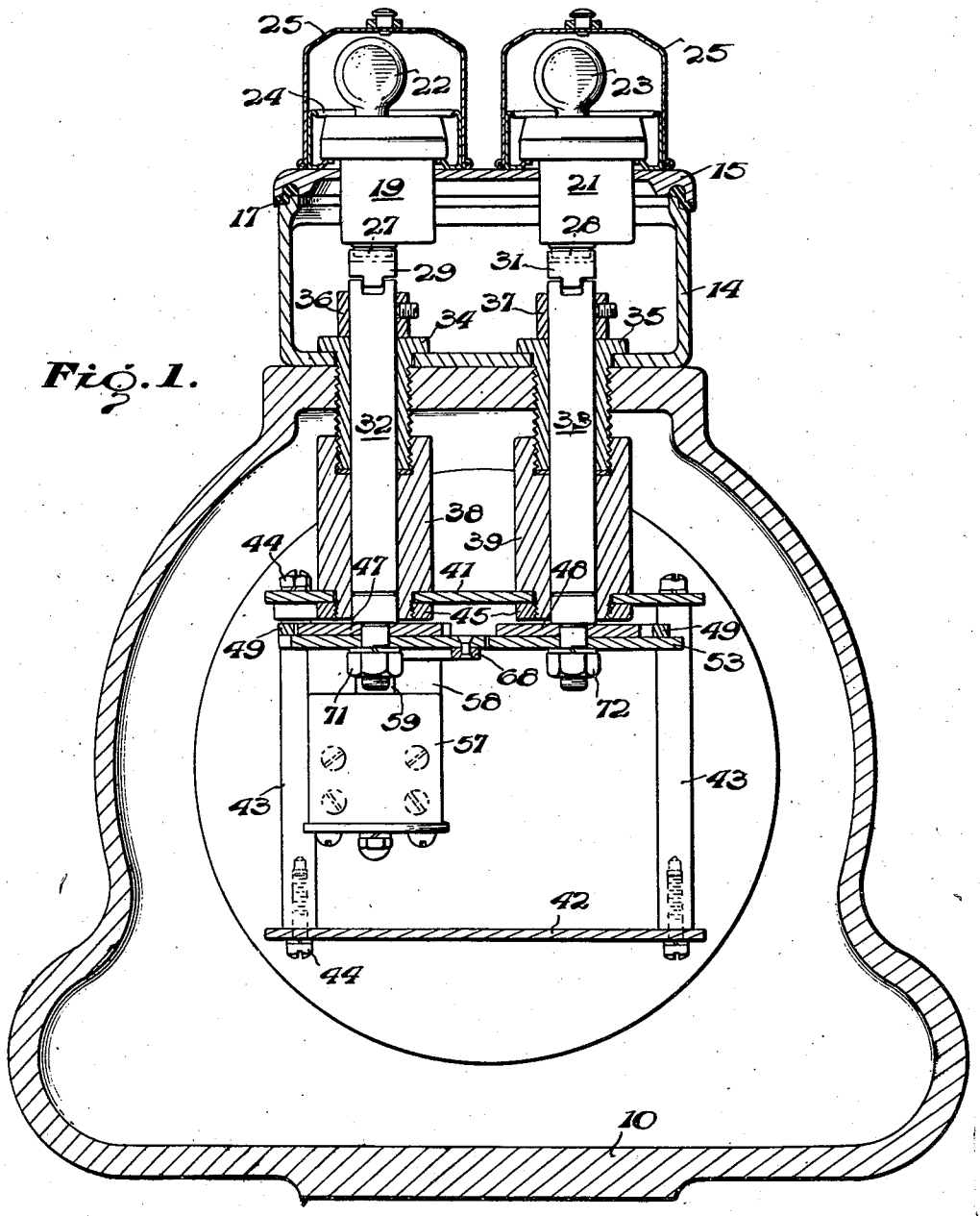
March 19, 1946. G. B. THIEME 2,396,759

INTERLOCK MECHANISM

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Fig. 1.



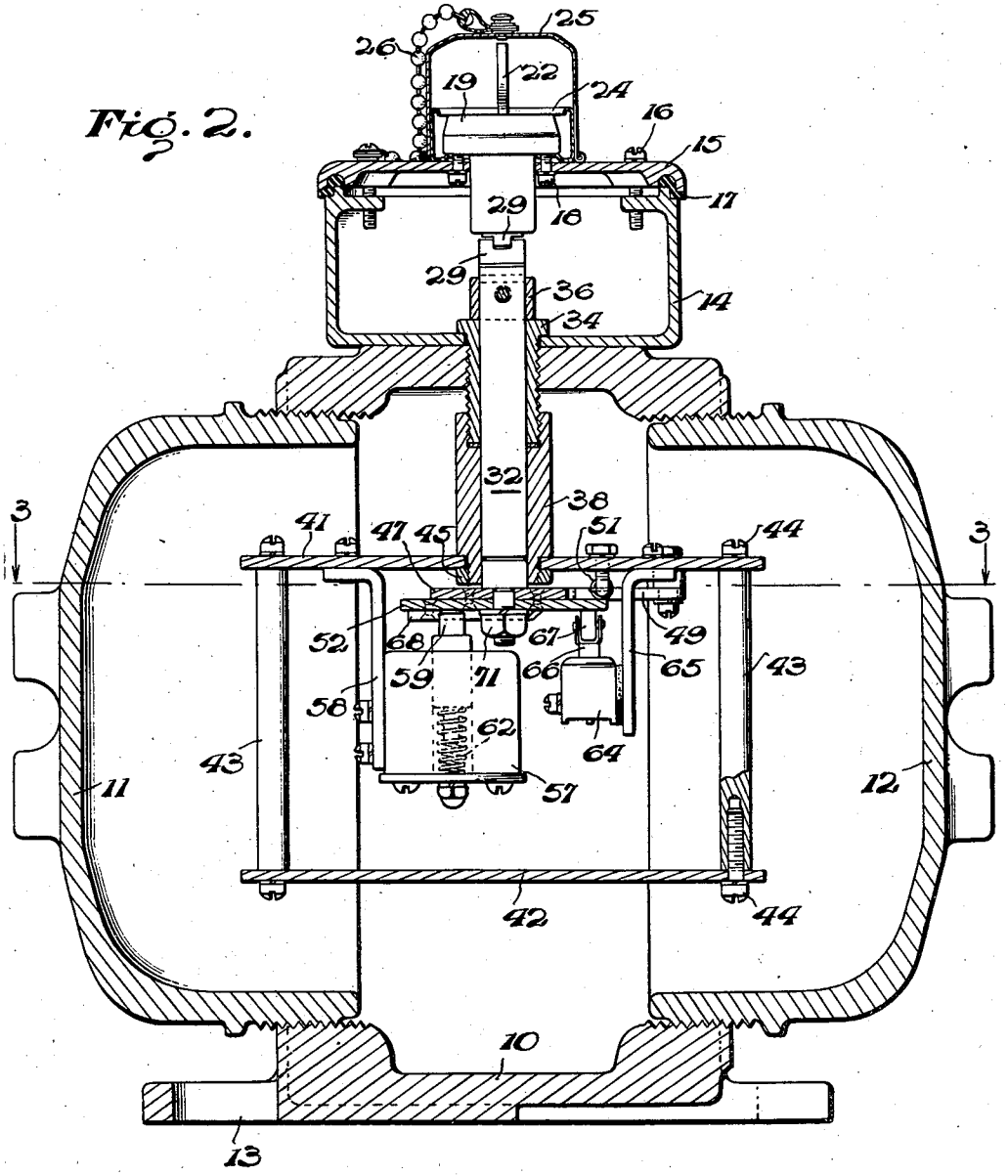
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Fig. 2.



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INTERLOCK MECHANISM

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Fig. 3.

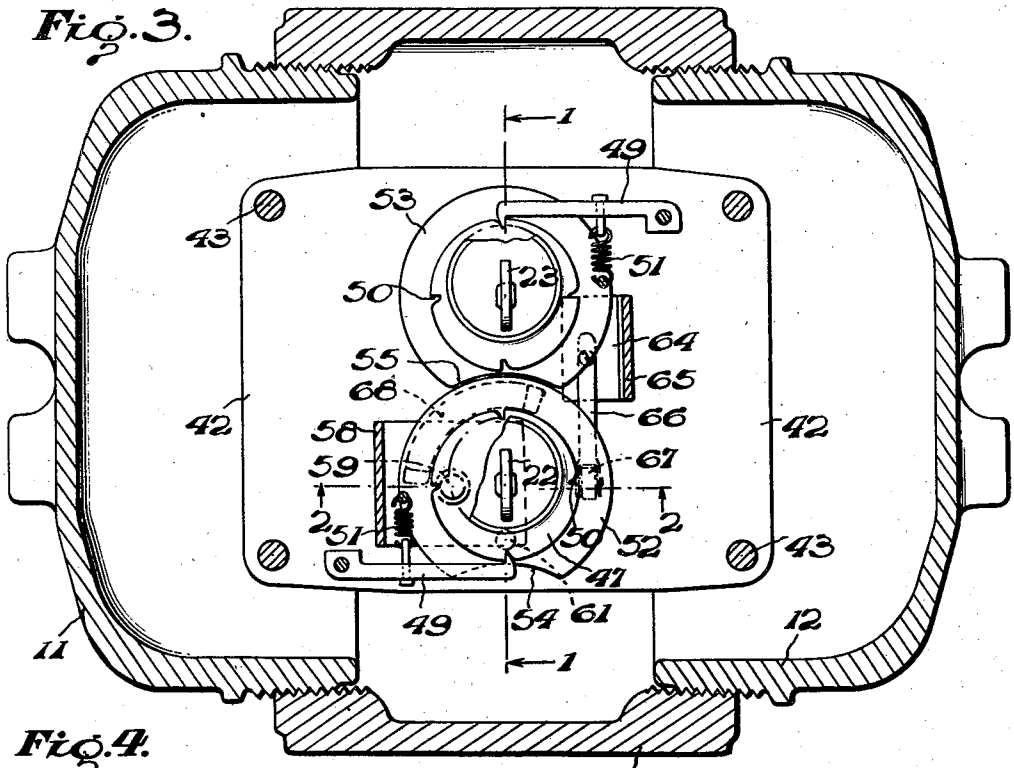


Fig. 4.

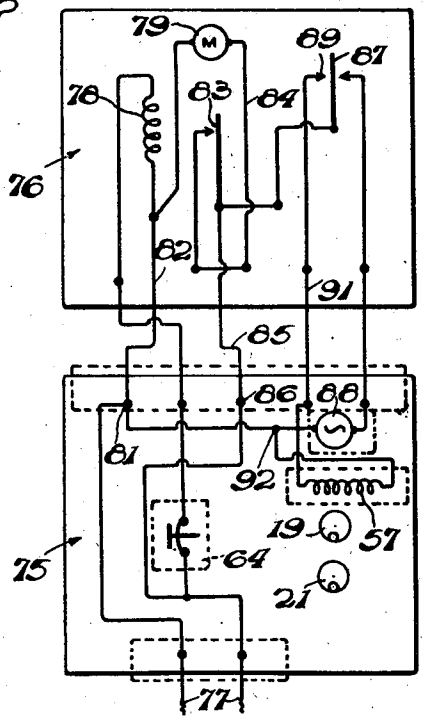
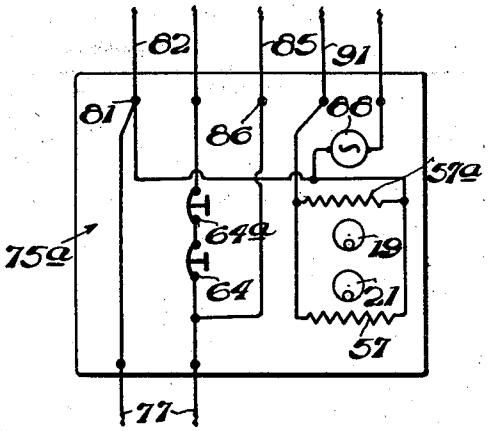


Fig. 8.



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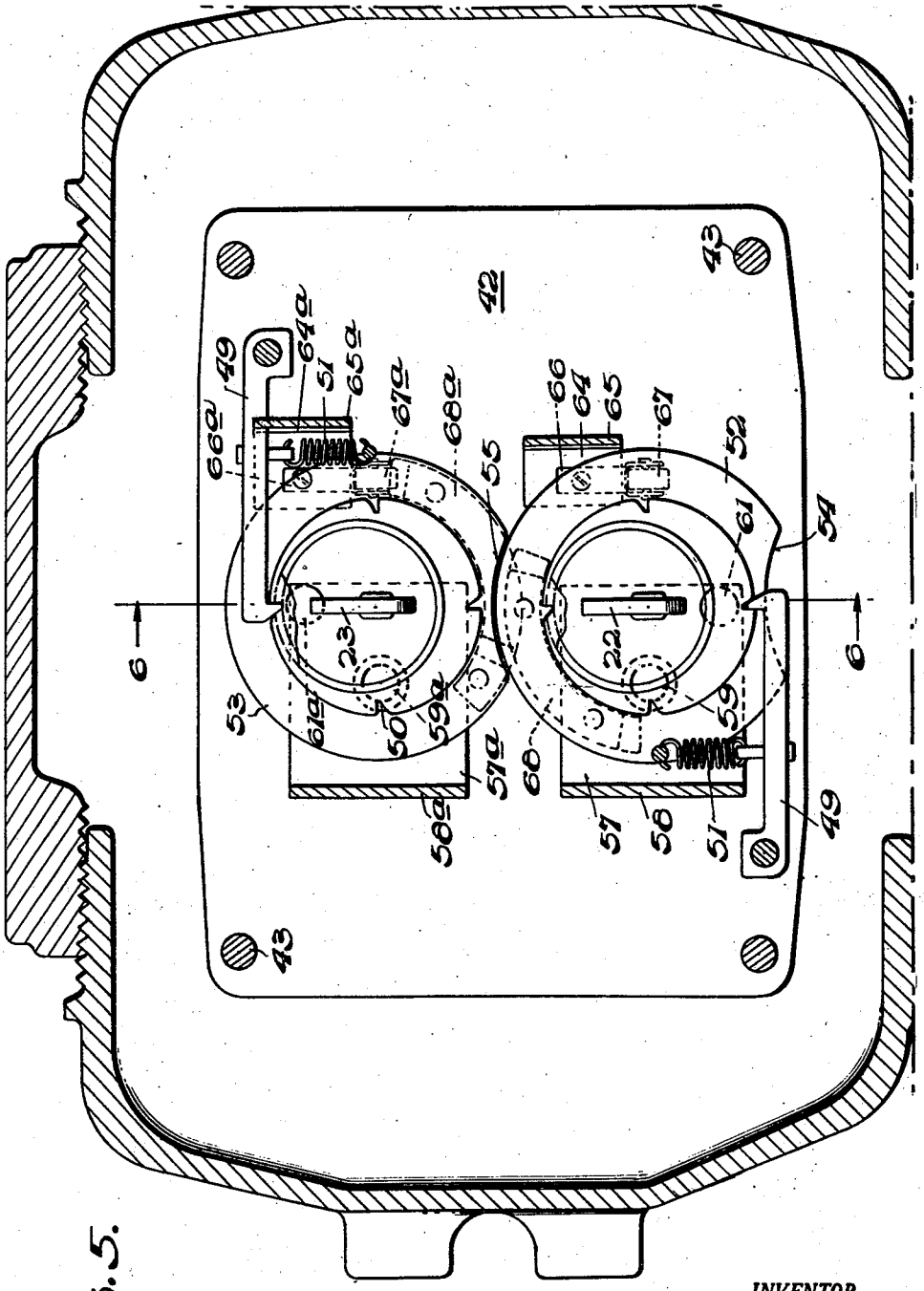


Fig. 5.

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Fig. 6.

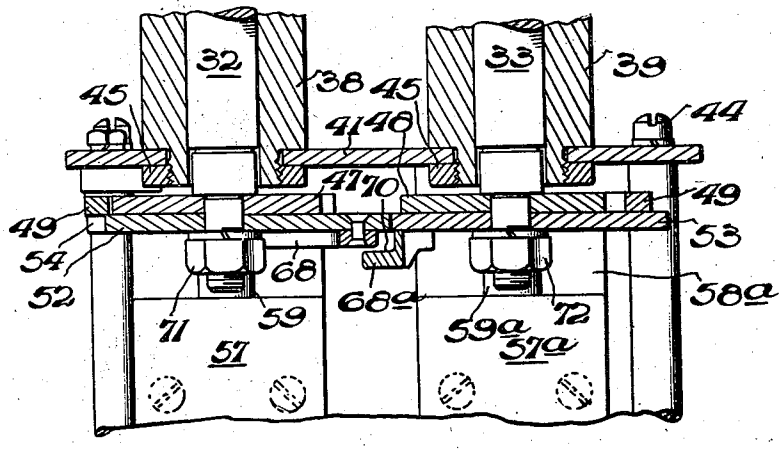
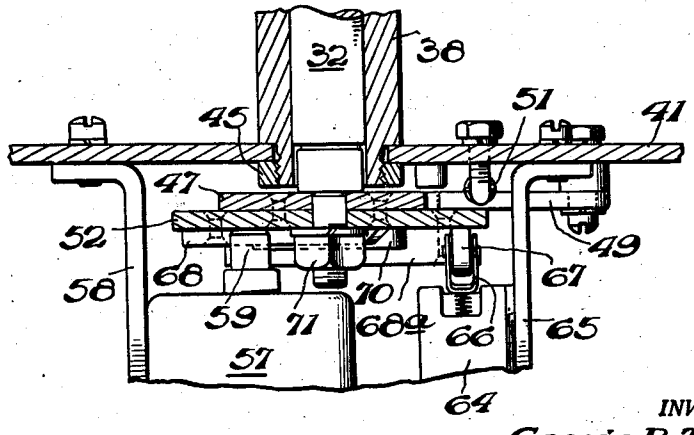


Fig. 7.



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UNITED STATES PATENT OFFICE

2,396,759

INTERLOCK MECHANISM

George B. Thieme, Jamaica, N. Y.

Application July 1, 1944, Serial No. 543,187

14 Claims. (Cl. 70—265)

The present invention relates to interlock mechanisms, more particularly mechanisms for compelling a certain sequence of operations to be carried out, as for instance in the opening and closing of valves in a chemical reaction conduit system, especially operations in which a time factor is involved, to insure the carrying out of a process in predetermined manner, although it is not limited to such use.

In certain chemical processes, the valves in the various fluid lines are controlled by key-controlled locks, and it has been customary heretofore for a supervisor to keep the keys in his custody and to maintain proper control over the process being carried out by turning over the proper key to an assistant, and directing him to open or close the appropriate valve at the end of the purge, blow-off, reaction, or other step of the process.

I have found that by employing a pair of rotatable devices into which two different keys may be inserted, and interlocking their operations in predetermined manner, so that one key will be freely insertible and removable, while the other will be held against removal, and providing means whereby the inserted key, when rotated less than a full revolution, will be locked against further rotation until a predetermined time interval has elapsed, and at the end of that period may be rotated a further distance, sufficient to permit removal of the other key, a novel interlock mechanism is provided which makes it possible to set up a predetermined sequence of locking and interlocking operations requiring the use of a set of keys, thereby eliminating the need for human supervision, inasmuch as the interlock mechanism of the invention compels or enforces insertion and removal of keys from the device in predetermined sequence, and prevents key withdrawal until a certain time interval has elapsed. By varying the key holding and releasing action, and the length of time the key or keys will be held, interlocking mechanisms may be provided in accordance with the invention to afford control of various types of operations.

It is accordingly the primary object of this invention to provide a novel interlock mechanism which will constantly retain one of two keys against removal, and which, upon rotation of one of the keys through a predetermined angle, will lock both keys against removal until a predetermined time interval elapses.

Another important object is to provide a multiple key interlock which, during one phase of operation, retains one key against removal, and upon insertion of a second key and rotation through a predetermined angle will lock both keys against removal until elapse of a predetermined time interval, when the second key may be rotated a further distance and the first key removed, the parts being so designed that the second key cannot be removed until the first key is reinserted and rotated into its original position.

A further object is to provide a novel interlock mechanism in which two keys are alternately held and released, the release of one key being controlled by rotation of the other key, and the latter being rotatable in steps under the control of a time control device.

Another object is to provide a novel two-key interlock mechanism which embodies means whereby one key may be operated to release the other key, but both keys cannot be removed simultaneously, and at least one of the keys is only releasable after the other has been rotated in successive time-controlled stages.

The invention further aims to provide, in an interlock mechanism, novel switch actuating and lock cylinder arresting mechanisms; a novel cam assembly for controlling the operation of adjacent lock cylinders; a novel mount for the interlock assembly; and further novel interlock improvements and refinements to be hereinafter pointed out:

Further objects will become apparent as the specification proceeds in conjunction with the annexed drawings, and from the appended claims.

In the drawings:

Fig. 1 is a vertical sectional view through an interlock mechanism embodying one form of this invention, taken substantially on the line 1—1 of Fig. 3;

Fig. 2 is a vertical sectional view through the apparatus taken along a vertical plane disposed at right angles to the plane of Fig. 1;

Fig. 3 is a horizontal sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a view showing the wiring diagram for the apparatus of Figs. 1 to 3 inclusive;

Fig. 5 is a view similar to Fig. 3 but illustrates a double interlock apparatus also forming part of the invention;

Fig. 6 is a vertical sectional view taken substantially along the line 6—6 of Fig. 5;

Fig. 7 is a vertical sectional view taken along a vertical plane disposed at right angles to the plane of Fig. 6; and,

Fig. 8 is a diagrammatic view illustrating the modified part of the wiring diagram for this form of the invention.

With continued reference to the drawings, wherein like reference characters have been employed to designate similar parts throughout the several views, I have illustrated the invention as being applied to an installation requiring incorporation of the switch parts in a gas and explosion proof casing 10, equipped with end closure caps 11 and 12. However, it is to be understood that the invention is not limited to use with a casing of this character. Case 10 is provided with mounting lugs 13 for supporting it in any desired manner.

The interlock mechanism of the invention is installed in the casing in novel manner, permitting maximum accessibility with a minimum of mounting structure.

Supported on a flat upper surface of casing 10 is a housing 14 having a closure 15 secured thereto in sealing relationship by means of cap screws 16 and a gasket 17. Secured to the upper face of closure 15, by means of cap screws 18 or the like, are lock assemblies 19 and 21 having keys 22 and 23 respectively cooperating therewith in well-known manner. A sheet metal thimble 24 is clamped under each lock barrel assembly and is provided with a closure 25, the latter being anchored to the top of closure 15 by a retaining chain 26, and suitable swivel connections.

The lock barrels shown are of well-known character and include shank portions projecting through openings in closure 15, and terminating in rockable shaft elements 27 and 28 respectively which are operatively engaged with coupling members 29 and 31. The latter transmit rocking movements of the lock barrel shafts to the interlock mechanism located within casing 10, in the manner now to be set forth.

Couplings 29 and 31 are engaged with rock shafts 32 and 33 respectively projecting into casing 10, and from the foregoing it is apparent that if it were not for the novel interlock mechanism of the invention, shafts 32 and 33 could be rocked at will by inserting keys 22 and 23 in their locks and turning them.

While shafts 32 and 33 may be coupled to the interlock mechanism of the invention in various ways, I preferably employ a novel assembly of parts which functions to efficiently journal the shafts for rocking movement; to secure housing 14 to housing 10; and also to operatively support the entire interlock mechanism in the housing as a unit. To this end shafts 32 and 33 are journalled in flanged bushings 34 and 35 respectively, which as seen in Fig. 1, are threaded into tapped openings in the upper wall of housing 10, and function to secure casing 14 in tight engagement therewith. Collars 36 and 37 secured to the upper ends of the shafts maintain them in proper vertically adjusted position. Tightly threaded on to the lower ends of bushings 34 and 35 are complemental bushings 38 and 39 respectively. The latter have reduced lower ends which project through openings in the upper plate 41 of a framework including a bottom plate 42 and intermediate posts 43 secured thereto by cap screws 44. Plate 41 is rigidly secured to bushings 38 and 39 by means of nuts 45.

From the foregoing disclosure it is apparent that all that is necessary to secure complete accessibility of the interlock mechanism is to remove closure 15 and its associated lock barrels; remove collars 36 and 37; and unscrew bushings 34 and 35, which permits the entire interlock mechanism to be dropped down and removed from casing 10 by way of one of the plugged openings.

Referring now to Figs. 1 and 3, shafts 32 and 33 rigidly carry ratchet discs 47 and 48 at their lower ends, which respectively cooperate with pawls 49. The latter are pivoted on the underside of plate 41 and are urged into engagement with notches 50 in their ratchet discs by tension springs 51. The pawl and ratchet assemblies accordingly effectively prevent counter-clockwise rotation of the barrels, as viewed in Fig. 3. Rigidly secured to the underside of discs 47 and 48, by rivets or the like are interlock discs 52 and 53 having notches 54 and 55 in their peripheries. As seen in Fig. 3, the periphery of disc 52 is received in notch 55 of disc 53, with the result that rocking movements of shaft 33 in either direction is prevented.

Operation of the parts is further controlled by a solenoid 57 carried by a downwardly extending bracket 58 from plate 41 and having a plunger 59 coacting with a single opening 61 in disc 52 carried by shaft 32. The plunger is normally urged upwardly by a spring 62, so that when the solenoid is deenergized, plunger 59 will be projected by the spring into opening 61 upon rotation of shaft 32 through an angular distance of 90° in a clockwise direction from the position of the parts illustrated in Fig. 3.

Also coacting with plate 52 is a micro-switch 64 carried by a depending bracket 65 carried by plate 41 and provided with an actuating arm 66, which is spring-urged upwardly and carries a roller 67 at its free end. The roller coacts with a cam 68 secured to the underside of disc 52. As seen in Fig. 3, cam 68 is provided with inclined end or ramp portions, and extends over an angular distance of approximately 90° around the disc. The micro-switch may be of any well-known character and is operable to open a timer control circuit (to be hereinafter described) when it is depressed, and to close the circuit when it is disposed in its upper position shown in Fig. 2. The ratchet and interlock disc assemblies are secured to their respective shafts by nuts 71 and 72, any suitable keying means being employed to insure unitary rotation.

Taking up the operation of the structure so far described, it is to be understood that the parts are shown in the initial or starting position in all the figures. Keys 22 and 23 cooperate with their lock barrel assemblies in such manner that they can be inserted and rotated through 360° and then released, the keys and lock barrels embody coacting projections which prevent removal in any other position, as is well understood in the art.

In the position shown in Fig. 3, key 23 has been rotated 180° from its insertion position and therefore is held against removal. Key 22 is disposed in removal position and will be assumed to have just been inserted in the apparatus. Pawl 49 prevents counter-clockwise rotation of the assembly with which key 22 is associated, and therefore the only movement possible is clockwise rotation. Upon clockwise rotation of key 22 through approximately 90°, plunger 59 is projected by spring 62 into opening 61 of plate 52, thereby locking the key against further rotation. Coincidental with rotating key 22 through 90°, cam 68 engages roller 67 and depresses arm 66 of micro switch 64 into circuit-breaking condition.

Upon conclusion of the foregoing operation,

the parts are locked against further manipulation until solenoid 57 is energized, inasmuch as the notch in disc 53 prevents rotation of key 23 in either direction and plunger 59 locks key 22 against rotation. Both keys are therefore retained.

Any suitable form of timer mechanism may be incorporated with the device to introduce a definite time interval between actuation of switch 64 and energization of solenoid 57, and in Fig. 4 I have shown one form of timer known in the trade as a "Micro-flex, HX51G Instantaneous Reset Timer," manufactured by the Eagle Signal Corporation, Moline, Illinois, which may be used. With continued reference to this figure, the interlock unit is designated diagrammatically as 75, and the timer unit as 76. Power is supplied by mains 77, one side of which leads through micro switch 64 to a clutch holding coil 78, which controls actuation of a spring-pressed jaw clutch driven by a motor 79, so that when micro switch 64 is opened, coil 78 releases the clutch and couples motor 79 to the timer mechanism, whereupon the timing cycle is initiated. The other side of the line 77 leads to a binding post 81, to which a lead 82 from coil 78 and motor 79 is connected.

Upon engagement of the jaw clutch in the manner just described, it causes a contact assembly 83 to close, and this action, through leads 84 and 85 and a binding post 86, closes the motor circuit. A contact assembly 87 closes the circuit through an indicator light 88 while the timer is in operation, to give a visible indication that the timing operation of the apparatus is in progress.

At the end of the timing interval, contact assembly 87 engages its opposite contact 89, extinguishing light 88 and energizing solenoid 57 through lines 91 and 92. Upon retraction of solenoid plunger 59 in the manner just described, key 22 is released for further clockwise rotation but is held against counterclockwise rotation by pawl 49. Accordingly, upon rotation of key 22 through an additional 90° travel (180° from the starting position), notch 54 of plate 52 is brought opposite plate 53, with the result that key 23 may now be rotated 180° clockwise and removed and employed to carry out some other phase of operation in the particular interlock-controlled system.

During the foregoing additional 90° rotation of key 22, cam 68 is so rotated as to allow roller 67 to roll off of its trailing end, restoring arm 66 to the circuit-making position shown in Fig. 2, whereupon clutch coil 78 is re-energized, disengaging the clutch and stopping the timer motor. This action also returns contact arm 87 to the mid-position shown in Fig. 4, thereby deenergizing the solenoid and re-setting the timer for the next cycle. When this occurs, spring 62 projects plunger 59 into engagement with the underside of disc 52.

It should be observed that upon conclusion of the operation just described, the parts are disposed 180° from the positions shown in Fig. 3, with the periphery of disc 53 received in notch 54 of disc 52, with the result that the latter cannot be rotated in either direction.

Upon reinsertion of key 23 in lock barrel 21, and rotation thereof through 180°, disc 53 is restored to the position shown in Fig. 3. Since this places notch 55 adjacent disc 52, the latter may now be rotated 180° clockwise, and key 22 removed. This final step restores the parts to the starting position, and after key 22 has been reinserted the cycle may be repeated.

It is accordingly apparent that the invention provides a pair of rotatable key-receiving devices which are so interlocked that one key is freely insertable and removable while the other is held against removal, and that means are provided whereby the inserted key, when rotated less than a full revolution, will be locked against further rotation until a predetermined time interval has elapsed, and that at the end of that period it may be rotated a further distance sufficient to permit removal of the other key, resulting in a mechanism which makes it possible to establish a predetermined sequence of locking and interlocking operations requiring the use of a set of keys, thereby eliminating the need of human supervision in a system embodying key-controlled units.

The foregoing embodiment of the invention provides a single timed period of key retention, and therefore is termed a single timer interlock. The invention also may be embodied in the form of a double timer interlock, and in Figs. 5, 6, 7, and 8, I have illustrated the invention embodied in that form.

With continued reference to these figures, similar reference characters have been utilized to designate parts which are common to this form of the invention, and also to that previously described. The lower ends of shafts 32 and 33 carry rachet discs 47 and 48 cooperating with pawls 49 in the manner previously described. Also interlock discs 52 and 53 are provided with notches 54 and 55 which coacts with the periphery of the other discs to lock the parts as previously set forth.

Pawls 49 cooperate with notches 50 in discs 47 and 48 to prevent counter-clockwise rotation (as viewed in Fig. 5). In this instance a second solenoid 57*a* having a plunger 59*a*, cooperating with an opening 61*a* in disc 53, is associated with the second lock assembly for controlling operation thereof in a manner similar to solenoid 57 associated with the first lock assembly, it being observed that opening 61*a* is located approximately 90° from the trailing end of cam shoe 68*a*. The latter is of special form as shown in Figs. 5 and 6, being flange-like and located materially below the level of disc 53, so as to provide a recess 70 of sufficient size to freely receive cam track 68 of disc 52 without interference, regardless of the relative angular positions of discs 52 and 53. A second micro-switch 64*a* is carried by a bracket 65*a* at a level sufficiently low to properly cooperate with the underside of cam track 68*a*.

Referring to Fig. 8, it is observed that micro-switches 64 and 64*a* are disposed in series in one of the leads 77, so that opening either switch will de-energize clutch coil 78 and energize timer 76 in the manner previously set forth. Solenoids 57 and 57*a* are disposed in parallel in the timer circuit, so that they will both be energized at the close of the timed period.

The operation of this form of the invention is as follows;

Assuming that the parts are in the positions illustrated in Fig. 5, with the periphery of disc 52 received in recess 55 of disc 53, the latter is locked against rotation in either direction, thereby preventing removal of key 23, inasmuch as the key is disposed 180° from the position where it may be removed. Lock barrel 19 on the contrary is disposed in its key-receiving position, and key 22 may accordingly be inserted and rotated through 90° in a clockwise direction, counter-

clockwise rotation being prevented by pawl 49. Upon rotation of key 22 through 90° as just described, solenoid plunger 59 is projected by spring 62 into opening 61 of disc 52, thereby locking the latter against further rotation. This operation, through cam track 68 and micro switch 64, opens the clutch coil circuit and initiates the timing operation in the manner previously set forth, it being observed that the periphery of disc 52 in cooperation with recess 55 of disc 53 still locks the latter against rotation. Accordingly, under these conditions both of the discs are locked out of key-releasing position and both keys are held.

With the parts in the positions just described, at the conclusion of the timed interval, the timer closes the solenoid circuit and simultaneously depresses plungers 59 and 59*a*. This frees disc 52 for further clockwise rotation, and when disc 52 has been rotated through an additional 90°, roller 67 rides up over the inclined trailing end of cam track 68 and closes the clutch coil circuit, thereby deenergizing the solenoid and resetting the timer. Disc 52 is now located 180° from the starting position with its recess 54 adjacent the periphery of disc 53, with the result that key 23 may now be rotated 180° and removed and utilized to carry out some other step of the system in which the device is incorporated.

After key 23 has been returned to and reinserted in barrel 21, it may be rotated 90° in clockwise direction. This brings disc 53 into a position disposed 270° from the position shown in Fig. 5, and allows plunger 59*a* to be projected into opening 61*a* of disc 53, thereby locking the latter against further clockwise rotation, counter-clockwise rotation being precluded by pawl 49. The foregoing 90° clockwise rotation of disc 53 causes cam track 68*a* to depress roller 67*a* and open micro switch 64*a*, thereby opening the clutch coil circuit and causing the timing cycle to be again initiated in the manner previously set forth, it being observed that the periphery of disc 53 still cooperates with recess 54 of disc 52 in such manner as to prevent rotation of the latter. Both keys are accordingly again retained against removal.

With the parts in the positions just described, at the end of the timed interval, the timer closes the solenoid circuit and causes plunger 59*a* to be withdrawn from opening 61*a* in plate 53, thereby freeing the latter for further clockwise rotation. Upon rotation of disc 53 through an additional 90° it is restored to the position shown in Fig. 5, with its recesses 55 located adjacent the periphery of disc 52, and simultaneously closes micro switch 64*a*, thereby resetting the timer and deenergizing the solenoid circuit.

From the foregoing, it is apparent that during the cycle of operations just described, the parts are restored to the position shown in Fig. 5, and disc 52 may be rotated clockwise 180° and key 22 removed. The parts are accordingly ready for the foregoing cycle to be repeated upon reinsertion of key 22.

It should be observed that although solenoids 57 and 57*a* are in each phase of the operation simultaneously actuated, this does not interfere with the proper sequence of operations, inasmuch as only one of them is used at any one time to lock the discs against rotation, since the other one merely rides against the lower surface of the other under the influence of spring 62. It should also be observed that in both forms of the invention discussed, cam track 68 is advanced slightly, so that the micro switches will be positively moved to open position slightly before the discs attain full 90° travel. This prevents retrograde rotation of the parts in an effort to avoid carrying out predetermined sequence of operation.

Inasmuch as it is impossible to rotate the parts during normal operation into such position as to permit simultaneous removal or insertion of both of the keys, it is necessary, when initially assembling the device, to rotate the keys into their desired relative positions prior to installing cover 15 on casing 14. During assembly, shafts 32 and 33 are also manually rotated into the desired predetermined angular relationship. It is then a simple matter to apply couplings 29 and 31 to shafts 32 and 33, and then apply cover 15 to casing 14.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced thereby.

What is claimed is:

1. In an interlock apparatus, a pair of key-controlled lock devices disposed in cooperative relationship; a key for operating each of said devices and freely insertible into and removable therefrom when said devices are disposed in predetermined angular positions; means coacting with said devices for causing one of said devices to be locked in key-retaining position while the other device is disposed in key-releasing position, and for causing the other of said devices to be locked in key-retaining position when said one device is disposed in key-releasing position, said one device also being movable into second key-retaining position, said coacting means also being operable to maintain said other device in key-retaining position when said one device is in said second key-retaining position; stop means for arresting movement of said one device when it attains said second key-retaining position, whereby both keys are retained against removal; means for preventing retrograde movement of said devices; and means for releasing said stop means, to thereby permit said one device to be moved into key-releasing position.

2. In an interlock apparatus, a pair of movable key-receiving devices; a key for operating each device, each device being movable from a key-releasing position into a plurality of key-retaining positions; means for locking one of said devices in key-retaining position when the other device is disposed in key-releasing position; means for causing said one device to also be locked in key-retaining position when said other device is moved into one of said key-retaining positions; means for arresting movement of said other device and preventing it from being moved beyond said one key-retaining position, whereby both keys are retained against removal; and means for automatically releasing said locking means at the end of a predetermined period of time, permitting movement of said other device into a position in which said one device may be moved into key-releasing position.

3. The interlock apparatus defined in claim 2, wherein said key-receiving devices are rotatable through 360 degrees about substantially parallel

axes and are operable to release said keys in one angular position, and are operable to retain said keys in all other angular positions.

4. The interlock apparatus defined in claim 2, wherein said key-receiving devices are rotatable about substantially parallel axes, and said other device carries an apertured disc-like member and said locking means comprises a plunger urged by spring means into coaction with the aperture of said member, and said means for releasing said locking means comprises electromagnetic means operable to retract said plunger against the action of said spring means.

5. In an interlock apparatus, a key-receiving device; a key for operating said device; means mounting said device for rotation; means for preventing said key from being inserted in or removed from said device except when the latter is disposed in a predetermined position; said device carrying a disc-like member; means for arresting said device against further angular movement after it has been rotated a predetermined distance from key-releasing position; comprising an axially movable plunger coacting with an opening in said member; electromagnetic means for controlling said plunger; a switch disposed in cooperative relationship with said member; cam means on said member for operating said switch when said device is rotated into locked position; and means controlled by said switch, for automatically energizing said electromagnetic means at the end of a predetermined time interval, to retract said plunger and free said device for rotation.

6. The interlock apparatus defined in claim 5, wherein said plunger is urged by spring means toward said member and said electromagnetic means is operable to retract said plunger against the action of said spring means.

7. The interlock apparatus defined in claim 5, wherein switch comprises a pivoted arm adjacent said member; and said cam means comprises a cam mounted on one face of said member and operable to engage and rock said arm when said device is rotated said predetermined distance from key-releasing position.

8. The interlock apparatus defined in claim 5, together with a second key-receiving device disposed in cooperative relationship to said first named device; and means for locking one of said devices in key-retaining position whenever the other is disposed in key-releasing position.

9. In an interlock mechanism, a pair of key-controlled lock devices disposed in side-by-side relationship; a key for operating each of said devices and being freely insertible into and removable therefrom when each of said devices is disposed in a predetermined angular key-releasing position, said devices each being movable into key-releasing position; control means for preventing said devices from being simultaneously moved into key-releasing position; and a time-controlled mechanism operably associated with one of said devices, for introducing a predetermined time interval into movement of said one device into key-releasing position.

10. The interlock mechanism defined in claim 9, wherein a second time-controlled mechanism is operably associated with the other of said devices for introducing a time-controlled phase into operation thereof.

11. In an interlock apparatus, a pair of independently rotatable key-receiving devices having coacting interlock means for controlling rotation thereof with respect to each other; a switch mechanism operatively associated with each of said devices and adapted to be opened and closed in response to rotation thereof; an electromagnetically actuated locking mechanism coacting with each of said devices and operable to arrest rotation thereof when they attain predetermined angular positions; a timer mechanism; and circuit means for causing said timer mechanism to initiate operation when either of said switches is opened, and for causing both of said locking mechanisms to be moved into unlocking condition upon conclusion of operation of said timer mechanism.

12. The interlock apparatus defined in claim 11, wherein said switch mechanisms are connected in series and said locking mechanisms are connected in parallel.

13. In an interlock mechanism, a pair of shaft members rotatable about spaced parallel axes; a disc rigidly carried by each shaft member, each disc having a notch adapted to receive the periphery of the other disc when said discs are disposed in predetermined angular positions, whereby said discs coact with each other to exert a controlling action upon said shaft members; a cam on each of said discs; a mechanism operably associated with and adapted to be actuated by each of said cams upon rotation of said shaft members, said cams each having an outer peripheral radius of curvature which is greater than the radius of curvature of the bottoms of said notches, whereby said cams define intersecting circular paths in response to rotation of said shaft members, one of said cams being disposed in axially offset relationship to the other cam with respect to the axes of rotation of said shaft members and being spaced from its disc by an amount sufficient to permit the other cam to pass between it and its disc without mechanical interference when said shaft members are rotated.

14. In an interlock apparatus, a pair of movable key-receiving devices; a key for operating each device, each device being movable from a key-releasing position into a plurality of key-retaining positions; means for locking one of said devices in key-retaining position when the other device is disposed in key-releasing position; means for causing said one device to also be locked in key-retaining position when said other device is moved into one of said key-retaining positions; stop means for arresting movement of said other device and preventing it from being moved beyond said one key-retaining position, whereby both keys are retained against removal, switch means automatically operable by said other device upon movement of the latter into said one key-retaining position; a timer mechanism automatically placed in operation by said switch means; electromagnetic means for releasing said stop means; and means for automatically energizing said electromagnetic means at the end of a predetermined period of time, in accordance with operation of said timer, thereby permitting movement of said other device into a position in which said one device may be moved into key-releasing position.

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