United States Patent [19]

Schnarr

[11] **3,771,823**

[45] **Nov. 13, 1973**

[54] **ELECTRICALLY CONTROLLED HOLD-OPEN DEVICE**

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[52] **U.S. Cl.** **292/270,** 49/1, 49/379, 16/49

[51] **Int. Cl.** **E05c 17/08**

[58] **Field of Search** 49/1, 2, 379; 16/49, 16/82; 292/25, 45, 270, 273, 274, 278

[56] **References Cited**

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Attorney—Hume, Clement, Hume & Lee Ltd.

[57] **ABSTRACT**

An electrically releasable hold-open device for use with a door closing mechanism employing a latch device that engages an element reciprocating in a trackway. The latch device has a pair of arms that are controlled by a solenoid. The solenoid, when energized, operates a wedge to spread the arms. The arms in spread position perform a latching function in cooperation with a cavity on the reciprocating element. The solenoid when deenergized deactivates the latching function.

9 Claims, 7 Drawing Figures

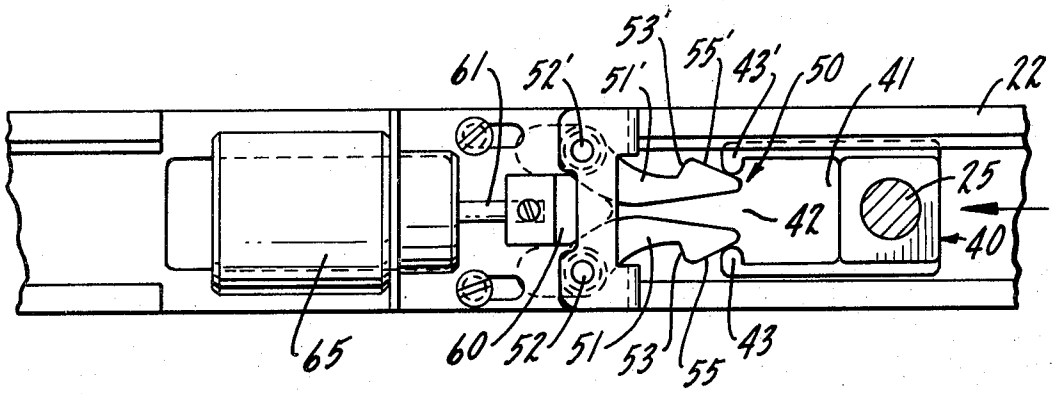


Fig. 1.

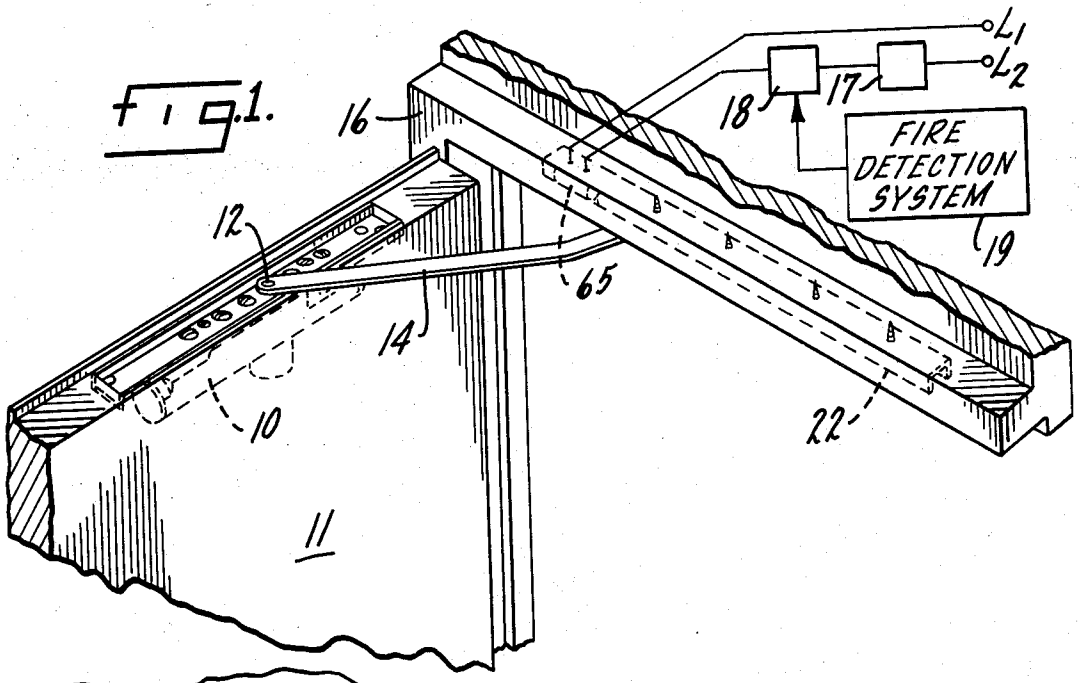
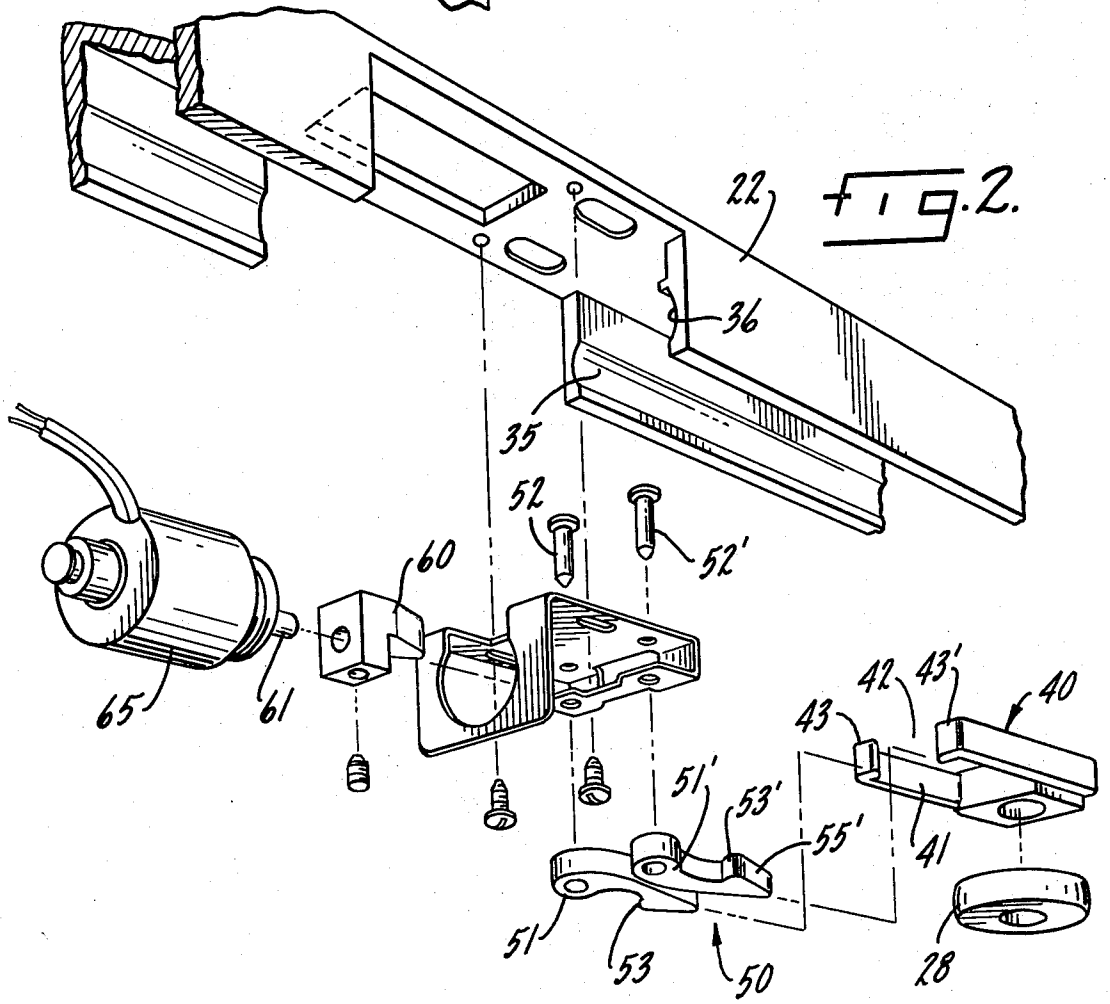

L1
L2
17
18
FIRE DETECTION SYSTEM
19
16
12
65
14
10
22
11

Fig. 2.


22
36
35
52
52'
60
65
61
42
43'
40
43
51'
53'
55'
41
51
53
50
28

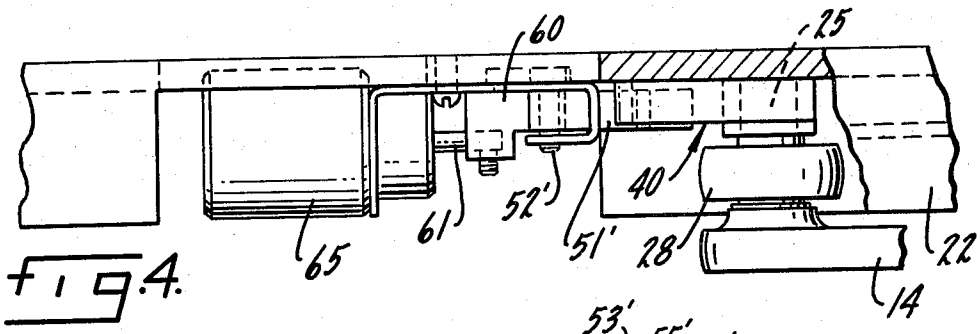


fig.4.

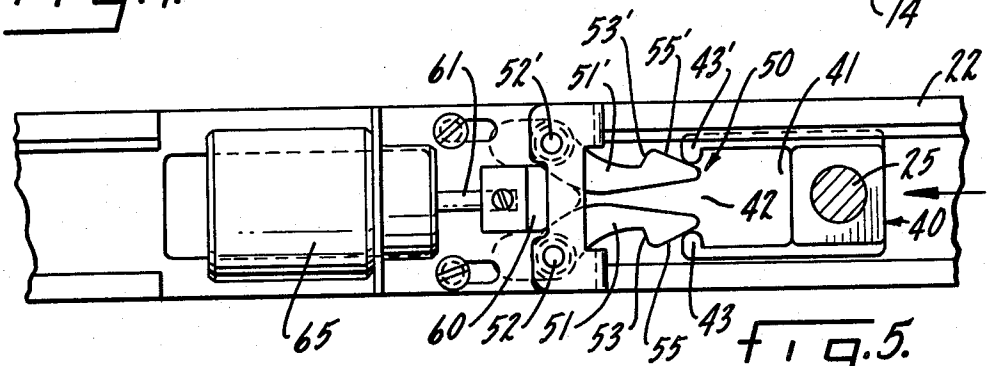
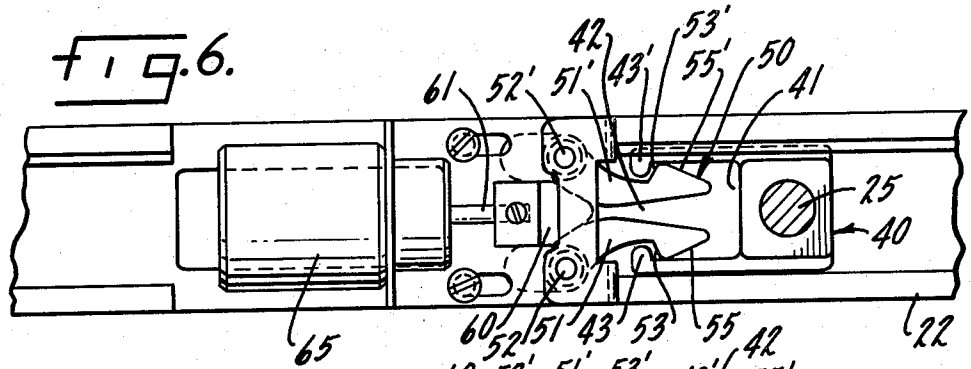


fig.5.

fig.6.



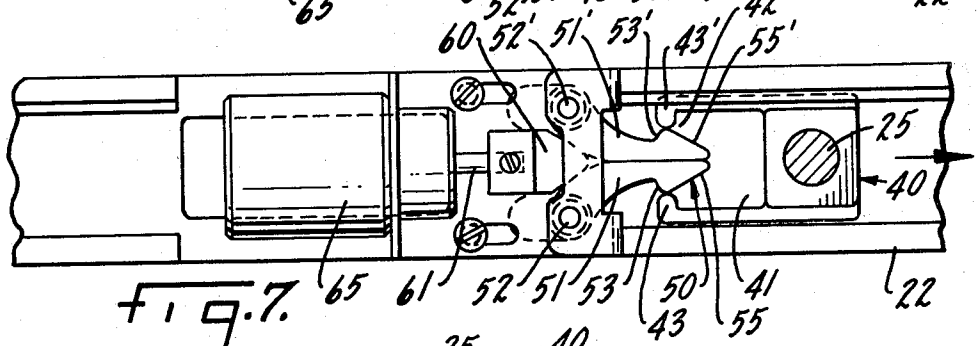


fig.7.

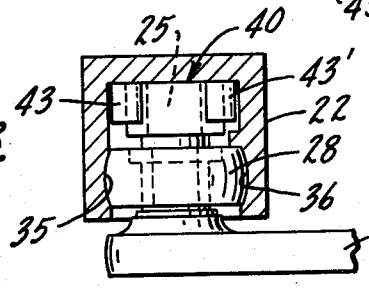


fig.3.

ELECTRICALLY CONTROLLED HOLD-OPEN DEVICE

FIELD OF THE INVENTION

This invention relates to an electrically controlled door hold-open device.

BACKGROUND OF THE INVENTION

Many public buildings, such as hospitals, hotels, factories, offices, and the like, are provided with fire or smoke doors for closing the passages connecting various areas in the building in the event of an emergency. Automatic devices are used for closing these doors.

In some situations, it is desirable to hold these doors in open position, so as to allow circulation of air, or to allow free flow of traffic. Many hold-open devices in use release automatically in the event of fire. Some of the hold-open systems use electrical devices for maintaining the door in hold-open position that permit the door to close in the event of fire, for example, the devices shown in Peterson U.S. Pat. No. 3,415,562, and Arnold U.S. Pat. No. 3,164,404.

SUMMARY OF THE INVENTION

It is, therefore, a principal object of the invention to provide an improved hold-open device that is electrically controlled so as to release a hold-open mechanism and to allow automatic closing of the door. It is a further object of the invention to provide an improved hold-open means that is automatically released upon electrical failure. It is another object of the invention to provide an electrically controlled hold-open device which is sufficiently simple in construction to make it economical to manufacture, and yet sufficiently reliable in service to provide for optimum safety and use.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a door closing and checking mechanism mounted in a door having a connecting arm to a trackway mounted in a door frame with which is associated the electrically controlled hold-open device of the present invention.

FIG. **2** is an exploded view illustrating the trackway and the electrically controlled hold-open device of the invention.

FIG. **3** is a cross-sectional view of the trackway illustrating the reciprocating element.

FIG. **4** is a fragmentary side view of the trackway partially broken away to illustrate the reciprocating element and latching mechanism.

FIG. **5** is a bottom view of the mechanism shown in FIG. **4** illustrating the trackway with the reciprocating element approaching hold-open position.

FIG. **6** is a bottom view similar to FIG. **5** but with the reciprocating element latched in hold-open position.

FIG. **7** is a bottom view similar to FIG. **5** but with the reciprocating element moved out of latched hold-open position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, a door closing mechanism **10** of a conventional type is shown mounted in the door **11**. The door closing mechanism has a spindle **12** operated by a spring (not shown) imparting closing movements to the door. The door closing mechanism also may contain some sort of a checking system for regulating the speed of the closing movements in a predetermined manner.

The spindle **12** is rotated during opening and closing movements of the door. An arm **14** is secured at one end to the spindle **12** of the door closing mechanism **10**. The other end of the arm **14** is pivotally connected to a spindle **25** that is reciprocated in trackway **22**. The trackway **22** is affixed to the door frame **16**, as shown in FIG. **1**. As shown in FIG. **3**, the reciprocating spindle **25** journals a roller **28** for free rotation in trackway **22**. The roller **28** thereby is reciprocated in the trackway **22** as the arm **14** is moved during the opening and closing movements of the door **11**.

As more fully explained in Flint U.S. Pat. No. 2,772,439, the outer periphery of the roller has an arcuate configuration to permit inclination of the axis of the roller with respect to the trackway. The trackway has two spaced sides **35** and **36**. Side **35**, which is nearest the door closing mechanism, has an arcuate concave track. The opposite side **36** has a disked portion which has a somewhat larger radius of curvature on the concave face thereof than the outer periphery of the roller to permit some tilting of the roller with respect to the trackway.

Above the trackway provided by sides **35, 36** is a space into which the end of spindle **25** projects. That end of the spindle supports a reciprocating element **40**, described more fully hereinafter.

As the door is opened, the spindle **12** moves arm **14**, and the roller **28** supported on spindle **25** is caused to travel within the trackway **22**. The reciprocating element **40**, supported on spindle **25**, likewise is caused to travel in the upper portion of the trackway **22**.

Referring now to FIGS. **4, 5, 6** and **7**, the hold-open mechanism will be described. During door opening movements, the roller **28** carrying spindle **25** will move from right to left, whereas during door closing movements, the roller will travel from left to right, as viewed in FIGS. **5, 6,** and **7**. The reciprocating element **40** has a yoke with a cavity **41**. The cavity **41** has an opening **42**. On the opposite sides of opening **42** are opposed shoulders **43, 43'**. A latch mechanism **50** is positioned to engage the yoke and keep it in hold-open position when electrically energized. The latch mechanism **50** is operated by solenoid **65**. The solenoid is connected to power source L_1, L_2 through series switches **17** and **18** (See FIG. **1**). Switch **17** may be manually activated to open or closed position to energize or deenergize the solenoid **65**. Switch **18** also in series with the power source is normally closed, but is controlled by a fire detection device **19** to open in the event of fire.

The latch mechanism **50** includes a pair of arms **51, 51'** pivoted on pins **52, 52'**. The pivoted arms at their end portions opposite the pins are provided with fingers **53, 53'** for engaging shoulders **43, 43'** and latching the element **40** in the door hold-open position as illustrated in FIG. **6**. A wedge **60** connected to the armature of solenoid **65** is positioned to spread the arms to condition the latch mechanism for a door hold-open function when the solenoid is energized as shown in FIG. **6**. The yoke **40** will cam the arms **51, 51'** together to the position shown in FIG. **7** under the force provided by the door closer **10** to permit the door to swing to door-closed position when the solenoid is deenergized, or by manual manipulation of the door if the solenoid is energized.

The wedge **60** is secured to longitudinally movable rod **61** which is activated by the armature of solenoid **65**. When solenoid **65** is energized, the armature is shifted toward the latch mechanism **50** so that the wedge is inserted between the arms **51, 51'**, and forces them apart. This action projecting the wedge between the arms **51, 51'** causes the fingers **53, 53'** to engage the shoulders **43, 43'** inside the yoke cavity **41** in order to perform a latching function as illustrated in FIG. **6.**

The arms **51, 51'** at their end portions opposite to pivots **52, 52'** are provided with inclined cam surfaces **55, 55'** in advance of the fingers **53, 53'**. The cam surfaces **55, 55'** are designed to engage the shoulders **43, 43'** and to cam the arms **51, 51'** together when the solenoid is energized and the element **40** is moved from a door closed position toward a door hold-open position. As illustrated in FIG. **5** when the reciprocating element **40** approaches the arms **51, 51'** as the door is opened, the shoulders **43, 43'** acting on the surfaces **55, 55'** close the arms together so that the reciprocating element **40** can be moved to the position shown in FIG. **6.**

After the element **40** reaches hold-open position, the arms spread in the cavity **41** and the fingers **53, 53'** engage the inner surfaces of the shoulders **43, 43'**, so that the door is latched as shown in FIG. **6.**

The solenoid when energized, however, does not have sufficient force to keep the fingers **53, 53'** latched in the yoke if manual pressure is applied to close the door. Manual pressure may be used to move the door from the door hold-open position illustrated in FIG. **6** to the unlatched position illustrated in FIG. **7.** When pressure is applied to close the door, the fingers **53, 53'** are moved together and the wedge **60** ejected from therebetween as shown in FIG. **7** by the action of the shoulders **43, 43'** on the fingers **53, 53'**. Of course, if the solenoid **65** is deenergized, the latch will be deactivated and the door will be shut under the power of closer **10.**

As shown in FIG. **1,** solenoid **65** is connected to an electrical power source through lines L_1, L_2. Switch **17** is used to energize or deenergize solenoid **65** in order to activate or deactivate the door hold-open function previously described and is connected in electrical series with the solenoid. Switch **18** is also connected in electrical series with solenoid **65,** but is normally closed, so that the solenoid may be manually controlled by switch **17.** Switch **18** is part of a fire detection system **19** that operates to open switch **18** only if the conditions of a fire are within the surveillance of **19.**

From the foregoing, it is believed that operation of the device will be apparent. In the usual condition, the electrically controlled hold-open device may be installed on the many fire and smoke doors of a large building in an electrical circuit as depicted in FIG. **1.** When the switch **17** is manually closed, the power supply energizes solenoid **65** so that the hold-open device will perform a latching function when the door is fully opened to door hold-open position. If the power supply is interrupted, the latching mechanism is deactivated and the door closer **10** will shut the door. This event will occur, for example, if the fire detection system **19** operates to open the switch **18,** or if the switch **17** is manually opened to deactivate the door hold-open function.

To place the door in hold-open position, the switch **17** is closed. This will energize solenoid **65** to spread the arms **51, 51'** and fingers **53, 53'** as illustrated in FIG. **5.** The door is then moved to hold-open position. The door movement to hold-open position causes element **40** to force the arms **51, 51'** together so that the fingers **53, 53'** engage cavity **41** of element **40** to perform the hold-open function. In the event of fire, the switch **18** is opened, or if it is desired to deactivate the hold-open function switch **17** is opened; in either case, the solenoid **65** is deenergized, releasing the arms **51, 51'** from spread condition, and allowing the closer **10** to move the door to closed position.

Other modes of applying the principles of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I claim:

1. In an electrically controlled door hold-open mechanism for use with a door closing mechanism, the combination comprising, an element mounted for reciprocable movements along a predetermined path during door opening and closing movements, at least one arm member mounted for latching movements with said element when the door is moved to a hold-open position, solenoid means for moving said arm member to latching position when energized, a finger on said arm member adapted to be positioned in the path of and for engagement by said element when said solenoid means is energized, means on said finger for camming the arm to one side when said element is moved to hold-open position, means on said finger for latching said element in hold-open position, switch means in circuit with said electrically energized means for controlling the hold-open position and deactivated position of said arm member.

2. The electrically releasable hold-open mechanism defined by claim **1** wherein said arm member is pivoted whereby the finger engages said element in hold-open position.

3. The electrically releasable hold-open mechanism defined by claim **1** wherein said element has a cavity for engagement by said finger in hold-open position.

4. The electrically releasable hold-open mechanism defined by claim **3** wherein said finger coacts with a cavity in said element in a hold-open position.

5. In an electrically controlled door hold-open device, the combination comprising, an element mounted for reciprocating movements along a predetermined path during door opening and closing movements, a cavity in one end of said element, at least one arm member having a finger thereon for entering said cavity when the door is moved to a hold-open position, means for coacting between said finger and said cavity to perform a hold-open function, solenoid means for operating said arm member and for latching said finger in said cavity to perform such door hold-open function, and switch means in circuit with said solenoid for electrically controlling said solenoid.

6. The door hold-open device of claim **5** wherein a pair of arms are pivotally mounted with fingers for performing a latching function in cooperation with said cavity in the reciprocating element.

7. In an electrically controlled hold-open device, the combination comprising, a door closer, a trackway adapted to be secured to a door frame, a reciprocable element mounted for movements in said trackway, arm means connected between said door closer and said reciprocable element, said element having side and end

walls, a pair of arm members positioned within said trackway to coact with the end wall of said element, means on said arm members and said element for performing a latching function, said arm members pivoted for movements to latching condition, solenoid means for controlling said arm members, and switch means in circuit with and for controlling energization of said solenoid.

8. The hold-open device of claim **7** in which said reciprocating element includes a cavity in the end wall for coaction with means on the arm member to perform a latching function.

9. In an electrically controlled hold-open device, the combination comprising, a door closer, an element mounted for reciprocating movements along a predetermined path during door opening and closing movements, arm means connected between said door closer and said reciprocating element, said reciprocating element is provided with a cavity, a pair of pivoted arm members adapted to be moved relative to each other for latching and unlatching coaction with said element to perform door hold-open and release functions, solenoid means for operating said arm members, said solenoid means when energized spreading said arm members for latching action in said cavity, and switch means in circuit with and for controlling said solenoid means.

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