Oct. 16, 1945. H. E. SOMES 2,387,097

TIMING MECHANISM

Filed Feb. 17, 1943 3 Sheets-Sheet 1

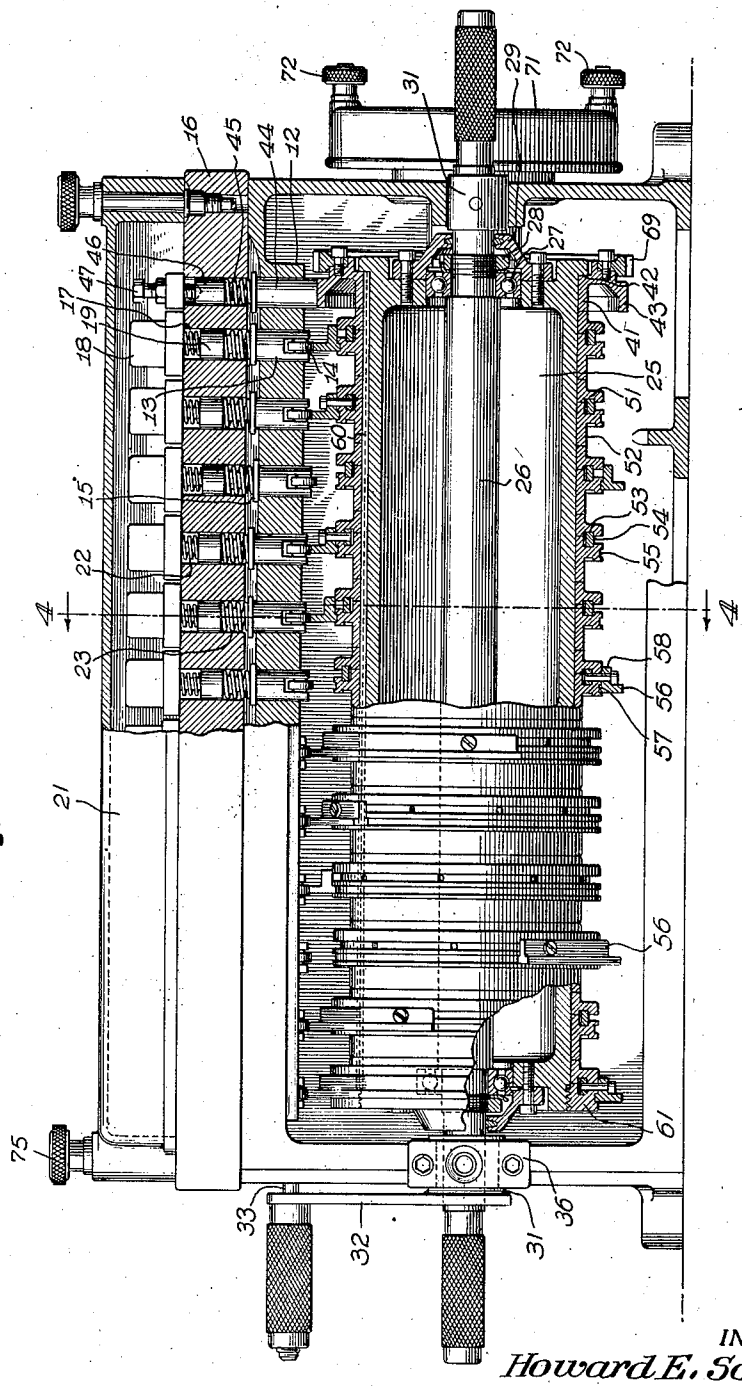


Fig. 1.

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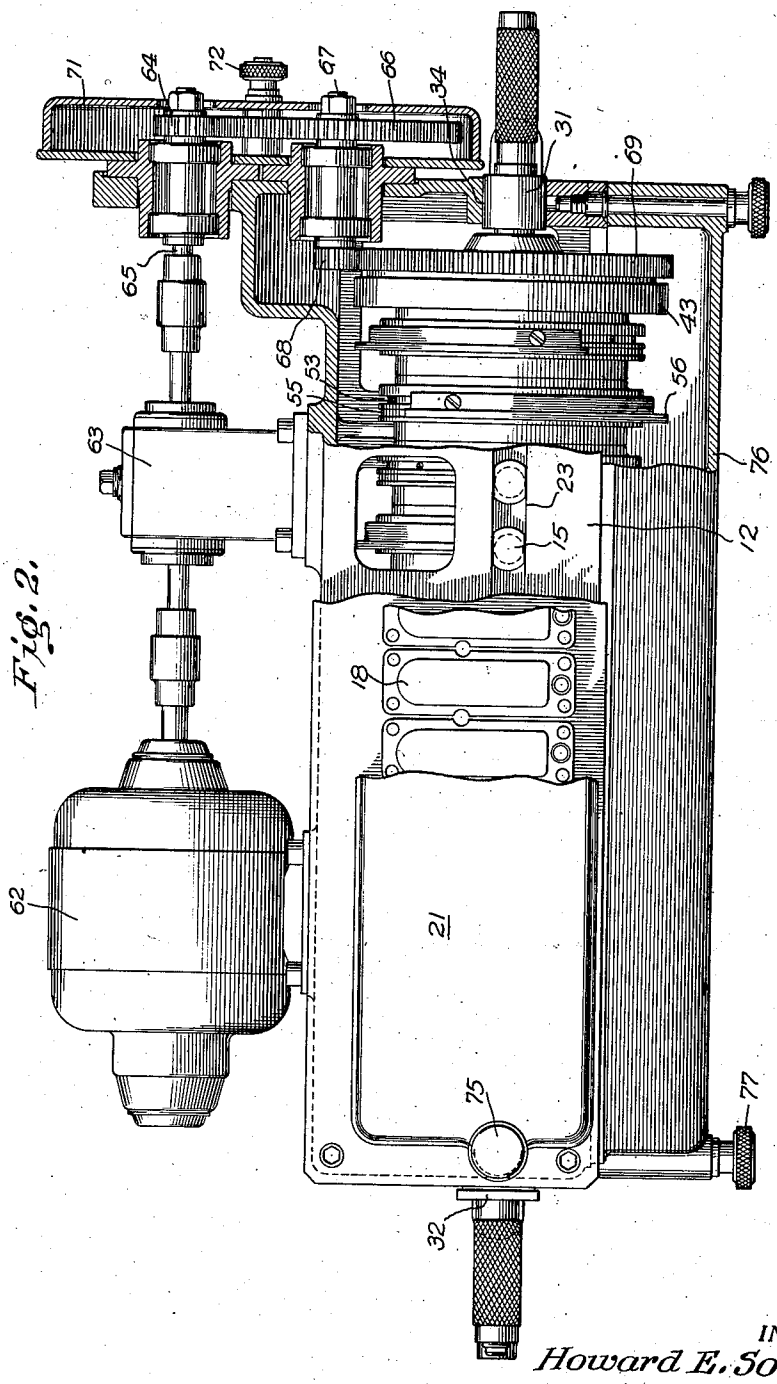


Fig. 2.

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Fig. 3.

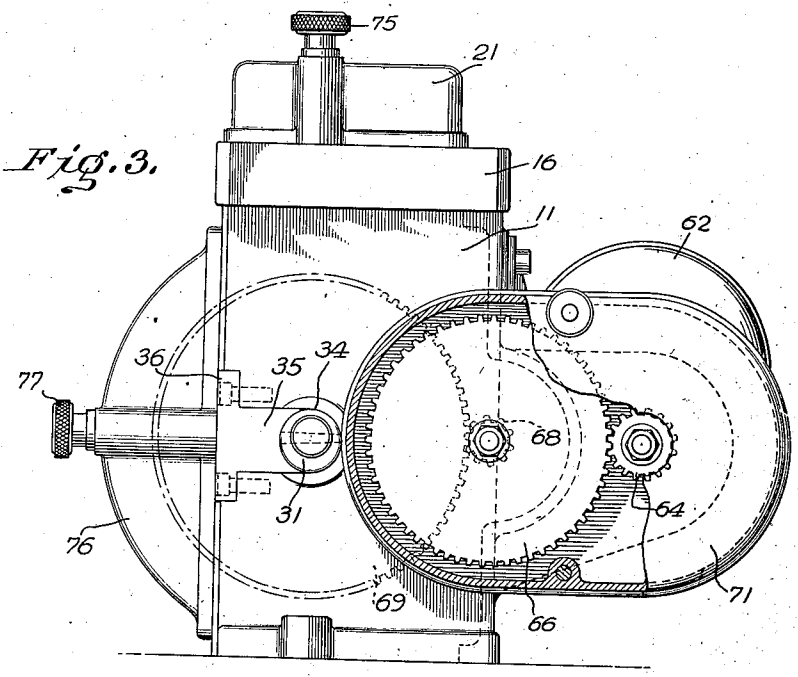
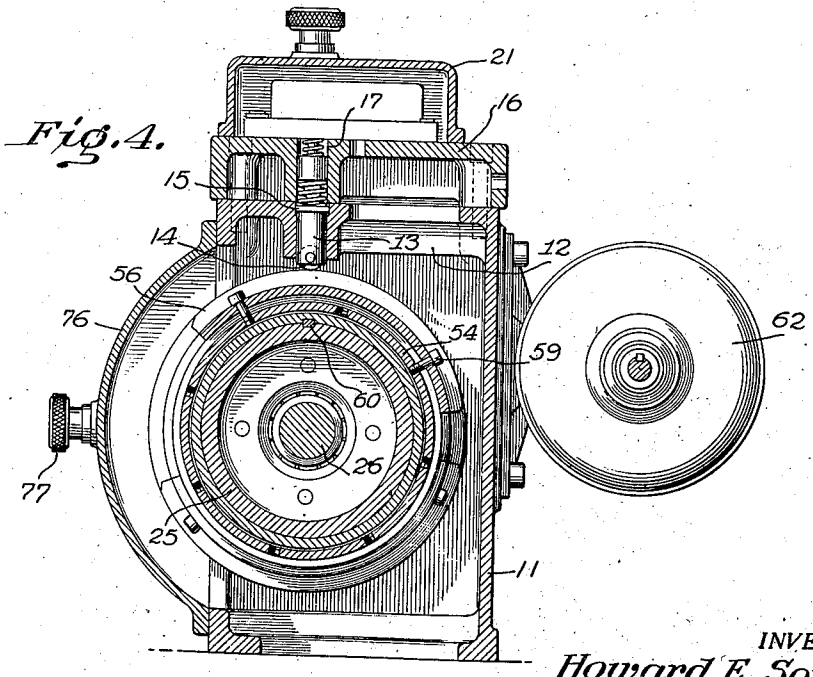


Fig. 4.



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TIMING MECHANISM

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Application February 17, 1943, Serial No. 476,229

6 Claims. (Cl. 74—568)

This invention relates to timing mechanisms and more particularly to a mechanism for controlling and timing the successive operations of a machine through a plurality of such control devices as, for example, electric switches and causing their operation in a predetermined sequence. Such a mechanism is used in controlling the sequence of operations in many different types of machines such, for example, as that shown in my Patent No. 2,281,297, April 28, 1942, for heat treating articles by electromagnetic induction heating and quenching.

In such a machine a given sequence and timing of the various operations is employed for a given type of work, but it will be apparent that a different type of workpiece requires a different sequence or timing, or both. Therefore, a different set of controls is required in order to adapt the machine operation to the different work, and an object of the present invention is to provide an improved timing mechanism of this type constructed and arranged to permit easy and quick adaptation of a given machine to any predetermined set of operations, and the easy changing thereof from one sequence or timing to another.

A further object is to provide a timing mechanism for controlling the operation of a machine constructed and arranged to be readily and easily removable to permit quick substitution of a different mechanism in order to change the timing of the machine operations in accordance with, for example, a change in the workpiece.

A further object is to provide a timing mechanism of improved construction and arrangement for controlling the operation of a plurality of such devices as electric switches, or the like.

These and other objects which will be apparent to those skilled in the art are obtained by the present invention, one embodiment of which is shown in the accompanying drawings in which:

Fig. 1 is a side elevation partly in vertical section of a timing mechanism constructed in accordance with one embodiment of this invention.

Fig. 2 is a top plan view of the device shown in Fig. 1 with parts thereof broken away for fuller illustration.

Fig. 3 is a side elevation of the right hand end of the machine shown in Fig. 1, and

Fig. 4 is a transverse section thereof substantially on the line 4—4 of Fig. 1.

In the present invention, a rotary cylindrical drum is provided with a plurality of cam rings or the like for operating a plurality of associated switches in predetermined sequence and timing for the purpose of controlling and timing the various operations of an associated machine in any predetermined manner. The switches are mounted on a frame adjacent the drum and an actuator for each switch is secured on the drum surface in position to engage and actuate the switch at the proper time upon rotation of the drum, the different actuators for the different switches being secured to the drum surface in proper relative positions to operate the various switches in the desired sequence. The drum surface is formed by a plurality of annular members which abut each other and are so constructed and arranged as to provide a support for a cam ring actuator adjacent each switch. Clamping means is provided for securing such a ring in place and the clamping mechanism is so formed that it can be shifted circumferentially of the drum so that the operating ring can be secured in the exact circumferential position desired. The arrangement is such that the drum can be easily and quickly removed from the mechanism and a separate drum having a different arrangement of switch actuating rings thereon can be substituted for the purpose of operating an associated machine in a different sequence of operations, or to provide a different timing of the different operations, so as to adapt the machine to a different type of workpiece.

As illustrated, the invention is shown in connection with a housing 11 having a top 12 provided with a longitudinal row of plungers or cam followers 13 mounted in openings extending through the top and having rollers 14 in the lower ends thereof and flanges 15 at the upper end to prevent the cam followers falling through the openings. The flanges 15 are non-circular and are positioned in a non-circular recess 20 formed in the housing top 12. A switch supporting bar 16 is mounted on the top of the housing and has a longitudinal series of openings 17 coinciding with the openings in which the cam followers 13 are mounted. A plurality of actuable devices such, for example, as electric switches 18 having switch actuating members 19 positioned in the openings 17 are mounted on top of the switch supporting bar 16 and are enclosed within a top enclosure 21. The actuating member 19 of each switch is spring pressed downwardly by a coil spring 22 interposed between the actuating member 19 and the body of the switch, and a coil spring 23 is interposed between each switch actuator and the associated cam follower 13 so that the latter is pressed downwardly thereby.

A sequence controlling and timing drum 25 is rotatably mounted on a supporting shaft 26

through roller bearings 27, one at each end of the drum. Each bearing race is held in place by a nut 28 and closed within an oil seal 29 which is clamped to the end of the drum and engages the supporting shaft at the outside of each roller bearing.

Each end of the supporting shaft 26 has an eccentric collar 31 secured thereto and a crank-arm 32 is secured to a collar 31 at one end of the shaft, the crank-arm having a spring pressed pin or detent 33 for yieldingly holding the crank in one position. The eccentric collars 31 are adapted to be mounted in bearing slots 34, see Figs. 2 and 3, and to be retained therein by bracket members 35 having flanges 36 adapted to be bolted to the end walls of the housing 11 to secure the collars 31 in place.

It will be apparent that rotation of the shaft by means of the crank 32 will raise and lower the timing drum 25 into and out of operative switch actuating position shown in Fig. 1. Moving the crank-arm 90 degrees from the position shown in Fig. 1 will obviously lower the drum 25 away from the cam followers 13, to permit ready removal of the drum and its substitution by another after first removing the securing blocks 35.

The drum surface and the locking means for supporting and fastening the various switch actuating cams in place is preferably formed by a plurality of annuli surrounding the drum proper and clamped between suitable end pieces. As illustrated, see Fig. 1, an end ring 41 engages an annular shoulder 42, formed in the end of the drum face. The ring has a periphery formed to provide a braking face 43 against which a spring pressed pin 44 is pressed to provide a drag for eliminating back-lash from the gear train employed to rotate the drum. The pin 44 is yieldingly pressed against the face 43 by a spring 45 positioned in the end opening of the switch bar 16, the spring seating against a block 46 which is movable by a backing screw 47 to vary the pressure of the spring 45.

A plurality of spacer rings 51 and cam supporting rings 52 are alternately arranged on the drum surface to provide a series of recesses 53 for loosely receiving clamping rings 54 which are thus positioned adjacent cam receiving slots 55 extending circumferentially around the outer face of each cam supporting ring 52. Each arcuate cam element 56 has an inner ledge 57 adapted to seat in the recess 55 of the supporting cam support 52 and a flange 58 which overlies the adjacent slot 53. It will be apparent that threaded clamping bolts 59 extending through the clamping flange 58 of each cam ring and threaded into the associated clamping ring 54 served to clamp the arcuate cam element 56 in place, and that the relative position of each cam on the supporting drum can be easily adjusted circumferentially inasmuch as the rings 54 are loosely mounted in the recesses 53. If the clamping pressure of the bolts 59 is relieved, the cam element and clamping ring can be adjusted circumferentially upon the drum to properly locate the arcuate cam element 56, thereupon tightening the bolt 59 to secure the parts in such position. A longitudinally extending key 60 keys the spacer rings 51 and cam supporting rings 52 to the drum. The spacer and cam supporting rings are secured in place by the end cam supporting ring 61 being threaded to the end of the drum, see Fig. 1.

Any suitable driving means can be employed for rotating the timing mechanism at the proper speed for operating the switches 18 in the desired timing and sequence. That illustrated comprises an electric motor 62 connected through a speed reducer 63 to a gear train comprising a change-speed gear 64 on the end of the shaft 65 connected directly to the speed reducer, and a second change-speed gear 66 on a countershaft 67 having a fixed gear 68 meshing with the driving gear 69 in the form of a gear ring bolted to the end ring 41 on the drum. It will be apparent that this arrangement locates the two change-speed gears 65 and 66 in an accessible location on the outside of the housing 11 to permit ready access thereto for the purpose of changing the gears 64 and 66 to vary the speed of the drum in accordance with any predetermined requirements. The change-speed gears 64 and 66 are normally enclosed by a cover 71 bolted in place and easily removable by bolts 72.

Assuming that it is desired to remove a timing drum which is in use and supported in operative position as shown in Fig. 1, and replace it with another drum having a different arrangement of cam elements 56 for operating the switches 18 in a different timing, or even a different sequence, due to a change in the workpiece being treated by an associated machine, the crank 32 is rotated 90 degrees by pulling toward the operator from the position shown in Fig. 1. This rotates the shaft 26 and eccentric collars 31 in the supporting side frames so as to lower the drum 25 sufficiently to drop the cam elements 56 out of operative engagement with the cam followers 13. Thereupon, after first removing the brackets 35, the shaft 26 and supported drum can be easily and readily withdrawn from the device and a second drum inserted in place. The second drum is inserted with the crank-arm 32 in horizontal position so that the eccentric bushings will support the drum in inoperative or lower position. After the clamping brackets 35 are replaced, the drum can be moved into operative position merely by rotating the crank 32 to the vertical position shown in Fig. 1 in which it is yieldingly held by the spring detent pin 33.

The cover 21 enclosing the switches 18 is secured in place my any suitable means such as the threaded bolts 75 so that the same can be easily removed to give access to the switches 18. A front cover 76 secured in place by such means as threaded bolts 77, or the like, is normally employed to cover the face of the drum along the side of the housing 11.

Although I have described in detail one specific embodiment of the present invention it will be apparent that the invention is not limited in any way to such details, but can be variously modified and adapted within the scope of the appended claims.

What is claimed is:

1. A timing mechanism comprising a plurality of control devices, an actuator for operating said devices in a predetermined manner including a rotary member and a plurality of separable annuli mounted on said rotary member and cooperating to form a series of supports for a plurality of cam elements, clamping rings held in place by said annuli, and means cooperating with said clamping rings to secure said cam elements in place on said supports.

2. A timing mechanism comprising a plurality of controlling devices, an actuator for operating said devices in a predetermined manner including a rotary drum, a plurality of supporting rings mounted on said drum, spacer rings interposed between said supporting rings and forming there-

with circumferential recesses, a clamping ring in each of said recesses, a cam element for actuating one of said control devices circumferentially adjustable on each supporting ring, means on said clamping rings for securing said cam elements in predetermined circumferential position, and means for securing said supporting and spacer rings on said drum.

3. A rotary element for timing mechanisms, comprising a rotary member, a plurality of annular rings mounted on said member against rotation relative thereto, each ring having a circumferential flange spaced from a corresponding flange of an adjacent ring an an annular marginal flange facing and axially spaced from the corresponding annular flange of the adjacent ring, a clamping ring disposed between said circumferential flanges and being shiftable transversely of the axis thereof into engagement with an arcuate portion of said annular flanges, an arcuate cam element seating against the peripheral surfaces of said annular flanges, and screw means extending through said cam element and between said annular flanges and threaded into said clamping ring for clamping said cam element against said annular flanges.

4. A rotary element for timing mechanisms, comprising a rotary member, a plurality of annular rings mounted on said member against rotation relative thereto, each ring having a circumferential flange spaced from a corresponding flange of an adjacent ring and an annular marginal flange facing and axially spaced from the corresponding annular flange of the adjacent ring, a clamping ring disposed between said circumferential flanges and being shiftable transversely of the axis thereof into engagement with an arcuate portion of said annular flanges, an arcuate cam element seating against the peripheral surfaces of said annular flanges, and screw means extending through said cam element and between said annular flanges and threaded into said clamping ring for clamping said cam element against said annular flanges, said cam element and clamping ring upon loosening of said screw means being circumferentially shiftable relative to said rotary member.

5. A rotary cam member for timing mechanisms comprising a rotary support having a plurality of longitudinally spaced circumferential recesses therein, the opposite walls of each recess having annular flanges at their radially outer peripheries longitudinally spaced from each other, a clamping ring disposed in each recess and being shiftable, transversely of the axis thereof, arcuate cam elements seated against the flanges of said recesses, and screw means extending through said cam elements and between said flanges and threaded into said clamping rings, said screw means being arranged upon threading into said clamping rings to clamp said clamping rings and cam element securely against said flanges.

6. A rotary timing device comprising a rotary support having an annular recess and an arcuate axially projecting flange located outwardly of the recess, a clamp ring element disposed in and having circumferential adjustment in said recess within said flange, an arcuate cam element disposed outside of and circumferentially adjustable on said flange, and means for clamping said clamp ring element and said cam element together upon said flange in any circumferentially adjusted position.

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