Jan. 10, 1950 E. J. BASTIN, JR., ET AL 2,494,155

IDENTIFICATION CARD-INTERLOCK SYSTEM

Filed March 3, 1947

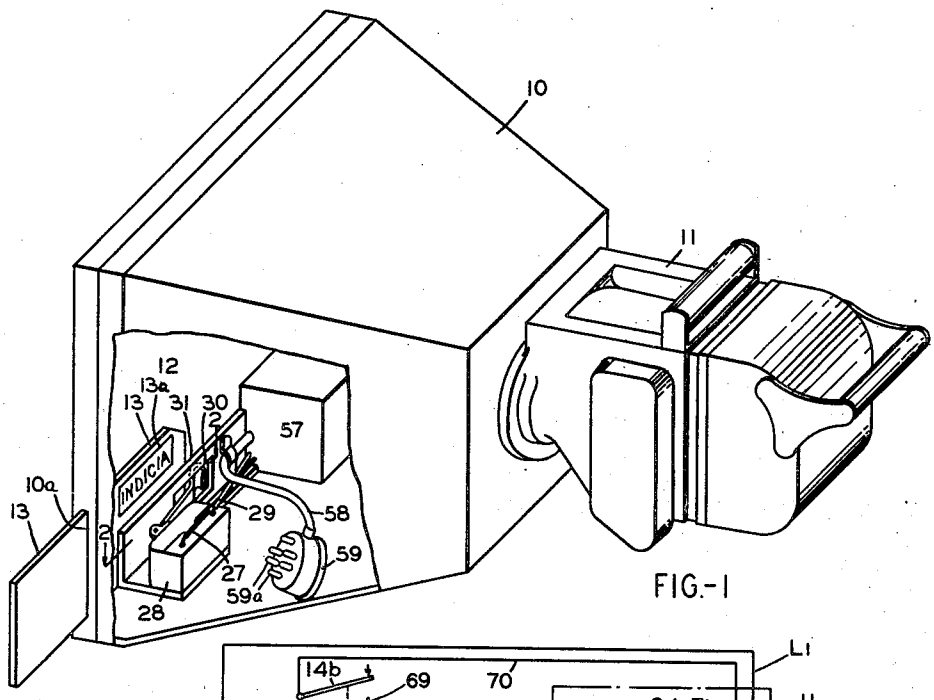


FIG.-1

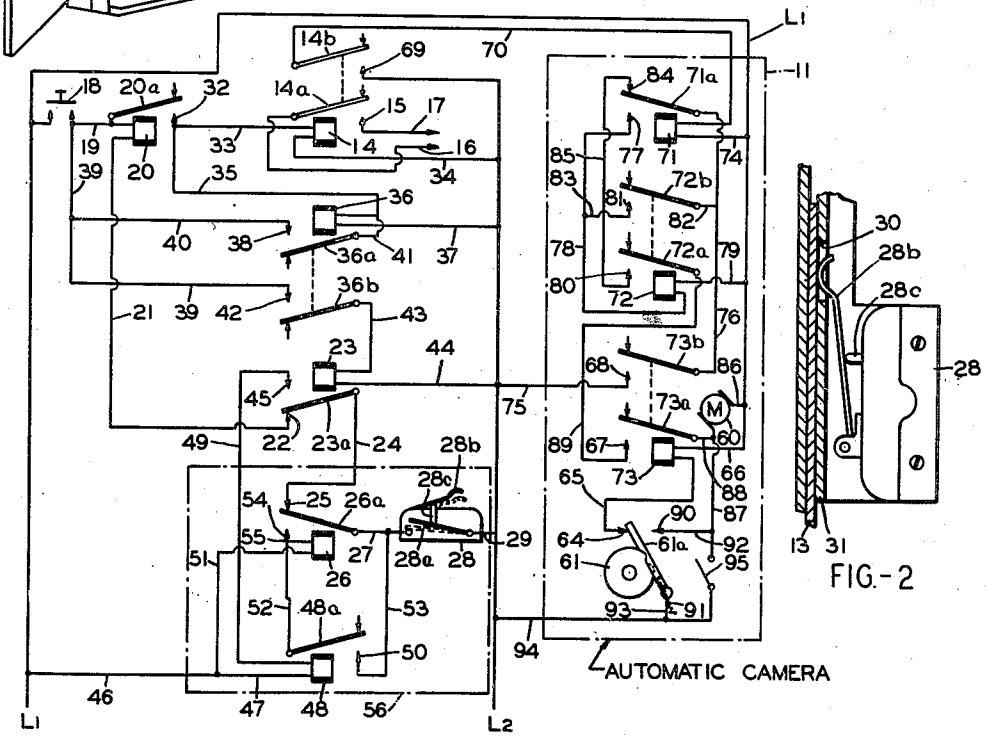


FIG.-2

FIG.-3

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Patented Jan. 10, 1950

2,494,155

UNITED STATES PATENT OFFICE

2,494,155

IDENTIFICATION CARD-INTERLOCK SYSTEM

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Application March 3, 1947, Serial No. 731,918

2 Claims. (Cl. 250—65)

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This invention relates to improvements in an X-ray control system utilizing an identification card and more specifically, it relates to an improvement whereby an interlock is provided compelling the removal and replacement of the identification card between successive exposures.

In the making of photographic records of a succession of radiographs, it is customary to use indicia for identifying the various radiographs. In the usual operation of such a system, an indicia bearing member, generally a card, is inserted in a predetermined location so as to be photographically recorded along with the accompanying radiograph. It is the purpose of the present invention to compel an attendant to change such an identification card each time an exposure is made.

One of the objects of the present invention is to provide an electrical system for carrying out the above purpose which will operate automatically to compel the changing of the identification card every time an exposure is made. Such a system comprises means for energizing the image producing system including an operator-operated member, such as a push button, and a normally open electrical circuit. The use of the identification card is compelled for causing the closing of this circuit before the image producing system may be energized. The deenergization of the image producing system then provides means for opening and maintaining open a portion of the above-mentioned circuit, the maintaining circuit including a device held in operated position by the identification card. It is then necessary for an attendant to remove the card so as to restore the first named circuit to operating condition. The present invention discloses one means for carrying out our invention in a fool-proof manner.

Other objects and advantages of the present invention will be apparent from the accompanying drawings and specification, and the essential features thereof will be set forth in the appended claims.

In the drawings,

Fig. 1 is a perspective view of a cone shape housing having a fluoroscopic screen at the larger end thereof and a recording camera at the smaller end thereof, and parts being broken away to more clearly disclose the application of our invention;

Fig. 2 is a fragmental sectional view taken along the line 2—2 of Fig. 1; while

Fig. 3 is a diagrammatic view illustrating electrical circuits adapted to carry out our invention.

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We have chosen to illustrate our invention as utilized in connection with the device disclosed in the copending application of Edwin R. Goldfield, Robert J. Stava, and Edgar J. Bastin, Jr., Serial No. 624,172, filed October 24, 1945, although other uses of our invention will occur to those skilled in this art. In this prior device, a cone is disclosed similar to the cone 10 of the present application and bearing the reference character 26 in the copending application. The slot 10a and the camera 11 of the present application corresponds to the slot 102 and the camera 33 of the copending application. It is contemplated in the present application that an X-ray tube would be provided as indicated in the housing 22 of the copending application so as to direct rays through the chest portion of a patient standing in front of the larger end of the cone 10 of this application, so that a shadow would be thrown upon the fluoroscopic screen and a record thereof made by the camera 11. It is believed that further disclosure of other apparatus utilized in the carrying out of our invention is unnecessary to those skilled in this art.

Referring now to the cone 10, the larger end thereof carries a fluoroscopic screen 12 upon which an image is made by the X-Rays indicated above. The camera 11 is provided with mechanism operated electrically in synchronism with the X-ray tube by means later described, which are well known in this art. Thus, a photographic record is made of the image of each patient as he stands before the cone 10. In such a system, it is necessary and desirable to identify each photographic record. For this purpose, an identification card 13 is filled out by an attendant giving various data regarding the patient and indicia appears at the point 13a on each card by which each patient may be identified. Our present invention compels the attendant to change this card each time the image producing system is energized, as will presently appear.

As shown diagrammatically in Fig. 3, a relay 14 is provided for causing the energization of the image producing system. This system might include the X-ray tube or the camera 11, but normally includes the automatic operation of both the tube and camera, as mentioned above. The relay armature 14a engages the contact 15 upon energization of the relay so as to complete a circuit through lines 16 and 17 to energize an X-ray tube in the portion of the housing 22

of the copending application mentioned above. In order to energize the relay 14 we have provided an operator-operated member such as the push button 18 and a normally open electrical circuit (closable by card 13) including the source L1, push button 18, line 19, relay 20, line 21, contact 22, armature 23a of relay 23, line 24, contact 25, armature 26a of relay 26 in its normally open position, line 27, microswitch 28 and line 29 to the other side of the circuit L2. As shown in full lines in Fig. 3, the blade 28a of switch 28 is normally in open-circuit position when there is no card 13 inserted into the slot 10a. Referring to Figs. 1 and 3, it will be noted that the switch 28 has an operating arm 28b which is normally urged outwardly to the position shown in Fig. 1 and indicated in full lines in Fig. 3. In this position the switch is open. When a card 13 is inserted through the slot 10a it engages the blade 28b moving it through the opening 30 in the bracket 31 to the broken line position of Fig. 3, and the position of Fig. 2, which causes the operating member 28c to move the switch blade 28a to circuit-closing position. Thus, whenever an identification card 13 is sufficiently inserted in slot 10a, switch 28 is closed, and whenever the card 13 is pulled out the switch 28 automatically opens. When a card 13 is in the predetermined position just described where it closes the switch 28, then only can the relay 14 be energized to close the image producing system circuit at 16 and 17, because then only can relay 20 be energized by depressing the push button 18. Energization of relay 20 attracts its armature 20a so as to complete a circuit through contact 32, line 33, relay 14 and line 34 to L2. This closes the armature 14a against contact 15.

Simultaneously with the above action current passes through line 35, relay 36 and line 37 to L2. This attracts the armature 36a against contact 38 so that the relay 36 locks itself in. This locking circuit is through lines 39 and 40, contact 38, armature 36a, lines 41 and 35, relay 36 and line 37. At the same time the armature 36b is closed against contact 42 which completes a circuit through line 39, contact 42, armature 36b, line 43, relay 23 and line 44.

When relay 23 is energized, the armature 23a is moved into engagement with the contact 45 which breaks the circuit at contact 22 through which relay 20 was energized, causing armature 20a to be released, but relays 36 and 14 continue to be energized through the locking in of relay 36 previously mentioned.

The closing of relay armature 23a against contact 45 completes a circuit from L1 through lines 46 and 47, relay 48, line 49, contact 45, armature 23a, line 24, contact 25, armature 26a, line 27, switch 28 and line 29. This energizes the relay 48 and attracts armature 48a into engagement with contact 50. This completes a circuit for energizing relay 26 as follows: Form L1 through lines 46 and 51 relay 26, line 52, armature 48a, contact 50, lines 53 and 27, switch 28 and line 29. Energizing of relay 26 attracts the armature 26a into engagement with contact 54 which breaks the original circuit through contact 25 which was necessary to initiate an exposure. The armature 26 locks itself in through lines 46, 51, a portion of 52, 55, contact 54, armature 26a, line 27, switch 28 and line 29. When the attendant releases push button 18, relays 14, 36, 23 and 48 are deenergized leaving relay 26 as the only relay which remains energized because it has a direct connection through lines 51 and 46 with L1 and relay 48 is deenergized through the opening of armature 23a.

In the last mentioned condition of the circuit, if the operator depresses push button 18, nothing will happen because the circuit for energizing relay 20 is open at contact 25. Thus, to set the circuit for another cycle, the armature 26a must be released by deenergizing relay 26. This is accomplished when the operator removes the card 13 permitting blade 28b to move outwardly to the full line position of Fig. 3, opening the switch blade 28a. This restores the original operating circuit for relay 20 so that another energization of relay 14 is possible. We have thus provided a fool-proof system whereby the circuit 16, 17 cannot be energized until a card 13 has been inserted through slot 10a to cause the closing of the original energizing circuit through switch 28. This circuit is generally broken automatically through armature 26a and can only be restored by removing the card 13 so as to permit switch 28 to open. Thus, an operator is compelled to change card 13 each time an exposure is made.

Certain of the parts of Fig. 3 are shown enclosed in the dot-dash line 56. This represents those parts which are shown mounted near the larger end of the cone 10 in Fig. 1. The switch 28 is mounted on bracket 31 which in turn is mounted on the cone. The housing 57 encloses relays 26 and 48 with their respective armatures and wiring and all of the electrical connections from this portion of the apparatus are combined in the electrical cable 58 terminating in a plug 59 having a plurality of prongs 59a adapted to complete the various circuits. In other words, where lines 46, 49, 24 and 29 cross the line 56 of Fig. 3, prong connections are provided. Other prongs 59a not used for this purpose are for performing other functions having no part in the present invention. This arrangement makes it easy to tear down and set up the apparatus which is designed to be easily portable.

The camera 11 includes a motor 60, indicated diagrammatically in Fig. 3, for the purpose of moving the film past the lens and gate to make successive photographic records. A cam 61 is driven by motor 60 through one complete revolution while the film is advancing one frame. When the camera is ready to take a picture, the cam switch 61a is in the position indicated, relay 73 is energized through lines 94 and 93, contact 64 and lines 65 and 66. Relay armature 73a is closed against contact 67 and armature 73b is closed against contact 68. Depression of button 18 for an X-ray exposure causes energization of relay 71 through contact 69, armature 14b of relay 14 and lines 70 and 74. Relay 72 is energized through line 75, contact 68, armature 73b, line 76, armature 71a (of relay 71), contact 77 and lines 78 and 79. Armatures 72a and 72b close against contacts 80 and 81 respectively, locking relay 72 in through lines 82 and 83. The circuit for motor 60 is now complete except at contact 84 against which armature 71a is normally closed when relay 71 is deenergized. This occurs at the end of the X-ray exposure when button 18 is released. Motor 60 then starts to turn energized through lines 86, 87, 88, armature 73a, contact 67, line 89, armature 72a, contact 80, line 85, contact 84, armature 71a, line 78, armature 73b, contact 68 and line 75. As the film begins to advance, cam switch 61a is thrown over against contact 90 (being snapped

over by spring 91). Motor 60 is now energized through lines 87 and 92, contact 90, switch 61a, lines 93 and 94. Movement of switch 61a de-energized relay 73 and opening of armature 73b causes relay 72 to drop out. When the film has advanced one frame, switch 61a returns to the position shown in Fig. 3, motor 60 stops, relay 73 is again energized and the camera is ready for the next exposure.

The motor 60 may be moved by hand switch 95 through lines 87 and 94 when it is necessary to move the film other than in the automatic manner described above.

What we claim is:

1. In apparatus comprising an X-ray tube and a fluorescent screen for providing an image responsive to rays from said tube and an identification card for said image and a holder for said card and a camera for making a record of said image and said card, the combination of an electrical system including a first relay for causing energization of said X-ray tube, a first circuit for energizing said first relay including an operator-operated member and a second relay, a third relay in parallel with said first relay and adapted to lock itself in when energized, a fourth relay energizable responsive to said third relay, a fifth relay, an armature for said fourth relay adapted when deenergized to close said first circuit and adapted when energized to cause energization of said fifth relay through a second circuit, means for locking said fifth relay in independently of said operator-operated member, a sixth relay, a normally open switch adapted to be held closed by said card in said holder, said switch connected in series in said first circuit, a third circuit energized independently of said other circuits and including said switch, and an armature for said sixth relay adapted when deenergized to close said first circuit and adapted when energized to break said first circuit and to close said third circuit.

2. In combination, an electrically operated image producing system, an operator-operated member, a normally open switch, an identification card for use with said system, a holder for holding said card in switch-closing engagement with said switch, self-locking relay means, a second relay having an armature normally open and adapted to be closed by energization of said second relay, electrical circuit means for energizing said image producing system including in series said operator-operated member and said self-locking relay means and said switch in closed position and said armature in open position, third relay means actuated by energization of said first named circuit means, a circuit for energizing said second relay including said third relay means in actuated condition, whereby said first named electrical circuit means is broken by said second relay armature in closed position, and a self-locking circuit for locking said second relay in energized condition and including in series said switch in closed position, whereby after one energization of said image producing system and release of said operator-operated member, said card must be removed from said holder to restore said armature to open position to complete said first named circuit means for again energizing said image producing system.

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