

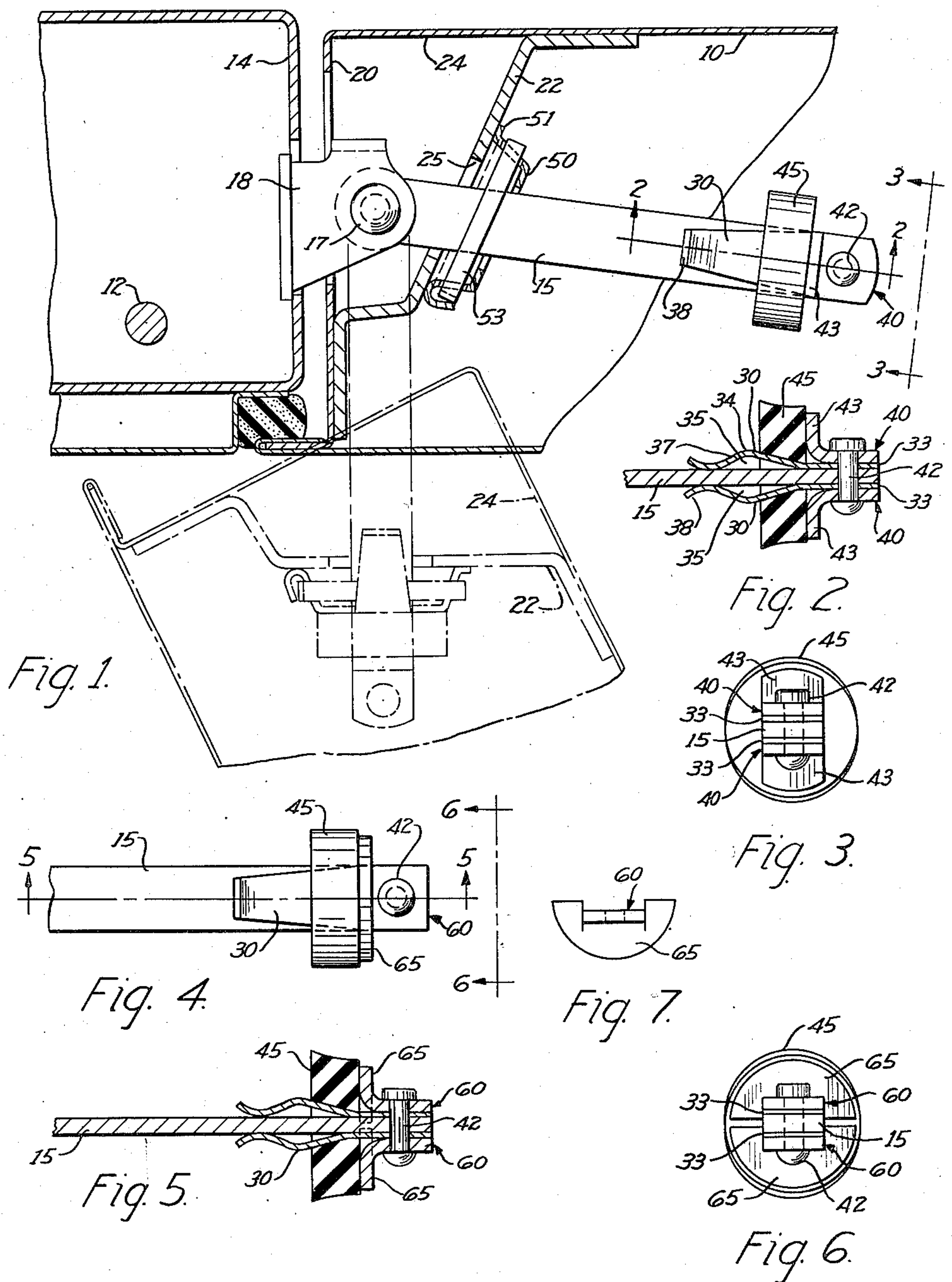
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DOOR CHECK AND HOLDING DEVICE

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## DOOR CHECK AND HOLDING DEVICE

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This invention relates to a combination check and holding device for retaining two cooperating members such as an automobile door and its frame in a predetermined position with respect to each other and more particularly to a device for checking the movement of a door or the like in one direction and then retaining the door in the checked position.

Devices made in accord with this invention are particularly adapted for use in conjunction with doors and door frames in which the door is hinged on an axis that is somewhat inclined but more nearly vertical than horizontal and is swung between opened and closed positions about that axis. The doors of present day automobiles frequently are hingeably mounted on inclined body posts or pillars, with the result that the doors have a natural tendency to swing to a closed position. The undesired closing movement of automobile doors as the result of such tendency has resulted in serious personal injury, and the provision of means for releasably holding such doors in open position whenever they are moved thereto is very desirable. The present checking and holding device functions when such a door is opened resiliently to limit the amount which the door may open and thereafter to retain the door in the opened position until it is pushed manually towards its closed position. More specifically the invention relates to the combination of a link member, one or more spring arm camming elements carried thereby and the means by which the link and cam members are secured together in operative relation; and as such represents an improvement over the device disclosed in Patent No. 2,237,046 issued April 1, 1941, to A. H. Breitenwischer and now assigned to my assignee.

A general object of the present invention is to provide a device of the type indicated, hereafter more commonly referred to as a door checking or door checking and holding mechanism, that is of improved and simplified construction. A further object is to provide a door check including a link or strap with a resilient bumper thereon to limit the extent to which the door may be opened, and at least one unitary angle member, one arm of which supports the bumper, the other being rigidly secured to the link. Still another object is to provide a combination check and holding device including a link carried by either the door or frame with spring arms on opposite faces thereof adapted releasably to engage holding elements carried by the complementary frame or door as the case may be and a novel means

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of retaining the spring arms, and a resilient bumper to stop the opening movement of the door, in place on the link.

Referring now to the drawings: Figure 1 is a horizontal section through a portion of a door member and door pillar or post member of an automobile body showing in solid lines the door in closed position and in dot and dash lines the position of the door and door check mechanism in open position; Figure 2 is a section as indicated by the line 2—2 on Figure 1; Figure 3 is an end elevation as indicated by line 3—3 on Figure 1 showing the elements carried by the unsupported end of the mechanism; Figure 4 is a fragmentary view similar to Figure 1 showing a modified form of checking and holding mechanism; Figure 5 is a section through Figure 4 as indicated by the line 5—5 thereon; Figure 6 is an end elevation of the mechanism shown in Figure 4 as indicated by line 6—6 thereon; and, Figure 7 is a detail showing in end elevation one of the angle members used to retain certain of the parts shown in Figure 4 in position.

As indicated above, the drawings illustrate two forms of the invention, both of which have certain common characteristics. Each form includes a link member of a door check and holding mechanism together with at least one spring arm carried against a broad face of the link and held against it by a short angle member, a rivet preferably being employed to secure the spring arm, angle member and link together as a unitary assembly. One arm of the angle member lies perpendicular to the link and provides a brace or back against which a resilient cushion or bumper bears, the bumper encircling both the link and the spring arm. Each form of the invention embodies improvements over the Breitenwischer patent described above in that each provides a construction whose components are somewhat simpler to fabricate and requires less material, both of which are important factors where the device is used in very large quantities as in the construction of automobiles, where at least two and frequently four check and holding devices are provided on each vehicle.

Referring now to the drawings and particularly to Figure 1, the generally hollow left front door of an automobile is indicated at 10 and is hingedly mounted at 12 to swing about a rearwardly inclined and generally hollow front post or pillar 14 that is rigid with the automobile frame. Because of the inclination of the body posts or pillars the tendency of the door is to swing to a closed position so that the door shown in Figure 1



normally tends to move from its open position shown in dot and dash lines to the closed position and this can result in serious personal injury, particularly if such movement of the door is unexpected. The other doors of the car normally are mounted on similarly inclined pillars and hence are subject to the same tendency to close unexpectedly. The door is checked in its opening motion by the resilient shock absorbing cushion or bumper that also cooperates to a degree with the spring arm holding mechanism thereafter to hold the door in the open position. While the particular uses of the door check and holding mechanism described herein are directed toward automobiles, and more particularly to those with inclined pillars, it will be evident that the invention may be used in other circumstances. The constructions described herein represent two preferred forms of the invention and customary method of use but the scope of the invention is limited solely by the appended claims. In the forms of the invention illustrated herein the checking and holding mechanism is shown as principally contained within the hollow door and supported by a link secured to the door post but it will be evident that the installation may be reversed so the mechanism is largely contained within the hollow vehicle body post or pillar and the link secured to the door.

The present device includes a relatively flat straight steel arm or link 15 having its front end pivotally or otherwise suitably connected at 17 on an axis substantially parallel with the hinge axis 12 to a bracket 18 secured to the post. The link 15 lies within the generally hollow door, passing through the front edge wall 20 thereof and through a thicker vertical reinforcing partition or rib 22 secured as shown to the edge member 20 and the interior panel member 24 of the door. The opening in the edge member 20 is of sufficient size to receive most of the bracket 17 and the pin 18 when the door is in the closed position shown in Figure 1. The opening in the vertical partition 22 is indicated at 25 and is in the form of a slot through which the flat link 15 may pass freely as hereafter described, the slot being of sufficient vertical width to permit spring arms mounted on the link to pass through the slot when the door is opened or closed. It will be evident that the relative location of the bracket 17 and link 15 may be reversed so the bracket is secured to the door and the link slides into position within the door post.

When the door is in the closed position the check and holding mechanism is inoperative but when the door is opened the mechanism functions first to check the door as it reaches its fully opened position and thereafter to hold the door in the opened position until such time as sufficient force is exerted upon it to release the holding mechanism and thereafter push the door to a closed position.

The components that cooperate with link 15 to make up the complete checking and holding mechanism are illustrated in Figures 2 and 3 and include two spring arms 30 formed of stiff spring steel and secured in cooperating relation with the link 15 and on opposite sides thereof. While it is preferred that two such spring members be provided it will be evident that, if desired, one only may be used without departing from the present invention. Each spring arm includes a relatively flat portion 33 adapted to lie against the link 15 and a central raised portion 34 providing a pocket between the link and arm. The

arm is bent inwardly at 37 again to contact the link and terminates in an outwardly extending lip 38 by which the spring arm is cammed over a bearing part hereafter described to permit the same to become seated and releasably locked in the pocket or released therefrom.

Each spring arm is secured permanently to the link 15 by an assembly including an angle member 40 positioned as shown in Figure 2 on top of the flat portion 33 of a spring arm in such manner that the angle member, spring arm and link 15 may all be secured together as a unitary assembly by a rivet 42. In the form of the invention illustrated in the drawings wherein two spring arms are employed it will be evident that two angle members as illustrated in Figure 2 are provided and that the rivet 42 joins the link, spring arms and angle members together. Each of the angle members 40 is provided with an outwardly extending arm 43 lying at right angles with the surfaces of the link 15 to function as a backing or reinforcing structure for supporting a resilient cushion 45.

This cushion is in the form of a pad made of rubber, synthetic rubber or other resilient material; preferably in the form of a relatively thick disc with a central opening to accommodate the link and spring arms as shown in Figure 2. The pad functions as a bumper to cushion a too rapid or forceful opening of the door and also cooperates with the spring arms to limit the amount they may flex outwardly when the door is either opened or closed. When the door is opened the full amount of the unabsorbed load transmitted by the cushion is taken by the vertical arms 43 of the angle members 40.

The mechanism just described engages with cooperating structure carried by the vertical reinforcing partition or rib 22 of the door. This structure takes the form of a frame or box 50 riveted or otherwise secured at 51 to the inner face of the rib 22 and in position to overlie the opening 25. Two steel bearing parts or arms 53 are supported in the box in such position that they extend across the opening 25 on each side of the link 15 and closely adjacent the flat faces thereof.

When the door is swung from closed to open position the various parts move relative to each other from the solid to the dotted line position of Figure 1 during which movement the lips 38 of the spring arms 30 engage the elements 53 and by them are cammed away from the link 15 as the opening motion of the door continues. As the door approaches its final position the portions 37 of the spring arms snap over elements 53 locking them in the openings 35 formed by the outwardly bowed portions in the position shown in dot and dash lines in Figure 1 thus locking the door in open position. The force of inertia due to the opening motion of the door is absorbed by the cushion 45 supported by the angles 40 as the door attains the position shown in dotted lines in Figure 1. The resilience of the cushion thereafter causes it to exert some inward force on the spring arms so they more tightly hold the elements 53 in the pockets 35 and thus assist in holding the door check mechanism in position. The arms 30 are very stiff to insure an adequate grip on the elements 53 but on the other hand the width of the door is such that a relatively small force at the edge of the door multiplied by the moment arm represented by this width enables the door to be closed easily.

When the door is pushed to a closed position



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the bowed portion of the spring arms adjacent the part 37 acts as a cam surface again to move the adjacent portion away from the link 15 and permit the elements 53 to be withdrawn from beneath the spring arms as the door leaves the dotted line position of Figure 1 to attain the closed position shown in solid lines in that figure.

A modified form of door check and holding mechanism is illustrated in Figures 4, 5, 6 and 7 and differs from the construction described above chiefly in the manner in which the spring arms and cushion are secured to and supported on the link. In this modified form the various components including the link 15, boxlike frame 50, and the hinged connection of the link at 17 may all be identical with that described in connection with Figures 1, 2 and 3. In like manner the resilient pad or cushion 45 and the spring arms 30 are of the same shape and construction as heretofore described.

Referring particularly to Figures 6 and 7 there is illustrated the aforementioned link 15, spring arms 30, cushion 45 and also angle members 60. The angle members, spring arms and link are all formed and secured together by a rivet 42 in such manner that the cross sections of the construction of Figure 2 and of the modified construction of Figure 5 appear in those figures to be identical. It will be seen by comparing Figures 3 and 6 that the angle members 60 differ from the angle members 40 in that the former are semicircular in shape as indicated at 65 in the latter figure so they cooperate as shown in providing a substantially circular reinforcing back plate to support the cushion and restrain it against movement along the link when the device receives the shock of checking the opening motion of the door.

In operation the form of invention shown in Figures 4, 5, 6 and 7 functions precisely as described in connection with Figures 1, 2 and 3: when the door is moved from the closed to the opened position it is checked by the cushion 45 and the lips 38 of the spring arms cam over the bearing parts 53 to seat them in the aforementioned pockets between the link and spring arms to hold the door open. Similarly when the door is closed the spring arms are cammed apart by the surfaces 37 and the door is released to be pushed into the closed position shown in Figure 1.

From the foregoing description it will be evident that I have provided a new and improved form of door check and holding device that possesses the advantage of simplicity of design and of assembly together with a sturdy construction adapted to the conditions incurred by use in automotive vehicles and the like.

I claim:

1. A door check and holding device for retaining a closure member and a supporting frame member therefor in predetermined position with respect to each other, said device comprising a link adapted to be connected to one of said members, resilient means carried by said link and adapted to interlock with said other member to restrict relative movement of said members with respect to each other, a cushion member carried by said link adjacent said means to check the relative movement of said members in one direction, an angle member overlying said resilient means and riveted to said means and said link to form a unitary assembly, one flange of said angle member lying substantially normal to said link in position to be engaged by and

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restrain said cushion against movement along said link.

2. A door check and holding device for retaining a closure member and a supporting frame member therefor in predetermined position with respect to each other, said device comprising a link adapted to be connected to one of said members and having a portion with opposed flat faces, resilient spring arms carried by said link against said faces and adapted to interlock with said other member to restrict relative movement of said members with respect to each other, a cushion member carried by and extending circumferentially of said link and said arms to check the relative movement of said members in one direction, an angle member overlying each spring arm, and a fastening element connecting said arms, angle members and link to form a unitary assembly, one flange of each angle member extending outwardly from said link in position to be engaged by and restrain said cushion against movement along said link.

3. A door check and holding device for retaining a closure member and a supporting frame member therefor in predetermined position with respect to each other, said device comprising a link adapted to be connected to one of said members and having a portion with opposed flat faces, resilient spring arms carried by said link against said faces and adapted to interlock with said other member to restrict relative movement of said members with respect to each other, a cushion member carried by and extending circumferentially of and outwardly from said link and said arms to check the relative movement of said members in one direction, an angle member overlying each spring arm, and a fastening element connecting said arms, angle members and link to form a unitary assembly, one flange of each angle member extending outwardly from said link, each of said flanges having a supporting face positioned to engage and restrain said cushion member against movement along said link, each of said flange supporting faces having a supporting area approximately as great as the area of the cushion member extending outwardly from one side of said link.

4. A door check and holding device for retaining a door member in open position with respect to a supporting frame member, said device comprising a link with a flat face adapted to be connected to one of said members, a flat spring arm carried against said face and shaped at one end to provide a pocket between the arm and link, an element carried by said other member and extending across said link in position to become seated in said pocket when said door is opened to retain the same in opened position, a cushion member carried by said link adjacent said arm to check the relative movement of said door in one direction, and an angle member overlying said spring arm and riveted to said arm and said link to form a unitary assembly in position to be engaged by and restrain said cushion against movement along said link.

5. A door check and holding device for retaining a door member in open position with respect to a supporting frame member, said device comprising a flat link adapted to be connected to one of said members, flat spring arms carried on opposite faces of said link and each shaped at one end to provide a pocket between the respective arm and said link, elements carried by said other member and extending across said link in position to become seated in said pockets when said



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door is opened to retain the same in opened position, a cushion member carried by said link adjacent said arms to check the relative movement of said door in one direction, and angle members overlying said spring arms and riveted to said arms and said link on opposite sides thereof to form a unitary assembly, one flange of each angle member extending outwardly from said link in position to be engaged by and restrain said cushion against movement along said link.

6. A door check and holding device for retaining a door member in open position with respect to a supporting frame member, said device comprising a flat link adapted to be connected to one of said members, flat spring arms carried on opposite faces of said link and each shaped at one end to provide a pocket between the respective arm and said link, elements carried by said other member and extending across said link in position to become seated in said pockets when said door is opened to retain the same in opened position, a flat cushion member carried by said link

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adjacent said arms to check the relative movement of said door in one direction, an angle member overlying said spring arms and riveted to said arms and said link to form a unitary assembly, one flange of each angle member lying normal to said link, each of said flanges having a flat supporting face adapted to engage and restrain said cushion member against movement along said link, each of said flat supporting faces having an area approximately as great as the flat area of the cushion member extending from one side of said line.

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## REFERENCES CITED

The following references are of record in the file of this patent:

## UNITED STATES PATENTS

Number	Name	Date
2,237,046	Breitenwischer	Apr. 1, 1941