July 3, 1934. L. KARDORFF 1,965,121

IMPULSE TRANSMITTER

Filed April 10, 1930 2 Sheets-Sheet 1

Fig. 1.

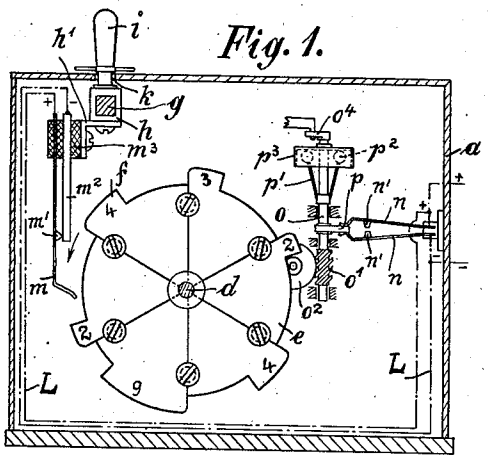

Fig. 2.

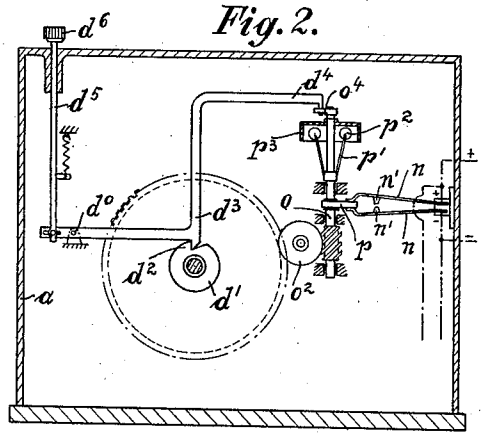

Fig. 3.

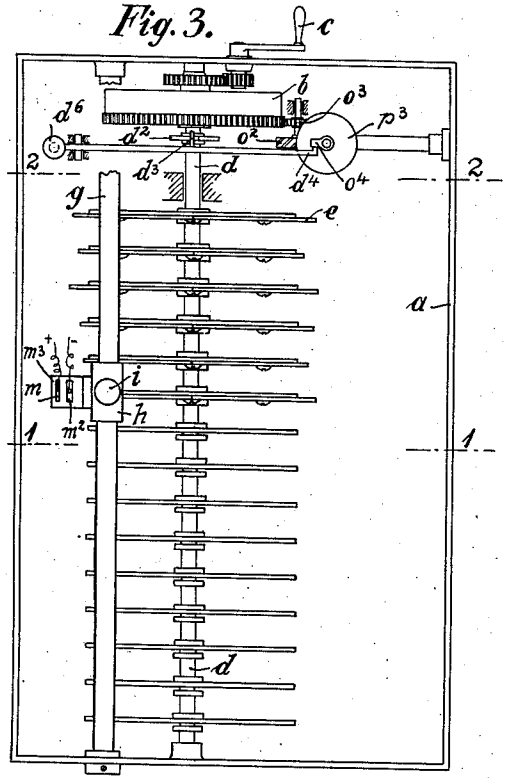

Fig. 4.

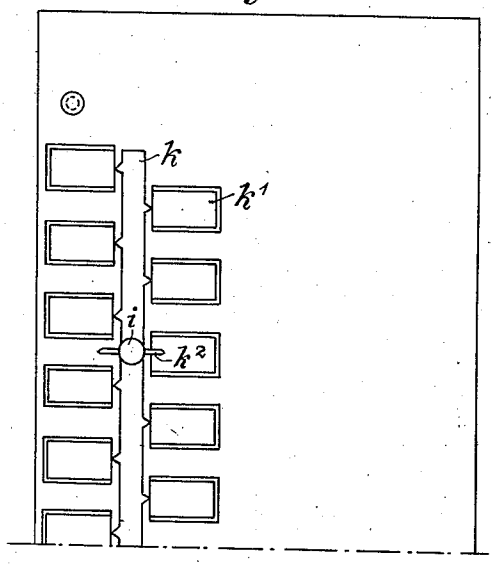

Fig. 5.

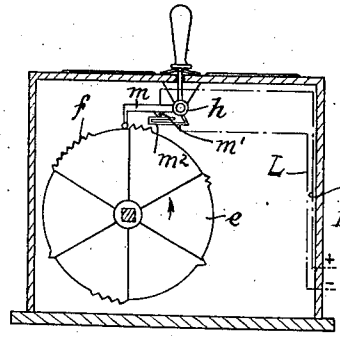

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Fig. 6.

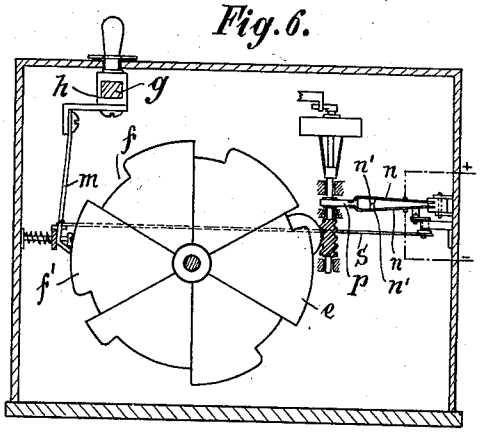


Fig. 9.

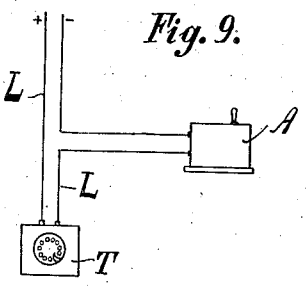


Fig. 7.

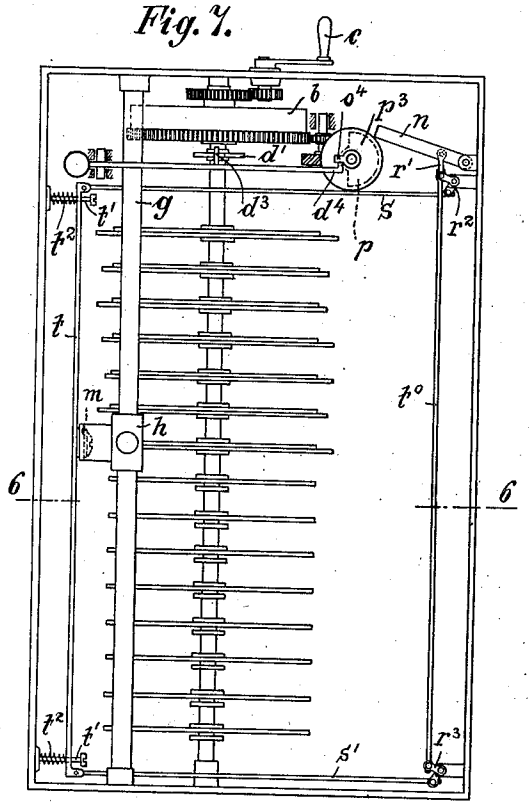
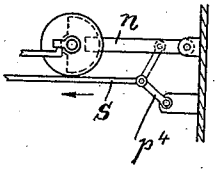


Fig. 8.



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UNITED STATES PATENT OFFICE

1,965,121

IMPULSE TRANSMITTER

Léon Kardorff, Hamburg, Germany, assignor to The American Self-Selector Corp., a corporation of New York

Application April 10, 1930, Serial No. 443,137
In Germany December 4, 1929

5 Claims. (Cl. 177—380)

In establishing telephone connections by a private party or subscriber without the assistance of the staff in the telephone office, the subscriber must rotate the selection disk as many times as the telephone call number has digits or signs. This is frequently felt as an inconvenience, particularly when connections required are repeatedly found to be engaged.

The object of the present invention is to design an apparatus by the aid of which connections may readily be established by easily accomplished adjustments.

With this object in view my apparatus comprises in general a plurality of disks, one for each telephone connection or call, to be made. These disks are mounted firmly on a rotary shaft, driven by electricity or by clockwork, or otherwise. The peripheries of the disks are provided with offset portions, cams or teeth, the lengths of certain offset portions and their consecutive order corresponding to the digits and denominations of the telephone call number, to which the disk belongs, which hereinafter I term call-disk. A slide is arranged to move parallel to the shaft of the disk and carries a yielding finger adapted to contact with raised portions on the periphery on any disk, to which the slide may be adjusted. A contact make and break device arranged in the telephone line is connected with the said slide and adapted to be operated when the yielding finger contacts with the portions of the periphery of the disk, to which the slide is adjusted; means being provided for impressing signals on the electric circuit of the telephone line by interrupting the current flow, corresponding in number to the size of the sector of the raised portion.

Various constructions may be designed for causing the necessary interruptions of current.

Thus in one construction the contact make and break device is mounted on the slide and may be so constructed and offset portions of the peripheries on the call disks so serrated, that on the disk rotating the teeth contacting with the yielding finger on the slide will directly transmit movements to the movable part of the contact make and break device to cause with the necessary rapidity the desired interruptions of current, corresponding to the digits in question.

In another construction a second contact make and break device is arranged in the telephone line, operated by suitable means, for instance by a clockwork to rapidly open and close the contact device without cessation. Raised portions on the periphery of the call disks, being in this construction without teeth, will cause the first named contact make and break device to open, during the time the yielding finger contacts with the same, while when the finger is intermediate the said raised portions on the periphery of the call disk, that is to say, when the said finger does not contact with such raised portion, this contact device will keep the circuit closed, so that the second contact make and break device has no effect on the circuit.

In a further construction the slide provided with the yielding finger, that contacts with raised portions on the call disks, instead of being connected with a contact make and break device, which in a regular manner periodically opens and closes the circuit, may be connected with the contact make and break device operated by the clockwork or the like for enabling continuous interruptions in such manner, that the said yielding finger is directly connected with the normally fixed, but in this instance yielding or pivoted contact piece of this contact device to pull this contact piece aside, when the circuit is to remain closed. In this case the construction may either be so designed that the yielding or pivoted contact piece is normally in a closed position, when the yielding finger on the slide is engaged by outwardly offset or such raised portions on the call disk, which correspond to the digits of the call numbers. This construction may be so improved, that said yielding or pivoted contact piece is normally in operating position, and that the portion of the periphery of the call disks, that are attributed to the digits of the call numbers, are offset inwardly instead of outwardly, as in previously described constructions, so that the portions intermediate those which belong to the digits or call numbers, are now raised portions to operate on the yielding finger of the slide to transmit movement to the yielding contact piece to turn it aside. In both these instances the raised portions on the call disk act as cams.

Fig. 1 is a cross section of the apparatus on the line 1—1 of Fig. 3, and

Fig. 2 a cross section on the line 2—2 of Fig. 3.

Fig. 3 is a plan of the apparatus partly in section, the cover being removed.

Fig. 4 is part of a plan of the apparatus.

Fig. 5 is a section of a modified apparatus drawn to a smaller scale.

Fig. 6 is a cross section of a modified apparatus on the line 6—6 of Fig. 7.

Fig. 7 is a similar view as Fig. 3 of the said modified apparatus.

Fig. 8 is a modified detail of the apparatus shown in Figs. 6 and 7, and

Fig. 9 is a diagrammatic view showing the apparatus arranged in the telephone line.

In the constructions shown in Figs: 1–4 within the casing *a* of the apparatus A, which it is well understood is to be always placed in circuit with the telephone line L of the telephone T (see Fig. 9), a clockwork *b* is mounted adapted to be wound up from outside by a key or hand-crank *c*. On the shaft *d* adapted to be driven by the clockwork *b* a plurality of disks *e* is fixedly mounted corresponding to the number of the calls for which the apparatus may be designed. Parallel to the shaft *d* a slide guide *g* is mounted in the end walls of the casing *a*, and on this guide a slide *h* is slidably mounted, a handle *i* of this slide projecting outwardly through a slot *k*. Connected with the slide *h* is a yielding finger or tongue *m*, and the disks *e* are provided with a number of offsets on their peripheries corresponding in number to the digits necessary for determining the local calls; thus for instance Hamburg requires 6 digits or signs, and therefore the disks are divided into 6 sections, each section having one offset *f*. The length of the offset corresponds to one of the signs or digits from 1–0, thus the offset for zero will have to correspond in length to ten units and the offset for the smallest number 1 will have to correspond in length to one unit, that is to say $\frac{1}{10}$ of that of zero. By way of example the call D3,2492 would require offsets in length equal to 4, 3, 2, 4, 9, 2 units. When thus the slide *h* is adjusted to a certain disk the tongue *m* will contact with the divers offsets *f* with interruptions in lengths of time corresponding to 4, 3, 2, 4, 9, and 2 units of time during one revolution of the disks *e*.

It will be noted that the leading corners of the offset portions *f* of the disk *e* are rounded off, or cut away to compensate for the thickness of the member *m*. In some cases it may be desirable to cut the trailing edge in the same manner to make the practical resultant timing equal to the theoretical timing.

This operation may be made use of for securing the telephone call in question in various ways.

Thus for instance in the construction shown in Fig. 5 the tongue *m* is provided with a contact piece *m'* of a contact make and break device *m'*, m^2 in the telephone line L. In this figure the lengths of the offsets on the disk *e* correspond to a number C2,1417, and therefore there will be on the rotation of the disk *e* in consecutive order 3, 2, 1, 4, 1, 7 interruptions in the telephone line, by which the telephone connection will be completed in the usual manner.

Instead of mechanically producing interruptions as by the aid of the construction shown in Fig. 5, which may have the drawback that it is difficult to secure a correct operation of the contact pieces and therefore the disks will have to be rotated generally slow, means may be provided for continuously causing interruptions in the telephone line and provide for securing contact in the line in another way at times, when no interruptions are wanted.

The construction shown in Figs. 1–4 is designed to fulfill this requirement. A second contact make and break device is arranged within the telephone line L. This second contact breaker as shown in the drawings consists of two yielding arms *n*, on each of which a contact piece *n'* is mounted. In front of these arms *n* a shaft *o* is journaled provided with a worm *o'* driven by a worm wheel o^2 operated by the clockwork *b*. A segment *p* is firmly mounted on the shaft *o* and made of insulating material and adapted to enter between the ends of the arm *n* to break contact between the contact pieces *n'* on rotation of the shaft *o*. The ratio of the worm *o'*, the worm gear o^2 and the intermediate gear o^3 is such that the shaft *o* is driven at a considerable speed to continuously break and make between the contact pieces *n'* in rapid succession.

Similar to the construction shown in Fig. 5 the tongue *m* has a contact piece *m'* forming part of the contact make and break device *m'* and m^2; the contact piece m^2 being attached to the slide *h* by an insulated block m^3, to which also is fastened the tongue *m* and which by the angle piece *h'* is firmly attached to the slide *h*.

In this case the contact make and break device *m'*, m^2 continuously keeps the circuit in the line L closed, no matter whether the contact make and break device *n*, *n'* is opened or closed. When, however, on rotation of the disk *e* the raised offsets *f* engage the tongue *m* the contact make and break device *m'*, m^2 will open the circuit at this place, and the contact make and break device *n*, *n'* will take the necessary effect to secure interruptions according to the lengths of the offsets *f*, that is to say, according to the digits and the consecutive order corresponding to the number of the telephone call.

In the construction shown in Figs. 1 and 2 the shaft *o* is connected with a regulator consisting of spring arms *p'* provided with weights p^2 at their ends adapted to contact with a fixed ring p^3, when the shaft *o* is driven at a certain speed, thus regulating the speed of the insulated segment *p*.

As will be understood any desired number of disks *e* may be mounted on the shaft *d* corresponding to the number of telephone calls, for which the apparatus may be constructed. In the construction shown 15 different telephone connections may be made by the apparatus. On the top of the casing, plates or panels *k'* may be arranged on which the different telephone connections may be indicated constituting a staggered visual indicator. Pointers k^2 may be attached to the slide *h* for facilitating correct adjustment to the call disks, to which the panels correspond, which in order to save space are arranged in staggered relation as shown.

The gearing of the clockwork *b* may be so designed that the pinion o^3 is continuously rotated to secure continuous interruptions of current by the contact make and break device *n'*, *n*, *p*, *n*, *n'*, and the shaft *d* must be driven by the clockwork through a friction clutch to secure rotation of the disks *e* only when the shaft *d* is released. This is secured by a ratchet wheel *d'* firmly mounted on the shaft *d*, and having only one tooth d^2 adapted to be engaged by the pawl d^3. The pawl d^3 is pivoted to a pin d^0 and engaged opposite the pin d^0 by a spring-pressed finger rod d^5 projecting out through the cover of the casing and provided with finger piece d^6. The pawl d^3 may be provided with a prolongation d^4 adapted to engage a finger o^4, when no call is made, the telephone line being in such case closed by the contact make and break device *m'*, m^2 to allow the speech to be transmitted.

When a call is to be made the slide *h* will be adjusted by the handle *i* to the disk *e* provided with offsets *f* of the requisite lengths corresponding to the number of the call, and the finger piece

d^6 pushed downward to release the ratchet wheel d' and the finger d^4, whereupon the clockwork b rotates the divers mechanisms described above to make the telephone connection in question. The tongue m contacting with the raised offsets f at times for securing the various interruptions by the aid of the rotation of the insulated segment p, continuously making interruptions as long as the shaft d is rotated. At the end of one revolution the pawl d^3 will engage the tooth d^2 of the ratchet wheel d' and the prolongation d^4 will engage the finger o^4 to stop the rotation of the shaft o. When this occurs contact make and break device m', m^2 closes the circuit for the telephone.

Instead of using both contact make and break devices, as shown in Figs. 1–4, only the contact make and break device n', n, p, n, n' may be used. This may be done by omitting the contact piece m^2 and connecting the tongue m by a rod s in such manner with the make and break device n', n, p, n, n' so as to withdraw the arms n from the action of the insulating segment p when no interruptions are required.

In the construction shown in Figs. 6 and 7 the offsets f instead of being raised beyond the periphery of the disks e are secured by depression, in which case the remaining part of the sections are raised, and therefore the tongue m will be pressed outwardly when no interruptions are required. To enable this the arms n are pivotally connected together on a bracket r and by a small rod or angle piece r' are connected to a bell crank lever r^2, by which a rod s may be operated by a slide h in such manner as to withdraw the arms n from the action of the segment p, when it is desired that the telephone line should not be interrupted.

In the construction shown the longitudinal bar t is guided at its end by bolts t' and pressed inwardly by springs t^2 surrounding said bolts t'. This bar t may be engaged by the tongue m when the tongue m itself is engaged by the raised portions f or by the raised portions f'. In the construction shown in Figs. 6 and 7 it is the raised portions f' intermediate the offsets f, which engage and push outwardly the tongue m. In so doing the bar t will also be pushed outwardly and being connected by the rod s, the bell crank lever r^2 and the angle piece r' with the contact arms n will withdraw these arms or the contact pieces n' from engagement with the segment p as shown in Figs. 6 and 7. For correct operation the rear end of the bar t is connected by a rod s' similar to the rod s with one arm of a second bell crank lever r^3 the other arm of which is connected with a bar t^0 with a corresponding arm of the bell crank lever r^2.

Instead of the means shown in the Figs. 6 and 7 to withdraw the contact arms n from the action of the segment p, any other means may be provided, for instance as shown in Fig. 8, the rod s being connected to the contact arms n by a toggle joint p^4. The operation being well known in the art it need not be described in detail.

The disks e may be made in sections in such manner that the various sectors, each of which carries one of the offsets f, may be attached to a common disk e' by means of set-screws e^2, so as to be removable. By providing a larger number of sectors any desired telephone connection may be provided for.

I claim:—

1. In a transmitter, a pair of impulse contacts; a rotating member for intermittently opening and closing said contacts at a predetermined uniform rate; a shaft; a plurality of code controller disks on said shaft for controlling the impulsing operation of said contacts; a source of driving energy; a positive drive connection from said source to said shaft and rotating member; the connections from said source to said rotating member driving said rotating member at a plurality of revolutions for each revolution of said shaft; a stop member; a pin protruding from said rotating member for engaging said stop member, said stop member being normally out of the path of said pin and means on said disk shaft at a predetermined angular position thereof for controlling the movement of said stop member into the path of said pin to bring said rotating member to a stop at a predetermined angular position.

2. In a transmitter, a pair of impulse contacts; a rotating member for intermittently opening and closing said contacts at a predetermined uniform rate; a shaft; a plurality of code controller disks on said shaft; a pair of contacts connected in multiple with said first pair of contacts and operated by said code controller disks for controlling the operation of said impulsing contacts; a source of driving energy; a positive drive connection from said source to said shaft and rotating member; the connections from the source to said rotating member driving said rotating member at a plurality of revolutions for each revolution of said shaft; a stop member; a pin protruding from said rotating member for engaging said stop member, said stop member being normally out of the path of said pin and means on said disk shaft at a predetermined angular position thereof for controlling the movement of said stop member into the path of said pin to bring said rotating member to a stop at a predetermined angular position.

3. In a transmitter, a pair of impulse contacts; a rotating member for intermittently opening and closing said contacts at a predetermined uniform rate; a shaft; a plurality of code controller disks on said shaft for controlling the impulsing operation of said contacts; a source of driving energy; a positive drive connection from said source to said shaft and rotating member; the connections from the source to said rotating member driving said rotating member at a plurality of revolutions for each revolution of said shaft; a stop member; a pin protruding from said rotating member for engaging said stop member, said stop member being normally out of the path of said pin, a lever member having a tooth riding over said disk shaft as it rotates and adapted to drop said tooth into a notch in said disk shaft, said lever member controlling said stop member to move it into the path of said pin when said tooth drops into the notch and manually operated means for raising said tooth from said notch for releasing said shaft for rotation.

4. In a transmitter, a pair of impulse contacts; a rotating member for intermittently opening and closing said contacts at a predetermined uniform rate; a shaft; a plurality of code controller disks on said shaft for controlling the impulsing operation of said contacts; a spring for supplying driving energy; means for maintaining said spring continually tensioned; a positive drive connection from said source to said shaft and rotating member; the connections from the source to said rotating member driving said rotating member at a plurality of revolutions for each revolution of said shaft; a stop member; a pin protruding from said rotating member for engaging said stop mem-

ber, said stop member being normally out of the path of said pin; a notch in said disk shaft; a lever member having a tooth riding over said disk shaft as it rotates and adapted to drop said tooth into said notch in said disk shaft, said lever member controlling said stop member to move it into the path of said pin when said tooth drops into the notch and manually operated means for raising said tooth from said notch for releasing said shaft for rotation.

5. In a transmitter, a pair of impulse contacts; a rotating member for intermittently opening and closing said contacts at a predetermined uniform rate; a shaft; a plurality of code controller disks on said shaft; a pair of contacts connected in multiple with said first pair of contacts; a bar extending parallel to said shaft and carrying said second mentioned pair of contacts; manually operated means for associating said second pair of contacts with any one of said controlled disks for controlling said first pair of contacts by the associated disk; a spring for supplying driving energy; means for maintaining said spring continually tensioned; a positive drive connection from said source to said shaft and rotating member; the connections from the source to said rotating member driving said rotating member at a plurality of revolutions for each revolution of said shaft; a stop member; a pin protruding from said rotating member for engaging said stop member, said stop member being normally out of the path of said pin; a notch in said disk shaft; a lever member having a tooth riding over said disk shaft as it rotates and adapted to drop said tooth into said notch in said disk shaft, said lever member controlling said stop member to move it into the path of said pin when said tooth drops into the notch and manually operated means for raising said tooth from said notch for releasing said shaft for rotation.

LÉON KARDORFF.