

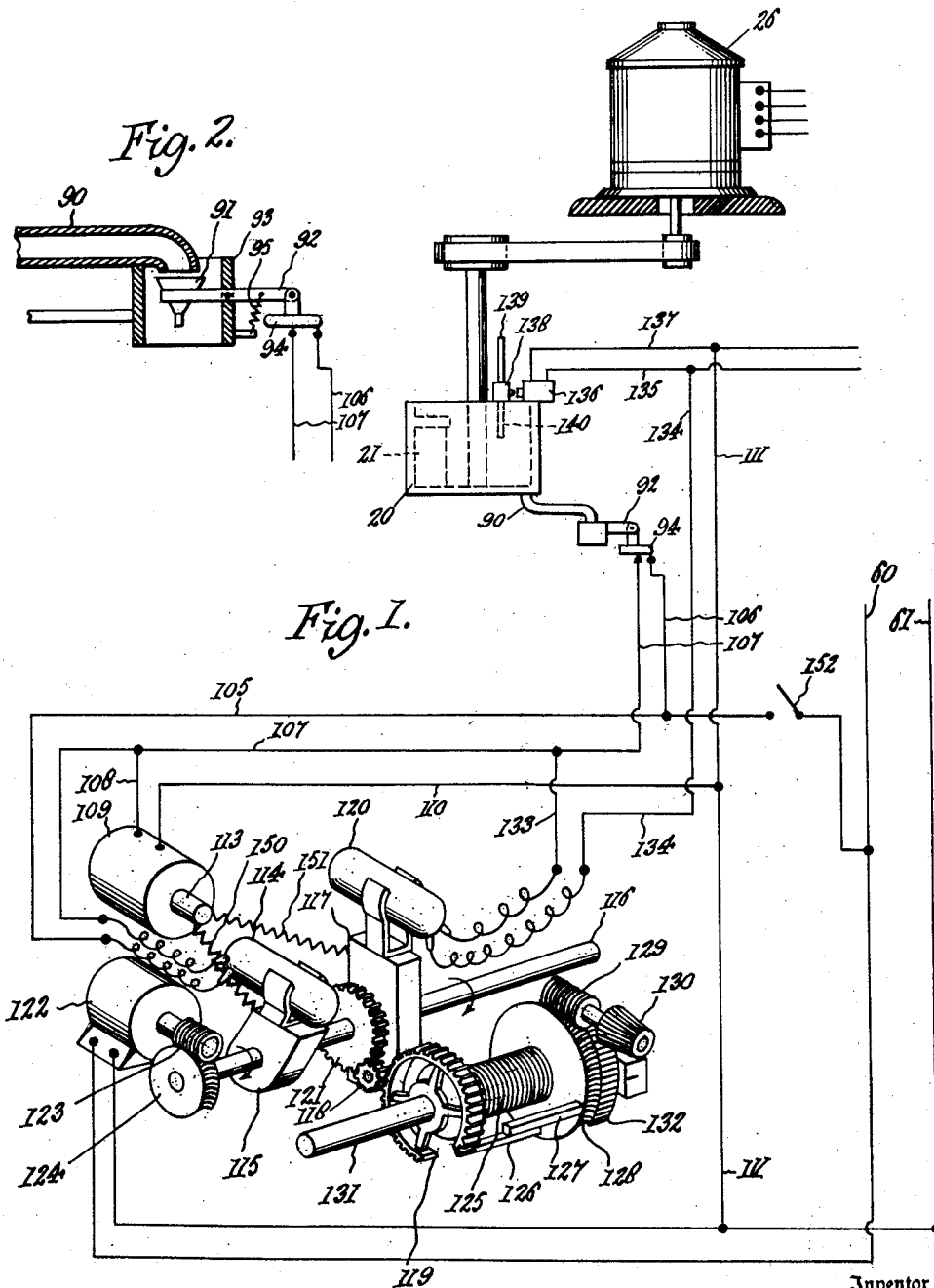
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TIMING DEVICE FOR CONTROL CIRCUITS

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TIMING DEVICE FOR CONTROL CIRCUITS

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3 Claims. (Cl. 161-1)

The present invention relates to improvements in timing devices for control circuits and more particularly to a mechanical-electrical timing device as applied in the control circuits for certain of the operations of full automatic centrifugal extractor machines such as are used for the separation of liquids from a magma consisting of a mixture of liquors and crystals of sugar, salt or the like.

This application is a division of my co-pending application Serial No. 245,790, filed December 14, 1938, which relates to improvements in controls, apparatus and other equipment for full automatic centrifugal extractors.

The principal object of this invention is to provide an adjustable timing device which regulates the time of current flow in a given circuit or circuits which in turn may operate (to open or close) electrically controlled valves and the like.

Another object is to provide a timing means which initiates the function of the mechanism which it controls and thereafter regulates the duration of the function and which is adjustable within limits to change the time of operation of the mechanism.

A further object of this invention is to provide means for automatically applying wash water to solids in the basket of an extractor at the correct instant regardless of variations in the raw product being processed and to separate heavy molasses extracted by the machine from the higher grade sugar syrup.

Still another object is to provide such a timing means as will accomplish the objects and purposes intended while employing a single solenoid.

With the foregoing and other objects in view as will become apparent from the following drawings and description the present invention will be more specifically pointed out and subsequently incorporated in the subjoined claims, it being understood that only such parts of the control means disclosed in my above identified co-pending application which directly relate to the present invention, are herein illustrated.

In the drawings wherein like characters of reference refer to like or corresponding parts throughout the several views,

Figure 1 is a schematic wiring diagram showing the circuits for the control of the wash water apparatus associated with the extractors and including the timing device according to the present invention.

Figure 2 is a detailed sectional view showing

the mechanically controlled switch for the operation of the timing device.

Referring to the drawings there is shown, in Figure 1, a centrifugal extractor machine 20 of the type commonly employed in separating liquids from a mixture of crystals and liquors commonly called a magma. The motor 26 drives the basket 21 of the extractor machine 20 to effect a separation of the liquors from the crystals of the magma or fillmass which is placed into the machine when operation thereof is initiated.

The liquor separated from the solid material flows through a discharge pipe 90 (Fig. 2) and into the funnel 91 mounted on the lever 92. The lever 92 is fulcrumed on the casing 93 and has the switch 94 mounted at its opposite extremity. The weight of the liquor in the funnel 91 overcomes the bias of the tension spring 95 and it is depressed thus tilting the switch 94 to open circuit position. As soon as the liquor has all been extracted from the solid in the basket 21 no more liquor is supplied to the funnel 91 and the liquor in the funnel drains out thus allowing the spring 95 to return the lever 92 to its normal position, closing the switch 94.

The purpose of the switch 94 in combination with the funnel 91 is to determine the proper moment for the application of the wash water. The wash water is introduced into the basket 21 of the extractor 20 by means of the pipe 139 and a valve 138 controlled by the solenoid 136. After the bulk of the liquids have been extracted from the crystalline mass it is the practice to spray a measured amount of water into the machine in order to wash any adhering syrup from the surface of the crystals. It is important that this water be applied at precisely the correct moment. If applied too soon, that is, before the syrups have been extracted it merely dilutes the syrup to some degree and unless an excessive amount is applied it does not wash the crystals. If applied too long after the syrups have been purged out then the remaining film of syrup on each crystal will have dried and hardened due to the circulation of air and cannot be readily washed off. As is seen from the above description, when the syrup ceases to flow into the funnel 91 the spring 95 tilts the arm 92 and the switch 94 is closed.

Referring to Figure 1 the circuits for the control of the wash water and the duration of such application to introduce a given quantity of wash water are shown. The switch 94 is used to operate the improved timing device which initiates the flow of wash water and regulates the amount

thereof introduced into the basket 21. When the switch 94 closes it completes a circuit from the 240 volt tap 80 through the wire 100, the wire 106, the switch 94, the wire 107, and the wire 108 to the solenoid coil 109. From the solenoid coil 109 the current passes through the wire 110 and the wire 111 to the opposite side of the line 61. The solenoid 109 is therefore energized and the plunger 112 is pulled in. This has two effects.

First, the switch 114 which is supported by the member 115 loosely journaled on the shaft 116 is tilted to closed circuit position by the spring connection 150 to the plunger 112. Secondly, the member 117 is tilted by spring 151 until the gear 118 meshes with the gear 119. Due to the angle of the switch 120 which is normally closed, this tilt is not sufficient to put it in open circuit position and this therefore closes the circuit from the 240 volt line 80 through the wire 105, the switch 114, the wire 107, the wire 133, the switch 120, the wires 134 and 135 to the water solenoid 136, and then the current returns through the wires 137 and 111 to the other side of the line 61. Thus, the solenoid 136 is energized and operates to open the valve 138 initiating the flow of wash water into the basket 21.

Switch 152 is provided in order that the above described circuit may be opened to cause resetting of the switch 114 and also to allow the timing switch 120 to be reset. Upon the opening of switch 152 the solenoid 109 is de-energized allowing the member 115 to angularly rotate on the shaft 116 thereby tilting the mercury switch 114 to its initial open circuit position.

The gear 118 is extricated from the cut-away portion or slot of the driven gear 119, and the member 117 carrying the timing switch 120 is readjusted on the shaft 116 where it is held by the biasing spring 151 in initial close circuit position. Thus, the operation of switch 152 provides means for repeated operation of the timing device.

The switch 152 is mechanically operated by another part of the control mechanism for the extractor to provide synchronism of the washing operation with the various other functions of the extractor cycle. The structure and operation of switch 152 cannot be here shown, disclosed or claimed since the present application is restricted to the structure and operation of the timing device. I have, however, in a copending application fully described and shown the type of control switch as embodied in switch 152.

An accurate measurement of the amount of wash water which is introduced into the basket 21 to wash the solids is made possible by the use of the improved timing device according to the present invention. In Figure 1 the shaft 116 is shown to be freely rotatable in the member 117, which is loosely journaled on the said shaft 116 similarly to the mounting of the member 115 as previously described. The gear 121, however, is keyed to the shaft 116 which is continuously driven by the constant speed motor 122 through the worm 123 and the worm gear 124. Therefore, when the member 117 is tilted due to the energizing of the solenoid 109 and the consequent pulling in of the plunger 112 the intermediate gear 118 mounted on the member 117 is brought into mesh with the gear 119.

This gear 118 is continuously rotated by meshing with the driving gear 121 which is keyed to the shaft 116 and therefore the gear 118 is also rotated when the member 117 assumes the tilted position. The rotation of the gear 118 continues

until the gear 118 drops into the cut-away portion of the gear 119. The angle of the switch 120 is such that the additional tilt produced by the gear 118 dropping into the cut-away part of the gear 119 is sufficient to put the said switch 120 in open circuit position by causing the liquid mercury conductor to flow within the switch away from the contact points.

It is evident that the interval of time between the meshing of the gears 118 and 119 and the opening of the switch 120 is dependent upon the initial relative position of the cut-away portion of the gear 119 with respect to the gear 118. The initial position of the cut-away portion of the gear 119 is freely adjustable within certain predetermined limits with the gear 119 of a given diameter. Since both the gear 118 and the worm gear 128 are free to rotate on the shaft 131, the spring 125 acts to keep the finger 126 of the gear 118 against the finger 127 of the worm gear 128 and it is seen that by manually rotating the worm gear 128 by means of the worm 129 and the knob 130 that the time between the initiation of rotation of the gear 118 and the cessation of the rotation by the dropping of the gear 118 into the cut-away portion on the gear 119 may be varied at will.

Also since the amount of water sprayed into the basket 21 is a direct function of the amount of time between the closing of the switch 114 and the opening of switch 120, for a given constant rate of flow of wash water, the scale 132 fastened to the worm gear 128 may be calibrated directly in gallons or quarts of water so that a direct measurement of the amount of wash water required may be made.

It may thus be seen that due to the control of the application and the amount of wash water by the improved timing device and due to the adjustability of the timing device variations of the amount of wash water may easily be made. This fact makes possible the production of sugar and various other materials of uniform quality and properties regardless of the variation of the properties of the raw fillmass which is introduced into the extractor 20.

There has been shown above the application of the timing device according to the present invention to the control of certain of the functions accompanying the processing of sugars, and like materials, and it is believed that such a timing device is particularly adaptable for controlling certain of the circuits in such industrial processes. However it is obvious that by certain minor changes and modifications the timing device may be made applicable for controlling the time of current flow in almost any of the known types of control circuits which are at present utilized in numerous industries.

It is further obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

What is claimed is:

1. A timer comprising a solenoid, an armature for said solenoid, means for energizing said solenoid at times to initiate the timer, a rotatable shaft, a constant speed motor drivingly connected to said shaft, a switch having a bracket mounted freely upon said shaft for swinging movement, a gear rotatably mounted on said bracket eccentrically of said shaft, a second gear

drivingly mounted on said shaft and meshing with the first said gear, a second shaft, a gear with an interrupted periphery mounted on said second shaft to mesh with the first said gear in one position of said bracket and adapted to be rotated by the first said gear to the interruption of its periphery and the first said gear being adapted to enter the interruption to permit further swinging of said bracket, and means connected to the armature of the solenoid for biasing said bracket to switch opening position.

2. A timer comprising a solenoid, an armature for said solenoid, means for energizing said solenoid at times to initiate the timer, a rotatable shaft, means for driving said shaft at a constant speed, a switch having a bracket mounted freely on said shaft for swinging movement to open and close said switch, means interconnecting said bracket and armature to swing the bracket when the solenoid is energized, a second shaft, a gear wheel having an interruption on its periphery and mounted on said shaft adjacent said bracket, a gear mounted eccentrically on said bracket for free rotation and adapted to mesh with the interrupted gear wheel when the bracket is swung by the solenoid, means for driving the latter said gear from the first said shaft whereby to drive the interrupted gear wheel when the gears are intermeshed, swinging of said bracket being limited by the intermeshing of said gears, the gear on said bracket being adapted to rotate the interrupted gear wheel to the interruption and then to enter the interruption and permit further swinging of said bracket, the further swinging of the bracket

being required to change the said switch, a manually operable adjusting wheel mounted on said second shaft, a yieldable driving connection between said wheels on said second shaft whereby the initial position of the interrupted wheel is adjustable by turning said adjusting wheel.

3. A timer comprising a switch openable and closable by angular movement thereof, a supporting member carrying said switch and mounted for angular movement, a drive gear adjacent said member, means for rotating said drive gear, a pinion in mesh with said drive gear and carried for angular movement about said drive gear by said supporting member, a driven gear disposed to mesh with said pinion in one angular position of the pinion, said driven gear having a peripheral slot of a size to receive therethrough said pinion, holding means for holding said supporting member in an original position with the switch closed and the pinion disengaged from said driven gear, initiating means cooperating with said holding means for angularly moving said supporting member to a position where said pinion engages said driven gear for initiating the timing section with the switch still closed, said pinion being adapted to move into the slot of said driven gear when said slot is presented to the pinion by predetermined angular movement of said driven gear adapted to cause said supporting member to have further angular movement opening said switch, and adjustable means associated with said driven gear for angularly adjusting said driven gear with the slot in a selective angular position.

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