

Feb. 5, 1929.

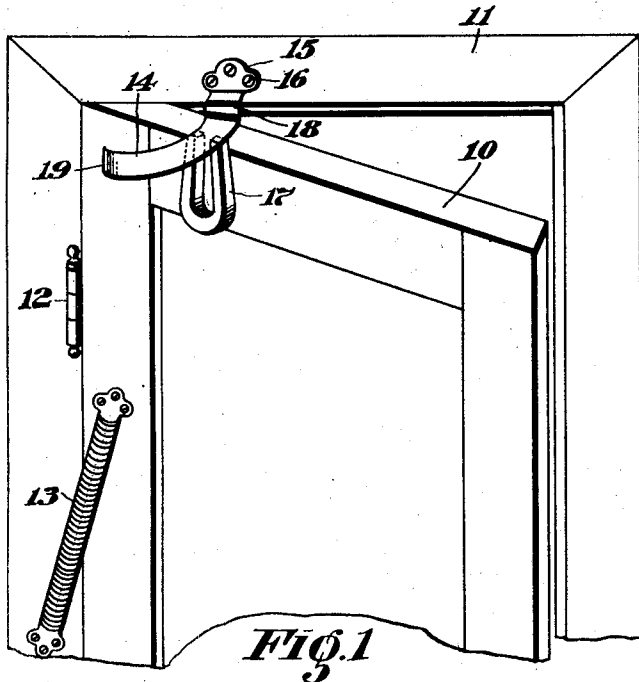
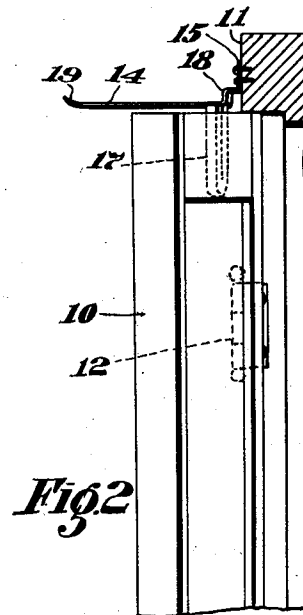
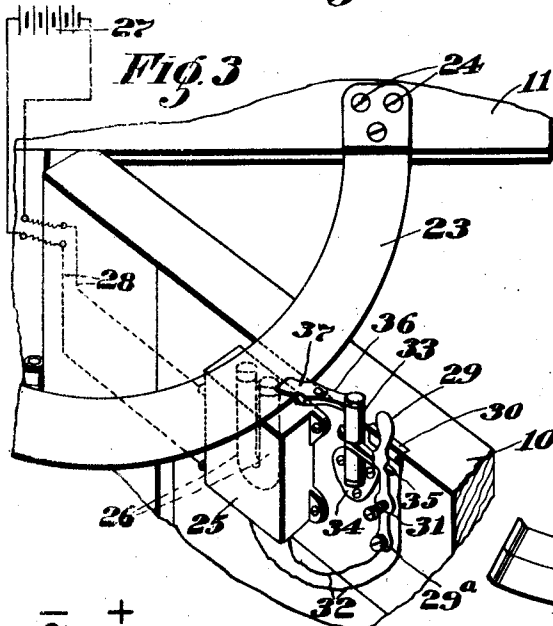
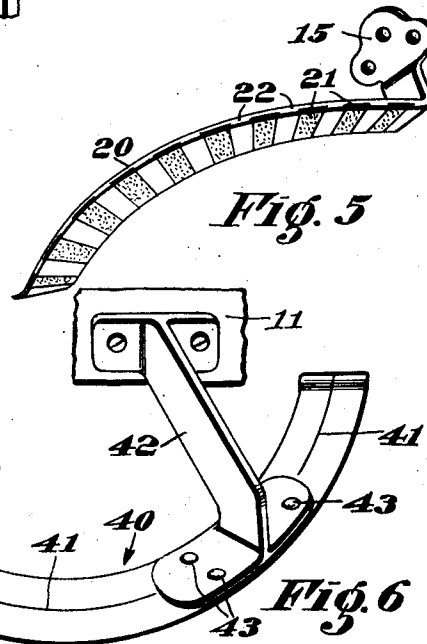
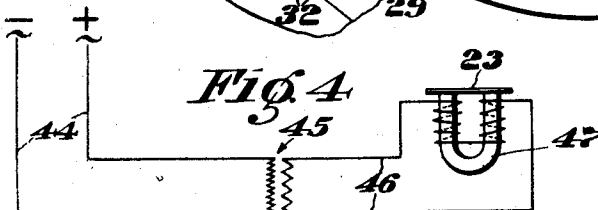
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D. DUDLEY

DOORCHECK

Filed Oct. 23, 1926

2 Sheets-Sheet 1



INVENTOR:
Dana Dudley
BY Robt. P. Harris,
ATTORNEY

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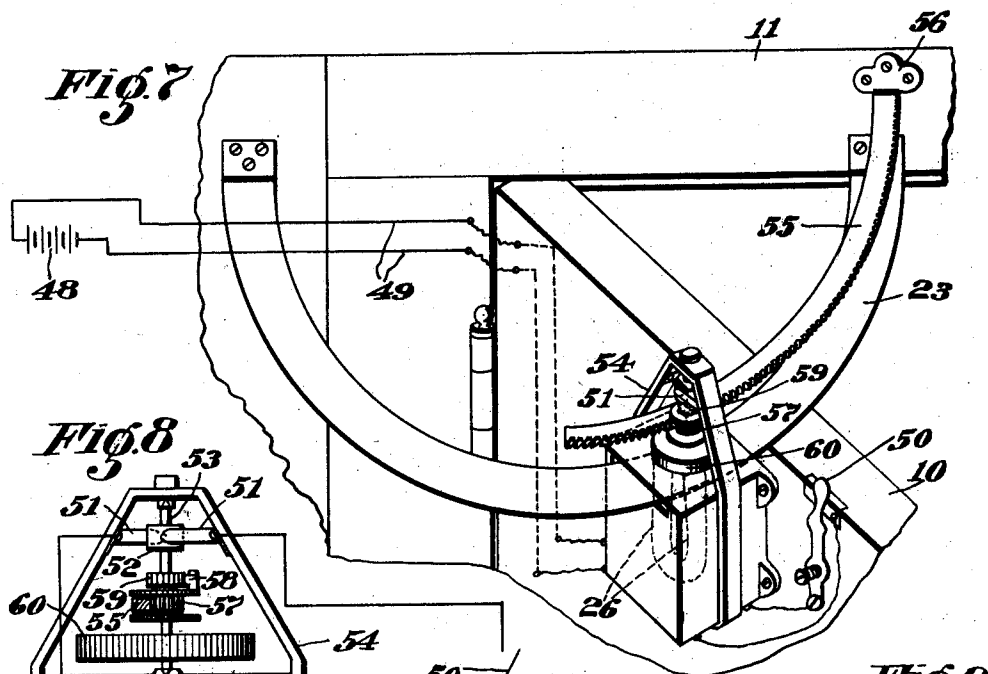
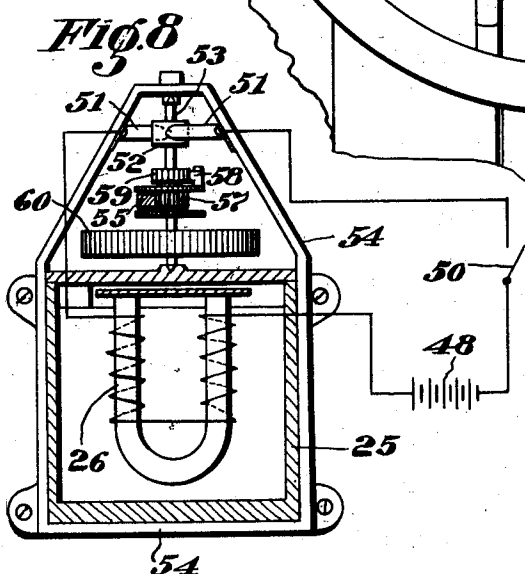
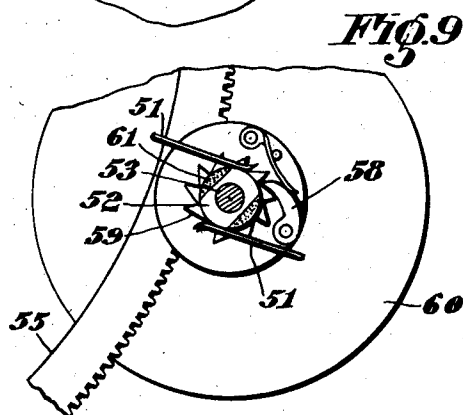
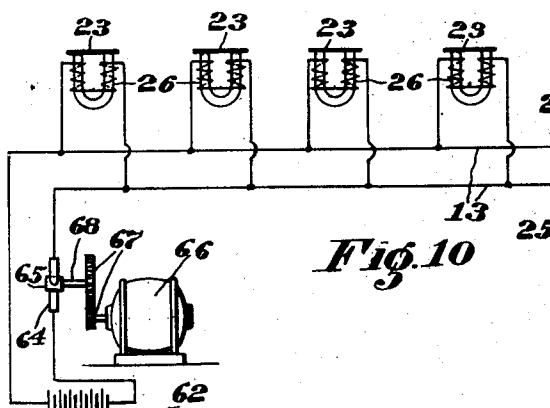
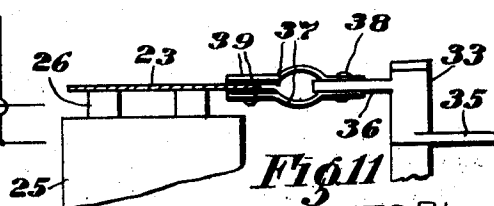
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D. DUDLEY

DOORCHECK

Filed Oct. 23, 1926

2 Sheets-Sheet 2



INVENTOR:
Dana Dudley
BY Robt. O. Harris
ATTORNEY

UNITED STATES PATENT OFFICE.

DANA DUDLEY, OF WAKEFIELD, MASSACHUSETTS.

DOORCHECK.

Application filed October 23, 1926. Serial No. 143,543.

This invention relates to a novel form of door check constructed to insure the smooth noiseless closing of doors.

Heretofore door checks have been commonly constructed of rubber or other resilient material that is supported either upon the door or the door-frame in position to receive the blow of the door as the latter approaches the closed position. While these resilient door checks serve to lessen the noise and jar produced by a banging door, they do not entirely eliminate the banging effect.

Pneumatic door checks employing confined air to retard the closing movement of a door have also been proposed heretofore, but these pneumatic door checks are expensive to construct and require frequent inspection and adjustment to insure their proper operation.

The present invention is therefore directed to a door check that is entirely unlike those above mentioned, and consists of a cooperating magnet and armature, one being mounted upon the door-frame and the other on the door, the arrangement being such that the magnetic attraction between the magnet and armature is utilized to exert a dragging or retarding action upon the closing door. The armature may be given sufficient length to cooperate with the magnet throughout the entire closing movement of the door, or these elements may cooperate throughout only a part of said closing movement, as desired.

In carrying out the present invention the magnet employed may be either a permanent magnet or an electro-magnet, and if an electro-magnet is employed it is desirable to provide a switch for cutting off the current to the magnet when the door is not being closed.

One feature of the invention therefore resides in a switch that operates automatically to cut off the current to the magnet while the door is in its closed position, and another feature of the invention resides in switch operating means for cutting off the current to the magnet during the movement of the door in the opening direction.

The door check of the present invention, in its simple form consists of a magnet that exerts a continuous pull upon the cooperating armature as the door is moved to its closed position, and while this simple construction works very well, it is desirable in many cases to employ means for making and

breaking the current supplied to the electro-magnet so that the magnet will alternately grip and release the armature during the closing movement of the door.

Another feature of the present invention therefore resides in means for making and breaking the current supplied to the magnet to vary the action of the magnet upon the armature.

Other features of the invention and novel combination of parts in addition to the above will be hereinafter described in connection with the accompanying drawings which illustrate good practical forms of the invention.

In the drawings:—

Fig. 1 is a perspective view of a door and door frame provided with a door check consisting of an armature and permanent magnet, the door being shown partly open.

Fig. 2 is a sectional view through the door frame of Fig. 1 looking toward the door check, the door being shown slightly open.

Fig. 3 is a view similar to Fig. 1, but shows the door as provided with an electro-magnet;

Fig. 4 is a diagrammatic view showing the electro-magnet of a door check as operated by alternating current;

Fig. 5 is a perspective view of a modified form of armature;

Fig. 6 is a perspective view of still a different form of armature;

Fig. 7 is a view similar to Fig. 1, but shows means associated with the door for making and breaking the current to the magnet;

Fig. 8 on an enlarged scale is a side view of parts shown in Fig. 7;

Fig. 9 is a top plan view of the operating parts of Fig. 8;

Fig. 10 is a diagrammatic view of a construction for supplying a make-and-break current to a plurality of electric door checks; and

Fig. 11 is an enlarged side elevation of the switch operating lever shown in Fig. 3.

The magnetic door check forming the subject matter of the present invention may be variously constructed and may be used upon any door to prevent the same from banging as it is closed. The door check is shown in the drawings as associated with the ordinary door 10 and door frame 11. The door 10 is secured to the door frame by the usual hinges 12 and is provided with a spring 13 of any well known construction which serves to close the door.

In the embodiment of the invention shown in Figs. 1 and 2 of the drawing the armature 14 has the arcuate-shape shown, and is secured to the upper portion of the door frame so that the arcuate portion of the armature will just clear the upper edge of the door. The armature may be secured to the door frame by providing it with the up-turned portion 15 adapted to be secured to the door frame by the screws 16. Upon the door 10 adjacent the upper end thereof is mounted a permanent or horseshoe magnet 17, the same being positioned so that as the door swings open or close the magnetic poles of the magnet 17 will slide along the under face of the curved armature 14 and the attraction of the magnet for the armature will hold the latter in contact with the magnet to thereby produce a frictional sliding engagement between these elements which will serve to retard the closing movement of the door. It may be desirable to disengage the magnet from its armature as the door reaches the nearly closed position, and this is accomplished by providing the armature with the upwardly bent portion 18 which causes the portion of the armature disposed adjacent the supporting frame 11 to lie in spaced relation to the magnet 17 when the door is in its closed position, as will be apparent from the drawings. The outer end of the armature 14 may be bent upwardly as at 19 to prevent the magnet from abutting against this end of the armature.

When the entire armature 14 is formed of iron or soft steel the engagement between the magnet and armature will cause a continuous drag to be exerted upon the closing door. It may be desirable to reduce this retarding action of the door check and this may be accomplished by employing the modified construction shown in Fig. 5, wherein the armature 20 is provided with the transversely extending strips 21 formed of brass or other non-magnetic metal, and which strips are interposed between the strips of magnetic metal 22.

In many cases it may be desirable to employ an electro-magnet rather than a permanent magnet to cooperate with the armature, and a construction to this end is therefore shown in Fig. 3 wherein the curved armature 23 is secured to the door frame 11 by the screws 24. Upon the door, near the upper end thereof, is mounted a box or casing 25 in which are placed one or more electro-magnets 26 which are arranged so that a pole of each of these magnets will lie adjacent the under face of the armature 23. The electric current for exciting the magnets 26 may be supplied from a battery or if desired from the ordinary electric lighting circuit such as is employed in most homes, but when the current for the magnets is taken from the electric light circuit it may be desirable to reduce the voltage of the same before it is led to the magnets

26. In the construction shown in Fig. 3 current from a battery 27 is conducted to the magnets 26 by the wires 28.

It is preferable that the magnets 26 be excited only when the door is being closed, since this is the only time a dragging effect is desired between the magnets and armature. The present invention therefore contemplates a construction whereby the current supplied to the magnets 26 is cut off as long as the door is in its closed position, and is also cut off while the door is being moved to its open position. While various forms of switches might be employed to this end, an extremely simple and satisfactory switch is shown in Fig. 3 of the drawings, and consists of the contact bar 29 which is secured to the door by a screw 29^a, and the bar 29 is pressed towards the door by a coiled spring 31, the arrangement being such that this spring normally holds the upper portion of the bar 29 in engagement with the contact plate 30 secured to the door. The switch thus formed is included in the circuit that supplies current to the electro-magnets 26, and to this end the conductor wires 32 are provided, one of which leads from the box 25 to the contact plate 30, while the other leads from the box 25 to the contact bar. The upper end of the bar 29 projects above the upper edge of the door 10 and is positioned so that as the door moves to the closed position the projecting end of this bar will strike against the door frame 11 and will be held thereby out of contact with the element 30 to open the switch and cut off the current to the magnets 26. As stated, it is desirable not only to prevent the electric current from reaching the magnets 26 when the door is closed, but also to prevent these magnets from being excited while the door is being opened; because, if the magnets are excited during the opening movement of the door, they will produce a dragging effect which will make the door harder to open. Means is therefore provided for cutting off the current to the magnets while the door is being opened, and the construction shown to this end consists of a rocking lever having a post 33 which is supported for rocking movement by the bracket 34 that is secured to the door 10. The post 33 has one projecting arm 35 which engages the contact bar 29 and an oppositely extending arm 36, to the outer end of which are secured a pair of resilient plates or springs 37 which may be secured to the arm 36 by the rivet 38. These spring plates are positioned to straddle the armature 23, as best shown in Fig. 11, and the inner faces of these spring plates may be provided with blocks formed of fibre or other frictional material 39, the arrangement being such that when the door is moved in the opening direction, the fibre blocks 39 will frictionally engage the opposite faces of the armature 23. This will exert a sufficient

dragging action upon the arm 36 to rock the lever 33 in a direction to cause the arm 35 to hold the switch element 29 in the open position. As soon as the door starts to move in the closing direction the frictional engagement of the faces 39 with the armature 23 will rock the lever in the opposite direction, and this will permit the switch element 29 to engage the contact plate 30. As a result of the construction just described current will be supplied to the electro-magnets only while the door is being moved in the closed direction, thus avoiding a loss of electrical energy.

Since the frictional engagement between the armature and the magnet or magnets is relied upon to retard the closing movement of the door it is important that the armature shall rest firmly upon the different electro-magnets. If the armature is made of relatively stiff metal it may not seat firmly upon the magnets throughout the entire movement of the door 10. To overcome this difficulty a modified construction is shown in Fig. 6 of the drawing wherein the armature 40 is split centrally, as indicated by 41, throughout the greater portion of its length, and as a result of this construction the adjacent portions of the armature 40 are free to move relatively to each other, thus insuring a proper engagement of each of the armature sections with a magnet. The split armature 40 may be supported from the door frame 11 by a bracket 42 to which the armature may be secured by rivets or the like 43. These rivets are preferably so constructed that they form a loose connection between the armature 40 and the supporting bracket so that the armature may partake of a slight rising and falling movement with respect to its supporting bracket.

In some cases it may be desirable to employ alternating current to excite the electro-magnets, since through the use of alternating current the attraction between the magnet and armature may be caused to vary or pulsate to vary the holding effect of the magnet upon the door. A construction to this end is therefore shown in Fig. 4, wherein the conductor wires 44 may lead from any source of alternating current to one coil of a transformer 45, while the other coil of the transformer is connected by conductor wires 46 to an electro-magnet 47. If the alternating current employed in the construction of Fig. 4 is secured from the ordinary electric light circuit, it will in most cases be desirable to reduce the voltage of this current before it is supplied to the magnet 47; the transformer 45 is therefore provided to step down the current supplied to the magnet 47 as low as desired.

In many constructions it may be desirable to make and break the current supplied to the electro-magnets 26 so that these magnets will alternately grip and release the armature as

the door partakes of its closing movement. This construction is desirable because it is easier to insure a complete closing movement of the door when the construction of the electro-magnet is such that it will alternately grip and release its armature, than when the construction is such that a continuous dragging action is exerted upon the armature by its magnet throughout the closing movement of the door. Various means might be employed for making and breaking the current supplied to the electro-magnets 26, and in Figs. 7, 8 and 9 of the drawing a construction is shown to this end which is so designed that the movement of the door serves to actuate the make-and-break mechanism. The armature 23 and electro-magnet 26 shown in Fig. 7 may be constructed as in Fig. 3, and current is supplied to the magnets 26 from a battery 48 or other source of electrical energy by the conductor wires 49. A switch 50, similar to the switch 29 above described, is preferably included in the circuit, as is also the make-and-break device which will now be described.

This make-and-break device is provided with the contact brushes 51 which engages the opposite sides of a rotating disk 52 secured to the revolving shaft 53. The opposite ends of the shaft 53 are journaled in bearings supported by the bracket 54 and this bracket supports the casing 25 that encloses the electro-magnet. The desired make-and-break action is secured by mechanism which is actuated by the movement of the door to rotate the shaft 53. The construction shown to this end consists of a curved rack 55 which is secured to the door frame 11 by a bracket 56. The teeth of this rack engage the gear wheel 57 which is rotatably mounted upon the shaft 53 so that the shaft may rotate relatively to the gear 57, the parts being so connected that the shaft may rotate relatively to the gear in one direction but not in the other. To this end the driving connection between the gear 57 and shaft 53 consists of a pawl 58 carried by the gear wheel 57 and which pawl engages a ratchet wheel 59 that is rigidly secured to the shaft 53, the arrangement being such that movement of the door in the opening direction will rotate the gear 57, but will not rotate the shaft 53 and the make-and-break device 52 secured thereto. It will therefore be seen that since the make-and-break device 52 is not rotated by the movement of the door in the opening direction, the device 52 may serve to cut off the current to the electro-magnet 26 while the door is being opened, thus causing the door to open freely. This may be accomplished by constructing the make-and-break device so that it will normally come to rest in the circuit-open position.

The pawl 58 is so positioned with respect to the ratchet wheel 59 that when the door is

moved towards its closed position, the rotation of the gear 57 will cause the pawl to rotate the shaft 53 and make-and-break device 52 to make and break the current supply to the electro-magnet during the closing movement of the door. The shaft 53 is preferably provided with a fly wheel 60 the momentum of which will cause the shaft 53 to continue to rotate at a relatively high speed while the rapid closing movement of the door is being checked by the dragging action of the electro-magnet 26 upon the armature 23.

In this manner the current supplied to the magnets 26 is made and broken a number of times during the closing movement of the door 10. The make-and-break device 52 secured to the shaft 53 may consist simply of a metal disk having provided at one or more points around its periphery the blocks 61 formed of insulating material.

When it is not desired to employ the movement of a door to operate a make-and-break device as shown in Fig. 7, a make-and-break current may be supplied to the magnet for one door or for a number of doors by the construction shown in Fig. 10, wherein the operating current which is supplied by a battery or other source of energy 62 is led to any number of electro-magnets 26 by the conductor wires 63. In order to make and break the current supplied to these magnets, a make-and-break device consisting of the contact blades 64 which engage a rotating disk 65 may be connected in the circuit just mentioned, as will be apparent from the drawing. The rotating disk 65, which may be similar in construction to the disk 52, may be rotated by a driving motor 66 which is provided with the reducing gears 67 for driving the shaft 68 upon which the disk 65 is mounted.

The construction shown in Fig. 10 is well adapted for use in apartment houses, hotels and other large buildings where a large number of door checks may be operated from the same make-and-break circuit 63. The number of times the current may be made and broken per second may of course be varied as desired, but in practice it has been found desirable to employ a relatively few makes and breaks per second so that a distinct grip and release effect will be produced by the electro-magnet.

What is claimed is:—

1. A door check for a swinging door, comprising in combination, an armature mounted upon the door frame and constructed to extend from the door frame in the direction in which the door opens, a magnet secured to the door in position to engage the armature and adapted to pull the armature against its end to thereby produce a frictional sliding engagement between the armature and magnet that retards the closing movement of the door.

2. An electric door check, comprising in

combination, an armature mounted upon the door frame and constructed to extend in the direction in which the door opens, an electro-magnet adapted to be connected to a source of electric energy and mounted on the door in position to attract and engage the armature so that the latter will exert a holding force upon the door to retard its closing movement, and a switch for cutting off the current to the magnet when the door is in its closed position.

3. An electric door check, comprising in combination, an arcuate armature mounted upon the door frame to extend therefrom in the direction in which the door opens, an electro-magnet adapted to be connected to a source of electric energy and mounted on the door to be moved thereby lengthwise of the armature and positioned so that the magnet when excited will hold the armature in frictional engagement with the magnet to exert a retarding force upon the closing door.

4. An electric door check, comprising in combination, an armature mounted upon the door frame to extend therefrom in the direction in which the door opens, an electro-magnet adapted to be connected to a source of electric energy and mounted on the door to be moved thereby lengthwise of the armature and positioned so that the magnet will hold the armature in frictional engagement with the magnet to retard the closing movement of the door, and a switch included in the circuit for the electric current and adapted to be actuated by the movement of the door.

5. A door check, comprising in combination, an armature mounted upon the door frame, an electro-magnet mounted on the door to be moved thereby along the armature and positioned so that the magnet will engage and act on the armature with a dragging force to retard the closing movement of the door, an electric circuit for supplying current to the magnet, and make-and-break means included in said circuit for making and breaking the current supplied to the magnet.

6. A door check, comprising in combination, an armature mounted upon the door frame, an electro-magnet mounted on the door to be moved thereby along the armature and positioned so that the magnet will engage and act on the armature with a dragging force to retard the closing movement of the door, an electric circuit for supplying current to the magnet, and rotating means actuated by the movement of the door to make and break the current supplied to the magnet.

7. An electric door check, comprising in combination, an armature mounted upon the door frame and constructed to extend in the direction in which the door opens, an electric magnet mounted on the door and adapted to exert a friction holding action on said arma-

ture to thereby retard the movement of the door, and an electric circuit for supplying current to the magnet.

5 8. An electric door check, comprising in combination, an armature mounted upon the door frame and constructed to extend in the direction in which the door opens, an electric magnet mounted on the door and adapted to exert a friction holding action on said arma-
10 ture to thereby retard the movement of the door, an electric circuit for supplying current to the magnet, and a switch for automatically cutting off the current to the magnet as the door reaches its closed position.

9. An electric door check, comprising in 15 combination, an armature mounted upon the door frame to extend therefrom in the direction in which the door opens, an electro-magnet adapted to be connected to a source of electric energy and mounted on the door 20 in position to attract and engage the armature so that the latter will exert a holding force upon the door to retard its closing movement, and a switch operable automatically to cut off the current to the magnet. 25

In testimony whereof, I have signed my name to this specification.

DANA DUDLEY.