May 29, 1956 J. E. MAY 2,747,718

RIBBON SHIFT MECHANISM FOR BUSINESS MACHINES

Filed May 18, 1953 5 Sheets-Sheet 1

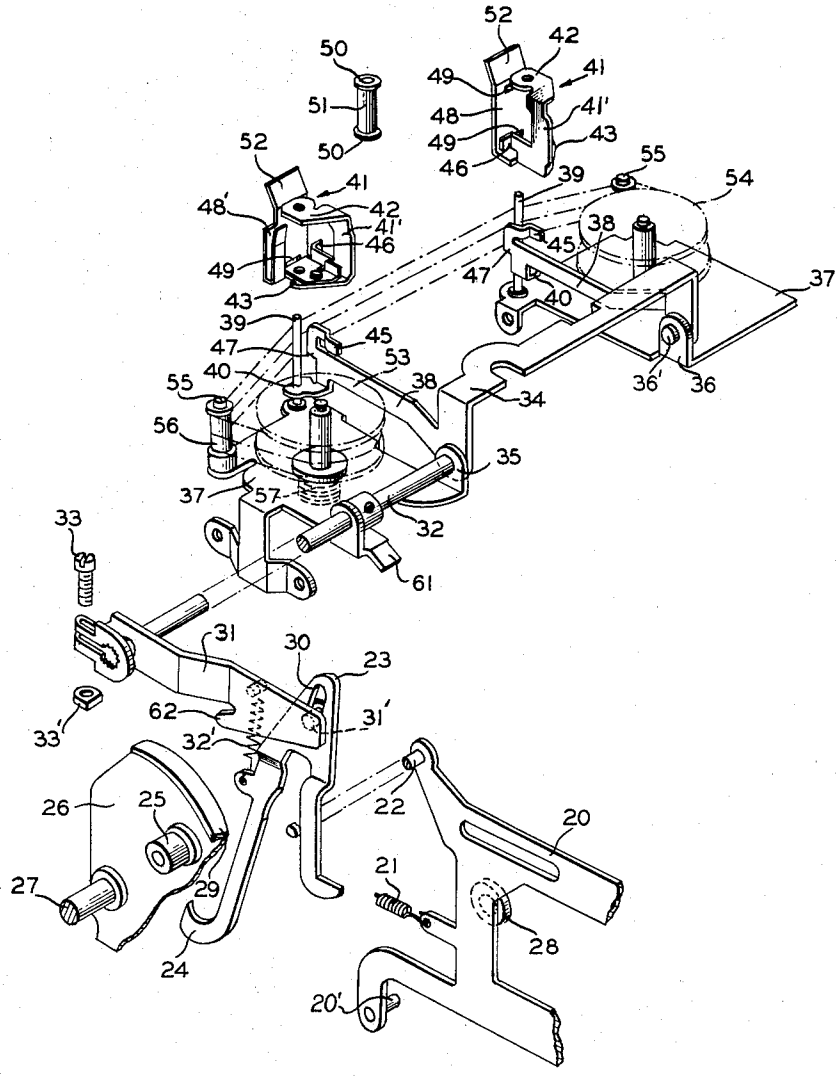

FIG. 1

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RIBBON SHIFT MECHANISM FOR BUSINESS MACHINES

Filed May 18, 1953 5 Sheets-Sheet 2

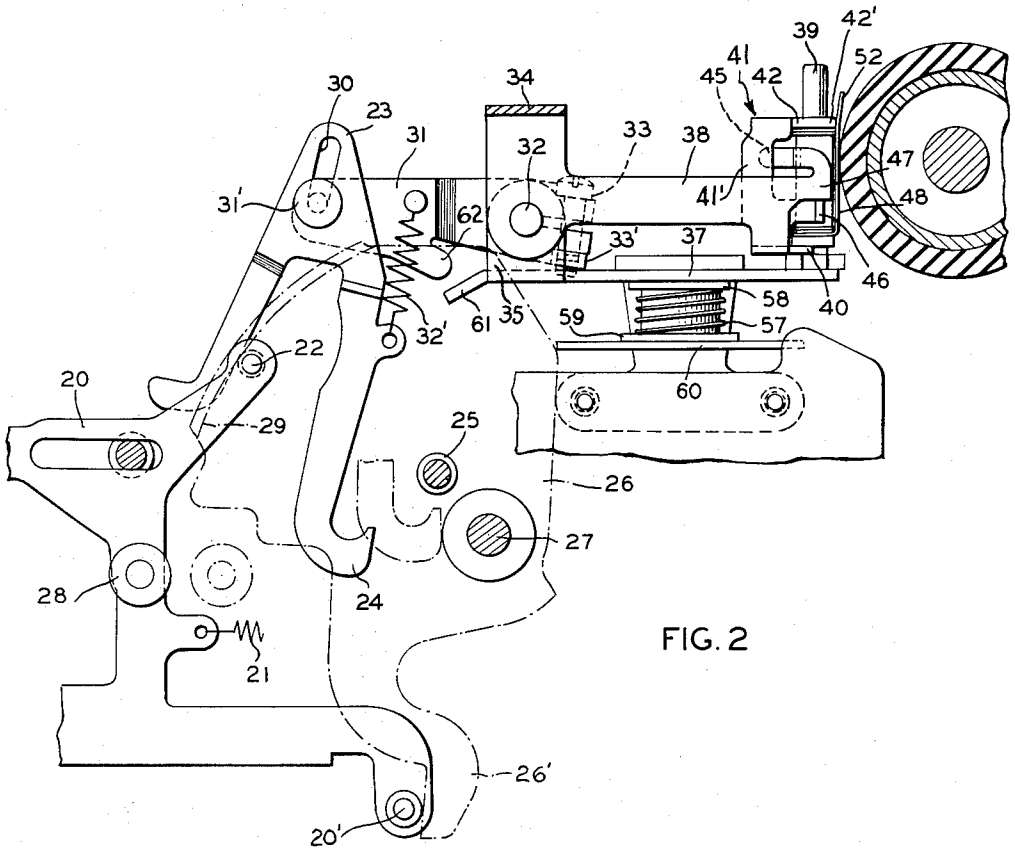

FIG. 2

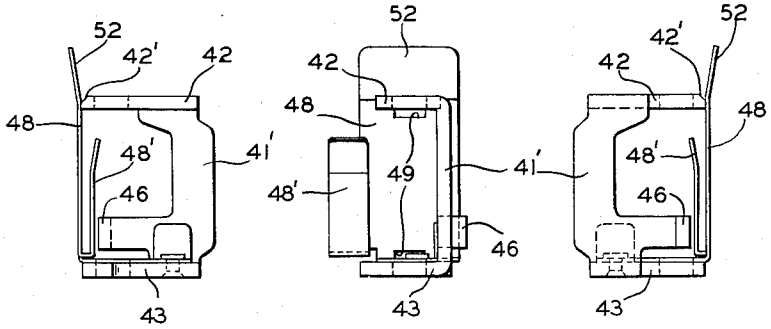

FIG. 8 FIG. 9 FIG. 7

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RIBBON SHIFT MECHANISM FOR BUSINESS MACHINES

Filed May 18, 1953 5 Sheets-Sheet 3

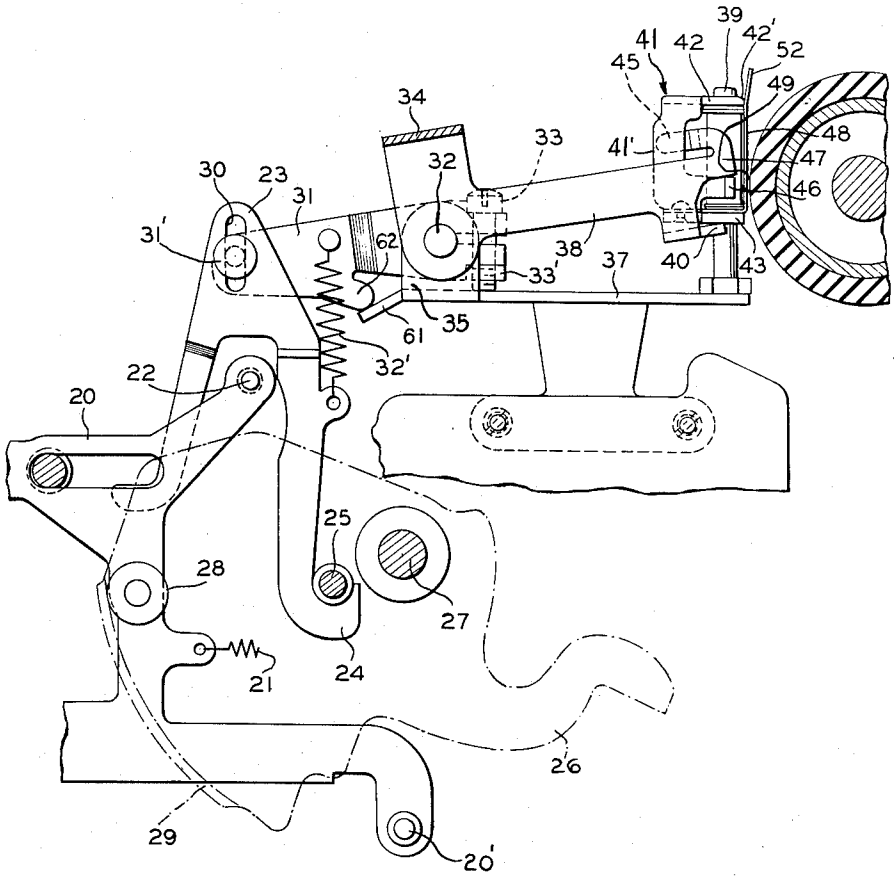

FIG.3

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RIBBON SHIFT MECHANISM FOR BUSINESS MACHINES

Filed May 18, 1953 5 Sheets-Sheet 4

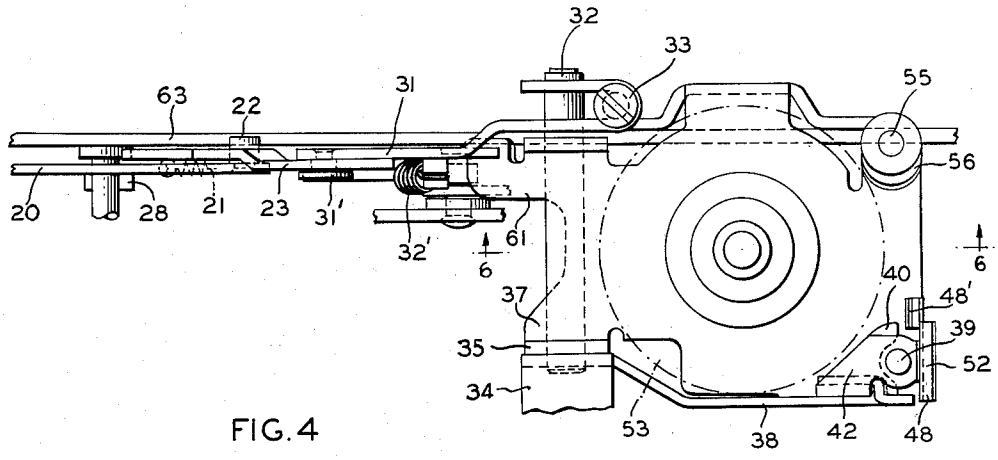

FIG. 4

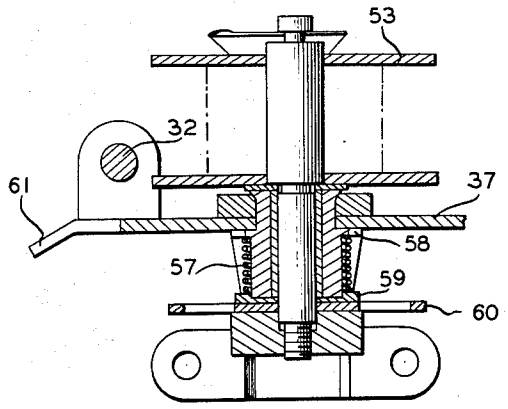

FIG. 6

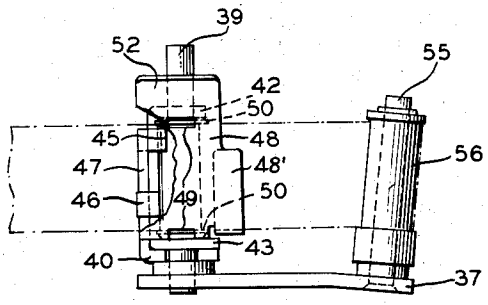

FIG. 5

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RIBBON SHIFT MECHANISM FOR BUSINESS MACHINES

Filed May 18, 1953 5 Sheets-Sheet 5

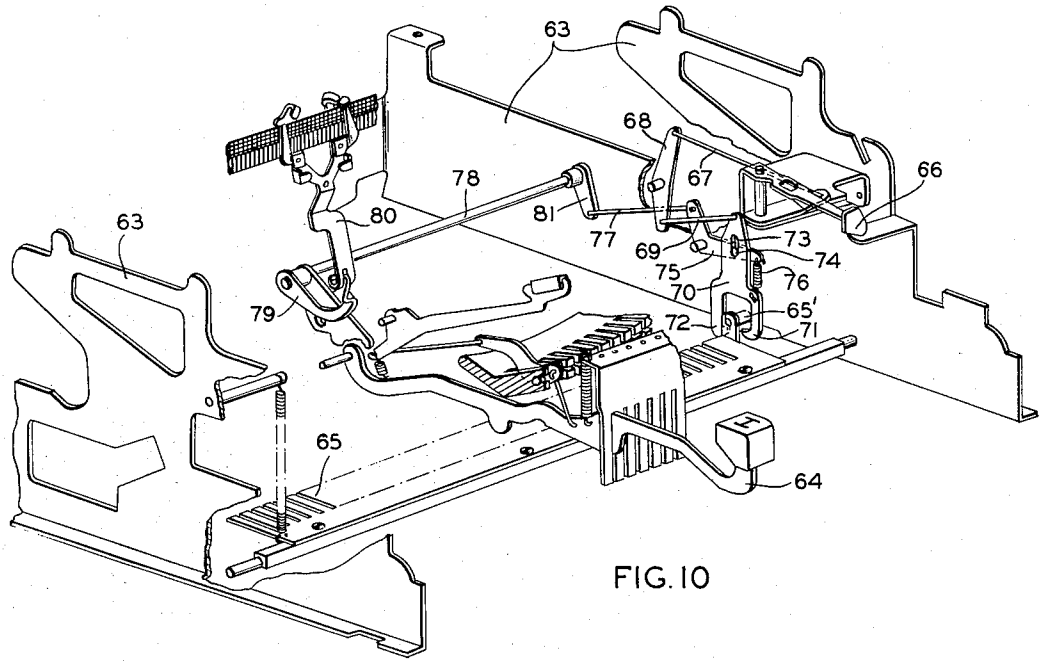

FIG. 10

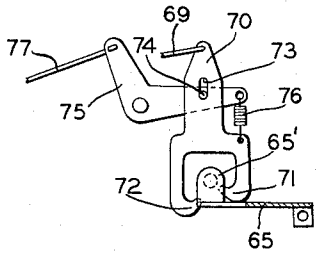

FIG. 11

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United States Patent Office 2,747,718 Patented May 29, 1956

2,747,718

RIBBON SHIFT MECHANISM FOR BUSINESS MACHINES

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Application May 18, 1953, Serial No. 355,757

10 Claims. (Cl. 197—157)

This invention relates to new and useful improvements in business machines such as typewriters, adding and calculating machines and the like and has especial reference to means to manually or automatically print in different colors as desired.

An object of the invention is to provide simple and efficient means which will automatically shift the ribbon in computing machines when totals or sub-totals are to be printed in a different color.

A further object is to provide a novel and efficient means for definitely driving the ribbon shift mechanism up and down whether the action is automatic or manual.

Another object is to provide a novel and efficient vibrator bail or plate for the ribbon guides.

Still another object is to provide novel and efficient ribbon guide elements.

Further and more specific objects, features, and advantages will more clearly appear from the specification hereinafter set forth especially when taken in connection with the accompanying drawings which illustrate a present preferred form which the invention may assume and which forms part of the specification.

In brief and general terms, the invention concerns a drive means which is driven by power or by key action; a latch means to be engaged with the drive means and operable to a plurality of positions either by manual means or by the cyclical operation of an element in the machine such as the total-taking link of a computing machine; a shift lever associated with the latch means; a ribbon shift plate or bail associated with the shift lever; and a ribbon guide on the ribbon shift bail.

A particular feature also resides in means whereby the connection between the latch means and the shift lever is constructed to have a certain amount of play to prevent injury of the parts if some of the elements are jammed.

Still another feature relates to a definite driving connection between the power means and the shift lever whereby it is definitely driven in its shifting and return movements.

Another feature resides in the association of the ribbon guide with its support whereby it will not turn thereon; whereby it is both lifted and lowered positively; and whereby the ribbon is firmly supported on and between guides and yet can be readily and easily inserted and removed from operative position.

A further feature has to do with guide rollers between the ribbon guides and the ribbon spools to prevent curling and twisting of the ribbon; and whereby the ribbon spools are kept under proper tension to eliminate overrunning of the ribbon from the spools.

Present preferred forms which the invention may assume are illustrated in the drawing, in which

Fig. 1 is an exploded isometric view of the principal form of the invention as applied to computing machines;

Fig. 2 is a partial side elevation of the mechanism, showing the parts in normal position;

Fig. 3 is a similar view showing the parts in position

when a total or sub-total is being taken and the printing is to be in a different color;

Fig. 4 is a partial plan view of the left-hand ribbon spool and the shift mechanism;

Fig. 5 is an end elevation viewed from the right in Fig. 4;

Fig. 6 is a vertical cross section taken on the line 6—6 of Fig. 4;

Fig. 7 is an enlarged right side elevation of the ribbon shift guide unit;

Fig. 8 is a left-hand elevation of the same unit;

Fig. 9 is a front elevation of the same unit;

Fig. 10 is a perspective view of the mechanism as adapted for use on a typewriter and under manual control; and

Fig. 11 is a detail view of the latch mechanism and related parts adapted for manual control in an ordinary typewriter.

Referring now to the preferred specific forms of the invention shown in the drawings, which are merely embodiments of the general broad invention involved, the first part of the mechanism to be described is the drive mechanism for computing machines.

Since the first nine figures of the drawing show the shift mechanism as related to a computing machine having a total taking link 20, reference may be had to U. S. Patent No. 2,203,336 to W. W. Landsiedel, which shows a total link 247 in Fig. 18 thereof, which link 247 is of the same general type employed in this invention. This link 20 is urged rearwardly by a spring 21, when released in the total taking cycle, and advances a stud 22 on its upper arm. This stud normally lies to the rear of an arm of a bell-crank 23, the other arm of which has a hooked portion 24, and normally holds the bell-crank in a forward position until the total link 20 is released and moves rearwardly and allows the bell-crank to move to swing the hooked portion to an operative position with respect to a stud or drive roller 25. Said roller is mounted on a cam plate 26 which is fixed to a main drive shaft 27 which oscillates once for every cycle of the machine. As the roller 25 is moved down, with the hooked portion swung into position, the hooked portion 24 is engaged and pulled down. Since the hooked portion is not released until the total link 20 is moved rearward, this engagement of the hooked portion by the roller 25 will only take place when totals or sub-totals are being taken. The link 20 is restored forwardly, at the end of a total taking cycle, by a camming shoulder 26' of cam plate 26 acting on a stud 20' carried by the link 20.

As the total link 20 is thus released, a roller 28 on the total link is moved rearward to lie back of a curved lip 29 on the cam 26 to hold the link in this position until the cam 26 is restored to normal. In add cycles the link 20 is not released and this roller 28 lies in front of the curved lip 29, which positively retains the link in its forward normal position.

The upper portion of bell crank 23 is provided with an elongated slot 30 in which rides a pin 31' on the end of a lever 31. A spring 32' is connected at one end to the hooked arm of the bell crank and at the other end to the lever 31 and tends to swing the bell crank 23 clockwise as viewed in Fig. 1. This construction will permit the spring 32' to swing the hooked portion 24 over to be moved down by roller 25 even though the lever 31 may be prevented from rocking for one reason or another and thus avoids damage to the apparatus.

Upon the forward return stroke of the total link 20, upon completion of a total taking operation, and after cam lip 29 has been rocked clear of roller 28, the stud 22 bears against the forward inclined arm of bell crank 23 and tends to rock the bell crank clockwise as viewed in Figs. 2 and 3. This clockwise rocking of the bell crank is re-

sisted by the spring 32', resulting in an upward camming motion of bell crank 23 by stud 22 which, through pin 31' positively rocks the lever 31 clockwise to return the lever 31 definitely to its original position.

The shift lever 31 is provided with a slotted U-shaped end provided with serrated aligned holes to permit the lever being slipped on the end of a shaft 32. The slotted end of the lever 31 may be tightened on the shaft 32 by means of clamping screw 33 and nut 33' which causes the serrations of the aligned holes to bite into the shaft 32 and securely position the lever on the shaft. By loosening the screw 33 the angular relation of the lever 31 on the shaft 32 may be readily adjusted as desired.

The construction thus far described has in operation effected the turning of shaft 32 and this is connected to a ribbon lifting mechanism.

This mechanism comprises a bail plate 34 having dependent end portions which are pivotally supported in upstanding ears 35 and 36 on the ribbon spool brackets 37. One end portion is connected to shaft 32 at ear 35 and the other on ear 36 by stud 36'. The bail plate 34 has rearwardly extending arms 38 at each end. As seen in the isometric view of Fig. 1 the total slide 20 and the ribbon shift actuating mechanism are located on the left side of the machine. The arms 38 extend rearwardly from the plate 34 toward the ribbon shift guide posts 39 which are fixed to and project upwardly from the right and left hand spool brackets 37. The ends of these arms 38 are provided at their bottoms with off-set ears 40 to support the ribbon shift guides 41 and may be notched to receive the posts 39. When the arms 38 are lifted by the tilting of the bail plate 34 and guides 41 which rest on the ears 40 and slide on posts 39 are lifted to shift the ribbon. These guides include the main vertical plate 41' with apertured top and bottom horizontal portions 42 and 43. The top plate 42 is bevelled at 42' to facilitate insertion of ribbon. The plate 41' is embraced by an off-set lip 45 on the arm 38 which keeps the guides from turning on the posts 39 when they move up and down. The guides are also provided with laterally projecting ears 46 near their bottom to be engaged by a lower shoulder 47 of the arms 38 so that when the arms 38 move down they will also move the guides down on the posts 39.

The rear of the bottom plate 43 is connected to an upstanding resilient plate 48 which extends upwardly in spaced relation to the plate 41 and has slots 49 at spaced vertical points thereon to receive the flanges 50 of guide ribbon rollers 51 which embrace the posts 39 and are disposed between the upper and lower plates 42 and 43 of the guides. The ribbon passes between the rollers 51 and the resilient plate 48 and is vertically restrained by the flanges 50. Plate 48 has a laterally disposed offset portion 48' at one side to further guide the ribbon. The top of the spring plate 48 is bent rearwardly as at 52 to permit the spring plate to be manually moved to facilitate the insertion and removal of the ribbon.

On the brackets 37 are disposed ribbon spools 53 and 54 (Fig. 1). The ribbon is guided by and in part measure is prevented from straying or curling in its passage from one spool to the other by means of the flanges 50 on the rollers 51. To further guard against straying or curling of the ribbon, a pair of stationary guard posts 55, mounted on the brackets 37, have rollers 56 over which the ribbon is threaded as clearly shown in Fig. 1. The posts 55 and the rollers 56 are preferably on a slight angle to direct the ribbon to a point midway between the raised and lowered positions of the ribbon so as to minimize and equalize the misalignment when it is shifted from one color to another. To still further guard against curling during shifting operations, each ribbon spool is provided with a friction resistance spring 57 (Fig. 6) which bears at one end against a fixed bushing 58 and at the other against a washer 59 which bears in turn against the drive gear 60 for the spool. This prevents overrunning of the spool and thus prevents curling.

To limit the rise of the ribbon shift mechanism an ear 61 is provided on the left hand spool bracket 37 and may be bent down at any desired angle. When the shift lever 31 is moved downwardly as above mentioned, an ear 62 thereon encounters the ear 61 and stops further downward movement of the lever. This ear 61 may be adjusted up or down to determine the amount of movement permitted the lever 31.

Having now described the structure of the invention as applied to a computing machine, it is desired to indicate the application of the invention to a standard typewriter.

Figs. 11 and 10 indicate in a general but clear manner this application. In these views the typewriter is shown as having the usual frame 63. One of the type keys 64 is indicated and, in its operation, is depressed and engages and pivots downwardly a universal bail bar 65 which is thus actuated by all the keys. There is shown the usual shift key 66 which has the usual three positions for printing in Red, Black, and Neutral. In the usual manner this key is connected to operate a link 67 which is connected to one end of a bell crank 68 the other end of which is connected by a link 69 to the top of a rock plate 70. The lower face of this plate 70 has downwardly extending spaced inwardly projecting hooks 71 and 72 disposed at different levels on the plate 70.

A roller or stud 65' on the end of bail 65 lies in the opening in plate 70 between and above the hooks 71 and 72. The plate 70 is loosely and pivotally connected by a slot 73 with a pin 74 projecting thereinto from one arm of a bell crank 75 which is connected by a spring 76 with a portion of plate 70. Spring 76 has the same function as spring 32' in Fig. 1. The other arm of the crank 75 is connected by link 77 to the end of a shift lever 81 which is fixed on a shaft 78 at the other end of which is an arm 79 connected to the usual typewriter ribbon guide shift mechanism 80.

Summary of operation

During ordinary cycling of the computing machine the total link 20 does not move rearwardly and therefore the bell crank 23 is not released to allow the hook 24 to be drawn down by the roller 25 on cam 26 on the main shaft 27. When a total is to be taken, however, mechanism well known in machines of this type will cause the link 20 to move rearwardly thus causing the bell crank 23 to be swung over by spring 32', move and tilt the shift lever 31 which tilts the bail plate 34 and lifts the arms 38 to raise the ribbon guide assemblies 41. The structure already set forth shows that the ribbon guide assemblies are definitely lifted and returned to normal position. The assemblies cannot turn on their axes and the ribbon itself is in several ways above mentioned prevented from straying or curling during the operation of the shift mechanism. When once the total link 20 is released it is locked in the usual manner in its operative position by the lip 29 of the cam 26 until near the end of that cycle. The degree of the tilting of the shift lever 31 is readily adjusted as desired. In the particular form of shift shown the ribbon assemblies are well spaced apart so that the two assemblies are at opposite sides of the bank of type elements usually employed in computers. Because of this unusually greater distance apart of the ribbon assemblies, the elements incorporated to insure that no straying or curling takes place are especially needful and effective.

In the operation of the invention as applied to an ordinary typewriter and shown in Figs. 10 and 11, the latch plate 70 is disposed in the normal neutral position, as illustrated in Fig. 10, in which the drive roller 65' is directly over the open space between the hooks 71 and 72. This is the position occupied by the plate 70 when the shift key 66 is in neutral position. When the key 64 is operated and depresses the bail bar 65, the roller 65'

moves down between the two hooks and therefore does not operate the shift mechanism. When the shift key **66** is moved to the red position, the plate **70** is rocked clockwise to swing the hook **71** beneath the roller **65'**. Since this is the higher of the two hooks it is contacted by the roller substantially as soon as the roller starts to move down so that a maximum of movement downwardly of the latch plate is effected in order to get the ribbon up to the red printing position. When the shift key **66** is moved to the black position, the plate **70** is rocked counterclockwise to bring the hook **72** under the roller **65'** and in this relation the roller has to move down a little before it contacts the hook since it does not have to lift the ribbon so far to print the black. The pin and slot connection between the latch plate **70** and the bell crank **75** and the use of spring **76** will allow a certain amount of play to avoid injury to the parts if certain of the parts such as the ribbon guides get jammed.

It will be noted that in each of these two instances of the application of the invention to a computing machine and a standard typewriter, there is provided a shift mechanism which is connected to a drive means either by the automatic action of an element in the machine during a machine cycle or by the operation of a key; there is also provided a latch means which is settable as desired either by automatic means or by hand to print red when desired. In one case the printing of red is effected by the movement of the latch under control of the total link whereas in the other case the latch is moved by the shift key. In the one case the latch is moved by the roller on the power cam, and in the other case the latch is moved by a roller on a bail operated by a typewriter key.

While I have described what I consider to be a highly desirable embodiment of my invention, it is obvious that many changes in form could be made without departing from the spirit of my invention, and I, therefore, do not limit myself to the exact form herein shown and described, nor to anything less than the whole of my invention as hereinbefore set forth, and as hereinafter claimed.

What I claim as new, and desire to secure by Letters Patent, is:

1. A ribbon shift mechanism which comprises a driving means, a driven shift lever, a latch pivoted on the lever by pin-and-slot connection, spring means forming a resilient connection between the latch and lever, a fully automatic linkage associated with the latch and actuated during a predetermined machine operation and adapted to control the positional disposition of the latch, a tiltable plate connected to the shift lever and having spaced arms, a ribbon guide resting on each arm, and upright posts adjacent the arms, said ribbon guides being apertured to slide up and down on said posts as they are raised and lowered by said arms.

2. A ribbon shift mechanism which comprises a driving means, a driven shift lever, a latch on the lever to be engaged by the driving means, fully automatic means actuated during a predetermined machine operation to dispose the latch in operative and inoperative relation to the driving means, a tiltable plate connected to the shift lever and having spaced arms, a ribbon guide resting on each arm, upright posts adjacent the arms, said ribbon guides being apertured to slide up and down on said posts as they are raised and lowered by said arms, an offset lip on the arms to embrace the guides to prevent the guides from turning on the posts, and offset ears on the guides to be engaged by a shoulder on the arms to move the guides down on the posts when the arms are lowered.

3. A ribbon shift mechanism which comprises a driving roller, means to depress said roller, a driven shift lever, a latch pivoted on said lever by pin-and-slot connection, spring means forming a resilient connection between the latch and lever, a fully automatic linkage associated with the latch and actuated during a predetermined machine operation and adapted to control the positional disposition of the latch with respect to the roller, a tiltable plate connected to the shift lever and having spaced arms, a ribbon guide resting on each arm, upright posts adjacent the arms, said ribbon guides being apertured to slide up and down on said posts as they are raised and lowered by said arms, an offset lip on said arms to embrace the guides to prevent the guides from turning on said posts, and offset ears on said guides to be engaged by a shoulder on the arms to move the guides down on the posts when the arms are lowered.

4. A ribbon shift mechanism which comprises a driving roller, means to depress said roller, a driven shift lever, a latch pivoted on said lever by pin-and-slot connection, spring means forming a resilient connection between the latch and lever, a hook portion on the latch to be engaged by said roller, a fully automatic linkage associated with the latch and actuated during a predetermined machine operation and adapted to control the positional disposition of the hook with respect to the roller, a tiltable plate connected to the shift lever and having spaced arms, a ribbon guide member resting on each arm, upright posts adjacent the arms, said ribbon guides being apertured to slide up and down on said posts as they are raised and lowered by said arms, an offset lip on each arm to embrace its related guide to prevent the guide from turning on the post, and an offset ear on each guide to be engaged by a shoulder on the related arm to move the guide down when the arm is lowered.

5. A ribbon shift mechanism which comprises a drive roller, means to depress said roller, a shift lever, a latch means pivotally connected to the lever by pin-and-slot means, a spring forming a resilient connection between the latch and lever, a hook on the lower portion of the latch means and adapted for engagement with said roller, and fully automatic means actuated during a predetermined machine operation to set the latch means to permit the hook to be engaged by said roller to shift the lever.

6. A ribbon shift mechanism which comprises a shift lever, a tiltable plate connected to the shift lever and having spaced arms, a ribbon guide resting on each arm, upright posts adjacent the arms, said ribbon guides being apertured to slide up and down on said posts as they are raised and lowered by said arms.

7. A ribbon shift mechanism which comprises a shift lever, a tiltable plate connected to the shift lever and having spaced arms, a ribbon guide resting on each arm, upright posts adjacent the arms, said ribbon guides being apertured to slide up and down on said posts as they are raised and lowered by said arms, an offset lip on the arms to embrace the guides to prevent the guides from turning on the posts, and offset ears on the guides to be engaged by a shoulder on the arms to move the guides on the posts when the arms are lowered.

8. A ribbon shift mechanism for computing machines which comprises a driving oscillatory cam having a roller thereon, a latch in the form of a bell crank having one arm with a hook on its end portion, a shift lever to which the latch is connected by pin-and-slot connection, a spring connected between the lever and the hooked arm to urge the arm in a direction toward the roller, a concentric lip on the cam, a total link adapted to be moved rearwardly when a total is to be taken, a stud on the link adapted to lie to the rear of the other arm of the latch to hold the latch in inoperative position, a spring for moving the link rearwardly when the link is released for taking a total whereby the hook is moved into the path of the roller to move the shift lever, and a roller on the link adapted to lie on one side of said lip when the link is in normal position and to lie on the other side of the lip when the link is in released position.

9. A ribbon shift mechanism for computing machines which comprises a driving oscillatory cam having a roller thereon, a latch in the form of a bell crank having one arm with a hook on its end portion, a shift lever to which the latch is connected by a pin-and-slot connection, a spring connected between the lever and the hooked arm to urge the arm in a direction toward the roller, a concentric lip

on the cam, a total link adapted to be moved rearwardly when a total is to be taken, a stud on the link adapted to lie to the rear of the other arm of the latch to hold the latch in inoperative position, a spring for moving the link rearwardly when released for taking a total whereby the hook is moved into the path of the roller to move the shift lever, a roller on the link adapted to lie on one side of said lip when the link is in normal position and to lie on the other side of said lip when the link is in released position, a tiltable plate connected to the shift lever and having spaced arms, a ribbon guide resting on each arm, upright posts adjacent the arms, said ribbon guides being apertured to slide up and down on said posts as they are raised and lowered by said arms, an offset lip on the arms to embrace the guides to prevent the guides from turning on the posts, and offset ears on the guides to be engaged by a shoulder on the arms to move the guides on the posts when the arms are lowered.

10. A ribbon shift mechanism for computing machines which comprises an oscillating cam having a driving roller thereon, a total link rearwardly releasable for total taking operations and when released reciprocable under control

of said cam, a shift lever, a bell crank pivotally connected to said shift lever, one arm of said bell crank having a hook portion engageable by said roller for driving said lever in one direction, said arm being yieldably urged towards engageable relation with said roller, and a stud carried by said total link and disposed in camming relation to the other arm of said bell crank for rendering said bell crank inoperative when the link is in restored position, said stud being effective through said other arm during the forward restoring movement of said link for driving said shift lever in the opposite direction.

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