Feb. 15, 1944. T. M. HAGENBOOK 2,341,546

LIGHT BEAM PROJECTION SYSTEM

Original Filed Nov. 6, 1940 2 Sheets-Sheet 1

Fig. 1

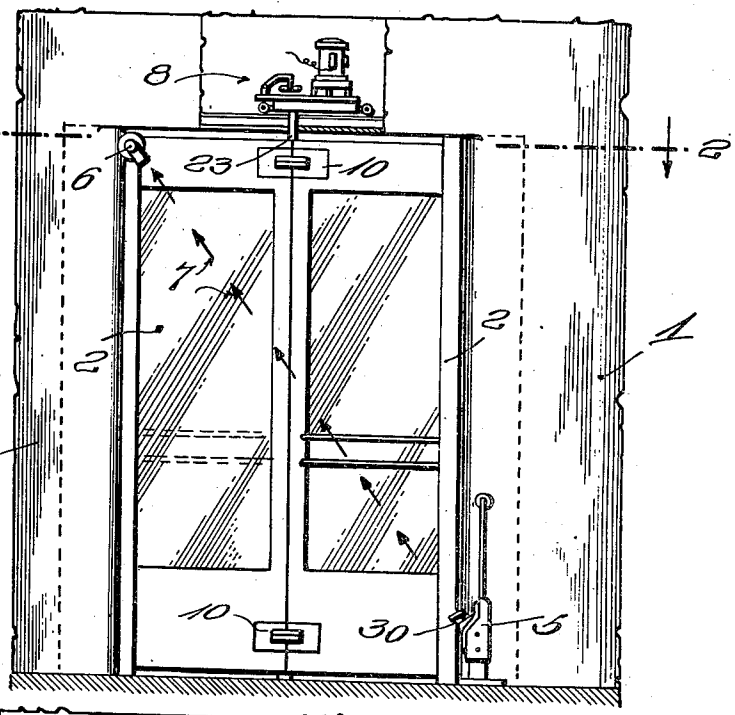
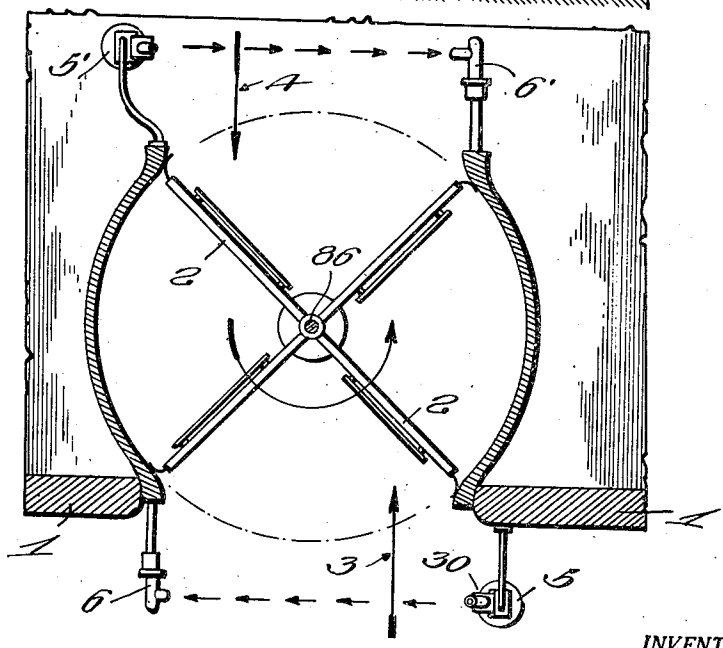


Fig. 2

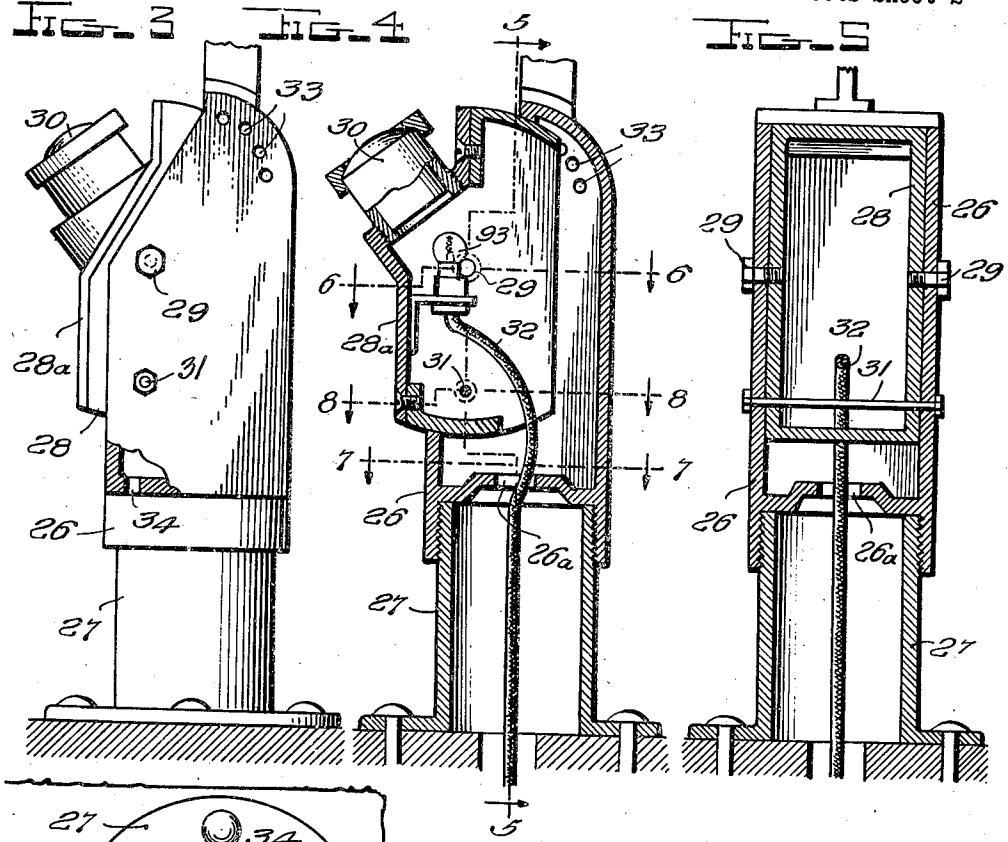


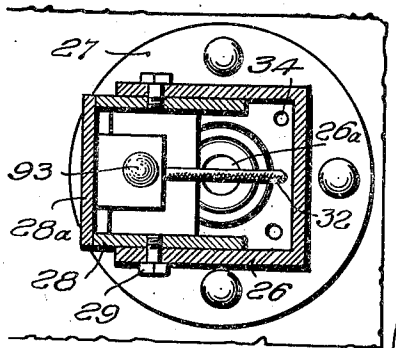
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Feb. 15, 1944. T. M. HAGENBOOK 2,341,546

LIGHT BEAM PROJECTION SYSTEM

Original Filed Nov. 6, 1940 2 Sheets-Sheet 2





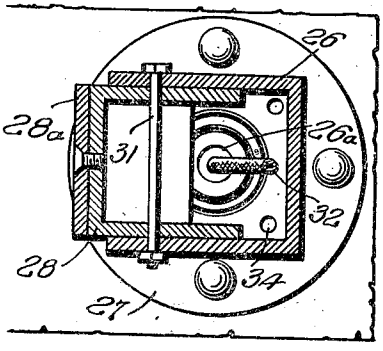


FIG. 6

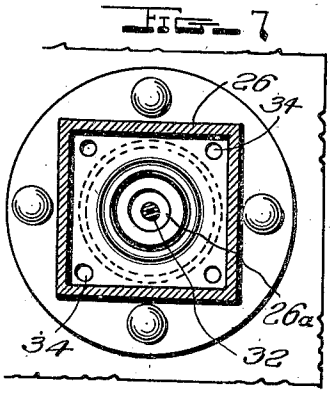
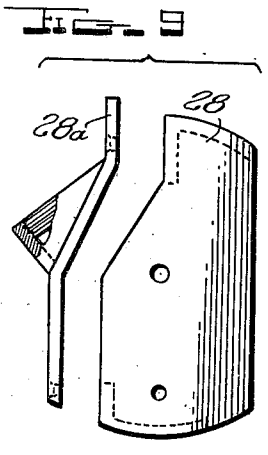


FIG. 8



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UNITED STATES PATENT OFFICE

2,341,546

LIGHT BEAM PROJECTION SYSTEM

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Original application November 6, 1940, Serial No. 364,568. Divided and this application August 23, 1941, Serial No. 408,080

2 Claims. (Cl. 240—1)

My invention relates broadly to revolving doors and more particularly to a light beam projection system for a motor driven revolving door system with automatic control means for the driving motor.

This application is a division of my application Serial No. 364,568, filed November 6, 1940, for Electrically controlled operating system for revolving doors.

One of the objects of my invention is to provide an improved light beam projection system for a motor driven revolving door system and electric circuit control means for automatically controlling the driving motor.

Still another object of my invention is to provide radiant energy control means disposed in relation to an arrangement of light beam projection system for a motor driven revolving door assembly, so that persons passing through the revolving door may control the automatic operation of the revolving door through the radiant energy control means; and further to provide a novel arrangement of means for mounting the radiant energy control means.

Another object of my invention is to provide a novel construction of mounting means for a light detecting device in a revolving door control system.

A still further object of my invention is to provide a construction of support for a light beam projection system for use in the control of revolving doors.

Other and further objects of my invention reside in the apparatus and control system, hereinafter described in more detail with reference to the accompanying drawings, in which:

Figure 1 is a view in elevation of a revolving door assembly showing the location of radiant energy control means at the doorway opening; Fig. 2 is a horizontal cross-sectional view of the revolving door assembly taken on line 2—2 of Fig. 1; Fig. 3 is a side elevational view of means for mounting a source of radiant energy in combination with a revolving door assembly; Fig. 4 is a vertical cross-sectional view of the mounting means shown in Fig. 3; Fig. 5 is a vertical sectional view taken on line 5—5 of Fig. 4; Fig. 6 is a horizontal cross-sectional view taken on line 6—6 of Fig. 4; Fig. 7 is a cross-sectional view taken on line 7—7 of Fig. 4; Fig. 8 is a cross-sectioned view of the radiant energy mounting means taken on line 8—8 of Fig. 4; and Fig. 9 is a detailed view of the parts of a secondary casing included in the radiant energy mounting means of Fig. 3.

My invention is directed to a motor driven revolving door system whereby the revolving door may be started and stopped automatically under the control of any person approaching the revolving door and intercepting a beam of energy for effecting operation of the revolving door. My invention contemplates many arrangements of energy beams with respect to the principal layout of the revolving door. I may employ a light source in combination with a photoelectric cell, or I may employ an emitter of infra-red rays in combination with an infra-red ray detecting device for controlling the circuits and mechanism for operating the revolving door. In certain installations of the system of my invention I locate the light source or infra-red ray emitter adjacent the floor at the entrance side of the revolving door and arrange the photoelectric cell or infra-red ray detector with respect to the light source or infra-red ray emitter in such position that persons approaching the entrance of the revolving door intercept the light beam or the energy beams of infra-red rays.

The photoelectric cell or infra-red ray detector is connected in a control circuit having a number of special features. The photoelectric cells or infra-red ray detectors on opposite sides of the revolving door each connect with the input circuit of an electron tube amplifier provided with relay means for controlling a motor starting relay and the circuits of an adjustable timer adapted to operate after a predetermined period corresponding to a desired cycle of operation of the revolving door. The control relay that responds to the operation of the adjustable timer releases the starting relay and opens the circuit to the driving motor which has high torque and minimum electrical and mechanical lag. The motor drives a speed reducer whose slow speed shaft connects with a combination friction and overrunning clutch system and the driving gear mechanism which operates the revolving door assembly.

There are a number of special features involved in the combination clutch system employed as it is essential that the clutch system operates positively in accordance with control impulses received from the photoelectric cell or infra-red ray detector. The revolving door is capable of being operated automatically by the driving motor and/or manually in the event that the photoelectric cell or infra-red ray detector control circuit may be disconnected or fail to respond. This automatic and/or manual operation is accomplished by providing an overrunning

clutch which when driven from the motor mechanism imparts movement to the revolving door but allows the revolving door to be manually rotated without imparting any motion to the driving mechanism. And in combination with the overrunning clutch, I provide a friction clutch which prevents injury to persons and property and the mechanism of the door itself by allowing slippage in the automatic driving system should the door become jammed for any reason. The overrunning clutch permits operation of the door when the driving motor is inoperative, whereas the friction clutch permits operation of the driving motor when the door is jammed; for maximum efficiency, therefore, the overrunning clutch is connected with the revolving door shaft, and the friction clutch with the shaft of the driving motor.

Referring to the drawings in more detail, Fig. 1 is an exterior view of the revolving door assembly with the wall of a building indicated at 1, and the revolving door wings at 2. As indicated in Fig. 2, the door is arranged to rotate in the conventional counterclockwise direction and persons therefore enter the revolving door substantially as indicated by arrow 3, that is at the right of the doorway opening. A corresponding condition exists at the inside approach to the revolving door where persons enter substantially as indicated by arrow 4. I take advantage of this circumstance to assure operation of the revolving door automatically by any person following arrows 3 or 4, by positioning a source of radiant energy in mounting means indicated generally at 5, adjacent the floor, and radiant energy detecting means indicated generally at 6, adjacent the upper portion of the revolving door. The source at 5 is arranged to direct radiant energy diagonally upward from its position adjacent the floor to the detecting means at 6 along the line indicated at arrows 7, which as indicated in Fig. 1, is necessarily crossed by any person entering the revolving door. The corresponding source at 5' and detecting means at 6' at the opposite side of the revolving door are similarly arranged as shown in Fig. 2 with the source 5' adjacent the floor beside the line of approach indicated at 4.

The trolley mechanism indicated generally at 8 in Fig. 1 may be rotated to a position at the side of the revolving door drum, when the revolving doors are folded. I may provide any suitable supporting means for the wings 2 of the revolving door to permit the door wings to be folded. The supporting means are shown generally at 10 in Fig. 1 and are preferably of the type shown in Patent No. 2,081,774, issued to John W. Shields on May 25, 1937, for Revolving door mechanism.

The mounting means for the source of radiant energy, shown generally at 5, 5', Figs. 1 and 2, is shown in detail in Figs. 3–9 as comprising a fixed casing 26, having a flanged supporting base 27 which is secured to the foundation, and a secondary casing 28 provided with a cover 28*a* and mounted in the fixed casing 26. As shown more clearly in Fig. 4, the secondary casing 28 has arcuate upper and lower walls described about the center of pivotal supports at 29. The source of radiant energy is shown as an electric lamp 93 mounted in fixed relation to the cover 28*a*, and a projection lens system is provided at 30 mounted in the cover 28*a* for cooperation with lamp 93 to direct a beam of light energy diagonally upward from the mounting means.

The angle of inclination of the light beam is determined by movement of the secondary casing 28 on the pivotal supports at 29, and fixed in determined relationship for a given installation by bolt means indicated at 31. As the exact position of the secondary casing 28 is indeterminable prior to actual installation of the apparatus, I prefer that the openings for the bolt means 31, in both the fixed casing 26 and the secondary casing 28 be not drilled until final adjustment of the inner casing 28 for proper direction of the light is decided upon; it will be understood, however, that any equivalent adjustable locking means may be provided in lieu of the bolt means 31. Electrical connection is made to lamp 93 by conductor means 32 which may be conveniently led upward through the foundation and the supporting base 27, thence through an opening 26*a* in the fixed casing 26 to lamp 93 in the secondary casing 28, the back of the secondary casing being open, as shown. Ventilation may be provided in the mounting means, as by apertures 33 in the upper portion and openings 34 in the bottom of fixed casing 26.

The operation may be summarized as follows. Upon a person's entering the revolving door at one side, the light beam is interrupted for controlling suitable relay mechanism which controls the driving motor for actuating the door.

Because of the diagonal arrangement of the light beams, which places the beams generally above the fields of movement of persons leaving the revolving door, the sequence of operation is ordinarily not repeated by the same person after his passage through the doorway. Persons in succession entering the door at either side repeatedly operate the control means so that the relay and control system is not allowed to release until the last person has passed out of the door and the time period of the control system, initiated by the movement of the last person across one or the other of the light beams, has run.

While I have disclosed my invention in a preferred form, I desire it understood that modifications may be made in the form and arrangement of the various elements, including the revolving door construction and the control and operating means, within the scope of the following claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A light beam projecting system comprising a support, a casing carried by said support and terminating in a substantially hood shaped structure open at one side thereof, a secondary casing having a substantially curved wall structure extending into the open side of said hood shaped structure, means for pivotally mounting said secondary casing for angular movement of the substantially curved wall structure of the secondary casing with respect to the hood shaped structure of the first mentioned casing, while maintaining a substantially light tight connection therewith, a light source mounted within said secondary casing, a lens system carried by said secondary casing for projecting a beam of light from said light source, and means for fixing the angular position of said secondary casing with respect to said first mentioned casing.

2. In a light beam projection system, a support, a casing carried by said support, said casing terminating in a substantially hood shaped structure of polygonal section open at one side thereof, a secondary casing of correspondingly shaped polygonal section and curved wall structure extending into the apertured side of said hood

shaped structure and forming a substantially light tight connection therewith, means pivotally mounting said secondary casing with respect to said hood shaped structure, a light source mounted in said secondary casing, light beam focusing system carried by said secondary casing in alignment with said light source for directing a beam of light in a predetermined direction dependent upon the angular position of said secondary casing with respect to said hood structure, and means for fixing said secondary casing in a selected position with respect to said hood structure.

THURLOE M. HAGENBOOK.