Oct. 25, 1949. A. J. SWANSON 2,485,937

DETENT FOR CARTRIDGE TYPE DOOR HINGES

Filed Dec. 7, 1946

2 Sheets-Sheet 1

FIG. 2.

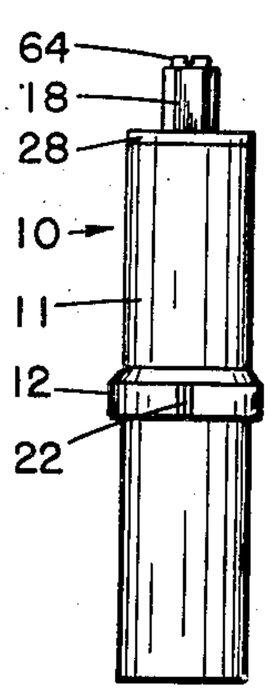

FIG. 1.

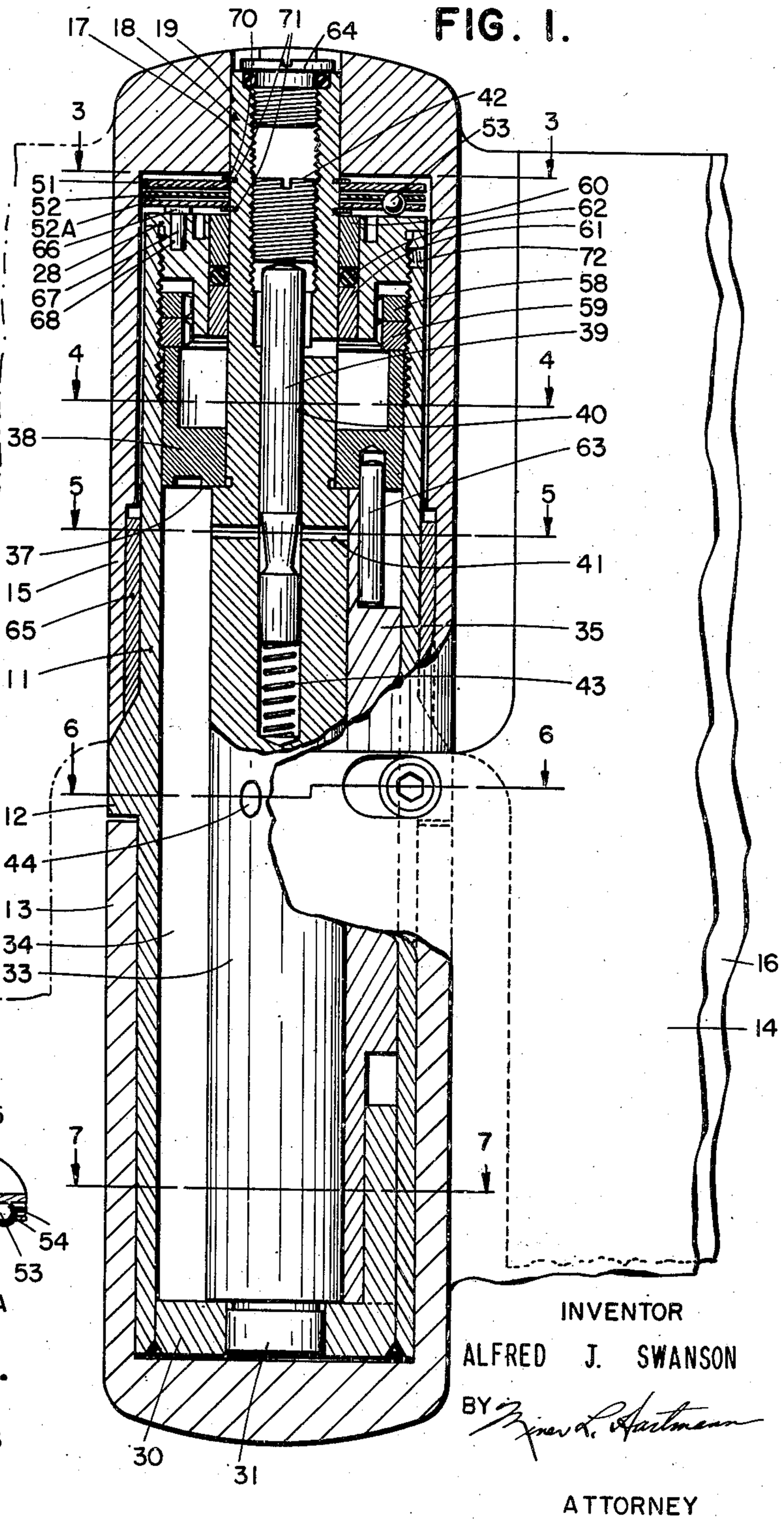

FIG. 9.

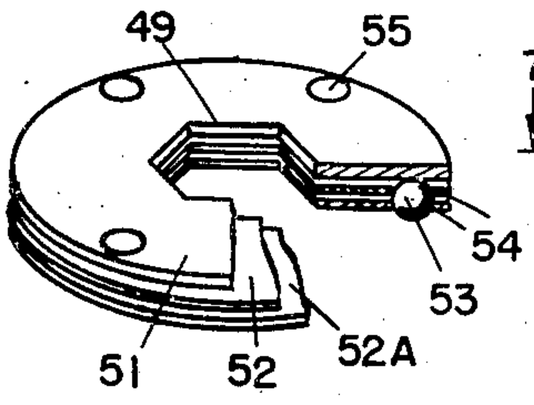

FIG. 10.

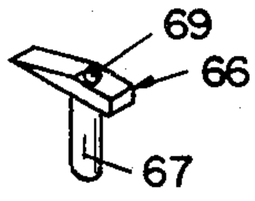

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FIG. 4.

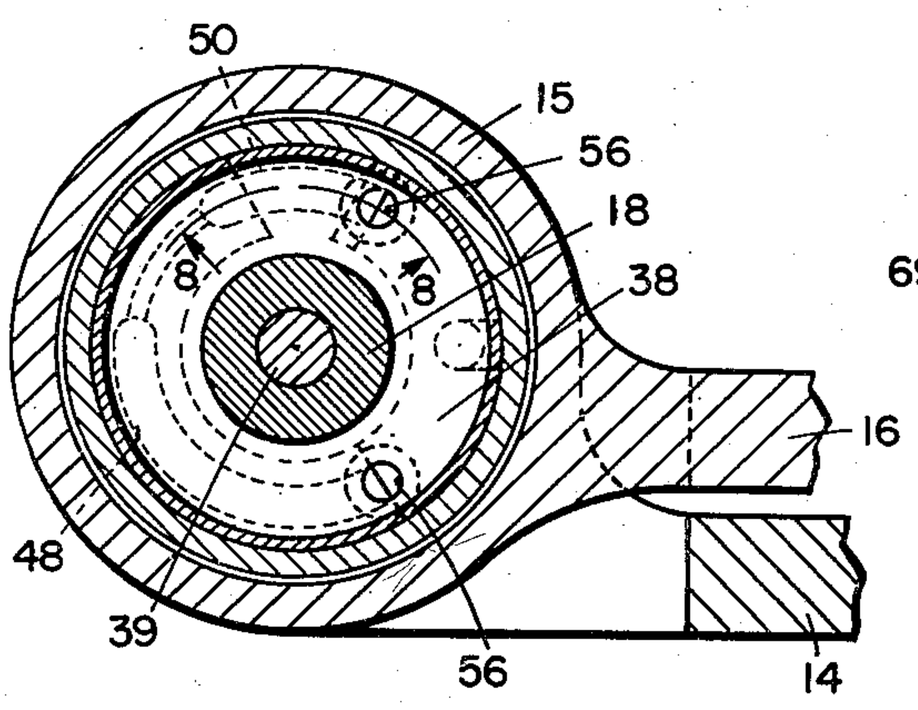


FIG. 3.

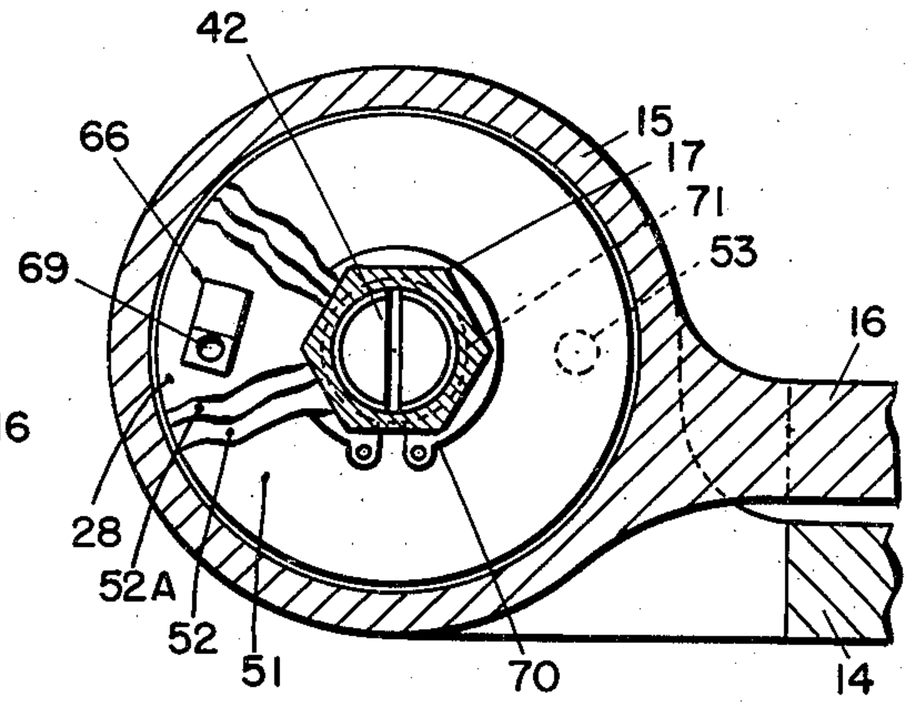


FIG. 5.

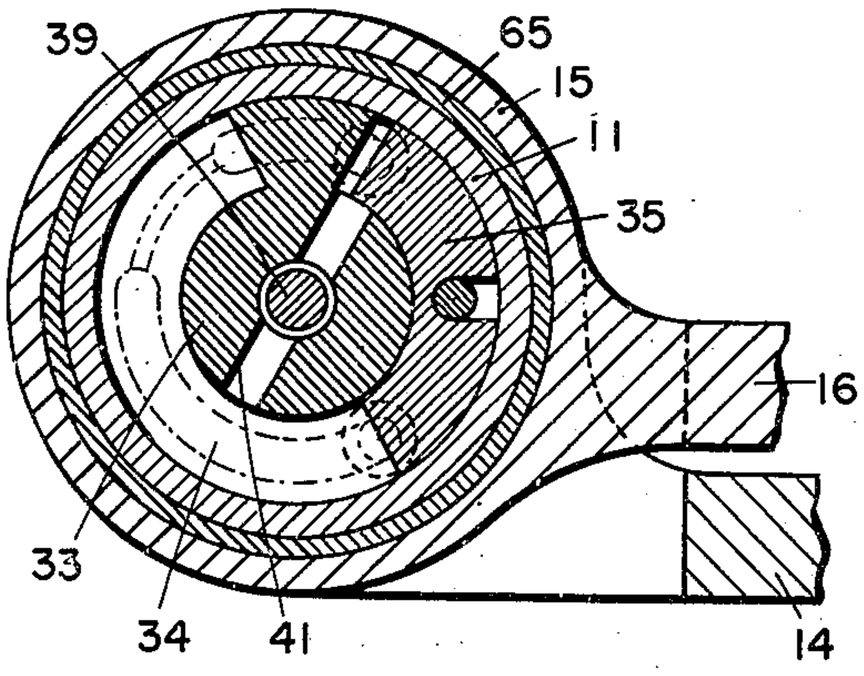


FIG. 7.

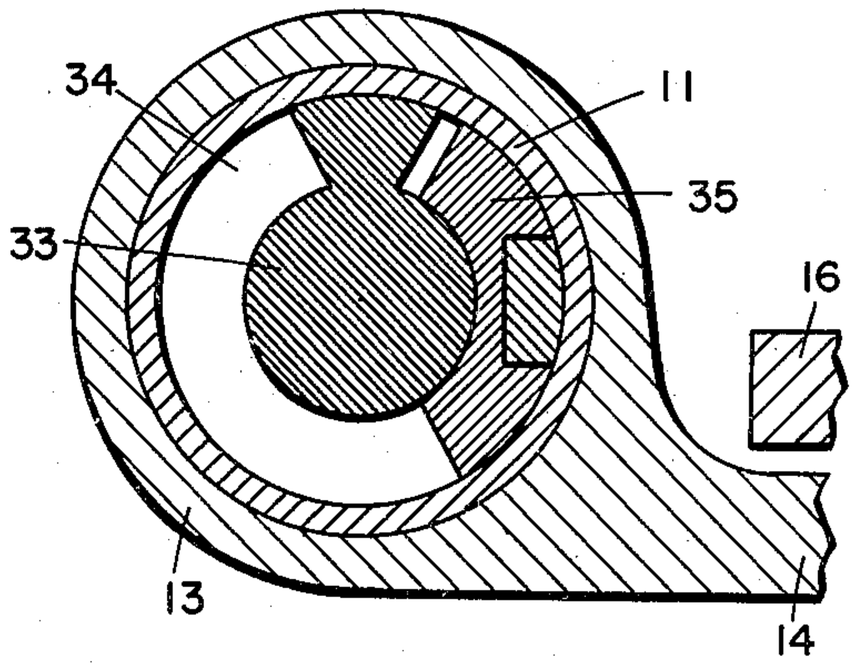
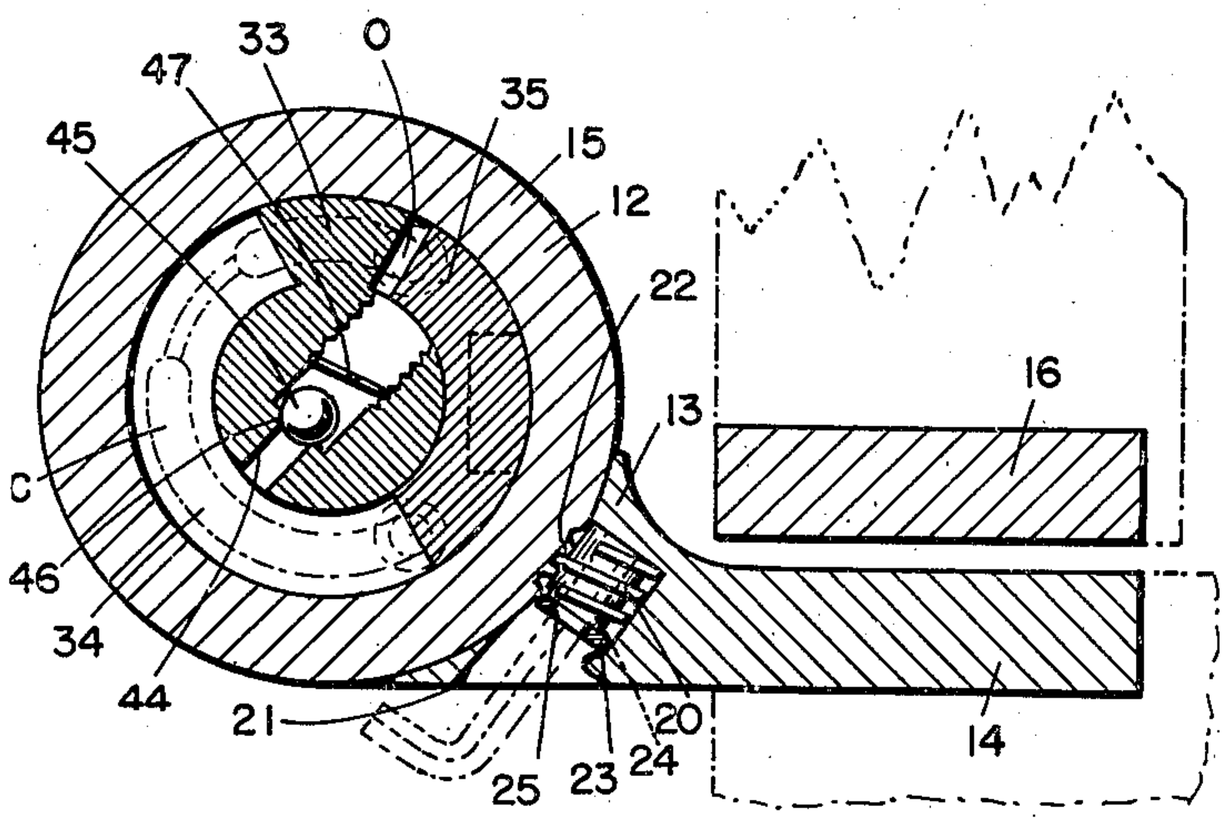
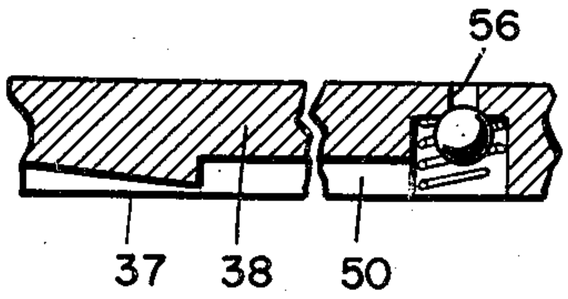


FIG. 6.

FIG. 8.





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Patented Oct. 25, 1949

2,485,937

UNITED STATES PATENT OFFICE

2,485,937

DETENT FOR CARTRIDGE TYPE DOOR HINGES

Alfred J. Swanson, Hollywood, Calif.

Application December 7, 1946, Serial No. 714,705

3 Claims. (Cl. 16—54)

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This invention relates to door closure control devices and in particular to detent means for a cartridge type door hinge.

One object of my invention is to provide a detent means for door hinges having interchangeable and removable cartridge-type control units concentric with the hinge pins. Another object of my invention is to provide detent means in a hinge having a removable cartridge-type hydraulic checking unit, for removably holding the parts in a selected relative position.

These and other objects are attained by my invention which will be understood from the following description, reference being made to the accompanying drawings in which:

Fig. 1 is a side elevation view partly in section and with parts broken away of my hydraulic checking hinge;

Fig. 2 is a side elevational view showing the cartridge containing an hydraulic checking mechanism;

Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a cross-sectional view taken on the line 5—5 of Fig. 1;

Fig. 6 is a cross-sectional view taken on the line 6—6 of Fig. 1;

Fig. 7 is a cross-sectional view taken on the line 7—7 of Fig. 1;

Fig. 8 is a cross-sectional view taken on the line 8—8 of Fig. 4;

Fig. 9 is a perspective view of the detent disks and ball; and

Fig. 10 is a perspective view of the detent wedge.

In general, my invention relates to a detent means for a door hinge having an hydraulic checking mechanism for controlling the angular movement of the door checking mechanism which is enclosed in a removable cartridge concentric with the hinge pin. The cartridge is operatively encased in the cavities of the outer half-casings, each of which is integral with one of the two hinge leaves of each hinge.

The removable cartridge 10 includes a cylindrical housing 11 containing the hydraulic checking mechanism and is seated up to the central collar 12 thereof, in the cavity of the lower outer half casing 13 to which is attached the leaf 14, and the upper half-casing 15 encloses to the collar 12 the upper part of the cylindrical cartridge to which is attached the other leaf 16, said upper half-casing 15 being non-rotatably attached to the hexagonal upper end of the hinge pin 18 by

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means of a hexagonal hole 19 in the upper end thereof.

A detent means is provided to removably hold the upper hinge leaf 16 at any selected angle relative to the other leaf 14, for example, to hold the attached door open at 90°, or 180°, from the closed position. In my improved embodiment, the detent means consists of one or more deformable spring disks placed between the top surface of the cartridge 11 and the upper end of the cartridge cavity of the upper half-casing 15, with wedge means placed at the desired detent position to frictionally engage the disk assembly. In the preferred form shown, a deformable spring steel disk 51 is riveted to two disks 52 and 52A, the rivets 55 being spaced around the periphery of the disks. The disks 51, 52, and 52A are provided with hexagonal center holes 49 fitting the hexagonal end 17 of the hinge pin. The lower disks 52 and 52A are provided with holes 54 disposed intermediate the rivets 55 and the center hole 49, in which is placed a steel ball 53, the ball being of greater diameter than the combined thickness of the disks 52 and 52A so that the ball abuts the under surface of the top disk 51 and extends below the lower surface of the lower disk 52A. The disk assembly is held in place longitudinally on the hexagonal end 17 of the hinge pin by snap clips 70 positioned above and below the disks, in grooves 71 in the hinge pin. A detent wedge member 66 is attached to the top surface of the closing cap 28 of the cartridge 10, a hole 68 being provided in the cap at the desired detent position, in which the mounting pin 67 is inserted. A dimple 69 is provided at the end of the incline to form a seat for the ball 53 at the detent position. When the hinge leaves and attached parts are rotated to the position at which the ball 53 is forced up the inclined surface of the wedge 66, and into the dimple 69, the disks act as a wedging detent. The wedging action against the spring action of the disks removably holds the parts at the desired position; the parts may be released by exerting sufficient force in the opposite direction to remove the ball 53 from the dimple 69 in wedge 66.

The cartridge 10 is adjustably held against turning in the cavity of the lower half-casing 13 by the helical pinion or worm 20 which is mounted in the cylindrical hole 21 drilled in the juncture of the casing with the lower leaf, at right angles to the axis of the cartridge so that the helical threads extend to engage worm gear teeth in the collar of the cartridge. The worm or helical pinion 20 is held in the hole 21 by means of the

apertured retaining washer 23, which is held in the cavity against one end of the pinion by peening or pressing the edge of the cavity over the washer, or otherwise fastening the washer to the lower leaf. The pinion 20 is conveniently provided with a hexagonal socket 24 which may be turned by means of a suitable tool inserted through the opening 25 of the washer 23. Indexing marks (not shown) may be provided on the collar 12 and the adjacent surface of the lower half casing 13. The central collar 12 of the cartridge is provided with teeth 22 adapted for engagement with the helical threads of the pinion 20. By turning the pinion 20, the axial position of the hydraulic cartridge 11 relative to the lower leaf 14, may be adjusted. After the adjustment is made, the pinion 20 continues to prevent the cartridge 11 from turning in the lower half casing 13, so that the hydraulic checking mechanism will function to control the movement of the hinge.

The hydraulic mechanism is enclosed in the hydraulic cartridge unit 10 which consists of a cylindrical cartridge housing 11 provided in its central portion with an outwardly extending collar 12. The hexagonal extension 17 of the hinge pin 18 extends above the cap 28 which closes the upper end of the cartridge housing 11. In the opposite end of the cartridge housing 11 there is provided a bottom closure 30 having a bearing 31 on the hinge pin 18.

The hydraulic checking mechanism consists of a rotary piston 33 forming an extension of the hinge pin 18 in a cylindrical working chamber 34 having a segmental partition member or dam 35. The working chamber 34 is formed by the inner surface of the cartridge housing 11, the radial ends of the dam 35, the bottom closing member 30 and the upper closing surface consisting of the bottom 37 of the reservoir bushing 38. A bearing for the lower end of the hinge pin 18 is formed by reducing the diameter of the hinge pin below the piston 33, to fit a hole in the closing member 30 for the cartridge housing. The rotation of the hinge pin 18 causes the angular movement therewith of the rotary piston 33 in the working chamber 34 from one edge of the dam 35 to the other edge, the dam 35 extending between the wall of the cartridge housing 11 to the surface of the hinge pin. As the piston moves, the hydraulic fluid is forced through several controlled conduits which act to regulate the hydraulic friction in the movement of the hydraulic fluid from one side of the piston to the other. One control consists of metering pin 39 operating in a hole 40 concentric with and in the center of hinge pin 18. At right angles to the hinge pin a bypass conduit 41 through the hinge pin is provided, the metering pin in the portion adjacent the conduit 41, being tapered so that the flow of hydraulic fluid may be closely regulated by the endwise movement of the metering pin 39. The pin 39 is positioned by the threaded plug 42 which is threaded into a hole in the upper part of the hinge pin, the metering pin 39 being held upwardly by a compressed coil spring 43 in the bottom of the hole 40. A oneway bypass conduit from one side of the piston to the other is provided by the hole 44 extending through the hinge pin 18 from one side of the piston 33 to the other, the hole being provided with a ball 45 in a seat 46 and held in place by a retainer 47. When the piston 33 is moved counterclockwise, hydraulic liquid flows freely from the "closed" side "C" of the working chamber to the "open" side "O" of the

chamber. When the piston is moved in the opposite direction, the ball 45 is forced into the seat 46 and shuts off the flow of hydraulic fluid. In the movement of the piston from "O" position to the "C" position, the flow of hydraulic fluid is further controlled by means of grooves of varying cross-sectional area, cut in the under surface 37 of the reservoir bottom which serves as the upper closing wall for the hydraulic working chamber. In the preferred arrangement, as shown, a bypass groove 48 large enough to permit substantially unrestricted movement of the hydraulic fluid therethrough is provided in the first part of the movement of the piston (in the direction of closing the hinge) following which the groove is tapered to gradually retard the flow of hydraulic fluid by gradually decreasing the cross-sectional area; followed by a terminal groove 50 similar in cross-sectional area to the bypass groove 48, allowing free flow of hydraulic fluid. The arrangement of connected bypass grooves thus described provides for the initial unretarded closing of the hinge and the attached door by suitable actuator means until the door approaches the fully closed position, at which point the constricted groove retards the flow of liquid and slows down the movement of the door, and then shortly before reaching the final closed position, the hydraulic resistance is removed by the provision of the large cross-sectional area 50 so that the door is forced into the latch to the fully closed position.

The non-pressured reserve hydraulic liquid reservoir consists of an annular space between the reservoir bushing 38 and the hinge pin 18. The reservoir is connected hydraulically with the working chamber by means of check-valved orifices 56, one on each side of the piston. The reservoir bushing is held in place within the cartridge housing by means of locking rings 58 and 59. The top portion of the reservoir is closed by the closing cap 28, and sleeve bearing 60 and 61 are provided between the hinge pin and the closing cap 60, the rubber O ring 62 being provided around the hinge pin between the bearings 60 and 61 to prevent leakage of hydraulic liquid. The radial position of the reservoir bushing is fixed by means of the key 63 in suitably placed holes in the reservoir bushing 38 and the dam 35. A closing cap 64 is provided at the upper end of the opening in the hexagonal extension 17 of the hinge pin 18.

The upper leaf 16 of the hydraulic hinge is preferably made integrally with the part-casing 15 adapted to fit over the upper portion of the hydraulic mechanism cartridge housing 11. A sleeve bearing 65 is provided between the cartridge and the inner surface of the part-casing 15; and a hexagonal hole 19 is provided in the upper end of the part-casing 15 adapted to non-rotatably engage the hexagonal shaft extension 17. The cap 64 is threaded into a hole in the end of the shaft extension 17 and is accessible through an opening in the upper part of the part-casing 15.

The lower leaf 14 is preferably made integrally with the lower part-casing 13 and is adapted to fit over the lower portion of the cartridge housing 11, the cartridge being held against turning by the worm gear 20 as previously described.

The advantages of my improved detent will be apparent. The detent allows the door to be held open at any selected angle, such as that shown of 180° from the closed position. The detent wedge may be located upon any desired

portion of cap 28 by inserting it into any one of a series of holes in the top surface of the closing cap of the cartridge, the unused holes being flush plugged to avoid the interference of the open unused holes with the smooth silent movement of the ball on the surface. The detent may be easily released, so that the hinge functions in the usual way.

Reference is made to my copending applications, Ser. No. 714,704, filed December 7, 1946, now Patent No. 2,469,447, dated May 10, 1949 and Ser. No. 35,640, filed June 28, 1948, the structure of the cartridge disclosed herein forming the subject matter of the latter application; and the worm gear adjusting device disclosed herein forming the subject matter of the former application.

I claim:

1. A hinge mechanism comprising a pair of leaves adapted for attachment to a closure and to a closure mounting frame; a cartridge having a cylindrical housing and a concentric shaft extension protruding from the upper end of said cartridge housing, said cartridge containing hydraulic checking means adapted to control the relative rotary movement of said shaft extension and said cartridge housing; a hollow upper part-casing extending from the edge of one leaf, adapted to fit over and turn on the upper portion of said cartridge housing, and to non-rotatably engage said shaft extension; a hollow lower part-casing extending from the edge of the other leaf, adapted to fit over the lower portion of said cartridge housing; and detent means for releasably holding said upper part-casing at a selected position relative to said cartridge comprising spring disk means non-rotatably attached to said shaft extension and disposed between the top surface of said cartridge and the contiguous surface of said upper part-casing, and wedge means disposed at a selected position on the top surface of said cartridge and adapted to engage a surface of said disk means to effect wedging engagement between said upper casing and said cartridge.

2. A hinge mechanism comprising a pair of leaves adapted for attachment to a closure and to a closure mounting frame; a cartridge having a cylindrical housing and a concentric shaft extension protruding from the upper end of said cartridge housing, said cartridge containing hydraulic checking means adapted to control the relative rotary movement of said shaft extension

and said cartridge housing; a hollow upper part-casing extending from the edge of one leaf, adapted to fit over and turn on the upper portion of said cartridge housing, and to non-rotatably engage said shaft extension; a hollow lower part-casing extending from the edge of the other leaf, adapted to fit over the lower portion of said cartridge housing; and detent means for releasably holding said upper part-casing at a selected position relative to said cartridge comprising a plurality of spring disks having center holes non-rotatably fitting over said shaft extension, means for holding together the outer edge portions of said disks to form a warpable disk bundle, said disk bundle being disposed between the top surface of said cartridge and the contiguous surface of said upper part-casing, a ball cavity in said disk bundle near the periphery thereof extending from the bottom of said bundle but not through the top disk thereof, a ball in said cavity having a diameter greater than the depth of said cavity and adapted to press against said top disk, a detent wedge attached to the top surface of said cartridge and adapted to press said ball in said cavity against the said top disk to buckle it whereby to removably wedge said upper casing relative to said cartridge at a selected angular position.

3. In a removable-cartridge type door hinge, a cartridge unit having a central shaft extension, an upper part casing and a lower part casing, each casing being attached to a hinge leaf and together forming a hinge; the upper part casing having a central hole to non-rotatably engage said center shaft; detent means between the top surface of said cartridge and the inside end surface of said upper part casing, said detent means being adapted for releasably holding said upper part casing at a selected angular position relative to said cartridge, said detent means comprising spring disk means non-rotatably attached to said shaft extension and disposed between the contiguous surfaces of said cartridge end and the inside end of said upper part casing and wedge means disposed at a selected position on the top surface of said cartridge and adapted to engage a surface of said disk means to effect wedging engagement between the upper casing and said spring disk means.

ALFRED J. SWANSON.

No references cited.