Aug. 9, 1949. L. B. HILL 2,478,630

POWER-OPERATED PRINTING MACHINE

Filed April 14, 1945 6 Sheets-Sheet 1

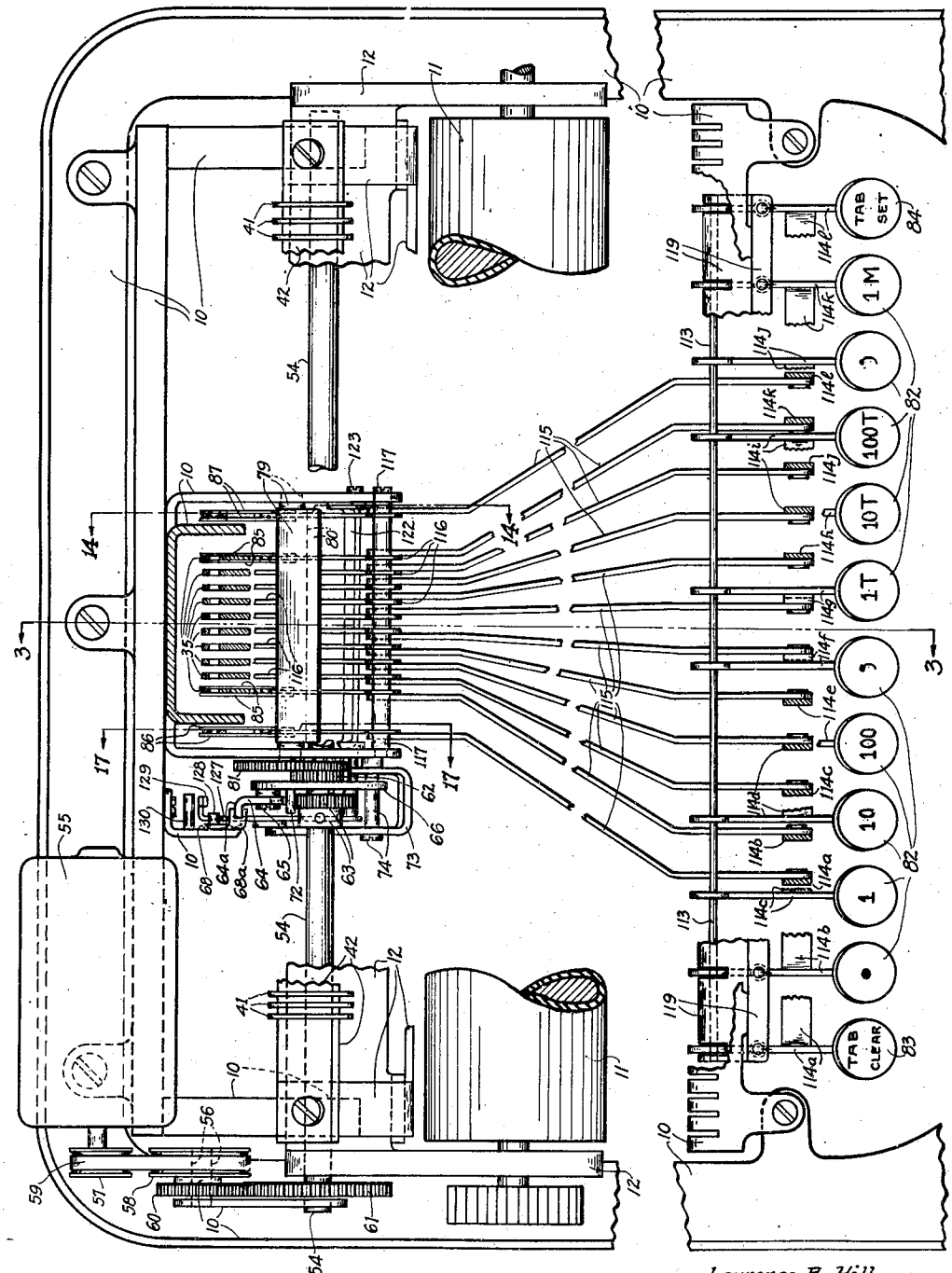


Fig. 1

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POWER OPERATED PRINTING MACHINE

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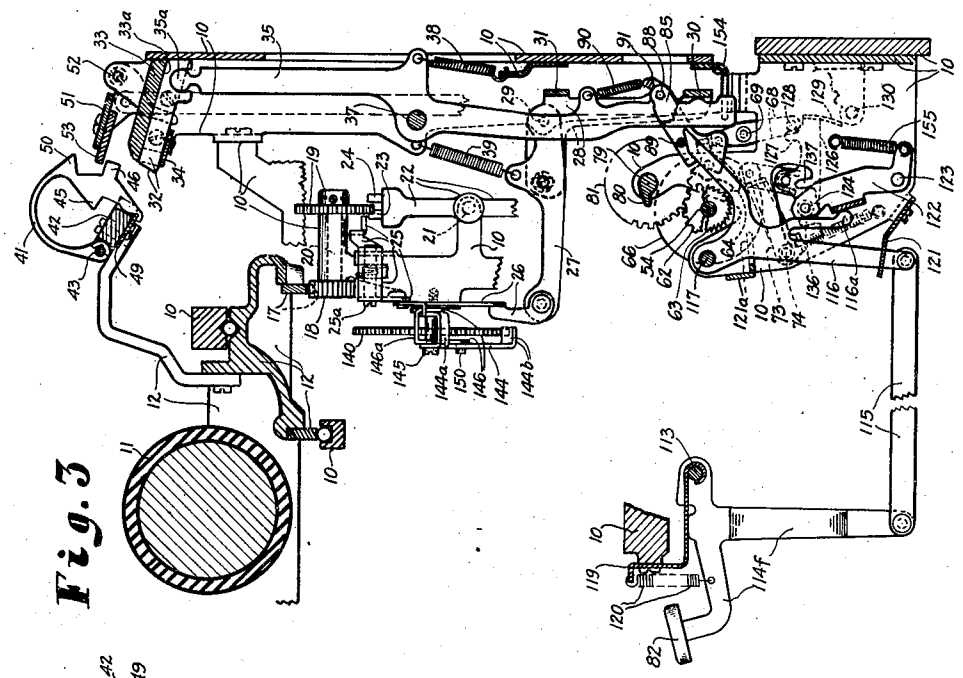


Fig. 3

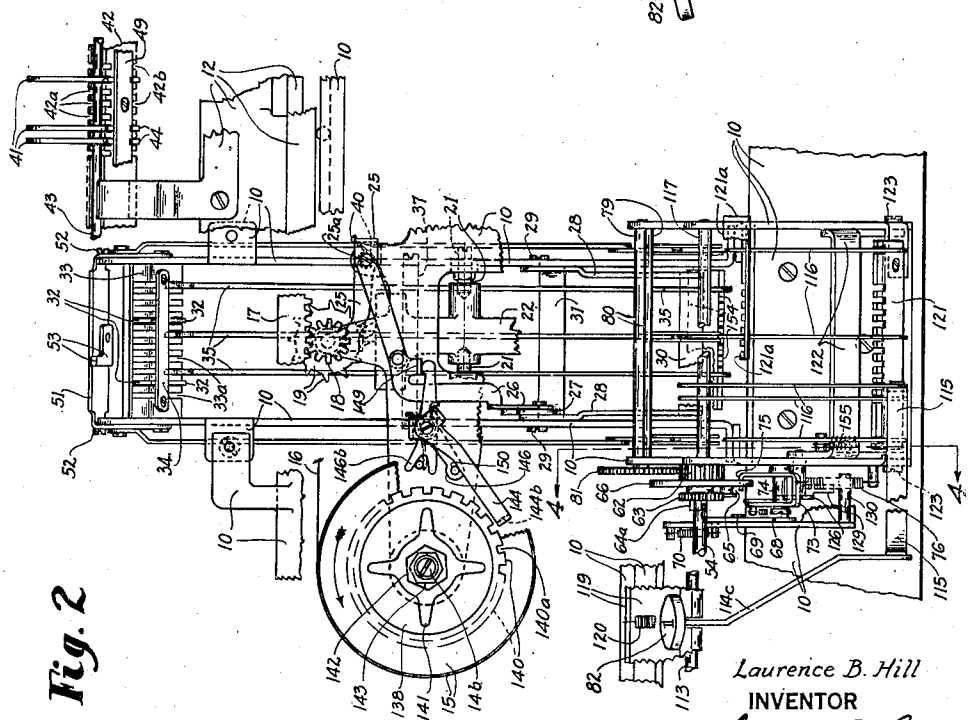


Fig. 2

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POWER OPERATED PRINTING MACHINE

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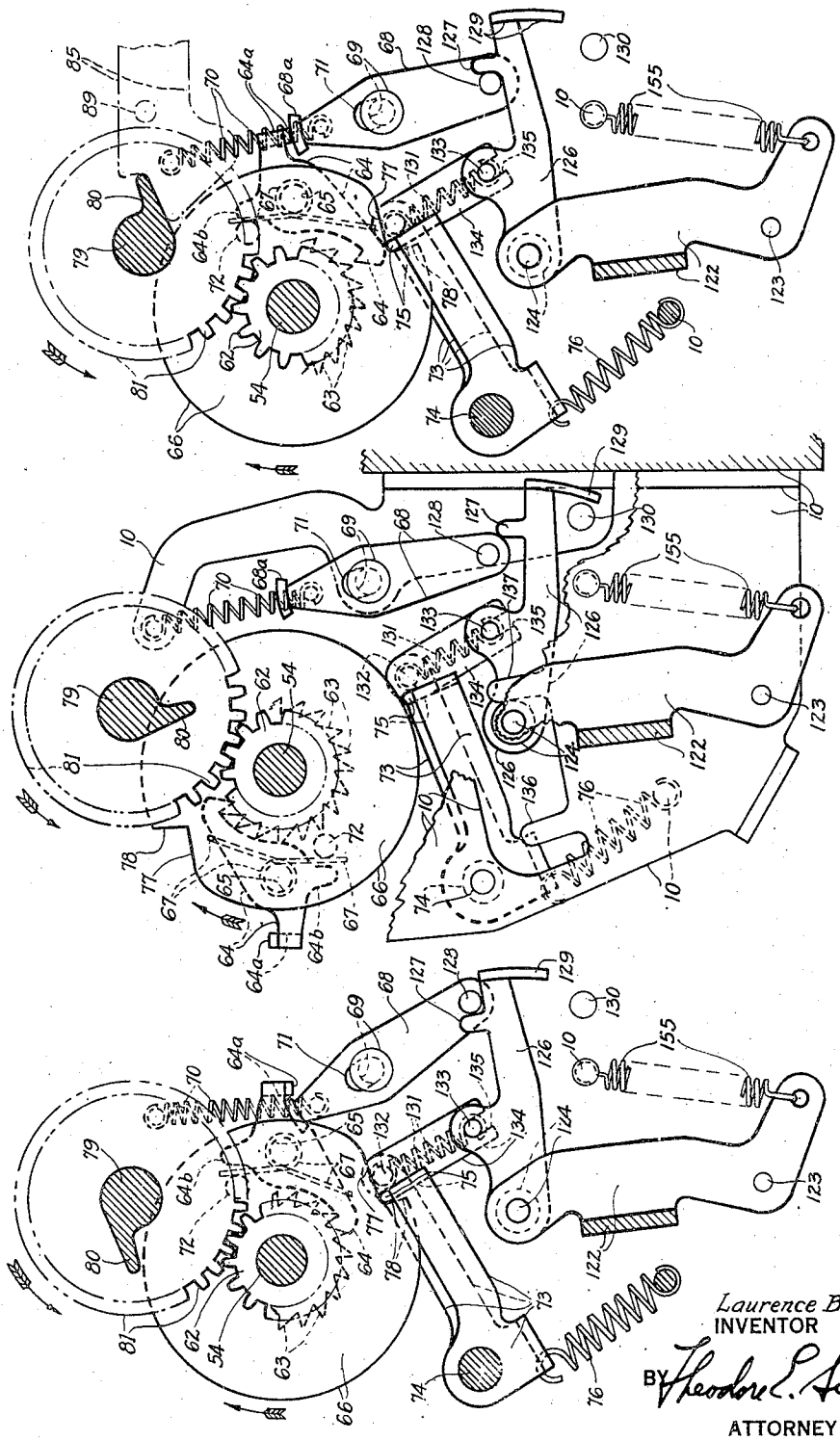


Fig. 6

Fig. 5

Fig. 4

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POWER OPERATED PRINTING MACHINE

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Fig. 8

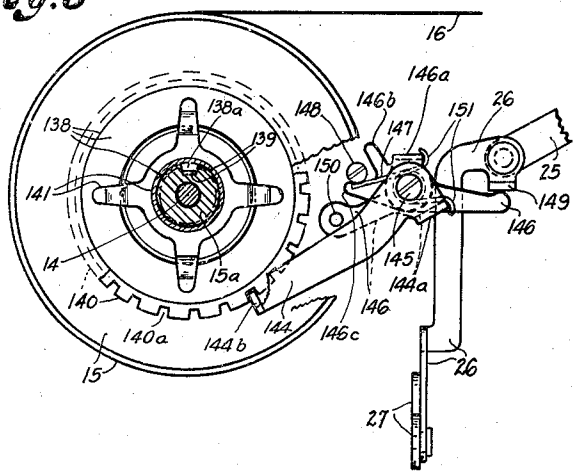


Fig. 7

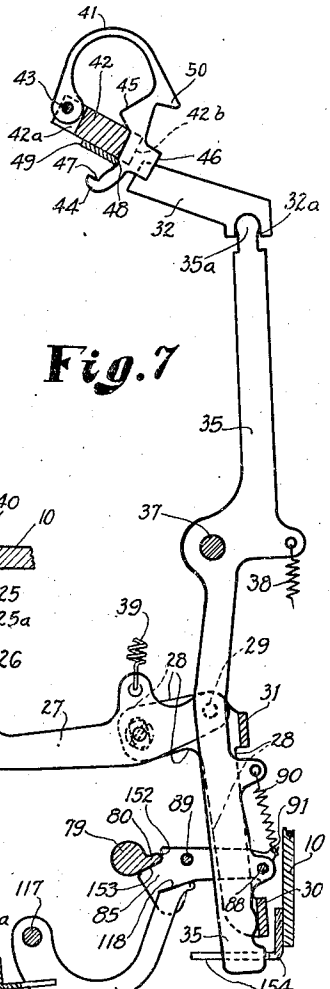


Fig. 9

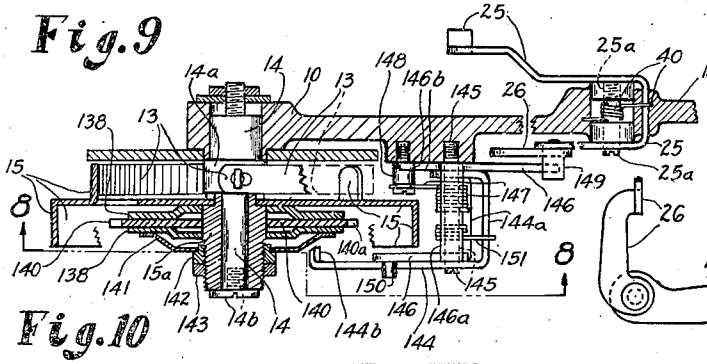


Fig. 10

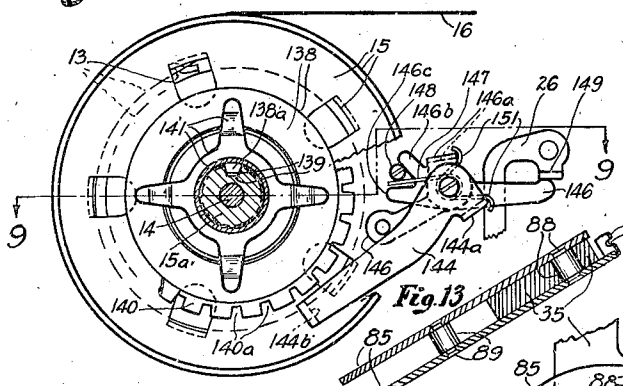


Fig. 13

Fig. 11

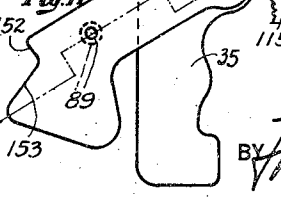
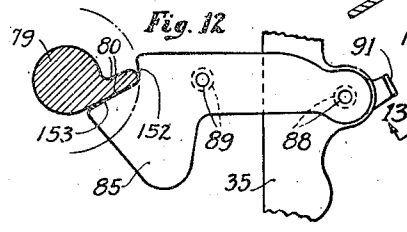
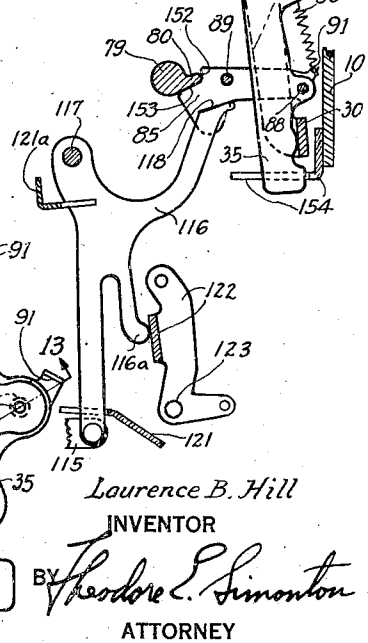


Fig. 12





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POWER OPERATED PRINTING MACHINE

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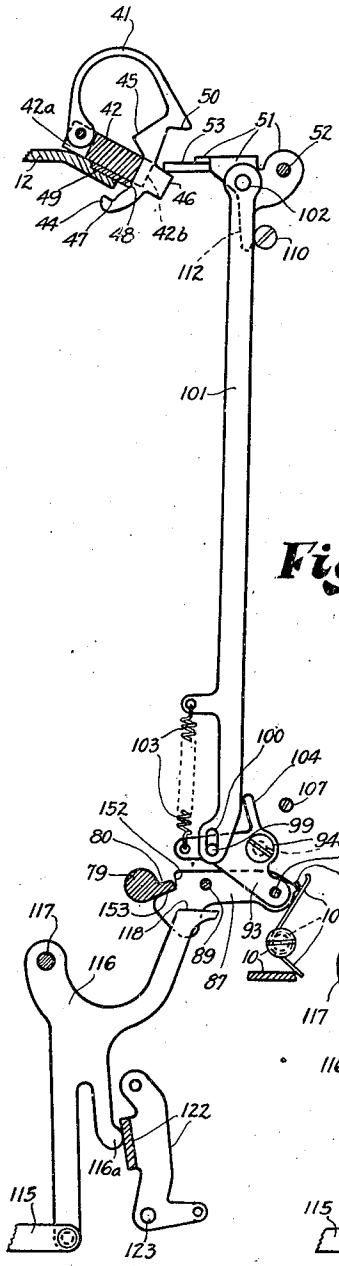


Fig. 16

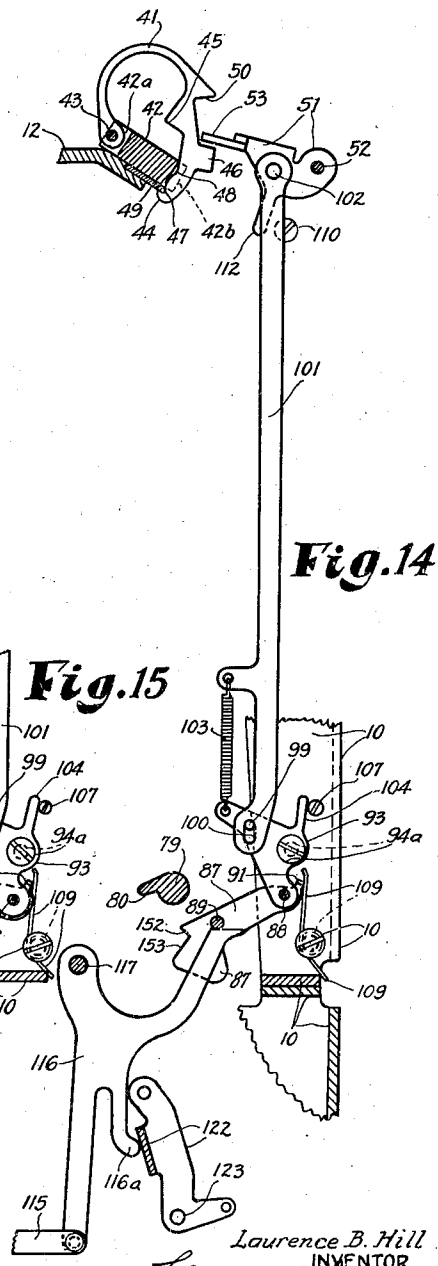


Fig. 14

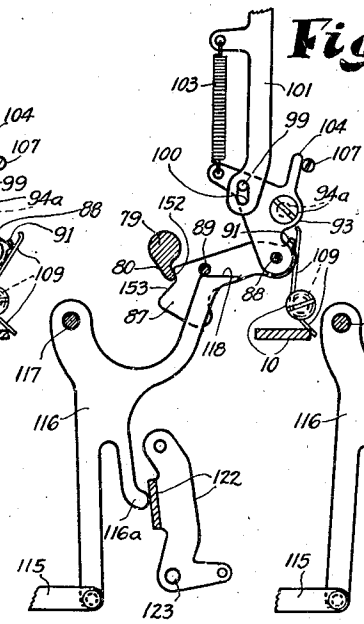


Fig. 15

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POWER OPERATED PRINTING MACHINE

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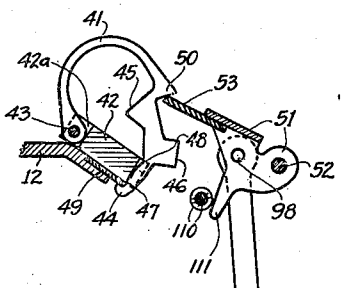


Fig. 17

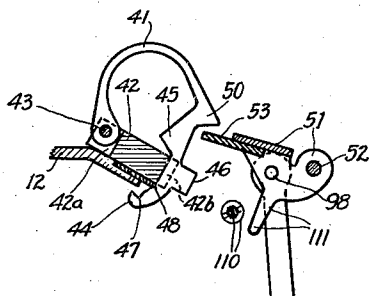


Fig. 19

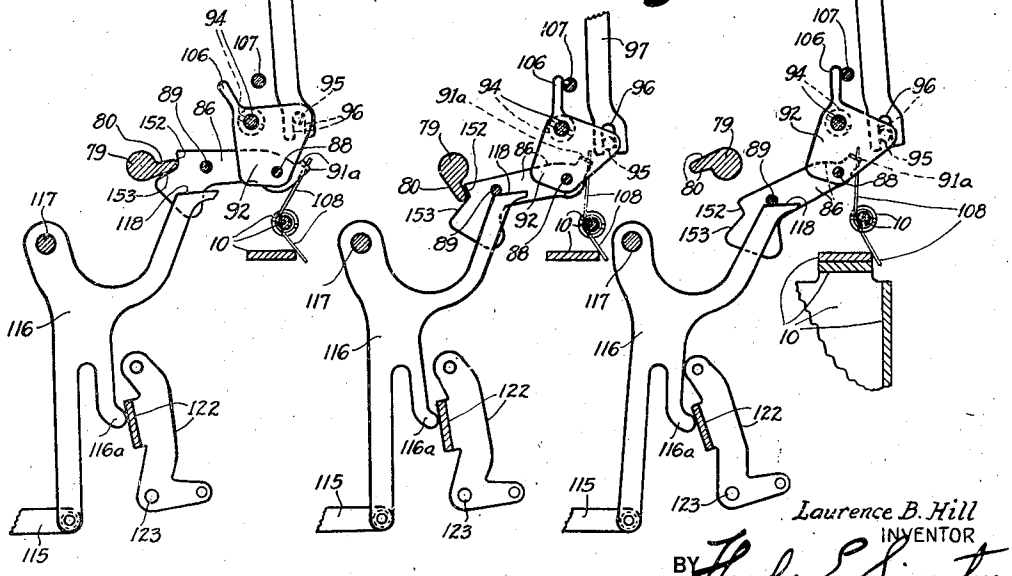


Fig. 18

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Patented Aug. 9, 1949 2,478,630

UNITED STATES PATENT OFFICE

2,478,630

POWER-OPERATED PRINTING MACHINE

Laurence B. Hill, Syracuse, N. Y., assignor to L. C. Smith & Corona Typewriters, Inc., Syracuse, N. Y., a corporation of New York

Application April 14, 1945, Serial No. 588,351

7 Claims. (Cl. 197—17)

1

The invention relates to improvements in power operated printing machines, the general purpose of the invention being to provide an improved power mechanism for actuating one or more elements of such printing machines as typewriting machines, listing or printing calculating machines, and the like. Such printing machines commonly include provisions for facilitating the printing of matter in tabular form, and a further purpose of the invention is to provide improved power actuated tabulating means suitable for such machines.

Another purpose of the invention is to provide an improved key-controlled power mechanism for actuating an operation effecting element of the machine in response to opposite strokes of the control key.

Another purpose of the invention is to provide an improved power mechanism wherein actuation of each of a plurality of operation effecting elements by a common power driven actuator is effected.

Another purpose of the invention is to provide a simple and efficient power mechanism for moving an operation effecting element in either of two opposite directions from a normal position and restoring said element to normal position.

Other purposes and advantages of the invention will appear from the following description of the embodiment of the invention in a tabulating mechanism for a typewriting machine shown in the accompanying drawings.

In the drawings:

Figure 1 is a fragmentary top plan view of a typewriting machine in normal idle condition equipped with the improved power mechanism, certain parts being broken away and others omitted for clarity of illustration of features of the power mechanism, and only so much of the known features of the machine being shown as is required for a clear understanding of the improvements;

Figure 2 is a fragmentary front elevation of the power mechanism in its normal idle condition with certain elements omitted and others broken away for clarity of illustration of features of the mechanism;

Figure 3 is a vertical sectional view on the line 3—3 of Figure 1, with the parts in normal idle condition;

Figures 4, 5 and 6 are detail vertical sectional views on the line 4—4 of Figure 2 showing certain parts of the mechanism in different stages of activation thereof;

Figure 7 is a detail sectional view similar to

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Figure 3, but showing one of the frame-carried tabulator stops being held in its set or active position;

Figure 8 is a detail sectional view on the line 8—8 of Figure 9, showing the carriage braking means in active condition;

Figure 9 is a detail sectional view on the line 9—9 of Figure 10;

Figure 10 is a view similar to Figure 8, showing the carriage braking means in its normal inactive condition;

Figures 11 and 12 are detail views taken on the line 3—3 of Figure 1, showing respectively in normal and fully shifted positions, and on an enlarged scale, one of the set of operation effecting elements and its associated interponent which are operative by the rotative actuator to selectively actuate the frame-carried tabulator stops;

Figure 13 is a sectional view on line 13—13 of Figure 11;

Figure 14 is a detail sectional view on line 14—14 of Figure 1, showing the setting and unsetting means for the carriage-carried tabulator stops in normal position with one of the stops unset to its inactive position;

Figures 15 and 16 are views similar to Figure 14, showing successive stages of the operation of the mechanism to set a carriage-carried stop in its active position of Figures 7, 16 and 17;

Figure 17 is a detail sectional view on line 17—17 of Figure 1, showing the setting and unsetting means for the carriage-carried tabulator stops in normal position with one of the stops set in its active position; and

Figures 18 and 19 are views similar to Figure 17 showing successive stages of the operation of the mechanism to unset a carriage-carried stop to its inactive position of Figures 2, 3, 14 and 19.

The known features of the machine will first be described. The stationary framework or main frame designated as a whole by the numeral 10 supports the working parts of the machine. The usual roller platen 11 is journaled in the platen carriage 12 which is mounted as usual on the frame to travel back and forth transversely of the machine. The carriage is urged from right to left by the usual motor spring 13 attached at one end to and wound about a stationary stub shaft 14 held to the framework, the other end of the spring being attached to the spring-driven drum 15. The draw band 16 is wound about the drum, and is attached at one end to the drum and at the other end to the carriage to constantly exert a pull toward the left on the carriage. The hub 15a of the drum is confined between an external

collar 14*a*, formed on the stub shaft 14, and the head of a screw 14*b* threaded into the forward end of the stub shaft.

The usual feed rack 17 is rigidly fixed to the carriage and extends transversely of the machine in mesh with the feed pinion 18. The feed pinion and the escapement ratchet wheel 19 are fixed on a shaft 20 journaled in framework 10. Pivoted on the framework at 21 is the escapement dog rocker 22 carrying the escapement dogs 23 and 24 which coact alternately with wheel 19 to letter space the carriage when the rocker 22 is actuated by known means not shown. Dog 23 is normally engaged with wheel 19 and is movable relatively to the rocker 22 to free the carriage from control of the dogs for running or jumping tabulating movement of the carriage from right to left.

To move the dog 23 relatively to the rocker to release the carriage for tabulating movement, there is provided the known bellcrank lever 25 pivoted on framework 10 at 25*a*, with one arm of the lever overhanging the dog 23 in the normal position of the dog rocker, and with the other arm of the lever connected by the link 26 with an arm 27 which is adjustably held by known means to rock in unison with an escapement release bail. The known bail has its side arms 28 pivoted at 29—29 on the frame to swing fore and aft of the machine and is located substantially medially of the right and left hand sides of the machine. The side arms of the bail are connected at their lower ends by a cross bar 30 and are also connected adjacent their upper ends by a stiffening or reinforcing bar 31.

Ten fore and aft slidable decimal tabulator stops 32 (only some of which are shown) are mounted on the framework 10 adjacent the rear of the machine substantially medially of the sides of the machine and are arranged side by side as usual for arresting the carriage at either of ten immediately successive letter space positions depending upon which one of said stops is projected to active position. Stops 32 are reciprocal substantially fore and aft of the machine in ten slots 33*a* formed in a block 33 forming part of the stationary framework of the machine, the stops being held up in the slots by a retaining bar 34 held to block 33. These stops, as will appear hereinafter, serve as counterstops for carriage-carried stops 41 later described.

Ten upstanding operating levers 35 are provided for sliding the stops 32 to their inactive and active positions, each lever 35 being positively connected with a different stop, and the levers being guided in a comb 154 fixed to framework 10. The stops in their inactive positions abut, as shown, at their rear ends a part of framework 10 which serves to limit retraction of the stops. Each lever 35 has a rounded upper end portion 35*a* rockably seated in a notch 32*a* in its associated stop, portions 35*a* being guided in the slots 33*a* in block 33, and all of the levers 35 being loosely pivoted intermediate their ends on a horizontal pivot rod 37 fixed to framework 10, and extending transversely of the machine. Springs 38 are connected to the levers 35 and to framework 10 to constantly urge the upper arms of the levers toward the rear of the machine and to normally yieldingly hold the stops 32 retracted to inactive position. A spring 39 is connected with framework 10 and with arm 27 to normally yieldingly hold the cross-bar 30 of the bail 28—30—31 against the rear edges of levers 35 adjacent the lower ends of the levers and to yieldingly hold the bellcrank lever 25 slightly out of contact with escapement dog 23. A light torsion spring 40 is connected with the framework 10 and bellcrank lever 25 to assist in restoring said lever to and holding it in its normal inactive position.

When either of the levers 35 is rocked in opposition to the pull of its return spring to project its associated stop 32 from inactive to active position, the bail will be rocked to actuate the bellcrank lever 25 to move escapement dog 23 out of engagement with escapement wheel 19 and thereby free the carriage for a running or jumping movement thereof to the left under the pull of motor spring 13.

A set of carriage-carried tabulator stops 41 (only some of which are shown) are provided for coaction with the frame-carried counterstops 32 to arrest tabulating travel of the carriage, there being one of the stops 41 for each letter-spaced printing position of the carriage. A tabulator stop carrying bar 42 is held to the carriage and extends transversely of the machine. Stops 41 are pivoted at one end on a rod 43 extending across guide slots 42*a* in the front edge of bar 42, and the other ends of the stops extend through guide slots 42*b* in the rear edge of bar 42. Each stop 41 has a projection 44 for arresting upward swinging of the stop when the stop reaches an inactive position, and a projection 45 for arresting downward swinging of the stop when the stop reaches its active position. Each stop 41 has a rearwardly projecting nose or lug 46 affording an abutment for engagement with the right hand side of a projected counterstop 32 to arrest the carriage if said stop 41 is set in active position. Lugs 46 of stops 41 will pass any retracted counterstop 32 in both the active and inactive positions of the stops 41 and will pass any projected stop 32 in the inactive position of stops 41. Each stop 41 has two small notches 47 and 48 for coaction with the rear edge of a thin bar 49 (held to the stop bar 42) to yieldingly latch the stop in inactive and active positions respectively, each said stop being slightly resilient to permit spreading of its ends apart when the stop is forcibly rocked about the pivot rod. Each stop 41 has a second rearwardly projecting nose or lug 50 above lug 46.

As is usual in machines having two sets of tabulating stops such as above described, each of the carriage-carried tabulating stops 41 is left set or releasably latched in either its active or inactive positions, one or more of the stops 41 being left in active position for the printing of a particular tabular arrangement of matter and the remaining ones being left in inactive position. For selective positioning of the stops 41 in any desired grouping of actively and inactively positioned stops, there is provided the known stop position changer or shifter which comprises a yoke 51 pivoted at 52 on the framework 10 for rocking thereof about a horizontal axis extending transversely of the machine, said yoke having a forwardly projecting stop-shifting finger or projection 53 located substantially medially of the sides of the machine and of such width transversely of the machine that in each letter spaced position of the carriage, said finger is interposed between the two projections 46 and 50 of a different one of the stops 41. The stop shifter 51—53 is shiftable in opposite directions from a normal intermediate position to shift a stop 41 registered therewith either to inactive or to active position and to return to the normal position of the shifter and leave the shifted stop in its shifted position.

The foregoing described parts of the machine are known. The improvements whereby the escapement release means, the stops 32 and the stop shifter 51—53 for stops 41 are moved by mechanical power will now be described, and there will also be described an improved braking means for retarding or controlling tabular movements of the carriage and improved means whereby said braking means are applied and released by mechanical power.

A main power shaft 54 extends horizontally across the machine adjacent the rear and bottom of the main framework 10, said shaft being journaled in the framework 10 and being constantly rotatively driven while the machine is in use. The driving means for shaft 54 comprises an electric motor 55 stationarily mounted in framework 10, a short countershaft 56 journaled in framework 10, pulleys 57 and 58 fixed respectively on the drive shaft of the motor and on the countershaft, a drive belt 59 connecting the pulleys, and meshing gears 60 and 61 fixed respectively on shafts 56 and 54, the motor being constantly energized from a suitable source of electric current when the machine is in use.

Loose on the main drive shaft 54 is a pinion or gear 62 which is connective at will with shaft 54 through a single revolution clutch mechanism to turn with shaft 54 through one revolution from a normal latched position of said pinion 62. This single revolution clutch mechanism is adapted to be put into action, or be tripped to couple pinion 62 with shaft 54, through depression of either one of a plurality of control keys hereinafter described.

The driving element of the clutch is a ratchet wheel 63 fixed to shaft 54, and the driven element of the clutch is a dog 64 normally held disconnected from the ratchet wheel. Dog 64 is pivoted at 65 to a disk 66 which is loose on shaft 54 and is coaxial with and fixed to the pinion 62. A torsion spring 67 is connected with the dog and disk to constantly bias the dog to engage the teeth of the ratchet wheel for driving of the pinion 62.

For tripping the clutch for biased driving engagement of the clutch elements, and for disengaging the clutch elements and arresting the driving element and pinion 62 when the latter has rotated 360 degrees, there is provided a clutch tripping and clutch disengaging lever 68 which is rockable about a fixed pivot 69 held to framework 10. The pivot 69 extends through a short longitudinal slot 71 in lever 68. A spring 70 is connected with framework 10 and the upper arm of lever 68 to urge the lever to and yieldingly hold it in the normal position shown in Figures 1 to 3 and Figures 5 and 6, in which pivot 69 is engaged with the lower end wall of slot 71.

In the normal disengaged condition of the clutch, the dog is held rocked about its pivot against the force of spring 67 into a position in which the nose of the dog is out of the path of travel of the teeth of the ratchet wheel 63, a lug 64*a* on the tail of the dog is seated on top of a lug 68*a* on the upper end of lever 68, and a stop lug 64*b* on the dog is engaged behind a stop pin 72 projecting laterally from disk 66. The force of spring 70 is sufficient to overcome the force of spring 67, but spring 70 is adapted to stretch momentarily to permit lever 68 to be momentarily driven downward by dog 64 at the end of each cycle of engagement of the clutch to cushion the shock of arrest of the dog by the lever and to insure complete separation of the dog from the ratchet wheel 63 while the dog is held against rotation by lever 68.

Reverse rotation of pinion 62, disk 66 and the clutch dog 64 about shaft 54 in the normal disengaged condition of the clutch is prevented by a U-shaped latch lever 73 journaled on a fixed pivot 74 held to framework 10. One rearwardly extending arm of lever 73 is formed with a laterally extending lug 75 opposed to and constantly urged toward the periphery of the disk 66 by a spring 76 which is connected to said lever and to the framework 10. The disk is provided with a peripheral notch one side of which affords a cam surface 77 and the other an abrupt shoulder 78. The lug 75 of latch lever 73 is normally engaged behind the shoulder 78 to hold the disk against accidental reverse rotation or reverse rotation by the force of the clutch dog spring 67. It will be observed, therefore, that the pinion 62 is normally releasably held in a predetermined angularly rotated position.

The pinion 62 is adapted to drive a rotative but normally stationary actuator. This actuator consists of a short horizontal shaft 79 which is journaled in framework 10 and is formed with a single longitudinal and straight fin or blade 80 which extends substantially the full length of the shaft and projects from the shaft a short distance in a plane substantially tangential to the shaft. The actuator is located substantially medially of the sides of the machine and is parallel to and located slightly above and to the rear of the main drive shaft 54. A pinion 81 is fixed on one end of the shaft 79 and meshes with pinion 62, the ratio of the pinions 62 and 81 being such that the actuator is rotatively driven through one-half of one revolution per each single revolution of pinion 62.

As hereinbefore described, the machine shown is provided with a group of the stops 32 arranged for decimal tabulation, but it will be obvious that a single stop 32 or a number less than 10 may be employed. In the machine shown, ten control keys 82 are provided for stops 32, one for each stop, and two additional control keys 83 and 84 are provided for the shifter or positioner 51—53 which moves the stops 41 carried by the platen carriage. These twelve control keys are arranged in the keyboard of the machine at the rear of the type control keys (not shown) to extend in a straight horizontal row across the machine with keys 83 and 84 at opposite ends of said row of twelve control keys. Depression of any one of these control keys will, through the means hereinafter described, cause the single revolution clutch to cycle to rotate the actuator 79—80 through one-half of one revolution from a normal position of the actuator, and restoration of the depressed key will cause the clutch to cycle to rotate the actuator through the second half of a revolution, thus restoring the actuator to its normal position. The normal position of the actuator with neither of the twelve control keys depressed is that shown in Figures 1 to 4 and Figures 14 and 17.

The actuator 79—80 is adapted to actuate the stops 32 and the shifter or positioner 51—53 for stops 41 selectively through the medium of twelve selectively settable interponents or couplers. Ten interponents 85, one for each stop 32, are provided, and two additional interponents 86 and 87 for the shifter 51—53 are provided in the machine shown. The twelve interponents are normally out of the path of movement of the actuator and are arranged for selective position-

ing thereof for movement by the actuator. Each interponent comprises two flat plates rigidly held together in spaced relation by two shouldered pins 88 and 89, the reduced ends of the pins passing through the plates and being peened over to lock the plates and pins together, as best shown in Figures 11 to 13.

Each interponent 85 is pivoted to and extends forwardly from the pendent arm of a different one of the levers 35, the pivot pin 88 of the interponent passing through a pivotal bearing hole in the lever with the side plates of the interponent contacting opposite side faces of the lever to guide the interponent. A light spring 90 is preferably connected with each lever 35 and with a lug 91 on the associated interponent 85 to urge the forward end of the interponent downward.

The interponents 86 and 87 are pivoted through their pivot pins 88 respectively to levers 92 and 93. The levers 92 and 93 are pivoted to framework 10 by axially aligned pivots 94 and 94*a* to rock about a common axis which extends horizontally transversely of the machine. A pin 95 is fixed to lever 92 behind this axis and is engaged in a longitudinal slot 96 in an upstanding link 97 which is pivoted at its upper end at 98 to the left hand side arm of the yoke-like stop shifter 51—53. A pin 99 is fixed to lever 93 forward of said axis and is engaged in a closed longitudinal slot 100 in an upstanding link 101, which link is pivoted at its upper end at 102 to the right hand side arm of the yoke-like stop shifter 51—53. Levers 92 and 93 are in effect bellcrank levers.

The stop shifter 51—53 is urged to, and yieldingly held in, a normal position thereof shown in Figures 2, 3, 14 and 17 by a spring 103 connected with link 101 and with the forward end of lever 93. A torsion spring 108 is connected with framework 10 and with lug 91*a* of interponent 86 to urge the forward end of the interponent downward and also to rock lever 92 to normally hold a stop lug 106 on the lever pressed rearward against a limit stop 107 on framework 10. Lug 91*a* extends leftward from the left hand side plate of interponent 86 but is otherwise similar to lugs 91 of the remaining interponents. A torsion spring 109 is engaged with framework 10 and with the lug 91 of interponent 87 to urge the forward end of this interponent downward and also to rock lever 93 to normally hold a stop lug 104 on the lever pressed rearward against the limit stop 107 on framework 10. A limit stop 110 on framework 10 is engageable by lugs 111 and 112 on the side arms of stop shifter 51—53 to limit rocking of the shifter in opposite directions from the normal intermediate position of said shifter. Normally the springs 103, 108 and 109 yieldingly maintain the levers 92 and 93 and the stop shifter in an idle condition in which the pin 99 is located at the closed upper end of the slot 100, the pin 95 is located midway between the upper and lower ends of slot 96, and the stop shifter is located in its intermediate inactive position shown in Figures 2, 3, 14 and 17.

Each of the twelve control keys (the ten keys 82 and the two keys 83 and 84) is a part of a different one of twelve similar operating trains, each of which trains is manually movable by pressure on its key from a normal position to which the train is biased to return when pressure is released on the key. The keys are fixed to the forwardly extending arms of twelve bellcrank key levers fulcrumed on a horizontal pivot rod 113 held to, and extending transversely from, the framework 10. The twelve control keys are held to twelve key levers 114*a* to 114*l*. The pendent arms of the key levers are bent inwardly toward the fore and aft medial vertical plane of the machine, and links 115 connect the lower ends of the key lever arms with the lower ends of the pendent arms of the twelve identical bellcrank levers 116.

The levers 116 are fulcrumed on a horizontal pivot rod 117 held to, and extending transversely of, the framework 10 slightly forward of shaft 54. Each lever 116 has a rearwardly and upwardly extending arm provided with an elongate upwardly facing end edge 118 normally located under and engaged by the pin 89 of the interponent to be moved by the lever, said arm of each lever being loosely engaged between the side plates of the associated interponent. The key levers are guided in slots in a comb 119 fixed to framework 10 and normally abut the bottom face of the comb forward of the slots as indicated in Figures 1 to 3. Return springs 120 for the twelve key operated trains are connected with comb 119 and the key levers. The levers 116 are spaced by and guided in combs 121 and 121*a* fixed to framework 10.

Depression of either one of the twelve control keys not only positions its associated interponent for actuation by the actuator 79—80 but also actuates a universal control means for the single revolution clutch, which control means is spring actuated or restored upon return of the depressed key and causes a complete cycle of operation of the single revolution clutch to take place both when a control key is depressed and when the key is released. The universal actuator 79—80 is thus rotated through the first half of a revolution whenever one of the control keys is depressed and completes the revolution whenever the depressed control key is released. This control means will now be described.

An upstanding bail 122 is located immediately behind the pendent arms of the group of twelve bellcrank levers 116. This bail has its side arms pivoted to the main framework 10 at 123—123 and is normally urged forward by a return spring 155 connected with the bail and the framework. The pendent arm of each lever 116 has at the rear thereof a finger 116*a* engageable with the crossbar of the bail 122 to rock the bail rearwardly upon depression of the lever actuating control key, fingers 116*a* being permanently bendable fore and aft of the machine for adjustment.

A pivot stud 124 fixed to the upper end of the left hand side arm of the bail projects leftward through a clearance slot in an adjacent part of framework 10 and pivotally supports the forward end of a rearwardly extending control arm 126 which is movable in response to rocking of the bail 122 and rotation of the disk cam 66 as hereinafter described. Projecting upward from the upper end of control arm 126 near the rear end of the arm is an upstanding lug or projection 127 coactive with a laterally extending pin or projection 128 held to clutch lever 68 near the lower end of the latter to rock lever 68 in one direction from clutch disengaging position when a control key is depressed and in the opposite direction from clutch disengaging position when the depressed control key is released. Extending laterally from and pendent

from the rear end of arm 126 is an arcuate lug 129 coactive for safety purposes as hereinafter explained with a pin 130 fixed to the frame.

A light spring 131, of less force than latch spring 76, extends downward from a stud 132 on the rear end of the left hand arm of latch 73 to a stud 133 on control arm 126 at the rear of the pivot 124 of arm 126 to normally hold the upper edge of arm 126 engaged under pin 128 on clutch lever 68. A push link 134 pivoted at its upper end on stud 132 has at its lower end a longitudinal slot 135 in the upper end of which stud 133 is normally held engaged by spring 131. Cam edge 77 of disk 66 is adapted to depress the rear end of latch lever 73 far enough to depress arm 126 about its pivot 124 to lower lug 127 far enough for pin 128 on lever 68 to pass over the top of lug 127. The bail is restored by spring 155 to the normal position shown in Figures 1, 2, 3, 14 and 17 from the key driven position of the bail shown in Figures 4, 5, 6, 7, 15, 16, 18 and 19. Permanently adjustably bendable stop lugs 136 and 137 are formed on a sheet metal part of the framework 10 for engagement by stud 124 to arrest rocking of the bail 122 at its normal and key-driven limits of motion.

A power actuated carriage braking means is provided, said means being effective to frictionally retard tabulating movements of the carriage and to frictionally resist rebound of the carriage when a tabulating movement of the carriage is arrested. The carriage brake is applied automatically whenever one of the ten control keys for stops 32 is depressed, and the brake is automatically released when the depressed control key is released.

A pair of metallic brake disks 138 are mounted on hub 15a of drum 15 to turn with the drum and slide axially of the drum, each of said disks being formed with a lug or key 138a engaged in and slidable along a keyway or groove 139 formed in and extending longitudinally of hub 15a. A rigid or substantially rigid friction disk 140 of fiber or other suitable material having a high coefficient of friction is loosely mounted on hub 15a between the disks 138 to permit disk 140 to slide axially of the drum and to permit the drum to rotate relatively to disk 140 when the latter is locked against rotation. A spring 141 in the form of a resilient metallic spider bears against the forward one of the disks 138 and constantly holds the three disks pressed together with the rear one of the disks 138 abutted against the drum. The spider is centered and seated on an annular boss on the adjusting nut 142 which is threaded on the hub 15a. By adjusting nut 142, the pressure with which the three brake disks are held engaged may be varied. A lock nut 143 threaded on the hub 15a retains the adjustment.

The frictional engagement between the three disks normally causes disk 140 to rotate with the drum, and power means are provided to lock the disk 140 against rotation in both directions whenever one of the control keys for stops 32 is depressed and to unlock said disk when the depressed key is released, said power means normally leaving disk 140 unlocked. The disk 140 has a plurality of closely spaced locking notches 140a formed in its periphery, the side walls of each notch being substantially parallel or only slightly divergent and extending substantially radially of the disk.

A locking arm 144 is formed at one end with a yoke-like portion 144a pivoted on a pivot pin 145 fixed to framework 10, said arm being formed at its free end with a rearwardly bent locking lug 144b arranged to engage edgewise in one of the notches 140a in disk 140 and corresponding in thickness with the narrower inner end portion of the notch. Movements of arm 144 to lock and unlock disk 140 are controlled by a lever 146 having a yoke-like intermediate portion 146a pivoted on pin 145 and stop lugs 146b and 146c. A torsion spring 147, wrapped around pin 145 and engaged with the yoke-like portion 146a of the lever 146 and with a pin 148 fixed to framework 10, normally holds the lever 146 rocked to a brake release position in which lug 146b is engaged with pin 148 as shown in Figures 2 and 10.

Brake applying rocking movement of the lever 146 is arrested by engagement of lug 146c with pin 148 as shown in Figure 8. Lever 146 is rocked to brake applying position by a lug 149 which is formed on and projects forwardly from the upper end of the link 26 which actuates the bellcrank 25 to release and restore the carriage escapement. Lug 149 overhangs the right hand arm of lever 146, and a pin 150 projects forward from the left hand arm of said lever and engages over the locking arm 144 between the pivoted and free ends of the locking arm. A torsion spring 151, wrapped around pin 145 and engaged with the yoke-like portion 144a of the locking arm 144 and the yoke-like portion 146a of lever 146, normally yieldingly holds the arm against pin 150 on the lever and yieldingly constrains the arm to rock with the lever. If lever 146 should be moved to brake applying position when no notch 140a is opposite lug 144b, the lug will ride on the periphery of the disk 140 until a notch 140a arrives opposite lug 144b, whereupon spring 151 will force the lug into the notch. The described arrangement prevents temporary blocking of power movement of link 26 when no notch 140a is positioned to receive lug 144b on a power down pull on link 26.

Operation

From the foregoing description of the various parts of the improved machine it will be obvious that the rotative actuator 79—80 rotates from a normal stationary position through the first half of a complete revolution when any one of the twelve control keys is depressed and remains stationary until the depressed key is released; and that thereafter said actuator rotates through the second half of a complete revolution when the depressed key is released and remains in its original and normal position until the same, or another, control key is depressed. It will also be obvious that twelve interponents (ten interponents 85, an interponent 86 and an interponent 87) are provided, each associated with a different control key for positioning thereof by key depression for actuation thereof by the rotative actuator.

Before describing the power actuation of the key-selected one of the interponents, a common feature of all of the twelve interponents not hereinbefore specifically described will be pointed out. The two side plates of each interponent are recessed at its top from its free forward end to provide forwardly facing shoulders 152, and also to provide upwardly facing shoulders or edges 153 extending forwardly from the lower ends of shoulders 152 to the forward ends of the interponents. At this point, it might also be pointed out that the fin or blade portion of the actuator

need not necessarily be disposed tangentially to the shaft portion of the actuator.

At the half-step rotated position of the actuator, the upper end of the shoulder 152 of the actuated interponent (and, preferably, also the lower end of said shoulder) is above a straight line through the axes of the actuator and pivot 88 of the interponent. The shoulders 152 and 153 of the interponents are so shaped that, in this position of the actuator, the shoulders 152 abut the then rearwardly directed edge of the fin portion of the actuator and curve about the axis of the actuator concentrically with said axis so as not to obstruct the second half of the revolution of the actuator while still locking the actuated interponent against return movement by a toggle-like action as long as the actuator remains in its half-step rotated position. The shoulders 153 of the interponents are preferably so shaped and related to the shoulders 152 that shoulders 153 of the actuated interponent abut fin 80 of the actuator at the half-step rotated position of the actuator. These features of the interponents and actuator are, perhaps, best shown in Figure 12, from which it will also be noted that the outer edge of fin 80 of the actuator is preferably rounded.

It will be noted that the part or lever to which the actuated interponent is pivoted is moved by the actuator and interponent with an action similar to that of a crank and a pitman which automatically connect to drive said part or lever, and which stop on dead center, or slightly past dead center, to hold the part or lever against biased return movement until the actuator and interponent are subsequently disconnected, the actuator resembling the crank and the interponent resembling the pitman.

To move a selected one of the ten stops 32 from inactive to active position and hold it there, the associated one of the ten keys 82 is depressed and held depressed, and to permit the actively positioned stop to return to its normal inactive position the depressed key is released.

When the selected one of the keys 82 is depressed and held depressed, the following actions take place. The selected one of the ten interponents 85 is rocked upward from the position shown in Figure 3 into a position for actuation thereof by the actuator 79—80, this latter position corresponding to the key-set position of the interponents 86 and 87 shown in Figures 18 and 15 in which shoulder 152 is raised into the path of rotation of fin 80 of the actuator. Setting of the interponent by depression of the selected key 82 causes the interponent setting lever 116 not only to lift the forward end of the selected interponent, but also rock the universal control bail 122 rearwardly from the normal position thereof shown in Figure 3, thus causing lug 127 on clutch control arm 126 to rock clutch disengaging lever 68 to the position shown in Figure 4, to permit the clutch elements 63 and 64 to engage under the influence of spring 67. During the initial portion of the ensuing single revolution of the driven clutch element and of the disk 66 and pinion 62, cam edge 77 of disk 66 moves the clutch latch lever 73 and link 134 downward, thereby rocking the clutch control arm 126 downward about its pivot 124 into the position shown in Figure 5, in which position, said control arm is held until the disk completes or substantially completes one revolution. In this depressed position of the control arm 126, the lug 129 thereon is engaged behind pin 130 to prevent return of the bail 122 even though the depressed control key be released before the first single cycle of revolution of the clutch is completed. Depression of the control arm, however, carries lug 127 thereon down far enough to permit pin 128 to pass forwardly thereover and permit clutch disengaging lever 68 to immediately reassume its normal position before disk 66 completes its revolution, as shown in Figure 5, so that lever 68 is immediately repositioned to disengage the clutch at the end of a single revolution of the driven clutch element. When this revolution is completed, the latch lever 73 will rock upwardly to lock the driven clutch element against reverse rotation, and arm 126 will rock upwardly to position lug 127 behind pin 128 on lever 68, as shown in Figure 6. It will be understood that the depressed key 82 should be held depressed until a stop 41 on the carriage has engaged the activated stop 32. After this stop engagement, with resultant arrest of the tabular travel of the carriage, has occurred, the depressed key is released, permitting spring 155 to rock the universal bail 122 forward to its normal position. This restoration of bail 122 causes lever 68 to be rocked by arm 126 and lug 127 from its normal position to again free the clutch for a second revolution of its driven element, the lever 68 rocking in a direction opposite to that in which it was rocked by rearward movement of the bail. If the depressed key 82 should be released prior to arrest of the carriage, the second revolution of the clutch will occur immediately upon completion of the first revolution, so that the actuator 79—80 will always be in normal position when no control key is depressed, since it will be noted that lug 129 and pin 130 prevent return of the bail to normal position until after the clutch has first completed one revolution so that the clutch will always be released once for each depression and once for each release of a control key.

The first revolution of the driven element of the clutch rotates the actuator 79—80 through one-half of one revolution from its normal position shown in Figures 3 and 4, to that shown in Figures 6 and 7. This half revolution of the actuator causes the following actions to occur. The set interponent 85 is moved to the position shown in Figure 7 and held locked in this position until the second revolution of the clutch and second half revolution of the actuator take place, whether or not the depressed key is released prior to the second revolution of the clutch. This movement and locking of the activated interponent 85 rocks the lever 35 connected therewith into the position shown in Figure 7 thus moving the connected stop 32 into its active position and rocking bail 28—30—31 and the connected arm 27 into the position shown in Figure 7 and locking them there. This movement of the bail and the arm 27 actuates (through link 26) the lever 25 to release the escapement and hold it released to permit the carriage to run to the left until arrested by engagement of a stop 41 with the activated stop 32 and also actuates (through link 26) the lever 146 to apply the carriage brake and hold it applied by the locking of the disk 140 by locking arm 144. On the second revolution of the clutch, the actuator makes the second half of a single revolution thereof, thus releasing the activated interponent 85, whereupon all the activated parts re-assume their respective normal positions under the influence of the several springs hereinbefore described.

One or more of the stops 41 carried by the

carriage are as usual set in active position and the others are set in inactive position with the stops releasably held in their respective positions. To change the setting of any stop 41, the stop is registered with part 53 of the stop positioner or setter 51—53 and the positioner is rocked from its normal intermediate position in one direction or the other depending upon whether the registered stop is to be moved to active or inactive position. Rocking of the positioner from its normal position moves the stop from one of its releasably held positions to the other, and restoration of the positioner to its normal position leaves the stop in the releasably held position to which it has been shifted. Depression and release of control key 84 results in downward rocking of the positioner from normal position to move the registered stop 41 from inactive to active position and in return of the positioner to normal position, while depression and release of key 83 results in upward rocking of the positioner from normal position to move the registered stop to inactive position and in return of the positioner to normal position.

Depression of control key 84 actuates its connected one of the twelve levers 116 to set the interponent 87 for actuation by the actuator 79—80 and rocks the bail 122 to start a single cycle of revolution of the clutch, while release of the key 84 permits restoration of the activated parts to normal, all in the manner described above in connection with power movement of stop shifting levers 35. The first half revolution of the actuator picks up the set interponent 87 as shown in Figure 15 and moves it to and holds it in the position shown in Figure 16 until, upon release of key 84, the clutch makes its second revolution and the actuator makes the second half of its revolution. The first half revolution of the actuator moves interponent 87 to rock lever 93 into the position shown in Figure 16, causing the positioner to be pulled down by link 101 and actively position the registered stop 41. The second half revolution of the actuator frees the locked interponent 87 and permits spring restoration of the interponent and the parts moved thereby up to and including the stop positioner. The space between lugs 50 and 46 of the stops 41 permits return of the positioner without movement of the registered stop. Depression of key 83 actuates its connected lever 116 to set interponent 86 and cycle the clutch to actuate lever 92 to rock the positioner upward from its intermediate position through link 97 to set a registered stop 41 in inactive position as shown in Figure 19, and release of key 83 causes the clutch to make its second cycle for restoration of the actuator to normal and frees the actuator driven parts for spring return to normal, leaving the stop in inactive position. The slots 96 and 100 in links 97 and 101 permit the described two-directional shift of the stop positioner from its normal intermediate position.

I claim:

1. A printing machine of the class described having, in combination, a normally stationary actuator which is rotative about a fixed horizontal axis and which, through only a single small part thereof around said axis, is extended eccentrically to said axis to form a single driving portion, an operation-effecting mechanism which is biased to move out of the path of revolution of the actuator into a normal stationary position and is settable for engagement and driving thereof against its bias by said driving portion of the actuator during an initial half of a revolution of the actuator in one direction out of and back into normal stationary position and for disengagement of said driving portion therefrom after the actuator turns through an initial portion of the final half of said revolution, an operation-control element for said actuator and for said operation-effecting mechanism which is movable from a normal stationary position for setting said mechanism and is biased to return to normal position when released, and power means responsive to movement of said control element against its bias to turn the actuator in said one direction out of its normal position through the first half of a revolution and responsive to return movement of said control element to complete said revolution of the actuator.

2. A printing machine, as claimed in claim 1, having means for automatically locking the actuator against rotation at the completion of each half-revolution of the actuator by the power means, and means responsive to each movement of the control element from its normal position and to each biased return movement of said element to release said locking means to free the actuator for rotation by the power means.

3. A printing machine, as claimed in claim 1, having several individually operable operation-effecting mechanisms of the kind set forth each settable for driving thereof against its bias by the driving portion of the actuator, and also having a corresponding number of individually operable operation-control elements of the kind set forth each operable to set a different one of the operation-effecting mechanisms when moved from normal position and to movements of each of which elements respectively from and to its normal position the power means is responsive in the specified manner to rotate the actuator.

4. A printing machine, as claimed in claim 1, wherein the actuator is a shaft which is concentric throughout most of its circumference with the fixed axis of rotation of the actuator and has extending therealong and fixed thereto a single fin-like driving portion which protrudes from the shaft in a single direction and is disposed substantially tangentially to the shaft, and wherein there are provided a plurality of said settable operation-effecting mechanisms individually settable for driving and release thereof by said fin-like driving portion, and there are also provided a corresponding plurality of said operation-control elements each movable from its normal stationary position to set a different one of said mechanisms and to movements of each of which control elements respectively from and to its normal stationary position the power means is responsive in the specified manner to rotate the actuator.

5. A printing machine, as claimed in claim 1, wherein the operation-effecting mechanism includes a lever which is biased to a normal position and a settable interponent which is pivoted to said lever and is biased to swing to a normal unset position out of the path of revolution of the actuator from a set position in which said interponent is drivable by the actuator in a direction to thrust said lever from normal position against its bias, and wherein movement of the operation-control element from normal position against its bias swings the interponent relatively to the lever into set position, said lever being rockable about a fixed axis parallel to that of the actuator and having an arm which is biased to swing toward the actuator and to which the interponent is

pivoted for up and down swinging movement in a plane to which the actuator axis is normal.

6. A printing machine, as claimed in claim 1, wherein the operation-effecting mechanism includes a lever which is biased to a normal position and a settable interponent, which interponent is pivoted to said lever for swinging of the interponent in a vertical plane and is biased to swing to an unset position out of the path of revolution of the actuator, and wherein, upon setting of the interponent, the driving portion of the actuator thrusts the lever against its bias through the medium of the interponent during the first half of the ensuing revolution of the actuator and is interposed at the end of said half revolution between the axis of rotation of the actuator and the pivotal axis of the interponent with said driving portion in thrust engagement with the interponent at a point located between said axes and substantially in a straight line passing through said axes.

7. A printing machine of the class described having, in combination, an actuator for driving operation-effecting mechanisms of the machine and which is mounted for rotation about a fixed axis and has a single straight driving portion which extends longitudinally of said axis and protrudes farther from said axis than the remainder of the actuator, manually depressible and spring returned operation control keys, power actuated means responsive to each said key and controlled respectively by key depression and key return to

rotate the actuator through only respectively the first and second halves of a single revolution which drives the actuator from and restores it to a normal stationary position, and operation-effecting mechanisms each settable by a different one of said keys to be first driven and then held driven through direct engagement therewith of said driving portion of said actuator during the first half of the ensuing revolution of the actuator and to be released by disengagement therefrom of the driving portion of the actuator during the initial portion of the second half of said revolution, each said operation-effecting mechanism being mounted and bias for free restoration thereof to a normal unset position out of the path of revolution of the actuator upon disengagement of the driving portion of the actuator therefrom.

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