United States Patent

[11] 3,634,741

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[54] **METHOD AND APPARATUS FOR EFFECTING THE ACTUATION AND NONACTUATION OF A RESPONSIVE INSTRUMENTALITY**
13 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **328/72,** 146/94, 307/293
[51] **Int. Cl.** **H03k 17/28**
[50] **Field of Search** 307/223, 293; 328/5, 43, 72, 73, 75; 146/94, 95

[56] **References Cited**

UNITED STATES PATENTS

2,620,440	12/1952	Baker et al.	328/43
3,142,323	7/1964	Metzler	146/94 X
3,144,893	8/1964	Dahms	146/95
3,223,856	12/1965	Joy	307/293 X
3,379,234	4/1968	Kasper	146/94 X
3,456,554	7/1969	Goodwin	328/73 X
3,519,051	7/1970	Badgley et al.	146/94 X

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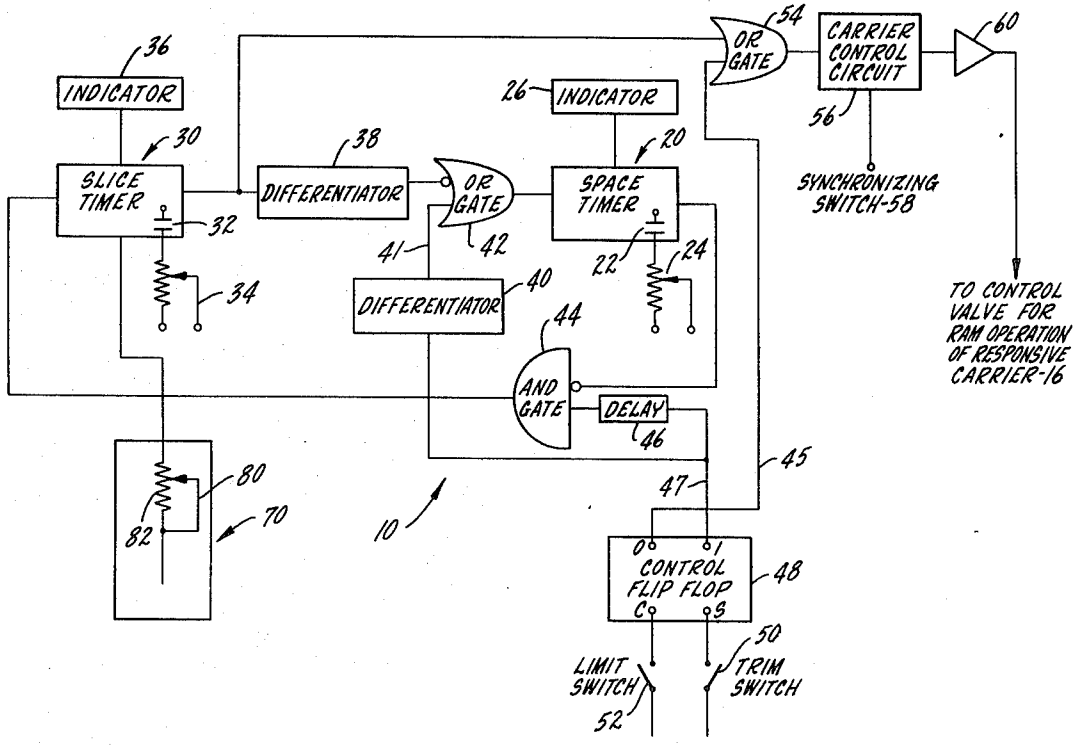
ABSTRACT: There is disclosed a method and an apparatus for alternately effecting the actuation and nonactuation of a responsive instrumentality in a manner such that during actuation of the instrumentality, cooperation can be effected for a variable system condition. The apparatus comprises a first timer having a timing period and a nontiming period, a second timer connected to the first timer also having a timing period and a nontiming period wherein the first timer is adapted to switch to the nontiming period after the timing period is completed and upon switching to the nontiming period actuates the second timer into its timing period. The second timer is connected to the instrumentality to be actuated and the instrumentality is actuated whenever the second timer is in its timing period and is not actuated when the second timer is in its nontiming period. Sensing means are connected to the second timer for continuously sensing a predetermined system condition and wherein the duration of the timing period of the second timer is responsive to the sensing means. Control means are connected in circuit with the instrumentality to be actuated as well as to the first and second timer wherein the control means is adapted to initially place the first timer to its timing period and the second timer into its nontiming period wherein after the timing period of the first timer is completed, the first timer switches to its nontiming period thereby placing the second timer into its timing period and thereby causing the instrumentality to be actuated, this actuation continuing until the second timer switches into its nontiming period whereby the first timer again switches to its timing period thereby effecting the alternate actuation and nonactuation of the instrumentality.



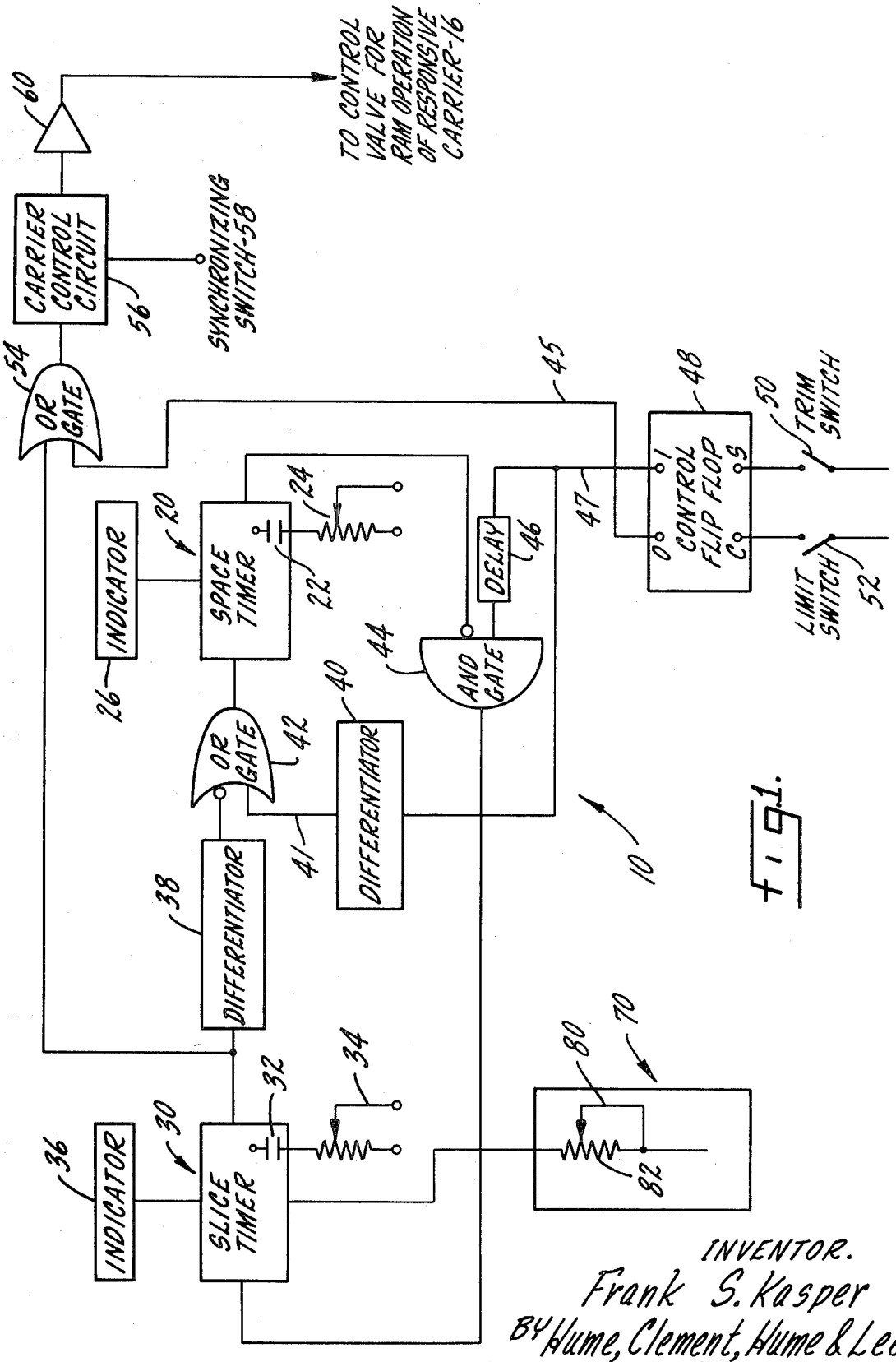


Fig. 1.

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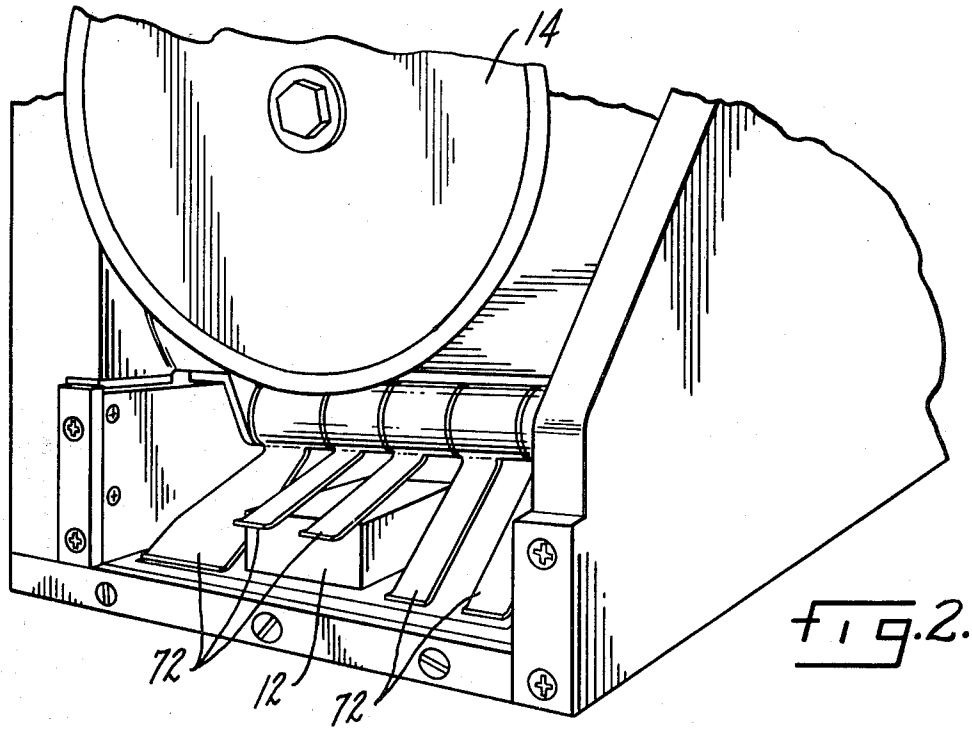

fig. 2.

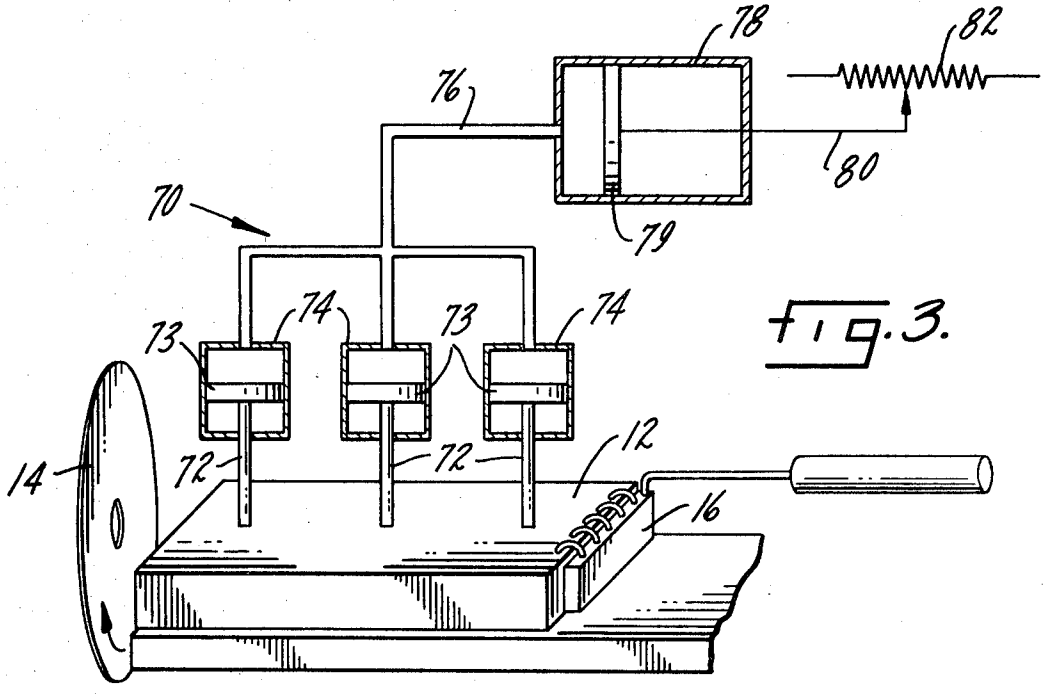

fig. 3.

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METHOD AND APPARATUS FOR EFFECTING THE ACTUATION AND NONACTUATION OF A RESPONSIVE INSTRUMENTALITY

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for controlling the alternate actuation and nonactuation of a movable instrument.

One industry which has a great need for an invention such as that disclosed in the instant disclosure is the meat industry. For many years bacon and other meats have been sliced on high-speed slicing machines and segregated into correct weight groups by manual or automatic techniques. One automatic technique includes the counting out of a given number of slices to the approximate desired weight. A second technique is to slice the bacon onto a scale until the correct weight is reached and then stop slicing for a short, predetermined time interval. Recently, even more sophisticated techniques have been developed wherein the amount of sliced bacon is weighed and where there is a slight discrepancy in the weight, small amounts of bacon are added to make up the desired weight.

In the meat cutting field, it has, therefore, been the general practice to employ various types of weighing devices which weigh the sliced meat to determine whether or not a proper amount has been sliced. After determining this weight, more or less meat is added to the sliced pile. Although such devices have served the purpose, they have not proved entirely satisfactory under all conditions of service.

SUMMARY OF THE INVENTION

The present invention contemplates a unique timer control system utilizing two timer controls, a slice timer and a space timer. The slice timer times for a predetermined period of time so that the desired approximate weight of sliced material is reached. The time duration of the slice timer contains a manual control whereby the operator may make small adjustments if the weight tendency of the sliced material is over or under the weight. After the slice timer times out, the space timer is triggered. The space timer provides a gap between groups of sliced material. The adjustment of the space timer may be altered by another manual control. After the space timer times out, the output of the space timer is fed through a gating circuit which triggers the slice timer again and the cycle is repeated. The output of the slice timer feeds a control circuit which operates a control valve for starting and stopping the feed of the product to be sliced which is normally placed on a movable carrier means and which is fed into a rotatable blade for slicing.

When the slice timer is operative in its timing period, a valve is energized causing the movable carrier to feed the product into the rotating knife blade. The two timers then alternately operate to cause a slicing period and a nonslicing period of the product. The slice timer normally triggers the space timer which in turn triggers the slice timer again. To accurately control the amount of product being sliced, a sensing means is placed in contact with the unsliced product. This sensing means measures the cross-sectional area of the uncut product and based upon this measurement, changes the timing period of the slice timer thereby allowing for a longer or shorter timing period. This timing period is inversely related to the cross-sectional area of the product to be sliced. In this manner, the proper amount of sliced product may be obtained very economically without the use of any weighing device on the output of the slicer.

It is, therefore, an object of the present invention to provide an improved method of and apparatus for controlling the operation of a system instrumentality in a reliable and efficient manner.

Another object is the provision of a method of and apparatus for accurately slicing a product into preselected and predetermined weight groups without the use of a weighing scale.

A further object is the provision of a method of and an apparatus for the automatic slicing of bacon into preselected and predetermined weight groups without the use of weighing scales.

Still another object is to provide a method and an apparatus which has the necessary versatility to be adapted for a variety of applications at relatively low cost and without substantial modification in the basic functional characteristics thereof.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings and which like reference numerals designate like parts throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a timer control circuit which constitutes the preferred embodiment of the invention.

FIG. 2 is a perspective view of the sensor circuit utilized in conjunction with the timer control circuit.

FIG. 3 is a schematic view of the sensor circuit shown in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Broadly, there is disclosed a method for automatically slicing a product and collecting the sliced product in weight groups of preselected magnitude in the absence of weighing. The invention achieves these weight groups of essentially identical weight, automatically, even though the product is sliced. First the product to be sliced is placed in contact with the slicing instrument thereby initiating the start of a slicing period. Secondly, the cross-sectional area of the product to be sliced is continuously sensed. Based on the varying cross-sectional area of the product, the timing period of a slicing cycle is varied. The timing cycle of the slicing period is determined by the preselected amount of the sliced product required and by the cross-sectional area of the unsliced product. Thirdly, a nonslicing period is then timed. The nonslicing period is initiated when the slicing period is terminated and finally, the slicing period is automatically reinitiated when the nonslicing period is terminated thereby causing an automatic sequential operation of slicing and nonslicing of the product.

This method of automatically slicing the product and collecting the sliced product into preselected measured weight groups will be more clearly understood when taken in conjunction with an apparatus for carrying out the method as shown in FIGS. 1–3.

Referring now to the drawings wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIG. 1, which illustrates a preferred embodiment, a timer control circuit **10** which is used to control the alternate actuation and nonactuation of a carrier means **16** (shown in FIGS. **2** and **3**). In a preferred embodiment, the timer control circuit **10** is utilized with a meat cutting machine. The timer control alternatively feeds a reciprocal meat carrier towards a constantly rotating blade and then removes the meat carrier from the constantly rotating blade.

Referring momentarily to FIG. **3**, a conventional meat cutting machine comprises a constantly rotating knife blade **14** and a responsive carrier means **16** upon which is carried the product **12** to be sliced. One such meat-cutting machine is the ANCO Model No. 827, manufactured by the ANCO Company of Chicago, Ill. This slicing machine is described in a manual entitled "Hydraulic Bacon Slicer Operating Instructions For the ANCO Model No. 827 Slicer Machine."

Referring now to FIG. **1**, it can be seen that the heart of the timer control system comprises two timers, a space timer **20** and a slice timer **30**. Each timer has two periods associated with it, a timing period and an ambient nontiming period. Also, each timer has an indicator **26** and **36**, respectively, associated with it, so that an observer or operator can determine

which timer is timing. One such timing control which may be utilized is described in U.S. Pat. No. 3,350,688 issued on Oct. 31, 1967, to Frank S. Kasper et al.; however, other timing devices may be employed.

Briefly, the operation of the timer control circuit **10** is used to actuate a control valve which in turn moves a carrier means **16** into contact with the rotating knife **14**. In operation, the slice timer **30** will time for a predetermined period of time so that the desired approximate weight of sliced product is reached. This assumes that the rotating knife is rotating in a constant r.p.m. so that reproducible results can be obtained. The time duration of slice timer **30** is controlled by a manual potentiometer **34** whereby the operator can make small adjustments if the weight tendency of the sliced product is over or underweight. After the slice timer times out, space timer **20** is triggered. Space timer **20** provides a gap between the groups of product being sliced. When space timer **20** is triggered, the carrier means **16** is stopped so that no further product is sliced. The timing period of space timer **20** may be adjusted by another manual potentiometer **24**. After the space timer timing period times out, the output of the space timer **20** is fed through an AND-gate **44** which triggers the slice timer **30** again and the cycle is repeated.

The output of slice timer **30** feeds a carrier control circuit **56** which operates a control valve for responsively feeding the carrier means **16**, having the product **12** upon it, towards the rotating knife blade **14**. When the slice timer **30** is operative, a valve (not shown) is energized causing the product to be fed into the knife. A synchronizing switch **58** indicative of the position of the knife blade is electrically connected to the carrier control circuit **56**. This provides a means for ensuring that the first slice is of proper thickness and that the last slice is of proper thickness as desired.

The sequencing of the cycling of slice timer **30** and space timer **20** can be interrupted by a gate control circuit which is under the control of a gating means, control flip-flop circuit **48**. The slice timer **30** will normally trigger the space timer **20** in turn triggers the slice timer **30** again providing that the gate control circuit is appropriately energized.

The gate control circuit broadly comprises an OR-gate **42** connected between slice timer **30** and space timer **20** and an AND-gate **44** connected between space timer **20** and slice timer **30**. Lastly, an OR-gate **54** is included between slice timer **30** and carrier control circuit **56**. It can thusly be seen that the control gate circuit comprises three logic means, OR-gates **42** and **54** and AND-gate **44** which thus control the operation of slice timer **30** and space timer **20**. Control flip-flop **48** which acts as a gating means and which operates OR-gate **54** and AND-gate **44**, receives inputs from trim switch **50** and limit switch **52**. In operation, slice timer **30** and space timer **20** continue cycling until limit switch **52** activates control flip-flop circuit **48** which in turn energizes gate **54** and the cycling stops. Control flip-flop **48** also provides an input to carrier control circuit **56** through OR-gate **54** which operates the control valve which in turn activates the carrier means so that the slicer may be operated. When the carrier means has been loaded with an unsliced product and it is desired to start the slicer machine in operation, trim switch **50** is closed which in turn operates control flip-flop **48** to produce a signal to the input of AND-gate **44** through a delay circuit **46** which causes timers **20** and **30** to begin their sequential operation.

A last feature provided by timer control circuit **10** is a sensor means **70** which senses the cross-sectional area of the product to be sliced. Basically, sensor **70** adjusts the duration of the timer period of slice timer **30** in inverse relationship to the cross-sectional area of the product to be sliced. Broadly, referring to FIGS. **2** and **3** as well as FIG. **1**, sensor **70** comprises a potentiometer **82**. The setting of this potentiometer is varied by the movement of a plurality of sensing fingers **72** shown in FIG. **3**. While only three sensing fingers **72** are shown, it will be recognized that any number can be used and the greater the number of fingers, the greater the accuracy of the sensing means.

Now, referring to FIG. **1**, the operation of timer control circuit **10** will be explained in more detail. The operation of timer control system **10** is initiated when the operator adjusts the product carrier means **16** (shown in FIG. **3**) so that the product to be sliced is manually fed into rotating knife **14** until several slices are cut. This manual slicing evens the edge of the product so that a fixed reference edge may be established. The carrier means in the ANCO slicer consists of a set of fingers or grippers (shown in FIG. **3**) which dig into the end of the product and firmly push the product into the knife. These grippers are connected to a rod and piston which are hydraulically operated. However, it will be recognized by one skilled in the art that any means may be used to move the product into the knife. At this time, the operator closes trim switch **50** which causes an output signal on lead **47**. This signal passes through differentiator **40** along lead **41**, through OR-gate **42**, to space timer **20**. This initiates the timing period of space timer **20**. No further slicing occurs at this point, thereby allowing the manually sliced portion of the product to be removed. While space timer **20** is in its timing period, an indication is given by indicator **26**. Indicator **26** may be a simple light bulb or any other conventional indicating means. The time duration of space timer **20** is determined and set by manual potentiometer **24** which is connected to the timing capacitor **22** of the timer control circuit. As mentioned above, one such timer control circuit is disclosed in U.S. Pat. No. 3,350,688. In this patent, the timing capacitor which is connected to the potentiometer would be capacitor **54** of the patent.

When space timer **20** is in its ambient nontiming period, or, in other words, its idle condition, it produces a low output. This low output from space timer **20** is applied to an input of AND-gate **44**.

When control flip-flop **48** is set by the actuation of trim switch **50**, space timer **20** is triggered through differentiator **40** and OR-gate **42**. This causes space timer **20** to move into its timing cycle and thus, a high output signal occurs on the output of space timer **20**. This high output signal is then applied to the circled input of AND-gate **44**. Another high input signal is applied to the other side of AND-gate **44** by the control flip-flop **48** through delay circuit **46**. Delay circuit **46** may be any conventional delay circuit such as an RC circuit. If delay network **46** were not in the timer circuit, a possibility would exist that there would be an output at AND-gate **44** since the upper input of AND-gate **44** is changing from a low to a high input. If this occurred, then the slice timer **30** would also be triggered at this time and both timers would then time simultaneously, rather than alternately as is required.

Continuing with the explanation of the operation of timer control circuit **10**, the control flip-flop circuit **48** is energized when trim switch **50** is closed by the operator. This energizes one input of AND-gate **44** after being delayed by delay circuit **46** as explained above. When this occurs, the output from space timer **20** will be permitted to pass through AND-gate **44** when the space timer completes its timing period and thereby produces a low output. This then causes slice timer **30** to switch from its ambient nontiming period to its timing period. Indicator **36** then indicates to the operator that slice timer **30** is in its timing period. When slice timer **30** is in its timing period, the product to be sliced which is on the carrier **16** is then brought into engagement with the rotating knife blade **14** and slicing begins. When slice timer **30** finishes its timing period, its associated indicator **36** is extinguished and space timer **20** is then triggered via differentiator **38** and OR-gate **42**. Specifically, when slice timer **30** completes its timing period, its output goes from high to low. Differentiator **38** then produces a differentiated pulse to the circle input of OR-gate **42**. This causes a high output signal at the output of OR-gate **42** which then triggers the space timer **20** into its timing period from its ambient nontiming period. This cycle is continued, space-slice-space-etc., until limit switch **52** is closed. It will be noted that differentiators **38** and **40** at the input of OR-gate **42** are utilized so that the OR gate is responsive to an instantaneous signal rather than being continuously responsive.

The timing period of slice timer **30** is determined by a potentiometer **34** connected to the timing capacitor of the timing circuit and by sensor **70**. The potentiometer **34** is a manual potentiometer which sets the nominal timing period of slice timer **30**. The combination of the average setting of fingers **72** of sensor **70** (FIGS. **2** and **3**) determines the average cross-sectional area of the product to be sliced. These fingers control the setting of potentiometer **82** of sensor **70** which also effects the slice timer time period duration as will be explained below. The output of slice timer **30** controls the carrier control circuit **56** through OR-gate **54**. The carrier control circuit **56** accepts an input from OR-gate **54** and from the synchronizing switch **58** so as to provide an output signal to power amplifier **60** at the correct time to synchronize the starting of the movement of the carrier means with the knife position to produce an acceptable first and last slice. The purpose of power amplifier **60** is simply to amplify the output from the carrier control circuit **56** and provide the power necessary to operate the control valve which operates the carrier means **16**. When the product has been completely sliced, a limit switch **52** is operated which ends the timing cycle and turns off the timer control circuit **10**.

Limit switch **52** operates control flip-flop circuit **48** so as to produce a high output on lead **45** and a low output on lead **47**. With a low signal on lead **47** which feeds one input of AND-gate **44**, AND-gate **44** will then have a low output, hence, no start signal will occur to trigger slice timer **30**; therefore, the cycling is stopped. The high output of flip-flop **48** on lead **45** is then applied to one input lead of OR-gate **54**. The output of OR-gate **54** then energizes carrier control circuit **56**. This causes the control valve to move into a run position causing the carrier to retract and permitting only manual operation of the slicer. To start the cycle all over again, trim switch **50** is then actuated as previously described and the space-slice-space-slice alternate cycle is again begun.

As mentioned above, sensor **70** is utilized to control the time duration of slice timer **30** in an inverse relation to the cross-sectional area of the product to be sliced.

Referring now to FIGS. **2** and **3**, the operation of sensor **70** will be explained. Conventional meat slicer machines such as the ANCO Model 827 described above, contain holddown fingers **72** which are used to hold the product to be sliced in position while being sliced and when the product is almost completely sliced, the last little piece is not pulled into the rotating knife. These holddown fingers **72** may be modified as will now be described to act as a sensor means to determine the cross-sectional area of the product to be sliced. One each of the sensor fingers **72** may be connected to a small cylinder piston **73** as will be recognized by one skilled in the art, any suitable connecting means may be utilized. Each small cylinder **74** in which the pistons **73** are confined is coupled to a large cylinder **78** by a tube **76**. As the sensing fingers under spring tension move up and down following the contour of the product to be sliced, the associated pistons **73** in each of the small cylinders **74** also move up and down. Oil or any other suitable fluid or gas is then moved in or out of the large cylinder **78** thereby moving piston **79** which moves arm **80**. Wiper arm **80** is connected to a potentiometer **82** so that wiper arm **80** may act as a potentiometer wiper thereby changing the resistance setting and, hence, changing the timing period of slice timer **30**. The movement of piston **79** of cylinder **78** is indicative of the average cross-sectional area of the product to be sliced. This can easily be seen by the following calculation:

$V=AD$

$v_1=a_1d_1$

$v_2=a_2d_2$

$v_3=a_3d_3$

where:

V = the incremental change in volume of cylinder **78** when piston **79** moves

v = the incremental change in volume of each small cylinder **74** when each piston **73** moves

A = area of piston head **79**

a = area of each small piston head **73**

D = displacement of piston head **79**

d = displacement of each small piston head **73**

therefore:

$V=v_1+v_2+v_3$

$AD=a_1d_1+a_2d_2+a_3d_3$

assume that:

$A=3a_1=3a_2=3a_3$

then:

$3AD=ad_1+ad_2+ad_3$

therefore:

$D=d_1+d_2+d_3/3$

Therefore, it can be seen that the displacement of piston cylinder **79** of the large cylinder **78** can be made to follow the average of the small piston motions represented by d_1, d_2 and d_3. When this motion is coupled to potentiometer **82**, an electronic signal is generated equal to the average position of the small pistons **73** (i.e., the position of the fingers **72**). Thus, the cross-sectional area of the product to be sliced may always be determined.

It should be understood, however, that while only three sensing fingers have been shown, any number of sensing fingers and any number of master cylinders may be utilized. It will be recognized that the greater the number of fingers, the more accurate the sensing will be. Furthermore, it will be recognized by one skilled in the art that each sensing finger **72** may be connected individually to its own potentiometer and that these potentiometers could then be connected in series to achieve an equivalent result to the use of a master cylinder and a single potentiometer. It is also interesting to note that the movement of the sensing fingers is made continuously as the product is being sliced. This means that the charging current into the timing capacitor **32** of slice timer **30** is continuously varying as the product is being cut so that the averaging technique of accounting for the cross-sectional area as well as the length of the product to be sliced gives an accurate indication of the amount of product being sliced so that slice product groups of equal weight may be formed. Therefore, the time period of slice timer **30** is inversely related to the charging current and this means that the variation of the sectional volume will be taken into account by the variation in the charging current as the product is being sliced.

It will be recognized by one skilled in the art that while the preferred embodiment was directed to a machine for slicing a product, it need not be limited as such. It will be recognized that timer control circuit **10** may be utilized in any environment wherein it is necessary to effect the actuation and nonactuation of a responsive instrumentality and wherein a varying system condition must be accounted for during at least a portion of the actuated period of the instrumentality. Both spacer timer **20** and slice timer **30** may be individually set so that their relative periods of timing and nontiming may be alternated.

It should be understood, of course, that the foregoing disclosure relates only to a preferred embodiment of the apparatus and of the method of the invention and that numerous modifications or alterations may be made therein without departing from the spirit and the scope of the invention as set forth in the appended claims.

What is claimed is:

1. A timer control circuit for alternately effecting the actuation and nonactuation of a responsive instrumentality comprising:

first timer means having a first condition and a second condition, said first condition representing a timing period and said second condition representing an ambient nontiming period wherein said first timer means is adapted to switch to said second condition after said timing period is completed;

second timer means connected in circuit with said instrumentality to be actuated and said first timer means, having a first condition and a second condition, said first condition representing a timing period and said second condition representing an ambient nontiming period wherein

said second timer means is placed in said first condition when said first timer means switches from said first condition to said second condition and wherein said instrumentality is actuated whenever said second timer means is in said timing period and is not actuated when said second timer is in said second condition;

sensing means connected to said second timer means for continuously sensing a predetermined system condition and wherein the duration of said timing period of said second timer means is responsive to said sensing means; and

control means connected in circuit to said first timer means, said second timer means and said instrumentality to be actuated wherein said control means is adapted to initially place said first timer means into said timing period and said second timer means into said second condition, wherein after said timing period of said first timer means is completed, said first timer means switches to said second condition thereby placing said second timer into said first condition and thereby causing said instrumentality to be actuated until said second timer switches into said second condition whereby said first timer again switches to said timing period thereby effecting said alternate actuation and nonactuation of said instrumentality.

2. The timer control circuit of claim **1** wherein said control means comprises first logic means connected between said first timer means and said second timer means wherein a change of condition of said second timer means causes a change in condition of said first timer means.

3. The timer control circuit of claim **2** wherein said control means further comprises second logic means connected between said first timer means and said second timer means wherein a change of condition of said first timer means causes a change in condition of said second timer means.

4. The timer control circuit of claim **3** wherein each of said timer means has a low output signal during said ambient nontiming period and a high output signal during said timing period.

5. The timer control circuit of claim **4** wherein said control means further comprises gating means for applying a signal to said first logic means and said second logic means.

6. The timer control circuit of claim **5** wherein said control means further comprises a means to delay said signal being applied to said second logic means by said gating means.

7. The timer control circuit of claim **6** further comprising a third logic means connected in circuit between the output of said second timer means and said instrumentality to be actuated.

8. The control circuit of claim **7** further including circuit means adapted to provide a signal from said gating means to said third logic means wherein said signal results in effecting the nonactuation of said instrumentality and thereby ending said alternation between said actuating and nonactuating periods.

9. The timer control circuit of claim **1** wherein said sensing means comprises a potentiometer, and wherein changes in the setting of said potentiometer in response to said system condition varies said timing period of said second timer means.

10. The timer control circuit of claim **8** wherein said sensing means comprising a potentiometer, and wherein changes in the setting of said potentiometer in response to said system condition varies said timing period of said second timer means.

11. The timer control circuit of claim **10** wherein said first logic means comprises an OR gate, said second logic means comprises an AND gate and said third logic means comprises an OR gate.

12. The timer control circuit of claim **11** wherein said gating means comprises a flip-flop circuit.

13. The timer control circuit of claim **12** wherein said first logic means further comprises a first differentiating means connected between said first input to said OR gate and said flip-flop circuit and a second differentiating connected between said second input to said OR gate and said output of said second timer means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,634,741 Dated January 11, 1972

Inventor(s) Frank S. Kasper

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 38; after the number 20, and before the word"in" in line 39; the word "which" should be inserted

Signed and sealed this 6th day of June 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O--366-334