

June 29, 1965

J. E. WHELAN
PLATFORM STABILIZER

3,191,895

Filed March 6, 1963

2 Sheets-Sheet 1

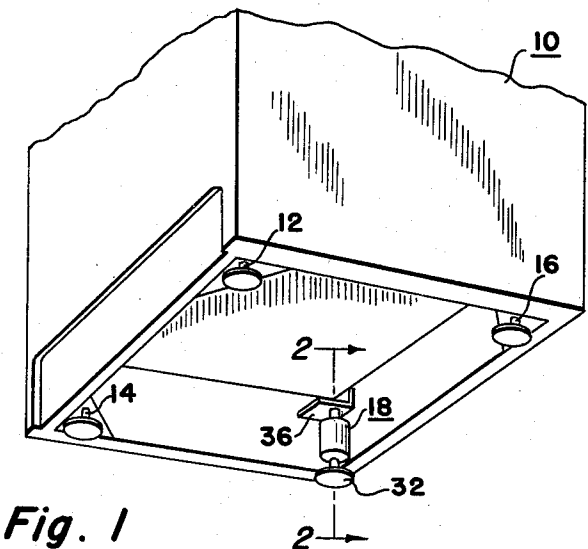


Fig. 1

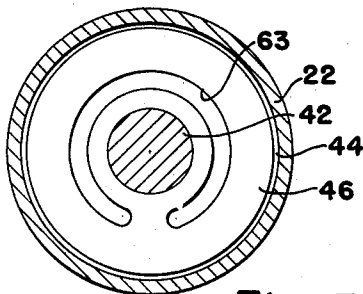


Fig. 3

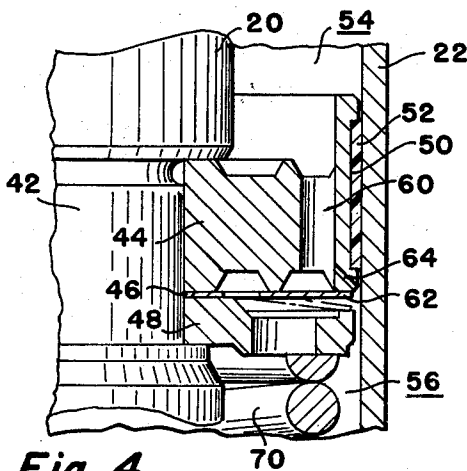


Fig. 4

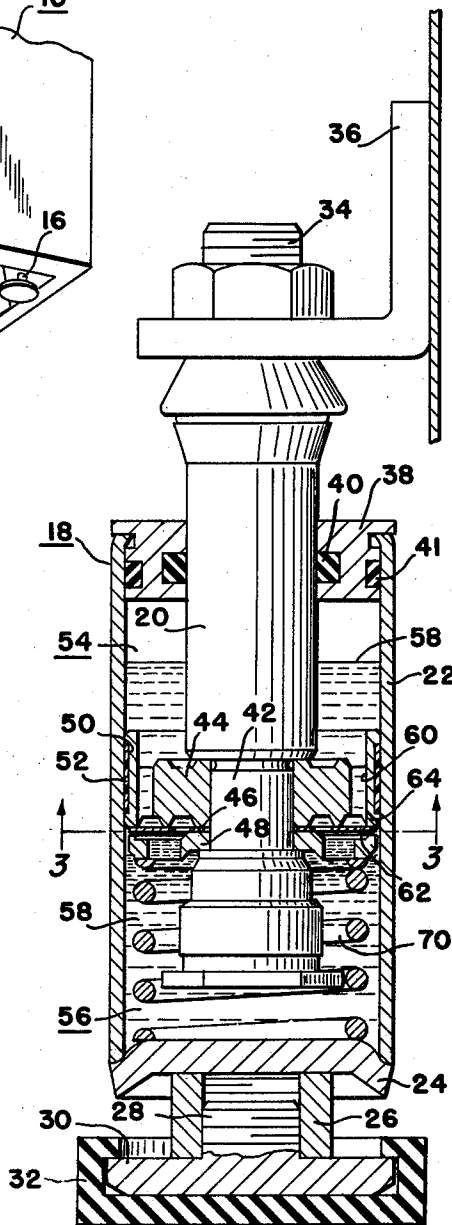


Fig. 2

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2 Sheets-Sheet 2

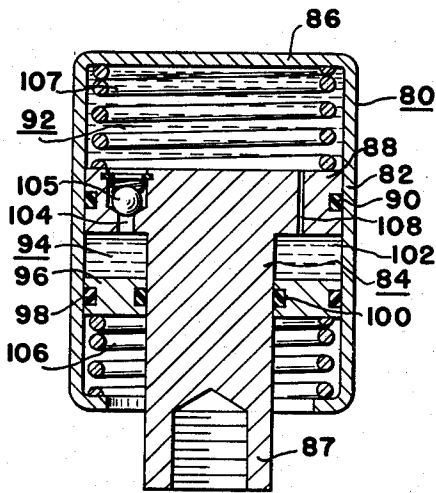


Fig. 5

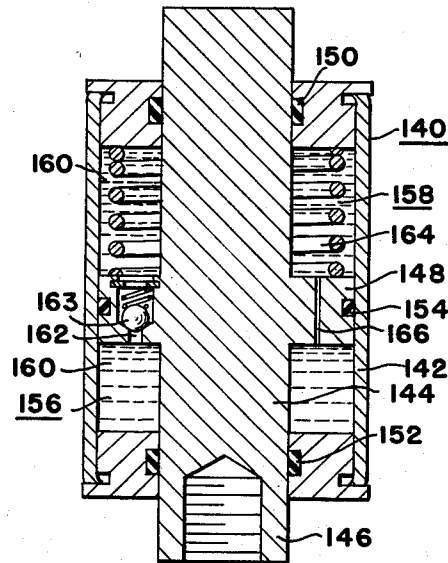


Fig. 7

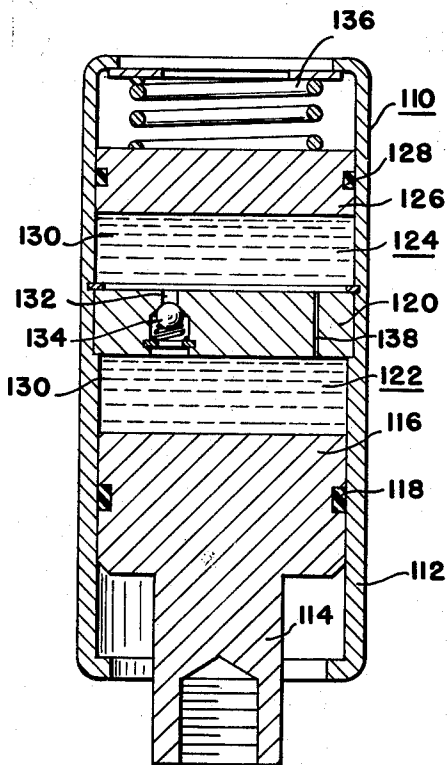


Fig. 6

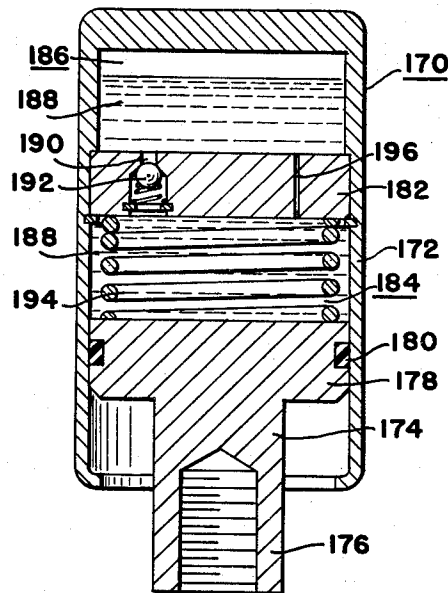


Fig. 8

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3,191,895

PLATFORM STABILIZER

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5 Claims. (Cl. 248—19)

This invention relates to adjustable legs and more particularly to automatically adjustable legs for stabilizing a platform or the like.

One problem with support mounting arrangements for platforms subjected to dynamic loadings, for example, the platform of an automatic clothes washer, is that all of the supporting legs of the system may not be in solid contact with a supporting surface in cases where the platform is shifted relative to a supporting surface having variances in the elevation thereof or when such a surface settles beneath one or more of the legs of the support mounting arrangement. Such instability causes the platform to rock about the legs that are in solid contact with the surface in an undesirable manner.

Accordingly, objects of the present invention are to provide an improved platform stabilizing arrangement; and to provide such an arrangement including means for continuously urging the platform supporting legs into solid contact with a supporting surface and further including means associated with such legs for resisting cyclical dynamic loading imposed thereon once the legs are in solid contact with the supporting surface.

A further object of the present invention is to provide an improved platform stabilizing arrangement having four or more legs supporting a platform subjected to cyclical dynamic loading with one or more of said legs including means for forcing all of the plurality of legs into solid contact with a supporting surface and further including means for stabilizing the platform against dynamic loading imposed thereon once the legs are in solid contact with the supporting surface.

A still further object is to provide an improved platform stabilizing arrangement that simplifies leveling of the platform.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

FIGURE 1 is a view in perspective of a platform including the present invention;

FIGURE 2 is a view partially in elevation and partially in section of the present invention;

FIGURE 3 is a view in horizontal section taken on the line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary view in section of a portion of the device illustrated in FIGURE 2;

FIGURE 5 is a diagrammatic view of another embodiment of the present invention;

FIGURE 6 is a diagrammatic view of still another embodiment of the present invention;

FIGURE 7 is a diagrammatic view of still another embodiment of the present invention; and

FIGURE 8 is a diagrammatic view of yet another embodiment of the present invention.

Referring now to the drawings, FIGURE 1 shows a platform 10 such as a platform carrying an automatic washing machine or the like having adjustable screw legs 12, 14 or the like located on the two front corners thereof and having a fixed leg 16 and a stabilizing leg 18 embodying one form of the present invention located on the left and right rear corners thereof, respectively. When the platform is resting on a supporting surface, it will

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be appreciated that the legs 12, 14 and 18 can be adjusted relative thereto to assure a solid contact between all four corner support points and the supporting surface.

The stabilizing leg 18 comprises an extensible piston rod 20 and cylinder 22 with the lower cylinder head 24 of the cylinder 22 having a tubular element 26 secured thereon for threadably engaging a screw 28 secured to a plate 30 inserted into supporting relationship with a platform surface engaging foot 32. The stabilizing leg 18 is secured by a threaded portion 34 on the outer end of the piston rod 20 to suitably fixed support means 36 on the platform 10 and the opposite end of the piston rod 20 is directed inwardly of the cylinder 22 through an opening in an upper cylinder head 38 serving as a retainer for O-ring seals 40, 41 at the inner and outer peripheries thereof for preventing fluid leakage from the cylinder 22 at the upper end thereof.

The opposite end of the piston rod 20 has a small diameter portion 42 formed therein with the shoulders thereof supporting a piston 44, valve plate 46 and retainer element 48 in axial abutment along the outer periphery thereof. The outer periphery of the piston 44 is recessed at 50 for carrying a sleeve-like seal 52 in sealing engagement with the inner surface of the cylinder 22 for forming separate fluid chambers 54, 56 within the cylinder 22 on either side of the piston 44. The fluid chambers 54, 56 have a suitable hydraulic fluid 58 therein with the fluid occupying a predetermined portion of the volume of said chambers to permit movement of the piston rod 20 inwardly of the cylinder 22. An arcuate passageway 60 is directed through the piston 44 for providing fluid communication between the chambers 54, 56 and an arcuate valve seat is formed at 62 on the lower face of the piston 44 against which the valve plate 46 seats to prevent fluid flow through the passageway 60 from the fluid chamber 56 into the fluid chamber 54 with the valve plate 46 having an arcuate groove 63 formed therein, as best shown in FIGURE 3, so that the outer periphery thereof will have sufficient flexibility to quickly move out of engagement with the valve seat 62 to permit free fluid flow from the fluid chamber 54 into the fluid chamber 56 as shown in FIGURE 4. The piston 44 further includes a restricted passageway 64 for leakage of fluid between the fluid chambers 54, 56.

In accordance with certain of the principles of the present invention, a coil spring 70 surrounding the lower end of the piston rod 20 has one end thereof bearing against the lower cylinder head 24 and the opposite end thereof bearing against the retaining element 48 for biasing the piston rod 20 and cylinder 22 apart, during which time there is free fluid flow through passageway 60 from chamber 54 to chamber 56, until a predetermined reactive force is imposed on the extensible stabilizing leg 18. Accordingly, in cases where the platform 10 is moved relative to the supporting surface to cause one of the legs 12, 14, 16 to be moved out of solid contact therewith, the spring 70 will cause the stabilizing leg 18 to extend sufficiently to cause all of the legs to again solidly contact the supporting surface therefor.

Once the legs supporting the platform 10 are all in solid contact with the supporting surface the valve plate 46 becomes seated on the valve seat 62 to prevent fluid flow from the fluid chamber 56 through the passageway 60 into the fluid chamber 54. The hydraulic fluid 58 in the fluid chamber 56 will consequently oppose any cyclical dynamic loads imposed on the stabilizing leg 18 that might tend to collapse the leg and cause the supporting legs associated therewith to be moved out of contact with the supporting surface. Thus, the stabilizing leg 18 has two operating phases in that it first of all makes use of spring force to move all of the legs of the support mounting

system into solid contact with the supporting surface therefor and then makes use of the hydraulic fluid therein to prevent collapse thereof when cyclical dynamic loading or the like is imposed on the platform 10.

The restricted passageway 64 across the piston 44 will, however, permit leakage of fluid from the fluid chamber 56 into the fluid chamber 54 when a sustained loading of a predetermined value is imposed on the stabilizing leg as for example when the supporting legs are shifted into a position where the leg 18 must retract a predetermined distance in order to again obtain solid contact between the legs and the supporting surface. In this case, a disproportionate portion of the weight of the platform is imposed on the leg 18 and the fluid in the chamber 56 is thereby forced across the restricted passageway 64 into the chamber 54 until the platform is again in a stable position.

Another advantage of the present invention is that it enables a platform to be quickly leveled since adjustment of the screw leg located diagonally of the stabilizing leg 18 will level the platform along the diagonal line therebetween without having to take up or extend the leg 18. More particularly, in the illustrated arrangement, the stabilizing leg 18 is associated with a fixed leg 16 on the rear of the platform and adjustable legs 12, 14 on the front of the platform and the length of the fixed leg 16 may be approximately at the midstroke of the stabilizing leg 18 and the midpoint of the adjustment range of the screw-type legs 12 and 14. This arrangement enables the platform to be located in an alcove or the like as a built-in type fixture where the rear legs are relatively inaccessible. If all of the legs are of the screw adjustable type, it is difficult to take up and extend the legs on the back of a platform so situated during leveling thereof. The provision of the improved stabilizing leg 18 in the described support mounting system, however, is such that the platform 10 can be leveled by merely adjusting the screw legs 12, 14 on the front thereof without having to take up or extend the supporting legs on the rear of the platform. This obviously enables the platform 10 to be leveled very quickly with a minimum of effort even though it is part of a built-in type fixture. Such improved leveling is also possible when any of the stabilizing arrangements to be discussed are employed in a support mounting system.

FIGURE 5 illustrates another stabilizing leg arrangement 80 constructed in accordance with the principles of the present invention to include an extensible cylinder 82 and piston rod 84 with the upper head 86 of the cylinder 82 being adapted to be connected to means for securing the stabilizing leg 80 to a platform having legs such as those illustrated in FIGURE 1 and with the piston rod having a threaded tubular portion 87 on the outer end thereof adapted to be connected to suitable means such as the foot 32 in the embodiment of FIGURE 2 for supporting the leg 80 on a platform supporting surface. The opposite end of the piston rod 84 is connected to a first piston 88 having an O-ring seal 90 located in the outer periphery thereof in sealing engagement with the inner surface of the cylinder 82 for forming a first fluid chamber 92 in the upper end of the cylinder. A second fluid chamber 94 is formed on the opposite face of the first piston 88 by the cylinder 82 and a second piston 96 slidably carried on the outer periphery of the piston rod 84 and including O-ring seals 98 and 100 in the outer and inner peripheries thereof, respectively, for preventing fluid leakage thereacross.

The fluid chambers 92, 94 have a suitable hydraulic fluid 102 therein and the first piston 88 has a passageway 104 directed therethrough for allowing fluid flow thereacross, under the control of a one-way check valve 105 located therein. A spring 106 is located between a portion on the lower end of the cylinder 82 directed inwardly toward the rod 84 and the lower surface of the second piston 96 for moving the second piston 96 rela-

tive to the first piston 88 to compensate for movement of the piston rod 84 into and out of the fluid chamber 94 during the operation of the stabilizing leg 80.

As was the case in the first embodiment, this arrangement of the invention includes a spring 107 mounted within the fluid chamber 92 between the upper cylinder head and the upper face of the first piston 88 for moving the first piston 88 relative to the cylinder 82 for obtaining solid contact between legs such as those illustrated in the first embodiment and a surface for supporting a platform connected thereto as previously discussed. When the piston rod 84 is extended outwardly of the cylinder 82 by the spring 107 there is an unrestricted flow of fluid from the chamber 94 to the chamber 92 and as was the case in the first embodiment, the stabilizing leg 80 will then be maintained in solid contact with a supporting surface by the hydraulic fluid 102 in the fluid chamber 92. A restricted passageway 108 is directed through the first piston 88 for permitting leakage from the fluid chamber 92 into the fluid chamber 94 when a sustained force is imposed on the leg as for example when the support mounting system including the stabilizing leg 80 is shifted into a new position where the stabilizing leg 80 must retract to obtain a stable platform as discussed in the first embodiment.

Another arrangement of the invention is illustrated in FIGURE 6 as including a stabilizing leg 110 comprising an extensible cylinder 112 and piston rod 114 with the upper head of the cylinder 112 adapted to be connected to means for securing the leg 110 to a platform having legs such as those illustrated in FIGURE 1. One end of the piston rod 114 is directed outwardly of the cylinder 112 and is adapted to carry a pad or foot such as the foot 32 in the embodiment of FIGURE 1 and the opposite end of the piston rod 114 is connected to a first piston 116 slidably mounted within the cylinder 112 at the lower end thereof and having an O-ring seal 118 in the outer periphery thereof for sealing against fluid leakage from the cylinder 112 across the piston 116.

The arrangement of FIGURE 6 further comprises a wall 120 formed in the cylinder 112 transversely thereof to form a first fluid chamber 122 in the cylinder 112 above the upper face of the piston 116. A second fluid chamber 124 is formed on the opposite side of the wall 120 by the cylinder 112 and a second piston 126 having an O-ring seal 128 in the outer periphery thereof slidably engaging the inner surface of the cylinder 112 for preventing fluid leakage from the cylinder 112 across the piston 126. The fluid chambers 122, 124 have a suitable hydraulic fluid 130 therein and the wall 120 has a passageway 132 directed therethrough for providing fluid communication between the fluid chambers 122, 124 under the control of a one-way check valve 134 located within the passageway 132.

As was the case in the previous embodiments, a spring 136 is located within the cylinder 112 between the upper head thereof and the upper face of the second piston 126 for biasing the second piston 126 downwardly to cause unrestricted fluid flow from the fluid chamber 124 through the passageway 132 into the second fluid chamber 122. This causes movement of the first piston 116 outwardly of the cylinder 112 until all of the legs of the platform mounting system associated with the stabilizing leg 110 are in solid contact with the supporting surface. Once the legs are in such solid contact the one-way check valve 134 will prevent fluid flow from the fluid chamber 122 into the fluid chamber 124 and the hydraulic fluid 130 within the fluid chamber 122 will effectively resist cyclical dynamic loading imposed upon the platform mounting system that might cause the stabilizing leg 110 to collapse. As was the case in the previous embodiments, a restricted passageway 138 is directed through the wall 120 to provide for leakage of fluid between the

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fluid chambers 122, 124 when a sustained loading of a predetermined value is imposed on the leg 110.

Another arrangement of the present invention is illustrated in FIGURE 7 as including a stabilizing leg 140 comprising an extensible cylinder 142 and piston rod 144 with the upper cylinder head of the cylinder 142 again being adapted to be connected to means for securing the stabilizing leg 140 to a platform having a plurality of legs as discussed above. One end of the piston rod 144 is directed outwardly of the cylinder 142 and includes a threaded tubular portion 146 adapted to carry a pad or foot for engaging a supporting surface for the platform and the opposite end thereof is directed through the upper head of the cylinder for supporting a piston 148 secured intermediate the ends thereof within the cylinder 142. Suitable O-ring seals 150, 152 are mounted within the upper and lower cylinder heads of the cylinder 142, respectively, for preventing fluid leakage outwardly of the cylinder 142 along the outer periphery of the piston rod 144 and the piston 148 has an O-ring seal 154 located in the outer periphery thereof engaging the inner surface of the cylinder 142 for preventing leakage across the outer periphery thereof between fluid chambers 156, 158 formed in the cylinder 142 on either side of the piston 148. A suitable hydraulic fluid 160 fills the chambers 156, 158. A passageway 162 is directed through the piston 148 for providing fluid communication between the fluid chambers 156, 158 under the control of a one-way check valve 163 located therein. In this arrangement extension of the stabilizing leg 140 is produced by means of a spring 164 mounted within the fluid chamber 158 having one end thereof engaging the upper cylinder head and the opposite end thereof engaging the upper face of the piston 148 to bias the cylinder 142 and piston 148 apart. The one-way check valve 163 is arranged to allow free fluid flow from the fluid chamber 156 to the fluid chamber 158 on such extension but will prevent fluid flow therebetween once the legs have been moved into solid contact as discussed above so that the hydraulic fluid 160 within the fluid chamber 158 will opposed dynamic loading imposed on the support mounting system that might tend to collapse the stabilizing leg 140. A restricted passageway 166 is, however, provided across the piston 148 for allowing leakage thereacross to stabilize the system when a predetermined sustained loading is imposed on the stabilizing leg 140.

Yet another arrangement of the present invention is illustrated in FIGURE 8 as including a stabilizing leg 170 comprising an extensible cylinder 172 and piston rod 174 with the upper head of the cylinder 172 again being adapted to be connected to means for securing the stabilizing leg 170 in a platform supporting system. One end of the piston rod 174 is directed outwardly of the cylinder 172 and has a tubular threaded portion 176 adapted to carry a pad or a foot for engaging a platform supporting surface and the opposite end of the piston rod 174 is located within the cylinder 172 and connected to a piston 178 having an O-ring seal 180 in the outer periphery thereof slidably engaging the inner surface of the cylinder 172 for preventing fluid leakage from the cylinder 172 across the piston 178. In this arrangement the cylinder 172 is divided into two parts by a wall 182 directed thereacross intermediate the ends thereof with the wall 182 and the upper face of the piston 178 forming a first fluid chamber 184 within the cylinder 172 separated by the wall 182 from a second fluid chamber 186 formed in the cylinder 172 above the wall 182. A suitable hydraulic fluid 188 in the fluid chambers 184, 186 flows through a passageway 190 directed through the wall 182 under the control of a one-way check valve 192.

In this arrangement the stabilizing leg 170 is adjusted into solid contacting relationship with a platform supporting surface by means of a spring 194 mounted within the first fluid chamber 184 having one end thereof bearing against the upper surface of the piston 178 and the

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opposite end thereof engaging the wall 182 for biasing the piston 178 in a direction to cause the piston rod 174 to move outwardly of the cylinder 172 during which time there is a free flow of fluid from the fluid chamber 186 through the passageway 190 into the fluid chamber 184. Once the stabilizing leg 170 is in solid contact with the supporting surface the fluid drawn into the fluid chamber 184 by the outward extension of the piston 178 is trapped therein by the one-way check valve 192 to oppose cyclical dynamic loading transmitted to the stabilizing leg 170 through the platform mounting system so as to prevent the collapse thereof. A restricted passageway 196 extends through the wall 182 allowing controlled leakage between the fluid chambers 184, 186 when a sustained force is imposed thereon under conditions discussed above.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A stabilizing leg comprising a cylinder, a first piston mounted within said cylinder, a second piston mounted within said cylinder, said first and second pistons and said cylinder forming separate chambers having an incompressible fluid therein, spring means within said cylinder for biasing said second piston in a first direction relative to said cylinder, control means permitting free flow of fluid between said chambers upon movement of said second piston in said first direction for causing a first predetermined relative movement between said cylinder and said first piston, said control means restricting fluid flow between said chambers upon relative movement between said first piston and said cylinder opposite to said first predetermined relative movement for causing fluid in one of said chambers to oppose such opposite movement.

2. A stabilizing leg for leveling a domestic appliance comprising, a cylinder, a piston mounted for reciprocation in said cylinder, a piston rod connected to said piston directed exteriorly of said cylinder, said cylinder and piston forming separate chambers having an incompressible fluid therein, a compression spring in one of said chambers for biasing said piston in a first predetermined direction to move said piston rod exteriorly of said cylinder, passageway means in said piston, one-way valve means for opening said passageway means upon movement of said piston in said first predetermined direction, said valve means operative to close said passageway means upon movement of said piston opposite to said first predetermined direction, and means in said piston for restricting fluid flow upon said opposite movement whereby said incompressible fluid serves as a hydraulic support when said leg is in a predetermined relationship with respect to the domestic appliance.

3. In the combination of claim 2, said piston including means on one face thereof forming a valve seat, said one-way valve means being a disc valve connected to said piston adjacent said one face and biased into sealing engagement with said valve seat to prevent flow through said piston passageway means upon movement in said first predetermined direction.

4. In the combination of claim 3, said disc valve having a radially inwardly located arcuate groove for causing the outer peripheral edge of said disc valve to have a high flexibility whereby said disc valve quickly responds to movement of said piston in said predetermined direction to allow free fluid flow through said piston passageway means.

5. A stabilizing leg for leveling a domestic appliance comprising, a hollow cylinder having oppositely closed ends, a piston mounted for reciprocation within said cylinder, a thin annular relatively frictionless bearing member supported in the outer periphery of said piston, said bearing member slidably sealingly engaging the inner wall of said cylinder, said cylinder and piston forming separate chambers on either side of said piston having an incompressible fluid therein, a piston rod having one end thereof

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secured to one face of said piston and the opposite end thereof directed exteriorly of said cylinder through one of the closed ends thereof for connection to the frame of a domestic appliance, a compression spring located in one of said separate chambers for moving said piston in a direction to cause said piston rod to move exteriorly of said cylinder, passageway means through said piston for fluidly communicating said separate chambers, valve means carried by said reciprocal piston and piston rod including means for opening said fluid piston passageway means upon movement of said piston rod exteriorly of said cylinder, said valve means being operative to close said

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piston passageway means upon movement of said piston rod into said cylinder.

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