

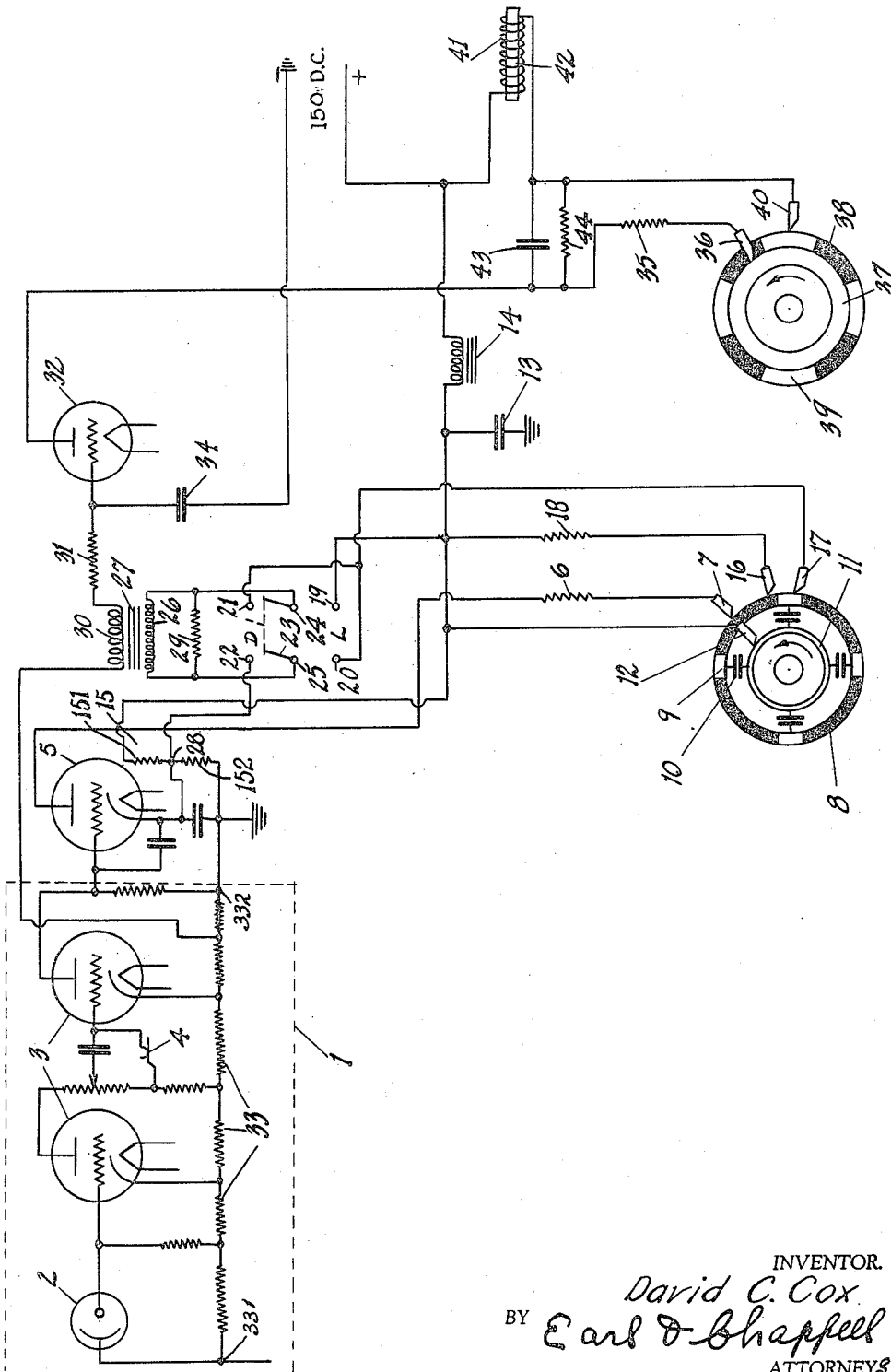
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SELECTIVE TIMING MECHANISM FOR SORTING MACHINES

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SELECTIVE TIMING MECHANISM FOR SORTING MACHINES

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The main objects of my invention are:

First, to provide a sorting machine having a timing mechanism adapted to delay actuation of the classifying or sorting means thereof for a predetermined period.

Second, to provide a sorting machine having a mechanism of the type described which is selective in operation, having means for displacing a certain classification or type of articles from a series of articles to be sorted and for permitting the other articles to pass the classifying point, or conversely, to displace articles other than a certain classification or type.

Third, to provide a selective classifying machine having improved provision for performing a mechanical step of classifying a predetermined interval after an inspection by which the classification is determined or, in other words, a delayed actuation of the mechanical means.

Fourth, to provide a machine of the type described having a delay mechanism adapted to receive an electrical impulse from a scanner means and in turn to actuate a further instrumentality in accordance with that impulse, the actuation being delayed for a predetermined period following the reception.

Fifth, to provide a sorting machine having means for mechanically classifying articles selectively on the basis of either the lightness or the darkness thereof.

Sixth, to provide a detector adapted to analyze articles in accordance with a physically perceptible characteristic thereof and to generate a delayed signal in accordance with variations in the said characteristic of different articles and further characterized by selective means for controlling the generation of the signal.

Further objects relating to details and economies of my invention will definitely appear from the description to follow. The invention is defined in the claims.

A structure embodying the features of my invention is illustrated in the accompanying drawing, the single figure of which is a diagrammatic representation of certain elements of a sorting machine and the wiring diagram enabling the operation of those elements.

The present invention relates in general to a photoelectric sorting machine having a selective timing mechanism for governing an impulse originating in response to variations in the character of articles being sorted, such, for example, as variations in the color thereof. In such a machine, it is desirable to inspect one or more

articles prior to mechanically classifying a previously inspected article, for the reason that such procedure permits the ejecting or classifying means employed to be removed from the inspecting zone or chamber. This makes possible improved illumination within the chamber and prevents damage to the reflecting surfaces therein or other mechanical impairment due to flying objects. In order to make this delayed operation possible, some type of memory device is necessary to retain the photoelectric judgment or judgments of intermediate articles.

To perform the delaying function described, the present invention makes use of the state of charge of individual condensers synchronized in operation with the appearance of the articles in inspecting position. I have illustrated and shall describe the timing or delay mechanism in a preferred application to the detecting, amplifying, and ejecting devices of a photoelectric sorting machine classifying objects in accordance with the brightness of light reflected therefrom. An alternative application thereof is illustrated and described in my copending application, Serial No. 222,787, filed August 3, 1938, wherein the same is coupled with a machine for sorting articles such as citrus fruit and the like on the basis of their relative ability or capacity to reflect a plurality of color components. It will be appreciated that further refinements would enable the machine to classify objects on a plurality of different and independent bases, for example, color and size.

This invention further includes provisions of particular value in a sorting machine in the form of a selective trip device for reversing the operating characteristic of the mechanical classifying means with relation to the type of articles classified thereby and the type of delay mechanism disclosed is of particular value in this reversible operation.

Referring to the drawing, the reference numeral 1 in general indicates a scanner or detector and amplifier composed of a photoelectric tube 2, usually mounted in a suitable housing (not shown) to inspect articles passing through an illuminating housing (also not shown), and a pair of suitable capacity-coupled amplifiers 3. A similar detector and amplifier is illustrated in my Patent No. 2,131,096, dated September 27, 1938. In the said patent, I utilize a normalizing mechanism in the form of a rotary commutator for periodically establishing a suitable bias on the grid of the second amplifier. Such an instrumentality may be included in the present

hookup and I have indicated the same conventionally by the switch designated 4. In my co-pending application, Serial No. 222,787, filed August 3, 1938, above referred to, I also make use of a similar normalizing device, however the same is not an essential element in the present invention.

The plate of the second amplifier 3 is connected to the grid of a gaseous discharge tube 5 of the type commercially designated "885" so that impulses originating in photoelectric tube 2 in response to variations in a shade or color of articles being sorted, and amplified by amplifiers 3, are impressed on the grid of tube 5.

The plate of tube 5 is connected through a suitable resistor 6 with a brush 7 bearing on a rotary delay device or detainer which is indicated by the reference numeral 8. This detainer carries a plurality of equally spaced conducting lugs 9, in this case four, insulated from one another and each connected to one side of a .1-microfarad condenser 10. The other plate of condenser 10 is connected to a continuous slip ring 11 upon which rides a brush 12.

Brush 12 is connected to the plus side of a 150-volt D. C. potential through a quieting filter constituted by a condenser 13 and a choke 14 arranged as illustrated. This quiet D. C. potential is also supplied to one end of a voltage divider 15 consisting of resistors 151, 152, and these resistors are so proportioned as to divide out carefully one-tenth of the 150 volts, or 15 volts, and apply it as a positive bias to the cathode of tube 5.

There are two further brushes 16, 17 bearing on detainer 8 as illustrated. The brush 16 is connected through a suitable resistor 18 to one terminal 19 of a two-blade double-throw switch having the fixed terminals 19, 20, 21, and 22.

The switch is generally designated 23. The blades of the switch are connected to terminals 24, 25 and these last named terminals are connected to the opposite ends of the primary 26 of the step-down transformer generally indicated 27. Brush 17 is connected to terminals 20 and 21 in the manner shown and the terminal 22 is connected to the intermediate point 28 on voltage divider 15, which, as stated, is at 15 volts for the 150-volt source employed. When switch 23 is actuated in a manner to connect terminals 19, 20 with transformer coil 26, i. e., in position L, the machine is set to permit light articles to pass and eject dark articles from a suitable conveyor (not shown) for transporting the articles past photo-tube 2. This position L will be designated the "light pass" position. When in opposite position, D, it is set to perform the reverse operation, namely, eject light articles and permit dark articles to pass. This position D will be designated the "dark pass" position. The accompanying operation will be hereinafter described with more particularity. A resistor 29 is placed in shunt with coil 26 to suppress oscillations which might otherwise be set up between the reactance of transformer 27 and the capacity of condenser 10 acting as a resonant circuit.

The secondary 30 of transformer 27 is connected through a resistor 31 to the grid of a discharge tube 32 of the type designated "FG17," and at its opposite end to a suitable point on the voltage divider 33 of scanner and amplifier 1, whereby to provide tube 32 with a suitable bias sufficiently negative to prevent ionization of the tube even when the tube is being supplied with plate voltage. The voltage divider 33 has a po-

tential of minus 300 volts applied to one terminal 331 thereof, while the other terminal 332 is at ground potential. These terminals are connected respectively to the photoelectric tube 2 and a plate resistor for second amplifier 3. The condenser 34 is arranged as illustrated to prevent hesitation in the performance of tube 22 and is connected to the minus side of the 150-volt source.

The plate of tube 32 is connected through a 10-ohm resistor 35 with a brush 36 riding on the slip ring 37 of a power commutator which is diagrammatically illustrated and indicated by the reference numeral 38. This power commutator may, if desired, be constructed as a part of the detainer inasmuch as the two members 8 and 38 are intended to rotate at the same speed and in the same relative phase. They are, however, completely insulated from one another. Commutator 38 has four conducting segments 39, one for each lug 9 on detainer 8. The said segments are separated from one another by intervening insulating sections, but are all in conducting relation through slip ring 37. A brush 40 rides on the periphery of power commutator 38 in electrical contact with the segments 39. This brush 40 is connected to the coil 41 of the electromagnetically actuated ejector device generally indicated 42, which is adapted when energized to displace articles from a suitable conveyor mechanism (not illustrated), transporting the same past scanning tube 2. The opposite end of coil 41 is connected to the plus side of the 150-volt D. C. source.

The 1-microfarad condenser 43 and the 4500-ohm resistor 44 are inserted between the leads for brushes 36 and 40 to de-energize ejector device 42 by providing a highly resistive path for the plate voltage of tube 32 in a manner which will be described.

Operation of detainer 8

Assume that switch 23 is in "light pass" position, L, i. e., down and in position to connect terminals 19, 20 with the transformer 27. When the condensers 10 leave brush 17, they are always discharged inasmuch as a 150-volt positive potential is applied to the inner leaf thereof by brush 12 and a similar positive potential is applied to the outer leaf thereof through filter 14, 13, resistor 29, coil 26, brush 17, and lug 9. Now, the tube 5, in order to operate, must have positive plate voltage and a suitably strong signal on the grid. Every time the object is scanned, the tube 5 receives plate voltage through brush 7. If detector and amplifier 1 causes the negative bias on the grid of tube 5 to be reduced sufficiently at this time, the tube ionizes or fires, thereby causing the detainer condenser 10 adjacent brush 7 to become charged. It becomes charged because the lug terminal of the condenser drops from plus 150 volts to approximately plus 15 volts. The presence of a dark object at the scanning station is thus recorded by the condenser.

The detainer now rotates until the lug of the condenser described reaches brush 17; in the meantime subsequent lugs, in this case three, pass brush 7 and permit the tube 5 to be ignited if its grid is in appropriate condition. When the lug under consideration reaches and engages brush 17, the primary 26 of transformer 27 compares the voltage at said lug with the voltage at brush 12 and in the assumed case wherein condenser 10 is in charged condition, the condenser

discharges and the transformer receives a surge, the circuit being (assuming that the switch is set in position for "light pass" operation) brush 12, switch terminal 19, primary coil 26, switch terminal 20, brush 17, and lug 9. This surge causes the transformer secondary 30 to drive the grid of tube 32 in a positive direction, overcoming the retaining bias thereon and firing the tube 32. The same surge which fires tube 32 removes the charge from the detainer condenser 10 under consideration, making both sides of the condenser 150 volts positive and thus preparing the condenser for the next contact with brush 7, i. e., placing the condenser in a condition to fire tube 5 if its grid has a suitably strong signal thereon as described above. Resistor 29 functions as described above, whereby the proper voltage of 150 volts will be left by brush 17 on the lug. Should the brush leave the lug during an unsuitable part of an oscillation and were the resistor 29 not present, a voltage far from plus 150 might be left on the lug. Of course, it is true that brush 16 would immediately remedy such a situation, since it holds a steady potential of plus 150; however in simple machines, according to my invention, it may be desirable to omit the reversible "light pass" and "dark pass" operation, in which case there would be no brush 16 and the system would not operate without the damping device constituted by the resistor.

When the switch is set in position D for "dark pass" operation, the firing of gaseous discharge tube 5 when the brush 7 engages a lug 9 occurs in the same manner as described above. However, when the said lug reaches brush 17, the voltage thereon (which is approximately 15 volts, as noted above,) is compared with a selected voltage of plus 15 instead of the 150-volt positive potential, the circuit being brush 17, switch terminal 21, transformer primary coil 26, switch terminal 22, point 28, resistor 152 and ground. The voltage on the condenser lug at that time and the voltage at point 28 are then equal or approximately so and the result is that the transformer receives no surge or a surge insufficient to discharge tube 32. In fact, when the machine is set for "dark pass" operation, the transformer only receives surges of magnitude effective to fire tube 32 when the condensers 10 have been ignored in passing brush 7, i. e., when a signal has not been received on the grid of tube 5. In this case, the 150 volts on the condenser lug plate, when compared with the voltage at point 28, serve to actuate the transformer to fire tube 32.

Since for "dark pass" operation all the lugs leaving brush 17 are at or near ground potential, the brush 16 is employed for preparing the condensers for new judgements by restoring them to 150 volts potential on both plates. This is done by connecting the lugs to the 150-volt potential through brush 16. Brush 12 is constantly connected thereto.

It will be noted that the positive bias of 15 volts applied to the cathode of tube 5 and the comparison voltage for the memory device or condenser 10 are equal. That this is so is simply a coincidence. Tube 5 is biased with one-tenth of 150 volts because (due to the specific characteristics of the "885" tube) this will maintain the trip point steady should the D. C. voltage source vary. Tubes of this type are "easier" to trip with high voltages on their plates than with low voltages. They are much more sensitive in this respect than other types of tubes, such as the "FG17," and consequently it would be necessary

to maintain a very accurate control of the D. C. line voltage were it not for the above arrangement. The voltage applied as a grid-cathode bias which will exactly withhold the trip is found to be just one-tenth of the plate voltage. Therefore, by dividing out one-tenth of the plate voltage by voltage divider 15 and applying it as positive cathode bias, I make the grid always trip at exactly the same potential, namely, ground potential. This is the only spot at which variations in the D. C. voltage could alter the machine's setting and the above described arrangement automatically compensates for such variations.

Inasmuch as the firing of tube 5 drops the voltage of the condenser terminals from 150 to 15 volts, as described above, it is desirable in "dark pass" operation to compare the same with a voltage of plus 15 rather than some other potential higher or lower than this value. Notwithstanding the fact that a slight discrepancy between the condenser plate potential and the comparison voltage, either higher or lower than plus 15, might not be sufficient to discharge tube 32, nevertheless, since the discrepancy is to be disregarded, the smaller it is the more certain we are that it will be disregarded.

Operation of power commutator 38

The brush 40 engages a conducting segment 39 on the commutator 38 slightly before a lug 9 on detainer 8 is engaging brush 17. The plate supply circuit for tube 32, when that tube is fired, is as follows: plus side of the voltage source, ejector electromagnet coil 41, brush 40, brush 36, resistor 35, and plate of tube 32. In other words, the resistor 35 alone restricts the surge. When a signal is received on the grid of tube 32, the latter fires, causing the electromagnetically actuated ejector mechanism 42 to be operated. When the conducting segment of commutator 38 passes brush 40, the plate current of tube 32 is interrupted, likewise the surge which actuates the electromagnet of ejector 42. The electromagnet circuit is not opened, but instead the resistance 44 of 4500 ohms is suddenly introduced into the plate circuit, causing a very rapid decrease in the current therein. The resultant collapse of magnetic lines in the coil 41 of the ejector electromagnet produces an E. M. F. which throws brush 40 and the plate of the power tube 32 negative, thus extinguishing it. The condenser 43 is inserted to safeguard the apparatus because without the same the sudden surge would be too violent, jeopardizing insulation and causing spark damage at the commutator.

Resistor 44 discharges condenser 43 while the ejector hammer is returning from the stroke. The discharge is by logarithmic decrement and is therefore incomplete and the next contact of brush 40 with a conducting lug 39 completes the discharge, the surge now being restricted only by resistor 35. The brush 36 is a slip ring brush keeping all the lugs on the power commutator 38 excited so that brush 40 can function as described.

Modifications of my invention will occur to those skilled in the art. For example, tube 5 may be a vacuum instead of a gaseous discharge tube. Tube 32 may also be a well exhausted tube, in which case the commutator 38, brushes 36, 40, condenser 43, and resistors 35, 44 may be omitted. It would then be necessary to produce a more sustained surge at the grid of tube 32 by appropriate timing of the resistor condenser hookup 31, 34. Moreover, there is a possibility of

employing members on the detainer other than the preferred condensers, which are capable of being unbalanced under certain conditions.

I have illustrated and described my improvements in an embodiment which is very practical. I have not attempted to illustrate or describe other embodiments or adaptations as it is believed this disclosure will enable those skilled in the art to embody or adapt my improvements as may be desired.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A sorting machine comprising photo-sensitive means for scanning objects to be sorted and for originating an electrical impulse when exposed to certain of said objects, article classifying means, and means to transmit a signal to said last named means in response to said electrical impulse but in delayed time relation thereto, comprising a gaseous discharge tube having the impulse impressed on the grid thereof, a condenser, means for impressing a potential on one plate of the condenser, means for intermittently applying anode potential to the tube in synchronism with the occurrence of the impulse whereby to ionize the tube in the event the grid is sufficiently charged by said impulse and thereby charge said condenser, comprising means electrically connected to the anode of the tube and periodically making electrical contact with the other plate of the condenser, and means for discharging said condenser a predetermined time interval after the charging thereof by applying a predetermined standard potential to the other condenser plate, the surge accompanying said discharge constituting the delayed signal for the classifying means referred to above.

2. A sorting machine comprising photo-sensitive means for scanning objects to be sorted and for originating an electrical impulse when exposed to certain of said objects, article classifying means, and means to transmit a signal to said last named means in response to said electrical impulse originating in the scanning means in delayed time relation to the impulse, comprising an ionizing tube connected to the scanning means whereby the impulse may be impressed on the grid of the tube, a rotatable member carrying a condenser, means for continuously connecting one plate of the condenser electrically with a source of standard potential, means connected to the anode of the tube and making electrical contact with the other plate of the condenser in synchronism with the origination of said impulses, whereby to charge the condenser if the grid is sufficiently biased and the tube ionizes, and means for periodically discharging said condenser a predetermined time interval after the charging thereof by connecting said other condenser plate with said potential source, the surge accompanying said discharge constituting the delayed signal for the classifying means referred to above.

3. A delay device for a detector adapted to transmit a signal in response to an electrical impulse originating in the detector in delayed time relation to the impulse, comprising a gaseous discharge tube connected to the detector whereby the impulse may be impressed on an electrode of the tube, a condenser, means for continuously connecting one plate of the condenser electrically with a source of potential, means connected to another electrode of the tube and making electrical contact with the other

plate of the condenser in synchronism with the origination of said impulses, whereby to charge the condenser if the first electrode is sufficiently energized and the tube ionizes, and means for periodically discharging said condenser a predetermined time interval after the charging thereof, the surge accompanying said discharge constituting the delayed signal referred to above.

4. A sorting machine comprising a detector, means adapted to transmit a signal in response to an electrical impulse originating in the detector in delayed time relation to the impulse, comprising a discharge tube connected to the detector whereby the impulse may be impressed on an electrode of the tube, a condenser, means for impressing a potential on one plate of the condenser, means for intermittently applying potential to a second electrode of the tube whereby to cause the same to ionize in the event the first named electrode is sufficiently charged, comprising means connected to the second electrode of the tube and making electrical contact with the other plate of the condenser, whereby to charge the condenser if said tube ionizes, and means for periodically discharging said condenser, in the event it is charged, a predetermined time interval after the charging thereof, the surge accompanying said discharge constituting the delayed signal referred to above, an article classifying means, and means for actuating the same in response to said signal comprising a thermionic tube and means for impressing the signal on an electrode thereof.

5. A sorting machine for articles, comprising a detector adapted to initiate an electrical impulse in accordance with variations in a physical characteristic of the articles, means to transmit a signal in response to the electrical impulse but in delayed time relation thereto, comprising a discharge tube having the impulse impressed on an electrode thereof, a rotatable member carrying a condenser, means for continuously connecting one plate of the condenser, electrically with a source of potential, means for intermittently applying potential to another electrode of the tube in synchronism with the occurrence of the impulses whereby to ionize the tube in the event a sufficiently strong impulse is on the first named electrode, and thereby charge the condenser, comprising means connected to the second named electrode of the tube and periodically making electrical contact with the other plate of the condenser, and means for periodically discharging said condenser in the event it is charged, a predetermined time interval after the charging thereof, said last named means being connected to the potential source whereby the discharge produces the delayed signal referred to above, a classifier, and means to actuate the latter in response to said signal.

6. A sorting machine for articles, comprising a detector adapted to initiate an electrical impulse identifying a certain characteristic of the articles, an article classifier, and means to transmit a signal for said classifier in response to the electrical impulse but in delayed time relation thereto, comprising a discharge tube having the impulse impressed on one electrode thereof, and means for intermittently applying potential to another electrode of the tube in synchronism with the occurrence of the impulses whereby to ionize the tube in the event the first electrode is sufficiently charged, said last named means comprising means for electrically recording the fact of such ionization when it occurs, and means

engaging said last named means after a predetermined time interval to forward an electrical surge or not, depending on the condition of said last named means, said surge, when it occurs, constituting the delayed signal referred to above, and means for actuating said classifier in response to the signal.

7. An article sorting machine comprising a detector adapted to initiate an electrical impulse during a sorting operation, an article classifier, and means to transmit a signal toward the classifier in response to said electrical impulse but in delayed time relation thereto, comprising a discharge tube having the impulse impressed on the grid thereof, means for intermittently applying anode potential to the tube in synchronism with the occurrence of the impulses whereby to ionize the tube in the event the grid is sufficiently charged, traveling condenser means alterable in condition in accordance with the occurrence or non-occurrence of such ionization for electrically recording the same, and means governed by said last named means to forward a delayed electrical surge or not, depending on the condition of the condenser means, said surge being identified with the delayed signal referred to above, said governed means being electrically connected to the classifier.

8. An article sorting machine comprising a detector adapted to initiate an electrical impulse during a sorting operation, an article classifier, and means to transmit a signal toward the classifier in response to said electrical impulse but in delayed time relation thereto, comprising a discharge tube having the impulse impressed on the grid thereof, means for intermittently applying anode potential to the tube simultaneously with the occurrence of the impulses whereby to ionize the tube in the event the grid is sufficiently charged, including means alterable in condition by the occurrence of such ionization for electrically recording the same, and means governed by said last named means to forward an electrical surge or not, depending on the condition of the last named means, said surge corresponding to the delayed signal referred to above, said governed means being electrically connected to the classifier.

9. A selective article sorting machine comprising a detector adapted to initiate an electrical impulse or not, depending on the physical characteristic of articles to be sorted, an article classifier, and selective mechanism for transmitting a delayed signal to the classifier in response to either the occurrence or non-occurrence of an electrical impulse, comprising an ionizing tube having the grid thereof connected to the source of the impulse, means for supplying anode voltage to the tube and for electrically recording the resultant ionization or failure to ionize of the tube, said means comprising a traveling condenser, means for continuously applying a potential to one plate thereof, means for periodically applying the same potential to the other plate, and means for periodically connecting said other plate with the anode of the tube simultaneously with the occurrence of the impulse, whereby to ionize the tube and charge the condenser if an impulse has been impressed on the grid, and selectively controllable means for periodically connecting said condenser to one comparison potential or another whereby to forward an electrical surge or not, depending on the condition of the condenser and on the potential with which it is connected, said surge

when it occurs constituting the delayed signal referred to above.

10. A selective article sorting machine comprising a detector adapted to initiate an electrical impulse or not, depending on the physical characteristic of articles to be sorted, an article classifier, and selective mechanism for transmitting a delayed signal to the classifier in response to either the occurrence or non-occurrence of an electrical impulse, comprising a discharge tube having the grid thereof connected to the source of the impulse, means for electrically recording the ionization or failure to ionize of the tube, said means comprising a condenser, means for applying potential to one plate thereof, means for applying potential to the other condenser plate, and means for periodically electrically connecting one of said plates with the anode of the tube, whereby to ionize the tube and charge the condenser if an impulse has been impressed on the grid, and selectively controllable means for periodically connecting said condenser to one comparison potential or another whereby to forward an electrical surge or not, depending on the condition of the condenser, said surge when it occurs being identified with the delayed signal referred to above.

11. A selective article sorting machine comprising a detector adapted to initiate an electrical impulse or not, depending on the physical characteristic of articles to be sorted, an article classifier, and selective mechanism for transmitting a delay signal to the classifier in response to either the occurrence or non-occurrence of an electrical impulse, comprising an ionizing tube having an electrode thereof connected to the source of the impulse, means for electrically recording the ionization or failure to ionize of the tube, said means comprising a condenser, means for applying potential to one plate thereof, means for applying potential to the other condenser plate, and means for periodically connecting one of said plates with another electrode of the tube, whereby to ionize the tube and charge the condenser if an impulse has been impressed on the first named electrode of the tube, and selectively controllable means for periodically connecting said condenser to one comparison potential or another whereby to forward an electrical surge or not, depending on the condition of the condenser, said surge when it occurs constituting the delayed signal referred to above.

12. In a sorting machine, a detector for initiating a signal, a classifier, and a device for forwarding an actuating surge identifiable with said signal to said classifier after a predetermined period, comprising a gaseous discharge tube, means for applying the signal to the grid thereof, means for periodically applying voltage to the anode of the tube whereby to cause the tube to ionize if a signal is present on the grid thereof, comprising a rotatable member having a conducting lug, a slip ring insulated from the lug, and a condenser connected between the lug and slip ring, a brush slidably engaging said rotatable member to periodically engage said lug, a second brush periodically engaging said lug a predetermined interval after its engagement by said first named brush, and a third brush in constant engagement with said slip ring, said second and third brushes being in circuit with a device to be energized in response to said signal, engagement of said lug with said first brush causing the tube to ionize in the event of a signal on the grid thereof and thereby charging

said condenser, said condenser engaging said second brush after a predetermined rotation of the member whereby to cause an energizing surge through said circuit if the condenser is charged.

13. A delay device adapted to transmit a signal in response to an electrical impulse but in delayed time relation thereto, comprising a discharge tube having the impulse impressed on an electrode thereof, means for periodically applying potential to another electrode of the tube simultaneously with the occurrence of the impulses whereby to ionize the tube in the event the first named electrode is sufficiently charged, including means connected to said other electrode alterable in condition by the occurrence of such ionization for electrically recording the same for a finite interval, and comparison means connected to said electrical recording means for determining the condition thereof, and means governed by said recording means and actuated thereby in delayed time relation to said occurrence to forward an electrical surge or not, depending on the condition of the recording means, said surge corresponding to the delayed signal referred to above.

14. A device for delaying application of an energizing electrical signal for a predetermined period, comprising a gaseous discharge tube, means for applying the signal to an electrode thereof, means for periodically applying voltage to another electrode of the tube whereby to cause the tube to ionize if a signal is present on the first named electrode, comprising a condenser, a brush connected to said other electrode and periodically engaging one plate of said condenser, a second brush periodically engaging said plate a predetermined interval after its engagement by said first named brush, a source of potential, and a third brush connected to said source and in constant electrical engagement with the other condenser plate, said second and third brushes being in circuit with a device to be energized in response to said signal, engagement of said condenser with said first brush causing the tube to ionize in the event of a signal on the first named electrode, and thereby charging said condenser, said condenser engaging said second brush to cause a delayed energizing surge through said circuit in the event said condenser has become charged, said surge representing said aforesaid signal in delayed form.

15. A delay device for forwarding a delayed signal in response to an impulse received thereby, comprising a thermionic tube having an electrode connected to the source of said impulse, a rotary member having a plurality of condensers therein, a corresponding number of surface conducting lugs each connected to one plate of the condensers, said lugs being spaced

uniformly around the member, and a continuous slip ring connected to the other plate of the condenser, a brush in engagement with said member adapted to contact said lugs and connected to another electrode of the tube to periodically connect said condensers with said tube and cause the latter to ionize in the event a sufficient charge is on the first named electrode thereof, and a pair of further brushes on said member contacting said slip ring and the lugs respectively, said last named brushes being adapted to periodically discharge said condensers in the event they are in charged condition.

16. A selective mechanism for transmitting a delayed signal in response to either the occurrence or non-occurrence of an electrical impulse, comprising an ionizing tube having an electrode thereof connected to the source of the impulse, means for supplying voltage to another electrode of the tube and for electrically recording the ionization or failure to ionize of the tube in accordance with the presence or absence of said impulse, said means comprising a traveling condenser, means for continuously applying potential to one plate thereof, means for connecting the other plate thereof with said last named electrode simultaneously with the occurrence of the impulse, whereby to charge the condenser if an impulse has been impressed on the first named electrode, and selectively controllable means for connecting said condenser with one comparison potential or another whereby to forward an electrical surge or not, depending on the condition of the condenser and on the potential with which it is connected, said surge when it occurs constituting the delayed signal referred to above.

17. A selective mechanism for transmitting a signal in response to either the occurrence or non-occurrence of an electrical impulse, comprising an ionizing tube having an electrode thereof connected to the source of the impulse, means for supplying voltage to another electrode of the tube and for electrically recording the ionization or failure to ionize of the tube in accordance with the presence or absence of said impulse, said means comprising a member adapted to be connected to said last named electrode and to be electrically unbalanced in the event of ionization of the tube, and means for connecting said member with said last named electrode in timed relation to the occurrence of the impulse, and means for connecting said member with one comparison potential or another whereby to forward an electrical surge or not, depending on the balanced or unbalanced condition of the member and on the potential with which it is connected, said surge when it occurs constituting the signal referred to above.

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