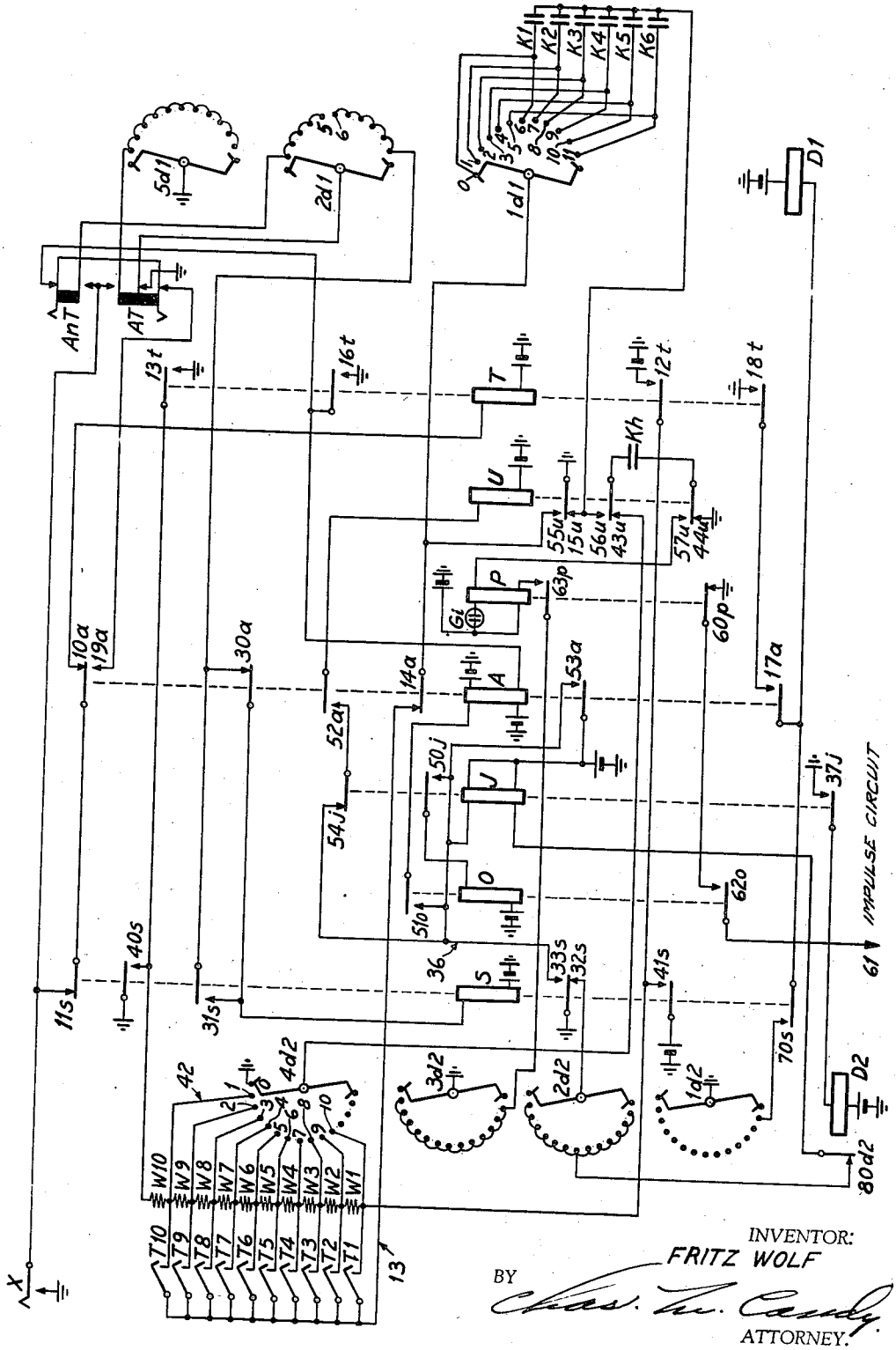
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IMPULSE TRANSMITTER

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IMPULSE TRANSMITTER

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The present invention relates to a registering device and in particular to a register-sender for telephone systems.

The purpose of the invention is to register switching critera, for example digits to be transmitted, and subsequently to transmit them, this being realized in that the switching criterion is taken up by a condenser, the number of switching operations required being determined by the application of potential up to a definite limiting value.

A further characteristic of the invention resides in that the striking potential of a glow lamp serves to mark the limiting potential.

An embodiment of the invention is represented in the drawing. The invention is not limited to this embodiment. Only those details which are necessary for the comprehension of the invention have been shown.

The embodiment represents a sender switch which is provided with a condenser for each digit, the condensers being charged to a potential by depressing a digit key, the potential corresponding to the key depressed. If, for example, the key 6 is depressed the potential only becomes sufficiently high for the glow lamp to strike after six impulses. (For gradually increasing the charging potential a rotary switch is used according to the invention. Naturally relays could alternatively be used for this purpose.)

The rotary switch with the rotary magnet D1 serves to connect up the individual condensers K1 to K6, while the rotary switch having the rotary magnet D2 serves to connect the additional potential in stages. The additional potential is supplied from an auxiliary condenser K*h*. The glow lamp is indicated by the reference G*i*.

For controlling the metering switch a single row of keys is provided. The individual keys are transitorily depressed in succession by the party operating the device. During the transitory depression of the keys the corresponding condenser is charged with a definite potential so that the potential corresponds to the particular key depressed.

The arrangement operates therefore in the following way:

Each time one of the keys T1 to T10 is depressed the key X is also depressed automatically. Through the closing of this key the following circuit for relay T is completed: earth, battery, the winding of relay T, contacts 10*a*, 11*s*, key X, earth. In this circuit relay T energizes. Through the closing of contacts 12*t* and 13*t* current is applied to the resistance W1 to W10. If now the first key to be depressed is the key T1 the condenser K1 which corresponds to the first level is charged in the following circuit: earth, battery, contact 12*t*, key T1, lead 13, contact 14*a*, wiper 1*d*1 of the rotary switch D1 in position 0, condenser K1, contact 15*u*, earth. Through the closing of contact 16*t* a circuit is completed for the upper winding of relay A. The following circuit for the rotary magnet D1 of the rotary switch is completed through the closing of contacts 17*a* and 18*t*: earth, battery, rotary magnet D1, contacts 17*a*, 18*t*, earth. The switch D1 consequently takes a step forward so that its wiper 1*d*1 has now passed from contact 0 to contact 1. Through the opening of contact 10*a* and the closing of contact 19*a*, relay T is disconnected. Relay T releases and by opening contact 18*t* the circuit for D1 is opened again. Relay A holds up although contact 16*t* has opened so long as the key X remains depressed. The locking circuit for relay A is as follows: earth, battery, the upper winding of relay A, key A*n*T, key AT, (the purpose of these keys will be described later), contacts 19*a*, 11*s*, key X, earth. Since the key X is still depressed during the step taken by the switch the potential destined for condenser K1 must be prevented from operating on the condenser K2. This is provided for in that contact 14*a* in the lead 13 is open during the step. The switch D1 now stands therefore with its wiper 1*d*1 on the first contact of its contact bank and thus connects up the condenser K2 which is provided for the second level. If now a key T6 is depressed condenser K2 is charged to a corresponding potential. While on the depression of the key T1 charge took place at a potential of, for example, —60 volts, after the depression of the key T6 a potential of —30 volts is applied to the condenser K2. The potential applied by the different keys varies from key to key by 6 volts. At the same time as key T6 is depressed the key X will close again so that the operations already described are repeated, i. e., the switch D1 takes a further step under the action of contact 17*a* and 18*t* so that now wiper 1*d*1 stands on contact 2 of the contact bank and is connected by condenser K3. This condenser is now similarly charged by the depression of any other key in the single keyset provided. These operations are continued as many times as there are digits in the subscriber's number to be transmitted. It will be assumed that 6

digits are to be transmitted. Thus the condenser K6 is the last to be charged i. e. wiper 1*d*1 of the rotary switch D1 occupies position 5. The person operating the impulse sender can thus transitorily depress in succession the keys in the key strip in accordance with the digits to be transmitted and the digits are then registered by the aid of the condensers K1 to K6 so that the transmission can commence. The switch D1 which serves to connect the individually charged condensers K1 to K6 now has its wiper 2*d*1 on contact 6 in the contact bank. The following circuit for relay S is now closed: earth, battery, winding of relay S, contact 30*a*, contact 6 in the bank of wiper 2*d*1, key AT and earth. In this circuit relay S energizes and closes its contact 31*s* and thus locks up. Through the opening of contact 32*s* and the closing of contact 33*s* the following circuit is completed for relay J; earth, battery, the upper winding of relay J, lead 36, contact 33*s* and earth. Relay J energizes in this circuit. Through the closing of contact 37*j* the rotary magnet D2 of the switch D2 is subjected to current. Wiper 4*d*2 takes a step forward and passes to position 1 in its contact bank. Since now relay T has released the functions of contacts 12*t* and 13*t* are taken over by contacts 40*s* and 41*s*. The auxiliary condenser K*h* is charged in the following circuit: earth, battery, resistance W1—W9 lead 42, wiper 4*d*2, the contact 43*u*, auxiliary condenser K*h*, contact 44*u* and earth. The auxiliary condenser K*h* is charged at 6 volts in this circuit in dependence upon resistance W10. On the energizing of relay J moreover contact 50*j* was closed and thus a circuit was completed for relay O. Relay O closes its contact 51*o* and thus completes a circuit for the lower winding of relay A. Relay A closes its contact 52*a* in the circuit for relay U. Since relay A closes its contact 53*a* the upper winding of relay J is short-circuited and this relay makes the delayed release. Since contact 52*a* is closed the closing of contact 54*j* completes a circuit for relay U. The circuits described pass to earth over contact 33*s*; relay U opens its contact 15*u* and closes its contact 55*u*. Moreover contact 43*u* is opened and contact 56*u* closes. Finally contact 44*u* is opened and contact 57*u* closes. Since through the closing of contacts 56*u* and 57*u* both condensers, in this case K1 and the auxiliary condenser K*h*, are connected in series, the potential is sufficient to cause the discharge tube G*i* to strike. According to the embodiment the striking potential of the discharge tube G*i* is 126 volts. Through the connection in series of the condenser K1 which in this case has been charged to a potential of 60 volts through the depression of the key T1 and the auxiliary condenser K*h* which has a potential of 6 volts and including the potential of the battery at the discharge tube of 60 volts the potential of 126 volts is reached. The discharge circuit is over contact 55*u* and wiper 1*d*1 in position 6 to earth. In this case therefore the striking potential of the discharge tube is reached after one step of the switch D2 and relay P energizes over its upper winding in series with the glow lamp and thus terminates the transmission of impulses by opening contact 60*p* in the sending circuit. Since the key T1 was depressed only one impulse had to be transmitted over the lead 61. Through the energizing of relay O the contact 62*o* was closed once.

Instead of the discharge tube a different device can be provided having the effect of causing the relay P controlling the impulse transmission to energize at a given potential. For example, a so-called lightning arrestor can be provided also the arrangement can be made to operate so that relay P did not energize but release.

Through the energizing of relay P contact 63*p* is also closed; thereby the lower winding of relay P is connected in the following circuit: earth, battery, lower winding of relay P, contact 63*p*, wiper 3*d*2, of the switch D2 and earth. In this circuit relay P holds up. Relay S is consequently made independent of contact 30*a*. If, for example, switch D1 has reached position 6 and the key depressed has not yet been released relay S would energize and the transmission of impulse trains would commence. In order to prevent this it is made necessary for relay A to release and to close contact 30*a* after the release of the key last depressed before relay S energizes. Since contact 30*a* opens and closes continuously on the impulsing it is shunted by contact 31*s* of relay S.

The relay group J, O and A operates meanwhile in the manner described so that the switch D2 is brought to the rest position over contact 37*j*. The homing period of the switch D2 provides sufficient time between the impulse trains transmitted for the necessary switching operations to take place at the switches to be set by the impulsing trains. Since wiper 4*d*2 in the zero position of switch D2 is connected to earth the condenser K*h* in the event of its having a residual potential, is discharged in order to be ready in a discharged state for the next charging operation. When the switch D2 executes the last step its wiper 1*d*2 earths the last rotary contact and thus closes a circuit for the rotary magnet D1, since contact 70*s* is closed, so that the associated switches make one step and pass into position 7.

In spite of wiper 2*d*1 being now in position 7 relay S remains energized. Wiper 3*d*2 of switch D2 has passed away from its continuous contact bank and has returned to the rest position consequently relay P is deenergized and contact 60*p* in the impulsing circuit has again closed. Meanwhile the relay group J, O, A has operated again. The closing of contact 62*o* which lies in the impulsing circuit cannot be effective however so long as contact 60*p* is open. Since now contact 60*p* is closed the impulses proceeding from this relay group are again operative. The switch D2 is advanced. The second digit to be transmitted is the digit 6 i. e. the key T6 has been depressed. The condenser K2 was thus charged at —30 volts. In order now to reach the striking potential of the discharge tube G*i* (126 volts) it is necessary to apply 6 volts six times to the auxiliary condenser K*h*. Relay U has operated at each step of the switch D2 and has operated its contacts as above described. It is thus determined on the individual steps whether the potential produced by the connection in series of the condenser K2 and K*h* is sufficient to strike the discharge tube. This striking potential is, however, only reached when the wiper 4*d*2 has reached position 6 in its contact bank. Meanwhile impulses are transmitted over contact 62*o* until in position 6 of the switch D2 relay P energizes as already explained and locks up and at contact 60*p* disconnects the impulse circuit to terminate the impulse transmission. The switch D2 then restores to its original position

thereby providing the time necessary between the transmission of impulse trains and whereby relay P again releases for the purpose of influencing the next impulse train to be transmitted.

The other digits are transmitted in the same way. The case will now be described in which the last digit is the digit 10. In this case the condenser K6 is charged in dependence upon the key T10 which has been depressed, to a potential of 6 volts. In this case the switch D2 must execute 10 steps in order to impart an additional potential of 10 times 6 volts—60 to the auxiliary condenser K*h* so that again the striking potential of 126 volts is connected to the discharge tube whereupon ten impulses are transmitted.

The arrangement thus operates so that an additional six volts is connected up on each successive step and that during each step one impulse is transmitted. It could also be arranged that through this successive application of auxiliary potential a particular position of the switch D2 is reached and from this position a corresponding number of impulses could thus be transmitted i. e. so that the transmission of impulses should remain dependent upon the successive application of additional potential but would not take place simultaneously with the application of potential.

Furthermore the system could be so arranged that a plurality of condensers and auxiliary condensers are provided which when charging are connected in parallel and when discharging are connected in series whereby higher potential stages could be used. The arrangement could, of course, also be reversed so that on charging the condensers are connected in series and on discharging in parallel.

For the case in which the impulses to be transmitted do not have the same number of digits as frequently occurs in telephone systems it is arranged that the digits registered can be transmitted after less than six digits have been so registered. Assuming that in the present case only one digit, for example the digit 1, is to be transmitted the rotary switch D1 must be brought into the sending position after the reception of one digit. This is able to be effected by the depression of the key A*n*T. Through the depression of this key relay T energizes and together with relay A, the two relays acting as an interrupter, brings the rotary switch to position 6 in which relay S energizes and disconnects relays A and T at contact 11*s*. In position 6 the same operations occur as already described when the switch D2 was brought to position 6. In the present case the switch D2 is restored to normal by depressing the key AT. Relay S releases and the homing circuit for D2 is closed over contact 32*s*. Moreover over key AT when depressed the following circuit for relay T is completed: earth, battery, relay T, contacts 10*a* and 11*s*, key AT, wiper 5*d*1 of switch D1 and earth. In this circuit relay T energizes and since the key AT is opened in the circuit for A operates it together with the relay A as an automatic interrupter until the wiper 5*d*1 of the switch D1 has passed away from its continuous contact bank.

For the case in which for any reason, for example through being knocked, the switch D2 is moved off normal a homing circuit is set up over the lower winding of relay J which passes over wiper 2*d*2, contact 32*s* and a contact 80*d*2 of the switch D2.

In order to bring the switch D1 to rest in such a case the key AT has to be depressed.

What is claimed is:

1. In combination, two condensers, means for placing a variable charge upon one of the condensers, a charging circuit for the other condenser, a discharge path for said two condensers, means for connecting the other condenser alternately to said charging circuit and to said discharge path, said last means effective to disconnect said other condenser from said charging circuit whenever it is connected to said discharge path and to disconnect said other condenser from said discharge path whenever it is connected to said charging circuit, means in said charging circuit for increasing the charge upon said other condenser by a predetermined increment each time same is connected to said charging circuit, thereby to raise the potential of said other condenser in substantially uniform steps, and a device in said discharge circuit operated when the charge upon said other condenser reaches an amount dependent upon the charge upon said one condenser.

2. In a register in which a digit is recorded as a quantity of charge on a register condenser, means for determining the value of the recorded digit comprising, a testing condenser, a charging circuit for said testing condenser, means for connecting said testing condenser alternately in said charging circuit and in series with said register condenser, means for altering the potential of said charging circuit between successive connections of said testing condenser therein, said last means operated repeatedly in synchronism with said connecting means and effective to change the potential of said charging circuit progressively in substantially uniform increments, whereby the successive connections of said testing condenser in said charging circuit vary the potential of said testing condenser in substantially uniform steps, the number of steps required to cause the effective total potential of said two condensers to arrive at a predetermined value being a measure of the charge on said register condenser and hence characteristic of the digit recorded.

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