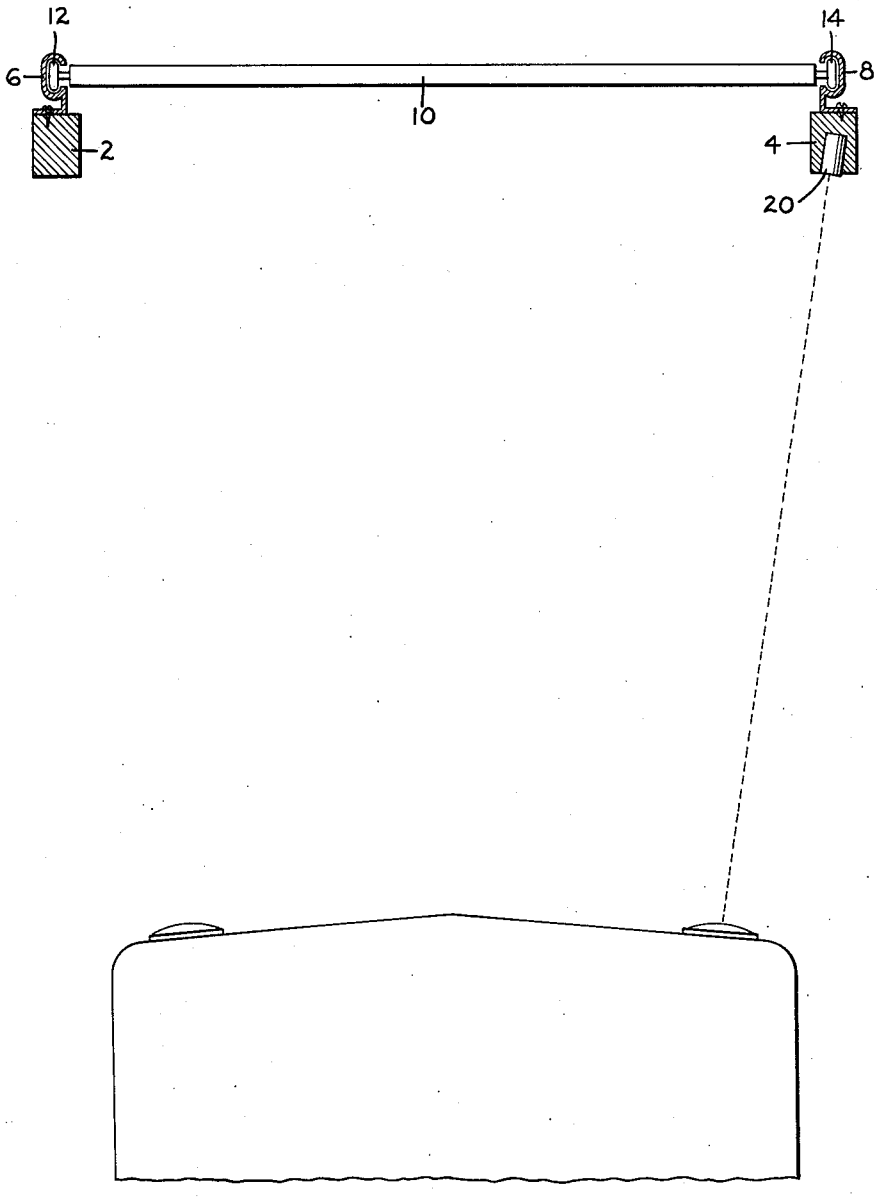
May 22, 1962 F. A. PURDY 3,036,256

BAFFLE PARTITIONED CAPSULE FOR DOOR OPERATORS

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FIG.1.



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BAFFLE PARTITIONED CAPSULE FOR DOOR OPERATORS

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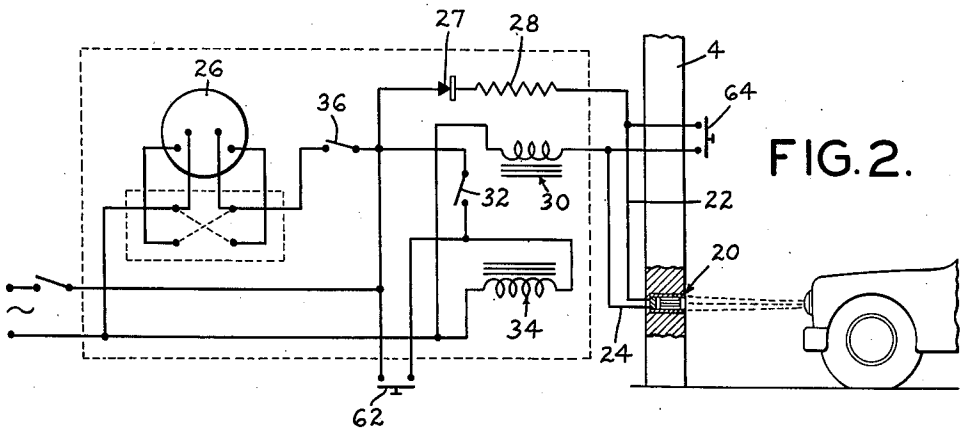


FIG. 2.

FIG. 3.

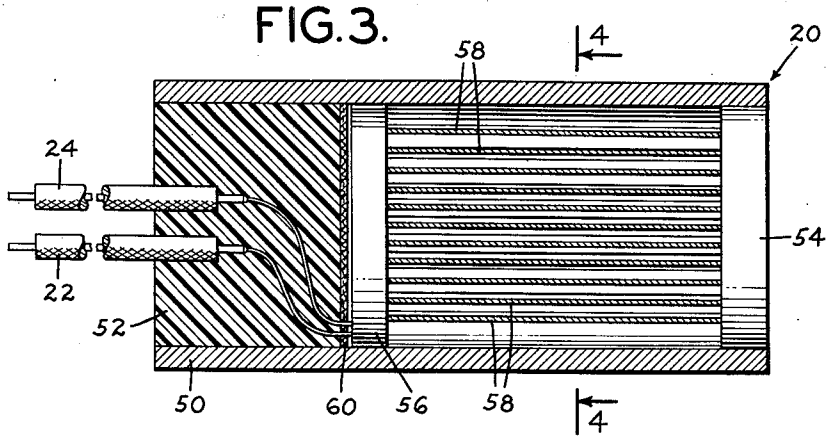
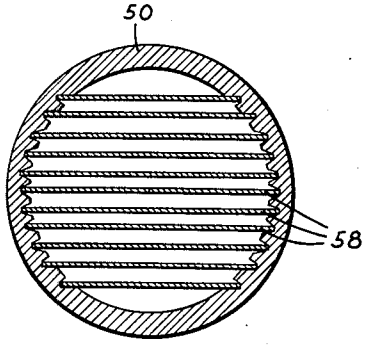


FIG. 4.



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BAFFLE PARTITIONED CAPSULE FOR DOOR OPERATORS

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2 Claims. (Cl. 318—480)

This invention relates to door operators and controls therefor and, more particularly, to devices for opening, closing and controlling the operation of, doors at garages, residential and commercial, by the utilization of artificial light, such as the headlamp beam of an automobile.

Proposals heretofore have been made for the automatic operation of garage doors utilizing the headlight beam to control the opening and closing of the door. Such devices have been employed, primarily, on the overhead type of garage door consisting of a plurality of horizontally arranged panels, hinged together, and operable from a vertical closed position to a horizontal overhead open position on tracks or channels attached to the door frame and disposed vertically and horizontally at opposite ends of the panels.

In copending application Serial No. 687,509 there is disclosed and described an automatic control system for such a door in which the headlight beam from an automobile, truck, or the like, is employed to energize a light-sensitive cell which, in turn, controls a motor to move the door into an opened or closed position, as the case may be. In the device of the copending application, light from the headlamps is first applied to and then withdrawn from a capsule containing the light-sensitive cell to cause a flow of electric current to the motor, the motor moving the door to the opened and closed position. In the event the application of light to the capsule is not withdrawn within a predetermined time interval, provision is made for preventing actuation of the motor and, thereby prevent the actuation of the door.

The actuation cycle, that is, first applying the headlight beam to the capsule and, thereafter, withdrawing the beam before the lapse of a predetermined time interval, is provided so that the actuation of the door may be effectively controlled at the will of the operator without actuation of the door by inadvertent application of light to the light-sensitive cell of the capsule which might be occasioned by vehicles entering the driveway or by ambient light admitted to the capsule due to the position of the sun, such as at sunrise or sunset, or from reflected ambient light which might occur from snow, lightning, or the like.

Since such cells are light sensitive, that is, are actuated by light being applied thereto, when such cells are utilized as an actuator for a garage door circuit, provision must be made so that the cell is not sensitized by ambient light but will be sensitized when light above a predetermined amplitude is applied thereto in order that the cell might energize the circuit to which the cell is attached. With a garage door actuator, the light amplitude at which the cell is sensitized to energize the circuit and to actuate the door must be of amplitude which can readily be furnished by a light source on the vehicle, such as the vehicle headlights, both in daytime and at night. Hence, it has been the practice to shield the light-sensitive cell of the capsule from ambient light such as daylight and to adjust the flow of current at the cell by a potentiometer with such accuracy that, even with natural light reaching the cell to an appreciable extent, the motor circuit and the door will not be actuated, while an addition of headlight rays will be thus effective, this adjustment being so fine as not to incapacitate the limited headlamp beam, at night, unaided by daylight, to produce the required flow. Since the amplitude of the beam which can be obtained from the vehicle, as from the headlights, is limited, it is necessary, while more effectively shielding the cell of the capsule from ambient light, to provide free access to the cell for the headlight beam.

In order to shield the cell as far as possible from ambient light and, at the same time, provide access to the cell by the headlight beam of a vehicle, in the past, the capsule containing the light-sensitive cell has included a long, narrow tube horizontally positioned in the door frame with the light-sensitive cell positioned at its inner end. While such positioning of the light-sensitive cell at the inner end of the tube has to some extent shielded the cell from ambient light, it has rendered the door actuation more difficult in that the headlight beam of the vehicle must be aimed into the tubing from a particular position in order that the light beam might strike the cell and not be deflected away from the cell by the side walls of the tube. This aiming of the headlight beam has required straight line alignment of the complete car body with the bore of the tube in order that the light beam might pass straight into the tube. To a large extent, where a long narrow tube has been used, the aiming of the light beam can be compared with attempting to fire a bullet through a narrow tube where the muzzle of the gun is positioned at some distance away from the end of the tube. Like the rifle, the headlight beam requires careful aiming in order that the beam strike the cell at the far end of the tube deflection by the side walls of the tube. As can be readily seen, the need for careful aiming of the headlight beam in order to actuate the light-sensitive cell to operate the motor circuit and the door, has distinct disadvantages. In addition to the inherent disadvantage of the straight line alignment of the complete car body with the bore of the tube, due to the thickness of the door-framing or trim used in conventional construction, the long capsules cannot be angularly accommodated in the trim but, in order to be positioned within the trim, must be aligned substantially straight into the trim. Thus aligned in the trim, the axis of the tube projects along the edge of the driveway. The alignment of the vehicle with the bore of the tube perforce brings the vehicle inconveniently to the very edge of the driveway.

It is an object of this invention to provide an improved capsule containing a light-sensitive cell for use in automatically operated garage doors.

It is a further object of the invention to provide such a capsule which is compact and which may be actuated by an artificial light applied over a wide range of angles.

It is a still further object of this invention to provide such a capsule which is compact and which may be readily installed within the confines of a door frame conventionally used with overhead doors.

A still further object is to provide a capsule so compact that, even in door-framing or trim of relatively thin cross-section, the capsule may be pointed toward the appropriate position of the vehicle headlight when the vehicle is normally midway of the driveway, instead of the capsule being confined to a position parallel with the sides of the framing or trim members, requiring the vehicle to be brought over toward the edge of the driveway, or farther than otherwise necessary.

These and other objects of the invention will be more readily apparent from the attached drawings of an embodiment of the invention, in which:

FIG. 1 is a plan view, partly in section, of an embodiment of the invention;

FIG. 2 is a diagrammatic sketch of a typical wiring diagram for an automatic door operator in which the light-sensitive capsule of the invention is employed;

FIG. 3 is a side view, somewhat enlarged and partly in section, of an embodiment of the invention; and

FIG. 4 is a view along the lines 4—4 of FIG. 2.

In the illustrated form of the invention, a capsule containing a light-sensitive cell, is positioned horizontally in

the door frame to receive a beam of light from the headlights of an approaching vehicle and, through the beam rays, the light-sensitive cell is sensitized, thereby closing a switch in a motor circuit to energize the motor and open or close the door, as the case may be. The capsule comprises a housing which is closed at its inner end and provided with a transparent or translucent opening at its outer end. The cell of light-sensitive material is positioned adjacent the closed end of the housing and is connected by wires to an appropriate switch in the motor circuit. Between the light-sensitive cell and the transparent or translucent end, a plurality of horizontal baffles are spaced vertically in the housing to permit light rays applied parallel to the planes of the baffles to reach the cell and, at the same time, to deflect and absorb rays of light which are applied non-parallel to the planes of the baffles, thereby preventing actuation of the light-sensitive cell by light rays which are applied non-parallel to the planes of the baffles.

Referring now to FIG. 1, there is shown vertical door frame elements 2 and 4 carrying tracks 6 and 8 and a door 10 between the frame members 2 and 4, the door 10 being provided at its ends with rollers 12 and 14 operable in tracks 6 and 8 respectively. A capsule, generally indicated as 20, is horizontally positioned in frame member 4. It is to be understood, however, the capsule may be positioned in the frame member 2 or in any other appropriate stationary member.

Referring now to FIG. 2, the capsule 20 is attached by leads 22 and 24 to the supply circuit of motor 26. Motor 26 is connected to door 10 to drive the door into an open or closed position in any appropriate manner, such as that disclosed in copending application Serial No. 687,509. Leads 22 and 24 are connected to a rectifier 27, resistor 28, and to relay 30 of solenoid switch 32, solenoid switch 32 being connected to a second relay 34 which energizes a second solenoid 36 for reasons more specifically set forth in my copending application.

Referring now to FIGS. 3 and 4, the capsule 20 comprises a housing 50 of metal, plastic, or any other suitable material, the housing 50 being provided at its inner end with a closure 52, which may be sealing wax, plastic, or the like, poured in to consolidate the wire, and its outer end with a transparent or translucent cover 54. Intermediate the closure 52 and cover 54 and adjacent the closure member 52, a light-sensitive cell 56 is vertically positioned in the housing 50. A plurality of baffles 58 are positioned horizontally between the cover 54 and cell 56, the baffles 58 being spaced vertically to form unrestricted parallel horizontal passages for light rays from the cover 54 to the cell 56. A gasket 60 of rubber, cork, or similar material, may be positioned between the closure 52 and cell 56, the closure 52 being provided with suitable passages for leads 22 and 24.

As best shown in FIG. 2, the capsule 20 is positioned in the door frame 4 horizontally and at a height substantially corresponding to the headlight beams, it being understood, of course, where the driveway and, hence, the approach of the vehicle to the door, is on an incline, the position of capsule 20 in the door frame may be adjusted in order that the light rays from the headlights will pass into the cell 20 along lines substantially parallel to the planes of the baffles 58. In practice, it is preferred to make the hole in the frame slightly larger than housing 50 and, after positioning the housing in the frame so that the light rays will enter the capsule along lines substantially parallel to the baffles, to apply putty or caulking around the capsule to hold the capsule, properly positioned, in the frame. In this manner, the capsule may be adjusted should the adjustment of the headlights be changed.

The light-sensitive cell 56 may be any suitable device which, when lighted, provides flow of electric current and when dark reduces or terminates such flow. It may be a crystal, such as shown in application Serial No. 473,572, filed December 7, 1954, now abandoned or Serial No. 750,284, filed July 21, 1958, now Patent No. 2,986,689; or it may be a self-generating or voltaic cell having a light-sensitive material bonded to a metal disc which generates electric current when lighted; or it may be a junction-type semiconductor, such as shown in U.S. Patent 2,641,713, or it may be any other device of a similar nature attached for the purpose.

In operation, light from sources above and below the open end of the capsule enter the open end of the housing along lines which are not parallel to the baffles 58 and, thereby, strike the baffles and are absorbed without actuating the cell. On the other hand, the beams from the approaching headlights enter the capsule along lines parallel to the planes of the baffles and, therefore, strike cell 56, energizing the cell to actuate the relay 30 and solenoid 32, thereby actuating relay and solenoid 34, 36 and motor 26 to open or close the door as the case may be. If, for some reason, it is desired to open or close the door when the vehicle is not present, manual switches 62, 64 are provided to allow manual operation of the door.

The housing 50 may be formed of any suitable material, such as plastic or metal, and the baffles 58 may be formed separately and inserted in appropriate grooves in the housing or may be integrally formed with the housing such as in an extruding operation. It is preferred to coat the surfaces of the baffles and the inside of the housing with a light absorbing material.

Through the invention, positioning of the light-sensitive cell a relatively short distance from the front or open end of the housing is made possible by the baffle design. Hence, while the light-sensitive cell is shielded from sensitization by light rays entering the capsule from sources above and below the capsule opening, light rays which are directed at the capsule along lines parallel to the baffles can reach the light-sensitive cell from sources which are not directly in front of the capsule. Thus, the field from which the cell can be sensitized is substantially widened and the necessity for aligning the vehicle in a straight line with the cell has been reduced. However, not every headlamp beam has an intensity sidewise of its core, such that the sidewise component, entering the capsule on a slant, and directly reaching only part of the cell, can cause enough current-flow to produce door-actuation. Utilization of headlight rays, in the sidewise angular projection of the beam, is a matter of proportioning of such rays out of the maximum head-on potential. Accordingly, the better the capsule may be aimed to receive the headlight beam full-on, the greater is the convenience to the driver in dependability of a casual projection of the beam to effect door-operation. This is particularly the case where the driver prefers to sweep his headlamp beam past the capsule rather than turn the headlamp on and off. In this practice, the driver, while his vehicle is conveniently midway of the driveway may veer the car to approach the beam outside the doorway and capsule, then, at the proper distance straighten the car toward the doorway sweeping the headlamp past the capsule and effecting the application and withdrawal of light to actuate the door. So that, in the angular position of the capsule, the driver is saved the necessity of getting so close to the edge of the driveway as almost to run off of it.

As an example of a capsule which can be readily installed within the door frame, a housing having an outside diameter of ¾", an inside diameter of ⅝", with baffles having a thickness of .005" has been utilized. The over-all length of such capsule is 1⅝" and the light-sensitive cell is positioned one inch from the open end of the housing. In installing such a capsule in a door frame, a one-inch hole is drilled angularly into the door frame in a substantial horizontal plane. The axis of the hole is directed toward the position of the vehicle headlamp with the vehicle normally midway of the driveway. The capsule is positioned in the one-inch hole and, after the capsule is properly aligned, the space between the

housing and door frame is filled with putty, caulking and the like. Thus, the capsule is compact and can be angularly positioned in the conventional door frame with its open end facing toward the position of the vehicle headlamps when the vehicle is midway of the garage driveway, the entire capsule being contained within the confines of the conventional door frame or trim member. Attempts to so angularly position the longer capsules of the prior art have required the complete removal of the frame member and the removal of a portion of the wall behind the frame in order to angularly accommodate the longer cell. Where the garage wall was of brick, concrete, stone or the like, after the trim was removed, the portion of the wall behind the frame had to be chiseled out. After replacing the trim, repainting was usually required. Removal of the trim and chiseling away of a portion of the garage wall was time-consuming and substantially increased installation costs. In addition to the other advantages, the shorter capsule of the instant invention avoids such unnecessary difficulties. In the device of the invention, the baffling of rays of natural light that approach the capsule on angles above and below the horizontal is so substantial that the potentiometer may be discarded in favor of a value adopted at the resistor in a coarse range as between the restriction of current-flow with ambient day-light and the door-actuating current-flow produced by the headlamp at night.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. In a garage door, a frame, a track on said frame, a door operable in said track from a vertical closed position in said frame to a horizontal open position above said frame, a motor for driving said door between said closed position and said open position, a circuit for said motor, a switch in said circuit connecting said motor to said circuit and a capsule for closing said switch, said capsule comprising a housing horizontally mounted in said frame having a closed end and an open end, a light-sensitive cell intermediate said ends and adjacent said closed end, and a plurality of opaque baffles in said housing intermediate said light-sensitive cell and said open end, said baffles being spaced vertically in said housing to provide parallel horizontal passages extending unrestrictedly across the open end of said housing and from said open end to said cell for unrestricted passage of light rays applied from the open end of said housing along lines substantially parallel to said baffles and to deflect light rays from said cell applied along lines which are not parallel to said baffles, whereby a beam of light rays applied along lines substantially parallel to said baffles from a vehicle to said capsule sensitizes said cell to close said switch and operate said motor and said door.

2. A garage door having a frame, a track on said frame, a door operable in said track from a vertical closed position to a horizontal open position, a motor for driving said door between said closed position and said open position, a circuit for said motor, a switch in said circuit connecting said motor to said circuit and a capsule for closing said switch, said capsule comprising a housing having a closed end and an open end having a light-transmitting cover, a light-sensitive cell in said housing adjacent said closed end, a plurality of opaque baffles in said housing intermediate said light-sensitive cell and said open end, said baffles being spaced vertically in said housing to form horizontally disposed planes across said housing to form unrestricted, parallel, horizontal passages for admitting light rays to said light-sensitive cell applied at the open end of said housing along lines substantially parallel to said planes of said baffles and to deflect light rays away from said cell which are applied along lines which are not parallel to the planes of said baffles, whereby a beam of light rays applied to said capsule along lines substantially parallel to the planes of said baffles closes said switch to operate said motor and said door.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,036,256 May 22, 1962

Frederick A. Purdy

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 58, after "of" insert -- an --; column 2, line 25, after "tube" insert -- without --.

Signed and sealed this 9th day of October 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents