

PATENT SPECIFICATION (11)

1 497 108 (10)



(21) Application No. 42353/75 (22) Filed 15 Oct. 1975 (19)
 (31) Convention Application No. 539 490 (32) Filed 8 Jan. 1975 in
 (33) United States of America (US)
 (44) Complete Specification published 5 Jan. 1978
 (51) INT. CL.³ B41J 7/92
 (52) Index at acceptance
 B6F 5M3 6B2J1 6B2JY 7A2 7AY EX

(54) IMPRESSION CONTROL APPARATUS FOR TYPEWRITERS

(71) We, SCM CORPORATION, a corporation of the State of New York, United States of America, of 299 Park Avenue, New York, New York 10017, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to drive systems for electrically-powered typing machines for example typewriters and, more particularly, to apparatus for selectively controlling the impression or typing density of such machines.

Adjustment of the driving force delivered to the typing action in electrically-powered typewriters and other typing machines is necessary in order to control the impression made by the typebar of the machine on the paper for variation thereof with respect to the number of carbon copies.

The present invention provides apparatus for controlling the driving energy transmitted to the typing mechanism of a typing machine comprising a typing mechanism arranged to be driven by a rotatable power roll, said power roll being connected to energy transmitting means for transmitting energy from a motor to said power roll to drive said typing mechanism, energy absorbing means for absorbing a portion of the energy from said energy transmitting means and retaining said absorbed portion until after the typing mechanism disengages from the power roll; and control means for controlling said portion of energy absorbed and thereby control the operation of said typing mechanism.

In a preferred embodiment, the power roll is driven by an electric motor through a drive belt and pulley. The pulley is rotatably mounted and resiliently connected to the power roll. The resilient connection provides an energy-absorbing means which is adjustably connected to the power roll pulley and controlled through an appropriate linkage by the operator of the machine in order to vary the energy absorbed by the resilient connection between the power roll and the

power roll pulley. A self adjusting means is also included to set the proper tension of the drive belt.

The preferred embodiment thus provides a drive system for a typing mechanism wherein the impression of type produced by the typewriter can be selectably controlled by the operator. In addition, apparatus for driving the typing mechanism is provided wherein the effective power stroke of the typing mechanism can be selectively varied. The apparatus is of a relatively simple construction, having few moving parts, and thus being durable and inexpensive to manufacture.

Preferably, a belt tension adjusting means for use on the belt drive of a typewriter is provided which is self adjusting to set the desired tension and which is quiet running and relatively inexpensive.

Features and advantages of the present invention will be apparent from the following description of an embodiment thereof given by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of part of an electric typewriter showing the type mechanism and the apparatus for driving and controlling the type mechanism;

Figure 2 is an exploded view, in perspective, of a portion of the apparatus for controlling the type action shown in Figure 1;

Figure 3 is a view, in perspective, of the apparatus of Figure 2 in assembled form and showing the relationship of the power roll of the machine to the assembled apparatus;

Figure 4 is a view of the apparatus for driving and controlling the type mechanism shown in Figure 1, with the apparatus in the position for minimum type impression;

Figure 5 is a view of the apparatus of Figure 4 with the apparatus shown in the position for maximum type impression; and

Figure 6 is an exploded view, in perspective, of the apparatus for tensioning the drive belt shown in Figure 1.

Referring to drawings and particularly to Figure 1, the drive elements and typing mechanism elements of a typewriter are shown mounted in a main frame 20 having

a front plate 22 and a side plate 24. A power source in the form of a motor 26 has an output shaft 28 driving a pulley 30 counterclockwise to drive a timing belt 32 which in turn rotates a pulley 34 to drive a power roll or toothed snatch roll 36 which provides driving force to a powered type mechanism or action 38. This power type action 38 is described at length in U.S. patent No. RE 25,011 and will be briefly described to show its relationship to the power transmission system of the present invention.

The powered type action 38 has a type key 40 connected to a key stem 42 which is positioned in a guide comb 44 so as to oscillate between its lowest point of travel when the key stem 42 contacts a key stop 46 and its upper point of travel when a bottom shoulder 48 of the key stem 42 contacts a silencing pad 50 assembled to the guide comb 44. The key stem 42 is pivoted on lower and upper key stem support links 52 and 54 respectively at lower and upper pivot points 56 and 58 respectively. The key stem support links 52 and 54 are pivoted to a fulcrum bar 60 at lower and upper pivot shafts 62 and 64 respectively. A key restoring spring 66, connected to lower key stem support link 52 and to a spring anchor 68, urges the type key 40 to the upper position until the bottom shoulder 48 of key stem 42 abuts silencing pad 50 of the guide comb 44.

A link extension tab 70 on the lower key stem support link 52 is connected through a spring 72 to a tripping trigger 74 which is mounted by a pivot pin 76 on the lower key stem support link 52. The upper end of tripping trigger 74 contacts the forwardmost ear 78 of a pawl rocking lever 80 which, in turn, is pivotally mounted by a pivot pin 82 to a toggle link 84 which, in turn, is pivotally mounted on a fulcrum bar 86.

The toggle link 84 is connected to a typebar sublever 88 at its remote end 90 by a link 92. One end of a return spring 94 is connected to the toggle link 84 at the remote end 90 and the other end to a stop bar 96 to urge the toggle link 84 upward until it rests against cushion pad 98 assembled to the stop bar 96. Also connected at pivot pin 100 to the toggle link 84 is a rocking cam 102. The rocking cam 102 is also connected to the pawl rocking lever 80 by a return spring 104. A drive pawl 106 is pivotally carried by the toggle link 84 and is provided with an engaging tooth 108.

The typebar sublever 88 is pivotally mounted on the frame 24 by a shaft 110. Typebar sublever 88 is connected to a typebar link 112 by a pivot pin 114. The typebar link 112, in turn, is connected by a pivot pin 116 to a typebar 118 which is pivoted to the frame 24 of the typewriter by a shaft 120. The typebar 118 is shown in its rest position on a typebar rest 122.

Operation of the typing action is initiated by depressing the type key 40 which, in turn, causes the lower key stem support link 52 to pivot thereby raising the link extension tab 70 and carrying upwardly with it the tripping trigger 74 thereby pivoting the pawl locking lever 80 counterclockwise about the pivot pin 82. A rearward extension 124 of the pawl rocking lever 80 engages and pivots the drive pawl 106 toward engagement with the teeth of the power roll 36. The rocking cam 102 is biased by the spring 104 against a cam surface 126 of the drive pawl 106 for pivoting engaging tooth 108 of the drive pawl 106 into full engagement with one of the teeth 128 of the power roll 36. The drive pawl 106 is pivoted clockwise about a pivot pin 130 until it rests against a stop 132 formed from the toggle link 84. The power roll 36 then drives the engaging tooth 108 being carried by the toggle link 84 in an arc about the shaft 86 until the engaging tooth 108 leaves a smaller arc formed by the teeth of the rotating power roll 36.

The toggle link 84, when pivoted about the shaft 86, works against the typebar return spring 94, and the downward movement of toggle link 84 causes the typebar sublever 88 to pivot about the shaft 110 which, in turn, translates the typebar link 112 to cause the typebar 118 to pivot about the shaft 120 until the type head 134 strikes a paper on a platen 135 of the typewriter.

The typebar return spring 94 will raise the toggle link 84 and thereby, through link 92, sublever 88, and the typebar link 112, cause the typebar 118 to return to the rest position against typebar rest 122.

Power from the motor 26 is transferred to the power roll 36 of the typewriter by energy transmitting means consisting of a timing belt 32 which drives energy transmission means generally indicated at 136.

Referring now to Figures 2 and 3, the energy transmission means 136 consists of the pulley 34 in the form of a fly wheel having a toothed rim 138 for driving engagement with the timing belt 32. Of course, any other type of pulley and belt arrangement could be used. The rim 138 of the pulley 34 is connected to a hub 140 by means of three webs, a bumper stop web 142, an adjuster plate web 144 and a third web 146.

The pulley 34 is mounted via its hub 140 on an extension bushing 148 consisting of a locking collar 150 having a forward tubular extension 152 which is provided with a groove 154 for receiving a "c" ring 156. A power roll drive plate 158 is affixed to the extension bushing 148 adjacent extension 152 and includes a pair of oppositely directed radial arms 160 and 162. The free end of the arm 162 is formed to provide a lateral extension bumper 164 which carries a resilient pad 166. The other arm 160 has spring

holding means which may be, as shown, simply notches 168, 170, 172.

When assembled on the pulley 34, the tubular extension 152 provides a rotational bearing surface and extends through the hub 140 and is laterally retained intermediate the inner surface of the power roll drive plate 158 and a washer 174 by the "c" ring 156.

The pulley 34 is resiliently connected to the extension bushing 148 by means of a control spring 176, which is attached at one end to an ear 178 on the rim 138 of pulley 34 and at the other end to one of the notches 170 on the arm 160. The other notches 168 and 172 are positioned radially along arm 160 to vary the position of the control spring 176 to adjust the moment arm of the spring connection between the pulley 34 and the extension bushing 148 on the power roll 36. Adjusting the moment arm of the connection of the spring 176 selectively adjusts the amount of energy absorbed by the control spring 176 for a given angular displacement between the extension bushing 148 and the pulley 34.

An impression adjuster plate 180 is a generally "D" shaped plate whose ends are spaced apart. The upper end of one cross arm 182 is bent inwardly to form an adjuster stop 184. An opposed upstanding arm 186 is formed intermediate of its ends, with an outwardly directed portion 188 so that its edge 190 can function as a cam follower. Extending angularly and laterally from the lower end of the cam follower 186 is a spring retaining tab 192. Proximate the junction of the tab 192 and the arm 168, there is provided a mounting passageway 194 for receiving a mounting screw 196 to pivotally attach the impression adjuster plate 180 to the pulley 34. The mounting screw 196 extends through a mounting boss 198 formed on one side of the adjuster plate web 144 and held in place by a locking nut 200. The adjuster stop 184 is urged toward an adjacent edge 202 of the third web 146 by an impression adjuster control spring 204 which is connected intermediate the tab 192 and an eye 208 formed in the bumper stop web 142.

Any relative rotational displacement between the pulley 34 and the extension bushing 148 is limited in one direction by means of the lateral extension bumper 164 engaging an adjacent edge 206 of the bumper stop web 142. Relative movement of the extension bushing 148 in the other direction, namely toward third web 146, is limited by contact between extension bumper 164 and the adjuster stop 184 of impression adjuster plate 180.

A control cam 210 which consists of head portion in the form of a conical camming surface 212 and a shank 214 is adapted to slidably fit within a tubular extension 215 of the power roll 36. Movement of the con-

trol cam 210 inwardly will cause the conical camming surface 212 to bear against the cam follower edge 190 and thereby pivot the impression adjuster plate 180 about the screw 196 causing the adjuster stop 184 to move toward the extension bumper 164. Opposite movement of the control cam 210 in an outward direction will allow the impression adjuster plate 180 to be pivoted under the influence of the control spring 204 and thereby move impression adjuster stop 184 away from the extension bumper 164.

With reference to Figure 1, axial movement of the control cam 210 toward and away from the tubular extension 215 is via a lazy "s" shaped control arm 216. One end 218 of the control arm 216 is pivotally connected to a bracket 220 by a shoulder screw 222 and an arm flange 224. The bracket 220 is, in turn, rigidly assembled to the side plate 24 by screws 226. The other end 228 of the control arm 216 terminates in a cam follower tab 230 which bears against a circular cam surface 232 carried on a rotatable adjusting wheel 234. The end 228 is inwardly biased toward the cam surface 232 by a spring 236 which is supported between an arm anchor 238 and a frame anchor 240. Intermediate the ends of the control arm 216 there is provided a plastic thrust bearing 242 extending through the control arm 216 and abutting an end face 244 (Figure 2) of the control cam 210. The adjusting wheel 234 is rotatably mounted to the side plate 24 by a shouldered screw 246. Rotation of the adjusting wheel 234 will therefore cause the cam follower tab 230 to move inwardly or outwardly limited by means of a stop 248 formed on the camming surface 232. Thus, as control arm 216 pivots inwardly, the plastic thrust bearing 242 drives the control cam 210 into the tubular extension 215. When control arm 216 pivots outwardly, the control cam 210 is free to move therewith under the force exerted by the control spring 204 biasing cam follower edge 190 of the impression adjuster plate 180 against the camming surface 212 of the control cam 210.

Referring to Figures 2 and 3, the entire energy transmission means 136 is supported on a power roll shaft extension 250 which passes through a bearing 252 carried by an inner frame 254. The inner frame 254 is supported by the side plate 24 and spaced therefrom by spacers 256 and screws 258. The power shaft extension 250 extends into the locking collar 150 and is attached thereto by a set screw 260 seating in a notch 262.

Referring again to Figure 1, when a type key 40 is depressed, the type action linkage previously described will cause the engaging head 108 of the drive pawl 106 to contact the teeth of the power roll 36. In trying to move the drive pawl 106 and consequently move the toggle linkage, the power roll 36

will meet with inertial resistance and additionally will be working against the spring force of the return spring 94. The resistance met by the power roll 36 will tend to slow the rotation of the power roll 36. However, the pulley 34, which is being driven directly by the motor 26 through the drive belt 32, will tend to rotate at its constant speed. Therefore, there will be a difference in the rotational velocity between the pulley 34 and the extension bushing 148.

Prior to actuating a key action, both the pulley 34 and the extension bushing 148 are directly connected by the extension bumper 164 contacting the edge 206 of the bumper stop web 142 and therefore rotate at the same speed.

The resistance experienced by the power roll 36 produces a relative angular displacement between the pulley 34 and the extension bushing 148, which displacement stretches the control spring 176 that constitutes the coupling there between, thereby absorbing a quantity of energy being delivered by the motor 26 to the extension bushing 148. This angular displacement between extension bushing 148 and the pulley 34, due to resistance encountered by the power roll 36, is limited by the abutment of the extension bumper 164 with the adjuster stop 184 of the impression adjuster plate 180, as the extension bumper 164 moves counterclockwise toward the third web 146. Thereafter, the abutment of the extension bumper 164 with the adjuster stop 184 will provide a direct drive from the pulley 34 to the power roll 36.

The relative angular separation of control stop 184 and extension bumper 164 varies the energy which the control spring 176 may absorb during deceleration of the power roll 36. Upon contact of drive pawl 106 with the teeth of power roll 36, the rotational velocity of the power roll 36 is decreased and the final velocity thereof is dependent on the time it is permitted to decelerate. This time is a function of the separation between extension bumper 164 and the control stop 184 and therefore the energy imparted to the typebar 118 and its subsequent impression is dependent on the final rotational velocity of the power roll 36 as the drive pawl 106 is driven outwardly thereof.

After contact between the drive pawl 106 and the power roll 36 is broken by the movement of toggle link 84 in the type action, the control spring 176 will release the energy previously absorbed and extension bushing 148 will rotate faster than the pulley 34 until extension bumper 164, moving in a relative clockwise direction, abuts the bumper stop web 142 of pulley 34 thereby eliminating the relative angular displacement between the pulley 34 and the extension bushing 148 and restoring the system

to its rest position, ready for the next engagement of a drive pawl 106 with the power roll 36. When the contact between the drive pawl 106 and the power roll 36 is broken, approximately one-third of the flight (free flight) of the typebar 118 remains before the type head strikes the platen 135. Momentum carries the type head 134 into contact with a paper on the platen 135. During the free flight of the typebar 118, sufficient time is provided for the extension bumper 164 to return to its rest position against the bumper stop web 142.

The amount of travel of the extension bumper 164 is limited by the adjuster stop 184 which is positioned by means of control of the control cam 210. As shown in Figure 5, when the control cam 210 is positioned at one extreme sufficiently in tubular extension 215, it will move the cam follower arm 186 of adjuster plate 180 to pivot the adjuster plate 180 until the adjuster stop 184 is abutting extension bumper 164. In this position, there is no energy absorption between the pulley 34 and the power roll 36 at any point in the cycle of actuating a typebar 118. In Figure 4, the control cam 210 is shown at its opposite extreme wherein the adjuster plate 180 will have pivoted to move adjuster stop 184 to its maximum spacing from extension bumper 164 which will thereby permit substantial extension of control spring 176 upon deceleration of the power roll 36, and accordingly, absorb a substantial amount of energy thereupon.

By varying the amount of stretch of the control spring 176 during deceleration, the amount of energy absorbed during the flight of the typebar 118 is varied. The amount of stretch of spring 176 is infinitely variable between the maximum and minimum limits of relative rotational travel of the extension bumper 164 toward the adjuster stop 184. Selective rotation of adjusting wheel 234 positions the control cam 210, which, in turn, positions the adjuster stop 184. Further, as mentioned previously, the arm 160 has three separate notch positions for the control spring 176 so that a gross adjustment as to the maximum amount of energy to be absorbed by the control spring 176 for a given angular displacement of the power roll 36 relative the pulley 34 can be made at the factory which will enable the manufacturer to set the type action of the machine to compensate for differences in the quantity of energy required to produce suitable impressions for different styles of type, or for different purposes to which the machine is to be used.

The impression control for all of the typebars is selectively controlled by means of the simple impression control apparatus described, which, in turn, is dependent on constant or uniform rotation of pulley 34. There-

fore, it is of importance for the proper functioning of the overall apparatus that tension for the drive belt 32 be properly set and should not be affected by minor variations in the production tolerance of the drive train apparatus. In order to insure proper drive belt operation, the apparatus includes a belt tensioning device generally indicated at 264 in Figure 1.

Referring to Figures 1 and 6, the belt tensioning device 264 consists of a bracket 266 pivotably connected to the side plate 24 by means of a shoulder screw 268. An idler pulley 270 is rotatably supported at the forward end of the bracket 266 by a shoulder screw 272. A felt tubular bushing 274 is positioned between the idler pulley 270 and the screw 272. A felt washer 276 is positioned between the idler pulley 270 and the bracket 266. Another felt washer 278 is positioned between the idler pulley 270 and a metal washer 280. When assembled (Figure 1), the head 282 of the screw 272 is positioned against the metal washer 280 which sandwiches the felt washers 276 and 278 and the idler pulley 270 against the bracket 266 such that the idler pulley 270 is free to rotate. The felt tubular bushing 274 and felt washers 276 and 278 serve as silencers to minimize noise from the idler pulley 270 when the idler pulley is rotated by the timing belt 32. The bracket 266 has an arcuate slot 284 along its upper edge. A lock screw 286 extends through a washer 288, through the slot 284 and is threaded into the side plate 24. A tension spring 290 is connected at one end to a spring anchor 292 formed outwardly from the side plate 24 and is connected at the other end to a spring anchor 294 formed outwardly from the bracket 266.

To set the proper tension for the drive belt 32, the motor 26 is in an off condition (de-energized) and the lock screw 286 is loosened. The idler pulley 270 is then manually lifted upward, which is the same direction of the pull by the tension spring 290, until all slack is removed from the belt 32. The idler pulley 270 is then released and the tension spring 290 will locate the idler pulley 270 in a predetermined position to set the desired tension for the drive belt 32. Thus, the tension spring 290 acts as a self adjusting means for tensioning the drive belt 32. The predetermined position of the idler pulley 270 is maintained by tightening the lock screw 286.

Accordingly, it can readily be seen from the above that an efficient and effective method is provided for adjusting the impression of type produced by a typewriter in a straightforward, uncomplicated, highly reliable manner. No impression controls of adjustments are required for the individual type actions of the individual keys. All control is provided at one location which is easily

accessible, and since the adjustment is made by absorbing energy before the printing takes place, the adjustment will be uniform for all of the type actions. Further, the apparatus itself is extremely simple, having relatively few moving parts, namely the extension bushing 148, the adjuster plate 180, the springs 176 and 204 connecting the extension bushing 148 and the adjuster plate 180 to the pulley 34 and the control cam 210 and control arm 216. Because of the simplicity of construction, the apparatus is relatively durable and maintenance free. Further, the apparatus offers a wide range of adjustment by repositioning the control spring 176 into one of the notches 168, 170 and 172 in the arm 160 thus providing one means for varying the amount of energy absorbed by the control spring 176. Another means for varying the amount of energy absorbed by the control spring 176 is provided by selectively positioning the adjuster stop 184 in one of its infinite number of fine settings relative to the extension bumper 164.

It should also be noted that the impression control device described does not in any way alter the path of the linkage but only adjusts the energy delivered to the various links at various points in their path of travel. Therefore, no lost motion linkages or sliding linkages are necessary to take up or shorten the travel of the various elements of the type action. Further, the impression control apparatus is directly driven from the power source of the machine and there are no intermediate pulleys or speed varying arrangements required.

The belt tensioning apparatus 264 ensures that the timing belt 32 is operating at maximum efficiency. Since the entire impression control device is directly connected to the timing belt 32, the timing belt 32 coupling is somewhat more important than would normally be the case in a standard power-transmitting system. The belt tensioning device, by ensuring proper tension of the device, avoids possible erratic operation of the type action due to changes in rotational speed of the power roll 36 that might be produced by a loose or slipping belt and also reduces the possibility of excessive noise and uneven wear on the belts and pulleys if the belt tension were too tight. The belt tensioning device is relatively simple and quiet in operation and is relatively inexpensive to manufacture.

WHAT WE CLAIM IS:—

1. Apparatus for controlling the driving energy transmitted to the typing mechanism of a typing machine comprising a typing mechanism arranged to be driven by a rotatable power roll, said power roll being connected to energy transmitting means for

fore, it is of importance for the proper functioning of the overall apparatus that tension for the drive belt 32 be properly set and should not be affected by minor variations in the production tolerance of the drive train apparatus. In order to insure proper drive belt operation, the apparatus includes a belt tensioning device generally indicated at 264 in Figure 1.

Referring to Figures 1 and 6, the belt tensioning device 264 consists of a bracket 266 pivotably connected to the side plate 24 by means of a shoulder screw 268. An idler pulley 270 is rotatably supported at the forward end of the bracket 266 by a shoulder screw 272. A felt tubular bushing 274 is positioned between the idler pulley 270 and the screw 272. A felt washer 276 is positioned between the idler pulley 270 and the bracket 266. Another felt washer 278 is positioned between the idler pulley 270 and a metal washer 280. When assembled (Figure 1), the head 282 of the screw 272 is positioned against the metal washer 280 which sandwiches the felt washers 276 and 278 and the idler pulley 270 against the bracket 266 such that the idler pulley 270 is free to rotate. The felt tubular bushing 274 and felt washers 276 and 278 serve as silencers to minimize noise from the idler pulley 270 when the idler pulley is rotated by the timing belt 32. The bracket 266 has an arcuate slot 284 along its upper edge. A lock screw 286 extends through a washer 288, through the slot 284 and is threaded into the side plate 24. A tension spring 290 is connected at one end to a spring anchor 292 formed outwardly from the side plate 24 and is connected at the other end to a spring anchor 294 formed outwardly from the bracket 266.

To set the proper tension for the drive belt 32, the motor 26 is in an off condition (de-energized) and the lock screw 286 is loosened. The idler pulley 270 is then manually lifted upward, which is the same direction of the pull by the tension spring 290, until all slack is removed from the belt 32. The idler pulley 270 is then released and the tension spring 290 will locate the idler pulley 270 in a predetermined position to set the desired tension for the drive belt 32. Thus, the tension spring 290 acts as a self adjusting means for tensioning the drive belt 32. The predetermined position of the idler pulley 270 is maintained by tightening the lock screw 286.

Accordingly, it can readily be seen from the above that an efficient and effective method is provided for adjusting the impression of type produced by a typewriter in a straightforward, uncomplicated, highly reliable manner. No impression controls or adjustments are required for the individual type actions of the individual keys. All control is provided at one location which is easily

accessible, and since the adjustment is made by absorbing energy before the printing takes place, the adjustment will be uniform for all of the type actions. Further, the apparatus itself is extremely simple, having relatively few moving parts, namely the extension bushing 148, the adjuster plate 180, the springs 176 and 204 connecting the extension bushing 148 and the adjuster plate 180 to the pulley 34 and the control cam 210 and control arm 216. Because of the simplicity of construction, the apparatus is relatively durable and maintenance free. Further, the apparatus offers a wide range of adjustment by repositioning the control spring 176 into one of the notches 168, 170 and 172 in the arm 160 thus providing one means for varying the amount of energy absorbed by the control spring 176. Another means for varying the amount of energy absorbed by the control spring 176 is provided by selectively positioning the adjuster stop 184 in one of its infinite number of fine settings relative to the extension bumper 164.

It should also be noted that the impression control device described does not in any way alter the path of the linkage but only adjusts the energy delivered to the various links at various points in their path of travel. Therefore, no lost motion linkages or sliding linkages are necessary to take up or shorten the travel of the various elements of the type action. Further, the impression control apparatus is directly driven from the power source of the machine and there are no intermediate pulleys or speed varying arrangements required.

The belt tensioning apparatus 264 ensures that the timing belt 32 is operating at maximum efficiency. Since the entire impression control device is directly connected to the timing belt 32, the timing belt 32 coupling is somewhat more important than would normally be the case in a standard power-transmitting system. The belt tensioning device, by ensuring proper tension of the device, avoids possible erratic operation of the type action due to changes in rotational speed of the power roll 36 that might be produced by a loose or slipping belt and also reduces the possibility of excessive noise and uneven wear on the belts and pulleys if the belt tension were too tight. The belt tensioning device is relatively simple and quiet in operation and is relatively inexpensive to manufacture.

WHAT WE CLAIM IS:—

1. Apparatus for controlling the driving energy transmitted to the typing mechanism of a typing machine comprising a typing mechanism arranged to be driven by a rotatable power roll, said power roll being connected to energy transmitting means for



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transmitting energy from a motor to said power roll to drive said typing mechanism, energy absorbing means for absorbing a portion of the energy from said energy transmitting means and retaining said absorbed portion until after the typing mechanism disengages from the power roll; and control means for controlling said portion of energy absorbed and thereby control the operation of said typing mechanism.

2. Apparatus according to claim 1, wherein said energy transmitting means comprises an energy storage means, and said energy absorbing means comprises connecting means rotatably and resiliently connecting said energy storage means to said power roll.

3. Apparatus according to claim 2, wherein said energy storage means comprises a fly wheel.

4. Apparatus according to claim 3, wherein said energy absorbing means further comprises spring means connected between said power roll and said fly wheel to absorb energy upon relative angular displacement between said fly wheel and said power roll.

5. Apparatus according to claim 4, wherein said energy absorbing means includes means for adjusting the energy absorbed upon relative angular displacement between said fly wheel and said power roll, comprising spring mounting means disposed on each of said fly wheel and said power roll; said spring mounting means on said power roll having a plurality of radially spaced positions for connecting said spring means to adjust the moment arm of said spring connection between said fly wheel and said power roll.

6. Apparatus according to claim 4 or 5, wherein said control means for controlling said energy absorbing means comprises limit means for limiting the relative displacement between said fly wheel and said power roll; and limit adjusting means for adjusting the position of said limit means to control the limit of relative displacement between said fly wheel and said power roll.

7. Apparatus according to claim 6 wherein said limit means comprises a power roll contact member connected to said power roll to rotate in fixed relation to said power roll and fly wheel stop means connected to said fly wheel and positioned to contact said power roll contact member; said limit adjusting means comprising position varying means to vary the relative position of said fly wheel stop means and power roll contact member.

8. Apparatus according to claim 7, wherein said position varying means comprises means movably connecting said fly wheel stop means to said fly wheel, fly wheel cam means movably mounted with relation to said fly wheel to move said fly wheel stop

means in relation to movement of said fly wheel cam means, said fly wheel stop means being arranged to rotate about an axis parallel to the axis of rotation of the fly wheel and be held in a rotated position by said cam means; and cam positioning means for positioning said fly wheel cam means to adjust the position of said limiting means and thereby limit the displacement between said power roll and fly wheel.

9. Apparatus according to claim 8 wherein said cam positioning means for positioning said fly wheel cam means comprises a control arm, means connecting said control arm to said fly wheel cam means, and manual positioning means for manually positioning said control arm to position said fly wheel cam means.

10. Apparatus according to claim 9 wherein said manual positioning means for manually positioning said control arm to position said fly wheel cam means comprises manually positionable cam means arranged to be mounted on said typing machine, and cam follower means on said control arm for positioning said control arm in response to the position of said manually positionable cam means.

11. Apparatus according to claim 10 wherein said energy transmitting means comprises belt means connecting said motor to said fly wheel, and belt tensioning means to adjust the tension of said belt means.

12. Apparatus according to claim 11 wherein said belt tensioning means comprises idler means, idler support means arranged to be pivotally connected to said typing machine for supporting said idler, and resilient means connected to said idler support means for urging said idler means into tensioning contact with said belt.

13. Apparatus according to claim 12 wherein said idler means comprises an axle extending from said idler support means, a bushing disposed about said axle; roller means disposed about said bushing means, said roller means having tapered shoulders at the ends thereof and a washer disposed in contact with each of said shoulders of said roller means; and wherein said idler means further comprises locking means for fixing the position of said idler means with respect to said typing machine.

14. A typewriter having a frame, a typing mechanism, a motor for powering said typing mechanism and means for controlling the driving energy transmitted to the typing mechanism which comprises a power roll, a pulley rotatably mounted with respect to said power roll, a belt drive connecting said motor and said pulley to rotatably drive said pulley, resilient means connecting said pulley to said power roll to allow relative displacement between said pulley and power roll in relation to energy absorbed by said resili-



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ent means, and control means connecting said pulley with said power roll to control the relative displacement between said pulley and said power roll.

5 15. A typewriter according to claim 14, wherein said resilient means connecting said pulley to said power roll to allow relative displacement between said pulley and said power roll comprise arm means extending
10 radially from the axis of rotation of said power roll; spring mounting means on said arm means; spring mounting means on said pulley radially displaced from the axis of rotation of said pulley; and spring means
15 connecting said spring mounting means on said arm and spring mounting means on said pulley.

16. A typewriter according to claim 14 or 15, wherein said resilient means connecting said pulley to said power roll to allow relative displacement between said pulley and said power roll includes means to adjust the energy absorbed by said resilient means comprising a plurality of spring
20 mounting points radially spaced on at least one of said spring mounting means on said pulley and said power roll spring mounting means.

17. A typewriter according to claim 14, 15 or 16 wherein said control means connecting said pulley and said power roll to control the relative displacement between said pulley and said power roll comprises a power roll contact member connected to
30 said power roll and radially disposed from the axis of rotation of said power roll, an adjusting member movably connected to said pulley, adapted to rotate with said pulley and having a stop member disposed to contact said power roll contact member, and
40 means for positioning said adjusting member to position said stop member with respect to said contact member of said power roll and thereby limit relative displacement
45 between said pulley and said power roll.

18. A typewriter according to claim 17, wherein said means for positioning said adjusting member comprises pivot means radially disposed from the axis of rotation
50 of said pulley connecting said adjusting member to said pulley, and a cam disposed at the axis of rotation of said pulley and in contact with said adjusting member to

pivot said adjusting member in response to the position of said cam.

19. A typewriter according to claim 18 wherein said means for positioning said adjusting member further comprises said adjusting member cam disposed to move along the axis of rotation of said pulley, and
60 spring means connected to said adjusting member and said pulley to urge said adjusting member into contact with said adjusting member cam.

20. A typewriter according to claim 19, wherein said means for positioning said adjusting member further comprises control arm means connected to said adjusting member cam to position said adjusting member cam, manually controlled means
65 for positioning said control arm means to position said adjusting member cam, said manually controlled means for positioning said control arm means comprising a selector wheel mounted on said typewriter, a
70 circular cam surface on said selector wheel, cam follower means on said control arm, and spring means connected to said control arm to urge said cam follower means on said control arm into engagement with
80 said circular cam on said selector wheel.

21. A typewriter according to claim 18, 19 or 20 further comprising a power roll extension extending along the axis of rotation of said power roll comprising an axle, an axial passage in said axle, and means
85 fixedly connecting said power roll extension to said power roll, and wherein said adjusting member cam comprises a conical camming surface, a cylindrical surface being
90 mounted in and being adapted to move in said axial passage in said axle of said power roll extension.

22. Apparatus for controlling the driving energy transmitted to the typing mechanism of a typing machine substantially as hereinbefore described with reference to the accompanying drawings.

23. A typewriter substantially as hereinbefore described with reference to the accompanying drawings.

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