

March 19, 1963

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3,081,847

DASHPOT

Filed Dec. 26, 1961

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FIG. 1.

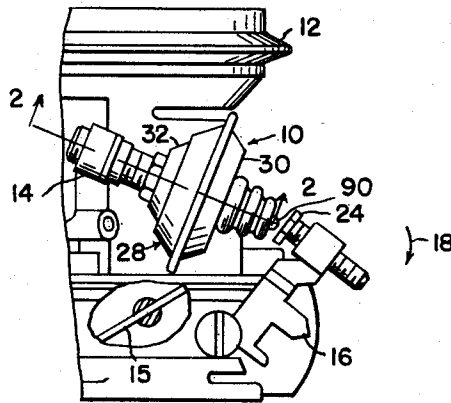
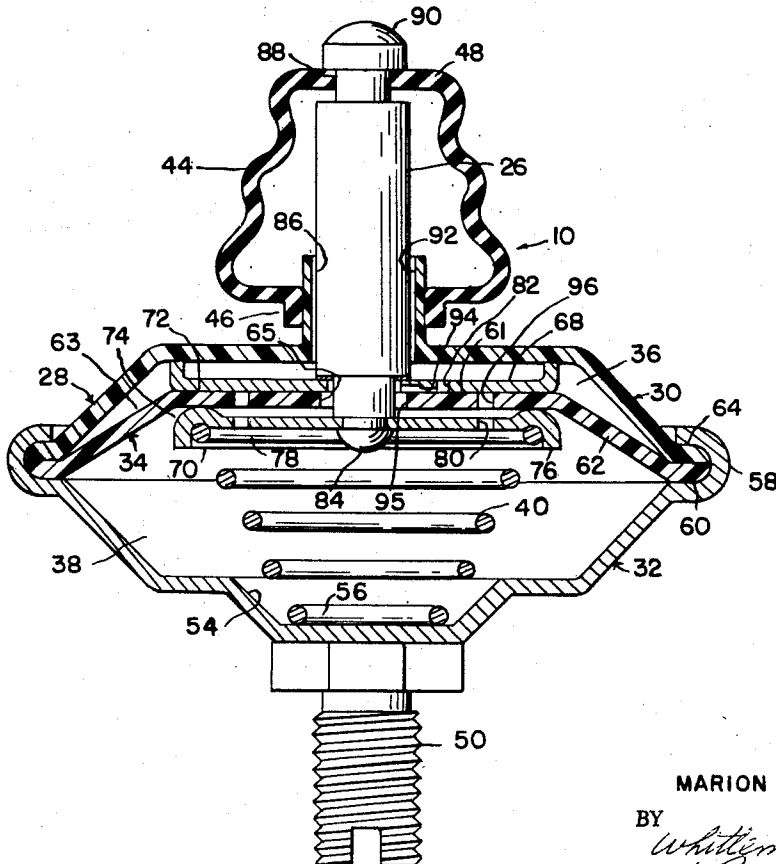


FIG. 2.



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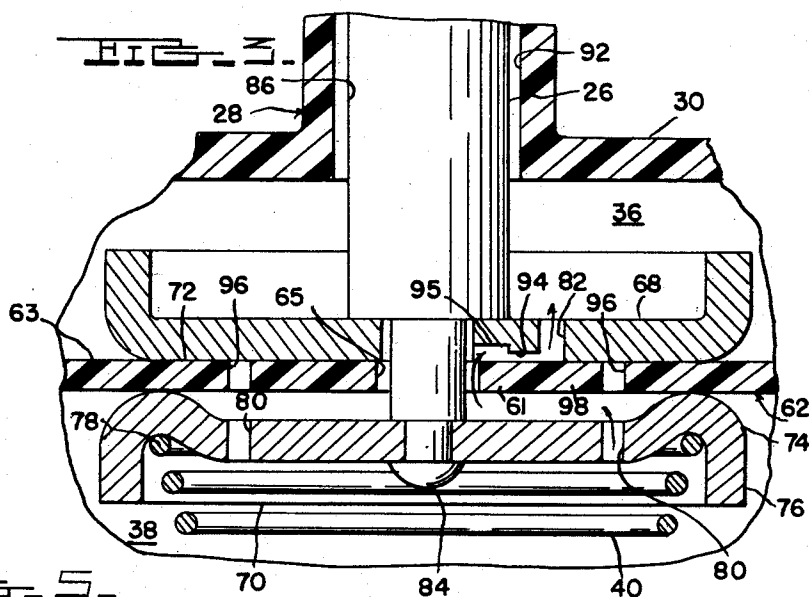


FIG. 5

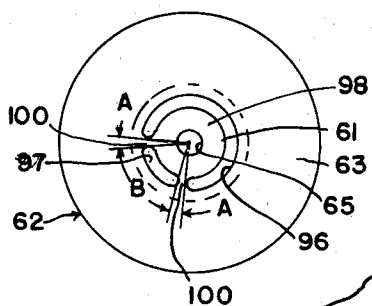
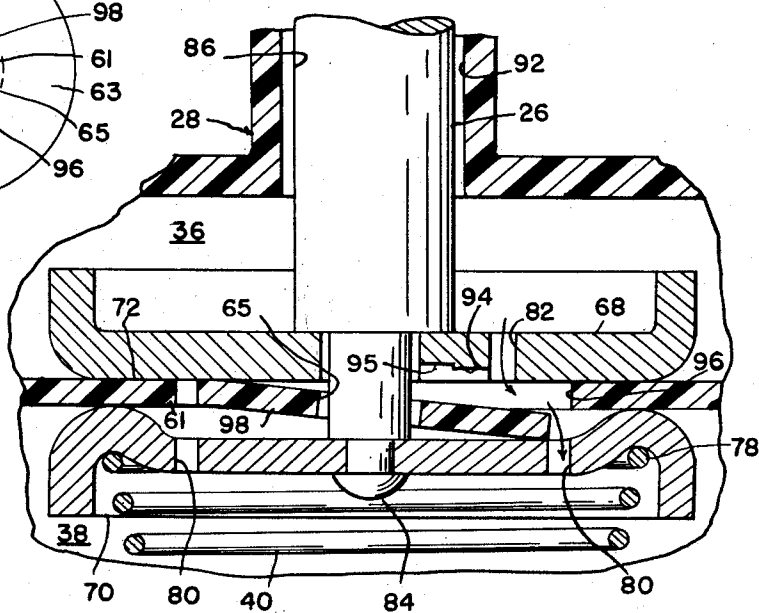


FIG. 4



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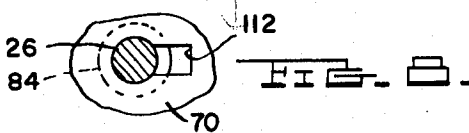
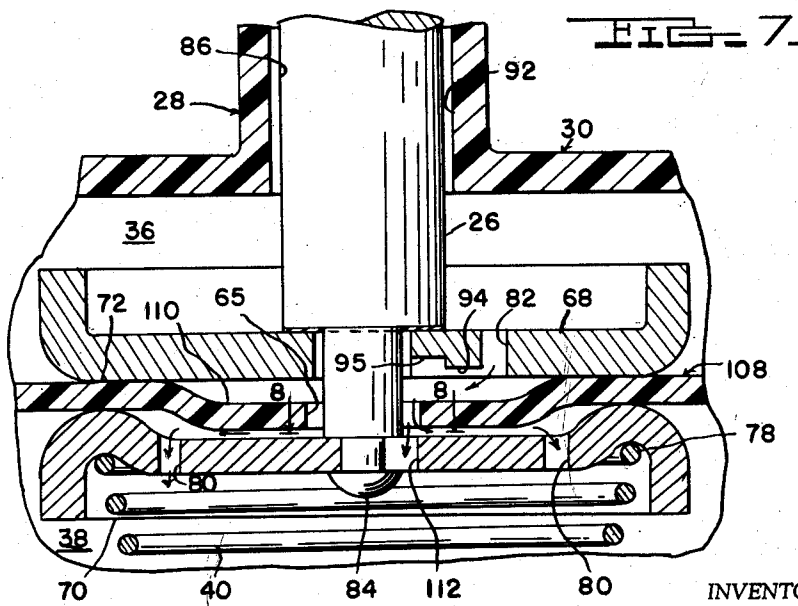
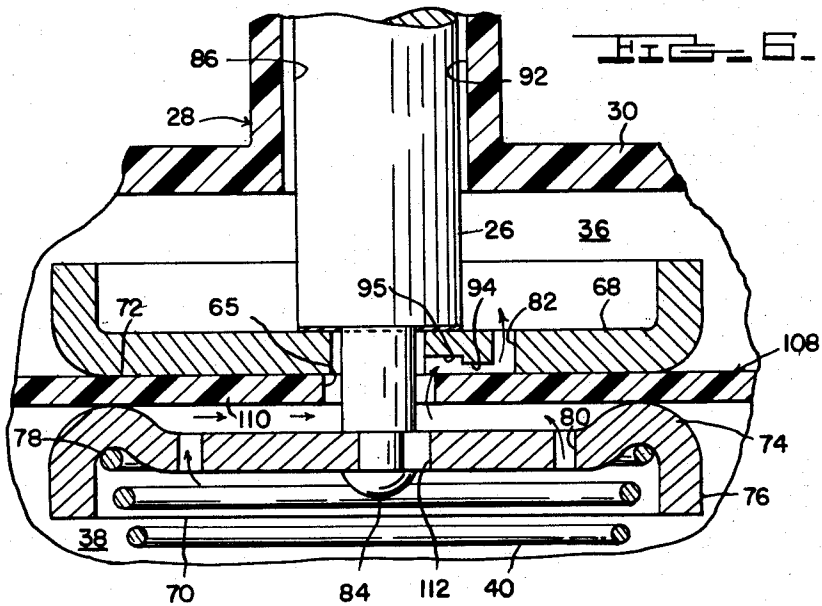
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3 Sheets-Sheet 3



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DASHPOT

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Filed Dec. 26, 1961, Ser. No. 162,117

7 Claims. (Cl. 188-94)

This invention relates to dashpots, and more particularly, to a new and improved dashpot construction especially useful as an anti-stalling device for delaying the final closing movement of a carburetor valve or throttle valve of an engine in order to prevent stalling of the engine.

The prior art illustrates various types of dashpots, one of which comprises a housing having a diaphragm assembly therein. The assembly includes a diaphragm, the outer periphery of which is clamped to the housing, and a pair of washer members which clamp the inner periphery of the diaphragm therebetween. In addition, a second annular diaphragm is loosely held between the washer members and serves as a valve member. The dashpot action is effected by means of the diaphragm assembly including the loose diaphragm which is operable in conjunction with a staked restriction in one of the washer members to restrict flow through the diaphragm assembly on movement of the diaphragm assembly in one direction.

The present invention has eliminated the use of the loose second annular diaphragm. The use of the loose diaphragm tended to vary its lateral position and cause a variation in the timing of the dashpot. While this construction worked satisfactorily, at least in theory, it was found in production that the riveting of the washer members tended to at times distort and stretch the inner portion of the loose diaphragm to the extent that it became too rigid to properly act as a valve member. In production operations, it was found that approximately twenty-five percent of the production flapper valves were caught on the stem when the riveting operation was performed.

In the present invention the dashpot diaphragm assembly includes a diaphragm which has an integral flap valve which is held in a fixed diametric position to eliminate variations in timing in the dashpot.

It is an object of the present invention to provide a dashpot diaphragm assembly of the aforementioned type in which an integral flap valve is struck out of the central portion of the inner zone of the diaphragm, and is hinged to the diaphragm at one side of a movable rod connected to the diaphragm and associated elements, said flap valve being adapted to be moved with respect to its hinge connection when subjected to a pressure differential on opposite sides thereof.

Another object is to provide a diaphragm assembly in a dashpot as set forth above which is simple in construction, economical to manufacture, and efficient in use.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating a preferred embodiment of the invention, wherein:

FIGURE 1 is an elevational view of a dashpot constructed in accordance with the invention in assembly with a carburetor;

FIGURE 2 is a longitudinal section of a dashpot shown in FIGURE 1 taken along the line 2-2 of FIGURE 1;

FIGURE 3 is an enlarged partial section of the dashpot shown in FIGURE 1 taken on the line 2-2 in FIGURE 1 and illustrating the position of the inner zone of the diaphragm during movement of the actuating rod in the downward direction as shown in FIGURE 2;

FIGURE 4 is an enlarged partial section of the dashpot shown in FIGURE 1 taken on the line 2-2 in FIG-

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URE 1 and illustrating the position of the inner zone of the diaphragm during movement of the actuating rod in the upward direction as shown in FIG. 2;

FIGURE 5 is a plan view of the diaphragm illustrating the arcuate groove provided therein;

FIGURE 6 is another embodiment of the present invention showing an enlarged partial section of the dashpot similar to the one shown in FIGURE 1 taken on the line 2-2 of FIGURE 1 and illustrating the position of the inner zone of the diaphragm during movement of the actuating rod in the downward direction;

FIGURE 7 is an enlarged partial section of the embodiment shown in FIGURE 6 and illustrating the position of the inner zone of the diaphragm during movement of the actuating rod in the upward direction; and

FIGURE 8 is a partial sectional view taken on the line 8-8 of FIGURE 7.

With particular reference to the drawings, a specific embodiment of the diaphragm clamping structure and dashpot construction of the present invention will now be disclosed.

As shown in FIGURE 1, a dashpot 10 is secured to carburetor 12 by means of bracket 14. The dashpot 10 serves to retard the closing of the throttle valve 15 of the carburetor 12 on engagement with the throttle linkage 16 to prevent stalling of an engine associated with the carburetor 12 due to rapid feeding of fuel thereto and sudden closing of the throttle valve thereof.

More specifically, the carburetor 12 includes the throttle linkage 16 operable on rotation of the throttle 15 in a throttle opening direction to move in the direction of arrow 18 in FIGURE 1. The throttle 15 is spring loaded in the usual manner to return to a closed position. The adjustable abutment 24 on linkage 16 is positioned to contact dashpot rod 26 on counterclockwise movement of the linkage 16 as the throttle valve approaches a closed position whereby the closing of the throttle valve 15 of the carburetor 12 will be retarded due to the action of the dashpot 10.

The dashpot 10, as shown best in FIGURE 2, includes a housing 28 having an upper part 30 made of a plastic and a lower metal part 32. Diaphragm assembly 34 is clamped between the upper and lower parts of the housing 28 to form chambers 36 and 38. The dashpot 10 further includes spring 40 urging the diaphragm assembly 34 in an upward direction, as shown in FIGURE 2, and previously indicated rod 26 secured to the diaphragm assembly 34 and extending through the housing part 30 and flexible boot 44. Boot 44 is slidably mounted at end 46 on the plastic housing part 30 and at the other end 48 is secured to the rod 26. Boot 44 while it is not provided with air tight connections serves to prevent foreign material from entering the housing part 30.

The part 32 of the housing 28 comprises a generally circular stamping formed as shown in FIGURE 2. The part 32 has secured thereto by convenient means, such as welding or the like, the threaded stud 50 for securing the dashpot 10 to the bracket 14. The part 32 of the housing 28 also includes a recess 54 adapted to receive the end 56 of the spring 40 and the annular flange 58 adapted to be spun over the radially outer periphery 60 of the integral diaphragm 62 and the flange 64 of the part 30 of the housing 28 to secure the diaphragm in assembly with the housing.

A diaphragm assembly 34 includes the integral diaphragm 62 which is divided into an annular inner zone 61 and an annular outer zone 63. The outer periphery of the outer zone 63 is secured between the flanges 58 and 64 of the parts 30 and 32 of the housing 28. The inner zone of the diaphragm 62 has an opening 65 therein which is sleeved over the end of rod 26 as best shown

in FIGURES 2-4 so as to provide clearance between the edges of the opening 65 and the rod 26. Diaphragm assembly 34 further includes the washers 68 and 70 which clamp the radially inner periphery 72 of the outer zone of the diaphragm 62 therebetween. Washer 70 is provided with a ridge 74 and flange 76 around the outer periphery thereof to provide a seat for the end 78 of the spring 40 and to space the main portion of the washer 70 from the diaphragm 62 to permit movement of the inner zone 61 of the diaphragm 62 axially of the rod 26. Washer 70 is further provided with openings 80 therethrough which are radially outwardly positioned in the washer 70 with respect to the possible radially outer portion of the inner zone 61 of the diaphragm 62. The washer 68 is provided with the opening 82 therethrough positioned opposite the inner zone 61 of diaphragm 62 and further includes the staked groove 94 between the inner periphery thereof and the opening 82 to provide an orifice between the washer 68 and the inner zone 61 of the diaphragm 62 through which air flows during operation of the dashpot. The radially inner portion 95 of the groove 94 is enlarged as best seen in FIGURES 3 and 4 to provide a constant length orifice 94 in conjunction with the inner zone 61 of the diaphragm 62 in all radial positions thereof whereby a constant dashpot rate may be maintained.

The inner zone 61 of the integral diaphragm 62 is provided with a pair of elongated arcuate grooves 96 and 97 which define a flap valve 98 which is integral with the diaphragm 62. The first elongated arcuate groove 96 preferably has an angular extent slightly greater than 270°. The second elongated arcuate groove 97 preferably has an angular extent of approximately 70° as indicated in FIG. 5 by the angle B. The elongated groove 97 is equally spaced circumferentially from the ends of the groove 96 by hinge connections 100. The hinge connections 100 each have an angular extent of approximately 9° as represented by the angle A in FIG. 5. The grooves 96 and 97 are located near the outer periphery of the inner zone 61 and are concentric with the opening 65 provided in the diaphragm 62. As previously mentioned, the grooves 96 and 97 define the flap valve 98 which is integral with the diaphragm 62 through means of the hinge connections 100. With such a construction the flap valve 98 may flex and move with respect to the remaining portion of the diaphragm 62 upon movement of the diaphragm assembly 34.

As previously indicated the washers 68 and 70 are secured to the end 84 of the rod 26 which extends through an opening 86 in part 30 of the housing 28. Rod 26 is reciprocal within the opening 86 and is retarded in its movement in a downward direction, as shown in FIGURE 2, but is capable of moving quickly in an upward direction as shown in FIGURE 2 as will later be considered. The rod 26 is provided with an annular recess 88 about the end 90 thereof for securing the boot 44 thereto.

The part 30 of the dashpot housing 28, as shown best in FIGURE 2, is constructed of a suitable plastic, such as Delrin, which has self-lubricating properties. The Delrin material has low friction properties and is highly resistant to abrasion and deterioration by hydrocarbons. The strength of the material varies over a wide temperature range between 7,500 and 14,700 p.s.i. in tension and between 5,200 and 18,000 p.s.i. in compression with different amounts of deformation. Rockwell hardness of the material is typically in the range M94, R120. Materials other than the specific example Delrin having similar properties may of course also be used for part 30 of housing 28 within the scope of the invention.

The term "plastic" as used herein is intended to define the materials included within the definition set forth in 1955 "Modern Plastics Encyclopedia," as follows:

"PLASTIC (a)—Capable of being molded; made of any type of Plastics.

(n.)—A plastic is any one of a large and varied group of materials which consists of, or contains as an essential ingredient, an organic substance of large molecular weight; and which while solid in the finished state, at some stage in its manufacture has been or can be formed (cast, calendered, extruded, molded, etc.) into shape by flow—usually through the application singly or together of heat and pressure."

Due to the provision of a plastic housing part 30 noises developed by the dashpot due to the movement of a metal rod 26 in a metal housing part has been eliminated. In addition, the requirement for lubrication between the rod 26 and the housing part 30 is eliminated or at least greatly reduced and the wear therebetween is minimized.

The housing part 30 includes the flange 64 as previously indicated. Since the flange 64 is also constructed of a plastic, sharp edges thereon which would tend to cut the diaphragm 60 are eliminated. In addition, should the flanges 58 or 64 not be perfectly flat which is often the case with stamped housing parts, a plastic flange 64 is easily deformed to agree with the contour of the flange 58 of the housing part 32 during spinning of the flange 58. Such conforming of a plastic flange 64 does not require pressure sufficient to cut the diaphragm 60 as is often the case when clamping a diaphragm between two housing parts.

Also since the part 30 of the housing 28 is molded rather than stamped, the air escape grooves 92 in passage 86 may be molded therein, thereby reducing the manufacturing steps required in the dashpot construction since the grooves 92 need not be machined in the rod 26. The manufacturing steps required in the dashpot construction are further reduced through the use of a plastic housing part 30 since the desired surface condition to provide maximum frictional resistance between the flange 64 and the diaphragm 60 may be molded during forming of the housing part 30 rather than being formed by a separate operation as is necessary with stamped metal housing parts. In addition, the use of a plastic housing part eliminates the reaming of the inside diameter of the part.

Thus the provision of a plastic housing part 30 provides quieter performance and longer life for the dashpot due to the self-lubricating properties thereof, permits manufacture of the dashpot with fewer steps since grooves, such as 92, and desired flange surface conditions may be molded into the housing part 30, and aids in the assembly of the finished dashpot since the flange 64 of a plastic housing part 30 may be easily deformed when clamping the diaphragm periphery between the flanges 58 and 64 without danger of cutting the diaphragm 62 or otherwise causing leaks therein.

The integral diaphragm may be made, as an example, from plastic material such as Dupont Cloth Fairprene #5029A.

In operation, with the throttle linkage 16 rotated clockwise so that the abutment 24 is out of engagement with the end 90 of rod 26 as shown in FIGURE 1, the components of the dashpot are positioned as shown in FIGURE 2. The linkage 16 is then subsequently moved in a counterclockwise direction so that the abutment 24 contacts the end 90 of the rod 26 as the throttle approaches an idle position. The rod 26 is thereafter forced downward by abutment 24 in opposition to spring 40.

As the rod 26 moves downward, as shown in FIGURE 2, the air in chamber 38 thereof attempts to pass through the diaphragm assembly 34 into chamber 36. As the air in chamber 38 passes through the openings 80 in the washer 70 the flap valve 98 of the diaphragm 62 is moved about its hinge connections 100 upward against the surface of the washer 68 and is held in this position due to air pressure thereon as shown in FIGURE 3. The flap valve 98 blocks the opening 82 in the washer 68. The staked groove 94 is provided in the washer 68 to permit bleeding

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of the air trapped in chamber 38 through the openings 80 and 65, staked groove 94 and opening 82 in washer 68 into chamber 36.

A portion 95 of grooves 94 extending from the radially inner periphery of the washer 68 to a point opposite the inner zone 61 of the diaphragm 62 at the groove is enlarged as best shown in FIGURES 2-4. A constant orifice length of controlling dimension for bleeding of air from chamber 38 regardless of the position of the flap valve 98 is thus provided as will be seen from inspection of the figures. A constant dashpot rate is thus provided in operation.

Thus the movement of the rod 26 in the downward direction as shown in FIGURE 2 is retarded due to the spring 40 and also due to the restricted passage of air through the diaphragm assembly 34. Linkage 16 is therefore caused to continue its counter clockwise rotation at a much slower rate than before contact of abutment 24 with the end 90 of the rod 26 of dashpot 10. Thus the throttle valve 15 is closed slowly on approaching an idle position to prevent stalling of an engine associated with a carburetor.

When the throttle valve 15 is again opened and the linkage 16 is rotated in a clockwise direction, the elements of the diaphragm assembly 34 assume the position shown in FIGURE 4 at which time the diaphragm assembly 34 and the rod 26 connected thereto are forced towards the part 30 of the housing 28 by means of spring 40. As the diaphragm assembly 34 is moved upwards as shown in FIGURE 2, the air in chamber 36 is permitted to pass freely through opening 82 in the washer 68, the arcuate groove 96 in the diaphragm 62 and opening 80 in washer 70 since the air passing in this direction through the diaphragm assembly 34 moves the flap valve 98 of the diaphragm 62 towards the surface of the washer 70, away from washer 68. Also during movement of the diaphragm assembly 34 air may pass into and out of chamber 36 through grooves 92 in housing part 30.

The embodiment illustrated in FIGURES 6-8 is somewhat similar to the preferred embodiment just described and therefore corresponding numerals will be utilized to designate similar parts. The embodiments differ specifically in the construction of the diaphragm which forms part of the diaphragm assembly 34. More specifically, the arcuate grooves 96 and 97 have been eliminated.

The integral diaphragm 108 is clamped between washers 68 and 70 as in the other embodiment. The inner zone 110 is arranged to flex or bend with respect to the portion of the diaphragm which is clamped between the washers 68 and 70. The inner zone 110 serves as the valve portion of the diaphragm and is held in a fixed diametric position thereby eliminating variations in timing. The operation of this embodiment is the same as described for FIGURE 3 when the rod is moved downwardly. As the air in chamber 38 passes through the openings 80 in washer 70, the inner zone 110 of the diaphragm 108 is moved upwards against the surface of the washer 68 to block opening 82 in washer 68 and is held in this position as is shown in FIGURE 6 due to air pressure acting thereon. The staked groove 94 functions in the same manner as described in the other embodiment.

When the throttle valve 15 is again opened, the elements of the diaphragm assembly assume the position shown in FIGURE 7. As the diaphragm assembly 34 is moved upwards, the air in chamber 36 is permitted to pass freely through opening 82 in the washer 68, the clearance provided in the diaphragm 108 between the rod and opening 65, and openings 80 in washer 70 since the air passing in this direction through the diaphragm assembly 34 moves the inner zone 110 of diaphragm 108 away from washer 68 towards washer 70.

In the event that the inner zone 110 of diaphragm 108 is urged against the washer 70 to block openings 80, a keyhole bleed slot 112 is provided in washer 70 immediately below opening 65. The keyhole slot 112 permits

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unrestricted passage of air therethrough and insures that the diaphragm 108 will not act as a valve in the return direction. The use of this type of diaphragm eliminates assembly is consistent within .10 of a second, while the requirement for double staking. Data proves that this dashpot rate is consistent within 1.0 second.

The present invention is an improvement over dashpot constructions utilizing a loose valve washer or diaphragm which tended to vary its lateral position and cause a variation in the timing of the dashpot. In the present invention, the loose valve has been eliminated. An integral diaphragm is utilized which includes a valve portion which cannot be displaced laterally. As a result the timing of the dashpot is more accurately controlled in production models.

The drawings and the foregoing specification constitute a description of the dashpot in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A dashpot comprising a housing having an opening therein, an integral diaphragm having inner and outer annular zones and spanning the interior of said housing, means connecting the outer periphery of the outer zone of said diaphragm to said housing, a pair of members maintained in axially spaced relation, means securing the inner periphery of the outer zone of said diaphragm between said members, said members being spaced apart inwardly of said securing means an axial distance in excess of the thickness of the inner zone of said diaphragm, an elongated rod secured to said members centrally thereof and extending through a centrally located opening provided in the inner zone of said diaphragm with clearance therebetween, said rod also extending through the opening in said housing, resilient means in said housing for biasing the rod out of said housing, an integral flap valve struck out of the inner zone of said diaphragm, said flap valve being hingedly connected to said diaphragm and adapted to be moved in the space between said members, the outer periphery of the portion of said flap valve which is free being spaced from the remaining portion of said diaphragm by a continuous elongated arcuate groove which is concentric to the axis of said rod and has an angular extent of approximately 270°, one of said members having an opening therethrough laterally outwardly with respect to the axis of said rod and laterally inwardly of the outer zone of said diaphragm, the other of said members having an opening therethrough opposite an intermediate portion of said flap valve, a transversely extending groove in the surface of said other member opposite said flap valve extending between the aforesaid clearance and the opening therethrough for providing an orifice between said flap valve and said other member when said flap valve is in a restricting position, said flap valve being moved to a restricting position with respect to the opening and orifice in said other member by the fluid medium in said housing on one side of said diaphragm to restrict the opening in said other member when said rod is moved in one direction to cause restricted passage of a medium in the dashpot, and said flap valve being moved to a non-restricting position with respect to the opening in said one member by the fluid medium in said housing on the other side of said diaphragm when said rod is moved in the opposite direction to cause unrestricted communication between the opposite sides of said diaphragm through the openings in said members and the aforesaid arcuate groove.

2. A dashpot comprising a housing having an opening therein, an integral diaphragm having inner and outer annular zones and spanning the interior of said housing, means connecting the outer periphery of the outer zone of said diaphragm to said housing, a pair of members maintained in axially spaced relation, means securing the

inner periphery of the outer zone of said diaphragm between said members, said members being spaced apart inwardly of said securing means an axial distance in excess of the thickness of the inner zone of said diaphragm, an elongated rod secured to said members centrally thereof and extending through a centrally located opening provided in the inner zone of said diaphragm with clearance therebetween, said rod also extending through the opening in said housing, resilient means in said housing for biasing said rod out of said housing, an integral flap valve struck out of the central portion of the inner zone of said diaphragm and surrounding said rod, said flap valve being hingedly connected to said diaphragm at one side of said rod and adapted to be moved in the space between said members, the outer periphery of the portion of said flap valve which is free being spaced from the remaining portion of said diaphragm by an elongated arcuate groove which is concentric to the axis of said rod, one of said members having an opening therethrough laterally outwardly with respect to the axis of said rod and laterally inwardly of the outer zone of said diaphragm, the other of said members having an opening therethrough opposite an intermediate portion of said flap valve, a transversely extending groove in the surface of said other member opposite said flap valve extending between the aforesaid clearance and the opening therethrough for providing an orifice between said flap valve of said other member when said flap valve is in a restricting position, said flap valve being moved to a restricting position with respect to the opening and orifice in said other member by the fluid medium in said housing on one side of said diaphragm to restrict the opening in said other member when said rod is moved in one direction to cause restricted passage of a medium in the dashpot, and said flap valve being moved to a non-restricting position with respect to the opening in said one member by the fluid medium in said housing on the other side of said diaphragm when said rod is moved in the opposite direction to cause unrestricted communication between the opposite sides of said diaphragm through the openings in said members and the aforesaid arcuate groove.

3. Structure as defined in claim 2 wherein the radially inner end of said transversely extending groove in said other member is enlarged for a distance such that said distance and the diameter of the rod between the members is greater than the diameter of said centrally located opening provided in the inner zone of said diaphragm whereby the restricted portion of the orifice between said flap valve and said other member is of constant length.

4. Structure as defined in claim 2 wherein said housing includes two housing parts, with one of said parts being made from plastic, and said connecting means comprising a radially outer annular flange on said one housing and a radially outer annular flange on the other housing part which is spun over the radially outer annular flange of said one housing part to clamp the outer periphery of the outer zone of said diaphragm to the radially outer annular flange of said one housing part.

5. Structure as defined in claim 2 wherein a sleeve is provided around said opening in said housing and radially inner axially extending grooves are provided therein to permit bleeding of a dashpot operating medium into and out of the dashpot.

6. Structure as defined in claim 2 wherein said arcuate groove has an angular extent of approximately 270°.

7. A dashpot comprising a housing having an opening therein, an integral diaphragm having inner and outer annular zones and spanning the interior of said housing, means connecting the outer periphery of the outer zone of said diaphragm to said housing, a pair of members maintained in axially spaced relation, means securing the inner periphery of the outer zone of said diaphragm between said members, said members being spaced apart inwardly of said securing means an axial distance in excess of the thickness of the inner zone of said diaphragm, an elongated rod extending through and secured to said members centrally thereof and extending through a centrally located opening provided in the inner zone of said diaphragm with clearance therebetween, said rod also extending through the opening in said housing, resilient means acting between one of said members and said housing for biasing the rod out of said housing, said one of said members having a pair of laterally spaced openings therethrough, one of said openings being located laterally outwardly with respect to the axis of said rod and laterally inwardly of the outer zone of said diaphragm and the other of said openings intersecting the opening therein for said rod, the other of said members having an opening therethrough opposite the inner zone of said diaphragm and laterally outwardly with respect to the axis of said rod, a transversely extending groove in the surface of the other member adjacent said inner zone of said diaphragm extending between the aforesaid clearance and the opening therethrough for providing an orifice between the inner zone of said diaphragm and said other member when the inner zone is in a restricting position, said inner zone being moved to a restricting position with respect to the opening and orifice in said other member by the fluid medium in said housing on one side of said diaphragm to restrict the opening in said other member when said rod is moved in one direction to cause restricted passage of a medium in the dashpot, and said inner zone being moved away from said other member to a non-restricting position with respect to the aforesaid pair of laterally spaced openings in said one member by the fluid medium in said housing on the other side of said diaphragm when said rod is moved in the opposite direction to cause unrestricted communication between the opposite sides of said diaphragm through the openings in said members and the clearance between said diaphragm and said rod.

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