Sept. 13, 1932. E. F. WATSON 1,877,437

START-STOP TELEGRAPH SYSTEM

Filed March 25, 1931

FIG. 1

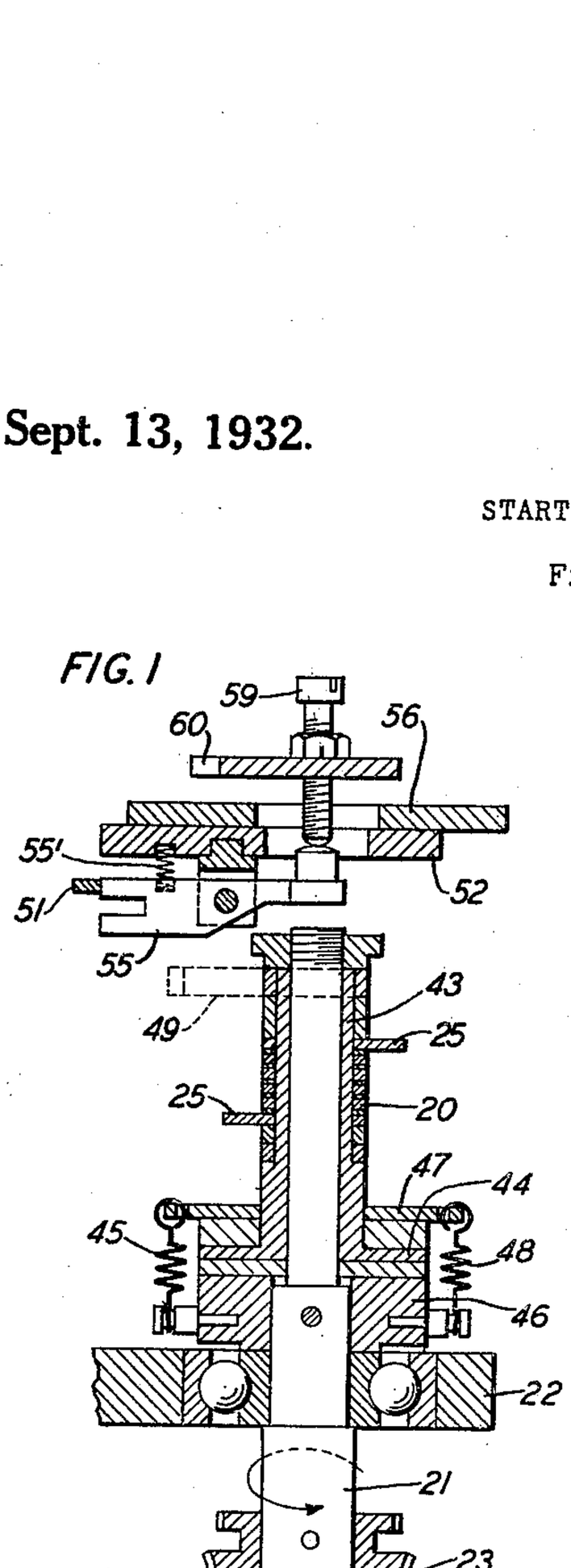


FIG. 2

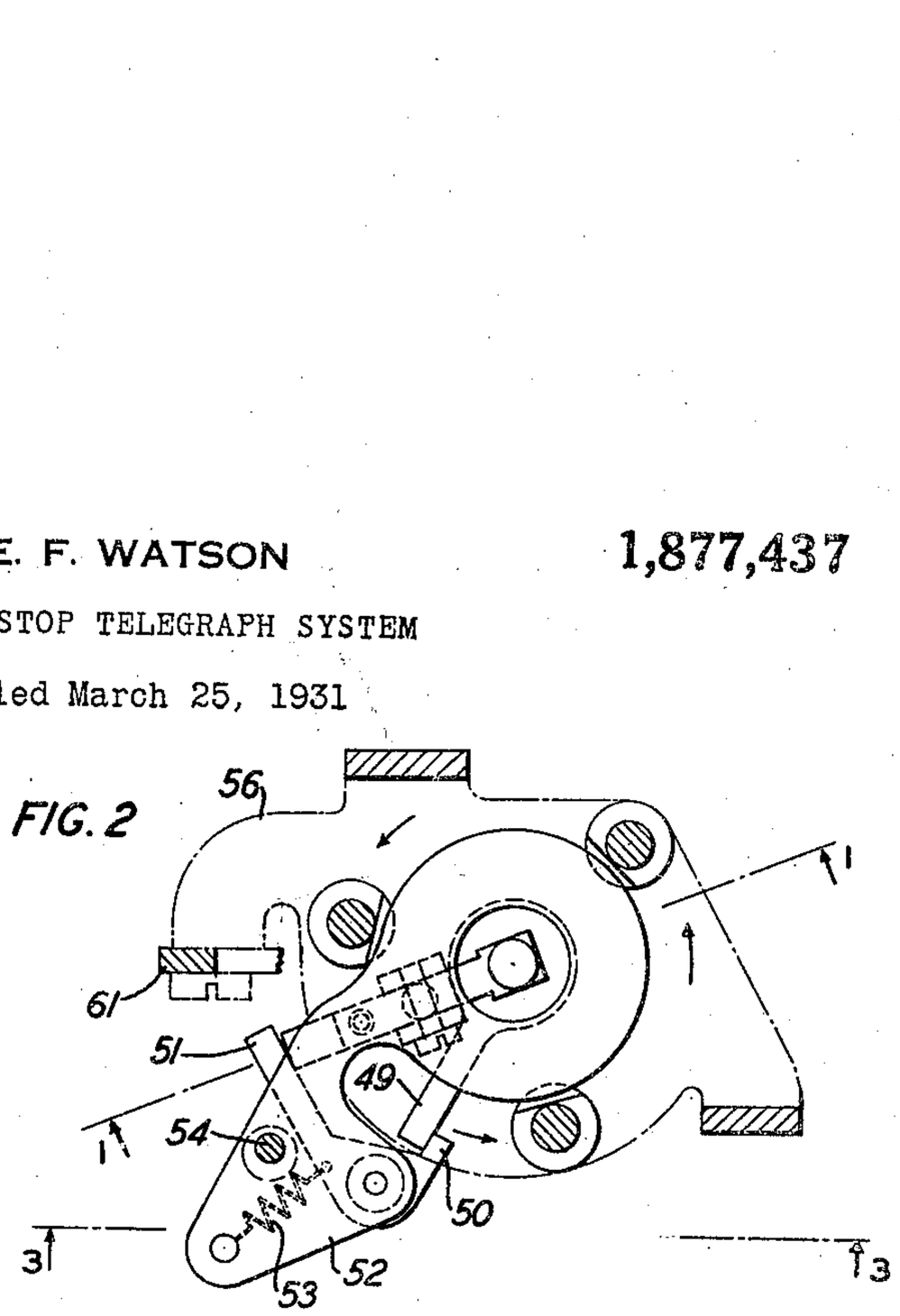


FIG. 3

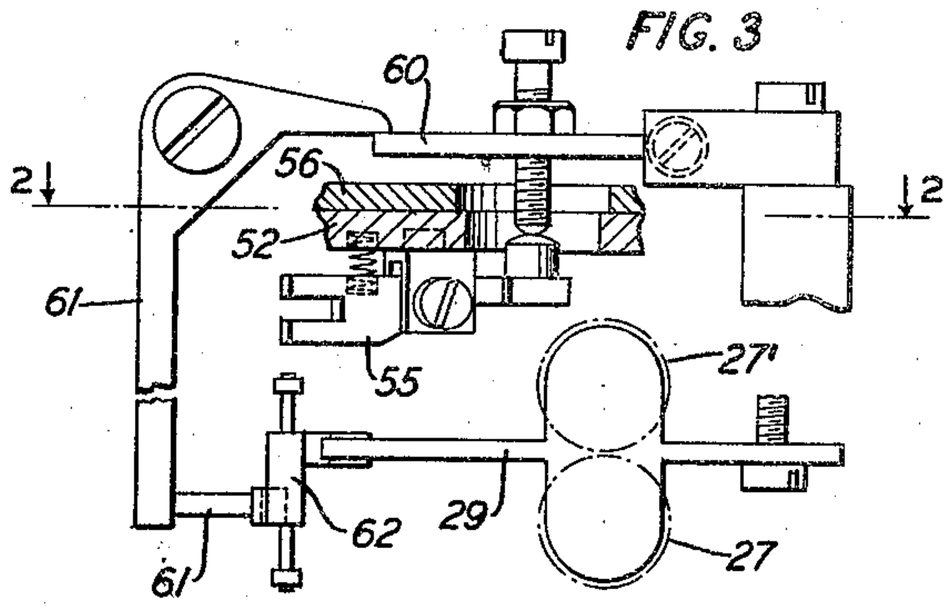


FIG. 6

FIG. 7

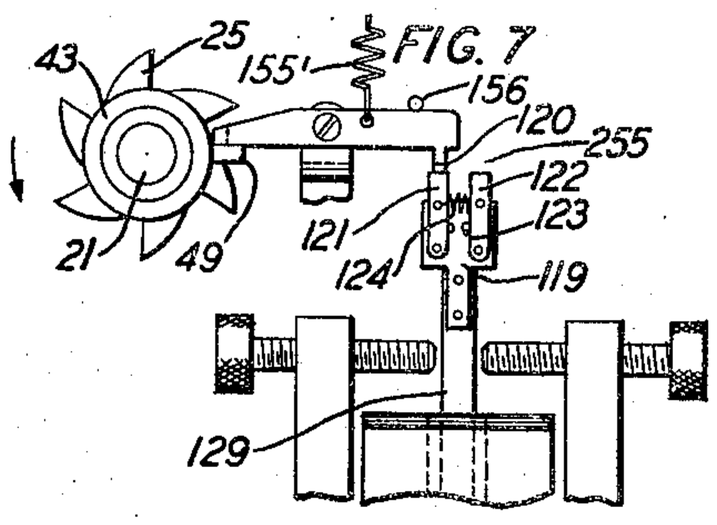


FIG. 4

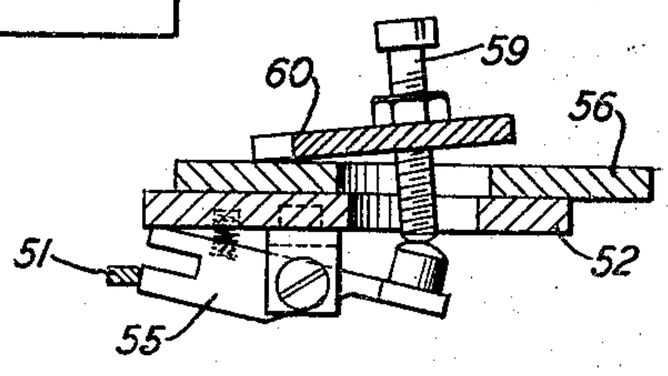
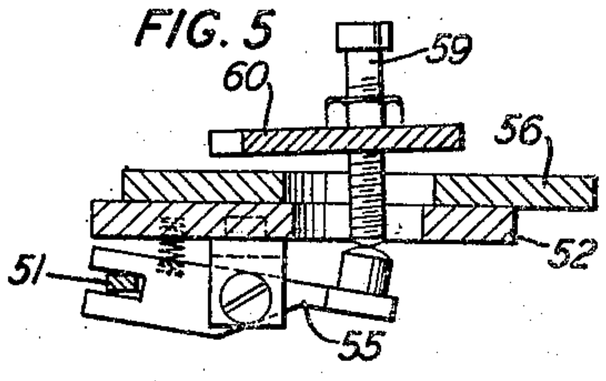


FIG. 5



INVENTOR
E. F. WATSON

BY

ATTORNEY

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UNITED STATES PATENT OFFICE

EDWARD F. WATSON, OF LARCHMONT, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

START-STOP TELEGRAPH SYSTEM

Application filed March 25, 1931. Serial No. 525,253.

This invention relates to signaling systems and more particularly to telegraph systems embodying intermittently rotating distributors.

An object of this invention is to decrease the number of line impulses required to operate a telegraph printer at any given speed of character printing.

One form of start-stop telegraph system employs a combination of eight impulses for the transmission of each character. Of these eight units, six are for the selection of the character to be printed, one is for stopping the distributor and one is for starting the same. The present invention employs a total of seven impulses. Six of these units select the desired character, while a single additional impulse controls the starting and stopping of the receiving distributor.

A system embodying a six-unit code, in which five units are for character selection, is old in the art. Such an arrangement is shown by Patent 1,578,299, issued March 30, 1926 to G. S. Vernam. The present invention, from one aspect, is an improvement on the system of the Vernam patent.

In accordance with an embodiment of the invention designed to accomplish the above and other objects and to possess the above named features, a rotary distributor is adapted to be started from rest once for each revolution, upon the receipt of a signal impulse of opposite polarity from the last signal of the preceding combination. The distributor is driven by a motor through a friction clutch and is restrained from revolution between successive cycles, by means of a pawl or dog. A magnet or relay is connected to the line and has an armature adapted to assume either one of two positions depending upon the polarity of the received impulse. A fork vibrates with the armature and the pawl is adapted to be forced by the distributor against the end of one of the tines of the fork. The pawl is held in this position until a signal impulse of opposite polarity is received. When this happens, one tine of the fork is moved from under the pawl, and before this tine is replaced by the other, the pawl moves into the recess between the two tines and thus releases the distributor for revolution through another cycle.

Figure 1 of the accompanying drawing is a vertical section of a printing telegraph receiver embodying the present invention, the section being taken along the line 1—1 of Fig. 2. The elements are shown in the position they occupy while a "marking" impulse is being received;

Fig. 2 is a plan view of the receiver, certain parts being shown in section;

Fig. 3 is a side view looking in the direction of the arrows 3—3 of Fig. 2, certain parts being in section;

Fig. 4 shows certain elements of the start-stop mechanism in the "spacing" position;

Fig. 5 shows the same elements as Fig. 4 intermediate the "spacing" and "marking" position; and

Figs. 6 and 7 show modified forms of the start-stop mechanism.

The receiving magnet 27 (Fig. 3) responds to impulses received over a telegraph line (not shown). The nature of the signals received is such that each character is represented by six permutations of spacing and marking impulses, supplemented by a single pulse which precedes the permutation pulses, for controlling the starting and stopping mechanism for the distributing cams. In the following description the start pulse will be referred to as the first pulse of a combination, and the six permutation pulses as the second pulse to the seventh pulse inclusive.

The start pulse for any character is selected by the distant transmitter to be always of opposite polarity to the last permutation pulse or the seventh pulse of the preceding signal character. Thus, if the last one of the permutation impulses happens to be a spacing impulse, then the start impulse for the following character will be marking, and vice versa. The transmitter at the distant end of the telegraph line may be of the general type disclosed in the Vernam Patent 1,578,299, issued March 30, 1926. In case the number of permutation impulses is six, the transmitter of the Vernam patent must be changed correspondingly, so that there are six stor-

ing relays and segments therefor, instead of five.

The description of the receiving printer which responds to the telegraph impulses picked up by the relay 27, will be confined chiefly to the mechanism for starting and stopping the distributor. The apparatus for printing the character in response to the vibrations of the armature of relay 27 has but a remote bearing upon the present invention. For a description of the printing apparatus reference is made to Morton Patent 1,745,633, issued February 4, 1930.

A distributor cam 20 is synchronized with the incoming telegraph signals by an improved start-stop mechanism. In the form of invention shown in Fig. 1, there are six cam parts 25, which are made of separate sheet metal stampings keyed upon a sleeve 43 that is loosely mounted on the upper reduced end of a shaft 21 and forms the driven member of a slip-friction clutch. The cam parts 25 are setting devices for selector elements. The driving shaft 21 is connected to a gear 23 adapted to be driven by a suitable motor (not shown). A flange 44 on sleeve 43 is interposed between felt washers 45 and the latter are engaged, respectively, by a collar 46 fixed to the shaft and a metal washer 47 connected to the collar by springs 48, the springs serving to press the parts of the friction clutch into contact. The friction drive device may assume any of the several forms common in the art.

A radial arm 49 on sleeve 43 is arranged to engage a stop 50 on an arresting dog 51. The latter is pivoted on an arm 52 (Fig. 2) and a light spring 53 tends to move the dog toward an adjustable eccentric stop 54 on the arm. The shaft and friction clutch tend to rotate the cam in an anti-clockwise direction as indicated by the arrows in Fig. 2, and the engagement of arm 49 with stop 50 tends to rotate the dog 51 on its pivot and normally hold the free end against one tine or the other of a forked latch 55. The latch 55 is pivotally mounted on arm 52 and its inner end is pressed upwardly against the screw 59 by a light spring 55′. Arm 52 is mounted on a bracket 56 and is adapted to be rotated about an axis concentric with the shaft 43 whereby to orient the stop 50 with respect to the selecting mechanism (not shown).

The inner end of the latch 55 is disposed in line with the axis of the cam sleve 43 and is engaged by an adjustable screw 59 on a trip lever 60 (see Figs. 1 and 3). The latter is pivoted with respect to bracket 56 and its free end is engaged by the horizontal arm of a bell crank 61, the vertical depending arm of which engages a second bell crank 62 that is operated by an armature lever 29 as shown in Fig. 3.

In Figs. 1. 2 and 3 the armature lever 29, bell cranks 62 and 61, trip lever 60, screw 59, and latch 55 are shown in the positions that they occupy during the time that the relay 27 is receiving a marking impulse. In the same figures, the position of the cam sleeve 43 and its radial arm 49 is shown to correspond with the seventh pulse of a particular combination, which happens to be a marking impulse.

The last impulse or "stop" impulse will be prolonged until the transmitter at the distant end of the line is ready to send out the next signal. Whatever may be the particular combination representing the next character to be transmitted, it must be preceded by a spacing impulse, in order to start the distributing cam 20, for the reason that the last pulse of the preceding combination happened to be a marking impulse.

When the first or spacing impulse of the following combination arrives it will cause the armature lever 29 to move to its spacing position. The armature lever in so moving rotates the bell crank 62 and consequently the bell crank 61 which moves in a clockwise direction as viewed in Fig. 3. The movement of the bell crank lever 61 depresses the trip lever 60, the screw 59 and the inner end of the latch 55. Now, if the radial arm 49 were in motion or in some other position where it did not press against the dog 51, the latch 55 would be free to move to its spacing position as shown in Fig. 4. However, the engagement of the lug 50 by the radial arm 49 presses the opposite end of the dog 51 inwardly so that the latch 55 is prevented from reaching the position shown in Fig. 4. As soon as the latch 55 has completed approximately half of its clockwise movement as viewed in Fig. 5, the dog 51 is released and moves into the space between the upper and the lower tine of the forked latch. This rotation of the dog releases the radial arm 49 and consequently the cam sleeve 43 together with the cam 20 rotate for one revolution.

During the time that the arm 49 is revolving from one stop position to the next, the armature lever 29 responds to spacing and marking impulses received at regular intervals but in irregular order depending upon the particular combinations selected at the transmitting end of the telegraph line. The spacing and marking impulses cause the latch 55 to assume the positions shown in Fig. 4 and Fig. 1, respectively, except that lug 51 does not bear against 55 except at the end of a cycle when the arm 49 bears against the lug 50. As the latch 55 moves from the marking position of Fig. 1 to the spacing position of Fig. 4 and vice versa, the dog 51 does not move to occupy a position betwen the two tines, except when the radial arm 49 is in its stopped position resting against the lug 50 of the dog 51.

When the radial arm 49 again strikes the lug 50 on the dog 51, the latch 55 will be either in the spacing position (Fig. 4) or in the

marking position (Fig. 1), depending upon the particular character selected. If the last character selection should be a spacing impulse, the radial arm 49 will engage the lug 50 on the dog 51 at the time that the latter is engaging the lower tine of the forked latch 55 as shown in Fig. 4. The lower tine will hold the dog 51 against movement until a marking impulse is received. Upon the receipt of a marking impulse the cam sleeve 43 will be released, the sequence of operation being somewhat similar to the sequence previously described when the start impulse was spacing. The marking impulse moves the armature lever 29 to the marking position, thereby releasing the pressure of the bell crank 62 from the bell crank 61, which in turn releases its pressure from the trip lever 60 and the screw 59, thereby permitting the spring 55′ to rock the latch 55 in a counter-clockwise direction toward the position shown in Fig. 1. The dog 51 moves into the space separating the upper and lower tines of the latch 55. The movement of the dog 55 is effective to release the radial arm 49 for another revolution in the manner previously described.

Figs. 6 and 7 are modifications of the present invention. Fig. 6 is based upon the same general principle as that of the embodiment shown in Figs. 1 to 5, inclusive, but is more simple in construction. The cam sleeve 43 and radial arm 49 of Fig. 6 are similar in construction and function to the corresponding parts in the embodiment shown in Figs. 1 to 5, inclusive. The radial arm 49 cooperates with a stop lever 151 which arrests the rotation of the arm 49 once for every revolution. Lever 151 is pivotally mounted upon a spring plate 116 to hold the lever 151 in a horizontal position. Lever 151 normally has its right-hand end held upward by spring 155′ against stop 156 except when the pressure of radial arm 49 holds the right-hand end down against latch 155.

The stop lever 151 carries a pin 120 which cooperates with a fork 155 attached rigidly to the upper end of armature 129 of a polar relay 127. The armature and fork move to the left in response to a spacing signal and to the right when a marking signal is received. When the shaft 43 reaches the limit of its travel the arm 49 will be stopped by the lever 151. At this instant the pin 120 will be resting on the top of either the right hand tine or the left hand tine (as in Fig. 6), depending upon whether the seventh impulse in a code combination happens to be spacing or marking respectively.

When the armature changes its position in response to a change of current through the relay 127, the pin 120 is free to move into the space between the two tines thereby releasing the arm 49. However, any changes from the spacing to the marking position of the armature during the time that the arm 49 is in motion will not cause any rotation of the stop lever 151.

Fig. 7 is an improvement upon the device shown in Fig. 6, the improvement residing in a fork 255 made up of movable parts. At the upper end of armature 129 is a plate 119 which carries two tines 121 and 122 normally held together against the stops 123 by a tension spring 124. When the pin 120 moves into the space between the tines 121 and 122 it will rub against the inner side of one of these tines, which will yield in order to prevent the pin 120 from interfering with the vibration of the armature 129. The modification of Fig. 7 possesses the further advantage in that friction between the pin 120 and the tines 121 and 122 is considerably reduced.

If desired, the pivoted tine arrangement of Fig. 7 may also be applied to the forked latch 55 of Figs. 1, 2 and 3.

While the invention has been described with reference to a selecting code in which each character is represented by permutations of six spacing and marking impulses, it will be understood that the invention is not limited to any particular number of code combinations. For example, the invention may be adapted for use with a five-unit code such as disclosed in the Vernam Patent 1,578,299, March 30, 1926. The necessary changes for adapting the machine to suit a different number of code combinations will be understood by those skilled in the art. One of the principal changes is to make the number of cams 25 equal to the number of selecting pulses which form a combination in each character.

The present invention is not limited to telegraph printers but may be used also in connection with regenerative repeaters or other start-stop distributor devices.

What is claimed is:

1. In a communication system, a rotary distributor of the start-stop type, a relay having an armature whose position is determined by the polarity of received impulses, and means for arresting the distributor between successive cycles, said arresting means being under the control of said armature, characterized by the provision of elements of intercoaction between said armature and said means whereby said arresting means is rendered non-arresting by the movement of said armature from either of two positions to the other.

2. In a signaling system, a start-stop distributor, adapted to execute a complete cycle of free movement, a receiving relay, a movable latch actuated by the relay in response to received signals and having a plurality of positions of rest, and stop means adapted to engage said latch in any of its positions of rest at the end of a cycle for preventing

the starting of the distributor while the latch is at rest.

3. In a telegraph system, a start-stop distributor, a receiving relay, a movable latch actuated by the relay in response to received telegraph signals and having a plurality of positions of rest, stop means adapted to engage said latch while it is at rest in any position for preventing the starting of the distributor, said stop means being adapted to be released by the latch whenever the latter is in motion as a result of the relay moving.

4. In a signaling system, a rotatable member, mechanism including a friction clutch for driving said member, a stop connected to said member, and remote control means for releasing said stop, said means comprising an armature adapted to be reciprocated by remote control, a first arrester adapted to intercept the stop while the armature is in one extreme position, a second arrester adapted to intercept said stop while the armature is in the other extreme position, and means for releasing the stop during the time that the armature occupies an intermediate position.

5. In combination, a rotatable member, driving mechanism for the member including a friction clutch, means for controlling the starting and stopping of the member, comprising a stop connected to the shaft and a reciprocating latch, remote control means for reciprocating said latch, said latch having two discrete surfaces for intercepting said stop, said surfaces being spaced apart sufficiently to release the stop during the interval while the latch is being reciprocated.

6. In a start-stop signaling system, a rotatable distributor, means for arresting and releasing said distributor, said means comprising a stop impelled by the distributor, a signal receiving magnet, a latch movable relatively to the stop by the magnet in response to received signals, said latch having a plurality of spaced surfaces each adapted to intercept the stop, said surfaces being separated sufficiently from each other to release the stop during the movement of the latch by the magnet.

7. In a start-stop signaling system, a receiving magnet provided with an armature, a rotatable distributor, means for arresting said distributor, said arresting means comprising a stop for the distributor, and connected thereto, a vibrating latch controlled by the receiving magnet, said latch having two discrete surfaces, each adapted to intercept the stop, said surfaces being spaced sufficiently to release the stop while the latch is changing position.

8. In a start-stop telegraph system, a rotatable distributor, a stop for arresting said distributor, a movable latch having a plurality of discrete surfaces each adapted to contact with the stop for preventing the latter from yielding, said contacting surfaces being separated by spaces permitting the stop to yield, and means including a telegraph receiving magnet for moving the latch to replace one contacting surface by another in response to a change in polarity of the received telegraph current, whereby to expose the separating space to the latch for releasing the distributor.

9. In a telegraph system, a receiving relay, a vibratile armature actuated by the relay in response to received signals, a rotatable start-stop distributor controlled by said armature, a stop connected to the rotatable distributor, a latch connected to the armature and extending lengthwise thereof, and having its free end abutting said stop, said latch being adapted to release said stop in response to a movement of the armature, the latch being yieldable transversely, whereby the vibration of the armature does not interfere with the release of the stop.

10. A remote control system comprising an intermittently rotatable member, a receiving relay, a fork actuated thereby to vibrate between two extreme positions in response to a received signal, means for restraining said member comprising a stop adapted to be urged by said shaft against one tine of the fork while said fork is at rest in either of its two extreme positions and adapted to be forced into the recess between the two tines when the fork changes its position, whereby to release the member.

11. A remote control system as defined in claim 10, in which the tines of the fork are transversely yieldable, whereby the tines may move apart from each other when the stop is received between the tines.

In testimony whereof, I have signed my name to this specification this 23rd day of March, 1931.

EDWARD F. WATSON.