May 31, 1955 E. V. SUNDT 2,709,745

LIGHTING APPARATUS FOR DOOR STRUCTURES

Filed Nov. 16, 1951 2 Sheets-Sheet 1

Fig. 1.

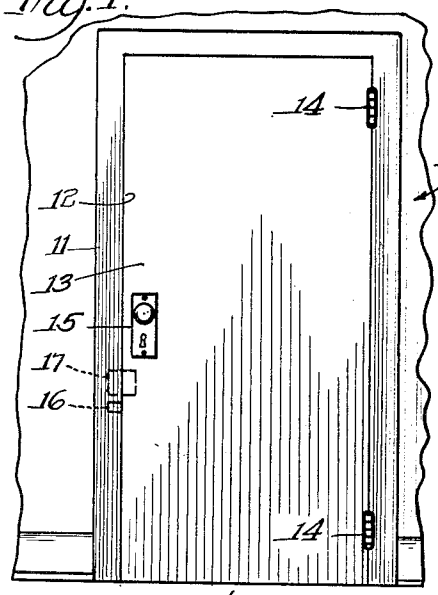


Fig. 2.

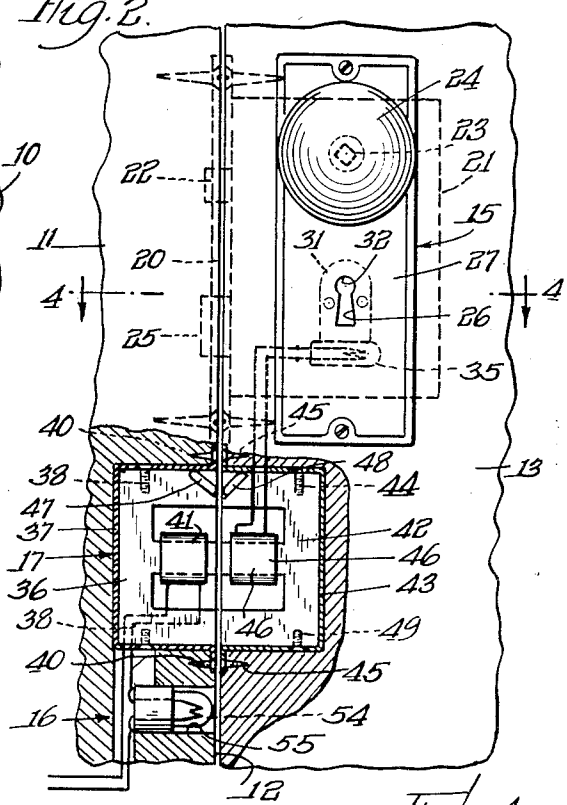


Fig. 3.

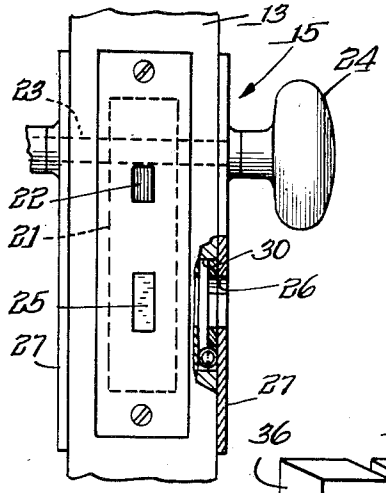


Fig. 4.

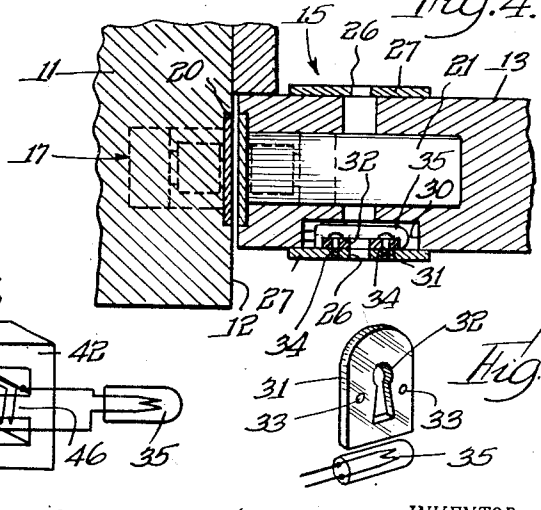


Fig. 5.

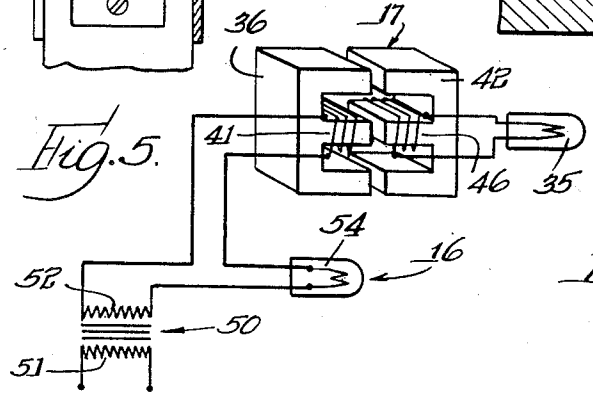


Fig. 6.

INVENTOR.
Edward V. Sundt
BY
Wallenstein & Spangenberg
Attys.

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LIGHTING APPARATUS FOR DOOR STRUCTURES

Filed Nov. 16, 1951 2 Sheets-Sheet 2

Fig. 7.

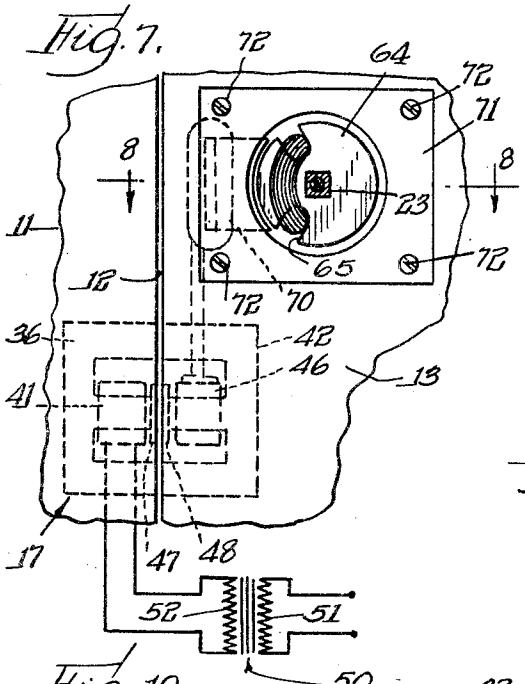


Fig. 8.

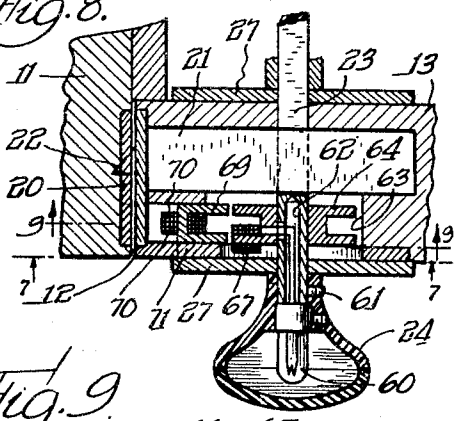


Fig. 9.

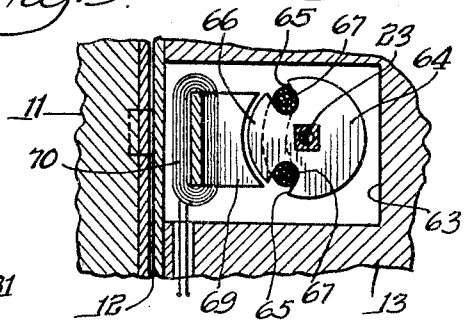


Fig. 10.

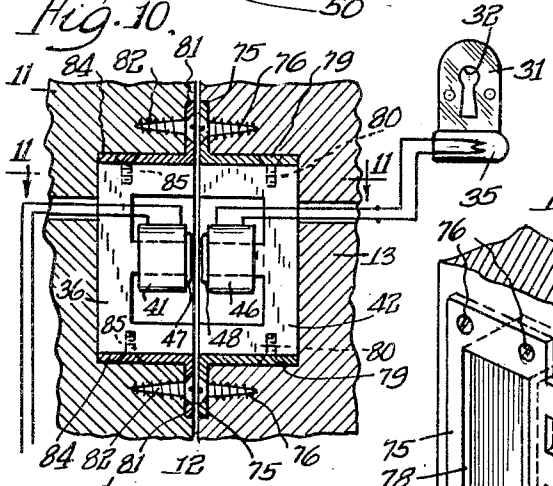


Fig. 11.

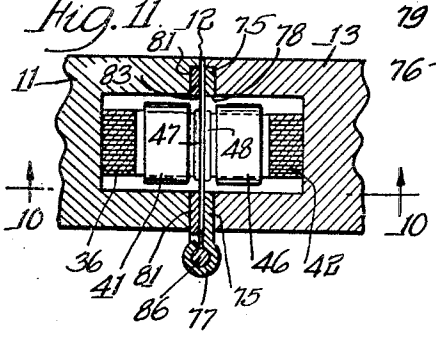


Fig. 12.

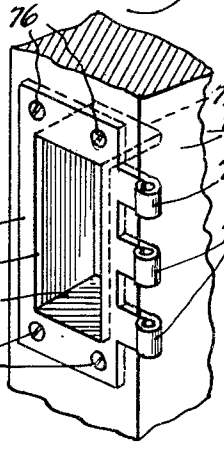
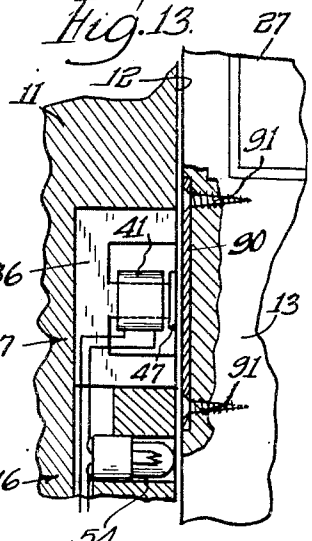


Fig. 13.



INVENTOR.

Edward V. Sundt

BY

Wallenstein & Spangenberg

attys.

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LIGHTING APPARATUS FOR DOOR STRUCTURES

Edward V. Sundt, Wilmette, Ill., assignor to Sundt Engineering Company, Des Plaines, Ill., a corporation of Illinois

Application November 16, 1951, Serial No. 256,699

14 Claims. (Cl. 240—2.13)

This invention relates to a lighting apparatus for door structures and the like having a stationary part with a door opening and a movable door for opening and closing the door opening.

The principal object of this invention is to provide a lighting apparatus for such door structures and the like for illuminating the door securing mechanism such as the keyhole of a lock mechanism or the doorknob of a latch mechanism when the door is closed and for illuminating the door opening and its environment when the door is opened.

A further object of this invention is to accomplish the foregoing results without the use of switches or the like or the use of flexible electric conductors or the like between the stationary door part and the movable door of the door structure.

In accordance with this invention, a first magnetic core is secured in the door opening of the stationary part of the door structure and it carries a winding which is connected to a source of alternating voltage such as the conventional household bell transformer. A second magnetic core is carried by the door adjacent to and in alignment with the first core when the door is closed. A lamp carried by the stationary part of the door structure is connected in series with the winding on the first core for illuminating the door opening and its environment and acts as a courtesy lamp when the door is opened. When the door is closed, the impedance of the winding is high and the lamp is off, but when the door is opened the impedance of the winding is decreased and the lamp is lighted. Thus, the cores and winding act as a control apparatus for the courtesy lamp.

The second core carried by the door may also carry a winding, this winding acting as a secondary winding and the winding of the first core acting as a primary winding. The two windings are magnetically coupled together through the two magnetic cores and act as a transformer when the door is closed. A lamp is connected in series with the secondary winding and is carried by the door for illuminating the door securing mechanism of the door when the door is closed. When the door is opened, the magnetic coupling is decreased and the lamp is turned off. Thus, the two cores and the two windings in addition to acting as a transformer also act as a control apparatus for this lamp.

Where the door securing mechanism comprises a key operated lock mechanism, the lamp may operate to illuminate the keyhole. In this connection, a light transmitting plate including a keyhole may be utilized. Where the door securing mechanism includes a latch mechanism, the lamp may illuminate the doorknob thereof. Here, the doorknob may be light transmitting and the lamp located on the inside of the knob. The rotary shaft of the latch mechanism which carries the doorknob may be provided with a core carrying a secondary winding connected to the lamp. This core is associated with a stationary core carried by the door, the stationary core carrying the primary winding connected to the secondary winding of the above described transformer. In this way electrical energy is magnetically transmitted to the lamp in the doorknob without the use of flexible leads or the like.

The transformer or magnetic coupling control apparatus between the stationary door part and the movable door of the door structure may, if desired, be incorporated in a hinge for the door. The lighting and control apparatus of this invention, while being disclosed in connection with a swinging door structure for a house or the like, may be utilized in connection with other door structures, such as sliding doors, windows, cabinets, cupboards, closets and the like.

Further objects of this invention reside in the details of construction of the lighting and control apparatus and in the cooperative relationships between the component parts thereof.

Other objects and advantages of this invention will become apparent to those skilled in the art upon reference to the accompanying specification, claims and drawings, in which:

Fig. 1 is an elevational view of a door structure having the lighting and control apparatus of this invention applied thereto;

Fig. 2 is an enlarged view partly in section, illustrating the lighting and control apparatus;

Fig. 3 is an elevational view partly in section of the end of a portion of the door and illustrating the door securing mechanism;

Fig. 4 is a sectional view taken substantially along the line **4—4** of Fig. 2;

Fig. 5 is a diagrammatic perspective view of the lighting and control apparatus;

Fig. 6 is a perspective view illustrating the light transmitting plate for the keyhole and its associated lamp;

Fig. 7 is an elevational view illustrating the lighting and control apparatus for the doorknob;

Fig. 8 is a sectional view taken substantially along the line **8—8** of Fig. 7;

Fig. 9 is a sectional view taken substantially along the line **9—9** of Fig. 8;

Fig. 10 is a vertical sectional view showing the lighting and control apparatus incorporated in a hinge for the door;

Fig. 11 is a sectional view taken substantially along the line **11—11** of Fig. 10;

Fig. 12 is a perspective view showing one-half of the hinge of Figs. 10 and 11; and

Fig. 13 is a sectional view illustrating another form of the lighting and control apparatus.

Referring first to Fig. 1, a door structure is generally designated at **10**. It includes a stationary door part **11** having a door opening **12** therein. A door **13** operates to open and close the door opening **12**, the door **13** being suitably hinged by means of hinges **14**. A door securing mechanism **15** operates to maintain the door closed when it is closed. It includes a key operated lock mechanism and/or a latch mechanism. This door securing mechanism **15** is provided with a lighting apparatus for illuminating the doorknob thereof or for illuminating the keyhole thereof. The stationary door part may also be provided with a lighting apparatus **16** operating as a courtesy light for illuminating the door opening and its environment upon opening of the door. The lighting apparatus for the door securing mechanism **15** and the lighting apparatus **16** are controlled by a control apparatus **17** having one portion carried by the stationary door part **11** and the other portion carried by the movable door **13**.

The stationary door part **11** is provided with a latch or lock plate **20** and the movable door **13** is provided with a latch and lock mechanism **21** received in a recess therein. This mechanism includes a latch **22** cooperating with a hole in the plate **20** and is controlled by a squared shaft **23** carrying a doorknob **24**. The mechanism also includes a lock bolt **25** operated by a key which may be inserted through a keyhole **26** in a cover plate **27**. This

door securing mechanism may be of standard and conventional design.

As illustrated in Figs. 2 to 4, the door 13 adjacent the keyhole is provided with a recess 30 under the plate 27 for accommodating a light transmitting organic synthetic plastic plate 31 provided with a keyhole 32. This plate 31 may be provided with holes 33 so that the light transmitting plate 31 may be secured to the cover plate 27 as by means of screws 34. A lamp 35, such as a neon lamp, is also received in the recess 30 adjacent the light transmitting plate 31 so that when the lamp 35 is turned on the light is transmitted through the light transmitting plate 31 to illuminate the keyhole 26, 32. If desired, the keyhole 26 in the cover plate 27 may be made larger than the keyhole 32 in the light transmitting plate 31 more effectively to illuminate the keyhole opening. If desired, the light transmitting plate may be eliminated and the keyhole opening illuminated directly by the lamp.

The lighting apparatus 16 for illuminating the door opening 12 and its environment may include a lamp 54 received in a suitable recess 55 in the stationary door part at the door opening.

The lamp 35 for illuminating the keyhole and the lamp 54 for illuminating the door opening and its environment are controlled by the control apparatus generally designated at 17, which is illustrated in more detail in Figs. 2 and 5. Here a magnetic core 36, preferably of laminated E formation, is secured to a mounting bracket 37 as by means of screws 38. This mounting bracket 37 is provided with flanges for receiving screws 40 for mounting the bracket and the core in a suitable recess in the stationary door part 11. The center leg of this core 36 carries a winding 41 which acts as a primary winding. A second core 42, also preferably of laminated E formation, is carried by a mounting bracket 43 as by means of screws 44. This mounting bracket 43 is also provided with flanges for receiving screws 45 to secure the mounting bracket 43 and, hence, the core 42 in a suitable recess in the door 13. The center leg of this core 42 is provided with a winding 46 which acts as a secondary winding. When the door 13 is closed the cores 36 and 42 are brought adjacent to and in alignment with each other for the purpose of magnetically coupling the primary winding 41 to the secondary winding 46 so that electrical energy is produced in the secondary winding 46 when electrical energy is applied to the primary winding 41. Thus, when the door is closed the control apparatus 17 operates as a transformer. The cores 36 and 42 are provided with suitable shading coils 47 and 48 to minimize or eliminate hum. When the door is opened the magnetic coupling between the primary and secondary windings 41 and 46 is reduced or broken. When the door is closed and the cores 36 and 42 brought into alignment, the impedance of the winding 41 is high so as to limit the current flow, but when the door is opened the impedance of the winding 41 is materially reduced materially to increase the current flow therethrough.

Electrical energy is applied to the winding 41 by means of a suitable step-down transformer, such as a conventional bell transformer generally designated at 50. This transformer includes a primary winding 51 connected to the usual household alternating voltage circuit and a secondary winding 52, the secondary winding 52 of the transformer being connected to the primary winding 41 of the control apparatus 17. The lamp 16 for illuminating the door opening and its environment is connected in series with the primary winding 41 and the lamp 35 for illuminating the keyhole of the lock mechanism is connected to the secondary winding 46. Thus, when the door 13 is closed the lamp 35 is lit for illuminating the keyhole. However, the lamp 16 is not lit due to the high impedance of the winding 41. When the door is opened the lamp 35 is turned off and the lamp 16 is lit due to the decrease in impedance of the winding 41.

In this way the lighting apparatus is energized and controlled without the use of switches or the like, or the use of flexible electric conductors or the like between the stationary door part and the movable door of the door structure.

Referring now to Figs. 7 to 9, the manner of illuminating the doorknob of the latch mechanism is illustrated in more detail. Here the doorknob 24, carried by the rotatable shaft 23, is made of light transmitting material such as a light transmitting synthetic organic plastic, the doorknob being suitably secured to the shaft as by means of a screw 61. Located within the light transmitting doorknob 24 is a lamp 60, the leads from which extend through a hole 62 in the end of the shaft 23. About the shaft 23 and behind the cover plate 27 the door is provided with a recess 63 for accommodating a core 64 carried by the shaft 23. This core 64 is a double annular core, one annular flange of which is provided with a pair of notches 65 forming a pole piece 66 therebetween. A winding 67 is located in the notches 65 about the pole piece 66 and is connected by leads extending through the hole 62 in the shaft 23 to the lamp 60. This winding 67 operates as a secondary winding.

A C shaped core 69 is also located within the recess 63 and carries a winding 70, the winding 70 acting as a primary winding. The core 69 may be carried by a suitable plate 71 secured to the door 13 as by means of screws 72. The primary winding 70 is conductively connected to the secondary winding 46 of the control apparatus 17 by suitable leads. When the rotatable shaft 23 is released to latch the door closed, the pole piece 66 lines up with the core 69 so that the secondary winding 67 is magnetically coupled to the primary winding 70 to act as a transformer for lighting the lamp 60 in the doorknob 24. Thus, when the door is closed, the doorknob 24 is illuminated. When, however, the door is opened, the doorknob 24 is no longer illuminated. Here the lamp 60 for illuminating the doorknob 24 is energized and controlled without the use of switches or the like, or the use of flexible electrical conductors or the like.

The control apparatus 17 may be incorporated directly in the hinge for the door, as is illustrated in Figs. 10 to 12. Here the hinge part carried by the door 13 includes a plate 75 having holes so that it may be secured to the door 13 as by means of screws 76. The plate 75 is provided with bearing portions 77 for receiving a hinge pin 86. The plate 75 is provided with a central opening 78 and with a pair of flanges 79 which extend into a recess in the door 13. The opening 78 receives the core 42 carrying the secondary winding 46 and the core 42 may be secured to the flanges 79 as by means of screws 80. The other hinge part includes a plate 81 which is secured to the stationary door part 11 by means of screws 82. It is also provided with a central opening 83 and inwardly extending flanges 84 extending into a recess in the stationary door part 11. The core 36 carrying the primary winding 41 may be secured to the inwardly extending flanges 84 as by means of screws 85. The two hinge parts are secured together by a hinge pin 86. When the door is closed the cores 36 and 42 are brought together magnetically to couple the primary and secondary windings 41 and 46. Here the shading rings 47 and 48 are applied to the center posts of the cores 36 and 42 for reducing or eliminating hum. The manner of operation of this combination hinge and control apparatus is the same as that described above in connection with the operation of the control apparatus generally designated at 17 in Fig. 2.

If it is desired to control only the lamp 54 of the lighting apparatus for illuminating the door opening and its environment, then the core 42 of the control apparatus 17 may be replaced by a core 90 in the form of a flat plate which is secured to the door 13 by means

of screws 91, as illustrated in Fig. 13. When the door is closed the core or plate 90 is brought adjacent the core 36 for completing a magnetic path which increases the impedance of the winding 41. Under these conditions the lamp 54 is not lit. When, however, the door 13 is opened the core or plate 90 is moved away from the core 36 to break this magnetic path, whereupon the impedance of the winding 41 is materially decreased to permit sufficient current to flow to illuminate the lamp 54. Here, as in other forms of this invention, the lamp 54 is controlled by the position of the door without the use of switches or the like.

While for purposes of illustration several forms of this invention have been disclosed, other forms thereof may become apparent to those skilled in the art upon reference to this disclosure and, therefore, this invention is to be limited only by the scope of the appended claims.

I claim as my invention:

1. In a door structure having a stationary part provided with a door opening, a movable door for opening and closing the door opening and a securing mechanism for securing the door closed, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the stationary part adjacent the door opening, a primary winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the movable door and movable adjacent to and in alignment with the first core when the door is closed, a secondary winding on the second core magnetically coupled to the primary winding through the first and second cores when the door is closed, and a lamp carried by the movable door adjacent the securing mechanism of the door for illuminating the securing mechanism and electrically connected in series with the secondary winding for lighting the lamp only when the door is closed and the primary and secondary windings are magnetically coupled.

2. In a door structure having a stationary part provided with a door opening and a movable door for opening and closing the door opening, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the stationary part adjacent the door opening, a winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the movable door and movable adjacent to and in alignment with the first core when the door is closed, the impedance of the winding being high when the door is closed and low when the door is opened, and a lamp carried by the stationary part for illuminating the door opening and its environment and electrically connected in series with the winding for lighting the lamp only when the door is opened and the impedance of the winding is low.

3. In a door structure having a stationary part provided with a door opening, a movable door for opening and closing the door opening and a securing mechanism for securing the door closed, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the stationary part adjacent the door opening, a primary winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the movable door and movable adjacent to and in alignment with the first core when the door is closed, a secondary winding on the second core, the impedance of the primary winding being high and the secondary winding being magnetically coupled to the primary winding when the door is closed and the impedance of the primary winding being low and the magnetic coupling between the primary and secondary windings being broken when the door is opened, a first lamp carried by the stationary part for illuminating the door opening and its environment and electrically connected in series with the primary winding for lighting the first lamp only when the door is opened

and the impedance of the primary winding is low, and a second lamp carried by the movable door adjacent the securing mechanism of the door for illuminating the securing mechanism and electrically connected in series with the secondary winding for lighting the second lamp only when the door is closed and the primary and secondary windings are magnetically coupled.

4. In a door structure having a stationary part provided with a door opening, a movable door for opening and closing the door opening and a lock mechanism including a keyhole for locking the door closed, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the stationary part adjacent the door opening, a primary winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the movable door and movable adjacent to and in alignment with the first core when the door is closed, a secondary winding on the second core magnetically coupled to the primary winding through the first and second cores when the door is closed, and a lamp carried by the movable door adjacent the keyhole of the lock mechanism for illuminating the keyhole and electrically connected in series with the secondary winding for lighting the lamp only when the door is closed and the primary and secondary windings are magnetically coupled.

5. In a door structure having a stationary part provided with a door opening, a movable door for opening and closing the door opening and a key operated lock mechanism for locking the door closed, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the stationary part adjacent the door opening, a primary winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the movable door and movable adjacent to and in alignment with the first core when the door is closed, a secondary winding on the second core magnetically coupled to the primary winding through the first and second cores when the door is closed, a light transmitting plate having a keyhole carried by the movable door adjacent the key operated lock mechanism, and a lamp carried by the movable door adjacent the light transmitting plate for illuminating the keyhole thereof and electrically connected in series with the secondary winding for lighting the lamp only when the door is closed and the primary and secondary windings are magnetically coupled.

6. In a door structure having a stationary part provided with a door opening, a movable door for opening and closing the door opening and a latch mechanism including a rotatable shaft for latching the door closed, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the stationary part adjacent the door opening, a primary winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the movable door and movable adjacent to and in alignment with the first core when the door is closed, a secondary winding on the second core magnetically coupled to the primary winding through the first and second cores when the door is closed, a third core carried by the door adjacent the rotatable shaft of the latch mechanism, a primary winding on the third core and electrically connected to the secondary winding of the second core, a fourth core carried by the rotatable shaft of the latch mechanism and in alignment with the third core, a secondary winding on the fourth core magnetically coupled to the primary winding of the third core through the third and fourth cores when the rotatable shaft is released, a light transmitting doorknob carried by the rotatable shaft of the latch mechanism for turning the same, and a lamp carried by the rotatable shaft for illuminating the doorknob and electrically connected in series with the secondary winding of the fourth core for lighting the lamp only when the door is closed.

7. In a door structure having a stationary part provided with a door opening, a movable door for opening and closing the door opening and a securing mechanism for securing the door closed, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the stationary part adjacent the door opening, a primary winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the movable door and movable adjacent to and in alignment with the first core when the door is closed, a secondary winding on the second core magnetically coupled to the primary winding through the first and second cores when the door is closed, a lamp carried by the movable door adjacent the securing mechanism of the door for illuminating the securing mechanism and electrically connected in series with the secondary winding for lighting the lamp only when the door is closed and the primary and secondary windings are magnetically coupled, and shading coils operatively associated with the cores for minimizing hum when the cores are moved into alignment.

8. In a door structure having a stationary part provided with a door opening and a movable door for opening and closing the door opening, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the stationary part adjacent the door opening, a winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the movable door and movable adjacent to and in alignment with the first core when the door is closed, the impedance of the winding being high when the door is closed and low when the door is opened, a lamp carried by the stationary part for illuminating the door opening and its environment and electrically connected in series with the winding for lighting the lamp only when the door is opened and the impedance of the winding is low, and a shading coil operatively associated with the cores for minimizing hum when the cores are moved into alignment.

9. In a door structure having a stationary part provided with a door opening, a movable door for opening and closing the door opening and a securing mechanism for securing the door closed, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the stationary part adjacent the door opening, a primary winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the movable door and movable adjacent to and in alignment with the first core when the door is closed, a secondary winding on the second core, the impedance of the primary winding being high and the secondary winding being magnetically coupled to the primary winding when the door is closed and the impedance of the primary winding being low and the magnetic coupling between the primary and secondary windings being broken when the door is opened, a first lamp carried by the stationary part for illuminating the door opening and its environment and electrically connected in series with the primary winding for lighting the first lamp only when the door is opened and the impedance of the primary winding is low, a second lamp carried by the movable door adjacent the securing mechanism of the door for illuminating the securing mechanism and electrically connected in series with the secondary winding for lighting the second lamp only when the door is closed and the primary and secondary windings are magnetically coupled, and shading coils operatively associated with the cores for minimizing hum when the cores are moved into alignment.

10. In a door structure having a door and a latch mechanism provided with a rotatable shaft, in combination therewith, a lighting apparatus comprising a source of alternating voltage, a first core carried by the door adjacent the rotatable shaft, a primary winding on the first core and electrically connected to the source of alternating voltage, a second core carried by the rotatable shaft

in alignment with the first core, a secondary winding on the second core magnetically coupled to the primary winding through the first and second cores when the rotatable shaft is released, a light transmitting doorknob carried by the rotatable shaft for turning the same, and a lamp carried by the rotatable shaft for illuminating the doorknob and electrically connected in series with the secondary winding for lighting the lamp.

11. In a door structure having a stationary door part provided with a door opening and a movable door for opening and closing the door opening in combination therewith, a control apparatus comprising a first magnetic core having a winding thereon, a mounting bracket carrying the first core and securing the same in a recess in the door opening of the stationary door part, a second magnetic core, and means securing the second core in a recess in the door in alignment with the first core when the door is closed for increasing the impedance of the winding when the door is closed and decreasing its impedance when the door is opened.

12. In a door structure having a stationary door part provided with a door opening and a movable door for opening and closing the door opening, in combination therewith, a control apparatus comprising a first magnetic core, a primary winding on the first core, a mounting bracket carrying the first core and securing the same in a recess in the door opening of the stationary door part, a second magnetic core, a secondary winding on the second core, a mounting bracket carrying the second core and securing the same in a recess in the door in alignment with the first core when the door is closed for increasing the magnetic coupling between the primary and secondary winding when the door is closed and for decreasing the magnetic coupling therebetween when the door is opened.

13. In a hinged door structure having a stationary door part provided with a door opening and a swinging door for opening and closing the door opening, in combination therewith, a combination hinge and control apparatus comprising a first hinge part having means securing the same to the door opening of the stationary door part, a bracket portion extending into a recess in the door opening of the stationary door part, a first core carried by the bracket portion in the recess and a primary winding carried by the first core, and a second hinge part having means securing the same to the door, a bracket portion extending into a recess in the door, a second core carried by the bracket portion in the recess and a secondary winding carried by the second core, the magnetic coupling between the primary and secondary windings being increased when the door is closed and decreased when the door is opened.

14. In a hinged door structure having a stationary door part provided with a door opening and a swinging door for opening and closing the door opening, in combination therewith, a combination hinge and control apparatus comprising a first hinge part having means securing the same to the door opening of the stationary door part, a bracket portion extending into a recess in the door opening of the stationary door part, a first core carried by the bracket portion in the recess and a winding carried by the first core, and a second hinge part having means securing the same to the door and a second core extending into a recess in the door, the impedance of the winding increasing as the door is closed and decreasing as the door is opened.

References Cited in the file of this patent

UNITED STATES PATENTS

629,631	Wellman	July 25, 1899
723,836	Cowing	Mar. 31, 1903
1,263,880	Glossop	Apr. 23, 1918
1,505,325	Elbert	Aug. 19, 1924
1,756,875	Montsinger	Apr. 29, 1930
1,961,865	Remington	June 5, 1934
2,309,840	Garvert	Feb. 2, 1943
2,575,820	Linton	Nov. 20, 1951