

April 23, 1935.

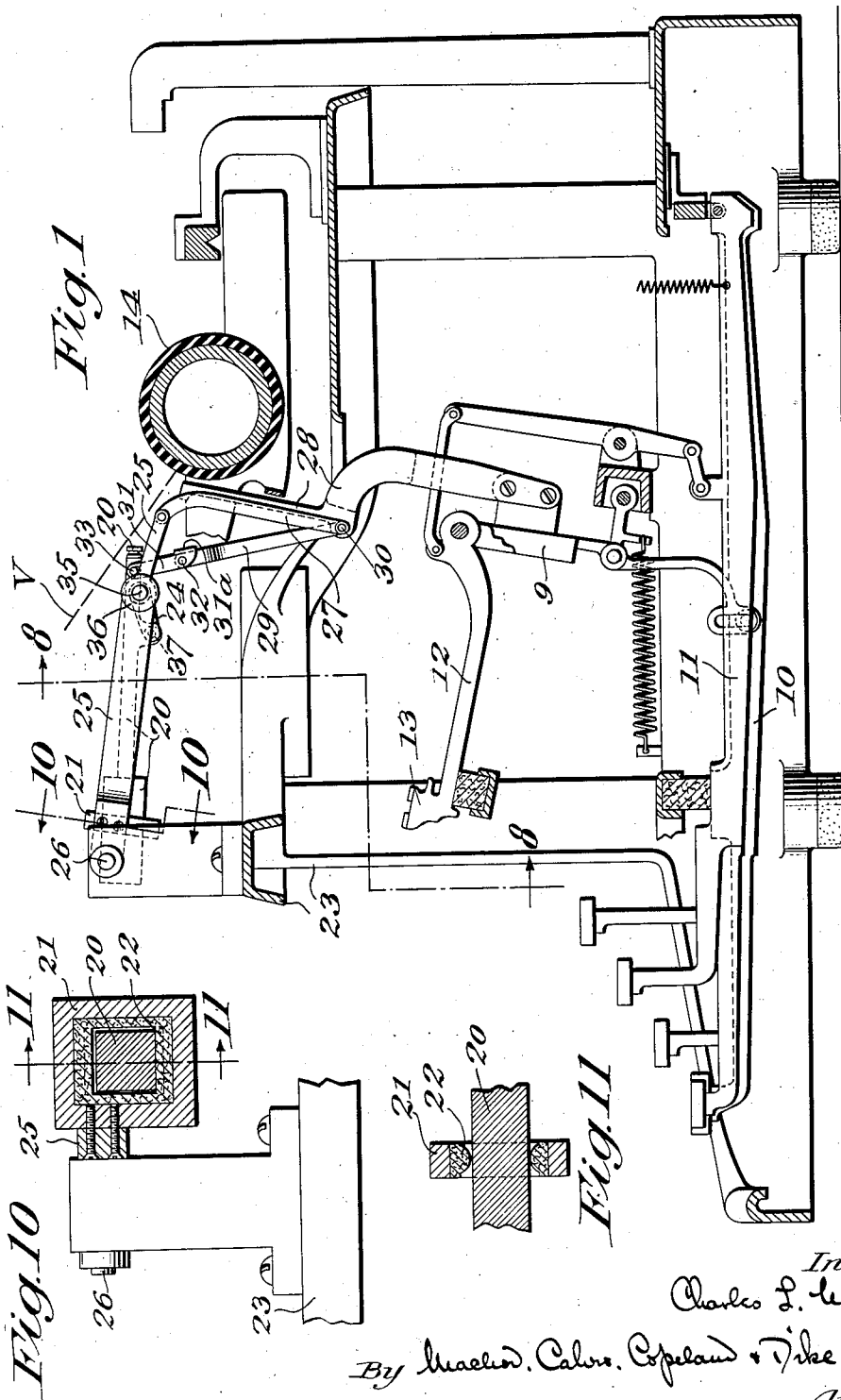
C. L. NORTON

1,998,555

TYPEWRITER

Filed Sept. 9, 1933

3 Sheets-Sheet 1



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TYPEWRITER

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3 Sheets-Sheet 2

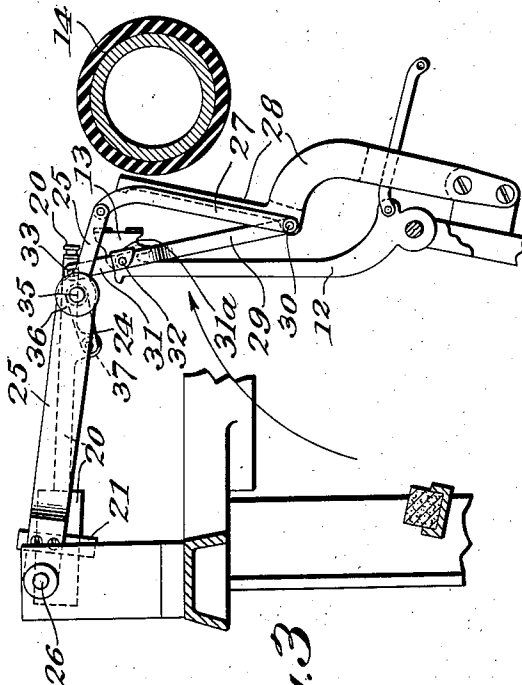


Fig. 3

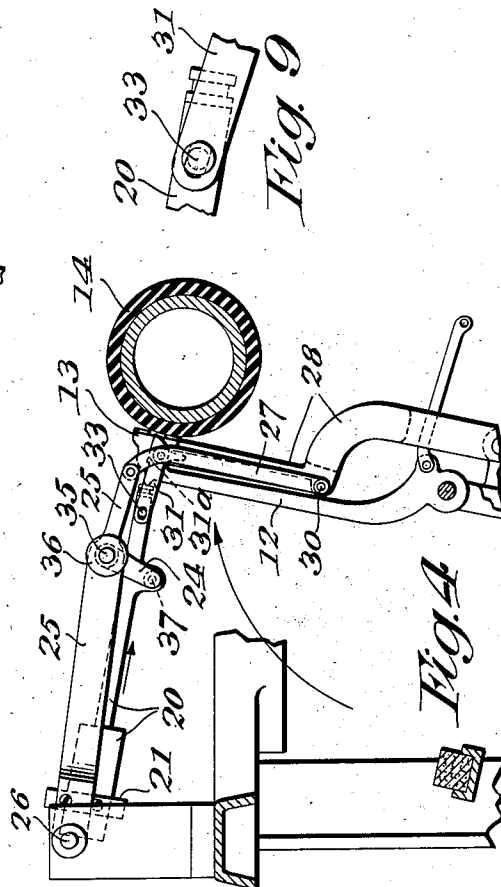


Fig. 4

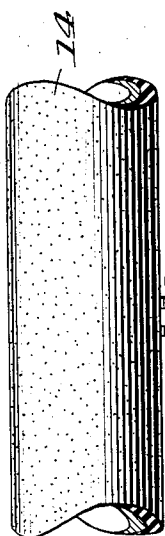


Fig. 2

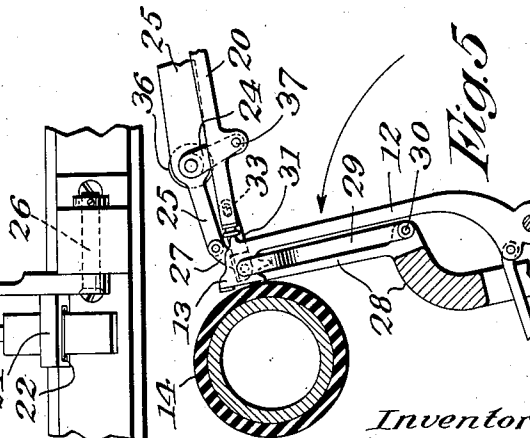


Fig. 5

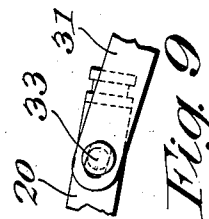


Fig. 9

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3 Sheets-Sheet 3

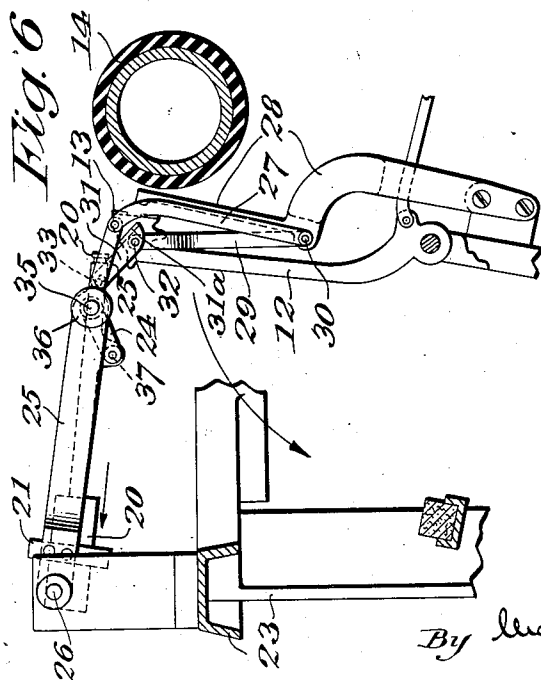
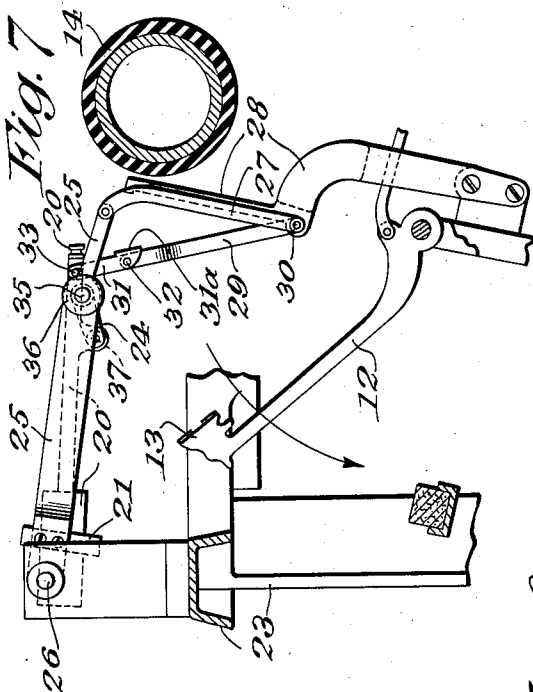
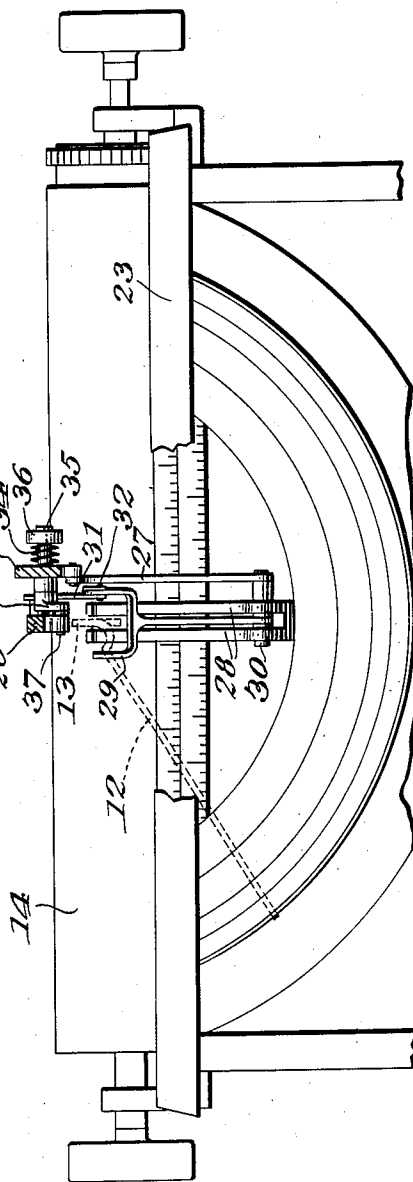


Fig. 8



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UNITED STATES PATENT OFFICE

1,998,555

TYPEWRITER

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Application September 9, 1933, Serial No. 688,787

12 Claims. (Cl. 197—23)

My invention relates to typewriters and similar machines, chiefly of the kind in which there is a freely swinging type bar carrying a type head which is so swung as to strike a blow against the paper on the platen, usually through an interposed ink ribbon. The object of the invention is to reduce the noise of such and similar machines and improve the printing and manifolding produced. The invention consists in a method and mechanism for accomplishing the desired result.

It is well understood by those who have studied the matter that a large part of the noise made by a machine of the kind in question is caused by the impact of the type head and the consequent resonance of the paper and, to a less degree, of the type head and platen. Investigation has proved that little or no noise is made if the type head has a relatively low velocity at the time of impact. But it has also been found that a freely swinging type head which, at the time of impact, is moving at a low enough velocity to be noiseless is not an effective printing mechanism, particularly for manifolding and where several carbon copies are required. I have discovered, however, that if the type head is moving at a relatively low velocity at or about the time of impact and is thereafter struck a sharp hammer blow by a freely moving hammer having sufficient momentum, an improved imprint is made, even through a considerable number of carbons, and there is no appreciable noise from the impact.

In putting my improved method of silencing into practical operation, I prefer to employ a sliding or swinging hammer whose mass is preferably concentrated behind the striking face, such for instance as a bar or rod shaped member the end of which acts as the striking face, and arrange the hammer so that at the time of impact it is moved only by its own momentum. The hammer is thrown freely forward and is free to rebound immediately after striking the type head. I also provide means in the form of a universal bar, i. e. a bar of small mass in the path of movement of all the type bars, which each type bar strikes as it approaches the printing point, and accelerating linkage by which the hammer is gradually started from its position of rest, i. e. its retracted position, and rapidly accelerated until it strikes the type head a sharp hammer blow. By this arrangement, the type bar actuates the universal bar and hammer and is itself slowed down to a speed below that at which impact is objectionably noisy, but thereafter is caused to print by being struck a sharp blow by the rapidly moving hammer. I find that I can use a hammer having a weight many times that of the type head and that this hammer can be made to strike a surprisingly powerful blow even though it is actuated entirely by the type bar, but the contact of the hammer with the type head is not noticeably noisy.

My improved method of silencing typewriters and the mechanism which operates in accordance with it have important advantages not attained by other devices.

The device is applicable to "front-strike" and other impact printing machines without change in their original mechanism and without loss of the very great advantages which machines of this kind have over so-called "pressure printers" in which the type is pushed or pried against the platen by mechanism such as a toggle which reduces the velocity of the type head substantially to zero just before the time of printing. Unlike the usual pressure printers, the printing of the machine operating by my novel method and supplied with my improved mechanism is not affected appreciably by variations in the combined thickness of the sheets of paper or carbon on the platen and the machine will operate successfully on an aggregate thickness on which a machine of the pressure printing type will not operate without adjustment of the abutment for the toggle in toggle operated machines, or of the pivot or the like in those which pry the type against the platen. In order that my invention may be better understood it may be said that the hammer imparts a blow to the type head, and that the blow is due entirely to the hammer being suddenly stopped when moving freely and consequently is due solely to the momentum of the hammer. After striking the type head, the hammer is free to rebound. In this respect, it is entirely different from the devices already referred to which push or press the type against the platen. To accomplish the desired result, it is necessary that the hammer be given the necessary momentum. I prefer to use a relatively heavy hammer, weighing perhaps 50 grams, i. e. about ten times the weight of the type head, to give it a relatively short movement, for example 10 millimeters, and to accelerate its movement as rapidly as possible, thereby giving it the necessary momentum. This construction produces the best manifolding with the least noise, yet provides a device which can operate successfully within the limits of time available when the machine is operated at high speed. The accelerating mechanism starts the hammer gradually and

therefore the type bar does not rebound from the universal bar or other contact member without setting the hammer in motion, as would be the case if the hammer had to be started suddenly.

It will be seen that my mechanism does not change the speed of the type bar until just before impact, and therefore that the mechanical action of a standard machine need not be changed or affected, and that the "touch" of the machine is not noticeably altered. In fact the speed of the machine is slightly improved owing to the fact that the more rapid rebound of the hammer more than compensates for any loss of speed just before printing contact.

Other objects and important advantages of the invention will be apparent without further extended discussion.

In the accompanying drawings:

Fig. 1 is a longitudinal vertical section of a typewriter having my invention applied thereto, certain parts being omitted for simplicity of illustration, and the type and hammer bars being shown in their normal or retracted positions.

Fig. 2 is a plan view of a portion of the mechanism shown in Fig. 1.

Fig. 3 is a view similar to Fig. 1 of a portion of the mechanism shown therein, the type bar being shown as having been moved out of its normal or retracted position toward the platen and in the act of striking the universal bar.

Fig. 4 is a similar view showing the positions of the parts at the instant of printing.

Fig. 5 is a view corresponding to Fig. 4 but viewing the parts from the opposite side.

Figs. 6 and 7 are views similar to Fig. 3 showing two positions of the type bar during its return from the platen toward normal position.

Fig. 8 is a transverse vertical section taken substantially on the line 8—8, Fig. 1.

Fig. 9 is an enlarged fragmentary detail view of the connection between the hammer bar and its actuating link.

Fig. 10 is an enlarged section taken substantially on the line 10—10, Fig. 1.

Fig. 11 is a section on the line 11—11, Fig. 10.

In the drawings there is shown a typewriter of the front strike type and of one standard construction to which is applied a silencing mechanism operating according to my novel method and embodying my invention. This is the form of my device which has proved to be most satisfactory, but is shown solely for purposes of illustration. In the typewriter shown there is a key lever 11 operating a swinging type bar 12 by suitable connections. The type bar is provided with the usual type head 13, i. e. the portion adjacent to and carrying the types. A platen is shown at 14. In a machine of this kind, the type head is swung rapidly from its normally retracted position of rest through an arc of substantially 90° toward the platen and is stopped by the latter. It will be understood that the construction which has been just described is well known and forms no part of my invention.

In the mechanism embodying my invention, I provide a hammer 20 which is preferably but not necessarily in the form of a rod or bar, the back end of which, i. e. the end toward the operator, is relatively large and massive while the front end is of a smaller cross-section to provide a small or concentrated striking face. The hammer is slidably mounted at its rear end in a guide 21 provided with an anti-friction surface which in the preferred form of my invention is a piece of fiber

or similar material and is shown at 22 in Figs. 10 and 11. The front end of the hammer 20 is pivoted at 37 to a rock arm 24 secured to a stud or rock shaft 35 mounted to turn in a bridge 25 which spans the space above the type basket and by which the guide 21 is carried. The bridge 25 is pivoted, as shown at 26, at its rear end to a fixed part of the frame of the machine 23 and at its front end to a link 27 the lower end of which is pivoted at 30 to the type guide 28 which, in machines of this type, is ordinarily supported on the type basket 9. It will be seen that when the shift key 10 of the machine lowers the type basket to print the upper case characters, the bridge 25 is moved with it and therefore the hammer maintains the same position with respect to the type head in the printing positions for both the upper and lower case types. The arm 24 serves to support and guide the front end of the hammer 20 and particularly to depress the front end of the hammer as it moves toward the type head, and to raise it during the return movement of the hammer, so that the type head may swing into printing position without colliding with the hammer. This makes possible a relatively short movement of the hammer. It will be observed that, while the hammer bar 20, guide 21, and bridge 25 are located between the operator and the platen, and at a sufficient elevation to permit the hammer bar to move in an endwise direction and downwardly to strike the type head, the arrangement is such as not to obstruct the operator's line of vision of the printing point, as indicated by the line V in Fig. 1.

At 29 is shown a universal bar also pivoted at 30, independently of the link 27, to the lower end of the type guide. This universal bar is conveniently forked at its upper end as shown in Figs. 2 and 8 and is so located as to be in the path of all the type bars. The point of contact of the type bars with the universal bar is preferably closely adjacent the type head but under some conditions, if preferred, the position may be varied.

One end of a link 31 is connected at 32 to one of the arms of the universal bar 29. The other end of the link 31 is connected to the hammer 20 by a pivot 33. Normally the link 31 occupies a position substantially in alignment with the universal bar 29, when viewed from the side as shown in Fig. 1, and is preferably provided with a stop 31a to prevent it from moving beyond this position.

To assist in retracting the universal bar and hammer to normal position after the hammer has struck the type head and rebounded therefrom, there is provided a coil spring 34 (Figs. 2 and 8) surrounding the stud 35, one end of said spring being connected with the bridge 25 and the other with a collar 36 secured to said stud. This coil spring and the pull exerted by the link 31 tend to lift the rear end of the hammer, thus greatly reducing the friction of the sliding hammer.

The operation of the device as already described is as follows. When the key 11 is depressed, the type bar 12 is swung upward through an arc of about 90°, attaining its maximum velocity just before it reaches the printing position when the machine is not provided with my silencing device. In the operation of my device the type bar 12 contacts with the universal bar 29 a short distance before it reaches the printing point, as shown in Fig. 3, the momentum of the type bar and type head being sufficient to push the universal bar smoothly ahead of it. The con-

tact with the universal bar has the effect of slowing the type bar and the parts are designed so that the velocity of the type head at the time of impact is below that at which an objectionable noise is produced. This point is difficult of exact estimation, but when the speed is less than 50% of the normal maximum speed of the type head of a machine of this character, the noise is hardly appreciable. Also, due to the relatively small mass of the universal bar, the impact of the type bar thereagainst is not productive of substantially appreciable noise. When the type bar contacts with the universal bar 29 and begins to push it ahead, the link 31, which is connected to one arm of the universal bar, pulls down the striking end of the hammer 20 and at the same time because of the action of the arm 24 begins to slide the hammer 20 toward the type head. During this movement, the link 31 turns on its pivot 32 out of alignment with the universal bar, and owing to this arrangement and the proportioning of the parts of the linkage, the movement of the hammer begins very gradually, but increases in speed, producing a rapid acceleration. This permits the use of a relatively heavy hammer, yet there is no danger that the universal bar 29 will resist the type bar sufficiently to cause the type bar to rebound from it because of the small mass of the universal bar and its connected linkage, and of the fact that, even though the universal bar is set into motion very quickly and abruptly, the massive hammer is set into motion very gradually. Continued forward movement of the type bar, carrying with it the universal bar 29, pulls the hammer 20 rapidly forward, the path of movement of the striking face being determined primarily by the arm 24. This will be easily understood from Figs. 1, 3 and 4, which show successive positions of the parts and their paths of movement. The parts are proportioned so that just at or about the time when the type head contacts with the paper (or ribbon, not shown) the striking face of the hammer will strike the back of the type head. The hammer, the movement of which is thus suddenly stopped at the time of its maximum velocity, imparts its energy to the type head, striking it a sharp hammer blow which has the effect of driving the type against the ribbon, paper, carbons etc. and producing the proper manifold impression. Thereafter it rebounds freely.

In practice, and to insure a free movement of the hammer, so that its momentum may be all expended on the type head and none of it be wasted in dragging forward with it any of the connected mechanism, I provide a loose connection preferably by making the pivot 33 and the hole in the link 31 a loose fit, as shown most clearly in Fig. 9. It will be seen therefore, that the hammer, which is accelerated very gradually, is brought to its maximum velocity just before contact with the type head, is thereafter free to continue its forward movement at the maximum velocity, to expend all of its energy on the type head, and to rebound without being restrained by connecting linkage. It will also be understood that the arrangement of the long slender hammer whose mass is entirely concentrated behind the striking face, has a maximum efficiency as a hammer and since the blow is struck by an endwise movement it has a minimum tendency to produce noise. Also it will be seen that the design is such that, although the blow takes place while the hammer is moving with its maximum velocity, this velocity may be relatively low and the necessary striking energy obtained, since the force of

the blow is the product of the mass and the square of the velocity.

Since the silencing mechanism above described involves no structural change in the printing mechanism or type bar action proper, but merely constitutes an addition to the latter, it can readily be supplied as an attachment for existing machines, or can be included in or omitted from otherwise standard machines as originally built with minimum interference with established manufacturing and assembling practices.

For convenience and brevity, the term "platen" is used in the claims to designate the make-up against which the type heads strike, that is to say, not only the platen roller, or its equivalent, itself, but also the paper, ink ribbon, carbon sheets, etc., interposed between said roller and the type heads.

I claim:

1. A mechanism for silencing a typewriter, which comprises means to reduce the speed of the type head to a speed at which impact against the platen is not objectionably noisy, a normally retracted, longitudinally moving hammer bar substantially freely movable under its own momentum when set in motion, and means to cause the hammer to strike the type head and drive it against the platen.

2. A mechanism for silencing a typewriter, which mechanism comprises means to reduce the speed of the type head to a speed at which impact against the platen is not objectionably noisy, a normally retracted, longitudinally moving hammer bar freely movable under its own momentum and positioned to strike the type head at about the time of printing contact, and means for actuating said hammer with an accelerating movement to strike the type head and drive it against the platen.

3. A mechanism for silencing a typewriter having a freely swinging type bar and a platen, which mechanism comprises a freely movable hammer, an accelerating linkage, and means actuated by the type bar to cause the linkage to accelerate the hammer and cause the latter to strike the type bar a hammer blow due to the acquired momentum of the hammer.

4. In a typewriter having a freely moving type head and a platen, silencing mechanism comprising a normally retracted, longitudinally moving hammer bar freely movable under its own momentum, a crank arm for supporting one end of the hammer bar adjacent the platen, a guide in which the opposite end of the hammer bar is slidably mounted, and means to set said hammer bar in motion whereby the hammer bar strikes the type head and drives it against the platen.

5. In a typewriter having a freely moving type head, a type basket, means to lower or raise the type basket to print upper and lower case characters, and a platen, silencing mechanism comprising a normally retracted, longitudinally moving hammer bar, a bridge movable up and down with the type basket, a crank arm connecting said bridge with one end of the hammer bar adjacent the platen, a guide in which the opposite end of the hammer bar is slidably mounted, and means to cause the hammer bar to strike the type head and drive it against the platen.

6. In a typewriter having a series of freely movable type bars and a platen, silencing mechanism comprising a hammer freely movable toward the platen, a universal bar in the paths of movement of the type bars, and means including accelerating linkage connecting said universal bar and

hammer to set said hammer in motion and cause the same to strike an actuated type bar a hammer blow and drive it against the platen.

7. In a typewriter having a series of freely movable type bars and a platen, silencing mechanism comprising a relatively heavy hammer freely movable toward the platen, a relatively light universal bar in the paths of movement of the type bars, and means including accelerating linkage connecting said universal bar and hammer to set said hammer in motion and cause the same to strike an actuated type bar a hammer blow and drive it against the platen.

8. In a typewriter having a frame, a series of swinging type bars, a type basket, and means to lower or raise the type basket to print upper and lower case characters, the novel silencing mechanism comprising a bridge one end of which is pivoted to the frame of the machine and the other is pivoted to a member movable up and down with the type basket, a hammer, a contact member in the paths of movement of the type bars, guiding means for the hammer secured to said bridge, and connections between the contact member and the hammer whereby the energy imparted by an actuated type bar and the contact member causes the hammer to move longitudinally and strike the type bar a hammer blow.

9. In a typewriter having a frame, a series of swinging type bars, a type basket, means to lower or raise the type basket to print upper and lower case characters, and a type guide at the printing point movable with the type basket, the novel silencing mechanism comprising a bridge one end of which is pivoted to the frame of the machine, a link connecting the opposite end of said bridge with the type guide, a hammer, a contact

member in the paths of movement of the type bars, guiding means for the hammer secured to said bridge, and connections between the contact member and the hammer whereby the energy imparted by an actuated type bar and the contact member causes the hammer to move longitudinally and strike the type bar a hammer blow.

10. In a typewriter and in combination, a platen, a type bar, means for impelling said type bar toward said platen, a hammer movable toward the platen to strike the type bar a hammer blow and means operable as the type bar approaches the platen for decelerating the type bar and simultaneously with said deceleration to accelerate the hammer to cause the latter to strike the type bar a hammer blow in the course of the acceleration of the hammer.

11. In a typewriter and in combination, a platen, a type bar, means for impelling said type bar toward said platen, a hammer freely movable of its own momentum toward the platen to strike the type bar a hammer blow, and mechanism operable as the type bar approaches the platen to decelerate the type bar and by transferring kinetic energy of the type bar to the hammer to accelerate the hammer, said hammer being operable thereafter to strike the type bar a hammer blow.

12. The method of silencing a typewriter having a type bar and a platen, which consists in causing the type bar to impart a portion of its energy to a hammer, thereby slowing down the type bar and accelerating the hammer, and thereafter causing the hammer to strike the type bar a blow the energy of which is derived solely from the momentum of the hammer.

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