

[72] Inventors **Kenneth R. Frechette;**
Daniel J. Rosborg, Bristol, Conn.
 [21] Appl. No. **765,755**
 [22] Filed **Oct. 8, 1968**
 [45] Patented **May 11, 1971**
 [73] Assignee **Litton Business Systems, Inc.**
New York, N.Y.

1,695,492	12/1928	Hokanson	197/17
1,789,661	1/1931	Schulze	197/17
1,818,200	8/1931	Dorsey	197/17
2,818,152	12/1957	Letterman.....	197/17
2,870,896	1/1959	Riffel.....	197/17
3,103,272	9/1963	Roggenstein.....	197/17
3,129,801	4/1964	Heyer.....	197/17

Primary Examiner—Edgar S. Burr

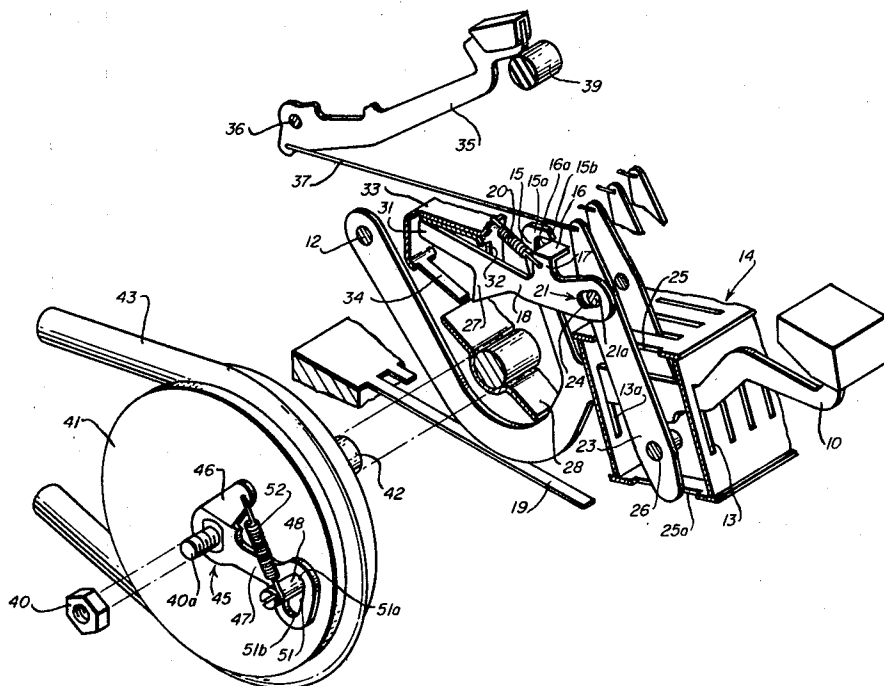
Attorneys—Joseph R. Spalla and Cornelius P. Quinn

[54] **TYPE ACTION HAVING LOST MOTION**
2 Claims, 2 Drawing Figs.

[52] U.S. Cl. 197/17
 [51] Int. Cl. **B41j 23/06**
 [50] Field of Search..... 197/17

[56] **References Cited**
UNITED STATES PATENTS
 1,455,112 5/1923 Crawley 197/17
 1,643,041 9/1927 Williams..... 197/17

ABSTRACT: An efficient type action for an electric typewriter characterized by an economy of parts, having a pawl adapted to be pulled into the tooth of a snatch roll by key lever depression, which is coupled to a type bar sublever by a lost motion pin and slot connection. The action is also associated with a resilient energy storing and controlled motion transmitting connection between a power source and the snatch roll.



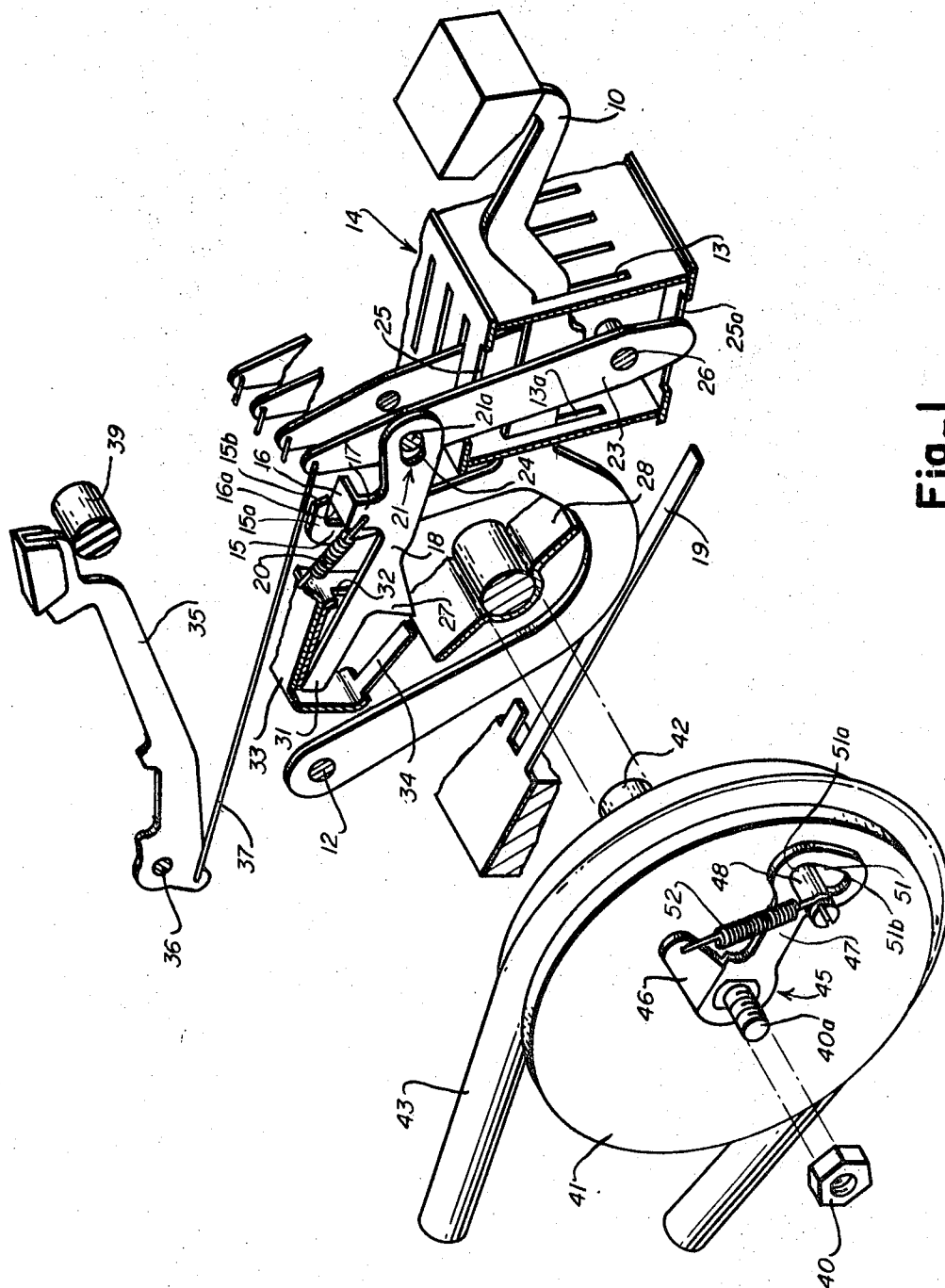


Fig. 1

INVENTORS
KENNETH R. FRECHETTE
DANIEL J. ROSBORG

BY *C. P. Gamm*
ATTORNEY

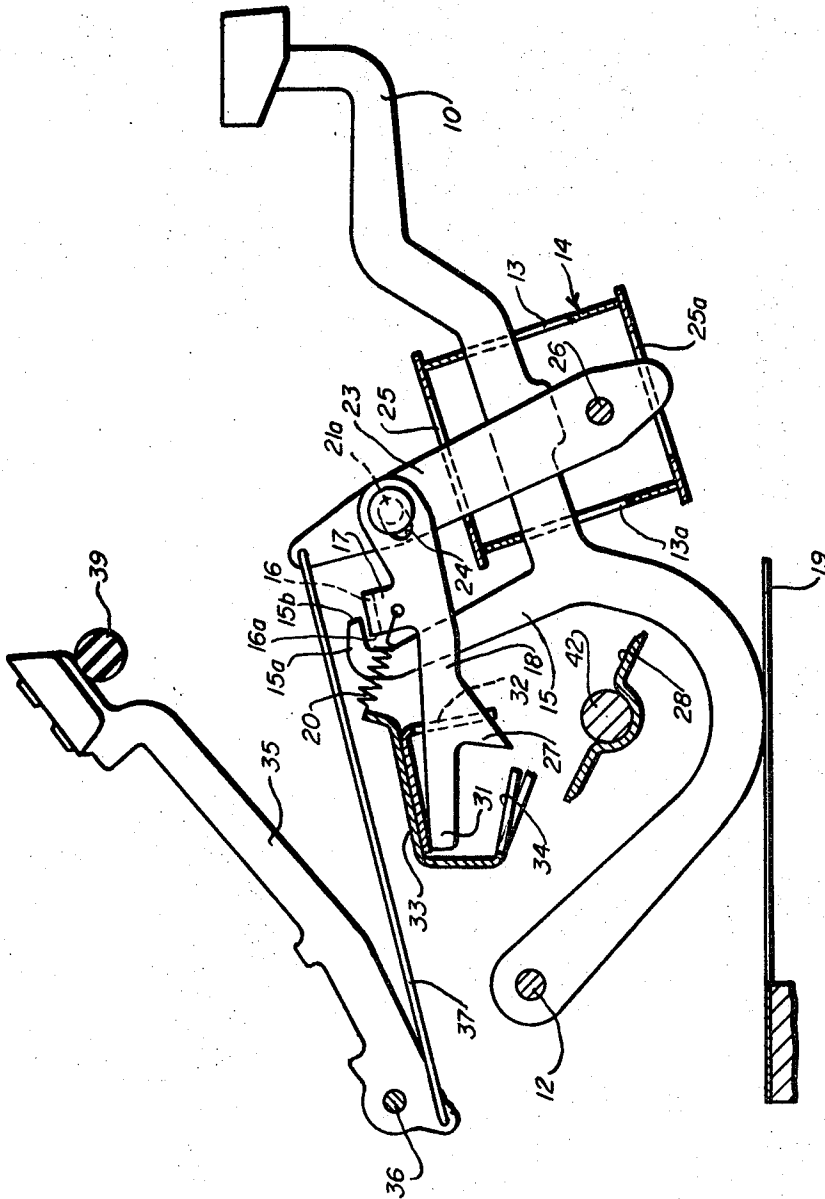
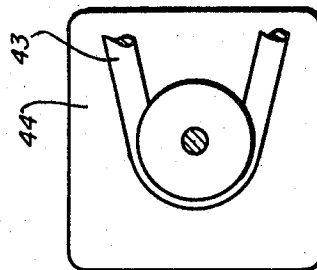
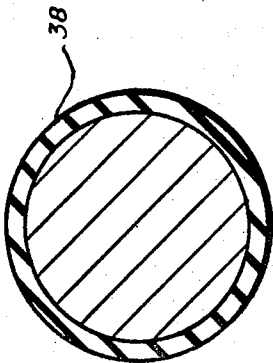


Fig. 2



INVENTORS
KENNETH R. FRECHETTE
DANIEL J. ROSBORG

BY *C. P. G. [Signature]*
ATTORNEY

TYPE ACTION HAVING LOST MOTION

BACKGROUND OF THE INVENTION

This invention relates to a powered type action and more particularly to a powered type action having a toothed snatch roll actuated pawl having a lost motion connection with a type bar sublever which serves to improve impression control, functions as a key lever bypass, and permits a simplified type action construction characterized by an economy of parts.

The perfection of a simplified low cost type action capable of producing quality printwork has long been sought in the typewriter industry. Since an electric typewriter of the type bar type normally includes at least 42 individual type actions, it is readily apparent that any simplification of the type actions characterized by the reduction of parts will normally result in a significant decrease in the number of parts and the assembly time necessary to build a typewriter, thereby effecting a substantial reduction in its total cost.

In conventional toothed snatch roll drive type actions, a pawl is pivotally coupled to a type bar sublever and is pulled into the path of a tooth of a continuously driven snatch roll in response to a key lever depression. In these conventional type actions a key lever bypass has normally been provided between the key lever and the pawl, and has usually taken the form of an intermediate lever interposed between the key lever and the pawl and adapted to allow the pawl to return to its normal position after the completion of a type action should the key lever be maintained overlong in a depressed condition.

In such machines adjustable impression control abutments have been provided to control the depth of pawl-tooth engagement, thus to regulate the interval of drive to the type bar. The adjustable abutments provided in type actions of the prior art to control the depth of pawl-tooth engagement have not always been effective, because quite often the pawl-tooth would be engaged by a tooth of the snatch roll and commence driving the sublever and the type bar before the pawl had the opportunity to contact an abutment, producing type impressions lighter than desired. To assure proper engagement before the transmission of drive, lost motion connections have been provided but have been relatively complicated.

While many attempts have been made in the past to reduce the number of parts through simplification of the key lever bypass and type action, none of the attempts made prior to the present invention have been completely successful without sacrifice to function.

Prior attempts to reduce the cost of manufacturing electric typewriters also include reducing the size of the electric motor employed to power the type actions, and driving the snatch roll through a flywheel mounted on the snatch roll. Unfortunately however, while such a power drive is more economical, its performance when used in conjunction with type actions of the prior art has been less than satisfactory. When the pawl of such a prior art type action comes into contact with the flywheel driven snatch roll, the pawl is normally jolted by the snatch roll producing an erratic type bar drive.

SUMMARY OF THE INVENTION

The simplified type action of the present invention has a pawl adapted to be pulled into the path of a tooth on a continuously rotated snatch roll in response to key lever depression and driven over an interval determined by the depth of pawl-tooth engagement. The pawl is, in accordance with the invention, coupled by a pin and slot connection to a type bar sublever. This particular location of the pin and slot connection enables the utilization of a single piece key lever to pull the pawl into engagement with the snatch roll, provides a key lever bypass characterized by an economy of parts, and also provides initial lost motion between the pawl and the sublever to assure the depth of pawltooth engagement to a preset degree. A resilient energy storing and controlled motion transmitting connection between a motor driven flywheel and the

snatch roll is provided to power the snatch roll. The spring constant of the resilient energy storing and controlled motion transmitting connection is adapted to limit the peak load carried by the snatch roll and delay transmission of power to the snatch roll to enable the snatch roll, when driving the sublever and the type bar to sequentially, angularly lag the motor driven flywheel, gradually resume the same velocity as the flywheel, and then move forward at a higher velocity than the flywheel until it returns to a normal angular position relative to the flywheel. This action coupled with the lost motion connection materially enhances the acceleration characteristics of the type bar.

Accordingly, an object of the present invention is to provide a simplified type action characterized by the elimination of parts normally required in type actions of the prior art without sacrifice of function or quality of printwork.

Another object of the present invention is to enhance the acceleration characteristics of a type action, by delaying the transmission of energy from a power source so as to enable the snatch roll, when driving the sublever and the type bar, to sequentially, angularly lag the motor driven flywheel, gradually resume the same velocity as the flywheel, and then move forward at a greater velocity than the flywheel until it returns to a normal angular position relative to the flywheel.

Still another object of the present invention is to provide a simplified type action which is much simpler in design and easier to assemble than conventional type actions.

A further object of the present invention is to provide a simplified type action which produces quality printwork, yet is much more economical to manufacture than type actions of the prior art.

A still further object of the present invention is to provide a type action which assures the attainment of a present pawl tooth engagement thus controlling type bar impression in a more efficient manner than was previously possible.

Other objects and advantages of the present invention will become readily apparent to those skilled in the art from the following description of a preferred embodiment of the invention taken in conjunction with the drawing, which forms a part thereof.

IN THE DRAWING

FIG. 1 is a perspective view of a portion of an electric typewriter embodying the type action of the present invention, and

FIG. 2 is a sectional side view of the type action in FIG. 1, shown in conjunction with a motor and a typewriter platen.

PREFERRED EMBODIMENT OF THE INVENTION

Referring now to the drawing wherein like reference characters designate like or corresponding parts, there is illustrated in FIG. 1 a key lever 10 fulcrumed about a cross shaft 12 and depressible to effect the initiation of a type action. The key lever 10 passes through slots 13 and 13a in a rectangular boxlike sublever mounting bracket generally identified by reference numeral 14, which extends across and is suitably supported on a machine frame. An elongated forwardly extending flat resilient tine 19 formed on a spring comb mounted on the machine frame underlies an arcuate edge of each key lever 10 biasing the key lever 10 to a normal rest position in abutment with the upper ends of slots 13 and 13a. The key lever 10 also has an upwardly extending portion 15 which has a forwardly extending hook 15a forming a bottom face normally overlying and adapted to engage the upper surface of a laterally bent-off ear 16 formed on an upwardly extending finger 17 of the driving pawl 18. A flat edge 15b is formed at the front end of the hook 15a for, at certain times, blocking a rearward edge 16a of the bent off ear 16 on the pawl 18 at the conclusion of a type action return stroke in the event the key lever 10 is held in a depressed position overlong, to provide for a delayed bypass as will hereinafter appear.

The driving pawl 18 is coupled to a sublever or member 23 by a lost motion producing pin and slot connection generally identified by the numeral 21, which permits key lever bypass and assures proper depth engagement of a pawl tooth with a snatch roll, both as will hereinafter be described. The pin and slot connection 21 includes an elongated slot 24 in the driving pawl 18 and a pin 21a extending from the sublever 23 into the elongated slot 24, so that the driving pawl 18 is pivotally and slidably mounted on the pin 21a extending from the sublever 23.

The sublever 23 extends through a pair of slots 25 and 25a formed in the top and bottom of the sublever mounting bracket 14 and is pivotally mounted on a cross shaft 26 supported by end plates and section plates (not shown) of the sublever mounting bracket 14. The sides of the slots 25 and 25a serve as guides for sublever 23 to maintain it in proper alignment as it is driven.

The driving pawl 18 has a downwardly projecting tooth nose 27 adapted when the pawl is rocked counterclockwise to be engaged by a tooth on a continuously rotating snatch roll 28. The snatch roll 28 may comprise two blades on a shaft 42, as illustrated in FIG. 1 or any other type snatch roll having any number of teeth desired may be used. The driving pawl 18 also has a rearward extension 31 extending through an open ended guide slot 32 in an impression control bracket 33. A coil spring 20 connected between the upwardly extending finger 17 of the driving pawl 18 and the impression control bracket 33 serves the dual function, of normally biasing the driving pawl 18 upwardly and rearwardly as viewed in FIGS. 1 and 2, and through the pin and slot connection 21 coupling the sublever 23 to the pawl 18, normally additionally biasing the sublever 23 to a rest position as illustrated in FIGS. 1 and 2.

The impression control bracket 33 is formed with forwardly extending bendable impression control tabs or fingers 34, each of which lies directly in the counterclockwise path of the rearward extension 31 of an associated driving pawl 18 so as to adjustably limit the depth of engagement of the projecting tooth 27 of the driving pawl 18 with a tooth of the snatch roll 28 and consequently to control the interval over which the driving pawl 18 is driven by the snatch roll 28, that is to control the point at which the nose 27 of the driving pawl is driven out of the circular path defined by the snatch roll teeth.

A type bar 35 pivotally mounted on a segment wire 36 is articulately connected by a link 37 to the sublever 23. The sublever 23 is adapted to drive the type bar 35 from a normal position on a headrest 39 into printing contact with the typewriter platen 38.

The snatch roll 28 is adapted to be powered by a flywheel 41 rotatably mounted on the end of a shaft 42 to which the snatch element or roll 28 is rigidly secured. As shown in FIG. 2, the flywheel 41, which takes the form of a pulley, is continuously rotated in a clockwise direction by a belt 43 driven by a smaller pulley on the output shaft of an electric motor to provide a speed reducing torque increasing driving relationship with the output shaft of the electric motor 44.

With reference again to FIG. 1, a lever generally identified by reference numeral 45, having two angularly disposed arms 46 and 47 is mounted on the end of the shaft 42 adjacent to flywheel 41 and is rigidly held in place on the shaft 42 by a nut 40 fastened to a threaded stud 40a extending from the end of the shaft 42.

A stud or pin 48 on the face of the flywheel 41 extends through an elongated arcuate slot 51 in arm 47 and is connected to arm 46 by a motion transmitting spring 52. The motion transmitting spring 52 is adapted to transmit power from the flywheel 41 to the snatch roll 28 and in accordance with its spring constant limit the peak load carried by the snatch roll 28. Accordingly, as long as the load exerted on the motion transmitting spring 52 does not exceed the load limit set by the spring constant, the motion transmitting spring 52 is adapted to hold the abutment afforded by the uppermost end 51a of the elongated arcuate slot 51 in contact with another abutment which is afforded by the pin 48, as viewed in FIG. 1.

Namely the snatch roll 28 under the urge of the spring 52 will resiliently trail the flywheel 41 in a relationship defined by said afforded abutments. However, when the load exerted on the motion transmitting spring 52, the motion transmitting spring 52 will flex or stretch in proportion to the magnitude of the load exceeding the load limit. Stretching of the motion transmitting spring is adapted to store energy therein and will temporarily decrease the power transmitted to the snatch roll 28 from the flywheel 41 and consequently will cushion the impact of the snatch roll 28 as it picks up the added load of the sublever 23 and the type bar 35.

In operation, the motor 44 continuously rotates the flywheel 41 clockwise as viewed in FIG. 1, which through the action of the motion transmitting spring 52 between the flywheel 41 and the shaft 42, effects continuous clockwise rotation of the snatch roll 28.

When the key lever 10 is depressed, the hook 15a of the key levers upwardly extending finger 15 engages the upper surface of the bent off ear 16 formed on the upwardly extending finger 17 of the driving pawl 18, pivoting the driving pawl 18 counterclockwise as viewed in FIG. 1 about the stud 21a extending from the sublever 23. The counterclockwise movement of the driving pawl 18 is limited by the rearward projection 31 of the driving pawl 18 coming into abutment with the associated impression control tab or finger 34. Counterclockwise movement of the driving pawl 18 results in the downwardly projecting tooth 27 of the driving pawl 18 being engaged by a tooth of the snatch roll 28.

With the downwardly projecting tooth 27 in engagement with the snatch roll 28, the snatch roll 28 drives the driving pawl 18 forward through an initial lost motion interval provided by the elongated slot 24, before the sublever 23 is driven, making certain that if the downwardly projecting tooth 27 of the pawl 18 should encounter the tooth of the snatch roll 28 before abutting the preset impression control finger 34, it will, during the lost motion drive interval be translated and rotated into abutment with the impression control finger 34 before drive is transmitted to the type bar 35, and thus assure the preset impression control. Naturally, if the downwardly projecting nose or tooth 27 of the pawl 18 is already in abutment with the preset impression control finger 34 before being engaged by the snatch roll 28, it will not be power rotated during the lost motion drive interval.

After the lost motion interval provided by the elongated slot 24, the snatch roll 28 picks up the load of the type bar 35 and the sublever 23, which in view of the magnitude of the inertia of the type bar 35 and the sublever 23 resisting the rotary movement of the snatch roll 28, almost brings the snatch roll 28 to a complete stop. Since the flywheel 41 is continually driven, this action of the inertia of the type bar 35 and the sublever 23 on the snatch roll 28 produces a load on the motion transmitting spring in excess of the limit set by its spring constant. Consequently, through the applied power of the motor and strongly supplemented by the momentum of the flywheel 41, the motion transmitting spring 52 stretches and continues to stretch, delaying momentarily the operation of the pawl 18 and in effect storing kinetic energy derived from the flywheel 41 proportionate to the excess load, as long as the load on the motion transmitting spring 52 is in excess of the spring constant.

During the interval in which the motion transmitting spring 52 is stretching, the snatch roll rotates at a velocity reduced from that of the flywheel 41 and may be said to lag angularly behind the flywheel 41, causing the pin 48 to travel clockwise in the elongated slot 51. The elongated slot 51 is by design of sufficient length in respect to the strength of the spring 52, to preclude the pin 48 from As the snatch element 28 encounters the resistance to operation of the sublever 23 and the type bar 35, the speed of the snatch element becomes radically reduced, and this is facilitated by the yieldable motion transmitting means comprising the spring 52, which becomes extended or strained by the power of the motor and the kinetic energy then residing in the flywheel 41. Gradually, but at in-

creasing pace the resistance to operation of the sublever and the type bar diminishes, so that the energy stored in the strained spring 52, as also the energy of the motor 44, becomes more effectively applied on the sublever and the type bar by the pawl 18.

Thus, obviously, the motion transmitting spring 52, through its inherent resilient action, begins to gradually return to its normal dimension, transmitting the power stored therein to the snatch roll 28. The gradual transmission to the snatch roll 28 of the power stored by the motion transmitting spring 52 pulls the snatch roll 28 ahead at accelerating velocity which rises above the velocity of the flywheel 41 until the snatch roll 28 is back to a normal angular position relative to the flywheel 41, the pin 48, that is until is again in abutment with the uppermost end 51a of the elongated slot 51. The return of the pin 48 into abutment with the uppermost end of the elongated slot 51 preferably occurs immediately prior to free terminal portion of the flight of the type bar toward the printing point.

The action of the motion transmitting spring 52 in storing a portion of the power from the flywheel 41 over an interval during which velocity of the snatch roll 28 is impaired by resistance of the type bar 35 and the sublever 23 to rotary motion of the snatch roll 28, and transmitting the stored power to the snatch roll 28 over an interval, after the resistance of the type bar 35 and the sublever 23 has decreased sufficiently to allow snatch roll 28 to resume its normal velocity, and during which the type bar is being accelerated, greatly enhances the acceleration characteristics of the type action and also provides for a gradual assumption of the load of the type bar 35 and the sublever 23, and smooth acceleration of the type bar 35 consequently.

After the snatch roll 28 drives the driving pawl 18 through a driving stroke and the downwardly projecting nose tooth 27 of the driving pawl 18 is thrown out of engagement with the snatch roll 28, and if the key lever 10 has been released and has returned to its normal position, the energy stored in coil spring 20 connected between the upwardly projecting finger 17 on the driving pawl 18 and the impression control brackets 33, will return the driving pawl 18 to a normal position seen in FIG. 2, wherein the bent off ear 16 underlies the hook 15a of the key lever 10 in an overlapping relationship lengthwise of the pawl. As this happens, the sublever 23 and the type bar 35 connected to the pawl 18 resume their normal rest positions as shown in FIG. 2.

If the key lever 10 is held in a depressed position overlong, the edge 16a of the bent off ear 16 of the returning driving pawl 18 will become intercepted by the edge 15b of the hook 15a of the key lever 10 preventing the full restoration of the driving pawl 18 by the coil spring 20, until such time as the key lever 10 is released. However, the lost motion capability of the pin and slot connection 21 between the driving pawl 18 and the sublever 23 permits the full return movement in the type bar 35 and the sublever 23 to their normal rest positions seen in FIG. 2.

Thus, in the simplified type action of the present invention, by providing a pin and slot lost motion connection which connects driving pawl 18 and the sublever 23 together, a simplified construction characterized by an economy of parts is attained in which a single piece key lever 10 is utilized to pull the driving pawl 18 into snatch roll engagement, and an initial lost motion interval is provided between the pawl 18 and the type bar sublever 23 to assure correct type bar impression control and to provide also a key lever bypass function.

The provision of a single piece keylever 10 for pulling the driving pawl 18 and the reduction of parts normally required to provide a keylever bypass in prior type actions significantly reduces the cost of parts and assembly time necessary for building a typewriter.

It is equally apparent that the resilient energy storing and controlled motion transmitting connection between the snatch roll 28 and the flywheel 41, by enhancing the smooth transmission of power to the type bar 35, makes a significant contribution to the effectiveness of the type action.

Also inherent in the utilization of the flywheel 41 to drive the snatch roll 28 by means of the energy storing and controlled motion transmitting connection, is the elimination of type bar damage resulting from the simultaneous depression of two or more keylevers, since the energy made available by the flywheel motor and is limited an amount sufficient to drive only one type action at a time.

Consequently, in addition to providing a simpler and more economical typewriter action, the present invention thus provides a typewriter action which is much more efficient than type actions of the prior art.

We claim:

1. In an electric typewriter having a continuously rotating toothed snatch roll,
 - a type bar,
 - a sublever linked to said type bar and rockable from and to a normal position respectively to operate and restore said type bar,
 - a pawl having a tooth thereon whose normal position is clear of the teeth of said snatch roll,
 - a combination pivotal and limited translatable lost motion connection between said pawl and said sublever, comprising a pin on one extending into a slot in the other, to allow said pawl, with the lost motion condition prevalent in said connection, to be moved pivotally on said sublever from its normal position to place the pawl tooth into the operating path of said toothed snatch roll, then to be translated and rotated over the interval over which said lost motion condition is taken up, and thereafter to rock said sublever from its normal position,
 - said pawl having an extension reaching beyond its said tooth in a direction opposite said lost motion connection,
 - a frame supported element positioned in the path of said pawl extension to control, during the lost motion interval of translation and rotation of said pawl relative to said sublever, the depth of engagement of said pawl tooth with said toothed snatch roll whereby the length of the power stroke which is impartable to said pawl by said snatch roll following said lost motion interval is determined,
 - a frame anchored spring connected to bias said pawl to its said normal position, to establish said lost motion condition in said connection, and to bias also said sublever to its normal position,
 - and a spring restorable key lever operable on depression directly on said pawl to move it into the operating path of said toothed snatch roll.
2. The invention defined in claim 1 wherein said key lever has a face for action on said pawl to move it into the operating path of said snatch roll,
 - said pawl having a face normally underlying the face on said key lever, said faces normally overlapping each other lengthwise of said pawl a distance substantially equal to the lost motion capacity of said lost motion connection,
 - said overlapping faces having each an adjoining end edge substantially rectangular thereto whereby if a key lever is still depressed during restoration of said pawl following its disengagement from the snatch roll the end edge of the pawl will be intercepted by the end edge of the said key lever face to preclude restoration and reengagement of said pawl, yet allow said type bar and said sublever to restore by reason of said lost motion connection whereby said key lever must first be allowed to restore before a next typing operation can be effected.