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TELETYPEWRITER PERMUTATION CODE
SIGNAL COMBINATION COUNTER
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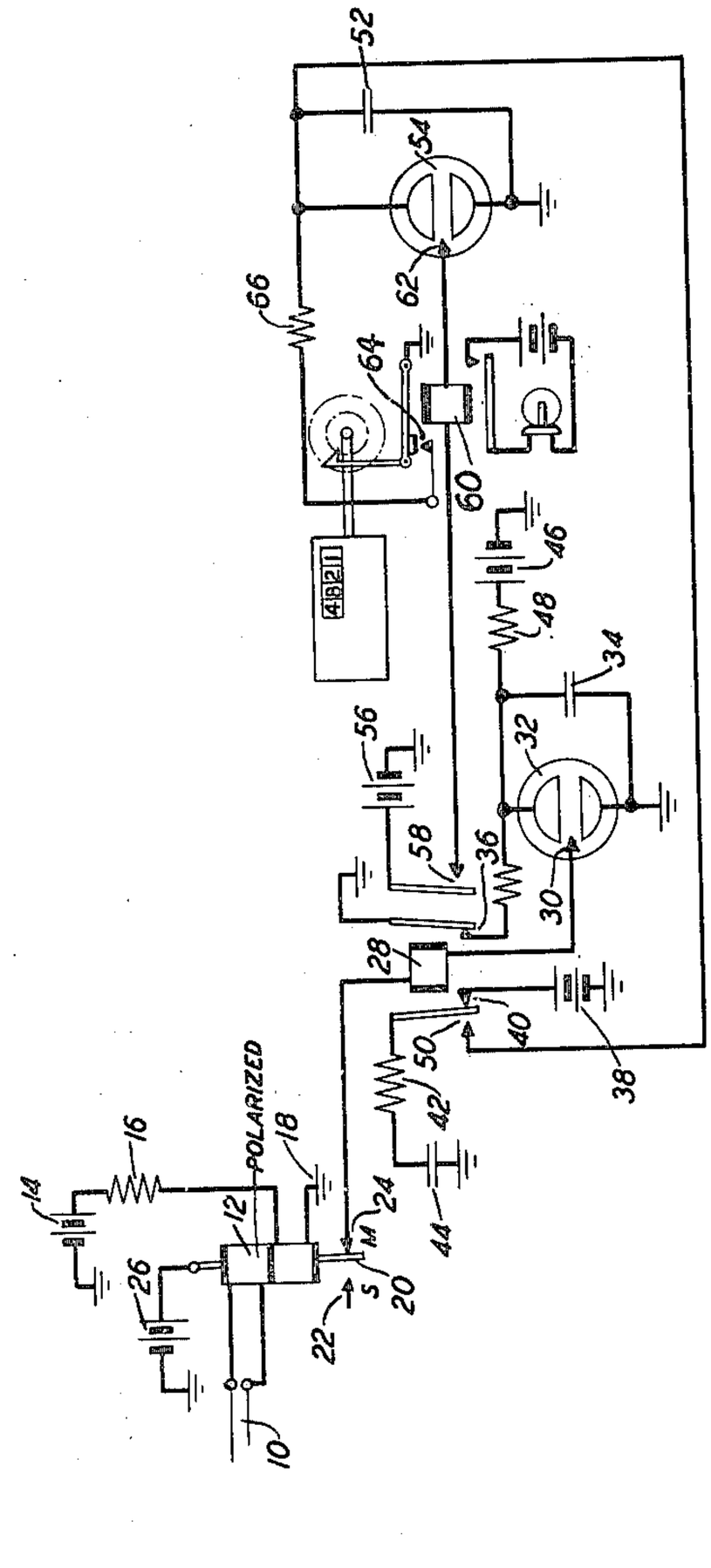

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TELETYPEWRITER PERMUTATION CODE SIGNAL COMBINATION COUNTER

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This invention relates to a cumulative multiple counter in which the multiple may be varied, that is to say a device which provides an indication of the number of times an event has occurred a multiple number of times and which is adjustable so as to vary the multiple number of events per indication for different countings. The device is herein described as applied to the counting of events which may be randomly spaced in time, but each of which requires a uniform interval for its occurrence but it is particularly pointed out that the interval required for occurrence may be variable for different countings so long as each event requires an interval greater than a minimum of a few thousandths of a second.

The invention provides a cumulative indication which increases or decreases in unit steps for each n happenings, n being any integral number, more than one, such as five, seven or ten or more or less. The multiple which is counted may be varied as desired.

The present counter is particularly useful for counting the occurrence of large numbers of events, such as in metering, wherein the charge may be a fixed unit for the occurrence of a multiple number of events. For instance in telegraphy, particularly in teletypewriter transmission service, the charge in certain instances may be based on the number of telegraph code combinations or on the number of teletypewriter permutation code combinations which are transmitted. Since a code combination is transmitted to define each letter, in certain services, such as in press services, tens of thousands of code combinations are transmitted. The charge may be based for instance on the number of words or on the number of lines which are transmitted. It is desirable under such circumstances to provide a counter which provides a single indication for a given number of combinations transmitted.

In counting many other events it is desirable at times to provide an indication of the number of multiple happenings rather than of single happenings. This is particularly true when the number of happenings in the multiple group may be required to be changed from time to time, such as when a unit charge is based on the transmission of different number combinations at different times.

An object of this invention is the improvement of multiple counters.

A more particular object of this invention is the provision of an inexpensive electronic multiple counter which is readily adjustable to count happenings of different duration and of different

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numbers of occurrences in the multiple group counted.

The invention may be understood from reference to the following description when read with reference to the single figure of the drawing which shows a preferred embodiment of the electronic counter applied to the counting of multiples of transmitted permutation code signal combinations. The invention is not limited to incorporation in the specific form illustrated and described herein nor to the counting of signal code combinations. It may be incorporated in many forms and in its present form or with minor obvious modifications may be employed to count multiples of many different events.

Refer now to the drawing which shows the electronic multiple counter.

In the drawing the plug 10 may be inserted in the jack of any direct current teletypewriter circuit arranged so that pulses of current and no current for marking and spacing signals are impressed between the two plug conductors and through the top winding of polar relay 12. The relay 12 is biased by current flowing from grounded battery 14 through resistance 16 and the bottom winding of relay 12 to ground 18, the effect of which constantly tends to urge the armature 20 toward the left to engage with its spacing contact 22. When no current flows in the top winding, the armature 20 is actuated to engage spacing contact 22. When successive signal elements are spacing signal elements the armature will remain in engagement with its spacing contact 22. Whenever current flows in the upper winding of relay 12 its effect tends to actuate the armature 20 toward its right-hand or marking contacts 24 and its effect is always dominant over the counter-effect in the lower or biasing winding, so that the armature 20, if in engagement with its spacing contact, will always be actuated to engage its marking contact 24 whenever current flows in its upper winding or, in the event that successive signal elements are marking elements, the armature 20 will remain in engagement with its marking contact throughout the interval of the successive marking elements.

The circuit is arranged to count permutation code signal combinations of the start-stop type in which the first or start signal element of each combination is always a spacing signal element, the intermediate signal elements are multielement current—no current permutation code signal elements, which define the character or function to be performed by the teletypewriter receiver and the last or stop signal element of each com-

bination is always a marking signal element. The armature of relay 12 is always in the marking condition that is engaged with its marking contact 24 for the stop interval which, during continuous transmission, is a slightly protracted interval at the end of transmission of each start-stop signal combination defining each character. When in this condition a circuit may be traced from battery 26 through marking contact 24 and the winding of relay 28 to the electrode 30 of gas-filled tube 32. In order to operate relay 28 it is necessary that the control gap in tube 32 be first ionized which, in turn, depends upon the potential of condenser 34. It will be assumed that the tube 32 has been ionized on a previous cycle and that the main gap bridged to electrode 30 is closed and that relay 28 has been operated. When relay 28 was operated contact 36 was closed. For this condition both terminals of condenser 34 are at ground potential. While relay 28 is operated a circuit may be traced from battery 38 through contact 40, resistance 42 and condenser 44 to ground, charging condenser 44, which is of small capacity, to the potential of battery 38.

The first or start signal element of every combination received by relay 12 is always a spacing signal element. In response to this the armature 20 of relay 12, as previously explained, is actuated to engage its spacing contact 22. As contact 24 is opened relay 28 is released and as potential is removed from electrode 30 the main gap of tube 32 is deenergized. The release of relay 28 opens contact 36, removing ground from the top plate of condenser 34 which starts to charge over a circuit from battery 46 through resistance 48 and condenser 34 to ground. The following signal elements of the permutation code combination are marking and spacing signal elements in any combination depending upon the character or function to be defined. Armature 20 will follow these signal elements being actuated to contacts 24 and 22 in accordance with the received signal elements of the permutation code combination. However, this is ineffective as, during an interval equal to the time required to receive the complete permutation code combination, condenser 34 will be charging and will not reach the potential necessary to ionize the control gap of tube 32 until an interval has elapsed equal to the interval required to receive a complete permutation code signal combination. At the end of this interval the control gap of tube 32 will be ionized. When the stop signal element is received, after the reception of the permutation code signal elements, the armature 24 will engage its marking contact 24 and at this time the engagement will be effective to ionize the main gap of the tube and to operate relay 28.

During the first stop interval, while contact 40 was closed, prior to the release of relay 28, condenser 44, which is of small capacity, was charged. When relay 28 released, contact 50 was closed. During this interval the relatively small charge accumulated in condenser 44 was transferred to condenser 52 which is of relatively large capacity. Relay 28 is operated and released once for each complete start-stop permutation code signal combination. Condenser 44 will be first charged and thereafter discharged into condenser 52 once for each such complete combination. A single measured increment of electrical energy will be transferred from condenser 44 to condenser 52 once for each such combination. In response to the accumulation of a chosen number of such transfers

the potential of condenser 52 will be raised sufficiently to ionize the control gap of gas tube 54.

The relative capacities of condensers 44 and 52, the potential of battery 38 and the potential required to ionize the selected tube 54 may be controlled to vary the number of transfers required to ionize the control gap of tube 54.

Each time relay 28 is released, in response to each succeeding start signal of a complete combination, battery 56 will be connected through contact 58 and the winding of message register 60 to electrode 62 of tube 54. This will be ineffectual except on the operation after condenser 52 has attained the desired potential, at which time the control gap of tube 54 will be ionized and the main gap will therefore ionize operating message register 60. The operation of the message register, which is well known in the art, will control a train of gears and indices, not shown, to provide a cumulative indication of the operations of the register. The register may of course count forward or backward.

When message register 60 operates it also closes contact 64 which discharges condenser 52 through resistance 66 to ground, preparatory to the start of another cycle. When contact 58 opens, following the operation of register 60, the register will release and the main gap of tube 54 will be deionized.

It should be apparent, therefore, that condenser 44 will be charged once for each complete start-stop permutation code signal combination. Condenser 52 will be charged to a particular potential once for each n combination, n being a chosen integral number, more than one. The register will provide a cumulative indication of the number of n combinations transmitted. In the arrangement, as described the electronic circuit counts multiple numbers of permutation code combinations. However, it should be apparent that the circuit may be employed to count the happenings of any events of uniform duration throughout a counting. All that is necessary is that the relay 12, or any other control, operate to one position, or assume a first condition, at the start of the event and to the opposite position, or assume a second condition, at the termination of the event, to control the connection of battery 14 to electrode 30. The capacity of condenser 44 and the potential of battery 38 may be varied as necessary to obtain the necessary increment of energy during the happening of an event of relatively long or short duration and to count successive occurrences of the event, however spaced in time. The events counted will ordinarily be of uniform duration but it is also pointed out that the events may be of varying duration so long as the duration of each exceeds a certain minimum interval necessary to permit the charging of condenser 34. With minor obvious modifications the circuit may be employed to discriminate between events of varying duration and to provide a cumulative indication of the number of happenings of an event exceeding a fixed minimum interval in duration.

What is claimed is:

1. A multiple counter for indicating a summation of a multiple number of happenings of an event, each of said happenings consisting of a plurality of discrete sub-events, said counter comprising an electronic device, a time control for said device, means for inaugurating the functioning of said time control in response to the occurrence of the first of said sub-events of an

individual happening of said event, means for terminating the functioning of said control after the elapse of a measured interval and in response to the occurrence of the last of said sub-events of said individual happening, means for ionizing said electronic device in response to said terminating of said functioning, means for accumulating an increment of electrical energy during said happening, means for transferring said increment once for each of said happenings, and means for operating an indicator in response to an integral number, more than one, of said transfers.

2. A multiple counter for counting the transmission of a multiple number of multielement start-stop permutation code telegraph signal combinations, said counter comprising a first electronic device, a time control for said device, a relay controlled by said device, a second electronic device, an electrical energy storage means for said second device, a register connected to said second device, means responsive to the reception of the start impulse of each of said combinations for starting said time control, means responsive to the reception of the stop impulse of each of said combinations for terminating said time control, ionizing said first electronic device, and operating said relay, means responsive to operation of said relay for measuring a definite increment of electrical energy, means for transferring said increment to said storage means and means, including said storage means, responsive to a plurality of said transfers for ionizing said second electronic device and operating said register.

3. An electronic counting circuit for counting the occurrence of individual events in multiple steps, said events each consisting in a plurality of discrete sub-events, said circuit comprising an electronic timing circuit responsive to controls operative at the beginning and end of each of said individual events, said circuit including means for preventing response to certain of said

sub-events, means controlled by said timing circuit for measuring an increment of electrical energy for each occurrence of said individual event, an increment accumulator and an electronically controlled counter responsive to the accumulation of a fixed multiple number of transfers of said measured increments.

4. An electronic counter for counting start-stop multielement permutation code signal combinations, comprising a receiving device responsive to each of said combinations, an electronic device connected to said receiving device, a condenser timing circuit connected to said electronic device, means for starting the charging of said condenser timing circuit in response to the reception of the first signal element of each of said combinations by said receiving device, means connected to said timing circuit for measuring an interval corresponding to the duration of each of said combinations, means for ionizing said electronic device at the termination of each of said intervals, and an electrical energy transfer and accumulator circuit, including a second electronic device controlled by said first electronic device, responsive to the transfer and accumulation of a definite multiple number of increments of electrical energy, one for each of said combinations, for operating a register connected to said second electronic device.

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