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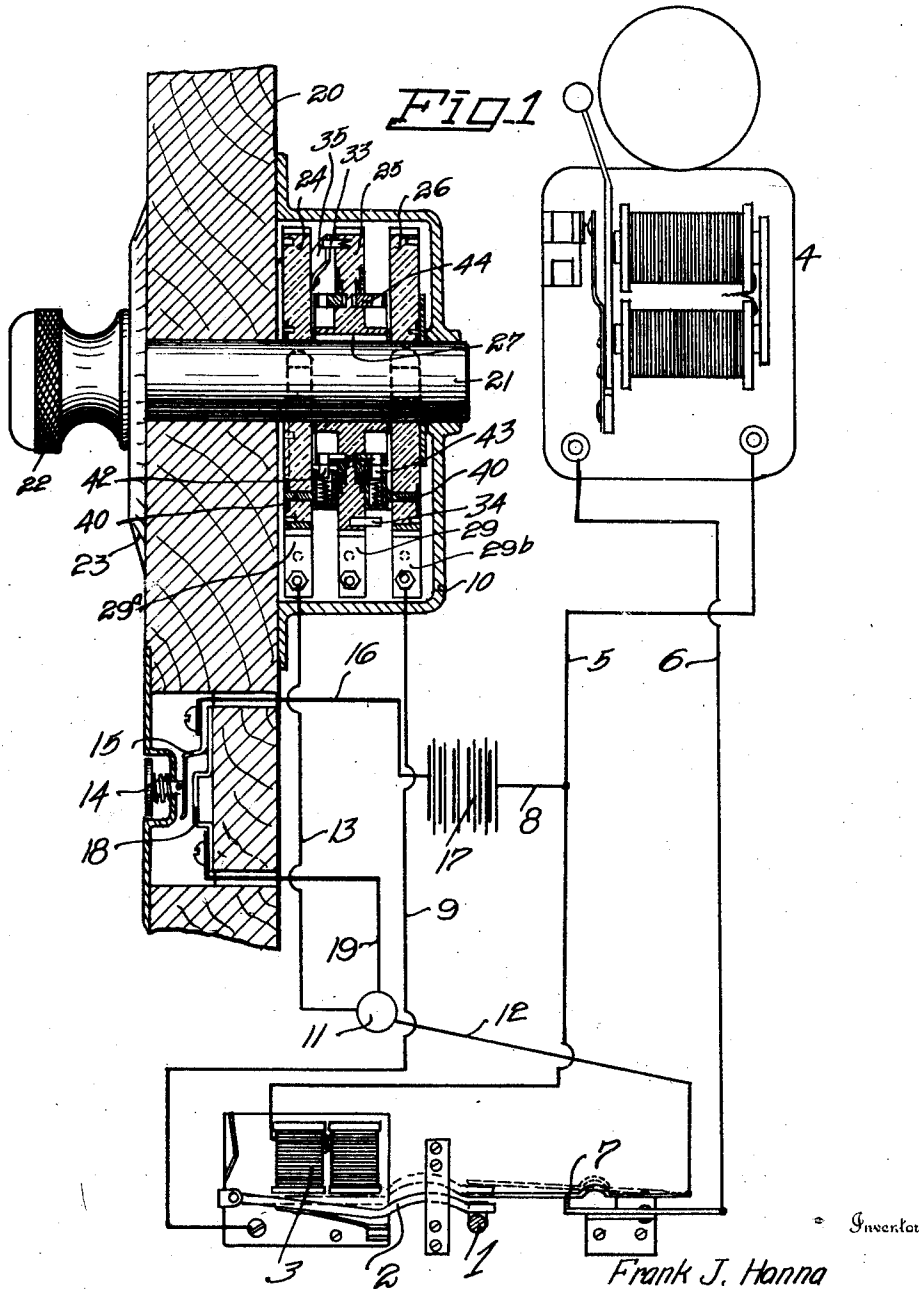
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PERMUTATION LOCK

Filed Feb. 10, 1926

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

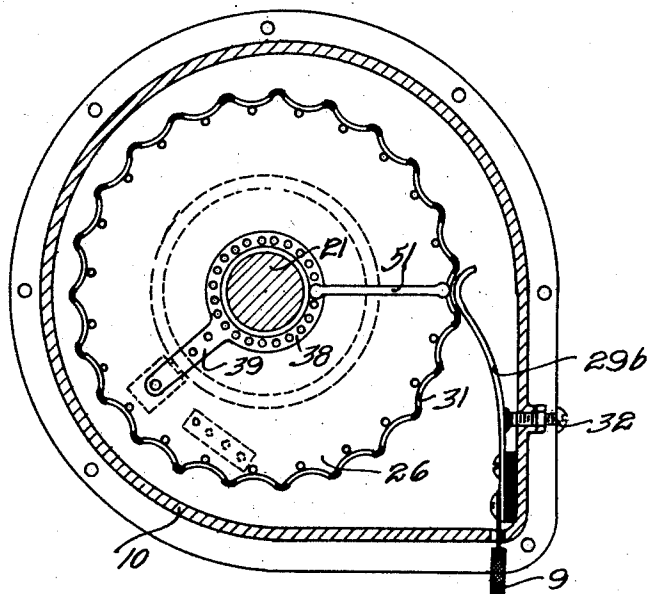


FIG. 2

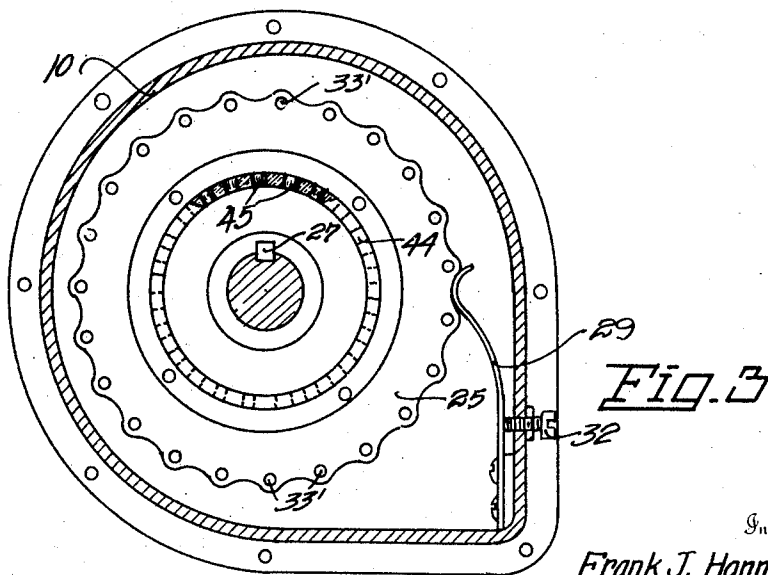


FIG. 3

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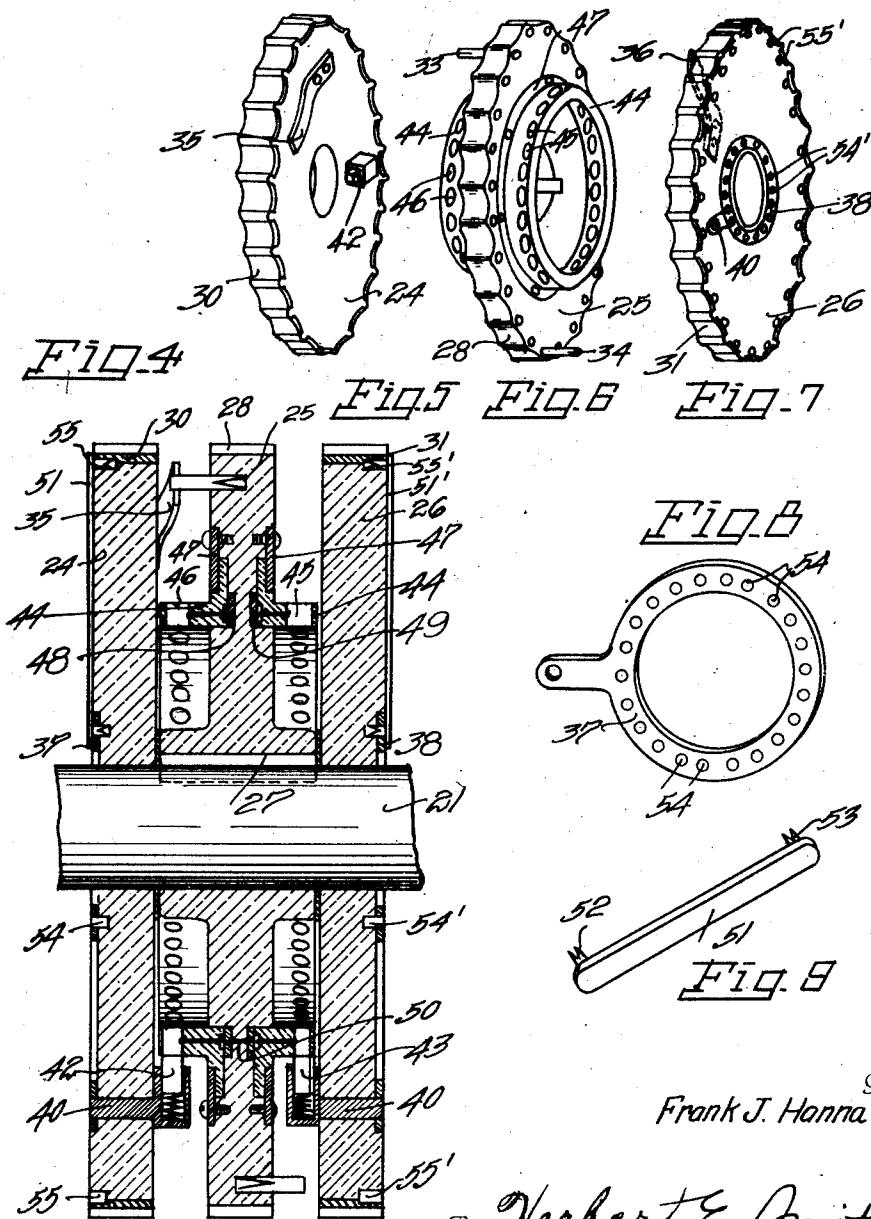
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UNITED STATES PATENT OFFICE.

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PERMUTATION LOCK.

Application filed February 10, 1926. Serial No. 87,297.

My present invention relates to improvements in permutation locks of the rotating tumbler type, electrically controlled and especially designed for use with safe doors.

5 An electrically controlled, audible, burglar alarm or annunciator, located at a police station or other suitable place is also provided in connection with the lock and adapted to be sounded as a warning when tampering with the lock occurs.

10 The door lock includes a slide bolt for the door, which bolt is electrically controlled, but may be released by the use of a circuit closer or push button in the electric control circuit, which circuit also includes means for cutting out the circuit of the electrically actuated burglar alarm, when the parts of the permutation lock are in proper electrical relation. A conductor bar is used in connection with one or more of the rotating tumblers and means are provided whereby the location of the conductor bar or bars may be changed for the purpose of changing the combination of the lock.

25 The invention consists in certain novel combinations and arrangements of parts involving the structures for accomplishing the above and other results, as will hereinafter be more fully set forth and claimed.

30 In the accompanying drawings I have illustrated one complete example of the physical embodiment of my invention wherein the parts are combined and arranged in accordance with the best mode I have thus far devised for the practical application of the principles of my invention.

35 Figure 1 is a sectional view of the permutation lock showing the bolt in section, the alarm in elevation, the electric control circuit, and accessories including the push button for releasing the bolt when the proper electrical connections are made by turning the tumblers.

40 Figure 2 is an enlarged sectional view through the lock casing and spindle, showing a face of the last tumbler, and the use of a changeable conductor bar carried thereby.

45 Figure 3 is a sectional view of the casing and spindle showing a face view of the intermediate or driving tumbler, carrying changeable contact pins.

50 Figure 4 is an enlarged sectional detail view through the three tumblers.

55 Figures 5, 6 and 7 are respectively perspective views of the first, driving, and last tumblers.

60 Figure 8 is a perspective view of one of the contact or conductor rings carried by the driven tumblers.

65 Figure 9 is a detail perspective view of one of the conductor bars, two of which are used on the driven tumblers.

70 In order that the general arrangement and relation of parts may with facility be understood reference should be had to Figure 1 where a standard type of slide bolt is indicated at 1 for use on a door or other part to be secured. This bolt is normally locked or held by a pivoted latch 2 which forms the armature for a solenoid 3 and the latter is electrically operated to release the latch and permit operation of the slide bolt 1. A suitable type of signal bell or burglar alarm is indicated at 4 and provided with wires 5 and 6, the former to the circuit opener 7 for the burglar alarm, which opener operates when the proper electrical connections have been made in the bolt control circuit, and the latter wire 6 is connected with the wire 8 of the solenoid circuit. The other wire 9 of the solenoid circuit extends to the lock casing 10 and is connected to a terminal on one of the tumblers as will be described. From the terminal 11 a wire 12 of the alarm circuit is extended to the circuit breaker 7, which it will be understood is normally closed, and a second wire 13 complementary to the wire 9 extends to the interior of the casing 10. The wires 9 and 13 form part of the control circuit which includes the tumblers and their accessories within the casing 10. Both the control circuit and the solenoid circuit are normally open, but may be closed by the pressure on a push button 14 of the circuit maker which includes a movable contact point 15 and the stationary contact point 18. From the movable contact point the wire 16 leads to the battery 17, and from the stationary contact point of the circuit maker or switch the wire 19 leads to the terminal 11.

90 The support 20 for the button 14 and the casing 10 may be the door that is locked by the slide bolt 1, or these parts may be located at remote and separated points with relation to the slide bolt.

105 The permutation lock is manually oper-

ated through the medium of its spindle 21 journaled in the casing 10 and the knob 22 and is provided with the usual dial 23 on the exterior of the support 20. Three tumblers indicated as 24, 25, and 26 are employed, the driving tumbler or intermediate tumbler 25 being keyed at 27 on the spindle and the two outer tumblers 24 and 26 being supported loosely on the spindle. The tumblers are fashioned as circular disks of uniform size and arranged concentrically on the spindle. They are made up of non-conducting material as bakelite and are each provided with a serrated edge or periphery. The serrated edge 28 of the driving or intermediate tumbler is adapted to co-act with a spring 29 secured to the inner face of a wall of the casing with its free end frictionally engaging the tumbler to retain it in stationary position.

The outer tumblers 24 and 26 have on their serrated edges, respectively, spaced, concave, conductor plates 30 and 31 against which the springs or resilient brushes 29^a and 29^b respectively engage. These brushes or contact blades 29^a and 29^b have the respective wires 13 and 9 of the control circuit attached to them as seen in Figure 1.

By means of a screw 32 provided for each of the spring blades 29, 29^a and 29^b the tension of the blades on the respective tumblers may be varied as desired to take up wear or to increase the frictional contact between the blades and the tumblers, and thus prevent slipping of the tumblers.

As best seen in Figure 6 the driving tumbler or intermediate tumbler 25 has projecting from its opposite faces a pair of pins 33 and 34, shown as located at diametrically opposite points, but capable of being located in different relative positions in the complementary pin holes 33' and 34' of the tumbler 25. Pins 33 and 34 are used as driving pins for co-action with the respective driving plates 35 and 36 secured against the inner faces of the two outer tumblers.

Thus by turning the knob 23 clockwise the driving tumbler and tumbler 26 may be coupled together by contact between pin 34 and plate 36 for revolving the tumbler 26 to proper position. Then by turning the knob anti-clockwise the pin 33 is made to contact with the plate 35 of the tumbler 24 to couple the driving tumbler and the tumbler 24 in order that they may be revolved together to a point selected or indicated on the dial 23.

On the outer face of each of the driven or outer tumblers a conductor ring as 37 and 38 is secured, concentric with the spindle, and each ring is fashioned with a radially extending arm as 39, the rings and arms being countersunk with their faces flush with the faces of the tumblers in which they are seated.

Each of these arms 39 has a conductor pin

40 secured thereto and the pin passes transversely through its tumbler to the inner face of the latter, where the pin is provided with an integral brush holder or cup 41. The tumbler 24 has a spring pressed brush 42 and the tumbler 26 has a spring pressed brush 43 carried in the holders and the brushes extend inwardly on radial lines toward the shaft or spindle.

At the opposite sides of the driving tumbler a pair of flanged rings 44 of non-conducting material are secured in annular grooves in the faces of the tumbler, and these rings as seen in Figure 4 project laterally from the tumbler. In one ring an annular series of radially disposed pins or contact points 45 is carried and in the other ring a complementary series of pins or contact points 46 is carried, the first series for co-action with the brush 42 and the second series for co-action with the brush 43. It will be seen in Figure 4 that the flanged rings project under the brushes and the brushes and complementary series of contact points are located in the same plane or path of travel. The flanged rings 44 are secured in position by means of a pair of retaining rings 47, one secured at each side of the driving tumbler.

The series of contact pins 45 is electrically connected with an interior conductor ring 48 of the tumbler 25, and the series of contact pins 46 is connected with a complementary conductor ring 49 in the tumbler, and these two conductor rings are electrically connected as indicated at 50.

Each of the driven tumblers 24, and 26, is provided with a changeable conductor link as 51, 51' having at their opposite ends pins 52 and 53. These links are adapted for detachable and changeable engagement with two concentric series of holes or sockets in the outer faces of the tumblers 24 and 26. Tumbler 24 has a series of holes 54 in the conductor ring 37 and a series of sockets 55 near the serrated periphery of the tumbler; and tumbler 26 has a series of holes or sockets 54' in the conductor ring 38 and a complementary concentric series of sockets 55' near the periphery of the tumbler. The pins 52 and 53 of the links are adapted to engage in a pair of sockets 54, 55 and in a pair of sockets 54' and 55'. The pins of the links in sockets 55 and 55' frictionally engage the concave conductor plates 30 and 31 of the tumblers. These links are interchangeable and may be applied to the respective tumblers to connect inner and outer contact points on the respective tumblers for the purpose of changing the combination of the permutation lock as desired.

Thus when the driving tumbler has been mechanically coupled as previously described with its driven or outer tumblers, the driving tumbler may be turned clockwise until

the contact points 45 and 46 are brought into electrical connection with the brushes 42 and 43 of the tumblers 24 and 26, to partially complete the control circuit. The circuit is then closed by pressure on the button 14 for the purpose of releasing the slide bolt 1. The control circuit extends from the battery 17 through wire 16 to the circuit closer or button 14 and thence through wire 19 to the terminal 11 and allows for the flow of electric currents through the permutation lock by way of the wire 13 and plate 29^a and contact plate 30 to the link 51'. From link 51' the current passes through ring 37 and its arm 39 to the brush 42, thence through the armature pin 45 and conductor rings 48 and 49 to the armature pin 46, brush 43, arm 39 and ring 38. From ring 38 the current flows through link 51 to plate 31 and spring plate 29^b and thence through wire 9 to the solenoid 3. The solenoid is thus energized to release its armature or the latch 2 from the slide bolt 1 as indicated by dotted lines in Figure 1. The movement of the armature 2 also breaks the connection of the normally closed circuit breaker 7 as indicated by dotted lines, to cut out the burglar alarm. When the bolt is released it may be retracted by suitable means to permit opening of the door.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is—

1. The combination with a driving tumbler and a pair of driven tumblers and separate coupling means for said driving tumbler and driven tumblers, of a pair of armature rings each having a series of armature pins on the driving tumbler, a brush on each driven tumbler for co-action with said pins and electrical connections between the armature pins of said series, a terminal on each driven tumbler for the respective brushes,

an annular series of contact plates on each driven tumbler and changeable conductor links connecting a terminal and a contact plate on each driven tumbler.

2. The combination with a spindle, a fixed tumbler and a loose tumbler thereon adapted for coupling with the fixed member, of an armature member on the fixed tumbler and a brush carried by the loose tumbler, a terminal ring on the loose tumbler for said brush, a series of contact plates on the loose tumbler, and a changeable conductor for connecting said terminal and a selected contact plate.

3. The combination with an intermediate tumbler having on opposite sides a ring with a series of armature pins and electrical connections between said pins, of a pair of tumblers each having a brush for co-action with a series of pins, a conductor ring connected with each brush and an annular series of holes in each ring, spaced contact plates on the peripheries of said pair of tumblers and an annular series of holes adjacent said plates, and a changeable conductor bar having end-pins to engage selected holes of the two series on each of said pair of tumblers.

4. In a permutation lock, a spindle, a tumbler rigidly secured thereto for rotation therewith, a pair of tumblers rotatably mounted on said spindle at opposite sides of said fixed tumbler, means for selectively coupling each of said rotatably mounted tumblers operatively with said fixed tumbler, electro-conductive means on each of said rotatable tumblers and adapted for selective disposition thereon, and means on said fixed tumbler for effecting an electrical conductor bridge between said electro-conductive means on the rotatable tumblers.

In testimony whereof I affix my signature.

FRANK J. HANNA.