March 31, 1959 R. D. DODGE 2,879,879

DECELERATING MECHANISM

Filed Dec. 29, 1954 2 Sheets-Sheet 1

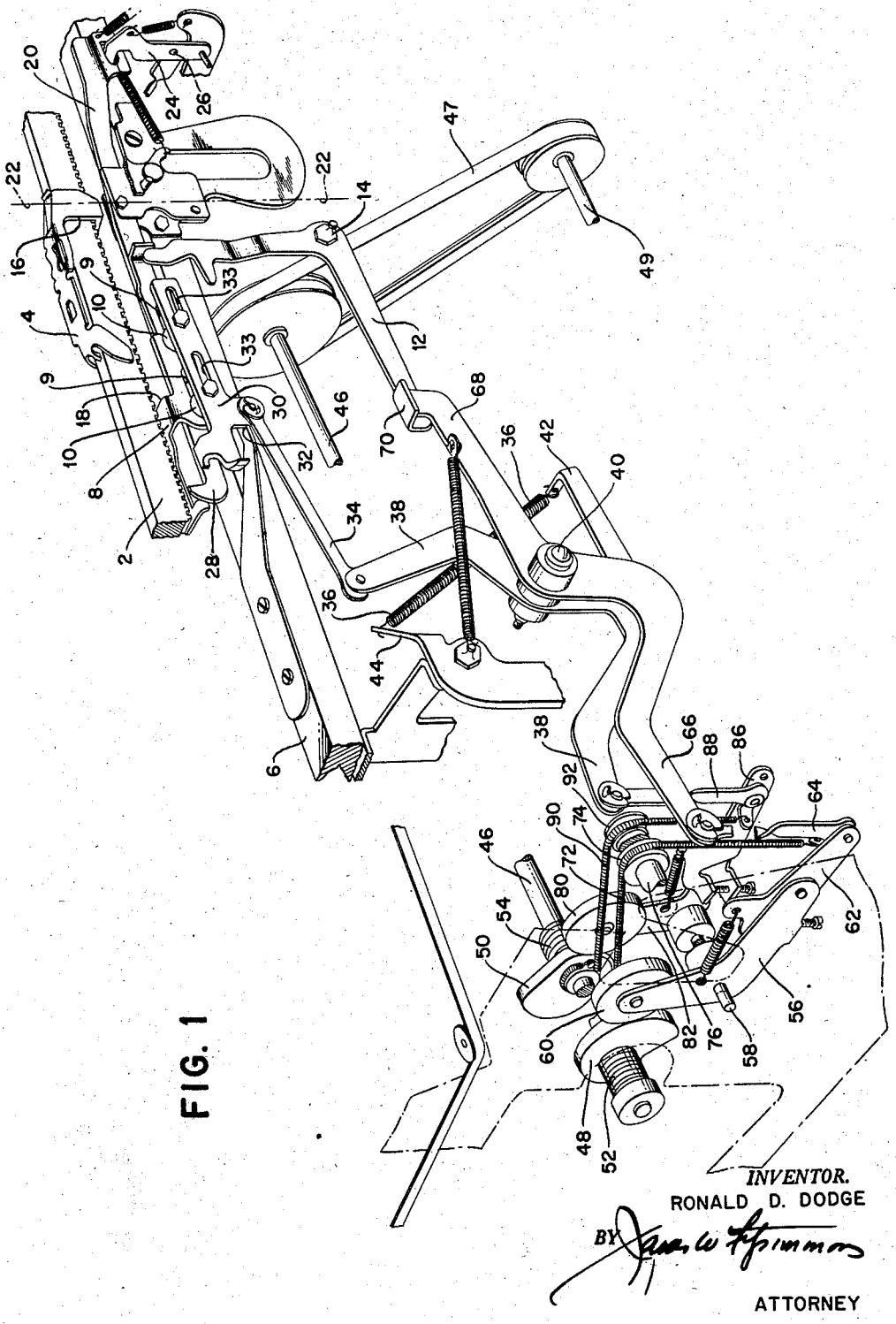


FIG. 1

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FIG. 2

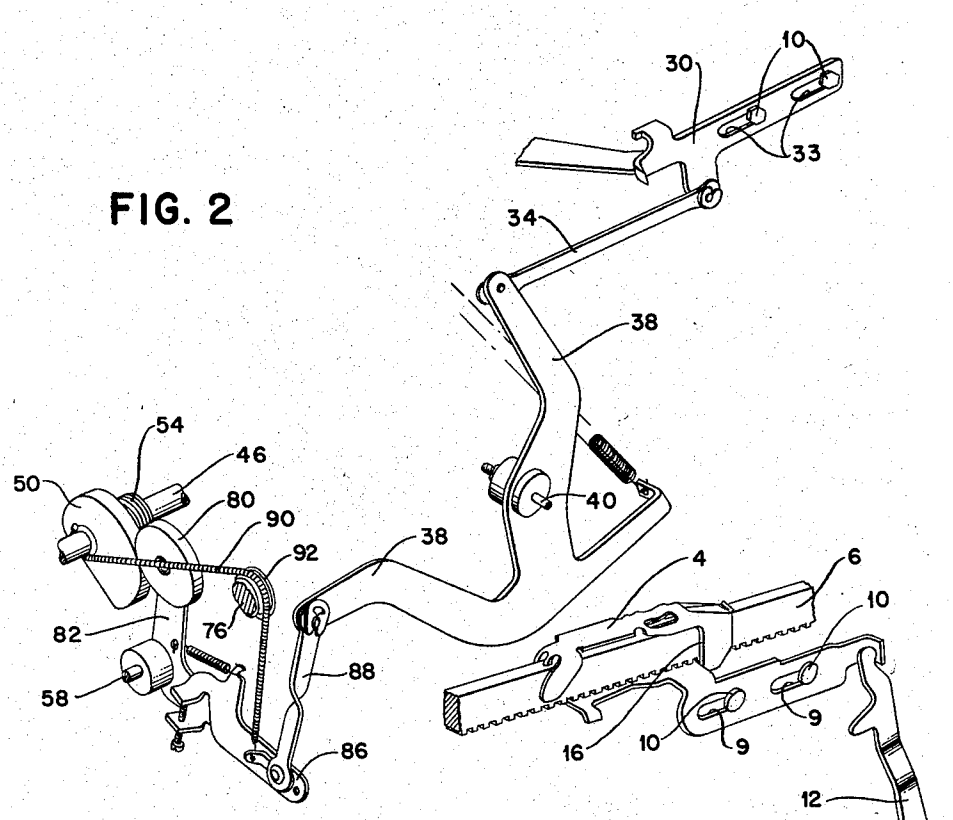
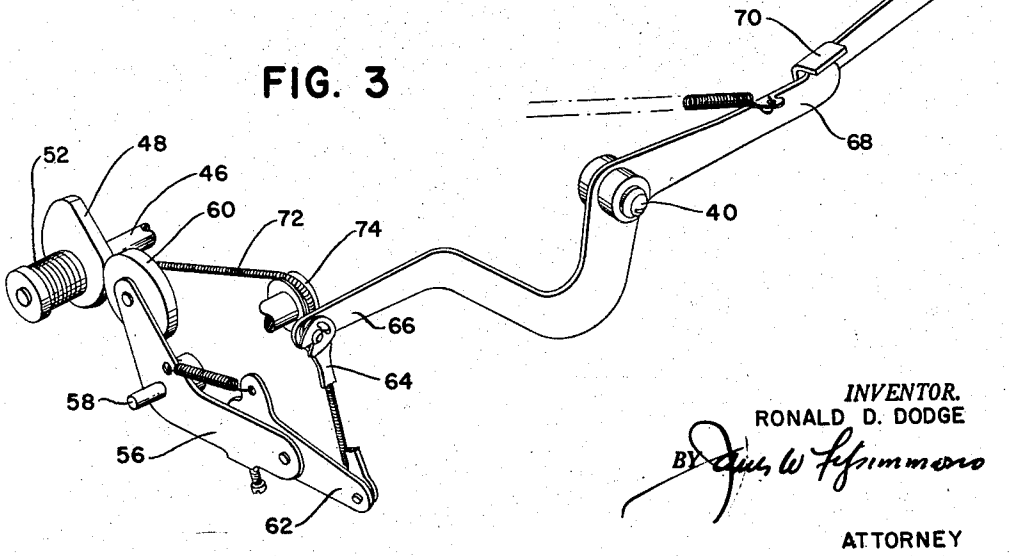


FIG. 3



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DECELERATING MECHANISM

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10 Claims. (Cl. 197—183)

This invention relates to movable carriage business machines and more particularly to an improved decelerating mechanism for absorbing shock while stopping a machine carriage after a free or power driven run.

It is well recognized in the business machine art, particularly typewriters, that some sort of shock reduction means must be employed to reduce the noise and shock of a carriage when it is returned or set free during a tabulation run. The art is replete with examples of snubbers, and air cushions which operate to reduce shock and noise during these carriage functions, but there is still need in the art for an improved speed sensitive decelerating mechanism.

It is, therefore, a first object of this invention to provide such an improved decelerating mechanism for a business machine carriage.

It is a still further object of this invention to provide a carriage decelerator which will function to slow down the carriage in agreement with any predetermined deceleration curve.

It is a still further object of this invention to provide an improved decelerator having operating parts that will require very little attention or adjustment during use.

Other objects of the invention will be pointed out in the following description and claims, and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a perspective view of the rear of the well known IBM typewriter showing the decelerating mechanism operable in conjunction with a tabulation and carriage return operation, respectively.

Fig. 2 is an exploded view of the elements of the tabulation decelerator.

Fig. 3 is an exploded view of the elements of the carriage return decelerator.

Briefly, this invention relates to a decelerator for a typewriter or business machine carriage wherein a decelerating cam is selectively interconnected with a power driving means that will act to limit the rate of rotation of the cam. The cam, which is engageable by one end of a bell crank, is provided with a predetermined curve for limiting the rate at which the bell crank can rotate about its pivot point. During a tabulation or carriage return run, a linkage system is actuated tending to rotate the bell crank and the decelerating cam thereby establishing a driving relationship with the power driving means. The slope of the cam and the driving rate of the power driving means is such that the carriage will be decelerated according to a predetermined curve.

Referring to the drawings, a typewriter carriage is illustrated as having a margin rack 2 carrying a margin stop 4 with the margin rack being movable with the carriage transversely relative to rails 6, of which one is shown.

In conventional typewriter installations, as more particularly shown in the patent, No. 2,818,959, to N. D. Walton, the typewriter is provided with a margin control

lever or check 8 which is slidable within fixed limits (slots 9) relative to supporting studs 10, which are secured to the typewriter frame. The sliding of margin check 8 is employed to rock a margin bell crank 12 which is pivotally suported about a stud 14 carried by the typewriter frame. More specifically, as the margin stop 4 is driven towards the margin check 8 due to the carriage being returned to its left hand position, a blocking shoulder 16 of the margin stop 4 engages a corresponding shoulder 18 of the margin check 8, thereby sliding the latter to the left relative to the studs 10 to rotate the margin bell crank 12 counterclockwise about its stud 14.

Conventional typewriters, as more particularly described in U.S. Patent 1,935,436, are further provided with a tabulating system wherein a tab lever 20 is positioned on the typewriter frame for pivotal movement about an axis indicated by the dash-dot line 22. The pivotal movement is in response to the operation of a tabulating power device (not shown) which acts to rock a bell crank 24 counterclockwise about a pivot pin 26 thereby pushing on the right hand end of the tab lever 20 to rock it counterclockwise about the axis 22 so that its left hand end 28 will push a tab check lever 30 out from behind a shoulder 32 freeing the check lever 30 for movement to the left within the limits of the slots 33. The tab check lever 30, which is connected to a crank arm 38 via a link 34, is biased to the left by a spring 36 which is used to rock the arm 38 counterclockwise about a pivot stud 40 carried by the typewriter frame. That is, arm 38 carries integrally the crank arm 42 and the spring 36 interconnects the crank arm 42 and a portion of the typewriter frame 44.

The tab check lever 30, when set in a checking position, as more particularly shown in U.S. Patent 1,935,436, is engageable with a column tab stop of the type well known in the art, and provided to be movable with carriages of IBM typewriters. As the carriage moves to the right (as viewed in Fig. 1), the check lever 30 will engage a tab stop (not shown) to drive the tab check 30 from its Fig. 2 position to the right towards the limit position shown in Fig. 1. When the carriage is actually stopped, the tab check 30 will have been recocked behind the shoulder 32 where it will remain until the next tab operation.

The actions of the rocking of the margin lever 12 about its pivot 14, and the movement of the tab check 30 first to the left as the tab key of a typewriter is operated, and then to the right and back to the position shown in Fig. 1 as the tab stop hits the tab check are employed, respectively, in conjunction with a corresponding decelerating mechanism to slow down the rate of carriage travel at the end of either a tabulating run or a carriage return operation.

Decelerator

The decelerator is shown in one embodiment, as being operable from an auxiliary shaft 46, which is continuously driven via the belt 47 by some motor drive 49.

The decelerating mechanism comprises, in the illustrated embodiment, a pair of cams 48, 50 which are attached by means of spring clutches 52, 54, respectively, to the continuously rotating shaft 46. The spring clutches 52, 54 are arranged to prevent clockwise rotation of the cams 48, 50 (as viewed in Fig. 1), at any rate faster than that of the shaft 46. More specifically, assuming that the shaft 46 is standing still, then any clockwise rotation of the cam 48 relative to the shaft 46 would tighten the spring 52 thereby preventing rotation of the cam 48. Since the shaft 46 is continuously rotating, however, the cam 48 can rotate clockwise at a speed no greater than that of the rotation of the continuously rotating shaft 46.

Decelerator on carriage return

In the operation of the carriage return decelerator, a crank arm **56** is pivotally supported about a shaft **58** to position a roller **60** carried by the crank arm **56** in peripheral contact with the cam **48**. The crank arm **56** has an adjustable extension **62** which is connected via a link **64** to a crank arm **66** which is pivotally supported about the stud **40**. The crank arm **66** has a second portion **68** located to the right of the stud **40** to be engageable with a shoulder **70** carried by the margin bell crank **12**. Through this linkage system, as the margin bell crank **12** is rotated counterclockwise about its pivot **14** (caused by interaction of margn stop **4** and margin check **8**) the shoulder **70** will act on the arm **68** to rock the crank **66** clockwise about the stud **40** thereby lifting on link **64** tending to rock the crank **56** counterclockwise about its pivot point **58** so as to drive the roller **60** into peripheral contact with the cam **48**. The peripheral inter-engagement between the roller **60** and the cam **48** provides a torque to rotate the cam **48** clockwise about the shaft **46** thereby engaging the spring clutch **52**.

Cam **48** has the form of a decelerating curve which will slow down the carriage at a predetermined rate. That is, as the carriage drives the roller **60** toward the cam **48** to rotate the latter clockwise relative to the shaft **46**, the cam **48** can be rocked from its Fig. 1 position wherein a great radius is in engagement with roller **60** to its Fig. 3 position wherein its minimum radius is in engagement with roller **60**. The rate of rotation of the cam from its Fig. 1 to its Fig. 3 position is controlled by the rate of rotation of shaft **46**, but the coincident rocking of arm **56** from its Fig. 1 to Fig. 3 position is regulated by the slope of cam **48**. Consequently, the shape of cam **48** is in the form of a decelerating curve which will slow down the carriage with a minimum of shock and noise.

In either position of the cam **48**, a spring **72** is interconnected between the outer end of the adjustable extension **62** and the hub of cam **48** via a pulley **74** rotatably supported about a frame supported shaft **76**. The spring **72** tends to rotate cam **48** counterclockwise, and accordingly, so long as the carriage is in any steady state position, the spring **72** will disengage the spring clutch **52** permitting shaft **46** to rotate freely within the hub of cam **48**.

With this apparatus, and since the rate at which the arm **56** can rotate counterclockwise is controlled by the inter-engagement of roller **60** and cam **48**, it is apparent that the rate of carriage deceleration is dependent entirely upon the shape of the cam **48** which shape can be set in accordance with the expected rate of carriage speed.

Decelerator on tabulation run

During a tabulation run, as heretofore described, the tab check lever **30** is first moved from a rest position (Fig. 1) out to a tab stop engaging position (Fig. 2) and then returned to its rest position through the action of the carriage supported tab stop approaching a predetermined position. Accordingly, the decelerator for the tabulation mechanism is arranged to operate oppositely from that of the carriage return decelerator. More specifically, the cam **50**, which is used in conjunction with the tabulation decelerator, is normally held at its clockwise limit, so that the smallest radius of the cam **50** is in engagement with the roller **80** carried by the crank arm **82** which, in turn (like the crank arm **56**), is pivotally supported about the shaft **58**. The crank arm **82** also has an adjustable outer member **86** which is connected via a link **88** to the crank arm **38** which, in turn (as heretofore described), is interconnected via the link **34** to the tab check lever **30**. In the operation of this mechanism, a tabulation operation of the typewriter first releases tab check lever **30** for movement to the left to the position shown in Fig. 2, wherein slots **33** are at their left hand limit with respect to supporting studs **10**. This movement of the tab check lever **30** to its left hand limit (as shown in Fig. 2), will

rock the bell crank **38** counterclockwise about the supporting stud **40**, thereby causing link **88** to be moved downwardly to rock the crank arm **82** clockwise about the supporting shaft **58** until it reaches a position similar to the Fig. 1 position of the crank arm **56**. A spring **90** interconnects extension **86** with the hub of cam **50** via frame supported pulley **92**. The spring **90** tends to rotate the cam **50** counterclockwise, and accordingly, as the roller **80** is moved clockwise, the spring **90** will act to rock the cam **50** counterclockwise with respect to shaft **46** until it reaches a position similar to that of cam **48** as viewed in Fig. 1. With the mechanism in this position, then as a tab stop strikes the tab check lever **30**, the latter will be moved to the right from the Fig. 2 position towards the Fig. 1 position which action will pull on link **34** to rock the crank arm **38** clockwise about its supporting stud **40** and thereby lift on the link **88** to rock the crank **82** counterclockwise about the supporting shaft **58** whereby the roller **80** tends to drive the cam **50** clockwise about shaft **46**. Since the cam **50** cannot rotate any faster than shaft **46** (because of spring clutch **54**), and since the cam **50** is provided with a preselected decelerating curve, the tab operation of the carriage will be slowed down at a rate commensurate with the slope of the decelerating curve formed on the cam **50**.

The carriage will be slowed down toward the end of a tab operation until the tab check **30** is driven back into its Fig. 1 position, whereupon the crank **38** and the crank **82** will assume a steady state position. Since roller **80** no longer tends to drive cam **50** in a clockwise direction, clutch **54** is automatically released, thus relieving load from shaft **46**.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a typewriter having a carriage movable across a printing position under the influence of a power imparting means, a device for decelerating said carriage after a free run comprising a bell crank, means positively interconnecting said bell crank and said carriage during the movement of said carriage through a predetermined distance to provide for the rocking of said bell crank in response to the carriage moving through said predetermined distance, power driving means, a cam, one way drive means interconnecting said cam and said power driving means, and means mounting said bell crank for engagement with said cam to interconnect the latter with said power driving means as said bell crank is rocked thereby limiting the rate of rotation of said bell crank and consequently the rate of travel of said carriage through said predetermined distance.

2. In a typewriter having a movable carriage and means driving the same across a printing position, a device for decelerating said carriage after a free run comprising power driving means, a crank arm pivotally supported for rocking movement toward and away from said power driving means, a cam having a decelerating curve mounted for one way driving engagement with said power driving means, and linkage means positively interconnecting said crank arm and said carriage during the movement of said carriage through a predetermined distance to provide for the rocking of the latter in response to the carriage moving through said predetermined distance, said crank arm having releasable driving connections with said cam during the rocking of said crank arm, the shape of said cam curve limiting the rate of rocking of said crank arm thereby limiting the rate of travel of said carriage through

said predetermined distance in conformity with the decelerating curve on said cam.

3. In a typewriter having a carriage mounted for movement across a printing position and power driving means for moving said carriage, a device for decelerating said carriage comprising a bell crank pivotally supported for rocking movement, linkage means positively connecting said bell crank and said carriage during the power driven movement of said carriage through a predetermined distance to provide for the rocking of said bell crank as said carriage moves through said predetermined distance, cam means engageable with said bell crank, and positive means controlling the rate of rotation of said cam means to limit the rate of rocking of said bell crank and thereby limit the rate of movement of said carriage through the said predetermined distance.

4. In a typewriter having a carriage mounted for movement across a printing position and power driving means for moving said carriage, a device for decelerating said carriage as it travels through a predetermined distance comprising a bell crank pivotally supported for rocking movement, linkage means positively interconnecting said bell crank and said carriage to provide for the rocking of said bell crank as the carriage is power driven through said predetermined distance, a continuously driven shaft, a cam having a decelerating curve mounted coaxially of said shaft, a crank arm mounted to rotate said cam, means positively interconnecting said crank arm and said bell crank, and spring clutch means interconnecting said cam and said shaft whereby said cam is normally disconnected from said shaft but is connected thereto as said crank arm is rotated, said cam having a continuously decreasing radius thereby limiting the rate of rotation of said crank arm and the rate of movement of said carriage through said predetermined distance in accordance with the rate of rotation of said shaft and the shape of said cam.

5. In a typewriter having a carriage mounted for movement across a printing position and power driving means for moving said carriage, a device for decelerating said carriage as it travels through a predetermined distance of power driven movement comprising a crank including means mounting the same for pivotal movement, positive means interconnecting said carriage and said crank to exert a torque thereon to pivot the same as said carriage is power driven through said predetermined distance, and positive means controlling the maximum pivotal rate of said crank while said torque is exerted thereon thereby limiting the rate of movement of said carriage through said predetermined distance.

6. In a typewriter having a carriage mounted for movement across a printing position and power driving means for moving said carriage, a device for decelerating said carriage as it travels through a predetermined distance of power driven movement comprising a crank including means mounting the same for pivotal movement, positive means interconnecting said carriage and said crank to exert a torque thereon to pivot the same as said carriage is power driven through said predetermined distance, and positive energy dissipating means controlling the maximum pivotal rate of said crank while said torque is exerted thereon thereby limiting the rate of movement of said carriage through said predetermined distance.

7. In a typewriter having a carriage mounted for movement across a printing position and power driving means for moving said carriage, a device for decelerating said carriage as it travels through a predetermined distance of power driven movement comprising a crank including means mounting the same for pivotal movement, positive means interconnecting said carriage and said crank to exert a torque thereon to pivot the same as said carriage is power driven through said predetermined distance, and means positively limiting the rate of rotation of said crank while said torque is exerted thereon thereby limiting the rate of movement of said carriage through said predetermined distance.

8. In a typewriter having a carriage mounted for movement across a printing position and power driving means for moving said carriage, a device for decelerating said carriage as it travels through a predetermined distance of power driven movement comprising a crank including means mounting the same for pivotal movement, positive means interconnecting said carriage and said crank to exert a torque thereon to pivot the same as said carriage is power driven through said predetermined distance, and means positively limiting said crank to rotation at a decreasing rate while said torque is exerted thereon thereby decelerating said carriage through said predetermined distance.

9. In a typewriter having a carriage mounted for movement across a printing position and power driving means for moving said carriage, a device for decelerating said carriage as it travels a predetermined distance of said power driven movement comprising a cam having a predetermined contour, means pivotally mounting the same on said typewriter, a bell crank pivotally supported on said typewriter and including means engageable with said cam contour to exert a torque thereon to pivot said cam about its pivot axis as said bell crank is pivoted, means positively interconnecting said carriage and said bell crank to exert a torque thereon to pivot the same as said carriage moves through said predetermined distance of power driven movement, and energy dissipating means positively controlling the rate of travel of said bell crank relative to said predetermined contour thereby limiting the rate of travel of said carriage through said predetermined distance.

10. In a business machine having a carriage mounted for movement across a printing position and power driving means for moving said carriage, a device for decelerating said carriage as it travels through a predetermined distance of said power driven movement comprising a cam having a predetermined contour, means pivotally mounting the same on said business machine, positive means responsive to movement of said carriage through said predetermined distance cooperating with said predetermined contour to exert a torque on said cam to rotate the same about its pivotal axis, said positive means limiting the rate of travel of said carriage as a function of said predetermined cam contour and the rate of pivotal movement of said cam, and means positively limiting the rate of pivotal movement of said cam thereby limiting the rate of travel of said carriage through said predetermined distance.

References Cited in the file of this patent

UNITED STATES PATENTS

1,516,685	Rinsche	Nov. 25, 1924
2,002,410	Michelsen	May 21, 1935