

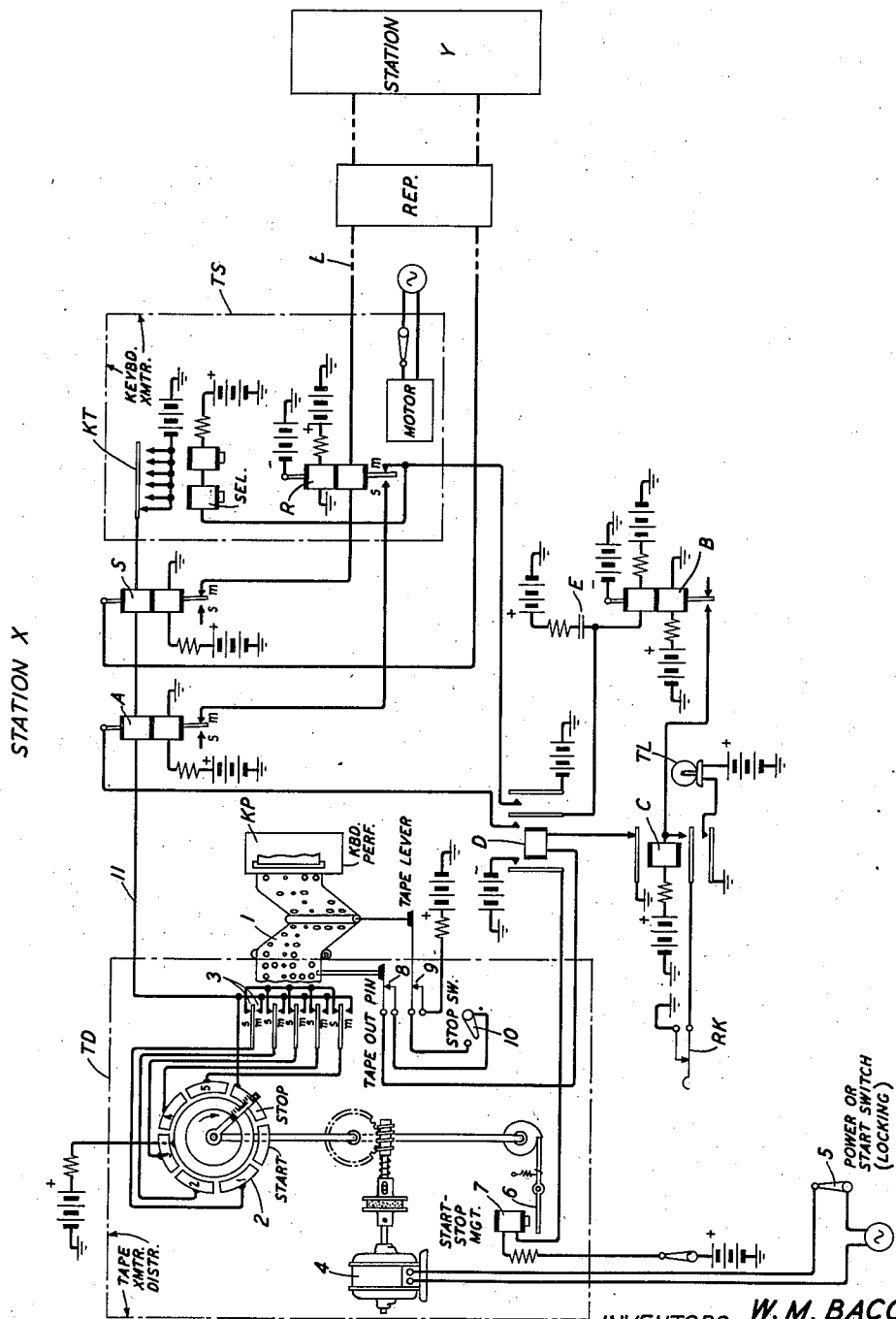
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W. M. BACON ET AL

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INTERCOMMUNICATION TELETYPEWRITER SYSTEM

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INTERCOMMUNICATION TELETYPEWRITER SYSTEM

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This invention relates to permutation code start-stop telegraph communication systems of the type known as half-duplex in which transmission may be accomplished in one direction at a time over a line or channel of transmission but not in both directions; more particularly, the invention relates to such systems in which automatic transmitters, for example, tape controlled transmitter-distributor sets are or may be utilized for transmission and supplied with message material from time to time by means of a keyboard perforator or a reperforator controlled by another incoming telegraph line, or manually.

In an exemplary embodiment there are assumed to be two such stations connected to a line or channel of transmission each of which transmits its message material to the other and each of which is provided with an automatic transmitter and a receiving recorder which may consist of a printing reperforator or teletypewriter for recording incoming messages.

In half-duplex communication systems in which the transmission is controlled by a keyboard-operated transmitter acting directly upon the line, interference caused by an attempt to transmit from both ends of the line simultaneously is recognized by the operators because of the mutilated local copy or by the use of a break signal which locks up the transmitting keyboard and renders it temporarily ineffective to transmit. The operators in such cases, by prearrangement or otherwise, retransmit the mutilated characters or parts of the message and also by prearrangement one or the other of them permits his or her keyboard to remain quiescent when the distant operator resumes transmission.

In a system in which automatic or tape controlled transmitters are employed it may happen that both transmitters may begin to transmit simultaneously or one may begin to transmit when the other is already transmitting, with consequent continued garbling of the messages or in some cases one transmitter may transmit a complete message during such time as the other transmitter is also transmitting with consequent complete loss of the message which fact may not be recognized by the attendant with the result that the message is completely lost or its absence may be recognized only after a time with resulting delay and confusion.

In accordance with the present invention means are provided whereby any attempt at simultaneous transmission from two ends of the system immediately stops both transmitters. Other means may be provided for locking the trans-

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mitters in a quiescent condition and sounding an alarm or lighting a lamp to indicate a trouble condition. Thereupon by prearrangement one of the operators may set back the tape in the tape controlled transmitter, if necessary, and reinitiate transmission. In other words, the two transmitters have the line equally available to them but any attempt to transmit simultaneously renders it unavailable to both. An arrangement of this kind has been styled a "circuit contention system" in that the two transmitters may contend for freedom to use the line but both may not use it at the same time.

Equipment for one station embodying the invention is shown in detail in the drawing, this station being designated station X, and it is understood that in the general case a communicating station Y may be furnished with identical equipment, station Y being merely indicated.

However, it is within the scope of the invention for the equipment of station Y to comprise either a keyboard transmitter or equipment similar to or equivalent to that of station X, it being not necessary that the arrangements of the two stations be identical. Furthermore, the use of the equipment at station X may be attended with advantage in some cases where there are three or more similar or equivalent stations connected to the same line or channel of transmission; in this case each station, upon transmitting, sends its messages to all of the others.

The equipment at station X comprises a keyboard perforator KP which may be replaced by a reperforator or any suitable means for supplying tape 1 punched with message material to a tape controlled transmitter-distributor set TD which is of conventional type comprising a segment and brush distributor 2 and a set of transmitting pins (not shown) which sense the holes in the tape and control transmitting contacts 3. A code hole in the tape permits the pins to rise and close their associated marking contacts, whereas absence of a hole causes the associated spacing contact to remain closed. The usual motor 4 connected to a source of power and a motor starting switch 5, driving clutch, magnet controlled start latch 6 controlled by start-stop magnet 7 and other such appurtenant elements are present.

In order for the magnet 7 to be energized and initiate transmission the relay D must be energized. Relay D is energized through a circuit from the back contact of relay C which thus must be deenergized, a "tape out" contact 8, a taut tape contact 9, and a stop or transmission control switch 10. A pin controls contact 8 by

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keeping it closed when tape is in the transmitting head of the transmitter and allowing it to open when no tape is present or in some systems, when an extra hole, indicating an end of message is punched in the tape in line with such pin. Let it now be assumed that the relay C is deenergized, that an ample supply of tape is available for transmission and looped through the transmitter to cause the contact 3 to be closed and that the stop switch 10 is closed. The transmitter-distributor set TD will then transmit over a path 11 through relays A and S and the normally closed contacts of the keyboard transmitter KT which is a part of a teletypewriter set TS. Normally, relays A, S and R are in their marking positions and selector magnet SEL is operated. Inasmuch as the relay D is energized the magnet 7 will also be energized and transmission will continue; the magnet D being energized closes a path extending from positive battery, through the windings of selector magnet SEL and make contact of relay D to connect the selector magnet SEL of the teletypewriter set TS directly to negative battery. Thus, although the relay S operates the receiving relay R this will not produce any operational effect upon the selector magnet SEL. At this time the relay A will open and close a path through its marking contact and the front contact of relay D to a point between the condenser E and the relay B but this will be without effect because when the relay A is on its marking contact to close the path just traced the relay R will also be on its marking contact to open the path and no effect will be produced on the relay B. Transmission will then continue under the control of the relay S over the line L which typifies any channel of transmission consisting of a directly connected loop, or including repeaters, carrier equipment, a radio channel or any other type of equipment extending to station Y. While this transmitting condition persists it is assumed that the attendant at a distant station will maintain his stop switch 10 open or that the distant transmitter will be without tape in which case the corresponding contact 3 will be open or for some other reason the distant transmitter is not transmitting. Whenever the tape loop at station X becomes taut to open contact 9 or the tape is cut or torn and runs out of the transmitter-distributor TD, the distant attendant will recognize that the line is idle and may initiate transmission. Under this condition the relay D will be deenergized and the holding circuit or the winding of selector magnet SEL will be removed. Should incoming signals arrive when relay D is deenergized, relay R would operate in response to them and thereby would operate the selector magnet SEL in a corresponding manner to record the message by means of the teletypewriter set TS which may be of any suitable type or, by way of example, of the type shown in Patent No. 1,745,633, granted on February 4, 1930, to S. Morton et al. Alternatively, the selector magnet SEL may be the selector magnet of a reperforator or printing reperforator for the purpose of recording the message at the station A or, if desired, the message may be perforated on one machine and printed on another, having separate selector magnets arranged in series in a well-known manner.

Let it now be assumed that each station is in a quiescent condition but prepared to transmit. This quiescent condition may be due to opening

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of the stop switch 10, opening of the taut tape contact 9, or opening of the "tape out" contact 8 which occurs when there is no tape in the transmitting head of the machine. Specifically, let it be assumed that the quiescent condition is due to opening of the stop switches 10 at the two stations. In case the quiescent condition is due to some other cause, the operation will not be different. Each operator has now provided by means of the keyboard perforator KP a complete message or series of messages to be transmitted to the other station and each operator simultaneously closes her stop switch 10 with the result that her local receiver is rendered non-responsive by the holding circuit for the selector magnet SEL, and transmission begins. Without the apparatus now about to be described, transmission would continue from both stations each without knowledge of the other and the messages would be garbled. However, under such condition the relay A at station X responds only to outgoing signal impulses and relay R is responsive to and under the control of both outgoing and incoming impulses. Consequently, for a portion of the time relay A will be on its marking contact and the relay R will be on its spacing contact which will close a circuit, extending from grounded negative battery, over the armature of relay R, the armature of relay A and the front contact of relay D, through the winding of relay B to grounded positive battery. There is a shunt on this path through the condenser E and resistance to grounded positive battery. The condenser E and the resistance may be proportioned in different ways so that a short hit upon the line or a slight irregularity in the operation of relays A and R will not cause the relay B to move its armature to its left-hand contact. Moreover, if desired, the condenser E and the resistance may be proportioned so that it will require that the circuit through the armatures of relays A and R be closed during more than one impulse or parts of impulses, for example, for at least a part of two consecutive impulses. This adjustment or selection of values for the capacitance of condenser E and resistance of the resistance element are available to be selected initially and as desired or they may be made adjustable for change from time to time. As a preferred adjustment relay B may operate on being energized for one full impulse period during a time required to transmit two impulses. Assuming now that transmission from the two termini has caused the relay B to operate against its biasing winding to close its left-hand contact. This will cause the relay C to be operated and locked up through a normally closed release key RK. Relay C will also energize the trouble lamp TL to give an indication to the attendant of the trouble condition. Moreover, relay C will open the circuit through the relay D which will release and stop transmission by opening the circuit through the winding of magnet 7. The relay D will also remove the holding circuit from the winding of the selector magnet SEL to condition the teletypewriter TS to a recording condition. By prearrangement both operators may now move their respective tapes back in their respective transmitters TD to retransmit whatever portion of the message has been garbled. Also by prearrangement or by understanding reached by manipulation of keyboard KT one or the other may open the stop switch 10 and both would then operate the key RK to prepare relay C for another operation.

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One or the other then would close or leave closed the stop switch 10 and resume transmission.

In the case of three stations on a line each transmitting to the other, a similar mode of procedure, whereby one station resumes control of the line, would be followed.

What is claimed is:

1. In a telegraph system, a main loop circuit for signal transmission, a plurality of signal transmitters and receivers connected to said loop circuit, two relays operated by each transmitter, one of said relays being also a receiving line relay connected to said loop circuit, means for operating said relays substantially simultaneously in response to signals outgoing from their local transmitter, recording means controlled by said receiving line relay responsive to signals incoming over said loop circuit, means for locking said recording means during outgoing transmission, and means operative when the said relays operate to positions different from each other for furnishing an alarm at said station local to said relays.

2. In a telegraph system, a channel of transmission, a station connected thereto, an automatic transmitter for transmitting signals comprising coded marking and spacing signals over said channel, start-and-stop control means for said transmitter operable to initiate transmission and restorable to suspend transmission, first means conditioned to marking and spacing conditions by signals outgoing from said transmitter, second means controllable to marking and spacing conditions by incoming signals, and responding means controlled jointly by said first and second means when they are in non-conforming conditions to restore said start-and-stop control means and thereby suspend transmission from said transmitter.

3. A system comprising a plurality of stations as per claim 2 connected at geographically separated points to the same channel of electrical pulse transmission.

4. In a telegraph transmission station, a tape controlled automatic transmitter operatively connected to a channel of transmission to transmit message signals thereto, start means for said transmitter, a plurality of repeating means concurrently responsive to message signals sent by said transmitter, one of said repeating means having its operating means controllable by said transmitter and also by message signals incoming over said channel, and means controlled by non-conforming operation of said plurality of repeating means to stop said transmission.

5. In a telegraph system, a channel of transmission, a station connected thereto, an automatic transmitter for transmitting signals comprising coded marking and spacing signals over said channel, start-and-stop control means for said transmitter operable to initiate transmission and restorable to suspend transmission, first means conditioned to marking and spacing conditions by signals outgoing from said transmitter, second means controllable to marking and spacing conditions by incoming signals, responding means controlled by said first and second means when they are in non-conforming conditions to restore said start-and-stop control means and thereby suspend transmission from said transmitter, said station including a receiving recorder for receiving incoming signals, means operated incident to initiating transmission by said start-and-stop control means to cause said

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recorder to assume a non-recording or non-responsive condition, and means operable incident to operation of said responding means to restore said recorder to recording condition whereby it is responsive to record signals incoming over said channel.

6. In a telegraph system, a station comprising an automatic transmitter, an outgoing channel of transmission, a first relay means operable only by signals outgoing to said channel, a second relay means operable only by said outgoing signals, a third relay means operable by said second relay means and also operable independently of said second relay means by signals incoming over said channel from a remote station, means operable for initiating transmission from said transmitter, and a fourth relay means to interrupt outgoing transmission when said first relay means is operated by outgoing signals and said third relay means is operated simultaneously by incoming signals.

7. In a telegraph transmission station, a tape-controlled automatic transmitter operatively connected to a channel of transmission to transmit message signals thereto, start means for said transmitter, a plurality of repeating means concurrently responsive to message signals sent by said transmitter, one of said repeating means having its operating means controllable by said transmitter and also by message signals incoming over said channel, means controlled by non-conforming operation of said repeating means to stop said transmitter, locking means for maintaining said automatic transmitter stopped when so stopped, and means operable incident to the release of said locking means to restart said automatic transmitter.

8. In a telegraph system, a station comprising an automatic transmitter, an outgoing channel of transmission, a first relay means operable only by signals outgoing to said channel, a second relay means operable only by said outgoing signals, a third relay means operable by said second relay means and also operable independently of said second relay means by signals incoming over said channel from a remote station, means operable for initiating transmission from said transmitter, a fourth relay means to interrupt outgoing transmission when said first relay means is operated by outgoing signals and said third relay means is operated simultaneously by incoming signals, a receiving recorder in said station, and further relay means to render said recorder non-responsive to signals when said means for initiating transmission is operated to initiate transmission, said further relay means operable for rendering said recorder responsive to signals incoming over said channel when said fourth relay means is operated to cause interruption of outgoing transmission.

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