

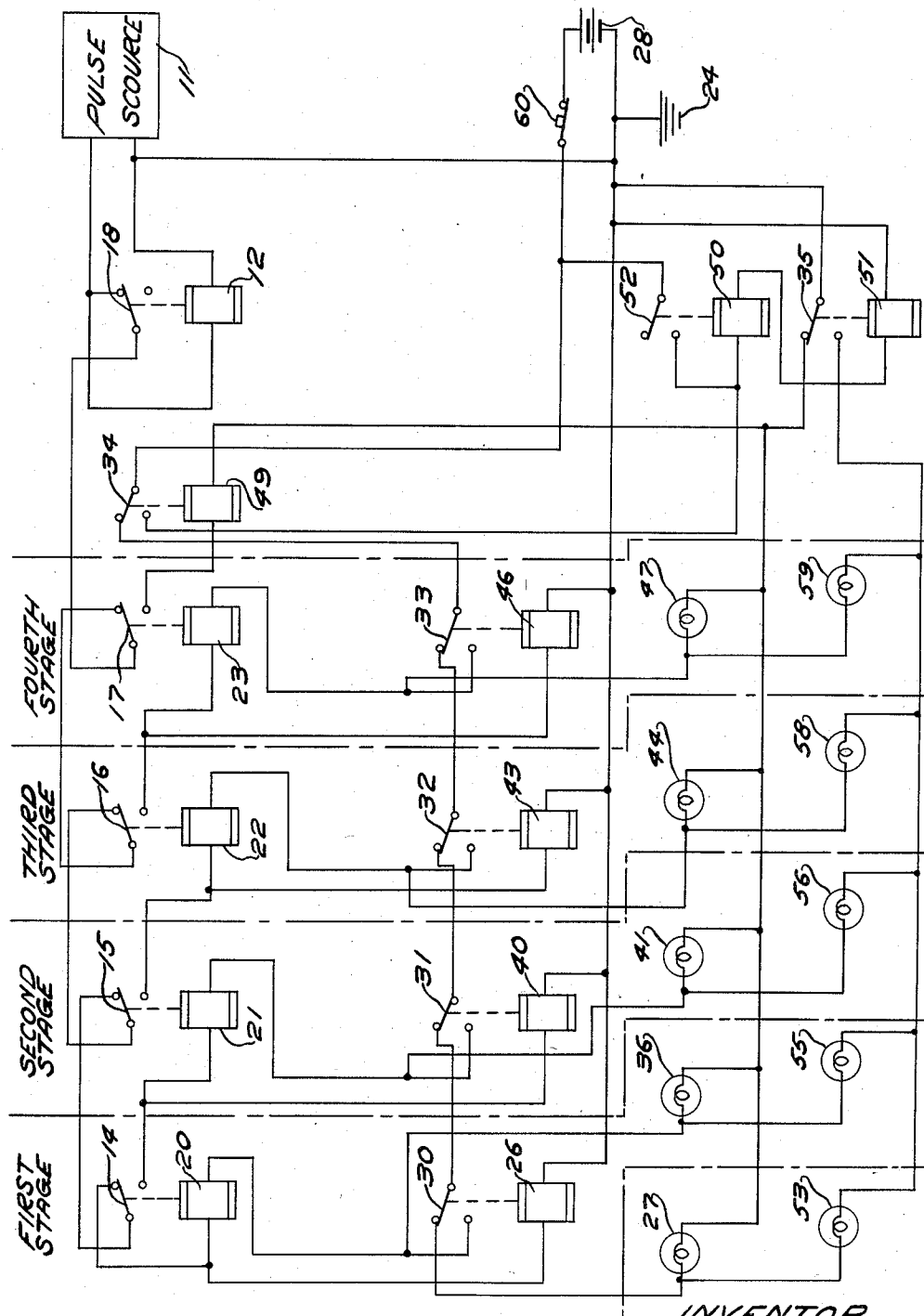
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IMPULSE COUNTING CIRCUIT

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IMPULSE COUNTING CIRCUIT

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This invention relates to impulse counting circuits and more particularly to relay type electrical impulse counters.

An object of this invention is to provide an impulse counter having counting stages which each count two impulses.

Another object of this invention is to provide an impulse counter which will be rendered inoperative when it has received the maximum number of impulses it is designed to count.

One embodiment of the invention may include a series of relays and count indicators connected in a plurality of counting stages whereby as impulses are received the counting stages are successively actuated until all stages have been sequentially traversed, whereupon each counting stage is again actuated in sequence to operate a second indicator in each of the stages. At the completion of the second traverse of the counting stages the entire circuit is rendered inoperative until it is reset to zero position by disconnecting it from its power supply.

Other objects and advantages of the invention will become apparent by reference to the following detailed description and the accompanying drawing wherein a single figure illustrates a preferred embodiment of the invention and discloses a schematic diagram of the impulse counting circuit with its components in normal unactuated position to begin a counting operation.

Referring now in detail to the drawing, a source 11 of impulses to be counted is shown connected to a relay 12 which opens a switch 18 to limit the duration of the impulses fed into a plurality of impulse counting stages (first, second, third and fourth). The first impulse is fed to the relay 12 and also through a plurality of normally unactuated double-throw switches 14, 15, 16, 17 and 18 operated by relays 20, 21, 22, 23 and 12, respectively, in the first, second, third and fourth counting stages, to ground 24 through a relay 26 in the first counting stage. A direct current voltage is applied by a battery 28 to a pilot lamp 27 which indicates a zero count and which is connected in series with a plurality of normally unactuated double-throw switches 30, 31, 32, 33, 34 and 35. When the relay 26 is actuated it operates the switch 30 to disconnect the zero pilot lamp 27 from the power supply 28 and to place the relays 20 and 26 in series across the power supply 28 whereupon the relay 20 is actuated to operate the switch 14 whereby the second impulse will be fed into the second counting stage. A first pilot lamp 36 for indicating a count of one is also connected across the power supply 28 when the relay is actuated.

The second impulse is fed to ground 24 through the actuated switch 14 and unactuated switches 15, 16, 17 and 18 and a relay 40 in the second counting stage, whereupon the switch 31 is operated to disconnect the first pilot lamp 36 and the relays 20 and 26 from the power supply 28 and to connect a second pilot lamp 41 thereto to indicate a count of two. Operation of the switch 31 also connects the relays 21 and 40 to the

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power supply 28, whereupon the switch 15 is operated to feed the third impulse into the third counting stage.

The third impulse is fed through the actuated switch 15 and unactuated switches 16, 17 and 18 to a relay 43 in the third counting stage. Relay 43 actuates the switch 32 to disconnect the second pilot lamp 41 and the relays 40 and 21 from the power supply 28 and to connect the relays 43 and 22 and a third pilot lamp 44 to the power supply, to thus indicate that three impulses have been received. When power is applied to the relay 22 it operates the switch 16 to feed the fourth impulse into the fourth impulse counting stage.

The fourth impulse is fed through the actuated switch 16 and unactuated switches 17 and 18 to a relay 46 in the fourth counting stage to operate the switch 33 for disconnecting the third pilot lamp 44 and the relays 43 and 22 from the power supply 28. This actuation of switch 33 connects the relays 46 and 23 and a fourth pilot lamp 47 to the power supply 28, whereupon switch 17 is actuated to feed the fifth impulse to a relay 49 to momentarily actuate the switch 34. Momentary actuation of switch 34 temporarily supplies power to relays 50 and 51 which actuate switches 52 and 35, respectively. Actuation of the switch 52 connects the relays 50 and 51 to the power supply 28, which connection is held by relay 50 until the power supply is interrupted. Upon actuation of switch 35 power is applied to a fifth pilot lamp 53 through unactuated switches 30, 31, 32, 33 and 34 and actuated switch 35, thus utilizing the first counting stage to indicate a count of two impulses (the first impulse and the fifth impulse).

The circuit is now in its original condition as disclosed in the drawing except that relays 50 and 51 are energized, relay 50 actuating switch 52 to keep these relays energized and relay 51 actuating switch 35 to disconnect the zero pilot lamp 27 from ground 24 and to ground the fifth pilot lamp 53.

The sixth impulse is fed through the unactuated switches 14, 15, 16, 17 and 18 to the relay 26, whereupon this relay actuates switch 30 to apply power from the power supply 28 to relays 26 and 20. Actuation of switch 30 connects a sixth pilot lamp 55 to the power supply 28 and disconnects the fifth pilot lamp 53 therefrom, thus indicating that six impulses have been received and counted. Switch 14 is now actuated to feed the seventh impulse into the second counting stage, whereupon a seventh pilot lamp 56 is lit and relays 40 and 21 are energized to actuate the switches 31 and 15 to disconnect the sixth pilot lamp 55 from the power supply 28 and to feed the eighth impulse into the third counting stage.

The eighth impulse lights an eighth pilot lamp 58 and the relays 43 and 22 are energized to disconnect the seventh pilot lamp 56 and the relays 40 and 21 from the power supply 28 and to feed the ninth impulse into the fourth counting stage. The ninth impulse is fed into the fourth counting stage to light a ninth pilot lamp 59 and to energize the relay 46 which actuates the switch 33 to energize the relay 23 to disconnect the eighth pilot lamp 58 and the relays 43 and 22 from the power supply 28.

The circuit has now received and counted nine impulses, which is the maximum number the present embodiment is adapted to count, and relay 23 has actuated the switch 17 to connect the impulse source 11 to the relay 49. The switch 35 is now held in operated position by the relay 51 which was energized as a result of the fifth pulse, thereby breaking the direct connection of the relay 49 to ground 24. The relay 46 is, however, now connected to ground 24 through the pilot lamps 27, 36, 41, 44, and 47 connected in parallel with each other and

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in series with the pilot lamps 53, 55, 56, 58, and 59, respectively, but the resistance of this circuit is such that further incoming impulses, which are of a limited amplitude and duration, will not energize the relay 46 or light the pilot lamps. Thus, after indicating nine impulses, the circuit is rendered inoperative.

A circuit reset switch 60 is provided for interrupting the power supply 28 to reset the circuit to zero to begin another counting operation. When the reset switch 60 is opened the relays 50 and 51 are de-energized, whereupon the switches 52 and 35 return to normal position to return the circuit to its original condition as illustrated in the drawing. The zero pilot lamp 27 is now lit to indicate a zero count. Incoming impulses will actuate the circuit as described above.

The above-described impulse counter serves to rapidly count incoming impulses and to render itself inoperative when it has received the maximum number of impulses it is adapted to count. Additional impulse counting stages can be connected between any of the stages shown in the drawing to increase the number of impulses which the circuit can count.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. An electrical impulse counting circuit, comprising a first series of normally grounded impulse count indicators forming a plurality of counting stages, a second series of impulse count indicators connected in parallel with the first series of indicators, power supply means for actuating the indicators, a first chain of relays, a second chain of relays, first switching means associated with and actuated by the first relay chain for sequentially connecting the first series of indicators and the second chain of relays to the power supply means, second switching means associated with and actuated by the second chain of relays for sequentially connecting the relays of the first chain to a source of impulses to be counted, connecting means responsive to the next impulse following actuation of

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the last indicator in the first series for disconnecting said first series from ground and connecting the second series of indicators thereto whereby additional impulses operate the counting circuit to sequentially connect the indicators in the second series to the power supply means to actuate said indicators.

2. A circuit for counting electrical pulses, comprising a plurality of counting stages connected together in a series, each said stage having normally grounded first count indicators and second count indicators connected in parallel and also having first and second relays, power supply means, a plurality of first contactors associated with the first relays one to each relay and normally connected in a chain to the power supply means, each of said first contactors being operable by the first relay associated therewith to break said chain and connect the power supply means to the count indicators and the second relay in the stage in which said contactor is connected, a plurality of second contactors associated with the second relays one to each relay and normally connected in a chain to a supply of pulses to be counted, each of said second contactors being operable by the second relay associated therewith to break said chain and connect the source of pulses to the first relay in the next counting stage in the series thereof whereby pulses are fed in sequence to the first relays in the series of counting stages, and switching means responsive to the first pulse received after the last counting stage in the series has been actuated for disconnecting the first indicators from ground and for grounding the second indicators whereby the second count indicators are then sequentially actuated as pulses are fed into the circuit from the pulse source.

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