May 16, 1944. L. P. CROSMAN 2,348,789

LISTING MACHINE

Original Filed Nov. 29, 1941 2 Sheets-Sheet 1

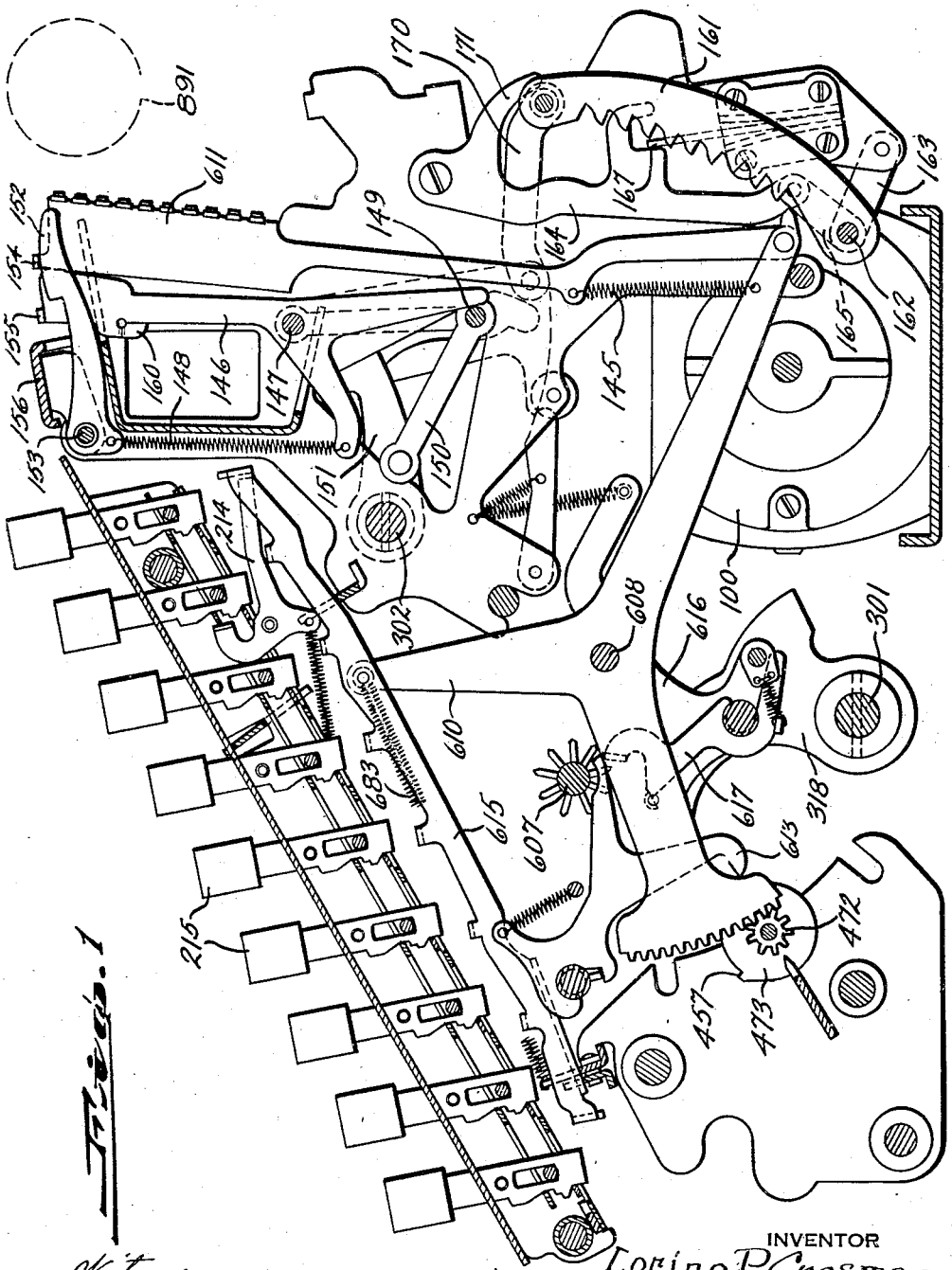

Fig. 1

Witness
Elmer W. Edwards

INVENTOR
Loring P. Crosman
BY
Marshall Wilder
ATTORNEY

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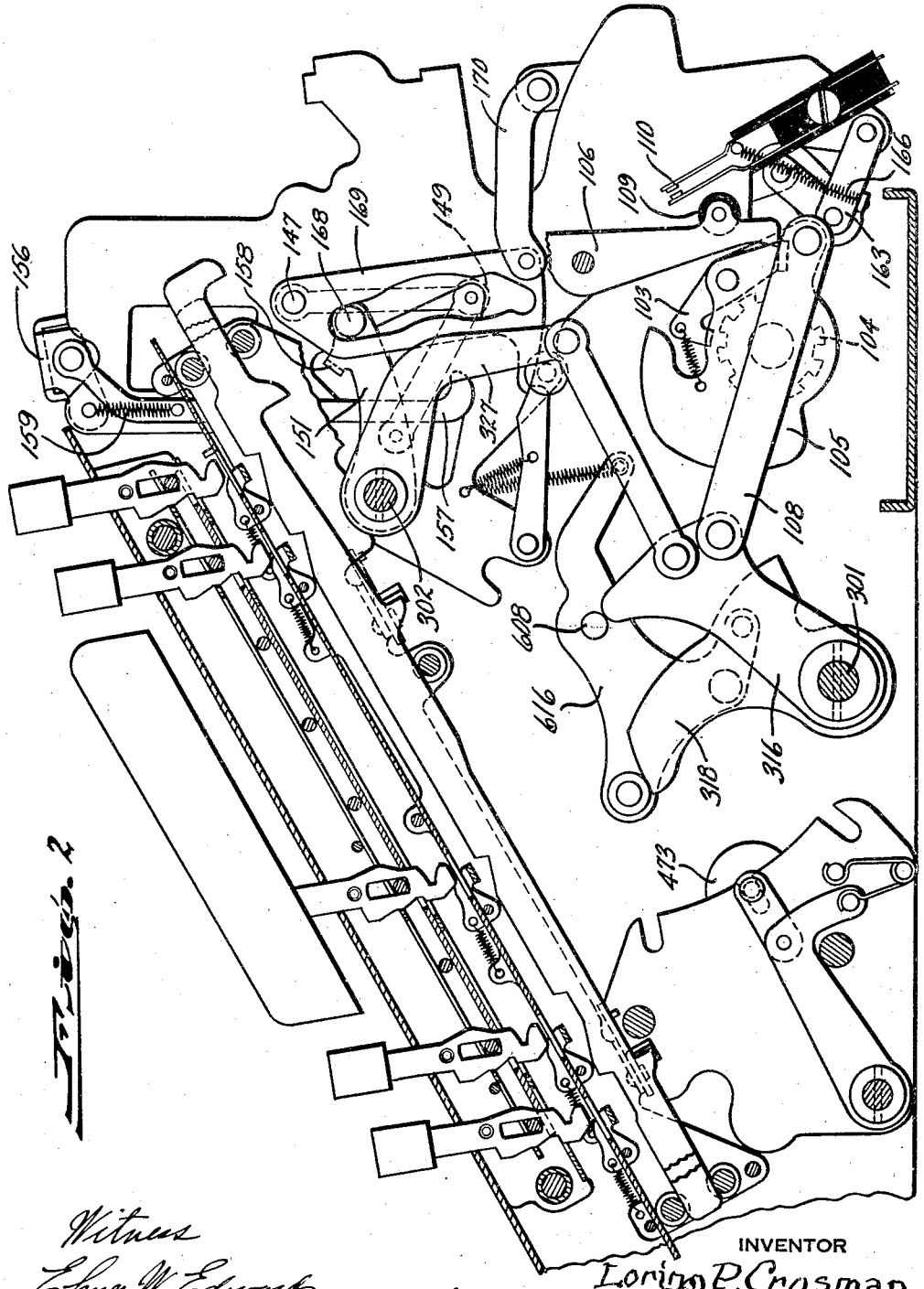

Fig. 2

Witness
Elma W. Edwards

INVENTOR
Loring P. Crosman
BY
Stuart Hilder
ATTORNEY

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UNITED STATES PATENT OFFICE

2,348,789

LISTING MACHINE

Loring Pickering Crosman, South Orange, N. J., assignor to Monroe Calculating Machine Company, Orange, N. J., a corporation of Delaware

Original application November 29, 1941, Serial No. 421,015. Divided and this application November 25, 1942, Serial No. 466,935

2 Claims. (Cl. 101—93)

The invention has relation to listing machines, and particularly to type aligning mechanism therefor, the present application being a division of application Serial Number 421,015, filed November 29, 1941, relating to printing mechanism.

The invention consists in the novel construction and combination of parts, as set forth in the appended claims.

In the accompanying drawings, illustrating the invention,

Fig. 1 is a vertical section taken through the keyboard and printing mechanism of a listing adding machine constructed in accordance with the invention.

Fig. 2 is a right side elevation of the machine, with casing removed, showing the operating and printing mechanisms.

The invention is shown as applied to a motor operated machine corresponding to a disclosure of United States Patent No. 1,932,013, issued to Loring P. Crosman on October 24, 1933, and entitled "Register," as modified in an application for patent of the present inventor, Serial Number 421,016, filed November 29, 1941.

Motor operation of the machine is initiated by imparting a rocking movement to clutch control lever 106 (Fig. 2), said lever being provided with an insulation roller 109 operable to close the contacts of a switch 110 interposed in the circuit of an electric motor 100 (Fig. 1). Rocking movement of lever 106 will also move the bottom end of said lever out of contact with a spring actuated pawl 103, mounted upon a plate 105 and forming the driven member of a clutch. Upon release, pawl 103 will be moved into contact with the driving member 104 of the clutch, having direct driving connection with the motor 100.

Plate 105 is connected by link 108 with an arm 316 fast upon a rock shaft 301, a cam 318 being also fixed upon said shaft and serving to impart reciprocatory motion to a frame 616, mounted upon a transverse shaft 608. Three-armed differential actuator levers 610 are loosely mounted upon shaft 608 and are normally coupled to frame 616 by means of a series of spring pawls 617. The forward arm of each differential actuator lever 610 is provided with segmental rack teeth, adapted to mesh with the pinions 472 of a series of accumulator wheels 473. Index bars 615 are pivotally connected with the upper arms of levers 610, these index bars being moved, upon counter-clockwise rotation of the levers, into engagement with the stems of selectively depressed keys 215. Type bars 611 are pivotally connected to the rearward arms of levers 610, each type bar being provided with a longitudinally disposed series of type representing the digits 0 and 1 to 9.

In additive accumulation, amounts having been set up on the digit keys 215, and motor operation initiated, the pinion 472 will first be disengaged from the actuator racks, and thereafter the racks will be moved counter-clockwise so that in a column in which the 7 key (for instance) has been depressed the actuator will be allowed a degree of movement sufficient to bring the numeral type 7 opposite the printing line of the platen 891. As each actuator lever is stopped by engagement of its index bar 615 with the key stem, the related pawl 617 will be lowered out of contact with the actuator, frame 616 continuing counter-clockwise to the full extent of its movement. Printing will now be effected, as hereinafter described, the pinions 472 brought into mesh with the actuator racks, and the frame 616 moved clockwise, the pawls 617 picking up the actuators during this movement and returning them to the normal position illustrated in Fig. 1.

In total taking operations, the motor operation of the machine is suspended before the actuator racks 610 have been moved, and the accumulator wheels 473 are rotated to zero, the pinions 472 being in mesh with the actuator racks. This is effected by releasing all of the column latches 214 and by rotation of a shaft 607 (Fig. 1) having a series of pins adapted to adjust a series of stops 613 individually into the paths of movement of zero stops 457 of the accumulator wheels. The pins of shaft 607 also operate to move the pawls 617, releasing the differential actuators 610 individually, for operation by their springs 683. The pins of shaft 607 operate successively, from right to left of the machine. The released lever 610 will rotate the accumulator wheels 473 in a subtractive direction (clockwise as viewed in Fig. 1) to zero, this action serving to displace the type bars 611 to a position in which the amount subtracted from the accumulator will be set on the printing line. Thereafter, motor operating being resumed, frame 616 will be rotated counter-clockwise; printing will be effected; the accumulator pinions 472 disengaged from the racks, and frame 616 rotated clockwise, picking up the actuators 610 successively, according to the positions in which they have been stopped by the accumulator wheels, and returning the parts to normal position. It may be noted that during these totaling

operations, none of the keys 215 are in depressed position.

The hammers

The digit type is solidly set in the type bars 611, and these type bars are normally held in forward position substantially spaced from the platen 891, by means of springs 145 (Fig. 1). Engaging the forward face of each type bar 611 is a hammer 146, mounted upon a shaft 147 fixed in the machine frame. The hammers are operated by means of a spring 148, and are normally held tensioned by means of a bail 149, suspended from shaft 147 and connected by a link 150 with a rock arm 151.

Arm 151 is fast upon a shaft 302 upon which is also fast an arm 327 (Fig. 2) having link connection with the motor driven arm 316. Thus, upon motor operation, and during the counterclockwise rotation of frame 616, shaft 302 will be rocked clockwise, and bail 149 moved forwardly, permitting the hammers 146 to rotate gradually in a clockwise direction until the type bars 611 are forced to a position wherein the type at the printing line will be closely adjacent to the surface of platen 891. Bail 149 will be held in this position during the printing operation, and will subsequently be returned to restore the hammers to normal position. This will be the entire operation of any of the hammers 146 located in columns to the left of those wherein keys 215 have been depressed.

Action of the hammers 146 in the active columns will be controlled as follows:

A series of latches 152 (one for each hammer 146) is provided, the latches being pivotally mounted upon a shaft 153, fixed in the machine framing, and being operated by the spring 148, which connects the latches 152 and the hammers 146, as seen in Fig. 1. Each latch 152 lies beneath a lug 154 of the related type bar 611, so that in the normal position of the type bars the latches are held out of engagement with lugs 155 of the hammers. Upon rotation of an actuator 616, however, and consequent displacement of a type bar 611, the lug 154 of said bar will move away from latch 152, which will thereupon rise and engage lug 155 of the hammer. This engagement is timed to occur before any substantial movement of the hammers is allowed by bail 149.

A bail 156, supported from shaft 153, is provided with a depending hook 157 (Fig. 2), adapted to be engaged near the extreme forward movement of the actuator drive by a lug 158 of arm 151, depressing bail 156, against the tension of a spring 159, thereby releasing latches 512 from engagement with the hammers 146. Thereupon hammers 146 will be violently operated by their springs 148, imparting sufficient momentum to the type bars 611 to insure the engagement of the type with the record material supported on platen 891.

In order to effect printing of zeros by the type bars to the right of those displaced by the actuators 616, the hammers are provided with overlapping lugs 160 (Fig. 1), which will serve to hold any hammer to the right of one secured by its latch. In other words, a latch 152, upon movement of bail 156, will release its related hammer 146 and all hammers lying to the right thereof, for printing operations.

It will be observed that in the normal position of the parts the type bars 611 lie well in front of platen 891, so that the printing line will be visible to the operator of the machine. This effect has been secured in machines wherein the type is slideably mounted in the type bar, but the result is herein secured in an extremely simple mechanism. The simplicity of the mechanism is also apparent in that the only parts individual to the columns of the printing mechanism are the type bars, the hammers, the hammer latches and a single operating spring.

Alignment of the type

Precise alignment of the type (forming more particularly the subject matter of the present invention) is secured by means of a toothed alignor 161 (Fig. 1) pivotally mounted at its lower end upon a floating shaft 162, said shaft having rearward connection with the framing of the machine by means of a link 163 and upward connection by means of toggle linkage 164, 165. Shaft 162 is normally held in raised position, with the toggle 164, 165 bowed, by means of a spring 166 (Fig. 2), the upward movement being limited by engagement of a shoulder of toggle link 165 with a leaf spring 167, secured upon the framing of the machine.

The teeth of alignor 161 are designed to engage with the toothed or pointed ends of the rearward arm of actuator levers 610, a series of ten tooth shoulders of the alignor 161 being related to each lever 610. The lower shoulder of alignor 161 is designed to engage the related actuator when it stands in zero position; the second tooth when it stands in 1 registering position, etc., the highest shoulder of the alignor corresponding to the 9 registering position of the actuator. The shoulders of the alignor will be engaged with and thereafter disengaged from the actuators successively, in the actuator positions running from 0 to 9 and from 9 to 0. In adding operations the engagement will occur immediately after the contact of a related index bar 615 with its depressed key, and in all operations the alignor will be disengaged from the actuator immediately before said actuator is picked up by the pawl 617 for restoration to normal. This latter action is particularly important in total taking operations, because after the printing has been effected the accumulator is disengaged from the actuator racks and the actuators and type bars would be free to move to their extreme, or 9 registering position under the influence of the springs 683, unless means were provided for checking this action. According to the present invention, this is one of the functions of the alignor 161.

Pivotal movement of the alignor 161 about shaft 162, to effect the engagement and disengagement of the actuators, is transmitted by means of a roller 168 (Fig. 2) engaging the cam slot of a plate 169, pivotally supported from shaft 147 and having link connection 170 with the upper end of the alignor. Parts 151, 169, 170, 164, 165, 163, 166 are provided in duplicate, at the two sides of the alignor. During the first portion of the cycle of motor operation, roller 168 will move along the forward wall of the cam slot of plate 169, providing first for a dwell, during the preliminary adjustment of the accumulators, etc., thereafter for forward movement of plate 149, effecting forward pivotal movement of the alignor about shaft 162, to bring the shoulder of the alignor successively into engaging position, roller 168 finally acting upon a dwell surface of the forward and of the rear walls of the slot of plate 169, during which time the printing occurs; then acting upon a cam surface which will effect rearward movement of plate 169 and rearward pivotal

movement of the alignor about shaft 162 to disengage the actuators successively, the final movement of roller 168 being along a dwell of a slot of plate 169.

In order to effect true alignment of the type without straining any of the parts by contact of the index bars 615 with the key stems or the contact of stops 613 with the zero stops 457, in totalizing, downward movement will be imparted to the alignor after all the teeth thereof have been brought into engaging position, this being effected by contact of the upper portion of the alignor with the toggle link 164, the final movement of plate 169 thus serving to straighten the toggle and to depress shaft 162.

Shaft 162 will remain in depressed position during the rearward pivotal movement of the alignor until at the end of such movement the upper end of the alignor will be brought against a tooth 171 of toggle link 164, to break the toggle 164, 165 and allow spring 166 to return the alignor parts to normal position.

I claim:

1. In a listing machine having a series of devices differentially displaceable from and to normal position and comprising differential actuators and type bars connected therewith, and reciprocatory operating means acting in its return movement to engage the actuators successively in accordance with the degrees of differential displacement of the individual devices and to return said devices to normal position; a pivotally mounted multiple toothed alignor, and means operable by the operating means to reciprocate said alignor pivotally, to engage selected teeth of the alignor with the differentially displaced devices and thereafter to disengage the same successively from the individual devices immediately prior to their engagement by the operating means.

2. In a listing machine having a frame, a series of differentially displaceable devices comprising differential actuators and vertical type bars connected therewith, stops for limiting the upward displacement of the type bars, and reciprocatory operating means for said devices; a floating shaft having rearward link connection and upward toggle link connection with said frame, a multiple toothed alignor pivotally mounted upon said shaft, and means operable by the operating means first to move the alignor pivotally to engage selected teeth of the alignor successively with the differently displaced devices and thereafter to straighten the toggle link connection to move the type bars downwardly to aligned position.

LORING PICKERING CROSMAN.