Jan. 20, 1959 E. H. GATES, JR 2,869,704

RIBBON SUPPLY APPARATUS FOR REVERSE IMAGE TYPING

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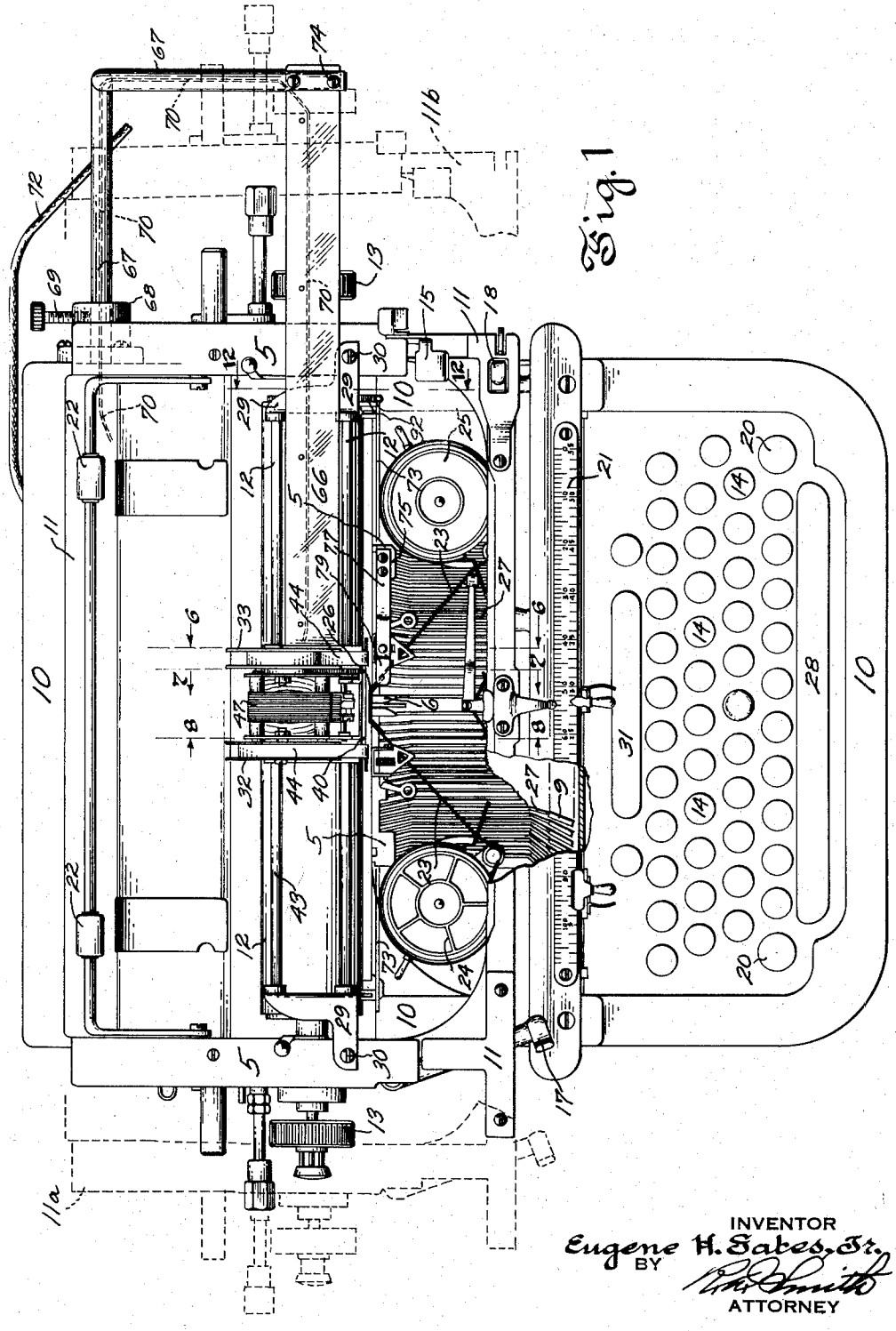


Fig. 1

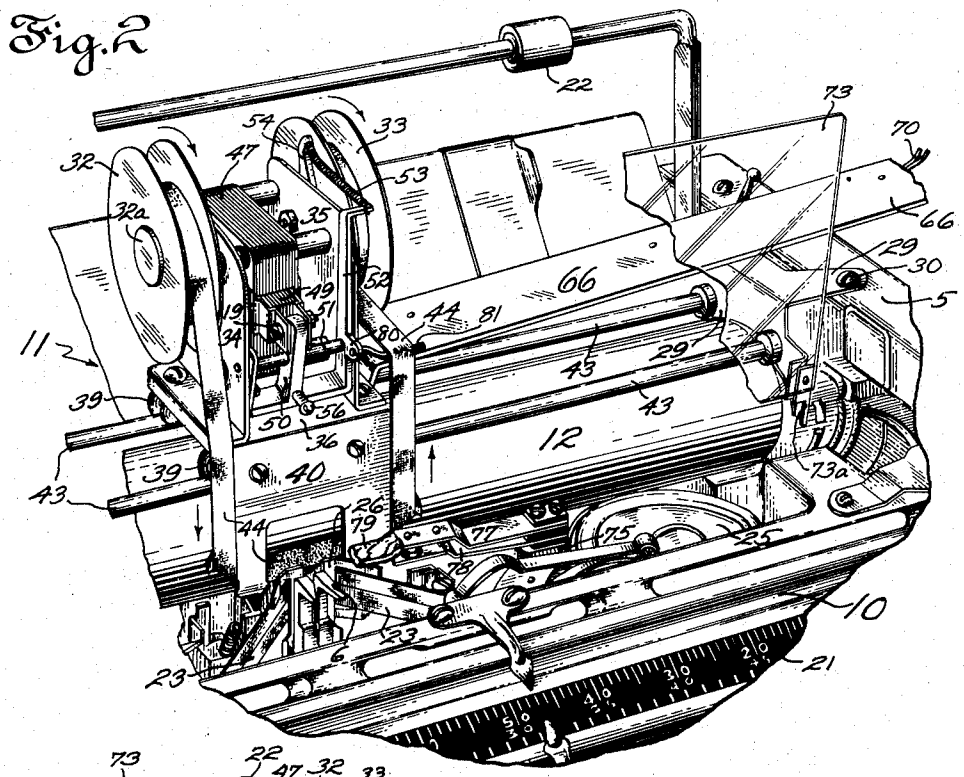
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Fig. 2



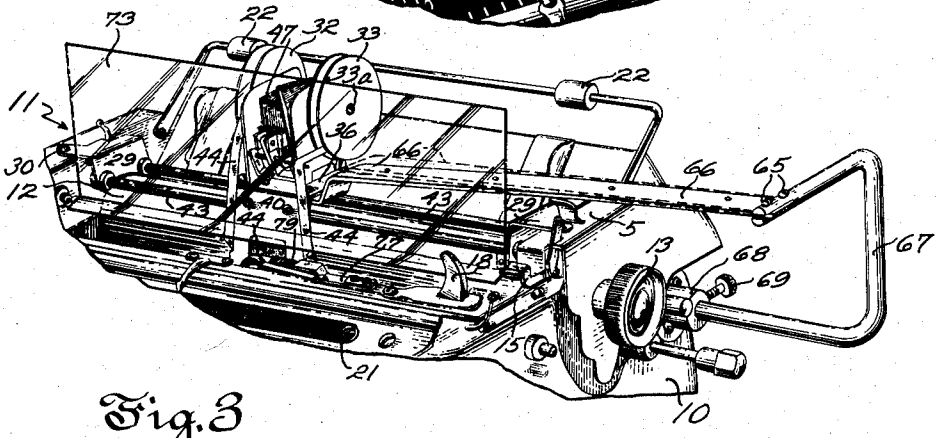


Fig. 3

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Fig. 4

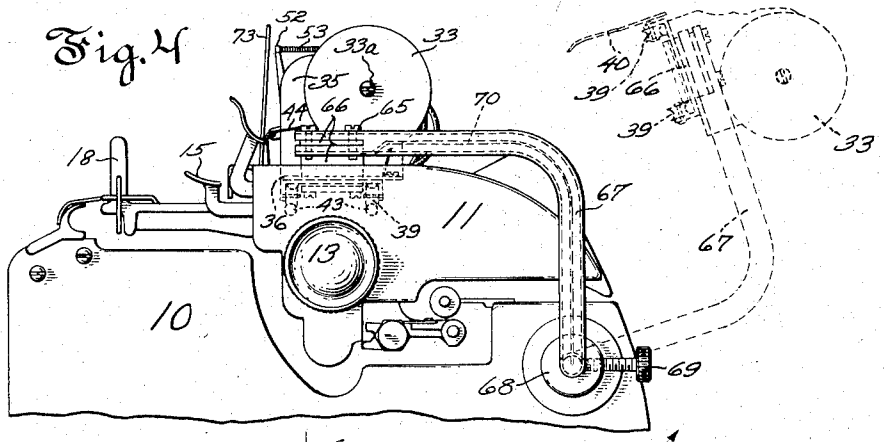


Fig. 5

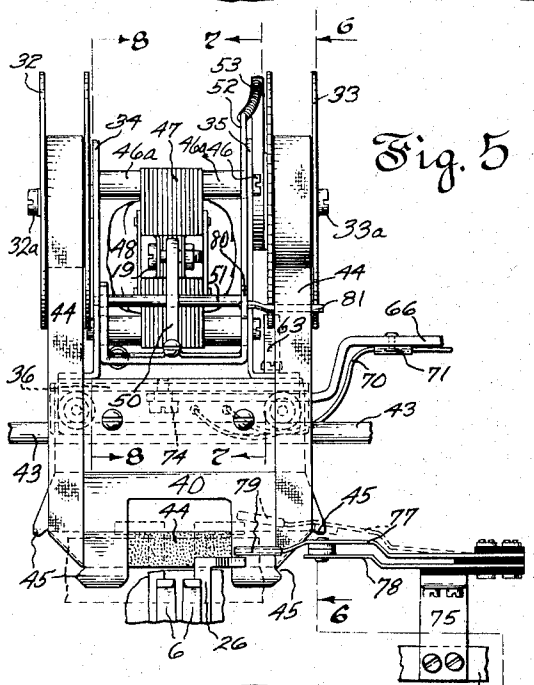


Fig. 6

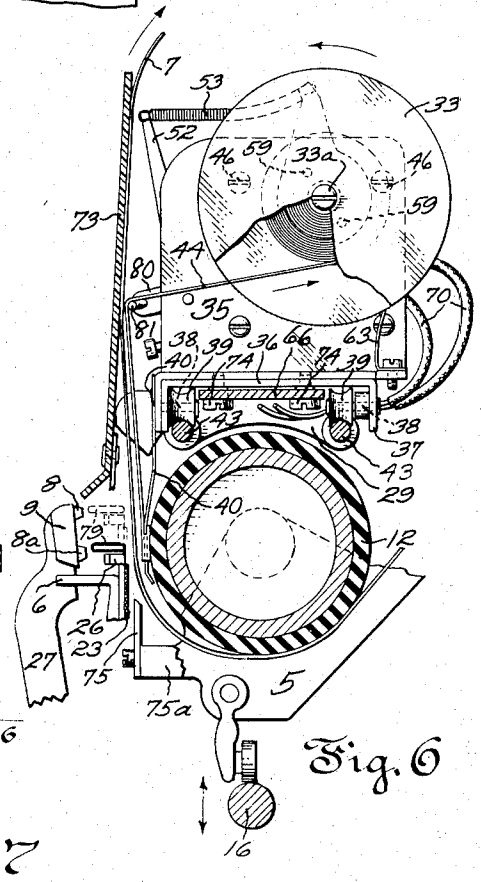
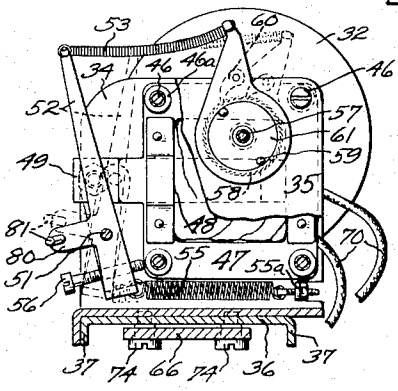


Fig. 7



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Fig. 9

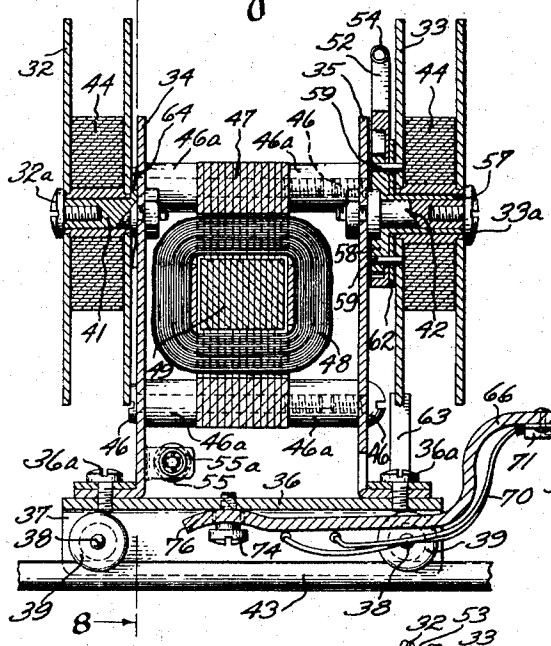
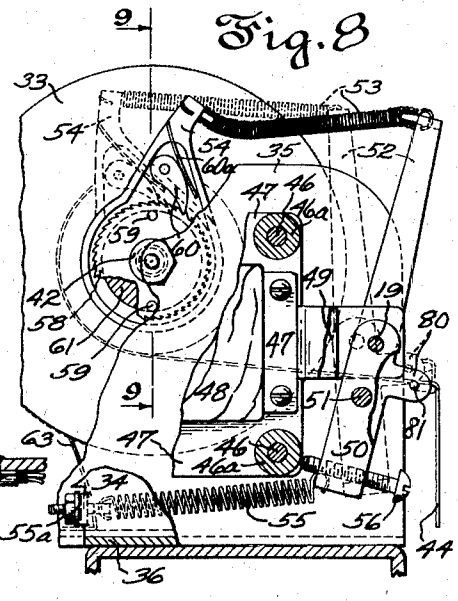


Fig. 8



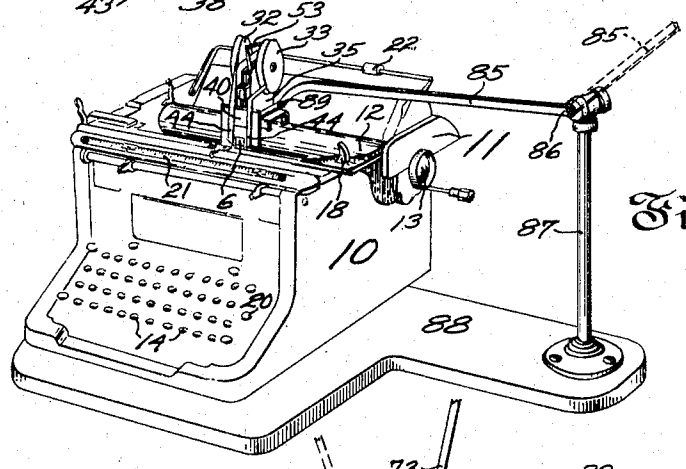


Fig. 10

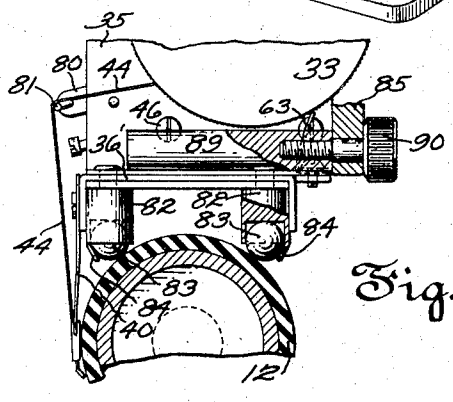


Fig. 11

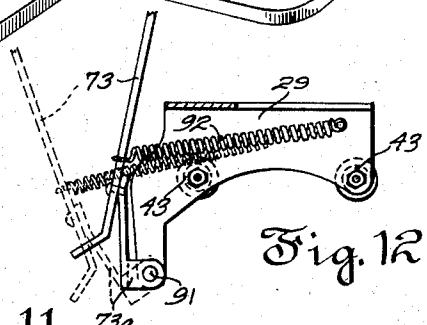


Fig. 12

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2,869,704

RIBBON SUPPLY APPARATUS FOR REVERSE IMAGE TYPING

Eugene H. Gates, Jr., Clinton, Conn.

Application January 11, 1954, Serial No. 403,386

18 Claims. (Cl. 197—151)

This invention relates to equipment preferably in a form for optional use that may be attached in removable manner to conventional typewriters so as to supply and automatically feed through the typing station of the typewriter an extra printing ribbon or paper tape for typing master sheets as used for instance in the Hectograph duplicating process. Such tape may carry a coating substance that will become deposited on the rear face of a blank sheet of work paper in reverse image of the type character by impact of the type head against the front face of the sheet when flung in usual manner toward the platen. Such reverse or mirror image becomes converted to normal when the impression thus typed on the master sheet is transferred to a multiplicity of copy sheets by direct contact pressure.

Prior proposals for storing and feeding an extra printing ribbon or coated paper tape through the fixed printing station in a typewriter have failed to envisage apparatus for this purpose that is capable of being attached to an otherwise purely conventional typewriter because they have contemplated mounting a tape play-off spool, a ribbon actuating and tape guiding mechanism and a tape take-up spool in widely scattered locations in outboard relation to the stationary frame of a conventional typewriter. This has required that long spans of the tape shall course in a roundabout path outside the normal compass of the typewriter in order to leave clear a path for the considerable lateral or transverse letter spacing movement of the carriage of the typewriter.

It is an object of this invention to provide a conventional typewriter with an extra ribbon or tape storing, guiding and automatic feeding apparatus in such arrangement that it forms a very small compact unit embraced within the normal boundaries of the machine and bodily attachable to and removable from an ordinary correspondence typewriter quickly and with ease.

Another object is so to combine such attachment with a conventional typewriter that it enables the platen surface to be moved as freely and fully as usual in all of its three usual directions, that is to say, in line spacing direction by rotation of the platen about its own axis, in letter spacing direction by lengthwise travel of the platen in unison with transverse carriage movement, and in shifting direction by up and down movements of the carriage for selectively typing upper or lower case characters.

Another object is to insure that the extra ribbon or tape shall be fed automatically and accurately to a fixed type striking location in front of the movable platen surface regardless of the free movability of the latter in all of its aforesaid different directions.

A further object is to insure that the extra tape shall be fed in steps at each increment of letter spacing carriage movement a distance at least equal to the width of the type character, so that at each and every typing stroke of any type bar there will be received by the master sheet from the tape a full and even deposit of the transfer coating. This requires that each new

stroke of a type head fall on a fresh unused field of the tape.

A further object is to cause the feeding of the tape in single steps of advance in accurately timed relation to the typing action of the machine. One way of insuring this is that each tape advancing step shall be initiated by the striking of a typing key at the finger board of the typewriter and then causing the tape feeding step to be completed and terminated automatically before there is time to strike another finger key.

A further object is to transmit tape feeding impulses to the extra tape supplying and feeding mechanism by means of electric current thus to avoid the necessity for mechanical transmission of tape feeding motion from any of the conventional operating parts of the typewriter to the extra tape supplying and feeding attachment.

A still further object is to support the extra tape supply unit so that it is free to float, i. e. rise and fall, in unison with up and down movements of the platen, while so constraining the unit that it is precluded from shifting its position relative to the body frame of the typewriter in any other direction.

These and related objects of the invention will appear in full particular from the following description of successful embodiments of the invention having reference to the appended drawings wherein:

Fig. 1 is a plan view of a conventional typewriter with an extra ribbon or tape supplying and feeding unit constructed for attachment thereto as readily removable equipment in accordance with the principles of this invention.

Fig. 2 is a perspective view drawn on an enlarged scale showing the right end portion of the typewriter carriage of Fig. 1 with the extra tape supply unit in working position thereon.

Fig. 3 is a perspective view drawn on a smaller scale showing the entire typewriter carriage and a means for orienting the extra tape supply unit shown removably placed in relation thereto.

Fig. 4 is a fragmentary side view of the machine looking from the right at Fig. 1.

Fig. 5 is a front view of the extra tape supply unit with certain cooperative parts of the conventional typewriter mechanism drawn on an enlarged scale.

Fig. 6 is an elevational view looking from the right at Fig. 5 showing certain parts in section on the planes 6—6 in Figs. 1 and 5 looking in the direction of the arrows.

Fig. 7 is a fragmentary view taken in section on the plane 7—7 in Fig. 1 looking in the direction of the arrows.

Fig. 8 is a further enlarged view of the tape spool driving mechanism taken partly in section on the plane 8—8 in Figs. 1 and 5, looking in the direction of the arrows.

Fig. 9 is a view taken in section on the plane 9—9 in Fig. 8 looking in the direction of the arrows.

Fig. 10 is a perspective view similar to Fig. 3 showing a modified embodiment of the invention.

Fig. 11 is a view similar to Fig. 6 showing details of the same modified form of the invention.

Fig. 12 is a fragmentary view of the mounting for the tiltable transparent guard plate as seen from the plane 12—12 in Fig. 1.

In Fig. 1 the stationary body frame of a conventional typewriter is designated **10** carrying in movable relation thereto the usual letter spacing carriage **11**. On carriage **11** there is rotatably mounted the usual paper feeding platen **12**.

As usual in conventional typewriters the carriage **11** is slidable from side to side of the machine, as between full line position and broken line positions **11***a*, **11***b*, in Fig. 1, for conveying the platen backed sheet 7 of letter

paper past the stationary printing station or striking point of the type heads 9 between the upstanding prongs of the bifurcate stationary type guide 6. This printing station is in fixed relation to the body frame 10. Carriage 11 or at least the platen bearing section 5 thereof further is shiftable vertically for presenting the imprint receiving spot on the master sheet 7 selectively to the upper characters 8 or to lower characters 8a on each type head 9.

Trunnions of the platen 12 are journaled in side walls of the carriage section 5 and the platen is turnable upon its own horizontal axis by means of hand knobs 13. Sliding of the carriage toward the left or right, such as to its broken line positions 11a and 11b in Fig. 1, occurs in usual manner under the propulsion of a carriage feeding spring (not shown). Leftwise sliding of the carriage takes place normally in letter spacing steps or increments of transverse movement responsively to each stroke of each type key 14 or of the usual spacer bar 28 through action of the usual escapement effecting mechanism (not shown) an example of which is illustrated in detail in many U. S. patents including Patent No. 2,178,688 comprising parts identified therein by reference numerals 47, 46, 44, 37, 54, 60, 61, 30, 29, 28 and 27. The carriage on occasion is permitted to slide to the left free of such escapement controlled steps by depressing the usual carriage release lever 15. Ordinarily the carriage is returned toward the right, such as to its broken line position 11b in Fig. 1 after completing a line of typing, by shoving it manually by means of the fixed carriage return handle 18 or the carriage return and line spacing lever 17.

Carriage 11 and/or its platen bearing section 5 is shifted bodily upward through conventional mechanism including a shift rail 16 (see Fig. 6) by manually depressing the customary shift key 20 at the key board and returns automatically by gravity when such key is released. An example of such conventional mechanism is shown in detail in the aforesaid U. S. Patent No. 2,178,688 comprising parts therein identified by reference numerals 164, 35, 34, 31 and 32.

Thus the surface of platen 12 is removable in three different directions with respect to the stationary or body frame 10 of the machine, these directions being horizontally or vertically in unison respectively with transverse and shifting movements of the carriage section 5, and in a revolving direction when the platen is turned by knob 13 relatively to the carriage.

Other parts familiar in a conventional typewriter and concerned more or less with the present improvements are the type bars 27, spacer bar 28, tabulator 31, the scale 21 that is stationary with the body frame of the machine, the paper presser rolls 22 that swing to and away from the platen surface, the regular inked fabric printing ribbon 23 which feeds back and forth between two ribbon spools 24 and 25, and the ribbon vibrator 26 at the printing station through which the ribbon 23 is threaded so that each depression of any type key 14 lifts ribbon 23 momentarily into printing position between the striking type head 9 and the letter paper 7. When the letter paper is to receive an impression solely on its rear surface to serve as a master sheet, ribbon 23 may be omitted and the vibrator 26 serves to operate an electric switch 77, 78 for purposes later to be explained. Functioning of the above named parts, as well as of conventional mechanism for transmitting the motion of any type key to means for actuating the ribbon vibrator 26 are described and illustrated in detail in said U. S. Patent No. 2,178,688 including parts therein identified by numerals 47, 168, 148, 138, 135, 132, 127, 101, 102 and 88.

In keeping with the objects of the present invention the extra ribbon supply unit, shown in detail in Figs. 5 to 9 of the drawings, comprises a ribbon storing and feeding apparatus for imparting an imprint on the rear face of a Hectograph master sheet 7. The apparatus as evident in Figs. 1 and 6 is compacted into an extremely small compass scarcely exceeding in overall dimension the breadth of the platen 12 itself. The unit incorporates a play-off spool 32 loaded with a roll of paper tape and a take-up spool 33 for storing the used length of tape. These spools may be of any desirable size since they are above the platen 12, distant from and clear of the ordinary working parts of a conventional typewriter. Spools 32 and 33 are retained by removable screws 32a, 33a in independently rotatable relation on supporting studs 41 and 42, fixedly mounted on spaced apart frame plates 34 and 35, respectively. These frame plates upstand from the base 36 of the tape supply unit and are fastened thereon by screws 36a. The base includes a floor wall having at its edges depending flanges two of which flanges 37 each have fixed thereon two pivot studs 38 on which are retained and freely turnable the traction wheels 39 having annularly grooved peripheries. This extra tape supply unit derives its support in part from the seating of the hollow peripheries of traction wheels 39 on and in rolling relation to two track rods 43, 43, that parallel the platen 12. Track rods 43 are herein shown to be supported from side walls 5 of carriage 11 slightly above and out of contact with the surface of platen 12 by means of end brackets 29, 29 removably fastened to the carriage by screws 30.

Fixed on and depending from the front flange 37 of the unit base 36 there is a bifurcate ribbon guide apron of thin sheet metal 40 disposed in close proximity to the front surface of the platen. Figs. 2, 3 and 5 show a short span of the surface treated paper tape 44 extending from play-off spool 32 downward across the front face of guide apron 40, then horizontally toward the right at the rear of guide apron 40, and then upward across the front face of the apron to the take-up spool 33. This latter span of the apron trains about an oscillated ribbon stroker 81. Tape 44 trains about oblique edges of the guide apron 40 for changing its direction of travel from vertical to horizontal and vice versa. Such oblique edges terminate at tape orienting shoulders 45 forming a shallow channel that is traversed by the traveling tape as it flexes about the oblique edge. Thus the short horizontal span of traveling tape whose treated surface is exposed and faces outward in Fig. 5 is always so oriented as to progress through and be presented at the fixed printing station of the typewriter. The untreated surface of tape 44 faces toward the rear in the two vertical spans of the tape shown in Fig. 5. Thus a master sheet of work paper 7, occupying the ordinary position of letter paper in the typewriter, will intervene between the striking type head 9 and the coated surface of the tape as best shown in Fig. 6. This will be true regardless of whether there is present in the typewriter the regular printing ribbon such as 23.

Between frame plates 34 and 35 of the tape supply unit there is fixedly suspended by means of mounting screws 46 and spacer collars 46a the field frame 47 of an electromagnet having the solenoid coil 48. A plunger armature 49 is magnetically attractable by the electromagnet and will be drawn centrally inward of the field frame 47 when solenoid 48 is electrically energized. Armature 49 is pivotally coupled at 19 to the upper end of a rocker bail that includes arm 50. Said bail swings on pivot shaft 51 which is supported at its opposite ends in the upright frame plates 34, 35 of the tape supply unit and spans the space therebetween. When coil 48 is not electrically energized, arm 50 and the bail of which it is a part is swung clockwise to its full line position in Fig. 8 by a spring 55 extending from the rocker bail to an anchorage bracket 55a on frame plate 34. In this position the rocker bail is normally arrested by its carried adjustable stop screw 56 whose end abuts the field frame 47.

The rocker bail also includes a spool actuating arm

52 operatively connected by a push-pull span of close-wound spring wire 53 to a pawl driving arm 54. Arm 54, as best shown in Fig. 9, is freely swingable on and relatively to a shouldered portion 61 of the hollow hub 57 of a ratchet wheel 58 from which shoulder dog pins 59 project and fit into sockets in the side flange of take-up spool 33 thereby to impel the latter in unison with ratchet wheel 58. A pawl 60, loaded by leaf spring 63, is carried by arm 54 so as to drive the teeth of ratchet wheel 58 intermittently and unidirectionally, thereby to advance the tape take-up spool 33 rotatively in successive steps in a clockwise direction in Fig. 8 (counterclockwise in Figs. 6 and 7). A loose shim 62 through which pins 59 extend serves as a spacer between spool 33 and the arm 54. A spur 80 on arm 52 carries the ribbon stroker 81.

One peripheral edge of spool 33 is roughened and constantly engaged by a leaf spring click 63 that is fixed on the base 36 of the tape supply unit so that spool 33 is prevented from ever making retrogressive movement clockwise in Figs. 4 and 6 (clockwise in Fig. 8) with the swinging of driving arm 54. A friction washer 64 intervenes between play-off spool 32 and frame plate 34 to prevent over-running of spool 32 as tape is withdrawn therefrom and thus keep the spans of tape taut from spool to spool.

The very small and compact tape storing and feeding unit above described is operably related to carriage 11 by resting on the track rods 43 in a manner to rise and fall bodily in response to vertical shifting movement thereof whenever the shift key 20 is depressed and released. In the construction herein shown the rise and fall of the unit is in unison with the rise and fall of the platen. Yet the unit is anchored to the body frame 10 of the typewriter in a manner to be oriented in stationary relation thereto during horizontal or traverse letter spacing sliding movements of the carriage. At the same time platen 12 is left entirely free to perform its paper feeding rotation or line spacing movement.

The means by which the tape supply unit is maintained fixedly orientated in respect to the body frame 10 of the typewriter, so that the horizontal span of tape 44 will remain constantly positioned at the printing station, comprises an elongate blade 66 which may be of metal sufficiently thin and limber to fail to support fully and alone the weight of the tape supply unit. This permits at least a portion of the weight of the latter to be borne by the track rods 43. A measure of coupling looseness results from the manner of attaching the base 36 of the tape supply unit to the free end of blade 66 as best shown in Figs. 7 and 9. The connecting screws 74 have clearance affording shoulders slightly longer than the thickness of blade 66 passing loosely through clearance holes therein and a rocker formation 76 is given to the blade. This enables all four of the traction wheels 39 to seat evenly and dependably on the track rods 43.

The outboard end of blade 66 is fixedly attached by screws 65 to the free end of a rigid support arm 67 of crank shape, or having compound bends, and the opposite end of arm 67 is firmly supported in a bearing 68 in the side of body frame 10 of the typewriter in a manner to be turnably adjustable. Arm 67 can be placed in any desired angular position in said bearing or can slide to any desired position laterally of the typewriter and be firmly fixed in any of such positions by means of the set screw 69. Support arm 67 may be of rigid hollow tubing so that insulating electric wires such as 70 can extend therethrough without interfering with the adjustive swinging of arm 67 between its positions shown in full and broken lines in Fig. 4. Wires 70 may extend inconspicuously along the under surface of blade 66 and be fastened thereto, as at 71, for feeding electric current to the solenoid 48.

The current supply for solenoid 48 can be derived from any ordinary electric outlet through an attachment cord 72 running from the typewriter. In electrical series with the solenoid 48 there are circuit make and break contacts in the form of conductive leaf springs 77 and 78, best shown in Fig. 5. These contact leaves are mounted on and in insulated relation to a stationary support bracket 75 and in insulated relation to each other. Support bracket 75 is removably mounted by screws upon any convenient point such as 75*a* of the vertically shiftable platen bearing carriage 11 or section 5 thereof or on some structure in the typewriter that shifts vertically therewith. Thus the bodily elevation of contact leaves 77, 78 always accords with the variable level of vibratory movement of ribbon vibrator 26 as the range of reciprocation of the latter rises or lowers with vertical shifting movement of the platen bearing carriage section 5, a common characteristic of operation in typewriting machines. The free terminal of upper contact leaf 77 is extended and carries a shoe 79 of insulation.

Insulative shoe 79 occupies the path of up and down movement of the top edge of ribbon vibrator 26 whose upward movement occurs each time any type key 14 is struck to fling the type head 9 against the master sheet 7.

Since the presence of the tape supply unit directly atop the platen blocks the usual path of play-off of the letter paper or master sheet 7 upward and toward the rear from the front surface of the platen after the sheet has passed the printing station 6, the paper sheet herein is arranged to be discharged directly upward at the front of the tape supply unit as best shown in Fig. 6. Therefore a guard plate 73, preferably of transparent glass or plastic, may be supported at its lower edge from the carriage section 5 of the machine with the aid of forward and backward tilting brackets 73*a* so as to stand generally upright in front of the master sheet 7. This prevents the paper if limp from flexing and falling forward as it is leaving the printing station. Fig. 12 shows the pivotal hinging 91 of brackets 73*a* to the brackets 29 and also a biasing spring 92 connecting guard plate 73 to bracket 29 and that yieldably maintains the plate 73 normally upright with hinge bracket 73*a* abutting the edge of bracket 29 to serve as a stop so that plate 73 is free to be pulled forward to its broken line position upon occasion for giving clear access to the printing station. Plate 73 will restore itself to its upstanding position when released.

In the typing of a master sheet, to be used for instance in the Hectograph process of copy reproduction, the regular typewriter ribbon 23 may be removed from the typewriter so that the type head can directly strike the bare paper of the master sheet. However it is commonly desired to observe what characters are being imprinted on the rear surface of the master sheet and ribbon 23 will be left in place and can perform its usual function of imprinting the front surface of the master sheet.

The operation of the machine in depositing an impression from the coating on one surface of tape 44 to the rear surface of the master sheet involves merely the striking of the type keys 14 as in ordinary typing. As each type head 9 arrives in very close proximity to the printing station the ribbon, vibrator 26 is caused to jump upward and remain at its highest position, but only for an instant while the type head is delivering its impact against the platen surface. The ribbon vibrator 26 then quickly drops without delay and the type bar continues its falling retraction to normal position of the type bars shown in Fig. 1.

Thus it will be seen that whether or not the regular ribbon 23 is present, electric contacts 77, 78 become separated by the upward stroke of vibrator 26 at the same instant that the ribbon 23, if present, would be lifted to the printing station. At that instant current supply is thereby cut off from the normally energized solenoid 48. While normally energized through the closed

contacts 77, 78, solenoid 48 maintains the plunger armature 49 drawn in toward the magnetic field frame 47 by sufficient magnetic attraction to overcome the pull of spring 55 thus holding the arms 52 and 54 in their broken line positions shown in Figs. 7 and 8. Upon de-energization of solenoid 48 by the opening of contacts 77, 78 spring 55 abruptly swings arms 52 and 54 to their full line positions in Figs. 7 and 8 whereupon slack tends to occur in tape 44 because of the lowering of the tape stroker 81. As fast as such slack occurs it is taken up by the simultaneous rotation of spool 33 clockwise in Fig. 8 driven by pawl 60. Then instantly as the ribbon vibrator 26 immediately falls again the circuit through solenoid 48 becomes remade by the automatic closing of contacts 77, 78. This reenergizes solenoid 48, restores both of arms 52, 54 to their broken line positions in Figs. 7 and 8 and the consequent upward movement of stroker 81 against the tape 44 feeds the tape from left to right through the printing station a linear extent at least equal to the width of type characters 8, 8a.

The above described tape feeding action of armature 49 rocks the bail of which arm 52 is a part on its pivot shaft 51. Through the push and pull ability of the close wound spring coil 53, arm 52 is capable of oscillating arm 54 in either direction in unison therewith. The resilience in spring 53 reduces the abruptness with which motion is transmitted from arm 52 to arm 54 and avoids jerking the paper tape in a way that might tear it. The aforementioned swinging of arm 52 from its full line to its broken line position in Figs. 7 and 8, causes the ribbon stroker 81 to lift upward on that span of the tape that is trained over it and courses toward the take-up spool 33. Such stroking of the ribbon is prevented from pulling the tape off from spool 33 because click 63 constantly opposes retrogressive turning thereof wherefore the tape becomes pulled off from play-off spool 32 and progresses a step from left to right through the printing station. Thus the fragile paper tape is at all times kept taut without imposing any tearing stresses upon it as it is drawn from the play-off spool 32 in intermittent steps of advancing feed while the play-off spool remains yieldably braked by friction washer 64.

When it is desired to use the machine merely as a conventional correspondence typewriter the blade 66 in Fig. 4, or the orienting arm 85 in Fig. 10, may be swung from full line to broken line position. This transports the extra tape supply unit far away from any location capable of interfering with the ordinary use of the typewriter. In the form of the invention shown in Fig. 4 the unit swings away from the platen far to the rear of the machine. In the form of the invention shown in Fig. 10 the unit swings away far to the right side of the machine.

At all times when the extra tape supply unit of this invention is in operating position atop the platen it permits free movement of the platen not only in its turning direction to feed the paper but in its transverse or letter spacing direction with the carriage. This freedom of carriage movement is assured by the free rolling of the traction wheels 39 on the track rods 43 in Fig. 2. In Fig. 11 corresponding freedom of platen movement is assured by the free rolling of balls 83 directly against the surface of the platen. In both embodiments of the invention the unit is permitted freely to rise and fall in unison with section 5 of the carriage because of the limberness of blade 66, which is capable of flexing easily between full and broken line positions in Fig. 3, and because of the ability of arm 85 to swing freely on its anchorage pivot 86 in the form of the invention shown in Fig. 10. When it is desired to pull the master sheet 7 forward away from the platen, the transparent guard plate 73 will readily tilt from its full line position to its broken line position or beyond in Fig. 12. Emptied and full spools of tape can be exchanged by removing the screws 32a, 33a and taking the spools off from the stud 41 or the ratchet wheel hub 57. The linear extent of tape which will be advanced at each feeding step can be varied by adjusting stop screw 56 which will vary the bail stroke.

In the form of the invention shown in Fig. 10 it is obvious that typewriters of different kinds can be interchanged on the same desk top for use at different times with the same tape supply unit, this requiring only a proper position of the machine in relation to the hinge standard 87 which may be determined by the usual sockets fixed on the table top to receive and locate the feet of the typewriter.

As an example of many other possible embodiments of the principles of this invention there is illustrated in Figs. 10 and 11 a different way of orienting the tape supply unit accurately in relation to the body frame 10 of the typewriter while permitting it to be supported at least in part on the carriage 11 of the machine. In this form of the invention the track rods 43 are omitted and the base 36' of the tape supply unit is equipped with fixedly depending short tubular legs 82 in the bottom hollow ends of which traction balls 83 are lodged and retained by inwardly bent lugs 84 with sufficient looseness to enable the balls to turn freely in the tubular legs 82 while in rolling contact with the peripheral surface of the platen 12. In place of the flexing blade 66 there is a stiff, unit orienting arm 85 hinged at 86 to be freely swingable from the top of a stationary standard or post 87 that is fixed on the same wooden table top 88 on which the body frame 10 of a conventional typewriter rests. Arm 85 is pivotally coupled to a boss 89 on the unit base 36' by means of a removable thumb screw 90.

Flexible insulated electric lead wires equivalent to those designated 70 in Figs. 1 and 2 may extend to the solenoid of the electromagnet in the tape supply unit of Fig. 10 in any desired manner from any desired point and may pass upward through and inside of the hinge standard 87 from below the table top 88 if the standard is made of pipe or tubing. The circuit through such lead wires will be made and broken at the correct times by switch 77—78 as shown in Figs. 2 and 5.

Ways of orienting the tape supply unit other than by means of the flexible blade 66 or the swingable arm 85 will suggest themselves as coming within the principles of this invention, such as to suspend the base 36 or 36' of the tape supply unit from above, with freedom for vertical movement only, or to support it with freedom for vertical movement only by means of vertical guide pins deriving rigid and stationary support from the back wall of the body frame 10 and slidably engaged with vertically elongated holes upstanding from and rigid with unit base 36. In typewriters where the entire bank of type bars shift vertically for printing upper case characters while the carriage remains on a constant level with the body frame of the machine there will not be required any freedom for vertical movement of the tape supply unit because the platen does not so move.

For the electromagnet 47, 48 there may be substituted other suitable forms of prime movers such as an electric motor with rotary armature constantly running or intermittently operative under control of switch 77, 78. If the motor is constantly running its driving connection to the tape feeding mechanism may be clutched and unclutched by magnetic means electrically operated by switch contacts 77, 78 or otherwise.

These and many other modifications in embodiments of the invention being possible and suggested by the disclosure hereof, the appended claims are directed to and intended to cover all equivalents for the structures and arrangements herein illustrated and described which fall within the broadest interpretation of the definitions of the invention as set forth in the claims.

I claim:

1. The combination in a typewriting machine having a stationary body frame, a rotatable paper feeding platen, carriage structure bearing said platen having a range of

horizontal letter spacing movement and conveying said platen lengthwise therewith in relation to said frame and at least in part shiftable vertically in relation to said frame, with type heads and a printing station receptive thereto at the front of said platen in fixed relation to said frame, of accessory apparatus for delivering a reverse image transfer tape to and through said printing station without impeding entrance or exit of work paper with respect to the machine comprising, a unit of tape delivering apparatus including guide means arranged to direct said tape in a course of feeding travel that traverses said printing station, connections operably relating said unit to at least a section of said carriage that is vertically shiftable in relation to said frame in a manner to cause said unit to perform rising and falling bodily movement in accordance with vertical shifting movement of said platen, an anchorage abutment stationed in relation to said body frame beyond said range of letter spacing carriage movement in the direction of said movement, and an elongate arm for orienting said unit having one end constrainingly coupled thereto and extending lengthwise of and above said platen and having its other end connected to and supported by said anchorage abutment in a manner permitting up and down movement of the first said end of said arm in unison with vertical shifting of said carriage structure.

2. The combination defined in claim 1, in which the said unit of tape delivering apparatus derives support at least in part from the said vertically shiftable carriage section.

3. The combination defined in claim 1, in which the said anchorage abutment incorporates a hinge having its pivotal axis disposed perpendicularly to the said direction of letter spacing carriage movement, and the said elongate arm comprises a rigid body swingably connected to said abutment by means of said hinge.

4. The combination in a typewriting machine having a stationary body frame, a rotatable paper feeding platen, carriage structure bearing said platen in horizontally movable relation to said frame at least in part shiftable vertically in relation to said frame, with type heads and a printing station receptive thereto at the front of said platen in fixed relation to said frame, of accessory apparatus for supplying and feeding a reverse image transfer tape to and through said printing station comprising, a unit of tape storing and feeding apparatus including guide means arranged to direct said tape in a course of feeding travel that traverses said printing station, connections operably relating said unit to at least a section of said carriage that is vertically shiftable in relation to said frame in a manner to cause said unit to perform rising and falling bodily movement in accordance with vertical shifting movement of said platen, and a unit constraining anchorage stationed in relation to said frame and coupled to said apparatus in a manner to restrict bodily movement of said unit relative to said frame other than said rising and falling movement thereof, in which combination the said unit constraining anchorage comprises structure connecting said unit to the said body frame of the typewriting machine in a manner to position said unit over the said platen including a relatively thin and limber and relatively wide elongate blade disposed for flexing only in substantially vertical directions when said unit is over said platen.

5. The combination in a typewriting machine having a stationary body frame, a rotatable paper feeding platen, carriage structure bearing said platen in horizontally movable relation to said frame at least in part shiftable vertically in relation to said frame, with type heads and a printing station receptive thereto at the front of said platen in fixed relation to said frame, of accessory apparatus for supplying and feeding a reverse image transfer tape to and through said printing station comprising, a unit of tape storing and feeding apparatus including guide means arranged to direct said tape in a course of feeding travel that traverses said printing station, connections operably relating said unit to at least a section of said carriage that is vertically shiftable in relation to said frame in a manner to cause said unit to perform rising and falling bodily movement in accordance with vertical shifting movement of said platen, and a unit constraining anchorage stationed in relation to said frame and coupled to said apparatus in a manner to restrict bodily movement of said unit relative to said frame other than said rising and falling movement thereof, in which combination the said unit includes an electrically energized prime mover, spools carrying end portions of the said tape, and motion transmitting mechanism connecting at least one of said spools to said prime mover for feeding actuation thereby.

6. The combination in a typewriting machine having a stationary body frame, a rotatable paper feeding platen, carriage structure bearing said platen in horizontally movable relation to said frame at least in part shiftable vertically in relation to said frame, with type heads and a printing station receptive thereto at the front of said platen in fixed relation to said frame, of accessory apparatus for supplying and feeding a reverse image transfer tape to and through said printing station comprising, a unit of tape storing and feeding apparatus including guide means arranged to direct said tape in a course of feeding travel that traverses said printing station, connections operably relating said unit to at least a section of said carriage that is vertically shiftable in relation to said frame in a manner to cause said unit to perform rising and falling bodily movement in accordance with vertical shifting movement of said platen, and a unit constraining anchorage stationed in relation to said frame and coupled to said apparatus in a manner to restrict bodily movement of said unit relative to said frame other than said rising and falling movement thereof, in which combination the said unit includes an electromagnet, spools carrying end portions of the said tape, an armature reciprocated by said electromagnet, and motion transmitting mechanism connecting at least one of said spools to said armature.

7. The combination in a typewriting machine having a stationary body frame, a rotatable paper feeding platen, carriage structure bearing said platen in horizontally movable relation to said frame at least in part shiftable vertically in relation to said frame, with type heads and a printing station receptive thereto at the front of said platen in fixed relation to said frame, of accessory apparatus for supplying and feeding a reverse image transfer tape to and through said printing station comprising, a unit of tape storing and feeding apparatus including guide means arranged to direct said tape in a course of feeding travel that traverses said printing station, connections operably relating said unit to at least a section of said carriage that is vertically shiftable in relation to said frame in a manner to cause said unit to perform rising and falling bodily movement in accordance with vertical shifting movement of said platen, and a unit constraining anchorage stationed in relation to said frame and coupled to said apparatus in a manner to restrict bodily movement of said unit relative to said frame other than said rising and falling movement thereof, in which combination the said unit includes an electromagnet, spools carrying end portions of the said tape, an armature reciprocated by said electromagnet, a tape stroker reciprocative in a path to pull intermittently on said tape, and motion transmitting mechanism connecting said tape stroker to said armature.

8. The combination in a typewriting machine having a stationary body frame, a rotatable paper feeding platen, carriage structure bearing said platen in horizontally movable relation to said frame at least in part shiftable vertically in relation to said frame, with type heads and a printing station receptive thereto at the front of said platen in fixed relation to said frame, of accessory apparatus for supplying and feeding a reverse image transfer tape

to and through said printing station comprising, a unit of tape storing and feeding apparatus including guide means arranged to direct said tape in a course of feeding travel that traverses said printing station, connections operably relating said unit to at least a section of said carriage that is vertically shiftable in relation to said frame in a manner to cause said unit to perform rising and falling bodily movement in accordance with vertical shifting movement of said platen, and a unit constraining anchorage stationed in relation to said frame and coupled to said apparatus in a manner to restrict bodily movement of said unit relative to said frame other than said rising and falling movement thereof, in which combination the said typewriting machine includes type heads thrustable one at a time toward the said printing station, and the said unit includes an electrically energized prime mover, tape feeding mechanism, motion transmitting mechanism connecting said prime mover to said tape feeding mechanism, an electric circuit including said prime mover and a circuit controlling electric switch arranged to be operated in predetermined time relation to the thrust of each of said type heads toward and away from said printing station.

9. The combination in a typewriting machine having a stationary body frame, a rotatable paper feeding platen, carriage structure bearing said platen in horizontally movable relation to said frame at least in part shiftable vertically in relation to said frame, with type heads and a printing station receptive thereto at the front of said platen in fixed relation to said frame, of accessory apparatus for supplying and feeding a reverse image transfer tape to and through said printing station comprising, a unit of tape storing and feeding apparatus including guide means arranged to direct said tape in a course of feeding travel that traverses said printing station, connections operably relating said unit to at least a section of said carriage that is vertically shiftable in relation to said frame in a manner to cause said unit to perform rising and falling bodily movement in accordance with vertical shifting movement of said platen, and a unit constraining anchorage stationed in relation to said frame and coupled to said apparatus in a manner to restrict bodily movement of said unit relative to said frame other than said rising and falling movement thereof, in which combination the said typewriting machine includes a ribbon vibrator and the said unit includes an electrically energized prime mover, tape feeding mechanism, motion transmitting mechanism connecting said prime mover to said tape feeding mechanism, an electric circuit including said prime mover and a circuit controlling electric switch arranged to be actuated by said ribbon vibrator.

10. The combination in a typewriting machine having a stationary body frame, a rotatable paper feeding platen, carriage structure bearing said platen in horizontally movable relation to said frame at least in part shiftable vertically in relation to said frame, with type heads and a printing station receptive thereto at the front of said platen in fixed relation to said frame, of accessory apparatus for supplying and feeding a reverse image transfer tape to and through said printing station comprising, a unit of tape storing and feeding apparatus including guide means arranged to direct said tape in a course of feeding travel that traverses said printing station, connections operably relating said unit to at least a section of said carriage that is vertically shiftable in relation to said frame in a manner to cause said unit to perform rising and falling bodily movement in accordance with vertical shifting movement of said platen, and a unit constraining anchorage stationed in relation to said frame and coupled to said apparatus in a manner to restrict bodily movement of said unit relative to said frame other than said rising and falling movement thereof, together with antifrictional rolling means operatively interposed between the said carriage section and the said unit transmitting weight of the latter to the former.

11. The combination defined in claim 10, in which the said rolling means include a wheel pivotally mounted on the said unit, together with a track extending parallel with the said platen on which said wheel rests.

12. The combination defined in claim 10, in which the said rolling means include balls turnably lodged in the said unit and resting on the surface of the said platen.

13. Unified apparatus for supplying and feeding a reverse image transfer tape to and through a printing station at the front of a typewriter platen, including in combination with the body of a typewriting machine and a platen for roll feeding work paper supported on said body in horizontally shiftable relation thereto for letter spacing movement, a unit frame supported over said platen, tape storing spools on said frame, and tape guiding structure depending from said unit frame in front of said platen at said printing station disposed to be traversed by the tape in traveling from one to the other of said spools, an anchorage abutment stationed in relation to said body beyond the nearest end of said platen in the direction of said letter spacing movement thereof, and an elongate arm for orienting said unit frame having one end constrainingly coupled thereto and extending lengthwise of and above said platen and having its other end connected to and supported by said anchorage abutment.

14. Unified apparatus for supplying and feeding a reverse image transfer tape to and through a printing station at the front of a typewriter platen, including in combination with the platen of a typewriting machine for roll feeding work paper, a unit frame supported over said platen, tape storing spools on said frame, and tape guiding structure depending from said unit frame in front of said platen at said printing station disposed to be traversed by the tape in traveling from one to the other of said spools, together with a transparent guard plate spaced from and upstanding in front of the said tape guiding structure and hinge structure on which said guard plate is mounted in a manner to be tiltable in a forward direction thereby to give access to the said printing station.

15. Unified apparatus for supplying and feeding a reverse image transfer tape to and through a printing station at the front of a typewriter platen, including in combination with the body of a typewriting machine and a platen for roll feeding work paper supported on said body in horizontally shiftable relation thereto for letter spacing movement, a unit frame supported over said platen, tape storing spools on said frame, and tape guiding structure depending from said unit frame in front of said platen at said printing station disposed to be traversed by the tape in traveling from one to the other of said spools, together with a constraining anchorage stationed in relation to said body and coupled to said unit frame in a manner to prevent movement thereof with said platen in letter spacing direction relative to said body and a prime mover and an oscillator actuatable thereby on the said frame, and one-way drive connections between one of the said spools and said oscillator.

16. Unified apparatus as defined in claim 15, in which the said drive connections include a second oscillator and a close wound coil of spring wire having its ends attached respectively to the said oscillators.

17. Unified apparatus for supplying and feeding a reverse image transfer tape to and through a printing station at the front of a typewriter platen, including in combination with the platen of a typewriting machine for roll feeding work paper, a unit frame supported over said platen, tape storing spools on said frame, tape guiding structure depending from said unit frame in front of said platen at said printing station disposed to be traversed by the tape in traveling from one to the other of said spools, an oscillator on said frame, one-way drive connections between one of said spools and said oscillator, a second oscillator, a close-wound coil of spring wire having its ends attached respectively to said oscil-

lators, an electromagnet, an armature reciprocated thereby, a driving connection between said armature and said second oscillator, and adjustable stop means restricting the extent of reciprocative movement of said armature.

18. The combination in a typewriting machine having a stationary body frame, a rotatable paper feeding platen, carriage structure bearing said platen having a range of horizontal letter spacing movement and conveying said platen lengthwise therewith in relation to said frame, with type heads and a printing station receptive thereto stationed at the front of said platen, of accessory apparatus for delivering a reverse image transfer tape to and through said printing station comprising a unit of tape delivering apparatus including guide means arranged to direct said tape in a course of feeding travel that traverses said printing station, an anchorage abutment stationed in relation to said body frame beyond said range of letter spacing carriage movement in the direction of said movement, and an elongate arm for orienting said unit having one end constrainingly coupled thereto and extending lengthwise of and above said platen and having its other end connected to and supported by said anchorage abutment.

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