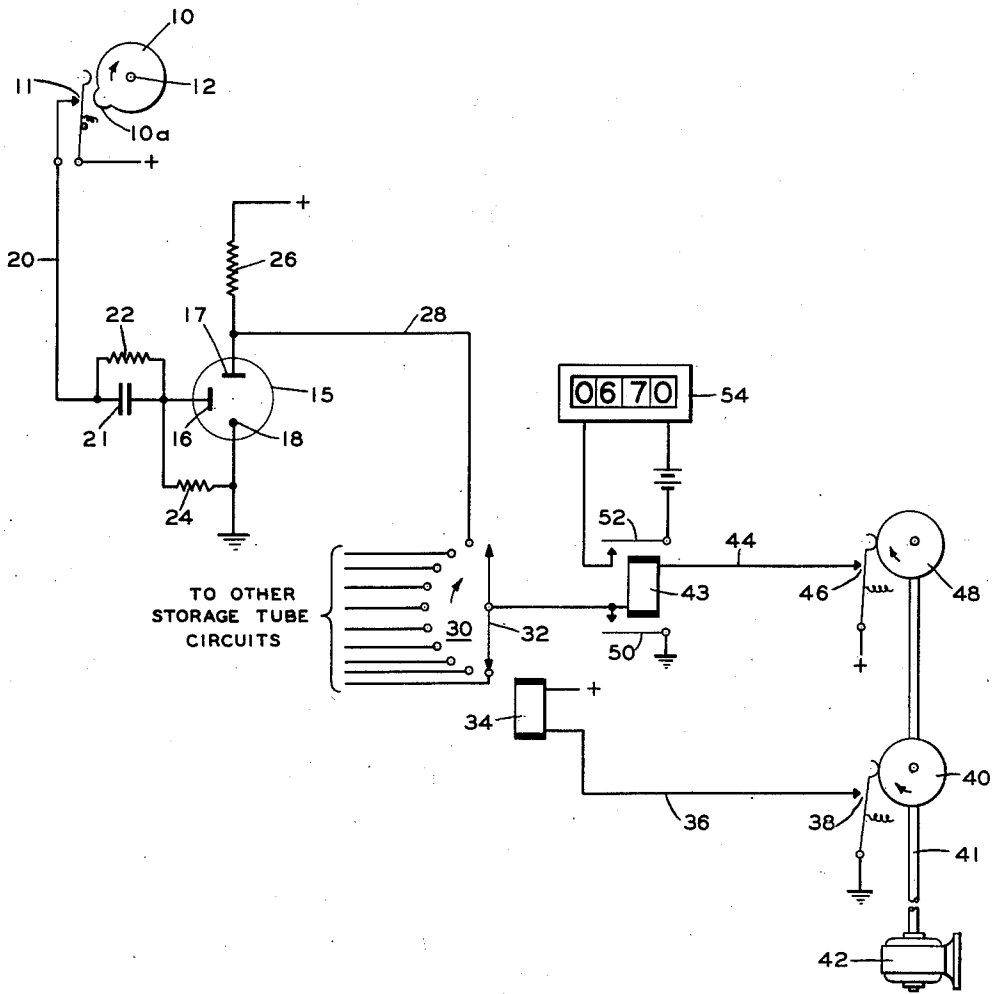


Dec. 19, 1950

G. L. BUSH
SIGNAL STORAGE CIRCUIT

Filed May 24, 1946

2,534,544



INVENTOR.
G. L. BUSH

BY

W. F. Presson
ATTORNEY

UNITED STATES PATENT OFFICE

2,534,544

SIGNAL STORAGE CIRCUIT

George L. Bush, Flushing, N. Y., assignor to The
Teleregister Corporation, New York, N. Y., a
corporation of Delaware

Application May 24, 1946, Serial No. 671,982

3 Claims. (Cl. 235-92)

1

This invention relates generally to an electrical signal storage and registering system, and more particularly to an improved system in which counting pulses respectively received from a plurality of sources are stored and caused to actuate or control a totalizer or other register.

In the manufacture or processing of many kinds of goods or items it is often desirable to have a production control system which registers the outputs of the various machines in groups, and in which the separate processes or outputs continually are totaled and displayed on indicators in the production controller's office or other place. To effect this each of the various machines may have electrical switch contacts which momentarily are closed, as by a cam, rod or other actuating member, to transmit a counting or registering pulse each time a predetermined number of operations have occurred, and usually these pulses heretofore have been stored temporarily on electromagnetic relays pending the operation of the totalizing indicators or other registers. The use of relays for this purpose complicates and adds appreciably to the cost of the system; and the additional relay contacts required increase the possibility of circuit trouble. Moreover, if one or more of the machines stops or remains idle in a position such that its switch-actuating member maintains the switch contacts closed, false registration is likely to result because of continued energization or reenergization of the associated storage relays heretofore employed.

One of the objects of the invention is a more suitable signal storage and registering system in which the number of operations of a plurality of individual machines or other production devices may be totaled and registered continually during the operation of the devices, and in which the signal storage devices operate on very low current, and impose only a very low current drain on the power supply during intervals between successive operations of the storage devices.

Another object is a registering system of the character described in which the counting pulses received from one or more machines or other production devices whose operations are to be counted, are temporarily stored on space discharge tubes in such manner that false operation of the registering system is obviated irrespective of whether certain of the production devices are in operation or are idle at the time.

Other objects and advantages will be apparent from the following detailed description of one illustrative embodiment of the invention, taken in connection with the accompanying drawing.

2

In the drawing a switch-actuating member 10, mounted on the shaft 12 of a machine which performs certain operations in the production or processing of articles or goods, is driven by the machine so that it closes momentarily the contacts 11 to produce a counting pulse each time a predetermined number of operations have been performed by the machine. In the form illustrated the actuating member comprises a cam rotated by the shaft 12, the cam lobe 10a closing momentarily the contacts 11 each time the cam makes one revolution, but it is to be understood that the actuating member may comprise a rod, pin, or other element suitable for controlling the switch contacts.

Operatively connected to the switch 11 is a gas-filled discharge tube 15, preferably of the cold cathode type, having a starter anode 16, a main anode 17 and a cathode 18. Various types of gas-filled discharge tubes may be used; the tube illustrated is of the type commonly known in the art as No. OA4G. Connected in the starter anode circuit 20 is a condenser 21 shunted by a resistance 22, the starting circuit also being connected to ground through a resistance 24. A source of positive potential is supplied through a resistance 26 to the main anode 17, and the main anode circuit is connected by a conductor 28 to one of the contacts of a contact bank 30 of a stepping switch or other scanning means; each of the contacts of the bank is individual to a storage tube circuit like that shown in the drawing, and hence is individual to a particular machine whose operations are to be registered. The purpose of the resistance 22 is to discharge condenser 21 whenever the switch contacts 11 open. Resistance 24 is effective to hold the starting anode 16 of the tube at cathode potential during the intervals between firing of the tube and controls the sensitivity of the firing circuit.

A rotary wiper or switch arm 32 is adapted to scan and engage successively the contacts of bank 30 as the wiper is rotated by a stepping magnet 34, the magnet being pulsed at timed intervals, over a conductor 36, by means of pulse contacts 38 controlled by a cam 40 which is eccentrically mounted on a rotating shaft 41 driven at suitable speed by a motor 42. The wiper arm 32 is connected to the winding of a relay 43, the circuit being continued through conductor 44 to timing contacts 46 controlled by a cam 48 which is eccentrically mounted on the shaft 41. Relay 43 has a lower, locking armature 50 and associated make contact, and an upper armature 52 and make contact which pulses an electromagnetic

register or indicator 54. The register may comprise any of various types known in the art which are adapted to respond to counting pulses. In such registers, the register wheel or indicator of lowest denominational or digits order usually is actuated by electromagnetic pawl and ratchet structure, the adjacent indicators in other denominational orders, such as tens, hundreds and thousands, being controlled either by mechanical carry-over means such as Geneva drives, such as shown in Figs. 16 and 17 of Haseltine et al. Patent No. 1,992,945, issued March 5, 1935, or by electrical carry-over means such as disclosed in the patent to May et al. No. 2,343,989, issued March 14, 1944.

If the rotary switch 30 is of the type which steps upon deenergization or release of its stepping magnet 34, the cams 40 and 48 are mounted on shaft 41 so as to be in phase with each other; if the switch 30 is of the type which steps upon energization of its magnet 34, then the cams 43 and 48 are mounted so as to be 180° out of phase with each other.

Each storage tube 15 is of the constant voltage drop type, and such a tube will remain fired with a current as small as 1 milliamperes flowing in its main anode-cathode circuit. Thus, even though a large number of the storage tubes may be firing concurrently, due to the closure of their associated switches 11, there is only a very low drain on the power supply. The rotary switch is continually being stepped, by the operation of the cam-controlled contacts 38 and magnet 34, and thus the wiper 32 successively engages the contacts of the bank 30. Immediately after the wiper engages a bank contact the cam-controlled contacts 46 close; if the storage tube connected to the bank contact is not firing the relay 43 is not energized, but if the tube is firing there is established a low impedance circuit through the tube, and relay 43 operates over a circuit from battery on the closed cam contacts 46, conductor 44, winding of the relay, switch wiper 32 and the bank contact which it engages, conductor 28 and the fired tube 15 to ground.

When relay 43 operates it is held operated for the duration of the closure of cam contacts 46, over its armature 50 and make contact, to ground, and this insures that a full-length pulse is supplied to the register 54. Also the operation of the armature 50 of the relay applies ground to the main anode 17 of the tube and thus extinguishes the tube whereby it is reset for subsequent firing upon closure of switch 11.

If one or more of the machines happens to stop with its associated contacts 11 in closed position, its tube circuit is prevented from falsely registering repeatedly notwithstanding that its bank contact 30 is scanned repeatedly, since the condenser 21 is operative when charged by the starting potential to reduce the starter anode potential to a value below that required for starting the tube. The rate of scanning by the rotary switch is sufficiently high so that in practice no more than one signal is generated by the contacts 11 of any one machine between successive scanning cycles of the switch. The register 54 currently displays the joint output of all the machines with which its registering circuit is associated, although it is to be understood that each machine may have a registering circuit individual thereto if desired, and in the latter case the winding of its relay 43 may be connected directly or through a switch to conductor 28 of the associated tube circuit.

Various modifications of the apparatus and circuit arrangement of the specific embodiment shown, and various equivalents or substitutes for the devices illustrated, will readily occur to those versed in the art without departing from the spirit or scope of the present invention. The disclosure, therefore, is for the purpose of illustrating the principles of the invention, which is not to be regarded as limited except as indicated by the scope of the appended claims.

I claim:

1. A signal storage system comprising a switch and means for automatically operating the switch to generate a signal each time a predetermined event occurs, a gas-filled discharge tube having a starter anode, a cathode and a main anode, a starting circuit controlled by said switch when operated for applying a source of starting potential to the starter anode, said starting circuit including a resistance-shunted condenser, a circuit including a source of potential connected to said main anode to maintain the tube fired after it has started thereby to store the signal, circuit means controlled by the main anode circuit for registering the stored signal, and means to prevent the circuit from falsely registering repeatedly when said switch remains in its said operated condition, said means comprising said resistance-shunted condenser connected in circuit with the starter anode and operative when charged by the starting potential to reduce the starter anode potential to a value below that required for starting the tube.

2. A signal storage and registering system comprising a switch and means for automatically operating the switch to generate a signal each time a predetermined event occurs, a gas-filled discharge tube having a starter anode, a cathode and a main anode, a starting circuit controlled by said switch when operated for applying a source of starting potential to the starter anode, said starting circuit including a resistance-shunted condenser, a circuit including a source of potential connected to said main anode to maintain the tube fired after it has started thereby to store the signal, means including a register circuit controlled by the main anode circuit for registering the stored signal, means to prevent the circuit from falsely registering repeatedly when said switch remains in its said operated condition, comprising said resistance-shunted condenser connected in circuit with the starter anode and operative when charged by the starting potential to reduce the starter anode potential to a value below that required for starting the tube, and means controlled by said register circuit for extinguishing said tube.

3. A signal storage and registering system comprising a switch and means for automatically operating the switch to generate a signal each time a predetermined event occurs, a gas-filled discharge tube having a starter anode, a cathode and a main anode, a starting circuit controlled by said switch when operated for applying a source of starting potential to the starter anode, a circuit including a source of potential connected to said main anode to maintain the tube fired after it has started thereby to store the signal, means for periodically producing electrical pulses, means including a register circuit controlled jointly by the main anode circuit and said electrical pulses for registering the stored signal and means to prevent the circuit from falsely registering repeatedly when said switch remains in its said operated condition, comprising a con-

denser connected in circuit with the starter anode and operative when charged by the starting potential to reduce the starter anode potential to a value below that required for starting the tube.

GEORGE L. BUSH.

5

REFERENCES CITED

The following references are of record in the file of this patent:

10

UNITED STATES PATENTS

Number	Name	Date
2,049,634	Troutman	Aug. 4, 1936
2,068,719	Troutman	Jan. 26, 1937
2,114,016	Dimond	Apr. 12, 1938
2,329,048	Hullegard	Sept. 7, 1943
2,420,590	Everhart	May 13, 1947