July 11, 1933. H. L. KRUM 1,917,308

PIN BARREL SELECTOR ARMATURE RETAINING TYPE

Original Filed Jan. 30, 1930

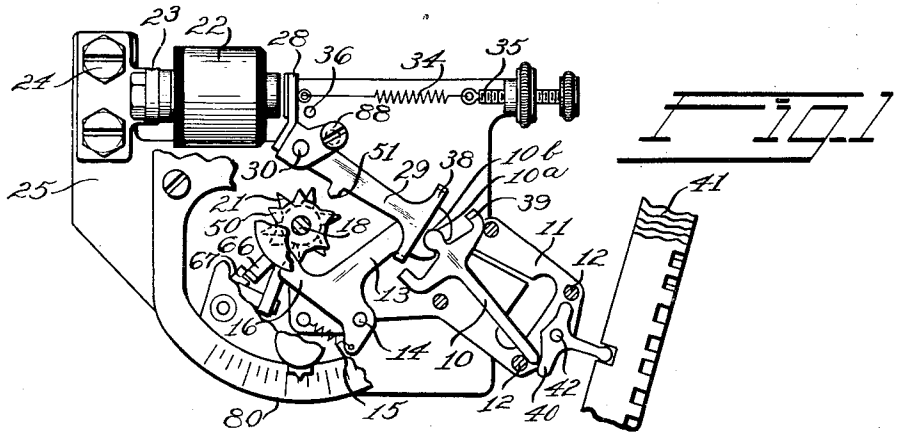

FIG. 1

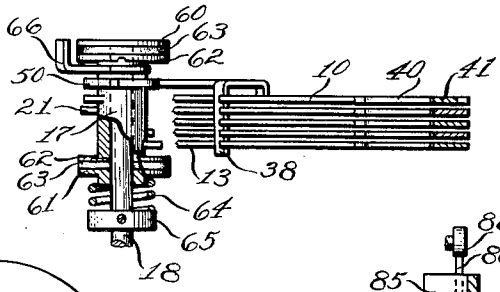

FIG. 2

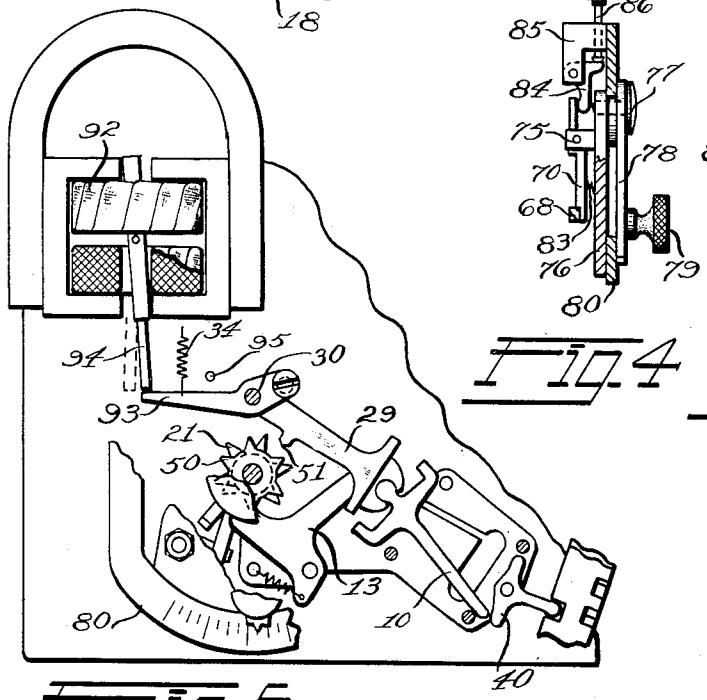

FIG. 5

FIG. 4

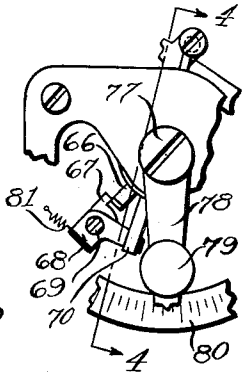

FIG. 3

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UNITED STATES PATENT OFFICE

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PIN BARREL SELECTOR ARMATURE RETAINING TYPE

Application filed January 30, 1930, Serial No. 424,643. Renewed September 29, 1932.

The present invention relates to selector mechanisms such as are employed for effecting the operation of telegraph receivers, printers, stock quotation recorders, remote control apparatus and the like.

More particularly the present invention relates to selector mechanisms comprising selector units which are adapted to be positioned or conditioned in different combinations in response to code signals comprising permutations of selecting conditions extending through a predetermined number of time intervals.

My invention is especially adapted for application to selector mechanism in which selector elements are mechanically set under the joint control of locally driven means such as a rotating shaft and a member or members actuated by magnetic means in response to the received code combinations of selecting conditions. In such mechanisms the setting of the selectors is controlled or determined by the vibratory movement of a magnet armature or armatures, or of a member or members actuated thereby, and each setting operation is timed by the local means in synchronism with the received signals.

Such selector mechanisms of the mechanical types, because of the absence of electrical contacts, are more durable and possess many advantages over those employing electrical distributors. They give good satisfaction, particularly in the start-stop systems in which the locally actuated member is stopped at the end of each code combination of selecting conditions, and is started into operation by a starting condition which precedes the selecting intervals of each code combination.

A problem that arises in such selector mechanisms is that the operating magnet or magnets must move fairly heavy mechanical elements and consequently must perform more work than relays in electrical types of selectors which have but to move their armatures to actuate electrical contacts. Where the operating magnet is included directly in the line circuit without a line relay and local source of current, the length of line upon which mechanical selector mechanisms may be used has heretofore been limited because the requirements of the line current for such a selector is greater than if required for the operation of relays.

A primary object of my invention is therefore to provide selector mechanisms of the mechanical types in which the amount of work performed by the electrically operated controlling elements responsive to received selecting conditions is reduced to a minimum.

Another object of my invention is to provide a selector mechanism accurately responsive to small currents and attenuated signals.

A further object of the present invention is to provide selector mechanisms having control magnets of the polar type in combination with novel means for removing all restraint from the armature of the magnet prior to the impulse intervals.

My present invention is capable of wide modifications and is adaptable to many types of electrically controlled selector mechanisms, and may be applied to mechanisms controlled by neutral or polar magnets. In applying my invention to a neutral magnet type of selector mechanism I employ the principle that the amount of current which an electro-magnet requires to hold its armature in attracted position is a small fraction of the amount of current the electro-magnet required to attract its armature from a distance. In such embodiments of my invention, I preferably provide a means entirely independent of the electro-magnet for moving the armature into engagement or near-engagement with the core of the electro-magnet. In applying my invention to a polar magnet type of selector mechanism I preferably provide a means entirely independent of the magnet for removing all restraint against operation of the armature during impulse intervals, particularly such restraint as may be produced by the mechanical selector elements. In both embodiments of my invention hereinafter disclosed in detail, I employ a power driven cam or star wheel as the means for effecting the desired result. However, other equivalent means may be employed for producing the same result, as will be obvious to those skilled in the art.

The various features and the foregoing as well as other objects of the invention will be apparent upon reference to the following detail description taken in connection with the accompanying drawing, while the scope of the invention will be particularly pointed out in the appended claims.

In the drawing:

Figure 1 is a plan view of the selector of the sword-and-T type, controlled by a neutral magnet, with portions omitted and broken away to reveal the essential operating members, and in which my invention is embodied.

Figure 2 is an elevation of selected parts of the mechanism shown in Figure 1.

Figure 3 is a plan view of the orientation elements of the selector shown in Figure 1.

Figure 4 is a section and view on the line 4—4 of Figure 3 showing the starting members and disclosing also features of orientation embodied in my invention.

Figure 5 is a view similar to Figure 1 and shows a modified form of selector in which the control is by a polar line magnet instead of by a neutral line magnet.

Similar numerals refer to similar parts throughout the several views.

Referring to Figures 1 and 2, the details of the selector mechanism disclosed are shown only in sufficient detail to enable an understanding of the present invention to be had. For a full understanding of details not disclosed herein and which form no part of the present invention, reference may be had to Patent # 1,745,633, granted Feb. 4, 1930 to Sterling Morton and Howard L. Krum. This mechanism comprises a set of five selectors in the form of thin flat fingers 10 arranged one above another between the guide plates 11. These plates are mounted on studs 12 and spaced by washers (not shown). The circular rear ends 10*a* of the fingers 10 engage corresponding sockets 10*b* in five thin flat bell-cranks 13 all pivoted on one shaft 14. Individual springs 15 normally hold the bell-cranks and selector fingers in the position shown in Figures 1 and 2 with the pointed rear end 16 of the bell-cranks adjacent to the cam barrel 17 on shaft 18, which is continuously driven by a properly regulated motor when the selector is in operation.

The cam barrel 17 (Fig. 2) has a spirally arranged series of cams 21, one for each of the bell-cranks 13, which rotate the five bell-cranks 13 in succession and thus reciprocate longitudinally the succession of selector fingers 10 as the cam barrel is rotated. In addition to the longitudinal movement, the selector fingers 10 have a lateral swinging movement between the pair of studs 12.

The setting of any selector finger 10 either to its right hand or to its left hand position is determined by the magnet 22 which is mounted on a bracket 23 which in turn is mounted adjustably by screws 24 to the plate 25 which forms the base of the entire selector. The magnet armature 28 is fixed to a lever 29. The lever 29 is U-shaped and its end adjacent to the armature is supported upon a pivot stud 30 fixed in the base plate 25. A spring 34 extending between the armature 28 and the adjusting screw 35 tends to move the armature into engagement with the stop 36 but normally magnet 22 is energized and holds the armature against the tension of its spring.

The free end of the armature lever 29 is provided with a pair of downwardly extending arms 38 and these arms constitute abutments which cooperate with arms 39 on the rear ends of the selector fingers 10 and act to position the latter in either right hand or left hand position.

The several fingers 10 act through a corresponding number of T-shaped levers 40 to position a set of permutation bars 41. The T-levers are arranged between the guide plates 11 and are pivotally mounted on a stud 42. The springs 15 normally hold the selector fingers 10 in their forward position and in engagement with the T-levers 40, and each permutation bar 41 thus is held in either one or the other of its two positions according to the position of the associated selector finger 10.

The abutments 38 on the armature lever 29 are positioned in the rear of the arms 39 of the selector levers 10 but are spaced more closely together than the ends of the arms 39 so that as the armature lever 29 vibrates in response to the received electrical conditions, the abutments 38 alternately move into and out of alinement with the ends of one or the other of the arms 39 and will cooperate with one or the other of the arms 39 as the fingers 10 are reciprocated by the associated bell-cranks and the rotary cam barrel to determine the setting of the fingers or selectors each in its right hand or left hand position.

As each signal pulse is received upon the line magnet 22 the magnet responds to one of the two different electrical conditions and selectively holds its armature lever 29 while the fingers 10 are reciprocated successively by the cams 21 of the spiral series on the cam barrel 17. The arms 39 are brought into cooperative relation with the abutments 38 at the corresponding signal intervals, thereby setting the selector fingers in variant combinations.

In the apparatus as designed and shown, a considerable distance of movement is required to shift the arms 38 from the one operating position to the other operating position and this would place a considerable burden of work upon the armature 28. Where the armature 28 operates by a sole source of power, namely, magnet 22, a predetermined electrical current will be required to produce the effect, whereas any

mechanical assistance given to the armature 28 would reduce the work required from the magnet 22 and thereby reduce the current required to produce the effect of selection.

In my invention I meet this problem by providing the multiple cam or star wheel 50 attached rigidly to the cam barrel 17 and co-operating with the point 51 upon the armature lever 29. In Figure 1 the teeth of the multiple cam 50 may be distinguished from the cams 21 by the difference in radial length. The cams 21 are five in number, one for each signal, and the teeth of the cam 50 are six in number, one for each signal of the intelligence code and one for the stop signal. When the cam barrel 17 rotates, the engagement of the teeth of cam 50 with the point 51 pushes the armature lever 29 repeatedly and thus repeatedly moves the armature 28 by mechanical power into its operated position near or against the magnet 22.

The cam barrel is driven from the shaft 18 through the medium of a friction clutch comprising two pairs of discs each pair having a washer of friction material between the discs. The disc 60 is attached rigidly to the shaft 18. The disc 61 is splined to the shaft 18. The discs 62 are attached rigidly to the cam barrel 17. Friction washers 63 are between the pairs of discs. A spring 64 is provided between the disc 61 and an adjustable set collar 65.

A stop arm 66 is rigidly attached to the cam barrel 17 and is provided with an upturned end which normally engages the lug 67 of the lower arm of the U-shaped stop gate 68 (Fig. 3). The gate 68 is mounted upon the pivot stud 69 and its upper arm is adapted to be engaged by the latch 70. The latch is pivoted on a journal block 75, (Fig. 4) and this journal block and the pivot stud 69 are both mounted upon an adjusting plate 76. The adjusting plate may be rotated about the pivot stud 77 by means of an arm 78 having an operating knob 79 and may be clamped, by any well known means, to a plate 80 which is fixed rigidly to the frame of the selector.

A spring 81 extending from the gate 68 to the frame of the selector tends to rotate the gate clockwise as viewed in Figure 3. The stop arm 66 tends to rotate the gate in reverse sense. The latch 70 restrains the gate 68 against the push of the stop arm 66.

The pivot stud 77 and the inner end of the latch 70 are in line with the axis of the shaft 18. A spring 83, compressed between the latch 70 and the adjusting plate 76, normally holds the outer end of the latch depressed and in position to engage the upper arm of the gate 68. A trip member in the form of a small bell-crank 84 is pivotally mounted in a bracket 85 upon the fixed plate 80 so that its inner end may engage the inner end of the latch 70 at a point in line with the axis of the shaft 18 and with the axis of the pivot stud 77.

A plunger 86 extends through the block 85 and is adapted to engage the bell-crank 84 and to be engaged by the eccentric head of a screw 88 on the upper arm of the armature lever 29.

The operation is as follows:

During the first line pulse or start interval, which is of spacing nature, the magnet 22 is deenergized and the movement of the armature lever 29 which will be effected by the spring 34 will cause the screw head 88 to shift the plunger 86 and thus rock the bell-crank 84. The inner end of the bell-crank 84 engages the inner end of the latch 70 and rocks the latch in its journal block 75 so that the latch disengages itself from the gate 68. The gate then is rotated in counter-clockwise sense as viewed in Fig. 3 by the pressure of the arm 66 against it. The cycle of operation of the cam barrel 17 thus is initiated. As soon as the stop arm 66 passes the end 67 of the gate 68, the gate will be rotated clockwise by its spring 81. During the signal code interval, the latch 70 will be vibrated without effect by the several received signal pulses comprising the code combination, but the stop pulse of marking nature which always terminates the cycle will withdraw the screw head 88 from the plunger 86 and will permit the spring 83 to operate the latch 70 and bell-crank 84, the latch 70 being thus left free to take its normal position to engage the upper arm of the gate 68. The stop arm 66 then will engage the end 67 of the gate and will rotate the gate against its spring 81 until the gate engages the latch 70 which will stop both the gate 68 and the stop arm 66 thus stopping the cam barrel 17 to which the stop arm 66 is attached. The parts are so constructed that the cam barrel 17 is stopped positively by the gate 68 at the end of each cycle and is readily released by the starting movement of the armature lever 29. Also the tripping arrangement permits the orientation adjustment of the gate 68 so that the engagement of the multiple cam 50 and its co-operating point 51 and the subsequent engagement of the first cam 21 and its co-operating bell-crank 13 will occur during the most favorable portion of each impulse condition of the received selective code.

The cycle being thus started with proper orientation, a tooth on the multiple cam 50 engages the point 51 on the armature lever 29 and rocks the armature lever counter-clockwise thus moving the armature 28 against the magnet 22 and thereafter the tooth on the cam 50 passes the point 51 and releases the lever 29. Should the magnet condition then be a marking impulse condition, the magnet 22 will be in energized condition at the time that the tooth on the cam 50 leaves the point 51 and accordingly the

armature 28 will be held by the magnet 22 even though the magnet be energized to a degree which would have been insufficient to attract the armature from its position against the stop 36 had the armature not been operated initially by the tooth on the cam 50. The armature 28 now being held by the magnet 22, the first cam 21 operates the first bell-crank 13 to move the first selector finger 10 to its marking position. Had the first impulse condition after starting been of spacing nature the armature 28 would not have been held by the magnet. The cam 21 follows the cam 50 by a very brief time interval yet of sufficient duration to permit the spring 34 to rock the armature lever 29 to its spacing position, that is, against its stop 36. Accordingly, if the first impulse condition had been of spacing nature, the spring 34 would have rocked the armature lever 29 to its spacing position as soon as the tooth on the cam 50 had released the lever 29 and then the first cam 21 would have rocked the first bell-crank 13 to move the first selector finger 10 to its pacing position. The operation for the remaining impulse conditions is similar including the stop impulse condition of marking nature, the cam 50 being provided with five operating teeth to operate armature 28 in accordance with the five selective impulse conditions and provided further with a sixth tooth for operating the armature 28 in preparation for the stop impulse condition which always is of marking nature.

A modification of my invention is shown in Figure 5 in which all of the details are the same except for the form of the magnet 92 which replaces the magnet 22 of Figure 1 and except that the arm 28 is omitted and is replaced by the extension 93 which engages the armature 94 of the magnet 92. The magnet 92 is polar in nature and operates its armature 94 in to its solid-line position in responsive to a signal pulse of marking nature and into its dotted-line position in response to a signal pulse of spacing nature. A stop 95 is provided to limit the clockwise movement of the extension 93.

In operation, assuming that the cam barrel 17 and cam 50 have been started in the manner hereinbefore described, a tooth on the cam 50 engages the point 51 on the lever 29 and rocks the lever 29 counterclockwise about its pivot 30 to an extent sufficient to permit the armature 94 of the magnet 92 to move to its marking or solid-line position. If the impulse condition being received is of marking nature, the magnet 92 will move its armature 94 to its marking position (shown in solid lines) and then the tooth on cam 50 moves out of engagement with the point 51 on the lever 29 and the spring 34 rocks the lever 29 clockwise until the extension 93 engages the end of the armature 94. The parts then occupy the position shown in solid lines in Figure 5. The armature 94 holds the lever 29 in this position while the first cam 21 operates the first bell-crank 13 to move the signal finger 10 to is position. Thereafter the next tooth on the cam 50 comes into engagement with the point 51 on the lever 29, and rocks the lever 29 counterclockwise about its pivot 30, leaving the armature 94 of the magnet 92 free to move. Should a spacing impulse condition be received at this time, the magnet 92 will move its armature into its spacing position (shown in dotted lines) and then the tooth on the cam 50 moves out of engagement with the point 51 on the lever 29 and the spring 34 rocks the lever 29 clockwise about its pivot 30 until the extension 93 comes into engagement with the stop 95. The lever 29 now occupies its spacing position so that when the second cam 21 rocks the second bell-crank 13, the second selector finger 10 will be moved to its spacing position.

Although the present invention has been illustrated and described in connection with selectors of the sword-and-T type, it is of course, obvious that the invention may be applied to other types of selectors without departing from the spirit or essential characteristic thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What I claim and desire to secure by United States Letters Patent is:—

1. In combination, an electro-magnet subject to marking and spacing impulse conditions, an armature for said electro-magnet, resilient means constantly urging said armature away from said electro-magnet, power driven means for periodically moving said armature into close proximity with respect to said electro-magnet and means for synchronizing the movements of said armature with the impulse intervals.

2. In combination, an electro-magnet subject to marking and spacing impulse conditions, an armature for said electro-magnet, a mechanical element adapted to occupy a first position in which it prevents movement of said armature or a second position in which it permits free movement of said armature, means constantly urging said element into its first position, power driven means for periodically urging said element into its second position and means for synchronizing the movements of said element with the impulse intervals.

3. In combination, selector mechanism, power driven means for operating said selector mechanism, an electro-magnet, a me-

chanical element controlled by said electro-magnet in accordance with code combinations of impulse conditions for controlling said selector mechanism, said mechanical element having two positions of rest, means constantly urging said mechanical element into one of its rest positions and additional power driven means for periodically moving said mechanical element into the other of its rest positions.

4. In a selector mechanism, a plurality of selector elements, power driven means for operating said selector elements successively, a single element cooperating with all of said selector elements for determining the selective operation thereof, an electro-magnet responsive to received electrical impulse conditions for controlling said single element, and a second power driven means operating in timed relation with respect to the impulse intervals for periodically operating said single element.

5. In a selector mechanism, a plurality of selector fingers, cam means for operating said fingers successively, a lever for controlling the selective operation of said fingers, an electro-magnet responsive to received electrical impulse conditions for controlling said lever and a power driven cam means operating in timed relation with respect to the impulse intervals for periodically rocking said lever.

6. In combination, selector mechanism, an electro-magnet having an armature operatively associated with said selector mechanism and operated in accordance with received code combinations of impulse conditions for correspondingly controlling the operation of said selector mechanism and means for periodically disassociating said armature from said selector mechanism in timed relation with said received impulse conditions whereby said armature is free to operate without any restraint in response to the impulse conditions of said magnet.

7. In a selector mechanism, a plurality of selector fingers, a power driven means for operating said fingers successively, a lever cooperating with all of said selector fingers for determining the selective operation thereof, an electro-magnet responsive to received electrical impulse conditions, an armature for said electro-magnet carried by said lever, spring means for constantly urging said armature to move away from said electro-magnet and a second power driven means for periodically rocking said lever to move said armature into close proximity with respect to said electro-magnet.

8. In combination, a selector mechanism, a power driven means for operating said selector mechanism, a lever for controlling the operation of said selector mechanism, an electromagnet responsive to received electrical impulse conditions, an armature for said electro-magnet carried by said lever, spring means for constantly urging said armature to move away from said electro-magnet and means for periodically rocking said lever to move said armature into close proximity with respect to said electro-magnet.

9. In combination, a selector mechanism, a power driven means for operating said selector mechanism, a lever for controlling the operation of said selector mechanism, an electro-magnet responsive to received electrical impulse conditions, an armature for said electro-magnet carried by said lever, spring means for constantly urging said armature away from said electro-magnet and a second power driven means for periodically rocking said lever to move said armature into close proximity with respect to said electro-magnet.

10. In combination, a selector mechanism, a power driven means for operating said selector mechanism, a lever for controlling the operation of said selector mechanism, an electro-magnet responsive to received electrical impulse conditions, an armature for said electro-magnet carried by said lever, spring means for constantly urging said armature away from said electro-magnet and means for periodically rocking said lever to move said armature into close proximity with respect to said electro-magnet, said last mentioned means operating in timed relation with respect to said impulse conditions.

11. In combination, a selector mechanism, a power driven means for operating said selector mechanism, a lever for controlling the operation of said selector mechanism, a polarized magnet responsive to received electrical impulse conditions, an armature for said polarized magnet having a predetermined path of movement between two rest positions in accordance with the impulse conditions, a spring for rocking said lever in a direction to bring one end thereof into the path of movement of said armature and means for periodically rocking said lever in the opposite direction to move the end thereof out of the path of movement of said armature.

12. In combination, a selector mechanism, a power driven means for operating said selector mechanism, a lever for controlling the operation of said selector mecanism, a polarized magnet responsive to received electrical impulse conditions, an armature for said polarized magnet having a predetermined path of movement between two rest positions in accordance with the impulse conditions, a spring for rocking said lever in a direction to bring one end of said lever into the path of movement of said armature and means for periodically rocking said lever in the opposite direction to move the end thereof out of the path of movement of said armature, said last mentioned means operating in timed relation with respect to said impulse conditions.

13. In a selecting apparatus, the combination of a group of selectors, an electromagnet responsive to code combinations of signal impulses, an armature for said electromagnet, said armature actuated in accordance with the signal impulses, means coacting with said armature, means for synchronizing the movements of said means with the impulse intervels, and means operatively associated with both said means and adapted to effect controlling operations in said selectors.

14. In combination, a selector mechanism a power driven means for operating said mechanism, a polarized electromagnet responsive to code combinations of marking and spacing impulse conditions, an armature for said electromagnet, the position of said armature determined solely by the nature of the impulse condition, an element adapted to be controlled by said armature in accordance with said conditions, power driven means operative synchronously with the speed of code pulsing to establish said element periodically in one position to escape said armature, and biasing means to determine the coactivity of said element and said armature.

15. In a selective apparatus, selecting means, a member for controlling the operation of said selecting means, an electromagnet, an armature for said electromagnet responsive to received electrical impulse conditions and operatively associated with said member, spring means for urging said armature to move in response to certain conditions of said electromagnet, and means for periodically rocking said member to control the movement of said armature.

16. In a selective apparatus, selecting means, a member for controlling the operation of said selecting means, an electromagnet, an armature for said electromagnet responsive to received electrical impulse conditions and operatively associated with said member, spring means for urging said armature to move in response to certain conditions of said electromagnet, and means for periodically rocking said member during the interval of the continuance of a predetermined received electrical impulse condition to control the movement of said armature.

17. In a selective apparatus, selecting means, a line magnet, an armature for said line magnet responsive to received electrical impulse conditions, and spring-and-cam means associated with said armature for urging said armature to move in accordance with electrical signals impressed on said magnet.

In testimony whereof I affix my signature.

HOWARD L. KRUM.