Oct. 18, 1955 G. A. LUNING 2,720,832

INDEXABLE TYPE WHEEL WITH RESET MEANS

Filed Sept. 26, 1952 4 Sheets-Sheet 1

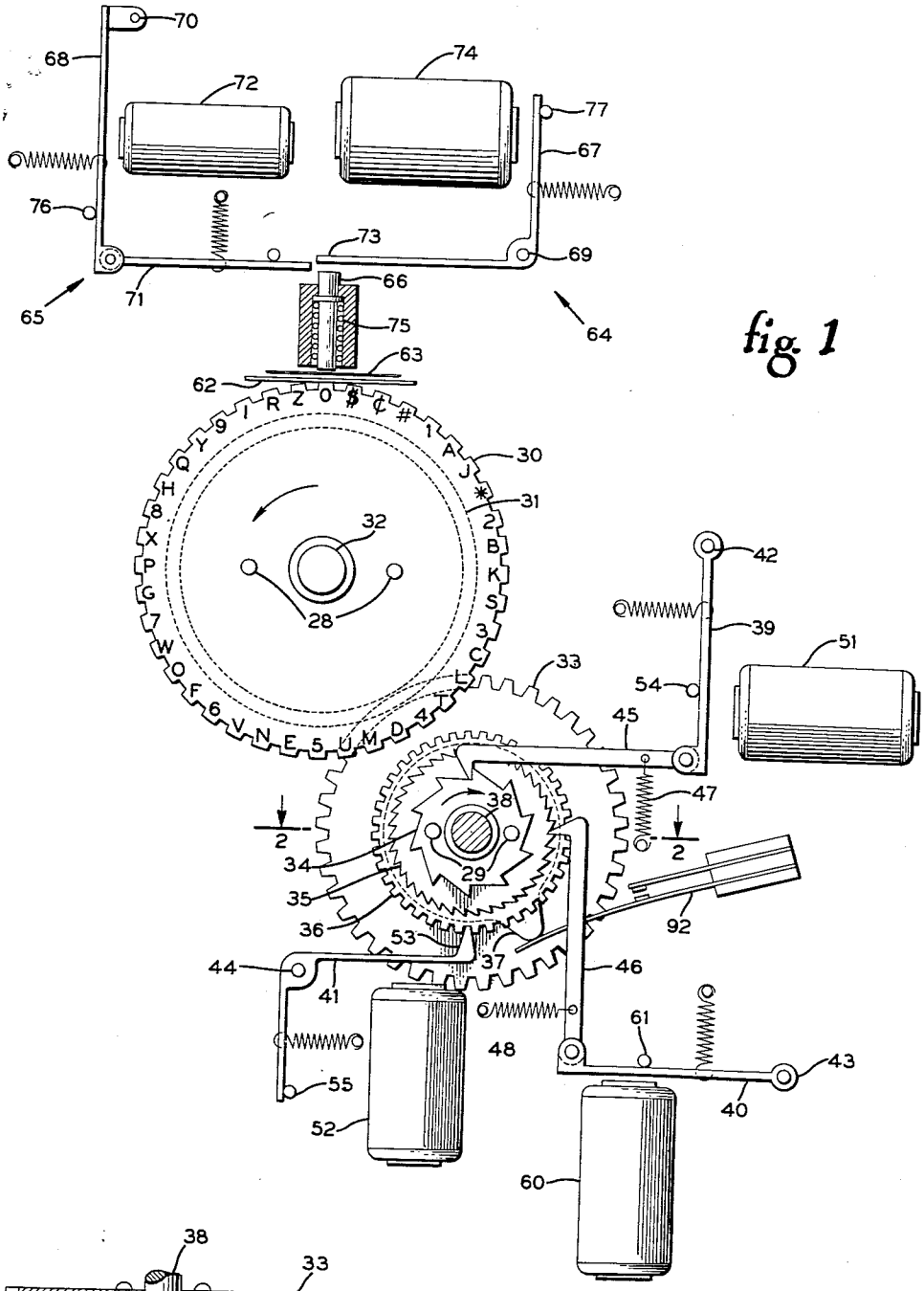


fig. 1

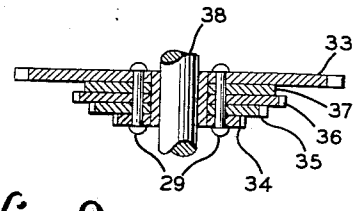


fig. 2

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INDEXABLE TYPE WHEEL WITH RESET MEANS

Filed Sept. 26, 1952 4 Sheets-Sheet 2

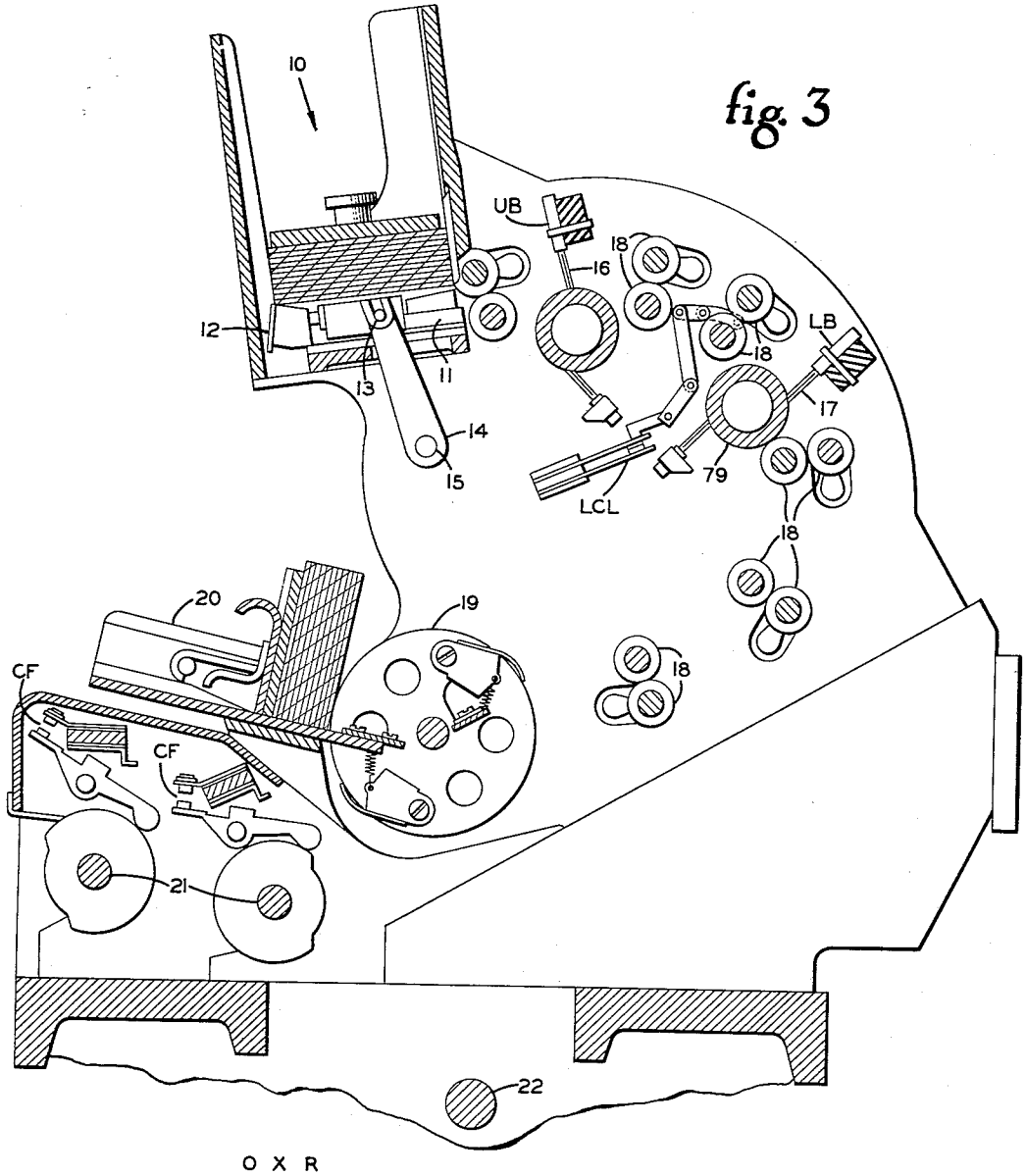


fig. 3

	O	X	R	
1	1	*	J	A
2	2	S	K	B
3	3	T	L	C
4	4	U	M	D
5	5	V	N	E
6	6	W	O	F
7	7	X	P	G
8	8	Y	Q	H
9	9	Z	R	I
0		#	¢	$

fig. 4

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Oct. 18, 1955 G. A. LUNING 2,720,832

INDEXABLE TYPE WHEEL WITH RESET MEANS

Filed Sept. 26, 1952

4 Sheets-Sheet 3

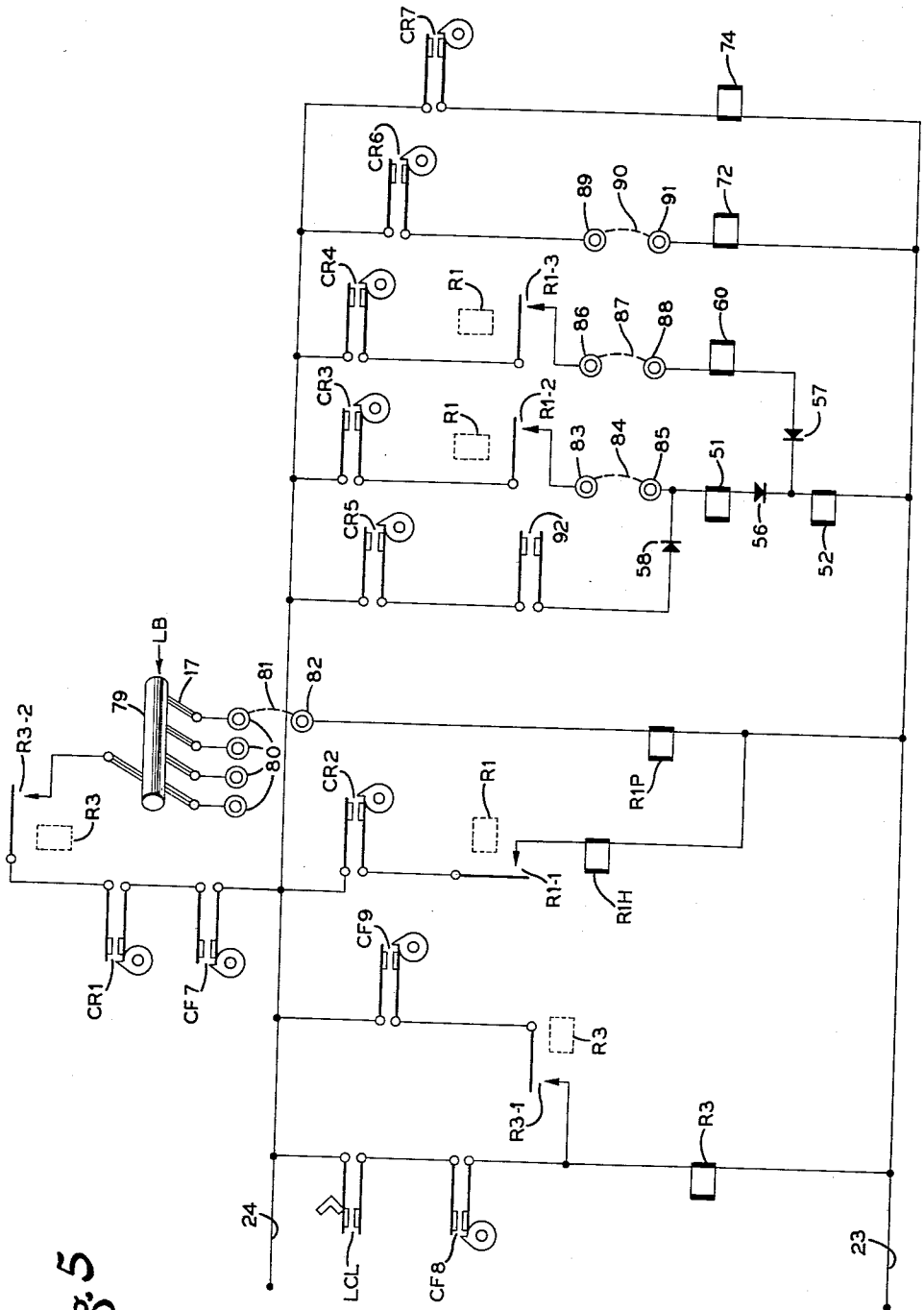


fig. 5

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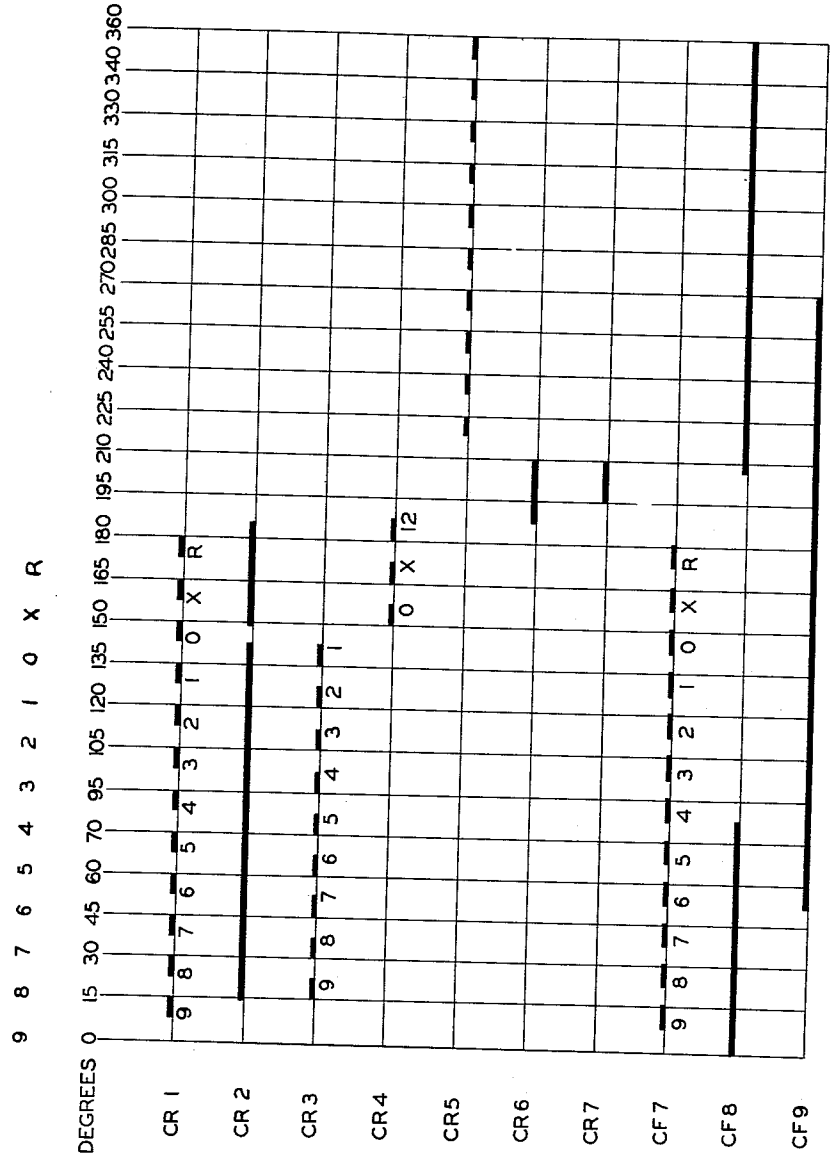
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INDEXABLE TYPE WHEEL WITH RESET MEANS

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fig.6



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2,720,832

INDEXABLE TYPE WHEEL WITH RESET MEANS

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Application September 26, 1952, Serial No. 311,594

2 Claims. (Cl. 101—93)

This invention relates to printing mechanisms in general, and more particularly to the variety wherein alphabetic, numeric, or special symbol printing can be performed under the control of records, such as perforated record cards.

An object of this invention is to provide an improved printing mechanism of the impulse controlled type.

A more specific object of this invention resides in the provision of improved type member reset means.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a diagrammatic view in side elevation of a single printing order of a printing mechanism constructed according to the present invention.

Fig. 2 is a cross sectional view taken along the line 2—2 of Fig. 1.

Fig. 3 is a vertical section of a card feeding mechanism.

Fig. 4 represents the card perforation code configuration and illustrates the alphabetic and numeric characters, and special symbols selected by perforations appearing in a card column.

Fig. 5 is a schematic electrical diagram for controlling the printing mechanism.

Fig. 6 is a timing diagram of the machine.

Card feeding and analyzing devices

Any suitable source of data representing impulses may be used to control the improved printing mechanism to be described. The one employed herein is the well known form of card feeding and analyzing device shown, for example, in patent to J. R. Peirce, No. 1,827,259, dated October 13, 1931; No. 2,042,324, dated May 26, 1936; and No. 2,199,547, dated May 7, 1940.

The card feeding mechanism is shown generally herein in Fig. 3. As is well known, card feeding operations are initiated by the usual manual start key so as to cause the energization of a card feed clutch magnet which causes the cards to be fed singly from the supply hopper 10 by the usual card picker mechanism comprising a slidably mounted reciprocable plate 11 carrying a picker knife 12 for cooperation with the record cards. The plate 11 has a pin and slot connection 13 with an arm 14 secured to a rock shaft 15. Shaft 15 is rocked by the card feed operating mechanism to reciprocate picker knife 12, to cause the card to be fed from the supply hopper 10 to the analyzing mechanism. The card is presented in succession to UB analyzing brushes 16 and LB analyzing brushes 17.

The feeding of record cards from station to station and to ejection is effected by pairs of feeding rollers 18 having the customary driving gear connections to the card feed operating mechanism. The cards pass from

the last pair of rollers 18 to a card stacker 19, that shown being of the rotary type. The cards are fed to a storage hopper 20 in the original order. As is usual in the form of card feeding mechanism shown, the machine includes cam operated contacts which consist of the CF contacts driven by shafts 21 which are rotated one revolution for each card feeding cycle.

A constantly running shaft 22 which rotates one revolution for each machine cycle is utilized to operate the CR cam contacts, designated in the wiring diagram shown in Fig. 5.

Interposed between the constantly rotating shaft 22 and the driving shaft of the feed mechanism is the usual card feed clutch magnet (magnet 48 of Fig. 6, Patent #2,042,324). The manner of energization of this magnet to initiate and maintain card feeding operations as long as cards are fed is very well known and for this reason is not explained herein in detail.

In general, two card feed cycles are initiated by the initial depression of a start key and a re-depression thereof. During the second card feed cycle the first card, as it is advanced from UB analyzing brushes 16 to LB analyzing brushes 17, closes card lever contacts LCL. So long as card feed operations continue, the said card lever contacts will remain closed due to the action of each succeeding card upon contacts LCL. The latter are closed when cam contacts CF8 close at 207° (Fig. 6) and by an obvious circuit an impulse will be directed to relay coil R3 (Fig. 5).

Relay coil R3 closes its contacts R3–1 and a stick circuit extends from one side of the line 23 through the R3 magnet, R3–1 contacts, CF9 cam contacts to the other side of the line 24. If card lever contacts LCL are closed when cam contacts CF9 are open, relay coil R3 will be held energized, the energization of the latter then being effected through the card lever contacts LCL and cam contacts CF8. When relay coil R3 is energized, it will close its contacts R3–2, thus connecting the contact roll of the LB analyzing brushes 17 to the circuit breakers CR1 and CF7. As long as card feed operations continue, LCL contacts will remain closed to maintain the energization of the relay coil R3 and the closure of its contacts R3–2, rendering the LB analyzing brushes 17 effective. After the second manually initiated card feed cycle, successive card feeding cycles automatically ensue as long as cards are fed. For each passage of a card passed the LB analyzing brushes, the improved printing mechanism now to be described in detail is controlled so as to print data recorded by the card perforations analyzed.

Printing mechanism

The machine is preferably provided with numeral, alphabet and special symbol type, and means for selecting such type so as to print, aside from numerals, letters and special symbols.

The alphabetic type are selected by perforations arranged according to the well known IBM alphabetical code shown in Fig. 4. As is known by those persons familiar with this art, an alphabetic character is represented in the aforesaid code by a digit perforation, i. e., 9 to 1, in combination with a zone perforation, i. e., 0, X or R. As applied to the instant invention, the particular 0, X and R zone perforation appearing in a record card column determines which of the several type of a group selected by a digit index point will be printed, whereas each digit index perforation selects a related group consisting of three non-numeral type and a numeral type. For example, if the perforation should be at the 2 index position and no zone hole is utilized in either the 0, X or R positions, the digit 2 will be printed. If a hole is also at 0, such hole in combination with the 2

hole will select the type S; if at the X index point position, type K will be selected; and if at the R position, type B will be selected.

As is shown in Fig. 1, a printing wheel **30** includes a plurality of type spaced equally, one from the other, along the periphery thereof. For the purpose of this description, the said wheel includes ten groups of three non-numeral type and one numeral type each; i. e., forty uniformly spaced type in all. Printing wheel **30** is attached by pins **28** to a toothed disc **31** for rotation therewith, both of which are freely mounted on shaft **32**. In mesh with disc **31** is a driving gear **33** which is fixedly attached by pins **29** to a group ratchet wheel **34**, a type ratchet wheel **35**, a detent wheel **36** and a reset cam **37**. The foregoing integral assembly for driving printing wheel **30** is freely mounted on shaft **38**. Group ratchet wheel **34** includes a number of equally spaced teeth along its periphery, each of which corresponds with one of the number of aforementioned printing groups. Type ratchet wheel **35** includes a plurality of equally spaced teeth along its periphery, each one of which corresponds with one of the aforementioned type positions.

Spring biased armatures **39**, **40** and **41** are pivotally mounted on studs **42**, **43** and **44**, respectively, and armatures **39** and **40** are also loosely attached, at their other ends, to pawls **45** and **46**, respectively, by pin connections. Springs **47** and **48** act upon pawls **45** and **46**, respectively, so as to bias the said pawls toward their respective ratchet wheels **34** and **35**.

By circuits to be subsequently described, when an analyzing brush senses a hole in any of the digit index positions 9 to 1, a circuit is closed to numerical magnet coil **51** and detent magnet coil **52**. As the magnet coils **51** and **52** are energized concurrently, their respective spring biased armatures **39** and **41** are attracted thereto so as to disengage the extended end **53** of armature **41** from a notch in detent wheel **36**, thereby freeing the aforedescribed printing wheel driving mechanism for movement, and so as to move pawl **45** to the right in order to advance ratchet wheel **34** one tooth. Due to the fact that the gear ratio of disc **31** and gear **33** is 1 to 1, printing wheel **30** will advance in a counterclockwise direction one tenth of its circumferential distance or, more specifically, one printing group. When coil **51** is de-energized, spring biased armature **39** will return to rest against stop pin **54**, moving with it pawl **45** so as to allow the notched end thereof to engage a succeeding tooth of wheel **34**. In addition thereto, when coil **52** is de-energized, spring biased armature **41** will return to rest against stop pin **55**, allowing extended end **53** to engage a notch of detent wheel **36**, thereby securely locking the printing wheel **30** and its driving mechanism.

When an analyzing brush senses a hole in any of the zone index positions 0, X and R, a circuit is closed to zone magnet coil **60** and detent magnet coil **52**. As the coils **60** and **52** are energized concurrently, their respective spring biased armatures **40** and **41** are attracted thereto, thereby disengaging the extended end **53** of armature **41** from a notch in detent wheel **36** so as to free the aforedescribed printing wheel driving mechanism for movement, and moving pawl **46** downwardly so as to advance ratchet wheel **35** one tooth. Therefore, printing wheel **30** will advance in a counterclockwise direction one fortieth of its circumferential distance or, more specifically, one type position. When coil **60** is de-energized, its spring biased armature **40** will return to rest against stop pin **61**, moving with it pawl **46** so as to allow the notched end thereof to engage a succeeding tooth of wheel **35**. In addition thereto, the de-energization of coil **52** will allow the printing wheel **30** and its driving mechanism to be securely locked in position as described hereinbefore.

It should be apparent from the foregoing description that printing wheel **30** will be advanced one group position for every electrical impulse applied concurrently to coils **51** and **52**, and one type position for every electrical impulse applied concurrently to coils **60** and **52**. Therefore, by selectively energizing the aforesaid coils, either singly or in combination, the said printing wheel may be advanced to any one of forty type positions. As the description advances, the method by which a specific type position is selected by electrical impulses due to related card perforations will be explained in detail.

Since various schemes for feeding paper and inked ribbons are well known to those persons familiar with the printing art, and since the means for feeding the same are not a part of this invention, they will not be described herein. Referring to Fig. 1, an inked ribbon **62** is positioned intermediate printing wheel **30** and a web of paper **63** upon which printed characters are to be recorded. By circuits to be subsequently described, when print magnet **64** and interposer magnet **65** are rendered operable together, a platen **66** is caused to strike the paper **63** so as to cause the paper to take an impression from the type which is in the printing position at the time.

Spring biased armatures **67** and **68** are pivotally mounted on studs **69** and **70**, respectively, and armature **68** is coupled, at its other end, to interpose bail **71**. When coil **72** is energized, its armature is attracted thereto whereby the end portion of bail **71** is moved between the upper surface of platen **66** and the extended hammer-end **73** of armature **67**. When, during the time that coil **72** is energized coil **74** is also energized, armature **67** is attracted, thereby causing the hammer-end **73** to strike bail **71** so that the said bail imparts a striking blow to platen **66**. This causes platen **66** to move within its casing against the action of spring **75** so as to cause a type impression to be recorded on paper **63**. As the coils **72** and **74** are de-energized, their respective spring biased armatures **68** and **67** are returned to rest against stop pins **76** and **77**, respectively. This allows platen **66** to be withdrawn from the paper by the action of compression spring **75**.

By circuits to be subsequently described, it will be shown that selective printing is possible by selectively energizing interposer coil **72**, i. e., if, when print magnet coil **74** is energized, coil **72** is not energized, hammer-end **73** will not strike bail **71** and platen **66** will not strike paper **63** to cause an impression thereon.

Circuit description

Fig. 5 illustrates the wiring for a single printing order of the printing mechanism for printing either numeric or alphabetic characters, or for printing special symbols.

The card LB analyzing brushes related to the selected controlling card columns terminate at plug sockets **80**, and plug connection **81** is made therefrom to the plug socket **82** of the printing order.

The print control circuit is from line **24** through CF7 and CR1 circuit breaker contacts, relay contacts R3–2 closed during analysis of all card holes, contact roll **79**, analyzing brushes **17**, plug socket **80**, plug connection **81**, plug socket **82**, relay pick coil R1–P, to line **23**.

Thus for listing numeric digits 9 to 1, and alphabetic or special symbol digits 9 to 1, 0, X and R, the above circuit is closed to pick relay R1. The contacts R1–1 to R1–3 are maintained in a picked position by energization of hold coil R1–H for a predetermined period of time. This circuit is from line **24**, through CR2 cam contacts, relay contacts R1–1, normally open, coil R1–H, to line **23**.

When coil R1–P is energized by a digit impulse representing a numeric digit 9 to 1, the group set-up circuit completed thereupon is from line **24**, through CR3 cam contacts, relay contacts R1–2 N/O, plug socket **83**, plug connection **84**, plug socket **85**, group magnet coil **51**, diode rectifier **56**, detent magnet coil **52**, to line **23**.

When coil R1–P is energized by a zone impulse representing a zone index 0, X or R, the type set-up mecha-

nism is rendered operative. The type set-up circuit is from line **24**, through CR4 cam contacts, relay contacts R1–3 N/O, plug socket **86**, plug connection **87**, plug socket **88**, type magnet coil **60**, diode rectifier **57**, detent magnet coil **52**, to line **23**.

At 187° of each card feed cycle CR6 cam contacts close so that interposer magnet coil **72** may be energized. This circuit is from line **24**, through CR6 cam contacts, plug socket **89**, plug connection **90**, plug socket **91**, coil **72**, to line **23**.

At 195° of each card feed cycle CR7 cam contacts close so as to complete a circuit from line **24**, through the said cam contacts, print magnet coil **74**, to line **23**.

During each card feed cycle, after printing time, CR5 circuit breaker cam contacts close in order to reset the printing wheel **30** (Fig. 1) to a zero setting, i. e., a starting position. This circuit is from line **24**, through CR5 cam contacts, reset contacts **92**, open only when printing wheel **30** is at a zero setting, diode rectifier **58**, group magnet coil **51**, diode rectifier **56**, detent magnet coil **52**, to line **23**.

Rectifiers **56**, **57** and **58** are used to prevent back circuits which would occur if two or more printing position circuits were connected.

Referring generally to Figs. 1 and 6, and more specifically to Fig. 5, the method by which characters and symbols are printed will be explained in detail.

At 360° of each card feed cycle, printing wheel **30** is positioned after reset so that the numeral zero is at the printing station, i. e., in alignment with platen **66**. When a card hole representing a digit 9 to 1, e. g., a 9 digit, is sensed by the LB analyzing brush **17** connected to coil R1–P, the said coil will be energized at 7½° when CR1 circuit breaker cam contacts close. Immediately thereafter when the contacts R1–1 close, magnet R1 is maintained in a picked condition through CR2 cam contacts until 141½°. In addition to the foregoing, at 15° CR3 circuit breaker contacts start to distribute a series of nine successive electrical impulses to group coil **51** and detent coil **52**. As explained hereinbefore, each impulse will cause pawl **45** (Fig. 1) to move to the right so as to advance printing wheel **30** one group position for each impulse. Therefore, at 142½° the said printing wheel will be positioned so that the numeral 9 is at the printing station. It should be evident at this time that a card hole representing an 8 digit will allow coil R1–P to become energized at 22½° so as to advance printing wheel **30** eight group positions, a 7 digit will allow coil R1–P to become energized at 37½° so as to advance the printing wheel seven group positions, etc.

When a card hole representing a zone 0, X or R, e. g., an X, is sensed by the LB analyzing brush **17** connected to coil R1–P, the said coil will be energized at 157½° when CR1 cam contacts close. Immediately thereafter when contacts R1–1 close, magnet R1 is maintained in a picked condition through CR2 contacts until 186½°. In addition to the foregoing, at 165° CR4 circuit breaker contacts start to distribute a series of two successive electrical impulses to type coil **61** and detent coil **52**. As explained hereinbefore, each impulse will cause pawl **46** (Fig. 1) to move downwardly so as to correspondingly advance the printing wheel **30** one type position. Therefore, for the given example, at 187½° the said printing wheel will have been advanced nine group positions as aforedescribed and two type positions so that the character R is at the printing station.

Interposer magnet coil **72** may be energized at 187½° so that printing may be effected at 195° when CR7 contacts close if the electrical connection between sockets **89** and **91** is complete. Means, e. g., class selection, well known to persons familiar with this art may be used to effect selective printing.

After printing time, printing wheel **30** is reset to its designated starting position in readiness for movement during the subsequent printing cycle. To accomplish this reset, contact **92**, open only when printing wheel **30** is at zero setting, permit CR5 cam contacts to distribute a series of impulses to group magnet coil **51** and detent coil **52** until the high lobe of cam **37** (Fig. 1) acts upon the lower strap of contact **92** so as to open the said contact. The said high lobe of cam **37** opens contact **92** when the numeral zero type on the printing wheel is positioned at the printing station. Thus, for example, after printing the character R, group magnet coil **51** will be impulsed at 217½° when CR5 cam contacts close. The first impulse therethrough will advance the printing wheel two type positions. Due to the fact that the aforesaid movement positions the character zero at the printing station, cam contact **92** will be opened by the high lobe of cam **37**, thereby preventing any subsequent CR5 cam contact reset impulses to energize group coil **51**. As the CR5 cam contacts complete a circuit by which group coil **51** may be successively impulsed a maximum of ten times, the printing wheel **30** may reset from any type position.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a printing machine of the class described, a type member having a sequence of equally spaced type thereon in groups each having an equal number of type; an electrical switch; a camming element mounted in said machine for movement with said type member so as to operate said switch when said type member is at a predetermined starting position; a first pawl and ratchet mechanism for advancing said type member one group position; a second pawl and ratchet mechanism for advancing said type member one type position; a first electromagnetic assembly for controlling said first pawl and ratchet mechanism whereby said type member is moved step-by-step a variable number of group positions; a second electromagnetic assembly for controlling said second pawl and ratchet mechanism whereby said type member is moved step-by-step a variable number of type positions; means for transmitting character representing impulses; a first electrical means controlled by said character transmitting means for successively pulsing said first electromagnetic means so as to effect step-by-step movement of said type member from the predetermined starting position to a select group of type corresponding to the number of pulses transmitted; a second electrical means controlled by said character transmitting means for successively pulsing said second electromagnetic means so as to effect step-by-step movement of said type member to select a predetermined type of the selected group for printing; means for effecting a printing operation; and a third electrical means controlled by said switch for successively pulsing said first electromagnetic means after a printing operation so as to effect step-by-step movement of said type member back to the predetermined starting position, whereat said switch is operated by said camming element to disable said third electrical means.

2. In a cyclically operable, record card controlled impulse type printer having a station for sensing numeric and zone indicia carried on a card, and feeding means for advancing a card past said station each machine cycle; the combination of a type wheel having a sequence of equally spaced type arranged along the periphery thereof in groups each corresponding to one of said numeric indicia, and each having an equal number of type corresponding to one of said zone indicia; an electrical switch; a camming element for operating said switch and mounted for movement with said type wheel so as to disable said switch whenever said type wheel is at a prede-

termined starting position; a first pawl and ratchet mechanism for advancing said type wheel one group position; a second pawl and ratchet mechanism for advancing said type wheel one type position; a first electromagnetic assembly for controlling said first pawl and ratchet mechanism whereby said type wheel is moved step-by-step a variable number of group positions each machine cycle; a second electromagnetic assembly for controlling said second pawl and ratchet mechanism whereby said type member is moved step-by-step a variable number of type positions each machine cycle; means controlled by said card sensing station for transmitting during a machine cycle character representing impulses corresponding to the numeric and zone indicia sensed on a card during the same machine cycle; a first electrical means controlled by said character transmitting means for successively pulsing said first electromagnetic means so as to effect step-by-step movement of said type wheel from the predetermined starting position to select a related group of type during the same machine cycle that the card is sensed; a second electrical means effective during the aforesaid machine cycle but after said first electrical means, and controlled by said character transmitting means for successively pulsing said second electromagnetic means so as to effect step-by-step movement of said type wheel to select a predetermined type of the selected group for printing; means operative to cause a printing operation after said first and said second electrical means are effective during the said machine cycle whereby a character corresponding to and represented by the sensed numeric and zone indicia is printed on a record sheet; a third electrical means effective during the aforesaid machine cycle after a printing operation, and controlled by said switch to successively pulse said first electromagnetic means so as to effect step-by-step movement of said type wheel to the predetermined starting position whereat said switch is disabled by said camming element to render said third electrical means ineffective; and type wheel detent means including a governing electromagnet therefor which is commonly connected to said first, said second, and said third electrical means, so that said type wheel is released for step-by-step movement whenever said first and said second electromagnetic means are pulsed.

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