Oct. 19, 1948. B. T. BICKEL 2,451,467

STRIP FEEDING DEVICE

Filed Oct. 16, 1942

2 Sheets-Sheet 1

Fig. 1

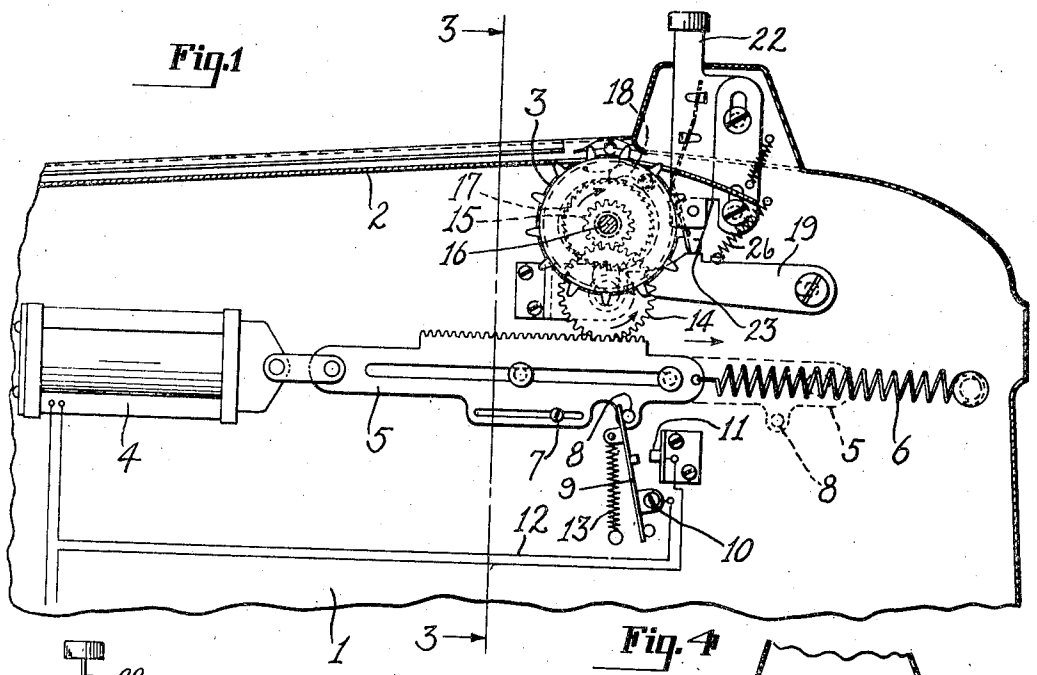


Fig. 3

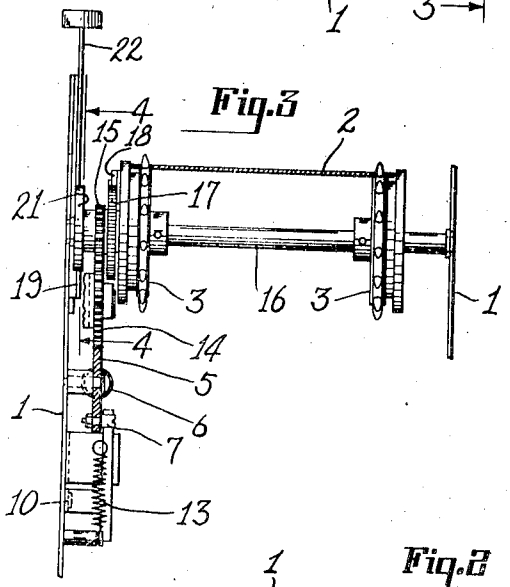


Fig. 4

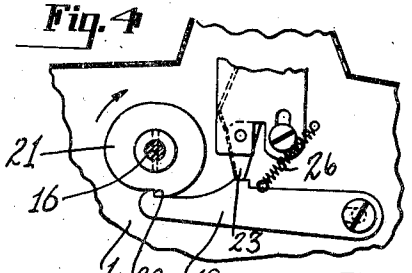


Fig. 5

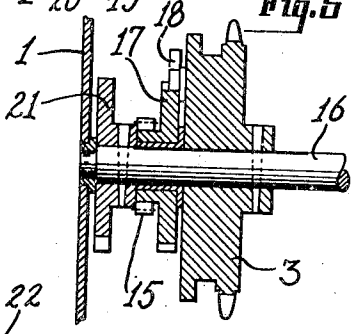
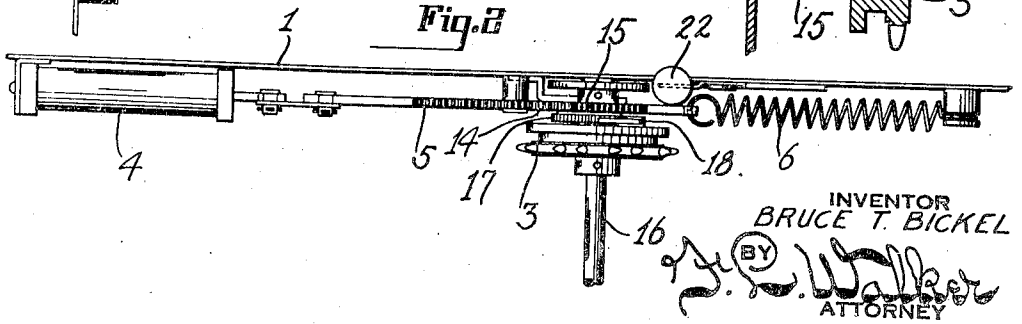


Fig. 2



INVENTOR
BRUCE T. BICKEL
BY
ATTORNEY

Oct. 19, 1948. B. T. BICKEL 2,451,467

STRIP FEEDING DEVICE

Filed Oct. 16, 1942

2 Sheets-Sheet 2

Fig. 6

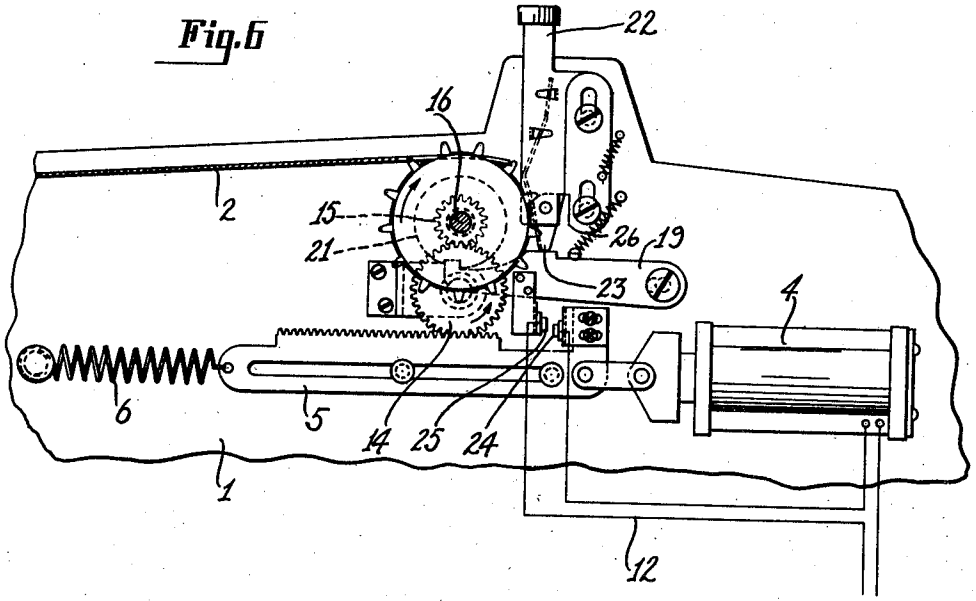
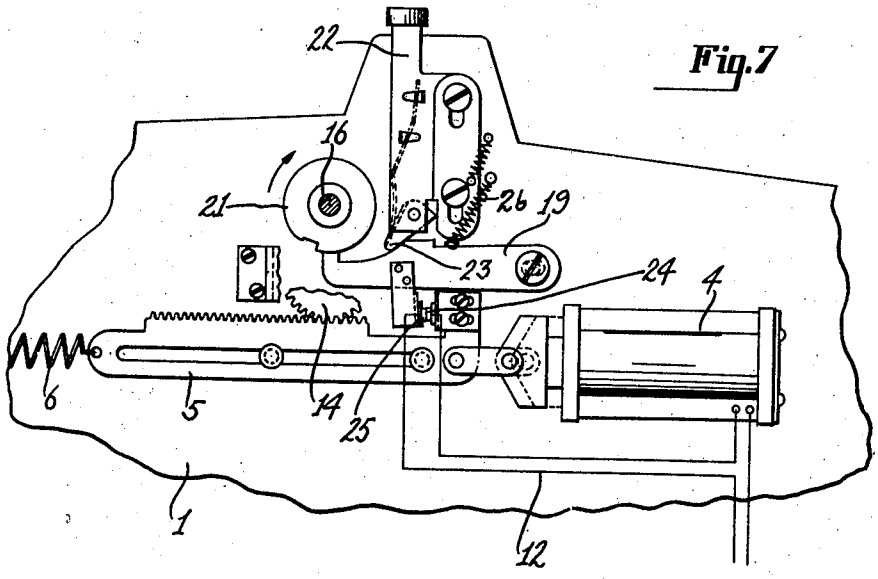


Fig. 7



INVENTOR
BRUCE T. BICKEL
BY
ATTORNEY

Patented Oct. 19, 1948

2,451,467

UNITED STATES PATENT OFFICE

2,451,467

STRIP FEEDING DEVICE

Bruce T. Bickel, Dayton, Ohio, assignor to The Standard Register Company, Dayton, Ohio, a corporation of Ohio

Application October 16, 1942, Serial No. 462,275

15 Claims. (Cl. 271—2.4)

1

This invention pertains to strip feeding mechanism, and more particularly to an electrically energized vibratory actuator for operating a strip feeding device to advance a continuous strip of material through successive measured distances, and arrest it in a prescribed position at the completion of each cycle of operation.

The invention is shown and described as applied to a pin type feeding device of an autographic register, for which purpose it is well adapted. It is to be understood that it is capable of other analogous uses and is not limited to the particular embodiment here shown. In conventional autographic registers and recording apparatus, wherein a continuous record strip is periodically advanced past a recording position by traveling pin type or other forms of feeding means, it is customary to provide for manual actuation thereof by a hand crank, or by a pull cable or slide. In some instances spring reaction is employed. In the application of pin type strip feeding devices to tabulators, addressing machines, and the like, it is customary to employ rotary power driven transmission gears.

The present motive means differs from such prior actuating mechanisms by utilizing a reciprocatory motion transmitting member repetitiously moved in one direction by an electromagnetic force against the retractive influence of a retracting spring, from which motion is transmitted by a pawl and ratchet couple to effect intermittent operation of the strip feeding member through successive short step by step movements.

The object of the invention is to improve the construction as well as the means and mode of operation of actuating means for strip feeding mechanisms, whereby such devices may not only be economically manufactured, but will be more efficient in use, automatic in operation, uniform in action, having few operating parts, and be unlikely to get out of repair.

A further object of the invention is to provide an actuating mechanism which will be of compact form and light weight, capable of incorporation in an autographic register cabinet or other apparatus housing of relatively small size.

A further object of the invention is to provide a vibratory actuator operable at a high rate of speed, and adapted to advance a strip of material rapidly by a substantially constant movement through a measured distance.

A further object of the invention is to provide a strip feeding mechanism or the like, having

2

the advantageous structural features and inherent meritorious characteristics and mode of operation herein set forth.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation or their equivalents, as hereinafter described or illustrated in the accompanying drawings.

In the drawings, where is shown the preferred but not necessarily the only form of embodiment of the invention;

Fig. 1 is a sectional view of an autographic register assembly, embodying the present actuating mechanism.

Fig. 2 is a top plan of the present actuating mechanism removed from the register.

Fig. 3 is a vertical sectional view of the assembled actuating mechanism on line 3—3 of Fig. 1.

Fig. 4 is a detail side elevation of a portion of the mechanism.

Fig. 5 is a detail sectional view of the pin wheel, ratchet, gear and cam forming parts of the mechanism.

Fig. 6 is a side elevation of a modified embodiment of the present actuating mechanism.

Fig. 7 is a detail view.

Like parts are indicated by similar characters of reference throughout the several views.

Heretofore electric motors have been incorporated directly in autographic registers for operating the strip feeding mechanism. The ordinary rotary motor has been found objectionably heavy and too large and bulky to be accommodated in a register housing of small size. The present actuating mechanism is so arranged in a flat relatively thin assembly as illustrated in Figs. 2 and 3, that it may be disposed along the inner side wall of the register housing or may be disposed on the bottom of the housing beneath the supply compartment of a typical register, without necessitating enlargement of the cabinet or housing, or crowding the register mechanism, and without adding materially to the weight of the register or disturbing its balance. Referring to the drawing, 1 is the housing or cabinet of a typical autographic register, of which 2 is the writing table. Continuous strips of record material are advanced over the writing tablet and past a recording position by a rotary pin wheel 3 engageable in longitudinally spaced holes in the strip. In the present instance the rotary pin

wheel receives a rapid succession of actuating impulses sufficient to advance the pin wheel through one complete rotation, and thereby advance the record strip a corresponding measured distance during each cycle of operation. However, the control devices may be arranged to arrest the pin wheel after a partial rotation of prescribed extent to advance the record strips corresponding lesser distance than by a complete rotation of the pin wheel.

To actuate the pin wheel through successive step by step movements, there is employed a solenoid 4 to the core of which is connected a reciprocatory rack bar 5. To the rack bar is connected a retractile spring 6, against the tension of which the solenoid when energized actuates the rack bar in one direction, and by which the rack bar and solenoid core are retracted after each operation. The rack bar 5 carries two relatively spaced studs 7 and 8, one of which is preferably adjustable relative to the other.

Projecting between the studs 7 and 8 is a circuit closer arm 9, pivoted at 10, and engageable with a contact 11 to intermittently close the circuit 12 and thereby energize the solenoid. The contact arm 9 is engaged by the stud 7, upon retractive movement of the rack bar 5 under influence of the spring 6 to close the circuit by moving the arm 9 into engagement with the contact 11 against the tension of a retracting spring 13. The closing of the circuit thereby energizes the solenoid to attract its core and the attached rack bar 5 against the tension of the spring 6. The release of pressure of the stud 7 upon the contact arm 9 permits the reaction of the spring 13 to retract the contact arm and open the circuit. If for any reason the contact fails to break, the stud 8 upon the moving rack bar will forcibly return the contact arm 9 to open position. Thus, the to and fro movement of the rack bar under alternate influence of the solenoid and retracting spring opens and closes the contact in the energizing circuit. The contact being broken by attractive influence of the solenoid, and the solenoid thereby deenergized, the spring instantly reacts to close the contact, which again energizes the solenoid to again break the contact. This alternating action occurs rapidly, being impeded only by inertia of the parts.

Intermeshing with the rack bar is a gear wheel 14 which is alternately rotated in opposite directions by the alternation of the rack bar. The gear wheel 14 meshes with a gear pinion 15 loosely journaled on the pin wheel shaft 16. Attached to the gear pinion 15 for unison alternating rotative motion is a ratchet wheel 17, with which engages a spring pressed pawl 18 carried by the pin wheel. The gear pinion and ratchet wheel alternate their direction of rotation in union with the alternation of the gear 14 and the rack bar 5. The partial rotation of the ratchet wheel 17 in one direction is idle, during which the pawl 18 rides idly on the moving ratchet wheel. However, on reverse movement of the ratchet wheel, the engagement of the pawl 18 therewith carries the pin wheel in unison through a like degree of movement. The successive partial rotations of the pin wheel are cumulative and total the desired degree of rotation to be imparted to the pin wheel at each operative cycle. At the end of the operative cycle the pin wheel is arrested and temporarily locked by engagement of a spring actuated detent arm 19 with a stop shoulder 20 upon a rotary cam 21

fixed on the pin wheel shaft and rotating therewith.

A manually depressible plunger 22 having a spring terminal finger 23 serves to dislodge the detent arm 19 from the stop shoulder 21, to permit actuation of the cam and pin wheel.

The initial movement of the cam and pin wheel under influence of the spring 6 moves the stop shoulder sufficiently past the detent 19 that the latter cannot reengage until the rotation is completed, or until a succeeding shoulder of the cam comes to engaging position in the event there are more than one stop shoulder and that a complete cycle of operation is less than a complete rotation of the pin wheel.

If the cam is timed to be engaged by the detent 19 at the beginning of or during the retractive movement of the rack bar and the effective stroke of the pin wheel driving motion, and hence before the energizing contact is closed, there will then remain stored in the spring 6 enough energy to complete the movement of the rack bar and close the contact 9—11 preparatory to the next cycle upon subsequent disengagement of the detent 19. If the locking engagement of the detent and stop shoulder occurs at the end of the retractive movement of the rack bar, after the energizing contact has been closed, the solenoid will be energized to retract the rack bar and transmission gears through their idle movements and tension the spring 6, simultaneously enabling opening of the energizing contact 9—11. However, the spring will be then held under tension and prevented from imparting an operative stroke to the parts by the engagement of the detent 19 with the stop shoulder 20, and the contact will remain open until the detent is disengaged preparatory to the succeeding cycle of operation. Thus, at whatever point in the movement of the rack bar the cycle terminates and the detent engages the stop shoulder, there will be automatically stored in the spring enough energy to initiate the succeeding cycle of operation.

It is quite feasible to reverse the operation, whereby the effective actuating stroke occurs under influence of the solenoid and the retractive action by the spring is entirely idle. In Fig. 6 is shown such modification, wherein are employed the same parts as before described, except that the solenoid, the rack bar and spring are arranged in reverse order to effect operative movement of the pin wheel in the desired direction under influence of the solenoid. A contact 24 is carried upon the rack bar for intermittent engagement with a corresponding contact 25 upon the depressible detent 19 at the limit of the retractive movement of the rack bar under influence of the spring 6. The contact 25 is normally out of the path of the rack carried contact 24 and is moved into contacting relation therewith by depression of the plunger 22 to initiate the operating cycle. The depression of the plunger 22 disengages the detent arm 19, out of engagement with the rotary cam 21. The detent m 19 then rides upon the periphery of the cam, and is so held in depressed position until, at the completion of the prescribed cycle, the detent arm again engages in the notch of the cam, into which it is elevated by the spring 26.

The contact 25 being depressed in the path of the contact 24, it is engaged thereby upon each retraction of the rack bar by the spring 6 to momentarily reenergize the solenoid. However, the entry of the detent arm 19 into the depression

in the rotary cam upon completion of the cycle of operation elevates the plunger 22 and with it the contact 24 out of engaging position. It so remains, and the mechanism remains dormant until the succeeding cycle is initiated by manual depression of the plunger 22.

The parts employed in such modified embodiment are the same as initially described, but with the solenoid and spring transposed. The mode of operation is likewise identical, except the sequence is reversed. The reaction of the solenoid affords the actuating impulse to the strip feeding pin wheel, whereas, as before described, the actuating impulse is afforded by the spring 6 coincident with the retraction of the rack bar.

In either embodiment, the alternating action of the solenoid and spring will be repetitious. The impelling movement transmitted to the strip feeding pin wheel through the pawl and ratchet drive devices will consist of a succession of rapid short step by step movements. The movement of the solenoid core in any event is relatively short, and insufficient to impart a full stroke movement of sufficient extent to advance the record strip a full form length. The closing of the contacts 9—11 or 24—25 energizes the solenoid, the movement of the core of which instantly opens the contacts which are immediately closed again by the spring in rapid sequence. Thus, the movement necessary to complete one full cycle of strip feeding action or a complete rotation of the pin wheels necessitates repetitious alternating movement of the rack bar, which becomes in effect a vibratory action under alternating influence of the solenoid and spring.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A strip feeding apparatus, wherein a continuous strip of material is progressively advanced through successive substantially equal lengths and arrested at the end of each feeding operation, including a reciprocatory rack bar, an electromagnetic device for moving the rack bar in one direction, a retracting spring against the yielding resistance of which the rack bar is moved under magnetic influence and by which it is moved in the opposite direction upon interruption of the magnetic influence, an energizing circuit for the electromagnetic device including a circuit make and break device operable by the reciprocatory rack bar to close the circuit upon retractive movement of the rack bar under influence of the spring and to open the circuit upon movement of the rack bar under influence of the electromagnetic device, a gear wheel meshing with the rack bar and receiving alternating

motion therefrom incident to the to and fro reciprocation of the rack bar, a pawl and ratchet couple, the driving member of which receives a to and fro oscillatory motion from the gear and imparts intermittent motion in one direction to the other member of the pawl and ratchet couple and returns idly independently thereof, a strip feeding member connected to and moving in unison with the driven member of the pawl and ratchet couple to advance an engaged strip through successive step by step movements, a rotary member having a stop portion advanced through a step by step movement in unison with the advancement of the strip, a detent engageable with the stop portion thereof upon the completion of each cycle of strip feeding operation to arrest the actuating mechanism, and a manually operable tripping member for disengaging the detent from the stop preparatory to initiation of a succeeding cycle of operation.

2. A recording apparatus, wherein an intermittently operable strip feeding device is progressively engageable with a continuous record strip for advancing the strip succeeding measured distances past a recording position, including an intermittent pawl and ratchet driving mechanism, a reciprocatory actuator therefor, electromagnet means for moving the reciprocatory actuator in one direction, a retractile spring against the yielding resistance of which the reciprocatory actuator is moved by the electromagnetic means in the opposite direction, an energizing circuit for the electromagnetic means, including a circuit make and break device, operated by the retraction of the reciprocatory actuator under influence of the spring to close the circuit to energize the electromagnetic means, and operated by the movement of the reciprocatory actuating member in reverse direction under influence of the electromagnetic means to open the circuit, and detent means for arresting the strip feeding operation upon the completion of a predetermined cycle of operation with the circuit closer in open condition and the spring under sufficient tension to close the circuit closer upon disengagement of the detent preparatory to a succeeding cycle of operation.

3. A recording apparatus, wherein a pin type feeding device is progressively engageable in longitudinally spaced holes in a continuous strip of record material for advancing the strip past a recording position, including a reciprocatory actuator for repetitiously operating the pin type feeding device through successive step by step movements, alternating spring and electromagnetic means for effecting repetitious operation of the actuator, an electrical control circuit for the electromagnetic means, a make and break contact in said circuit intermittently opened upon the movement of the actuator in one direction, and permitted to close upon movement of the actuator in reverse direction, and means for automatically limiting the repetitious operation thereof to a predetermined cycle necessary to advance a record strip a prescribed distance.

4. A recording apparatus, wherein a strip feeding device is progressively engageable with a continuous record strip to advance the strip successive measured distances past a recording position, a pawl and ratchet driving mechanism, a reciprocatory actuator therefor, electromagnetic means for automatically imparting repetitious motion to the reciprocatory actuator in one direction to advance the strip feeding device

through a step by step movement, a retracting spring against the yielding resistance of which the reciprocatory actuator is movable under electromagnetic influence, a detent for automatically arresting the strip feeding device when the total of repetitious advancements of the strip has equaled a predetermined measured distance and manual means for initiating a succeeding cycle of operation.

5. A recording apparatus, wherein a continuous strip of material is progressively advanced past a recording position and intermittently arrested with prescribed areas thereof in registry with the recording position, including a strip feedng device, an electric solenoid, an energizing circuit therefor, a circuit make and break device in said circuit, a spring against the tension of which the solenoid is operable, the make and break device being under the combined control of the solenoid and the spring by which it is alternately opened and closed under alternating influence of the solenoid and spring respectively, motion transmitting means for imparting step by step motion to the strip feeding device, and means for automatically limiting the cycle of operation to a predetermined advancement of the record strip.

6. A recording apparatus, wherein a continuous strip of material is progressively advanced past a recording position and intermittently arrested with prescribed areas thereof in registry with the recording position, including a strip feeding device, an electromagnetic vibrator, motion transmitting means for imparting repetitions step by step motion from the electromagnetic vibrator to the strip feeding device, and automatic means for arresting the cycle of operation when by the total of repetitions step by step motion the strip has been advanced a predetermined distance.

7. A recording apparatus, wherein a continuous strip of material is progressively advanced past a recording position and intermittently arrested with prescribed areas thereof in registry with the recording position, including a strip feeding device, an electromagnetic power device, a control circuit therefor including a circuit make and break device, intermittently opened by influence of the electromagnetic power device, a spring for intermittently closing the circuit make and break device to energize the electromagnetic power device, a detent for automatically arresting the cycle of alternate opening and closing of the switch with the switch open and the spring under tension, and motion transmitting means for imparting successive step by step movement to the strip feeding device.

8. A recording apparatus, wherein a continuous strip of material is progressively advanced past a recording position and intermittently arrested with prescribed areas thereof in registry with the recording position, including a strip feeding device, an electromagnetic power device, a control circuit therefor including a circuit make and break device, a spring tensioned by the electromagnetic device, a motion transmitting device actuated through an alternating sequence by alternate influence of the electromagnetic power device and that of the spring to impart succesive step by step movement to the strip feeding device, and a detent device automatically arresting the step by step movement when the total thereof equals a predetermined distance of advancement of the continuous strip.

9. A recording apparatus, wherein a continuous strip of material is progressively advanced past a given position and intermittently arrested with prescribed portions thereof in registry with the given position, including a strip feeding device, an alternating actuator therefor, means for imparting repetitious to and fro motion thereto, a pawl and ratchet mechanism for imparting successive movements of the actuator in one direction to the strip feeding device, detent means for arresting the cycle of operation when a continuing succession of to and fro motions of the actuator has advanced the strip a predetermined distance, and manually controlled means for initiating a succeeding succession of continuing to and fro motions of the actuator.

10. A recording apparatus, wherein a continous strip of material is progressively advanced past a given position, including a strip feeding device, an electromagnetic member and a spring disposed in opposed relation, an electric energizing circuit for the electromagnetic member including a circuit make and break device under the combined control of the electromagnetic member and the spring, and opened to deenergize the electromagnetic member by the operation thereof and closed to reenergize the electromagnetic member by reaction of the spring tensioned by the operation of the electromagnetic member, motion transmitting means for imparting successive step by step movement to the strip feeding device in synchronism with the alternate energization of the electromagnetic member and the spring, automatic detent means operable upon completion of a predetermined cycle of operation for arresting the strip feeding device, and manual means for initiating a succeeding operative cycle.

11. A recording apparatus wherein a continuous strip of material is advanced through a step by step movement, including a spring, an electromagnetic member intermittently energized to tension the spring and thereupon deenergized the reaction of the tensioned spring being utilized to reenergize the electromagnetic member in continuous alternating sequence, a strip feeding device, means for imparting to the strip feeding device successive strip feeding impulses by the intermittent energization of one of said members, and means automatically terminating the strip feeding impulses at the completion of a predetermined cycle of operation and tensioning the spring by which sufficient power is temporarily stored in the spring to initiate the succeeding cycle of operation upon release thereof.

12. A recording apparatus, wherein a continuous record strip is intermittently advanced past a recording position and arrested at the end of each advancement with a prescribed area thereof in record receiving position, a strip feeding device, an electrically energized vibratory motor, a pawl and ratchet mechanism for imparting repetitious step by step movement from the vibratory motor to the strip feeding device, a detent for automatically arresting the strip feeding device at the completion of a predetermined number of step by step movements, and manual means for initiating a succeeding cycle of operation.

13. A recording apparatus, wherein a continuous record strip is intermittently advanced past a recording position and arrested at the end of each advancement with a prescribed area thereof in record receiving position, a strip feeding device, an electrically energized vibratory

motor, motion transmitting means for transmitting successive unidirectional actuating impulses from the motor to the strip feeding device, and detent means for automatically limiting the operation of the strip feeding device to a predetermined number of successive impulses.

14. A strip feeding apparatus, wherein a continuous record strip is intermittently advanced predetermined distances and arrested with a prescribed area thereof in registry with a given position, including a traveling strip engaging device, a vibratory actuator therefor, motion transmitting means imparting a succession of repetitious step by step movements to the strip engaging device, arresting means for automatically terminating the action of the vibratory actuator and motion transmitting means at the end of a predetermined series of step by step movements by which the strip is advanced a predetermined distance, and initiating means for setting the vibratory actuator in operation.

15. A strip feeding apparatus, wherein a continuous record strip is intermittently advanced predetermined distances and arrested with a prescribed area thereof in registry with a given position, including a traveling strip engaging device, motion transmitting means for imparting repetitious step by step movement to the traveling strip engaging device, electrical impulse mechanism for inducing the step by step movement of the motion transmitting means by a succession of electrical impulses, a cycle determining member by which the operation of the apparatus is terminated at the end of a predetermined period of operation and starting means for initiating the operative period.

BRUCE T. BICKEL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
431,784	Scott	July 8, 1890
1,192,171	Dixon	July 25, 1916
1,268,377	Mortimer	June 4, 1918
1,378,889	Mortimer	May 24, 1921
2,127,704	Sheppard et al.	Aug. 23, 1938
2,160,916	Sherman et al.	June 6, 1939
2,193,759	Birr	Mar. 12, 1940

Certificate of Correction

Patent No. 2,451,467. October 19, 1948.

BRUCE T. BICKEL

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 2, line 18, after the word "plan" insert *view*; column 7, lines 34 and 38, claim 6, for "repetitions" read *repetitious*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 15th day of March, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.