

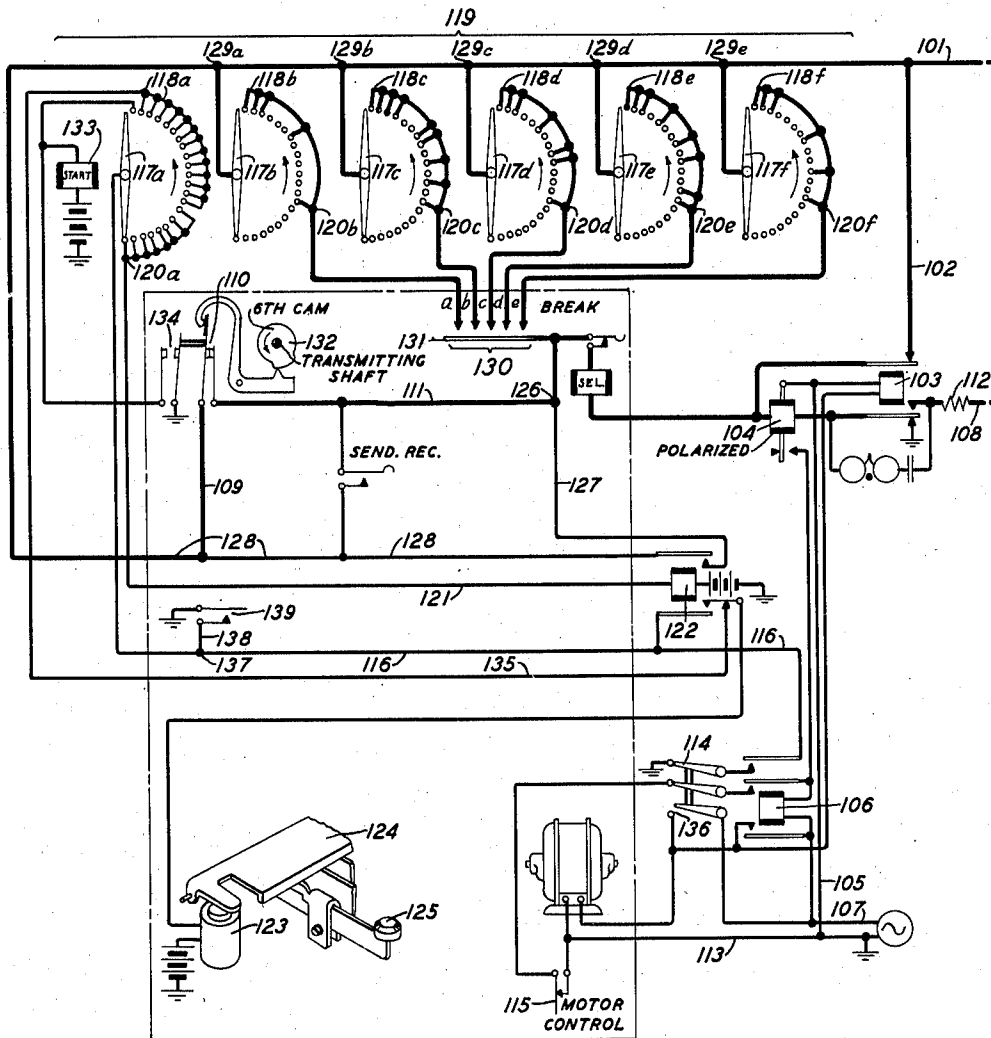
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TELETYPEWRITER "ANSWER BACK" CIRCUIT

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TELETYPEWRITER "ANSWER BACK"  
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This invention pertains to teletypewriter switching systems and more particularly to an improvement over known arrangements for automatically transmitting a series of code signal trains from a telegraph station to form successive symbols in a fixed message. These signal trains may be transmitted from a called telegraph station in response to the reception of a teletypewriter signal from a teletypewriter station with which the called station is connected.

In the operation of communication systems, various services are provided, such as the so-called "time of day," "weather reports," "holiday message," "test sentence," "answer back" and numerous others, wherein the subject-matter of the messages transmitted remains unchanged for considerable periods. In the case of certain of these messages, it is necessary to change the subject-matter from time to time.

When such service is provided in teletypewriter systems, various apparatus has been used for setting up the codes of the characters to be transmitted. In many cases cams have been cut so as to actuate the signaling contacts in the desired manner. In other cases, a continuous tape has been used.

It is an object of the invention herein to improve the apparatus used in teletypewriter systems for the automatic transmission of a fixed message.

It is a further object of the invention herein to reduce the cost of and to increase the flexibility of the apparatus used for automatically transmitting a fixed message in a teletypewriter system.

A feature of this invention is the adaptation of a well-known, inexpensive, and widely used multibank, rotary selector switch to set up successively, by means of its brushes and banks, the elements constituting the signal trains forming the successive characters of the fixed message to be automatically transmitted.

Although in the disclosure hereunder a teletypewriter transmitter is used in conjunction with the rotary switch, the teletypewriter plays no part in setting up the code of the characters. The function of the teletypewriter as used herein is to control the timing of the transmitted signals and to transmit the start and stop impulses at the beginning and ending of each character train. It is not necessary to use a teletypewriter to do this as the function may be performed by any of a number of other machines, such as a transmitting distributor, or, in general, any device which will transmit a start signal together

with the train of impulses set up on the selector as shown herein and a stop impulse in the proper sequence and with the proper timing, so as to cooperate satisfactorily with the receiving mechanism with which it is connected.

Any one skilled in the art will appreciate the flexibility of the proposed arrangement, which requires only strapping or leaving open contacts on five of the banks of a step-by-step selector to form the open or closed elements of the character forming train. When used with a teletypewriter transmitter as shown herein, one side of the station loop is connected to each of five brushes which cooperate with each of the five banks. Certain of the bank terminals on a particular bank are strapped together and connected to one of the five character element contacts on the teletypewriter transmitter. Other bank terminals are left unwired. Each of the five teletypewriter contacts which ordinarily transmit the character forming signal elements is closed in turn, so that each is positioned to transmit only a marking signal element. When the corresponding selector brush is in engagement with a strapped bank terminal, the path between the two loop conductors through the selector brush and bank is closed and a marking signal element is transmitted. If the corresponding selector brush for a particular teletypewriter transmitting contact is not strapped, the station loop circuit is open during the interval that the selector brush is in circuit and in engagement with the open contact, even though the corresponding teletypewriter transmitting contact which is in circuit is closed. A spacing signal element is transmitted, therefore, when an open bank terminal takes its position in its proper sequence in the path between the two station loop conductors.

The invention herein has been illustrated in connection with an "answer back" device. In such a device either in response to a particular incoming signal, or upon establishing connections with the called station, a fixed message, for which the transmitting apparatus has been previously arranged, is automatically transmitted to the calling station. The message may, of course, take any form. It may identify the called station. It may transmit a weather forecast, a stock quotation, the time of day or any other subject-matter.

The invention herein, however, is not limited to "answer back" arrangements. It may be applied generally to automatically transmit trains of timed impulses each comprising almost any

uniform number of elements, each element susceptible of variation to form either of two signals.

Reference to the single figure of the drawing which shows the invention incorporated in a teletypewriter station circuit to provide an "answer back" device and the following detailed description will provide an explanation of the invention.

The manner in which the "answer back" circuit operates will now be described in detail.

When direct current battery of the proper polarity is connected to conductor 101 at the distant central station, the circuit is extended through conductors 101 and 102, the top back contact and armature of relay 103, through the winding of relay 104 and the bottom armature and back contact of relay 103 to ground, operating the armature of relay 104 to engage its right-hand contact. When the armature of relay 104 engages its right-hand contact, a circuit is closed from ground on the lower power supply conductor through conductor 105, the armature and right-hand contact of relay 104, winding of relay 106 and conductor 107 to the upper power supply conductor, operating relay 106. The operation of relay 106 operates relay 103 over a path from ground on the lower power supply conductor, conductor 105, winding of relay 103, bottom front contact and armature of relay 106, over conductor 107 to the opposite side of the power supply. The operation of relay 103, by closing its bottom make contact, closes the path through the station circuit to form with conductors 101 and 108, which extend to the central switching station, a continuous closed loop. The operation of relay 103 also breaks the path through conductor 102 to ground heretofore traced by opening its top back contact. That part of the loop circuit included in the normal telegraph signal path through the station may now be traced over conductor 101, through conductor 109, contact 110, (to be described in more detail herein) conductor 111, through the station break key and selector magnet, relay 104 winding, bottom armature and front contact of relay 103 and resistance 112 to conductor 108. When the station loop is established, relay 104 releases, as the polarity of the battery connected to its winding is changed at the central station in a well-known manner.

The operation of relay 106 also closed the power circuit to drive the teletypewriter motor. This circuit extends from ground on one side of the power supply, through conductor 113, the teletypewriter motor, through the bottom front contact and armature of relay 106 and conductor 107 to the opposite side of the power supply. Relay 106 operated, locks through its top inner armature and make contact, through the middle pole of the station start switch 114, motor control contacts 115 and conductor 113 to ground.

The operation of relay 106 also supplies ground through the top pole of switch 114, the top outer make contact of relay 106, conductor 116, switch arm 117a of bank 118a of the "answer back" selector 119, bank contact 120a, conductor 121 and the winding of relay 122 to battery, operating relay 122. The operation of relay 122 closes a path which operates "answer back" magnet 123, from ground through the top pole of switch 114, top outer front contact and armature of relay 106, bottom armature and front contact of relay 122, through the winding of magnet 123 to battery. The operation of relay 122 at its top armature and front contact closes a short-circuiting path around the teletypewriter signal code trans-

mitting contacts from junction point 126, through conductor 127, top front contact and armature of relay 122 and conductor 128 to junction point 129a to 129e, inclusive.

The teletypewriter transmitter used herein operates according to the Baudot principle in which a train or signal elements is transmitted for each character, each train comprising a spacing or no current pulse, as a start pulse, followed by five elements, each of which may be a current or no current impulse in various combinations according to the particular character to be transmitted and a final current pulse for a stop pulse. When power is connected to the teletypewriter motor, a driving shaft in the teletypewriter is rotated. If any one of the group of character keys of the transmitter is depressed, each of the group of five character element contacts, 130a to 130e, inclusive, is operated independently in such manner as to assume either one of two positions. A latch withdrawn from engagement with the teletypewriter driver shaft, or transmitting shaft as it is otherwise known, permits the driving shaft to rotate the transmitting shaft, by means of a friction clutch, through one revolution. During this single revolution, a closed circuit or an open circuit is established successively through each of contacts 130a to 130e and bus-bar 131, dependent upon the position in which each of the contacts has been independently fixed, which in turn is dependent upon the code of the character to be transmitted. This mechanism is well known in the teletypewriter art.

The contacts 110 are the contacts on the teletypewriter which close the loop through the station circuit when the teletypewriter transmitter is in the stop position, which is the position assumed when the teletypewriter transmitting shaft is idle, and during the intervals between the transmission of successive characters.

The special teletypewriter station circuit of the invention herein, arranged to transmit a station identifying code, is distinguished particularly by the inclusion in the circuit of (1) the magnet 123 which operates the "repeat letters" key 125 by means of the armature bail 124 and (2) the selector switch 119, comprising the switch arms 117a to 117f, the switch terminal banks 118a to 118f and the magnet 133 which rotates the switch arms in unison.

Ordinarily in the operation of a teletypewriter station circuit, the selector switch is not used. The station loop is closed through contacts corresponding to contacts 110 during the stop intervals. When one of the character keys is operated, the contacts corresponding to 110 are opened to transmit a start impulse. Then each of contacts 130a to 130e, inclusive, is positioned so that the loop through the station circuit is connected through each of these contacts in turn. The loop may be opened or closed by each contact in succession. In the invention herein the opening and closing of the circuit for the transmission of the station identifying code is not performed by contacts 130a to 130e. Instead the selector switch arms and banks are connected individually in series with the transmitting contacts. The transmitting contacts 130a to 130e are positioned successively in series in the circuit and closed. This is performed by automatically operating a particular key by means of a magnet. In this case the "repeat letters" key 125 is operated by magnet 123. This in turn releases the transmitting shaft 132 and positions all of the contacts 130a to 130e so that the station loop is

closed through each one in turn. Notwithstanding each of the teletypewriter transmitting contacts is closed in its turn, as it takes its position in the station loop circuit due to the operation of the "repeat letters" key, the station loop circuit may be opened or closed in succession during the transmission of each of the five signal elements comprising the code of a character, dependent upon whether the path connecting loop conductor 101 to loop conductor 108 is opened or closed through the selector brush arm and bank terminal in series with contacts 130a to 130e, inclusive, at the particular instant.

It may be observed that there are six switch banks, 118a to 118f, inclusive, and but five character contacts 130a to 130e. Only five of the six switch banks, 118b to 118f, inclusive, are employed in setting up the code of each character of the identifying code. The sixth bank, 118a, is used (1) to prevent the transmission of characters until the teletypewriter motor has attained normal speed, which is attained after it has completed eight revolutions; (2) to maintain the "answer back" magnet energized, so that the "repeat letters" key will be maintained in a depressed position in turn positioning the character code transmitting contacts 130a to 130e in series in the station loop circuit and closed while the "answer back" selector bank is setting up successively the code for the various characters forming the "answer back" message; (3) to stop the selector switch brushes on the last bank terminals and place the selector under the control of the station power switch 114.

As the character code transmitting shaft 132 revolves, contacts 110 are first opened by means of its associated cam. Contacts 134 are closed. This energizes the switch rotor magnet 133. As is well known, the energizing of rotor magnet 133 does not rotate the switch arms 117a to 117f. This does not occur until the rotor magnet 133 is deenergized. Contacts 134 will remain closed as the transmitting shaft rotates through the positions in which contacts 130a to 130e, inclusive, are successively closed during part of one revolution. Simultaneously with the reopening of contact 130e, contacts 134 are reopened. This removes ground from the rotor magnet 133, deenergizing it, and steps each of the arms 117a to 117f, inclusive, simultaneously to its next succeeding terminal on its associated selector bank.

The path from ground through the top pole of switch 114, conductor 116, switch arm 117a, conductor 121 and the winding of relay 122 is maintained closed while switch arm 117a is in engagement with each of the first eight contacts on bank 118a and as it moves progressively between these contacts, so that the short circuit through the top armature and front contact of relay 122 is maintained between conductors 101 and 108 around each of the transmitting contacts. The loop through the station is thus maintained closed and no signals are transmitted to the distant station even though the transmitter in the station where the "answer back" mechanism is located goes through the steps of transmitting a start pulse and five marking pulses on each of the first eight revolutions of the transmitter.

As the transmitting shaft revolves for each cycle, the rotor magnet is energized as contacts 134 close during each start pulse. The rotor magnet is released when contacts 134 are opened simultaneously with the ending of the transmission of the last of the five code elements of each

character. The arms 117a to 117f are moved simultaneously to the next succeeding terminal on their associated banks, 118a to 118f, each time rotor magnet 133 releases. This occurs once each revolution of the transmitting shaft.

After the transmitting shaft has revolved eight times, the teletypewriter motor will have attained the proper speed for the transmission of code signals. The transmission of the character code signals will start on the ninth revolution of the transmission shaft. The six brushes 117a to 117f, inclusive, at that time will each be in engagement with the ninth contact on its respective bank. With brush 117a in engagement with the ninth terminal on bank 118a, the path through the winding of relay 122 will be broken and relay 122 will release. This will break the short circuit around the teletypewriter transmitting contacts. The opening of contacts 110 will then be effective to transmit a start impulse and the open or closed circuit which will be established through the ninth terminal of each of banks 117b to 117f will be effective to transmit a marking or a spacing impulse to comprise the code of the character it is desired to transmit.

When brush arm 117a is in engagement with the ninth terminal of bank 118a, a circuit may be traced from ground through the top pole of switch 114, the top outer front contact and armature of relay 106, switch arm 117a, ninth terminal of bank 118a, conductor 135, the bottom break contact combination of relay 122, through the winding of magnet 123 to battery. This will hold magnet 123 operated. The bottom contacts of relay 122 are make-before-break contacts. The reason for this is to prevent the deenergization of magnet 123 when relay 122 releases. The circuit from battery on one side of the magnet 123 winding to ground is transferred from the path directly through the bottom armature of relay 122, to the path through the ninth contact on bank 118a and the bottom make-before-break contacts of relay 122 before the path through the bottom armature of relay 122 is broken. This maintains the bail 124 and the "repeat letters" key 125 in the depressed position.

Bank terminals 9 to 21, inclusive, on each of the five banks, 118b to 118f, inclusive, are available for the transmittal of code characters. A total of thirteen symbols identifying the called station, or for any other purpose, may be sent. It should be observed that the path through each of the bank terminals of banks 118b to 118f, inclusive, between the eighth and twenty-second terminals, may be wired in such manner as to be open or closed so as to send either a marking or a spacing signal element as desired to form the character required.

Although the banks shown have but twenty-two terminals each, a bank having more than twenty-two terminals may, of course, be substituted if more than thirteen characters are to be transmitted.

It is, of course, possible to use a number of selectors successively, each arranged with six banks, one bank for control, and five banks for character formation. When the characters set up on the first selector have been transmitted, control of the transmission of the characters is transferred to the first bank of each of the succeeding selectors in turn and the character code is set upon the five remaining banks. With this arrangement it is possible to transmit messages of any length without limitation. If a

continuous message is to be sent, it is not necessary to reserve a group of terminals on each bank to permit the transmitter to come up to speed as, once started, the transmitter need not be stopped until the message has been transmitted.

Applicant contemplates the use of his invention, not only as a called station identifying device, but also as a means for transmitting by means of telegraph or teletypewriter signals, predetermined messages set up on the selectors in rotation by means of a clock-controlled switching mechanism to transmit the time of day in response to the reception of a particular character from a distant station.

It may also be used for transmitting any message, such as weather reports, stock market quotations, etc., the selector bank signals being changed from time to time as necessary. To facilitate changing the message which is transmitted in such cases, applicant proposes to terminate all conductors connected to the selectors in flexible terminations such as jacks and plugs for manual change of the transmitted message or in separate selector banks and switches where it is desirable to change the message mechanically, as in "time of day" service. In this manner a selector switch bank wired in accordance with the new changed message may be readily substituted for a switch bank, the message on which is no longer to be transmitted.

When brush 117a steps from the twenty-first to the twenty-second terminal of bank 118a the path to ground heretofore traced is opened and magnet 123 releases.

When brush 117a is stepped to the twenty-second terminal of bank 118a, the circuit may be traced from ground, through the top pole of switch 114, the top outer make contact and armature of relay 106, brush 117a, the twenty-second terminal of bank 118a through the selector rotor magnet to battery. The ground supplied over this path maintains the rotor magnet 133 energized under control of the station start switch 114.

The "answer back" device remains in this condition under control of the station start switch 114 until the switch is operated to break the ground connection. This releases the selector rotor magnet which rotates one step, so that one end of each of the double-ended switch arms, 117a to 117f, inclusive, engages the first contacts 120a to 120f of each of selector banks 118a to 118f. The operation of switch 114 by opening the path through the middle pole breaks the holding path for relay 106 which thereupon releases. The engagement of the bottom pole of switch 114 on its cooperating contact 136 closes an obvious power supply circuit for the teletypewriter motor, to replace the path broken at the bottom armature and back contact of relay 106 when relay 106 releases. Relay 103 is maintained operated after the release of relay 106 over a path from ground on the lower power supply conductor, through conductor 105, through the winding of relay 103, through contact 136, the bottom pole of switch 114 and conductor 107, to the upper side of the power source. This maintains the line loop to the central station closed. At the conclusion of communication, switch 114 is restored to its position as shown on the circuit drawing, so that the cycle of operations described above may be repeated.

As an alternative or as a complementary arrangement for the above, it is possible to provide

an "answer back" arrangement which may be used to check the identity of a station with which a second teletypewriter station is connected while communication between the stations is in progress rather than before it has started. The modification in the above-described arrangement which is necessary in order to perform this is of a very minor nature. It consists in the provision of the conductor 138 shown connected to junction point 137 in conductor 116. This conductor may be extended through contacts 139 to ground. Contacts 129 are normally open but are arranged to be closed in any suitable manner on receptions of a designated signal. Ground supplied through contacts 139 under these circumstances takes the place of ground supplied through the top pole of switch 114 and the top front contact and armature of relay 106. The switch 114 will have been operated to the down position. Relays 104 and 106 will be released and relay 103 will be operated. The operation of relay 122, magnet 123, "repeat letters" key 125, selector 119, contacts 110, contacts 130a to 130e and contacts 134 is the same as described above. Under these circumstances, however, it is not necessary to delay the transmission of character signals as the teletypewriter motor will be operating at full speed. If, therefore, this feature alone is required, all of the bank positions may be wired for characters. If the two "answer back" arrangements are required, it will be necessary to prevent the transmission of characters until after eight revolutions of the teletypewriter motor, as the operation is limited by the conditions under which the teletypewriter motor has to be started.

What is claimed is:

1. In a teletypewriter switching system, an automatic teletypewriter transmitter comprising a plurality of pairs of cooperating transmitting contacts, means in said teletypewriter for actuating each of said pairs independently to open or close each of said pairs, a plurality of other pairs of cooperating transmitting contacts, means for opening or closing each of said other pairs independently, one contact of each of said pairs of teletypewriter contacts connected individually with one contact of each of said pairs of other contacts to form a plurality of parallel branches each having two pairs of cooperating transmitting contacts in series, and means for delaying the connection of said parallel branches operatively in circuit in sequence until said transmitter has attained normal operating speed.

2. In a teletypewriter switching system, a teletypewriter station circuit having a plurality of teletypewriter transmitting contacts therein with means for positioning each of said contacts successively in series in said station circuit in the open or closed position, a plurality of other transmitting contacts in said circuit, means for connecting said transmitting contacts and said other contacts successively in series, magnetic means for operating a particular teletypewriter key to establish said series connections and means for maintaining said key continuously in the operated position while an "answer back" message is transmitted.

3. In a teletypewriter switching system, a station loop circuit, a first pair of contacts in series in said circuit, a plurality of other pairs of contacts, means for disengaging said first contacts operatively from said loop and substituting therefor each of said other pairs in succession, means for positioning said substituted contacts so

that they are closed when so substituted, a multibank selector switch in said circuit having a plurality of switch arms and a plurality of terminal banks each cooperating individually with each of said arms, means for positioning each one of said arms in engagement individually with successive terminals on its cooperating bank, means for extending said loop circuit successively through each of a plurality of series circuits comprising one of said switch arms, a terminal on one of said banks and one of said pairs of contacts, means for opening or closing said loop as it is extended through each series circuit, and means for delaying the first of said openings or closings for a definite measured interval.

4. In a teletypewriter switching system, a teletypewriter circuit comprising a multibank selector switch, said switch having a plurality of switch arms connected individually in series with individual teletypewriter transmitting contacts, said switch having also an individual arm and bank for delaying the transmission of teletypewriter signal elements.

5. In a teletypewriter switching circuit, a multibank, rotary selector, a circuit interrupting device for stepping said selector, means for connecting a telegraph circuit in succession to each of a plurality of brush arms on said selector, means for opening or closing said telegraph circuit as said circuit is connected to each brush arm in turn to transmit successive signal elements of a character in accordance with the Baudot code, means for forming successive characters on successive terminal levels of said banks a motor driven teletypewriter transmitter for timing the transmission of signals from said selector and an individual brush and bank on said selector for preventing the transmission of signals until said teletypewriter motor has attained normal operating speed.

6. In a teletypewriter switching circuit, a telegraph station loop circuit, an "answer back" circuit

in said station circuit comprising a selector switch, said selector having a plurality of banks, each bank having a plurality of terminals, means for setting up connections on said selector to transmit successive trains of electrical impulses to form successive characters in accordance with the Baudot code and impulse transmission delay means comprising a closed shunt path across said loop through a plurality of successive terminals on a particular bank on said switch.

7. In a teletypewriter switching system, a teletypewriter station circuit, an "answer back" mechanism therein comprising an electric motor coupled to a teletypewriter transmitter having transmitting contacts for transmitting "answer back" signals, starting means for said motor responsive to remote control means connected to said circuit and means, comprising a contact bank and cooperating brush arm on a magnetically operated rotary selector connected to said circuit for preventing the transmission of "answer back" signals until said motor has attained normal operating speed.

8. In combination in a teletypewriter switching system, a teletypewriter station circuit, a teletypewriter transmitter in said circuit, a motor driving said transmitter, a plurality of transmitting contacts on said transmitter, an "answer back" device comprising a multibank, multi-switch arm, rotary selector connected to said transmitter, a plurality of parallel circuits, each extending individually through one of said switch arms, one of said banks and one of said transmitting contacts, a magnet responsive to a signal received by said circuit for starting said motor to operate said "answer back" device, and means connected to said contacts for preventing the transmission of "answer back" signals until said motor has attained its normal operating speed.

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