

- [54] TELESCOPIC COUNTERBALANCE
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- [73] Assignee: **General Motors Corporation, Detroit, Mich.**
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- [51] Int. Cl. **E05c 17/30**
- [58] Field of Search 16/49, 72, 84, 85, 197; 49/379; 248/354, 402, 403; 292/262, 338

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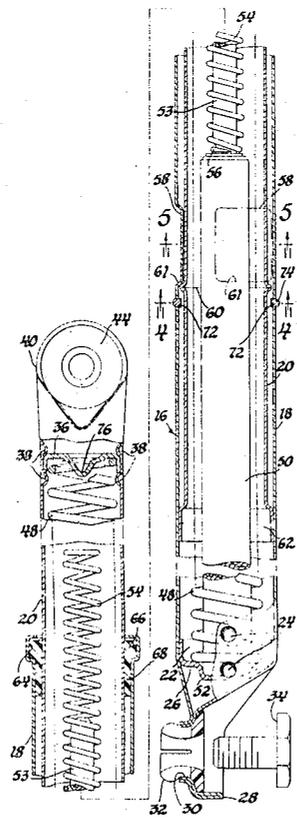
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[57] **ABSTRACT**

A telescopic counterbalance for a hinged closure includes inner and outer telescopic members which are biased apart to their telescopic outward position. Bearing arrangements on the inner end of each member slidably bear on the other member. The members are located in extended position by a plurality of depressions on the outer member engaged by an integral collapsed rib on the inner member. The depressions and rib are located intermediate the bearing arrangements and the ends of the member to space the bearing arrangements and increase the bending strength of the counterbalance.

- [56] **References Cited**
UNITED STATES PATENTS
- 2,920,338 1/1960 Folk 16/49 HO
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2 Claims, 8 Drawing Figures



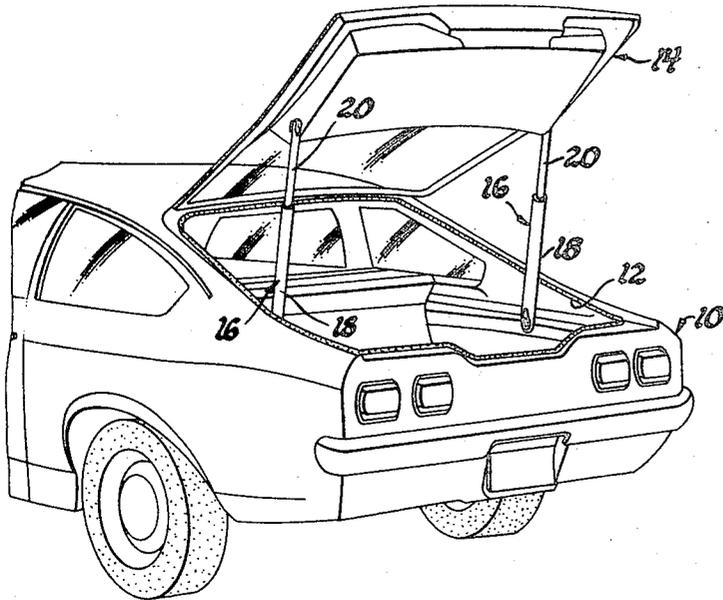


Fig. 1

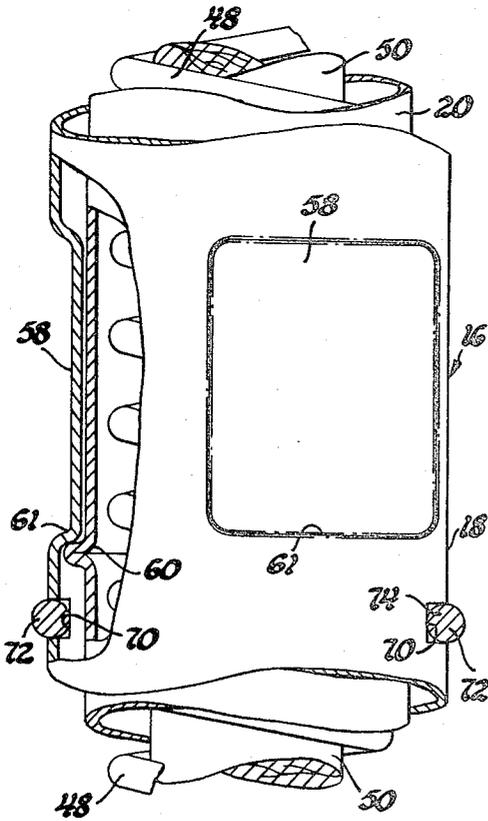


Fig. 3

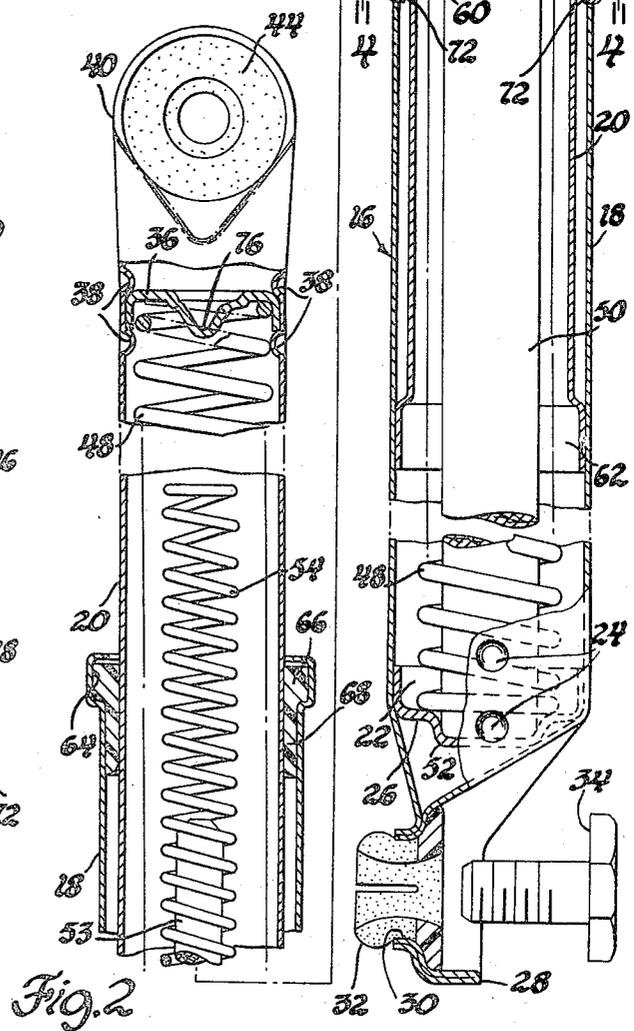


Fig. 2

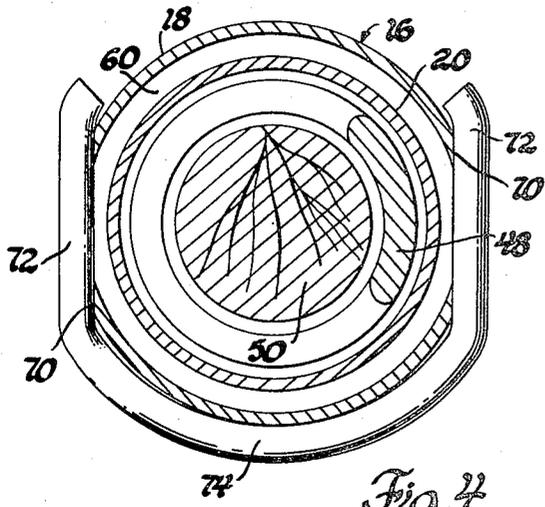


Fig. 4

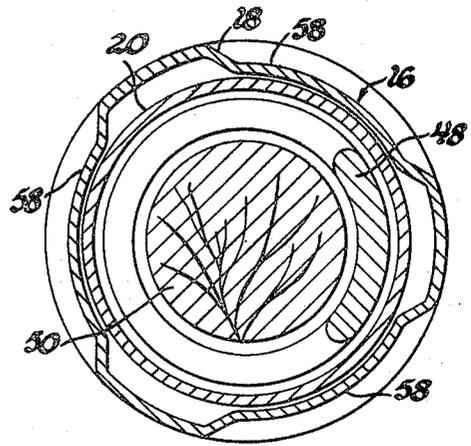


Fig. 5

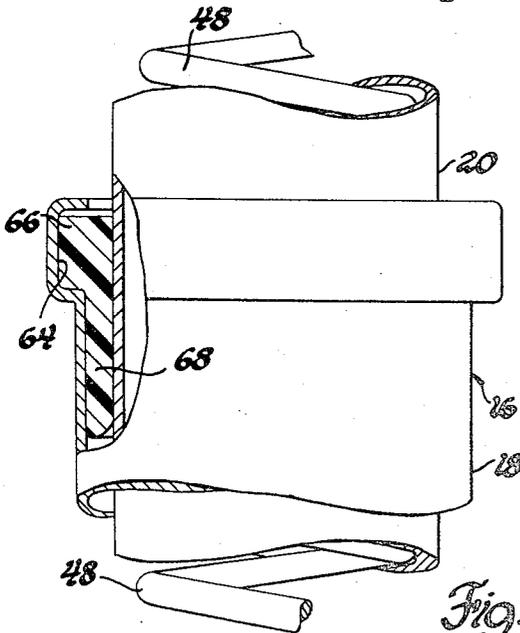


Fig. 6

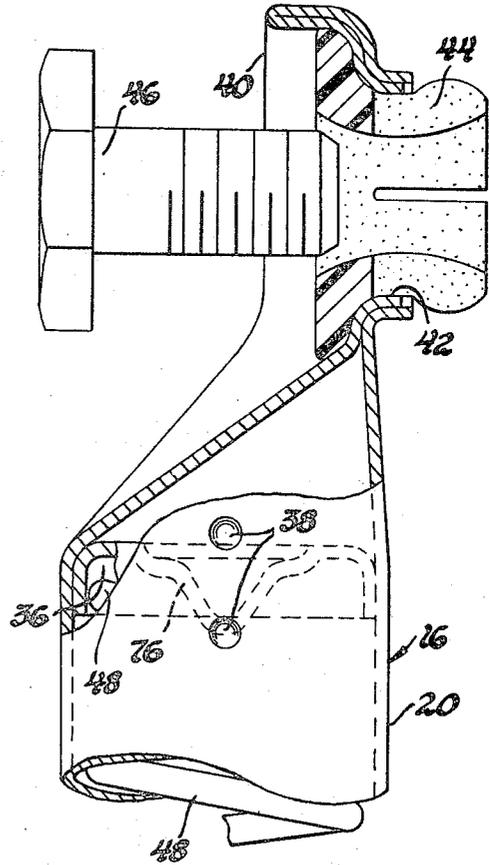


Fig. 7

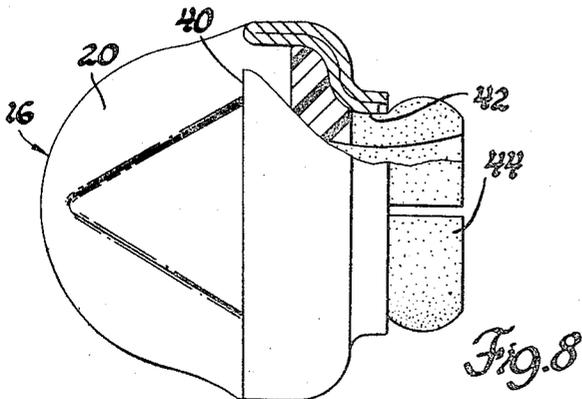


Fig. 8

TELESCOPIC COUNTERBALANCE

This invention relates generally to telescopic counterbalances and more particularly to such a counterbalance having improved bending strength as well as an improved arrangement for providing a fixed stop in the extended position of the counterbalance.

Telescopic type counterbalances are well known. Generally such counterbalances include inner and outer tubular members which are biased outwardly of each other or to an extended position by an internal compression spring. The outer ends of the members are respectively secured to a closure and to the support on which the closure is hinged.

In order to provide a stop arrangement locating the members in extended position, it has been proposed to have a stop on the inner end of the inner member engage a depressed continuous or discontinuous groove of the outer member. In such an arrangement, the inner end of the outer member is located adjacent the outer surface of the inner member or engages such surface to provide the bearing arrangement.

The telescopic counterbalance of this invention provides an improved bearing arrangement as well as an improved stop arrangement over those heretofore proposed. In order to increase the bending strength of the counterbalance in extended position, the inner end of each is provided with a suitable bearing arrangement for slidably engaging the other member, and the bearing areas are spaced as far as possible in the extended position by a fixed stop arrangement. This provides maximum telescopic overlap of the members in their extended position. The fixed stop arrangement is located intermediate the ends of the members and intermediate the bearing arrangements in all positions of the counterbalance.

In the preferred embodiment of the invention, the inner end of the outer tubular member is provided with a plastic bearing member having a substantial surface bearing on the outer surface of the inner member. The inner end of the inner member is provided with an outwardly flared flange having a substantial surface bearing on the inner surface of the outer member. The fixed stop arrangement includes a plurality of circumferentially spaced depressions intermediate the outer member which extend to adjacent the outer surface of the inner member. The inner member is provided with an intermediate integral continuous collapsed rib which engages the depressions in the extended position of the counterbalance to provide a fixed stop. The collapsed rib extends to closely adjacent the inner surface of the outer member so that under bending loads, the depressions and the rib respectively engage the inner and outer members to cooperate with the bearing arrangements in providing increased bending strength.

One feature of this invention is that it provides a telescopic counterbalance including inner and outer telescopic members having bearing arrangements on the inner ends thereof for slidably engaging each other, with these bearing arrangements being spaced in the extended position of the counterbalance for maximum telescopic overlap of the members by a fixed stop arrangement. Another feature of this invention is that the fixed stop arrangement is located intermediate the bearing arrangements and of the members in all positions of the counterbalance. A further feature of this invention is that the bearing arrangement of one mem-

ber can engage the intermediate stop of the other member should there be no engagement of the fixed stop of the one member with that of the other member.

These and other features of the invention will be readily apparent from the following specification and drawings wherein:

FIG. 1 is a partial rear elevational view of the vehicle body having a closure mounted thereon for movement between open and closed positions and counterbalanced by a telescopic counterbalance according to this invention;

FIG. 2 is an enlarged partially broken away view of the telescopic counterbalance;

FIG. 3 is an enlarged view of a portion of FIG. 2;

FIG. 4 is an enlarged sectional view taken generally along the plane indicated by line 4—4 of FIG. 2;

FIG. 5 is an enlarged sectional view taken generally along the plane indicated by line 5—5 of FIG. 2;

FIG. 6 is an enlarged view of a portion of FIG. 2;

FIG. 7 is an enlarged view of a portion of FIG. 2; and

FIG. 8 is an enlarged view of a portion of FIG. 2.

Reference is made herein to copending application U.S. Pat. Ser. No. 354,702 Bela Sandor, filed Apr. 26, 1973, assigned to the assignee of this invention and disclosing the same telescopic counterbalance.

Referring now particularly to FIG. 1 of the drawings, a vehicle body designated generally 10 includes a rear opening 12 which is opened and closed by a hatch or closure 14 which is conventionally hinged to the body adjacent the forward edge of the opening. The closure 14 is counterbalanced during movement between an open position, as shown, and a closed position, not shown, wherein it closes opening 12, by a pair of telescopic counterbalances 16 according to the invention. The counterbalances 16 are respectively pivotally connected at the outer ends thereof to the closure 14 and to the body 10 and are of like construction. Accordingly, only one will be described in detail and it will be understood that the other is the same.

Referring now to FIG. 2, the counterbalance 16 includes an outer or female tubular member 18 and an inner or male tubular member 20. The members can be formed of any conventional material. A spring seat or cup 22 seats within the member 18 adjacent the free or outer end thereof and is secured in place by spaced pairs of dimples 24 which engage the free edge of the cup 22 and also engage underneath the base wall 26 thereof. The member 18 adjacent to the cup 22 is collapsed upon itself and formed into a double walled cup-shaped end portion 28. The material of the base wall of this end portion is formed to provide a circular flanged opening 30 which receives a headed plastic grommet 32. The head of the grommet engages the base wall of portion 28 and the split legs of the grommet extend outwardly through the opening 30 and engage under the flange thereof. A conventional headed bolt 34 is received through the grommet and attaches the member 18 to a suitable mounting on the body 10.

As shown in FIGS. 2 and 7, a spring seat or cup 36 is received in the member 20 adjacent the free or outer end thereof and is retained in place by spaced pairs of dimples 38 engaging both the base wall and the free edge thereof. The member 20, adjacent the cup 36, is collapsed upon itself in the same manner as member 18 and formed into a cup-shaped end portion 40. The material of the base wall of this end portion is formed in

the same manner as that of end portion 28, into a flanged opening 42 which receives a grommet 44 of the same construction as grommet 32. Grommet 44 receives a bolt 46 which secures the member 20 to the closure 14. Thus, the free or outer ends of the members 18 and 20 are respectively secured to the body 10 and to the closure 14 for pivotal movement relative thereto as the members 18 and 20 move telescopically relative to each other between their telescopic outward and inward positions as the closure moves respectively between open and closed positions. The double walled construction of the end portions 28 and 40 ensures that these portions will have adequate strength under all service conditions. The grommets 32 and 44 obviate all noise problems caused by pivotal movement of the members 18 and 20 relative to the bolts 34 and 46. Additionally, the cups 22 and 36 function as dies during the forming of the end portions 28 and 40.

A main coil compression spring 48 extends continuously through the members 18 and 20. One end of the spring seats on the base wall 26 of the cup 22 while the other end of the spring seats on the base wall of cup 36 to continually bias the members 18 and 20 apart or to their telescopic outward position relative to each other. A circular wooden dowel 50 has one end thereof received and retained in a central depression 52 of the member 26. The dowel 50 extends through the spring 48 and controls snaking of this spring relative to the members 18 and 20 as the spring is compressed when the members 18 and 20 move to their telescopic inward position. By using a wooden dowel objectionable noise caused by movement of the spring relative to the dowel is reduced to a minimum.

The dowel 50 includes an integral extension 53 of reduced diameter. A coil compression spring 54 surrounds the extension 53 and extends outwardly therefrom for approximately half its length. The spring 54 is retained on the extension by having a coil 56 thereof of reduced diameter received within an annular groove of the extension.

As best shown in FIGS. 2, 3, and 5, the member 18 is provided with three equally spaced rectangular shaped depressions 58 of arcuate cross section which extend closely adjacent the outer surface of member 20. The depressions are located intermediately of member 18 and are formed by pressing in portions of the wall of this member. The member 20 is provided with an intermediate integral collapsed rib 60 which extends closely adjacent to the inner surface of member 18. Rib 60 is engageable with the innermost end walls 61 of the depressions, FIG. 3, when the members are in their telescopically extended position to provide a primary fixed stop arrangement limiting telescopic outward movement of the members. Additionally, as shown in FIG. 2, the inner end of member 20 is provided with a flared or cup-shaped terminal flange 62 which slidably bears on the member 18 and is of an outer diameter slightly less than the inner diameter of the member 18. As shown in FIGS. 2 and 6, the inner end of the member 18 is provided with an inwardly opening integral groove 64 which receives the flange 66 of a plastic bearing or bushing 68 slidably bearing on member 20.

The flange 62 on the inner end of member 20 and the bushing 68 provide spaced bearing arrangements for the counterbalance 16. It will be noted that both the flange and bushing have a substantial bearing area on

the member they respectively engage. When the counterbalance is in its extended position as shown in FIG. 2, it can be seen that these arrangements are spaced as far as possible for increased bending strength. The fixed stop arrangement provided by the rib 60 and the depressions 58 is always located intermediate the members 18 and 20 and, of course, the bearing arrangements. Additionally, under bending loads, the inner surfaces of the depressions 58 will engage the outer surface of member 20 and the rib 60 will engage the inner surface of the outer member 18 to thereby increase the resistance of the counterbalance to bending loads.

Should there be a lack of engagement of the rib 60 with the end walls 61 of the depressions 58, then the flange 62 will engage such end walls to provide a secondary stop arrangement. Likewise should there be a lack of engagement of the walls 61 with the rib 60, the rib will engage the bushing 68 to provide the secondary stop arrangement. Alternatively, the flange 62 and the bushing 68 can provide the secondary stop arrangement upon a lack of engagement of both the rib 60 and the depressions 58. Thus, various secondary stop arrangements are provided should there be no primary stop arrangement.

The member 18, as shown best in FIGS. 2 and 4, includes diametrically opposite slots 70 which receive the straight legs 72 of a generally C-shaped clip 74 partially surrounding the member 18. The legs 72 and the rib 60 provide a releasable detent for the members 18 and 20 in their fully extended position since the rib must move past these legs during both inward and outward telescopic movement of the members 18 and 20.

The counterbalance 16 is shown in FIG. 2 in its extended position with the closure 14 in its open position. Spring 48 counterbalances the closure in this position and engages rib 60 with the end wall 61 of depressions 58. As the closure 14 moves toward its closed position and the members 18 and 20 telescope inwardly, the rib 60 initially moves past the legs 72 by forcing these legs apart relative to each other in order to release the detent. As the members 18 and 20 continue to move inwardly of each other, the spring 48 is compressed and counterbalances the weight of the closure 14. When the closure 14 is substantially closed, such as within 13 degrees of closed position, the free end of the spring 54 will engage and seat a central conical seat 76, FIG. 7, of the cup 36 during the final closing movement of the closure 14. In the specific embodiment shown, this engagement will occur at approximately the final 13 degrees of closing movement of the closure 14. Further movement of the closure 14 to its final closed position will then compress the spring 54 to store spring energy. The free end of the extension 53 will be slightly spaced from the seat 76 when the closure 14 is in its closed position. The closure will be retained in this position by a conventional releasable latch.

When such latch is released to open the closure 14, the energy stored in the spring 54 adds to that stored in spring 48 to provide an additional pop-open force aiding the spring 48 in quickly moving the closure to a partially open position wherein the seat 76 moves out of engagement with the spring 54. The closure 14 is counterbalanced for the remainder of its opening movement by the spring 48.

Thus, this invention provides an improved telescopic counterbalance.

We claim:

1. A telescopic counterbalance for a closure movable between open and closed positions relative to a support comprising, in combination, a pair of telescopic annular members movable telescopically inwardly and outwardly of each other and adapted to have their outer ends respectively secured to the closure and to the support, means biasing the members in a telescopic outward direction to bias the closure to an open position, each telescopic member including bearing means adjacent the inner end thereof and stop means spaced substantially from a respective bearing means, the bearing means of each member slidably bearing on the other member as the members move telescopically relative to each other to provide spaced bearing areas increasing the bending strength of the telescopic counterbalance, the stop means of the members being engageable with each other upon movement of the members in a telescopic outward direction to provide a fixed stop delineating the extended position of the members and located in spaced relationship to the bearing means intermediately thereof to function as an additional bearing point for increased bending strength.

2. A telescopic counterbalance for a closure movable between open and closed positions relative to a support comprising, in combination, a pair of telescopic annu-

lar members movable telescopically inwardly and outwardly of each other and adapted to have their outer ends respectively secured to the closure and to the support, means biasing the members in a telescopic outward direction to bias the closure to an open position, each telescopic member including bearing means adjacent the inner end thereof and stop means spaced substantially from a respective bearing means, the bearing means of each member slidably bearing on the other member as the members move telescopically relative to each other to provide spaced bearing areas increasing the bending strength of the telescopic counterbalance, the stop means of the members being engageable with each other upon movement of the members in a telescopic outward direction to provide a fixed stop delineating the extended position of the members, and located in spaced relationship to the bearing means intermediately thereof to function as an additional bearing point for increased bending strength, the bearing means of one member being located in the path of the stop means of the other member and engageable therewith to provide the fixed stop upon a lack of engagement of the stop means of the one member with that of the other member.

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