May 19, 1936. H. L. KRUM ET AL 2,040,856

TAPE ADVANCING DEVICE

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FIG. 1

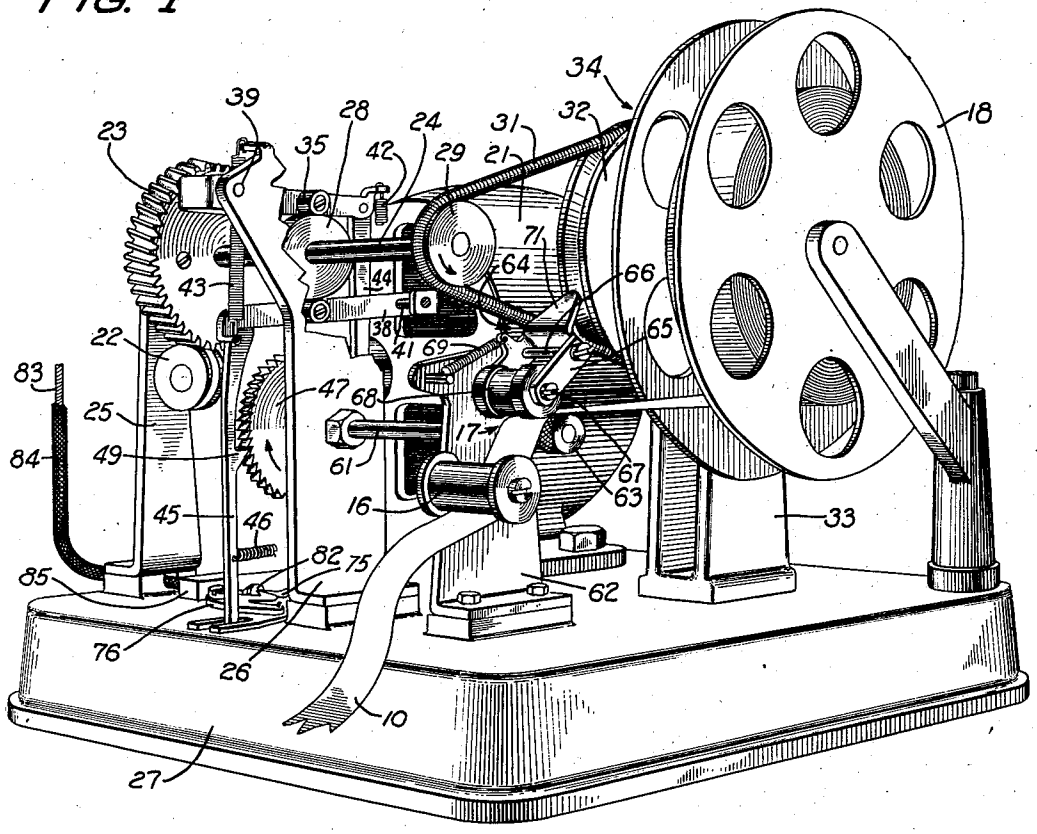
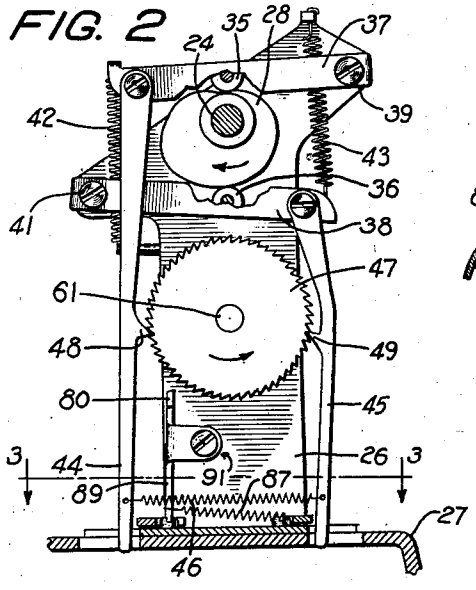


FIG. 2



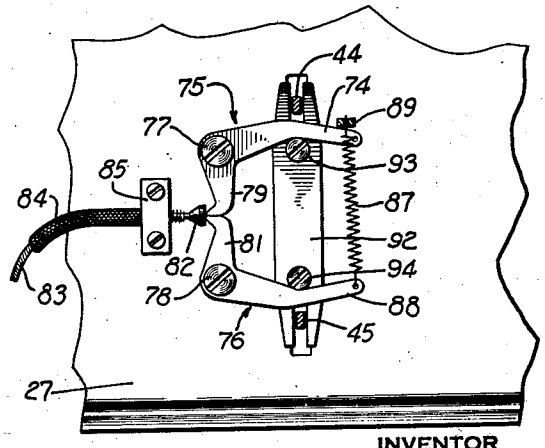


FIG. 3

INVENTOR
HOWARD L. KRUM
WALTER J. ZENNER
BY H. B. Whitfield
ATTORNEY

May 19, 1936. H. L. KRUM ET AL 2,040,856

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FIG. 4

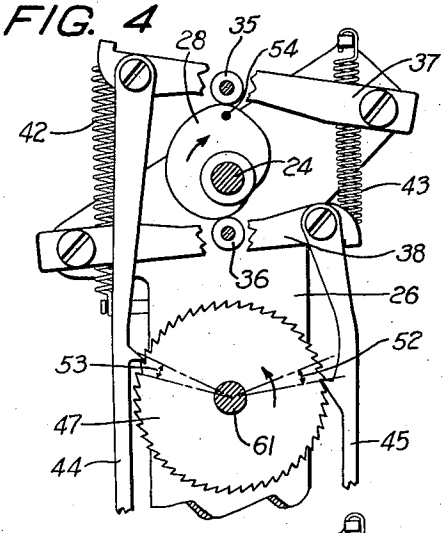


FIG. 5

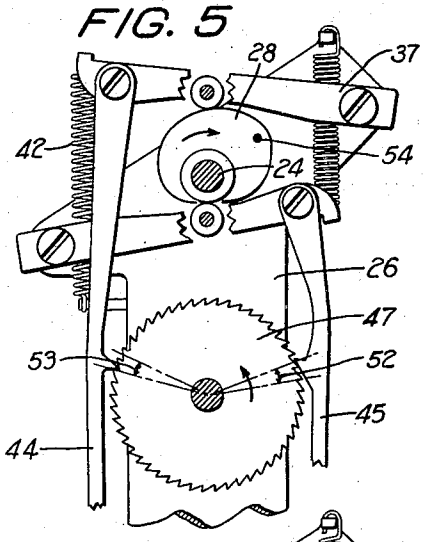


FIG. 6

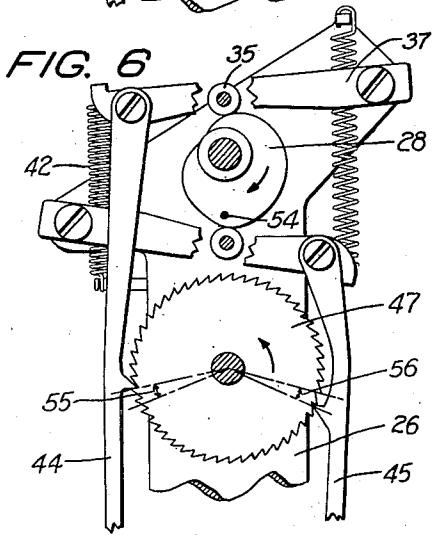


FIG. 7

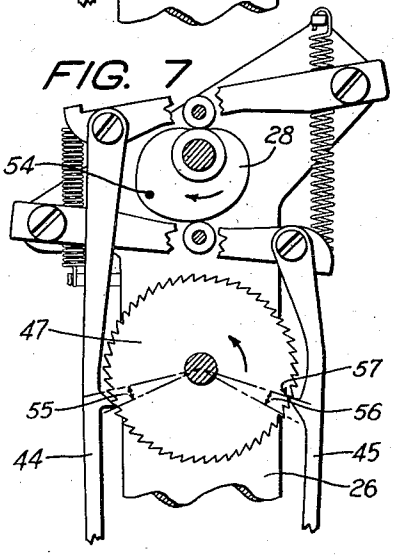
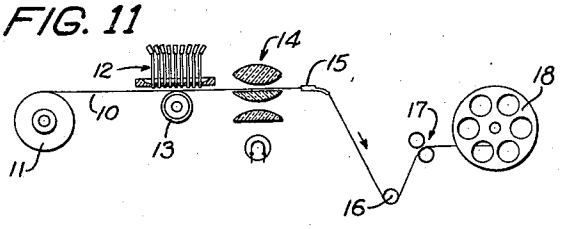


FIG. 11



INVENTOR
HOWARD L. KRUM
WALTER J. ZENNER
BY H. B. Whitfield
ATTORNEY

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FIG. 8

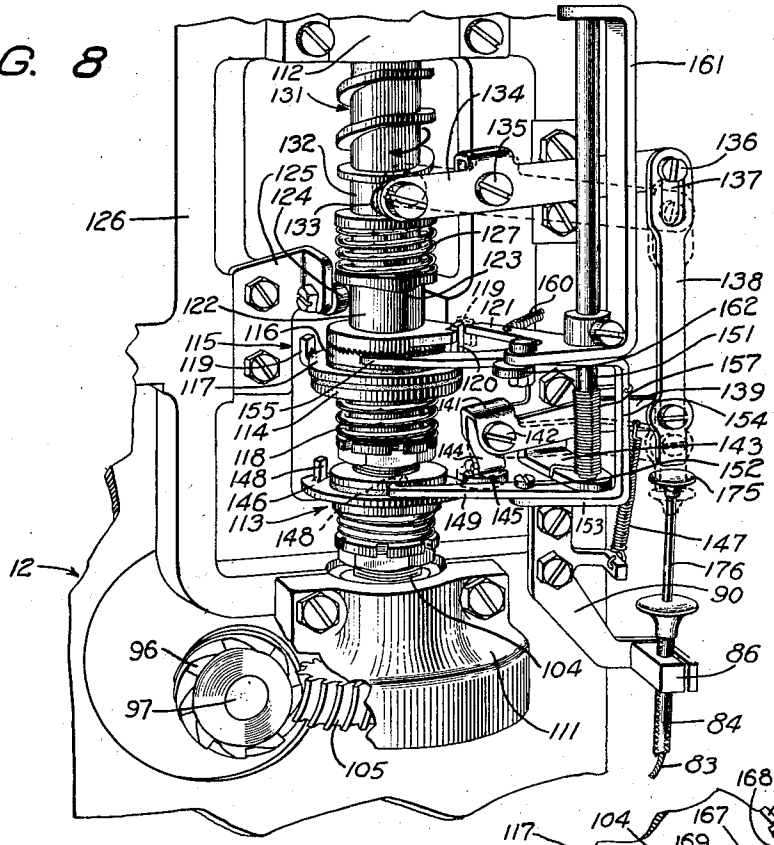
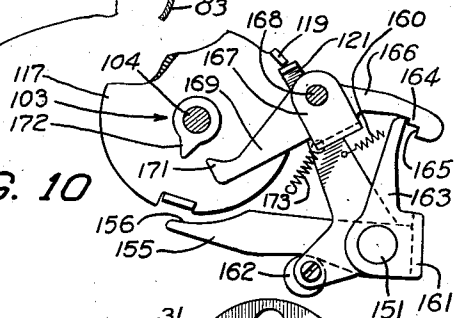
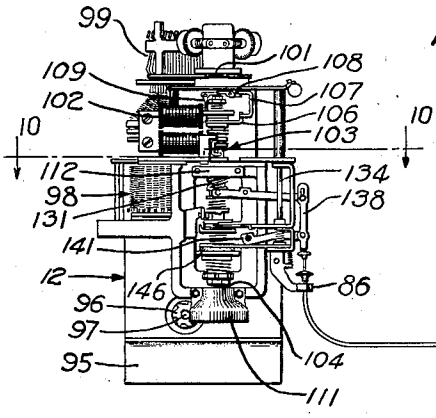


FIG. 10





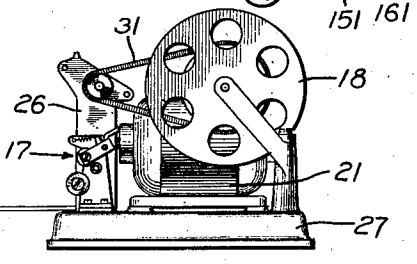


FIG. 9

INVENTOR
HOWARD L. KRUM
WALTER J. ZENNER
BY H. B. Whitfield
ATTORNEY

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UNITED STATES PATENT OFFICE

2,040,856

TAPE ADVANCING DEVICE

Howard L. Krum, Kenilworth, and Walter J. Zenner, Des Plaines, Ill., assignors to Teletype Corporation, Chicago, Ill., a corporation of Delaware

Application November 2, 1934, Serial No. 751,126

30 Claims. (Cl. 178—42)

This invention pertains to combination printing telegraph and projection systems, and more particularly to devices for imparting continuous movement to the recording medium through the telegraph and projection machines.

It has been found desirable in brokerage offices to project upon a screen the information printed on a ticker tape, so as to accommodate simultaneously a greater number of observers. This result is achieved by printing the information to be displayed upon a transparent or translucent tape and subsequently passing the tape through a projection machine. Normally the tape is advanced through the printer by a step-by-step spacing mechanism, thus imparting to the tape a movement which produces a running account of the ticker information proceeding along the projection screen spasmodically. Such a system is not conducive to easy reading.

The principal object of this invention is to provide a solely mechanical means for imparting to the recording medium a continuous movement at a speed consistent with the effective operation of the cooperating recording device.

According to a feature of the invention, the printing telegraph receiver includes a mechanism responsive to signalling conditions for selectively determining a character to be printed on a strip, and a pair of elements effective for each character selection to control the continued actuation of a motor driven tape advancing device.

The foregoing and other objects are achieved by eliminating the customary step-by-step spacing mechanism of the recording device and utilizing a device whereby a continuous motion is imparted to the recording medium during a continuance of recording operations and is arrested automatically upon the cessation of recording operations.

In accordance with the preferred embodiment of the present invention, the projecting unit is inserted in the space or location normally occupied by the spacing mechanism of the recording apparatus, which may be of the type disclosed in U. S. Patent No. 1,939,710, issued to A. H. Reiber et al., and as thus arranged, the projection unit is interpositioned between the recording apparatus and the tape advancing device, such that the tape is drawn through the printing zone of the recording apparatus, then immediately through the projector to the tape engaging members of the tape advancing device.

Specifically, the tape advancing device according to the present invention includes a ratchet drive mechanism impelled alternatively by each of a pair of pawls actuated by a single cam having such conformation as to impart to the ratchet driven mechanism a uniform continuous movement through an overlap of the operative strokes of the reciprocating pawls; that is, a complete reciprocation of each pawl comprises an operative stroke and a return stroke, and the final portion of the operative stroke of one pawl overlaps the initial portion of the operative stroke of the other pawl, thus insuring a continuous rotation of the ratchet wheel on the tape engaging roller shaft and precluding the possibility of any hesitative or jerky movement to the tape. With this type of drive mechanism, although the pawls operate upon the ratchet wheel alternatively, still there are short periods when the alternations are being effected when both pawls are acting upon the ratchet simultaneously to produce the aforementioned overlap. Moreover, the action and inaction of the pair of pawls with the common ratchet wheel is controlled through a flexible push wire or cable means by a pair of cams in the recording or printing apparatus. The cams are operated in out-of-phase relation with each other during the continuance of printing or recording operations.

A better understanding of the invention may be had from the following description, taken in conjunction with the accompanying drawings, in which

Fig. 1 is a perspective view of the tape advancing device of the present invention;

Fig. 2 is an elevational view of the driving mechanism for the tape advancing elements;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2;

Figs. 4 to 7 inclusive show various operative positions of the driving mechanism shown in Fig. 2;

Fig. 8 is a fragmental perspective view of the control mechanism for the tape advancing device associated with the main operating shaft of the printing apparatus disclosed in the aforementioned patent;

Fig. 9 illustrates the operative relationship between the tape advancing device and the printing apparatus;

Fig. 10 is a sectional view taken on line 10—10 of Fig. 9, and

Fig. 11 is a schematic diagram illustrating the application of the present invention to a projection system.

Generally, the projection machine is preferably juxtapositioned to the recording device to reduce to an absolute minimum the time transpiring between the recording and the appearance of that record on the screen. The maintenance of a minimum distance between the recording

device and the projector is highly desirable so as to preclude the possibility of delaying the presentation of the information upon the screen. If the projector is not so placed, there is likelihood that the information on the portion of the tape between the recorder and projector will be displayed until after further recordations are made, which, in the event of an inactive market, might not occur for an appreciable time.

As illustrated in Fig. 11, the tape supply is derived from a tape spool 11 located either interiorly or exteriorly of a printing unit 12 which may be of a type similar to that disclosed in the aforementioned patent. The tape 10 is passed over a platen 13 of the printing unit, then to an adjacently disposed projector 14, from which it passes over a tape guide 15, around a guide roller 16, through tape engaging means 17, to a reel 18 of a tape take-up device which is, in the present embodiment, located in the tape advancing device.

Referring to Fig. 1, which illustrates the tape advancing device, it is observed that this device comprises a continuously running motor 21, which imparts, through a pinion 22 mounted on the shaft thereof, continuous motion to a worm gear 23 carried on a main drive shaft 24 which is journaled in bearings mounted in brackets 25 and 26 supported on the base 27 of the tape advancing device.

Also mounted on shaft 24 are a cam 28 and a grooved pulley 29. The pulley 29 is operatively connected by a belt 31 with a pulley 32 carried on the tape reel shaft (not shown) journaled in a bracket 33 mounted on the base 27, which shaft also carries the tape reel 18 of a tape take-up device indicated generally as 34. The belt 31 functions so that when the tape 10 is held taut between the tape engaging means 17 and the reel 34, it slips on the pulley 32, thus precluding the likelihood of severing the tape. For this purpose the belt 31 has been found to give best results when constructed of a continuous helical spring, since its yieldability provides the utmost of protection to the tape against severance and compensates for the increasing diameter of the tape wound on the reel 34.

Having reference to Figs. 1 and 2, the cam 28 operates upon a pair of cam follower rollers 35 and 36 carried by levers 37 and 38 pivoted at 39 and 41, respectively, to bracket 26. Lever 37 is normally biased by a spring 42 extending between the extremity of lever 37 and bracket 26, thus constantly maintaining follower roller 35 in operative relationship with the periphery of cam 28. Similarly, lever 38 is normally biased by a spring 43 extending between the extremity thereof and bracket 26, thereby holding follower roller 36 constantly in contactual relationship with cam 28.

Pivotally connected to and depending from the extremities of levers 37 and 38 are a pair of pawl members 44 and 45 respectively, which are yieldably connected near their lower extremity by a common spring 46 which tends to maintain these pawls in operative relationship with a ratchet wheel 47 interposed therebetween. Pawl teeth 48 and 49 of pawl members 44 and 45 respectively, are operatively disposed with respect to ratchet wheel 47 such that pawl tooth 48 acts to rotate ratchet wheel 47 upon the downward movement of lever 44, and pawl tooth 49 acts to rotate ratchet wheel 47 upon the upward stroke of pawl lever 45.

The periphery or contour of cam 28 is especially designed to impart through levers 37 and 38 and pawl members 44 and 45 a continuous rotation to ratchet wheel 47. To illustrate the effect of the special contour of cam 28, Figs. 4 to 7 inclusive have been presented to show various operative relationships between the driving parts to show particularly the overlap of the operative strokes of the pawl members 44 and 45. As indicated in Fig. 4, pawl member 44 is shown in its extreme upward position preparatory to imparting rotative motion to ratchet wheel 47. Pawl member 45 is still proceeding in an upward direction, and through its coengagement with ratchet wheel 47 is effecting its rotation. Now, pawl member 45 has still to continue to coact with ratchet wheel 47 through the angular distance indicated by numeral 52 to its extreme vertical or upward position, but as pawl member 45 traverses this distance, pawl member 44 will traverse simultaneously the angular distance indicated by numeral 53, thus showing that for a predetermined period, both pawl members 44 and 45 are acting to impart, simultaneously, rotative motion to ratchet wheel 47, thus providing an overlap of operative coaction. As the pawls 44 and 45 are actuated from the position shown in Fig. 4 to that shown in Fig. 5, the cam 28 has rotated an angular distance represented by the relative positions of the dot 54 indicated on cam 28.

The position of the pawl members 44 and 45, shown in Fig. 6, is that position at which the pawl member 45 has been returned to its extreme lowermost position preparatory to again imparting rotation to the ratchet wheel 47, and pawl 44 is shown as still coacting with ratchet wheel 47 to impart rotative motion thereto. Now, as pawl 44 continues in its downward direction in coactive engagement with ratchet wheel 47 to impart continued rotation thereto, pawl member 45 is being returned upwardly concurrently therewith in coactive engagement with ratchet wheel 47. This concurrent engagement of pawls 44 and 45 with ratchet 47 will continue for a predetermined interval of time or until pawl members 44 and 45 have traversed angular distances 55 and 56 (Fig. 6) after which pawl 44 has reached its extreme lowermost position shown in Fig. 7, at which time pawl member 45 has reached the position indicated by the numeral 57 (Fig. 7), thus again providing an overlap of the operative strokes of the pawl members 44 and 45. To complete the sequence, the pawl 45 continues its upward effective movement in coactive engagement with ratchet 47, and pawl 45 is again returned from the position shown in Fig. 7 to its extreme upward position shown in Fig. 1 preparatory to repeating the aforedescribed cycle. By this manner, smooth rotational movement is assured to ratchet wheel 47 as there is no instant at which ratchet wheel 47 is not being subjected to the actions of either one or both of the pawl members 44 and 45.

As long as pawl members 44 and 45 are permitted to remain in operative engagement with ratchet wheel 47 through the biasing action of spring 46, they will, through their reciprocative motions, impart constant rotation to ratchet wheel 47. However, when it is desired to arrest the rotation of ratchet wheel 47, the pawl members 44 and 45 are acted upon by the mechanism shown in Fig. 3 to be disengaged simultaneously from the ratchet wheel 47, thus arresting the motion of the tape engagement device 17 without arresting the rotation of operating cam 28, as will presently appear.

Referring again to Figs. 1 and 2, the ratchet wheel 47 is fixed to a shaft 61 journaled in brackets 26 and 62. The shaft 61 extends to the right (as viewed in Fig. 1) beyond the bracket 62 and carries on its end a knurled roller 63 which comprises a part of the tape engaging means 17. A tape pressure means indicated generally as 64, which comprises a U-shaped portion 65 carried on a stud shaft 66 mounted in the bracket 62 is disposed above the roller 63. Loosely mounted on a stud shaft 67 and disposed between the arms of the member 65 is a pressure roller 68. The pressure means 64 presses against roller 63 by means of a spring 69. A thumb portion 71 is provided should it be desired to effect manually the release of the pressure exerted by the roller 68 against the tape 10. A flanged tape guide roller 16 is carried on the bracket 62 adjacent to the roller 63. The tape 10 is passed underneath the guide roller 16, thence between the rollers 63 and 68 of the tape engaging means, then around the hub of the reel 18 of the tape take-up device 34.

The disengagement mechanism shown in Fig. 3 comprises essentially, a pair of bell crank members 75 and 76 pivoted at 77 and 78 respectively, to the base 27. Members 75 and 76 are identical in construction but are disposed oppositely to each other, thus presenting the inner confronting ends of arms 79 and 81 thereof into substantially contiguous relationship. The extremities of arms 79 and 81 are provided with laterally disposed portions adapted to coact simultaneously with a plunger 82 secured to one end of a release cable or push wire 83 slidably operable in a conduit 84 extending between a terminal clamp 85 mounted on base 27 of the tape advancing device, and a terminal clamp 86 (Fig. 8) mounted on a bracket 90 associated with the printing apparatus. Of course, the cable 83 and plunger 82 are connected in any suitable and well-known manner, such that when pressure is applied to the cable at the printing apparatus, plunger 82 will be partially ejected, thus imparting, simultaneously, rotative motion to bell crank members 75 and 76 against the tendencies of a spring 87, extending between arm 88 of bell crank member 76 and depending arm 89 of pivoted member 91 (Fig. 2).

The rotative motion thus imparted to bell crank members 75 and 76 by the plunger 82 acts to spread the pawl members 44 and 45 against the action of their common spring 46 to effect the simultaneous disengagement of pawl teeth 48 and 49 from the ratchet wheel 47. Nevertheless, reciprocative motion is still being imparted to pawl members 44 and 45 by cam 28, the pawl members being guided at their lower ends by a guide member 92 having bifurcated ends to accommodate pawl members 44 and 45. Carried upon the guide member 92 are a pair of stops 93 and 94 against which the bell crank members 75 and 76 abut due to the action of the spring 87 when the pressure upon plunger 82 is relieved. When this occurs, pawl members 44 and 45 are reengaged under the action of spring 46 with the ratchet wheel 47.

The pivoted member 91, shown in Fig. 2, is provided with a laterally or forwardly disposed portion 89 which cooperates with ratchet wheel 47 to serve as a detent therefor when the pawls 44 and 45 are disengaged therefrom. As bell crank 75 (Fig. 3) is rotated through the action of plunger 82 as previously described, its arm 74 coacts with arm 89 of member 91, causing the latter to rotate in a clockwise direction (as viewed in Fig. 2) to bring the portion 80 into engagement with the teeth of ratchet wheel 47 substantially simultaneously with the disengagement of pawls 44 and 45. This braking or detent feature is essential because without it the tape take-up device 34, which is constantly tending to rotate due to its operative connection with constantly rotating pulley 29, will tend to impart rotation to ratchet wheel 47 by pulling the tape 10 through the tape engaging device 17, thus tending to defeat the purpose of the invention.

Having reference now to Fig. 8 which illustrates the control mechanism for the tape advancing device associated with the printing apparatus, only so much of the printing apparatus is herein shown in Figs. 8 and 10 as is necessary to disclose the present invention. For a more comprehensive understanding of the detailed construction of this printing apparatus, reference may be had to the aforementioned patent. Briefly, the printer 12 comprises a base 95 (Fig. 9) upon which is mounted a continuously running motor (not shown), the pinion 96 of which is shown carried on the motor shaft 97. Superposed above the motor compartment are the selector discs and selector members (not shown) which occupy the portion indicated generally as 98. Above this portion is disposed the type basket indicated generally as 99, which, as disclosed in said patent, comprises a series of vertically disposed type bars arranged in two substantially semi-circular groups disposed one on each side of the directional movement of the tape, each type bar being adapted to be rotated inwardly and downwardly toward a common printing zone to effect printing upon the recording medium which enters through a suitable conduit 101 provided therefor.

As previously mentioned, the tape 10, after passing through the said printing zone is directed through the projection device 14 (Fig. 11). The printing apparatus 12 is of the single magnet selector type having a single magnet 102 which coacts with a selector cam assembly 103 carried on a vertically disposed shaft 104 which, through worm gear 105 (Fig. 8) and pinion 96, is continuously rotated by the motor. As fully described in said patent, the selector cam assembly 103 is frictionally connected to shaft 104 and is provided with a stop disc 106 which abuts a stop gate 107 (Fig. 9) which, in turn, is prevented from swinging by a stop gate latch 108, the latter being controlled by a bell crank member 109 cooperatively associated with the armature extension of the selector magnet 102.

As is well known, a printing apparatus of this type is selectively operated by means of equal length letter codes or equal length code combinations of signalling conditions or impulses and in which the elements carried on the main operating shaft 104 are adapted to make one complete revolution each time a character is to be printed. Printers of this type are operated on the "start-stop" principle, wherein each group of selecting or code impulses is preceded by a start impulse and followed by a stop impulse, the function of which primarily is to maintain unison between the transmitting apparatus and the receiving apparatus. Since the normal stop condition of the signal line is marking, or current, selector magnet 102 is normally energized and its armature lever is normally attracted so that upon the receipt of a start signal, which is of a spacing or no-current nature, it will be deenergized momentarily, thus releasing its armature lever, which causes the

bell crank 109 to rotate slightly in a counterclockwise direction, causing latch 108 to rock slightly in a clockwise direction, and permitting disc 106, which receives its motion from the shaft 104, to swing the stop gate 107, thus permitting the selector cam assembly to make one complete revolution, the stop gate 107 in the meantime being returned to its normal position by a spring (not shown), to be again latched thereat by latch 108 during the stop condition of the signal line.

Shaft 104 is carried by anti-friction bearings (not shown) mounted in brackets 111 and 112 and carries various cam and clutch assemblies which are described in detail in said patent, with the exception that cam assembly indicated generally as 113 has been added for the purpose of the present invention. As disclosed in said patent, the flanged sleeve 114 is fixed to the shaft 104 for rotation therewith and comprises a part of a combination friction and grab clutch generally indicated as 115. The driving portion 116 of the tooth or grab clutch, also fixed to the shaft 104, is adapted to rotate with portion 114. A disc 117, together with a pair of felt washers are interposed between the portions 114 and 116 so that, due to the pressure exerted by a helical spring 118, the disc 117 tends to rotate due to the frictional relationship of the parts mentioned, until the stop lug 119 thereon abuts stop arm 121.

The illustration in Fig. 8 shows the parts which are carried upon the main shaft 104 in a position in the course of their rotation, the stop position of the lug 119 being indicated, in dotted lines, as abutting arm 121. The driven portion 122 of the grab clutch is shown engaged with the driving portion 116, but when the stop lug 119 has reached the stop position in engagement with arm 121, the cam portion 123 on the driven portion of the clutch 122 will have reached a point in engagement with the follower roller 124 carried on a bracket 125 fixed to frame 126 of the printing apparatus, in which position the portion 122 will be cammed upwardly against the compressive action of a helical spring 127 to effect the disengagement of the driven portion 122 from the driving portion 116, which is the normal stop position of clutch 115. To illustrate further, for purposes of clarity, the action of the combination friction and grab clutch 115, it will be assumed that arm 121 has been actuated to become disengaged from the lug 119, whereupon disc 117 is initially rotated by reason of its frictional connection with shaft 104. Member 122 is also rotated initially by disc 117 through lug 120 thereon until the cam portion 123 passes beyond roller 124, in which event the member 122 is urged by spring 127 into meshing engagement with driving portion 116 of the grab clutch, the latter being effective for substantially the remainder of the rotation to impart positive movement to a cam member 131 operatively connected thereto, or until cam portion 123 again coacts with roller 124 to disengage the grab clutch and lug 119 will again be arrested by arm 121 to arrest the action of the friction clutch.

Mounted above the portion 122 of the grab clutch is the multi-cam member 131 which is connected with said portion 122 for rotation therewith by tongue and groove means. By having reference to said patent, it will be noted that the multi-cam 131 is provided with two cam grooves to control various printing functions. In practicing the present invention, cam groove 132 is employed as one of the pair of control cams, and is adapted to coact through a follower roller 133 with one end of a lever 134 pivoted at 135 to the frame 126 for operating lever 134. The outer end of lever 134 is provided with a shoulder screw 136 which operates reciprocatively in a slot 137 of a link 138. The lower end of link 138 is pivotally connected to arm 139 of a bell crank lever 141 pivoted at 142 to a bracket 143 fixed to frame 126. Arm 144 of lever 141 carries a cam follower roller 145 which coacts with the periphery of a cam 146 adapted to rotate through frictional interconnection with shaft 104. Lever 141 normally tends to rotate in a clockwise direction under the action of a spring 147 distended between arm 139 thereof and bracket 90. Cam disc 146 has integral therewith a vertical lug 148 which cooperates with a stop arm 149 to arrest the rotation of cam disc 146.

Arm 149 is pivoted on a fixed vertical rod 151 carried in the printing apparatus and is adjustably secured by slot-and-screw adjustment 152 to arm 153 of a bail 154 also carried on rod 151. Bail 154 is also provided with an arm 155 which has a cam surface 156 (Fig. 10) which cooperates with lug 119 to effect at a predetermined instant in the cycle of operations, as will hereinafter appear, a slight counterclockwise rotation to bail 154 to effect in turn the release of lug 148 from the stop arm 149. Bail 154 normally tends to rotate in a clockwise direction under the action of a coiled spring 157 encircling the rod 151 as indicated in Fig. 8.

Stop arm 121, previously alluded to, is a part of bail member 161 pivotally mounted on the rod 151. Having reference to Figs. 8 and 10, it is noted that arm 121 is provided with a lateral projection at the extremity of which is carried an adjustment cam screw 162, the function of which is to adjust the operative relationship between arm 155 and bail 161 so as to procure the proper coaction between lug 119 and cam surface 156. Bail 161 normally tends to rotate in a clockwise direction due to the action of a spring 160 distended between arm 121 and the frame of the printing apparatus.

As noted in Fig. 10, bail 161 is provided with an arm 163 which coacts with a pair of shoulders 164 and 165 on arm 166 of a lever 167 pivoted at 168. The extremity of arm 169 of lever 167 is provided with a cam following portion 171 which coacts with a release cam 172 associated with the selector cam assembly 103. Lever 167 normally tends to rotate in a clockwise direction, as viewed in Fig. 10, by a spring 173 acting to hold arm 166 into cooperative engagement with arm 163 of bail 161 such that when arm 163 engages shoulder 164, portion 171 is presented in the circumferential path of release cam 172. When, during the cycle of operation of selector cam assembly 103, cam 172 coacts with portion 171 to rotate it slightly in a counterclockwise direction against the action of spring 173, shoulder 164 will become disengaged from the extremity of arm 163, thus permitting bail 161 to respond to spring 160 to be rotated slightly in a clockwise direction until the extremity of arm 163 engages shoulder 165. This movement of bail 161 effects the disengagement of arm 121 from lug 119, thus initiating the rotation of cam disc 117 which, as previously noted, rotates for a brief period under the action of the friction clutch until cam 123 rides out of engagement with roller 124 to permit the engagement of the grab clutch members 116 and 122, after which the grooved cam 131 rotates under the positive driving action of a grab clutch.

After lug 119 has traveled a predetermined portion of its revolution, it cooperates with cam

portion 156 to effect the counterclockwise rotation of bail 161 to release cam disc 146 for rotation. It is thus seen that the initiation of the cam disc 146 follows the initiation of disc 117, and hence grooved cam member 131, so as to produce an out-of-phase relationship between the cams 146 and 131. As cam 117 continues its rotation, lug 119 eventually is arrested after a single cycle of rotation by stop arm 121, but cam 146 continues to rotate thereafter for a short period until lug 148 is arrested by arm 149, thus enabling a predetermined further action of the feeding means 17. This out-of-phase relationship is utilized in actuating levers 134 and 141 in such manner that during the continuous out-of-phase rotation of cams 131 and 146, link 138 will be maintained substantially quiescent in its vertical uppermost position, which is that position shown in full lines in Fig. 8.

During the inoperative or rest period of the printing apparatus, levers 134 and 141 assume the dotted line positions shown in Fig. 8 and link 138 assumes its lowermost position, and in so doing, depresses the cap member 175 of cable 83 to the dotted line position, imparting corresponding downward movement to plunger 176 and cable or push wire 83 to effect, as previously described, through bell cranks 75 and 76 (Fig. 3), the disengagement of pawls 44 and 45 (Fig. 2) from ratchet 47. Now, upon the initiation of rotation of disc 117 and cam 131 in response to the disengagement of stop arm 121 from lug 119, lever 134 will be actuated to its solid line position in Fig. 8 and thus carry, by means of the stud screw 136, link 138 upwardly, at the same time imparting counterclockwise motion to lever 141 against the action of spring 147 independently of cam 146, in this manner holding cam follower 145 out of engagement with the periphery of cam 146.

As before noted, the rotation of cam 146 begins subsequent to the rotation of cam 131 and after rotating a short distance, cam 146 engages follower 145 and acts to maintain for a predetermined definite period, lever 141 in its full line position while cam 131 at the completion of its rotation tends to rotate lever 134 again into its dotted line position. Stud screw 136 will now occupy the position at the lower part of slot 137, link 138 being maintained in its uppermost position solely by means of cam 146. During successive cycles of operation, the cams 131 and 146 are rotating substantially continuously, thus maintaining the out-of-phase relationship between cam groove 132 and periphery of cam 146 so that levers 134 and 141 act alternately to maintain link 138 in its uppermost position, under which condition the pressure is relieved from push wire 83 so that it is free to be acted upon by spring 87 (Fig. 3), thus permitting the engagement of pawls 44 and 45 with ratchet 47.

Upon a cessation of printing operations, the rotation of cam 131 is first arrested by the abutment of lug 119 upon stop arm 121, and lever 134 assumes the dotted line position shown in Fig. 8 with the shoulder screw 136 located at the bottom of slot 137. Subsequently thereto the rotation of cam 146 is arrested by the abutment of lug 148 upon arm 149, whereupon lever 141 is rotated to its dotted line position under the action of spring 147, thus carrying with it link 138, whereupon pressure is again applied to cap member 175 actuating the push wire 83 to effect, through bell cranks 75 and 76, the disengagement of pawls 44 and 45.

General operation

Briefly, during the inoperative condition of the printing apparatus; that is, that condition which obtains upon the cessation of signal reception, the link 138 is held in its lowermost position by spring 147 to apply pressure to push wire 83 to maintain, through bell cranks 75 and 76 (Fig. 3), the pawl members 44 and 45 out of engagement with ratchet wheel 47 and the detent 80 in engagement therewith. However, during the continuance of this condition, the motor 21 of the tape advancing device is continuously running and through pinion 22 and gear 23 rotates operating cam 28 and pulley 29, thus causing, through cam 28, the pawl members 44 and 45 through their respective levers 37 and 38 to reciprocate ineffectively, and tending, through pulley 29, to rotate tape reel 18 to take up the tape between the tape engaging device 17 and said reel.

Now, upon the reception of code signals for the initiation of printing operations corresponding thereto, the start signal will deenergize the normally energized selector magnet 102, causing its armature lever to trip latch 108 through the medium of bell crank 109, to permit the rotation of selector cam assembly 103 by the removal of the restraint of stop gate 107 on disc 106 (Fig. 9). As the cam assembly 103 rotates, release cam 172 (Fig. 10) will, in timed relation with the selective operations, coact with cam portion 171 to rotate lever 167 against the action of spring 173 to effect the disengagement of shoulder 164 from arm 163 of bail 161. Bail 161 is then permitted to rotate slightly in a clockwise direction by the action of spring 160. The movement of bail 161 effects the release of disc 117 for rotation by disengaging stop arm 121 from lug 119.

As previously mentioned, disc 117 rotates a short distance due to friction until grab clutch 116 and 122 are permitted to engage. Under the positive driving action of the grab clutch, cam 131 continues in its rotation. Lever 134, due to the conformation of cam groove 132 shortly thereafter is rotated from its dotted line position shown in Fig. 8 to its solid line position, and through shoulder screw 136 raises the link 138 and rotates lever 141 therewith against the action of spring 147. Push wire 83 is thereupon freed, to be acted upon by spring 87 (Fig. 3) through bell crank members 75 and 76, thus removing the restraint upon pawl members 44 and 45 (Fig. 2) and permitting the engagement of their respective pawl teeth 48 and 49 with ratchet 47. Simultaneously therewith detent 80 is disengaged from ratchet wheel 47.

Due to the reciprocating movement of pawl members 44 and 45 and the overlap relationship between operative periods of teeth 48 and 49 upon ratchet 47, as previously described, uniform rotative motion is imparted to ratchet wheel 47 in a counterclockwise direction (as viewed in Fig. 2), thus imparting like rotation to the tape engaging roller 63 whereby, through the cooperation of pressure roller 38, the tape 10 is drawn uniformly through the printer 12 (Figs. 9 and 11).

In this manner the initiation of the tape advancing device into operation is effected substantially immediately following the reception of code signals. To maintain link 138 in its uppermost position during the reception of successive code signals, cam 146 has been provided, as previously described, which is operative in out-of-phase relation with cam 131; that is, while lever

134 has been returned to its inoperative or dotted line position, the tape advancing device is nevertheless maintained in actuation for a short period between signal code combinations; otherwise the tape advancing device would be actuated intermittently in timed relation to the reciprocal action of link 138. However, this reciprocal action of link 138 during the reception of successive code signals has been prevented by the out-of-phase relationship between cams 131 and 146. Thus, after lug 119 has traversed a predetermined distance, it coacts with cam portion 156 to rotate bail 161 to effect the release of arm 149 from lug 148, thereby permitting cam 146 to rotate, which rotation during a single operation will continue for a period after cam 131 has come to rest. However, due to the out-of-phase relationship herein described, disc 117, and hence cam 131, will have been reinitiated into further operation before cam 146 has arrived at its normal stop position. Therefore, the contour of cam 146 is so conformed that when cam 131 has rotated lever 134 to its dotted line position, lever 141 will be acted upon by cam 146 to maintain link 138 in its uppermost position, thus preventing link 138 from pressing upon cam 175 and acting upon push wire 83. So, during successive cycles of operation, lugs 119 and 148 will be released for operation in timed relation to effectuate the out-of-phase operation of cams 131 and 146.

Finally, upon a cessation of selective conditions, cam 131 will first arrive at its stop position to actuate lever 134 to its dotted line position followed shortly afterward by the arrestment of cam 146 by the coaction of lug 148 with stop arm 149 to permit lever 141 to be acted upon by spring 147 to actuate link 138 to its lowermost position, thus applying pressure to cap 175 to push the cable 83 against arms 79 and 81 of bell cranks 75 and 76 to again effect the disengagement of pawls 44 and 45 from ratchet wheel 47 and the engagement of detent 80 therewith, causing the inaction of tape engaging device 17.

Manifestly, a tape advancing device has been provided which is responsive to code signalling impulses and which produces a smooth and continuous movement to the tape. It is, of course, understood that the invention is capable of embodiment in many other forms than that specifically disclosed without departure from the spirit and scope of the invention as defined in the appended claims, or which may come within the scope of equivalency.

What is claimed is:

1. In combination, a printing telegraph receiver comprising a mechanism selectively responsive to signalling conditions for determining a character to be printed on a medium, a device for advancing the medium through the receiver, and an all-mechanical means effective during the operation of the receiver and during a predetermined cessation thereof for causing the continuous operation of said medium advancing device.

2. In combination, a printing telegraph receiver comprising a mechanism selectively responsive to signalling conditions for determining a character to be printed on a medium, a device for advancing the medium through the receiver, and mechanically operated elements embodied in said receiver and effective at respective periods during the operation of said receiver and during a predetermined cessation thereof for causing the continuous operation of said medium advancing device.

3. In combination, a printing telegraph receiver comprising a mechanism selectively responsive to signalling conditions for determining a character to be printed on a medium, a device for advancing the medium through the receiver, a motor for driving said device, means contained in said receiver for controlling the effectiveness of said motor drive on said device, and an all-mechanically operated mechanism controlled by said means for insuring the continued operation of said device during a momentary non-operativeness of said receiver.

4. In combination, a printing telegraph receiver comprising a mechanism responsive to signalling conditions for selectively determining a character to be printed on a strip, a pair of elements effective for each character selection, a device for advancing the strip continuously including a motor actuated mechanism, and means controlled by said pair of elements for controlling the continued actuation of said motor actuated mechanism.

5. In combination, a telegraph printing mechanism selectively responsive to received permutation code combinations of current impulses operative to record characters on a tape, a tape moving means, a plurality of cams, means dually controlled by said cams for controlling the operation of said tape moving means, and mechanical means effective with said cam controlled means for controlling the continued actuation of said tape moving means.

6. In combination, a printing telegraph receiver comprising a mechanism responsive to signalling conditions for selectively determining a character to be printed on a strip and a pair of cyclically operable elements effective for each character selection, a device for advancing the strip continuously including a motor actuated mechanism, and means controlled by the out-of-phase operation of said pair of elements for controlling the continued actuation of said motor actuated mechanism.

7. In combination, a telegraph printing mechanism selectively responsive to received permutation code combinations of current impulses operative to record characters on a tape comprising a first cyclically operable means and a second cyclically operable means, said first means controlled by said impulses and said second means controlled by said first means whereby both said means operate in out-of-phase relation with respect to each other, a tape moving means, and means controlled by said first and second means for controlling the continued actuation of said tape moving means.

8. In combination, a recorder responsive to equal length letter codes adapted to make a record on a tape and comprising a signal responsive means, a first cyclically operable means controlled by said means, and a second cyclically operable means controlled by said first cyclically operable means, a tape moving means, and means controlled by said first and second cyclically operable means for controlling the continued actuation of said tape moving means.

9. In a news exhibiting apparatus comprising a telegraph printing mechanism selectively responsive to received permutation code combinations of current impulses operative to record characters on a tape and embodying a pair of elements, each making a cyclic movement for each received code combination, and means to impart continuous movement to the tape comprising a motor actuated mechanism controlled

by the out-of-phase operation of said pair of elements.

10. In a tape actuator, a first member operable under certain operating conditions, a second member operable under other operating conditions, a pair of elements operable reciprocatively by said first member whereby the initial portions and final portions of the operative strokes of said elements overlap to insure uniform continuous operation of said second member, and means for controlling the continued actuation of said second member.

11. In combination, a printing telegraph receiver, a motor actuated tape advancing device, a motion-transmitting means extending therebetween, cam controlled means in said receiver for acting upon said means, mechanism in said device acted upon by said motion-transmitting means, and cam means for controlling said cam controlled means to effectuate through the control of said motion-transmitting means the continued actuation of said advancing device.

12. In combination, a printing telegraph receiver, a motor actuated tape advancing device, a motion-transmitting means interpositioned between said receiver in said device, a pair of elements in said receiver effective for each printing operation, ratchet drive means in said advancing device acted upon by said motion-transmitting means, and means controlled by said pair of elements for acting upon said motion-transmitting means to control through said ratchet means the continued actuation of said advancing device.

13. In a tape actuator, a continuously rotating cam element, a pair of pawl means continuously reciprocated by said element, and a tape engaging device comprising a ratchet wheel adapted to be continuously rotated by said pawl means, the initial and final portions of the operative strokes of said pawl means adapted to overlap to insure the continuous rotation of said ratchet wheel.

14. In combination, a printing telegraph receiver comprising a device responsive to signalling conditions for selectively determining a character to be printed on a strip, a mechanism effective for each character selection, strip advancing means including a continuously rotating cam element, a pair of pawl means continuously reciprocated by said element, an engaging device for said strip comprising a ratchet wheel adapted to be continuously rotated by said pawl means, the initial and final portions of the operative strokes of said pawl means to overlap to insure the continuous rotation of said ratchet wheel, and means controlled by said mechanism for controlling the continued actuation of said engaging device.

15. In combination, a telegraph printing mechanism selectively responsive to received permutation code combinations of current impulses operative to record characters on a tape, a tape moving means, a pair of sequentially initiated rotatable elements having overlapping cycles of operation, and means controlled by said elements for controlling the continued actuation of said tape moving means.

16. In combination, a printing telegraph receiver comprising a mechanism responsive to signalling conditions for selectively determining a character to be printed on a strip, a pair of elements effective for each character selection, a device for advancing the strip continuously including a continuously rotating cam element, a pair of pawl means continuously reciprocated by said element, an engaging device for said strip comprising a ratchet wheel adapted to be continuously rotated by said pawl means, the initial and final portions of the operative strokes of said pawl means adapted to overlap to insure the continuous rotation of said ratchet wheel, means controlled by said pair of elements for controlling the continued actuation of said engaging device, and means effective upon the controlled inaction of said engaging device by said pair of elements to lock said ratchet wheel against rotation.

17. In combination, means for printing upon a record strip, plural cam means operable sequentially in each cycle of operation of said printing means, a continuously running motor, and means controlled by said cam means for causing said motor to feed said strip a predetermined amount following each printing operation.

18. In combination, means for printing upon a record strip, a continuously running motor, means operable from and to normal position in each cycle of operation of said printing means, means for feeding said record strip, means for causing said motor to operate said feeding means in response to the operation of the second recited means from normal position, and means for suspending the return of said second recited means to normal position to enable said feeding means to feed the record strip through a predetermined additional extent.

19. In combination, means for printing upon a record strip, an element movable in each cycle of operation of said printing means, strip feeding means, control means responsive to a certain directional movement of said element for bringing said feeding means into action, and means for suspending the movement of said element in another direction to enable a predetermined further action of said feeding means.

20. In combination, means for printing upon a record strip, means for feeding said record strip, means constantly tending to operate said feeding means, and means including a pair of sequentially initiated rotatable elements having overlapping cycles of operation effective upon the inaction of said printing means for rendering said operating means ineffective to actuate said feeding means and for locking said feeding means against actuation.

21. In combination, a printing telegraph receiver comprising a mechanism responsive to signalling conditions for selectively determining a character to be printed on a strip, a pair of sequentially initiated rotatable elements having overlapping cycles of operation effective for each character selection, a device for advancing the strip continuously including a motor actuated mechanism, and means controlled by said pair of elements for controlling the continued actuation of said motor actuated mechanism.

22. In combination with a telegraphic device, a tape moving means, a plurality of cams, means controlled by said cams for controlling the operation of said tape moving means, and mechanical means effective with said cam controlled means for controlling the continued actuation of said tape moving means.

23. In combination with a telegraphic device, a tape moving means, a plurality of cams, means controlled by the out-of-phase operation of said cams for controlling the operation of said tape moving means, and means effective with said cam controlled means for controlling the continued actuation of said tape moving means.

24. In a telegraphic device responsive to sig

nalling impulses, a first cyclically operable means, a second cyclically operable means, said first means controlled by said impulses and said second means controlled by said first means whereby both said means operate in out-of-phase relation with respect to each other, a motor actuated means, and means controlled by said first and second means for controlling the continued actuation of said motor actuated means.

25. In a telegraphic device, a first means operable under certain operating conditions, a second means operable under other operating conditions, a motor actuated means, and means controlled by the out-of-phase operation of said first and second means for controlling continued actuation of said motor actuated means.

26. In combination with a telegraphic device responsive to signalling conditions, a strip advancing means, a continuously rotating cam element, a pair of pawl means continuously reciprocated by said element, a strip engaging device comprising a ratchet wheel adapted to be continuously rotated by said pawl means, the initial and final portions of the operative strokes of said pawl means adapted to overlap to insure the continuous rotation of said ratchet wheel, and signal controlled means to render said pawl means ineffective.

27. In combination with a telegraphic device responsive to signalling conditions, a strip advancing means, a continuously rotating cam element, a pair of pawl means continuously reciprocated by said element, a strip engaging device comprising a ratchet wheel adapted to be continuously rotated by said pawl means, the initial and final portions of the operative strokes of said pawl means adapted to overlap to insure the continuous rotation of said ratchet wheel, signal controlled means to render said pawl means ineffective, and means controlled by said signal controlled means to lock said ratchet wheel.

28. In combination, a strip advancing means, a first member operable under certain operating conditions, a second member operable under other operating conditions, a pair of elements operable reciprocatively by said first member to impart, through an overlap of their operative strokes, continuous movement to said second member, and means for controlling the continued movement of said second member.

29. In combination, a strip advancing means, a first member operable under certain operating conditions, a second member operable under other operating conditions, a pair of elements operable reciprocatively by said first member to impart, through an overlap of their operative strokes, continuous movement to said second member, means for controlling the continued movement of said second member, and means controlled by said last recited means to lock said second member against movement.

30. In combination, means for printing upon a record strip, a first cam means operable in each cycle of operation of said printing means, a continuously running motor, and a second cam means having its initiation into rotation controlled sequentially by said first cam means in said cycle of operation for causing said motor to feed said strip a predetermined amount following each printing operation.

HOWARD L. KRUM.
WALTER J. ZENNER.