

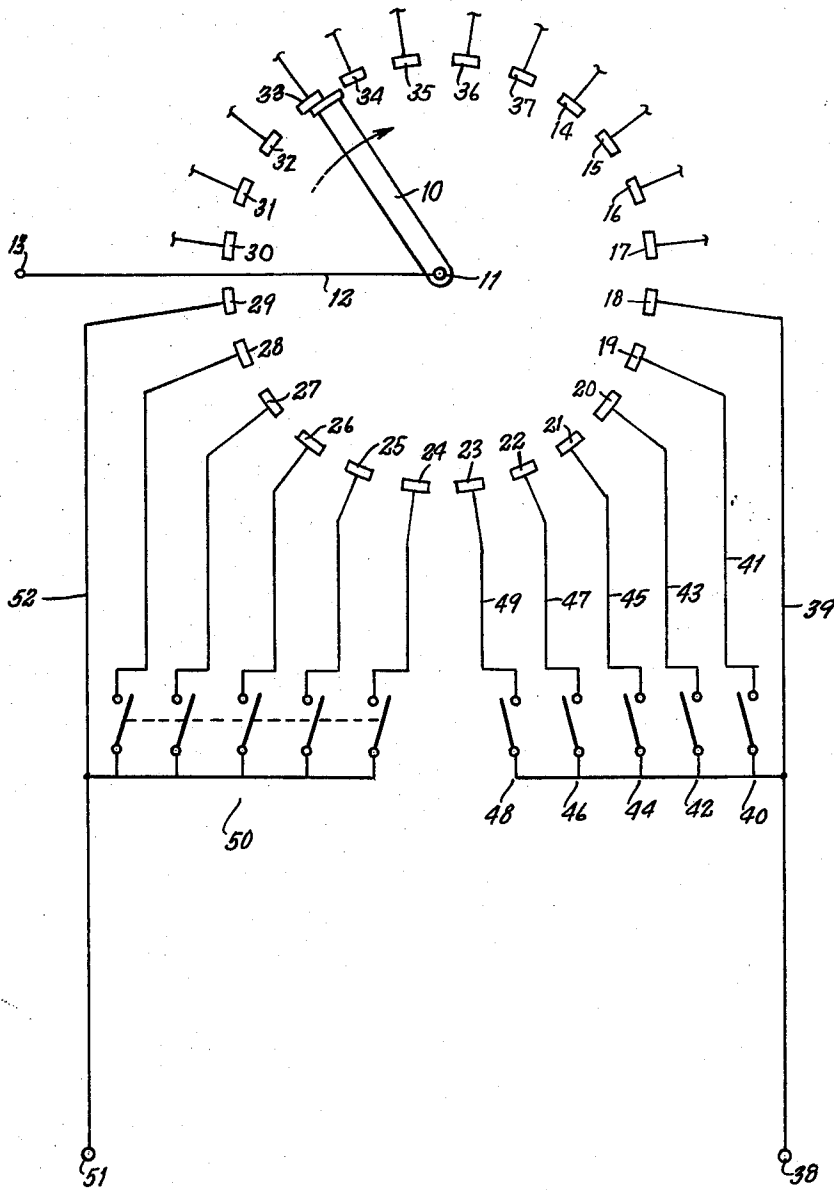
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SEQUENTIALLY OPERATED TIMING MECHANISM

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SEQUENTIALLY OPERATED TIMING MECHANISM

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This invention relates to a timing mechanism suitable for controlling the scheduling of electrically operated equipment. This application is a continuation-in-part of application Serial No. 4,788, filed January 26, 1960 and now U.S. Patent No. 3,016,004.

In certain types of machinery or equipment, it may be desirable to be able to control the time cycle of the electrically operated components thereof. Thus, for example, a machine may include an electrically operated component which is to function for only a portion of the overall cycle of the machine. There are numerous timing devices presently available for accomplishing this result. However, such devices must be pre-set for the type of cycling desired. That is to say, the device is designed to make electrical contact at a predetermined point in the overall cycle, and to maintain such contact for a predetermined portion of the overall cycle.

In many instances, this necessity of pre-setting the timing device is not disadvantageous. Thus, for example, the distributor in the conventional automobile internal combustion engine may be adjusted to produce the desired spark-plug firing cycle only when the engine is not functioning. However, once the desired cycle is attained there is usually no need to readjust or modify the cycle thereafter.

On the other hand, certain machines require continual modification of the timing of the various components to adjust for constantly varying conditions. Such a machine is exemplified by the one disclosed in copending application Serial No. 4,788, now U.S. Patent No. 3,016,004, filed by C. M. Harper and G. F. Harrington on January 26, 1960. In the meat treating machine disclosed in the above copending application, pickling fluid is pumped sequentially into alternate sides of a piece of meat by separate pumps. The variations in thickness, quality, etc. of the piece of meat being treated are factors which control the amount of fluid which is to be injected into the respective sides of the piece of meat. Since the meat from one lot to another may vary in these characteristics, it is necessary to adjust, from time to time, the amount of pickling fluid to be introduced. Clearly, if it were necessary to stop the operation of the machine each time the cycle were to be changed, the efficiency in terms of production of treated meat per unit of time would be adversely affected.

Accordingly, it is an object of this invention to provide a timing mechanism for control of electrically operated equipment which permits modifications of the time cycle or scheduling of the said equipment while the said equipment is in operation.

It is a further object of this invention to provide a timing mechanism which can be simply and easily adjusted to modify the scheduling or timing cycle thereof.

It is another object of this invention to provide a timing mechanism which may be designed to provide change in the scheduling or timing cycle thereof either in relatively small or in relatively large increments of the overall cycle.

Briefly stated, a preferred form of the timing mechanism of the present invention comprises a contact arm which is rotatable about a pivot point and a plurality of switch contacts, spaced one from the other and arranged in a circle described about a center coincident

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with said pivot point. The width of the contact arm and the spacing of the switch contacts are chosen so that the rotating arm makes contact with the next succeeding switch contact before breaking contact with the first switch contact. Means are provided to electrically connect adjacent switch contacts one to the other.

The manner of use of the timing mechanism is as follows: the contact arm and at least one switch contact are connected into an electrical circuit so that contact of the arm and switch closes the electrical circuit and operates whatever mechanism is connected in the electrical circuit. The speed of rotation of the contact arm determines the frequency of operation of the mechanism since the circuit will thus be closed once for each full revolution of the contact arm.

As stated above, adjacent switch contacts may be electrically connected. Thus, by connecting switch contacts to the one contact which is already in the electrical circuit, the period of time the circuit is closed during each full revolution may be extended. Accordingly, proper choice of the speed of rotation of the contact arm in conjunction with appropriate selection of the number of switch contacts to be connected provides an infinite selection of timing cycles which vary both as to frequency and duration. The timing mechanism of this invention may be used to control a plurality of electrically operated mechanisms by assigning to each mechanism a consecutive group of switch contacts. Thus, for example, the timing mechanism could be divided into quadrants, the switch contacts in each quadrant being available to schedule the operation of the electrical apparatus connected thereto.

The invention will be more readily understood when described in conjunction with the drawing which is a schematic view of a preferred embodiment of the timing mechanism of this invention.

Referring now to the drawing, there is shown contact arm 10 which is rotatable about point 11 by driving means, not shown.

Contact arm 10 is connected to lead 12 which in turn is connected to terminal 13.

A plurality of switch contacts 14 through 37 are arranged in a path which is a circle having point 11 as its center. Switch contacts 14 through 37 are mounted on means, not shown, to assure stability of operation.

Only those of contacts 14 through 37 which are in the lower portion of the path are shown to be electrically connected for simplicity of exposition. Thus, contact 18 is electrically connected to terminal 38 by lead 39. Switch contact 19 is connected to single-pole single-throw switch 40 by lead 41. Likewise, switch contact 20 is connected to single-pole single-throw switch 42 by lead 43, etc.

Assume that an electrically operated mechanism, such as a solenoid, is to be scheduled in its operation by means of the timer shown in the drawing. Terminals 13 and 38 are connected into the electrical circuit of the solenoid, for example, so that the solenoid will function only when arm 10 makes electrical contact with switch contact 18. The manner in which this may be accomplished is well known in the art.

Arm 10 is then rotated. The solenoid will be actuated once during each full revolution or cycle, this occurring when arm 10 contacts switch contact 18. The speed of rotation of arm 10 will determine the rate at which the solenoid is actuated per unit time, i.e. how many times the solenoid will be actuated per minute.

The period of time during each cycle for which the solenoid will remain in an actuated position is determined by the total time the arm 10 is in contact with some portion of switch contact 18. This period of time may be extended simply by closing switch 40 so that the solenoid will then remain in an actuated position not only during the time the arm is in contact with switch contact 18 but

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for an additional period represented by the time of contact with switch contact 19. Of course, this time may be further extended by closing any or all of switches 42, 44, 46 and 48.

The size of the switch contacts, the number of switch contacts and the spacing of the switch contacts may be varied to suit the exigencies of any particular situation. The distance of the switch contacts from the pivot point of arm 10 may also be varied to provide additional flexibility, if necessary.

Any type of arrangement is suitable for electrically connecting adjacent switches. Thus, although single-pole single-throw switches were used for switch contacts 18 through 23, a five-pole single-throw switch 50 is shown in conjunction with switch contacts 24 through 29. For such use, contact 29, which is connected to terminal 51 by lead 52, can be electrically integrated with switch contacts 24 through 28 by closing switch 50. A second electrical device, such as a pump motor, may be scheduled by use of this group of switch contacts.

It is to be understood that any means whereby adjacent switches may be electrically connected is suitable. Accordingly, rotary switches and ganged switches may also be used.

In addition to the high degree of flexibility with respect to attaining the type of scheduling or time cycle desired, the present invention is possessed of another important advantage. The time cycle can be varied without the necessity of shutting down either the timing mechanism itself or the electrical apparatus being controlled. Thus, for example, the frequency of the cycle may be modified merely by changing the speed of rotation of arm 10. Also, the duration of the actuation period of the cycle may be increased or decreased by closing or opening the connections between adjacent switches. Both of these adjustments may be made during the operation of the timing mechanism.

The timing mechanism described above is intended merely as illustrative of the present invention. It is to be understood that variations may be made therein by a

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worker skilled in the art without departing from the spirit or scope of this invention.

I claim:

1. A timing mechanism comprising a plurality of equidistant spaced contacts arranged in a circle, the said contacts being divided into four quadrants with at least three contacts in each quadrant, a contact arm rotatable about the center of said circle and adapted to electrically engage each of said contacts successively, a common electrical lead connected to said contact arm, four quadrant electrical leads respectively connected to a different one of four of said contacts, each of said four contacts being located in a different one of said four quadrants, whereby each quadrant lead is associated with a different quadrant, respective switch means connecting the remaining contacts of each of the four quadrants in parallel arrangement to the quadrant lead associated therewith, whereby any one of the remaining contacts in any quadrant is connected to the quadrant lead associated therewith by closing its respective switch means, thereby providing a completed circuit between said common electrical lead and said last named quadrant lead when said contact arm electrically engages the contact whose respective switch means is closed.

2. The timing mechanism of claim 1 in which said contact arm electrically engages the next succeeding contact before moving out of engagement with the first contact.

3. The timing mechanism of claim 1 in which said switch means are manually operable.

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