April 4, 1939. M. T. GOETZ 2,152,641

TAPE CONTROLLED APPARATUS

Filed Aug. 9, 1937

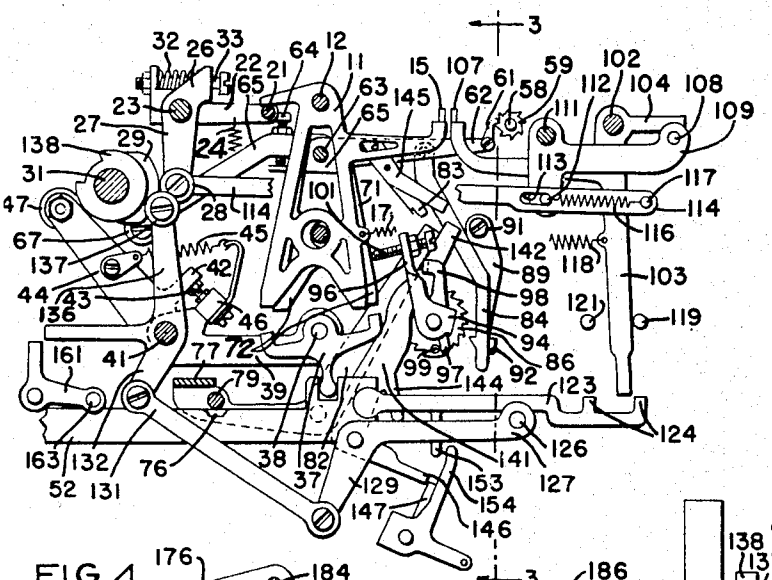


FIG. 2

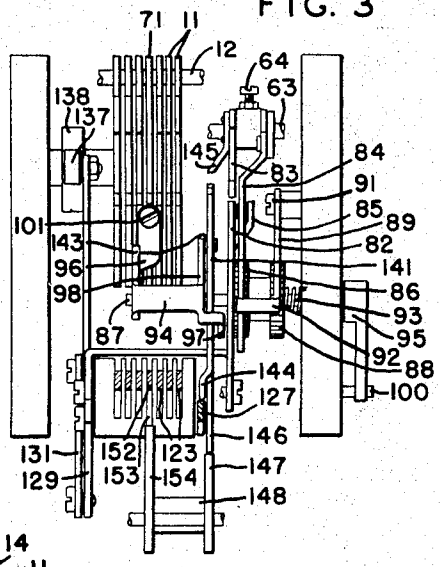
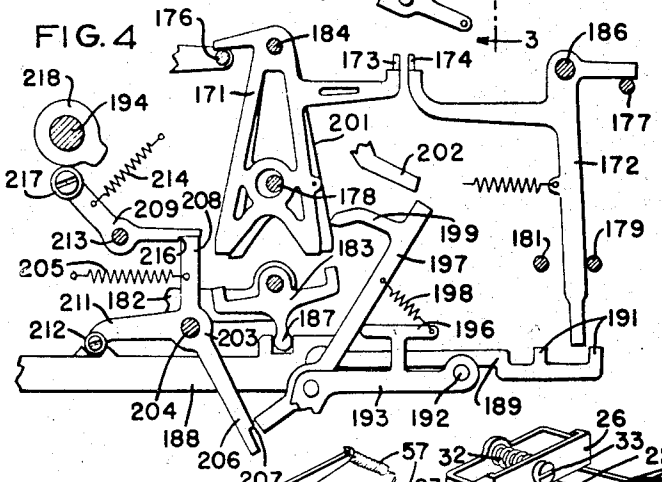


FIG. 3

FIG. 4



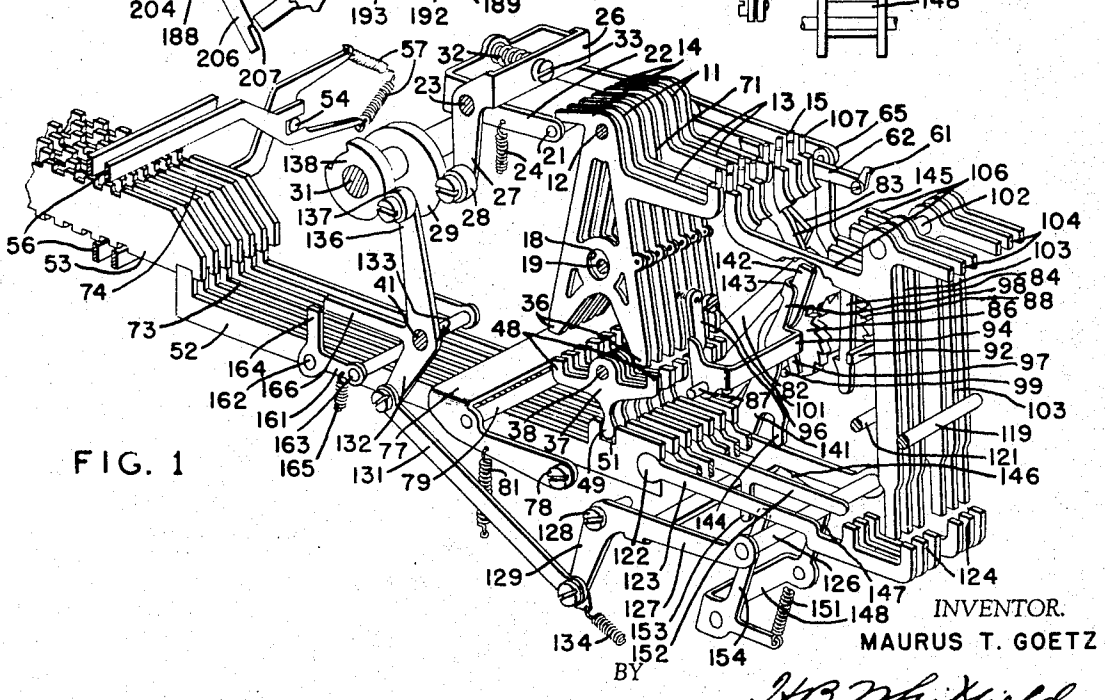


FIG. 1

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TAPE CONTROLLED APPARATUS

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31 Claims. (Cl. 199—18)

This invention relates to linecasting and composing machines and particularly to the operation of such machines by signal responsive apparatus.

An object of the invention is to modify the operation of the signal responsive control apparatus, upon a predetermination of the appearance of the signals in certain sequences, prior to the exercise of control by said signals.

Commercially available linecasting machines include mechanism for releasing matrices from the matrix storage magazines, and each matrix release mechanism requires a certain interval of time in which to effect the release of a matrix and return to normal position so as to be prepared for the next matrix release operation. The time required for the completion of a cycle of operation of the matrix release mechanism of various machines may vary and even in a single machine, certain of the matrix release mechanisms may operate more rapidly than others.

When the composition of lines involves no paired characters, the composing mechanism may be operated with such rapidity as to result in overlap in the operation of the several matrix release mechanisms. However, when a character is repeated one or more times during composition, there can be no overlap in the operation of the mechanism for releasing the matrix of that character, as the releasing mechanism must return to normal condition before it can be operated again to effect the release of the second of the matrices.

When supervision by automatic control apparatus is imposed upon linecasting and composing machines, the speed of composition is limited only by the capabilities of the linecasting and composing machine, as the control apparatus itself may be operated as rapidly as desired. Thus the automatic control apparatus may be operated at a speed to take full advantage of overlap in the operation of release mechanisms assigned to effect the release of different matrices. Operation of the linecasting and composing machine at maximum efficiency is thus attained. The repeated release of matrices from the same matrix storage channel when the linecasting and composing machine is operated from an automatic control apparatus, requires that operation of the control apparatus be retarded or temporarily interrupted to permit the operated matrix release mechanism to return to normal before being again set in operation.

According to the present invention, there is provided in an apparatus operable under the control of perforated tape for supervising the operation of a linecasting and composing machine, an instrumentality for delaying the response of the perforated tape controlled mechanism to repeated matrix release control signals in the tape. This is accomplished by providing in the record reader portion of the control mechanism, which includes a set of levers carrying sensing pins for sensing the perforations in the tape, a second set of feeler levers provided with sensing pins for effecting the pre-sensing of signal combinations prior to their presentation to the main sensing pins. Thus, when the principal and auxiliary sensing pins are simultaneously sensing identical signal combinations, the two sets of feeler levers will be identically positioned. It is this identity of positionment of the two sets of feeler levers through which a delay to insure the proper release of repeated characters is accomplished.

In one embodiment of the invention, the simultaneous presentation of a pair of identical signals to the two sets of sensing pins results in a delay in the presentation of the second signal combination to the principal sensing pins during which the release of the first of the two identical matrices may be effected and the matrix release mechanism restored to normal.

In another embodiment of the invention, the record reader mechanism operates in the same manner in response to not more than two successive identical signals as it does in response to two successive different signals to insert no delay before the release of the second matrix. However, if the next signal is identical with the first two, it will not be permitted to become effective immediately but its effectiveness will be delayed.

In general, the invention is disclosed herein as applied to an automatic control apparatus for linecasting and composing machines according to the disclosure of application Serial No. 600,606, filed March 23, 1932, by Howard L. Krum et al., which matured into Patent No. 2,091,286 on August 31, 1937. A delay mechanism, with which the present invention has been coordinated and the fundamental elements of which are shown herein, is fully disclosed and described in application Serial No. 704,467, filed December 29, 1933, by L. M. Walden, which matured into Patent No. 2,090,654 on August 24, 1937. Reference is also made to Patent No. 2,104,030 granted January 4, 1938, to the present applicant, which discloses a mechanism for inserting delays upon the presentation of repeated character signals to the record

reader of an automatic control unit for linecasting and composing machines.

For a full and complete understanding of the invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawing in which,

Fig. 1 is a diagrammatic perspective view of a record reader mechanism into which has been embodied the invention in one of its forms;

Fig. 2 is substantially an elevational view of the mechanism shown in Fig. 1;

Fig. 3 is a vertical sectional view taken approximately on the line 3—3 of Fig. 2; and

Fig. 4 is substantially an elevational view in diagrammatic form showing a modified embodiment of the invention.

Referring now to the drawing in which like reference numerals designate corresponding parts throughout the several views and particularly to Figs. 1 to 3 inclusive, reference numeral 11 indicates tape sensing levers rockably mounted upon common pivot rod 12. Levers 11 have oppositely extending arms 13 and 14, the former of which are provided at their outer ends with upstanding tape sensing pins 15. Tape sensing levers 11 are biased in counterclockwise direction, as viewed in Fig. 2, by springs 17, which have been omitted from Fig. 1 for the sake of clarity, and are provided in the body portion thereof with circular apertures 18 through which extends a fixed rod 19 to limit the movement of levers 11. Arms 14 of the tape sensing levers 11 are presented in the operating path of bar 21 carried by bail 22 which is rockably mounted upon pivot rod 23. Bail 22 is biased in clockwise direction, as viewed in Fig. 2, by tension spring 24. Pivot rod 23 also supports bail 26 provided with arm 27, which carries at its free end roller 28 which engages cam 29 carried by record reader shaft 31. A compression spring 32 held in position by screw 33 is disposed between bails 26 and 22 and serves as a yieldable interconnection through which motion is imparted from bail 26 to bail 22 which, through rod 21, imparts clockwise rotation to tape sensing levers 11, as viewed in Fig. 2, and effects withdrawal of tape sensing pins 15 from a perforated signal storage control tape (not shown), as is fully set forth in any of the hereinbefore identified applications.

Tape sensing levers 11 terminate at their lower ends in spaced prongs 36. Below each of the tape sensing levers 11, a T-shaped transfer lever 37 is rockably mounted upon a rod 38 carried by transfer bail 39. Bail 39 is rockably mounted upon pivot rod 41 and is provided with arm 46 which carries adjusting screw 43. A transfer bail operating lever 44 in the form of a bell crank has arm 42 thereof presented against adjusting screw 43. Extending between arm 46 of bail 39 and lever 44 is a spring 45 which holds the two levers in the position shown and through which movement is effected. Transfer bail operating lever 44 has cam follower roller 47 presented in engagement with a transfer cam (not shown) carried by record reader shaft 31, and is operable by its cam in counterclockwise direction, as viewed in Fig. 2, to impart counterclockwise rotation to transfer bail 39 through spring 45 to lift T-shaped transfer levers 37 for cooperation with tape sensing levers 11 in a manner which will now be described.

The laterally extending portions of T-shaped transfer lever 37 have upstanding abutments 48 spaced apart a greater distance than the distance between the depending prongs 36 of tape sensing levers 11. The spacing of abutments 48 of transfer levers 37 is such that when a tape sensing lever 11 is presented in its extreme clockwise position, which occurs when its tape sensing pin encounters an imperforate portion of the tape, the left-hand prong 36 of the tape sensing lever will be presented in alignment with and in the path of the left-hand abutment 48 of the associated transfer lever 37. Conversely, when a tape sensing lever 11 is presented in its extreme counterclockwise position, which condition exists when its tape sensing pin encounters and projects through a perforation in the tape, the right-hand prong 36 of the tape sensing lever is presented in alignment with and in the path of the right-hand abutment 48 of the associated transfer lever 37. Rod 38 carried by transfer bail 39 lifts transfer levers 37, upon operation of transfer bail operating lever 44, a distance in excess of that required to bring one of the abutments 48 of each of T-levers 37 into engagement with prongs 36 of those of the tape sensing levers 11 which have been set under the control of a signal combination in the tape in positions different from those in which they were presented according to the preceding signal combination. Thus a T-lever, upon coming into engagement with a prong 36 of a tape sensing lever 11 before the T-lever reaches its limit of travel, will be rocked clockwise or counterclockwise about rod 38, depending upon the position in which the tape sensing lever is presented. It will be evident from this that when the tape sensing levers have been set in accordance with a signal combination in the tape, and the transfer bail 39 has been actuated, the T-shaped transfer levers will be set in extreme clockwise or counterclockwise positions in accordance with the signal combination in the tape.

The intermediate or vertical portions of transfer levers 37 are formed at their lower extremities with disc-like portions 49. These disc-like portions are disposed in parallel sided notches 51 formed in the upper edges of link bars or extensions 52 of code bars 53. Thus, as each of the T-shaped transfer levers 37 is set in its extreme clockwise position under the control of its associated tape sensing lever 11, the code bar extension 52 and code bar 53 articulated to it are set in extreme left-hand position. Conversely, each of the transfer levers 37 that is set in extreme counterclockwise position effects the presentation of its associated code bar 53 and extension or link bar 52 in extreme right-hand position. The disc-like portions 49 of transfer levers 37 and the notches 51 of link bars 52 are so proportioned that the disc-like portions 49 are not lifted out of the notches 51 when the transfer levers 37 travel upwardly due to operation of the transfer bail 39.

Code bars 53 have their edges provided with notches and lugs in accordance with the code upon which the apparatus is to be operated, which may be a permutation code, so that for each permutational setting of code bars 53 in accordance with a signal combination interpreted by tape sensing levers 11, one and only one alignment of notches transversely of the code bars 53 is established. Extending longitudinally of the code bars 53 and parallel thereto is a rod 54 (Fig. 1), which carries a plurality of selectable bars 56 mounted thereon for rocking movement and extending transversely of code bars 53. Selectable bars 56 are biased by springs 57 for rocking movement toward the edges of code bars 53 and into engagement with the lugs thereof, and

when an alignment of notches is presented to one of the selectable bars 56, that bar enters the aligned notches under the influence of spring 57. Through the operation of selectable bars 56 after selection thereof, under the control of signals presented to the tape sensing mechanism, the composing and line conveying functions of the linecasting and composing machine are controlled. Reference may be had to the hereinbefore mentioned Krum et al. patent for a complete understanding of the manner in which selectable bars 56 control the composing and line conveying mechanism.

Feeding of the tape to present the signal combinations successively to the tape sensing pins 15 is effected by a sprocket (not shown), carried by a shaft 58 (Fig. 2). Shaft 58 has keyed or otherwise secured thereto a ratchet 59 with which there cooperates a pawl 61 to effect feeding of the tape. Tape feed pawl 61 is carried by one end of a lever 62 which is rockably mounted upon pivot rod 63 and is biased clockwise by tension spring 66 (not shown). At the end opposite to that upon which tape feed pawl 61 is carried, lever 62 is engaged by an adjustable screw 64 carried by a lever 65 also mounted on pivot rod 63. Lever 65 carries a cam follower roller 67, which engages a cam (not shown) carried by record reader shaft 31. It will be evident that as lever 65 is rocked counterclockwise (Fig. 2) by its operating cam on record reader shaft 31, screw 64 engaging lever 62 rocks that lever counterclockwise to lift pawl 61 so that it may engage an advance tooth of ratchet 59 preparatory to rotating the ratchet counterclockwise upon the return stroke of lever 62 to feed the perforated tape past sensing pins 15. The reason for providing levers 62 and 65 instead of a single lever is that under certain circumstances, which will be described later, it is desirable to block lever 62 in its extreme counterclockwise position to prevent feeding of the tape while permitting lever 65 to rock alternately counterclockwise and clockwise under the control of its operating cam carried by record reader shaft 31, which is normally continuously rotatable. Such an arrangement also provides a convenient adjustment for the travel of the feed pawl 84.

All of the mechanism heretofore described is fully disclosed and described in the hereinbefore identified Krum et al. patent. The mechanism which is about to be described is not found in the Krum et al. patent but is disclosed and described in the above mentioned patent of L. M. Walden. The purpose of the mechanism is to interpose between the sensing of predetermined signal combinations and the selection of the selectable bar 56 responsive thereto a time delay interval which may be of a duration represented by several cycles of operation of record reader shaft 31.

It may be noted by reference to Figs. 1 and 3, that six tape sensing levers 11 with arms 13 and tape sensing pins 15 have been provided, and that between the third and fourth of the tape sensing levers 11 is a lever 71 also pivoted on pivot pin 12 and similar in all respects to tape sensing levers 11 except that it has no arm corresponding to arms 13 and no tape sensing pin. Centrally positioned lever 71 has depending prongs 72 similar to prongs 36 of tape sensing levers 11 and intended for cooperation with the central one of the T-shaped transfer levers 37. The center one of the transfer levers 37 is articulated to a link bar 73, which in turn is connected to a special bar 74 centered in the group of code bars 53. Bar 74 is provided with lugs which may block the selection of certain of the selectable bars 56 when bar 74 is presented in one of its positions and which may unblock the same ones of bars 56 to permit the selection thereof when bar 74 is presented in its other position. Blocking of any one of the selectable bars 56 with reference to either of the two positions which bar 74 may occupy may be accomplished by providing lugs in predetermined positions. With this arrangement, an alignment of notches in bars 53 may be presented to one of the selectable bars 56 which may be unable to respond and enter the alignment of notches due to blocking by a lug on bar 74. Withdrawal of the blocking lug to permit the selectable bar 56 to enter the alignment of notches may be accomplished by shifting bar 74, which is shiftable under the control of pivoted lever 71 associated with the tape sensing levers 11 and through the operation of transfer bail 39, as will be described later. Those of bars 56 which are to be left free for selection irrespective of the position of bar 74, are presented across a portion of the edge of bar 74 which has no blocking lug. It will be observed that pivoted lever 71 is normally presented in its extreme counterclockwise position due to the biasing effect of spring 17, and that through cooperation of the central one of transfer levers 37 with lever 71, link bar 73 and blocking bar 74 are normally presented in extreme left-hand positions, as viewed in Figs. 1 and 2.

As shown in Fig. 2, link bars 52 may be provided with notches 76 and link bar 73 may have a similar notch. A bail 77 pivoted at 78 extends across link bars 52 and 73 and is provided with a rod 79 extending across bars 52 and 73 directly above the position occupied by notch 76 of central link bar 73 when that bar is presented in its normal or extreme left-hand position. Notches 76 of link bars 52 are so positioned that for certain permutational settings of bars 52 and code bars 53, notches 76 will be presented in alignment below rod 79, whereupon bail 77 will be permitted to respond to the biasing effect of tension spring 81 and will rock counterclockwise. Bail 77 is provided with arm 82 extending upwardly obliquely and terminating adjacent to and in alignment with a downwardly obliquely extending arm 83 carried by tape feed lever 62. The operation of tape feed lever 62 by its operating lever 65 under the control of the tape feed cam is such that lever 62 is normally held in extreme counterclockwise position, at the proper time is permitted by the cam to rock clockwise under the influence of spring 66 to effect feeding of the tape, and is immediately restored to extreme counterclockwise position. Arm 83 of tape feed lever 62 is thus normally presented in its uppermost position, and does not interfere with the presentation of arm 82 of bail 77 in blocking relation to arm 83. Arm 82 upon being rocked counterclockwise with bail 77 is presented in blocking relation to arm 83, and the tape feed lever 62 is prevented from effecting feeding of the tape when tape feed cam rotates into position for permitting lever 62 to operate. Tape feed operating lever 65 may continue to operate under the control of its cam without interference by blocked lever 62, by merely lifting screw 64 out of engagement with tape feed lever 62.

At its extreme right-hand end, as viewed in Fig. 2, tape feed operating lever 65 carries depending pawl 84. This pawl is normally held out of engagement with ratchet 86, carried by stub shaft 87, by a projecting arm 85 mounted near

the upper end of arm 82 of the bail 77 (Fig. 3). Upon the counterclockwise movement of bail 77 to bring its arm 82 into blocking position with reference to depending arm 83 of tape feed lever 62, pawl 84 becomes free to rock clockwise about its pivotal mounting by a spring (not shown) individual thereto, and thus to come into engagement with ratchet 86. Stub shaft 87 also carries a ratchet 88 with which is aligned a holding pawl 89 pivoted at 91 to a fixed member. Pawl 89 is biased in clockwise direction by tension spring 90 and is provided near its lower end with a transversely extending arm 92 which is presented in engagement with pawl 84 on the side opposite to that which engages ratchet 86. Pawl 89 thus follows the leftward and rightward movement of pawl 84, and when the latter is permitted, by obliquely extending arm 82, to move into engagement with ratchet 86, pawl 89 moves into engagement with ratchet 88 and becomes a holding pawl for ratchets 86 and 88 and thus for stub shaft 87. A torsion spring 93 arranged around stub shaft 87 and having one end secured to a stationary portion of the machine and the other end secured to ratchet 88 rotates ratchets 86 and 88 when they are free of pawls 84 and 89, respectively, into stop position which is settable and is determined by the angular position on shaft 87 of an adjustable stop arm 95 which cooperates with fixed stop 100.

Stub shaft 86 has rockably mounted thereon a bail-shaped lever 94 which has arm 96 at one end thereof and arms 97 and 98 at the other end. Arm 97 of bail-shaped lever 94 extends into the path of a pin 99 carried by ratchet 86. Arm 98 cooperates with a mechanism to be described later. Arm 96 carries at its upper end an adjustable screw 101, the end of the shank of which is presented in alignment with and substantially in engagement with pivoted lever 71 carried by tape sensing lever pivot rod 12. Bail-shaped lever 94 is ckable counterclockwise by engagement of pin 99 with arm 97 when ratchet 86 is operated by pawl 84, and is effective through screw 101 to rock lever 71 to its extreme clockwise position.

The selection and operation of pivoted lever 71 and blocking bar 74 under the control of the ratchet feed mechanism will now be described. Upon the setting of link bars 52 and code bars 53 under the control of tape sensing levers 11 into permutative position according to which blocking bar 74 is to be rendered effective, an alignment of notches 76 is presented to bar 79 carried by bail 77. The bail rotates counterclockwise to permit bar 79 to enter notches 76. Tape feed lever 62 is held in its counterclockwise position by its operating lever 65, and depending blocking arm 83 is held out of the path of arm 82 of bail 77. Arm 82, under such conditions, moves to its blocking position. The counterclockwise rocking of arm 82 of bail 77 simultaneously effects blocking of tape feed lever 62 through depending arm 83 and permits pawls 84 and 89 to come into engagement with their respective ratchets 86 and 88. Lever 65 continues to be rocked by its cam (not shown) as if effecting tape feeding, but instead it lifts and lowers pawl 84. This causes ratchet 86 to be rotated step by step, and upon each feeding operation, pawl 89 holds ratchet 88 and prevents the ratchets and shaft 87 from returning to normal position under the influence of spring 93. The feeding of ratchet 86 brings pin 99 into engagement with arm 97 of bail-shaped lever 94 and continued ratchet feeding causes counterclockwise rotation of bail-shaped lever 94, as viewed in Figs. 1 and 2, to effect clockwise rocking of pivoted lever 71.

During the feeding of ratchet 86, transfer bail 39 undergoes repeated operation in timed relation to ratchet feed operating lever 65, both of these elements being operated by cams carried by continuously rotatable shaft 31. Likewise, the tape sensing pin withdrawing bail 22 operates repeatedly. However, since the tape feed is disabled and the tape is held stationary, tape sensing levers 11 repeatedly sense the same signal combination and are set according to the same permutational distribution prior to operation of transfer bail 39 and presentation of transfer lever 37 into cooperation with tape sensing levers 11. Thus the transfer levers 37 find the same signal combination that they previously found, hence no movement is imparted to link bars 52 and code bars 53. The next operation of transfer bail 39, after bail-shaped lever 94 has rocked pivoted lever 71 to its extreme clockwise position, results in shifting of link bar 73 and blocking bar 74, due to the fact that the center one of transfer levers 37 finds lever 71, with which it cooperates, shifted to a different position than that which it had previously occupied, whereupon the transfer lever rocks counterclockwise and shifts link bar 73 and blocking bar 74 rightwardly, as viewed in Figs. 1 and 2.

The shifting of bar 73 rightwardly causes its notch 76 to be moved rightwardly also, which cams rod 81 to its unselected position, thus causing bail 77 to be rocked clockwise. Obliquely extending arm 82 is thus moved out of blocking relation with depending arm 83 of tape feed lever 62, whereby tape feeding operation is resumed. Obliquely extending lever 82, in moving to its unselected or extreme clockwise position, withdraws pawl 84 from engagement with ratchet 86, and pawl 84, through arm 92, withdraws pawl 89 from engagement with ratchet 88. The ratchets, thus being freed, respond to torsion spring 93 and rotate in clockwise direction to their stop or normal position. The release of ratchets 86 and 88 permits bail-shaped lever 94 to return to its normal position and centrally located pivoted lever 71 responds to the urge of its spring 17 and returns to its extreme counterclockwise position. Thereafter, upon the next operation of transfer bail 39, the center one of transfer levers 37 finds lever 71 in its counterclockwise position and restores centrally located link bar 73 and blocking bar 74 to normal or left-hand position.

Apparatus, the operation of which has just been described, which includes blocking bar 74 and the mechanism for controlling it, is fully disclosed and described in the hereinbefore mentioned patent to L. M. Walden, to which reference may be had for more detailed description. The mechanism now to be described comprises and embodies, individually and in combination with the mechanism heretofore described, the invention of the present application.

A pivot rod 102 is provided (Figs. 1 and 2) upon which are pivotally mounted auxiliary tape sensing levers 103. The auxiliary tape sensing levers are provided with oppositely extending arms 104 and 106. The free ends of arms 106 are upwardly turned and are provided with tape sensing pins 107. Pins 107 are equal in number to tape sensing pins 15 carried by tape sensing levers 11, are presented adjacent to tape sensing pins 15, and the centers of the two sets of pins coincide with the centers of the perforations of two adjacent code

combinations in the control tape, so that two signal combinations may be sensed simultaneously by the two sets of pins. Arms 104 of auxiliary tape sensing levers 103 correspond to arms 14 of principal tape sensing levers 11 and are engaged by a rod 108 extending beneath arms 104 transversely thereof, said rod being carried by a bail 109 pivotally mounted upon pivot pin 111. Bail 109 is provided with a pin 112 which is disposed in an elongated slot 113 in a link 114, which is articulated to lever arm 27 which actuates the principal sensing pin withdrawing bail 22. At its free end which is the right-hand end as viewed in Fig. 2, link 114 carries spring post 117 which is engaged by one end of a tension spring 116, the other end of which engages pin 112. Pin 112, slot 113, and spring 116 establish a yieldable connection between link 114 and bail 109, so that when lever 27 is operated by its cam 29 to effect clockwise rotation of the principal tape sensing levers 11 through bail 22, bail 109 is rocked counterclockwise about pivot rod 111 by link 114, and auxiliary tape sensing levers 103 are rocked counterclockwise through bail rod 108 to effect withdrawal of auxiliary sensing pins 107 from the tape simultaneously with the withdrawal of principal sensing pins 15 to permit advancement of the tape. Tension springs 118 bias auxiliary tape sensing levers 103 in clockwise direction, thus tending to present pins 107 in tape sensing position. Stop rods 119 and 121 extending across the depending arms of levers 103 limit rocking movement thereof.

Each of the link bars 52 is provided at its extreme right-hand end, as viewed in Figs. 1 and 2, with a cut away portion, the walls of which are conformed to an incomplete cylinder. The disc-shaped end 122 of a testing bar 123 is disposed in the recess afforded by the cutting away of the partially cylindrical portion in each link bar 52. Near its extreme right-hand end, each testing bar 123 is provided with a pair of upstanding abutments 124. The lower end of the depending arm of each of the auxiliary tape sensing levers 103 is presented in alignment with the two upstanding abutments 124 of the corresponding testing bar 123, and the spacing between the two abutments 124 of a bar 123 is such that when an auxiliary tape sensing lever is in extreme counterclockwise position and the corresponding link bar 52 and testing bar 123 are in their extreme left-hand positions, the right-hand abutment 124 is presented directly below the end of the tape sensing lever, but if the testing bar is in its extreme right-hand position, neither of its abutments 124 is in alignment with the lower end of auxiliary tape sensing lever. Conversely, if an auxiliary tape sensing lever 103 is presented in its extreme clockwise posititon, and a corresponding bar 52 and testing bar 123 are in there extreme right-hand positions, the left-hand abutment 124 of the testing bar will be presented directly beneath the depending arm of the auxiliary sensing lever 103, but if the testing bar is presented in its extreme left-hand position, neither of its abutments will be aligned with the end of the depending arm of the auxiliary tape sensing lever.

Testing bars 123 rest on a rod 126 carried by a bail 127 pivotally mounted as at 128. An arm 129 of bail 127 is connected by link 131 to an arm 132 of a bell crank lever 133 pivoted at 41. Spring 134, connected to bail arm 129, applies counterclockwise biasing to bail 127. Arm 136 of bell crank lever 133 carries at its outer end cam follower roller 137 which engages cam 138 carried by continuously rotatable shaft 31. It will be observed that cam 138 has a recess in the periphery thereof, which at the proper time in the cycle of operation of shaft 31, releases bell crank lever 133 for counterclockwise rocking movement by power supplied by spring 134 through link 131.

When bell crank lever 133 rocks counterclockwise, it reciprocates link 131 rightwardly, as viewed in Figs. 1 and 2, which in turn imparts counterclockwise movement to lever arm 129 and bail 127 to lift the outer or right-hand end of testing bars 123, pivoting their disc-shaped portions 122 within the recesses in link bars 52, these movements being conditioned upon a presentation of all of the auxiliary sensing levers 103 out of blocking alignment with all of the upstanding abutments 124 of testing bars 123. The circumstances under which testing bars 123 may or may not be blocked by auxiliary tape sensing levers 103 and the operation of the apparatus in consequence of such conditions will be described later.

A bell crank lever 141 pivotally supported coaxially with the pivotal support of testing bar lifting bail 127 has an upwardly and obliquely extending arm 142 in the operative path of which, as it rocks counterclockwise, is a laterally extending portion 143 of arm 98 of bail-shaped lever 94. Arm 142 has a depending finger 144 which rests on one of the arms of bail 127 and the upper end of arm 142 is presentable in the path of an arm 145 depending from tape feed lever 62. Another arm 146 of bell crank lever 141 terminates adjacent to a blocking arm 147 of bail-shaped lever 148, which is pivoted at 149 and is biased in counterclockwise direction by tension spring 151. By the engagement of finger 144 with the arm of bail 127, counterclockwise rocking movement is imparted to bell crank lever 141 when testing bars 123 and tape sensing levers 103 permit bail 127 to undergo a full stroke of rocking movement under the control of cam 138. Arm 142 of lever 141 blocks arm 145 of tape feed lever 62 and imparts counterclockwise rocking movement to bail-shaped lever 94 through engagement with laterally extending portion 143 to effect shifting of centrally located pivoted lever 71 to its extreme clockwise position to the same extent and in the same manner as if bail-shaped lever 94 had been actuated by pin 99 carried by ratchet 86. As bell crank lever 141 rocks counterclockwise to effect rocking of pivoted lever 71, the free end of its arm 46 clears the upper end of arm 147 of bail-shaped lever 148 which responds to the biasing effect of tension spring 151 and rocks counterclockwise to present the upper end of arm 147 in blocking relation to arm 146 of bell crank lever 141. Pivoted lever 71 is thus held in its extreme clockwise position for an interval to permit transfer bail 39 to lift T-shaped transfer lever 37 and to set blocking bar 74 and link bar 73 in accordance with the new setting of pivoted lever 71.

Centrally located link bar 73 has at its extreme right-hand end an aperture similar to those in link bars 52 into which is fitted the disc-shaped portion of a slide bar 152, the free end of which rests upon rod 126 of testing bar operating bail 127, and which has intermediate its end, a depending arm 153. Bail-shaped blocking lever 148 has an upstanding arm 154, which is presented in alignment and immediately to the right (as viewed in Figs. 1 and 2) of arm 153 of slide bar 152 when the latter is in its extreme left-hand position, which is the condition when pivoted lever 71 occupies its normal or extreme

counterclockwise position. When blocking bar 74 and link bar 73 are moved to the right by movement of the centrally located one of T-shaped transfer levers 137 into engagement with the shifted pivoted lever 71, depending arm 153 of slide bar 152 is shifted rightwardly and bail-shaped lever 148 is rocked in clockwise direction against the tension of spring 151 to effect withdrawal of arm 147 of lever 148 from blocking engagement with arm 146 of bell crank 141. Bell crank lever 141 is thus released and is permitted to return to its normal position, it being understood that bail 127, being operated in accordance with the contour of cam 138, had returned to its extreme clockwise position after the latching of bell crank lever 141 in its extreme counterclockwise position. Bail 127 therefore does not block arm 144 of lever 141 nor otherwise prevent the return of bell crank lever 141 to its normal position. Bail-shaped lever 94 likewise returns to its normal position and permits centrally located pivoted lever 71 to return to its counterclockwise or normal position.

The restoration of bell crank lever 141 to its normal position effects unblocking of depending arm 145 carried by tape feed ratchet operating lever 62. Normal tape feeding operation is resumed, and upon the next operation of transfer bail 39, link bar 73 and blocking bar 74 are restored to their extreme left-hand positions due to previous restoration of pivoted lever 71 to its extreme counterclockwise position. As previously stated, the operation of bail 127 to effect interruption of the tape feed mechanism is dependent upon a condition of non-interference with or non-blocking of testing bars 123 by auxiliary tape sensing levers 103. This condition exists when principal tape sensing levers 11 and auxiliary tape sensing levers 102 are sensing identical signal combinations simultaneously.

By way of illustration of the foregoing statement, let it be assumed that identical signal combinations are presented to the two sets of sensing levers and that these signal combinations comprise a perforation presented to the foremost (as viewed in Figs. 1 and 2) sensing pin in each set and imperforate portions of the tape presented to the remaining five pins in each set. Upon the release of the tape sensing levers by their respective bails to permit them to sense the signal combinations, the foremost one of the principal tape sensing levers 11 will rock into its counterclockwise position as its tape sensing pin 15 enters the perforation, and the remaining tape sensing levers in the set will be presented in their extreme clockwise positions, whereas the foremost of the auxiliary tape sensing levers 103 will move into its extreme clockwise position and the others will be presented in extreme counterclockwise position. Upon operation of transfer bail 39, the foremost of link bars 52 and code bars 53 will be shifted to their extreme left-hand positions and the remaining link bars and code bars will be presented in extreme right-hand positions. Testing bars 123 will be correspondingly positioned. As previously stated, an auxiliary tape sensing lever 103 presented in counterclockwise position blocks a testing bar 123 presented in extreme left-hand position and a sensing lever 103 presented in clockwise position blocks a testing bar 123 presented in extreme right-hand position. With all but the foremost of sensing levers 103 presented in counterclockwise position and all but the corresponding one of the slide bars 123 presented in extreme right-hand position, none of the tape sensing levers 103 blocks a testing bar 123, and upon presentation of recess in cam 138 to cam follower 137, bail 127 can operate through its full cycle to rock bell crank lever 141 counterclockwise, which interrupts the tape feeding mechanism, rocks pivoted lever 71 to its extreme clockwise position, and becomes latched in its operated position.

If the signal combination presented to auxiliary tape sensing levels 103 should differ from that presented to principal tape sensing levers 11, one or more of auxiliary tape sensing levers 11, would be presented in a position different from that set forth in the above described hypothetical and illustrative signal sensing condition. The auxiliary sensing lever or levers would be presented in position to oppose and block the lifting of the corresponding testing bar or bars 123 by bail 127 so that bell crank lever 141 would not be rocked and normal tape feeding would not be interrupted. Thus it will be observed that upon the presentation of any two identical signal combinations to the two sets of tape sensing pins simultaneously, the second of the two signal combinations is not advanced to the principal sensing pins in the normal manner, but the advancement of the tape is delayed for the interval required to set pivoted lever 71 by operation of bail 127 and to transfer this setting to link bar 73, which interval is represented by substantially one cycle of operation of shaft 31.

The timing of the several operations is controlled by record reader shaft 31, since all of the operating cams are carried by that shaft. Timing can best be understood by reference to the following description of the several operations arranged in chronological order. Assuming that lever arm 27 has been rocked counterclockwise by its cam 29 to withdraw the tape sensing pins 15 and 107 from the tape and that tape feed lever 65 has operated to advance the tape to present the first of two identical signal combinations to tape sensing pins 15 and the second to pins 107, cam 29 permits lever 27 to return to its extreme clockwise position whereby tape sensing pins 15 and 107 are presented to the two signal combinations and the tape sensing levers 11 and 103 are positioned permutatively in accordance with the signals. Transfer bail 39 is then operated by its car to effect positionment of link bars 52 and code bars 53. During the transfer operation, selectable bars 56 are held out of engagement with code bars 53 by a spreader cam which is operated under the control of shaft 31 and which is not shown herein but is fully disclosed in the Krum et al. patent hereinbefore identified.

Immediately after the setting of code bars 53 is completed, selectable bars 56 are permitted to come into engagement with code bars 53 and that selectable bar which finds an alignment of notches comes into selected position for actuation to control a composing operation of the linecasting and composing machine. Also, immediately after the operation of transfer bail 39, the recess in cam 138 is presented to its cam follower 137 and bail 127 is permitted to operate to test the setting of auxiliary tape sensing levers 103. Levers 103 are so positioned with respect to testing bars 123 that they affect no blocking thereof and bail 127 is able to operate through a full cycle, whereby tape feeding is blocked, pivoted lever 71 is moved to its extreme clockwise position, and lever 141 is latched in operated position to maintain these conditions. Full use has

thus been made of the settings of both sets of tape sensing levers and they may now be withdrawn from tape sensing position by operation of lever arm 27, thus completing one cycle of operation of shaft 31.

Following withdrawal of the tape sensing pins from the tape, tape feed operating lever 65 is actuated by its cam but the actuation is idle since tape feed lever 62 is blocked and cannot operate ratchet 59 to effect feeding of the tape. Therefore, when cam 29 permits lever arm 27 to be restored to its extreme clockwise position, both sets of tape sensing pins are presented to the same signal combinations that they previously sensed. As stated in the preceding paragraph, the next operation is that of transfer bail 39 which is able to effect movement of link bar 73 and blocking bar 74 only, as code bars 74 are already set in the proper position in accordance with the positions of tape sensing levers 11. The shifting of link bar 73 to its extreme right-hand position effects unlatching of lever 141, as previously described, and the shifting of blocking bar 74 establishes an important condition; namely, the presentation of its blocking lugs in opposition to all of the selectable bars 56 that control operations in the repetition of which a delay is required. This blocking is important because immediately following the operation of the transfer bail, selectable bars 56 are permitted to seek selection and that bar which had been previously selected and to which an alignment of notches in code bars 53 is still presented would be selected and operated a second time for a single signal combination presented to tape sensing pins 15.

The unlatching of lever 141 due to rightward shifting of link bar 73 permits the return of pivoted lever 71 to its extreme counterclockwise position and permits tape feed lever 62, which was of necessity blocked in its extreme counterclockwise position, to return to its clockwise position under the influence of spring 66 upon withdrawal of tape sensing pins 15 and 107 at the beginning of the third cycle of operation of shaft 31. The tape is thus fed to present the second of the two identical signal combinations to tape sensing pins 15 and the next signal combination to pins 107. Following the feeding of the tape and the sensing of the signal combinations in the third cycle, transfer bail 39 operates and since tape sensing levers 11 are arranged as in the preceding cycle and code bars 53 are correspondingly produced, link bar 73 and blocking bar 74 only are to be moved in view of the restoration of pivoted lever 71 to its normal position. The transfer accomplishes the restoration of link bar 73 and blocking bar 74 to their normal positions. That selectable bar 56 to which an alignment of notches is presented is now free to be selected. Immediately after the transfer operation, cam 138 releases bail 127 for operation and it will or will not be fully operated depending upon the positionment of auxiliary tape sensing levers 103. The response of bail 127 will determine whether another delay is to be effected or whether normal operation of the record reader mechanism is to be resumed.

Under certain circumstances, it may be found undesirable to interrupt the normal passage of successive identical signals through the record reader. For example, tape is sometimes passed through and ejected from the perforating mechanism of the apparatus for preparing the tape for control of a linecasting and composing machine by simultaneously depression of the "tape" key and a repeat key. Take thus produced carries only the perforations intended for cooperation with the feed sprocket and from the standpoint of a permutation code, represents repeated all blank signal combinations. Also, it is the custom to obliterate signal combinations of groups of signal combinations for the purpose of effecting corrections by converting them to the "rubout" combination, which has a perforation in all possible code positions. "Tape" and "rubout" signal combinations exercise no controlling effect over a linecasting and composing machine. There is, therefore, no reason for delaying the presentation of successive ones of such signals and it is in fact desirable that a series of them shall be passed through the record reader mechanism as rapidly as possible, for the reason that the linecasting machins is standing idle while such signal combinations are being sensed.

Accordingly, it is proposed to disable the repeat character delay mechanism hereinbefore described with reference to certain signal combinations of which "tape" and "rubout" are outstanding examples. Bail 161 (Figs. 1 and 2) may be employed for disabling the repeat character delay mechanism. This bail is pivoted at 162 and has rod 163 spanning link bars 52 and 73 similar to bar 79 of bail 77. Bail 161 is provided with upstanding arm 164 which terminates just below an arm 166 carried by testing bar lifting bail bell crank 133. In the normal position of bail 161, its arm 164 just clears the free end of arm 166 of bell crank 133. It is proposed to provide notches in link bars 52 similar to notches 76 heretofore described, and so positioned with reference to rod 163 of bail 161 that when link bars 52 have been set in accordance with a signal combination with reference to which the repeat character delay mechanism is to be disabled, an alignment of notches will be presented to rod 163 whereby bail 161 will be enabled to rock clockwise under the influence of spring 165 to present the free end of its arm 164 in blocking relation to arm 166 of bell crank 133. Thereafter, upon the presentation of the recess in cam 138 to cam follower 137, bell crank lever 133 will be prevented from rocking and bail 127 will remain unlifted even though testing bars 123 are not blocked by auxiliary tape sensing levers 103.

After a series of repeated signals by which bail 161 was selected have passed through the record reader mechanism and a different signal combination has been presented to the principal tape sensing pins 15, rod 163 of bail 161 is lifted upwardly by camming action due to the shifting of one or more of the link bars 52, and arm 164 is withdrawn from blocking engagement with arm 166 of bell crank 133. Since link bar 73 plays no part in the selection or unselection of bail 161 but must afford clearance for rod 163 to permit it to enter an alignment of notches in the other link bars, bar 73 may have an elongated notch which will not bar selection nor effect unselection of bail 161 due to presentation of link bar 73 in either of its possible positions or movement from one to another of those positions.

A modified embodiment of the invention is shown in Fig. 4. This embodiment is intended for use in control units for linecasting machines which attain a satisfactory response from the linecasting machines to release two identical character matrices successively without the interposition of a delay between the first and second release control operations, but which may fail to respond to three or more like control opera-

tions presented at the normal operating speed of the control mechanism. In apparatus in accordance with this embodiment of the invention, two identical signal combinations are permitted to be presented to the principal sensing pins in order, but if the third signal is like the first two, the presentation of the third to the principal sensing pins is delayed.

Referring to Fig. 4, it will be observed that principal and auxiliary tape sensing levers 171 and 172 respectively are substantially identical with tape sensing levers 11 and 103 respectively, that tape sensing pins 173 and 174 are substantially identical with sensing pins 15 and 107, that sensing pin withdrawing bail rods 176 and 177 are identical in construction and operation with rods 21 and 108 of the previously described figures, that sensing lever stops 178, 179, and 181 are identical with stops 19, 119, and 121, respectively, and that transfer bail 182 and T-shaped transfer levers 183 are substantially identical with those shown in Figs. 1 and 2, and labeled 39 and 37, respectively. Tape sensing levers 171 and 172 are pivoted at 184 and 186 respectively. T-shaped transfer levers 183 are articulated by their disc-like portions 187 to notched link bars 188 which are connected to code bars (not shown) similar to code bars 53 shown in Fig. 1. Tape feeding mechanism identical with that shown in Fig. 2 is provided for feeding the perforated tape to present signal combinations successively to the sets of tape sensing pins 173 and 174. Each of the link bars 188 has articulated to it at the extreme right-hand end thereof a testing bar 189 provided with testing abutments 191, the arrangement being the same as that shown in Figs. 1 and 2. Testing bars 189 are supported intermediate their ends by rod 192 extending transversely thereof and carried by bail 193 which is generally similar to bail 127 previously described and which may be permitted to rock periodically under the control of a cam (not shown) carried by continuously rotatable shaft 194 and operating through a bell crank and link (also not shown), these elements having been omitted from Fig. 4 in order to show more clearly other elements that are directly concerned with the embodiment shown in Fig. 4 and that do not appear in the disclosures of Figs. 1 and 2.

Bail 193 is provided with a projection 196 against which rests a lever 197 which is pivoted coaxially with the pivotal mounting of bail 193. Lever 197 is urged into engagement with projection 196 by tension spring 198 and is provided with an arm 199 presented in alignment with and for operation of a non-tape sensing pivoted lever 201, which corresponds to pivoted lever 71 of Figs. 1 and 2 and is mounted on pivot rod 184 which pivotally supports principal tape sensing levers 171. Lever 197 is arranged to receive motion in counterclockwise direction from bail 193 through its projecting portion 196 when bail 193 is rocked counterclockwise and through arm 199 to shift pivoted lever 201 from its extreme counterclockwise to its extreme clockwise position. Lever 197, in moving to its extreme counterclockwise position, is presented in blocking relation to an arm 202 depending from tape feeding lever (not shown) so that the feeding of the perforated tape is interrupted upon the presentation of pivoted lever 201 in its extreme clockwise position.

A latch lever 203 for latching bail operated lever 197 in extreme counterclockwise position is pivoted at 204 and is biased in counterclockwise direction by tension spring 205. Lever 203 is provided with three arms, one of which 206 is provided with shoulder 207, another of which 208, extends upwardly and is arranged to be engaged by a latch lever 209, and the last of which 211, supports a rod 212 which spans link bars 188. Latch lever 209 is pivoted at 213, is urged in clockwise direction by tension spring 214, and is provided with shoulder 216 for holding shoulder 207 of arm 206 of lever 203 out of blocking relation to lever 197. Latch lever 209 also carries cam follower roller 217 which engages cam 218 carried by continuously rotatable shaft 194. Cam 218 periodically rocks latch lever 209 counterclockwise, whereby lever 203 is permitted to escape from shoulder 216 and to rotate counterclockwise under the influence of spring 206, so that lever 203 may become effective to latch lever 197 when that lever is actuated by bail 193.

Each of link bars 188 is provided with a cam projection which is movable from one side to the other of rod 212 carried by arm 211 of lever 203 as the link bars are moved back and forth from one position to another in the setting of code bars responsive to the sensing of signal combinations by the principal tape sensing levers. When one of the cam projections 219 passes under spanning rod 212, it cams the rod upwardly and thus rocks three-armed lever 203 a sufficient distance in clockwise direction to cause its arm 208 to be engaged by shoulder 216 of latch lever 209.

In the embodiment of the invention shown in Fig. 4, cam 218 is so arranged on shaft 194 that it rocks lever 209 to unlatch lever 203 previous to the operation of transfer bail 182. If, upon operation of the transfer bail, a different signal combination is presented to the principal tape sensing pins 173 than that previously sensed, one or more of link bars 188 will be shifted and will, through their cam projections 219 cooperating with rod 212, reengage arm 208 of lever 203 with latching shoulder 216 before testing bar operating bail 193 is released by its cam for operation. If, on the contrary, the operation of transfer bail 182 effects no change in the setting of link bars 188, three-armed lever 203 will not be restored to disabled or latched condition, but will remain in position to latch lever 197 when that lever is operated.

Let it be assumed that the last of a series of signal combinations of which no two are alike has been advanced to the principal sensing pins and is about to be sensed, and that the first of two successive identical signals is in position to be sensed by auxiliary tape sensing pins 174. Upon each release of lever 203 from shoulder 216 in the cycles of operation which have attended the sensing of the various different signals, lever 203 has been restored to latched condition due to the shifting of one or more of link bars 188 upon operation of transfer bail 182. Lever 203 will likewise be relatched for the cycle at present under consideration and bail 193 will be prevented from operating through its full stroke due to the fact that one or more of auxiliary tape sensing levers 172 will block one or more of the testing bars 189.

After the link bars 188 have been set in accordance with the signal combination presented to sensing pins 173, the perforated tape is advanced one step so that now two identical signal combinations are presented to the two sets of sensing pins 173 and 174. After these signal combinations have been sensed and after the release of three-armed lever 203 by lever 209, the permu-

tational setting of tape sensing levers 171 is transferred by T-shaped transfer levers 183, and one or more of link bars 188 is moved to a new position since, according to hypothesis, the signal now presented to principal sensing pins 173 differs from the signal previously sensed. This results in relatching of three-armed lever 203 by shoulder 216. Thereafter, bail 193 is released for operation by its cam, and since identical signal combinations are now being sensed by the two sets of tape sensing pins, none of the auxiliary tape sensing levers 172 blocks the testing bars 189, and those bars are free to rock and permit bail 193 to rock lever 197 counterclockwise to effect shifting of lever 201 to its extreme clockwise position. Since lever 203 is held in its extreme clockwise position by shoulder 216 of lever 209, lever 197 does not become latched in operated position but returns to normal or idle position as bail 193 returns to normal position, and pivoted lever 201 is restored by its spring to extreme counterclockwise position. Depending arm 202 of the tape feeding lever is therefore not blocked, and upon the next operation of the tape feeding mechanism, the second of the two identical signal combinations will be advanced to be sensed by the principal tape sensing pins 173 in the normal manner, thus bringing the next signal combination into position for sensing by the auxiliary tape sensing pins 174, which combination has been assumed to be different from the two identical signal combinations. The last of the two identical signal combinations is sensed by pins 173, and prior to the operation of transfer bail 182, cam 218 disengages shoulder 216 from arm 208 of three-armed lever 203 and permits that lever to rock into its extreme counterclockwise position. Upon the operation of transfer bail 182, no change occurs in the setting of link bars 188, and lever 203 remains in position in which it is capable of latching lever 197.

Lever 197 cannot be operated, however, for the reason that one or more of auxiliary tape sensing levers 172 are presented in blocking relation to one or more of testing bars 189. It will thus be observed that a pair of identical signal combinations have passed through the record reader mechanism without introducing any delay in the operation thereof.

It will now be assumed that three or more identical signal combinations appear in the tape for presentation to sensing pins 173 and 174. The first and second of these signal combinations will be presented to the principal tape sensing pins 173 and will be sensed in order without the introduction of a delay as in the previously described example. In the cycle of operation following presentation to the principal sensing pins 173 of the second of the three identical signals, three-armed lever 203 will be unlatched by operation of cam 218 and will remain in position to latch lever 197 because of the fact that as the transfer is effected, no change occurs in the setting of link bars 188. The signal combination presented to auxiliary tape sensing pins 174 is now identical with that presented to pins 173 and auxiliary sensing levers 172 will be so disposed with respect to testing bars 189 that those bars will not be blocked and bail 193 will be enabled to rock lever 197 counterclockwise to effect the shifting of pivoted lever 201 and will be latched in that position by shoulder 207 of lever 203 so as to remain operated while bail 193 is restored to its unoperated position. The tape feeding lever will thus be blocked and in the next attempted feeding of the tape, no advancement thereof will result. In the operation of transfer bail 182 in the cycle attended by blocking of the tape feed, the centrally located one of the link bars, which is the one controlled by pivoted lever 201, will be shifted and the blocking bar which it controls will be presented in blocking relation to the selectable bars which control operations incapable of performance in rapid repetition. Thus, during the cycle in which the feeding of the tape is prevented, a signal combination is sensed a second time, but the blocking bar prevents the selectable bar from entering the alignment of notches corresponding to the signal.

The shifting of the centrally located link bar causes its cam projection to lift rod 212 to effect clockwise rocking of three-armed lever 203, which will release lever 197 for restoration to its normal position by a spring 198 and which will become latched on shoulder 216. Blocking of the tape feed lever is thereby discontinued and in the next cycle the tape is permitted to advance. This brings the third of the identical signals into position for sensing by the principal sensing pins 173, and the next signal combination into alignment with the auxiliary sensing pins 174. Both sets of perforations are sensed, latch 209 is operated by cam 218 to unlatch lever 203, and the transfer bail 182 operates. Due to release of tape feed blocking lever 197 by the shifting of the centrally located link bar in the preceding cycle, its arm 199 has permitted pivoted lever 201 to return to counterclockwise position, and the transfer effects restoration of the blocking bar and its link bar to normal position. Access of a selectable bar to its alignment of notches is now afforded, and the operation which the signal is intended to control will be performed.

The restoration of the link bar to normal position causes through its cam projection, relatching of three-armed lever 203, so that bail operated lever 197 cannot be latched in operated position. Thus a delay following the sensing and transfer of the third of the identical signal combinations cannot be introduced whether the next combination, which is being sensed by the auxiliary sensing pins is like the three signals, and permits bail 193 to operate lever 197, or whether it is different so that one or more of auxiliary sensing levers 172 block bail 193 through testing levers 172. Tape feeding will not be prevented, and at the beginning of the next cycle upon withdrawal of the sensing pins, the third of the three identical signals will be shifted out of alignment with the principal sensing pins, and the next signal will be presented to those pins.

Let it be assumed that this signal is like the three that have preceded it. The cycle of operation will be like that attending the sensing of the second of the identical signals. As the transfer bail operates following unlatching of lever 203, no movement of any of the link bars 188 occurs so that lever 203 remains in position to latch lever 197. Bail 193 will operate through a full stroke if the signal sensed by the auxiliary sensing pins is like that sensed by the principal sensing pins, and will thus cause lever 197 to become latched in extreme counterclockwise position. This, as previously described, results in blocking the tape feed and in shifting the blocking bar in the next cycle of shaft 194. However, if any of levers 172 block testing bars 189, no delay will be introduced. Thus it will be observed that the mechanism of Fig. 4 introduces a delay in the

presentation of the third of three or more identical signals, and in the presentation of the fifth of five or more identical signals to the principal sensing pins, and blocks the response of the selectable bars to the second sensing of the second and fourth of the signals. The delay occurs after each pair of signals if the next signal is like the pair. An advantage over the embodiment shown in Figs. 1 and 2 is thus afforded in that where the linecasting and composing machine is capable of delivering two matrices from the same channel at the speed at which the automatic control unit is operated, doubled letters, which are found in many words of the English language, may be composed without the interposition of a delay interval. The appearance of a letter three times in successidon in a word is extremely rare if not actually unknown. Accordingly, the composition of words can proceed without any delay interval due to repeated characters. This is not possible in the embodiment shown in Figs. 1 and 2 because a delay is interposed between any two successive identical characters irrespective of whether there are two or several such characters.

The embodiment of the invention shown in Fig. 4 contemplates that it may be undesirable to have the delay mechanism selected for operation upon the presentation of certain signals in series, such as the "tape" and "rubout" signals. The blocking out of the delay mechanism may be accomplished in the same manner as that disclosed in Figs. 1 and 2; namely, by providing a bail like bail 161 having a rod spanning the link bars adapted to enter alignments of notches in the link bars, and having an arm presentable in position to block the cam controlled bell crank which supervises the testing for repeated signals.

It will be understood that the embodiment shown in Fig. 4 may be incorporated in an automatic control unit having a ratchet feed operated delay mechanism for predetermined operating conditions by arranging lever 197 so as to be operable upon the lever which is controlled by the ratchet, as in Figs. 1 and 2, rather than for direct operation of pivoted lever 201. Likewise, for those installations of the embodiment of the invention shown in Figs. 1 and 2 in which the ratchet feed operated delay mechanism is not desired, lever 141 may be arranged to operate directly upon pivoted lever 71 in accordance with the disclosure of Fig. 4 instead of through bail-shaped lever 94.

In the foregoing description of operation and timing of the mechanisms contemplated by the invention, the feeding of the tape has been referred to as occurring at the beginning of a cycle and the other operations have been identified in the order in which they occur. The tape feeding operation is a logical point of reference from which to outline a description of operation, since the first step leading to the performance of an operation by the linecasting and composing machine is the presentation of a signal combination which will effect selection of the operation. Tape movement may not be the first operation performed by the automatic control unit in a cycle of the cam shaft, starting from its stop or rest position and stopping at the same point. For example, it may be found that better operating margins are obtained by effecting tape feed just before the cam shaft reaches its rest position, which would place tape feed at the end of an established cycle of the cam shaft, and all of the operations described hereinbefore as following tape feeding would occur in the next cycle in advanced angular phase with reference thereto. Since the cam shaft is intended to rotate continuously, there is no decided break between cycles of operation, and therefore, in a theoretical analysis, any point may be chosen as the beginning of a cycle. The feeding of the tape is a convenient point of beginning, and the description has been predicated on this choice.

Although certain specific embodiments of the invention have been shown and described herein, it will be understood that the invention is not to be interpreted as being limited to such embodiments but is capable of modification and rearrangement both as to component parts and modes of operation within the scope of the appended claims.

What is claimed is:

1. In a strip controlled apparatus, means for sensing a signal combination, means for effecting a control condition corresponding thereto, means for simultaneously sensing the next signal combination, means for comparing said signal combinations, and means for varying the responsiveness of the control condition in accordance with certain comparative conditions.

2. In a strip controlled apparatus, means for sensing a signal combination, means for effecting a control condition corresponding thereto, means for simultaneously sensing another signal combination, and means for comparing said signal combinations.

3. In a strip controlled apparatus, a set of principal strip sensing levers, a set of auxiliary strip sensing levers, a set of selector elements variably positionable in accordance with the setting of the principal strip sensing levers, a set of testing bars articulated to said selector elements and operable to test the setting of said auxiliary strip sensing levers, and means controlled by said testing bars for varying the operation of said apparatus.

4. In a strip controlled apparatus, a set of principal strip sensing levers, a set of auxiliary strip sensing levers, strip sensing members carried by said levers, means for advancing a strip to said members, a set of selector elements variably positionable in accordance with the setting of the principal strip sensing levers, a set of testing bars articulated to said selector elements and operable to test the setting of said auxiliary strip sensing levers, and means controlled by said testing bars for blocking said strip advancing means.

5. In a strip controlled apparatus, a set of principal strip sensing levers, a set of auxiliary strip sensing levers, a set of selector elements variably positionable in accordance with the setting of said principal strip sensing levers, a plurality of function bars individually responsive to said selector elements, a set of testing bars articulated to said selector elements and operable to test the setting of said auxiliary strip sensing levers, and means controlled by said testing bars for blocking said function bars.

6. In a strip controlled apparatus, a set of principal strip sensing levers, a set of auxiliary strip sensing levers, a strip feeding mechanism, a set of selector elements variably positionable in accordance with the setting of said principal strip sensing levers, a plurality of function bars individually responsive to said selector elements, a set of testing bars articulated to said selector elements and operable to test the setting of said auxiliary strip sensing levers, means operable under control of said testing bars for blocking said strip feeding mechanism, means also opera-

ble under control of said testing bars for blocking said function bars, and means associated with the last mentioned means for disabling said strip feed blocking means.

7. In a tape controlled apparatus, a signal storage tape advancing mechanism, a set of sensing levers to be variously positioned in accordance with a signal combination in the tape, a second set of sensing levers to be variously positioned simultaneously with the first set in accordance with the next signal combination in the tape, a set of selector elements, means for transferring the setting of the first mentioned set of sensing levers to said selector bars, a set of testing bars associated with said selector elements, means for actuating said testing bars, means controlled by said testing bars for blocking said tape advancing mechanism, means for latching said blocking means, and means subsequently operable under the control of said testing bars for disabling said latching means.

8. In a tape controlled apparatus, a plurality of sets of simultaneously operable tape sensing levers, selector means controlled by one of said sets of levers, testing means associated with the selector means for testing the setting of another of said sets of levers, cam controlled means for operating said testing means, and means controlled by said testing means for altering the effectiveness of said selector means.

9. In a tape controlled apparatus, tape feeding mechanism, a set of principal tape sensing levers, a set of auxiliary tape sensing levers, and means under the joint control of both sets of tape sensing levers for effecting disablement of said tape feeding mechanism.

10. In a tape controlled apparatus, a set of principal tape sensing levers, a set of auxiliary tape sensing levers, means for controlling the signal sensing operation of both sets of sensing levers simultaneously, and means under the control of the auxiliary tape sensing levers for delaying the response of said apparatus to said principal tape sensing levers.

11. In an automatic control mechanism, a set of principal signal sensing elements, a set of selector members controlled thereby, a set of auxiliary signal sensing elements, means controlled by said auxiliary signal sensing elements for postponing the effectiveness of said selector members, means for latching the last mentioned means, cam operated means for conditioning said latching means, and means associated with said selector means for disabling said latching means.

12. In an automatic control mechanism, a set of function performing bars, means for selecting said bars individually, means for blocking the selection of said bars, principal signal responsive means for controlling said selecting means, auxiliary signal responsive means for controlling said blocking means, means for latching the control means for the blocking means in operated condition, and means associated with said blocking means for disabling said latching means.

13. In an automatic control mechanism, a set of function performing bars, means for selecting said bars individually, means for blocking the selection of said bars, principal signal responsive means for controlling said selecting means, auxiliary signal responsive means for latching the control means for the blocking means, periodically operated means for conditioning said latching means, and means associated with said selecting means and said blocking means for disabling said latching means.

14. In an automatic control mechanism, a set of function performing bars, means for selecting said bars individually, means for blocking the selection of said bars, principal signal responsive means for controlling said selecting means, auxiliary signal responsive means for controlling said blocking means, means for latching the control means for the blocking means in operated condition, and means associated with said selecting means and said blocking means for disabling said latching means.

15. In a selector mechanism, a set of pivotally mounted tape sensing levers presentable in either of two selective positions, a special lever pivotally supported with said tape sensing levers and normally presented in one of two selective positions, a selection controlling bar controlled by each of the aforementioned levers, a set of pre-sensing levers, and means controlled by said pre-sensing levers for controlling the presentation of said special lever in the other of its selective positions.

16. In a selector mechanism, a set of pivotally mounted tape sensing levers presentable in either of two selective positions, a special lever pivotally supported with said tape sensing levers and normally presented in one of two selective positions, a selection controlling bar controlled by each of the aforementioned levers, a set of pre-sensing levers, and means controlled jointly by said pre-sensing levers and by the selection controlling bars controlled by the first mentioned tape sensing levers for presenting said special lever in the other of its selective positions.

17. In the control of linecasting and composing machines, a method of inserting delay intervals between repeated functional operations which comprises simultaneously sensing pairs of signal combinations, arresting the feeding of the signal carrying medium upon the sensing of a pair of like signals, and blocking the function performing instrumentalities in the cycle attending the arrestment of feeding of the medium.

18. In the control of linecasting and composing machines, a method of inserting delay intervals between repeated functional operations which comprises simultaneously sensing pairs of signal combinations, directly comparing one of said signal combinations with the other, arresting feeding of the signal carrying medium upon comparison of like signals, and blocking the performance of a functional operation during the arrestment of feeding the medium.

19. In the control of linecasting and composing machines, a method of inserting delay intervals between repeated functional operations, which includes the steps of simultaneously sensing pairs of signal combinations, establishing a predetermined condition in the event such signal combinations are duplicates, and rendering said established condition effective in the event the next succeeding signal combination corresponds to said pair of signal combinations.

20. In the control of linecasting and composing machines, a method of inserting delay intervals between repeated functional operations, which includes the steps of simultaneously sensing pairs of signal combinations in a signal carrying medium, establishing a predetermined condition in the event such signal combinations are duplicates, rendering said established condition effective in the event the next succeeding signal combination corresponds to said pair of signal combinations, and effecting arrestment of the signal carrying medium through the effectiveness of said condition.

21. In a strip controlled apparatus, means for sensing a signal combination in a control strip, means for simultaneously sensing another signal combination in the control strip, and means controlled by said first mentioned sensing means for sensing the positions of the second mentioned sensing means to effect an appropriate control.

22. In a strip controlled apparatus, means for sensing a signal combination in a control strip, means for simultaneously sensing another signal combination in the control strip, timing means for controlling the operation of both sensing means, and means controlled jointly by said first mentioned sensing means and said timing means for sensing the positions of the second mentioned sensing means.

23. In a selector mechanism, a plurality of selectable bars, a plurality of selecting bars, a selection modifying bar, a plurality of sets of record sensing elements, means controlled by one set of record sensing elements for controlling said selecting bars, means also controlled by said one set of record sensing elements for controlling said selection modifying bar, and means controlled jointly by said sets of record sensing elements for also controlling said selection modifying bar.

24. In a selector mechanism, a plurality of selectable bars, a plurality of selecting bars, a selection modifying bar, a plurality of sets of record sensing elements, means controlled by one set of record sensing elements for controlling said selecting bars, means including a ratchet feed mechanism also controlled by said one set of record sensing elements for controlling said selection modifying bar, and means controlled jointly by said sets of record sensing elements for controlling said selection modifying bar independently of said ratchet feed mechanism.

25. In a strip controlled apparatus, a plurality of sets of simultaneously operable strip sensing levers, selector means controlled by one of said sets of levers, testing means associated with the selector means for testing the setting of another of said sets of levers, cam controlled means for operating said testing means, and means operable selectively by said selecting means for disabling said cam controlled means.

26. In a record strip controlled apparatus, cyclically operable means for advancing a record strip, means for simultaneously sensing a plurality of records in said strip, and means responsive to the sensing of identical records for disabling said strip advancing means.

27. In a record strip controlled apparatus, means for advancing a record strip, means for sensing a plurality of records in said strip simultaneously, means responsive to the sensing of identical records for disabling said strip advancing means, and means responsive to the sensing of a predetermined number of identical records for preventing the disablement of said strip advancing means.

28. In a strip controlled apparatus, a plurality of sets of simultaneously operable strip sensing levers, selector means controlled by one of said sets of levers, testing means associated with the selector means for testing the setting of another of said sets of levers, means controlled by said testing means for varying the operation of said selector means, means for latching said last mentioned means, and means controlled by said selector means for disabling said latching means.

29. In a strip controlled apparatus, a plurality of sets of simultaneously operable strip sensing levers, selector means controlled by one of said sets of levers, testing means associated with the selector means for testing the setting of another of said sets of levers, means controlled by said testing means for varying the operation of said selector means, means for latching said last mentioned means, means for conditioning said latching means, and means controlled by said selector means for disabling said latching means.

30. In a strip controlled apparatus, a plurality of sets of simultaneously operable strip sensing levers, selector means controlled by one of said sets of levers, testing means associated with said selector means for testing the setting of another of said sets of levers, means controlled by said testing means for varying the operation of said selector means, means for latching said last mentioned means in operated condition, cam controlled means for conditioning said latching means, and means controlled by said selector means for disabling said latching means.

31. In a record strip controlled apparatus, a plurality of sets of simultaneously operable record sensing elements, selector means controlled by one of said sets of elements, testing means associated with said selector means for testing the setting of another of said sets of elements, means controlled by said testing means for varying the operation of said selector means, means for latching said last mentioned means in operated condition, cam controlled means for conditioning said latching means operable prior to the actuation of said selector means, and means controlled by said selector means and operable prior to the operation of said testing means for disabling said latching means.

MAURUS T. GOETZ.

CERTIFICATE OF CORRECTION.

Patent No. 2,152,641. April 4, 1939.

MAURUS T. GOETZ.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, first column, line 4, for the reference numeral "137" read 37; and second column, line 10, for "levels" read levers; line 12, for "11" read 103; line 50, for the word "car" read cam; page 7, first column, line 53, for "produced" read positioned; and second column, line 6, for "of" read or; line 18, for "machins" read machine; page 10, first column, line 17, for "successidon" read succession; same page, second column, line 30, claim 2, for the words "and means" read and mechanical means; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of December, A. D. 1939.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)