

Jan. 20, 1959

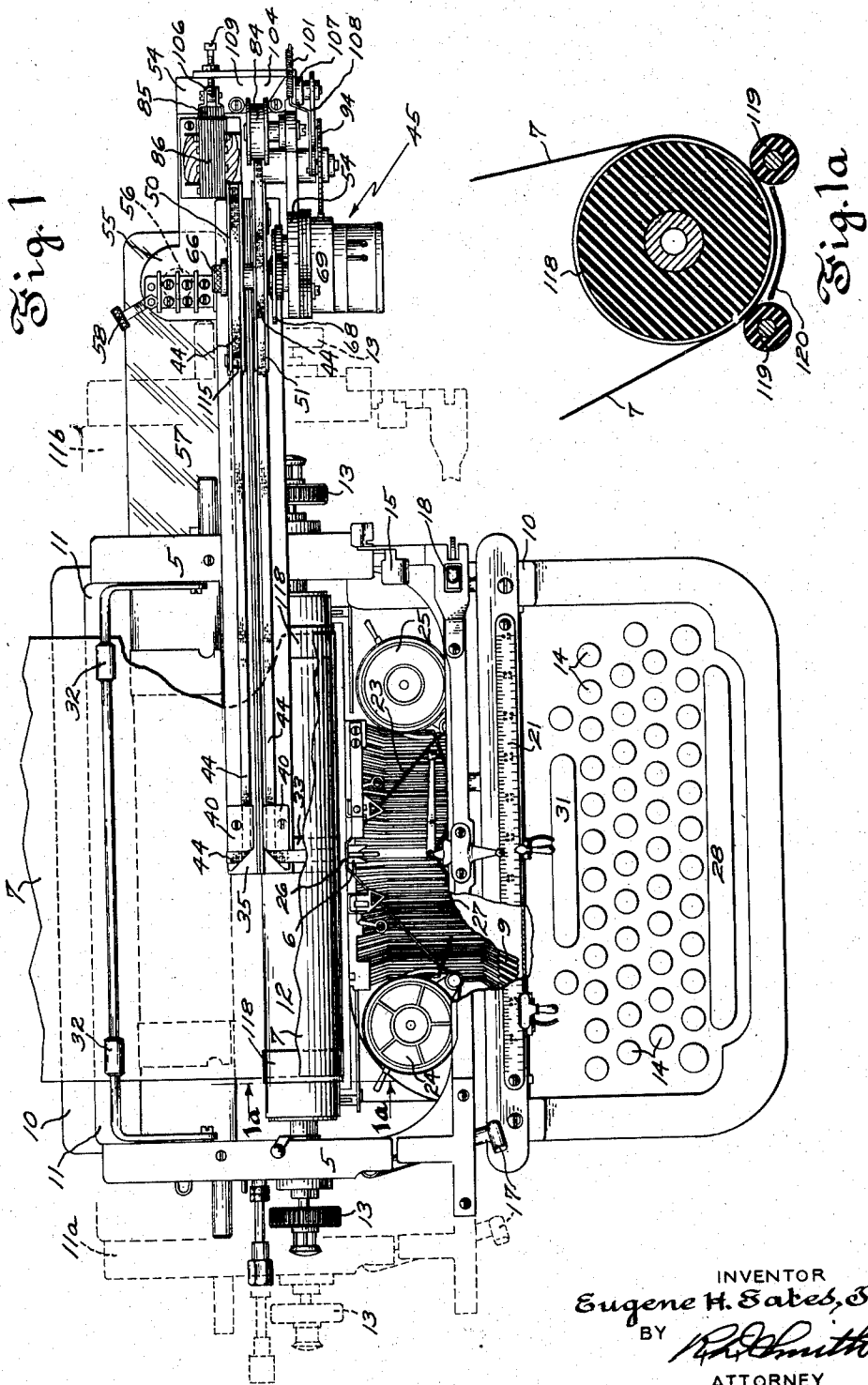
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OUTBOARD RIBBON SUPPLY APPARATUS FOR TYPEWRITERS

Filed July 5, 1957

5 Sheets-Sheet 1.



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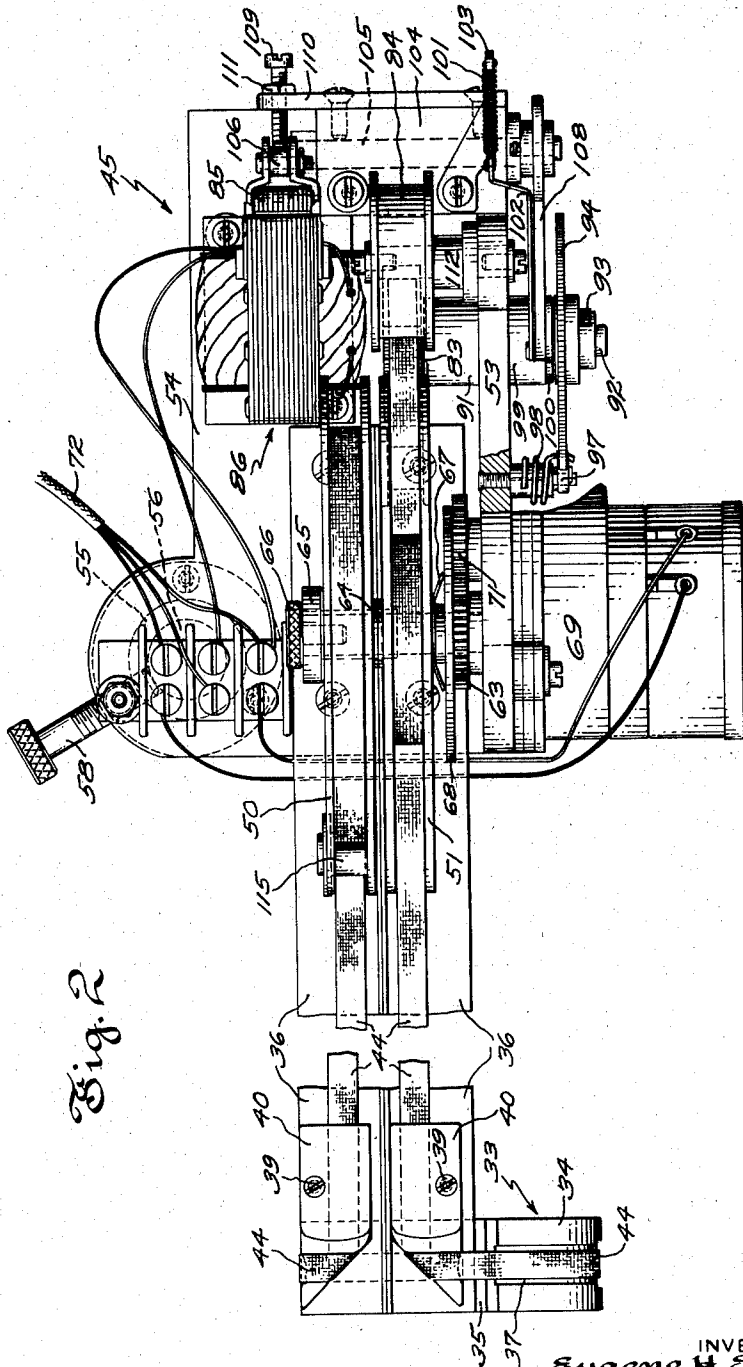
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OUTBOARD RIBBON SUPPLY APPARATUS FOR TYPEWRITERS

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5 Sheets-Sheet 2



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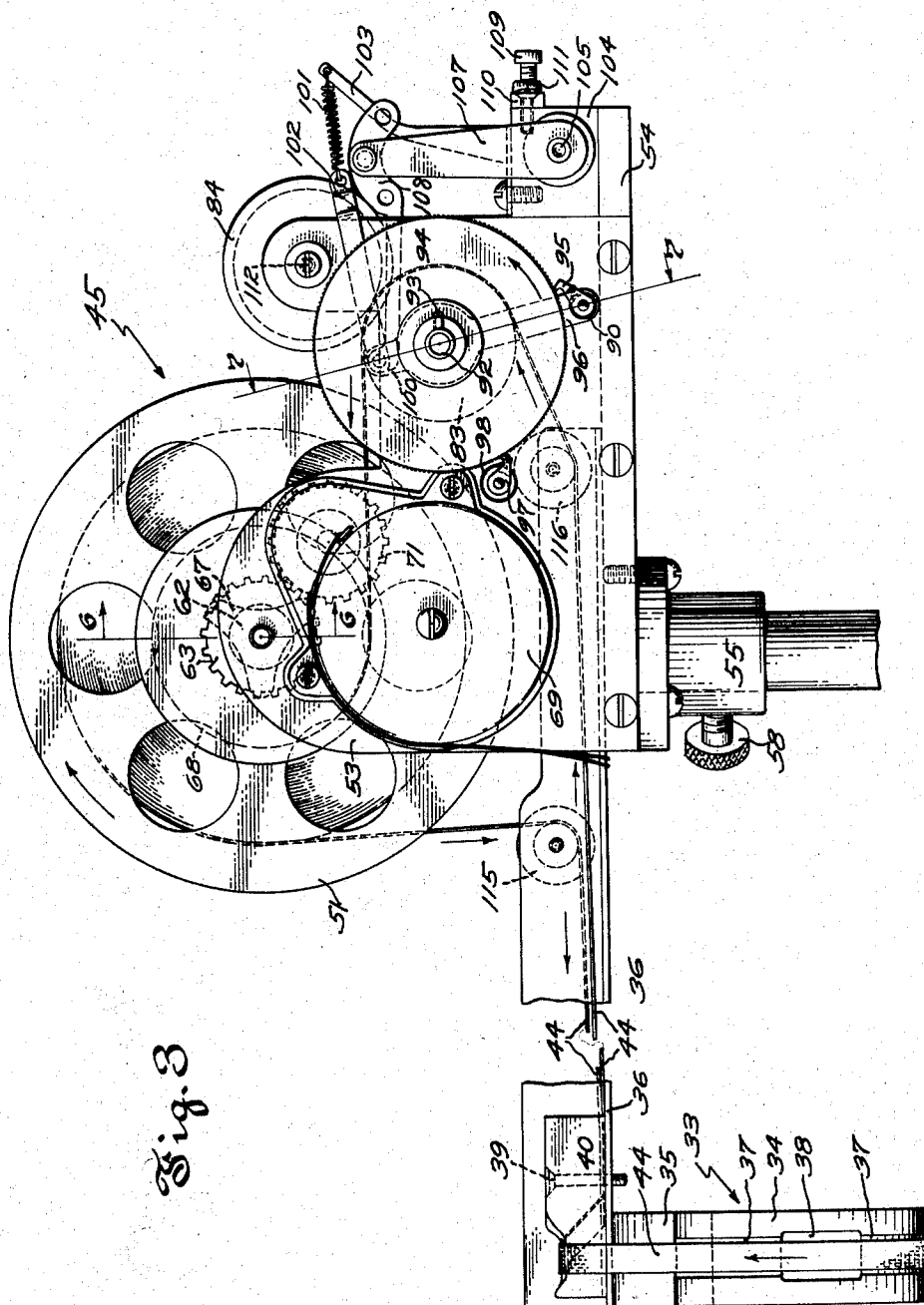
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OUTBOARD RIBBON SUPPLY APPARATUS FOR TYPEWRITERS

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5 Sheets-Sheet 3



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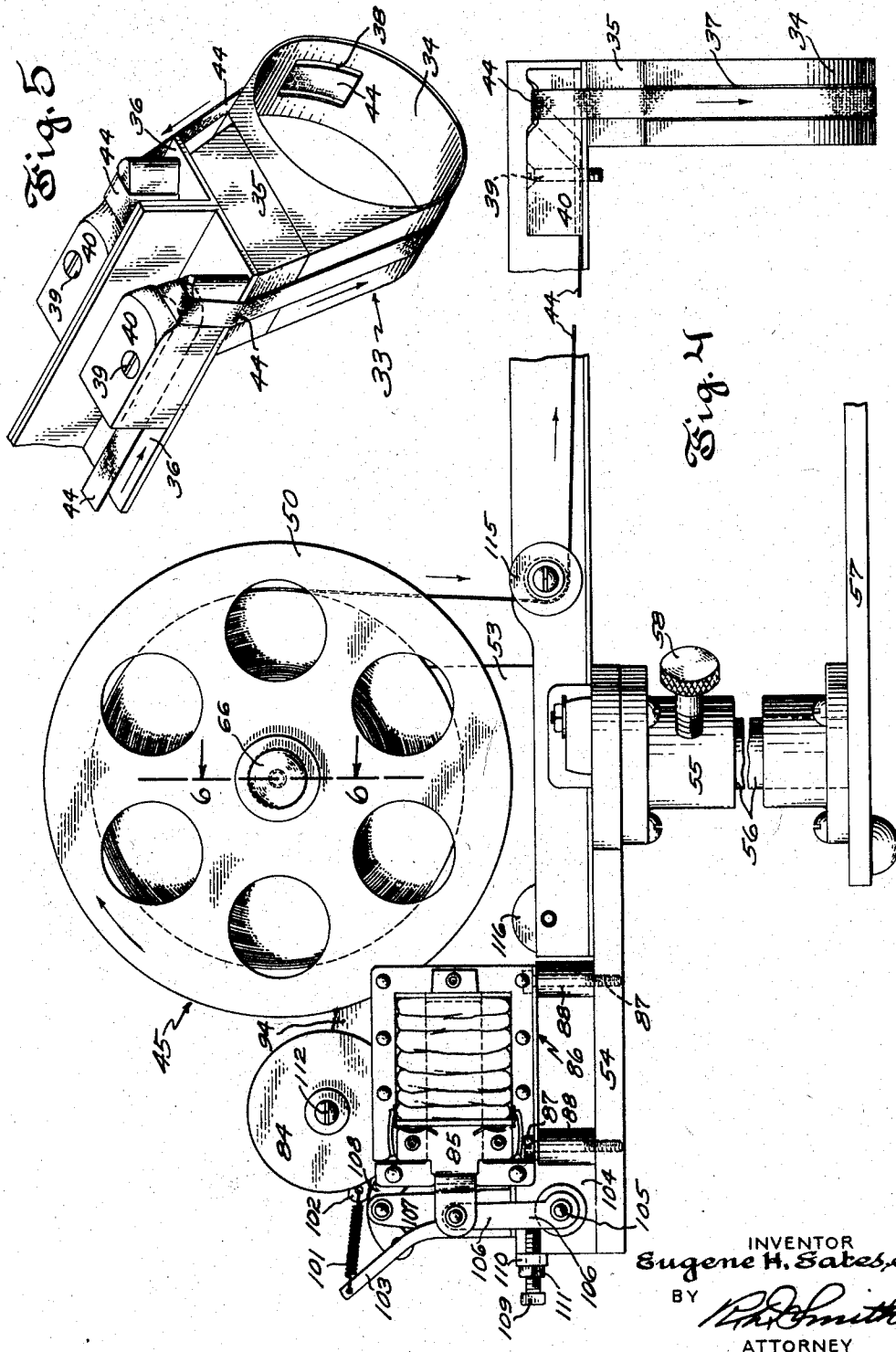
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OUTBOARD RIBBON SUPPLY APPARATUS FOR TYPEWRITERS

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5 Sheets-Sheet 4



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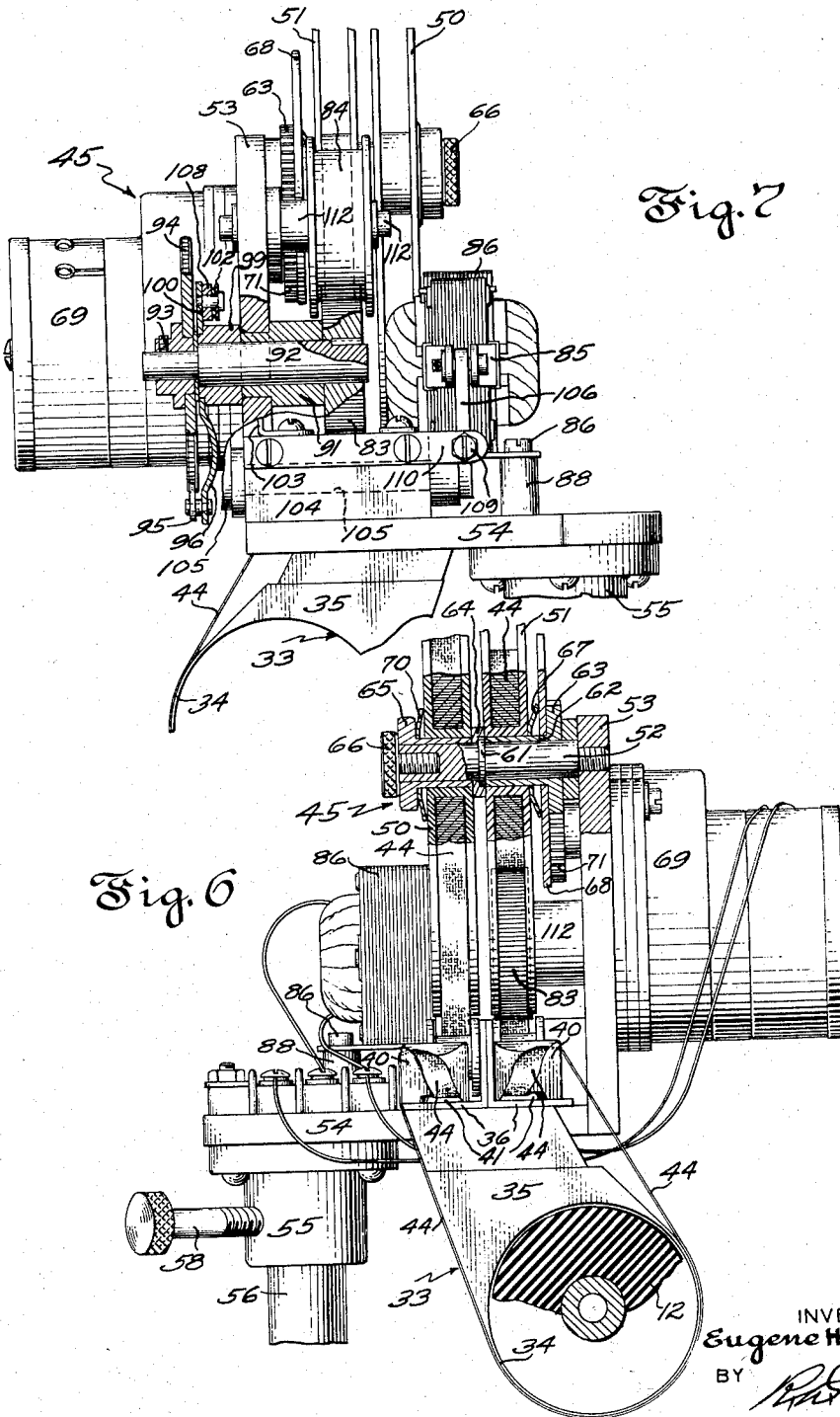
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OUTBOARD RIBBON SUPPLY APPARATUS FOR TYPEWRITERS

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5 Sheets-Sheet 5



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OUTBOARD RIBBON SUPPLY APPARATUS FOR TYPEWRITERS

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

Application July 5, 1957, Serial No. 670,211

12 Claims. (Cl. 197—151)

This invention relates to accessory equipment that may be joined in a removable manner to conventional typewriting machines and thereby made operative to feed to and retrieve from the printing station of the machine a continuous length of printing ribbon or a dispensable carbon coated paper tape to serve in place of sheet carbon paper for typing reversed characters on the rear surface of master sheets in the Hectograph duplicating process. The reverse or "mirror" image on the rear surface of a thus typed master sheet when removed from the typewriting machine is transferred to a multiplicity of copy sheets by direct contact pressure as well understood in the art.

In its above mentioned use the present invention may be regarded as embodying improvements over a comparable apparatus disclosed in my copending application, Serial No. 403,386, filed January 11, 1954.

Among the objects of the present improvements is freedom from the presence of bulky, tape storing spools and tape impelling power mechanism just above the platen closely adjacent the printing station of the typewriting machine. Such is accomplished herein by relocation of all such mechanism to a position in outboard relation to the range of lengthwise, letter spacing movement of the platen and to such position that throughout the length of the platen the entire region above the space that lies directly at the rear of the platen is clear of encumbrance in all letter spacing positions of the platen.

A related object is, by the above arrangement, to maintain wholly unobstructed the path in which a flat sheet of work paper can be inserted edgewise downward into the roll feeding grasp of the rear face of the platen as is customary in an ordinary typewriting machine.

Another object is to prevent looseness and tangling of the tape by insuring adequate long distance guidance therefor and constant complete takeup thereof on an exhaust spool incorporated in the tape impelling power mechanism remote from the printing station of the machine as fast as the tape returns from said station to the exhaust spool.

The foregoing and other objects of the invention will appear in further particular from the following description of a successful embodiment of the improvements having reference to the accompanying drawings wherein:

Fig. 1 is a view looking downward on a conventional typewriting machine having detachably joined thereto an auxiliary tape delivering and retrieving apparatus embodying the present improvements and indicates in broken lines opposite limits of the range of letters spacing movement of the platen carriage in the machine.

Fig. 1a is a fragmentary view taken in section on the plane 1a—1a in Fig. 1 drawn on an enlarged scale.

Fig. 2 is a contracted plan view of the auxiliary apparatus detached from the typewriting machine and drawn on an enlarged scale in suitable actual size.

Fig. 3 is a front elevation of the apparatus shown in Fig. 2.

Fig. 4 is a rear elevation of the same apparatus.

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Fig. 5 is a fragmentary perspective view of a terminal portion of the ribbon guiding structure, a part of which encircles the platen at the printing station.

Fig. 6 is an endwise view of the auxiliary apparatus looking toward the right at Fig. 4, showing in fragmentary section on the plane 6—6 in Fig. 4 the bearing support for the tape carrying reels looking in the direction of the arrows.

Fig. 7 is an opposite endwise view of the apparatus looking toward the left at Fig. 3, showing in fragmentary section on the plane 7—7 in Fig. 3 the bearing support for the tape impelling mechanism looking in the direction of the arrows.

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

Carriage 11 is slidable from side to side of the machine between broken line positions 11a, 11b in Fig. 1, for conveying the platen backed sheet 7 of work 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. Such printing station remains in fixed relation to the body frame 10. Carriage 11, or at least the platen bearing section 5 thereof, may further be shiftable vertically in some styles of typewriting machines for presenting the imprint receiving spot on the master sheet 7 selectively to the upper case characters or to lower case characters on each type head 9. In other styles of typewriting machines such as that shown in Fig. 1 the platen carriage need not rise and fall but the shifting to upper case characters is accomplished by depressing the entire bank of type bars 27 as is well understood in the art.

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 involving propulsion by a carriage feeding spring (not shown). Spring caused leftwise sliding of the carriage takes place normally in letter spacing steps or increments of transverse movement which occur 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). As an example of conventional mechanism operating in this manner reference may be had to United States Patent No. 2,178,688 and particularly to parts identified therein by reference numerals 47, 46, 44, 37, 54, 60, 61, 30, 29, 28 and 27. Carriage 11 on occasion is permitted to slide to the left free of escapement controlled stepping 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 its return handle 18 or the combined carriage return and line spacing lever 17 toward the right.

Thus the surface of platen 12 is movable in at least two different directions with respect to the stationary body frame 10 of the machine, these directions being horizontally with the carriage and in a revolving direction as when the platen is turned about its own axis 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 machines, the paper presser rolls 32 that can be swung toward and away from the platen surface, a regular inked fabric printing ribbon such as 23 which feeds back and

forth between two ribbon spools 24 and 25, and the regular ribbon vibrator 26 at the printing station through which ribbon 23 is threaded so that the striking of any type key 14 lifts ribbon 23 momentarily into printing position between the striking type head 9 and the work paper 7. When a blank work paper such as a master sheet 7 is to receive an impression solely on its rear surface in the Hectograph master typing process the ordinary letter writing ribbon 23 may be omitted. The vibrator 26 will remain in operation however and serves to actuate an electric switch (not shown) for carbon tape feeding 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 ample 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 improvements all of the tape impelling apparatus having power motivated parts is stationed in outboard relation to the range of platen and carriage travel sidewise of the typewriting machine and preferably in approximate longitudinal alignment with the direction of such travel. This makes it possible to avoid the presence of any supporting structure arching forwardly over the platen from the back of the machine an arrangement which, in the prior art, has blocked the pathway for insertion of a sheet 7 of work paper downward into the machine immediately at the rear of the platen. The only part of the presently improved tape delivering apparatus that lies close to the platen comprises slim lightweight tape guiding ways for directing the tape 44 lengthwise of the platen from the remotely stationed impelling apparatus to and from the printing station of the machine.

The tape guiding structure incorporates a stationary tape looping ring or guide band 33, featured in Fig. 5, which somewhat loosely encircles the platen at the printing station so that the platen is free at all times to revolve about its axis therewithin and independently thereof, as well as to shift lengthwise freely through such stationary ring-like guide. Most of the circular extent of the ring guide 33 comprises a thin but rigid cylindrical band 34 which loops away from and back to a solid supporting head 35. By means of this head the band 34 is suspended fixedly from the ends of the tape supporting ways 36.

These ways comprise two stiff and rigid, fixedly joined angle strips whose combined L-shaped sections form an extended structure of inverted T-shape in cross section providing the separate tape supporting ways 36 side by side separated by an upstanding fin throughout the length of the ways.

The cylindrical band 34 is grooved at 37 around its outer curved surface to provide a circumferential shallow channel that is tracked by the tape in progressive increments of travel about the platen. Thus the traveling bight of the tape 44 is separated by band 34 from the surface of the platen at all points except where it spans an aperture 38 in the band. The gap formed by aperture 38 is clearly shown in Fig. 5 to be spanned by the tape. In the bight of the tape that extends about the band 34 the carbon coated surface of the tape, when composed of paper strip, faces outward and lies on the convex surface of the tape so that none of the coating of carbon or transfer substance on the tape can come into contact with the platen through aperture 38 but is presented forward at the aperture 38 in register with the printing station of the typewriter where the type heads 9 make impact against the paper sheet 7.

Fig. 1a shows that by these improvements entirely free clearance is afforded for downward entrance of a flat sheet 7 of work paper into the machine directly at

the back of the platen as is customary, so that the sheet can drop into the clutches of conventional pressure clamps and/or rollers 119, 119 which cause the surface of the platen to drag the paper around with it and feed it upward out of the machine past the printing station at the front of the platen. 120 is the usual paper guide pan.

On each of the ways 36 just above the ring head 35 there is fixed by screws 39 a block 40 shaped to divert the direction of tape travel. A straight groove 41 in the bottom of each block provides a short shallow tunnel extending lengthwise of the ways under the block to accommodate the width of the tape, and through which the tape is drawn. The terminal end of each block 40 tapers to a horn shape and is bluntly rounded transversely of the taper to provide a smoothly contoured direction diverting corner over which the tape glides without abrupt flexure and thereby changes its direction of travel from rectilinear travel along the way 36 to its curved path of travel about the band 34, and vice versa on return to the supply unit.

Figs. 1 and 2 show tape 44 coursing along one of the ways 36 as it is played off in the direction of the arrow from the tape impelling apparatus which is designated 45 as a unit. Thus the tape comes to pass along under one of the blocks 40, thence obliquely upward and across the transversely rounded horn-shaped terminal of the block and thence downward around the platen encircling band 34. Tape 44 returns upward across the open aperture 38 at the front of the platen then upward to and diagonally across the horn-shaped terminal of the other direction converting block 40, thence downward and under said block in a path along way 36 leading back to the tape impelling apparatus.

The unitary impelling apparatus may assume various mechanical forms and still benefit by its presently improved location in relation to a typewriting machine to which it is to supply the tape 44. The organization of tape impelling apparatus herein disclosed embodies novel features which enable it to function to particular advantage in its said improved location and will now be described.

To avoid tangling of loose or poorly controlled stretches of the tape there is provided a tape play-off reel 50 and a tape take-up reel 51 mounted coaxially side by side for independently controlled rotary movement on bearing support structure best shown in Fig. 6. Each of these reels aligns diametrically with a different one of the ways 36. Support of both reels is derived from a common long bearing stud 52 which is fixed in and projects horizontally from a frame plate 53 upstanding rigidly from a base plate 54. Also rigid with and depending from base plate 54 there is a mounting socket 55 by means of which the entire tape impelling and delivery unit is removably lodged on the top end of a supporting standard 56. Standard 56 upstands from a rigid platform bar 57 that is fixed on and projects from beneath the body frame 10 of the typewriting machine. Such bar appears in Fig. 4 as having fixed to it the bottom end of standard 56. A set screw 58 in socket 55 fixes the position of apparatus unit 45 on the standard 56 and hence in relation to the body frame of the typewriting machine.

Fig. 6 shows the bearing stud 52 provided with a thrust shoulder 61. Between shoulder 61 and the frame plate 53 there is free to turn on stud 52 the elongate hub 62 of a spur gear 63. A thrust collar 64 is kept positively forced to the right against stud shoulder 61 by a flanged bearing bushing 65 retained by the head of an end screw 66 that threads into the end of stud 52.

Take-up reel 51 is yieldably clutched in rotary relation to gear hub 62 through friction exerted axially by a cupped spring washer 67 that bears between a flange 68 fixed on hub 62 and the side of reel 51. Reel 51 is urged to rotate constantly clockwise in Fig. 3 by continual ro-

tation of the aforesaid spur gear 63 driven by a meshing gear 71 that is powered by a constantly running electric motor 69 supported on frame plate 53. However, reel 51 does not exert the pull on tape 44 that causes the tape to be impelled to and from the printing station of the machine. The constant tendency of reel 51 is to rotate rapidly enough to prevent slack from occurring in that length of the tape which has overrun the point where the tape is positively drawn along by intermittent pulls thereupon. Such pulls are exerted by mechanism that includes a draft wheel 83 having a tape gripping roughened periphery that revolves while there is tangentially pressed toward it the relatively smooth periphery of a flanged idler wheel 84. This causes the tape to be gripped between the two wheel peripheries and drawn along as the wheels turn together in synchronous steps of rotation.

Step by step increments of rotation are imparted to draft wheel 83 by reciprocative driving mechanism that thus causes the aforesaid intermittent pulls on the tape that draw it in progressive steps of advance across the ring aperture 38 at the printing station. Such step-by-step rotation of draft wheel 83 is caused by successive strokes toward the right in Fig. 4 of a plunger armature 85 of an electromagnet 86 that is fixedly mounted on base plate 54 by screws passing through spacer posts 83 and threading into the base plate.

Details of the rotary bearing support for draft wheel 83 are best shown in Fig. 7 where the frame plate 53 is shown to carry fixedly a bearing lug 91 in which is journaled the stub shaft 92 having draft wheel 83 keyed to the inner end thereof. Fixed on the opposite or outer end of shaft 92 by means of a set screw 93 is a fine toothed ratchet wheel 94 adapted to be driven only counterclockwise in Fig. 3 in increments of rotary movement by successive strokes of a driving pawl 95 pivotally carried at the end of a stroker arm 96. Pawl 95 is urged by spring 90 into one-way driving engagement with ratchet wheel 94. Retrogressive or clockwise turning of ratchet wheel 94 in Fig. 3 is prevented by a click 97 pivotally mounted on frame plate 53 and urged against the ratchet wheel by a spring 98 as shown in Figs. 2 and 3.

The stroker arm 96 is carried by a hub 99 that is free to oscillate on and relatively to stub shaft 92. At the diametrically opposite side of hub 99 there is a crank arm 100 that swings in unison with stroker arm 96 and which is constantly and yieldably urged clockwise in Fig. 3 by a spring 101 through the medium of a connecting link 102. Spring 101 is anchored to an upstanding bracket 103 stationed on a bearing block 104 that is fixed to the base plate 54.

A rocker shaft 105 is journaled in bearing block 104 on one end of which shaft is fixed a rocker arm 106 pivotally connected to the plunger armature 85 of electromagnet 86. On the other end, shaft 105 fixedly carries another rocker arm 107 which is pivotally connected by a pitman link 108 to crank arm 100. Thus when armature 85 is drawn toward the electromagnet 86 by energization of its solenoid, rocker arms 106 and 107 are swung counterclockwise or to the left in Fig. 3, or toward the right in Fig. 4, so that stroker arm 96 by means of pawl 95 drives ratchet wheel 94 and with it the tape feeding draft wheel 83 an increment of counterclockwise movement in Fig. 3 sufficient to advance tape 44 in the direction of the arrows a distance at least equal to a single letter spacing movement of the typewriter platen 5. A positive limit to the clockwise or return swing of stroker arm 96 is provided by an adjustably positioned stop screw 109 which threads through a spur 110 of bearing block 104 into abutting engagement with rocker arm 106 and is fastened in selectively set positions by a lock nut 111.

The idler wheel 84 which cooperates with draft wheel 83 is rotatably supported and axially retained in any convenient manner on a horizontal bearing post 112 fixedly projecting from frame plate 53 and which may be mount-

ed in a hole through the latter giving sufficient clearance for slight bodily adjustment of the position of bearing post 112 toward and away from draft wheel 83.

Tape 44 is furnished to the draft demand of wheel 83 from a play-off reel 50 with the intermediate directional guidance of a stationary idler spool 115 mounted on the delivery way 36 near said reel, the tape being trained to glide under said spool as shown in Fig. 4. A similar stationary idler spool 116 is mounted in the return way 36 near the draft wheel 83 under which the tape is trained to glide, thence upward to and about draft wheel 83 as shown in Fig. 4. Play off reel 50, as shown in Fig. 6, has rotary bearing on the aforementioned bearing bushing 65 between the thrust collar 61 and the head flange of bushing 65. Suitable light frictional resistance for braking the turning of reel 50 in playing off the tape may be provided by an axially expansive friction washer 70 shown between reel 50 and the head flange of bearing bushing 65 in Fig. 6.

It has been mentioned that, during tape delivering and retrieving operation of the apparatus, motor 69 runs fast enough to insure constant and complete take-up on reel 51 of used tape emerging from the clench of wheel 83 and 84 even though electrical energization of the tape impelling electromagnet 86 is intermittent. A single such electrical energization occurs at each stroke of any of the type keys 14 or of the letters spacing bar 28 of the typewriting machine under control of an electric circuit making and breaking device that may be like that fully illustrated and described in my aforesaid application Serial No. 403,386. It will not be necessary herein to repeat particulars of such circuit control unless the said application should fail to eventuate in patent. In that event there will be transplanted into the instant application such such duplication of the disclosure in said copending application pertaining to electrical energization of electromagnet 86 as may be proper.

If difficulty is encountered in joining the herein improved apparatus to some styles of already fabricated typewriting machines because of interference with rollers or clamps such as 119 in Fig. 1a that press the paper against the surface of the platen by the stationary tape looping band 33 in letter spacing or lengthwise movement of the platen, I may provide relief for this condition in several ways. One way is to reduce the circumference of the cylindrical platen to a radial extent slightly greater than the thickness of band 33 for some length of the platen less than the width of the work paper 7 thus leaving both end portions of the platen at normal undiminished diametrical size for cooperating in their usual way with all associated parts of the machine. But if paper sheets 7 are to be used which are not wide enough to overlap both such undiminished end portions of the platen then as an alternative the platen can be equipped with one or more encircling spacer sleeves 118 that are slidably adjustable along the platen to self maintained points in the length thereof. Such sleeve or sleeves will be positioned to intervene between the margin or margins of the paper sheet and the surface of the platen as shown in Fig. 1a and will serve to hold conventional presser rollers such as 119 and/or other paper feed clamping devices separated from the surface of the platen sufficiently to make room for the presser rollers or clamps 119 to pass freely the stationary tape looping ring 33 as the platen slides lengthwise through such ring. A suitable amount of space to be thus provided might be, say, $\frac{1}{32}$ " in radial measurement.

These and other modifications can be resorted to for accommodating various peculiarities of construction in different makes of typewriting machines not originally designed for joindure with my improved tape delivering apparatus, wherefore the appended claims are directed to and intended to cover not only the precise shapes and arrangement of parts herein illustrated and described but

all fair equivalents thereof which come within the scope of the invention as defined by the claims.

I claim:

1. Accessory apparatus for progressively delivering reverse image transfer tape at the printing station of a type-writing machine between the platen and the striking type heads without blocking the entrance of flat sheets of work paper when inserted edgewise downward into said machine directly at the rear of the platen comprising in combination with the platen, a unit of tape storing and impelling mechanism stationed in endwise outboard relation to the letter spacing range of platen movement, tape looping structure localized at the printing station of the machine constructed and arranged to guide tape in a partially circular path around said platen at said printing station, and tape supporting ways extending between said outboard unit and said tape looping structure and extending along and proximate said platen, whereby the tape is guided in predetermined paths isolated from the platen throughout the distance separating said unit from the printing station of the machine without blocking entrance of flat sheets of work papers to be inserted edgewise downward into the machine directly at the rear of the platen.
2. Accessory apparatus as defined in claim 1, wherein the said tape storing and impelling mechanism and the said tape looping structure are joined together by the said tape supporting ways in a manner to constitute a rigid assembly.
3. Accessory apparatus as defined in claim 1, together with cylindrical sleeves surrounding said platen spaced apart lengthwise thereof having at least as great radial thickness as the radial thickness of the said tape looping structure.
4. Accessory apparatus as defined in claim 1, in which the said platen comprises longitudinal portions of regulation circumference near the ends of the platen for cooperating with conventional paper feed rollers, and a portion of relatively diminished circumference intermediate said end portions thereby to afford radial clearance for the feed rollers freely to pass the said stationary tape looping structure during longitudinal movement of said platen.
5. Accessory apparatus as defined in claim 1, in which the said tape storing and impelling mechanism includes a tape play-off reel, a tape take-up reel, and tape clenching wheels in advance of said take-up reel in the travel of the tape, together with an intermittently motivated prime mover connected to rotate said wheels step by step, and a constantly motivated prime mover connected to rotate said tape-up reel continually at sufficiently fast speed to prevent the occurrence of slack in the tape between said clenching wheels and said take-up reel.

6. Accessory apparatus as defined in claim 1, in which the said tape looping structure comprises a U-shaped band having upstanding arms of its length straddling the said platen from below with sufficient radial clearance to permit free longitudinal movement of said platen through said band.
7. Accessory apparatus as defined in claim 6, in which one of the said upstanding arms of the said U-shaped band contains an aperture at the front of the said platen in register with the said printing station and traversed by the said tape, whereby the impact of a type head striking through said aperture toward said tape is borne by said platen and not by said band.
8. Accessory apparatus as defined in claim 1, in which the said tape looping structure comprises a curved tape guiding band looping around and passing under the said platen.
9. Accessory apparatus as defined in claim 8, in which the said band contains an aperture at the front of the said platen in register with the said printing station and traversed by the said tape, whereby the impact of a type head striking through said aperture toward said tape is borne by said platen and not by said band.
10. Accessory apparatus as defined in claim 9, in which the said band contains a shallow groove in its outer convex surface approximating the width of the said tape and extending from the said aperture in both directions along the looping course of said band, thereby to assure register of said tape with said aperture.
11. Accessory apparatus as defined in claim 8, in which the said tape guiding band depends fixedly from an end of the said tape supporting ways, together with a corner forming guide block for diverting the direction of tape travel to or from said ways having a tape guiding rounded contour above the said tape guiding band over which the tape may be led, said contour leading obliquely to the lengthwise extent of said ways in a manner to change the direction of tape travel from accord with one of said ways to accord with said band and from accord with said band to accord with the other of said ways.
12. Accessory apparatus as defined in claim 11, in which the said guide block cooperates with the said ways to form a rectilinear channel aligned with the longitudinal extent of said ways, said block terminating in a horn-shaped end portion incorporating the said obliquely leading rounded contour.

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