Feb. 3, 1942. I. E. COLE ET AL 2,271,625

SYNCHRONIZING SYSTEM

Filed Aug. 2, 1939 3 Sheets-Sheet 1

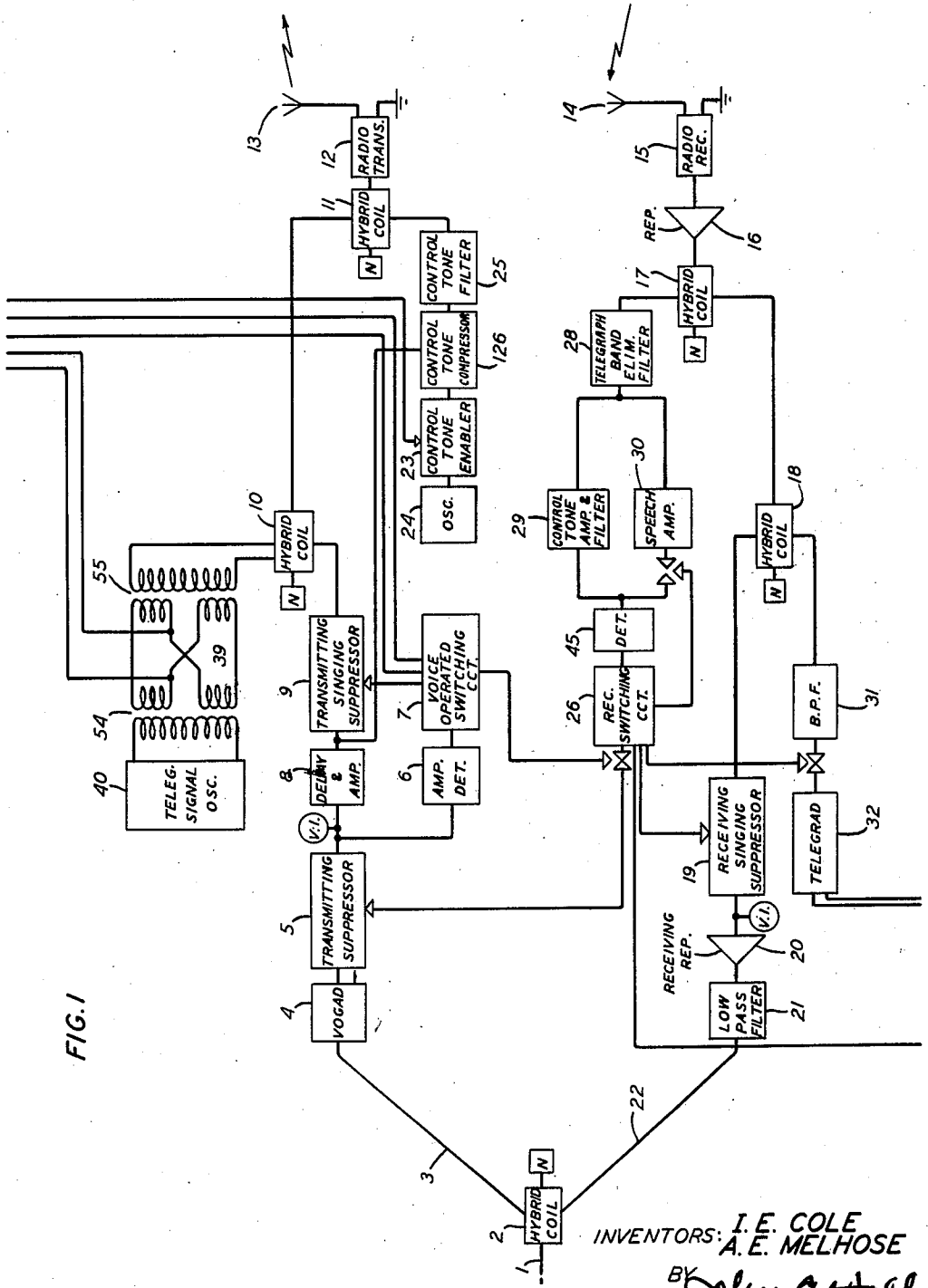

FIG. 1

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SYNCHRONIZING SYSTEM

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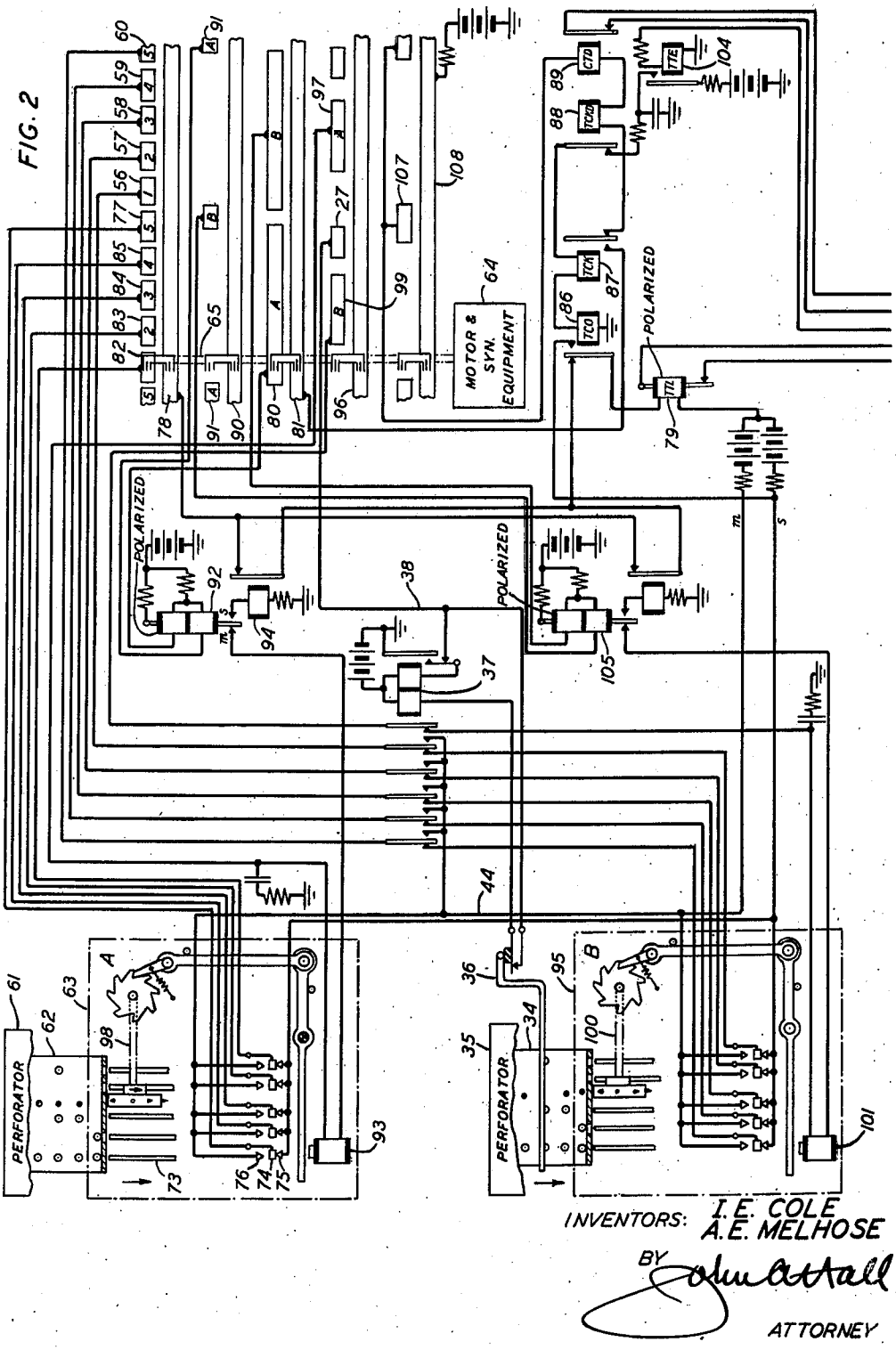
FIG. 2



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Feb. 3, 1942. I. E. COLE ET AL 2,271,625

SYNCHRONIZING SYSTEM

Filed Aug. 2, 1939 3 Sheets-Sheet 3

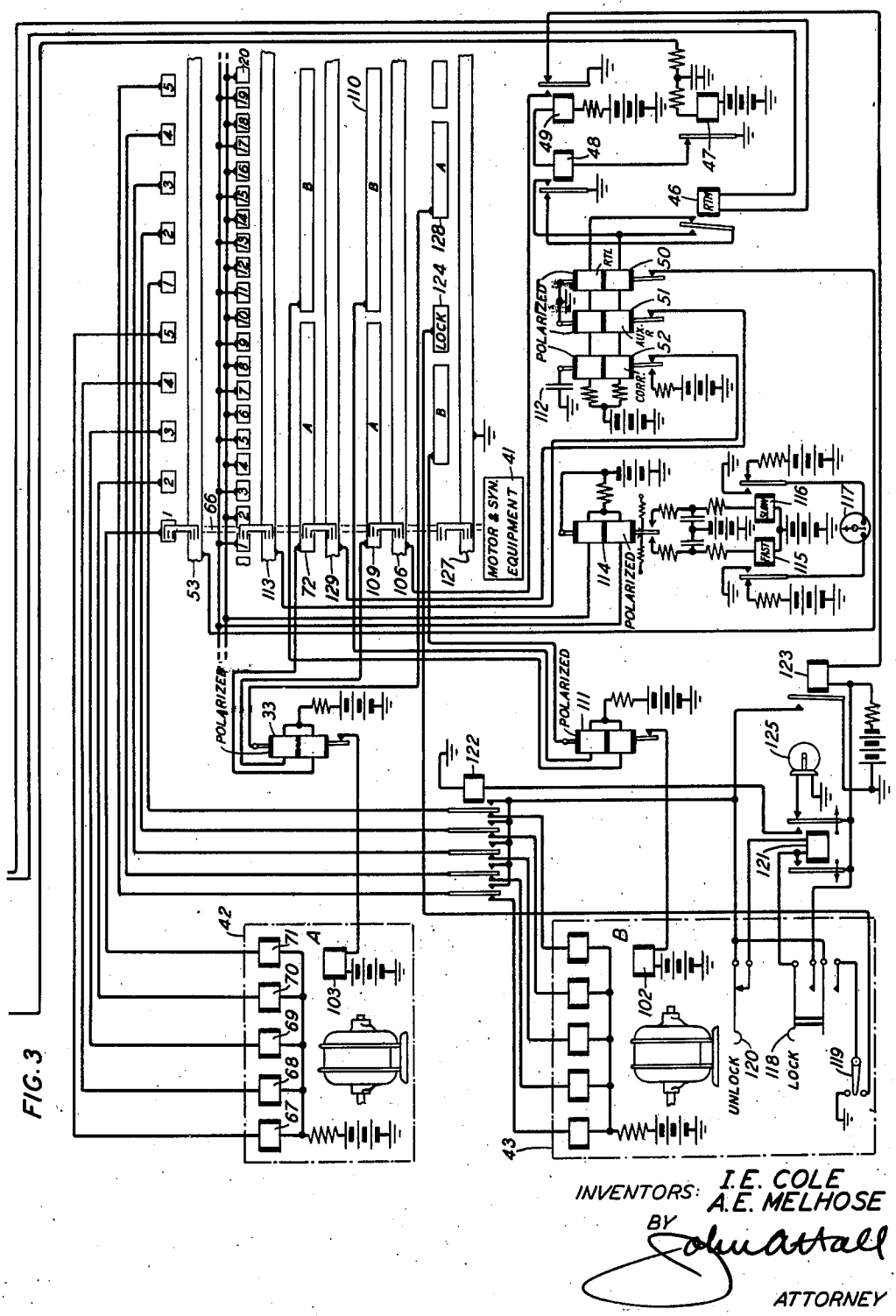

FIG. 3

Patented Feb. 3, 1942 2,271,625

UNITED STATES PATENT OFFICE

2,271,625

SYNCHRONIZING SYSTEM

Ira E. Cole, Montclair, N. J., and Alfred E. Melhose, St. Albans, N. Y., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application August 2, 1939, Serial No. 287,926

15 Claims. (Cl. 179—4)

This invention relates to communication systems and particularly to permutation code machine telegraph systems in which rotary distributors are used at each end of a common channel to provide service for a plurality of telegraph channels.

An object of the invention is to provide means for locking a receiving device out of service during idle times under such control that it will automatically be restored to normal condition when the idle time has come to an end.

In a system where synchronous distributors are kept in synchronism with each other through the action of correcting means responding to transitions from one to another type of telegraph signal, such for instance as a transition from a spacing to a marking condition, it has been found expedient to change the normal idle time signals sent on at least one channel so that there will be at least one effective transition from spacing to marking per cycle of operation of the distributors for correcting purposes. A system of this nature is disclosed in the application Serial No. 287,925, filed by I. E. Cole on even date herewith.

In such a system the machine telegraph receivers at the distant end will respond in a characteristic manner. Those on the channels where the idle time signals have not been changed will appear to be idle, but that on the one channel where the idle time signals have been changed will respond by printing a long series of the same character or by noisy movements of some parts. If, for example, the normal idle time signals comprise a series of spacing signals the receivers will respond in such manner that they appear idle, and if such normal idle time signals are changed to a series of marking signals, then the receivers will respond as though the code for "letters" is being repeatedly received. This causes a movement of parts and may be considered an annoyance if it occurs for any considerable length of time.

A feature of this invention is a means for locking a receiver which is thus being operated out of service under control of means responding to the continuous reception of such changed idle time signals.

Where such a telegraph system is made a part of an interpolated telegraph and telephone system wherein a voice controlled means switches the system from telegraphic use to telephonic use, this locking means is also put under control of the voice controlled switching means so as to hold the telegraph receiver out of service during those periods when the voice has taken command and there is consequently no telegraph transmission.

A feature of the invention is a slow releasing relay which is energized through manual means by an attendant and is then held under control of the continuous and repeated reception of the code which causes the meaningless operation of the receiver, or if the system is incorporated in an interpolated telephone and telegraph system, is held under control of such telegraphic reception during periods of telegraphic use of the system and under control of the voice controlled switching means during periods of telephonic use of the system.

Another feature of the invention is a multicontact relay for severing the connections between the receiving distributor and switching such connections to a slow releasing relay which is then held operated by the incoming telegraphic signals. When the character of the incoming signals change, as when the operator at the distant end clears his tape in the usual way by sending a series of spacing signals, then the slow releasing relay releases and returns the receiving circuits to normal.

Another feature of the invention is a signal which indicates when the telegraph receiver is in circuit and when it is out of service.

Still another feature is a manual means for placing the receiver back in service when it is being automatically held out of service. This may be used as a check, for if the attendant is in any doubt he may release the automatic holding means and then when he finds that conditions are proper, may again place the receiver out of service.

The drawings consist of three sheets, comprising Fig. 1 in the form of a block schematic diagram and Figs. 2 and 3 in the form of circuit diagrams illustrating the invention. With Fig. 2 placed above and Fig. 3 placed below Fig. 1, a complete diagram illustrating the invention is formed.

Fig. 1 is a general schematic of a system in which the invention may be employed. A speech path 1 leads to a hybrid coil 2 from which a path 3 for outgoing speech leads to a vogad 4. The outgoing speech then passes through a transmitting suppressor 5 and by means of an amplifier detector 6 operates a chain of relays 7, here labeled as "voice operated switching circuit." This voice operated switching circuit controls a transmitting singing suppressor 9 so that the outgoing speech can pass from the transmitting suppressor 5 through the delay and amplifier 8 and the

transmitting singing suppressor 9 to the hybrid coil 10. From the hybrid coil 10 the speech reaches another hybrid coil 11 and thence goes through the radio transmitter to an antenna 13. Through radio transmission, the speech will be received at some distant point and for purposes of explanation it will be assumed that the distant point has a receiving circuit similar in all respects to the lower part of Fig. 1. The radio frequency modulated speech, therefore, enters antenna 14, passes through a radio receiver 15 and thence demodulated speech passes the voice frequency repeater 16 to a hybrid coil 17. From the hybrid coil 17 the speech goes into hybrid coil 18, thence through the receiving singing suppressor 19, the receiving repeater 20, a low-pass filter 21 and a path 22 to a hybrid coil, such as 2, whence it goes to the receiving subscriber over a line, such as 1.

The voice operated switching circuit 7 controls a control tone enabler 23 through the contact and armature of the relay 89 so that a source of control tone 24 is passed through the control tone compressor 126 and the control tone filter 25 to the hybrid coil 11 and thus accompanies speech. The voice operated switching circuit 7 also controls a switching point leading from the receiving switching circuit 26 at the same terminal to the transmitting suppressor 5 so as to open this circuit during the periods that speech is going out from line 1 to antenna 13. During this time the voice operated switching circuit 7 also controls the telegraph control circuit shown in Fig. 2 by operating relay 104 in order to stop the action of the telegraph transmitting circuit during the time the voice is being transmitted from line 1 out over antenna 13 by the usual modulation means.

At the receiving end the control tone with the usual modulation of the carrier frequency coming in over antenna 14 is demodulated in radio receiver 15 and passes through the hybrid coil 17 and thence through a telegraph band elimination filter 28 and into a control tone amplifier and filter 29. This operates the receiving switching circuit 26 which performs several functions as follows: first, the receiving switching circuit 26 controls a normally open circuit between the telegraph band elimination filter 28 and the receiving switching circuit 26, including a speech amplifier 30 so that when control tone is first received the switching circuit 26 will be operated thereby and then held operated thereafter by speech currents flowing through the amplifier 30. When the control tone is first transmited it goes out into antenna 13 at high volume but after an interval determined by the delay introduced by the delay and amplifier 8 the speech operates a compressor 126 to reduce the volume of the control tone to avoid overloading the radio transmitter 12 by the combination of control tone and speech. This, of course, operates to advantage at the receiving end by giving an impulse of great strength through the control tone amplifier and filter 29 to operate the circuit 26 before the path through the speech amplifier 30 is closed.

The receiving switching circuit also controls the receiving singing suppresor 19 to open up the speech path. The receiving switching circuit 26 also controls a normally closed path between the band-pass filter 31 and the telegrad 32 so that, while speech is being received, the telegrad 32 will be disabled. At the same time, the receiving switching circuit 26 controls the switching relay 33 for two telegraph channels.

During pauses in the speech, either when the subscriber at the distant end is talking into channel 1 or during the time when the subscriber on channel 1 pauses during his talk out over the antenna 13, the telegraph apparatus shown in Fig. 2 is in operation. This comprises perforators 61 and 35 working respectively into tape transmitters 63 and 95 and thence into the rotary distributor shown in the upper right-hand corner of Fig. 2 and here designated generally by the numeral 64, indicating the motor and synchronous equipment for driving such distributor. The rotary distributor works through the control circuit comprising various relays of Fig. 2 and by means of relay 79 controls the telegraph signal converter 39. This signal converter is a circuit controlling device disclosed in Patent 1,749,851 to H. C. Silent, March 11, 1930. When the relay 79 is on its marking contact, then the telegraph signal converter is in such a condition that alternating current coming from the telegraph signal oscillator 40 passes freely into hybrid coil 10 for transmission out over the antenna 13. When the relay 79 has its armature driven to its spacing contact, then the suppressor action of telegraph signal converter 39 blocks off the telegraph signaling current and no current will, therefore, get into hybrid coil 10.

At the distant end these telegraph signals in the form of spurts of alternating current of the usual form of a carrier of the oscillator frequency with side-bands about seventy cycles wide caused by the modulation of the carrier by the telegraph transmitter are received over antenna 14 by the radio receiver 15 and thence through the repeater 16 whence they pass through the hybrid coils 17 and 18 to the band-pass filter 31. Thereafter the signals enter the telegrad 32 and are converted from varying strength alternating current signals to uniform strength direct current signals of practically the same strength at which they were received over the antenna 14. For a complete description of the telegrad, reference is made to application Serial No. 283,368, filed July 8, 1939 by Barney et al. These direct current signals then pass through the switching relay circuit to Fig. 3 and the rotary distributor 41 to the two printers 42 and 43. During the reception of telegraph signals the receiving switching circuit 26 is unoperated and the speech path is blocked off by the receiving singing suppressor 14.

The rotary distributor 14 is kept in synchronism with the distant rotary distributor of Fig. 2 by means generally described in the Cole et al. Patent No. 2,207,720, dated July 16, 1940, and in particular by the means disclosed in a patent granted to L. A. Meacham No. 2,207,748, dated July 16, 1940.

For purposes of the present description, it is only necessary to mention the fact that the rotary distributor 41 will be kept in perfect synchronism with the distributor of Fig. 2 if there is an occasional transition from a spacing to a marking impulse, that is, if there is an occasional operation of the relay 79. Such transitions are caused during the normal operation of either the A channel or the B channel, here represented by tape transmitters 63 and 95, respectively. If there is a stoppage of transmission over both channels at the same time so that neither transmitter 63 nor transmitter 95 is in operation, then the means of the present invention is provided to cause an occasional operation of the relay 79. Specifically, as shown, the relay 79 will go

through one cycle of operations per cycle of operation of the rotary distributor of Fig. 2.

In operation, if no voice currents are being transmitted from line 1 and the voice operated circuit, therefore, is unoperated, the telegraph apparatus of Fig. 2 will be fully enabled with relay 104 in the position shown.

The tape transmitter 63 has five pins, such as 73, which will engage perforations in the tape 62. When this occurs, the contact 74 is moved from its lower contact 75 to its upper contact 76. The upper contact 76 represents a marking condition and the lower contact 75 represents a spacing condition. When in the course of operation of the distributor the shaft 65 brings a brush into position to make the contact between segment 77 and ring 78, either spacing current from contact 75 or marking current from contact 76 will be extended through the telegraph transmitting line relay 79. If marking current is transmitted, then the polar relay 79 will be left in the position shown, whereby the secondaries of transformers 54 and 55 are closed and the tone from source 40 is transmitted into the hybrid coil 10 and thereafter out over antenna 13. If spacing current is transmitted through the relay 79, then the armature will move to the left and the suppressing action of the telegraph signal converter 39 will prevent any tone being transmitted into the hybrid coil 10, thus establishing a spacing signal condition.

Let us assume that the shaft 65 is just coming to a position where it will make a connection from segment 80 to ring 81 and where the brush working on ring 78 will successively pass over the segments 82, 83, 84, 85 and 77, comprising the five code segments from the channel A transmitter. Under the assumption that the voice circuit is not actuated at this time, the relays 86, 87, 88 and 89 will be in the positions shown. As just previously mentioned, a connection has been made between ring 90 and segment 91, thus connecting ground to the lower winding of relay 92. Relay 92 will then have moved its contact to the position shown so that battery is connected to one side of the stepping magnet 93 in the channel A tape transmitter 63. This magnet is not energized at this time. Since relay 87 is in the position shown, the connection between common ring 81 and segment 80 is ineffective and, therefore, relay 92 is left in the position shown. Now, as the brush successively passes over segments 82, 83, 84, 85 and 77, the marking or spacing signal current, as the case may be, is transmitted through the back contact and armature of relay 94 to the contact and armature of relay 86, winding of relay 79, to the common point of the marking and spacing batteries.

As the brushes connected to shaft 65 pass further along and are now in the position of transferring the record from tape transmitter 95, a connection will be made from ring 96 to segment 97 and thence to the other side of stepping magnet 93 so that, while the record from tape transmitter 95 is being transmitted, the shaft 98 of tape transmitter 63 will be rotated and the tape advanced to the next set of code perforations. In a similar manner, during the movement of the shaft 65, a connection will be made to segment 99 while the record from tape transmitter 63 is being transmitter and shaft 100 will be rotated through the energization of magnet 101. In this manner the record of the two transmitters will be alternately transmitted by the relay 79.

Let it be assumed now that there is a stoppage of transmission over the B channel. This means that the tape 34 will become taut and the taut tape switch 36 will operate to open the circuit between the left-hand winding or relay 37 and conductor 38. Prior to the operation of taut tape switch 36, a connection will be made between ring 96 and segment 27 once per cycle of operation of the rotary distributor and at a time just after the brush has left the segment 99. This results in the placing of ground on the conductor 38 leading in parallel to the two windings of relay 37. These windings, however, are equal and opposed so that the relay 37 does not become operated at this time. However, when the taut tape switch 36 is operated, then the next time that connection is made between the ring 96 and the segment 27 the right-hand winding of relay 37 alone will be energized and, since there is now no opposing force, the relay 37 will operate and through its right-hand armature and front contact will lock in an operated position. The left-hand armatures of this multicontact relay 37 now transfer the tape transmitter contacts from the distributor contacts 56, 57, 58, 59 and 60 to conductor 44, leading to the marking battery. Therefore, as long as relay 37 is operated, the telegraph transmitting line relay 79 will be driven to its marking contact while the brush on shaft 65 is passing over segments 56 to 60, inclusive.

If during this time the channel A becomes idle, then spacing current will be connected to the segments 82, 83, 84, 85 and 77 and hence the telegraph transmitting line relay 79 will send out first five spacing signals and then five marking signals and will repeat this operation as long as there is stoppage of transmission on both channels. Thus, there will be at least one transition from a spacing to a marking impulse per cycle of operation of the rotary distributor.

When transmission is resumed on channel B, the perforation of more tape will cause the taut tape switch 36 to operate to the position shown and, hence, when the brush of the rotary distributor again makes contact between ring 96 and segment 27, the left-hand winding of relay 37 will be energized. Since the right-hand winding is already energized, the result will be equal and opposed and the relay 37 will become deenergized. Therefore, as the shaft 65 of the rotary distributor proceeds and the segments 56 to 60 are reached, normal conditions will exist and proper transmission of the codes will take place.

The operations of the relay 86 to 89, inclusive, are fully explained in the Cole et al. Patent No. 2,220,889, dated Nov. 11, 1940. In general, when the voice takes command of the circuit and the voice operating circuit 7 is operated, then relay 104 becomes operated and, in turn, causes the operation of relays 86 and 87. Thereupon the transmission of telegraph signals is stopped through the operation of relay 92 and its companion relay 105, which prevent the operation of the stepping magnets 93 and 101, respectively.

If the transmission of code is at a critical point, as when a connection is being made between ring 108 and segment 107, the relays 88 and 89 will be operated so as to prevent the operation of relay 104 from operating the relays 86 and 87 to stop the transmission of a telegraph code. This condition, however, lasts for only a very short interval and relays 88 and 89 will return to normal so that relays 86 and 87 may become operated in the usual manner.

At the receiving end, the telegraph pulses coming in over antenna 14 will pass through hybrid

coils 17 and 18 and the band-pass filter 31 to the telegrad 32 where they will be changed to direct current impulses in a manner fully described in the aforementioned Barney et al. application. The result will be that relay 46, known as the receiving telegraph master relay, will be driven to the position shown for each marking impulse and will be driven to the opposite position for each spacing impulse.

Relay 47 is controlled by the receiving switching circuit 26 so that during the periods of telegraph transmission this relay will be operated and consequently relays 48 and 49 will be released and in the position shown. Therefore, each marking impulse will result in the operation of the chain of relays 50, 51 and 52.

Relay 50 extends a ground connection through its armature to the distributor ring 53 and as the brush mounted on the shaft 66 moves forward the printer magnets 67, 68, 69, 70 and 71 will be operated according to the code being received by the receiving telegraph master relay 46. The operation of auxiliary relay 51 during a marking impulse closes a connection from ground through its armature and marking contact to ring 129 and thence to segment 72 through the appropriate brush on shaft 66 to the lower winding of relay 33 to positive battery. This drives relay 33 to its marking contact, as shown, and since this is a polar relay and will keep its armature where last placed until it is energized in the opposite direction, this relay will remain as shown until relay 49 is energized. Now as the shaft 66 moves along and is controlling the set of selecting magnets of channel B printer 43 a connection will be made between the ring 127 and segment 128 through the armature and contact of relay 33 to cause the energization of printer magnet 103. If shaft 66 gets beyond the five small segments connecting selecting magnets 67 to 71, inclusive, the relay 88 cannot be driven to its spacing contact again until the shaft gets back to near the position shown.

Thus, while the selecting magnets of printer A are being set the printing magnet 102 will be operated, and while the selecting magnets of channel B printer are being selectively operated the printing magnet 103 of channel A printer will be operated.

In a manner fully described in the Cole Patent No. 2,220,889, relay 47 moves to the position shown when voice currents take command of the voice operated switching circuit 26. At that time relays 48 and 49 become operated. Relay 48 drives all of the relays 50, 51 and 52 to their spacing contacts and relay 49 closes at appropriate times connections from ring 106 through segments 109 and 110 to drive the relays 33 and 111 to their spacing contacts through their lower windings. Hence, as soon as the voice takes command the printers are disabled.

With relay 52 on its spacing contact, a connection is established for charging condenser 112. Whenever there is a transition from a spacing to a marking signal, condenser 112 is discharged through the marking contact of relay 52 and ring 113 into segments leading either to the upper or the lower winding of relay 114. If the distributor is in prfect synchronism, then the condenser 112 will discharge practically as the brush is passing from a segment leading to one winding of relay 114 and on to a segment leading to the other winding of relay 114, with the result that relay 114 remains idle. With the least unbalance, however, relay 114 operates to its right or its left contact momentarily. As the severity of the unbalance increases the action of relay 114 becomes more decided, with the result that the fast relay 115 or the slow relay 116 becomes operated. In the present case an indicator 117 is shown and this will be operated to indicate that the distributor 41 is running either fast or slow.

The indicator 117 is here used merely to illustrate means fully described in the application to Meacham Patent No. 2,207,748, whereby a correction in the speed of the distributor is made. So long as both channels are working, or so long as either channel is working, there will be an occasional transition from spacing to marking and hence there will be an occasional correcting impulse. In the case of stoppage of transmission on both channels, then the printer 42 will continuously receive five spacing impulses, with the result that no operation will take place. The printer B, however, due to the operation of the taut tape switch 36 of Fig. 2, will continuously receive five marking impulses. This is the code for "Letters" and will result only in operating certain mechanism in the printer which will cause a sound which, if repeated too many times, may become annoying. If the repeated operation of the "Letters" mechanism does become annoying to the operator, then the special means of the present invention is provided.

The operator at printer B may lock out this printer by once operating the manual key 118. If the switch 119 is thrown to its upper position, then a circuit will be established from ground, switch 119, the lower temporarily closed contacts of key 118, the contacts of key 120, the winding of relay 121, through the upper temporarily closed contacts of key 118 to negative battery. Relay 121 locks in a circuit from negative battery, the left-hand armature and front contact of relay 121, the contacts of key 120 to the trunk contacts of relay 122. Relay 122 is operated through the right-hand armature and front contact of relay 121 and this relay now transfers the distributor contacts for channel B from the selecting magnets of channel B to the winding of relay 121. Relay 121 is slow to release and as long as marking impulses are coming in, relay 121 will remain operated.

If the voice takes command of the receiving switching circuit 26, then relay 47 will be released, with the result that relay 49 will now become operated. While relay 49 is unoperated a circuit through its back contact causes the operation of relay 123 but when relay 49 becomes operated, relay 123 releases and holds relay 121 operated during the periods in which the voice has control of the system and the telegraph receiving apparatus is disabled.

When telegraph transmission is resumed over channel B it is the usual practice for the operator thereat to send a series of spaces in order to clear his tape. This will result in the transmission of a series of spacing impulses, with the result that the slow-operating relay 121 will become released. This in turn releases the multicontact relay 122 so that the channel B printer is again put into operative condition.

As an alternative arrangement, the switch 119 may be moved to its lower contact and hence the original circuit for the energization of relay 121 will be closed only when the brush on shaft 66 makes contact between ring 127 and segment 124. This arrangement is made for reasons to prevent a possible error which might appear if the key 118 were pressed after one or more, but not all. of

the selecting magnets of the channel B printer had been set by marking impulses. Any such error which might appear would be inconsequential, so that the arrangement including the segment 124 is a refinement to a high degree.

The lamp 125 is provided to be energized through the back contact of relay 121. Therefore, when lamp 125 is glowing it will indicate that the channel B printer is in its normal operative condition and when the lamp is extinguished it will indicate that the channel B printer is locked out of service to prevent annoyance. Should the operator desire to check conditions, he may operate key 120. This will cause relay 121 to restore, with the result that channel B printer will be put back into service. If the operator observes a repeated Letters function, he may again press key 118 to lock this printer out of service and it will be automatically placed back in operative condition in the manner hereinbefore described.

It is to be understood that the present invention is not to be limited to the specific manner of providing an occasional transition from a spacing to a marking impulse shown and described in Fig. 2 but that any means for producing the same result may be employed. For instance, a permanently inverted channel might be employed or a manual means for producing marking instead of spacing impulses during idle periods on one channel might be used.

What is claimed is:

1. In a communication system, a receiving terminal comprising telephone and telegraph receiving means and speech controlled switching means for alternatively rendering either the said telephone or the telegraph means effective, said telegraph means including permutation code responsive means and means for locking said last means out of service under control of the repeated reception of a particular permutation code during intervals of effective telegraphic reception and under control of said switching means during intervals of effective telephonic reception.

2. In a communication system, a receiving terminal comprising telephone and telegraph receiving means and speech controlled switching means for alternatively rendering either the said telephone or telegraph means effective, said telegraph means including permutation code responsive means, means for manually switching said last means out of service, and means for thereafter holding said permutation code responsive means out of service under control of the repeated reception of a particular permutation code during intervals of effective telegraphic reception and under control of said speech controlled switching means during intervals of effective telephonic reception.

3. In a communication system, a receiving distributor, a plurality of segments on said distributor leading to a receiving device, means for disconnecting said segments from said receiving device and connecting them to a slow releasing relay, and means under control of said slow releasing relay for maintaining said changed connections responsive to the continued and repeated reception of signals over said distributor segments.

4. In a communication system, a receiving terminal comprising telephone and telegraph receiving means and speech controlled switching means for alternatively rendering either the said telephone or telegraph means effective, said telegraph means including a synchronous distributor having a plurality of segments leading to a receiving device, a multicontact relay for switching said segments from said receiving device to a slow releasing relay, said slow releasing relay, manual means for first operating said slow releasing relay, means including said connections to said segments effective during intervals of telegraphic reception and said first switching means effective during intervals of telephonic reception for holding said slow releasing relay operated, and means under control of said slow releasing relay for operating said multicontact relay.

5. In a communication system, a receiving terminal comprising telephone and telegraph receiving means and speech controlled switching means for alternatively rendering either the said telephone or telegraph means effective, said telegraph means including a synchronous distributor having a plurality of segments leading to a receiving device, a multicontact relay for switching said segments from said receiving device to a slow releasing relay, said slow releasing relay, manual means for first operating said slow releasing relay, means including said connections to said segments effective during intervals of telegraphic reception and said first switching means effective during intervals of telephonic reception for holding said slow releasing relay operated, means under control of said slow releasing relay for operating said multicontact relay, and a visual signal for indicating that said distributor segments are connected to said receiving device.

6. In a communication system, a communication channel, means for communicating over said channel by telephone and by telegraph, voice responsive means for switching terminal apparatus from telegraph transmitting and receiving apparatus to telephone transmitting and receiving apparatus, a pair of synchronous distributors at the ends of said channel for cooperating with said telegraph transmitting and receiving apparatus, said telegraph apparatus including said distributors comprising a plurality of telegraph channels, correcting means for said distributor at the receiving end of said channel responsive to transitions from one to another type of telegraph signal, means at the transmitting end of said channel responsive to stoppage of telegraph communication for changing the normal idle time telegraph signals on one of said telegraph channels to provide at least one effective transition per cycle of operation of said distributors, and means at the receiving end of said channel for locking the receiving telegraph apparatus on the said channel on which said normal idle time telegraph signals have been changed out of service under control of said changed signals and said terminal switching apparatus means.

7. In a communication system, permutation code responsive receiving means, means for locking said permutation code receiving means to be non-responsive to received permutation code, and means for restoring said means to responsive condition under control of repeated reception of a particular permutation code combination.

8. In a communication system, means for receiving and interpreting permutation code combinations, means for manually switching said means out of code receiving relation, means for holding said means out of code receiving relation during reception of an indefinite number of code combinations, and means operative under control of repeated reception of a particular permuta-

tion code combination for restoring said means to code receiving relation.

9. In a permutation code receiving system, permutation code responsive receiving means, means for locking said means out of service, a visual signal for indicating when and whether said means is in service, means operative under the control of selected code combinations for restoring said means to service.

10. In a combination, a permutation code receiving channel, a code interpreting device operative to receive and interpret repeated identical code combinations received over said channel, means for locking the code interpreting device out of service, means for maintaining it out of service during repeated reception of said code combinations, and means operative under the control of selected code combinations to restore said device to service.

11. In a telegraph code receiving channel, means for receiving and distributing permutation code impulses, a code interpreting device for said impulses, means for locking said device out of code interpreting relation during reception of an indefinite train of code combinations, and means for restoring said device to service under control of other selected code combinations.

12. In a receiving system comprising distributing apparatus designed to operate synchronously in relation to incoming impulses, means for supplying incoming impulses corresponding to a plurality of channels of communication, a receiving code interpreting device connected to one channel having means operated by a continuous train of marking impulses for synchronizing purposes, means for locking said code interpreting device out of control of said train of impulses, and means operated by reception of consecutive code combinations of spacing impulses upon said channel to unlock said locking means.

13. In a system of telegraphic transmission, wherein application of voice signals to said system suspends the telegraphic transmission, a receiving instrument for telegraphic impulses, means for locking said instrument out of telegraphic impulse receiving relation during periods of telegraphic reception, and means controlled by voice reception for maintaining said device locked out of telegraphic receiving relation, in combination with instrumentalities operating under the control of telegraphic code combinations for removing said device from control of either of said locking means.

14. A channel of telegraphic reception comprising distributing means and a code interpreting instrument supplied thereby, in combination with means for locking said code interpreting instrument out of operation under the control of an indefinite train of marking impulses, and means for restoring said device to code interpreting relation under the control of an indefinite train of spacing impulses.

15. In a signaling system comprising a transmission channel, telegraph apparatus associated with a receiving end thereof and adapted to receive signals in the telephone frequency range, telephone apparatus adapted to be associated with said channel, means for automatically disconnecting the telegraph apparatus from said receiving end and connecting the telephone apparatus thereto on arrival on telephone currents, and means for locking said telegraph apparatus in non-responsive relation to received telegraph impulses during the reception of synchronizing telegraph impulses.

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