July 1, 1969 R. A. STONE 3,452,388

COUNTERBALANCING LID AND HINGE SUPPORT

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Fig. 1.

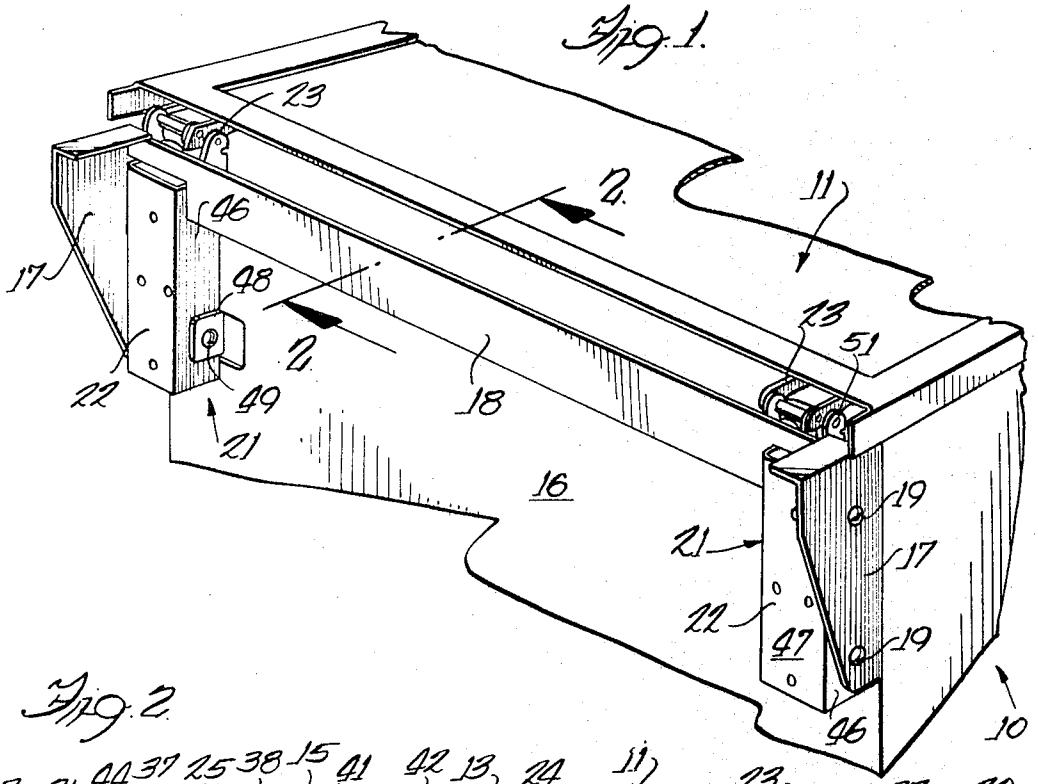
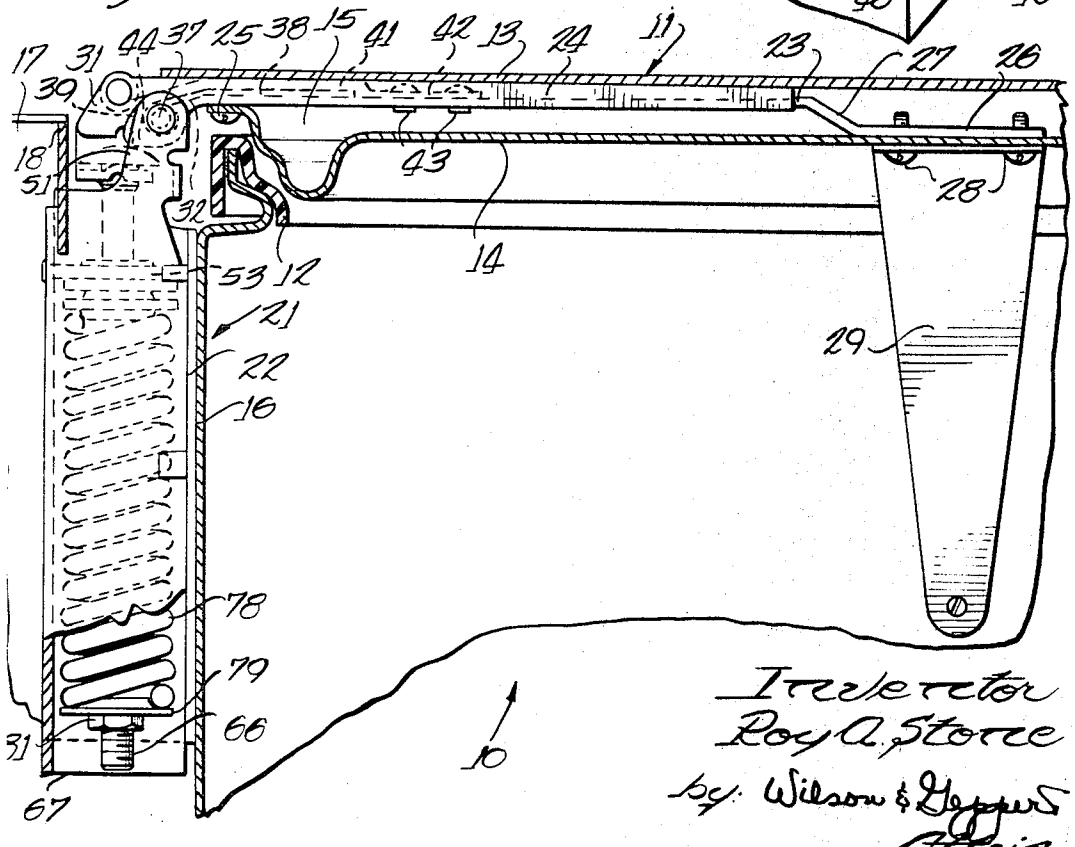


Fig. 2



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Fig. 3

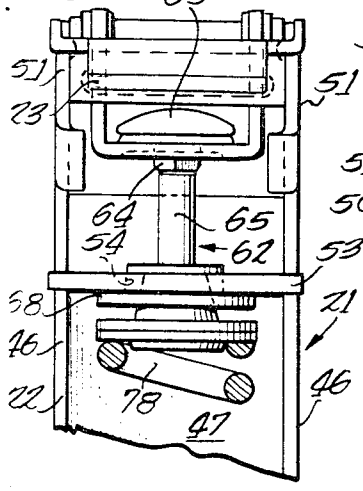


Fig. 4

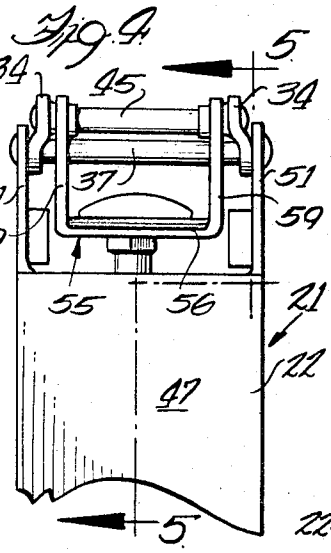


Fig. 5

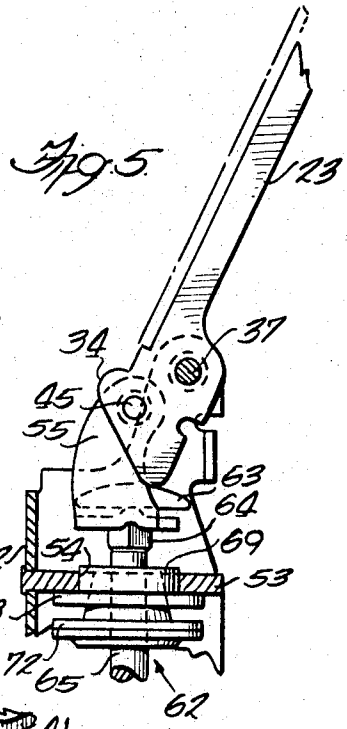


Fig. 6

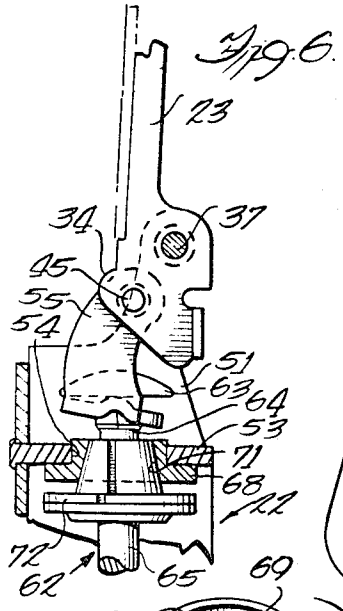


Fig. 7

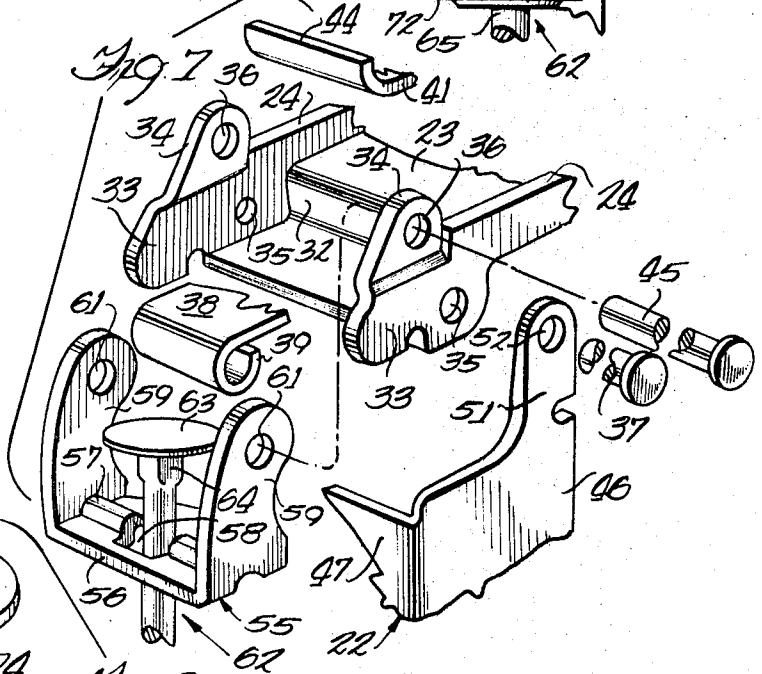
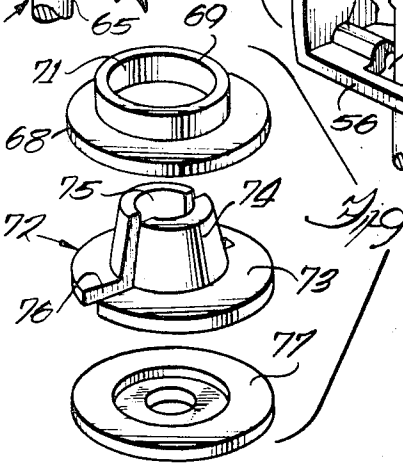


Fig. 8



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3,452,388

COUNTERBALANCING LID AND HINGE SUPPORT

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U.S. Cl. 16—190
6 Claims

ABSTRACT OF THE DISCLOSURE

A counterbalancing lid and hinge support utilized on a cabinet having a relatively heavy hinged lid, such as a dishwasher, with friction braking means to retard movement of the lid due to gravity. The lid and hinge support includes a housing or casing secured to the cabinet and a lid wing pivoted to the housing and secured to the lid of the cabinet. An elongated bolt is connected to the lid wing through a pivotal bolt bracket and extends downward into the housing and through a rigid plate therein to terminate in a threaded lower end. A compression spring encompasses the bolt between a washer retained at the threaded lower end of the rod a friction bushing mounted adjacent and below the rigid plate. The bushing has a conical projection extending into and conformably received in a tapered passage in a retainer abutting the plate, so that increased spring pressure causes the bushing to be compressed and provide greater frictional or snubbing contact with the bolt and thus impede movement thereof.

The present invention relates to a counterbalancing lid and hinge support for a cabinet having a hinged lid, and more particularly to a counterbalancing lid and hinge support having a variable frictional impedance upon movement of the lid by the force of gravity.

Among the objects of the present invention is the provision of a counterbalancing lid and hinge support for a relatively heavy lid hinged to a cabinet which will effectively counterbalance the weight of the lid by the use of a compression spring throughout all positions in the path of travel of the lid between open and closed positions. The lid and hinge support provides a simple and compact structure having a lid support wing pivotally mounted on a housing secured to the exterior rear surface of the cabinet or enclosure so that the lid may be pivoted between a fully closed horizontal position and a fully open vertical position providing free access to the contents of the enclosure.

Another object of the present invention is the provision of a counterbalancing lid and hinge support for the lid of a cabinet or enclosure having a lid support wing pivoted on a housing with a compression spring in said housing and connected between the housing and the lid wing. An elongated bolt is mounted on a bolt bracket in the lid support and extends downward through the housing to adjacent the bottom thereof. The compression spring encompasses the bolt with one end of the spring abutting a washer adjacent a stationary plate adjacent the upper end of the housing and the opposite end of the spring abutting a washer retained on the bolt by a nut on the threaded end of the bolt and bearing against the washer. The force exerted by the spring can be adjusted for lids of different weight by adjustment of the nut on the bolt.

A further object of the present invention is the provision of a counterbalancing lid and hinge support having a variable force frictional motion impeding means for the elongated bolt depending on the position of the lid and the resultant force exerted by the compression spring, the frictional motion impeding means includes a retainer member positioned below the stationary plate in the housing and having a central conical opening through which the elongated bolt extends. A generally conical expanding and compressible bushing having a radial flange at one end is positioned below the retainer member with the bushing received within the conical opening in the retainer. The bushing has a central passage receiving the elongted bolt in frictional engagement therewith. As the force exerted by the compression spring is increased due to compression of the spring by closing movement of the lid, the telescoping conical surfaces cause a compression of the bushing about the bolt which, in turn, creates greater frictional drag or snubbing action on the bolt.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawings:

FIGURE 1 is a fragmentary perspective view of a cabinet and lid showing the rear wall thereof with the counterbalancing lid and hinge supports of the present invention mounted thereon.

FIG. 2 is an enlarged fragmentary vertical cross sectional view taken on the line 2—2 of FIG. 1, with a portion of the support housing broken away.

FIG. 3 is a partial front elevational view of the counterbalancing lid and hinge support.

FIG. 4 is a partial rear elevational view of the counterbalancing lid and hinge support.

FIG. 5 is a vertical cross sectional view of the upper end of the counterbalancing lid and hinge support taken on the line 5—5 of FIG. 4 showing the lid in partially open position.

FIG. 6 is a vertical cross sectional view similar to FIG. 5, but with the lid in fully open position.

FIG. 7 is an enlarged fragmentary exploded perspective view of the pivotal components of the counterbalancing lid and hinge support.

FIG. 8 is an enlarged exploded perspective view of the expansible and compressible bushing assembly.

Referring more particularly to the disclosure in the drawings wherein is shown an illustrative embodiment of the present invention, FIG. 1 discloses a cabinet or enclosure **10** having a top opening lid **11**, such as would be utilized for a dishwasher or similar appliance. In the case of a dishwasher, the enclosure **10** would be the tub and be provided at its upper edge with a sealing gasket **12**. The lid **11** has a lid top wall **13** and a spaced interior liner **14** forming an insulating space **15** therebetween. Mounted on the rear wall **16** of the enclosure or tub **10** is a pair of mounting brackets **17**; one at each edge thereof adjacent the upper edge of the tub. A reinforcing bar **18** extends across and parallel to the rear wall **16** between the brackets **17**.

Mounted on each bracket **17** by suitable fastening means, such as screws **19**, is a counterbalancing lid and hinge support **21** having a generally channel-shaped housing **22** and an elongated generally flat lid wing **23**. The lid wing extends into the space **15** between the lid top **13** and the lid liner **14** and has a pair of parallel upwardly extending flanges **24** forming a channel shape for approximately three-quarters of its length; the flanges abutting the interior surface of the lid top wall **13**. The lid wing **23** is secured to the lid liner **14** by screws **25** adjacent the pivotal mounting of the lid wing, and the free end **26** of the lid wing is downwardly offset, as at **27**, and is secured thereat to the lid liner by screws **28** or other suitable means. A bracket **29** for a rack in the dishwasher may also be secured to the inner surface of the lid liner by the screws **28**.

At the rear pivotally mounted end **31** of the lid wing **23**, the wing is downwardly offset at **32**, and the flanges are enlarged to form projections **33**, having upwardly extending and inwardly offset ears **34** (see FIG. 7). The projections **33** are each provided with a pivot opening **35** adjacent the offset **32** and a second opening **36** in each upper ear **34**. The openings **35** are aligned to receive a pivot pin **37** for pivotally mounting the lid wing **23** on the housing **22** and to provide a pivotal axis for the lid **11**.

A support bracket **38** is affixed or spot welded within the channel portion of the lid wing **23** (FIGS. 2 and 7) and has a curled end **39** which encompasses the pivot pin **37**. Also, a support strap **41** overlies the support bracket **38** and is provided with an offset end **42** beyond the support bracket **38** which is riveted to the lid wing **23** at **43**, and the opposite end **44** is curled upwardly partially around a second pin or rivet **45** received in the aligned openings **36** in the ears **34**.

The housing **22** is generally channel-shaped having side walls **46**, **46** and a connecting rear wall **47**, one side wall being secured to the mounting bracket **17** by attaching means such as screws **19**. A tab **48** (FIG. 1) is bent to extend outwardly perpendicular to the rear wall **16** of the tub **10** and the tab **48** is secured to the adjacent wall **46** of the housing **22** by a screw **49**. At the upper end of each side wall **46**, **46** is an upwardly extending ear **51** adjacent the rear wall **16** and sealing gasket **12**; each ear having an opening **52** to be aligned with the openings **35** in the lid wing **23** and receive the pivot pin **37**. The pivot pin **37** has an enlarged head at one end and the opposite end is upset to retain the support **21** assembled.

The housing **22** is provided with a transverse plate **53** therein staked to the housing adjacent the upper end and the ears **51** thereof and extending horizontally across the housing with an enlarged central opening **54** therein (FIG. 6). A generally U-shaped bolt bracket **55** (FIG. 7) has a base portion **56** with a laterally extending raised ridge **57** thereacross and a square central opening **58** extending through the ridge; a pair of upwardly extending ears **59** on the base portion **56** each have an opening **61** to be aligned with the openings **36** in the lid wing **23** to receive the second rivet or pin **45** headed at one with the opposite end upset to retain the lid wing and bolt bracket together.

An elongated bolt **62** mounted in the housing has an enlarged domed head **63**, a short square shank portion **64** adjacent the head **63**, and an elongated depending cylindrical shank **65** terminating in a lower threaded end **66** adjacent the lower end of the housing **22**. The bolt extends downward through the openings **58** in the bolt bracket **55** and the opening **54** in the plate **53** to extend into the housing **22** and terminate adjacent the lower open end **67** of the housing (FIG. 2). Also within the housing **22** is a metal retainer **68** abutting the plate **53** and having a central annular projection **69** conformably received in the enlarged opening **54** of plate **53**. The retainer **68** and projection **69** has a central conical bore or tapered passage **71** therethrough. Below the retainer **68** is an expansion bushing **72** (FIGS. 5, 6 and 8) having a a radial flange **73** spaced from the retainer **63** and a conical sleeve **74** extending upward from the flange and received in the corresponding conical passage or opening **71** in the retainer **68**. The sleeve **74** has a central bore or passage **75** slidably and frictionally engaging the cylindrical shank **65** of the bolt **62**. The bushing **72** has a diametrically extending slot **76** cutting through the flange **73** at one side of the sleeve, through the sleeve **74** and partially through the flange on the opposite side of the sleeve, the slot aiding in the expansion or contraction of the bushing. The bushing **72** is formed of a suitable plastic material, such as Delrin, to provide frictional engagement with the encompassed bolt **62** but permit the latter to have controlled sliding movement.

Below and abutting the bushing **72** is a washer **77**, and encompassing the shank **65** of the bolt **62** is a compression spring **78** having one end abutting the washer **77** and the opposite end abutting a second washer **79** vertically adjustable on the bolt **62** by a nut **81** therebelow threadingly engaging the threaded end **66** of the bolt. The washer **77** has a central depression and the washer **79** has a central embossment locating the opposite ends of the spring **78**.

In operation, the greater the compressive force of the spring **78**, the greater will be the compression force exerted on the bushing **72** by the coaction between the conical sleeve **74** and the conical passage **71** in the retainer **68**; which results in a greater frictional force exerted by the bushing **72** upon the shank **65** of the bolt **62**. The frictional force on the bolt **62**, along with the force of the spring **78** counterbalances the force of gravity acting on the lid **11** tending to close the lid on the cabinet **10**.

When the lid **11** is in its horizontal closed position as seen in FIG. 2, the compressive force of the spring **78** and the frictional force exerted by the bushing are at their greatest level. At the lid **11** is opened, the lid wing **23** pivots about the pivot pin or rivet **37** and the pin or rivet **45** moves in an arc around the pivot pin **37** as seen in FIGS. 5 and 6. Movement of the rivet **45** in the ears **34** in a counter clockwise direction lowers the bolt bracket **55** relative to the plate **53**; thus lowering the bolt **62** to decrease the amount of spring compression exerted between the washers **77** and **78**. This is turn lowers the frictional contact of the bushing **72** as that bushing expands. In closing the lid, the change in forces are reversed and greater spring compression causes the bushing sleeve **74** to be forced into the tapered passage **71** of the retainer **68** to cause contraction of the bushing **72** and increase the frictional forces exerted in the bolt thereby.

Adjustment of the nut **81** on the threaded end **66** of the bolt **62** will adjust the initial compression exerted on the spring **78**. Utilizing this construction, the lid **11** is easily manually moved to any position between fully open and fully closed with the frictional forces exerted by the bushing **72** on the bolt **62** tending to hold the lid in any position of adjustment. Latching means may be provided for retaining the lid in closed position.

Having thus disclosed my invention, I claim:

1. A counterbalancing lid and hinge support for a lid pivoted to the frame of an enclosure such as a cabinet, comprising a housing mounted on the frame and a lid wing secured to a lid, a pivot pin joining said housing and lid wing for pivotal movement thereabout, a generally U-shaped bolt bracket pivotally mounted on said lid wing and having a central opening therethrough, an elongated bolt extending through the opening in the bolt bracket and depending into the housing, said housing being of channel shape having side walls and a rear wall with said side walls each terminating in an upwardly extending ear supporting said pivot pin, a plate extending across and secured in said housing adjacent the upper end thereof and having a central opening therethrough, said bolt depending through the opening in said plate and terminating adjacent the lower end of the housing in a threaded end, a compression spring encompassing said bolt between said plate and said threaded end, an upper and a lower retaining washer positioned at the ends of said spring, a nut threadedly engaging the threaded end of said bolt and abutting said lower washer, a retainer abutting the underside of said plate with a central annular projection conformably received in said central opening of the plate, said annular projection having a tapered central bore therethrough, and a conical bushing having a radial flange located between said retainer and said upper washer, said bushing having a central passage therethrough receiving said bolt and a tapered outer wall conformably received in the tapered passage of the retainer, said bushing cooperating with said retainer and adapted to frictionally engage the bolt.

2. A counterbalancing lid and hinge support as set

forth in claim 1, in which said bolt has an enlarged head received in and abutting the U-shaped bolt bracket.

3. A counterbalancing lid and hinge support as set forth in claim 2, in which said bolt bracket includes a base connecting a pair of upwardly extending ears, said base having a ridge extending thereacross between said ears, and said opening is centrally located to interrupt the ridge, said enlarged bolt head cooperating with said ridge to allow limited pivotal movement of said bolt relative to said bolt bracket as said lid is moved between open and closed positions.

4. A counterbalancing lid and hinge support as set forth in claim 1, in which said lid wing is a generally flat channel-shaped member having a pair of aligned openings receiving said pivot pin, and a pair of upwardly and rearwardly extending ears having aligned openings to receive a second pin, said bolt bracket having ears, each bracket ear having an opening adapted to be aligned with the openings in the ears of the lid wing to receive said second pin.

5. A counterbalancing lid and hinge support as set forth

in claim 1, in which said housing has upper and lower open ends.

6. A counterbalancing lid and hinge support as set forth in claim 1, in which said bushing has a slot extending diametrically through the bushing, through the radial flange at one side of the bushing and partially through the radial flange at the opposite side of the bushing.

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U.S. Cl. X.R.

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