March 15, 1955 H. H. WENZEL 2,703,906

HOLD-OPEN DOOR CHECK

Filed March 31, 1954 3 Sheets-Sheet 1

FIG. 1

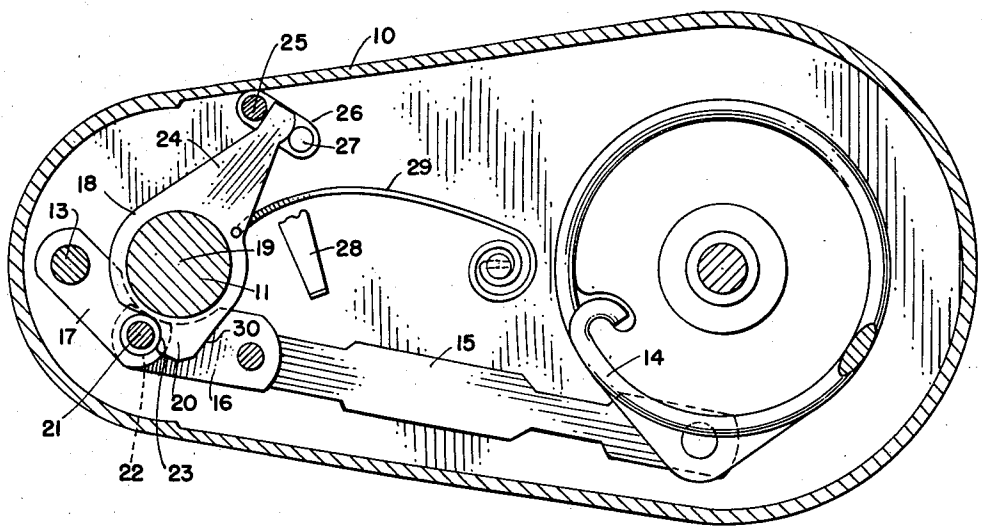
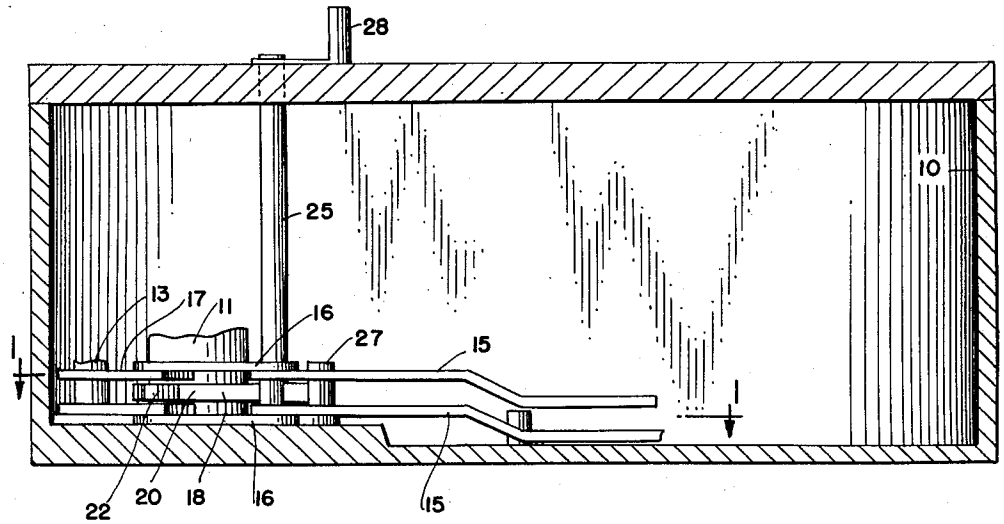


FIG. 2



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March 15, 1955 H. H. WENZEL 2,703,906

HOLD-OPEN DOOR CHECK

Filed March 31, 1954 3 Sheets-Sheet 2

FIG. 3

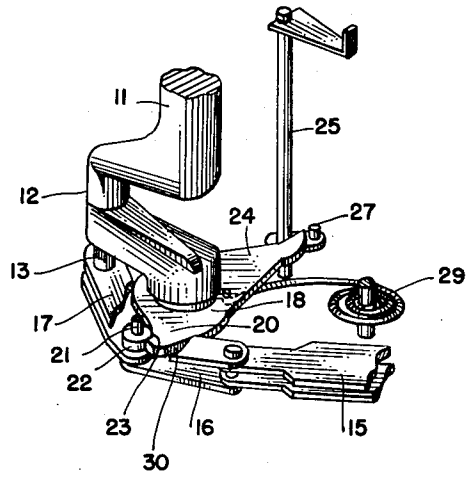
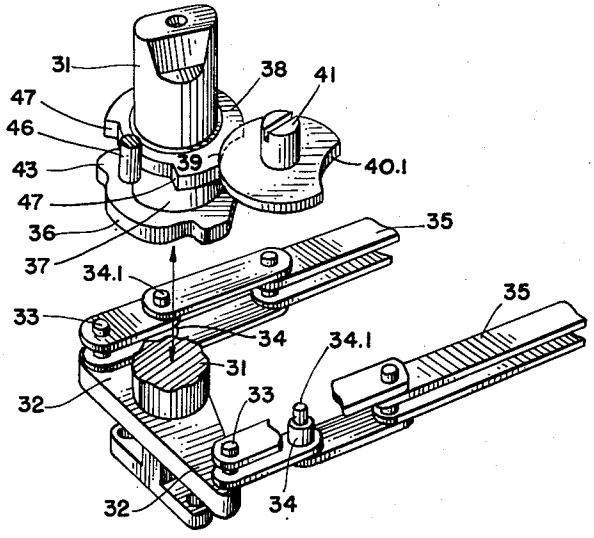


FIG. 4



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March 15, 1955 H. H. WENZEL 2,703,906

HOLD-OPEN DOOR CHECK

Filed March 31, 1954 3 Sheets-Sheet 3

FIG. 5

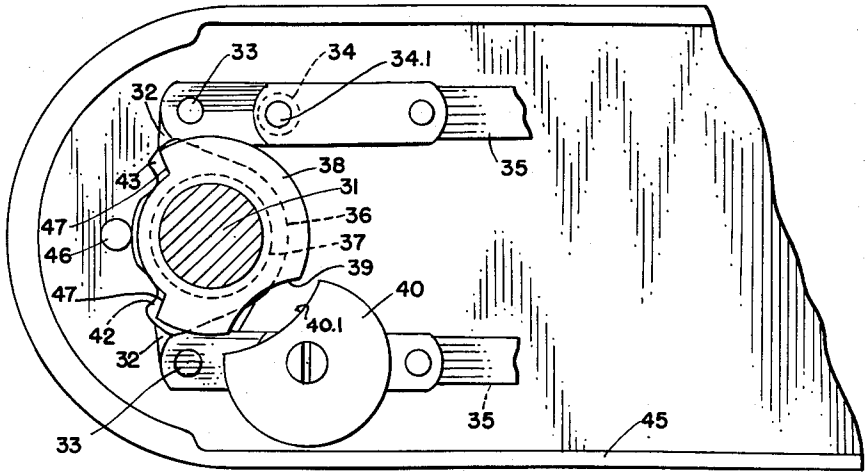
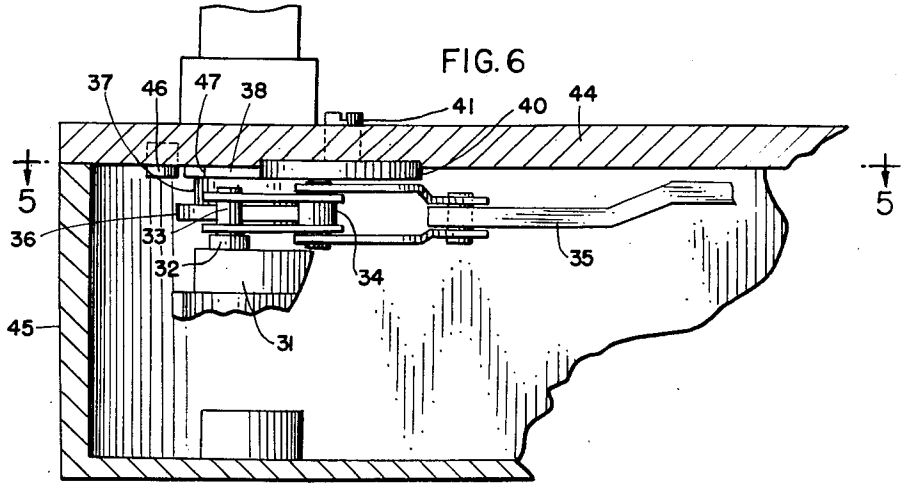


FIG. 6



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HOLD-OPEN DOOR CHECK

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Application March 31, 1954, Serial No. 420,074

10 Claims. (Cl. 16—55)

This invention relates to hold-open detent mechanism suitable for use in floor hinges of the general type of Patent No. 1,064,255, Closer and Check for Single-Acting Doors, dated June 10, 1913, and Patent No. 1,025,309, Door Closing Mechanism, dated May 7, 1912, both issued to Oscar C. Rixson.

The main objects of this invention are to provide an improved form of hold-open detent mechanism for swinging doors; to provide such detent mechanism that can be readily applied to floor hinges of existing types of door checks with minimum need for changes in the structure of any parts of such devices that have become standardized by long usage; to provide such improvements at minimum additional cost; to provide such hold-open detent mechanism that can be selectively changed between "on" and "off" status by a simple operation; to provide improved means for locking the hold-open detent in its door-controlling position; and to provide in such detent mechanism an improved arrangement wherein the door is automatically held in its open position and is releasable by a slight application of initial force in the manual closing of the door.

Two specific embodiments of this invention are illustrated in the accompanying drawings in which:

Figure 1 is a plan of a single-acting floor hinge equipped with hold-open detent mechanism constructed according to this invention, omitting parts of the floor hinge and checking structure that are not deemed essential to the disclosure of the present invention.

Fig. 2 is a side elevation of the detent mechanism with the casing shown in section.

Fig. 3 is a perspective view of the single-acting door hold-open detent mechanism of Figs. 1 and 2, illustrating the arrangement and operation of the selector lock that renders the detent mechanism operative or inoperative with respect to the door.

Fig. 4 is a perspective view of a hold-open detent mechanism for double-acting doors with some of the parts separated for more clearly illustrating the structure thereof.

Fig. 5 is a top plan of the same, and

Fig. 6 is a side elevation of the same.

In the form shown in Figs. 1, and 2, the main supporting frame **10** is a housing that is adapted to be embedded in the floor below the door and has journaled therein the upright spindle **11** which supports and turns with the door.

In accordance with the usual construction, the spindle **11** is a crank shaft having a crank pin **12** that coacts with dashpot mechanism, not shown, for checking the speed of the closure of the door, and a crank pin extension **13** that is connected with a spiral torsion spring **14** by door closing linkage which usually comprises a long link **15** and a series of short links for flexing about the spindle. In the present structure there are two such shorter links **16** and **17**. These links are pivotally connected together end to end between the spring **14** and crank pin **13** as shown, so that the shorter links can flex around the spindle **11** in its rotation for the opening and closing movements of the door.

According to the present invention the hold-open detent mechanism comprises a member **18** in the form of a single toothed cam that is loosely rotatable on the lower part of the spindle **11** for independent rotation about the axis **19** of that spindle within a limited range of angular movement.

The radial tooth or lobe **20** of the cam **18** coacts with a shoulder on the linkage provided by a pivot pin **21**

which connects the links **16** and **17**, which pivot has mounted thereon an anti-friction roller **22**. The cam surface **23**, on the side of the tooth **20**, is so formed that when the cam **18** is held in the position in which it is shown in Fig. 1, the tooth **20** will engage the roller **22** on the link pin **21** and hold the door closing linkage against the pull of the spring **14**. When extra force is applied for closing the door, the cam surface **23** of the tooth **20** allows the roller to ride over the tooth, through outward buckling of the joint between the links **16** and **17** against the resistance of the spring **14**, so as to release the linkage. The spring **14** is then free to perform its normal function of turning the spindle **11** to bring the door to its fully closed position.

In Figs. 1, 2 and 3 the parts are in the position corresponding to that in which the detent mechanism holds the door open at 90° to its normally closed position As shown in Fig. 1, the cam **18** is locked for holding the door in this open position by means of an integral, radially projecting arm **24**, which is normally shiftable into and out of engagement with a stop pin **25** on the frame **10** during opening and closing action of the door, and in order to lock the cam arm in this door-holding position, the stop pin **25** has an arm **26** carrying a stud **27** that can be rotated about the pin **25** by a handle **28** from locking position, as in Fig. 1, to an open or releasing position, as shown in Fig. 3. When the arm **24** is released the cam **18** is free to turn on the spindle **11** and is normally urged to the position shown in Fig. 3 by a light return spring **29**.

When the door is closed, the crank pin **13** will have swung substantially 90° counterclockwise and the roller **22** will have been moved some distance to the right of the normal position of the tooth **20**. Thus, when the arm **24** of the cam is free from the locking stud **27**, the swinging of the door to an open position will cause the roller to contact the cam surface **30** of the tooth **20** and thereby turn the cam **18** with the spindle **11** so that roller **22** does not pass over the tooth and the linkage is free to operate in its normal way to cause the door to return automatically to its closed position under the action of the return spring **14**.

When the end of the arm **24** is locked between stop pin **25** and the stud **27**, as in Fig. 1, the tooth **20** will be held stationary and the opening of the door will cause the roller **22** to ride over the cam surface **30** into position for holding engagement with the cam surface **23** whereby the door will be normally held in the open position. At such times the manual pressure on the door in the closing direction will force the roller **22** to cam itself outwardly and ride over the cam surface **23**, past the tooth **20** in the backward direction but the detent cam **18** will remain stationary and ready to hold the door at its open position against the normal action of the return spring **14** unless a definite closing force is applied to the door.

In the form shown, each short link of the linkage system comprises a pair of plates that are spaced apart vertically to accommodate the roller **22** and the cam tooth **20** between them.

In the form shown in Figs. 4, 5 and 6, the hold-open detent mechanism is arranged for a double-acting door and is shown in operating position with the door closed. In this case the hinge spindle **31** has two crank arms **32** with crank pins **33** and each of these crank pins is connected by chain linkage to a separate main motor spring. These springs are not illustrated in Figs. 4, 5 and 6, but are well known in the art, one being arranged to close the door when it is swung to one side, and the other being arranged to close the door when it is swung to the other side. The detent rollers **34** correspond to the roller **22** of the single-acting door holder mechanism and the linkages **35** correspond to that of the single-acting mechanism in relation to their respective spring. The rollers **34** are journalled on the pivots **34.1** of the linkages **35**.

In the case of the double-acting door, the hold-open cam **36** is carried by the sleeve **37** which is loosely mounted on the spindle **31**, and this sleeve has an annular selector member **38** spaced above the hold-open cam **36**. The selector member is the means for rendering the hold-open cam operative and is provided with an arcuate

notch 39 in its margin shaped to receive the periphery of an annular lock cam 40, which is rotatably mounted on a shaft or pin 41 so that it can be turned into and out of locking engagement with the notch 39 to prevent or permit turning of the cam 36 under the influence of the rollers 34. The lock cam 40 also has its margin cut away, as at 40.1, sufficient to allow clearance for the necessary rocking movement of the selector member 38, with the hold-open cam 36, when the lock cam 40 is out of holding engagement with the selector cam member, and the hold-open mechanism is not functioning.

As shown, the hold-open cam 36 is provided with two lobes or teeth 42 and 43, one on each side of the spindle 31, which are engageable with the respective rollers 34, during swinging movement of the door, in the same manner as described for the single acting mechanism of Figs. 1, 2, and 3, the roller being shifted during movement of the door by means of the crank arms 32 which turn with the spindle 31 and pull the linkages 35 on one side or the other according to the direction which the door is swung.

Only the head of the pin 41 extends through the cover 44 of the housing 45 of the double-acting door check, and this pin 41 is provided with a screw driver slot by means of which it can be turned in either direction to put the hold-open detent mechanism into and out of operation as will be readily understood from Figs. 4, 5 and 6.

In order to accommodate the detent mechanism to the structure of the double-acting door check, the hold-open cam 36 is located in the upper part of the casing, as shown in Fig. 6, because that happens to be the location of the linkage of the existing door check mechanism with which the hold-open detent assemblage is associated.

In the case of the double-acting door, a return spring for centering the selector member 38, and corresponding to the spring 29 of the single-acting door, is unnecessary because the annular periphery of the lock cam 40, upon entering the cut-out portion 39 of the selector member 38, will automatically cam the selector member to its central position for hold-open operation. A suitable fixed stop 46, engageable with the angularly spaced shoulders 47 on the selector member 38, is provided to limit turning movement of the selector member so that the cut-out notch 39 will never be shifted beyond a position for operative entry of the lock cam 40 when it is turned in one direction or the other.

Thus when the lock cam 40 is held in the locked position as shown in Fig. 4, the location of both hold-open cam teeth or lobes 42 and 43 will be held in fixed position for hold-open engagement with either of the rollers 34 according to which direction the door is swung, and it will be understood that when one of the rollers 34 is engaged with the lobe or tooth 42 or 43, the other roller 34 will be out of position to engage with its respective lobe or tooth.

The main advantages of this invention reside in the relatively simple means for permitting a swinging door to be automatically held in open position when swung to a predetermined position, and yet be readily releasable for normal closing operation by a relatively slight amount of manual pressure on the door. Other advantages reside in the arrangement whereby the hold-open mechanism can be easily set to be either operative or inoperative; and in the relatively simple manner and low cost by which the automatic hold-open mechanism can be incorporated in existing door closing devices.

Although but two specific embodiments of this invention are herein shown and described, it is understood that numerous details of the invention shown may be altered or omitted without departing from the spirit of the invention as defined by the following claims.

I claim:

1. In a door check, a frame, a door hinge spindle having a crank arm, a door-closing spring, a linkage connecting said crank arm and spring to urge said spindle to its door-closing position, a cam loosely journalled on said spindle for independent rotation about the axis thereof and having a radial cam tooth in the path of said linkage, a shoulder on said linkage adapted to engage with said cam tooth when the door is in an open position, and means on said frame adapted to hold said cam with said cam tooth in position to obstruct the door-closing action of said spring.

2. In a door check, a frame, a door hinge spindle having a crank arm, a door-closing spring, a linkage connecting said crank arm and spring to urge said spindle to its door-closing position, a cam loosely journalled on said spindle for independent rotation about the axis thereof and having a radial cam tooth in the path of said linkage, a shoulder on said linkage adapted to coact with said cam tooth when the door is in open position, and means on said frame adapted to hold said cam with its tooth in position to obstruct the door-closing action of said spring, said cam tooth having a cam surface adapted to deflect said shoulder over said tooth when said spindle is turned by extraneous force applied to the door.

3. In a door check, a frame, a door hinge spindle having a crank arm, a door-closing spring, a linkage connecting said crank arm and spring to urge said spindle to its door-closing position, a cam loosely journalled on said spindle for independent rotation about the axis thereof and having a radial tooth in the path of said linkage, a shoulder on said linkage adapted to coact with said tooth when the door is in an open position, and means on said frame adapted to hold said cam with its tooth in position to obstruct the door-closing action of said spring, said tooth having a cam surface on each of both side edges thereof adapted to deflect said shoulder over said sprocket tooth when said spindle is turned through movement of the door.

4. In a door check, a frame, a door hinge spindle having a crank arm, a door-closing spring, a linkage connecting said crank arm and spring to urge said spindle to its door-closing position, a cam loosely journalled on said spindle for independent rotation about the axis thereof and having a radial cam tooth in the path of said linkage, a shoulder on said linkage adapted to coact with said tooth when the door is in an open position, and means on said frame adapted to hold said cam with its tooth in position to obstruct the door-closing action of said spring, said tooth having a cam surface adapted to deflect said shoulder over said tooth when said spindle is turned by extraneous force applied to the door, and said linkage comprising a pair of links having pivotal connection adjacent said shoulder adapted to buckle to permit such deflection of said shoulder.

5. In a door check, a frame, a door hinge spindle having a crank arm, a door-closing spring, a linkage connecting said crank arm and spring to urge said spindle to its door-closing position, a cam loosely journalled on said spindle for independent rotation about the axis thereof and having a radial tooth in the path of said linkage, a shoulder on said linkage adapted to engage with said tooth when the door is in an open position, and means on said frame adapted to lock said cam with its tooth in position to obstruct the door-closing action of said spring.

6. In a door check, a frame, a door hinge spindle having a crank arm, a door-closing spring, a linkage connecting said crank arm and spring to urge said spindle to its door-closing position, a cam loosely journalled on said spindle for independent rotation about the axis thereof and having a radial tooth in the path of said linkage, a shoulder on said linkage adapted to coact with said tooth when the door is in an open position, a lock means on said frame adapted to engage said cam to hold said tooth in position to obstruct the door-closing movement of said linkage; and a return spring acting between said cam and frame for normally urging said cam angularly toward position for engagement by said lock means.

7. In a door check, a frame, a door hinge spindle having a crank arm, a door-closing spring, a linkage connecting said crank arm and spring to urge said spindle to its door-closing position, a cam loosely journalled on said spindle for independent rotation about the axis thereof and having a radial tooth in the path of said linkage, a shoulder on said linkage adapted to coact with said tooth when the door is in an open position, said cam having a radially disposed arm, a stop means on said frame positioned to be engaged by said arm for holding said cam with its tooth in position to engage said shoulder and hold the door open, a return spring normally urging said arm toward said stop means, and a detent shiftable into and out of position to hold said arm against said stop means.

8. In a double-acting door-closing device which includes a frame, a door-carrying hinge spindle having a pair of crank arms connected by separate linkages to a pair of main springs for respectively urging the door to a closed position from respectively opposite open posi-

tions, a hold-open detent mechanism comprising a cam journalled on said spindle for independent rotation about the axis thereof, a pair of radial teeth on said cam angularly spaced apart for coaction with respective linkages, a shoulder on each linkage positioned to engage the respective cam tooth at a certain respective position of the linkage corresponding to a hold-open position of the door, and lock means shiftable into and out of position to engage said cam and hold the same in its door-holding position.

9. In a double-acting door-closing device which includes a frame, a door-carrying hinge spindle having a pair of crank arms connected by separate linkages to a pair of main springs for respectively urging the door to a closed position from respectively opposite open positions, a hold-open detent mechanism comprising a cam journalled on said spindle for independent rotation about the axis thereof, a pair of teeth on said cam angularly spaced apart for coaction with respective linkages, a shoulder on each linkage positioned to engage the respective cam tooth at a certain respective position of the linkage corresponding to a hold-open position of the door, and lock means shiftable into and out of position for holding said cam in its door-holding position, each said cam tooth being shaped to cause the respective linkage shoulder to escape from holding relation therewith when the spindle is turned by extraneous force applied to the door.

10. In a double-acting door-closing device which includes a frame, a door-carrying hinge spindle having a pair of crank arms connected by separate linkages to a pair of main springs for respectively urging the door to a closed position from respectively opposite open positions, a hold-open detent mechanism comprising a cam journalled on said spindle for independent rotation about the axis thereof, a pair of teeth on said cam angularly spaced apart for coaction with respective linkages, a shoulder on each linkage positioned to engage the respective cam tooth at a certain respective position of the linkage corresponding to a hold-open position of the door, an annular selector member secured to said cam in axially spaced relation therewith and having a circularly arcuate notch in its periphery, and an annular lock cam rotatably mounted on said frame in position to peripherally engage in said notch to lock said selector member and cam against rotation, said lock cam having a portion of its margin removed to provide a path for free passage of the periphery of said selector member when said lock cam is turned to a predetermined inoperative position.

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