

March 10, 1959

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2,877,444

REMOTE SELECTING SYSTEM AND APPARATUS

Filed May 6, 1955

2 Sheets-Sheet 1

FIG. 1

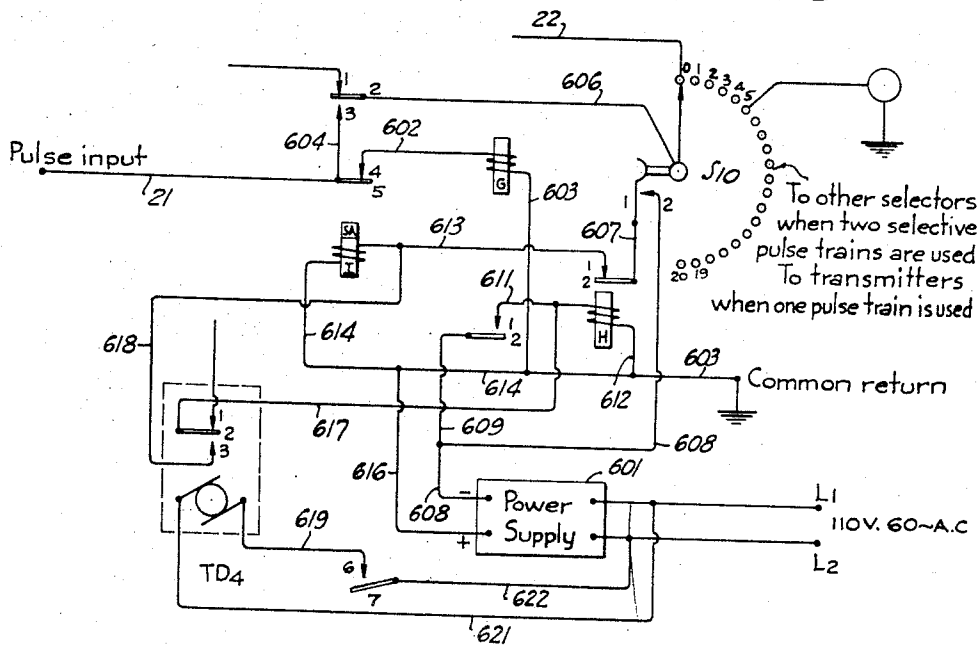
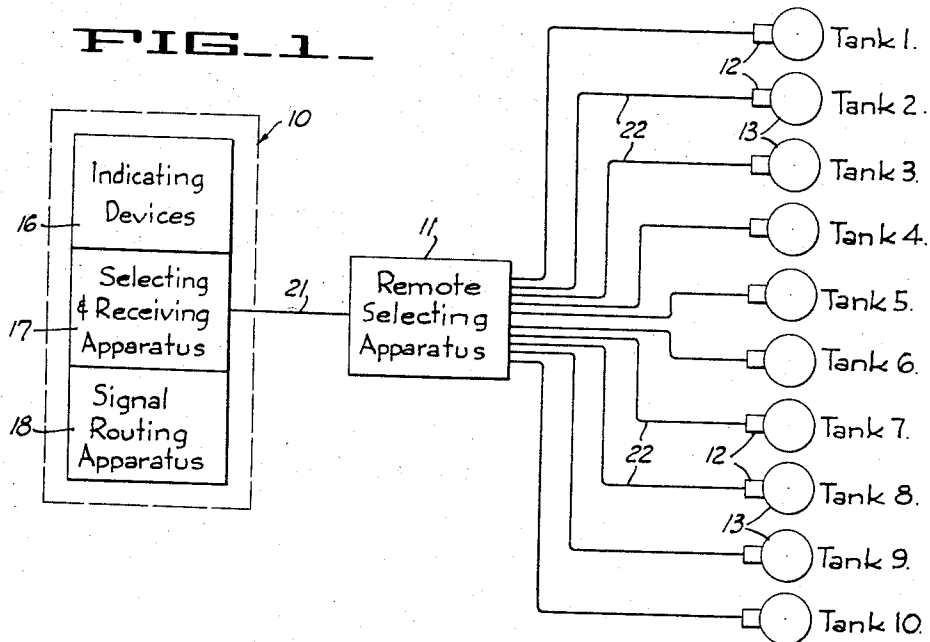


FIG. 2

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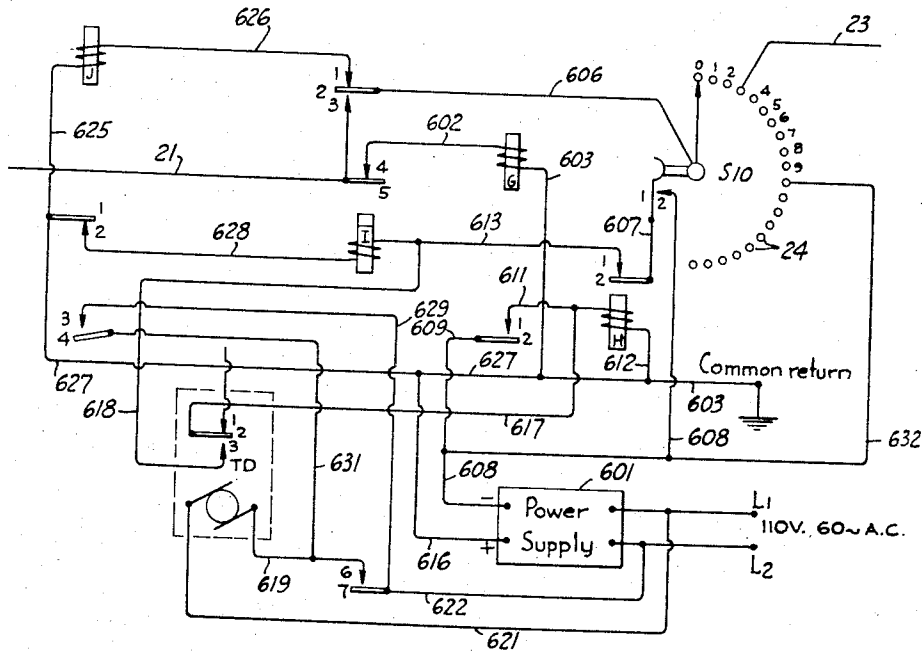
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2 Sheets-Sheet 2

FIG. 3



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REMOTE SELECTING SYSTEM AND APPARATUS

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Application May 6, 1955, Serial No. 506,513

5 Claims. (Cl. 340-147)

This invention relates generally to a remote selecting system and apparatus and more particularly to a system and apparatus of this type for use in telemetering systems.

In many instances, it is desirable to provide remotely located means for selecting a particular device in reading and metering operations. By way of example, it may be desirable to select a particular pulse transmitter of the type disclosed in co-pending application Serial No. 342,402, filed March 16, 1953 in the names of Ellsworth A. Hosmer, Jack S. Hawley and Albert E. Jurs, Jr., from a plurality of such transmitters situated in proximity to the remote selecting apparatus.

In general, it is an object of the present invention to provide remote selecting apparatus of the type adapted to be actuated by one or more series of pulses for selecting a particular device.

Another object of the invention is to provide an apparatus of the above character which is adapted to complete a circuit to the selected device for a predetermined interval of time.

Another object of the invention is to provide apparatus of the above character adapted to automatically "home" itself.

Another object of the invention is to provide apparatus of the above character which can be cascaded.

Another object of the invention is to provide apparatus of the above character adapted to be operated by two or more series of pulses to select another remote selecting apparatus or to select a particular device proximately located to the first named remote selecting apparatus.

A further object of the invention is to provide apparatus of the above character which will automatically "home" itself at the end of one series of pulses if a second series of pulses is not transmitted within a predetermined interval of time.

Other objects and advantages of the invention will appear from the following description taken in conjunction with the accompanying drawings.

Referring to the drawing:

Figure 1 is a block diagram of a telemetering system incorporating a remote selecting apparatus embodying the present invention.

Figure 2 is a circuit diagram of one embodiment of my invention illustrating remote selecting apparatus of the type adapted to receive a single series of selecting pulses.

Figure 3 is a circuit diagram of another embodiment of my invention illustrating a remote selecting apparatus of the type adapted to receive two series of selecting pulses.

The telemetering system illustrated in the block diagram of Figure 1 consists of a reading station 10 connected through remote selecting apparatus 11 to a plurality of transmitters 12 situated at remotely located tanks 13. The transmitters 12 may be of the type disclosed in co-pending application Serial No. 342,402 filed March 16, 1953 now Patent No. 2,814,798 and may be connected to different devices within the tanks 13 so that the

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transmitters may relay information to the reading station 10, for example, information relating to liquid level and temperature.

The reading station 10 illustrated in the block diagram of Figure 1 consists of a plurality of indicating devices 16 which may be of any suitable type adapted to be actuated by pulses and may be graduated in terms of feet and inches to receive liquid level information. The reading station 10 also includes selecting and receiving apparatus 17 and signal routing apparatus 18. The signal transmitting and receiving apparatus 17 and the signal routing apparatus 18 may be of the type disclosed in my co-pending application Serial No. 506,560 filed May 6, 1955.

Any suitable means may be utilized for connecting the reading station 10 to the remote selecting apparatus 11 such as wire or radio and which in this instance will be shown as line 21. The remote selecting apparatus 11 is connected to transmitters 12 in the vicinity thereof by a plurality of lines 22. However, if desired, radio or similar means can be utilized.

In general, as described in my co-pending application Serial No. 506,560 filed May 6, 1955, the selecting and receiving apparatus 17 and the signal routing apparatus 18 includes selecting means, the actuation of which causes the transmission of one or more series of selecting pulses, the number of pulses being determined by the transmitter 12 to be selected. These selecting pulses are received by the remote selecting apparatus 11 to actuate the same to cause it to select the proper conductor 22 connected to the desired transmitter 12. After the connection is established, the selecting and receiving apparatus 17 and the signal routing apparatus 18 send a start pulse over line 21 through the remote selecting apparatus 11 and through conductor 22 to the selected transmitter 12.

The start pulse initiates operation of the selected transmitter 12 causing it to send one or more series of confirming code pulses, and one or more additional series of pulses. These pulses are all sent over conductor 22 through the remote selecting apparatus 11 and through conductor 21 to the signal routing apparatus 18. The confirming code pulses actuate confirming code means in the selecting and receiving apparatus 17 and the additional series of indicating pulses are received by the indicating devices 16 to give a visual or audio indication of the information transmitted by the selected transmitter 12.

After completion of the reading operation, the reading station, the remote selecting apparatus 11 and the transmitters 12 are provided with means whereby they are returned to their home positions after which they are in condition for an additional reading operation.

As shown schematically in Figure 2, the remote selecting apparatus 11 consists of a plurality of relays, relays G and I, a step coil H, a stepping switch S10, a time delay device TD-4 and a D. C. power supply 601. Relay G is provided with contacts 1 and 2, step coil H is provided with self interrupting contacts 1 and 2, and relay I is provided with contacts 1 through 7. The time delay device TD-4 is provided with contacts 1 through 3. Stepping switch S10 is provided with a plurality of terminals, terminals 1 through 20 and with off-normal contacts 1 and 2. The D. C. power supply 601 is connected to a suitable source of power such as 110 volts 60 cycle A. C. by lines L1 and L2.

As described previously, the remote selecting apparatus 11 can be connected to the reading station 10 by any suitable means such as line 21. In this instance, line 21 is connected to movable contact 5 of relay I. Stationary contact 4 of relay I is connected to one side of the winding of relay G by conductor 602. The other side

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of the winding of relay G is connected to ground by conductor 603. Stationary contact 3 of relay I is connected to line 21 by conductor 604. Movable contact 2 of relay I is connected to the wiping contact of switch S10 by conductor 606. The terminals 1 through 20 of switch S10 are connected to a plurality of transmitters 12 by any suitable means such as a plurality of conductors 22.

Off-normal contact 1 of switch S10 is connected to movable contact 2 of step coil H by conductor 607. Off-normal contact 2 of switch S10 is connected to the negative terminal of the D. C. power supply 601 by conductor 608. Conductor 608 is connected to movable contact 2 of relay G by conductor 609, stationary contact 1 of relay G is connected to one side of the step coil H by conductor 611 and the other side of the step coil H is connected to conductor 603 by conductor 612.

Stationary contact 1 of step coil H is connected to one side of the winding of relay I by conductor 613 and the other side of the winding of relay I is connected to conductor 603 by conductor 614. Conductor 614 is connected to the positive terminal power supply 601 by conductor 616.

Movable contact 2 of TD-4 is connected to conductor 611 by conductor 617 and stationary contact 3 of TD-4 is connected to conductor 613 by conductor 618.

Stationary contact 6 of relay I is connected to one side of the motor of time delay device TD-4 by conductor 619 and the other side of the motor of time delay device TD-4 is connected to line L1 by conductor 621. Movable contact 7 of relay I is connected to line L2 by conductor 622.

The operation of the remote selecting apparatus as shown in Figure 2 may now be briefly described as follows: It is apparent from Figure 2 that when the remote selecting apparatus 11 is in its "home" position, the line 21 is grounded. This circuit is completed from line 21, through contacts 4 and 5 of relay I, the winding of relay G, conductor 603 to ground. Let it be assumed that a series of selecting pulses are being sent by the reading station 10 over line 21 to the remote selecting apparatus 11 in a manner described in my copending application Serial No. 506,560 filed May 6, 1955. The G relay will be operated by each of these pulses and hence it can be said to "follow" the pulses. The circuit is completed from line 21 through contacts 4 and 5 of relay I, the coil of relay G, conductor 603 to ground.

The periodic operation of the G relay will periodically open and close contacts 1 and 2 of the G relay which will in turn energize step coil H. This circuit is completed from the negative terminal of the D. C. power supply 601 through conductor 608, conductor 609, contacts 1 and 2 of relay G, conductor 611, the step coil H, conductor 612, conductor 603 to ground. Thus, step coil H will be energized a number of times equal to the number of pulses sent over the line 21. The wiping contact of switch S10 will thus be advanced to a terminal equal to the number of pulses sent over the line 21.

It is apparent that as soon as the wiping contact has moved from terminal zero to terminal 1, the off-normal contacts 1 and 2 will be closed which will cause energization of the relay I. This circuit is completed from the negative terminal of the D. C. power supply 601 through conductor 608, off-normal contacts 1 and 2 of the switch S10, interrupting contacts 1 and 2 of step coil H, conductor 613, the winding of relay I, conductor 614, conductor 603 to ground. However, relay I is of the "slow acting" type and will not be operated during the reception of the selecting pulses because the energizing circuit for relay I is periodically broken by interrupting contacts 1 and 2 of step coil H. Thus, it can be said that relay I does not follow the selecting pulses. However, as soon as transmission of the selecting pulses has terminated, a predetermined interval will elapse during which relay I will operate closing its contacts 6 and 7 to energize the motor of time delay device TD-4.

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Energization of relay I also closes its contacts 2 and 3 and opens its contacts 4 and 5 so that when the start pulse is transmitted over line 21, as described in my copending application Serial No. 506,560, filed May 6, 1955 the start pulse will be transmitted over the proper line 22 to the selected transmitter 12. The opening of contacts 4 and 5 prevents the operation of relay G by the start pulse.

After the start pulse has been transmitted to the transmitter, the transmitter sends the confirming code pulses and additional series of pulses as previously described.

After a predetermined interval, during which the transmitter has sent the above information, the time delay device TD-4 operates closing its contacts 2 and 3. Closure of contacts 2 and 3 of TD-4 energizes the circuit for step coil H to return switch S10 to its "home" position. The circuit is completed from the negative terminal of the D. C. power supply 601, through conductor 608, off-normal contacts 1 and 2 of switch S10, conductor 607, contacts 1 and 2 of step coil H, conductor 613, conductor 618, contacts 2 and 3 of TD-4, conductor 617, step coil H, conductor 612, conductor 603 to ground. As soon as step coil H is energized, it will open its interrupting contacts 1 and 2 de-energizing itself to re-establish the energizing circuit. Thus, the switch S10 will be stepped around until it returns to its "home" position and the energizing circuit is opened by off-normal contacts 1 and 2.

It will be noted that during this stepping operation of switch S10 to the "home" position, the energizing circuit to the I relay is periodically interrupted by opening of the contacts 1 and 2 of stepping coil H. However, since the I relay is of the "slow acting" type, it will not release movable contacts 5 and 7, but as soon as the switch S10 has been stepped to its "home" position, the energizing circuit for relay I will remain open for sufficient time to allow relay I to release. Release of relay I will close its contacts 1 and 2 and 4 and 5 and will open its contacts 2 and 3 and 6 and 7. Its contacts 2 and 3 will be opened disconnecting line 21 from the wiping contact of switch S10. Closure of contacts 4 and 5 reconnects line 21 to relay G. The opening of contacts 6 and 7 deenergizes the circuit of the motor of time delay device TD-4. The time delay device TD-4 is provided with means for automatically resetting itself upon de-energization. It is apparent that this device is now in its normal resting or "home" position and is adapted to be operated by another series of selecting pulses.

It is apparent that the remote selecting apparatus 11 shown in Figure 2 can be used in conjunction with other remote selecting apparatuses 11 for selecting a predetermined transmitter from a large group of transmitters merely by cascading the remote selecting apparatuses 11 and sending two or more series of selecting pulses. The first series of selecting pulses would be sent over line 21 and will serve to step the switch S10 to the proper terminal, the selected terminal being connected to another remote selecting apparatus 11 identical to that shown in Figure 2. The second series of pulses will pass from the line 21 through contacts 2 and 3 of relay I, conductor 606, the wiping contact of switch S10, through the selected terminal and conductor 22 to another selecting apparatus 11 which will be operated in a manner similar to that described above to select a transmitter connected to one of the terminals of the second remote selecting apparatus 11.

As shown schematically in Figure 3, I have shown another embodiment of my remote selecting apparatus which differs in the following manner. An additional relay J is provided to permit the remote selecting apparatus 11 to accept two series of selecting pulses to permit remote selection of additional remote selecting apparatuses 11 and local selection of transmitters in the vicinity of the first remote selecting apparatus 11. Relay J is provided with contacts 1 through 4 which are connected to the

apparatus in the following manner. Movable contact 1 of relay J is connected to one side of the winding of relay J by conductor 625 and the other side of the winding of relay J is connected to stationary contact 1 of relay I by conductor 626. Movable contact 1 of relay J is also connected to conductor 603 by conductor 627 and conductor 627 is connected to the positive terminal of power supply 601 by conductor 616. Stationary contact 2 of relay J is connected to one side of the winding of relay I by conductor 628 and stationary contact 3 of relay J is connected to conductor 622 by conductor 629. Movable contact 4 of relay J is connected to conductor 619 by conductor 631.

Terminals 1 to 9 of switch S10 are connected to remotely located selecting apparatuses 11 by any suitable means such as wire or radio, but in this instance have been shown to be connected by a plurality of lines 23. Terminal 10 of switch S10 is connected to conductor 608 by conductor 632. The remainder of the terminals of switch S10 may then be connected to proximately located transmitters by any suitable means such as conductors 24.

The operation of the apparatus shown in Figure 3 may now be briefly described as follows: The transmission of the first series of pulses from the reading station 10 over the line 21 will cause the apparatus to operate in a manner very similar to that described for the operation of the apparatus in Figure 2, i. e., the wiper of switch S10 will be advanced to a terminal corresponding to the number of pulses sent over the line 21. For example, if three pulses are sent, the wiping contact of switch S10 will be advanced to terminal 3 and contacts 2 and 3 of the I relay will be closed, whereupon the second series of pulses will be transmitted out through terminal 3 of switch S10 through line 23 to the remotely located remote selecting apparatus 11 to cause it to select a predetermined transmitter.

However, if it is desired to select one of the transmitters proximately located to the remote selecting apparatus herein described, the following sequence of operations take place: Let it be assumed that the first series of selecting pulses consists of ten pulses, and that the wiper of switch S10 is advanced to terminal 10. This will cause the operation of relay J and prevent the operation of relay I. The circuit for energizing the J relay is completed from the negative terminal of the D. C. power supply 601, through conductor 608, conductor 632, terminal 10 of switch S10, the wiping contact of switch S10, conductor 606, contacts 1 and 2 of relay I, conductor 626, the winding of relay J, conductor 625, conductor 627, conductor 603 to ground. Operation of relay J opens its contacts 1 and 2 and thus prevents the operation of relay I.

The remote selecting apparatus 11 is now in condition to receive a second series of selecting pulses from line 21 which will cause the wiping contact of step switch S10 to be advanced an additional number of terminals, the number depending upon the number of pulses received from line 21, to select a proximately located transmitter 12. The advancement of the wiping contact of step switch S10 opens the circuit for energizing relay J and thus allows the I relay to be operated after completion of reception of the second series of pulses. Operation of relay I energizes time delay device TD-4. After a predetermined interval during which predetermined information is sent from the transmitter 12, time delay device TD-4 operates to close its contacts 2 and 3 to start the homing cycle previously described for Figure 2.

If for some reason, a second series of pulses is not received by the remote selecting apparatus shown in Figure 3, the apparatus will be returned to a "home" or "resting" position in the following manner. Assuming that the first series of pulses has been received and that the wiping contact of switch S10 has been advanced to terminal 10 and that relay J has been energized, the energization of relay J will close its contacts 3 and 4 to

energize the motor of the time delay device TD-4. If the second series of pulses is not received during the predetermined time interval set up on the time delay device TD-4, contacts 2 and 3 of TD-4 will be closed to energize step coil H to advance the wiping contact of switch S10 from terminal 10 to terminal 11. This causes release of relay J and de-energization of time delay device TD-4.

However, since off-normal contacts 1 and 2 of switch S10 are still closed because switch S10 is still on terminal 11, relay I will become energized in a manner previously described. Energization of relay I will close its contacts 6 and 7 to again energize time delay device TD-4 which after a predetermined interval of time will again close its contacts 2 and 3 to energize step coil H to cause the switch S10 to advance to its "home" or "rest" position after which it will be in condition for receipt of selecting pulses.

It will be evident from the foregoing that I have provided remote selecting apparatus which is suitable for selecting a predetermined device from a great plurality of devices proximately or remotely located. Any number of devices can be read from one reading station merely by cascading my remote selecting apparatuses. In addition, it is apparent that means has been provided for selecting devices proximately located to the remote selecting apparatus and for selecting devices remotely located from the remote selecting apparatus.

I claim:

1. In a selecting apparatus of the character described adapted to be actuated by a series of pulses received on an incoming line to select a device from a plurality of such devices, the apparatus comprising a switch, a plurality of terminals on said switch, said terminals being connected to said devices, said switch including a wiping contact movable from a home position and adapted to engage said terminals successively, said switch also including off-normal contacts and a stepping coil having interrupting contacts in series with said off-normal contacts, said off-normal contacts being open only when said wiping contact is in its home position, and circuitry connecting said switch to said incoming line, said circuitry including relay means responsive to said pulses for causing energization of said stepping coil each time a pulse is received on said incoming line, time delay means, and additional relay means operated after all of said series of pulses have been received for starting operation of said time delay means, said time delay means including switch means for causing operation of said stepping coil after a predetermined interval through said interrupting contacts and said off-normal contacts for returning said wiping contacts to a home position.

2. Selecting apparatus as in claim 1 wherein said relay means responsive to said pulses includes a relay which follows said pulses and wherein said additional relay means operated after receipt of said pulses includes a relay which does not follow said pulses.

3. In a selecting apparatus of the character described adapted to be actuated by first and second series of pulses received on an incoming line to select a device from a plurality of such devices, a first selection apparatus comprising a switch, a plurality of terminals on said switch, said switch including a wiping contact movable from a home position and adapted to engage said terminals successively, said switch also including off-normal contacts, and a stepping coil having interrupting contacts in series with said off-normal contacts, said off-normal contacts being open only when said wiping contact is in its home position, and circuitry connecting said switch to said incoming line, said circuitry including relay means responsive to said first series pulses for operating said stepping coil each time a pulse is received in said first series of pulses, time delay means, and additional relay means operated after said first series of pulses are received for starting operation of said time delay means,

said time delay means including switch means for causing operation of said stepping coil after a predetermined interval through said interrupting contacts and said off-normal contacts for returning said wiping contacts to said home position, a plurality of second selection apparatuses connected to predetermined terminals of said first selection apparatus, each of said second selection apparatuses comprising a switch, a plurality of terminals on said last named switch, said last named terminals being connected to said devices, said last named switch including a wiping contact movable from a home position and adapted to engage said last named terminals successively, said last named switch also including off-normal contacts and a stepping coil having interrupting contacts in series with said off-normal contacts, said last named off-normal contacts being open only when said last named wiping contact is in its home position, and circuitry connecting said last named switch to one of said terminals on said first selection apparatus, said last named circuitry including relay means responsive to said second series of pulses for operating said stepping coil each time a pulse is received in said second series, time delay means, and relay means operated after said second series of pulses have been received for starting operation of said last named time delay means, said time delay means including switch means for causing operation of said last named stepping coil after a predetermined interval of time through said last named interrupting contacts and said last named off-normal contacts for returning said last named wiping contact to a home position.

4. In a selecting apparatus of the character described adapted to be actuated by a series of pulses received on an incoming line to select a device from a plurality of such devices, a switch, a plurality of terminals on said switch, said terminals being connected to said devices, said switch including a wiping contact movable from a home position and adapted to engage said terminals successively, said switch also including off-normal contacts, and a stepping coil having interrupting contacts in series with said off-normal contacts, said off-normal contacts being open only when said wiping contact is in its home position, and circuitry connecting said switch to said incoming line, said circuitry including a first relay having first, second and third sets of contacts, a second relay having one set of contacts, a power supply and time delay means, said first set of contacts being normally open and adapted to connect said incoming line to said wiping contact, said second set of contacts being normally closed and connecting said incoming line to said second relay whereby upon receipt of pulses on said incoming line said second relay is operated by each pulse, said one set of contacts for said second relay being normally open and connecting said power supply to said stepping coil whereby upon each operation of said second relay said stepping coil is operated to advance the wiping contact to the next terminal, said third set of contacts being normally open and being adapted to connect said time delay means to said power supply, said first relay being connected to said power supply through said interrupting contacts and said off-normal contacts and being operated only after receipt of all of said series of pulses, said time delay means including normally open contacts which are closed after a predetermined interval of time after operation of said time delay means to cause energization and operation of said stepping coil through said interrupting contacts, the interrupting contacts serving to repeatedly energize and de-energize the stepping coil to rapidly advance the wiping contact to its home position.

5. In a selecting apparatus of the character described

adapted to be actuated by first and second series of pulses received on an incoming line to select a device from a plurality of such devices, a first selection apparatus comprising a switch, a plurality of terminals on said switch, said switch including a wiping contact movable from a home position and adapted to engage said terminals successively, said switch also including off-normal contacts and a stepping coil having interrupting contacts in series with said off-normal contacts, said off-normal contacts being open only when said wiping contact is in its home position, and circuitry connecting said switch to said incoming line, said circuitry including relay means responsive to said pulses for operating said stepping coil each time a pulse is received in the first series of pulses on said incoming line, time delay means, relay means normally operated after receipt of said first series of pulses for starting operation of said time delay means, means actuated by movement of said wiping contact to a predetermined terminal of said switch to prevent operation of said means operated after receipt of said first series of pulses to permit said second series of pulses to cause operation of said stepping coil, said last named means only being actuated during the time said wiping contact is in engagement with said predetermined terminal, said time delay means including switch means for causing operation of said stepping coil after a predetermined interval of time through said interrupting contacts and said off-normal contacts for returning said wiping contact to a home position, a plurality of second selection apparatuses connected to the terminals of said switch between a home position and said predetermined terminal, the other terminals of said switch being connected to proximately located devices, each of said second selection apparatuses comprising a switch, a plurality of terminals on said last named switch, said last named terminals being connected to additional devices, said last named switch including a wiping contact movable from a home position and adapted to engage said last named terminals successively, said last named switch also including off-normal contacts and a stepping coil having interrupting contacts in series with said off-normal contacts, said last named off-normal contacts being open only when said wiping contact is in its home position, and circuitry connecting said last named switch to one of the terminals of said first named switch, said last named circuitry including means responsive to said second series pulses for operating said stepping coil each time a pulse is received in said second series of pulses, time delay means and means operated after said second series of pulses are received for starting operation of said last named time delay means, said last named time delay means including means for causing operation of said stepping coil after a predetermined interval of time through said interrupting contacts and said off-normal contacts for returning said wiping contact to a home position.

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