May 8, 1934. E. J. VALLEN 1,957,509

APPARATUS FOR MOVING OBJECTS

Filed April 8, 1931

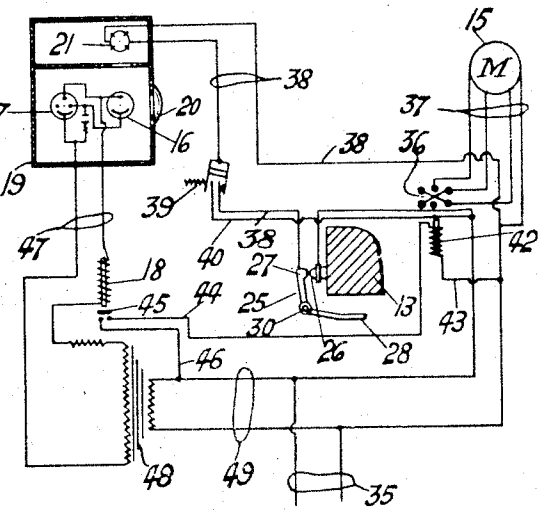


Fig. - 3

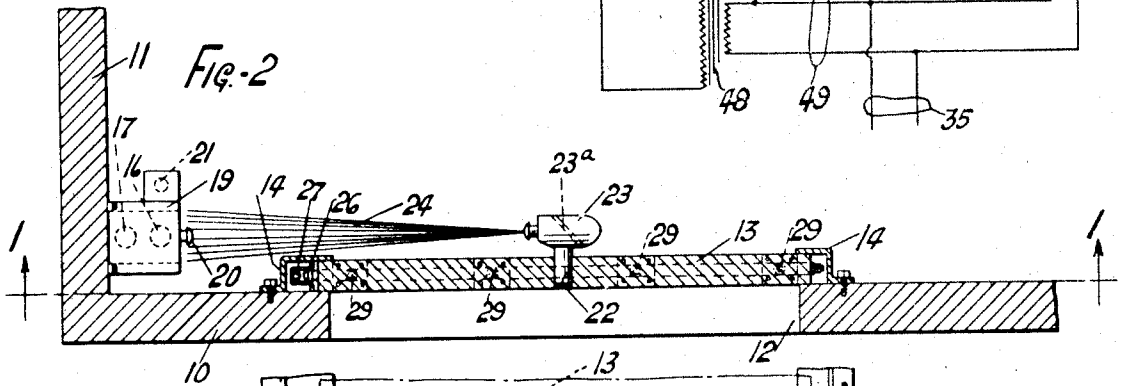


Fig. - 2

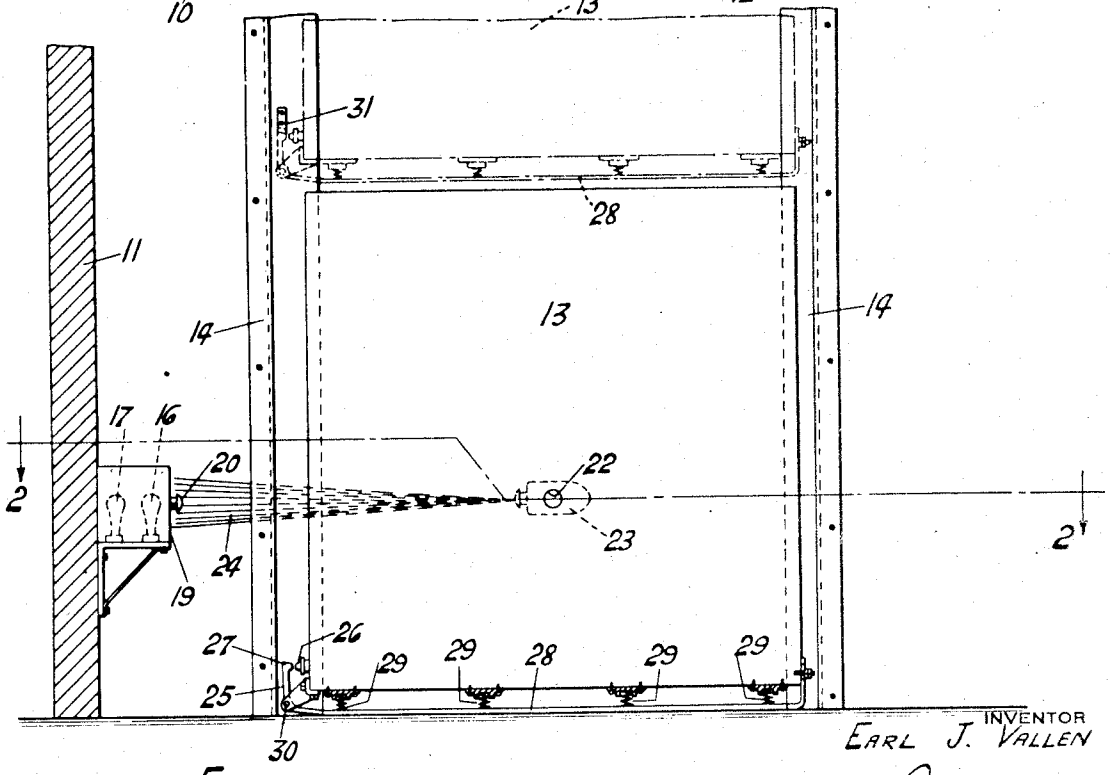


Fig. - 1

INVENTOR
EARL J. VALLEN

BY Ely & Barrow

ATTORNEYS

Patented May 8, 1934 1,957,509

UNITED STATES PATENT OFFICE

1,957,509

APPARATUS FOR MOVING OBJECTS

Earl J. Vallen, Akron, Ohio

Application April 8, 1931, Serial No. 528,593

20 Claims. (Cl. 250—41.5)

This invention relates to apparatus for moving objects, and more especially it relates to automatic apparatus for determinately changing the relative positions of objects contingent upon conditions of light or darkness.

The invention is especially useful in combination with doors, such as garage doors, as a means by which the driver of a motor vehicle may cause a garage door to open without manual effort on the part of himself or others, and without requiring him to leave his vehicle.

The chief objects of the invention are to save time and labor in the moving of objects; to provide automatic apparatus for moving objects from one determinate position to another; to provide means whereby the apparatus may be manually set in motion; to provide a safety feature whereby movement of the object will stop upon the encountering of an obstacle; and to provide light-sensitive apparatus that will continue to function after passing out of the range of the light that initially set it in motion.

Of the accompanying drawing,

Figure 1 is a front elevation of a door and light-sensitive apparatus associated therewith for opening and closing the door, the figure being a section on the line 1—1 of Figure 2;

Figure 2 is a section on the line 2—2 of Figure 1; and

Figure 3 is a wiring diagram of the apparatus embodying the invention.

Referring to the drawing, 10, 11 respectively are the adjacent walls of a building such as a garage, 12 is a doorway in the wall 10, and 13 is a door of the vertically movable type in the doorway 12, said door moving in slideways formed by laterally positioned brackets 14, 14. For raising and lowering the door 13 there is provided a reversible motor 15, shown diagrammatically in Figure 3, which motor is connected to the door in any known or desired manner.

The light sensitive apparatus controlling the operation of the motor 15 is the usual commercial unit comprising a photo-electric cell 16, grid-glow tube 17 and relay 18, said apparatus being self-contained in a receptacle 19 that may be mounted for convenience upon the garage wall 11. The receptacle 19 is provided with a lens 20 through which light is admitted to the photo-electric cell 16 to energize the apparatus, and the receptacle 19 also houses an ordinary electric lamp 21 which is adapted to be lighted automatically to keep the light-sensitive mechanism in operation after its initial energization.

The apparatus is designed to be operated, to raise or open the door 13, by light from the head-lamps of an automobile. Accordingly the door is formed with an aperture 22 at about the height of the ordinary automobile head-lamps, and behind said aperture is a device 23 containing an angularly-disposed mirror 23ª that deflects the light-rays entering the aperture 22 and diverts them toward the lens 20 of the receptacle 19 that houses the light-sensitive apparatus. The reflecting device 23 may be positioned far enough back of the door 13 so that only rays of light directed against the door 13 substantially from in front of the same will pass through the aperture 22 and reach the reflector in the device 23. The device 23 may be disposed in a number of angular positions so as to direct a beam of light 24 toward the lens 20 of the receptacle 19, thus permitting the latter to be mounted in the most suitable of a number of positions. It will be obvious that the device 23 will direct light rays toward the lens 20 only from one position of the door 13, and in the position the door is closed, as shown in full lines in Figure 1.

Mounted upon the door 13 near the bottom thereof is an electrical switch 25 comprising a stationary contact 26 and a movable contact 27. The latter has an extension 28 positioned along the bottom margin of the door 13 and yieldingly held in determinate spaced relation thereto by compression springs 29, 29. The contact structure 27, 28 is pivotally mounted at 30, the arrangement being such that when the door is closed the contacts 26, 27 are separated and the switch 25 is open. Opening of the door 13 permits the springs 29 to expand and thereby to move the extension 28 in a manner to close the switch 25. A cam or other suitable device 31 is mounted upon a guide bracket 14 or the wall 10 in position to engage the movable contact member 27 when the door is fully opened, and to move said contact member to open the switch 25.

Referring to the wiring diagram shown in Figure 3, the apparatus is operated by 110 volts of electrical current brought to the apparatus over power lines 35 which are connected to a reversing switch 36 and motor 15. Leads 37 extend from the reversing switch and one power line to the reversible motor 15. Leads 38 extend from the power lines to the lamp 21. In one side of the line 38 is the switch 25, and in the same side of the line is a single-throw, two-blade, break-before-make switch 39, one blade of which normally keeps the line 38 closed, and the other blade of which is adapted to make contact with a lead 40 connected to one side of the power lines 35.

The reversing switch 36 of a well-known type is operable from neutral position to a position with the leads connected in one way, back to neutral and then to a position with the leads reversely connected and again to neutral, and so on in succession upon each actuation of the switch. It is arranged to be operated first in the usual way by a solenoid 42, one conductor 43 of which extends to one side of the power line 35, its other conductor 44 extending to a contact member 45 operated by the relay 18, the member being adapted to connect the conductor 44 to a lead 46 extending to the other side of power line 35. The relay 18 is mounted in one side of line 47 that connects the light-sensitive mechanism with the high side of a transformer 48, the low side of the latter being connected to the power line 35 by conductors 49.

Operation.—When the door 13 is closed the respective elements of the apparatus, including electrical mechanism, are in the normal positions shown in the drawing, the reversing switch 36 being in neutral position. Whenever a vehicle with head-lamps lighted drives toward the door 13, such light from the lamps as passes through the aperture 22 in the door is deflected by the device 23 and projected in a beam 24 against the receptacle 19, some of the light passing through the lens 20 therein and falling upon the photo-electric cell 16. The latter is thereby activated and varies the current flowing through conductor 47 so that the relay 18 is operated to throw the contact member 45 across lines 44, 46 whereby power from the line 35 is conducted to the solenoid 42 and operates the later to throw the reversing switch 36 to one of its alternative operative positions whereby power from the line 35 is conducted to the motor 15. With the door 13 closed as shown, the switch 36 will be thrown into the position whereby the motor will be driven in the direction to raise the door.

As the door 13 rises, which causes the beam of light 24 to move away from the lens 20 or to be extinguished as the aperture 22 passes out of the beam of light from the vehicle head-lamps, the springs 29 move the member 28 so as to close the switch 25 whereby current from the leads 35 flows through conductors 38 to the lamp 21 and lights the same, thereby continuing the operation of the photo-electric device and assuring continued rotation of the motor 15. When the door reaches its uppermost position indicated in broken lines in Figure 1, the member 27 of the switch 25 is engaged by the cam 31 and the switch thereby opened, thus darkening the lamp 21 and terminating the activity of the photo-electric cell whereby the contact member 45 is moved out of engagement with the conducts 44, 46 and power cut off from the solenoid 42. The latter is thereby caused to assume its normal condition and moves the reversing switch to a neutral position which cuts off power to the motor 15 and stops the same.

When it is desired to lower the door 13 it is only necessary to press the switch 39. This opens one side of the line 38 through the switch 25 to the lamp 21 and connects the lamp with power from the line 35 through conductor 40 about the switch 25. Lighting of the lamp 21 causes the other elements of the apparatus to function in the manner previously described except that the reversing switch 36 is thrown to connect the power leads in the opposite direction to reverse the direction of current flowing to the motor 15 whereby the latter is driven in the direction to lower the door 13. When switch 39 is released after the door starts to close, switch 25 maintains the circuit to lamp 21 to continue the closing operation. The apparatus is restored to inoperative condition when the member 28 on the bottom of the door reaches the floor and is moved against the pressure of the springs 29, to open the switch 25.

The arrangement of the switch-extension 28 upon the bottom of the door is a safety feature that assures stopping of the closing movement of the door if an obstacle is encountered in its path.

The apparatus is automatic in its door opening operation, and is of especial utility for public garages that are open all night. Such garages employ but few operators for night work, and this invention makes it possible to keep the garage doors closed, without requiring a patron to remain outside and sound his horn to arouse an employee before gaining admittance.

The photo-electric mechanism may be adjusted so as not to function except when actuated by light of determinate minimum brilliance, and the distance from the front of the door to the deflecting device 23, through the aperture 22, is such that only those light rays directed at the door from substantially in front of the same will reach the deflecting device, thus reducing the possibility of unintentional opening of the door.

Although the door 13 is shown as a vertically moving door, the invention is equally applicable to horizontally moving doors, or doors mounted upon hinges.

The invention may be modified within the scope of the appended claims which are not limited wholly to the exact constructure shown and described.

What is claimed is:—

1. In apparatus for moving objects, the combination of means for propelling the object, stationary light-sensitive mechanism controlling the propelling means, means on the object for illuminating the light-sensitive mechanism to initiate actuation of the same, and means controlled by movement of the object for continuing operation of the propelling means independently of the aforesaid means on the object.

2. In apparatus for moving objects, the combination of means for propelling the object, stationary light-sensitive mechanism controlling the propelling means, means on the object for diverting a beam of light that falls thereon onto the light-sensitive mechanism to initiate actuation of the same, and means controlled by movement of the object for continuing operation of said propelling means independently of the said means on the object.

3. A combination as defined in claim 2 in which the light-diverting means is so positioned as to receive and divert only such light rays as are directed toward it from a limited range of positions.

4. Apparatus as defined in claim 2 in which the light-diverting means comprises a mirror.

5. In apparatus for moving objects, the combination of means for propelling the object, stationary light-sensitive mechanism controlling the propelling means, means on the object effective upon directing a light-beam toward the same for illuminating the light-sensitive mechanism to initiate actuation of the same, and means independent of said means on the object for continuing the operation of the propelling means after the light-sensitive mechanism is no longer illuminated by the light-beam that initially actuates it, by reason of the movement of the object, said,

last named means being controlled by movement of the object.

6. In apparatus for moving objects, the combination of means for propelling the object, light sensitive mechanism controlling the propelling means, means for actuating the light sensitive mechanism by light from an extraneous source to operate the propelling means in one direction, and means independent of the last-named means for maintaining the operation of the propelling means in said direction after the light from the extraneous source is no longer applied to said actuating means, said last-named means being controlled by movement of the object.

7. In apparatus for moving objects, the combination of means for propelling the object, light sensitive mechanism controlling the propelling means, means on the object for illuminating the light-sensitive mechanism with light from an extraneous source to initiate actuation of said propelling means, and means for illuminating the light-sensitive mechanism for continuing the operation of the propelling means after the illuminating means on the object has moved out of range of light from the extraneous source.

8. A combination as defined in claim 7 in which the illuminating means on the object is a light-deflecting device comprising a mirror.

9. In apparatus for moving objects, the combination of means for propelling the object, light-sensitive mechanism controlling the propelling means, means on the object for illuminating the light-sensitive mechanism to initiate actuation of the same upon directing a light beam toward the object, and means for illuminating the light-sensitive mechanism to continue the operation thereof after it is no longer illuminated by the light-beam that initially actuates it, by reason of the movement of the object.

10. In apparatus for moving objects, the combination of means for propelling the object, light-sensitive mechanism controlling the propelling means, means on the object for actuating the light-sensitive mechanism by light from an extraneous source to initiate actuation of the propelling means, and means for illuminating the light-sensitive mechanism to continue operation of the apparatus after the light from the extraneous source is no longer applied to said actuating means by reason of the movement of the object.

11. In apparatus for moving objects, the combination of means for propelling the object, light-sensitive mechanism controlling the propelling means, light-deflecting means on the object for illuminating the light-sensitive mechanism with light from an extraneous source to initiate actuation of the propelling means, and means for illuminating the light-sensitive mechanism to continue the operation of the apparatus after the light-deflecting means has moved out of range of the extraneous light-source by reason of movement of the object.

12. In apparatus for moving objects, the combination of means for propelling the object, light-sensitive means controlling the propelling means, means on the object for actuating the light sensitive means with light from an extraneous source to initiate actuation of the propelling means, and means for illuminating the light-sensitive means whenever the object-propelling means is in operation.

13. A combination as defined in claim 12 including means for extinguishing the last-mentioned illuminating means when the object has moved a determinate distance.

14. In apparatus for moving objects, the combination of means for propelling the object in two directions, light-sensitive mechanism controlling said propelling means, means for illuminating the light-sensitive means with light from an extraneous source to actuate the same to move the object in one direction, and manually operable means for actuating the light-sensitive mechanism to move the object in another direction.

15. A combination as defined in claim 14 in which the object-propelling means is constructed to operate alternately in opposite directions.

16. In apparatus of the character described, the combination of a door formed with an aperture, power means for opening the door, stationary light-sensitive mechanism controlling said door-opening means, and light-deflecting means so arranged with relation to the aperture in the door as to deflect light-rays passing therethrough onto the light-sensitive apparatus to actuate the same.

17. A combination as defined in claim 16 in which the light deflecting means is so positioned with relation to the door-aperture as to be reached only by such light rays as are directed toward the aperture from a limited determinate range of positions.

18. A combination as defined in claim 16 in which the door-opening means is adapted also to close the door, including means for stopping the operation of said means automatically as the door becomes fully opened or fully closed.

19. In apparatus of the character described, the combination of a power circuit including a reversible motor, a reversing switch in said circuit, a coil circuit including a magnetic coil for operating said reversing switch, a circuit including light-sensitive mechanism adapted to connect the coil circuit to the power circuit, a lamp circuit so connected as to light the lamp when the motor is running, said lamp being adapted to actuate said light-sensitive mechanism, and means operable by said motor for connecting the lamp circuit to the power circuit.

20. A combination as defined in claim 19 including means in the lamp circuit adapted to connect said circuit with the power circuit independently of the connecting means operable by the motor.

EARL J. VALLEN.