July 9, 1963 D. F. MAY 3,096,815

DOOR OPERATING APPARATUS

Filed April 15, 1960 2 Sheets-Sheet 1

FIG. 1

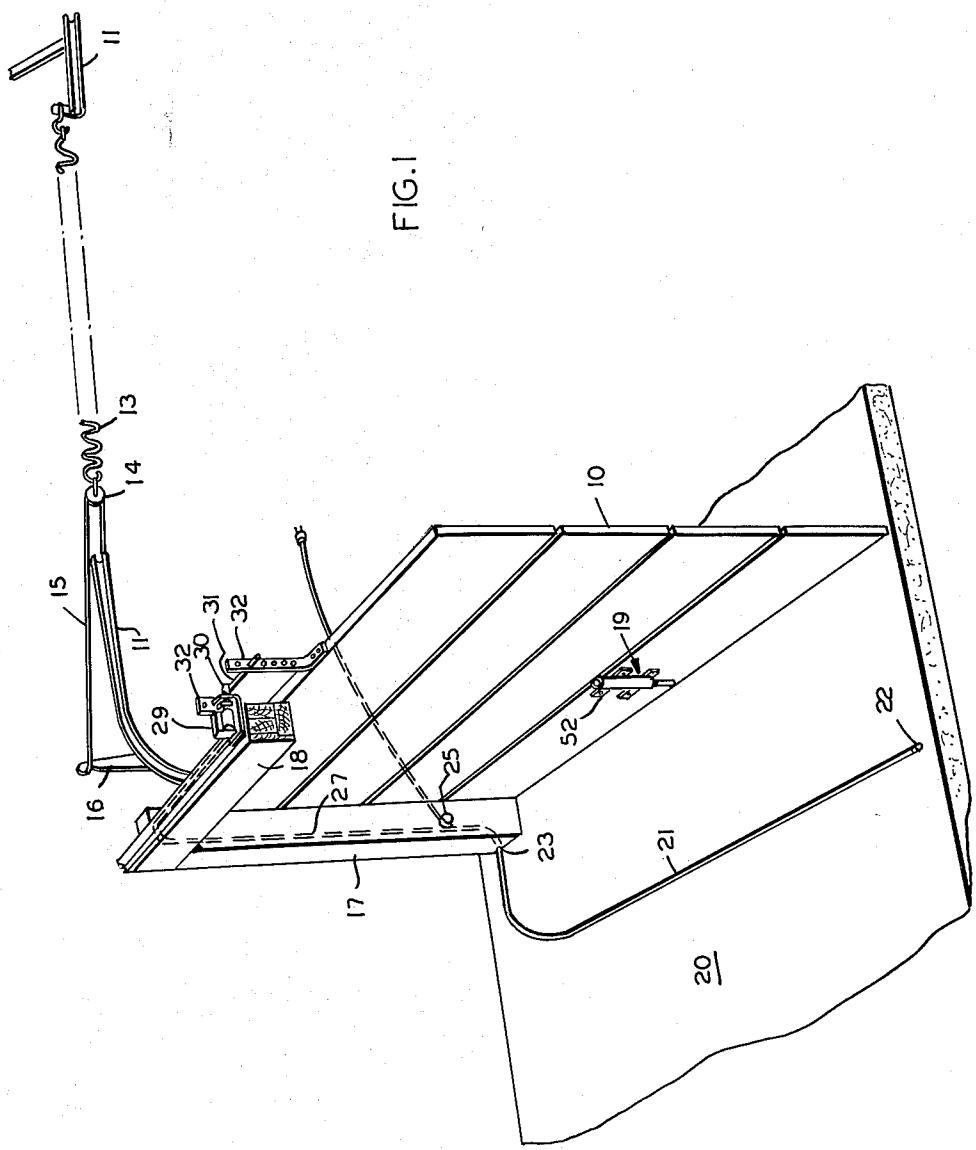
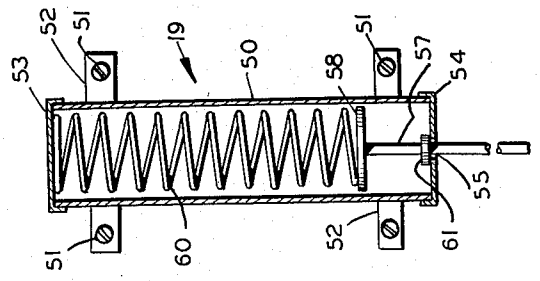


FIG. 6



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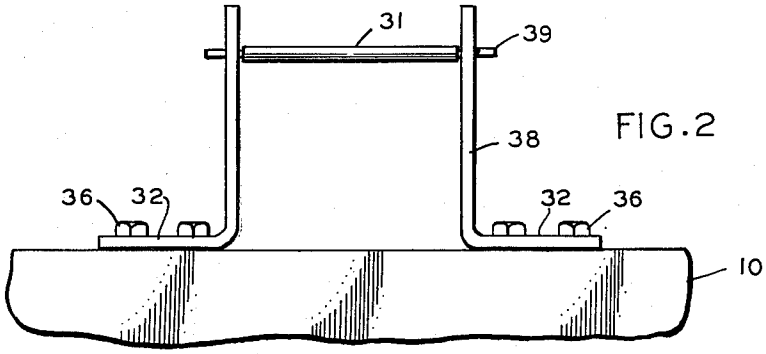

FIG. 2

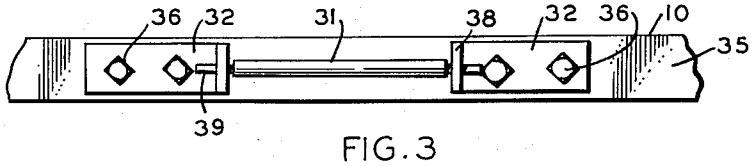

FIG. 3

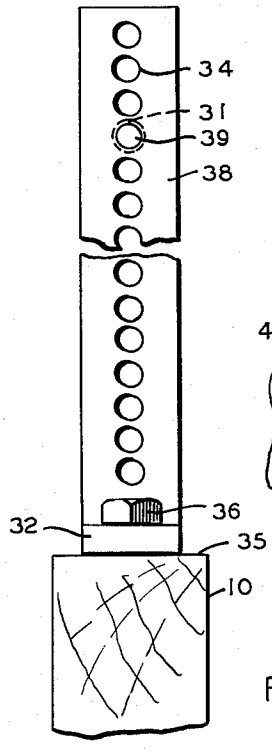

FIG. 4

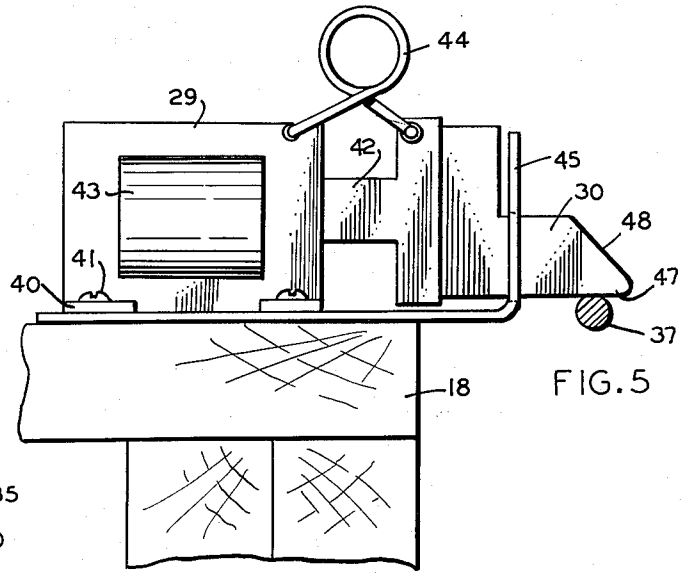

FIG. 5

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DOOR OPERATING APPARATUS

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2 Claims. (Cl. 160—188)

This invention relates to an apparatus for automatically operating a door. More particularly, the invention concerns an apparatus which functions to raise a garage door of the overhead type from closed to open position upon the approach of a vehicle.

While a plurality of systems for opening a garage door are presently known, those which are in use and are operated at the approach of a vehicle by automatic means are complex and costly. Many such systems require the employment of expensive motors to move the door between open and closed positions, in addition to photoelectric relays and a light source from which a constant beam of light emanates. In systems of this type the cost of the various components, as well as the expense of installation, makes purchase prohibitive for a large majority of persons. Moreover, such apparatus are prone to malfunction due to their complexity.

Any system employing a photoelectric cell may easily be actuated by means other than an approaching vehicle. Children and intruders can easily gain access to the garage merely by disrupting the constant beam of light, and animals may also accidentally open the door. In addition, a photoelectric circuit requires a separate switch for turning the light source off and on, further adding to the cost and complexity of the apparatus.

It is a primary obect of this invention to provide apparatus for automatically operating an overhead garage door, which apparatus functions without the use of a motor or photoelectric cell and so is markedly inexpensive in contrast to apparatus employing such devices.

It is another object of this invention to provide apparatus for automatically operating and opening a closed garage door, which apparatus is of such simple construction that it can be installed by a homeowner of average mechanical skill.

It is still another object of this invention to provide apparatus for automatically opening a closed overhead garage door, which apparatus can be actuated only by a heavy object, such as a vehicle approaching the garage.

In accordance with one embodiment of the present invention, apparatus is provided which includes a garage door, means continuously urging the door toward open position, and means for retaining the door in closed position. A fluid reservoir having an elastic portion is disposed in front of the door in position to be contacted and compressed by a vehicle approaching the door. Such compression acts to move the door retaining means to a position in which it releases the door and permits the door to move toward open position.

In one distinctive form of the invention, the means for retaining the door in closed position comprises a roller member mounted on the door at the top thereof and a tongue mounted on the garage itself. In door retaining position the tongue overlies and bears against the roller, blocking movement of the roller and the door past the tongue. When it is desired to open the door, a solenoid or other means is operated to withdraw the tongue from

blocking position. The solenoid is actuated by a fluid pressure responsive switch, which is in turn actuated by the increase in fluid pressure effected when a vehicle compresses an elastic portion of a fluid reservoir disposed at the approach to the garage.

Once opened, the garage door is returnable to closed position by manual or other means. When it reaches closed position, it will again be held in that position by the door retaining means until released upon compression of the fluid reservoir by an approaching vehicle.

Suitable means urging the door toward open position are the springs or weights which are employed in a conventionally constructed overhead garage door to counterbalance the weight of the door. Such springs may be so adjusted, or such weights so increased, that they will not merely make the door easier to lift but will continuously urge the door toward open position. In addition, one or more boosters may be utilized to give an initial extra push to the door as it starts to move away from closed position.

These and other objects, features and advantages of the present invention will become more apparent when taken in connection with the preferred embodiment thereof hereinafter described and illustrated in the accompanying drawings, which form a part hereof, and in which:

FIG. 1 is a perspective view of the embodiment, showing portions of a garage, door and driveway with the apparatus of the invention installed;

FIG. 2 is an enlarged front elevational view of a roller assembly mounted at the top of the door;

FIG. 3 is a top plan view of the assembly of FIG. 2;

FIG. 4 is a side elevational view of the assembly of FIGS. 2 and 3;

FIG. 5 is a side elevational view of a solenoid assembly according to the embodiment, and

FIG. 6 is an enlarged, vertical sectional view of the booster of FIG. 1.

Referring now to the drawings, and in particular to FIG. 1 thereof, apparatus according to the present invention is shown installed and ready for use. Illustrated therein is a conventional garage door **10** of the overhead type having a plurality of horizontally disposed panels between which the door pivots as it moves between open and closed positions. In such movement the garage door **10** is conducted by guideways **11**, which receive track rollers (not shown) in the usual manner.

Also conventional is the apparatus composed of a spring **13** and pulley **14** mounted as illustrated. Trained over and around the pulley **14** is a cable **15** attached to one end of a stationary member **16**. At its other end the cable **15** is attached to part of the door. In a conventional garage door such structure assists in moving the door toward open position when a small amount of manual force has been exerted in that direction. In the present invention, the spring and pulley assembly is so adjusted that it urges the closed door toward open position without any additional manual force.

It will be understood, of course, that for the purposes of clarity and ease of illustration only a guideway **11**, spring **13** and pulley **14** at one side of the door **10** have been shown, and that such structure is normally duplicated at the other side of the door. A booster **19** is advantage-

ously utilized to force the door from closed position as it begins to move toward open position.

The door 10 is located at the entrance to a garage or other structure, which includes vertically elongated side beam 17 extending beside the door and a horizontally elongated header 18 forming the top of the garage entrance. To the front of the garage is a driveway 20, on which an automobile or other vehicle travels in approaching the door.

Positioned in the path of the vehicle as it approaches the door 10 is a fluid reservoir 21, which may be located by means of a groove formed in the driveway 20 or merely fixed to the driveway by any suitable means. At least a portion of the reservoir 21 is elastic and projects upwardly from the plane of the driveway in position to be compressed by the weight of a vehicle rolling over it. In usual practice, an elastic penumatic tube is employed as the reservoir.

As seen in FIG. 1, the reservoir 21, which is plugged at one end 22, extends across the approach to the door 10 and then enters the side beam 17 through a bore 23 provided for that purpose. At its other end the reservoir 21 leads to a fluid pressure responsive switch, indicated generally at 25 and fixed to an inner surface of the side beam 17. There are several fluid pressure switches now in commercial production which will be satisfactory for use in the present apparatus. Such a switch acts to close an electric circuit when fluid in a chamber of the switch reaches a predetermined pressure. The switch is connected to a source of electric potential, as indicated. The switch 25 is most effective if it includes means for adjusting the fluid pressure sufficient to close the circuit, such a switch presently being manufactured by Cal-Van, Inc., of Jackson, Michigan. The switch can then be adjusted so that only pressure at least as great as that from an automobile will generate fluid pressure sufficient to actuate the switch.

While the fluid in the reservoir 21 and switch 25 will normally be air, other liquid or gaseous fluids may be employed with appropriate switches.

Also illustrated in FIG. 1 is wiring 27, which extends from the fluid pressure responsive switch 25 to the solenoid 29. Likewise illustrated are a tongue 30, controlled by the solenoid 29, and a roller 31 mounted between brackets 32 at the top of the door 10 and better illustrated in other figures of the drawings.

The manner in which the roller 31 is mounted at the top of the garage door 10 is best shown in FIGS. 2, 3 and 4. A pair of brackets 32, having a series of spaced, aligned orifices 34 therethrough, are fastened to the top edge 35 of door 10 by means of cap screws 36. Upwardly positioned legs 38 of brackets 32 hold a roller 31, trunnions 39 at the ends of the roller being inserted through two aligned orifices 34. It will be obvious that the position of the roller 31 can be changed vertically by inserting the roller trunnions 39 into different pairs of aligned orifices 34, thereby compensating for variations in the height of the header 18, expansion of the door 10 due to heat, and the like.

The structure of one embodiment of the solenoid 29 and its associated tongue 30 is best seen in FIG. 5. As there illustrated, lugs 40 of the solenoid 29 serve to fix the solenoid to the header 18 by screws 41 inserted therethrough and into the wooden header. So poistioned, the bar 42 of the solenoid 29 moves inwardly toward the solenoid coil 43 (to the left in FIG. 5) when coil 43 is energized. When coil 43 is not energized, spring 44 disposes the bar 42 outwardly of coil 43. Since the tongue 30 is welded or otherwise securely and rigidly fixed to the bar 42, the tongue 30 is positioned inwardly and outwardly with the bar, outward movement being arrested by a fixed stop member 45. Thus, when coil 43 is not energized, tongue 30 projects outwardly over roller 31 to block upward motion of the roller and the door 10 on which the roller is carried. Energizing coil 43 draws the bar 42 and tongue 30 inwardly against the pull of the spring 44 to permit upward movement of the roller 31 and the door 10.

A roller is utilized to provide a bearing surface for the tongue 30 because such an arrangement permits the use of an inexpensive, lower-powered solenoid. As the energized solenoid withdraws the tongue 30 horizontally, roller 31 rotates on its trunnions 39. Such rotation minimizes the force necessary to withdraw the tongue 30, which force would be much greater if the tongue were withdrawn while in contact with a suitable, stationary bearing surface.

The tongue 30 is formed with a rounded lower end 47 and an inclined surface 48 extending from lower end 47 inwardly and upwardly. Such form enables the tongue to be easily returned to blocking position as the door is moved from open to closed position without the need for further apparatus or manual positioning of the tongue.

An embodiment of the booster 19 according to the invention is illustrated in sectional view in FIG. 6. The booster comprises a cylindrical shell 50 fixed in vertical position to a surface of the garage door 10 at the bottom thereof by screws 51, which pass through tabs 52 attached to the shell 50. The shell 50 is closed at its top by a cap 53 and at its bottom by another cap 54 that has an aperture 55 centrally located therein. Through aperture 55 passes a shaft 57, which terminates at its upper end in a fixed washer 58 serving to retain a spring 60 within the shell 50 between the washer 58 and the upper cap 53. A collar 61 fixed to shaft 57 below the washer 58 limits downward movement of the shaft 57, the collar being of such dimensions that it will not pass through the aperture 55 in the lower cap 54. One or more of such boosters are positioned so that, in door-closed position, shaft 57 is forced upwards, compressing spring 60 and tending to force shaft 57 downwards to thereby initially propel door 10 toward open position.

In operation, the garage door 10 is first moved to closed position. With no vehicle compressing a portion of the fluid reservoir 21, the tongue 30 overlies the roller 31 and blocks upward movement of the door 10, such upward movement being induced by springs 13 and one or more boosters 19. When a vehicle rolls over an elastic portion of the reservoir 21, fluid pressure responsive switch 25 closes to energize solenoid 29, which withdraws tongue 30 over rotatable roller 31 and out of door-blocking position. The door 10 is thus released and moves toward open position, from which it may again be closed by manual or other means.

While a preferred embodiment of the invention has been described hereinbefore and illustrated in the accompanying drawings, it will be apparent that the novel features of the invention may be embodied in other forms. It is desired, therefore, that the invention be limited only by the scope of the following, appended claims.

I claim:

1. An automatic door opening apparatus for a garage formed with an access opening having a header at its upper dimension, said apparatus comprising a door having front and back walls defining top, side and bottom door edges between them, said door being movable between a closed position in which it is substantially vertical and blocks access through said opening and an open position in which said access is unblocked, means continuously urging said door for movement at least initially in the substantial direction of its vertical axis past said header toward said open position, means for retaining said door in said closed position, said retaining means including a pair of spaced brackets fixed to said door at said top edge and extending upwardly from said top edge, said brackets being formed with aligned apertures, a roller journaled in said apertures for rotation above said door between the planes of said front and back walls, and a tongue fixed to a solenoid mounted on said header, said tongue abutting

said roller when said door is in said closed position to block movement of said door from said closed position, an elastic fluid reservoir disposed near said door in position to enable a vehicle approaching said door to contact and compress a portion of said reservoir, and a switch for converting a change in fluid pressure in said reservoir into a change in quantity of electrical energy, said change in electrical energy causing said solenoid to withdraw said tongue from a position abutting said roller to permit said door to move toward said open position.

2. An automatic garage door operating apparatus as claimed in claim 1, said bracket being formed with a plurality of pairs of aligned apertures so that said roller can

be mounted a varying heights above said top edge of said door.

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