May 31, 1932. E. E. KLEINSCHMIDT 1,860,464

SELECTIVE SYSTEM AND APPARATUS THEREFOR

Original Filed Nov. 18, 1924 4 Sheets-Sheet 1

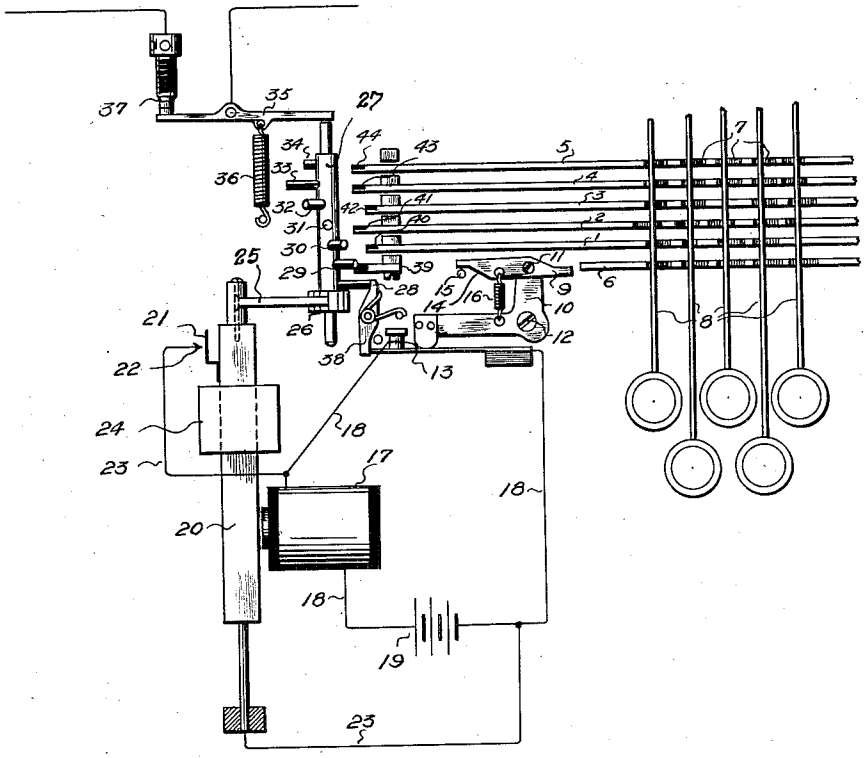


Fig. 1

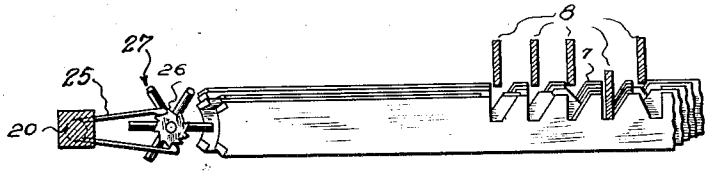


Fig. 2

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SELECTIVE SYSTEM AND APPARATUS THEREFOR

Original Filed Nov. 18, 1924 4 Sheets-Sheet 2

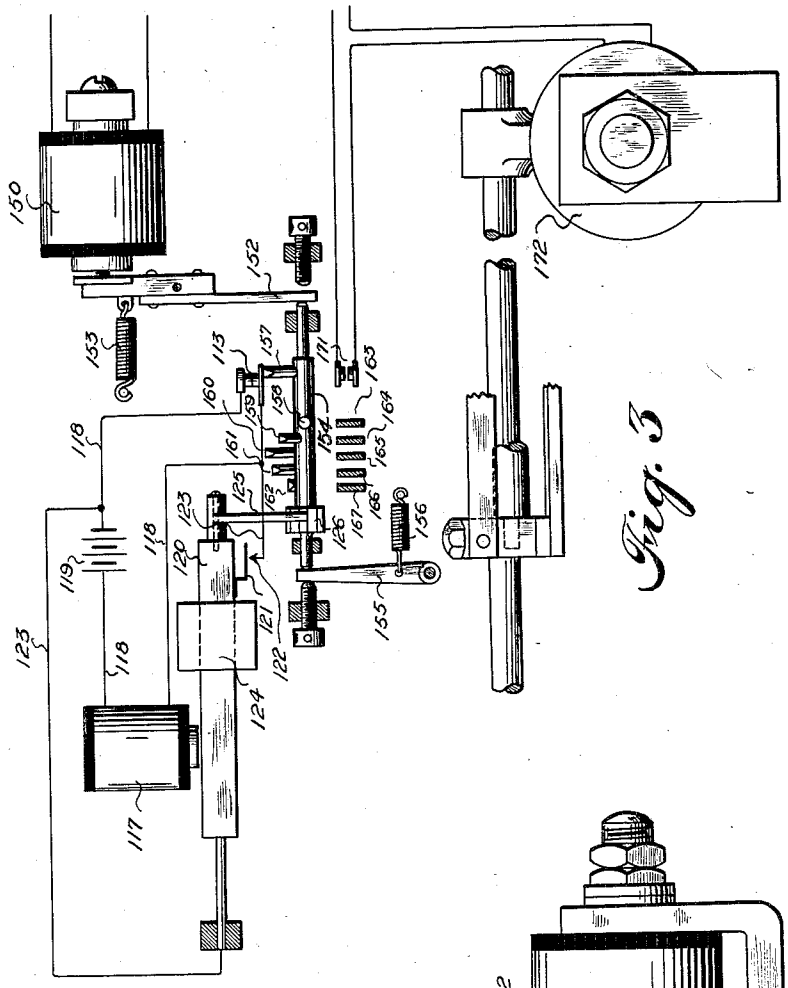


Fig. 3

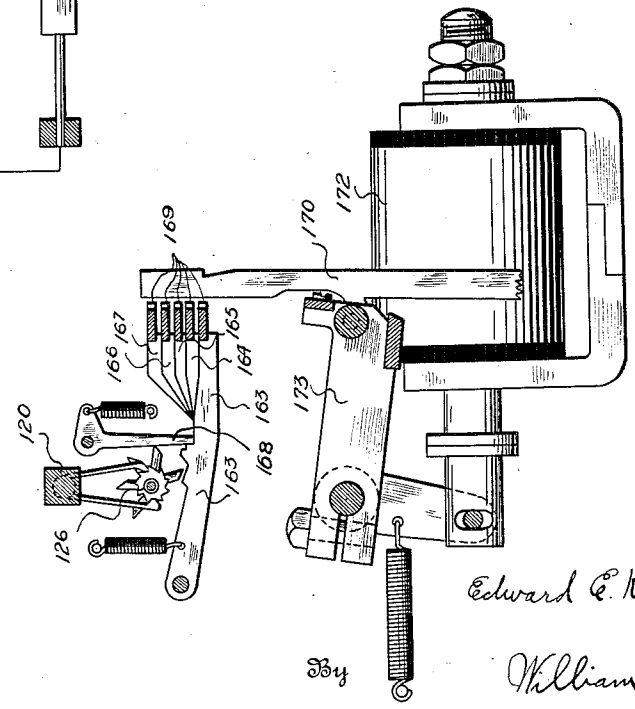


Fig. 4

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SELECTIVE SYSTEM AND APPARATUS THEREFOR

Original Filed Nov. 18, 1924 4 Sheets-Sheet 3

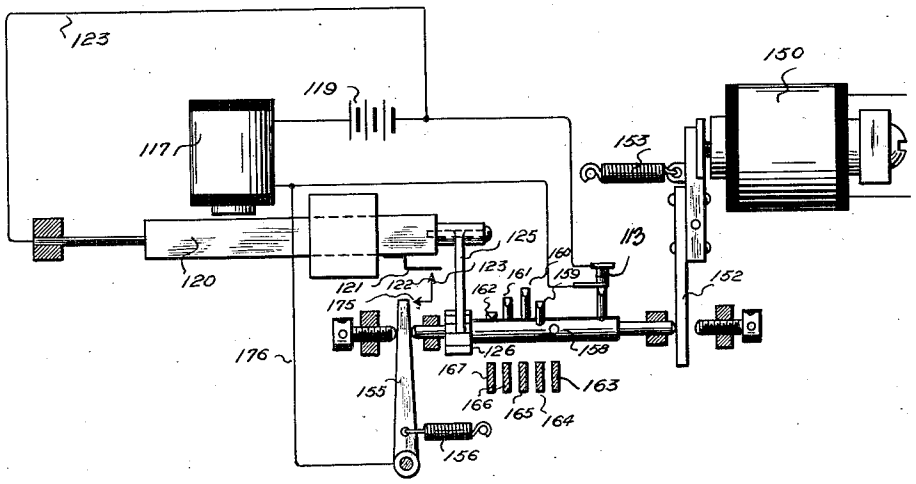


Fig. 5

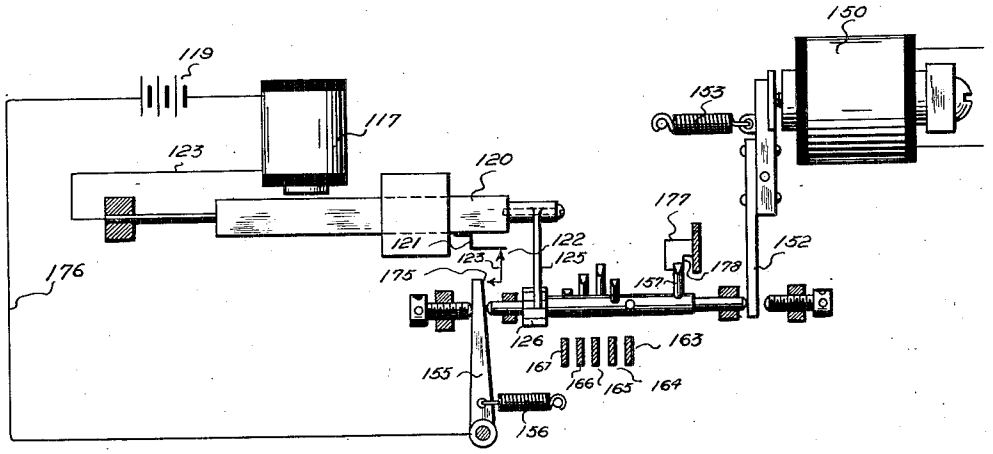


Fig. 6

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SELECTIVE SYSTEM AND APPARATUS THEREFOR

Original Filed Nov. 18, 1924 4 Sheets-Sheet 4

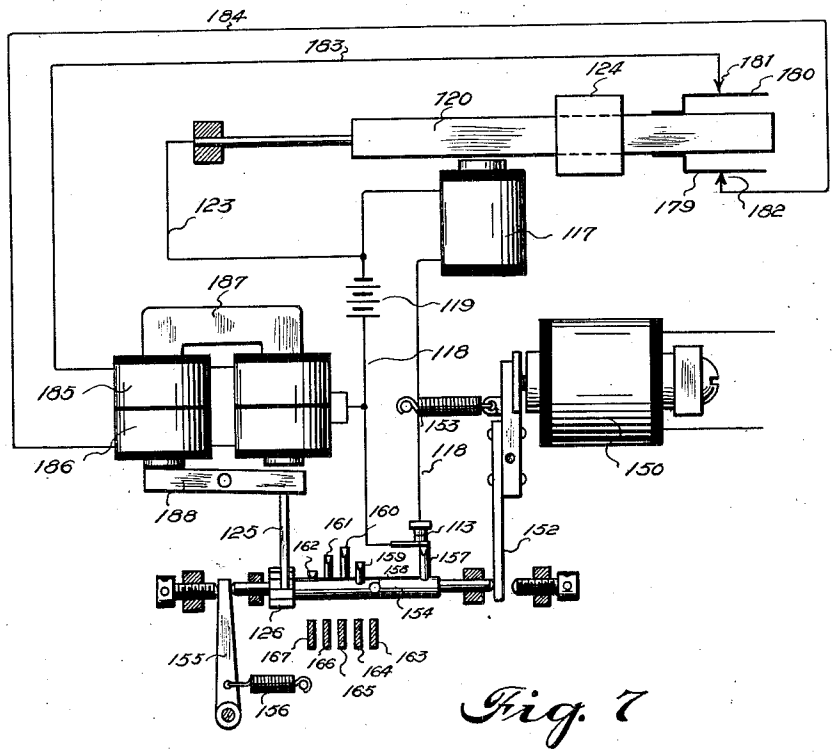


Fig. 7

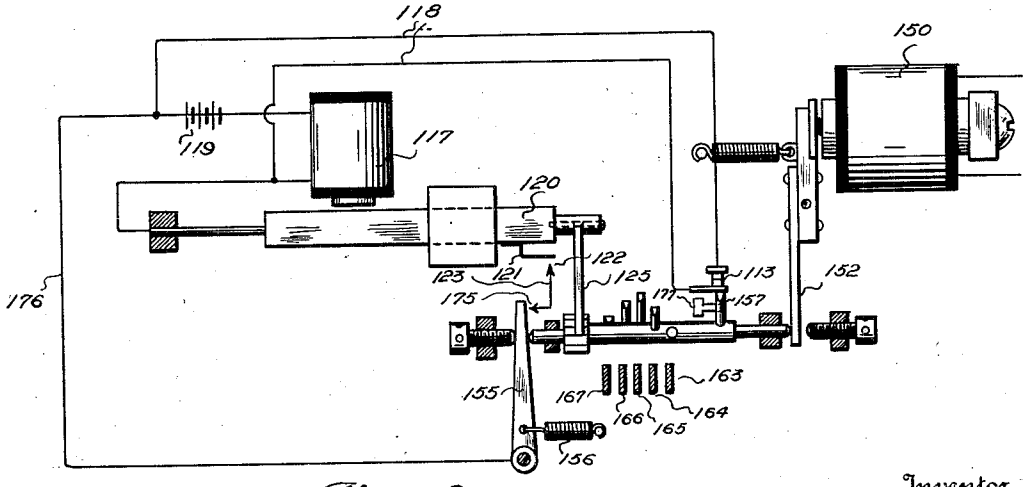


Fig. 8

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Patented May 31, 1932

1,860,464

UNITED STATES PATENT OFFICE

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SELECTIVE SYSTEM AND APPARATUS THEREFOR

Refile for abandoned application Serial No. 750,625, filed November 18, 1924. This application filed November 30, 1928. Serial No. 322,947.

The present invention disclosed in the present case which is substituted for application Ser. No. 750,625, relates to selective systems and apparatus therefor.

More particularly, the invention relates to selective systems and apparatus particularly useful for printing telegraphs.

The objects of the invention are to provide novel driving and control means for rotary transmitter and selector elements; to provide novel methods of establishing concordance of action between the rotating transmitter and receiver elements; to provide novel transmitting and receiving apparatus; and such other objects as may be attained by utilization of the various combinations and subcombinations hereinafter set forth.

Broadly the invention consists in substituting for the alternating current drives disclosed in U. S. Patent #1,703,152, issued Feb. 26, 1929 to Edward E. Kleinschmidt, either a direct reed driving means or reed controlled driving means. Because of the light weight of parts and small amount of energy necessary to actuate the rotary elements of the apparatus as disclosed in the copending application, it is possible to drive these elements mechanically by a reed vibrating freely for the period of one selective combination. The energy of the drive may however be increased by the use of magnetic drive circuits for the reed.

Referring to the drawings—

Fig. 1 is a more or less diagrammatic plan view showing the essential parts of a keyboard transmitter adapted for use in the improved system.

Fig. 2 is a sectional front elevation with parts broken away to show the driving means.

Fig. 3 is a plan elevation showing essential elements of an improved receiver.

Fig. 4 is a side elevation with parts broken away of the receiver shown in Fig. 3.

Figures 5 and 6 illustrate modifications in which the reed vibration is under the control of selective impulses.

Fig. 7 illustrates a modification in which the vibrating reed controls a magnetic drive circuit.

Fig. 8 illustrates a continuous synchronous system.

Transmitting apparatus

Referring to Fig. 1, numerals 1 to 6 denote a plurality of transversely movable permutation bars each bearing a plurality of cam surfaces 7. A plurality of letter or signal bars 8 are mounted to co-act with the cam surfaces on bars 1 to 6, so that when the bars 8 are depressed, bars 1 to 6 are moved transversely in various combinations in accordance with a predetermined code as is well known in the art. Bar 6 is a universal bar and is moved transversely by the depression of each key or signal bar 8. As bar 6 moves transversely to the left on depression of a key, it engages pawl 9. Pawl 9 is moved forward by 6 and actuates bell crank 10, upon which 9 is pivotally mounted at 11. Bell crank 10 moves about its pivoted point 12 and opens contacts 13. As pawl 9 is moved to the left its cam surface 14 rides on fixed pin 15 and stresses spring 16. After contacts 13 have been opened the cam action of pin 15 on surface 14 moves pawl 9 about point 11 to release the pawl from actuating engagement with bar 6. In this manner, if a key is held depressed after the selective combination controlled thereby has been sent, contacts 13 will be free to close and a second character will not be sent. When the key is released pawl 9 and bell crank 10 will be returned to normal position under influence of the contact spring and spring 16. The usual keyboard interlock (not shown) may be provided to guard against release of a depressed key before the combination has been completely transmitted.

Opening of contacts 13 interrupts a circuit through reed drive magnet 17, conductors 18, and battery 19. Magnet 17, when energized holds reed 20 in stressed position and when deenergized permits reed 20 to move to the left in Fig. 1. As the reed moves to the left a contact 21 carried thereby engages fixed contact 22 and completes an energizing circuit through conductor 23, magnet 17, conductor 18, battery 19, conductor 23, and reed 20. The reed will then be attracted causing

interruption of the circuit at contacts 21 and 22, and will vibrate at a predetermined rate which may be varied by shifting the position of weight 24 in well known manner.

Pivotally mounted on reed 20 is a forked double acting pawl member 25. As reed 20 moves to the right in Fig. 2, the upper arm of 25 pushes on a tooth of driving wheel 26 and the lower arm of 25 is moved from engagement with one tooth and rides over the next tooth on 26. On the return movement of 20, the lower branch of 25 pulls on the tooth it has ridden over, and the upper branch moves away from the tooth it pushed and rides over the next tooth. Each vibration of the reed 20 will rotate wheel 26 an angular distance of one tooth.

Mounted in bearings, or supports (not shown) so as to be rotatably and axially movable, is a pin barrel 27. Toothed wheel 26 is is rigidly fastened to, and rotates barrel 27. Mounted on barrel 27 in angularly and axially displaced relation to each other is a series of pins 28 to 34. Barrel 27 is normally held in retracted axial position by a contact member 35 through the action of spring 36. Line contacts 37 are normally closed with 27 in retracted position. In normal resting position of the pin barrel, pin 28 engages a latch member 38 and prevents locking of contacts 13.

When as above described, contacts 13 have been permitted to open by actuation of bar 6, reed 20 commences to vibrate and rotates the pin barrel. On the first step, 28 moves out of engagement with 38 which then locks contacts 13 in open position. Pin 29 then engages a fixed cam member 39. This causes axial movement of the pin barrel and thereby opens contacts 37 causing a preliminary or start condition on the line. After 29 has passed cam 39, barrel 27 is axially restored through action of spring 36, and contacts 37 are again closed. The pin barrel continues to rotate and pins 30 to 34 successively pass by cam members 40 to 44 carried by bars 1 to 5. As shown in Fig. 1, bars 2, 4 and 5 are actuated and in this condition interpose cams 41, 43 and 44 respectively in the paths of pins 31, 33 and 34. As each pin passes a corresponding actuated bar (1 to 5) an axial movement of the pin barrel will be caused, actuating contacts 37 to send code combinations of marking and spacing conditions on the line of transmitting medium. It will be obvious that the relative times occupied by marking, spacing, start, and stop condition may be varied at will by increasing or decreasing the width of cams 39 to 44 in varying proportions to suit varying line conditions. Block signals or separated interval signals may obviously be sent depending on proportions of the parts. Reversed polarity impulses may also be used if desired, in an obvious manner. After the last impulse of a combination has been sent contacts 37 remain closed, and the pin barrel rotates under control of the vibrating reed until pin 28 engages latch 38 and permits contacts 13 to close. Even if the key is held depressed contacts 13 will close, magnet 17 will energize stopping vibration of reed 20 and rotation of the pin barrel, and the key must be released to permit re-engagement of bar 6 and pawl 9 before another code combination can be sent. It will of course be understood that the parts are shown in schematic form and distorted relation to better illustrate the invention. For the sake of clearness supports have been omitted and only so much of well known apparatus has been illustrated as is required to clearly show the invention.

Because of the lightness of parts, the drive circuit comprising contacts 21 and 22 and conductors 23 may be eliminated, and the energy stored in the reed 20 may alone be relied upon to complete rotation of the pin barrel.

Receiving apparatus

In the embodiment of apparatus shown in Figures 3 and 4, a reed drive circuit for the receiver rotary member the same as that used at the transmitter is utilized. The description need not be here repeated, but for convenience, the same numerals with 100 added thereto have been utilized to designate like parts. By eliminating contacts 121, 122 and conductors 123, the free vibration of reed 120 will rotate the receiver cam shaft between the start and stop positions.

Incoming code combinations of electrical impulses operate line magnet 150 to actuate armature 152 about a pivotal point, under influence of spring 153, in obvious manner. Movement of 152 (as shown in Fig. 3) caused by a starting line condition, permits cam shaft 154 to move axially to the right under influence of member 155 and spring 156, moving pin 157 and permitting contacts 113 to open the holding circuit through magnet 117. Cam shaft 154 then rotates under the influence of the reed drive arrangement in definitely timed relation with respect to the change of line conditions caused by the transmitter. As the cam shaft rotates, cams 158 to 162 successively pass trips 163 to 167. If a marking condition exists on the line as a cam passes its trip, axial movement of the cam shaft will be permitted by 150 and the respective cam is caused to align with and actuate its respective trip. If a spacing condition exists on the line as a cam passes the trip, no axial movement of the barrel will be permitted and the trip will be unactuated. The rotation of the cam shaft 154 is so timed that bars 1 to 5 (Fig. 1) of the transmitter will cause marking or spacing conditions which control the actuation of trips 163 to 167 respectively. With bars 2, 4 and 5 actuated, trips 164, 166 and 167 will be set. As

trips 163 to 167 are set latches 168 individual to each trip operate to retain the set trips in actuated position. Trips 163 to 167 control a plurality of movable slotted selector bars 169. The selector bars 169 control a plurality of actuating bars 170 which in turn control the desired selective operation. A selector of this type is fully disclosed in my U. S. Patent #1,567,392, issued Dec. 29, 1925, to which reference may be had for details of the selector and mechanism controlled thereby. Only so much of the selector mechanism is here shown as will enable a complete understanding of the invention to be had in its specific application to the selector disclosed in aforementioned Patent #1,567,392. It should, however, be understood that the present invention is useful in other relations.

After a selective combination has been completely received pin 157 closes contacts 171 and completes an energizing circuit for operating magnet 172. Magnet 172 supplies or controls the actuating energy for completing a selected operation. In the apparatus shown 172 operates bail 173 which in turn completes the operation of a selected actuating bar 170. The selector mechanism may control a printing telegraph machine of the types shown in my U. S. Patents No. 1,565,165, issued Dec. 8, 1925; No. 1,564,442 issued Dec. 8, 1922; and No. 1,448,750, issued March 20, 1923, in which case, bars 170 would actuate the type-bars, and magnet 172 would be the printer magnet.

Pin 157 then closes contacts 113 causing magnet 117 to energize and to hold the parts in zero position until a start condition of a succeeding code combination is received.

In Fig. 5 a modification of the drive arrangement shown in Fig 3 is disclosed. In this form conductor 123 connects contact 122 to a contact 175. With the cam shaft shifted to the right, arm 155 engages contact 175 and completes a circuit for magnet 117 through arm 155 and conductor 176. When the cam shaft is to the left, arm 155 is out of engagement with contact 175. The remaining parts are the same as set forth in connection with Figures 3 and 4. In operation an energizing circuit for magnet 117 will be completed each time a spacing condition is received. The reed 120 and the rotation of the cam will accordingly be under line control between the start and stop signals, and will be corrected by the selecting impulses if it should be out of phase. In the arrangement shown in Fig. 3, the vibrations of the reed and rotation of the cam shaft are under solely local control between the start and stop positions. By positioning contact 175 so that movement of arm 155 to the right interrupts engagement therewith and movement to the left closes the circuit, correction will occur on marking impulses.

In Fig. 6 a form is shown in which a mechanical stop 177, such as shown in my copending application, Ser. No. 704,022, filed April 3, 1924, is substituted for the holding circuit through contacts 113 of the form shown in Fig. 5. The proportion of parts is such that in zero position pin 157 will be held against stop 177, pawl 125 will be hooked over a tooth on wheel 126 holding reed 120 away from magnet 117 with contact 121 engaging contact 122, and arm 155 will be disengaged from contact 175. Upon the receipt of the first or start condition magnet 150 will de-energize permitting the cam shaft to shift to the right. Pin 157 will pass through notch 178 and arm 155 will engage contact 175. Magnet 117 will now attract reed 120 causing interruption of the drive circuit. The reed 120 will vibrate and cause a complete rotation of the cam shaft in unison with the received impulses until the cycle is complete and the parts come to rest in the position shown. Contacts 175 and arm 155 will be engaged only when the cam shaft is to the right or when spacing conditions are received, and accordingly the rotation of the cam shaft will be line controlled in rotation between the start and stop positions. When the drive circuit is opened the stepping of the cam shaft will continue due to the free vibration of reed 120. By connecting conductor 176 directly to conductor 123, the control of rotation of the cam shaft by the selecting impulses is removed, and the rotation is, under solely local control between the start and stop position.

Instead of driving the cam shaft mechanically, the vibrating reed may be utilized to control a neutral or a polarized stepping magnet or other driving means, such for example, as is shown in the copending application. In Fig. 7, reed 120 has springs 179 and 180 applied thereto which alternately engage contacts 181 and 182 as the reed vibrates. Contacts 181 and 182 are connected by conductors 183 and 184 to coils 185 and 186 of a polarized drive magnet 187 of the type disclosed in the copending application. The other ends of coils 185 and 186 are connected to battery 119 through conductor 118. As in the copending case, pawl 125 is pivotally supported on armature 188 of magnet 187. Windings 185 and 186 are applied in such manner that when energized, the polarities of the magnetic fields set up are opposite in character. In operation, the cam shaft moves endwise in response to a received start condition, de-energizing magnet 117 and permitting reed 120 to vibrate. The circuits are then completed alternately through windings 185 and 186, conductors 183 and 184, contacts 182 and 181, reed 120, conductor 123 through battery 119 and conductor 118, causing armature 188 to vibrate in unison with the reed. Pawl 125 will rotate the cam shaft in properly timed relation

with the received impulses until a revolution has been completed and pin 157 closes the holding circuit for magnet 117 through contacts 113 in response to the stop condition.

It will be obvious that the drive arrangement of Fig. 6 may be applied to the transmitter pin barrel by substituting contacts 13 of Fig. 1 and the controlling means therefor for contacts 113 and the control of Fig. 6.

Six unit continuous system

In the arrangements shown in Figures 1 to 5, a seven unit start-stop system is shown. A lower frequency system may be provided by eliminating the extra receiver stop condition after each impulse and depending upon a mechanical and electrical stop operable on the fifth selecting impulse. The mechanical stop of the fifth pulse is preferably of the type disclosed in co-pending application, Serial Number 704,022, filed April 3, 1924. The essential parts of such a system are disclosed in Fig. 8. Any usual form of automatic transmitter may be used which will transmit the selective code combinations at a proper rate, each preceded by a receiver start condition always of the same character. The speed of the transmitter is preferably controlled by a vibrating reed drive. The arrangement is the same as that shown in Fig. 6 except that mechanical stop 177 is positioned to stop the cam shaft immediately after the fifth selecting impulse has set the corresponding finger on receipt of a marking condition and after the selecting mechanism has been set into operation by the closing of contacts 171 (Fig. 3), also contacts 113 are added. In arrested position contacts 113 are closed and complete a holding circuit for magnet 117. Each time the cam shaft moves to the right in response to a spacing condition, an energizing circuit will be completed through contact 175 and arm 155 for magnet 117.

The reed 120 is normally biased toward contact 122 so that when the parts are at rest with magnet 117 de-energized, spring 121 will engage contact 122. To start the reed 120 into vibration the line is opened permitting magnet 150 to de-energize and arm 155 to engage contact 175. This will start rotation of the receiving cam shaft. The line may then be closed and pin 157 will be brought into engagement with stop 177 and will close contacts 113. The first impulse of each signal will cause de-energization of magnet 150, causing the cam shaft to move to the right in Fig. 8. Pin 157 will permit contacts 113 to open and will drop off shelf 177. Continuous transmission may now proceed, and the reed 120 will be corrected and have energy supplied thereto to maintain vibration each time a spacing condition is received during the first four selecting intervals of a signal, and each time the fifth selecting interval is a marking condition. The system will accordingly remain in synchronism during transmission and may be readily brought in unison to start transmission.

Having described preferred embodiments of my invention, what is desired to be secured by Letters Patent and claimed as new is:

1. A telegraph system comprising apparatus adapted to transmit code combinations of selecting conditions each preceded by a synchronizing condition; and receiving apparatus responsive to said selecting conditions, and maintained in synchronism with said transmitting apparatus by said synchronizing condition and by certain of said selecting conditions.

2. A telegraph system comprising transmitting apparatus adapted to transmit code combinations of selecting conditions; a vibrating reed timing the rate of operation of said transmitting apparatus; receiving apparatus responsive to said code combinations; a vibrating reed timing the rate of operation of said receiving apparatus in unison with said transmitting apparatus; and means for initiating and controlling the vibrations of said reed responsive to certain of said selecting conditions, and unresponsive to others of said selecting conditions.

3. A telegraph system comprising transmitting apparatus adapted to transmit code combinations of selecting conditions each preceded by a receiver start condition, and a receiver responsive to said selecting conditions comprising a reed initiated in vibration by said start condition and timed in operation by certain of said selecting conditions.

4. In a selective apparatus, a rotary element, a vibrating reed timing the speed of operation of said rotary element, a holding magnet for said reed, and a pair of contacts controlled by said rotary element controlling said magnet.

5. Selecting apparatus comprising an axially and rotary movable means, a vibratory member timing the rotary movement of said means, a holding magnet for said vibratory member, and contacts controlling said holding member and controlled by the axial movement of said means.

6. The combination as set forth in claim 1, which said receiving apparatus is corrected by the last selecting condition of a code combination.

7. The combination as set forth in claim 1, in which said receiving apparatus is corrected by the last selecting condition of a code combination only when it is a marking condition, and is corrected by the remaining spacing conditions of each code combination.

8. In a printing telegraph system, a transmitter comprising a plurality of selector

members movable in combination in accordance with the signal to be transmitted, a start member, a motor for said transmitter, an electrical supply circuit for said motor, a pair of contacts in said supply circuit mechanically operated by said start member.

9. The combination as set forth in claim 8, in which said motor comprises a vibratory reed together with an actuating magnet for said reed connected in said supply circuit.

10. A transmitting apparatus, comprising a selecting mechanism, means to operate said selecting mechanism in accordance with the signals to be transmitted, a driving motor for said transmitter, control contacts for said motor, means for actuating said contacts at the beginning of a signal to initiate operation of said motor, and locking means to maintain said contacts in position to continue the operation of said motor until the completion of a signal independently of the operation of said first mentioned means.

11. The combination as set forth in claim 10, together with means for invariably actuating said locking means to arrest the operation of said motor at the end of each signal independently of the operation of said first mentioned means.

12. In a selecting system, a rotary member, a series of elements adapted to be operated by said rotary member, a signal controlled member acting to selectively control said series of elements according to the signals received, and a member having a natural period of motion adapted to time the operation of said rotary member, and mechanical connections between said member and said rotary member to transmit the power to drive said rotary member.

13. In combination, a plurality of selecting members, a rotating member responsive to received code combinations of impulses for distributing said impulses to said elements and a member having a natural period of motion directly connected to said rotating member for supplying the power to drive said member.

14. In combination, a plurality of selecting members, a rotatable distributor responsive to received code combination of impulses for distributing said impulses to said members and a tuning fork mechanically connected to said distributor for rotating said distributor.

15. In combination, a plurality of selecting members, a rotatable distributor responsive to received code combination of impulses for distributing said impulses to said members, a tuning fork mechanically connected to said distributor for rotating said distributor, circuit connections for normally maintaining said tuning fork non-operative and means responsive to a received signal for rendering said tuning fork operative to operate said distributor.

16. In a selecting system, a rotatable cam shaft, a plurality of selector members selectively operated by said cam shaft, a vibrating member mechanically connected to said shaft for driving said shaft, electro-magnetic means responsive to received signals for controlling said vibrator and electrical connections for said electro-magnetic means controlled by said cam shaft.

17. In a selecting system, a rotatable cam shaft, a plurality of members selectively operated by said cam shaft, electro-magnetic means responsive to received signals for operating said cam shaft to operate said selector members, a vibrating member mechanically connected to said shaft for driving said shaft, electro-magnetic means for controlling said vibrator and circuit connections for said electro-magnetic means controlled by said cam shaft, said electro-magnetic means being normally held non-operative while said cam shaft remains at rest, and responsive to a received start signal for rendering said vibrator operative for a single cycle of operations.

18. In a signalling system, a source of power comprising a vibrating member, a rotating member directly driven by said vibrating member, and an electric magnet responsive to a line signal for releasing sufficient power from said vibrating member to drive said rotating member one revolution.

19. A transmitting apparatus comprising a selecting mechanism, means to operate said selecting mechanism in accordance with a signal to be transmitted, a source of power comprising a vibrating member directly and mechanically connected to said transmitting mechanism for operating said transmitting mechanism and means operative at the beginning of a signal period for releasing sufficient of said power from said vibrating mechanism to operate said transmitting mechanism until the completion of the signal code.

20. A transmitting apparatus comprising a selecting mechanism, and a rotatable shaft for operating said selecting mechanism in accordance with signals to be transmitted, a source of power for said rotatable shaft and means for releasing sufficient of said power at the beginning of a signal to maintain said rotating member in rotation for one revolution for transmitting a code combination of impulse conditions.

21. In a signalling system, a rotatable member, a vibrating member, for supplying the power to rotate said rotatable member and circuit connections for controlling the vibration of said vibrating member said circuit connections being jointly controlled by said vibrating member itself and by received impulses.

22. In a signalling receiver, a rotatable member, an electro-magnet responsive to received combinations of impulse conditions, a vibrating member for directly rotating said

rotatable member and means controlled by said electro-magnet for controlling the operation of said vibrating member.

23. In a signalling receiver, an electro-magnet responsive to received combination of impulse conditions, a rotatable member arranged to be operated by said electro-magnet, a vibrating member for rotating said rotatable member and means controlled by said received impulse conditions, for controlling the operation of said vibrating member during the operations of said rotatable member.

24. In a signalling system, a rotatable member, a vibrating member for rotating said rotatable member, a magnet for controlling the vibration of said vibrating member, a normally open electric circuit for said magnet, and means responsive to a received signal for closing said circuit whereby said vibrating member is started into operation, said vibrating member when in operation periodically opening said magnet circuit to maintain itself in operation.

25. In a signalling system, a rotatable member, a vibrating member for rotating said rotatable member, a magnet for controlling the vibration of said vibrating member, a normally open electric circuit for said magnet, and means responsive to a received signal for closing said circuit whereby said vibrating member is started into operation, said vibrating member when in operation periodically opening said magnet circuit to maintain itself in operation said last mentioned means being operative at the end of a signal period to open said circuit.

26. In a selecting system, a signalling line, a rotating member, means for variably operating said rotating member, means controlled by the variable operation of said member for transmitting code combinations of conditions over said line, a rotating member at the other end of said line, a series of selecting elements, a vibrating member for each of said rotating members, mechanical connections between each said said vibrating members and its associated rotating member for driving said rotating members, one of said vibrating members being arranged to operate its associated rotating member entirely in accordance with its mechanical constructions, means controlled by said received code conditions for controlling the operation of said second vibrating member to operate in synchronism with said first vibrating member whereby said rotating members are maintained in synchronism and means responsive to received code conditions for variably operating said selecting elements.

27. In a signalling system, a transmitting station, a receiving station, a rotating member at each station, vibrating means at each station, each having a natural period of vibration for driving said rotating members, means whereby one of said vibrating members is free to vibrate and means whereby the other of said vibrating members is controlled in accordance with the vibration of the first mentioned vibrating member.

28. In a signalling system, a transmitting station, a receiving station, a vibrating member at each of said stations, a rotary member at each station driven directly by said vibrating members, said vibrating member at said transmitting station being free to vibrate, means controlled by said rotary member at said transmitting station for transmitting code combinations of conditions to said receiving station and means controlled by said received code combinations of conditions for controlling the rate of vibration of said receiving station vibrating member.

29. In a signalling system, a transmitting station, a receiving station, a vibrating member at each of said stations, a rotary member at each station driven directly by said vibrating members, said vibrating member at said transmitting station being free to vibrate, means controlled by said rotary member at said transmitting station for transmitting code combinations of signalling conditions to said receiving station, means controlled by said received code combinations of signalling conditions for controlling the rate of vibration of said receiving station vibrating member, and selector members variably operated by said rotating member at said receiving station in accordance with the received code combinations of conditions.

30. In a signalling system, a transmitting station, a receiving station, a vibrating member at each of said stations, a rotary member at each station driven directly by said vibrating members thereat, said vibrating member at said transmitting station being free to vibrate, means controlled by said rotary member at said transmitting station for transmitting code combinations of impulse conditions preceded by a start impulse condition, an electro-magnet at said receiving station responsive to said start conditions and received code combinations of impulse conditions for releasing the vibrating member thereat to vibrate through a single revolution and for maintaining said vibrating member in synchronism with said transmitting station vibrating member whereby said rotary members are maintained in synchronism.

31. In a signalling system, a transmitting station, a receiving station, a vibrating member at each of said stations, a rotary member at each station driven directly by said vibrating members thereat, said vibrating member at said transmitting station being free to vibrate, means controlled by said rotary member at said transmitting station for transmitting code combinations of impulse conditions preceded by a start impulse condition;

an electro-magnet at said reeciving station responsive to said start impulse conditions for releasing the vibrating member, and circuit connections for said electro-magnet independent of said last means whereby said electro-magnet is operated in accordance with said received code combinations of impulse conditions for maintaining said vibrating member in timed relation with said received signals whereby said transmitting and receiving station rotary members are driven in synchronism.

32. In a selecting apparatus, a signalling line; two oscillating members, one at each end of said line, one of said members having its oscillations determined by its mechanical construction, the other member having its oscillations controlled by line signals; a plurality of groups of selectable elements, a group associated with each oscillating member; a mechanically operative connection between each oscillating member and its group of elements; and means for transmitting line signals in accordance with the setting of one group of elements, whereby the other group of elements is set in accordance with said signals.

33. In a selective apparatus, a signalling line; two oscillating members, one at each end of said line, one of said members having its oscillations determined by its mechanical construction, the other member having its oscillations controlled by line signals; a group of selectable elements associated with each oscillating member; means for transmitting line signals in accordance with the setting of one group of elements; and a single member having its movements controlled by both of said oscillating members and acting to set and operate the other group of said elements in accordance with line signals.

34. In a selecting apparatus, a signalling line, means for transmitting signals over said line, a series of elements to be selected, two oscillating members, one of said oscillating members having its oscillations determined by its mechanical construction, the other oscillating member having its oscillations controlled by the line signals; mechanically operative connections between said elements and said two oscillating members whereby said elements are selected and operated according to the line signals.

35. In a selecting apparatus, a signalling line, means for transmitting signals over said line, a series of elements to be selected, two oscillating members, one of said oscillating members having its oscillations determined by the line signals, the other oscillating member having its oscillations determined by its mechanical construction; a single member having its motion controlled by both of said oscillating members and acting to set and operate said elements according to the signals.

36. A transmitting apparatus, including a selecting mechanism, means to operate said selecting mechanism in accordance with a signal to be transmitted; a single element operable to produce signal impulses, an oscillating member having its rate of oscillations determined by its mechanical construction and adapted to cooperate with said selecting mechanism to control the operation of said element according to the signal to be transmitted.

37. A transmitting apparatus, including a selecting mechanism, means to operate said selecting mechanism in accordance with a signal to be transmitted; two oscillating members, one of said members having its oscillations determined by its mechanical construction, a single member having its movements controlled by said one of said oscillating members and said selecting mechanism to control the oscillations of the other of said oscillating members according to the signal to be transmitted.

38. A transmitting apparatus, including a selecting mechanism, means to operate said selecting mechanism in accordance with a signal to be transmitted; a single element, two oscillating members, one of said oscillating members having its oscillations determined by its mechanical construction and adapted to cooperate with said selecting mechanism to control the movements of said single member to thereby control the oscillations of the other of said oscillating members according to the signal to be transmitted.

In testimony whereof I affix my signature.

EDWARD E. KLEINSCHMIDT.