

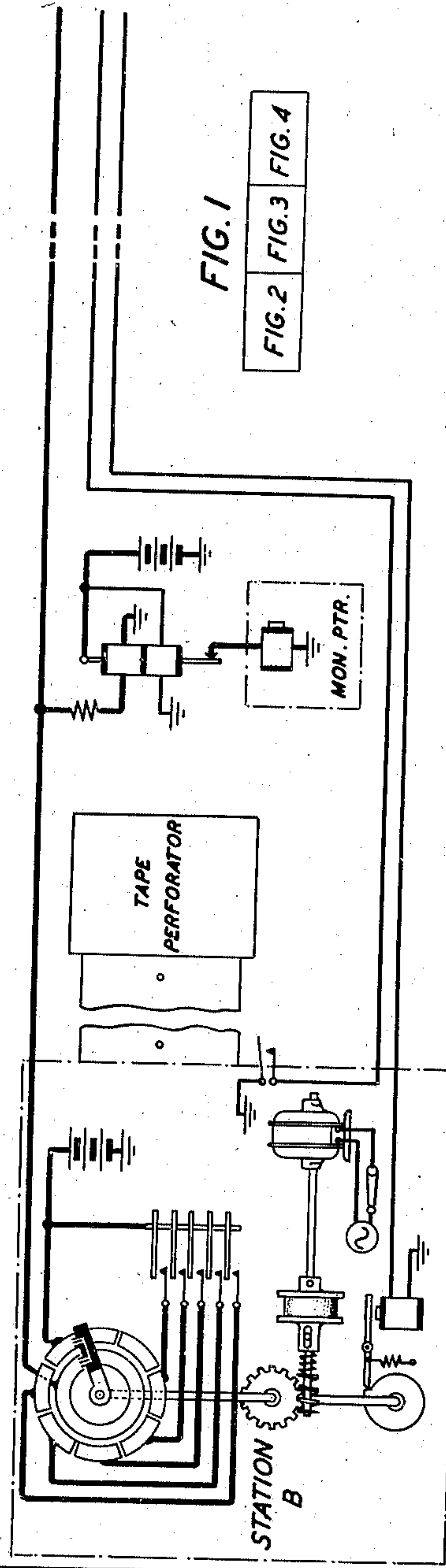
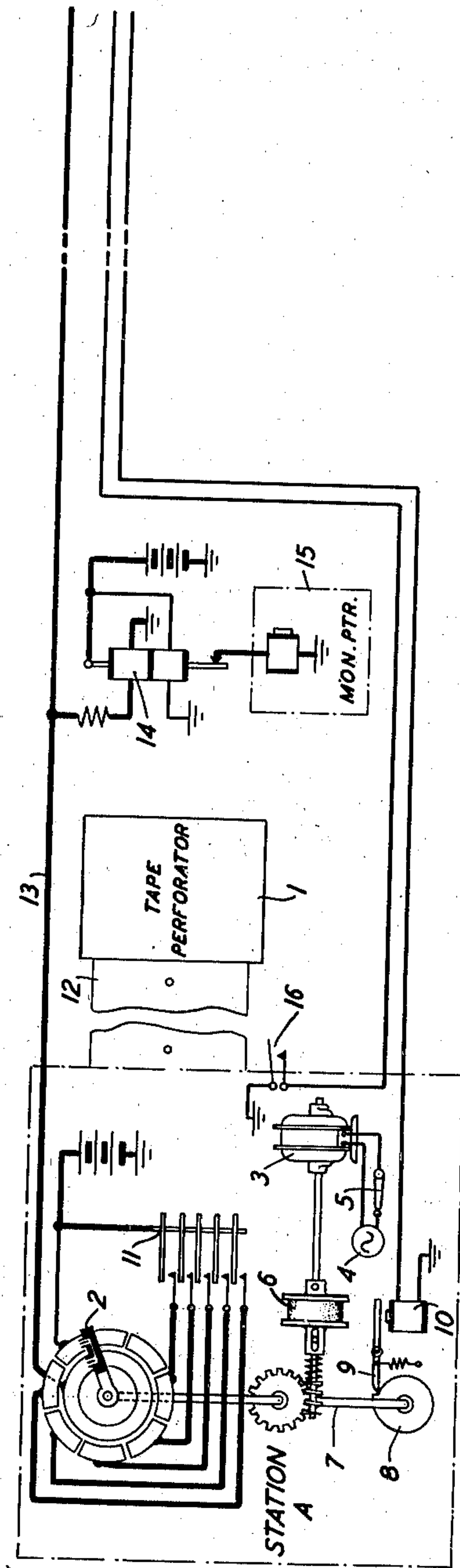
Nov. 11, 1941.

C. A. BORGESON
COMMUNICATION SYSTEM

2,262,543

Filed May 27, 1939

3 Sheets-Sheet 1



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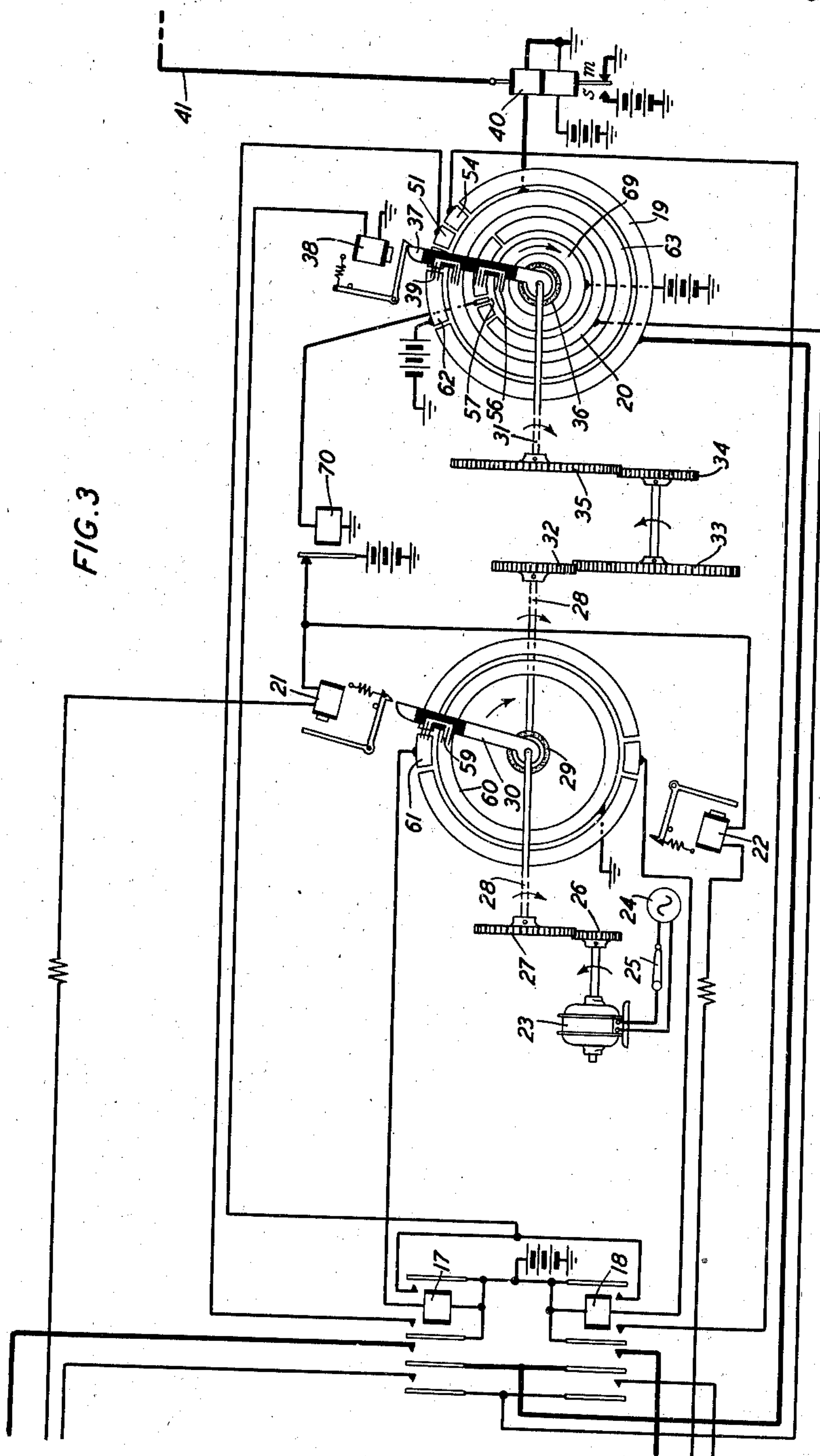
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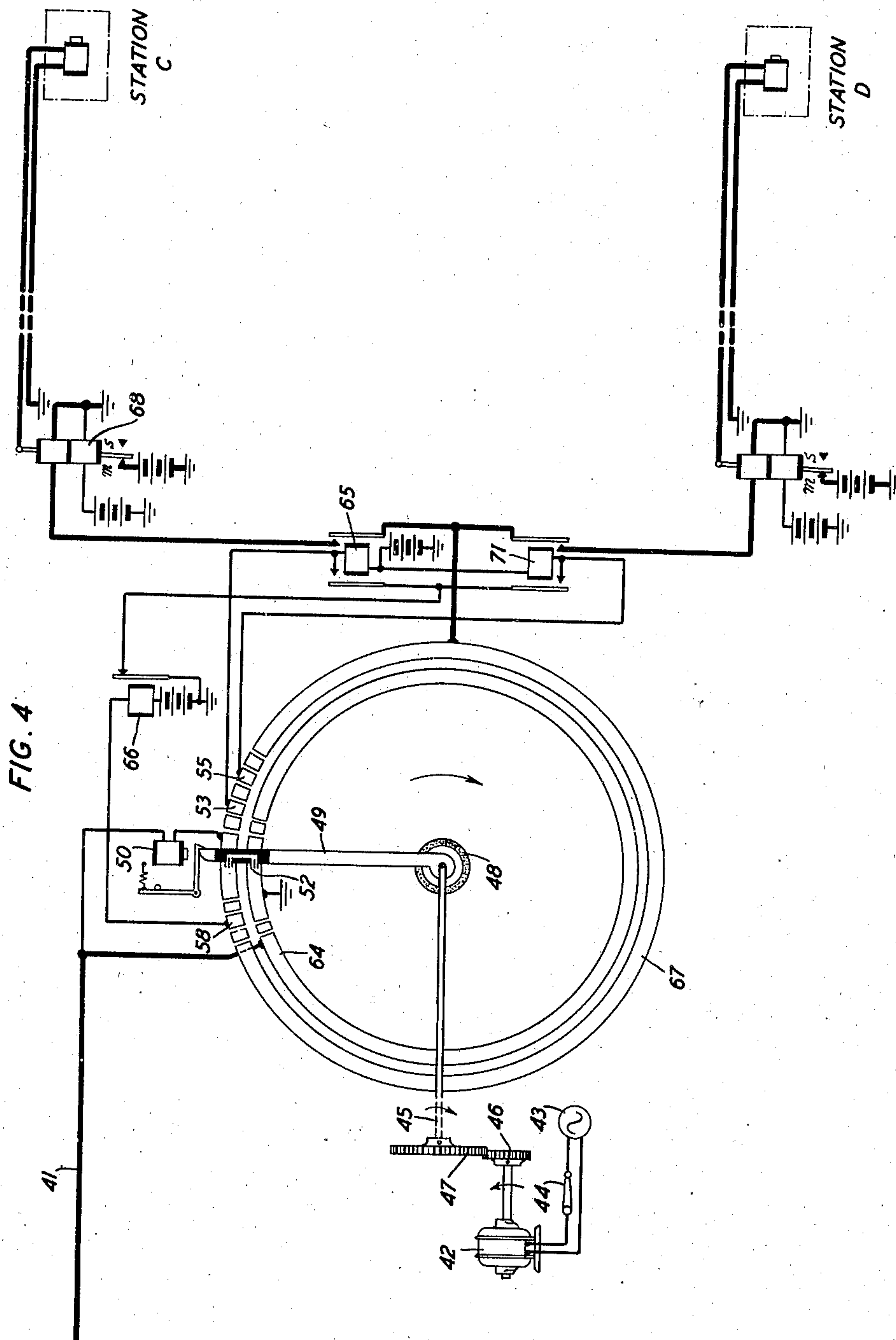
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2,262,543

COMMUNICATION SYSTEM

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Application May 27, 1939, Serial No. 276,169

6 Claims. (Cl. 178—52)

This invention relates to communication systems and particularly to telegraph systems where intelligence is transmitted from point to point by permutation code.

The object of the invention is to provide service for a plurality of subscribers at one point to a corresponding plurality of subscribers at another point over a common channel which appears to each subscriber as a direct, individual and permanently established connection to another particular subscriber.

In accordance with this invention, an automatic time allotter is provided so that equal intervals are in turn allotted to each pair of subscribers who are at any time operating their communication system. Where only a single pair of subscribers are operating their system, the full time of the channel is allotted to them, but where more than one pair are transmitting messages, then the various pairs use the single channel share and share alike.

I am aware of an arrangement disclosed in Patent No. 2,171,542, granted to Cunningham et al. Sept. 5, 1939, wherein the time of a common channel linking a pair of synchronously operating distributors is divided among connections which appear to the subscribers to be direct individual and permanently established connections between corresponding local stations at opposite ends of such channel. I am aware of the fact that such appearance in this disclosure is maintained by the transmission between each character code over such common channel of signals identifying that apparent connection which is next to have the use of such common channel.

I am further aware of the disclosure in Patent No. 2,224,250, granted to Borgeson et al. Dec. 10, 1940, wherein start-stop distributors are employed at each end of a common channel and identification signals are transmitted for each operation of such start-stop distributors prior to the transmission of intelligence signals for each apparent connection with the time of inactive connections given over to active connections.

I am further aware of the disclosure in Patent No. 2,207,314, granted to Cunningham et al. on July 9, 1940, wherein a novel start-stop distributor means at each end of the common channel is employed comprising a high speed distributor for transmitting identification signals and a low speed distributor for transmitting intelligence signals together with a circuit arrangement whereby the time of inactive connections is given

over to and divided equally and automatically among active connections.

My contribution to this art is an arrangement employing start-stop distributing means at the opposite ends of a common channel wherein the high speed and a low speed distributor are used only at the transmitting end, wherein a low speed distributor only is used at the receiving end and wherein the circuits and apparatus employed to perform the necessary functions are cut down to nothing more than a single relay per local station at each end. In the present case the high speed distributor at the transmitting end acts as a sequence allotter and the low speed distributor which may be termed a time allotter in cooperation with the individual relay per local station operates to transmit both identification and intelligence signals.

A feature of the invention is what may be termed, a sequence allotter which continuously tests the various transmitting subscribers' lines and stops at each in turn when they wish to transmit. When such a subscriber's line is in the transmitting condition, this sequence allotter stops its movement, connects the line to the time allotter and after a predetermined period and under control of the time allotter moves forward to test the next transmitting subscriber's line. There the operation is repeated. If, however, the second transmitting subscriber's line is not in a transmitting condition, the sequence allotter does not pause but goes on immediately to another and next in order line.

In accordance with another feature of the invention, the time allotter may be adjusted to allow the transmission of a plurality of character codes during each operation thereof or it may be adjusted to allow the transmission of only a single character code. The design and adjustment of this apparatus depends on the character of the service to be rendered, and it may be varied over wide limits without in any manner departing from the spirit of the invention.

In accordance with another feature of the invention, both the sequence allotter and the time allotter are start-stop devices, that is, they are both driven by constantly rotating shafts through clutch arrangements so that they may be latched in a stationary position and then started at appropriate times through latch releasing actions. The sequence allotter will continuously rotate until latched in a stationary position when a subscriber starts to transmit. The time allotter will remain stationary until released under the same conditions.

Another feature of the invention is an individual latching magnet in the sequence allotter for each station which by its energization under control of such station indicates in the sequence allotter a present capacity in said station to transmit.

Another feature is a single relay per station at each end of the common channel for connecting the station through the start-stop distributor thereat to the common channel. At the transmitting end such single relay is directly under control of the sequence allotter. Through the sequence allotter, this relay is also under the control of the station and the time allotter. At the receiving end, such single relay is under control of its associated relay at the transmitting end. After energization it is held under control by the start-stop distribution thereat.

The drawings comprise three sheets containing Figs. 2, 3 and 4, which, placed as indicated in Fig. 1, form a circuit diagram illustrating the invention.

In Fig. 2 there are shown two stations, the upper marked station A and the lower marked station B. At the extreme left of Fig. 4 there are shown two stations, the upper marked station C and the lower marked station D. Station A and station C form a pair and it appears to the subscribers at these stations that they have a direct, individual and permanently established connection between each other. Likewise, stations B and D form a pair. In the drawings, as shown, only the transmitting apparatus is shown at station A and only receiving apparatus is indicated at station C. For purposes of clarity, only one-way transmission is shown, but it will be understood that transmission in the other direction through similar apparatus and circuits may be carried on.

Station A comprises essentially a tape perforator 1 and a transmitting distributor designated by its arm 2, and a motor 3 operated from a source of current 4 through a circuit including a switch 5. The slip clutch 6, drives the shaft 7 through suitable gearing. Cam 8 on this shaft is arranged to be engaged by a latch 9 through which the shaft 7 may be prevented from rotating. When the magnet 10 is operated then the latch 9 is withdrawn from cam 8 and the shaft 7 is caused to rotate. Thereupon, the arm 2 sweeps over the segments of the distributor and transmits the permutation code set up on the contacts, generally designated 11, as they are operated by the punching of the tape 12. In the position shown, the brush on arm 2 makes connection from positive battery to the line 13, this being a marking stop signal.

Branching off from the line 13 is a relay 14 for operating a monitoring printer 15. A switch 16, known as the tape switch, is closed when sufficient tape has been punched to cause the apparatus at the station A to operate.

Station B is a duplicate of station A and operates in the same way.

In Fig. 3 there is a relay 17 individual to station A and the relay 18 individual to station B. When relay 17 operates it connects the transmission line 13 from station A through the front contact and middle left armature to the intelligence segment 19 of the time allotter. When relay 18 is operated it connects the transmission line from station B to this same segment. When relay 17 is operated it connects the latch magnet of station A through the outer left armature to segment 20 of the time allotter and when relay

18 is operated it connects a similar point from station B to this segment. The tape switch 16 at station A controls latch magnet 21 of the sequence allotter and the tape switch of station B, in a like manner, controls the latch magnet 22 of the sequence allotter.

The main part of Fig. 3 shows a constant speed motor 23 driven from a source of current 24 in a circuit including a switch 25. Through gears 26 and 27 the motor 23 drives the shaft 28 at a constant speed. 29 indicates a slip clutch through which the arm 30 of the sequence allotter is coupled to the shaft 28. The arm 30 is under control of latches operated by the latch magnets 21 and 22 and will rotate continuously at high speed when both of these latch magnets are de-energized. The speed at which this arm travels is preferably as high as possible, having due regard for the inertia of the various parts.

The shaft 28 also drives the shaft 31 through a series of gears 32, 33, 34 and 35, though shaft 31 could as well be driven by a separate motor. As indicated by the proportions of these gears, the shaft 31 is driven at a slower speed than the shaft 28. In this case, a slip clutch 36 drives a distributor arm 37 when this arm is released by the latch under control of latch magnet 38. During the greater proportion of the revolution of the arm 37, the brush 39 will be in contact with the intelligence segment 19 and will connect this to the upper winding of relay 40 for transmission of intelligence over the line 41. The length of time during which brush 39 engages intelligence segment 19 may be a period just sufficient to transmit the permutation code for one character or it may be a period long enough to transmit several permutation character codes. The exact design of this apparatus depends upon the commercial conditions.

In Fig. 4 there is shown a constant speed motor 42 driven from a source of power 43 through a circuit containing switch 44. This motor drives a shaft 45 through a pair of gears 46 and 47. A slip clutch 48 serves to couple a distributor arm 49 to the shaft 45 when this distributor arm is released by the latch magnet 50. The distributor arm 49 is constructed and arranged to travel at practically the same speed as the arm 37. For purposes of practical operation, the arm 49 should complete its revolution slightly ahead of the arm 37. The speed, however, must be accurate enough so that when the brush 39 contacts segments 51, the brush 52 will be in contact with segment 53. Likewise, when brush 39 is in contact with segment 54, brush 52 must be in contact with segment 55.

The operation is as follows: If station A is in a condition to transmit then the tape switch 16 will be closed and latch magnet 21 will be energized. Therefore, arm 30 will be caused to stop in the position shown and, in this position, brush 39 will close a circuit from ground, ring 60, segment 61 to the winding of relay 17. Relay 17, becoming energized, connects the transmission line 13 to intelligence segment 19 as hereinbefore noted and at the same time connects battery to segment 51. Through its right-hand armature, relay 17 connects battery to the latch magnet 38 which withdraws the latch from arm 37 and allows this arm to start its travel. In the idle position as shown, brush 39 connects positive battery on segment 62 to the line segment 63, whereby a marking condition is normally held on the transmission line 41. As soon, however, as magnet 38 becomes operated and withdraws the latch from arm 37,

brush 39 passes off from segment 62 and thereby causes relay 40 to go spacing. This places positive battery on the line 41 which results in the energization of latch magnet 50, whereupon arm 49 is released. Therefore, arm 37 and arm 39 rotate together.

Now as brush 37 passes over segment 51, battery is connected through the inner left armature of relay 17, segment 51, line segment 63 to relay 40. This relay goes marking and applies ground to conductor 41 which is extended from line segment 64 over brush 52 to segment 53 and thence to the winding of relay 65. Relay 65 operates and locks to ground on the back contact of relay 66 so that for the main part of the rotation of arm 49, the line 41 is extended from line segment 64 through brush 52 to segment 67 and thence over the right-hand armature and front contact of relay 65 to line relay 68. This relay responds to the mark and space signals transmitted over line 13 by the tape transmitter at station A and relays the permutation code signals to station C in a well-known manner.

During the rotation of arm 37 the brush 56 establishes a connection from battery over ring 69 to segment 20 and thence over the outer left-hand armature and front contact of relay 17 to the latch magnet 10 at station A. It should be noted that as the arm 37 nears the completion of a rotation, that this circuit will be broken in time to stop the distributor arm 2 before the brush 39 has left segment 19. This arrangement may be made so that from one to any desired number of characters may be transmitted from station A while arm 37 is making a single revolution.

After the brush 56 has passed off segment 20 and neared the point where the arm 37 will be stopped by the latch controlled by magnet 38, a connection will be made over brush 56 and segment 57 to relay 70 resulting in the energization of this relay. This will open the circuit of latch magnet 21, the latch will be withdrawn and arm 30 will be allowed to move forward. Under the assumption that station A only is transmitting, latch magnet 22 will be deenergized and therefore, the arm 30 will not be stopped by magnet 22 when it gets into a position diagonally opposite to that shown but will come around again to the position shown. In the meanwhile, arm 37 has advanced and relay 70 has become deenergized and latch magnet 21 has again become energized.

About the time that relay 70 is energized, brush 52 passes over segment 58 and causes the energization of relay 66 which releases relay 65. Therefore, during one revolution of arm 37 and correspondingly, one revolution of arm 49, a predetermined amount of transmission has taken place by the station A in its connection to station C.

If station B alone were in a condition to transmit then the same sequence of events would take place with the exception that, in this case, a connection would be made over segment 54, instead of segment 51, to cause the operation of relay 71, instead of relay 65. In this manner, station D is coupled with station B in a manner similar to that in which station C was coupled with station A.

If both station A and station B wish to transmit at the same time, then at the end of each revolution of the time allotter arm 37, the sequence allotter arm 30 will move on and be

stopped by a latch magnet under control of the next station in a condition to transmit.

It will be at once apparent that whereas only two transmitting stations and two receiving stations are shown, it is within the spirit of the invention to provide a plurality. This may be done by placing a plurality of segments, such as 61, in the path of the brush 59 of the sequence allotter. In like manner, there will be a corresponding plurality of segments, such as 51 and 54, and a corresponding plurality of segments, such as 53 and 55, with appropriate relays, such as 65 and 71, to effectively connect the line to the appropriate receiving stations. There will of course be a plurality of latch magnets such as 21 and 22 and a plurality of individual relays such as 17 and 18.

What is claimed is:

1. In a telegraph system, a main line, start-stop apparatus including a distributor connected to the ends of said main line, a plurality of extension lines connected to the start-stop apparatus at each end of said main line and an auxiliary distributor cooperating with said start-stop distributor, a start magnet for said auxiliary distributor individual to each of said extension lines connected to said start-stop distributor and operative connections between said auxiliary distributor and said plurality of extension lines.

2. In a communication system, a plurality of subscribers' stations at one locality linked to a like plurality of subscribers' stations at another locality over seemingly direct, individual and permanently established connections, a common channel for said connections between said localities, transmitting means at one locality comprising a high speed sequence allotter for automatically determining the order in which each of said connections shall use said common channel and a slow speed stop-start distributor for identifying every allotted connection by means of a different signal individual to each connection, and rendering it effective for a predetermined length of time, and receiving means at the other of said localities comprising a slow speed start-stop distributor cooperating with said transmitting slow speed stop-start distributor for selecting the receiving end of each allotted connection and rendering it effective for a substantially equal length of time.

3. In a communication system, a plurality of subscribers' stations at one locality linked to a like plurality of subscribers' stations at another locality over seemingly direct, individual and permanently established connections, a common channel for said connections between said localities, transmitting means at one locality comprising a sequence allotter for automatically determining the order in which said connections shall use said common channel and a stop-start distributor for identifying and rendering effective for a predetermined period an allotted connection, operating means responsive to a ready to transmit condition at said stations for effectively associating such stations with said transmitting means comprising a single relay only per station, receiving means at the other said locality comprising a start-stop distributor for selecting the receiving end of an allotted connection and rendering it effective for an equal length of time and operating means responsive to said receiving distributor for effectively associating said receiving stations with said distributor comprising a single relay only per station.

4. In a communication system, a plurality of

subscribers' stations at one locality linked to a like plurality of subscribers' stations at another locality over seemingly direct, individual and permanently established connections, a common channel for said connections between said localities, a sequence allotter for automatically determining the order in which said connections shall use said common channel, means individual to each station for establishing a condition in said sequence allotter indicating a present capacity to transmit, a start-stop distributor for signaling over said common channel the identity of each allotted connection and for rendering said allotted connection effective for a predetermined period and means individual to each station under joint control of said sequence allotter and said distributor for connecting an allotted connection to said common channel.

5. In a communication system, a plurality of subscribers' stations at one locality linked to a like plurality of subscribers' stations at another locality over seemingly direct, individual and permanently established connections, a common channel for said connections between said localities, a sequence allotter for automatically determining the order in which said connections shall use said common channel, means individual to each station for establishing a condition in said sequence allotter indicating a present capacity to transmit, a start-stop distributor for signaling over said common channel the identity of each allotted connection when said allotted connection is rendered effective and for rendering said al-

lotted connection effective for a predetermined period, a single relay only individual to each station for connecting an allotted connection through said distributor to said common channel and means jointly controlled by said distributor and said stations for controlling said relays.

6. In a communication system, a plurality of subscribers' stations at one locality linked to a like plurality of subscribers' stations at another locality over seemingly direct, individual and permanently established connections, a common channel for said connections between said localities, a sequence allotter for automatically determining the order in which said connections shall use said common channel, means individual to each station for establishing a condition in said sequence allotter indicating a present capacity to transmit, a start-stop distributor for signaling over said common channel the identity of an allotted connection and for connecting said common channel in said allotted connection for a predetermined period, only a single relay individual to each station for connecting said station to said distributor at the transmitting end of said common channel, a start-stop distributor at the receiving end of said common channel cooperating with said first distributor and only a single relay individual to each station thereat for connecting each said station to said second distributor.

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