Sept. 1, 1959 T. SPARKS 2,902,135

DOUBLE RIBBON MECHANISM

Filed June 14, 1956 5 Sheets-Sheet 1

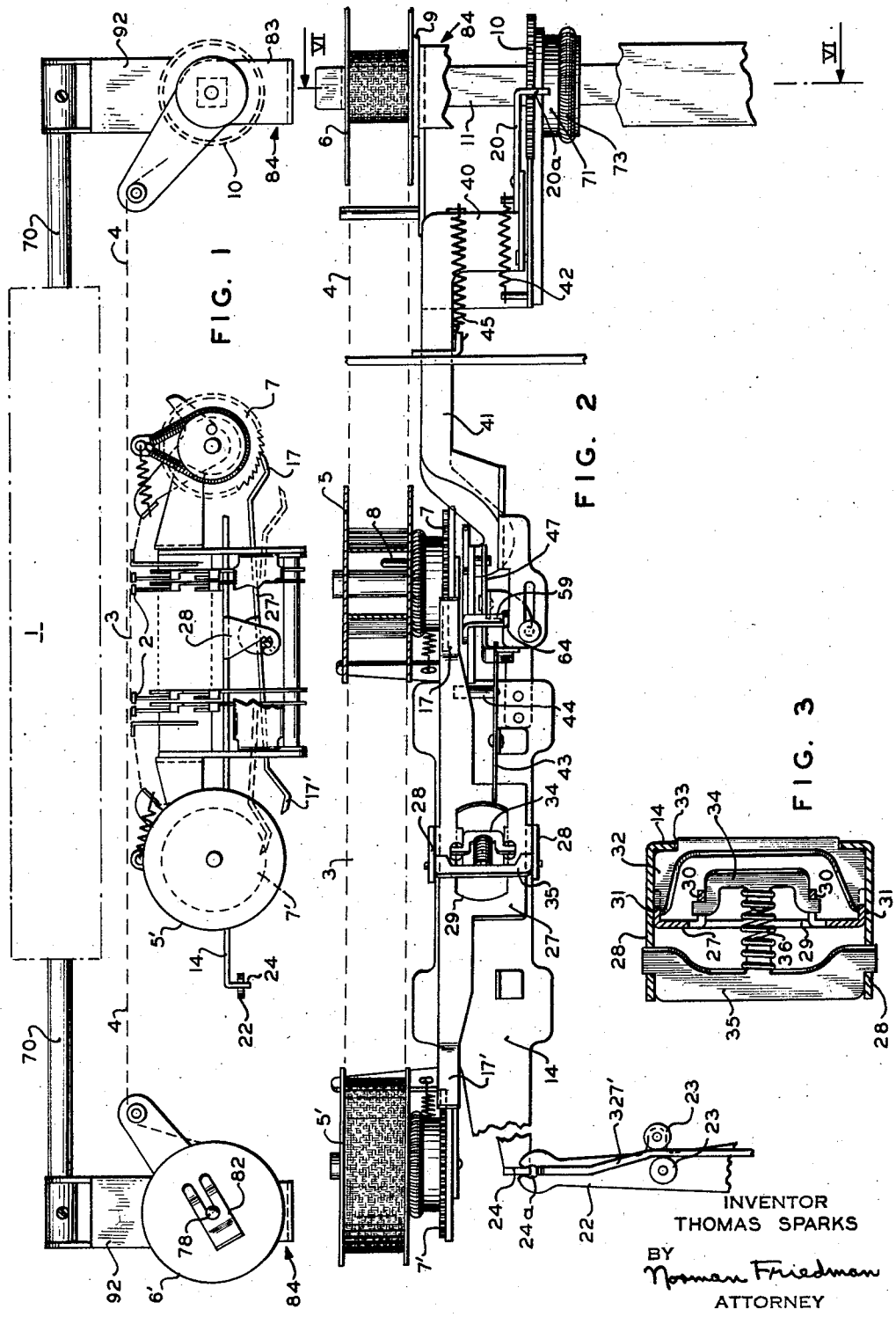

FIG. 1

FIG. 2

FIG. 3

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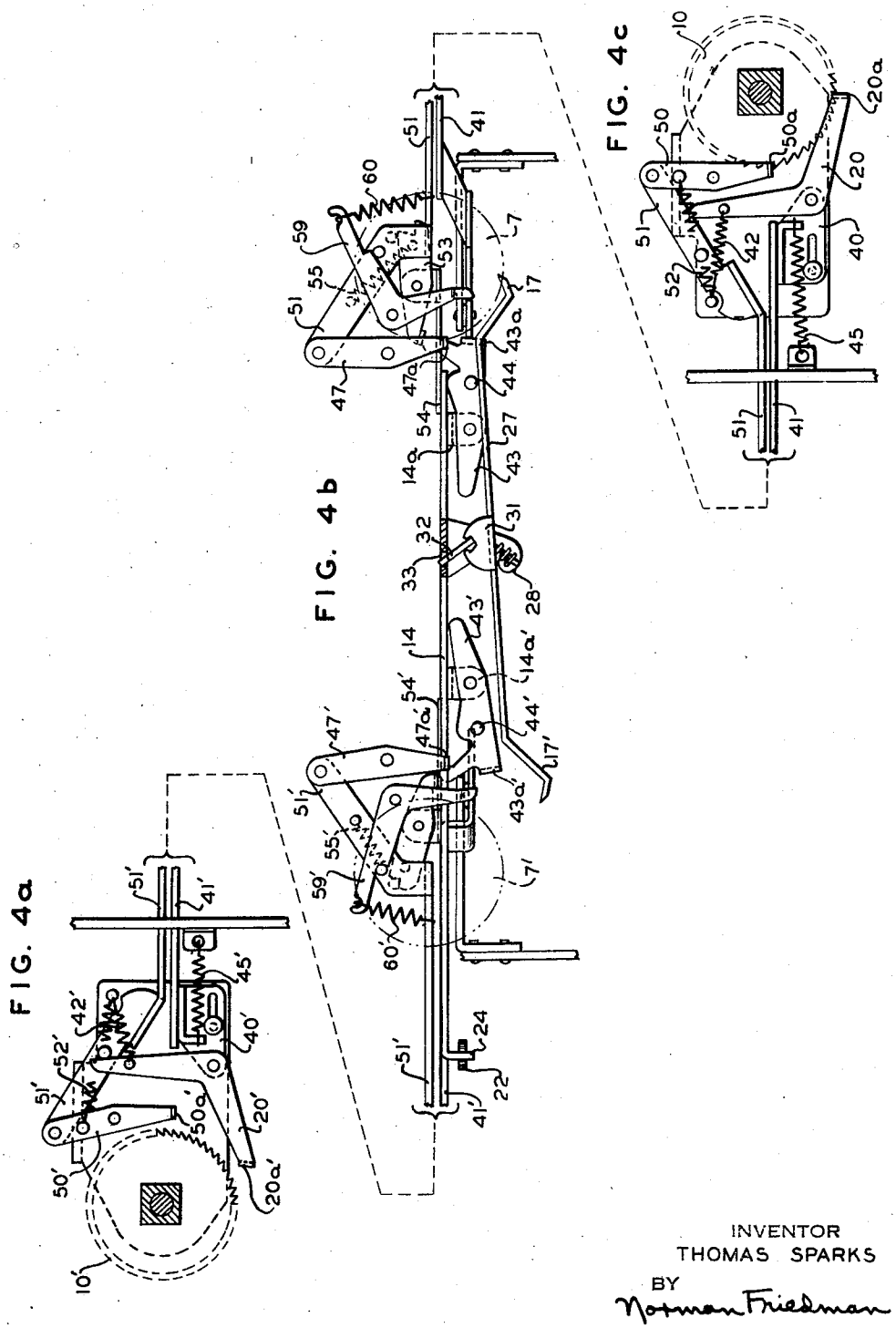
Sept. 1, 1959 T. SPARKS 2,902,135

DOUBLE RIBBON MECHANISM

Filed June 14, 1956 5 Sheets-Sheet 2



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DOUBLE RIBBON MECHANISM

Filed June 14, 1956 5 Sheets-Sheet 3

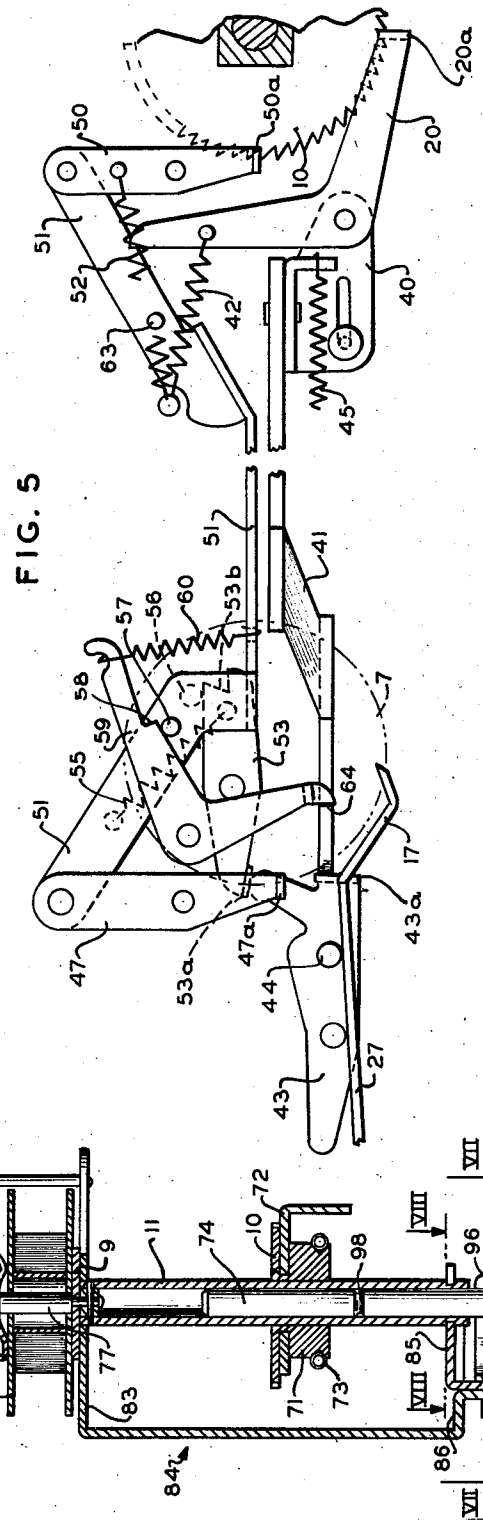

FIG. 5

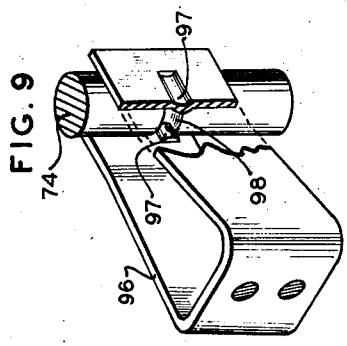

FIG. 9

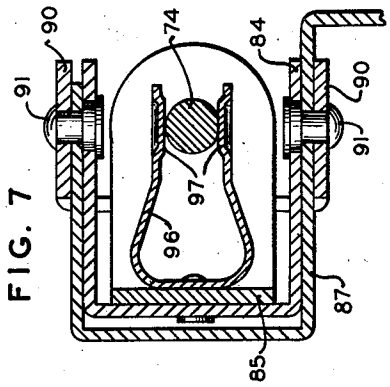

FIG. 7

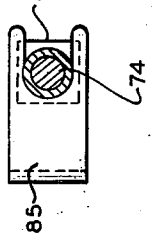

FIG. 8

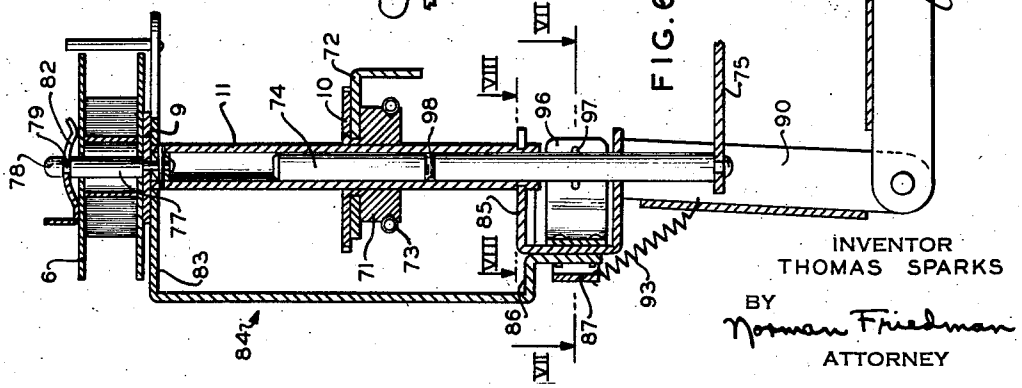

FIG. 6

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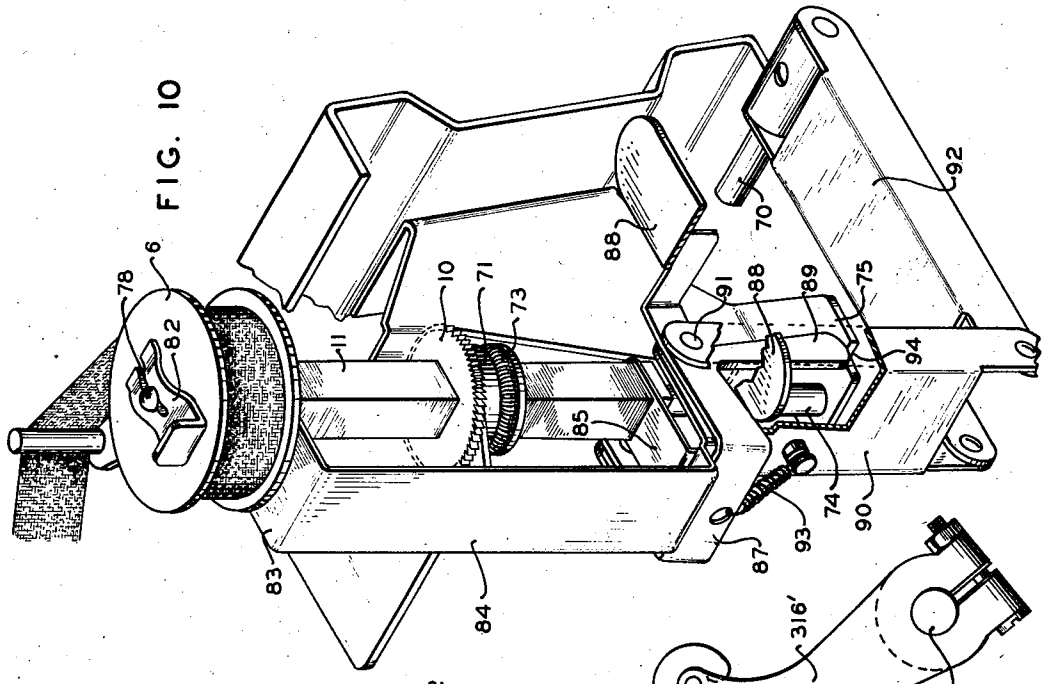
Sept. 1, 1959 T. SPARKS 2,902,135

DOUBLE RIBBON MECHANISM

Filed June 14, 1956 5 Sheets-Sheet 4

FIG. 10



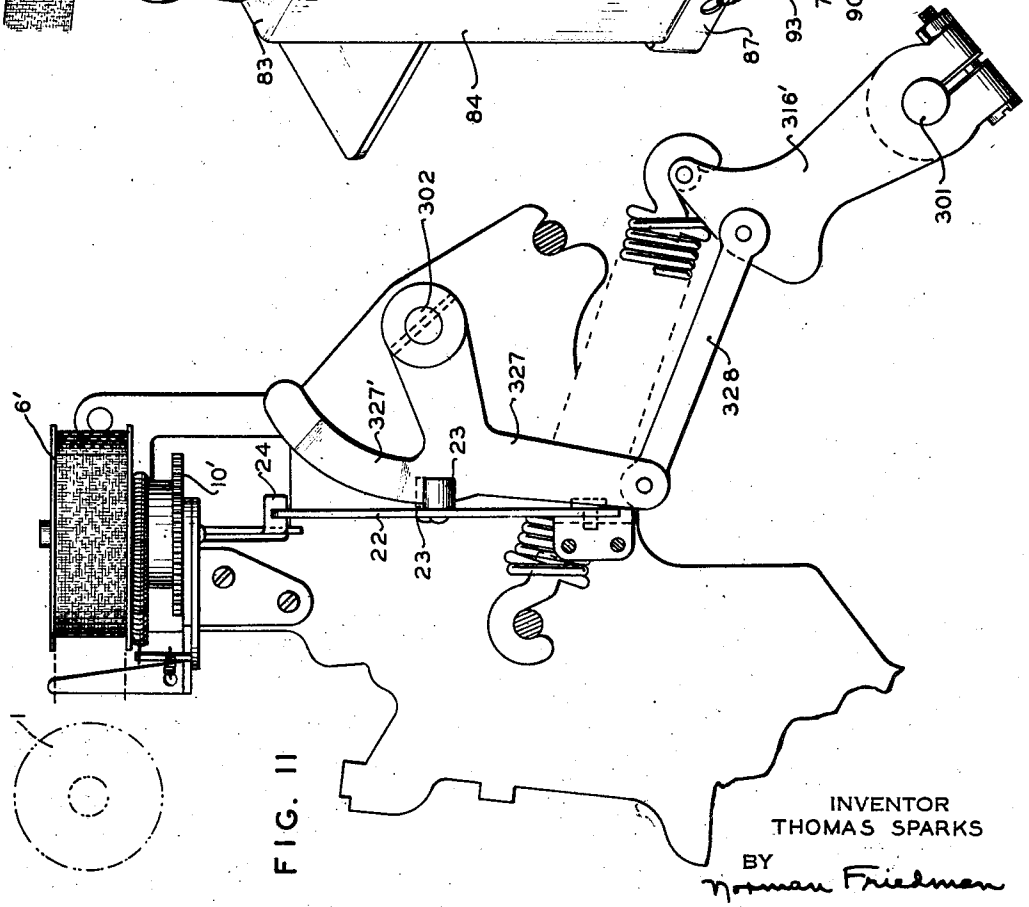


FIG. 11

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Sept. 1, 1959 T. SPARKS 2,902,135

DOUBLE RIBBON MECHANISM

Filed June 14, 1956 5 Sheets-Sheet 5

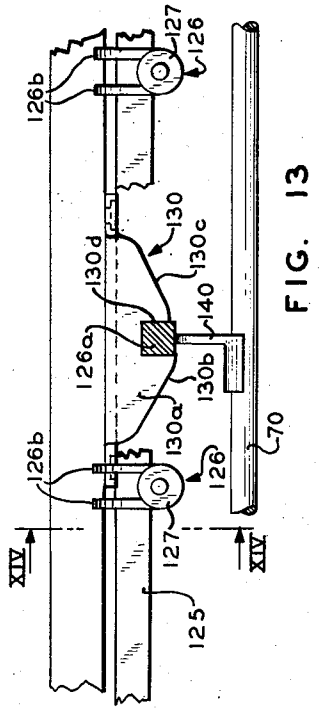

FIG. 13

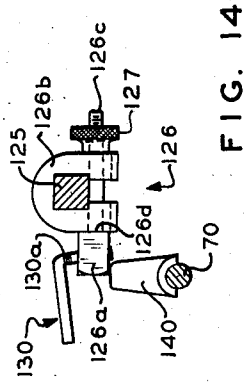

FIG. 14

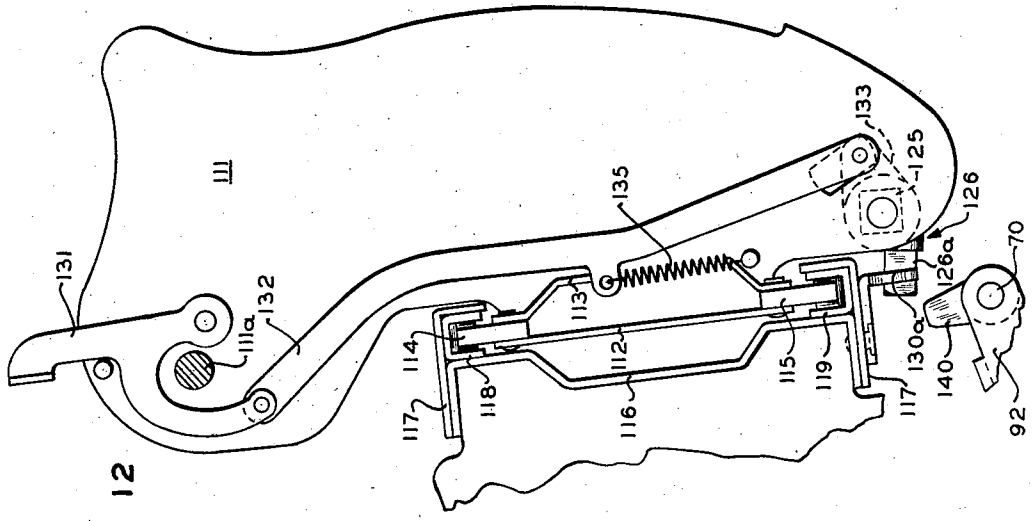

FIG. 12

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United States Patent Office 2,902,135 Patented Sept. 1, 1959

2,902,135

DOUBLE RIBBON MECHANISM

Thomas Sparks, Orange, N.J., assignor to Monroe Calculating Machine Company, Orange, N.J., a corporation of Delaware

Application June 14, 1956, Serial No. 591,314

18 Claims. (Cl. 197—153)

This invention relates to calculating machines or other business machines which incorporate a double ribbon mechanism for simultaneously producing two ribbon copies.

It is a primary object of the invention to provide an improved double ribbon advancing mechanism.

It is a further object to provide a double ribbon advancing mechanism in which the advancing mechanism for both ribbons is positively power-driven.

It is a further object to provide a double ribbon advancing mechanism in which the ribbons are power-driven from a common actuating means independently of one another.

It is a further object to provide an improved double ribbon mechanism which automatically reverses the direction of feed in response to the complete unwinding of one of the ribbons from either of its spools.

It is a further object to provide an improved double ribbon mechanism in which reversal of feed of both ribbons is responsive to the unwinding of one of the ribbons from either of its spools, and provision is made for permitting slippage of the spools of the other ribbon if said other ribbon is unwound first.

It is a further object to provide an improved double ribbon mechanism in which one of the ribbons is movable to either side of normal printing-line position so as to permit printing with only one ribbon and facilitate insertion of paper into the machine and replacement of the ribbons.

In the drawings:

Fig. 1 is a top plan view of the improved double ribbon mechanism with certain parts removed.

Fig. 2 is a fragmentary front elevation drawn to a larger scale and partially in section, showing the two right-hand spools and the inner left-hand spool.

Fig. 3 is a detail vertical sectional view taken through the center of the machine and showing details of the toggle mechanism for reversing the direction of feed of one of the ribbons.

Figs. 4*a*, 4*b*, and 4*c* collectively comprise a top plan view showing the ribbon feeding and reversing mechanism of both ribbons.

Fig. 5 is a fragmentary top plan view showing a portion of Fig. 4 in larger scale.

Fig. 6 is a sectional view taken on line VI—VI of Fig. 2.

Fig. 7 is an enlarged sectional view taken on line VII—VII of Fig. 6.

Fig. 8 is a sectional view taken on line VIII—VIII of Fig. 6.

Fig. 9 is a fragmentary perspective view showing the structure for latching the spools of one of the ribbons in an uppermost position of adjustment.

Fig. 10 is a perspective view of the structure shown in Fig. 6.

Fig. 11 is a left-side elevation of a listing machine in which the improved double ribbon mechanism is incorporated, and showing the nature of the power train from the motor of the machine to the ribbon feed slide.

Fig. 12 is right-side elevation of the machine showing the shiftable carriage and the mounting means therefor.

Fig. 13 is a fragmentary rear elevation of the machine showing the structure for maintaining the carriage in different shifted positions, and also showing means for locking the carriage when the rearmost ribbon is in other than non-printing position.

Fig. 14 is a sectional view taken on line XIV—XIV of Fig. 13.

In the present disclosure, the improved double ribbon mechanism is shown applied to an adding-listing machine as disclosed in United States Patent 2,678,161, issued May 11, 1954. It will be understood, however, that the present invention may be incorporated in any desired type of typewriting, calculating, or other business machine.

Referring now to the drawings, and particularly to Fig. 1, Fig. 2, and Figs. 4*a* through 4*c*, the machine includes a platen **1**, type bars **2**, and two printing ribbons **3** and **4**. Ribbons **3** and **4** are secured at their opposite end portions to right and left spools **5**, **5'** and **6**, **6'** respectively. Spools **5** and **5'** are rotated by ratchet wheels **7**, **7'**, each ratchet wheel being in driving relation with its corresponding spool by means of a pin **8** (Fig. 2) fixed with the wheel and extending through a mating aperture in the lower end plate of the spool. Each of outer spools **6** and **6'** is frictionally held against and rotated by a separate drive disc **9** (Figs. 2, 6) driven from ratchet wheels **10**, **10'** through a square shaft **11**. The nature of the mounting of spools **6** and **6'** will be discussed subsequently in greater detail in conjunction with the description of mechanism for lowering and raising said spools.

The ratchet wheels **7**, **7'** and **10**, **10'** are provided with pairs of feed pawls **17**, **17'** and **20**, **20'** respectively (Figs. 4*a* through 4*c*), said two pairs of feed pawls being independently driven from a reciprocatory ribbon feed slide **14**. Right-hand pawls **17** and **20** operate to advance ratchet wheels **7** and **10** counterclockwise to feed ribbons **3** and **4** from left to right, while left-hand pawls **17'** and **20'** function to advance ratchet wheels **7'** and **10'** clockwise to feed the ribbons from right to left.

When ribbons **3** and **4** are being fed to either side of the machine, the pair of feed pawls on that one side is in enabled condition and those on the opposite side are disabled. The mechanism is so arranged that upon restraint of feeding movement of ribbon **3** in either direction (as by unwinding of said ribbon from either of its spools **5**, **5'** to which it is securely fastened), the direction of feed of both ribbons **3** and **4** is reversed by enablement of the disabled pawls and disablement of the enabled pawls.

Referring to Fig. 11, the listing machine in which the double ribbon mechanism is incorporated includes a motor driven rock shaft **301** upon which is fast a rock arm **316'** having link connection **328** with a lever **327** fast on rotatable shaft **302** and having a laterally bent cam arm **327'**. As set forth in the aforementioned Patent No. 2,678,161 and noting particularly Fig. 6 thereof, oscillation of rock shaft **301** by an electric motor to which it is connected will cause a corresponding oscillation of lever **327** and cam arm **327'** about the axis defined by shaft **302**. A rock lever **22** is pivotally mounted to the machine framing at its lower end and is provided with two rollers **23** (Figs. 2, 11), one on each side of cam portion **327'**, for engagement with said cam portion.

A ribbon feed slide **14** (Figs. 1, 2) mounted in the machine framing for reciprocatory movement laterally of the machine, is provided at its left-hand end with a forwardly extending lug **24** which is received in a slot **24***a* formed in the upper portion of lever **22** so that lever **22**

is in driving relation with slide 14. Thus, oscillation of lever 327 and cam arm 327' by rock shaft 301 will oscillate lever 22, and cause ribbon feed slide 14 to reciprocate and accordingly actuate the various feed pawls 17, 20, 17', 20'.

Ratchet wheels 7 and 7' are advanced by feed pawls 17 and 17' respectively. Pawls 17 and 17' are driven from feed slide 14 and are arranged so that when either pawl is in enabled position and operable to advance its ratchet wheel, the other pawl is disabled from operable relation with its ratchet wheel. To this end, pawls 17 and 17' are provided at opposite ends of a plate 27. Plate 27 is secured to forwardly extending upper and lower lugs 28 of feed slide 14 (Figs. 1, 2, 3), each lug having a notched hook-like forward portion. Plate 27 has a central opening 29 and two rearwardly extending pairs of slotted hinge lugs 30, 31 above and below the opening. The slots of the inner lugs 30 open forwardly, while the slots of the outer lugs 31 open rearwardly. A major portion of the rear edge of the bight of a U-shaped plate 32 is received in a vertical slot 33 formed in feed slide 14 for lateral pivotal movement of plate 32 about its bight, while the forward ends of the legs of plate 32 are pivotally received in the notches of outer lugs 31. The end legs of smaller E-shaped plate 34 are pivotally received in the forwardly opening slots of the inner lugs 30, and the end legs of larger E-shaped plate 35 are pivotally received in the slots of lugs 28 of feed slide 14. A compression spring 36 encompasses the middle legs of E-shaped plates 34 and 35 and tends to urge these plates apart.

The above-described construction provides a toggle mechanism for maintaining plate 27 and consequently pawls 17 and 17' in either one of two positions of adjustment. One of these positions is shown in Figs. 1 (full lines), 4b, and 5 wherein plate 27 is spring-urged to its counterclockwise position, thereby enabling pawl 17 for cooperation with ratchet wheel 7 and disabling pawl 17' from cooperation with ratchet wheel 7'. In this position of the parts, reciprocation of feed slide 14 will cause feed pawl 17 to advance ratchet wheel 7 counterclockwise during each right-hand stroke of the feed slide and thereby feed ribbon from spool 5' to spool 5. Plate 27 will remain in this position until ribbon 3 is completely unwound from spool 5' to spool 5. When this condition occurs, ratchet wheel 7 will be restrained from further rotation since the unwound end of ribbon 3 is securely fastened to spool 5'. Accordingly, upon the next drive stroke of pawl 17 to the right, a reaction thrust will be exerted by ratchet wheel 7 upon plate 27 causing smaller E-shaped plate 34 to snap to the left (Fig. 2), whereupon spring 36 will snap larger E-shaped plate 35 to the right. This repositioning of plates 34 and 35 causes pawl plate 27 to be spring-urged to pivot clockwise to the broken-line position shown in Fig. 1, thereby enabling pawl 17' by moving it to engageable relation with wheel 7 and disabling pawl 17 by moving it from engageable relation with ratchet wheel 7. Pivotal movement of pawl plate 27 as described above results in reversal of the direction of ribbon feed, since ribbon 3 will now be fed from spool 5 to 5'.

Feed pawls 20 and 20' (Figs. 4a through 4c) are provided for advancing ratchet wheels 10 and 10' of the second ribbon 4, said pawls being coupled to ribbon feed slide 14 independently of pawls 17 and 17'. The arrangement is such that when pawl 17 is enabled and pawl 17' disabled, pawl 20 is enabled and pawl 20' disabled. Conversely when reversal of the direction of feed of ribbon 3 occurs as described previously, resulting in disablement of pawl 17 and enablement of pawl 17', pawl 20 will be disabled and pawl 20' enabled, thereby resulting in reversal of feed of ribbon 4 also.

Pawls 20 and 20' (Figs. 4a, 4b, 4c, 5) are pivotally mounted on brackets 40, 40' fast on the outer ends of connecting plates 41, 41', said pawls including at their outer ends downwardly extending lugs 20a, 20a' for feeding engagement with the teeth of ratchet wheels 10 and 10'. Brackets 40, 40' are slotted and are slidably supported by fixed pins extending through the slots. Springs 45, 45' bias the respective brackets inwardly toward the center of the machine, and springs 42, 42' urge the lugs 20a, 20a' of pawls 20, 20' toward the teeth of their respective ratchet wheels 10, 10'. Reciprocatory movement is imparted to connecting plates 41 and 41' by means of latch arms 43, 43' interposed between the inner ends of each of plates 41 and 41' and feed slide 14. Latch arms 43, 43' include downwardly extending vertical lugs 43a, 43a' at their respective outer ends for driving abutment with the inner ends of connecting plates 41, 41', and are pivotally mounted on forwardly extending brackets 14a, 14a' of feed slide 14 for reciprocation with said feed slide. The pivotal mounting of latch arms 43, 43' permits their rotation between an enabled position wherein their lugs can drivingly abut the inner ends of connecting plates 41, 41' and a disabled position wherein the lugs 43a, 43a' merely pass in front of said connecting plates upon reciprocation of feed slide 14 and latch arms 43, 43'. The limiting rotary positions of latch arms 43, 43' are determined by abutment of their intermediate humped portions and their inner end portions respectively with feed slide 14. In this regard, note particularly Fig. 4b.

The mechanism is so arranged that when either of inner pawls 17 or 17' is enabled, the corresponding outer pawl 20 or 20' is also enabled. Referring to Figs. 4b and 5, it will be seen that pawl 17 is in enabled condition. A pin 44 on latch arm 43 is accordingly engaged by pawl plate 27 thereby holding said latch arm counterclockwise in enabled driving position. A similar pin 44' is provided on arm 43' for corresponding enabling engagement with the left-hand portion of pawl plate 27.

Accordingly, it will be seen that when feed pawls 17 and 20 are so enabled, they will be independently driven from feed slide 14 to advance ratchet wheels 7 and 10, and thereby feed ribbons 3 and 4 from left to right onto spools 5 and 6 respectively.

The various ratchet wheels 17, 20, 17', 20' (Figs. 4a, 4b, 4c, 5) are provided with respective check pawls 47, 50, 47', and 50' to prevent retrogression of said ratchet wheels during the inactive return half-cycle of the respective feed pawls. Each check pawl is provided at its forward portion with a vertically extending lug (47a, 50a, 47a', 50a') for engagement with the ratchet wheel teeth, and is pivoted intermediate its ends to the machine framing for movement of the lugs to and from engageable (enabled) position with the ratchet teeth. The two check pawls on either side of the machine (47, 50; 47', 50') are interconnected for simultaneous joint movement by elongated bars 51 and 51' pivoted to the upper ends of the check pawls.

The outer check pawls 50, 50' are biased by springs 52, 52' into engagement with the outer ratchet wheels 10, 10' thereby also urging the respective inner check pawls 47, 47' into engagement with inner ratchet wheels 7, 7'. As will be described subsequently, when the two feed pawls (17, 20 or 17', 20') on either side of the machine are disabled, the corresponding check pawls (47, 50 or 47', 50') on the same side of the machine will also be disabled by being swung out of engageable relation with their ratchet wheels.

Figs. 4a, 4b, 4c and 5 show the positions of the various parts for feeding both ribbons from left to right. Thus, right-hand feed pawls 17 and 20 are in enabled position for advancing ratchet wheels 7 and 10. Latch arm 43 for driving connecting plate 41 is maintained in its enabled position by engagement of pawl plate 27 with pin 44, plate 27 and therefore arm 43 being resiliently urged in position by the afore-described toggle compression spring 36. When ribbon 3 is completely unwound from spool 5, pawl 17 is canted clockwise out of engageable relation with ratchet wheel 7 by operation of the toggle mechanism as described previously. Thereupon, pawl plate 27 will be removed from engagement with pin 44

of arm 43, permitting said arm to be urged (by mechanism described below) out of driving engagement with the inner end of connecting plate 41, thus breaking the driving connection between feed slide 14 and said connecting plate.

The mechanism providing for disablement of outer feed pawl 20 and check pawls 47, 50 upon disablement of inner feed pawl 17 will now be described.

A member 53 (Figs. 4*b*, 5), pivotally secured to an extension 54 fast with feed slide 14, is provided at its inner end with a vertically extending lug 53*a*. A spring 55, which is secured to bar 51, is relatively light in action as compared with spring 45 of bracket 40, and urges lug 53*a* against a rearwardly extending nose of arm 43.

Member 53 is provided at its outer (rightward) end with a notched portion 53*b* for engagement with a pin 56 on bar 51. A second pin 57 on bar 51 is adapted to be engaged by a recessed portion 58 of a bell crank 59 pivotally mounted on the machine framing. Spring 60 tends to urge recessed portion 58 forwardly. With arm 43 in enabled (counterclockwise) position, its rearwardly extending nose portion maintains member 53 in clockwise position. Upon forward disabling movement of feed pawl 17, arm 43 will be free for clockwise rotation. However, since spring 55 is much lighter than spring 45, said spring 55, acting through member 53 upon arm 43 will be unable to overcome the frictional force between arm 43 and connecting plate 41 caused by spring 45, until completion of a substantial portion of the next left stroke of feed slide 14. At this time, the inwardly (leftwardly) directed force exerted by spring 45 (and therefore the frictional force) will have lessened sufficiently to permit clockwise rotation of arm 43 and counterclockwise rotation of member 53 under the action of spring 55, member 53 having been carried sufficiently far inwardly to the left by feed slide 14 so that notch 53*b* can swing toward pin 56. The limiting clockwise position of arm 43 will be determined by abutment of its inner, left end portion with feed slide 14. In the corresponding limiting position of member 53, pin 56 of bar 51 will be seated in the outer notched portion 53*b* of said member.

During the next half-cycle of feed slide 14 to the right, member 53 will carry pin 56 and consequently bar 51 to the right, causing clockwise movement of check pawls 47 and 50 about their central pivotal mountings. Check pawls 47 and 50 are accordingly disabled by being swung inwardly (leftwardly) out of engageable relation with their corresponding ratchet wheels 7 and 10. Rightward movement of bar 51 carries pin 57 into opposition with the recess 58 of bell crank 59, thereby permitting said bell crank to swing forwardly under the action of spring 60 until pin 57 is seated in recess 58. Bell crank 59 acting on pin 57 will therefore maintain bar 51 and check pawls 47, 50 in disabled position.

Since arm 43 is now out of the path of connecting plate 41, said connecting plate and feed pawl 20 will be moved by spring 45 to their innermost limiting positions as determined by the pin and slot connection of the plate bracket 40 with the machine framing.

A third pin 63 (Fig. 5) is provided at the outer (rightward) end of bar 51 to disable outer feed pawl 20 as follows. It will be recalled that disablement of check pawls 47, 50 is brought about by outward movement of bar 51. During this outward movement of bar 51, its pin 63 engages a rearwardly extending leg of feed pawl 20 thereby disabling said pawl by rotating it clockwise out of engageable relation with ratchet wheel 10.

The various feed and check pawls of the right-hand ratchet wheels 7 and 10 will remain in their disabled positions during feed of ribbon from right-hand spools 5, 6 to left-hand spools 5', 6'. When ribbon 3 is completely unwound from spool 5, reversal of ribbon feed will again occur.

At this time, the left-hand components of the mechanism designated by primed reference numerals will function in the same fashion as their corresponding unprimed right-hand counterpart components as described previously, while said right-hand components will now become operative to reverse the direction of ribbon feed by enabling the feed and check pawls 17, 20, 47, 50. It should be noted that the left-hand components are essentially a mirror image of the corresponding right-hand components, both as to physical structure and mode of operation.

The complete unwinding of ribbon 3 from spool 5' will cause the toggle mechanism to snap pawl plate 27 counterclockwise to the position of Fig. 5 upon a left stroke of feed slide 6 thereby placing feed pawl 17 in enabled position.

Pin 44 of arm 43 will be engaged by plate 27, swinging said arm 43 counterclockwise (Fig. 5) and member 53 clockwise whereby the notched outer portion 53*b* of member 53 is swung forwardly free of pin 56. Latch arm 43, being enabled to engage its lug 43*a* with connecting plate 41, will therefore drive said plate to the right on the next right stroke of feed slide 14. A shoulder 64 at the inner end of connecting plate 41 (Figs. 2, 5) will move bell crank 59 counterclockwise, removing the recessed portion 58 of said bell crank from blocking engagement with pin 57 of bar 51, and thereby permitting check pawls 47 and 50 to swing into engagement with ratchet wheels 7 and 10 under the action of spring 52. This movement of check pawls 47, 50 (and bar 51) will cause pin 57 of bar 51 to impart a further counterclockwise rotation to bell crank 59, thereby moving the forward portion of said bell crank outwardly (rightwardly) beyond the outer limit of reciprocatory movement of shoulder 64 of connecting plate 41.

Spool mounting and height adjusting mechanism

Since reversal of feed of both ribbons is responsive solely to the unwinding of ribbon 3 from either of its spools (5, 5') no difficulties arise if reversal occurs before ribbon 4 is completely unwound from its corresponding outer spool (6 or 6'). However, should either end of ribbon 4 be reached before ribbon 3 is unwound, undue stresses might be imposed upon the parts, since the feed pawl for said ribbon at the opposite side of the machine will continue to be driven from feed slide 14 so long as ribbon 3 is being fed in the same direction. Accordingly mechanism is provided which permits the appropriate spool 6 or 6' of ribbon 4 to slip when the latter condition occurs.

Further, the operator of the machine may at times wish to make a single copy by employing only ribbon 3 to print. In addition, ribbon must be replaced from time to time, and the presence of ribbon 4 renders the insertion of paper difficult. Normally, ribbon 4 is maintained at the printing line as shown in Fig. 2. To provide for these above-mentioned eventualities, however, spools 6, 6' and consequently ribbon 4 are movable below the printing line to a non-printing position and above the printing line to a position wherein said spools and ribbon are readily accessible for replacement, and paper can more easily be inserted into the machine.

The structural arrangement whereby spool slippage is permitted and adjustment of spools 6, 6' and ribbon 4 to positions below, at, or above the printing line will now be described conjointly.

It should be noted that separate mechanisms for performing these functions are provided for each of spools 6, 6'. The details of such mechanisms are substantially the same for both spools, with the exception that either mechanism (the right in the present case) is provided with a manually engageable operating lever. Of course, operating levers may be provided on both sides if desired. A carry-over shaft 70 (Figs. 1, 6, 10) links the two mechanisms so that operation of one of said mechanisms will cause a simultaneous corresponding operation of the other mechanism.

Referring to Figs. 6 and 10, ratchet wheel **10** is rigidly secured to friction brake pulley **71** for rotation of these elements as a unit journalled in fixed bracket **72**. Coil spring **73** maintained under tension is seated in the circumferential groove of pulley **71**, thereby somewhat restricting free rotation of ratchet wheel **10**.

Vertical square shaft **11** extends slidably through a corresponding axial square hole provided in ratchet wheel **10** and pulley **71**. Shaft **11** will therefore be driven by ratchet wheel **10** but is slidable vertically independently of said ratchet wheel. A circular shaft **74** fast on a fixed plate **75** serves to slidably mount square shaft **11**, the latter being provided with a circular longitudinal bore in which circular shaft **74** is received.

Securely fixed to the upper end of square shaft **11** are drive disc **9** and a pin **77**, the latter having a head **78** above an annular groove **79**. Spool **6** is mounted on pin **77** and is resiliently held in frictional driven contact with drive disc **9** by a slotted spring clip **82**. The slot of clip **82** is narrower than the transverse diameter of head **78**, whereby the opposed arms of the clip extend within groove **79** and are engaged by head **78** to resiliently urge spool **6** downwardly against disc **9**. If, as mentioned previously, the end of ribbon **4** is reached before ribbon **3** has been completely unwound from its appropriate spool, the appropriate spring clip **82** will permit slippage of spool **6** or **6'** on its friction drive disc **9** until reversal occurs.

Upper arm **83** of a bracket **84** embraces the upper end of square shaft **11**. The lower portion of bracket **84** is rigidly secured to a yoke **85** (Figs. 6, 7, 8, 10) and is provided with a lower shoulder **86**. The upper leg of yoke **85** is bifurcated (Fig. 8), the bifurcations extending into a circumferential groove of square shaft **11**, whereby said yoke and shaft are linked together for vertical movement as a unit. The lower leg of yoke **85** slidably embraces circular shaft **74**. A bail **87** underlies shoulder **86** of bracket **84** and includes a control lever **88** (Fig. 10) fast therewith and adapted to be manually engaged by the operator. A downwardly extending stop arm **89** of control bail **87** normally rests on stationary plate **75** in printing line position of the parts as shown in Fig. 10. Control bail **87** and yoke **85** are provided with a common pivotal mounting on upwardly extending ears of a link **90** by means of pins **91** (Figs. 7, 10). Link **90** is pivoted to a link **92** fast on shaft **70**, the latter being rotatably mounted in the machine framing. At its left-hand end shaft **70** is fast with link **92** of the height adjusting mechanism of spool **6'** (Fig. 1) so that operation of the right-hand height adjusting mechanism (of spool **6**) causes a corresponding simultaneous functioning of the left-hand mechanism (of spool **6'**).

Should the operator desire to move ribbon **4** to its downward position, the rear portion of lever **88** is grasped and swung downwardly, rotatably moving stop arm **89** forwardly and into vertical alignment with a notch **94** provided in plate **75**. The parts are therefore free to descend under action of their weight to their lower position of adjustment, where they are held by abutment of yoke **85** against plate **75**, ribbon **4** and its associated spools now being in their lower or non-printing position.

To raise ribbon **4** to its uppermost, paper-loading position, operating lever **88** or any portion of bail **87** or bracket **84** is grasped and manually elevated, thereby moving the parts upwardly. The operator will continue upward movement of the parts until they are releasably latched in uppermost position (above the printing line) as follows. A member **96** (Figs. 6, 7, 9) rigidly secured to yoke **85** is provided with inwardly extending detent portions **97** formed on opposed arms which resiliently press against circular shaft **74**. When the parts have been elevated sufficiently, detents **97** will snap into a groove **98** of circular shaft **74**, releasably latching the parts in their upper position.

The ribbon is returned to printing-line position as follows. The operator grasps the forward portion of control lever **88** and presses downwardly. Detents **97** are forced out of groove **98** and the movable parts can descend freely. Since the operator is pressing down on the forward portion of control lever **88**, bail **87** is rotated so as to bring stop arm **89** into position to engage plate **75** and halt downward movement when printing-line position is reached. However, should the operator release control lever **88** before printing-line position of the parts is reached, spring **93** will serve to position bail **87** counterclockwise to place stop arm **89** in engageable relation with plate **75**.

If the machine is of the type having a shiftable carriage, it is desirable that means be provided to prevent carriage shift when ribbon **4** is in either of its upper positions, i.e., in either printing or paper-loading position for the following reason.

It will be understood that when both ribbons **3** and **4** are to be employed for printing, the paper sheet upon which ribbon **3** prints is disposed between the ribbons and is constrained to move with the carriage. If the carriage were then to be shifted, ribbon **4** being in middle or upper position, the paper sheet would be carried along with the carriage and forced against the outer, obliquely extending lateral portions of said ribbon (see Fig. 1), thereby crumpling the paper.

If, however, only ribbon **3** is employed for printing, its paper sheet will be threaded through the carriage, i.e., around the platen, above and behind ribbon **4**, said ribbon being in lowermost non-printing position. Accordingly, the carriage may now be shifted freely without any possibility of ribbon **4** engaging and damaging the paper when the carriage is shifted.

Figs. 12–14 show the machine provided with a conventional transversely shiftable carriage **111** having a rotatable shaft **111*a*** (Fig. 12) upon which platen **1** is mounted. Fast with the carriage **111** are mounting plates **112, 113** to which are rigidly secured upper and lower rails **114, 115**. To the fixed framing of the machine are secured stationary plates **116, 117** which mount upper and lower stationary channel-shaped guide tracks **118, 119** in which said rails **114** and **115** run. Tracks **118** and **119** are provided with suitable roller bearings to minimize the running friction between said tracks and rails **114** and **115** in shifting movement of carriage **111**.

Means is provided to releasably hold carriage **111** in any desired shifted position as follows. A square shaft **125** is rotatably mounted on the carriage and extends from side to side thereof. Loosely mounted on square shaft **125** are a plurality of stop members **126** each including a forwardly extending nose **126*a*** of square cross-section, and a resilient U-shaped bracket **126*b*** (Figs. 13, 14) which embraces square shaft **125** and has laterally spaced walls (Fig. 13) which are connected at their bottom portions. A rearwardly extending threaded stud **126*c*** which is integral with nose **126*a*** extends between said walls of bracket **126*b***. The integral member comprising nose **126*a*** and stud **126*c*** is slidable longitudinally in bracket **126*b*** for engagement of a shoulder **126*d*** (Fig. 14), formed by the junction of said nose and stud, with the front (left in Fig. 14) leg of bracket **126*b***. A nut **127** is threaded on stud **126*c*** and is adapted to engage the rear leg of bracket **126*b***. Stop members **126** can be fixed at any desired position along shaft **125** by merely threading nut **127** on stud **126*c*** until the legs of bracket **126*b***, abutted by shoulder **126*d*** and nut **127** respectively, firmly grip said shaft. While only two stop members **126** are shown in Fig. 13, it will be understood that any desired number may be provided.

A stationary plate **130** is fixed on the lower rear portion of the machine framing and includes a vertical portion **130*a*** having opposed downwardly extending oblique cam surfaces **130*b*** and **130*c***. A square slot **130*d*** (Fig. 13) provided at the common terminus of cam surfaces **130*b*, 130*c*** is adapted to receive the nose **126*a*** of any one

of stop members **126** fixed on square shaft **125** and thereby releasably maintain carriage **111** in a given shifted position. Cam surfaces **130***a* and **130***b* serve to guide nose **126***a* toward slot **130***d*.

To permit shifting of the carriage, square shaft **125** must be rocked counterclockwise (Fig. 12), to swing stop member **126** downwardly free of slot **130***d*. Accordingly, a manually engageable operating lever **131** is rotatably mounted in carriage **111**. A link **132** is pivoted at its upper end to lever **131**, and at its lower end to a crank **133** fast on square shaft **125**. Spring **135** biases link **132** downwardly, thereby urging shaft **125** clockwise (Fig. 12) and maintaining one of stop members **126** within slot **130***d*. To permit carriage **111** to be shifted, the upper end of operating lever **131** is moved rearwardly (clockwise in Fig. 12), elevating link **132**, and thereby causing counterclockwise movement of crank **133**, shaft **125**, and stop member **126**. Nose **126***a* of member **126** is accordingly moved downwardly and freed from slot **130***d*, whereupon carriage **111** may be shifted laterally and thereafter maintained in shifted position by engagement of any other one of members **126** within slot **130***d*.

As stated previously, it is desirable to prevent carriage shift when ribbon **4** is in middle (printing-line) or upper (paper-loading) positions. To this end, an ear **140** (Figs. 6, 12–14) is provided fast on shaft **70**, which shaft, it will be recalled, serves to link the left and right mechanisms for adjusting the height of spools **6** and **6'**, and ribbon **4**. It will be seen from an inspection of Figs. 6 and 10 that vertical movement of the height adjusting mechanism will cause a corresponding rotation of shaft **70**. Ear **140** is so positioned on shaft **125** that when ribbon **4** is in lower, non-printing position, said ear will lie forwardly of the nose **126***a* of the stop member **126** which is then within slot **130***d*, this relative positioning of the parts being shown in Fig. 12. However, when spools **6**, **6'** and ribbon **4** are raised to printing line or paper-loading positions, shaft **70** will be rotated clockwise (Figs. 6, 10, 12), moving ear **140** beneath and closely adjacent to nose **126***a*, whereby said nose is blocked from downward movement as shown in Figs. 13 and 14. Accordingly, carriage **111** cannot be shifted until ribbon **4** is again returned to lower non-printing position, at which time counterclockwise movement of shaft **70** will return ear **140** to its ineffective position of Fig. 12.

I claim:

1. In a machine adapted for use with two printing ribbons, each ribbon being secured at its opposite end portions to a spool: a first pair of two feeding means, each for one spool of each ribbon, for moving said ribbons in one direction; a second pair of two feeding means, each for the other spool of each ribbon, for moving said ribbons in the opposite direction; means for actuating both pairs of feeding means; means coupling both feeding means of one of said ribbons to the actuating means; means, independent of said last mentioned coupling means, providing a positive direct drive connection between the actuating means and both feeding means of the other ribbon; and means controlled by said one ribbon for reversing feeding movement of said ribbons in either direction comprising means for disabling that said pair of feeding means which moves the ribbons in that direction and enabling the other said pair of feeding means.

2. In a machine adapted for use with two printing ribbons, each ribbon being secured to its opposite end portions to a spool: separate ratchet means for rotating each of the spools of each ribbon; a first pair of two feed pawls, each for one ratchet means of each ribbon, for moving said ribbons in one direction; a second pair of two feed pawls, each for the other ratchet means of each ribbon, for moving said ribbons in the opposite direction; means for actuating both pairs of feed pawls; means for coupling the two feed pawls of one of said ribbons to the actuating means; means, independent of said last mentioned coupling means, providing a positive direct drive connection between the actuating means and both feed pawls of the other ribbon; and means controlled by said one ribbon for reversing feeding movement of said ribbons in either direction comprising means for disabling that said pair of feed pawls which moves the ribbons in that direction and enabling the other said pair of feed pawls.

3. The subject matter of claim 2, and further including separate check pawls for each of said ratchet means.

4. The subject matter of claim 3, and means for enabling the pair of check pawls corresponding to the last mentioned other said pair of feed pawls, means for disabling the other pair of check pawls, and means providing a positive direct drive connection between said check pawl disabling means and said actuating means for actuation of said disabling means independently of said feed pawls.

5. The subject matter of claim 4, the two check pawls of each of said pairs of check pawls being interconnected for simultaneous joint operation.

6. The subject matter of claim 4, said check pawl disabling means comprising a member adjustable between enabled and disabled positions, and means operable in response to operation of said reversing means for moving said member to enabled position.

7. In a machine adapted for use with two printing ribbons each secured at its opposite end portions to a spool: means for selectively feeding said ribbons in a given direction or in the opposite direction; means for actuating said feeding means; means for reversing the direction of ribbon feed; and means for selectively moving one of said ribbons to positions at the printing line and to either side of the printing line, and releasably maintaining said one ribbon in said positions.

8. The subject matter of claim 7, said ribbon moving means including stop means movable between a given position for holding said one ribbon at the printing line and another position providing for movement of said one ribbon to one side of the printing line.

9. The subject matter of claim 7, said positions to either side of the printing line being positions above and below the printing line respectively.

10. The subject matter of claim 7, said machine including a shiftable carriage, and means responsive to the position of said one ribbon for preventing carriage shift when said ribbon is at and to one side of the printing line and permitting carriage shift when said ribbon is to the other side of the printing line.

11. In a machine adapted for use with two printing ribbons each secured at its opposite end portions to a spool: means for advancing one spool of each ribbon to feed the ribbons in one direction; means for advancing the other spool of each ribbon to feed the ribbons in the opposite direction; means responsive to complete unwinding of one of the ribbons from either of its spools for reversing the direction of ribbon feed; and means providing a slippable coupling between the spools of the other of said ribbons and the advancing means for said last-mentioned spools, whereby said other ribbon will not advance should it become unwound from its spools in either direction prior to operation of said means for reversing the direction of ribbon feed.

12. In a machine adapted for use with two printing ribbons, each ribbon being secured at its opposite end portions to a spool: a first pair of two feeding means, each for one spool of each ribbon, for moving said ribbons in one direction; a second pair of two feeding means, each for the other spool of each ribbon, for moving said ribbons in the opposite direction; means for actuating both pairs of feeding means; means coupling both feeding means of one of said ribbons to the

actuating means; means, independent of said last mentioned coupling means, providing a positive direct drive train between the actuating means and each of both feeding means of the other ribbon, said drive train including a drive interponent adjustable between enabled and disabled positions; and means for reversing feeding movement of said ribbons in either direction comprising: means for disabling the one feeding means which moves said one ribbon in that direction, means responsive to operation of said disabling means for disabling the drive interponent for the feeding means which moves said other ribbon in that direction, and means for rendering effective the pair of feeding means which moves said ribbons in the opposite direction.

13. In a machine adapted for use with two printing ribbons, each ribbon being secured at its opposite end portions to a spool: a first pair of two feeding means, each for one spool of each ribbon for moving said ribbons in one direction; a second pair of two feeding means, each for the other spool of each ribbon, for moving said ribbons in the opposite direction; means for actuating both pairs of feeding means; means coupling both feeding means of one of said ribbons to the actuating means; means, independent of said last mentioned coupling means, providing a positive direct drive train between the actuating means and each of both feeding means of the other ribbon, said drive train including a drive interponent adjustable between enabled and disabled positions; and means for reversing feeding movement of said ribbons in either direction comprising: means for disabling the pair of feeding means which moves the ribbons in that direction, means for enabling the opposite feeding means for said one ribbon, and means responsive to operation of said enabling means for enabling the drive interponent for the opposite feeding means of said other ribbon.

14. In a machine adapted for use with two printing ribbons, each ribbon being secured at its opposite end portions to a spool: a first pair of two feeding means, each for one spool of each ribbon, for moving said ribbons in one direction; a second pair of two feeding means, each for the other spool of each ribbon, for moving said ribbons in the opposite direction; means for actuating both pairs of feeding means; means coupling both feeding means of one of said ribbons to the actuating means; means, independent of said last mentioned coupling means, providing a positive direct drive train between the actuating means and each of both feeding means of the other ribbon, said drive train including a drive interponent adjustable between enabled and disabled positions; and means for reversing feeding movement of said ribbons in either direction comprising: control means for disabling the feeding means which moves said one ribbon in that direction and enabling the opposite feeding means thereof, and means operable in response to operation of said control means for disabling the drive interponent for the feeding means which moves said other ribbon in that direction and enabling the drive interponent for the opposite feeding means of said other ribbon.

15. In a machine provided with two printing ribbons having portions thereof disposed one behind the other and adapted to receive record sheets to be printed upon between said ribbon portions and behind the rear ribbon portion: a first pair of spools supporting one of said ribbons; a second pair of spools supporting another of said ribbons; and means for moving a pair of said spools simultaneously for selectively moving one of said ribbon portions relative to the other to positions at the printing line and above the printing line, respectively.

16. In a machine provided with two printing ribbons having portions thereof disposed one behind the other and adapted to receive record sheets to be printed upon between said ribbon portions and behind the rear ribbon portion: a first pair of spools supporting one of said ribbons; a second pair of spools supporting another of said ribbons; and means for moving a pair of said spools simultaneously for selectively moving one of said ribbon portions relative to the other to positions at the printing line and below the printing line, respectively.

17. The subject matter of claim 15, said one ribbon portion being the rear ribbon portion.

18. The subject matter of claim 16, said one ribbon portion being the rear ribbon portion.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,902,135 September 1, 1959

Thomas Sparks

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 12, line 38, after "rear ribbon portion." insert the following claim:

-- 19. In a machine provided with at least two printing ribbons having portions thereof disposed one behind the other and adapted to receive record sheets to be printed upon between said ribbon portions and behind the rear ribbon portion: a first pair of spools supporting one of said ribbons; a second pair of spools supporting another of said ribbons; and means for moving a pair of said spools whereby to selectively move an entire ribbon relative to another to positions at the printing line and to either side of the printing line, respectively. --; in the heading to the printed specification, line 7, for "18 Claims." read -- 19 Claims. --.

Signed and sealed this 8th day of March 1960.

(SEAL)
Attest:
KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents