

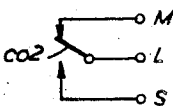
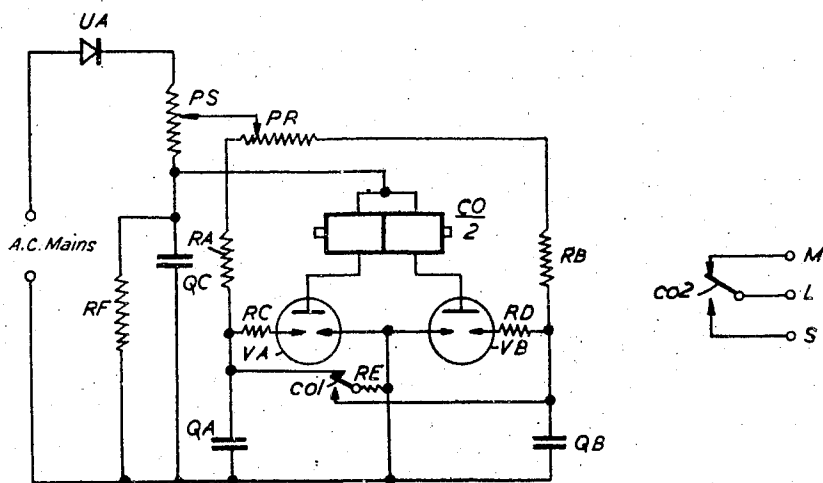
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PULSE GENERATOR

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PULSE GENERATOR

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1 Claim. (Cl. 250—36)

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This invention relates to electrical impulse generators, that is to arrangements for generating repetitive signals consisting of two conditions occurring alternately and consecutively in equal over-all periods of time. Such conditions are hereinafter designated respectively "mark" and "space". They may consist, for example, in the opening and closing of relay contacts, in the presence and absence of current on a line, or in the application of positive and negative potential to a point.

Objects of the invention are to provide for the accurate timing of the pulses, to permit of adjustment in the overall length of pulses and in the ratio of "mark" to "space," and to construct a generator which is simple and robust.

The several features of the invention include the provision of two condensers, a pair of electron discharge devices, which may be vacuum tubes or gas-filled tubes of the three-element type, and two relay windings arranged to be energized whenever a respective tube becomes conducting under the control of an associated condenser. The relay windings may form part of a single or two separate relays having contacts for the generation of the impulses and also for alternately charging and discharging the two condensers.

The description that follows relates to the accompanying drawing which shows the circuit of an impulse generating arrangement in accordance with the present invention.

The circuit shown employs two cold cathode gas-discharge tubes VA and VB which are arranged so that they can be ionised alternately: each tube is associated with a condenser QA and QB which charges up at a predetermined rate until its voltage reaches a predetermined value sufficient to fire the respective tube; a common relay CO transfers the charging circuit from one condenser to the other as a result of the firing of the tube: the whole arrangement being symmetrical in form.

Considering the circuit in detail, it will be seen that the alternating current mains supply is taken over a rectifier UA to a potentiometer consisting of resistances PS and RF in series, with a condenser QC in parallel with RF. This potentiometer arrangement has a partial smoothing effect upon the rectified current, but leaves a substantial ripple thereon for a purpose to be mentioned below.

From a point towards the upper or positive end of the potentiometer, i. e. between the higher-valued resistance RF and the lower-valued PS,

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a connection is taken to the two windings of a relay CO and thence to the anodes of the respective tubes VA and VB. The relay CO, common to both tubes is a side-stable locking relay, that is, its armature can take up either of two positions, according to which of its windings was last energised, and is there held until an energisation of the other winding to change it over. A suitable relay for adaption for use in this manner is that which has been disclosed in British Patent No. 496,697.

The cathodes of the discharge tubes are connected together and to the negative end of the potentiometer.

The uppermost or more positive connection to the potentiometer is that provided by the slider on resistance PS; that is connected to a slider on a resistance PR which has its two ends connected, one to a resistance RA and the other to a resistance RB. Each of these latter resistances is taken over one of the condensers QA, QB to the negative end of the potentiometer.

From a point intermediate the resistance RA and condenser QA a connection is taken over resistance RC to the auxiliary anode of tube VA, and similarly at RD in the case of tube VB. Also from points intermediate the resistances RA, RB and condensers QA, QB there are connections to a change-over contact set operated by relay CO, a resistance RE leading from the armature of this contact set to the negative end of the potentiometer.

The manner in which the circuit functions to generate impulses will be readily understandable. With the contacts *col* in the position shown, then condenser QA is short-circuited over resistance RE, while condenser QB is being progressively charged up over resistance PS, PR and RB. This charging will continue until the voltage on the condenser QB, applied over resistance RD to the auxiliary anode of tube VB, makes the auxiliary anode sufficiently positive with respect to the cathode, that the tube VB is fired. Then a current flows through the right-hand winding of relay CO and causes the relay-contact to change over from the position shown to the alternative position. This energisation of CO is but momentary however, owing to the fact that the rectified alternating-current, although partially smoothed, is still sufficiently raw, that is still carries sufficient ripple, to reduce the anode voltage below the sustaining value for a part of each mains cycle. The tube VB is thus very quickly quenched.

Meanwhile, the relay CO having changed over

and its contacts being held in their new position despite the cessation of operating current, condenser QB will have been discharged over resistance RE, and condenser QA will have started to charge up. The functioning as already described will now be repeated for tube VA, the succession firing of both tubes constituting a complete cycle of pulse-generation.

The times taken for the first half-cycle, the second half-cycle and the complete cycle, will of course depend upon the values of the components and of the voltage applied to them. Thus the values of resistance RB and condenser QB will control the time of the first half-cycle, those of RA and QA the second half-cycle, and setting of PR will provide a limited measure of ratio adjustment between the two. Again, the setting of the common potentiometer PS provides a limited adjustment of the over-all cycle-time.

The generated pulses are of course utilised in the circuit which includes a second contact set co2 of relay CO, the line L receiving either a mark condition from the M-lead or a space condition from the S-lead.

It will be understood that the invention may take other forms than that actually illustrated. For example, the single polarised side stable relay CO with its two windings may be replaced by two simple relays each having a locking circuit that includes normally closed contacts of the other. However, the advantage of the single relay, especially a relay like that disclosed in British patent specification No. 496,697, is that its change-over times in both directions are, or can be made the same.

Again some specific circuit arrangements may be included to quench the tubes, instead of relying upon the ripple in raw rectified alternating current: or the tube may not be quenched but may remain operative until the firing of the other tube, their operation being then not only alternate but alternative. In this latter case the need for a locking relay arrangement will be removed: and in either case direct current instead of alternating current may be used as the supply.

The electron tubes, instead of being gas-dis-

charge tubes, may be normal thermionic valves of high vacuum.

What is claimed is:

A circuit arrangement for the generation of impulses, each consisting of a mark and a space comprising two gas-discharge tubes having their cathodes connected together and to the negative side of a supply, two arrangements of a condenser and a resistance in series connected across said supply, two resistances each connected from the auxiliary anode of one tube to a point intermediate the condenser and resistance in one of said series arrangements, a two-winding side-stable relay having each winding connected between the anode of one tube and the positive side of a raw rectifier-alternating-current supply and change-over contacts of said relay connecting said cathodes over a resistance with the said intermediate points alternatively so that firing of a tube as a result of charging of the corresponding condenser causes change-over of said contacts to discharge said corresponding condenser to permit charge of the other condenser.

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