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3,129,801

POWER OPERATED TYPEWRITER

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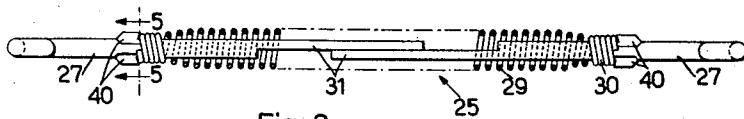


Fig. 3

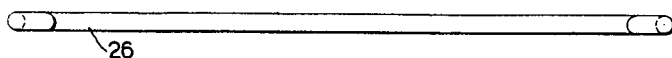


Fig. 4

Fig. 5

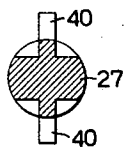


Fig. 2

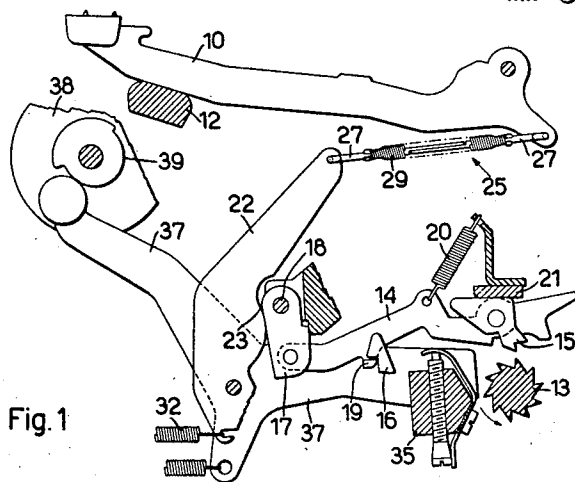
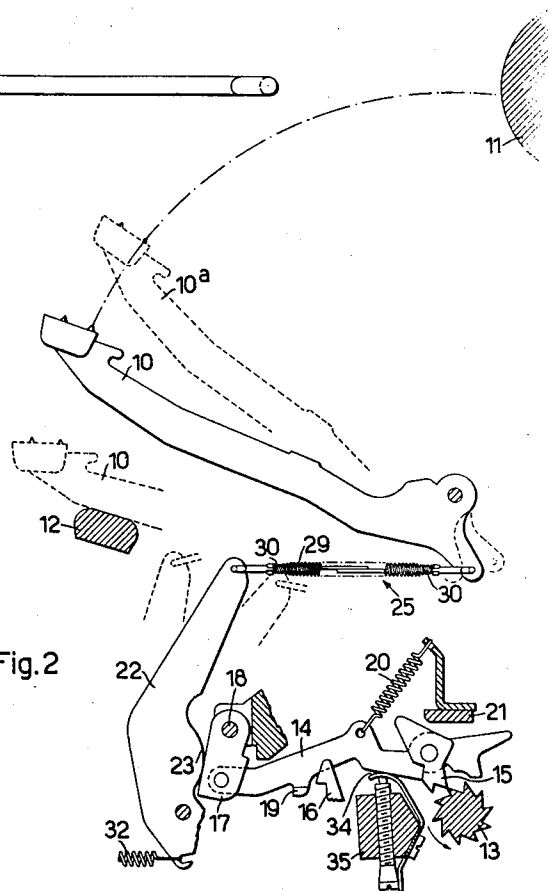


Fig. 1

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## POWER OPERATED TYPEWRITER

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This invention relates to typewriters in general and more particularly to the kind in which type actions are selectively associable with a common power drive member for receipt of transitory power impulses, and wherein as a result the type bars are driven partially toward a printing point but complete their printing motion by power to momentum.

Such typewriters embody conventionally devices whereby within certain limits the intensity or magnitude of the power impulses impartable to the individual type actions are predeterminable in respect thereto. Certain type actions, such as those for typing punctuation marks, embody types of very small printing areas. These type actions relatively to others should give forth very light printing blows if they are to produce imprints of substantially the same darkness or texture as the large type-face actions, or if they are to avoid perforating the work sheet.

It has been extremely difficult in the past, and often totally impractical, to adjust the power impulses of the punctuation type actions or obtain with reasonable constancy and accuracy the desired weakness of impressions. The underlying main reason for this has been that weak-powered impressions required very short power pulses which are unreliable to control, and also call for unduly long momentum travels of the type bars wherein the latter are subject to unpredictable friction conditions. Moreover, the degree of effectiveness of the power impulses of short durations on the type bars were very greatly affected by the momentary conditions under which the type actions happened to be picked up. If a type action happened to be picked up from full rest, then the effective power impulse imparted thereto obviously was greatly different than if the action was picked up while returning from a previous operation. If power impulses are very short, then also other mechanism shocks are unduly conducive to non-uniformity of typing performance.

According to the present invention, at least certain type actions which embody types of very small printing areas, such as the punctuation type actions are provided with flexible motion transmitting provisions which are so constituted that such type actions, when power pulsed, will sustain a loss of energy transmittal to the type bars, causing them to type with diminished vigor. The said provisions are preferably of a character so that the stated loss of energy transmittal is so great as to make longer power pulses necessary which will enable the type actions to perform with better control and uniformity. The type bars having the stated flexible motion transmitting provisions associated therewith are power-moved closer to the platen but attain a lesser speed and consequently strike with lesser but better controlled speed.

Resilient provisions in the type bar operating trains are known in the art but not organized in a cooperative relationship which produces the aforesaid results and advantages.

It may thus be stated to be a broad and general object of the invention to provide in a power-operated typewriter, simple and efficient means for obtaining typing impressions of uniform-strength appearance from all the various type-actions, regardless of type areas involved.

It is also an object of the invention to provide for transmittal of power operating strokes at least in connection with certain type bars with an attendant loss of energy transmittal thereto, thereby to provide for weakened typing impressions calling for longer and better controllable power actuating impulses.

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It is a still further object of the invention to provide efficient power operating means for type actions correlated with power regulating means therefor so that despite the differing-area printing faces on the type bars, appropriately proportioned power movements will be imparted to all type bars to produce substantially equal strength appearance imprints at each different regulated position of said means.

Other objects of the invention will become apparent upon consideration of the drawings and in the light of the description which follows.

In said drawings:

FIGURE 1 is a sectional side elevation showing in its normal position a power-operable type action embodying a flexible motion transmitting link,

FIGURE 2 is a side elevation similar to FIGURE 1, but illustrates the type action partially operated and sustaining a loss of energy transmittal to the type bar,

FIGURE 3 is an enlarged-scale detail view of said flexible motion transmitting link in a strained condition,

FIGURE 4 is an enlarged-scale detail view of a non-flexible motion transmitting link, and

Finally, FIGURE 5 is a cross-sectional detail view of the flexible link of FIGURE 3 at line 5—5 of such figure.

The invention is disclosed in connection with a power type action of the kind shown in the patent to Yaeger, No. 2,675,109, dated April 13, 1954. Referring now to FIGURE 1, type bars 10 are arranged in a usual curved array for pivotal movement against a platen 11 from diversive positions in which they rest on a usual curved pad 12. A single power roll or fluted shaft 13 is common to all the type bars 10. It extends transversally of the machine and is driven in the direction of the indicated arrow. A series of power actuators 14 which are individually related to the various type bars, stand normally all disengaged from the fluted shaft 13 thereabove in the position seen in FIGURE 1, each actuator including a usual snatch pawl 15 pivotally carried thereon.

At their front ends, the actuators 14 are pivotally connected to arms 17 which are provided on a frame supported pivot rod 18. Each actuator 14 has a spring 20 urging it rearwardly and upwardly to the normal position seen in FIGURE 1, the normal position of separation of the snatch pawl 15 from the fluted shaft 13 being established in cooperation with a bar 21.

Engagement of said actuators is selectively effectable under the control of type keys, not shown, or otherwise, through the operation of hook elements 16 which overlie lugs 19.

Each arm 17 operates a related sub-lever 22 by contact with a rolling face 23 on the latter. Said levers 22 reach upwardly to the differing levels of the related type bars, and, according to a preferred form of the invention, some are connected to their type bars by a flexibly extendable link structure 25, and some by a plain link 26 of constant length. Said flexibly extendable link structures 25 are provided only in association with the type bars which have type faces of very small printing area, such as the punctuation type bars. A link structure 25 is shown in FIGURE 3 in an enlarged and extended aspect. It comprises two link elements 27 consisting of stiff wire stock in a straight line, such elements having thereon a spring coil 29 which by reduced-diameter ends 30 has opposite anchorage association with said elements 27 at spaced locations. Intermediate said coil ends 30, the spring coil is slightly larger for the link elements 27 to slide therein freely, but snugly. Moreover, the link elements 27 have

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within the spring coil, portions 31 of half-round cross section which are slidably adjacent, the spring coil 29 being effective to maintain the link elements 27 slidably and fairly stiffly in line. A preferred manner in anchorage of the spring coil 29 on the elements 27 will be described in detail later herein. The spring coil 29 constitutes a flexibly strainable motion transmitting element in a type bar actuating train.

The contracted, normal condition of the link structures 25 is depicted in FIGURE 1. A spring 32 biases each sub-lever 22 and related type bar to its normal position as illustrated in FIGURE 1. The rolling faces 23 are preferably designed so that the differently located upper ends of the sub-levers 22 have substantially the same acceleration characteristics.

Upon engagement of any actuator 14, it will be driven forwardly to impart a cyclic motion to its related sub-lever 22. At a predetermined point the actuator, while being driven, engages by a cam face thereof an adjustable abutment 34 which is individual thereto, these abutments being provided on a transverse bar 35. Consequential to such engagements, as illustrated in FIGURE 2 the actuators 14 disengage themselves from the fluted shaft. In type actions which embody the constant-length links 26, the type bars 10 are forcibly driven until the disengagement of the actuator 14 occurs. However, in reference to the type actions which embody a flexibly extendable link 25 the strength of the spring coil 29 is such that, as shown in FIGURE 2, it will undergo considerable yielding while transmitting motion. This means that a loss of motion transmittal to the type bar occurs by reason of the flexible nature of the link structure 25. It further means that some of the energy input by the actuator 14 is not transmitted to the type bar 10.

In FIGURE 2, the actuator 14 is shown at the point of disengagement. In view of the flexible nature of the link structure 25, the full line position of the type bar 10 has been reached. Had the link 25 been inflexible, then the type bar 10 would have reached the position indicated at 10<sup>a</sup>. Obviously the amount of energy transmittal over the individual link structures 25 is variably predeterminable by adjustments of the abutments 34.

As soon as the actuator 14 becomes disengaged, the energy stored in the strained spring coil 29 becomes unavailable for further driving influence on the type bar because the sub-lever 22 is then free to restore and will do so under the tension of its spring 32. The loss of energy transmittal provided for in the above manner is very appreciable and has facilitated a considerable lengthening of the power stroke of the actuators 14 in all those type actions that are equipped with the flexible link structure 25, it being understood that the loss of transmitted energy is evidenced by a reduced speed of travel of the pertinent type bar. The lengthening of the power strokes as facilitated by the link structure 25 has also the beneficial effect that at the time the actuator disengagement takes place, the mechanism shocks, which are incidental to the initial pick up of the type actions and of differing violence, are already well absorbed, that is the type bar travels then at well-controlled speed. On the other hand the increased distance of travel of the type bars 10 effected under the power of the actuators 14 provides that the type bars are required to move under momentum a lesser distance, so that frictional influences, which are subject to change, are encountered over a shorter range of type bar travel, and thus become minimized.

Collective regulation of strengths of imprints is obtainable through adjustment of the abutment bar 35, by old mechanism. Said bar 35 forms a pivoted bail structure with spaced levers 37 so that this bail structure is differently positionable by an impression regulating control knob 38, through cams 39.

With respect to type actions embodying extendable link structures 25, the adjustment of the bar 35 for lengthened strokes of the actuators 14 has the effect of causing

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increased straining of the link structures with an attendant greater loss of energy transmittal to the type bars. This loss of energy attendant in respect to type bars which are operated by extendable link structures 25 is so proportioned that in the various positions of the impression control all the type bars will effect imprints of substantially uniform imprint-strength appearance despite the printing faces of greatly differing areas.

The reduced-diameter ends 30 of the spring coil have a press fit upon the link elements 27. However, the frictional grip afforded is insufficient to maintain the spring coil ends firmly anchored. In fact, each time the link structure 25 is strained, the coil ends 30 will slip a minute extent on the elements 27. Then, whenever the structure 25 contracts following its straining, the link elements 27 snap in opposite directions toward each other so that the instance the spring coil becomes fully contracted, the spring ends 30 tend to execute a violent jump from each other beyond their original positions on the link elements 27. For controlling such jumps of the spring ends 30, the link elements 27 are each provided with two diametrically opposite undercut burrs 40. Through said burrs 40, the spring ends 30 become relocated in correct relations on the elements, each time cancelling out the slippage which occurs as the spring 29 is strained. It will be observed that the burrs do not serve as anchorages. Also to be noted is that the link structures 25 are very slender, which is important in view of the danger of operating interference between them. Instead of the springs 30 having frictional association upon the link elements, their ends may be attached otherwise, as by soldering. However, this method of attachment is expensive and has been found to be subject to failure after long-time use.

According to the preferred embodiment of the invention hereinabove described, the flexibly extendable link structures are restricted to type bars 10 having small-face types. It has however been discovered that the flexibly extendable link structures may be advantageously used additionally in type actions embodying large-face types. Obviously in either of these different embodiments of the invention the type actions with increasingly larger face types require correspondingly increased stronger typing blows against the platen. If the flexibly extendable link structures are also to be used for large-face type actions, then reduced lengths of power strokes for some of the very large-face type actions are in order. This is because the pertinent link structures are undergoing recovery toward normal length before the actuator disengagement takes place so that consequently the type bar speed is super-imposingly increased by the recovery of the spring coil 29 before the actuator disengages. The link structures 25 or equivalent flexible motion transmitting provisions have the advantageous effect of cushioning undue mechanism shocks and particularly also the shocks which accompany the disengagement of the actuators. It is for this reason especially that type actions involving relatively large type-faces may be equipped also with flexible motion transmitting provisions, but, of course, these provisions do not act to divert printing energy from the related type bars.

It should be understood that broadly the invention provides for a loss of energy transmittal to at least one type bar, through the provision of any kind of flexible motion transmitting provision in its operating train which strains but does not recover substantially before the power operating pulse ceases.

The spring coil 29 in any type action may be said to constitute a flexibly strainable motion transmitting element which has a flexing strength properly correlated on one hand to the power stroke force of its related actuator and on the other hand also to the inherent force of opposition to acceleration afforded by the type bar, so that the power stroke of said actuator produces through such strainable element 29 a partial power operation of the type bar and attendant thereto produces in said element

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itself a flexure which obtains at the end of said partial power operation. Obviously, when in the cyclic operation of the actuator 14 the latter becomes divorced from the constantly operating power member 13, there results immediately a relaxation of the then flexed element 29. Therefor, the energy which as a result of the said partial power operation of the type bar has become stored in said element 29, becomes promptly and automatically unavailable for type bar driving influence, so that thereupon the completing operation of the type bar is by force of attained momentum and devoid of that part of the energy which produced the flexure of said element 29.

What is claimed is:

1. A spring link motion transmitting assembly comprising in combination,

(a) two wire rods extending toward each other in a straight line and including portions of generally complementary fractional cross section extending in a lengthwise overlapping relationship and slidably parallel to each other,

(b) and a distensible spring coil being placed axially parallel upon said wire rods with at least said overlapping rod portions slidably and stiffly contained therein and with the spring coil at opposite locations beyond said rod portions having impositive anchoring attachment on said rods through some end-turns thereon having a diametrically contracting friction hold thereon,

(c) the said rods embodying abutment means for said spring coil by its ends to locate oppositely thereagainst through shock movements of the spring coil ends lengthwise from each other when the spring coil turns compact against each other after the spring link assembly has transmitted motion.

2. In a typewriter, the combination of:

(a) a type bar,

(b) a constantly operating power member,

(c) and means to transmit motion from said power member to said type bar to drive the latter partially toward a printing position, comprising,

(d) an element for motion-receiving association with said power member for a given period to receive a given-extent power motion therefrom,

(e) and comprising further a flexible motion transmitting link structure which is so constituted that attendant to transmitting motion it will become extended to a significant degree from a normal condition and so that at the end of said motion receiving association of said element the type bar will be travelling at a lesser speed than if said provision were inflexible, said provision after said limited motion receiving association of said element, being allowed by the latter to resume its normal condition without exerting further driving force on said type bar, the said link structure comprising,

(f) two elongate elements extending toward each other in line,

(g) a distensible spring coil placed over said elongate elements and having coil-ends forcibly pressing thereupon to have friction holds oppositely thereon at two spaced points but said elongate elements having free sliding capability intermediately of the coil ends, said spring coil being normally contracted substantially to compactness,

(h) and abutment means on said elongate elements and adjoining the said coil ends therebeyond for location of the latter thereagainst,

(i) each of said coil-ends having friction holds on said elements which may slip slightly therealong from said abutment means when the spring coil is being distended, said spring coil by contracting to compactness following each operation of said element, moving said elongate elements relatively toward each other and the shock of completely effected contraction of said spring coil, urging said coil-ends from

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each other so as to locate them on the element to the opposite limits afforded by said abutments, wherefor the spring coil-ends are correctly correlated in respect to the elongate elements after each effected type bar operation.

3. In a typewriter having a type bar, a flexibly extendable link structure for transmittal of motion to said type bar comprising:

(a) two elongate link-elements in line,

(b) a distensible spring coil placed over said elongate elements and having coil-ends pressing forcibly at two spaced points thereupon to exert friction holds thereon but said spring coil intermediate of said coil-ends being dimensioned relatively to said elements for sliding capacity thereon,

(c) and abutment means on said elements and adjoining the said coil-ends therebeyond for location of the latter thereagainst, each of said coil-ends having friction holds on said elements which may slip therealong slightly from said abutment means when the spring coil is being distended, said spring coil, when contracting subsequently to being distended, moving said elements relatively toward each other so that when said spring coil becomes fully compacted, the coil-ends will receive shocks directionally from each other, inducing them to slip reversely on said elements to the limit afforded by said abutments.

4. The invention set forth in claim 3, the said elements being made of round stock and said abutments being struck up from said round stock to project radially therefrom.

5. In a typewriter having a type bar and power means to operate said type bar, in combination:

(a) a constantly operating power member,

(b) a type bar actuating train interposed between said member and said type bar and comprising therein, (b1) an actuator connectable transitorily with said member for receipt of a cyclic power stroke therefrom wherein said train operates said type bar only partially toward a printing position

(b2) and a flexibly strainable motion transmitting element of a flexing strength so correlated on one hand to the power stroke force of said actuator and on the other hand to the inherent force of opposition to acceleration afforded by said type bar, that the power stroke of said actuator produces through said element a partial power operation of said type bar and attendant thereto produces in said element itself a flexure which obtains at the end of said partial power operation,

(c) means to connect said actuator with said member for receipt of said cyclic power stroke,

(d) and means associated with said actuating train to facilitate at the end of said partial power operation of said type bar an immediate relaxation of the then flexed element and consequently to facilitate a completing travel of the type bar by force of attained momentum which is devoid of that part of the operating energy which was instrumental to produce the flexure of said element.

6. The invention set forth in claim 5, the said flexibly strainable motion transmitting element comprising:

(a) two wire rods extending toward each other in a straight line and including portions of complementary fractional cross sections extending in a lengthwise overlapping parallel relationship,

(b) and a distensible spring coil carried axially parallel upon said wire rods and having an interior diameter to confine said overlapping rod portions mutually therein in a stiffly but freely telescoping manner, said spring coil having at its opposite ends anchorage associations upon the two wire rods which extend toward each other.

7. In a typewriter having a complement of type bars of which some have relatively small and some relatively

large printing face area types and having power means to operate said type bars, in combination:

- (a) a constantly operating power member,
- (b) individual actuating trains for said type bars interposed between said power member and the various type bars and comprising each, 5
- (b1) an actuator connectable transitorily with said member for receipt of a cyclic power stroke therefrom to effect an operation of the related type bar partially toward a printing position. 10
- (b2) the actuating trains related to such of the type bars which have relatively small printing face area types, exclusive of those related to such of the type bars which have relatively large printing face area types, comprising each a flexibly strainable motion transmitting element of a flexing strength correlated 15
- on one hand to the power stroke force of its related actuator and on the other hand to the inherent force of opposition to acceleration afforded by the type bar related thereto, so that the power stroke of any 20
- of these actuators through its related strainable element produces a partial power operation of the type bar in train therewith and attendant thereto produces in said element a flexure which obtains at the end 25
- of such partial power operation,

- (c) the typewriter including further, selective control means to connect said elements for receipt of said cyclic power strokes,
- (d) and means variously associated with said actuators to disconnect them from said power member after receipt of their said power operations, whereby at the end of the stated power operation of any type bar embodying in its train a flexibly strainable element, there is facilitated the immediate relaxation of such element and thus a completing movement of the operated type bar by power of momentum which is devoid of the part of energy input expended by the actuator in effecting the flexure of said element.

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