United States Patent [19]

Blum

[11] **3,814,228**

[45] **June 4, 1974**

[54] **REPEAT MECHANISM FOR A PRINTER**

[75] Inventor: **Rudolf Blum,** Nuernberg, Germany

[73] Assignee: **Triumph Werke Nuernberg A.G.,** Nuernberg, Germany

[22] Filed: **Nov. 21, 1972**

[21] Appl. No.: **308,554**

[30] **Foreign Application Priority Data**

Nov. 29, 1971 Germany 2159071

[52] **U.S. Cl.** **197/16,** 197/17, 197/107

[51] **Int. Cl.** **B41j 5/22**

[58] **Field of Search** 197/16, 17, 18, 107, 98, 197/108

[56] **References Cited**

UNITED STATES PATENTS

3,086,635	4/1963	Palmer	197/16
3,151,722	10/1964	Salto	197/17
3,306,417	2/1967	Gassino et al.	197/17
3,339,695	9/1967	Palmer	197/17
3,537,562	11/1970	Caudill et al.	197/17
3,721,327	3/1973	Werf et al.	197/16 X

OTHER PUBLICATIONS

IBM Customer Engineering Instruction Manuel, No. 241-5032-2, p. 16, January 1966.

Primary Examiner—Robert E. Pulfrey
Assistant Examiner—R. T. Rader
Attorney, Agent, or Firm—Keith D. Moore

[57] **ABSTRACT**

A type action of a single element printer is provided with a repeat mechanism which enables each type key to effect repeated printing of a corresponding type character. The depression of a selected type key initiates the operation of a character selection mechanism which determines the orientation of the print element to print the selected type character and at the same time operates a control means to enable a rotatable coupling means to cyclically drive the print element in an orienting movement to the orientation determined by the character selection mechanism and in a printing movement to impact the selected type character against a recording medium. The cyclical driving movement is determined by a camming surface on the rotating coupling means which operates on the control means at the end of the cycle so as to stop the rotational movement of the coupling means and conclude the printing operation. Repeated printing of the selected type character is effected by a repeat mechanism which operates upon the further depression of the type key to retain the control means in the actuated position so as to continue the rotational movement of the coupling member.

8 Claims, 3 Drawing Figures

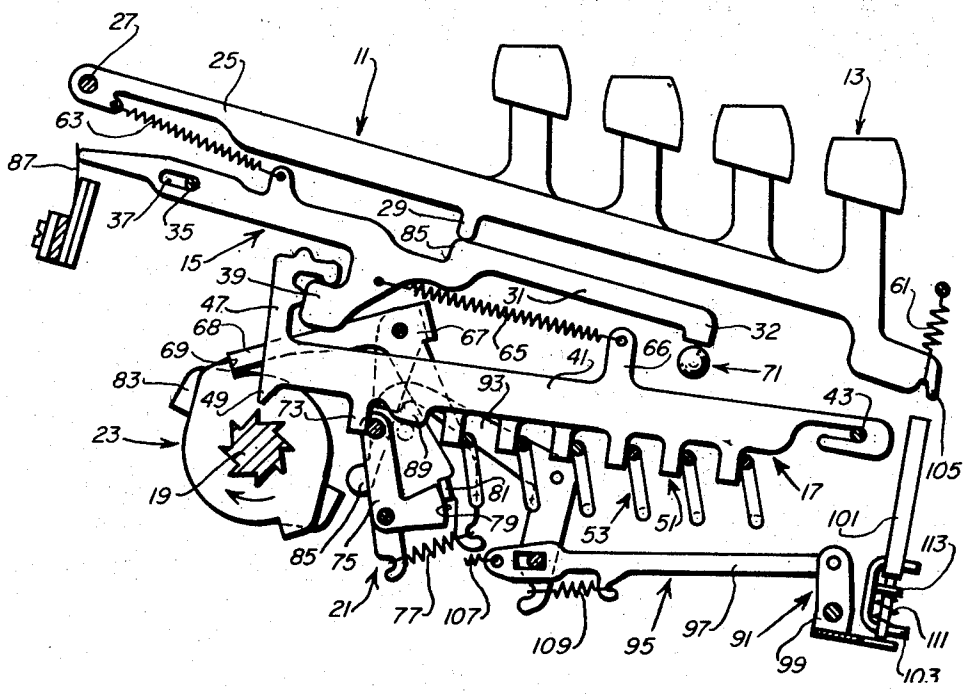


Fig_1

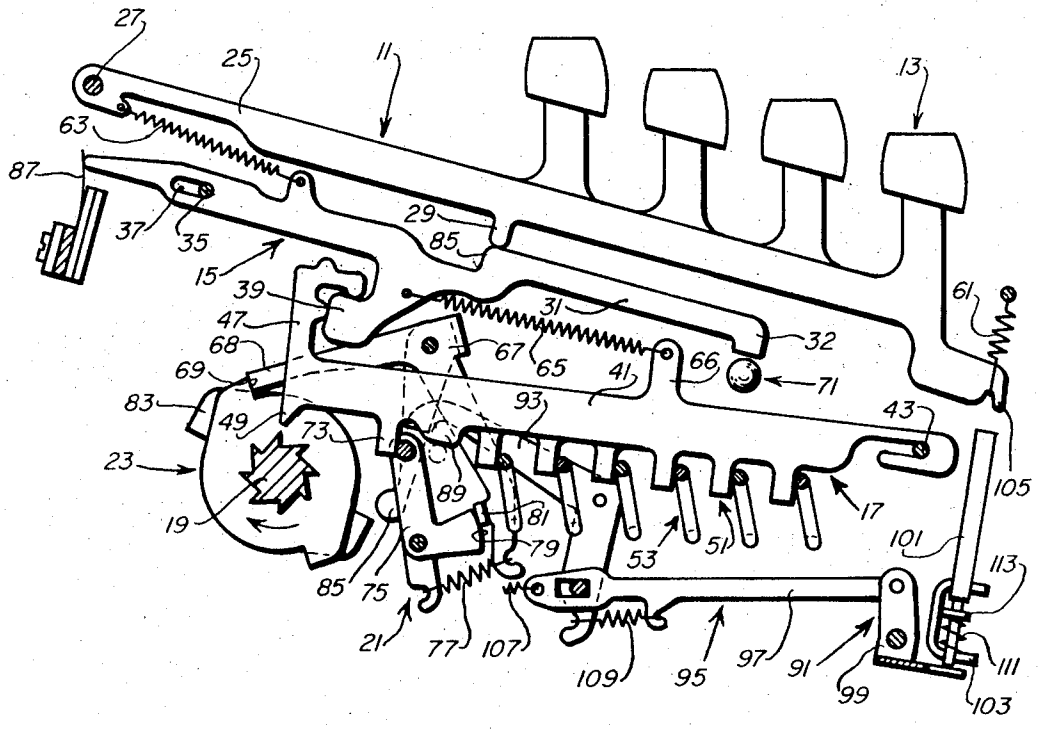

27
25
11
13
63
87
37
35
15
29
85
39
31
47
68
67
65
41
66
32
71
69
83
49
73
93
43
61
105
23
19
89
81
79
53
51
17
101
113
85
75
21
77
107
109
95
97
91
99
111
103

Fig_3

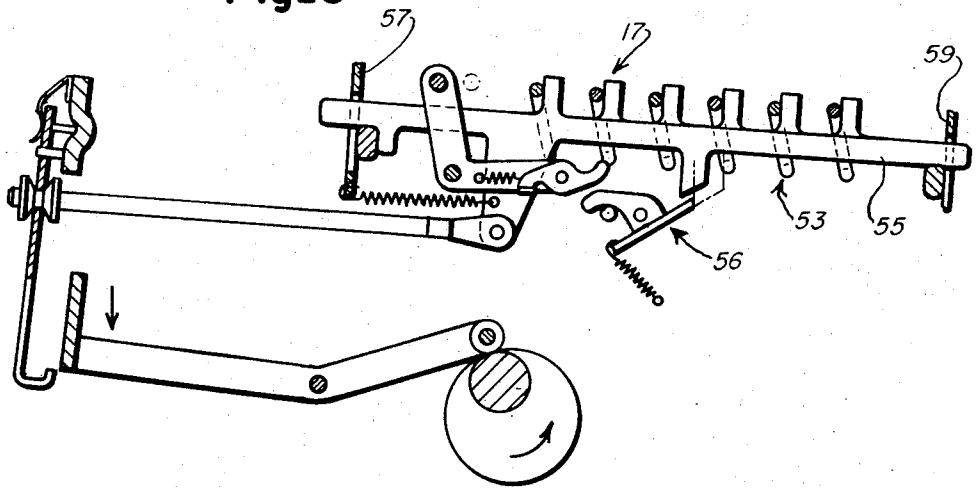
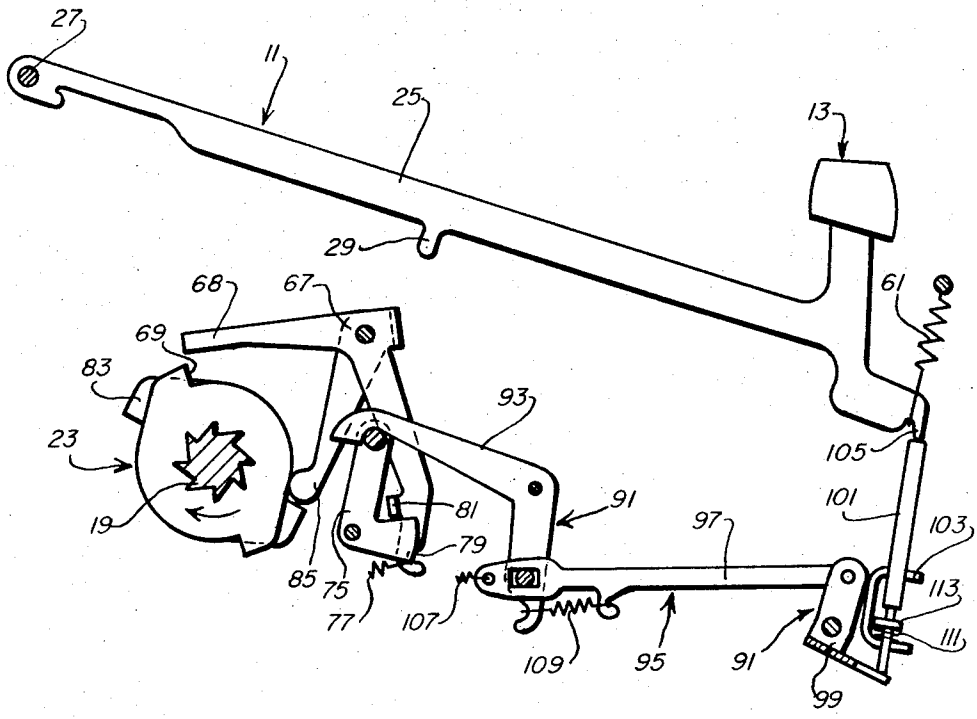

57
17
59
53
55
56

Fig_2


27
11
25
13
29
68
67
61
69
83
93
23
105
91
101
19
81
97
103
79
85
75
113
77
107
109
95
91
111
99

REPEAT MECHANISM FOR A PRINTER

This invention relates to a repeat mechanism in a power driven typewriter for effecting repeated printing of selected type characters, and more particularly to a repeat mechanism for a typewriter having a single print element with a plurality of different type characters at different positions wherein printing of a selected type character is effected by orienting the print element to position the selected type character for printing and driving the print element in a printing movement to impact the selected type character against a recording medium.

In a power driven typewriter, it is desirable to provide a plurality of type keys with the capability of effecting repeated printing of corresponding type characters, and it is also desirable to provide the type keys with the capability of being operated during an ongoing printing operation so as to set the next type character to be printed upon completion of the ongoing printing operation. However, in a single element typewriter the proper orientation of the print element for printing a selected type character is determined by the operation of a character selection mechanism, and the operation of the character selection mechanism is likely to be disrupted by the operation of another type key during an ongoing printing operation and result in the printing of an erroneous type character.

In the past, to enable a plurality of type keys of a single element printer to effect repeated printing, it has been necessary to provide the printer with a special repeat key which must be depressed in conjunction with a selected type key so as to hold the character selection mechanism in an operated position to prevent the operation of another type key from interfering with an ongoing printing operation. Such an arrangement is shown in U.S. Pat. No. 3,339,695. However, the use of a special repeat key is undesirable because it complicates the operation of the keyboard in a manner tending to reduce the typing speed of a typist as well as requiring additional space in a complex and crowded typewriter.

Accordingly, an object of the present invention is to provide a single element typewriter with a repeat mechanism enabling a plurality of type keys to each directly effect repeated printing of the associated type characters without the simultaneous operation of a special repeat key.

Another object of the invention is to provide a single element typewriter with a repeat mechanism capable of effecting repeated printing of a selected type character without being disrupted by the operation of another type key during an ongoing printing operation.

Still other objects, features and advantages of the present invention will become apparent to those skilled in the art from a reading of the following detailed description of a preferred embodiment, taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a sectional view of a type action constructed in accordance with the present invention for effecting repeated printing of a selected type character, and illustrating the condition of the type action in the normal rest position;

FIG. 2 is a partial sectional view of the type action shown in FIG. 1 and illustrating the condition of the type action during the repeated printing of a type character; and

FIG. 3 is a partial sectional view of another portion of the type action shown in FIG. 1 and illustrating the condition thereof in a normal rest position.

Referring now in detail to the figures in the drawing, there is shown a type action, generally indicated **11**, for controlling the printing operation of a single print element typewriter, not shown, and effecting repeated printing of selected type characters. As is conventional, the single print element has a plurality of type characters formed thereon at different positions, and the printing of a selected type character is effected by orienting the print element to bring the selected type character into position for printing while driving the print element in a printing movement to impact the selected type character against a recording medium. The type characters formed on the print element have corresponding type keys, generally indicated **13**, which are located on a keyboard, not shown, with each type key forming a part of a type key means, generally indicated **15**, associated with a type character on the single print element, and the printing of a selected type character is initiated by depressing the corresponding type key **13**. Although only a single type action is illustrated in the drawing, it is to be understood that each type key **13** operates a similar type action **11** associated with different type characters on the single print element.

As explained below in further detail, the depression of a selected type key **13** causes a character selection means, generally indicated **17**, to be driven in an operating movement by a rotatable drive means in the form of a snatch roll **19** rotatably driven by a suitable motor, not shown, to determine the proper orientation of the print element for printing the selected type character. The operating movement of the character selection means **17**, actuates a control means, generally indicated **21**, to enable a coupling means, generally indicated **23**, to apply driving movement to the print element to orient the print element to the position determined by the character selection means **17** as well as to drive the print element in a printing movement to impact the selected type character against the recording medium. The print element, the recording medium, the motor and other portions of the typewriter are not shown since they form no part of the present invention and may be desirably conventional.

As shown, the type key **13** is carried on a keylever **25** which is pivotally supported at a forward end **27** thereof and has a projection **29** for engaging another portion of the key means **15** in the form of an intermediate key member **31**. The intermediate key member **31** is slidably and pivotally supported about a rod **35** which is received in a slot **37** formed in the member **31** which also has a lower projection **39** for engaging the character selection means **17**. The character selection means **17** includes an interposer **41** which is supported for movement about a rod **43** which is received in a slotted portion at the rearward end of the interposer **41** while the forward end of the interposer **41** is held in a rest position by a hooked portion **47** engaging the lower projection **39** of the intermediate member **31**. The forward end of interposer **41** has a tooth **49** for engaging the rotating snatch roll **19** to effect a sliding operating movement along the rod **43**. In addition, a plurality of lugs, generally indicated **51**, are formed on the interposer **41** for engaging a series of coding rockers, generally indicated **53**, which are pivotally supported for moving corresponding code selector members **55**

which may be slidably supported between a pair of brackets **57, 59** located to one side of the keyboard area of the typewriter. As is conventional, the selector slides **55** are common to a plurality of type actions and correspond to the positions of the type characters on the single print element and serve to operate further mechanisms, not hereinafter described, for controlling the orienting movement of the single print element. In addition, the interposer **41** has another depending lug **73** for actuating the control means **21** during an operating movement of the interposer **41** to enable the coupling means **23** to apply a driving movement to the single printing element. Although not shown, the plurality of other type actions **11** operated by the other type keys **13,** referred to hereinabove, each include corresponding keylevers **25,** intermediate key members **31** and interposers **41,** which are mounted in side-by-side relation, while the rotating snatch roll **19** and the coding rockers **53** are common to the plurality of type actions **11** and extend transversely thereto beneath the side-by-side mounted interposers **41.**

In the rest position, the keylever **25** is normally urged upwardly to a raised position by resilient biasing means in the form of a spring **61** stretched between the rearward end of the keylever **25** and a suitable portion of the typewriter frame while the intermediate key member **31** is urged upwardly and forwardly by another spring **63** stretched between a suitable portion of the keylever **25** and the intermediate key member **31** so as to move the intermediate key member **31** forwardly until one end of the slot **37** abuts the rod **35.** The interposer **41** is normally maintained inoperative by the raised position of the intermediate key member **31** and is urged forwardly to a rest position by resilient biasing means in the form of a spring **65** stretched between a suitable portion of the intermediate key member **31** and a suitable projection **66** formed on the interposer **41.** The coupling means **23** is supported for rotational movement relative to the rotating snatch roll **19** and is rotatably driven to effect movement of the single print element. To prevent rotational movement of the coupling means **23,** the control means **21** includes a coupling controller **67** having a blocking arm **68** which engages a stop abutment **69** of the coupling means **23.**

When the type key **13** is depressed to initiate the printing of a selected type character, the projection **29** on the pivoting keylever **25** pivots the intermediate key member **31** and forces a rearward portion **32** into a conventional ball ratchet, generally indicated **71,** which serves as an interlock preventing more than one intermediate key member **31** from being depressed at a given time. The pivoting of the intermediate key member **31** moves the interposer **41** downwardly and brings the tooth **49** into engagement with the rotating snatch roll **19** which drives the interposer **41** rearwardly in a sliding operating movement. With the operating movement of the interposer **41,** the lugs **51** pivot the coding rockers **53** and cause corresponding code selector members **55** to slide from a rest position to an operated position to operate additional mechanisms determining the orientation of the single print element for printing the selected type character. As the code selector members **55** move to the operated position, they become latched in the operated position by suitable latch means, generally indicated **56.** In addition, as the interposer **41** is driven rearwardly by the rotating snatch roll **19,** it moves the intermediate key member **31** from the ball ratchet **71** to enable a type key **13** of another type action **11** to be depressed, while the depending lug **73** actuates the control means **21** to remove the blocking arm **68** of the coupling controller **67** from blocking engagement with the stop **69,** thus enabling the coupling means **23** to be rotatably driven to effect the orienting and printing movements of the single print element.

As more particularly shown in FIGS. **1** and **2,** the control means **21** includes a pivotally supported actuating member **75** which may be located at one side of the keyboard with a rod-like portion extending laterally beneath the interposer **41** for being engaged by the projection **73** during the operating movement of the interposer **41.** The actuating member **75** and the coupling controller **67** are connected for movement with each other by resilient means in the form of a spring **77** stretched between depending portions of the actuating member **75** and the coupling controller **67.** When the actuating member **75** is in the rest position, as shown in FIG. **1,** the blocking arm **68** of the coupling controller **67** is maintained in engagement with the stop **69** by an abutment **79** formed on the actuating member **75** and engaging a projection **81** on the coupling controller **67.** When the actuating member **75** is moved to the actuated position, as shown in FIG. **2** by the movement of the interposer **41,** the abutment **79** moves past the projection **81** to enable the urging of the spring **77** to pivot the coupling controller **67** and remove the blocking arm **68** from engagement with the stop **69,** thus enabling the coupling means **23** to be rotatably driven to drive the single print element in orienting and printing movements.

As the printing element is driven in orienting and printing movements during a printing operation, the cycle of the printing operation is defined by a camming surface **83** formed on the rotating coupling means **23.** When the actuating member **75** is pivoted to the actuated position, as shown in FIG. **2,** the accompanying movement of the coupling controller **67** brings another arm **85** thereof into engagement with the camming surface **83.** The arm **85** serves as a cam follower and slides along the rotating camming surface **83** which moves the coupling controller **67** at the end of the printing cycle to bring the blocking arm **68** into blocking engagement with the stop **69,** thus stopping the rotational movement of the coupling means **23** to conclude the printing cycle. As the coupling controller **67** moves into blocking engagement with the rotating coupling means **23,** the resilient urging of the spring **77** pivots the actuating member **75** from the actuated position to the rest position, thereby resetting the type action for another printing operation.

While the single print element is undergoing orienting and printing movements during the cyclical printing operation, the interposer **41** is returned to a rest position under the urging of the spring **65** in preparation for the operation of another type key means **15,** and the intermediate key member **31** is returned to the normal rest position under the urging of the spring **63** if the type key **13** is no longer depressed. If the type key **13** remains depressed, then the intermediate key member **31** is prevented from returning to the rest position by the depending projection **29** which engages a shoulder **85** formed in the intermediate key member **31,** thus preventing the rearward portion **32** of the intermediate key member **31** from again moving into the ball ratchet

71. With the removal of the rearward portion 32 of the intermediate key member 31 from the ball ratchet 71, another type key means 15 may be operated to program another type character for printing. As more particularly shown in FIG. 1, the pivoting of an intermediate key member 31 moves the rearward portion 32 into the ball ratchet 71 while the forward portion of the intermediate key 31 is latched into the pivoted position by a suitable detent, in the form of a leaf spring 87. However, during an ongoing printing operation the interposer 41 is prevented from undergoing an operating movement by the laterally extending rod-like portion of the actuating member 75. When the actuating member 75 moves to the actuated position, the laterally extending portion moves into blocking relation with a suitable abutment 89 formed on each interposer 41 to prevent an interposer 41 of another type action from moving into engagement with the rotating snatch roll 19.

In accordance with the present invention, repeated printing of the selected type character is effected by operation of a repeat means, generally indicated 91, which retains the actuating member 75 in the actuated position to enable the coupling controller 67 to move freely in accordance with the rotating camming surface 85 while being urged to the operated position by the spring 77 connecting the depending portions of the actuating member 75 and the coupling controller 67. As more particularly shown in FIG. 2, the repeat means 91 includes a holding means in the form of a pawl 93 which is pivotally supported for movement from a rest position, as shown in FIG. 1, to an operated position, as shown in FIG. 2, to hold the actuating member 75 in the actuated position. The pawl 93 is operated by a repeat linkage means, generally indicated 95, which includes a pull rod 97 connecting the pawl 93 to a pivotally supported bar 99 which extends transversely beneath the plurality of type actions 11 and may be operated by a plunger 101 associated with the type action 11. Although only a single plunger 101 is shown, it is to be understood that a plurality of type actions 11 may have a corresponding plunger 101. The plungers 101 are slidably supported in a bracket 103 for engagement by a nose portion 105 formed on the type key-lever 25. The pull rod 97 and the pivotally supported bar 99 are normally maintained in rest position by resilient biasing means in the form of a spring 197 stretched between the pull rod 97 and a suitable portion of the typewriter frame, while the pawl 93 is maintained in a rest position by a spring 109 stretched between suitable portions of the pull rod 97 and the pawl 93. The plunger 101 is normally maintained in a raised position by a spring 111 which is coiled around the plunger 101 between a flange 113 formed thereon and the bracket 103.

In operation, repeated printing of the selected type character is effected by depressing the type key 13 to a repeat position, as shown in FIG. 2, so as to press the nose portion 105 of the keylever 25 downwardly against the plunger 101 to pivot the bar 99 and move the pawl 93 from the rest position to the holding position to retain the actuating member 75 in the actuated position. With the actuating member 75 held in the actuating position, the blocking arm 68 of the coupling controller 67 moves freely in accordance with the rotational movement of the camming surface 83 and is repeatedly operated under the urging of the spring 77 so as to be moved from blocking engagement with the stop 69 on the coupling means 23, thus enabling repeated rotational movement of the coupling means 23. The repeated printing continues until the type key 13 is no longer depressed and returns under the urging of the spring 61 to the normal rest position shown in FIG. 1, whereupon the holding pawl 93 is returned to the rest position under the urging of the spring 107 thus enabling the coupling controller 67 to return the actuating member 75 to the rest position at the conclusion of a printing cycle, as previously described.

What is claimed is:

1. In a single element printer, the combination comprising:

type key means for controlling the printing of a type character and including a type key lever depressible to initiate the printing of the type character,

character selection means including code selector members corresponding to the different positions of a plurality of type characters on a print element and being movable from a rest position to an operated position for determining the orientation of the print element.

said character selection means further including an interposer associated with said type key lever and being movable from a rest position in response to the depression of said type key lever for an operating movement to move said code selector members corresponding to the type character of said type key lever from the rest position to the operated position to determine the orientation of the print element to print the selected type character,

coupling means for controlling the application of drive power to the print element to effect an orienting movement of the print element to the orientation determined by said character selection means and to effect a printing movement of the print element to a printing position to impact the selected type character against a recording medium,

said coupling means being movable to effect the orienting and printing movements of the print element and stationary to prevent movement of the print element,

control means normally blocking the movement of said coupling means and being actuated in response to the operating movement of said interposer for actuating the movement of said coupling means to effect the orienting and printing movements of the print element to print the selected type character,

said coupling means having a camming surface formed thereon for defining a printing cycle of the print element,

said control means having a cam follower engaging the camming surface during the movement of said coupling means for returning said control means to blocking relation with said coupling means at the end of the printing cycle to prevent further printing of the print element, and

said interposer being returned to the rest position upon completion of the operating movement to actuate said control means so as to enable said control means to return to blocking engagement with said coupling means upon completion of the printing cycle of the print element, and

repeat means operable in response to a further depression of said type key lever for retaining said control means in the actuated condition subsequent to the return of said interposer to the rest po-

sition to continue the movement of said coupling means so as to effect repeated printing movement of the print element.

2. In a single element printer according to claim 1:

said control means including an actuating member movable from a rest position to an actuated position in response to the operating movement of said interposer to prevent a subsequent operating movement of another interposer during the printing cycle so as to prevent a subsequent operation of said character selection means,

said actuating member normally being returned to the rest position at the end of the printing cycle as determined by the camming surface of said coupling means, and

said repeat means including holding means operable in response to the further depression of said type key lever for holding said actuating member in the actuated position to effect repeated printing of the selected type character.

3. In a single element printer according to claim 2:

said holding means being a pawl supported for movement between a rest position and a holding position for holding said actuating member in the actuated position,

said repeat means further including a repeat linkage means connected with said holding means for normaly maintaining said holding means in the rest position and being movable to effect movement of said holding means from the rest position to the holding position, and

said type key lever having a portion for engaging said repeat linkage means upon movement to a depressed repeat position for moving said repeat linkage means to effect movement of said holding means to the holding position.

4. In a single element printer, the combination comprising:

type key means for controlling the printing of a type character and being depressible to initiate the printing of the type character,

character selection means for determining the orientation of a print element having a plurality of type characters at different positions to print the type character corresponding to said type key means,

said character selection means including code selector members corresponding to the positions of the type characters on the print element and being movable from a rest position to an operated position for determining the orientation of the print element,

said character selection means further including an interposer associated with said type key means and being movable from a rest position in response to the operation of said type key means for an operating movement to move said code selector members corresponding to the type character of said type key means from the rest position to the operated position to determine the orientation of the print element to print the selected type character,

coupling means for controlling the application of drive power to the print element to effect an orienting movement of the print element to the orientation determined by said character selection means and to effect a printing movement of the print element to a printing position to impact the selected type character against a recording medium,

said coupling means being movable to effect the orienting and printing movements of the print element and stationary to prevent movement of the print element,

said control means normally blocking the movement of said coupling means and being actuated in response to the operation of said character selection means for actuating the movement of said coupling means to effect the orienting and printing movements of the print element to print the selected type character,

said control means including a coupling member for blocking the movement of said coupling means and being supported for movement between a blocking position and an enabling position.

said control means including an actuating member movable from a rest position to an actuated position in response to the operating movement of said interposer to prevent a subsequent operation of said character selection means by preventing a subsequent operating movement of said interposer during the printing cycle,

said coupling member having a portion for engaging said actuating member,

resilient biasing means for urging said coupling member into engagement with said actuating member for movement therewith,

said actuating member having an abutment formed thereon for maintaining said coupling member in the blocking position upon said actuating member being in the rest position,

said coupling member being urged to the enabling position by said resilient biasing means upon movement of said actuating member to the actuated position to serve the abutment from engagement with said coupling member,

said coupling means having a camming surface formed thereon for defining a printing cycle of the print element,

said control means having a cam follower engaging the camming surface during the movement of said coupling means for returning said control means to blocking relation with said coupling means at the end of the printing cycle to prevent further printing of the print element,

resilient biasing means for urging said interposer to the rest position upon completion of an operating movement,

said actuating member normally being returned to the rest position at the end of the printing cycle as determined by the camming surface of said coupling means,

repeat means operable in response to further depression of said type key means for retaining said control means in the actuated condition to continue the movement of said coupling means so as to effect repeated printing movement of the print element, and

said repeat means including holding means operable in response to the further depression of said type key means for holding said actuating member in the actuated position.

5. In a single element printer, the combination comprising:

a type key lever for controlling the printing of a type character and being depressible to initiate the printing of the type character,

an intermediate key member associated with said type key lever and being depressible from a rest position in response to the depression of said type key lever to an actuated position in blocking relation to the depression of another type key lever,

character selection means associated with said type key lever and operable in response to the depression of said intermediate key member for determining the orientation of a print element having a plurality of type characters at different positions to print the type character corresponding to said type key lever and for removing said intermediate key member from blocking relation to the depression of another type key lever,

coupling means for controlling the application of drive power to the print element to effect an orienting movement of the print element to the orientation determined by said character selection means and to effect a printing movement of the print element to a printing position to impact the selected type character against a recording medium,

said coupling means being movable to effect the orienting and printing movements of the print element and stationary to prevent movement of the print element,

control means normally blocking the movement of said coupling means and being actuated in response to the operation of said character selection means for actuating the movement of said coupling means to effect the orienting and printing movements of the print element to print the selected type character,

said coupling means having a camming surface formed thereon for defining a printing cycle of the print element,

said control means having a cam follower engaging the camming surface during the movement of said coupling means for returning said control means to blocking relation with said coupling means at the end of the printing cycle to prevent further printing of the print element, and

repeat means operable in response to further depression of said type key lever for retaining said control means in the actuated condition to continue the movement of said coupling means so as to effect repeated printing movement of the print element.

6. In a single element printer according to claim **5**:

said character selection means including code selector members corresponding to the positions of the type characters on the print element and movable from a rest position to an operated position for determining the orientation of the print element,

said character selection means further including an interposer associated with said intermediate key member and being movable from a rest position in response to the depression of said intermediate key member for an operating movement to move said code selector members corresponding to the type character of said type key lever from the rest position to the operated position to determine the orientation of the print element to print the selected type character and for removing said intermediate key member from blocking relation to the depression of another type key lever,

said control means including an actuating member movable from a rest position to an actuated position in response to the operating movement of said interposer to prevent a subsequent operation of said character selection means by preventing a subsequent operating movement of said interposer during the printing cycle,

resilient biasing means for urging said interposer to the rest position upon completion of an operating movement,

said actuating member normally being returned to the rest position at the end of the printing cycle as determined by the camming surface of said coupling means, and

said repeat means including holding means operable in response to the further depression of said type key lever for holding said actuating member in the actuated position to effect repeated printing of the selected character.

7. In a single element printer according to claim **6**:

said holding means being a pawl supported for movement between a rest position and a holding position for holding said actuating member in the actuated position,

said repeat means further including a repeat linkage means connected with said holding means for normally maintaining said holding means in the rest position and being movable to effect movement of said holding means from the rest position to the holding position,

said type key lever being supported for a depressible movement from a normal rest position to a depressed repeat position, and

said type key lever having a portion for engaging said repeat linkage means upon movement to the depressed repeat position for moving said repeat linkage means to effect movement of said holding means to the holding position.

8. In a single element printer according to claim **6**:

said control means including a coupling member for blocking the movement of said control means and supported for movement between a blocking position and an enabling position,

said coupling member having a portion for engaging said actuating member,

resilient biasing means for urging said coupling member into engagement with said actuating member for movement therewith,

said actuating member having an abutment formed thereon for maintaining said coupling member in the blocking position upon said actuating member being in the rest position, and

said coupling member being urged to the enabling position by said resilient biasing means upon movement of said actuating member to the actuated position to move the abutment from engagement with said coupling member.

* * * * *