March 31, 1964 L. E. PALMER 3,126,998

ESCAPEMENT MECHANISM FOR TYPEWRITER

Filed Oct. 17, 1961 3 Sheets-Sheet 1

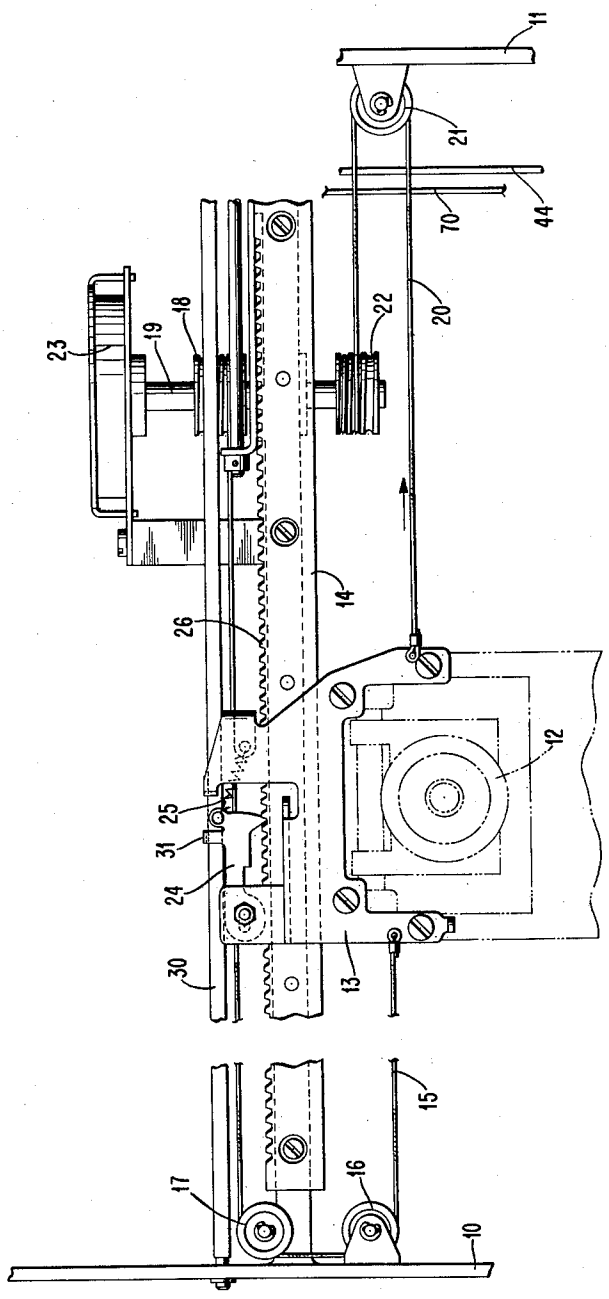


FIG. 1

INVENTOR.
LEON E. PALMER

BY W. E. Sherwood

ATTORNEY.

March 31, 1964 L. E. PALMER 3,126,998

ESCAPEMENT MECHANISM FOR TYPEWRITER

Filed Oct. 17, 1961 3 Sheets-Sheet 2

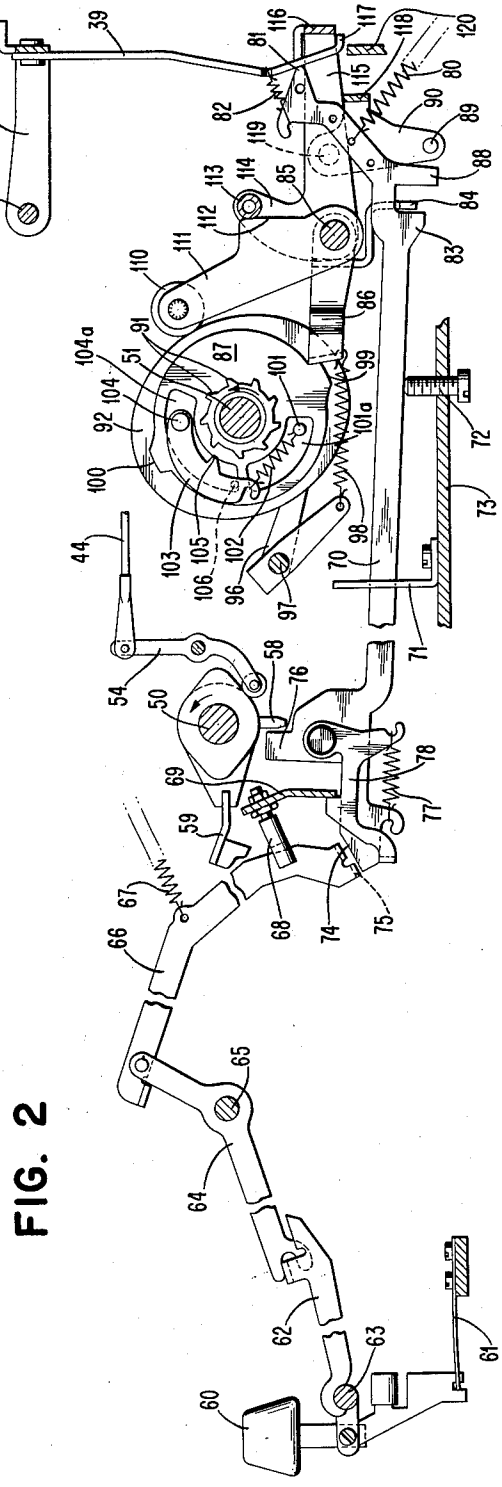


FIG. 2

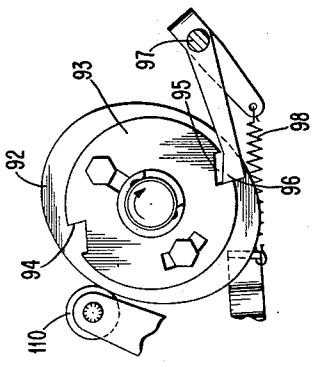


FIG. 5

March 31, 1964 L. E. PALMER 3,126,998

ESCAPEMENT MECHANISM FOR TYPEWRITER

Filed Oct. 17, 1961 3 Sheets-Sheet 3

FIG. 4

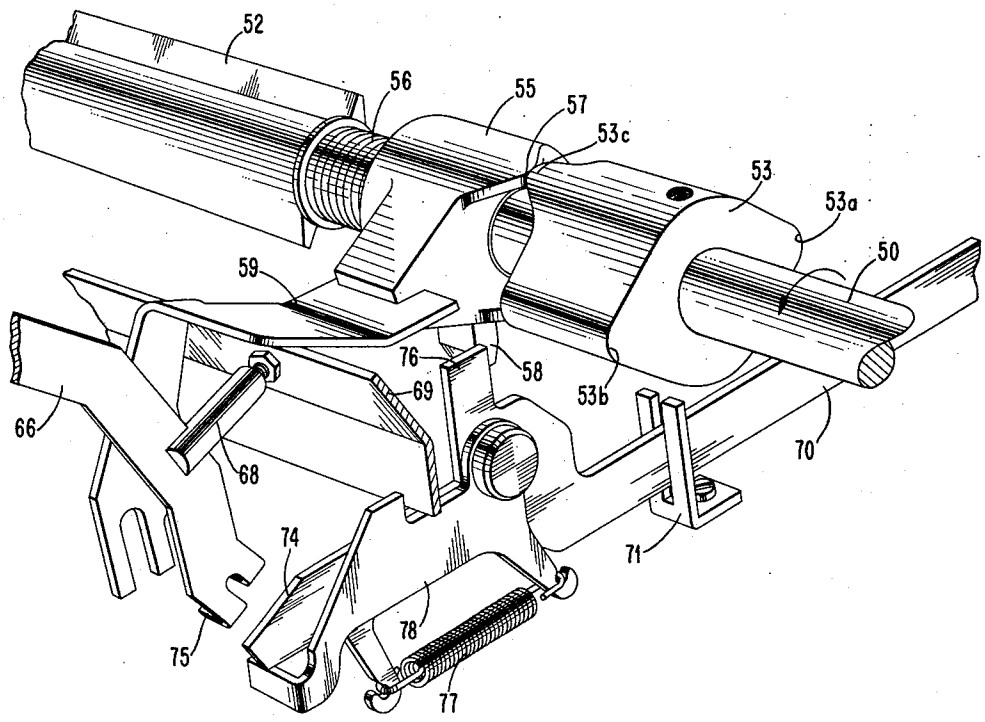
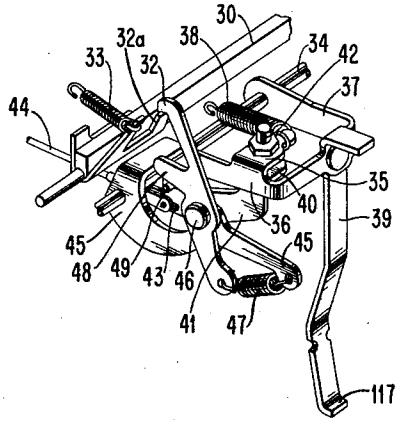


FIG. 3



United States Patent Office 3,126,998 Patented Mar. 31, 1964

3,126,998

ESCAPEMENT MECHANISM FOR TYPEWRITER

Leon E. Palmer, Lexington, Ky., assignor to International Business Machines Corporation, New York, N.Y., a corporation of New York

Filed Oct. 17, 1961, Ser. No. 145,706
7 Claims. (Cl. 197—82)

This invention relates to typewriters and more particularly to escapement mechanisms having an inherent time delay action especially well suited for use with typewriter space bars.

In typewriters employing a single element type head like that shown in U.S. Patent 2,919,002, issue to L. E. Palmer on December 29, 1959, a certain lapse of time occurs after a letter key is struck by the typist and before escapement takes place, such a time period normally being in the order of about 40–50 milliseconds. The letter key cycle entails a positioning of the head and a typing of a character before escapement can take place. With respect to the space bar cycle, however, escapement normally takes place within a time lapse of about 20–30 milliseconds since there is no need for delay. Due to the substantial difference between these two periods of time, it is found that without corrective measures being present it is possible for the typist to strike the space bar too soon following the striking of a letter key with the result that the escapement mechanism will receive impulses from two actuating sources and only one escapement will occur. In such an event the intended space between consecutive words will be lost despite the actuation of the space bar. It has been discovered that this disadvantage may be overcome by storing the impulse from the space bar until after the escapement action from the letter key is completed, and thereupon passing the space bar impulse to the escapement mechanism, whereupon the intended sequential operations of that mechanism are obtained.

An object of the invention is to provide an improved escapement mechanism for typewriters.

Another object is to provide an improved mechanism which operates to introduce a delay in the operation of an escapement mechanism resulting from actuation of a typewriter space bar until a print cycle which may then be taking place, has been completed.

A further object is to provide an improved arrangement for storing an escapement impulse from a typewriter space bar when the escapement mechanism is operating in response to actuation of a type key.

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 plan view, with portions broken away, of a carriage for a type member and means for effecting its escapement.

FIG. 2 is a cross sectional view of a keyboard having the improved space bar escapement drive mechanism associated therewith.

FIG. 3 is a perspective view of an actuating means for an escapement mechanism associated with the carriage for the type head.

FIG. 4 is a perspective view of a mechanism controlling operation of the escapement mechanism.

FIG. 5 is an elevational view of a clutch as viewed from the side opposite that shown in FIG. 2.

The improved escapement mechanism disclosed herein forms part of a typewriter which is similar to that shown and described in the patent mentioned above. The typewriter includes the usual frame having a base and side members 10 and 11 mounting a keyboard having key

levers, not shown, which may be actuated to effect operation of a single element print head 12, shown in outline in FIG. 1, for printing characters corresponding to the levers actuated. The mechanisms for driving the head have not been shown since they form no part of the present invention. Print head 12 is mounted upon a carriage 13, which is slidably supported by a stationary bar 14 extending transversely of the typewriter. Connected to one side of the carriage is a flexible cable 15 which passes around pulleys 16 and 17 attached to the side frame 10, and then is wrapped around a pulley 18 fixed to a shaft 19.

Another cable 20 is connected to the carriage and passes around a pulley 21 attached to the side frame 11 at the opposite side of the machine. Cable 20 is then wrapped around a pulley 22 which is also fixed to the shaft 19. A spring motor 23 is connected to the shaft 19 and tends to rotate the latter in a direction to wind up cable 20 while paying out cable 15. It will be seen that this effects movement of the carriage 13 from left to right in a typing direction along the bar 14 when the escapement mechanism, later to be described, is suitably actuated. Pivotally mounted on the carriage is a dog 24 which is urged by a spring 25 into engagement with teeth 26 on the bar 14 for holding the carriage against movement by the motor 23 acting on the cables 15 and 20. When the dog 24 is moved out of engagement with one of the teeth 26 and then immediately released, the carriage 13 moves to the right until the dog engages the next adjacent tooth. This results in a movement of the print head 12 to its next printing position.

For moving the dog away from the teeth 26 there is provided a bail 30, FIGS.. 1 and 3, which is pivotally supported at its ends in the side frames 10 and 11 and is tiltable between a normal first position in which the dog engages with a tooth on the bar 14 and a tilted second position in which the dog is disengaged from that bar. Formed on the dog is a projecting portiotn 31 loosely hooking over the top edge of the bail so that a rocking of the latter to its second position results in a pivoting of the dog away from the teeth 26.

Adjacent the right end of the bail, and as best shown in the perspective view of FIG. 3, is a framework forming a portion of the escapement mechanism and including a hook member 32 having a lip releasably engageable with the top edge of a plate 32*a* fixed to the bail and serving to tilt the bail to its second position against the action of a restoring spring 33, whenever that framework itself is pivoted in one direction, as later to be explained. It will be understood that the framework includes structure employed to effect escapement action following the striking of a letter key, as well as escapement action comprehended by the present invention. For purposes of the present disclosure, the framework is shown as being pivotable about a rod 34 the axis of which is generally parallel to the tilting axis of the bail. Journalled upon this rod is a U-shaped member having a shelf 35 projecting into the space between its side arms 36 and 37, and with a biasing spring 38 attached thereto for holding the U-shaped member in an upward position. An arm 39, later to be described, is pivotally attached to the U-shaped member between the side arms. Underlying the shelf 35 is a second shelf 40 formed integral with another arm 41 pivotally mounted on rod 34, and by means of an adjustable spacing screw 42 carried by the upper shelf 35, downward movement of arm 39 causes a downward movement of arm 41 when the screw engages the lower shelf 40. The arm 41 is provided with a slot 43 receiving one end of a link 44 employed in the conventional escapement action following the striking of a letter key. As will thus be apparent, the actuation of the letter-key-link 44 may thus cause an escapement of

the carriage independently of any actuation by the space-bar-actuated means, and, due to the lost motion of link 44 in the slot 43, the framework may pivot downwardly to effect an escapement caused by the space-bar-actuated means independently of any actuation by the letter-key-actuated means.

The arm 41 is integrally connected to a spaced arm 45 which also is pivotally journalled on rod 34 and which at an intermediate location carries a pivot pin 46. The hook member 32 is pivotally mounted on pin 46 and by means of a tension spring 47 connected between the lower end of the hook member and the outer end of arm 45, the bail-engaging lip of the hook member is urged into bail-engaging position. For effecting a rapid release of the bail from the hook member, that hook member is provided with a cam projection 48 which moves against a stationary pin 49 attached to the typewriter frame and causes a rapid lifting of the lip of the hook member as the framework is pivoted to its downward position.

Referring now to FIGS. 2 and 4, a rotatable first shaft 50 which turns 180° in response to the striking of a letter key, and a constantly rotating second shaft 51, each of the shafts serving the respective purposes described in the aforementioned Palmer patent, are present in the typewriter with which the present invention is employed. Shaft 50 functions as a cyclically operable means and has rigidly attached thereto a fluted portion 52 serving in the positioning of the type head 12, as well as an escapement cam portion 53 having a pair of spaced cam lobes 53*a* and 53*b* serving to actuate the escapement link 44 when a letter key is actuated. As shown in FIG. 2, a lever 54 is rocked by one or the other of the cam lobes to actuate the link 44 after a character is typed. As a feature of the present invention, an open space is formed between the portions 52 and 53 on the shaft and an axially projecting cam lobe 53*c* extends into that space. Within that space a cylindrical shuttle member 55 encompassing the shaft 50 and reciprocable therealong is mounted, a compression spring 56 being interposed between the shuttle member and the fluted portion 52 of the shaft. The shuttle member, moreover, is provided with an axially projecting cam lobe 57 which when contacted by a cam lobe 53*c*, in one home position of shaft 50 as shown in FIG. 4, holds the shuttle member to the left in its retracted position against the action of spring 56, all for a purpose later to become apparent. As the shaft 50 turns 180° during the typing of a character, the shuttle member moves first to the right in FIG. 4 and then is returned to the position shown by a second cam lobe 53*c* diametrically opposite to that shown.

Rigidly attached to the shuttle member 55 is an abutment 58, and by means of a slot in the shuttle member and into which a flat plate 59 projects at all times, rotation of the shuttle member is prevented without interference with its reciprocable movement on shaft 50.

Considering now FIG. 2, a space-bar-actuated means or linkage, includes a space-bar 60 adapted upon being struck to move downwardly against the action of a restoring leaf spring 61. Pivotally attached to this bar is a lever 62 supported upon a rod 63 and with the distal end of the lever being engageable with one end of a bell crank 64 which in turn is supported upon and rotatable about a rod 65. The other end of the bell crank is pivotally attached to a pawl 66 which is biased by spring 67 acting upon the linkage in opposition to spring 61, the pawl being guided in its movement by means of a bifurcated guide 68 which conveniently may be mounted upon a stationary wall 69 the lower edge of which serves to latch the interposer now to be described.

This interposer may comprise an elongated narrow member 70 guided in a bifurcated guide 71, and resting upon the end of an adjustable screw or the like 72 mounted in a base portion 73 of the typewriter frame. At its end confronting the above described linkage, the interposer has a contact surface 74 adapted to be contacted

by a shoulder 75 on the pawl 66 (FIG. 4) and to receive therefrom an impulse moving that end of the interposer downwardly and rearwardly into unlatched position when the bar 60 is depressed. Extending upwardly from the interposer is a projection 76, and mounted upon the interposer and biased into normal latching position by means of a spring 77 is a latch member 78. A spring 80 normally urges the interposer rearwardly and holds a nose 81 of the interposer in contact with the arm 39 of the framework, this contact being further assisted by a tension spring 82 joining the interposer and arm 39, as best seen in FIG. 2.

Adjacent its rearward end, the interposer includes a first shoulder 83 adapted during the unlatched rearward movement of the interposer to contact one arm 84 of a bell crank pivoted upon a rod 85, the other arm 86 of that bell crank having an edge serving as a dog for a clutch member 87. Also adjacent its rearward end, the interposer includes a second shoulder 88 adapted to be contacted by a drive pin 89 projecting laterally from an arm of a restoring lever 90, later to be described.

The constantly rotating shaft 51 carries a ratchet wheel having teeth 91, and journalled upon that shaft is a cam member 92. Rigidly attached to one face of the cam 92, as seen in FIG. 5, is a plate 93 having recesses 94 and 95 therein and into which a dog 96 is adapted to engage with a ratchet-like action to prevent reverse rotation of the cam. The dog 96 is mounted upon a pin 97 and is provided with an angularly spaced arm integral with the dog 96 and mounting a tension spring 98, the other end of which is attached to the arm 86. Mounted between the other face of cam 92 and the ratchet wheel, is the clutch member 87 having projecting portions 99 and 100 into the path of which the dog 86 is urged under the action of spring 98. A pin 101 extending from the side of the cam through an elongated slot 101*a* in the cluch member mounts a tension spring 102 which is connected to an arcuate arm 103 pivoted upon another pin 104 extending from the cam through another slot 104*a*. This arm carries a tooth 105 which is engageable with one of the teeth 91 on the ratchet wheel when spring 102 is free to contract. The end of the slot 104*a* adjacent the free end of the arm 103 acts as a cam surface against which a pin 106 on the free end of the arm slides when the clutch member 87 and the cam 92 turn relative to each other. When the dog 86 is moved out of the path of the projecting portion 99, the pin 106 acting against the cam surface under the action of the spring 102 causes the clutch member to rotate counterclockwise relative to the cam 92 until the tooth 105 engages one of the teeth 91. This results in a driving of the cam 92 by the shaft 51 until the dog 86 again engages one of the projections and holds the clutch member while the cam 90 continues to turn until the arm 103 is forced outwardly by the pin 106 acting on the cam surface. As will thus be noted, the clutch arrangement immediately engages the arm 103 mounted on the cam 92 with the teeth 91 and causes the cam to rotate as soon as dog 86 is pulled from its locking engagement with the clutch member during the rearward movement of the interposer 70. This cam rotation continues until the dog 86 is re-engaged with the next projection on the clutch member, after which the tooth 105 is lifted out of engagement with the teeth 91 and the cam remains at rest until the dog 86 again is actuated.

Bearing against the edge of cam 92 at all times is a cam follower 110 pivotally mounted upon an arm 111 which in turn is pivoted upon the rod 85. This arm includes a cam surface 112 against which a cam follower 113 mounted upon one arm 114 of a framework-actuating bell crank is located. The other arm 115 of this bell crank, which also is pivoted upon rod 85, is provided with a laterally extending shoulder 116 positioned above a short rearwardly bent portion 117 at the lower end of the arm 39 of the framework. Thus, as the arm 115 rocks downwardly, as seen in FIG. 2, the portion 117 which is lodged

under shoulder **116**, due to previous movement of the unlatched interposer to the rear, will be forced downwardly by that shoulder **116** and the framework will be pivoted to cause the hook member **32** to actuate the bail. During this same downward movement of arm **115**, the lower edge of that arm strikes a laterally projecting shoulder **118** on the interposer-restoring lever **90** which is separately and pivotally mounted alongside the arm **115** upon a suitable pin **119**. The resultant pivoting of lever **90** causes its pin **89** to move against the shoulder **88** of the interposer and to drive that interposer to the left into its latched position. As the arm **115** moves downwardly with the lower end of the arm **39** under the shoulder **116**, the left side of the arm **39** moves in back of an upwardly projecting plate **120** which holds the arm **39** engaged with the shoulder **116** while the interposer **70** is being forced to the left. After the interposer has been moved to its latched position and the arm **115** has been moved upwardly to a position in which the arm **39** clears the plate **120**, the spring **82** operates to move the arm **39** from under the shoulder **116** and into engagement with the nose **81** on the interposer.

With the foregoing description in mind, reference now is made to FIG. 4 wherein it will be seen that the abutment **58** moves into and out of the path of movement of projection **76** on the interposer depending upon the angular position of shaft **50**. The motion of this shaft with its cam **53** which serves to actaute the link **44** for effecting escapement necessarily involves a predetermined period of time. It will further be noted that following the unlatching of the interposer from the wall **69** during a print cycle, the interposer may initially move to the rear only until the projection **76** comes into contact with the abutment **58** and that this amount of movement is insufficient to cause the shoulder **83** of the interposer to trip the dog **86** of the clutch (FIG. 2). The rotation of shaft **50** brings the cam lobes **53***a* and **53***b* alternately into position for effecting the actuation of the letter-key-actuated means, such as link **44**. Significantly, this same rotation causes the cam lobe **53***c* to move from its home position in contact with the cam lobe **57** on the shuttle **55**, causing the abutment **58** to move into obstructing position with respect to the projection **76** on the interposer **70** at the same time the escapement mechanism is receiving its impulse from the letter-key-actuated means. As soon as the printing and escapement resulting from actuation of a letter key has been completed, the abutment **58** is moved out of the path of the projection **76** and the interposer **70** continues its movement to effect escapement for the earlier actuated space bar.

It will also be appreciated that shaft **50** is in a position like that shown in FIG. 4 at the time the interposer **70** is restored to its latched position so that abutment **58** provides no obstruction to projection **76** during that restoring movement.

If no character print cycle is taking place when the space bar **60** is depressed, the interposer **70** is free to move immediately for effecting an escapement.

While there has been shown in this application one form which the invention may assume in practice, it will be understood that it may be modified and embodied in other forms without departing from the scope of the invention.

What is claimed is:

1. In a typewriter, a movable carriage having a single element type head thereon, an escapement mechanism for said carriage, cyclically operable means for effecting a printing operation by said type head, means driven by said cyclically operable means for actuating said escapement mechanism, space-bar-operated means for actuating said escapement mechanism independently of said driven means, and means positioned by said cyclically operable means during a cycle of printing operation for obstructing movement of said space-bar-operated means until the cycle of printing operation has been completed.

2. In a typewriter, a movable carriage having a single element type head thereon, an escapement mechanism for said carriage, cyclically operable means for effecting a printing operation by said type head and including a rotatable shaft, means driven by said shaft for actuating said escapement mechanism following a printing operation, space-bar-operated means for actuating said escapement mechanism independently of said driven means and including a longitudinally movable interposer, and a retractable means movable during each cycle of printing operation into the path of interposer movement thereby to obstruct movement of said interposer and to prevent operation of said escapement mechanism by said interposer until completion of said cycle of printing operation, said retractable means being movable by said shaft into retracted position out of the path of movement of said interposer following completion of each cycle of printing operation.

3. A typewriter as defined in claim 2 including means for latching said interposer in a position of readiness for subsequent operation of said space-bar-actuated means following completion of an escapement of said carriage caused by a previous movement of said interposer.

4. In a typewriter, a movable carriage having a single element type head thereon, an escapement mechanism for said carriage, cyclically operable means for effecting a printing operation by said type head and including a rotatable shaft having first and second cam members carried thereby and rotatable therewith, means driven by said first cam member for actuating said escapement mechanism following a printing operation, space-bar-operated means for actuating said escapement mechanism independently of said driven means and including a longitudinally movable interposer, and a retractable means movable during each cycle of printing operation into the path of interposer movement thereby to obstruct movement of said interposer and to prevent operation of said escapement mechanism by said interposer until completion of said cycle of printing operation, said retractable means being moved by said second cam into retracted position out of the path of movement of said interposer following completion of each cycle of printing operation.

5. A typewriter as defined in claim 4 wherein said retractable means comprises a shuttle member movable axially of and in surrounding relation to said shaft and being restrained against rotation with said shaft.

6. A typewriter as defined in claim 5 including a spring normally urging said shuttle member toward obstructing position within the path of movement of said interposer.

7. In a typewriter having a single element type head mounted upon a movable carriage, the combination comprising, an elongated tiltable bail, a stationary bar having teeth thereon extending along the path of movement of said carriage, teeth-engaging means mounted upon said carriage and biased toward teeth-engaging position, said teeth-engaging means being connected to said bail for movement lengthwise of the same and for actuation into and out of teeth-engaging position in dependence upon the degree of tilt of said bail, an escapement mechanism having a framework pivotable about an axis generally parallel to the axis of tilting of said bail; said framework having an actuating arm, a hook member releasably engageable with said bail for moving the same to its tilted position during pivoting of said framework in one direction, and means for moving said hook member normally into engagement with said bail during pivoting of said framework in its other direction; a movable space-bar-linkage; an elongated reciprocable interposer normally retained in latched position against a stationary portion of the typewriter frame and having a first portion engageable by said linkage for unlatching of said interposer, a second portion engageable with said arm on said framework, a latching means, and a rigid projection extending from said interposer; cyclically operable means for effecting a printing operation by said type head and including

a rotatable first shaft, a retractable abutment means movable during each cycle of printing operation into the path of movement of said projection, said abutment means being movable by said first shaft into retracted position out of the path of movement of said projection following completion of each cycle of printing operation, means normally urging said interposer toward said framework, the relative locations of said projection and of said abutment in their intersecting paths of movement providing sufficient space for unlatching of said interposer and for holding the projection of the unlatched interposer in contact with said abutment during a portion of the time of rotation of said first shaft thereby to cause a time lag in the movement of said bail to its tilted position, a rotatable second shaft having a clutch carried thereby in

normally disengaged relation thereto and including a cam, means operable by said interposer following movement of said abutment out of the path of said projection for temporarily engaging said clutch with said second shaft, and means operable by said cam, while said clutch is engaged with said second shaft, for engaging said actuating arm of said framework to pivot said framework in said one direction and for striking said interposer thereby to restore said interposer to its latched position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,388,253	Gumprecht	Aug. 23, 1921
1,560,031	Barney	Nov. 3, 1925