

May 13, 1952

C. GODEREZ

2,596,676

DOOR CHECK AND CLOSER

Filed April 19, 1949

3 Sheets-Sheet 1

FIG. 1.

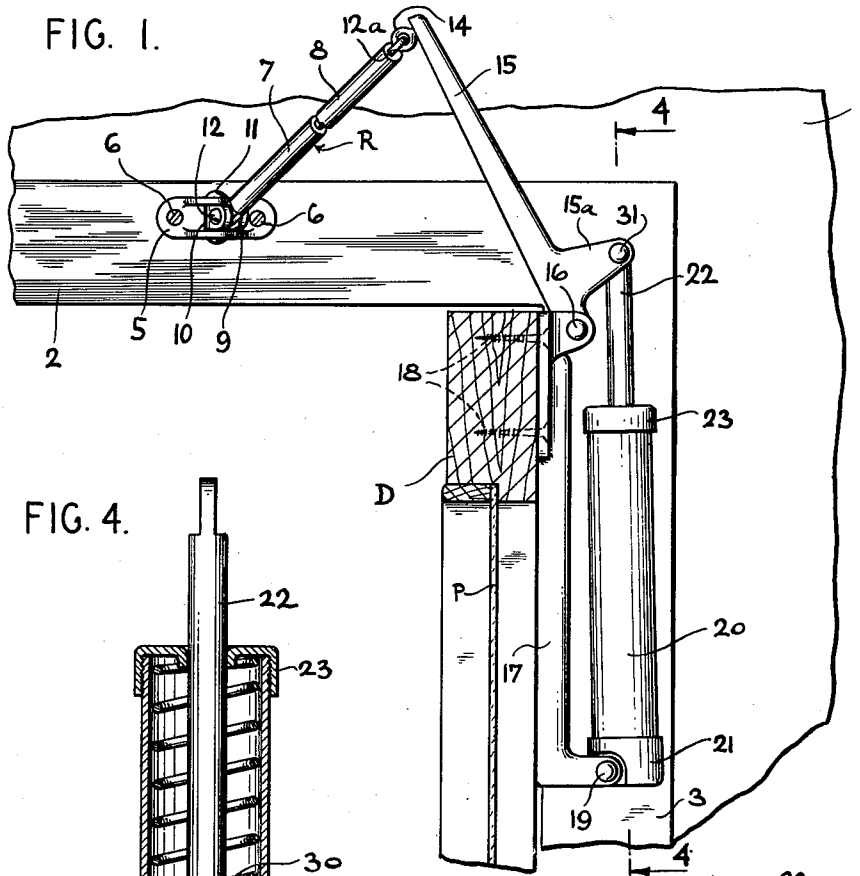


FIG. 4.

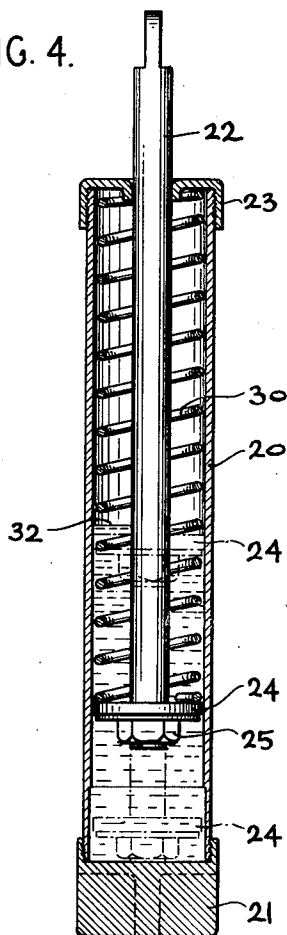
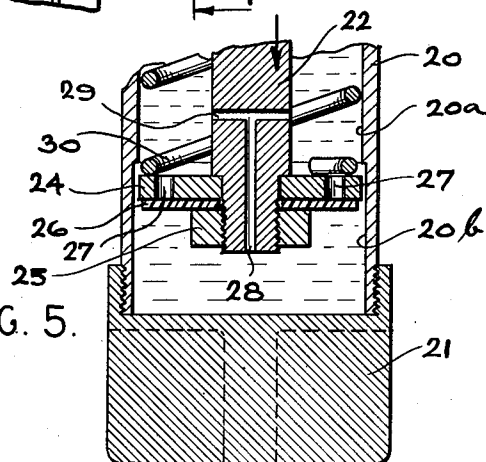


FIG. 5.



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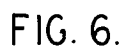
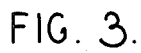
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FIG. 2.

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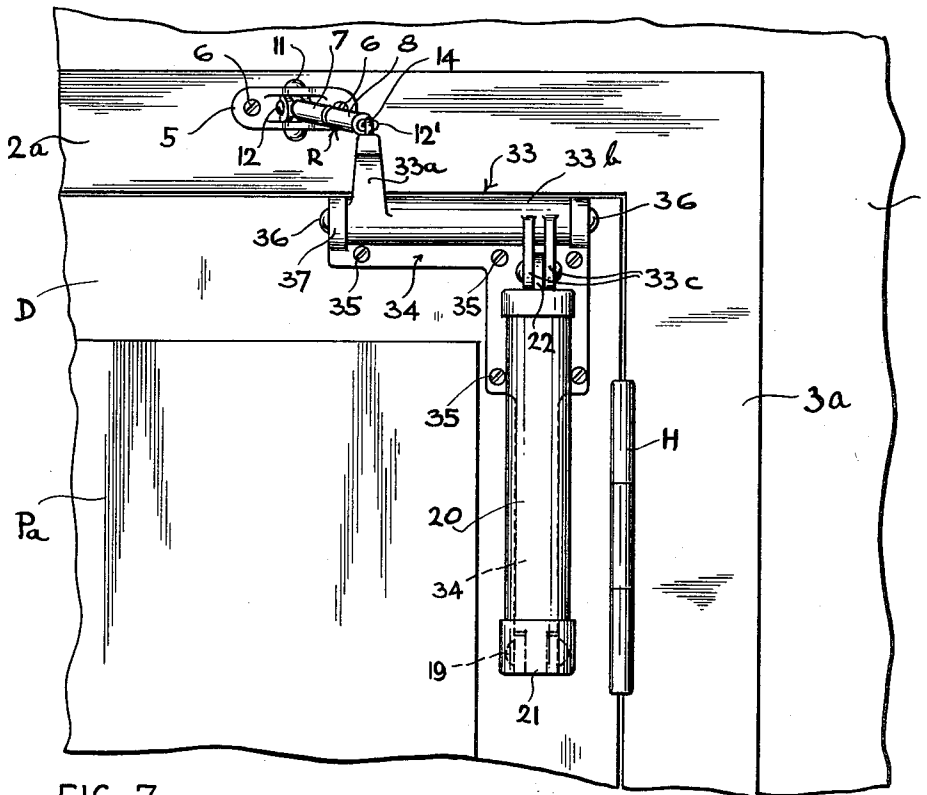
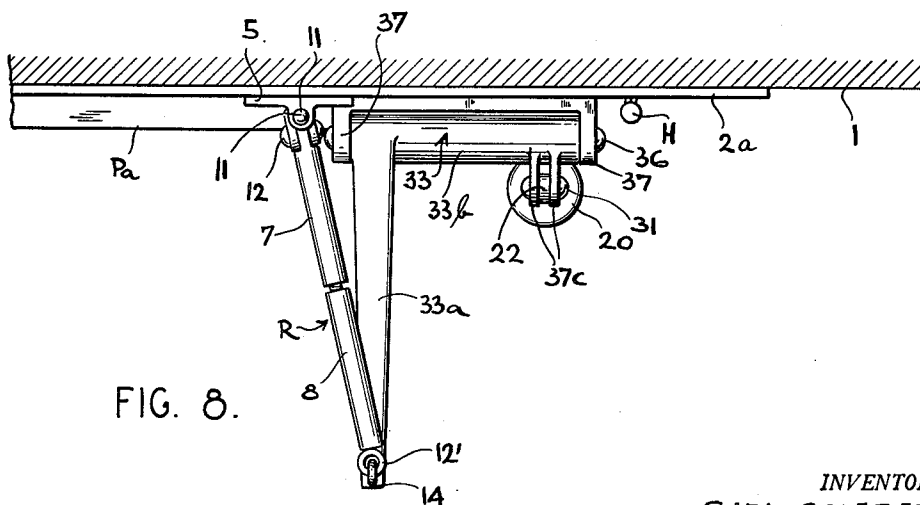
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DOOR CHECK AND CLOSER

Filed April 19, 1949

3 Sheets-Sheet 3



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ATTORNEYS

UNITED STATES PATENT OFFICE

2,596,676

DOOR CHECK AND CLOSER

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Application April 19, 1949, Serial No. 88,421

8 Claims. (Cl. 16—52)

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My invention relates to a new and improved door check and closer.

According to my invention, I provide a simple and efficient door check and closer of the hydraulic type, which can be manufactured at low cost and easily applied.

Other objects of my invention will be stated in the annexed description and drawings which illustrate preferred embodiments thereof.

Fig. 1 is a front elevation, partially in vertical section, of the improved device of the first embodiment. The door D is shown in its open transverse position, in which it is perpendicular to the plane of the door-frame.

Fig. 2 is a top plan view of Fig. 1, showing the parts when the door D is fully closed. The door is not shown in this view, because it is concealed in the door-frame.

Fig. 3 is another top plan view, showing the door in the open transverse position of Fig. 1.

Fig. 4 is a vertical section on the line 4—4 of Fig. 1. When the door D is fully closed, the piston 24 is in its bottom broken-line position of Fig. 4. When door D is fully open, piston 24 is in its top broken-line position of Fig. 4, which also shows an intermediate position of piston 24 in full lines.

Fig. 5 is an enlarged partial vertical section of the cylinder and its bottom cap, showing the piston 24 in a position intermediate its bottom broken-line position of Fig. 4 and its top broken-line position of Fig. 4. Fig. 5 illustrates the sealing position of the disc-valve or flap-valve 26, during the closing movement of the door, during which piston 24 is moved downwardly, as illustrated by the vertical arrow in Fig. 5.

Fig. 6 is a view, similar to Fig. 5, showing the downward flexing of the edge-portion of the disc-valve or flap-valve 26, when the piston 24 is moved upwardly during the opening movement of the door.

Fig. 7 is a front elevation which illustrates the second embodiment.

Fig. 8 is a top view of Fig. 7.

In the first embodiment, but without restriction thereto, the wall 1 is planar and vertical, and it has a vertical and planar door-frame of rectangular shape in the plane of said wall 1. Said door-frame has horizontal frame-members 2 and vertical frame-members 3.

The door D is planar in this embodiment and it is connected to one vertical frame-member 3 by conventioned hinges H, so that the door D turns on a vertical axis. In this embodiment, door D has a planar panel P.

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A bracket 5 is fixed to the top horizontal frame-member 2 by screws 6 or other fastening means. Rod R consists of two rod-sections 7 and 8, which are adjustably connected to each other, in order to vary the length of rod R.

The inner end of rod-section 7 is connected to bracket 5 by a universal joint 9, so that rod R can turn around a vertical axis at bracket 5, and rod R can also turn around a horizontal axis at bracket 5.

A forked joint-member 10 of this universal joint 9, is turnably connected to horizontal and transverse lugs of bracket 5 by a vertical pivot-pin 11, so that joint-member 10 can turn only around a vertical axis relative to bracket 5. A horizontal pivot-pin 12 is connected to the vertical and transverse lugs of joint-member 10. The rod-section 7 is turnably connected to horizontal pivot-pin 12 by an eye formed thereon. The only movement of rod R, relative to horizontal pivot-pin 12, is a turning movement around the horizontal axis of pivot-pin 12.

An eye 12a is fixed to the outer end of rod R. This eye 12a is interlaced or interlinked with another eye 14, which is fixed to the upper or outer end of the long leg of an angular lever 15, which is pivotally connected by a horizontal pivot-pin 16 to the vertical leg of an angular bracket 17. Said vertical leg of bracket 17 is fixed to door D by screws 18 or other fastening means.

Said bracket 17 has a horizontal leg, whose end is of horizontal forked shape. The bottom cylinder-cap 21 is fixed air-tight and liquid-tight to the bottom end of cylinder 20 by cooperating threads. This bottom cylinder-cap 21 has a flat web which is located between the lugs of the horizontal leg of bracket 17. This flat web of cylinder-cap 21 is connected to said lugs of bracket 17 by a horizontal pivot-pin 19. This pivot-pin 19 is optionally offset relative to the longitudinal axis of cylinder 20. The cylinder 20 can thus turn relative to bracket 17 and door D, around the horizontal axis of pivot pin 19.

The bottom portion of cylinder 20 is filled with a pool of checking liquid, whose top level is indicated in Fig. 4 by the horizontal line 32. The top level 32 of this pool of checking liquid remains substantially at line 32 when the piston 24 is moved up or down.

The cylinder 20 has an integral wall which has an upper cylindrical wall-portion 20a which extends to the top of cylinder 20, and a bottom cylindrical wall-portion 20b which extends to the bottom of cylinder 20. The bottom wall-portion

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20b is of greater diameter than the top wall-portion 20a.

A piston 24 is provided in cylinder 20. The diameter of the vertical edge or periphery of piston 24 is substantially equal to the diameter of top wall-portion 20a. The vertical edge or periphery of piston 24 may make a sealing fit or a close fit with top wall-portion 20a, so that there is little or no passage of the checking liquid between the vertical periphery of cylinder 24 and the top wall-portion 20a. The checking liquid can flow easily through the clearance between the vertical edge or periphery of piston 24 and bottom wall-portion 20b.

The piston 24 is provided with a circular row of holes 27. The underside of piston 24 is provided with a disc-valve or flap-valve 26, which is made of any suitable resilient sealing material. This flap-valve 26 is maintained by its resilience in the normal shape of Fig. 5, in which it seals or substantially seals the holes 27.

The piston 24 is fixed to the lower end of piston rod 22. The lower end of piston rod 22 has a reduced bottom end-portion which extends through a central bore of piston 24 and through an aligned central bore of flap-valve 26. An internal annular shoulder of piston rod 22 abuts the top planer surface of piston 24. The bottom end-portion of piston rod 22 is externally threaded. A clamping nut 25 clamps the flap-valve 26 and piston 24 to piston rod 22. This bottom end-portion of piston rod 22 optionally has a vertical recess or bore 28, which opens into an optional horizontal bore 29 above piston 24.

At its upper end, a cap 23 is fixed to cylinder 20. This cap 23 has a vertical bore, through which piston rod 22 extends. The piston rod 22 fits closely and slidably in the bore of cap 23. This fit need not be air-tight, although it may optionally be an air-tight fit or a substantially air-tight fit.

The upper end of piston rod 22 is turnably connected to the short arm 15a of lever 15 by a horizontal pivot pin 31.

The cylinder 20 is filled with air above the top level 32 of the pool of checking liquid. This air may be at the same pressure as that of the atmosphere external to cylinder 20, when piston 24 is in its bottom position which is shown in broken lines in Fig. 4. When piston 24 is moved above said bottom position, the air may be compressed to any desired pressure. This air pressure is preferably slight.

A compression spring 30 normally maintains piston 24 in its bottom position indicated in broken lines in Fig. 4, which corresponds to the completely closed position of the door D in Fig. 2.

When the door D is completely closed, and as shown in Fig. 2, the lever 15 is in a vertical transverse plane which is perpendicular or substantially perpendicular to the common plane of the closed door D and wall 1. The rod R is then in a vertical plane which is inclined away from hinge H, relative to the transverse vertical plane of lever 15.

When door D is fully closed, the axis of cylinder 20 is vertical, the pivot pin 31 is close to the top of cap 23, the long arm of lever 15 is upwardly inclined from pivot pin 16, and rod R is inclined upwardly relative to the long arm of lever 15. The axis of the short arm 15a of lever 15 is then substantially vertical.

When the door is moved between its completely closed position and its transverse open position

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of Fig. 1, there is only a slight turning movement of cylinder 20 around the axis of pivot pin 19, which is offset laterally relative to the common axis of cylinder 20 and the piston rod 22.

The drawings are substantially to scale and accurately show the positions of the parts when door D is fully closed and in transverse open position, and reference to the drawings is made for further disclosure.

Opening movement of door

When door D is fully closed, piston 24 is in its bottom broken-line position of Fig. 4, with the bottom end of piston-rod 22 close to the inner wall of bottom cap 21. The compression and resilience of the flap-valve 26 maintains its edge-portion in the normal sealing position of Figs. 4 and 5, in which flap-valve 26 seals or substantially seals the holes 27. The compression spring 30 keeps the door closed. Said compression spring 30 may be under any selected compression when door D is closed.

When door D is opened, a transverse thrust is exerted at pivot pin 16 upon lever 15. Said pivot pin 16 is located laterally at any desired distance from the vertical hinges H. This thrust exerts an upward tilting force upon lever 15 and rod R, so that the pivot point of intersection between their interlinked eyes 12 and 14 moves upwardly and transversely towards wall 1. While the rod R is thus upwardly turned about the horizontal axis of pivot-pin 12, the inner end of rod R also turns around the vertical axis of pivot-pin 11.

While the piston 24 is located in the bottom wall-portion 20b, the checking liquid flows easily around the edge of piston 24, during the upward movement of piston 24 in said bottom wall-portion 20b.

In one commercial model, and as one example to which the invention is not limited, the length of spring 30 is 5.5 inches, and said spring 30 exerts a force of 20 pounds when piston 24 is in its bottom position, and said spring 30 exerts a force of 60 pounds when the door D is in the transverse open position of Figs. 1 and 2.

During the upward movement of piston 24 in bottom wall-portion 20b, the free flow of the checking liquid around the edge of piston 24 may prevent any substantial downward pressure on the edge-portion of flap-valve 26, so that its compression under clamping nut 25 and its resilience will maintain said edge-portion of flap-valve 26 in the normal sealing position of Fig. 5.

Also, the optional vertical bore 28 and the optional horizontal bore 29 of piston-rod 22 provide relief means between the chamber of cylinder 20 above piston 24, and the chamber of cylinder 20 below piston 24.

The sealing edge of flap-valve 26 may be flexed to its non-sealing position of Fig. 6, even while piston 24 is located in bottom wall-portion 20b. This will depend, among other factors, upon the speed of opening of door D. A slight excess of pressure in the chamber above the piston 24 will flex the edge-portion of flap-valve 26 to said non-sealing position of Fig. 6.

There is optionally but not necessarily a sufficiently close fit between piston rod 22 and the bore of top-cap 23, so that the air in cylinder 20, above the pool of checking liquid, will be compressed during the upward movement of piston 24, if the checking liquid cannot flow at sufficient speed from above piston 24, to below piston 24. This excess air pressure will be sufficient to flex the edge-portion of flap-valve

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26 to non-sealing position. Hence, the pool of checking liquid remains substantially in the position of Fig. 4 during the entire upward movement of piston 24, with little or no change in the position of line 32.

While piston 24 is moving upwardly in top wall-portion 20a, the edge-portion of flap-valve 26 is maintained in the non-sealing position of Fig. 6.

Hence the opening movement of door D is opposed only or substantially only by spring 30.

The leverage of the opposing force of spring 30 is a maximum, when door D is fully closed, and said leverage decreases as the door D is opened. Hence, as the compression of spring 30 is increased during the opening movement of door D, the effect of the increase in longitudinal force of spring 30 is counterbalanced, at least to some extent, by the decrease in leverage of the closing force of spring 30.

In the illustrative commercial embodiment above specifically described, the length of rod R is 8 inches, the length of the long arm of lever 15 is 8 inches, and the length of the short arm 15a, in a direction perpendicular to the long arm of lever 15, is one inch.

In this embodiment, the door D is open to its maximum extent when said door is in transverse position and turned 90° from its closed position, because door D then abuts the transverse wall which is adjacent wall 1.

During the opening movement of door D, the pivot-pin 31 turns from a position at one side of pivot-pin 16, to a position at the other side of pivot-pin 16. In this embodiment, the lever 15—15a is turned through an angle of 120° in a vertical plane, between the open and closed positions of door D.

When door D has been fully turned to its open position through an angle of 90° around the vertical axis of hinges H, the piston 24 is still immersed in the pool of checking liquid as shown by the top broken-line position of piston 24 in Fig. 4. The part of piston rod 22 which extends above the cylinder 20 in the fully open position of door D, is never immersed in the pool of checking liquid. Hence the checking liquid does not wet the part of piston rod 22 which is exposed in its full-line position of Fig. 1, and the checking liquid cannot drip from this exposed part of the piston rod 22, and there is no loss of checking liquid.

The enlarged bottom wall-portion 20b may be optionally omitted, in which case, the wall-portion 20a will extend from the top of cylinder 20 to its bottom.

Closing movement of door

This is illustrated in Fig. 5. As soon as piston 24 is moved downwardly under the force of spring 30, when the door D is released so that it can close, the edge-portion of flap-valve 26 will be held by its resilience and the slight excess of pressure below the piston 24, in its sealing position of Fig. 5.

The closing movement of door D is then regulated by the flow of the checking liquid through the optional relief bores 28 and 29.

The invention is not limited to the relief passage 28—29, because such relief passages may be omitted by providing a slight clearance, as 0.005 inch, between the periphery of piston 24 and the inner wall 20a of cylinder 20.

The flap-valve 26 is an example of a one-way valve which is closed during the closing move-

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ment of the door D, and which is opened during the opening movement of the door D, and the invention is not limited to this preferred type of one-way valve.

5 The invention includes the sub-combinations disclosed herein.

It is noted that the eye of rod-section 7 mounted on pin 12 can turn around a horizontal axis relative to eye 14, in addition to the vertical turning movement of the eye of rod-section 7 mounted on pin 12 relative to eye 14. Hence said eyes exemplify a universal joint.

The door D may be provided with conventional means for holding it in fully open or partially open position.

The checking liquid may be of any height in cylinder 20, and the pool of checking liquid may even wholly fill cylinder 20.

Although the cylinder 20 is not in truly vertical position at all times, said cylinder 20 always remains in upstanding position.

In the second embodiment of Figs. 7 and 8, the door D has an outwardly bulging panel Pa, instead of the planar panel P of the first embodiment.

In this second embodiment, the door D is a supplemental door which is hingedly connected to another main or supporting door, which provides a frame having frame elements 2a and 3a for door D. The door D can swing outwardly relative to said supporting door, which is hingedly connected to a suitable frame. The door D, in this second embodiment, therefore provides a panel which can turn outwardly relative to the supporting door.

In the second embodiment, similar parts are designated by the same reference numerals as in the first embodiment. In this second embodiment, the lever 15 is replaced by a lever 33, which has an arm 33a, and a cylindrical part 33b. The top panel of the frame of the door D is provided with a bracket 34 which is fixed to said top panel by screws 35 or other suitable fastening means. The cylindrical hub 33b is pivotally connected to the lugs 37 of this bracket 34, by means of a pivot pin or pivot pins 36. This cylindrical hub 33b is provided with lugs 33c. The upper end of the piston rod 22 is located between said lugs 33c, and a pivotal connection is provided by means of a pivot pin 31, as in the first embodiment. The bracket 34 as shown in broken lines in Fig. 7, has a bottom portion. The bottom cylinder cap 21 is pivotally connected to this bottom portion of the bracket 34 in the same manner as in the first embodiment. Figs. 7 and 8 show the door D in its fully closed position. The operation of the second embodiment is the same as that of the first embodiment.

In this second embodiment, the compression spring 30 may be supplemented or replaced by a torsion spring in cylinder 33b. In this second embodiment, rod R and lever 33a turn through an angle of 180° between the fully closed and fully open position of door D.

In each embodiment the bracket 5 is fixed or intended and adapted to be fixed to a longitudinal face of the door whose movement is to be checked.

I have shown preferred embodiments of my invention, but numerous changes and omissions and additions can be made without departing from its scope.

I claim:

1. In a door-check and closer, the sub-combination of a bracket, a cylinder pivotally connected to said bracket, said bracket being adapted and

intended to be fixed to a longitudinal face of a door, said cylinder being transversely tiltable relative to said door when said bracket is fixed to said door, a piston slidably located in said cylinder, a piston rod fixed to said piston and having a rod-part which extends outwardly of one respective end of said cylinder, said cylinder having a first chamber between said piston and said respective end of said cylinder and having a second chamber between said piston and the other end of said cylinder, relief passage-means connecting said chambers and adapted to permit the flow of a checking liquid from said first chamber to said second chamber when said piston is moved towards said other end of said cylinder, additional passage-means between said chambers, a movable one-way valve located to control the flow of checking liquid through said additional passage-means, said valve being biased to closing position, said valve being opened by pressure in said first chamber over said second chamber when said piston is moved away from said other end, spring-means connected operatively to said piston and urging it towards said other end, a lever pivotally connected between its ends to said bracket, said lever being also pivotally connected to said rod-part, the free end of said lever being connected by a universal joint to the outer end of a rod, and universal joint means adapted to connect the inner end of said rod to a frame member of said door.

2. In a door-check and closer, the combination of a bracket adapted to be fixed to a longitudinal face of a door, a cylinder, said cylinder being pivotally connected to said bracket and being transversely tiltable relative to said door, a piston slidably located in said cylinder, a piston rod fixed to said piston and having a rod-part which extends outwardly of one respective end of said cylinder, said cylinder having a first chamber between said piston and said end of said cylinder and having a second chamber between said piston and the other end of said cylinder, relief passage-means connecting said chambers and adapted to permit the flow of a checking liquid from said first chamber to said second chamber when said piston is moved towards said other end of said cylinder, additional passage-means between said chambers, a movable one-way valve located to control the flow of checking liquid through said additional passage-means, said valve being biased to closing position, said valve being opened by pressure in said first chamber in excess of pressure in said second chamber when said piston is moved away from said other end, spring means which urge said door to closing position and which urge said piston towards said other end, a lever pivotally connected between its ends to said bracket at a first selected pivot-point, said lever being pivotally connected at a second selected pivot point to said rod-part, a primary universal joint connected to the free end of said lever, a secondary joint adapted to be connected to the frame of said door, and a connecting rod linked to said universal joints.

3. A combination according to claim 2, in which said relief passage-means are provided in said piston rod, said additional passage-means are provided in said piston, and said one-way valve is connected to said piston-rod.

4. A combination according to claim 2, in which said door is mounted to turn on a vertical axis, said cylinder is upstanding in all positions of said door, said rod-part extends above said cylinder, said second selected pivot point is below

said first selected point when the door is closed and said second selected pivot point is above said first selected pivot point when the door is open, and said other frame element is located above said door.

5. A combination according to claim 2, in which said door is mounted to turn on a vertical axis, said cylinder is upstanding in all positions of said door, said rod-part extends above said cylinder, said second selected pivot point is below said first selected point when the door is closed and said second selected pivot point is above said first selected pivot point when the door is open and turned substantially 90° from its closed position, and said other frame element is located above said door, said second pivot point being located relative to said first pivot point so that said second pivot point turns through an arc of substantially 120° between the closed and open positions of the door.

6. A combination according to claim 2, in which said door is mounted to turn on a vertical axis, said cylinder is upstanding in all positions of said door, said rod-part extends above said cylinder, said second selected pivot point is below said first selected point when the door is closed and said second selected pivot point is above said first selected pivot point when the door is open and turned substantially 90° from its closed position, and said other frame element is located above said door, said second pivot point being located relative to said first pivot point so that said second pivot point turns through an arc of substantially 120° between the closed and open positions of the door, the free end of said lever turning through an arc of substantially 120° between the closed and open positions of the door.

7. A combination according to claim 2, in which said door is mounted to turn on a vertical axis, said cylinder is upstanding in all positions of said door, said rod-part extends above said cylinder, said second selected pivot point is below said first selected point when the door is closed and said second selected pivot point is above said first selected pivot point when the door is opened, and said other frame element is located above said door, the checking liquid only partially filling the cylinder and being always at the lower end of said cylinder, the rod-part which extends above said cylinder when said door is open being above said checking liquid when said door is closed, the piston rod having a sufficiently close fit in the respective end of the cylinder to create excess pressure in said first chamber to open said valve when said piston is moved towards said respective end.

8. A sub-combination according to claim 1, in which the pivotal connection between said cylinder and said bracket is offset relative to the axis of said cylinder.

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