring **43** that biases the hammer in a clockwise direction on a supporting shaft **41**. The accumulating sectors **23** of the calculating machine are rotatably supported by a shaft **47** connected to side frames of the machine and upper arms thereof are pivotally connected to associated index racks **49** which cooperate with corresponding keys **51** of the keyboard. The accumulating sectors **23** are biased in a counterclockwise direction on the shaft **47** by springs **53**, the latter springs serving also to bias the index racks **49** in a forward direction.

It should be noted that the inventive typebars **21** illustrated in FIG. 1 in like manner to conventional typebars commonly used in calculating machines of this type, may comprise numeric type characters ranging from either **0** through **9** or **0** through **11**, and provision may also be made for the inclusion of alpha characters with which to identify different types of transactions.

In calculating machines of the kind illustrated in FIG. 1 and disclosed in U.S. Pat. No. 1,853,050, depression of selected keys **51**, and a well-known motor bar (not shown) results in a machine operation in which the index racks **49** and the accumulating sectors **23** are released to the bias of their associated springs **53**, and are thereby activated until upright lugs on the index racks are limited by the stems of the depressed keys. This activation results in a differential elevation (or upward translation) of the typebars **21** to bring type characters cor-

responding to the selected keys into horizontal alignment with the ribbon and printing line on the record medium. During this upward translation the hammers 37 are pre-cocked in a counterclockwise direction and the springs 33 serve to bias the typebars in a counterclockwise direction on their respective pivot points such that their elongated offset projections 29 are retained in contacting relationship with the associated projections or tines 35 of the guide comb 25. Later in the machine operation, the pre-cocked hammers 37 associated with the differentially elevated typebars are released to the control of their associated springs 33 and thereby impelled into contact with the hammer-striking edges 27 of their associated typebars. The typebars, in turn, are impelled in a clockwise direction (as viewed in FIG. 1) and the selected type characters are impacted thereby into printing contact with the ribbon and record medium.

Whereas, in calculating machines of the type herein described, the spring-motivated force that is transmitted from each hammer to its associated typebar remains constant, the moment of force of the typebar against the platen varies in inverse relationship to the degree of differential elevation provided the typebar prior to the release of the hammer, such variable force of the typebar being measured by the product of the velocity of force of the hammer into the perpendicular distance between the selected type character and the pivot point of the typebar. This variable impacting force together with the varying surface areas of the selected characters would serve to produce printed character representations of non-uniform density, type characters positioned along the lower portion of the typebar and having relatively large surface areas producing low print density and characters disposed along the upper portion of the typebar and having relatively small surface areas producing high print density.

A preferred embodiment of the inventive typebar is illustrated in FIG. 2, wherein a contoured plate 57 of similar thickness to the width of the offset projection 29 is fixed to the side surface of each typebar in contiguous relationship to the offset projection. A contoured periphery 59 of the plate 57, in cooperation with its associated projection or tine 35 of the guide comb 25, serves to provide a variable clearing distance between the hammer-striking edge 27 of the typebar and the fully biased or pre-cocked hammer 37, before the hammer is released to the control of its spring 43. Each contoured plate 57 is individually formed in such manner that its periphery 59, in limiting cooperation with the projection 35 of the guide comb 25, will provide a minimum clearing distance between the striking edge of the typebar and the impacting head of the hammer when a type character of normally low print density is to be printed, and will provide a maximum clearing distance between the striking edge of the typebar and the impacting head of the hammer when a type character of normally high print density is to be printed. It will be observed from FIG. 2 that the least possible clearing distance between the typebar and the hammer would be provided by contact of the inner surface 24 of the offset projection 29 of the typebar against the tine 35 of the guide comb 25. FIG. 2 shows a twelve pitch typebar such as would be used in the pence column of a sterling currency machine, the type character 10 being located in printing position in the illustration. It is apparent that lowermost type characters 10 and 11 of this typebar would additionally present larger surface areas than would the characters 0 through 9. Maximum impacting force is provided for printing these normally low density type characters by minimizing the pre-cocked clearing distance between the striking edge 27 of the typebar and the impacting head 39 of the hammer 37, this being accomplished by permitting the projection 29 of the typebar to limit against the tine 35 of the guide comb 25 before the hammer is released to the control of its spring 43.

Still another embodiment of the invention is shown in FIG. 3 wherein the variable pre-cocked clearing distance between the striking edge of the typebar 21 and the impacting head 39 of the hammer 37 is provided by means of a variable contour formed in the striking edge itself, as indicated at 27'. In this embodiment, the typebar is biased by its spring 33 such that the inner surface 24 of its elongated offset projection 29 is held into limiting contact with its associated tine 35 regardless of the longitudinal placement or surface area of the selected type character, as was the case with the conventional typebars mentioned earlier. The contoured striking edge 27' of this typebar however, in itself, provides for the variable pre-cocked clearing distances between the striking edge of the typebar and the impacting head 39 of the hammer, according to the longitudinal placement and surface areas of the selected type characters, greater distances being provided by means of relatively deep cutouts in the striking edge 27' when type characters of normally high print density are to be printed, and lesser distances being provided by means of relatively shallow cutouts, or by the absence of a cutout, when type characters of normally low print density are to be printed. It will be observed that the 3 type character is located in printing position in FIG. 3. Since this character presents a larger surface area than the character 1, and a smaller area than the character 10, the striking edge 27' corresponding to the character 3 provides a lesser and greater clearing distance, respectively, than the clearing distances provided for the characters 1 and 10.

While the invention has been shown and described in considerable detail, it will be understood that variations thereof may be had without departing from the spirit and scope of the invention.

What is claimed is:

1. In an alpha-numeric printer having indexing means, at least one impactable and translatably positionable typebar having a plurality of type characters of variously dimensioned surface areas, said typebar being drivenly and rockably associated with a resiliently activated hammer and impactably associated with a rotatable platen, said typebar being also translatably activatable from a normal home position to bring selected ones of said type characters into printing alignment with an inked ribbon and a record medium interposed between said typebar and said platen, said printer having a guide comb comprising at least one longitudinal slot defined by at least a pair of horizontal projections for rockably and translatably housing said typebar, said typebar additionally comprising:

a. a shank member pivotally connected to said indexing means, said shank member being also spring connected to said indexing means such that said typebar is biased into said longitudinal slot and away from said platen,

b. a head member coupled to said shank member, said head member having a web portion movably housed within said longitudinal slot of said guide comb and having also an elongated offset projection connected to the edge of said web portion adjacent said platen, said offset projection rigidly carrying on an outer surface thereof said plurality of type characters, said web portion comprising also a striking edge opposite said edge connected to said offset projection, said striking edge being cooperably aligned with an impacting head of said associated hammer, and

c. differential spacing means associated with an inner surface of said offset projection and with at least one of said pair of horizontal projections of said guide comb, said means being effective for differentially spacing said typebar from said hammer according to the printing characteristics of said selected type characters and to their placement along said outer surface of said offset projection, said differential spacing means serving to establish a variable distance between said striking edge of said typebar and said impacting head of said hammer prior to said resilient activation thereof, said variable distance providing a lesser distance therebetween when type characters of normally low print density are located in said printing alignment with said platen, and providing a greater distance therebetween when type characters of normally high print density are so located, said normally

low and normally high print densities being influenced jointly by the surface areas of the selected type characters and the degree of translatable activation required of said typebar to bring said selected type characters into printing alignment with said inked ribbon and said record medium.

2. The typebar defined in claim 1 wherein said differential spacing means comprises: a contoured plate of equivalent thickness to the width of said elongated offset projection connected to said web portion of said typebar, said contoured plate being attached to said web portion with one edge thereof disposed in contacting relationship with said inner surface of said elongated offset projection, said contoured plate being provided with peripheral irregularities on the opposite edge thereof, said irregularities in cooperation with one of said pair of horizontal projections defining said longitudinal slot of said guide comb in response to said bias of said typebar into said longitudinal slot serving to establish a variable distance between said striking edge of said translatably positioned typebar and said impacting head of said hammer prior to said resilient activation thereof.

3. The typebar defined in claim 2 wherein said peripheral irregularities of said edge of said contoured plate in cooperation with said horizontal projection of said guide comb serve to provide a relatively lesser distance between said striking edge of said typebar and said impacting head of said hammer prior to said resilient activation thereof when type characters of normally low print density are located in said printing alignment with said platen, and to provide a relatively greater distance therebetween when type characters of normally high print density are so located, the minimum distance therebetween being provided by the cooperation of said horizontal projection of said guide comb and said inner surface of said elongated offset projection of said web portion of said typebar adjacent a terminal end of said contoured plate.

4. The typebar defined in claim 1 wherein said differential spacing means comprises: an irregular contour formed in said striking edge of said typebar, said contour providing peripheral irregularities which in response to said bias of said typebar into said longitudinal slot of said guide comb serve to establish a variable distance between said striking edge of said translatably positioned typebar and said impacting head of said hammer prior to said resilient activation thereof, said bias of said typebar into said slot being effective to position said typebar such that said inner surface of said elongated offset projection is held in translatable contact with one of said pair of horizontal projections of said guide comb.

5. The typebar defined in claim 4 wherein said peripheral irregularities provided by said contour of said striking edge of said head member serve to afford a relatively lesser distance between said striking edge and said impacting head of said hammer prior to said resilient activation thereof when type characters of normally low print density are located in said printing alignment with said platen, and to afford a relatively greater distance therebetween when type characters of normally high print density are so located.

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