

July 29, 1941.

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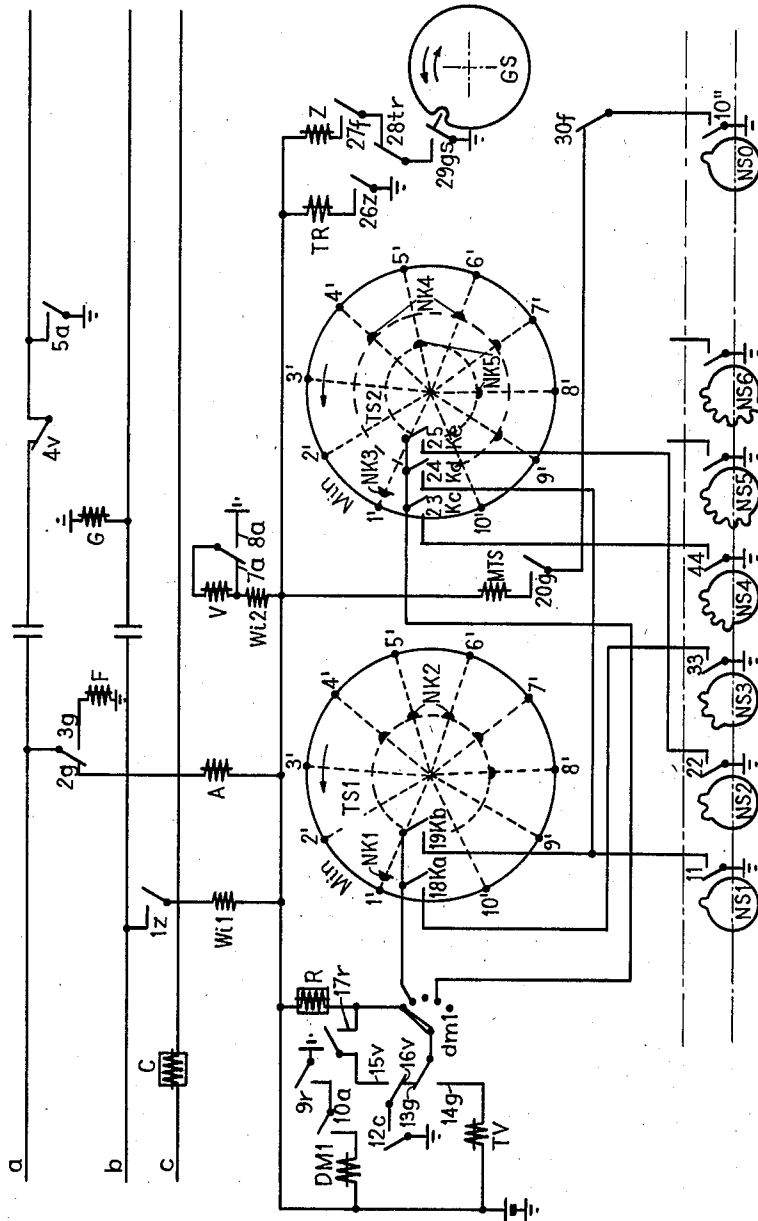
2,250,735

TELEPHONE SYSTEM

Filed Feb. 3, 1938

2 Sheets-Sheet 1

FIG. 1



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2,250,735

TELEPHONE SYSTEM

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Application February 3, 1938, Serial No. 188,402
 In Germany February 24, 1937

18 Claims. (Cl. 179—7.1)

The present invention relates to a circuit arrangement for metering variously rated calls in remote communication systems and more especially telephone systems in which the metering impulses are registered and are subsequently transmitted to the meter of the calling station by the restoration to normal of the registering member.

It aims at fulfilling all the possible tariff requirements while considerably simplifying the devices necessary for determining the magnitude of the fee to be charged and for transmitting the corresponding number of metering impulses and achieves this in that a controlling device under the action of a time switch is selected in dependence upon the device set in accordance with the value of the call and brings the registering member under the influence of one particular impulse sending device of a plurality of such devices at definite intervals of time so that this device is advanced by an amount corresponding to the fee to be charged for this interval of time.

By the arrangement according to the invention it is possible to construct the fee register as a simple device having only one mechanical contact. Furthermore, the arrangement according to the invention enables the drive for the register to be common to a plurality of metering impulse transmitters and in fact for the whole exchange.

Embodiments of the invention are represented in the drawings. Fig. 1 shows, by means of a conventional circuit diagram, metering control equipment situated at the exchange, and Fig. 2 illustrates one modification of this equipment.

The principal components of the arrangement in Fig. 1 are as follows:

(1) Zone switch DM1

The zone switch DM1 is set by the impulses transmitted by the calling subscriber after the manner of a discriminator switch. For the sake of simplicity it will be assumed that the value of the call is determined by one digit and that this digit is taken up by the zone switch which is shown as a simple rotary switch. By means of the wiper *dm1* which is set on a particular contact by the characterizing digit transmitted devices are connected up which control a further device for calculating the fee in accordance with the value of the call.

(2) The tariff cams

On a common shaft are arranged a plurality

of tariff cams TS1 and TS2 which are shown in Fig. 1. Each of these cams represents a particular zone. These cams possess a definite shape in accordance with the zone in that they are provided with projections or similar contact members having a definite orientation. The cams serve to influence a member determining the number of metering impulses to be transmitted, by a determined amount at definite times.

(3) The fee register GS

The fee register GS serves to determine the number of metering impulses to be transmitted. It is controlled by the tariff cam corresponding to the zone in question for each call and is advanced by a definite amount at definite intervals of time during the course of the call. At the end of the call the fee register is restored by steps into the rest position and transmits one metering impulse for each step.

(4) The impulse sender NS

At the bottom of the drawing a group of cam discs are shown mounted on the same shaft and rotating once for example every 10 seconds. The tariff cam selected determines which of the impulse senders NS1 to NS6 is to transmit impulses for advancing the fee register during the individual time units. Every 10 seconds the impulse sender NSO completes a circuit for the magnet of the tariff disc so this is advanced in steps at intervals of 10 seconds.

The mode of operation of the arrangement shown in Fig. 1 will now be described in detail. When the metering repeater is seized relay C energizes over lead *c*. It closes its contact 12c and thus completes the following circuit for the winding of the slow-acting relay R: earth, contacts 12c, 16v and 13g, wiper *dm1*, in the rest position, the winding of relay R, battery and earth. Relay R closes its contact 9r and thereby prepares the impulse circuit for magnet DM1 of the zone switch. When now the subscriber transmits the digit which determines the value of the call relay A becomes energized impulsively over the speaking lead *a* and contact 2g. Through the opening of contact 1a the short-circuit which previously existed across the winding of relay V is broken and this relay is switched on by the closing of contact 8a: earth, contact 8a, the winding of relay V, resistance W12, battery and earth. Since it can only be deenergized by short-circuiting at contact 1a relay V makes a delayed release. The brief interruptions at contact 8a during the impulsing do not therefore suffice to cause the relay to release. Re-

lay V therefore maintains its contacts operated throughout the whole duration of the impulsing. At contact 4v the upper speaking lead is broken so as to prevent distortion during the transmission of the impulses which are extended over the upper speaking lead to the succeeding connecting devices over contact 5a. Through the impulsive closing of contact 10a the zone switch *dm1* is set in accordance with the impulses transmitted: earth, contacts 9r and 10a, magnet *DM1*, battery and earth. During the impulsing relay R remains energized in the following locking circuit: earth, contacts 12c, 15v and 17r, the winding of relay R, battery and earth. The wiper *dm1* of the zone switch is brought to a particular position corresponding to the impulse transmitted. It will be assumed in the present case that it is set on the first contact in its contact bank. On the transmission of the impulse train characterizing the value of the call, contact 7a remains closed for a longer period so that relay V has the opportunity of releasing. Through the opening of contact 15v the locking circuit of relay R is broken. Since now contact 17r is open relay R is prevented from being operated during the transmission of the following impulse trains. The latter are transmitted to the succeeding connecting device by contact 5a in the same way.

When the connection to the wanted subscriber is established and the latter replies, relay G is energized in the metering repeater by the application of battery potential to the lower speaking lead. Through the opening of contact 2g the impulse relay A is disconnected from the upper speaking lead and by the closing of contact 3g the winding of relay F and earth potential is connected to the upper speaking lead. Relay F is energized on the termination of the call when battery potential is connected in the known way to the upper speaking lead, through the replacement of the calling subscriber's receiver. Through the closing of contact 20g the magnet MTS is brought under influence of the 10 seconds switch by way of contact 30f. The magnet MTS serves to advance a series of tariff cams mounted on a shaft of which cams only two TS1 and TS2 are shown. Since it was assumed that the zone switch was standing on the first contact cam TS1 is accordingly connected and now decides the number of metering impulses to be transmitted. The 10 seconds contact which is controlled by the cam disc NSO is mounted together with a plurality of differently shaped cam discs of which only the discs NS1 and NS6 are shown on a shaft driven continuously at such a velocity that it executes a complete rotation in 10 seconds. Only one of these impulse sending devices need be provided per exchange.

The tariff cams are constructed in a particular manner according to the zone which they represent. They possess projections arranged in various successions and at various distances from their centers, which operate on particular contact springs. The tariff cam TS1, for example, possesses two different groups of projections, namely NK1 and NK2. The projections NK2 all lie on the same radius which is smaller than that on which are disposed the projections NK1.

When the cam NSO closes the 10 seconds contact for the first time the following circuit is established for the magnet MTS: earth, 10 seconds contact, contacts 30f, 20g, magnet MTS,

battery and earth. The tariff disc is therefore advanced one step. No other switching operations take place at the moment because the cam NK1 only engages with its associated contact spring 18ka, after a definite period, the "period of grace." For example this takes place after the second closing of the 10 seconds contact, i. e., after a minimum time of 10 seconds or a maximum time of 20 seconds. The contact 18ka is closed for 10 seconds by the cam NK1 on the tariff disc TS1. In consequence the cam disc NS3 is connected up and now transmits 3 impulses to the magnet TV through the triple closing and opening of contact 33: earth, contact 33, contact 18ka closed by cam NK1, contact 1 in the contact bank of the zone switch, wiper *dm1*, contact 14g, magnet TV, battery and earth. The magnet TV serves to advance the fee register GS in the present case during the operation of contact 18ka by an amount determined by the cam disc NS3, namely by 3 steps. On the next closing of the 10 seconds contact, the magnet MTS receives a further stepping impulse so that the tariff disc is advanced a further step. The cam NK1 is now no longer in engagement with the contact spring 18ka so that for the moment no further influencing of the stepping magnet TV and thus no further advance of the fee register GS takes place. The tariff disc is so constructed that it is advanced by an angular displacement indicated by the drawing after the expiry of each minute. Only after the call has lasted for 3 minutes do the further switching operations take place. After the expiry of the 3 minutes a cam, in the first place cam NK2, becomes operative. It closes contact 19kb and thus switches on the cam disc NS1. The associated contact 11 is closed once during the operation of contact 19kb so that the stepping magnet TV now receives an impulse over the following path: earth, contact 11, contact spring 19kb operated by the first cam NK2, contact 1 in the bank of the zone switch, wiper *dm1*, contact 14g stepping magnet TV, battery and earth. The fee register GS is thus advanced a further step. No further advancement of the fee register takes place until the expiry of the fourth minute. Then the contact spring 19kb is influenced, this time by the second cam NK2 whereby the cam disc NS1 is connected up again and by influencing the stepping magnet TV once advances the fee register GS a further step. As may be seen directly from the drawing after the expiry of every further minute the contact 19kb is closed by a cam NK2 so that after the expiry of every minute the fee register is advanced by one step.

When the calling subscriber terminates the call by replacing his receiver battery potential is applied to the upper speaking lead in the preceding connecting device in the known way and relay F is energized over contact 3g. Through the opening of contact 30f, the 10 seconds contact is disconnected. Through the closing of contact 27f the following circuit is set up for the relay Z which transmits the metering impulses: earth, contact 29gs (mechanical contact of the fee indicator which is closed as long as the latter is off-normal) contact 28tr (a contact of the magnet TR which restores the fee register from the position which it has assumed back to normal), contact 27f, the winding of relay Z, battery and earth. Through the closing of contact 12 battery potential is applied to the lower speaking lead over resistance W11, whereby a metering

impulse receiving relay is energized in a preceding connecting device and extends the metering impulses to the calling subscriber's meter. Relay Z also closes its contact 26z and thus completes the following circuit for the magnet TR: earth, contact 26z, magnet TR, battery and earth. The magnet TR switches the fee register one step back and opens its contact 28tr and thus breaks the above-described circuit for relay Z. Relay Z opens its contacts 1z and 26z. The first of these serves to disconnect battery from the lower speaking lead and thus terminates the first metering impulse. The latter contact breaks the circuit for the backward stepping magnet TR. Accordingly contact 28tr is closed again and thus the circuit for the metering transmitting relay Z is once more established. Relay Z transmits the next metering impulse over the lower speaking lead and at the same time influences the backward stepping magnet TR so that the fee register is stepped back a further step. This interaction between the metering transmitting relay and the backward stepping magnet TR continues until the fee register has reached its rest position in which the mechanical contact 29gs is opened. The circuit for the metering impulse transmitting relay Z cannot now be completed again. Thus a number of metering impulses are transmitted by the fee register corresponding to the length of the fee register bank traversed during the call or to the angular extent by which it was advanced.

If the called subscriber sets up a call of a different value then instead of tariff disc TS1 another tariff disc is connected up by the zone switch and its wiper *dm1*. If for example the digit operating on the metering transmitter comprises 3 impulses the wiper *dm1* is set on the third contact. In consequence the tariff disc TS2 is connected up. As may be seen from the drawing the fee register is operated in a different manner from that in which it was operated by the fee disc TS1. When after the called party has replied and the grace period has expired contact 23kc is closed by the cam NK3 the cam disc NS4 is connected up and the associated contact 44 is closed four times during the operation of contact 23kc. The advancing magnet TV of the fee register GS thereby receives four impulses over the following path: earth, contact 44 operated by the cam disc NS4, contact 23kc, closed by the cam NK3, wiper *dm1* on contact 3, contact 14g, winding of the advancing magnet TV, battery and earth. The fee register, therefore, in the case of this call is advanced four steps for the first 3 minutes. In the space between the radii 1' and 4' there are no further cams on the tariff disc TS2. Only when after the expiry of 3 minutes conversation, the radius 4' comes into the position occupied by the radius 1' after the expiry of the grace period is contact 24kd operated by the cam NK4 in this position and thereby connects up the cam disc NS1 which now advances the fee register one step for the fourth minute of conversation. The impulse transmitted by the cam disc NS1 takes the following path: contact 11 operated by the cam disc NS1, contact 24kd, operated by the cam NK4 on radius 4', wiper *dm1*, on contact 3, contact 14g, advancing magnet TV, battery and earth. After the expiry of the fourth minute of conversation the radius 5' comes into the operating position. The contact 25ke is now closed by the cam NK5 lying on the radius 5' and consequently the cam disc NS2 is switched on and sends 2 impulses to the advancing magnet TV of the fee

register over the following path: earth, contact 22 operated by the cam disc NS2, contact 25ke operated by the cam NK5 on radius 5', wiper *dm1* at contact 3, contact 14g, advancing magnet TV, battery and earth. The fee register is thus advanced by two further unit steps at the beginning of the 5th minute of conversation. As may be seen directly from the drawing the fee register is advanced by one step at the beginning of the 6th, 7th and 9th minute of conversation, while at the commencement of the 8th minute the fee register is again advanced by two steps.

In this way all tariff requirements can be met by a particular arrangement by the cams on the tariff discs. These means are provided for determining in a simple way the moment for influencing the fee registering and the degree of influencing in accordance with the magnitude of the fee prescribed for the unit length of conversation.

According to the arrangement shown no fee reckoning takes place during the grace period, i. e., about 10 to 20 seconds after the called party has replied. It can, however, very easily be arranged with the means set out for the fee register to be advanced to the desired extent for example by one unit immediately on the relay of the called party by means of a corresponding cam. In this case if it is established that the called subscriber is not the one desired, by giving the clearing signal during the grace period the calling subscriber's meter will only be charged to an extent of one unit.

The reckoning of the fees according to the different tariffs (day and night tariff) is also not represented. This may also be arranged for in that different tariff discs are provided for the day and night tariff and the connection of the one or other tariff discs is then effected by a contact or the like controlled by a clock in the known way.

The arrangement shown in Fig. 2 corresponds in principle with the arrangement shown in Fig. 1. The only important differences are:

1. That a separate tariff disc is not provided for each value of call, but a single disc is provided for all the zones.
2. That the 10 second impulses do not directly bring about the advancing of the tariff discs but are registered by a switch and the tariff disc is advanced by the latter in larger intervals of time.

According to Figure 2 the zone switch serves to register the 10 seconds units.

The detailed mode of operation of this arrangement is as follows:

On seizing the metering transmitter relay C1 energizes and closes its contact 70cl and thus completes the following circuit for the winding of relay R1: earth, contacts 70cl, 69vl, 66gl, wiper *dm1* in the rest position, the winding of relay R1, battery and earth. Relay R1 closes its contacts 67rl and 63rl and thereby prepares the locking circuit for itself and prepares the impulse circuit for the magnet DM of the zone switch. Contact 81rl is opened and thus prevents a premature operation of the magnet TFM of the tariff disc TF. When impulse trains are transmitted by the calling subscriber relay A1 in the metering transmitter is energized impulsively over the upper speaking lead and contact 50gl. The magnet DM of the zone switch receives numerical impulse trains corresponding to the value of the call over the following path: earth, contacts 63rl, 61al, magnet DM of the zone switch, battery and earth. The wipers *dm1*, *dm2*, *dm3* of the zone switch are thus set on a particular contact. Through the

opening of contact 55a1 on the first energizing of relay A1 and the closing of contact 56a1, the following circuit is set up for relay V1: earth, contact 56a1, the winding of relay V1, resistance W14, battery and earth. Relay V1 does not release during the transitory interruptions at contact 56a1 and thus remains energized throughout the whole impulse train. Thus the upper speaking lead is cut off by the opening of contact 57v1 during the transmission of the impulse trains sent out by the calling subscriber. The transmission of the impulse trains to the succeeding connecting devices is effected by contact 58a1 over the upper speaking lead. During the impulse train the following locking circuit is established for relay R1: earth, contacts 70c1, 68v1, and 67r1, the winding of relay R1, battery and earth. On the transmission of the impulse train serving to determine the value of the call, contact 55a1 remains closed for a prolonged period so that relay V1 has the chance to release. Consequently contact 68v1 is opened and the locking circuit for relay R1 is broken. On the transmission of the succeeding impulse trains relay R1 cannot energize again so that the magnet DM of the zone switch receives no further impulses on account of contact 63r1 being open.

The function of the switch DM solely as a zone switch is terminated after the first impulse train operating on the repeater. The zone characteristic is now taken over by another device so that the zone switch becomes free and can be used for other purposes, namely in this case as a time register.

After relay R1 has released contact 81r is closed so that the following circuit is completed over magnet TFM of the tariff disc TF: earth, relay interrupter RU1, contact 83dmw (rotary off-normal contact of the rotary magnet DM closed so long as the latter is off-normal) contacts 85zp and 81r1, magnet TFM, battery and earth. Under the influence of the relay interrupter RU1 the tariff disc TF is now advanced until one of the cams mounted on the arcs kr7 to kr9 closes that contact of the contacts ZO1 to ZO5 which is connected to the contact on which wiper dm1 has been set by the characterizing digit transmitted.

If the wipers of the zone switch DM were brought to position 1 the tariff disc TF is completed by the relay interrupter RU1 until the cam on the inner side of the circle kr7 has closed the associated contact ZO1. The following circuit is then set up: earth, contacts 70c1, 69v1 and 66g1, wiper dm1 in position 1, contact ZO1 closed by the cam on the circle kr7, the winding of the zone testing relay ZP, battery and earth. Relay ZP locks up throughout the call in the following circuit: earth, contacts 71c1 and 73zp, the winding of relay ZP, battery and earth. The opening of contact 84zp breaks the stepping circuit for the tariff disc TF and thus brings the latter to rest. Relay ZP also closes its contact 65zp and causes the zone switch DM to be stepped to normal in the following path: earth, relay interrupter RU, contacts 65zp and 64g1, wiper dm3, of the zone switch in the working position, magnet DM, battery and earth. When the zone switch has reached its rest position under the influence of the relay interrupter the stepping circuit is broken at wiper dm3.

The reckoning of the fee now takes place in a manner similar to that already described in accordance with the tariff corresponding to the sector Zo1.

When after the call has been set up the called party replies relay G1 is energized in the metering repeater through the application of battery to the lower speaking lead.

Through the opening of contact 50g1 the impulse relay A1 is disconnected, while through the closing of contact 51g1 relay F1 and earth potential are connected to the upper speaking lead. Through the closing of contact 60g1 the magnet DM of the zone switch is now brought under the influence of the ten-seconds contact.

The zone switch takes up the individual-ten-seconds impulses and registers them and transmits the stepping impulse to the tariff disc TF at definite intervals of time, for example, every minute.

If after the expiry of the period of grace (about 10 to 20 seconds) the wiper dm2 of the switch DM reaches the second contact in its bank, the following circuit obtains for the magnet TFM of the tariff disc TF: earth, contacts 87c1, 86g1, wiper dm2 in position 20'', contacts 85zp, 81r1, magnet TFM, battery and earth. The tariff disc is now advanced by one step so that now contact 77kw is closed by the cam on the circle kr3. Contact 77kw stands in contact with the cam disc NS3, which like the other cam discs of the common impulse sending device is not shown in Fig. 2, but corresponds to that of Fig. 1. During the time in which contact 77kw is closed three impulses are thus transmitted over the following path to the advancing magnet TV1 of the fee register GS1: cam disc NS3, contacts 77kw, 74tf (contact of magnet TFM) stepping magnet TV1, battery and earth. The fee register GS1 is thus advanced by three steps.

After the expiry of the first minute of conversation, wiper dm2 passes into position 2', so that once more the stepping circuit for magnet TFM of the tariff disc TF is closed: earth, contacts 87c1, 86g1, wiper dm2 in position 2', contacts 85zp, 81r1, magnet TFM, battery and earth. The tariff disc is thus advanced by a further step. No further advancing of the fee register takes place for a moment since in the present position of the tariff disc no contact is closed by a cam. After the expiry of the second minute of conversation the wiper dm2 passes into position 3', so that the tariff disc is advanced a further step. In this position of the tariff disc also no contact is closed by a cam so that the fee register is not advanced. When after the expiry of the third minute of conversation when wiper dm2 has passed into position 4', the tariff disc is advanced a further step, the contact 75ku is closed by a cam arranged on the circuit kr1. Contact 75ku is in contact with the cam disc NS1 shown in Fig. 1. The stepping magnet TV1 for the fee register GS1 thus receives an impulse so that it is advanced by a further step.

As may be seen directly from the drawing, the fee register GS1 is now advanced one unit after the expiry of each succeeding minute of conversation in accordance with the tariff embodied by the sector Zo1.

When the calling subscriber gives the clearing signal by hanging up his receiver at the end of the call, battery potential is applied to the upper speaking lead in the well known way in a preceding device and this energizes relay F1 over contact 51g1. Through the opening of contact 72f the ten-seconds contact is disconnected from the magnet DM. Through the closing of contact 88f1 the following circuit is set up for the metering repeating relay Z1: earth, contact 90gs1

(closed so long as the fee register is off-normal), contacts 89tr1, 88f1, the winding of relay Z1, battery and earth. Through the closing of contact 53z1 battery potential is applied to the lower speaking lead over resistance W13 and thus the first metering impulse is transmitted. Through the closing of contact 59z1 the backward stepping magnet TR1 of the fee register is switched on, so that the fee register is switched back one step. Through the opening of contact 89tr1 of the backward stepping magnet the metering repeating relay Z1 is disconnected and terminates the first metering impulse by opening contact 53z1. At contact 59z1 the circuit for the backward stepping magnet is broken, so that contact 89tr1 closes again. Relay Z1 is now energized again in the above-mentioned circuit and causes the second metering impulse to be transmitted. In this way as many metering impulses are transmitted to the calling subscriber's meter as the number of steps which the fee register GS1 has to be displaced to bring it from the position in which it has been set into the rest position. With the fee register in the rest position contact 90gs1 is opened and thus terminates the metering operation.

If the first impulse train operating on the metering repeater consisted of three impulses the wipers of the zone switch DM are set on the third contact. Over wiper dm1 contact ZO2 is then connected up. After the end of this impulse train and when relay R1 has released the tariff disc is advanced under the influence of the relay interrupter RU1 until contact ZO2 is closed by the cam lying on the periphery of the circuit kr8. The following circuit is then set up for the zone testing relay ZP: earth, contacts 70c1, 69v1, 66g1, wiper dm1, in position 3, contact ZO2, the winding of relay ZP, battery and earth. Relay ZP promotes the same switching operations as those already described.

The computing of the fee now takes place in accordance with a tariff embodied by the sector ZoII. When the tariff disc is advanced one step after the expiry of the grace period contact 78kr is closed by the cam on the circle kr4. The fee register is advanced four steps by the cam disc NS4 which is thereby connected. After three minutes have expired contact 75ku is closed by a cam on the circle kr1 and thereby the fee register is advanced one step by the cam disc NS1. After the expiry of the next minute, i. e., the fourth minute, contact 76kv is closed by a cam on the circle kr2 whereby the cam disc NS2 is connected up causing the fee register to be advanced two steps. After the expiry of the fifth and sixth minutes the fee register is advanced a further step as may be seen directly from the drawing and after the seventh minute by two steps and so on. At the end of the call the operations for restoring the fee register GS1 and the transmission of a number of metering impulses corresponding to the angular extent by which the fee register was advanced during the course of the call then set in again in the manner described.

The other sectors of the fee switch are constructed in a different manner corresponding to the associated fee. If for example a call is set up in the zone 3 the tariff disc is advanced after the transmission of the characterising number until the cam on the inside of the circle kr8 has closed contact ZO3. The advancing of the fee register GS1 during the course of the call in accordance with the fee to be charged is then con-

trolled by cams which are arranged in a particular manner (not shown) on the sector ZoIII.

What is claimed is:

1. A call charging arrangement for use in a communication system in which calls may be extended over connections having different values, including a member having a normal position, a plurality of impulse senders, means for rendering different ones of said impulse senders effective at different times during a call over a connection, impulse responsive means operated by said different impulse senders to advance said member step by step from its normal position an amount dependent both upon the value of said connection and upon the duration of the call thereover, means for restoring said member to its normal position after the call has been terminated, and call charging means controlled by said member during its restoration to said normal position.

2. A call charging arrangement for use in a communication system in which calls may be extended over connections having different values, comprising variably operable means set in dependence upon the value of a connection, a register having a normal position, a plurality of driving members, time controlled means for rendering certain of said members, depending upon the setting of said first means, effective at intervals during a call over said connection, said members advancing said register from its normal position by an amount depending both upon the value of the connection and the duration of the call thereover, means for restoring said register to its normal position after the call has been terminated, and call charging means controlled by said register during its restoration to said normal position.

3. A call charging arrangement for use in a communication system in which calls may be extended over connections having different values, comprising variably operable means set in dependence upon the value of a connection, a register having a normal position, a plurality of impulse senders, time controlled means for rendering different ones on said impulse senders, depending upon the setting of said first means, effective at different times during a call over said connection, impulse responsive means operated by said different impulse senders to move said register step-by-step in one direction from its normal position by an amount depending both upon the value of the connection and the duration of the call thereover, means effective after the call has been terminated for moving the register step-by-step in the opposite direction and for transmitting call charging impulses at the same time, and means operated by the register upon its arrival at said normal position for rendering said last means ineffective.

4. A call charging arrangement for use in a communication system, including a register having a normal position, a plurality of driving elements for said register, time controlled means operating during a call to render different ones of said driving elements effective at intervals in accordance with a predetermined program, the distance said register has been driven from its normal position at the termination of the call thereby depending in part upon the duration of the call, means for restoring said register to its normal position after the call has been terminated, and call charging means controlled by said register during its restoration to said normal position.

5. A call charging arrangement for use in a

communication system, including a register having a normal position, a plurality of driving elements for said register, time controlled means operating during a call to render different ones of said driving elements effective at intervals in a predetermined sequence, the distance said register has been driven from its normal position at the termination of the call thereby depending in part upon the duration of the call, said register restored to its normal position after the termination of a call, an impulse generator for transmitting call charging impulses while the register is being restored to said normal position, and means operated by said register upon its arrival at said normal position for rendering said last means ineffective.

6. A call charging arrangement for use in a communication system in which calls may be extended over connections of different values, including a register, a plurality of register controlling elements adapted to control said register in different manners, and a plurality of movable members, the different members corresponding respectively to connections of different values, each member rendered effective only when a call is extended over a connection of the value to which that member corresponds and moved continually during said call to cause different predetermined ones of said elements to control said register at predetermined times throughout the call.

7. A call charging arrangement as claimed in claim 6, wherein the different members first render different elements effective thereby initially to control the register differently in accordance with the value of the connection over which the call is extended.

8. A call charging arrangement as claimed in claim 6, wherein the different members first render different elements effective thereby initially to control the register differently in accordance with the value of the connection over which the call is extended, and wherein each member thereafter renders effective at intervals an element different from the first element rendered effective by that member thereby to control the register in accordance with the duration of the call.

9. A call charging arrangement as claimed in claim 6, wherein the different members first render different elements effective thereby initially to control the register differently in accordance with the value of the connection over which the call is extended, and wherein each member thereafter renders effective at intervals in a predetermined sequence a plurality of elements different from the first element rendered effective by that member thereby to control the register in accordance with the duration of the call.

10. A call charging arrangement for use in a communication system in which calls may be extended over connections of different values, including a plurality of movable members each corresponding to a connection of a particular value and rendered effective when a call is extended over a connection of that value, an impulse operable register, and a plurality of impulse generators each capable of being rendered effective by one or more of said members thereby to control said register, that member which is rendered effective moving continually in one direction during the call and rendering different ones of the generators effective to control the register at predetermined intervals of time and in a predetermined sequence.

11. A call charging arrangement for use in a communication system in which calls may be extended over connections of different values, including a register, a plurality of register controlling elements adapted to control said register in different manners, and a time controlled member operating continually during a call and, in accordance with a prearranged plan, at times rendering different ones of said elements effective to control said register, said member having a plurality of said prearranged plans a particular one of which is rendered effective in accordance with the value of the connection over which said call is extended.

12. A call charging arrangement for use in a communication system in which calls may be extended over connections of different values, including a register, a plurality of registers controlling elements adapted to control said register in different manners, a time controlled member moving continually during a call, a plurality of series of projections carried by said member, each series comprising one or more projections moved in a particular path by said member, means situated in the path of each series and controlled by the projections of that series to at times render a particular one of the register controlling elements effective to control the register, and means controlled in accordance with the value of the connection over which said call is extended for rendering only certain predetermined ones of said series effective.

13. A call charging arrangement as claimed in claim 12, wherein one or more of said register controlling elements is rendered effective under control of more than one series of projections.

14. A call charging arrangement for use in a communication system in which calls may be extended over connections of different values, including a register having a normal position, a plurality of driving elements for moving said register in a particular direction but adapted to control the register in different manners, a plurality of movable members, the different members corresponding to connections of different values, each member rendered effective when a call is extended over a connection of the value to which that member corresponds and moved continually during said call to cause predetermined ones of said driving elements to control said register at predetermined times throughout the call, means effective after the call has been terminated for moving said register in the opposite direction and for transmitting call charging impulses at the same time, and means operated by said register upon its arrival at said normal position for rendering said last means ineffective.

15. A call charging arrangement for use in a communication system in which calls may be extended over connections of different values, including a register having a normal position, a plurality of driving elements for moving said register away from its normal position, different ones of the elements adapted to control the register in different manners, a time controlled member operating continually during a call and, in accordance with a predetermined program, rendering different ones of said driving elements effective to control said register, said member having a plurality of said predetermined programs a particular one of which is rendered effective in accordance with the value of the connection over which said call is extended, means for restoring said register to its normal

position after the call has been terminated, and call charging means controlled by said register during its restoration to said normal position.

16. A call charging arrangement for use in a communication system in which calls may be extended over connections of different values, including time controlled means, movable means initially set in dependence upon the value of a connection and thereafter moved from the initial setting under control of said first means during a call over the connection, a register, and a plurality of register controlling elements adapted to control said register in different manners, different ones of said elements rendered effective by said movable means at intervals throughout said call in a sequence predetermined by the initial setting of said movable means.

17. A call charging arrangement for use in a communication system in which calls may be extended over connections of different values, including a register, a plurality of register controlling elements adapted to control said register in different manners, a movable allotting mem-

ber determining which, if any, of the register controlling elements shall be effective, means operated in accordance with the value of a connection, said allotting member thereupon moved under control of said last means to an initial position determined by the value of said connection, said last means thereafter operated as a timing means to move said allotting member step-by-step from said initial position during a call over said connection, various ones of said register controlling elements being rendered effective in a predetermined sequence by said allotting member as it occupies various positions.

18. A call charging arrangement as claimed in claim 17, wherein the first register controlling element rendered effective by the allotting member is different for different initial positions of the member, whereby the register is initially controlled in different manners in accordance with the value of the connection over which the call is extended.

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