

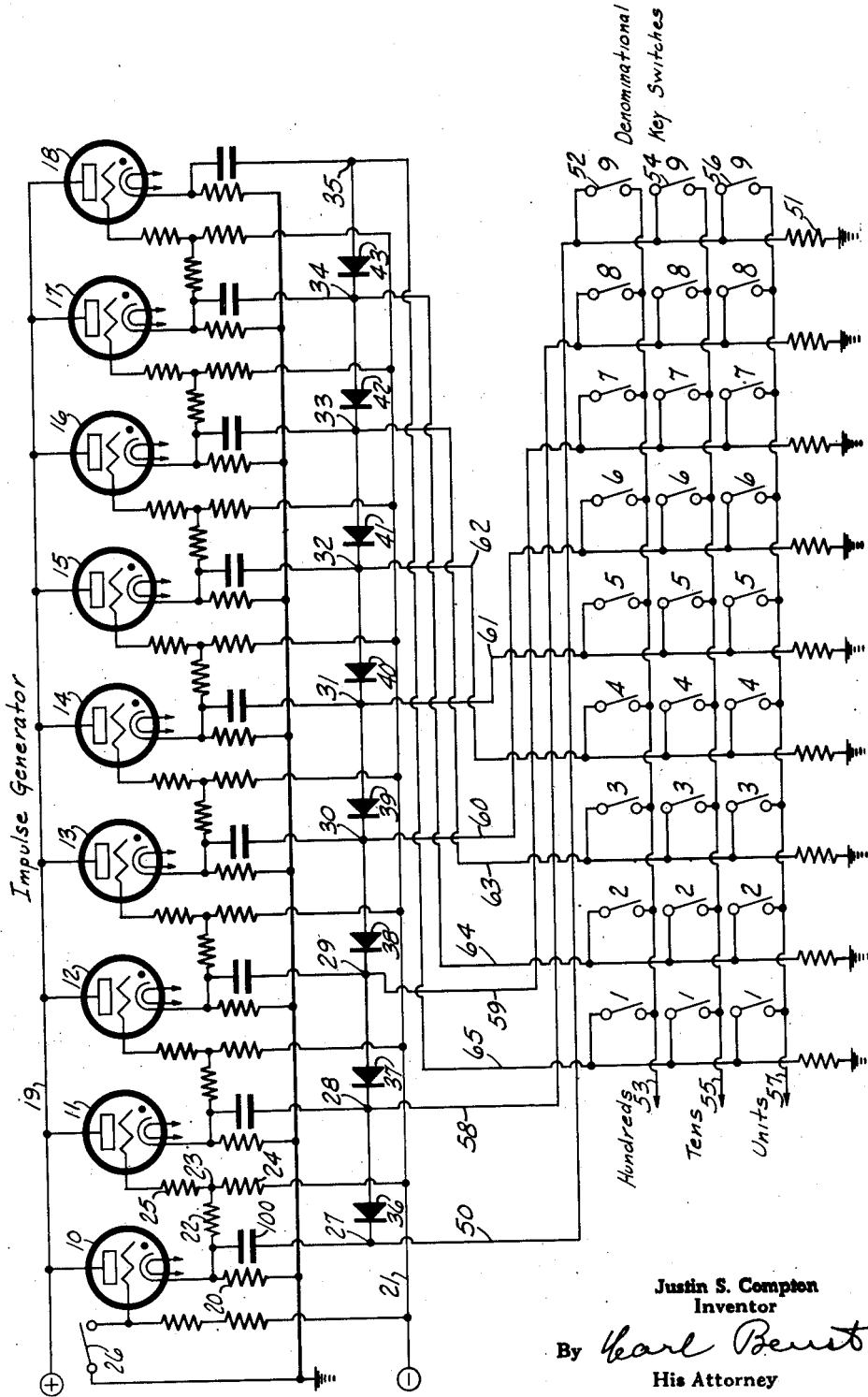
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ELECTRONIC DEVICE

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## ELECTRONIC DEVICE

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This invention relates to a single denominational electronic electric impulse generator for serving a plurality of denominations of an impulse counting device in a single operation.

It is an object of this invention to provide an electronic electric impulse generator having an electron tube impulse producing element for each digit of a denomination together with output means and switching means so that, in a single operation of the tubes, electric impulses may be sent equalling a selected digit value for each of a plurality of counting denominations.

Another object of the invention is to provide a plurality of impulse output circuits, one for each digit value of a denomination, each of which is served by the same impulse producer but each circuit receiving only the number of impulses represented by its assigned digit value.

Another object of the invention is to provide means to produce electronically a fixed number of electric impulses from which may be obtained groups of varying numbers of impulses.

With these and incidental objects in view, the invention includes certain novel features of construction and combinations of elements, the essentials of which are set forth in appended claims and a preferred form or embodiment of which is hereinafter set forth with reference to the drawing which accompanies and forms a part of this specification.

The drawing represents a circuit diagram of a decimal system single denominational electronic impulse producer for serving a three-denominational decimal system impulse counter.

### General description

Referring to the drawing, there is provided a plurality of nine gaseous triode electron discharge tubes 10, 11, 12, 13, 14, 15, 16, 17, and 18, each having its anode connected to a positive potential supply conductor 19, and each having its cathode connected to ground through a resistance such as, for example, resistance 20 serving the tube 10, and connected to a negative potential supply conductor 21 through a resistance, like resistance 22, a point, like point 23, and a resistance, like resistance 24. Each control grid, except the grid for tube 10, is connected to a negative potential supply through a resistance, like resistance 25 serving tube 11, to keep the tubes in a normally non-conducting condition. The grid of tube 10 is connected directly through resistances to the negative supply conductor.

The potential supplies and resistances are balanced with the tube characteristics, so that, if

the control grid of tube 10 is grounded, as by switch 26, said tube 10 will fire and become conducting, and, in so doing, the rise in its cathode potential will change the potential at point 23 in a positive manner, so that the grid of tube 11 will lose control and tube 11 will become conducting, which in turn causes tubes 12, 13, 14, 15, 16, 17, and 18 to become conducting automatically in sequence. Such automatically operating chain of tubes is well known in the art and is fully described in United States application for Letters Patent Serial No. 325,040, of Joseph R. Desch and Robert E. Mumma, filed March 20, 1940, to which reference is made.

The sharp positive potential impulse produced at the cathode of a tube as it fires is transmitted through a capacitor such as capacitor 100, serving the tube 10, to a point 27. In a similar manner, point 28 receives a positive potential impulse as tube 11 fires, point 29 receives a positive impulse as tube 12 fires, point 30 receives a positive impulse as tube 13 fires, point 31 receives a positive impulse as tube 14 fires, point 32 receives a positive impulse as tube 15 fires, point 33 receives a positive impulse as tube 16 fires, point 34 receives a positive impulse as tube 17 fires, and point 35 receives a positive impulse as tube 18 fires.

Points 27 and 28 are connected through a rectifier 36, points 28 and 29 are connected through a rectifier 37, points 29 and 30 are connected through a rectifier 38, points 30 and 31 are connected through a rectifier 39, points 31 and 32 are connected through a rectifier 40, points 32 and 33 are connected through a rectifier 41, points 33 and 34 are connected through a rectifier 42, and points 34 and 35 are connected through a rectifier 43. All of these rectifiers are oriented to pass positive impulses only in the direction of point 27, and the rectifiers should be of the type having a low internal capacity.

It will be apparent that, when tube 10 becomes conducting, only point 27 will receive the positive potential impulse; that, when tube 11 becomes conducting, points 28 and 27 will receive the positive potential impulse; and that, when tube 12 becomes conducting, points 29, 28, and 27 will receive the positive potential impulse. Thus, as each tube fires, it produces an impulse which is transmitted to its own output terminal and to all other output terminals between its own and point 27.

Therefore, as the tubes 10 to 18 inclusive are automatically fired in sequence, point 27 will receive nine impulses, point 28 will receive eight

impulses, point 29 will receive seven impulses, point 30 will receive six impulses, point 31 will receive five impulses, point 32 will receive four impulses, point 33 will receive three impulses, point 34 will receive two impulses, and point 35 will receive one impulse.

Point 27 is connected by conductor 50 through resistance 51 to ground. When key switch 52 is closed, conductor 53, serving a hundreds bank of an impulse counter, will be given nine impulses on an operation of the impulse generator. Key switch 54, when closed, will cause nine impulses to be transmitted to conductor 55 serving a tens bank of an impulse counter. Key switch 56, when closed, will cause nine impulses to be transmitted to conductor 57 serving a units bank of an impulse counter.

Conductors 58, 59, 60, 61, 62, 63, 64, and 65 in a similar manner serve the "8" key switches, the "7" key switches, the "6" key switches, the "5" key switches, the "4" key switches, the "3" key switches, the "2" key switches, and the "1" key switches, respectively.

Thus, by the closing of a selected key switch in chosen denominations of the denominational key switching unit, the desired number of impulses will appear in the corresponding denominational output conductor.

The invention is not to be deemed limited by the number of tubes in the generator or by the number of output denominations served, as it is apparent that the principle of the invention is susceptible of expansion or contraction in either respect.

While the form of the invention herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the form herein disclosed, for it is susceptible of embodiment in various other forms all coming within the scope of the claims which follow.

What is claimed is:

1. A plurality of electric impulse producers, each when operated producing one impulse; means to operate all of said producers in sequence wherein each producer is operated once; an output circuit having in series therein a plurality of unidirectional current devices oriented in the same direction; and means coupling each impulse producer to a point between two of said unidirectional devices.

2. A plurality of electron tubes; means supplying operating potential to said tubes, which means includes a resistance associated with each tube so that conduction commencing in a tube causes a potential impulse at a point between the resistance and the tube; means interconnecting the tubes so that they may be made to become conducting one at a time in sequence; an output circuit for each tube, each coupled to the associated point; and a unidirectional electric current transmitting means joining each two adjacent output conductors in the sequence, so that each output conductor receives an impulse from the act of conduction commencing in its associated tube, and one for the act of conduction commencing in each tube succeeding it in the sequence.

3. A plurality of gaseous electron tubes; means supplying operating potential to said tubes, which means includes a resistance associated with each tube so that conduction commencing in a tube

causes a potential impulse at a point between the resistance and the tube; means interconnecting the tubes so that they may be made to become conducting one at a time in sequence; an output circuit for each tube, each coupled to the associated point through a capacitor; and a unidirectional electric current transmitting means joining each two adjacent output conductors in the sequence, so that each output conductor receives an impulse from the act of conduction commencing in its associated tube, and one for the act of conduction commencing in each tube succeeding it in the sequence.

4. In combination, a unidirectional electric impulse circuit including a plurality of points interconnected by unidirectional electric current passing devices, all of said devices being oriented to pass current in the same direction; and means for impressing an electric impulse on said circuit at each point in sequence.

5. In combination, a unidirectional electric impulse circuit including a plurality of points interconnected by unidirectional electric current devices, all of said devices being oriented in the same direction; means for impressing an electric impulse on said circuit at each point in sequence; and an output means for each point, each of which output means receives an impulse from its associated point and each succeeding point in the sequence.

6. In combination, a plurality of gaseous triode electron tubes each having an anode, a cathode, and a control grid, said tubes being equal in number to the number of digits in a denomination of a particular numerical system; means supplying operating and discharge control energy to said tubes which includes a resistance in each cathode supply; means interconnecting the tubes in a chain for automatic discharge in sequence; a terminal point associated with each tube to which its cathode is electrostatically coupled; a rectifier connecting the point associated with one tube of the chain with the point associated with the next tube of the chain in either direction, which rectifiers are oriented to pass positive electric impulses toward the point associated with the first tube of the chain; and a plurality of denominational output circuits each having a plurality of switches for connecting it to a selected one of said points.

7. In combination, a plurality of triode electron tubes each having an anode, a cathode, and a control grid, said tubes being equal in number to the number of digits in a denomination of a particular numerical system; means supplying operating and discharge control energy to said tubes which includes a resistance in each cathode supply; means interconnecting the tubes in a chain for automatic discharge in sequence; a terminal point associated with each tube to which its cathode is electrostatically coupled; a rectifier connecting the point associated with one tube of the chain with the point associated with the next tube of the chain in either direction, which rectifiers are oriented to pass positive electric impulses toward the point associated with the first tube of the chain; and a plurality of denominational output circuits each having a plurality of switches for connecting it to a selected one of said points.

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