

March 12, 1946.

G. H. RIDINGS

2,396,286

AUTOMATIC FACSIMILE TELEGRAPH SYSTEM

Filed Jan. 13, 1943

2 Sheets-Sheet 1

FIG. 1

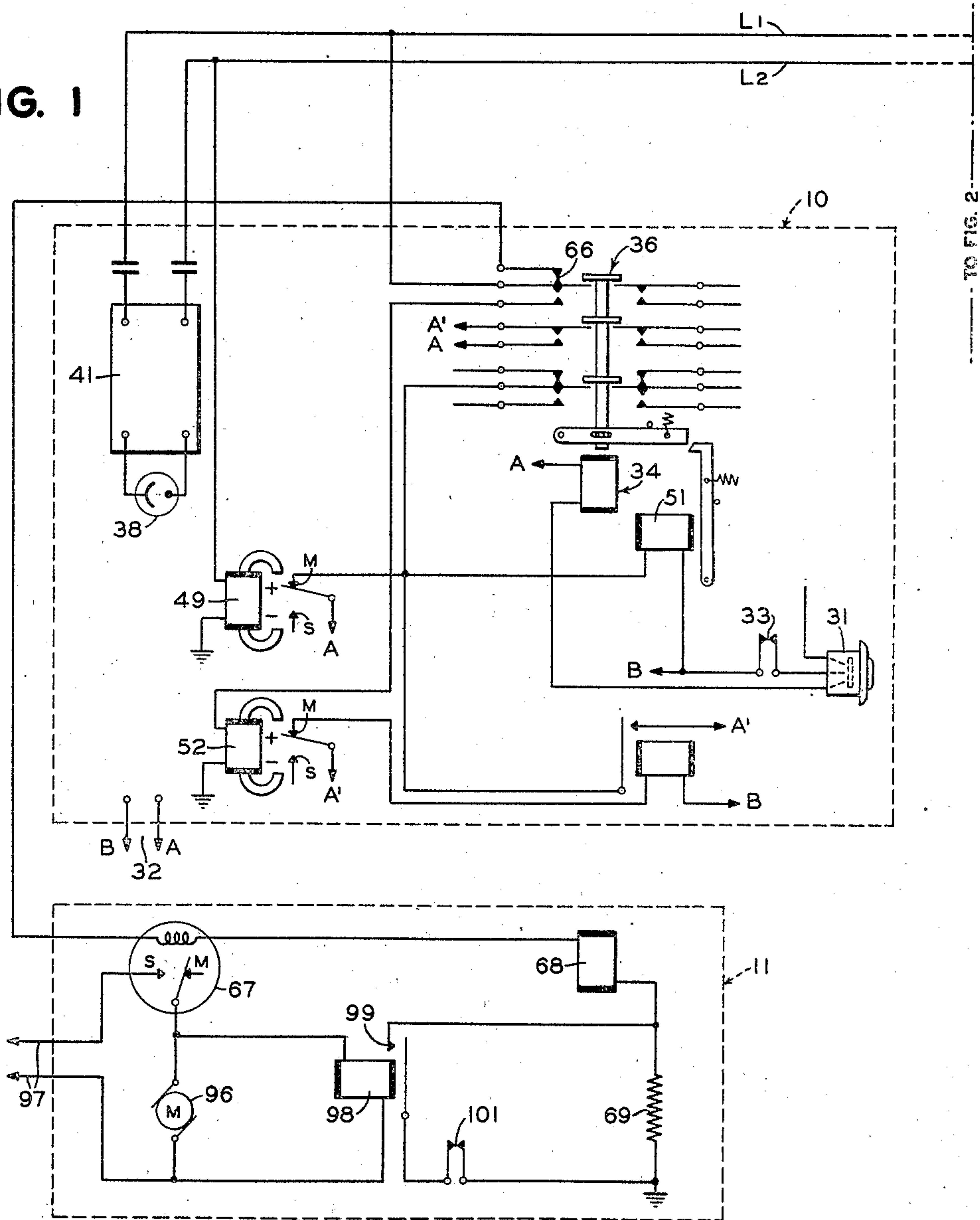
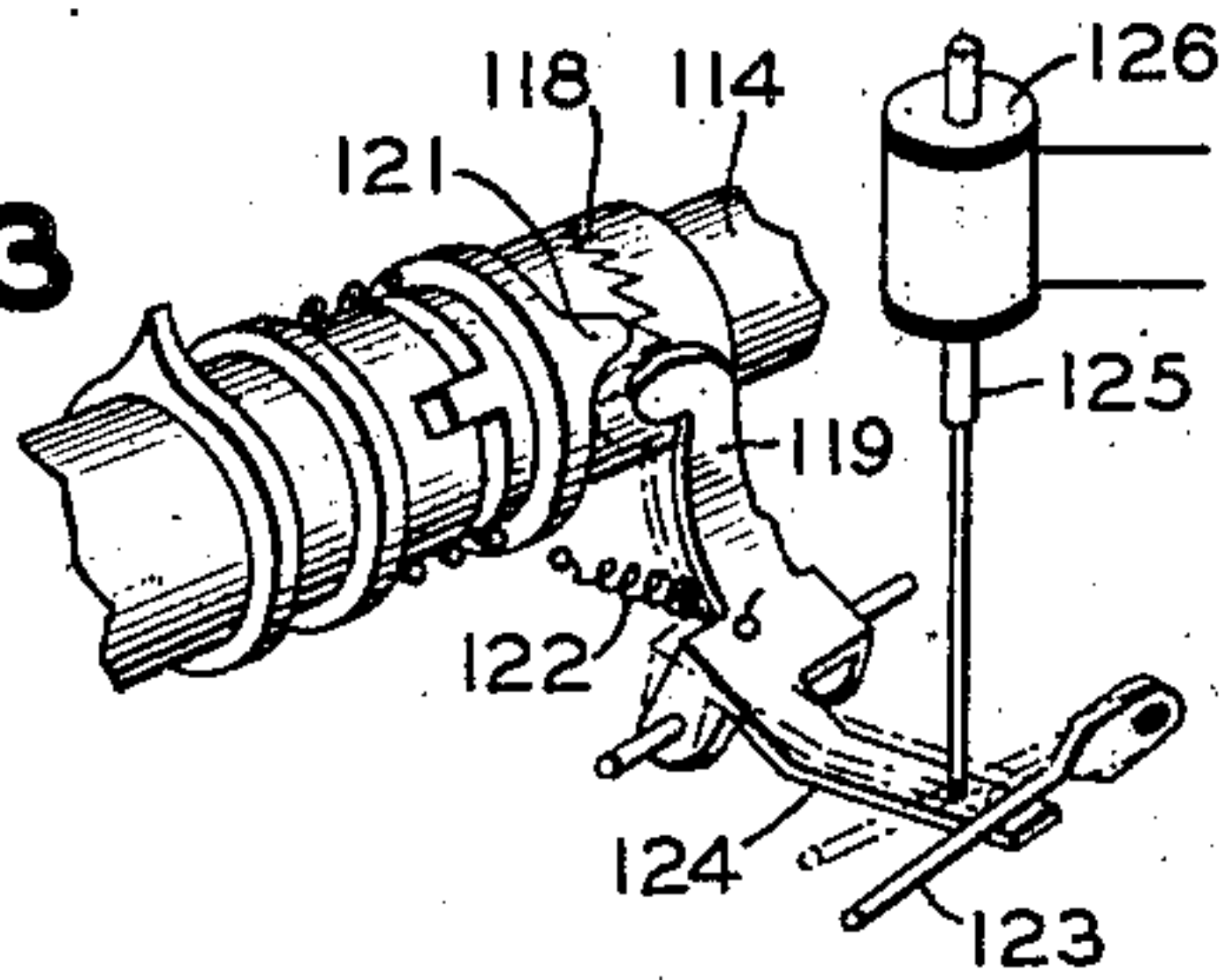


FIG. 3



INVENTOR
G. H. RIDINGS

BY *M. J. Reynolds*
ATTORNEY

March 12, 1946.

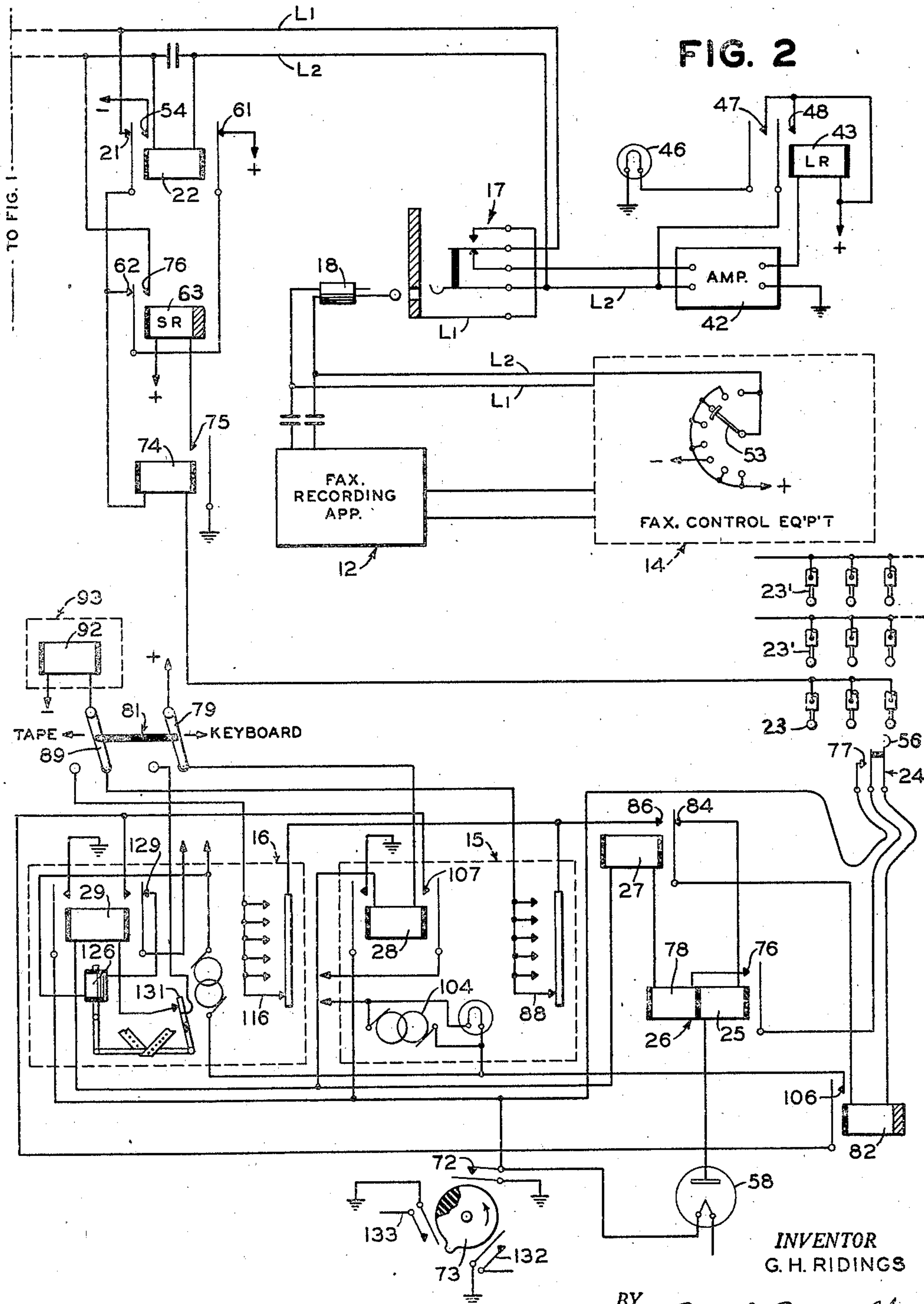
G. H. RIDINGS

2,396,286

AUTOMATIC FACSIMILE TELEGRAPH SYSTEM

Filed Jan. 13, 1943

2 Sheets-Sheet 2



INVENTOR
G. H. RIDINGS

BY *M. J. Reynolds*
ATTORNEY

UNITED STATES PATENT OFFICE

2,396,286

AUTOMATIC FACSIMILE TELEGRAPH SYSTEM

Garvice H. Ridings, Summit, N. J., assignor to
The Western Union Telegraph Company, New
York, N. Y., a corporation of New York

Application January 13, 1943, Serial No. 472,203

4 Claims. (Cl. 178—5)

The present invention relates to automatic telegraph systems and more particularly to a novel system and combined apparatus for obtaining record communication in either direction between a central station and a plurality of outlying stations.

In accordance with this invention the central office is provided with facsimile recording and control equipment and also with code signaling equipment for generating and transmitting printing telegraph signals. Each outlying station is provided with an automatic facsimile transmitter combined with an automatically operable printing telegraph recorder. Means are provided for insuring non-interfering operation of these facilities with a minimum of delay in handling traffic.

An object of the invention is to provide for automatically handling record communication traffic by combined facsimile telegraph and printing telegraph apparatus over a single communication circuit.

Still another object of the invention is to provide facsimile telegraph communication from one or more local or outlying stations to a central office and printing telegraph communication from the central office to one or more outlying stations.

The foregoing and other objects of this invention will be more apparent from the following description when taken in connection with the drawings, in which:

Fig. 1 is a diagrammatic showing of an automatic facsimile transmitter and an automatic printer-recorder combined in a single station;

Fig. 2 is a diagrammatic showing of the electrical features of central office terminal equipment designed to serve one or more of the outlying stations shown on Fig. 1 of the drawings; and

Fig. 3 is a fragmentary perspective view of a detail of a well known tape transmitter shown diagrammatically in Fig. 2 of the drawings.

For the sake of convenience, the circuit arrangement is illustrated for only one branch office, and only one set of facsimile recording apparatus and code transmitting equipment is shown at the central office. Referring to the drawings, Fig. 1 shows diagrammatically a local station employing a facsimile transmitter 10 which may be in all respects similar to that disclosed and claimed in Patent No. 2,262,715, granted to R. J. Wise et al., November 11, 1941. The local station also includes a conventional telegraph printer 11 of any well known type. The

central office equipment shown in Fig. 2 of the drawings includes facsimile recording and phasing apparatus 12, control equipment 14 for the apparatus 12, a keyboard operated code transmitter 15 and a tape controlled code transmitter 16. The facsimile recording apparatus 12 and control equipment 14 may be identical with similar apparatus shown in Fig. 10 of Patent No. 2,262,715 referred to above. The keyboard transmitter 15 is of the conventional type and the tape transmitter 16 is or may be of the type disclosed in Patent No. 1,805,374, granted to S. W. Rothermel, May 12, 1931. As the central office equipment is designed to serve a plurality of outlying stations, each having equipment similar to that shown in Fig. 1, each communication circuit from these stations comprises conductors L1 and L2 ending in a jack 17. Each of these jacks is accessible to a plug 18, the cord circuit of which is connected to the facsimile recording apparatus 12 and the control equipment 14. The conductor L1 of the communication circuit shown extends by way of break contact 21 of a relay 22 to a plurality of contact studs 23. These studs and studs 23' of other circuits are accessible to a jack 24 of an operator's cord circuit. The cord circuit comprises a circuit arrangement interconnecting the jack 24 with a winding 25 of a relay 26, a relay 27 and a motor control relay 28 of the keyboard transmitter 15 or a motor control relay 29 of the tape transmitter 16. The cord circuit and studs form a concentration circuit for simplex printers of the outlying stations similar to that shown in Patent No. 1,804,327, granted to H. W. Drake et al., May 5, 1931.

Facsimile transmission from a transmitter 10 to the central office is obtained in the manner fully set forth in Patent No. 2,262,715 above referred to. Briefly, an operator at the transmitter 10 having a message suitably inscribed on a message sheet to be recorded on the recorder 12 of the central office operates the push button 31 which completes a circuit from the B bus bar of the power supply source 32 through the message sheet control switch 33 and through the operating magnet 34 of the multiple switch 36. Certain contacts of the switch 36, as more fully set forth in the patent referred to, cause generation of a carrier by the scanning photocell 33 which is amplified by the amplifier 41 and transmitted over the line conductors to the jack 17 associated with this machine.

The carrier current is amplified in an amplifier 42 and operates a relay 43 which is included in the plate circuit of one of the tubes in the

amplifier 42. Energization of this relay lights a supervisory lamp 46 at its make contact 47. An additional relay tongue and make contact 48 applies positive signaling potential to line L2 which moves the tongue of the polar relay 49 at the local station to its contact M thereby connecting the locking coil 51 of the switch 36 across the A and B bus bars of the power supply source 32. The tongues of the polar relay 52 and the polar relay 49 are moved in accordance with signaling potentials applied to the conductors L1 and L2 respectively by the control equipment 14, in the manner set forth in Patent No. 2,262,715 referred to above, with one exception now to be pointed out. The rotary switch, which corresponds to the rotary switch 177 in the patent referred to above, is provided with seven studs omitting the "message accepted" and "off" positions so that it has seven active positions rather than nine as shown in the patent. Reference character 53 indicates one of the arms of this rotary switch.

To obtain desired operation of the automatic facsimile transmitter 10, the signaling potential maintained on the conductor L2 at the make contact 48 of the relay 43 or by the switch arm 53 maintains energization of the relay 22 so that negative signaling potential is applied to the studs 23 at the make contact 54 of this relay. This negative potential appearing on the studs 23 of the line associated with the busy machine prevents operation of either of the code transmitters 15 or 16 should the operator connect the jack 24 to one of the studs 23. The circuit extending from the tip 56 of the jack 24 including the winding 25 of the relay 26 terminates at ground after passing through a vacuum tube rectifier 58. It is therefore impossible for an operator at the central office having a message for an outlying station, the facsimile transmitter of which is in operation, to interrupt facsimile communication which is in progress.

When the facsimile equipment is idle, the relay 22 is deenergized and a suitable source of positive potential is connected at the break contact 61 of this relay and a break contact 62 of a slow-to-release relay 63 to the line conductor L1 and also to the studs 23 associated with that line conductor.

At the transmitting station the positive potential on the line conductor L1 is applied by way of a set of normally closed contacts 66 of the switch 36 to a control relay 67, printer selector magnet 68 and a resistor 69 to ground. The relay 67 is a polar relay, the tongue of which normally rests against either contact and does not move except upon a reversal of current flowing through its coil. The relay 67 is connected so that when positive potential is applied to the line conductor L1, the tongue is against the marking contact M and when a negative potential is applied to the line conductor L2 the tongue rests against the spacing contact S. This relay does not respond to interruptions in the flow of current through its winding.

A printer operator at the central station having a message to be transmitted to the printer 11 will connect the jack 24 to the stud 23 nearest her position which will cause energization of the winding 25 of the relay 26 by way of vacuum tube 58 when a cam switch 72 operated by a rotary cam 73 is closed. The function of the cam switch will be described later on. Current flowing in the tip circuit of the jack from the potential source connected at the break contact 61 of the relay 22 will energize a relay 74 which will energize

the relay 63, by way of the make contact 75. The tongue of the relay 63 will apply positive potential to the conductor L2 from the make contact 76 thereby locking the switch 36 at the facsimile transmitter 10. Operation of the relay 63 will be maintained in spite of subsequent interruption of current flowing in the coil of the relay 74 as said relay 63 is a slow-to-release relay.

Energization of the relay 26 will complete a circuit at its make contact 76 from ground at the switch 72 through the jack spring 77, through the locking coil 78 of the relay 26, the winding of the relay 27, the motor control relay 28, the switch arm 79 of the double throw switch 81 to a battery or other suitable source of energy. The switch 81 is provided for selecting either the keyboard transmitter 15 or the tape transmitter 16 for operation. The switch 81 may, for convenience, remain in the right hand or "keyboard" position. A marginal relay 82 adjusted to operate on higher than normal values of current does not operate at this time. The relay 27 operates and opens the circuit including the operating coil 25 of the relay 26 and its break contact 84. This results in disconnection of the tip contact 56 of the jack 24 from the operating coil 25 of the relay 26. A make contact 86 of the relay 27 connects the code signaling contacts 88 of the keyboard transmitter 15 to the tip contact 56 of the jack 24 by way of the coil of the marginal relay 82. The code signaling contacts 88 are connected by way of an arm 89 of the switch 81 through the selector magnet 92 of a local printer 93 to a source of negative code signaling potential. The printer 93 may be of any suitable or desired type and its driving motor may be connected to operate in any suitable manner when the driving motors of either of the code transmitters is in operation.

The negative potential applied at the make contact 86 of the relay 27 is applied to line conductor L1 and the resulting current reversal in the coil of polar relay 67 at the outlying station or branch office causes its tongue to move to the S contact. The printer motor 96 is supplied with energy from a suitable source 97 when the relay 67 is energized by line current flowing from the negative signaling current source at the central office. A make contact 99 of a relay 98 short circuits the resistor 69, causing an increase in current flow in the line conductor L1. Reference character 101 indicates a set of normally closed contacts which may be operated by the usual device in the printer 11 for indicating by the ringing of a bell or otherwise that the supply of blank paper or tape at the printer is exhausted. It will be understood that other contacts similar to the contact 101 may be included in the bridging circuit for the resistor 69 and made to open in response to some other condition at the printer, if desired.

At the central office the increased current flowing through the coil of the marginal relay 82 causes it to operate, thereby completing the circuit of the keyboard transmitter motor 104 at its make contact 106 and the make contact 107 of the motor starter relay 28.

By operating the keyboard of the transmitter 15 in the usual manner, the contacts 88 will set up code combinations to operate the printer 11 at the local office in the usual manner. The polar relay 67 will not respond to these code signaling impulses. The local printer 93 will print a record at the central office of traffic which is being sent to the selected local office.

The central office operator after completing transmission to the local office, disconnects the

jack 24 thereby deenergizing the relay 74 and after a short interval of time the slow-to-release relay 63 releases its tongue so that positive potential is again applied to line L1 at the break contact 62. The reversal of current flow in the operating coil of the polar relay 67 at the local office printer 11 causes its tongue to move from the spacing contact S thereby stopping the printer motor 96 and releasing the relay 98. The relays 26, 27 and 28 are released thereby shutting down the code transmitting equipment at the central office.

An operator having a message for a local station may, if this local station is busy, punch the message in a tape by an ordinary tape perforator (not shown) which feeds tape to the tape transmitter 16. The switch 81 is placed in the "tape" position. The tape transmitter will not operate during the existence of busy line conditions since a negative potential is placed upon the stud 23 or 23' to which the jack 24 is connected either at the relay 22 associated with this stud or by a tape or keyboard code transmitter connected to this line at another position. The operating coil 25 of the relay 26 will not be energized and therefore the operating circuit for the relays 27 and 29 will not be completed.

Referring to Fig. 3 of the drawings, which shows a detail of the tape transmitter referred to in Patent No. 1,805,374 above, the cam drive shaft 114 which operates the code transmitter contacts 116 in succession is provided with a clutch 118 which is declutched to prevent operation of the contacts 116 when a pivoted stop arm 119 is engaged against the shoulder of a cam projection 121. With the arrangement shown in the patent referred to, a spring 122 maintains the stop arm 119 in contact with the projection 121 when a tape loop operated arm 123 is raised. The arm 123 cooperates with an extension 124 of the stop arm 119. The core 125 of a magnet 126 is connected to the extension 124 so that when magnet 126 is energized, the arm 119 is maintained against the shoulder 121, preventing operation of the cam shaft.

Referring again to Fig. 2 of the drawings, with jack 24 connected to a busy line and the switch 81 in its "tape" position, the magnet 126 is energized at the break contact 129 of the relay 29. When the busy condition no longer exists, positive potential is applied to the tip 56 of the jack 24 which energizes the operating coil 25 of the relay 26. When the cam 73 operates the switch 72, the relays 27 and 29 are energized in the manner set forth and negative signaling potential is applied to start the motor 96 of the local station printer 11. Automatic operation of the tape transmitter 16 will be initiated and will continue until the tape loop is exhausted thereby drawing up the arm 123 and opening a switch 131 to stop operation of the tape transmitter.

The switches 72, 132 and 133 operated by the cam 73 are provided to insure that when three tape transmitters are connected to a busy line, only one, depending on which of these switches is closed first, will start and maintain communication when the busy line condition is lifted. The other tape transmitters 16 connected to the line will operate one at a time. It will be understood that more than three operators' positions, each

having a tape transmitter 16, may be provided with a cam operated switch for each tape transmitter.

The nature of the invention will be determined from the foregoing and the scope thereof is defined in the appended claims.

What is claimed is:

1. A telegraph system comprising two stations interconnected by a communication circuit, a facsimile telegraph transmitter at one of said stations, a facsimile telegraph recorder at the other of said stations, a code signal controlled telegraph printer at said station having said facsimile telegraph transmitter, a printer code transmitter at said station having said facsimile telegraph recorder, manually operable means at both of said stations for obtaining operation of said facsimile telegraph transmitter jointly with said facsimile telegraph recorder, and means for controlling the operation of said code signal controlled printer automatically solely from said station having said printer code transmitter.

2. A telegraph system comprising two stations interconnected by a communication circuit, a facsimile telegraph transmitter and a code signal controlled telegraph printer normally connected to said circuit at one of said stations, switching means at said station, means including said switching means for automatically disconnecting said code signal controlled telegraph printer from said communication circuit when said facsimile telegraph transmitter is operative, and means at said other station for controlling said switching means.

3. A telegraph system comprising two stations interconnected by a communication circuit, a facsimile telegraph transmitter at one of said stations and a facsimile telegraph recorder at the other of said stations interconnectable over said circuit, a code signal controlled telegraph printer at said station having said facsimile telegraph transmitter and a printer code transmitter at said station having said facsimile telegraph recorder also interconnectable over said circuit, switching means at said stations, and means for controlling operation of said switching means from one of said stations to permit operation of one only of said interconnected recorders and transmitters at a time over said circuit.

4. A telegraph system comprising a pair of stations interconnected by a communication circuit, a signal controlled telegraph printer and a facsimile telegraph transmitter at one of said stations, a facsimile telegraph recorder, a keyboard controlled transmitter and a tape operated transmitter at the other of said stations, a control unit for the operating mechanism of said keyboard controlled transmitter, control means for the operating mechanism of said tape transmitter, means for connecting either said keyboard transmitter or said tape operated transmitter to said communication circuit at a time, and means for controlling the operation of said operating mechanism of the connected one of said transmitters in accordance with a condition existing on said communication circuit as established by said facsimile telegraph transmitter and facsimile telegraph recorder.

GARVICE H. RIDINGS.