

Oct. 27, 1936.

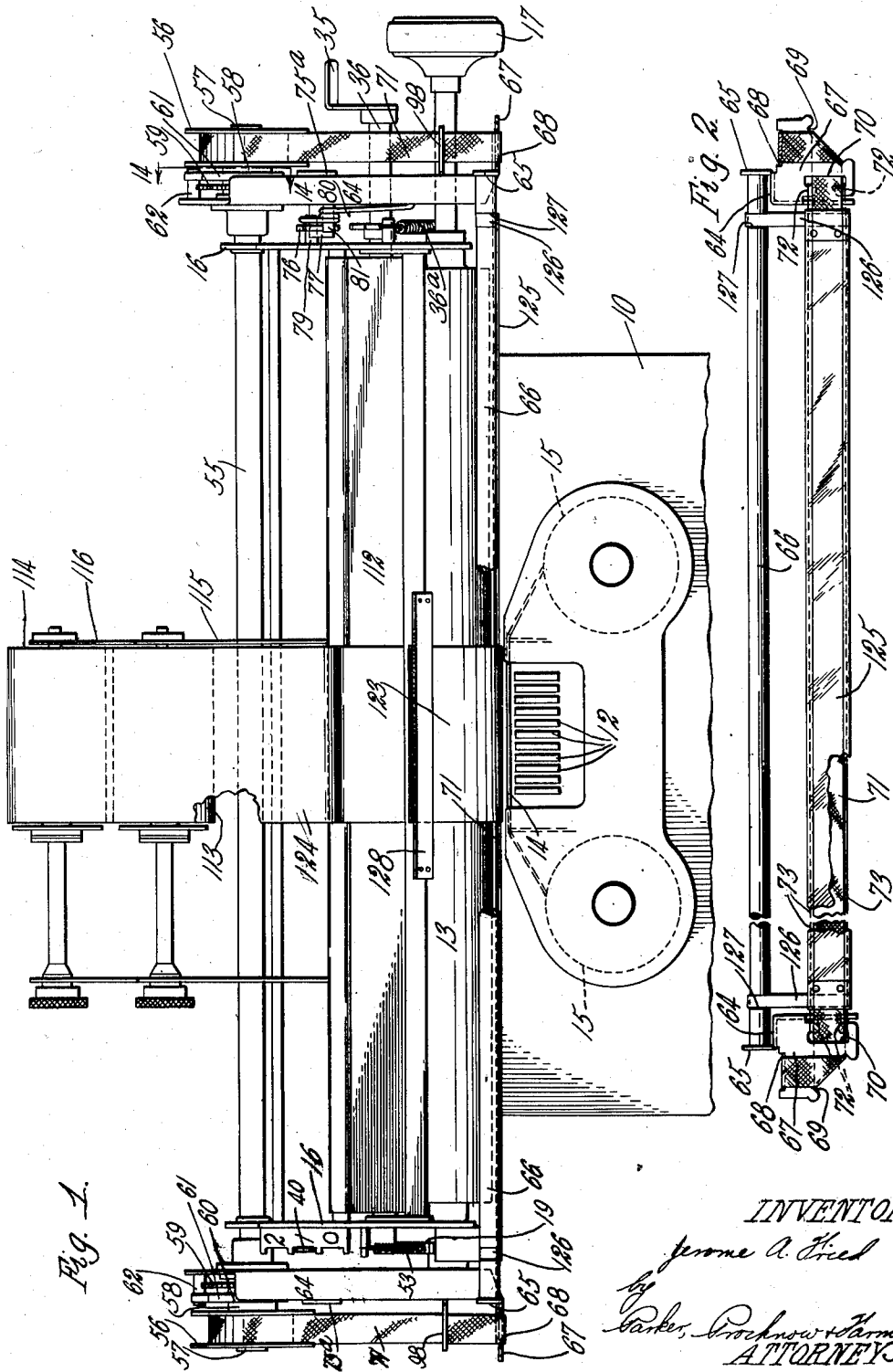
J. A. FRIED

2,058,859

PRINTING MECHANISM

Filed Aug. 13, 1934

7 Sheets-Sheet 1



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PRINTING MECHANISM

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7 Sheets-Sheet 2

Fig. 3

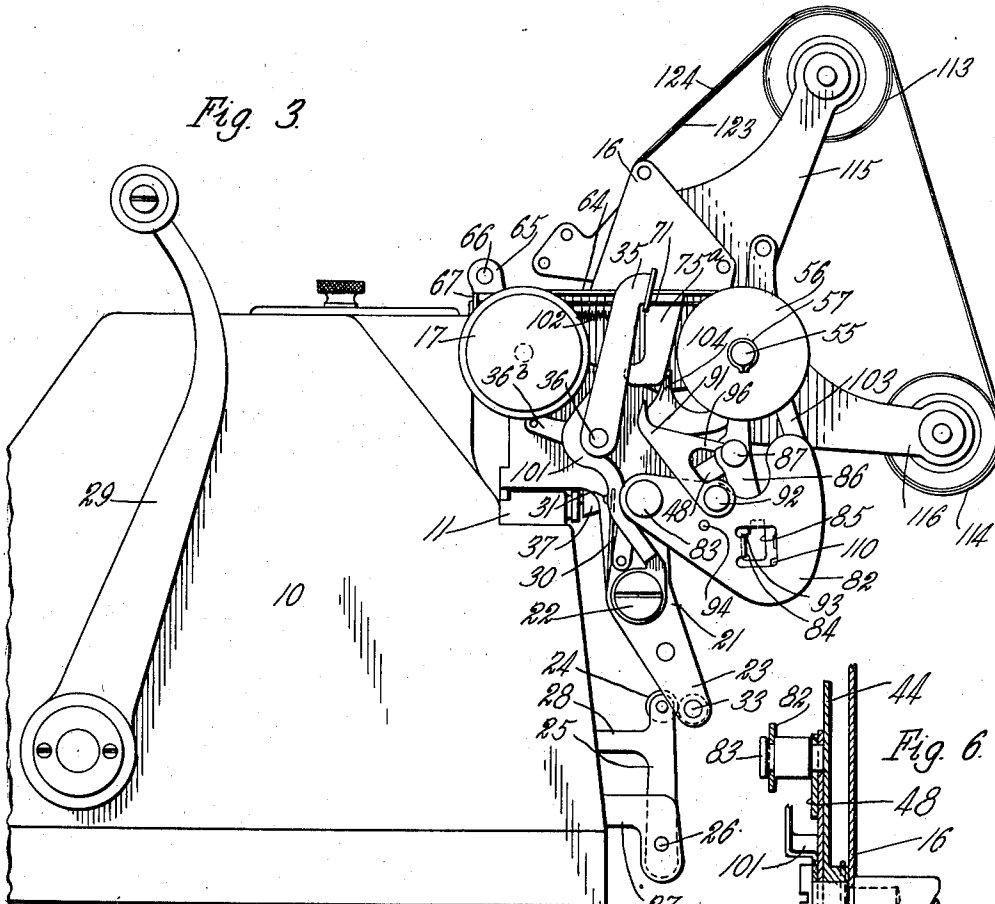


Fig. 6

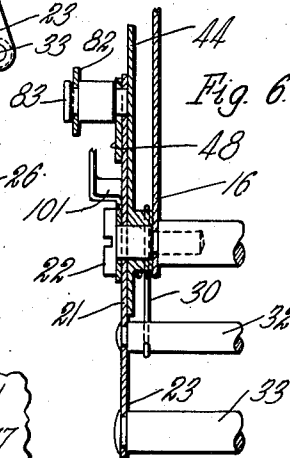


Fig. 5

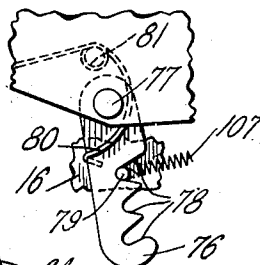
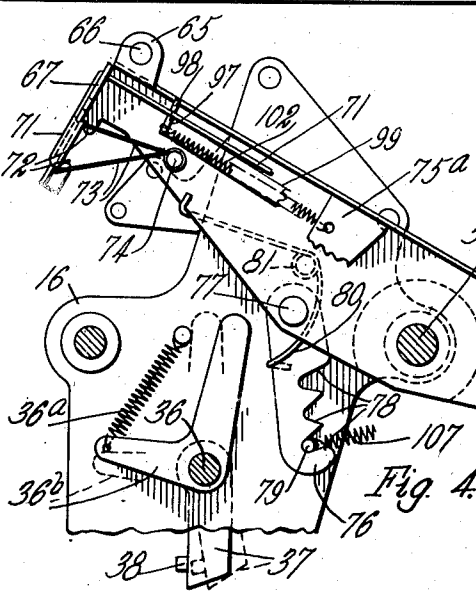


Fig. 4



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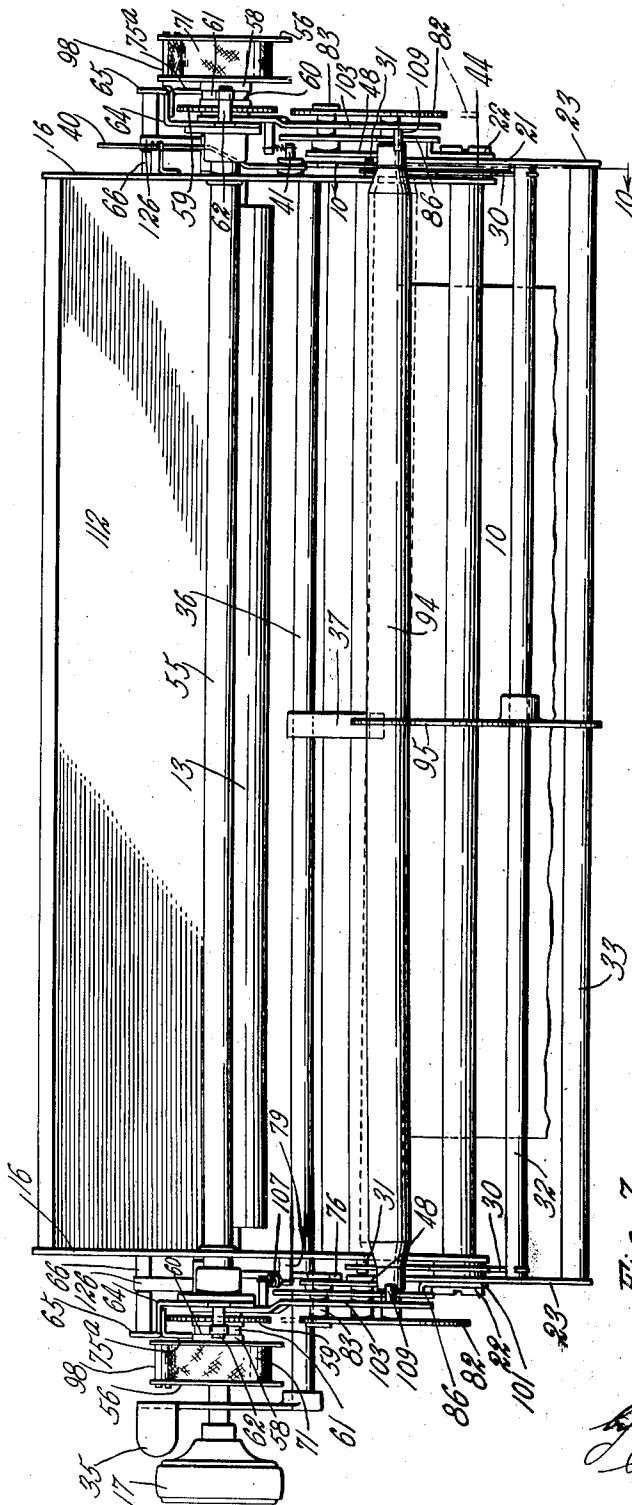


Fig. 7.

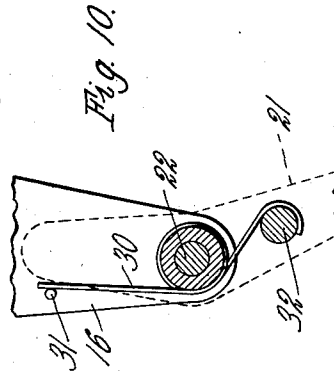


Fig. 10.

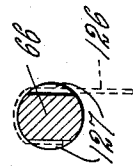


Fig. 9.

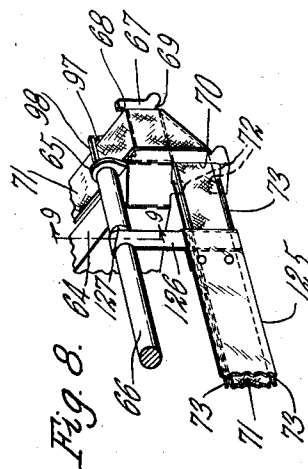


Fig. 8.

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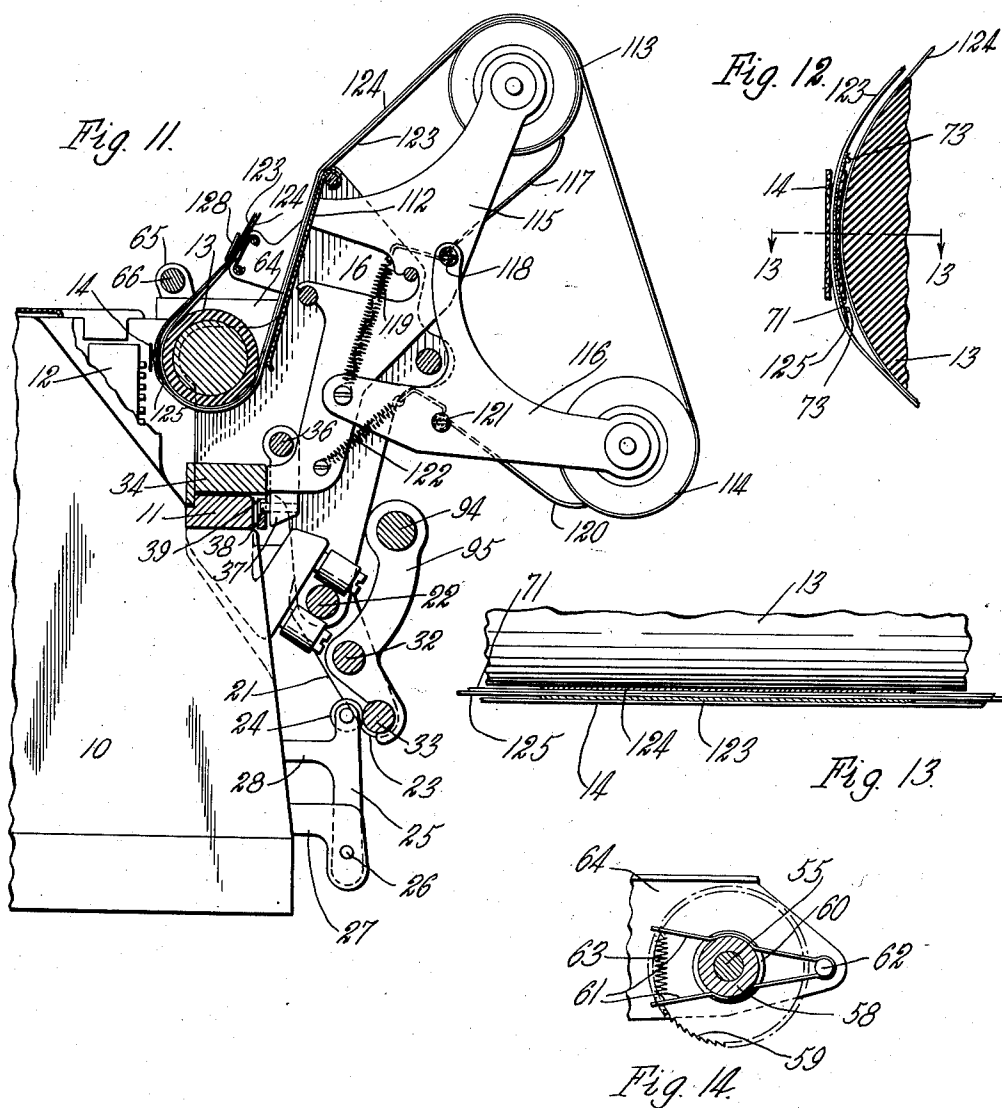
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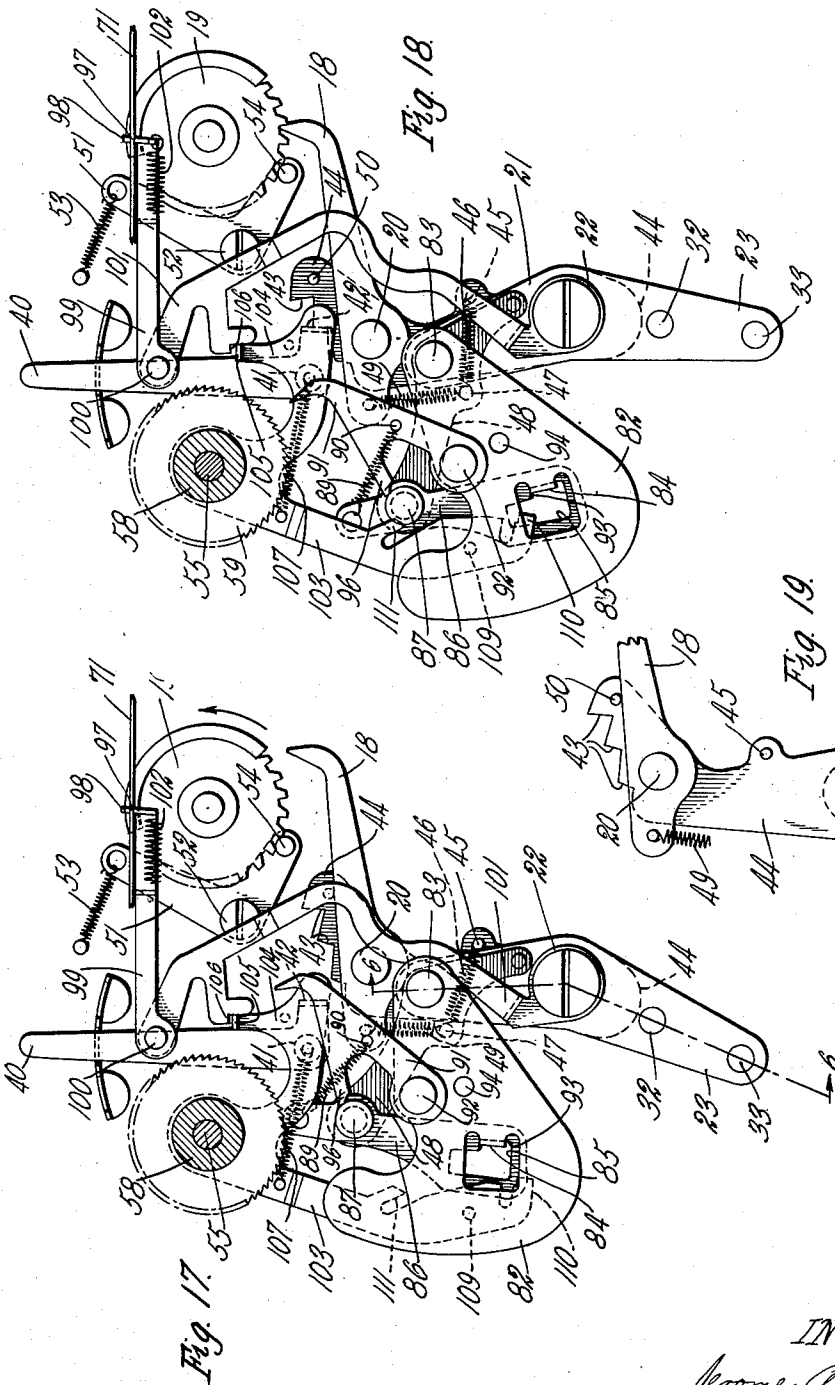
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7 Sheets-Sheet 6



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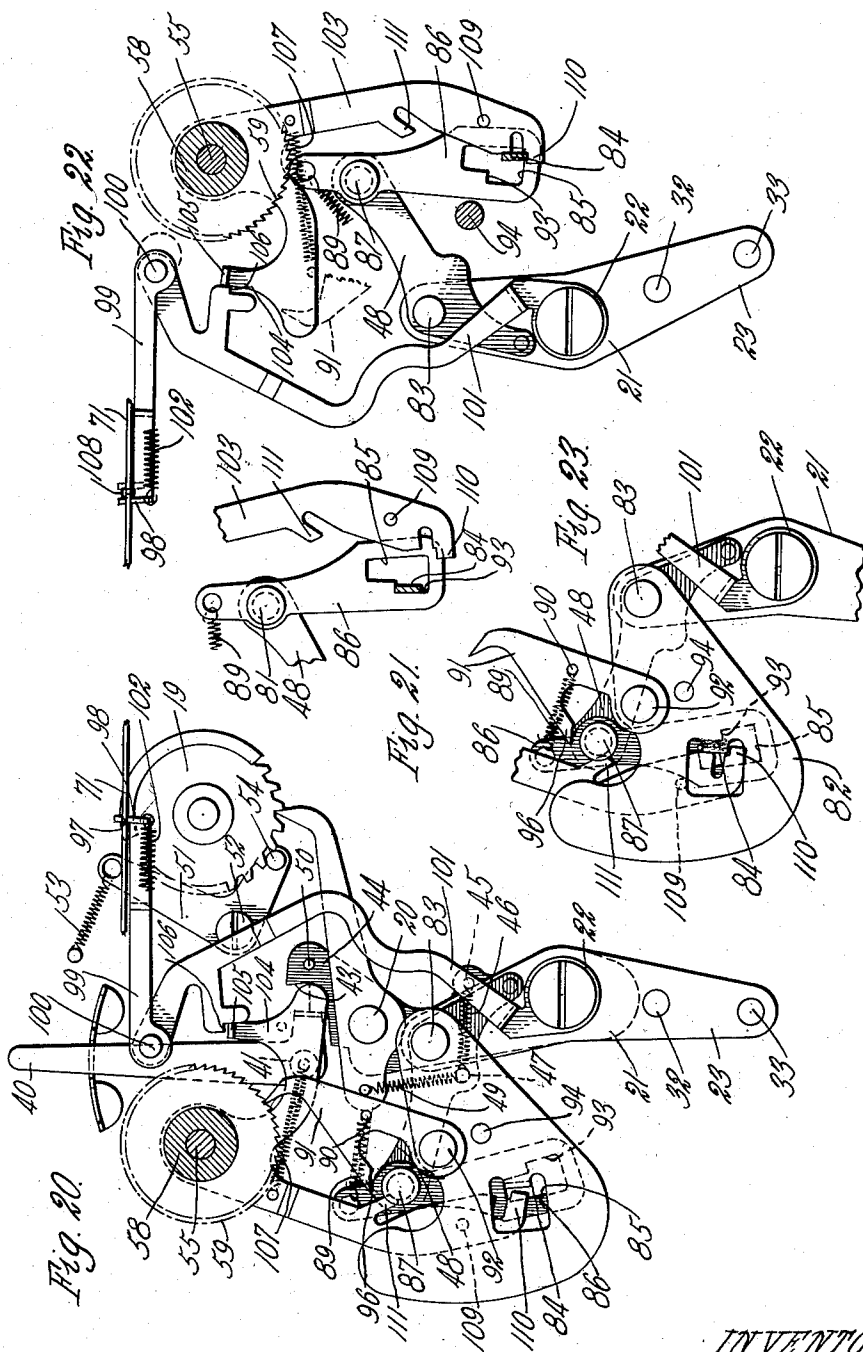
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PRINTING MECHANISM

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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

2,058,859

PRINTING MECHANISM

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Application August 13, 1934, Serial No. 739,595

17 Claims. (Cl. 197—153)

This invention relates to printing mechanism of the type commonly employed in typewriting and calculating machines, in which a plurality of type are selectively operated against a platen, either singly or in groups. It is frequently desirable to make duplicate ribbon copies of whatever printing is done on such a machine, and such duplicate copies may be easily made in accordance with this invention.

An object of the invention is to provide improved printing mechanism of the typewriter and calculating machine type, with which duplicate ribbon copies of all printing may be easily made in a simple manner, and which will be relatively simple, practical, convenient and inexpensive.

Another object of the invention is to provide improved means for mounting a ribbon, and guiding it along a platen through printing position thereon which may be easily shifted into and out of printing position, and with which the direction of travel of the ribbon may be reversed automatically in a simple and dependable manner.

Another object of the invention is to provide improved printing mechanism of the type utilizing an inked ribbon, with which smudging of the paper being printed upon by the ribbon will be reduced, with which a plurality of ribbons may be used for making a plurality of ribbon copies of whatever is printed, and with which an extra ribbon may be shifted into and out of printing positions as occasion requires.

A further object of the invention is to provide improved means for mounting, guiding and feeding a ribbon through printing position with respect to a platen.

In the accompanying drawings:

Fig. 1 is a plan of the carriage and of an adding and subtracting machine constructed in accordance with this invention;

Fig. 2 is a front elevation of a portion of the carriage of the same, illustrating the manner in which the duplicating ribbon is guided along the platen through printing position;

Fig. 3 is an end elevation of the improved machine shown in Fig. 1;

Fig. 4 is an end elevation, similar to Fig. 3, of a part of the mechanism on the carriage, with some of the parts broken off to show parts otherwise concealed;

Fig. 5 is an end elevation of part of the mechanism shown in Fig. 4, but illustrating the parts in different operative positions;

Fig. 6 is a fragmentary, sectional elevation of part of the carriage mechanism shown in Fig. 3,

the section being taken approximately along the line 6—6 of Fig. 17 and illustrating some of the details of construction of the universal bar;

Fig. 7 is a rear elevation of the carriage and parts carried thereby;

Fig. 8 is a perspective of a portion of one end of the carriage, and illustrating the guides for the ribbon, the support of the flexible strip for preventing back printing, and of the wires for reducing smudging;

Fig. 9 is a transverse, sectional elevation taken through the mechanism of Fig. 8, the section being taken approximately along the line 9—9 of Fig. 8 to illustrate a mounting for the support of the strip that prevents back printing;

Fig. 10 is a sectional elevation of a part of the carriage and universal bar at one end of the carriage, the section being taken approximately along the line of 10—10 in Fig. 7;

Fig. 11 is a transverse sectional elevation through the machine at approximately the printing position;

Fig. 12 is a fragmentary sectional elevation, on an enlarged scale, of the platen at the printing zone and illustrating the arrangement of ribbons and paper;

Fig. 13 is a sectional plan of the same, the section being taken approximately along the line 13—13 of Fig. 12;

Fig. 14 is a sectional elevation through a part of the carriage, the section being taken approximately along the line 14—14 of Fig. 1;

Fig. 15 is an end elevation of the rear part of the left hand end of the machine of Fig. 1, with the parts in their normal, inactive positions;

Fig. 16 is a similar view of the opposite end of the machine, with different operative positions of certain of the parts shown by dotted lines;

Fig. 17 is an end elevation of the carriage somewhat similar to Fig. 15, but with certain of the parts removed to show parts otherwise concealed thereby, and showing the positions of certain of the parts when the ribbon is feeding in the opposite direction from that shown in Fig. 15;

Fig. 18 is a view similar to Fig. 17 but with the parts in the positions occupied at an intermediate point in the operating cycle, such as when the operating handle has been pulled forwardly for the running in of a number;

Fig. 19 is an elevation of parts shown in Figs. 17 and 18, with certain parts removed in order to illustrate parts otherwise largely concealed thereby;

Fig. 20 is a view similar to Fig. 15 but with certain of the parts removed to show other parts,

and with the parts in the operative positions assumed at an intermediate point in a printing operation, such as when the operating handle is at the end of its forward stroke or movement;

Fig. 21 is an elevation illustrating latching details of the ribbon reverse mechanism;

Fig. 22 is an end elevation of certain of the parts of Fig. 16, and illustrating an intermediate step in the reversal of the direction of travel of the ribbon; and

Fig. 23 is an elevation of some of the parts shown in Fig. 20, just before they assume the positions shown in Fig. 20, which is a step between the positions shown in Figs. 21 and 20.

In the illustrated embodiment of the invention, the machine to which the duplicating device is attached is shown as an adding and subtracting machine, and for a more complete disclosure of that type of machine reference may be had to United States Patents Nos. 1,386,021 and 1,386,022 issued August 2, 1921, and No. 1,571,567 issued February 2, 1926. It will be understood, however, that the invention is not limited to adding and subtracting machines of this type, but is applicable also to typewriters and other calculating machines, or machines printing by means of inked ribbons. The calculating and printing mechanism is largely enclosed in a cabinet 10, having therein a main frame which includes a carriage runway or supporting bar 11, Figs. 3, 15 and 16. The mechanism in the casing 10 operates a plurality of type bars 12, Figs. 1 and 11, arranged in a row along the rear of the housing 10, and selectively set for operation from the usual keyboard, not shown.

The type bars 12, during a printing operation, are selectively shifted endwise, or vertically, into printing positions, and the type bars then are struck or moved rearwardly against a platen 13, Fig. 11. A regular ribbon 14, Figs. 1, 11 and 12, is mounted by the housing 10 so as to extend between suitable spools 15, by which the ribbon is fed in one direction or the other, and the stretch between the spools, is suitably guided along the platen between it and the type bars 12, as usual in adding machines and as disclosed in the patents hereinabove cited. The platen 13 is mounted in a carriage frame 16, for rotation about its longitudinal axis for line spacing purposes, and this rotation may be imparted to the platen either by the usual knob or handle 17 (Figs. 1, 3, and 7) provided on one end of the spindle of the platen, or by a pawl 18, Figs. 17 to 20, which engages with and drives a ratchet wheel 19 fixed on the spindle of the platen 13 at one end thereof.

The pawl 18 is operated, to drive the ratchet wheel 19, from the printing mechanism, and for this purpose the pawl 18 is pivotally mounted on a pin or stud 20 (Figs. 15, 17, 18 and 19) which moves with a universal bar or rocking frame 21 that is pivoted at 22 to the carriage frame 16. The universal bar or member 21 (Figs. 3, 7, 15 and 16) extends for approximately the full length of the carriage, and has a depending tail 23 which is substantially co-extensive in length with the length of the universal bar. This tail is engaged and operated at intervals by a roller 24, provided on a lever 25 that is pivoted at 26 (Fig. 3) to a bracket arm 27 extending rearwardly from the main frame. The lever 25 is provided with an arm 28 which extends into the housing 10, Fig. 3, and it is there connected to the printing mechanism and to the main operating handle 29 in a manner common in adding machines.

It is, of course, understood that in this type of adding machine, after a number has been set up on the usual keyboard, not shown, the handle 29 is pulled forwardly to a predetermined position and then released or returned to the normal position shown in Fig. 3. During the operation of the handle 29 in a forward direction, the lever 25 is rocked toward the housing 10, which releases the universal bar 21. A spring 30 (Fig. 10), which acts between a pin 31 on the carriage frame 16 and a rod 32 on the universal bar 21, rocks the bar 21 in a direction to carry its tail 23 toward the housing 10 so as to follow the lever 25. The tail 23 of the universal bar, at its lower end, carries a rod or bar 33 which extends from end to end of the bar 21 and engages with the roller 24 in the different positions of adjustment of the carriage across the rear of the housing 10.

The carriage frame 16 is provided with a supporting part 34 (Fig. 11) which is detachably connected to the runway or track 11 of the main frame at the rear of the housing 10, and slides along the same from side to side of the housing 10. A carriage release lever 35, Figs. 3 and 7, 25 is mounted on a shaft 36, which extends lengthwise of the carriage and at an intermediate point carries a depending arm 37 (Figs. 4 and 11). The arm 37 is provided with a locking pin 38 that engages in any one of a series of notches 39 (Fig. 11) arranged at intervals along the rear of the runway or guide 11 of the main frame. Thus, the carriage may be locked in different adjusted positions across the rear of the housing 10, and the carriage release lever 35 is, of course, yieldingly urged by a spring 36a, (Fig. 4) acting on an arm 36b provided on the shaft 36, in a direction to insert the pin 38 into any one of the notches 39 with which it may be aligned.

When the handle 29 is returned to the normal position shown in Fig. 3, the lever 25 will be rocked rearwardly, and will forcibly rock the universal bar 21 in a direction to feed the pawl 18 forwardly and cause it to turn the ratchet wheel 19 a desired extent. This extent may be varied by a line spacing lever 40, Figs. 15, 17 and 18, which is pivoted at 41 to the carriage frame and has a laterally extending lug 42. The lug 42 is engageable with any of the steps 43 provided on an arm 44 which is pivoted on the rod or bearing stud 22 of the universal bar.

The arm 44 carries a pin 45 which abuts against the edge of one of the members of the universal bar 21, being urged thereagainst by a spring 46 acting between the pin 45 and a stud 47 provided on one of the arms 48 carried rigidly by the universal bar 21, at the ends thereof. The spring 46 thus yieldingly holds the arm 44 against the universal bar for normal movement therewith, but when the arm 44 is stopped by the engagement of a step 43 thereof with the lug 42, the spring 46 will yield and permit continued movement of the universal bar for a full increment of oscillation.

The pawl 18 is urged towards the ratchet wheel 19 by a spring 49 (Fig. 19) which connects a tail of the pawl 18 with the stud 47 (Figs. 17 and 18) on the arm 48, but this movement of the pawl 18 by spring 49 is limited by its engagement with a pin 50 (Fig. 19) provided on the arm 44. As soon as the universal bar begins its movement while the handle 29 is moving forwardly, the pin 50 will be moved upwardly and rearwardly as the arm 44 follows the universal bar, which swings the pawl 18 into engagement with the

teeth of the ratchet wheel 19, and during continued movement of the universal bar the pawl 18 will trail over the teeth of the ratchet wheel until the arm 44 is stopped by the engagement of one of its steps 43 with the lug 42 on the line spacing lever 40.

During continued further movement of the universal bar, the arm 44 is held against further movement, which stretches the spring 46. When the handle 29 is released or started on its return movement to the rear (Fig. 3), the universal bar will start its reverse movement. During this reverse movement the universal bar will again pick up the pin 45 and force the arm 44 back into its normal position shown in Fig. 17, but in doing so the pawl 18 will drive the ratchet wheel in the direction of the arrow (Fig. 17) until the pin 50 re-engages the pawl 18 and forces the latter out of engagement with the ratchet wheel. The greater the extent of movement of the arm 44 until it is stopped by the lug 42, the greater will be the travel given the ratchet wheel 19, and through it the platen, before the pawl 18 is disengaged from the ratchet wheel during the return movement of the universal bar.

The ratchet wheel is held against overrunning and reverse movements by a click pawl 51 (Figs. 17 and 18) which is pivoted at 52 to the carriage frame and urged by a spring 53 in a direction to carry a click pin 54 into engagement with the ratchet teeth. The pin 54 is round or cylindrical so that when it enters between two teeth of the ratchet wheel it will center or position the ratchet wheel or platen, and yet may be cammed outwardly when the ratchet wheel is propelled by pawl 18, or when the platen is turned in either direction by manual manipulation of knob 17 (Figs. 1 and 7).

A rod 55 (Figs. 7, and 14 to 18) is rotatably mounted in, and extends beyond, the ends of the carriage frame 16. Ribbon spools 56 are rotatably mounted on the ends of the rod 55, the spools being confined rotatably on the ends of the rod 55 by split rings or keys 57 (Figs. 3 and 15), each of which is sprung into a peripheral groove of the rod 55. Each spool 56 has a hub 58 (Fig. 1) extending therefrom toward the other spool, and a ratchet wheel 59 is fixed on the end of each hub. The teeth on one ratchet wheel 59 are inclined in one direction, and on the other wheel are inclined in the opposite direction. Each hub 58 is provided with a peripheral groove 60, Fig. 14, which receives related brake arms 61 extending from a pin 62, to which they are anchored, and straddling the hub 58. The free ends of each pair of arms 61 are connected by a spring 63, which yieldingly urges the brake arms 61 into engagement with opposite sides of the hub 58, so as to frictionally retard the rotation of that spool and its ratchet wheel.

The pins 62 (Figs. 4 and 14) are mounted on arms 64, (Figs. 1, 4 and 14) provided at opposite ends of the carriage and fixed on the rod 55 on which the spools are rotatably mounted. The arms 64 extend forwardly of the carriage and at their forward ends have upstanding lugs 65 (Figs. 1, 3 and 4) which are connected by a rod 66, rigidly fixed thereto and forming therewith a bail that is hinged to the carriage at the rear thereof, and extends across the forward part of the carriage. The forward part of this bail swings, from a position above the carriage and platen, forwardly and downwardly into a position along the platen.

The forward ends of the arms 64 are flanged laterally and in a direction away from one another, to provide ribbon guides 67 (Figs. 1, 2, 4 and 8). Each of these ribbon guides or flanges 67 is provided in its upper edge with a guide notch 68, and its lower free corner is bevelled or cut off at approximately 45°, as shown in Figs. 2 and 8. Each bevelled edge is provided with a notch 69, which also serves as a guide for the ribbon. Each flange or guide 67 also depends somewhat below its line of attachment to the end of an arm 64, and the vertical edge of this depending portion is provided with a notch 70, Figs. 2 and 8, which is aligned horizontally with the notch 69.

The duplicating ribbon 71 is attached at its ends to the spools 56, and from each spool the intermediate portion of the ribbon 71 extends forwardly along the arms 64, passes over the upper edge of the guide 67 in the notch 68 thereof, thence downwardly over the forward face of the guide or flange 67, thence through the notch 69 and around the bevelled edge of the guide or flange, thence along the rear face of the flange or guide 67 and through the notch 70 towards the opposite end of the carriage. The portion of the ribbon 71 extending between the flanges or guides 67, passes along the front of the platen when the arms 64 are lowered into the operative position shown in Figs. 1, 3, 11 and 12, and this duplicating ribbon, as it moves along the platen, will move past the printing zone determined by the type bars 12. When the ribbon bail, formed of the arms 64 and the rod 66, is swung upwardly, the forward stretch of the ribbon 71 which extends along the platen will be shifted upwardly away from the platen and out of the printing zone, this position of the bail being shown in Fig. 4.

The side walls of each notch 70 (Fig. 2) are provided with tongues 72, (Figs. 2, 4 and 8) which extend toward one another. A pair of wires 73 are anchored at one end to a pin 74 which is provided on one of the arms 64, and from that pin the wires 73 extend forwardly and are hooked around the adjacent tongues 72, and then towards the opposite end of the carriage in parallel relation to one another, as shown in Figs. 2 and 8, and then around the tongues 72 at the opposite end of the carriage (Fig. 15) the free ends of the wires 73 being there connected by springs 75 to a lug or arm 75^a on the adjacent bail arm 64. The two wires 73 thus extend between the two ribbon guides 67, along opposite marginal edges of the ribbon 71, and are kept taut by the springs 75. The wires 73, however, move vertically with the bail and the duplicating ribbon as the ribbon is shifted with the bail into and out of the printing zone or position.

In order to hold this bail yieldingly in and out of printing position, a detent 76 (Figs. 4 and 5) is pivoted by a pin 77 to one of the arms 64, so as to depend therefrom. This detent 76 is provided with a plurality of V-shaped notches 78 along one edge thereof, which engage over a detent pin 79 that is provided on one of the plates of the carriage frame 16. A spring 80 is anchored, intermediate of its ends, by a loop which fits over a pin 81 on the adjacent arm 64, one end of the spring 80 extending downwardly and being hooked at its free end over the edge of detent 76 which is opposite from the notches 78.

The opposite end of the spring 80 is hooked, while under tension, under the lower edge of the adjacent arm 64, and thus the spring 80 yield-

ingly and resiliently urges the detent 76 against the pin 79 and forms a prop for holding the ribbon bail formed of the arms 64 and rod 66 in different positions, depending upon which one of the notches 78 engages with the pin 79. When the ribbon bail is swung upwardly into an inoperative or non-printing position, the bottom notch of detent 76 will engage with the pin 79, as shown in Fig. 4, and when the bail is lowered into printing position, the notch 78 at the other end of the detent will engage with the pin 79, as shown in Fig. 5.

When the middle notch 78 is engaged with the pin 79, the bail will be in an intermediate position, not shown, in which the ribbon 71 is out of, but just above, printing position. Because of the V-shape of the notches 78, the ribbon bail may be swung upwardly and downwardly by applying sufficient force thereto, during which the pin 79 will cam the detent 76 sidewise as the pin engages in the notches successively. This provides a yielding lock or latch for holding the bail and duplicating ribbon in different positions, one of which is the printing position.

A control member in the form of a plate 82, Figs. 15 to 20, is provided at each end of the carriage and hinged upon a stud 83 provided on the adjacent end of the universal bar 21. The members 82 extend rearwardly of the carriage from the studs 83 and are provided with struck out lugs 84. The lugs 84 on the two members 82 extend toward one another, and are received in slots 85 provided in depending hinged latch arms 86 which are pivoted at 87 to arms 48 extending rigidly and rearwardly from the ends of the universal bar 21.

At each end of the carriage, a spring 89 is connected at one end to the adjacent latch arm 86, and at its other end is anchored to a pin 90 on a pawl 91 which engages with and drives the ratchet wheel 59 on the adjacent ribbon spool. Each pawl 91 is pivoted at 92 to the adjacent control member 82 and thus, as each control member 82 is oscillated, the pawl 91 will be oscillated with it. Each spring 89 performs the double function of urging its related pawl 91 towards the teeth of a ratchet wheel 59, and of urging the latch lever 86 in a direction to engage its notch 93 in a side wall of the slot 85 with the lug 84 on the adjacent member 82, as shown particularly in Fig. 21.

The control members 82 at opposite ends of the carriage are connected by a rod 94 (Figs. 7, 15 to 18, 20, 22 and 23), this rod 94 passing through and rocking in a cross frame member 95 (Fig. 7) provided on the universal bar, so that the rod 94 will rock back and forth with the universal bar, but also will be tiltable in its rocking bearing or fulcrum in the cross member 95, one of such tilting positions being shown by full lines in Fig. 7, and the other position being shown by the dash lines in the same figure. Thus, when either control member 82 is rocked upon its stud 83 at one end of the carriage, it will transmit, through the rod 94 a rocking movement to the other member 82 in the opposite direction.

When either control member 82 is latched in its lowermost position of movement on its stud 83, as shown in Figs. 16, 17, 18 and 21, the pawl 91 carried thereby will be shifted downwardly with respect to the universal bar, until a tail 96 thereof, (Figs. 15 to 18, 20 and 21) engages at its end against the adjacent stud 87 which pivots the adjacent latch arm 86 to the universal bar 21. That stud 87 limits the movement of the pawl 91

toward the adjacent ratchet wheel 59, so that during the rocking of the universal bar, that pawl 91 will be held out of engagement with the adjacent ratchet wheel 59. The normal position of the pawl 91 is shown in Fig. 17 under such conditions, and the same pawl, still under the same conditions, is shown in Fig. 18 in the position it occupies at the end of a partial cycle, such as after the main operating handle has been pulled forwardly to the maximum extent, and at which time that pawl 91 should come the nearest to engaging the ratchet wheel 59 during the movement of the universal bar. It will be observed that under those conditions that pawl 91 will be held out of engagement with its related ratchet wheel 59 in the movements of the universal bar, and consequently no operation of the adjacent spool 56 will take place.

While one control member 82 is thus latched in its depressed or lowermost position, as shown in Figs. 17 and 18, for example, the other control member 82 is held in its upper and elevated position on the universal bar, in which its lug 84 is out of latched relation with the notch 93 of the slot 85 of the adjacent latch arm 86. When either control member 82 is moved to its elevated position, it shifts the pivoted end of its pawl 91 upwardly and nearer to the adjacent stud 87, so that the tail 96 of that pawl will no longer engage with that stud 87 and prevent engagement of that pawl with its related ratchet wheel, and consequently that pawl 91 will operate a ribbon spool 56 at that end of the machine.

The mechanism for causing a reversal in this direction of feed of the ribbon will next be described. For this purpose the ribbon leaving each spool 56, in passing forwardly to the guides 67 will pass through a slot 97 (Figs. 15 and 16) of a fork or flange 98 which is provided at each end of the carriage upon the end of an arm 99, that is pivoted at 100 on the free end of a latch lever 101. Each lever 101 is pivoted on one of the studs or bearings 22 at the axis of oscillation of the universal bar. A spring 102 is connected at one end to each arm 98 through which the ribbon extends, and at its other end is suitably anchored to the ribbon bail, (Figs. 4 and 15) such as to the lugs 75^a provided on the arms 64. The springs 102 urge the arms 99 endwise or toward the adjacent spools 56.

Latch release levers 103, which may be bell crank levers, are pivotally hung, one at each end of the carriage, on the ends of the rod 55 which extends lengthwise of the carriage and serves as a part of the ribbon bail. Each lever 103, Figs. 15 to 18, and 20 to 23, has a forwardly and upwardly extending arm 104, carrying a laterally turned lug 105 which engages against a shoulder 106 provided on the latch lever 101. Each lever 103 is yieldingly and resiliently urged in a direction to elevate its lug 105, by a spring 107 which is connected to the depending arm of the lever 103 and to any suitable part of the frame of the carriage, such as to the pivot pin or stud 41 of the lever 40 at one end of the machine, and to the stud or pin 79 (Figs. 4 and 5) at the other end of the machine. Each spring 107 thus urges its lever 103 in a direction to carry its lug 105 upwardly and against the shoulder 106 of the adjacent latch lever 101, so that if either latch lever 101 is rocked forwardly, such as by an endwise pull on an arm 99, the released lever 103 will be rocked in a direction to raise its lug 105.

The endwise pull or force on the arm 99, which is necessary to move the latch lever 101 and

release the adjacent lever 103, is obtained by providing a suitable protuberance or button 108, Fig. 22, on the ribbon near each end thereof. Each button 108 is too large to pass through the slot 97 in the fork or flange 98 of the arm or member 99, and consequently carries the arm 99 with it and the ribbon. In Fig. 22 one of the latch levers 101 is shown by full lines in the position it occupies after it has been pulled forwardly by the button 108 on the ribbon, to release the adjacent lug 105 on the lever 103. When either lever 103 is released in this manner, its spring 107 rocks the depending arm of that lever forwardly and carries a pin 109 thereof against an edge of the adjacent latch arm 86, rocking the latter forwardly to disengage the notch 93 thereof from the lug 84 on the adjacent control member 82, and place a lug or nose 110 thereof beneath that lug 84. Such a position of parts is shown in Fig. 22.

At the next operation of the universal bar 21, the lug 110 which has just been engaged beneath a lug 84, prevents the downward movement of this lug 84 and its control member 82 with the universal bar, and hence the lug 84 and its control member 82 will really be raised with respect to their position on the universal bar 21. This relative upward movement of that control member 82 tilts the rod 94 about its fulcrum and rocks the other control member 82 at the other end of the carriage downwardly on the universal bar, notwithstanding the latter's movement with the universal bar. This carries the lug 84 on that other member 82 downwardly in the slot 85 of its related latch arm 86, and when it reaches the notch 93 in that arm 86, the spring 89 connected to that arm 86 will rock that arm into latching position with that lug 84, as shown in Figs. 16, 17, 18 and 21, thereby latching that other control member 82 in its relatively lowered position to the universal bar 21. This holds the control member 81, which has just been elevated on such universal bar, in its elevated position as shown in Fig. 15.

During such movement of the universal bar which has produced this chain of operations just described, the stud 87 (Fig. 23) on the universal bar at that end of the carriage where the latch 103 was released, engages a tail 111 on the depending arm of the adjacent lever 103 and cams that lever 103 in a direction to lower its lug 105 and re-engage it beneath the shoulder 106 on its latch lever 101, as shown in Fig. 20. When the relatively elevated control member 82 is now rocked with the universal bar 21, its pawl 91 will engage and trail over the spool ratchet wheel 59 at that end of the carriage during the forward movement of the main operating handle 29, and then as the handle moves rearwardly or is restored to its normal position, the universal bar 21 in returning to its normal position will act through that pawl 91 to propel that ratchet wheel 59 and its spool 56 to feed the ribbon 71 in the opposite direction from that in which it was previously being fed.

This winds the ribbon 71 upon the spool 56 at the end of the carriage shown in Fig. 20, and this feeding operation, step by step, for the ribbon 71 at each operation of the universal bar 21, will continue until the ribbon is nearly unwound from the spool at the opposite end of the carriage which is shown in Fig. 16, at which time a button 108 on the ribbon at that end will act through its related arm 99 and latch lever 101 to release the lever 103 at that end of the carriage,

whereupon the control members 82 are released and rocked in the manner just described to reverse the direction of feed of the ribbon.

The paper to be printed upon may be fed to the platen in the manner and by mechanism common in typewriters and adding machines, and in moving toward the platen the paper travels along the table 112, Figs. 1 and 11. When the paper from rolls is employed, the rolls 113 and 114 are suitably mounted in brackets 115 and 116 (Fig. 11) extending rearwardly from the carriage frame. A brake 117 is hinged upon a pin 118, and urged by a spring 119 in a direction to engage the periphery of the roll 113 for the purpose of exerting a slight drag or brake thereon, and thus keeping the paper taut. Similarly, a brake 120 is pivoted at 121 and is urged by a spring 122 into contact with the roll 114 to exert a slight brake or drag thereon.

When only one copy of the printing is desired, the paper strip 123 from the upper roll 113 is guided over the paper table 112 and to and around the platen, but, when two copies are desired, the paper strip 124 from the roll 114 is brought up and over the upper roll 113, and the paper strips from the two rolls are conducted together over the paper table 112 and to and around the platen 13. When duplicate copies are desired the superposed sheets or strips 123 and 124 are separated as they come up above printing position, and the wires 73, duplicating ribbon 71 and wires 73 are swung downwardly with their bail and knifed or inserted between the sheets into printing position, as shown in Figs. 11 and 12.

With this arrangement, the paper strip 123 will be disposed between the two ribbons, and consequently when the type bars 12 are impacted or pressed against the platen for printing purposes, an original printing will be made upon both strips of paper, but there will be back printing from the under or duplicating ribbon 71 upon the rear face of the outer strip 123. If this back printing is objectionable, it may be overcome by disposing a thin, flexible strip or sheet 125, Figs. 2, 8, 12 and 13, along the strip of ribbon 71 on the ball between the guides 67, so that the strip 125 will run parallel to and in front of the ribbon 71, and between the ribbon 71 and the strip 123. The strip 125 may be of any suitable, thin, flexible sheet material, and I have found that "Cellophane" or transparent sheets of viscose or cellulose material may be used for this purpose with great success.

The strip 125 extends for approximately the length of the carriage, and at its ends is looped around and anchored to arms 126 which are hooked over the bar 66 of the ribbon bail. To limit displacement of the arms 126 endwise of the carriage, the bar 66 may have one or more slots or flat portions 127 milled therein adjacent each end, as shown particularly in Figs. 8 and 9 and the upper end of each arm 126 is bent back upon itself in an approximately U-shape, and the inverted U-end sprung slightly and frictionally clamped over the bar 66 at the milled slots or flat portions 127. Suitable shims may be disposed between the arms 126 and the ends of the slots 127 and straddling the bar 66 in order to provide a limited adjustment for the arm 126 toward and from one another and stretch the strip 125 taut. Obviously, any other means for mounting the strip 125 may be employed if desired.

In the operation of a calculating machine, such as has been herein described and illustrated, the

parts are assembled in the manner shown in the drawings, and the paper is fed to and around the platen. When only one copy of the printing is desired, the ribbon ball is swung upwardly, such as into the position shown in Fig. 4, which places the duplicating ribbon 71, the "Cellophane" strip 125 and the wire 73 in an upper or non-printing position where they do not interfere with the normal use of the machine for printing upon one strip of paper. Of course, the single strip of paper may be inserted under the duplicating ribbon and the single copy made directly on that strip from the ribbon 71.

This ribbon ball may also be disposed in an intermediate position, only partially elevated, such as is provided when the pin 79 (Fig. 4) is engaged in the middle notch 78, and in that case the duplicating ribbon is still out of printing position but disposed just above it, so that it may be quickly and easily lowered into printing position. This intermediate position is also used when the two strips of paper are fed around the platen and separated so as to pass on opposite sides of the duplicating ribbon 71 and the "Cellophane" strip 125.

After the strips of paper 123 and 124 have been so passed around the platen, and the duplicating ribbon and strip 125 have been knifed between these strips of paper, the free ends of the strips of paper may then be brought together and guided under the usual tear off strip of bar 128, Fig. 1. With the duplicating mechanism arranged in this manner to print duplicate ribbon copies, the usual keyboard, not shown, is manipulated to set up a number, and then the handle 29, Fig. 3, is pulled forwardly as far as it will go, and released or returned to the normal position shown in Fig. 3. During such operation of the handle 29, the type bars 12 are first selectively elevated, so as to present the different types thereon in printing position in front of the ribbon 14, and then the type bars are forced as a group against the platen or ribbon 14 to print in a manner common in calculating machines of this type.

The ribbon 14 prints directly upon the paper strip 123, and the pressure transmitted there-through upon the "Cellophane" strip 125 and the duplicating ribbon 71, prints a duplicate record on the paper strip 124. During repeated operations of the printing mechanism, the usual ribbon 14 will be fed intermittently in a manner common to machines of this type, and the duplicating ribbon 71 will also be fed lengthwise along the platen in one direction or the other, depending upon which of the control members 82 is in its relatively elevated position. At each operation of the printing mechanism, the universal bar 21 is rocked or oscillated, during which the line spacing pawl 18 engages and operates the ratchet wheel 19 through one or more lines determined by the position of the lever 40 (Fig. 20).

Let it be assumed, for example, that at this time, the control member 82 at the left hand end of the machine is in its unlatched position, such as shown in Figs. 15 and 20. In this unlatched position, this control member 82 is elevated with respect to the universal bar 21, and through the connection of the tilting bar 94, the control member 82 at the right hand end of the machine is in its latched or lowered position, as shown in Fig. 16. With this setting of the control members 82, the pawl 91, at the left hand end of the machine and which is attached to the elevated control member 82, will be in a position to engage and

feed the ratchet wheel 59 and ribbon spool 56 at the left hand end of the carriage in the direction of the arrow shown in Fig. 15. The driving position of this pawl 91 is shown in Fig. 20, which represents the position of the parts taken after the main handle 29 has been pulled forwardly to the full extent.

When the handle 29 is pulled forwardly in this manner, the universal bar 21 is released by the forward movement of the member 25, Fig. 15, and the spring 30, Figs. 10 and 16, acting on the universal bar, will rock said bar in a direction to lower the left hand member 82 from the position shown in Fig. 15 to the position shown in Fig. 20. This carries the pawl 91 at the left hand end of the carriage into driving relation to the related ratchet wheel 59. When the main handle 29 is returned to its normal position shown in Fig. 3, the member 25 (Figs. 3 and 15) is moved rearwardly and forces the universal bar 21 back into its normal position shown in Fig. 15, and as it does so the pawl 91 at the left hand end of the carriage, imparts to the ratchet wheel 59, with which it has been engaged, a short increment of rotation before it reaches the position shown in Fig. 15. This feeds the duplicating ribbon 71 from right to left on the carriage, and this movement of the ribbon 71 is repeated at each operation of the universal bar.

When the duplicating ribbon 71 has been nearly unwound from the spool 56 at the right hand end of the carriage, a button 108 thereon, Fig. 22, will engage the forked end of arm 98, Fig. 16, and being unable to pass through the slot 97 therein, will pull the arm 99 forwardly or endwise, which rocks the latch lever 101 forwardly to release the lug 105 of the adjacent lever 103. The latter is then moved by its spring in a direction to carry its pin 109 against the adjacent latch lever 86, forcing the latter forwardly so as to disengage the lug 84 of the right hand control member 82, and permit it to rise. When the lug 105 is released, the following movement of the lever 103 elevates the lug 105 into the position shown in Fig. 22, which holds the latch lever 101 in that position.

When the depending end of the lever 103 moves forwardly and disengages the lug 84 of the control member 82 at the right hand end of the carriage, the lug 110 of the lever 103 concomitantly engages beneath the lug 84, as shown in Fig. 22, so that at the next operation of the printing mechanism, the control member 82 at the right hand end of the carriage is held against downward movement with the universal bar. The movement of the latch lever 86 at that end of the carriage downwardly with the universal bar results in a relative movement of the lug 84 of the right hand member 82 into the upper end of the slot or aperture 85 at that end of the carriage, and the holding of the lug 84 at that end of the carriage causes a tilting of the connecting bar or rod 94 (Fig. 7) in a manner to lower control member 82 at the left hand end of the carriage from the relative position shown in Fig. 16 at the upper part of the slot 85, to the relative position shown in Figs. 17 and 18.

When the lug 84 at the left hand end of the carriage is forcibly moved downwardly, until it comes opposite the notch 93 in slot 85, the spring 89, which is connected to the latch lever 86 at the left end of the carriage, will shift that latch lever 86 in a direction to latch that lug 84 in its relatively lowered position. The relative lowering of the left hand control member 82 with

respect to the stud 87 on the universal bar, causes the engagement of the tail 96 of pawl 91 on that control member with the adjacent stud 87, and this shifts the pawl 91 into the inoperative position shown in Figs. 17 and 18, in which it cannot engage and operate the ratchet wheel 59 at the left hand end of the carriage upon oscillation of the universal bar. This discontinues the feeding of the ribbon step by step toward the left end of the carriage.

When the control member 82 at the right hand end of the carriage was unlatched and elevated by the operations just described, that control member moved upwardly with respect to the stud 87 at that end of the carriage, and this rendered the pawl 91 at that end of the carriage again effective to engage and drive the right hand spool 56 in a direction to again wind the ribbon on that spool. At the first operation of the universal bar following the unlatching of the lug 84 at the right hand end of the carriage by the depending end of the lever 103, the stud 87 at that end of the carriage, as it approaches the limit of its movement with the universal bar, will engage the tail 111 (Fig. 23) of that lever 103 and cam the lever 103 in the opposite direction against the action of its spring. This lowers the lug 105 on lever 103 from the position shown in Fig. 22 to a point beneath the shoulder 106, which releases the arm 99 and latch lever 101, and these are then returned to normal positions by the action of spring 102 at the right hand end of the carriage. The ribbon is then fed step by step from the left to the right on the carriage, and when this ribbon has been substantially unwound from the ribbon at the left hand end of the carriage, a button 108 on the duplicating ribbon at the left hand end thereof will cause a reversal of the direction of feed in a manner similar to that just described.

When the use of the duplicating ribbon is not desired, it is swung upwardly by its bail into an inactive position. When the duplicating ribbon is in printing position, however, the wires 73 which are kept taut by the springs 74, will urge the "Cellophane" strip and the paper strip 123 in a direction away from the duplicating ribbon 71, so that the rubbing of the duplicating ribbon on the paper strip 124 in a manner to cause smudging on that paper strip will be reduced or eliminated. Back printing on the paper strip 123 from the duplicating ribbon will be prevented by the "Cellophane" strip which is sufficiently thin to transmit the printing impression to the duplicating ribbon.

It will be understood that various changes in the details and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art, within the principle and scope of the invention, as expressed in the appended claims.

I claim:

1. A printing machine of the typewriting and calculating machine type, comprising a main frame, printing mechanism carried by said frame, a platen against which said printing mechanism operates, a ribbon carried by said main frame, extending along said platen, and in the path of travel toward said platen of the printing mechanism, a carriage mounting said platen for linear travel past printing position, and for rotary movement for line spacing, a second ribbon extending along said platen between the platen and the first mentioned ribbon and

mounted at its ends on said carriage, whereby when superposed sheets of paper are mounted on said platen, with one sheet between said platen and the second ribbon, and the other sheet between said ribbons, the operation of said printing mechanism will print duplicate ribbon copies on said sheets, a strip of thin flexible sheet material mounted on said carriage and extending between said ribbons, whereby when said other sheet of paper is disposed between the first mentioned ribbon and said flexible sheet, back printing on said other sheet from said second mentioned ribbon will be prevented, means carried by said carriage and extending along said platen between said flexible sheet and said platen and yieldingly urging said flexible sheet and said other paper in a direction away from said platen to reduce smudging on said paper sheets by said ribbons, and spring means for keeping said smudge preventing means taut in a direction of the length of the carriage.

2. In a printing mechanism of the typewriter and calculating machine type, the combination of a main frame, printing mechanism carried by said main frame and selectively operable, a carriage, a platen mounted on said carriage for rotation about its longitudinal axis for line spacing purposes, means mounting said carriage on said main frame for relative movements in directions to carry said platen lengthwise past printing positions, a universal bar carried by said carriage and operable by said printing mechanism at each operation of that mechanism, in all the different positions of the carriage during the movements of said carriage, a ribbon mounted on said carriage to extend lengthwise along said platen through printing position thereon, spools on said carriage on which the ends of the ribbon are wound, and pawls carried by said universal bar and operable directly upon said spools for feeding said ribbon in each direction step by step through printing position.

3. In a printing mechanism of the typewriter and calculating machine type, the combination of a main frame, printing mechanism carried by said main frame and selectively operable, a carriage, a platen mounted on said carriage for rotation about its longitudinal axis for line spacing purposes, means mounting said carriage on said main frame for relative movements in directions to carry said platen lengthwise past printing positions, a universal bar carried by said carriage for travel therewith and operable by said printing mechanism at each operation of that mechanism, in all the different positions of the carriage during the movements of said carriage, a ribbon, means pivotally mounted on said carriage for supporting said ribbon normally to extend lengthwise along said platen through printing position thereon, but swingable to carry said ribbon upwardly out of printing position, spools on said carriage and rotatable on the axes about which the ribbon swings, pawls on said universal bar and acting directly on said spools to rotate said spools and feed said ribbon in each direction step by step through printing position, and means also provided on the carriage for incapacitating said pawls alternately and thus changing the direction of feed of said ribbon automatically after the ribbon reaches a desired limit of travel in each direction.

4. In a printing mechanism of the typewriter and calculating machine type, the combination of a main frame, printing mechanism carried by said main frame and selectively operable, a car-

riage, a platen mounted on said carriage for rotation about its longitudinal axis for line spacing purposes, means mounting said carriage on said main frame for relative movements in directions to carry said platen lengthwise past printing positions, a universal bar carried by said carriage and operable by said printing mechanism at each operation of that mechanism, in all the different positions of the carriage during the movements of said carriage, axially aligned spools mounted on said carriage, a ribbon guide hinged on said carriage to swing about the axes of said spools and supporting said ribbon normally to extend lengthwise along said platen through printing position thereon, pawls on said universal bar and operable at each actuation of said bar directly upon said spools, and means operable alternately to guide each of said pawls out of driving relation to its spool, and thus cause said bar to feed said ribbon in each direction step by step through printing position.

5. In a printing device of the typewriting and calculating machine type, a frame, printing mechanism on said frame and selectively operable, a carriage mounted for movement relatively to said frame, a platen mounted on and relatively movable with said carriage past a printing position in which the printing mechanism operates against said platen, a ribbon extending along said platen in a position between the platen and the printing mechanism, means including ribbon guides and ribbon spools carried by said carriage adjacent the ends thereof for feeding said ribbon in a direction along said platen, a universal bar carried by said carriage and operable by said printing mechanism in different positions of said carriage in its movements on said frame, members mounted on said universal bar, at spaced points along the bar, for movements in directions crosswise of the axis of movement of said universal bar, a ratchet wheel connected to each spool for driving the same, a pawl carried by each member and yieldingly urged into engagement with the adjacent spool-driving ratchet wheel, a cam on said universal bar adjacent each member for camming the adjacent pawl out of engagement with its related ratchet wheel upon relative movement of the adjacent member on said universal bar in one direction, and releasing it upon movement in the opposite direction, means connecting the members at spaced points along said bar for shifting said members in opposite directions to force disengagement of the pawl on either member from its related ratchet wheel, whenever the other member is moved on said bar to permit engagement of its pawl with the adjacent ratchet wheel, and means controlled by the ribbon in its travel between said spools for shifting said member connecting means to render said pawls effective alternately on said ratchet wheels and thereby reverse the direction of travel of said ribbon automatically after the ribbon reaches a desired limit of travel in each direction.

6. In a printing device of the typewriting and calculating machine type, a frame, printing mechanism on said frame and selectively operable, a carriage mounted for movement relatively to said frame, a platen mounted on and relatively movable with said carriage past a printing position in which the printing mechanism operates against said platen, a ribbon extending along said platen in a position between the platen and the printing mechanism, means in-

cluding ribbon guides and ribbon spools carried by said carriage adjacent the ends thereof for feeding said ribbon in a direction along said platen, a universal bar carried by said carriage and operable by said printing mechanism in different positions of said carriage in its movements on said frame, members mounted on said universal bar, at spaced points along the bar, for movements in directions crosswise of the axis of movement of said universal bar, a ratchet wheel connected to each spool for driving the same, a pawl carried by each member and yieldingly urged into engagement with the adjacent spool-driving ratchet wheel, a cam on said universal bar adjacent each member for camming the adjacent pawl out of engagement with its related ratchet wheel upon relative movement of the adjacent member on said universal bar in one direction, and releasing it upon movement in the opposite direction, means connecting the members at spaced points along said bar for shifting said members in opposite directions to force disengagement of the pawl on either member from its related ratchet wheel, whenever the other member is moved on said bar to permit engagement of its pawl with the adjacent ratchet wheel, and means controlled by the ribbon in its travel between said spools for normally locking said members against relative movement on said bar, but unlocking and shifting said members and their connecting means and then locking them in their shifted positions, automatically whenever the ribbon reaches a desired limit of travel in each direction.

7. In a printing device of the typewriting and calculating machine type, the combination of a platen, printing mechanism operable on said platen, a support for said platen, a universal bar operable by said printing mechanism, a ribbon, means for guiding said ribbon along said platen through printing position, spools to which the ends of the ribbon are connected, a ratchet wheel connected to each spool to operate the same, the operation of said spools by said ratchet wheels causing movement of the ribbon in opposite directions through printing position, depending upon which ratchet wheel is being operated, members mounted on said universal bar, at spaced points along said bar, for movements in directions crosswise of the axis of movement of said bar, a pawl carried by each member and yieldingly urged into engagement with an adjacent spool-driving ratchet wheel, means connecting said members for causing their movements in opposite directions whenever one of them is moved, means on said bar adjacent each member for camming the pawl on the adjacent member into a position in which it cannot engage and operate its ratchet wheel, when that member is moved in one direction on said bar, a latch carried by said bar adjacent each member for latching the adjacent member in one of its positions, and means controlled by said ribbon in its travel between said spools and operable automatically for unlatching one member from said bar and shifting it in a direction to latch the opposite member to said bar and change the activity of said pawls and thereby the direction of feed of said ribbon.

8. In a printing device of the typewriting and calculating machine type, the combination of a carriage mounted to travel, a platen on said carriage, printing mechanism operable on said platen and past which said platen and carriage travel, a universal bar travelling with said carriage and operable by said printing mechanism at any posi-

tion of travel with said carriage, a pair of ribbon spools on said carriage, a ribbon extending between said spools and along that face of said platen which is operated upon by said printing mechanism, a control member mounted on said universal bar adjacent each spool and shiftable on said bar in a direction transversely of the direction of travel of said carriage, means connected to each member and operable, through operation of said bar, on the adjacent spool to rotate it and wind said ribbon step by step upon operation of said bar, means connecting said control members for causing movements of said members in opposite directions on said bar upon operation of one of them, means for incapacitating the spool rotating means of each control member upon operation of that member in one direction, means for latching said members in their end positions of movement on said bar, and means controlled by said ribbon, after it has travelled a predetermined distance in either direction, for operating said latching means to release said control members and for operating said members in opposite directions upon the next operation of said universal bar, whereby the ribbon feeding means associated with each spool will be rendered effective alternately so as to reverse the direction of travel of said ribbon automatically.

9. In a printing device of the typewriting and calculating machine type, combination of a carriage, a platen mounted on said carriage, means mounting said carriage for travel in a desired path, printing mechanism operable on said platen in its travel with said carriage, a bail element hinged on said carriage for movement in a direction crosswise of the direction of travel of said carriage, a pair of ribbon spools mounted to rotate, a ribbon connecting said spools and guided by said bail element lengthwise along said platen past printing position on said platen when the bail element is swung downwardly to a position adjacent the platen, a pair of wires anchored at one end of said bail element and extending along opposite edges of, and approximately in the plane of, said ribbon from end to end of said platen, spring means connecting the other ends of said wires to said bail element and keeping said wires taut, and means on said carriage and operable by said printing mechanism for feeding said ribbon step by step in either direction upon operation of said printing mechanism.

10. In a printing device of the typewriting and calculating machine type, the combination of a carriage, means mounting said carriage for linear travel, a platen rotatably mounted on said carriage and extending endwise in the direction of travel of said carriage, a printing mechanism operable on said platen in the different positions of travel of said platen with said carriage, a pair of ribbon spools mounted on said carriage, a ribbon connecting said spools, means on said carriage for guiding said ribbon between said spools and along said platen past printing position, a universal bar carried by said carriage and operable by said printing mechanism in any position of the platen in its travel with said carriage, a pair of control members mounted on said universal bar for bodily movement therewith, one adjacent each spool and each pivoted on said bar for movement thereon in directions crosswise of the direction of travel of said carriage, whereby said control members will be moved with said universal bar and also are capable of independent movement thereon, means connecting said control members for causing their independent movement on said bar in

opposite directions, latch means carried by said bar and latching said control members in their extreme positions of movement on said bar, means operated by each control member in its movement with said universal bar solely when latched in one position thereon for rotating the adjacent spool, and feeding the ribbon step by step in one direction, and means controlled by said ribbon and operating said latch means and said connecting means to move said control members into their other extreme positions and reverse the direction of feeding of said ribbon automatically after a predetermined movement thereof in each direction.

11. In a printing device of the typewriting and calculating machine type, the combination of a platen, printing mechanism operable against said platen, a ribbon, means guiding said ribbon through printing position between said printing mechanism and said platen, a pair of spools to which the ends of the ribbon are connected, a universal bar operable by said printing mechanism, a pair of control members mounted on said bar for bodily movement therewith and each independently movable on said bar, means operated by each member for rotating the adjacent spool upon operation of said bar, means connecting said members for moving them in opposite directions on said bar and movable with said members and said bar, each of said members being operable upon its adjacent spool when in one position on said bar, and inactive on that spool when in the other position, means for holding said members in said other positions, and means controlled by said ribbon and operable to release said holding means and upon operation of said bar shift said members in opposite directions and thereby reverse the direction of travel of said ribbon after it has travelled a predetermined distance in each direction.

12. In a printing device of the typewriting and calculating machine type, the combination of a platen, printing mechanism operable against said platen, a ribbon, means guiding said ribbon through printing position between said printing mechanism and said platen, a pair of spools to which the ends of the ribbon are connected, a universal bar operable by said printing mechanism, a pair of control members mounted on said bar for bodily movement therewith and each independently movable on said bar, means operated by each member for rotating the adjacent spool upon operation of said bar, means connecting said members for moving them in opposite directions on said bar and movable with said members and said bar, each of said members being operable upon its adjacent spool when in one position on said bar, and inactive on that spool when in the other position, a latch device carried by said bar adjacent each control member and operable to latch that member in its position in which it is inactive on said spool, means operable by said ribbon after the ribbon has travelled a predetermined distance in each direction for releasing the latched control member and then reversing the positions of said control members on said bar automatically upon operation of said bar, whereby the direction of travel of said ribbon will be automatically reversed by the reversal of said members.

13. In a printing device of the typewriting and calculating machine type, a platen, printing mechanism operable against said platen, a ribbon disposed between said printing mechanism and said platen, a pair of spools to which the ends of the ribbon are connected and by the rotation of which

the ribbon can be fed in either direction, a universal bar operable by said printing mechanism, a pair of control members mounted on said bar for movement therewith and independently shiftable thereon, a pawl carried by each member and operable on the adjacent spool, by which the operation of each member with said bar will rotate said spool in a step by step manner, means carried by said bar and engageable by each pawl, when the related control member is moved on said bar in one direction into one position, for camming said pawl out of driving relation to its related spool, a latch carried by said bar adjacent each member for latching that member in the position in which its pawl is inactive to drive its related spool, means connecting said members for operating them in opposite directions on said bar whenever either one of them is operated on said bar, and means operable by the ribbon after it has travelled a predetermined distance in either direction for releasing the latched control member and upon operation of said universal bar reversing the positions of said control members to change the direction of feed of said ribbon.

14. In a printing device of the typewriting and calculating machine type, a platen, printing mechanism operable against said platen, a ribbon disposed between said printing mechanism and said platen, a pair of spools to which the ends of the ribbon are connected and by the rotation of which the ribbon can be fed in either direction, a universal bar operable by said printing mechanism, a pair of control members mounted on said bar for movement therewith and independently shiftable thereon, a pawl carried by each member and operable on the adjacent spool, by which the operation of each member with said bar will rotate said spool in a step by step manner, means carried by said bar and engageable by each pawl, when the related control member is moved on said bar in one direction into one position, for camming said pawl out of driving relation to its related spool, a latch carried by said bar adjacent each member for latching that member in the position in which its pawl is inactive to drive its related spool, means connecting said members for operating them in opposite directions on said bar whenever either one of them is operated on said bar, means operable by the ribbon after it has travelled a predetermined distance in either direction for releasing the latched control member and upon operation of said universal bar reversing the positions of said control members to change the direction of feed of said ribbon, and means operated by said bar for restoring the unlatching means to poised position.

15. In a printing device of the typewriting and calculating machine type, a platen, printing mechanism operable against said platen, a ribbon disposed between said printing mechanism and said platen, a pair of spools to which the ends of the ribbon are connected and by the rotation of which the ribbon can be fed in either direction, a universal bar operable by said printing mechanism, a pair of control members mounted on said bar for movement therewith and independently shiftable thereon, a pawl carried by each member and operable on the adjacent spool, by which the operation of each member with said bar will rotate said spool in a step by step manner, means carried by said bar and engageable by each pawl, when the related control member is moved on said bar in one direction into one position, for camming said pawl out of driving relation to its related spool, a latch carried by said bar adjacent

each member for latching that member in the position in which its pawl is inactive to drive its related spool, means connecting said members for operating them in opposite directions on said bar whenever either one of them is operated on said bar, a spring pressed release element adjacent each latch bar and resiliently urging it in a direction to engage the adjacent latch and unlatch the adjacent control member, an auxiliary latch for holding said release element in poised position in which it is free of said latch, means operated by said ribbon after a predetermined travel in one direction for operating said auxiliary latch to release said element, and means operable by said bar, upon operation thereof, for first reversing said control members and then restoring any unlatched releasing element to poised position.

16. In a printing device of the typewriting and calculating machine type, a platen, a printing mechanism operable on said platen, a ribbon disposed between said platen and printing mechanism, a universal bar operated by said printing mechanism, a pair of control members pivoted on said bar, a pair of ribbon spools to which the ends of said ribbon are connected, each spool having a ratchet wheel attached thereto, a pawl pivoted to each control member, operable upon the ratchet wheel of the adjacent spool, and spring pressed towards that ratchet wheel, so as to rotate that spool upon movement of that control member with said bar, means connecting said control members for rocking them in opposite direction on said bar, means carried by said bar and engageable with each pawl when the control member to which that pawl is connected, is rocked in one direction on said bar, for camming that pawl into a position in which it is clear of the ratchet wheel upon movement of said bar, whereby only one of said pawls will be effective at any one time and said pawls can be made alternately active by moving said control members in opposite direction on said bar, a latch for holding each control member in its rocked position in which its related pawl is inactive on the adjacent ratchet wheel, and means controlled by the ribbon during its travel in each direction for releasing the latch which is effective on a control member and then rocking the released control member on said bar during further operation of said bar, whereby the feeding of said ribbon will be automatically reversed in direction by the ribbon itself.

17. In a printing device of the typewriting and calculating machine type, a platen, a printing mechanism operable on said platen, a ribbon disposed between said platen and printing mechanism, a universal bar operated by said printing mechanism, a pair of control members pivoted on said bar, a pair of ribbon spools to which the ends of said ribbon are connected, each spool having a ratchet wheel attached thereto, a pawl pivoted to each control member, operable upon the ratchet wheel of the adjacent spool, and spring pressed towards that ratchet wheel, so as to rotate that spool upon movement of that control member with said bar, means connecting said control members for rocking them in opposite direction on said bar, means carried by said bar and engageable with each pawl when the control member to which that pawl is connected, is rocked in one direction on said bar, for camming that pawl into a position in which it is clear of the ratchet wheel upon movement of said bar, whereby only one of said pawls will be ef-

fective at any one time and said pawls can be made alternately active by moving said control members in opposite directions on said bar, a latch for holding each control member in its rocked position in which its related pawl is inactive on the adjacent ratchet wheel, a release element mounted independently of said bar adjacent each control member and operable on the adjacent latch from a poised position for releasing that control member and holding said member against movement with said bar, to cause a

reverse movement of said members on said bar during actuation of said bar, and means carried by said bar for restoring each release element to poised position following a reversal of said members, and means controlled by the ribbon for holding said release elements in poised positions and rendered effective after a predetermined travel of the ribbon in either direction for causing operation of that release element which will reverse the direction of travel of the ribbon.

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