April 19, 1938. H. HIRSCHFELDT 2,114,469

IMPULSE TRANSMITTER

Filed Dec. 19, 1934

Fig. 1.

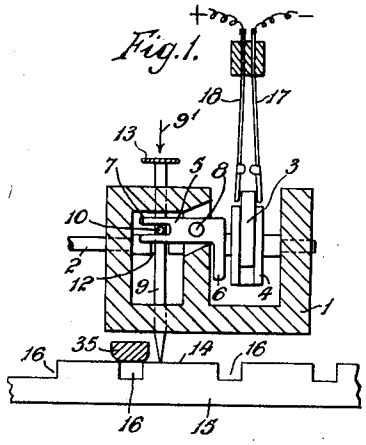


Fig. 2.

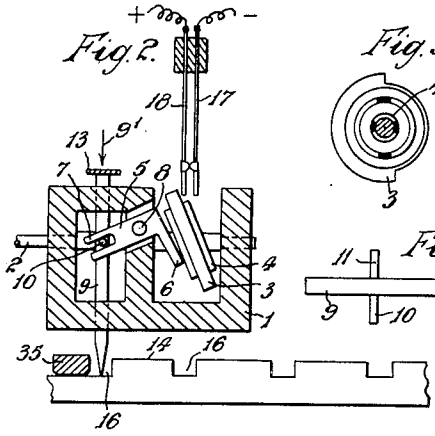


Fig. 3.

Fig. 4.

Fig. 5.

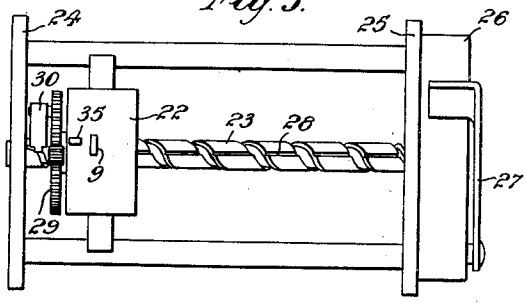


Fig. 10.

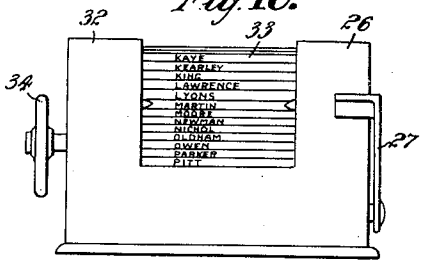


Fig. 7.

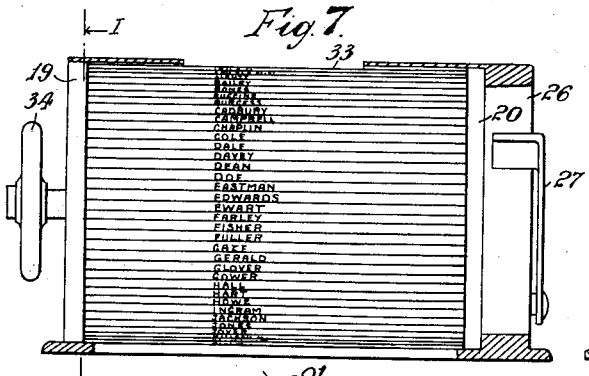


Fig. 8.

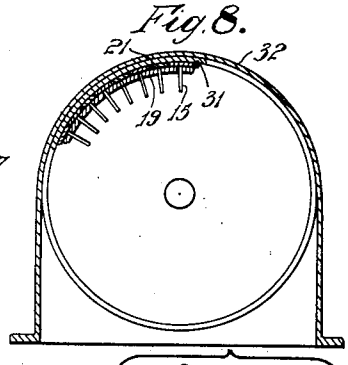


Fig. 6.

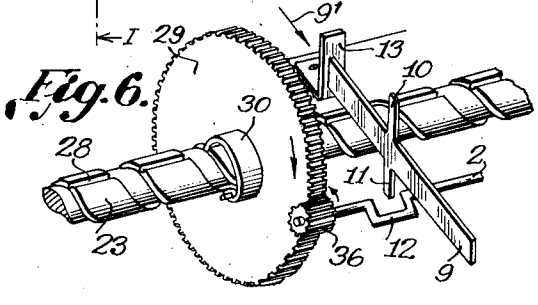
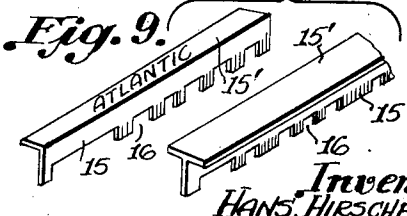


Fig. 9.



Inventor:
HANS. HIRSCHFELDT.

By [illegible]
Atty

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IMPULSE TRANSMITTER

Hans Hirschfeldt, London, England

Application December 19, 1934, Serial No. 758,217
In Great Britain December 21, 1933

18 Claims. (Cl. 179—90)

This invention relates to impulse transmitters which, while particularly suitable for use in connection with automatic telephone apparatus, can nevertheless be used for numerous other purposes such as for example, telegraphic transmission, signaling, for the control of intermittently operating machines or mechanism and all other purposes where electrical impulses are utilized.

For the sake of simplicity the invention will hereinafter be more fully described in its application to automatic telephone systems. In connection with this application the impulse transmitter of the present invention is of the known type in which the impulses or groups or series of impulses required for obtaining a given telephone number are automatically produced by merely setting the transmitter in a given position denoted by the name of the subscriber.

One object of the present invention is to provide an impulse transmitter of simple and compact construction which occupies a minimum of space.

A further object of the invention is to provide an impulse transmitter in which relatively small selector members or other control organs can be employed.

Still a further object of the invention is to provide an impulse transmitter capable of accommodating a relatively large number of selector members or stencils within a relatively confined space.

Still a further object of the invention is to provide an impulse transmitter in which selector members or the like of relatively small dimensions, can be utilized by virtue of a feeler device coacting with an electric switch, the feeler device being provided with a reciprocating member coming periodically into and out of contact with the selector member which has projections or recesses which cause the feeler device to influence the switch.

Still a further object of the invention is to provide an impulse transmitter in which, in contradistinction to the hitherto known constructions, the feeler device is not in permanent gliding contact with a selector member, but is reciprocated or otherwise periodically moved into and out of contact therewith.

Further objects and advantages of the invention will become apparent from the following description.

A typical embodiment of the invention is illustrated purely by way of example but not by way of limitation in the accompanying drawing, in which:—

Fig. 1 shows one form of feeler device coacting with a contact device under the influence of a projection of a selector member in the position in which it sends out an impulse;

Fig. 2 is an elevation of the same arrangement as in Fig. 1, when the feeler device has entered a recess in the selector member and no impulse is sent;

Fig. 3 is a side elevation of a detail of Figs. 1 and 2;

Fig. 4 shows on a larger scale, part of the feeler device of Figs. 1 and 2;

Fig. 5 shows a sliding block, carrying the feeler device in conjunction with the actuating mechanism;

Fig. 6 is a perspective view of the feeler device, showing the mechanism for driving same;

Fig. 7 is a partial longitudinal section through a drum composed of a plurality of selector members;

Fig. 8 is a transverse section along line I—I of Fig. 7;

Fig. 9 represents two selector members;

Fig. 10 is a front elevation of the impulse transmitter.

In the embodiment shown a spindle 2, to which an impulse disc 3 is secured by means of a universal joint 4 (Fig. 3) is mounted in a frame 1. Spindle 2 is driven by the pinion 29 (Figs. 5 and 6) which engages with a pinion 36 on said spindle 2. The impulse disc is of the form shown in Fig. 3 and normally rotates between contacts 17, 18 of an electric impulse-transmitting switch, making and breaking the circuit and thus transmitting an impulse once per revolution. A bell crank lever 5, having an arm 6 bent at right angles to the shaft 2 and an arm provided with a fork or guide 7, is pivotally mounted at 8 in said frame 1. A feeler rod 9 provided with diametrically oppositely projecting pins 10 and 11 is mounted in said frame 1 in such a way that it is free to move in the axial direction. The feeler 9 is under the pressure of a spring 13, one end of which is screwed or riveted to a sliding block 22, the action of which will be more fully described hereinafter. As is shown in Fig. 1, said spring tends to press the feeler in the direction of the arrow 9' against the edge 14 of a selector member 15. The spindle 2 is cranked at 12, or carries a cam 12, and on rotation of spindle 2 in a counter-clockwise direction (Fig. 6), said cam or crank first bears against pin 11 of the feeler 9, and on further rotation of the spindle lifts the feeler 9 against the pressure of the spring 13 in the direction opposite to that

of the arrow 9' (see Figs. 1 and 2). On further rotation of the spindle 2 the cam or crank is ultimately disengaged from the pin 11, whereupon spring 13 moves the feeler 9 in the direction of the arrow 9'. When the spindle 2 again engages underneath pin 11 the cycle is repeated, thus causing feeler 9 to reciprocate continuously. When the crank or cam 12 comes in contact with pin 11 of the feeler 9 the opposite pin 10 causes the bell crank lever 5 to move a little, but not sufficient to cause the arm 6 to bear against and displace the swingably mounted impulse disk 3. If, on encountering a recess 16 in the selector member 15 the feeler is able to move further in the direction of the arrow 9' (Fig. 2), the arm 6 of the bell crank lever 5 forces the swingably mounted impulse disc 3 into the oblique position shown in Fig. 2, so that it moves out of its normal path between the contact blades 17, 18 of the impulse transmitting switch. If, however, the feeler 9 encounters a projection 14 on the selector member 15 (Fig. 1), its stroke is checked and consequently the turning movement of the bell-crank lever 5 is restricted, so that the rotating impulse disc 3 remains in its normal upright position, in conformity with the action of centrifugal force and opens and closes the blades 17, 18 of the contact, that is to say, causes an impulse to be transmitted once per revolution.

The method of operation of the feeler member is an extremely important feature of the present invention. In all the constructions of impulse transmitters heretofore proposed, a gliding electric contact or a gliding feeler member controlling an electric contact is in permanent contact with the selector member. The use of a gliding contact however, necessitates the use of selector members of large dimensions in order to produce the requisite impulses and the intervals therebetween.

Thus in the known constructions it has been proposed to provide the selector member with a number of projections or teeth corresponding to the number of current impulses to be transmitted and to arrange said projections in groups between which are left spaces corresponding to the intervals between the impulse groups, the relation between the times of opening and closing of the impulse transmitting switch being regulated by the distance between adjacent teeth and their shape and by the relative speed of travel of the selector member. As can be readily seen such a construction requires selector members of large dimensions.

The herein described method of operation of the feeler device however, permits the use of selector members of relatively small dimensions since the electrical and timing conditions of the impulses are independent of the shape and dimensions of the projections and recesses of the selector member whilst the varying amplitudes of reciprocation of the feeler device which so to speak, taps its way along the selector member determine the series of impulses to be transmitted and the intervals therebetween.

The feeler rod 9 may of course, be replaced by any other means capable of coming intermittently into contact with the selector member, and performing a reciprocating, circular, oscillatory or other periodic movement without departing from the principle of the invention.

In the embodiment described, the contact device and the feeler device coacting therewith are jointly mounted on a sliding block 22 (Fig. 5) which is moved, by a traverser, such as a worm 23 or the like, in a direction parallel to the axis of the cylinder, from its neutral position next the plate 24 in which the worm is mounted, to the oppositely disposed cover plate 25 of the clockwork mechanism. The actuating movement is transmitted, for example by a clockwork mechanism, housed in a casing 26 and coupled to the traverser worm 23. The pinion 29, which is attached to the sliding block 22, but is free to rotate relatively thereto, is driven by means of a pawl 30 attached thereto and engaging in one or more longitudinal slots 28 provided in the traverser worm. This pawl must be wider than the thread cut in the worm, in order to enable it to slide over the thread. The clockwork is wound up by depressing a lever 27, which is located outside the apparatus and springs back automatically when released. On the winding lever 27 being depressed, the worm 23 moves the sliding block 22 into the initial operative position next the plate 25. When the lever 27 is released, the unwinding clockwork spring turns the worm and causes the sliding block 22 to move, in the opposite direction, into its neutral position at 24. The rate of unwinding is preferably controlled by a governor.

While the sliding block 22 is moving toward the end 24, the end of the pawl 30 engages in the groove 28 in the traverser worm 23, thus rotating the pinion 29 and causing the pinion 36 on spindle 2 to reciprocate the feeler 9. Since pinion 29 is attached to the sliding block 22, the movement of the latter causes pinion 29, and therefore pawl 30, to slide along the groove 28. When the traverser worm 23 is turned in the opposite direction to return the block 22 to its initial operating position, pawl 30 no longer engages in the groove 28; pinion 29 does not rotate; and the feeler 9 therefore does not come into operation.

As shown in Figs. 7 and 8, the selector members 15 are inserted in radial grooves as 21 between two carriers 19 and 20—preferably designed as discs—so that their outer flanges 15', which lie in mutual contact, form a closed hollow cylinder or polygon 33. If the names of the telephone subscribers, or the like, be inscribed on the external members or flanges of the selector members, a record will be obtained, in successive lines, of the subscribers which can be automatically selected by the impulse transmitter. The selector members 15 are preferably of L-, T- or other suitable cross section (Fig. 8). The members or flanges projecting inwardly in the cylinder are provided with projections and recesses corresponding to the subscriber's number. A suitable arrangement consists in shaping the flange 15 of the selector member like a comb if desired with staggered teeth lying in two different planes—by stamping out, or the like—beforehand, so that the individual prongs or tongues can be bent over or pinched off, to enable the desired number of gaps 16 to be formed by simply bending or pinching off a certain number of said prongs or tongues.

Fig. 6 shows how a hollow cylinder can be constructed by the insertion of the whole of the selector members 15, or name plates, and by designing the carrier 19 (Fig. 6) in the form of a disc, and the annular form of the carrier 20, supported by engaging round the cover plate 25 of the clockwork mechanism.

In the present embodiment of the automatic current-impulse transmitter, the apparatus as a whole comprises three units, namely, in the

first place, the casing **32** with inspection opening **33** (Fig. 9) secondly, the feeler device and contact device (Fig. 5) integrally mounted inside same, and, thirdly, the hollow cylinder formed by the assembled selector members and adapted to be rotated, by means of the handle **34**, between the two and in relation to the interior apparatus.

The selector drum is preferably in connection with a line-spacer, so that a given selector member, or name plate can be easily brought into any desired position under the inspection opening. In that position, the inwardly extending flange of the corresponding selector member provided with the characters corresponding to the subscribers number is situated in the working line of the feeler rod of the feeler device. Current is supplied to the contact device (which is also mounted on the sliding block **22**) for example through flexible wire spirals, slip pillars and brushes, or the like.

The hand lever **27** is connected to a check pawl (not shown) which allows the selector drum or cylinder to be turned only when the lever **27** is in the neutral position, in order to prevent the selecting operation from being disturbed by external influences.

Moreover the hand lever is preferably provided with locking means preventing its return if it has not been moved to the full extent so as to ensure that the impulse transmitter operates only when the carriage **22** is in its proper initial operating position. Preferably also said hand lever is provided with additional locking means adapted to prevent same being depressed again before it has completed its return movement.

When the herein described current-impulse transmitter is being employed for telephonic purposes, care should be taken to prevent the crackling noises from being audible in the receiver during the selecting operation. This result is achieved, for example by providing the block **22** with a sliding shoe **35**, under pressure of a spring-controlled lever, and sliding along the selector member **15**. The shoe **35** must be broader than the recesses **16**, or the like provided in the selector members **15**, and corresponding to the intervals between the individual current-impulse groups, so that it does not drop until all groups of impulse characters have been passed. While the shoe **35** slides over the top of the selector member, the microphone and telephone contacts are short-circuited, but once it drops after the last group of impulses have been transmitted, the microphone and telephone circuits are restored and speech can be transmitted.

The casing of the apparatus is provided with a slot (not shown) to render the opening of the whole apparatus unnecessary when selector members are to be inserted or changed. The whole inner mechanism is protected by an inner cover which has merely an opening in the line of the feeler below the inspection opening **33** in order to avoid interference with the inner mechanism when changing a selector member.

I claim:—

1. An automatic impulse transmitter comprising a member the configuration of which determines the sequence of the impulses to be transmitted, a feeler device, means for moving said feeler device in relation to said first-mentioned member, means for bringing said feeler device alternately into and out of contact with said first-mentioned member during said relative movement and means operated by said feeler device in accordance with the amplitude of stroke thereof as determined by the configuration of said first-mentioned member for controlling an electric switch.

2. An automatic impulse transmitter comprising a member the configuration of which determines the sequence of the impulses to be transmitted, a feeler device, means for moving said feeler device in relation to said first-mentioned member, means for reciprocating said feeler device alternately into and out of contact with said first-mentioned member during said relative movement and means operated by said feeler device in accordance with the amplitude of stroke thereof as determined by the configuration of said first-mentioned member for controlling an electric switch.

3. An automatic impulse transmitter comprising a plurality of selector members the configuration of which determines the sequence of the impulses to be transmitted, a feeler device, means for bringing a predetermined one of said plurality of selector members into cooperating relationship with said feeler device, means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with said selector member during said relative movement and means operated by said feeler device in accordance with the amplitude of stroke thereof as determined by the configuration of the selector member for controlling an electric switch.

4. An automatic impulse transmitter comprising a selector member the configuration of which determines the sequence of the impulses to be transmitted, a feeler device, means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with said selector member during said relative movement, an electric switch, and a rotating cam disc movable by said feeler device in accordance with the amplitude of stroke thereof as determined by the configuration of the selector member into and out of co-operating relationship with said electric switch.

5. An automatic impulse transmitter comprising a selector member having an indented edge, the configuration of which latter determines the sequence of the impulses to be transmitted, a feeler device, means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with the indented edge of said selector member during said relative movement and means operated by said feeler device in accordance with the amplitude of stroke thereof as determined by the indentation of the edge of said selector member for controlling an electric switch.

6. An automatic impulse transmitter comprising a selector member the configuration of which determines the sequence of the impulses to be transmitted, a feeler device, means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with said selector member during said relative movement, an electric switch, a tiltably mounted rotating cam disc normally coacting with the contacts of said switch, and an arm cooperating with said cam disc and operatively connected to said feeler device such that increases in the amplitude of the stroke of said feeler device as determined by the configuration of the selector member cause said arm

to tilt said cam disc out of its normal position in which it coacts with said switch contacts.

7. An automatic impulse transmitter comprising a selector member the configuration of which determines the sequence of the impulses to be transmitted, a feeler device, means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with said selector member during said relative movement, an electric switch, a rotating spindle, a cam disc tiltably mounted on said spindle and normally rotating between the contacts of said switch, and an arm adapted to bear on said cam disc and operatively connected to said feeler device such that increases in the amplitude of the stroke of said feeler device as determined by the configuration of the selector member, cause said arm to tilt said cam disc out of its normal position between said switch contacts.

8. An automatic impulse transmitter comprising a plurality of selector members the configuration of which determines the sequence of the impulses to be transmitted, a feeler device, means for bringing a predetermined one of said plurality of selector members into cooperating relationship with said feeler device, means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with said selector member during said relative movement, an electric switch, a tiltably mounted rotating cam disc normally coacting with the contacts of said switch, and an arm cooperating with said cam disc and operatively connected to said feeler device such that increases in the amplitude of the stroke of said feeler device as determined by the configuration of the selector member cause said arm to tilt and bring said cam disc out of its normal position in which it coacts with said switch contacts.

9. An automatic impulse transmitter comprising a plurality of profiled selector members of different configuration arranged in the form of a cylinder, a feeler device located inside said cylinder, means for bringing a predetermined one of said selector members into cooperating relationship with said feeler device, means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with said selector member during said relative movement, an electric switch, a rotating cam disc normally coacting with the contacts of said switch, and an arm cooperating with said cam disc and operatively connected to said feeler device such that increases in the amplitude of the stroke of said feeler device as determined by the configuration of the selector member cause said arm to tilt and bring said cam disc out of its normal position in which it coacts with said switch contacts.

10. An automatic impulse transmitter comprising a plurality of selector members of angular section, each having at least one indented edge, a feeler device, means for bringing the indented edge of a pre-determined one of said selector members into cooperating relationship with said feeler device means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with the indented edge of said selector member during said relative movement, an electric switch, a rotating cam disc normally coacting with the contacts of said switch, and an arm cooperating with said cam disc and operatively connected to said feeler device such that increases in the amplitude of the stroke of said feeler device as determined by the configuration of the indented edge of said selector member cause said arm to tilt and bring said cam disc out of its normal position in which it coacts with said switch contacts.

11. An automatic impulse transmitter comprising a plurality of selector members of angular section, each having at least one indented edge arranged in the form of a cylinder with their indented edges projecting radially inwards, a feeler device located inside said cylinder, means for bringing a pre-determined one of said selector members into cooperating relationship with said feeler device means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with the indented edge of said selector member during said relative movement, an electric switch, a rotating spindle, a cam disc swingably mounted on said spindle and normally rotating between the contacts of said switch, and an arm cooperating with said cam disc and operatively connected to said feeler device such that increases in the amplitude of the stroke of said feeler device as determined by the configuration of the indented edge of said selector member cause said arm to tilt and bring said cam disc out of its normal position between said switch contacts.

12. An automatic impulse transmitter comprising a plurality of selector members of angular section, each having at least one indented edge arranged in the form of a cylinder with their indented edges projecting radially, a feeler device, means for turning said cylinder to bring the indented edge of a pre-determined one of said selector members into cooperating relationship with said feeler device means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with the indented edge of said selector member during said relative movement, an electric switch, a rotating cam disc normally coacting with the contacts of said switch, and an arm cooperating with said cam disc and operatively connected to said feeler device such that increases in the amplitude of the stroke of said feeler device as determined by the configuration of the indented edge of said selector member cause said arm to tilt and bring said cam disc out of its normal position in which it coacts with said switch contacts.

13. An automatic impulse transmitter comprising a plurality of selector members of angular section, each having at least one indented edge arranged in the form of a cylinder with their indented edges projecting radially inwards, a feeler device, located inside said cylinder, means for turning said cylinder to bring the indented edge of a pre-determined one of said selector members into cooperating relationship with said feeler device means for moving said feeler device in relation to said selector member, means for reciprocating said feeler device alternately into and out of contact with the indented edge of said selector member during said relative movement, an electric switch, a rotating cam disc normally coacting with the contacts of said switch, and an arm cooperating with said cam disc and operatively connected to said feeler device such that increases in the amplitude of the stroke of said feeler device as determined by the configuration of the indented edge of said selector mem-

ber cause said arm to tilt and bring said cam disc out of its normal position in which it coacts with said switch contacts.

14. An automatic impulse transmitter comprising a plurality of profiled selector members arranged in tubular form, a feeler device, means for moving said feeler device in relation to said selector members, means for bringing a predetermined one of said plurality of selector members into cooperating relationship with said feeler device and means operated by said feeler device for influencing an electric circuit.

15. An automatic impulse transmitter comprising a plurality of profiled selector members arranged in tubular form with their profiled edges directed radially inwards, a feeler device located inside said tube, means for moving said feeler device in relation to said selector members, means for bringing a pre-determined one of said plurality of selector members into cooperating relationship with said feeler device and means operated by said feeler device for influencing an electric circuit.

16. An automatic impulse transmitter comprising a plurality of profiled selector members arranged in tubular form, a feeler device, power driven worm gear carrying said feeler device and moving same in relation to said selector members, means for bringing a pre-determined one of said plurality of selector members into cooperating relationship with said feeler device and means operated by said feeler device for influencing an electric circuit.

17. An automatic impulse transmitter comprising a plurality of profiled selector members arranged in tubular form with their profiled edges directed radially inwards, a feeler device located inside said tube, power-driven worm gear carrying said feeler device and moving same in relation to said selector members, means for bringing a pre-determined one of said plurality of selector members into cooperating relationship with said feeler device and means operated by said feeler device for influencing an electric circuit.

18. An automatic impulse transmitter comprising a plurality of profiled selector members arranged in tubular form with their profiled edges directed radially inwards, a feeler device located inside said tube, means for moving said feeler device in relation to said selector members, means for turning said tube to bring a pre-determined one of said plurality of selector members into cooperating relationship with said feeler device and means operated by said feeler device for influencing an electric circuit.

HANS HIRSCHFELDT.