A fluid actuated piston assembly, disposed for movement within a cylinder, has a primary piston section. At least one transverse clutch member is pivotally mounted in the primary piston section and is engageable with the cylinder wall. Spring means are interposed between the primary piston section and the clutch member and normally act to pivot the latter into wedging engagement with the cylinder wall whereby to prevent travel of the piston assembly in the cylinder in one direction. A secondary piston section is engageable with the clutch member for pivoting the same out of wedging engagement with the cylinder wall against the force of the spring means when actuating fluid pressure in the cylinder moves the secondary piston section relative to the primary piston section whereby to permit travel of the piston assembly in the cylinder in the one direction.
1 FLUID OPERATED PISTON AND CYLINDER MEANS

FIELD OF THE INVENTION

The present invention relates generally to fluid operated piston and cylinder means adapted, for example, for operating a vehicle window.

SUMMARY OF THE INVENTION

The present invention is directed to fluid operated piston and cylinder means wherein the piston assembly is provided with clutch means automatically operable to prevent travel of the piston assembly in the cylinder in one direction. Heretofore, various types of clutch means, for example in the form of wedges or rollers, have been proposed for incorporation in fluid actuated piston assemblies. In contrast, the present invention contemplates the use of pivotally mounted clutch members which contribute to improved efficiencies and economies.

More particularly, the piston assembly of the present invention comprises a primary piston section, at least one transverse clutch member, spring means interposed between the primary piston section and the clutch member, and a secondary piston section. When actuating fluid pressure is introduced into one end of the cylinder against the primary piston section, the piston assembly is moved in the direction of the other end of the cylinder. When actuating fluid pressure is relieved or exhausted from the one end of the cylinder, the spring means acts to pivot the clutch member into wedging engagement with the cylinder wall thereby to prevent travel of the piston assembly in the cylinder in the one direction. When actuating fluid pressure is introduced into the other end of the cylinder against the secondary piston section, the secondary piston section is moved relative to the primary piston section and pivots the clutch member out of wedging engagement with the cylinder wall against the force of the spring means whereby to permit travel of the piston assembly in the cylinder in the one direction.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of fluid operated piston and cylinder means embodying the principles of the present invention and a partial sectional view of a vehicle window with which the piston and cylinder means is associated;

FIG. 2 is a front elevational view of the fluid operated piston and cylinder means;

FIG. 3 is a front elevational view with portions being broken away to show the interior of the piston and cylinder means;

FIG. 4 is a sectional view taken substantially along the line 4–4 in FIG. 3 looking in the direction indicated by the arrows;

FIG. 5 is a top view of the piston and cylinder means;

FIG. 6 is a sectional view taken substantially along the line 6–6 in FIG. 4 looking in the direction indicated by the arrows;

FIG. 7 is a sectional view taken substantially along the line 7–7 in FIG. 3 looking in the direction indicated by the arrows;

FIG. 8 is a sectional view taken substantially along the line 8–8 in FIG. 3 looking in the direction indicated by the arrows;

FIG. 9 is a sectional view corresponding generally to FIG. 8 but shows several of the components in a changed operating position; and

FIG. 10 is a sectional view taken substantially along the line 10–10 in FIG. 3 looking in the direction indicated by the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1 and 2, there is indicated generally by the reference numeral 12 fluid operated piston and cylinder means embodying the principles of the present invention. By way of illustration, the fluid operated means 12 may be mounted within a vehicle door frame 14 for raising and lowering a window 16 held in a channel 18. The fluid operated means 12 is comprised of a cylinder assembly 20 in which is slidably mounted a piston assembly 22 (e.g., FIG. 3).

As shown in FIGS. 2, 3 and 4, the cylinder assembly 20 comprises an elongated rectangular cylinder 24 having a narrow longitudinal slot 26 and ports 28 formed in the wall thereof. Secured in the ends of the cylinder 24 are closure units 30 each having an open slot 32 lengthwise of the cylinder slot 26 and a passageway 34 connecting the adjacent cylinder port 28 with the interior of the cylinder 24. Extending along the inside of the cylinder 24 lengthwise of the cylinder slot 26 and closure unit slots 32 is a thin flexible seal strap 36 preferably of metal. The ends of the strap 36 are secured to the ends of the closure units 30 by means of retainers 38 and screws 40 (FIGS. 5 and 7). The cylinder ports 28 are connected by fluid lines 42 to a suitable control valve (not shown) by means of which either port 28 can be connected to a source of actuating fluid pressure such as compressed air (not shown) and the other connected to exhaust.

As shown in FIGS. 3, 6, 8 and 10, the piston assembly 22 comprises a primary piston section 44 formed with a pair of spaced open guide slots 46 lengthwise of the cylinder slot 26, an arm 48 projecting through the cylinder slot 26, an oppositely facing central open cavity 50, and an oppositely facing open guide slot 52. A portion of the seal strap 36 extends through the primary piston section 44 along the bottom walls of the guide slots 46 and cavity 50.

The primary piston section 44 is also formed with two identical laterally spaced transverse openings 54 therethrough. Each transverse opening 54 is comprised of a first end portion with a pair of parallel side walls 56, a second end portion with one side wall 58 substantially parallel to the side walls 56 and a second side wall 60 diverging outwardly away from the one side wall 58, and intermediate arcuate portions 62 joining the adjacent side walls 56, 58 and 60 and defining spaced bearing seats. Pivotally mounted in each of the transverse openings 54 is a clutch member 64. Each clutch member 64 comprises a body portion 66 having a cylindrical surface engageable with the wall of the cylinder 24 and pivotally seated on the bearing seats 62, and an arm portion 68 engageable with the wall of the cylinder 24. Interposed between the primary piston section 44 and the clutch members 64 are spring means in the form of a pair of coil springs 70.

The piston assembly 22 further comprises a secondary piston section 72 having a main body portion 74, an extension portion 76 of reduced width and defining with the body portion 74 a pair of laterally spaced
shoulders 78, a pair of laterally spaced stop lugs 80 adjacent one end of the body portion 74, and a stop ledge 82 at the outer end of the extension portion 76. When the secondary piston section 72 and the primary piston section 44 are in assembled relation, the body and extension portions 74 and 76 slidably fit in the guide slot 52, the shoulders 78 are engageable with the clutch members 64, the stop lugs 80 are engageable with the adjacent end of the primary piston section 44 for limiting movement of the secondary piston section 72 relative to the primary section 44 in one direction, and the stop ledge 82 is engageable with the interior wall of the primary piston section 44 adjacent the inner end of the guide slot 52 for limiting movement of the secondary piston section 72 relative to the primary piston section 44 in the other direction.

Mounted on the end of the primary piston section 44 remote from the transverse openings 54 is a snap-on resilient seal 84, and mounted on the end of the secondary piston section 72 remote from the primary piston section 44 is a corresponding snap-on resilient seal 86. The resilient seals 84 and 86 are respectively notched at 88 and 90 to accommodate the seal strap 36. The piston assembly 22 is moveable within the cylinder 24 relative to the seal strap 36. Fluid under pressure introduced into the cylinder 24 for actuating the piston assembly 22 causes the seal strap 36 to have sealing engagement with the wall of the cylinder 24 along the cylinder slot 26 except where the piston assembly 22 is located; the resilient seals 84 and 86 have peripheral sealing engagement with the wall of the cylinder 24 and the strap 36 whereby to seal off the cylinder slot 26 where the piston assembly 22 is located at any given time. The arm 48 of the primary piston section 44 is connected in a conventional manner to the window channel 18 (FIG. 1).

Operationally, the coil springs 70 normally act to pivot the clutch members 64 into wedging engagement with the wall of the cylinder 24 (FIG. 9). In this manner, downward travel of the piston assembly 22 in the cylinder 24 is prevented and the piston assembly 22 is held in any selected vertical position.

When it is desired to elevate the piston assembly 22, actuating fluid pressure is introduced into the lower end of the cylinder 24. The upward force acting against the primary piston section 44 effects both pivoting of the clutch members 64 out of wedging engagement and upward movement of the piston assembly 22. At the selected elevated position, the actuating fluid pressure is relieved or exhausted from the lower end of the cylinder 24 and the clutch members 64 are again pivoted by the springs 70 into wedging engagement for holding the piston assembly 22 in the selected elevated position.

When it is desired to lower the piston assembly 22, actuating fluid pressure is introduced into the upper end of the cylinder 24. The downward force acting against the secondary piston section 72 initially effects downward movement of the latter relative to the primary piston section 44 causing the shoulders 78 to pivot the clutch members 64 out of wedging engagement (FIG. 8). Thereafter, the piston assembly 22 is moved downwardly as a unit. At the selected lowered position, the actuating fluid pressure is relieved or exhausted from the upper end of the cylinder 24 and the clutch members 64 are pivoted back by the springs 70 into wedging engagement for holding the piston assembly 22 in the selected lowered position.

While there has been shown and described a preferred embodiment of the present invention, it will be understood by those skilled in the art that various modifications and rearrangements may be made therein without departing from the spirit and scope of the invention.

The invention claimed is:
1. For use in a cylinder, a fluid actuated piston assembly comprising a primary piston section, at least one transverse clutch member pivotally mounted in said primary piston section and being engageable with the cylinder wall, spring means interposed between said primary piston section and one side of said clutch member and normally acting to pivot the latter into wedging engagement with the cylinder wall whereby to prevent travel of said piston assembly in the cylinder in one direction, and a secondary piston section engageable with the other side of said clutch member for pivoting the same out of wedging engagement with the cylinder wall against the force of said spring means when actuating fluid pressure in the cylinder moves said secondary piston section relative to said primary piston section whereby to permit travel of said piston assembly in the cylinder in said one direction.
2. The piston assembly and the claim 1 wherein said primary piston section has at least one transverse opening therethrough, and said clutch member is pivotally mounted in said transverse opening and has opposed ends engageable with the cylinder wall.
3. The piston assembly of claim 2 wherein said transverse opening is comprised of a first end portion with a pair of side walls, a second end portion with a pair of side walls one diverging outwardly away from the other, and intermediate arcuate wall portions joining the adjacent side walls of said first and second end portions and defining spaced bearing seats; and wherein said clutch member is comprised of a body portion in said first end portion and having a cylindrical surface engageable with the cylinder wall and pivotally seated on said bearing seats, and an arm portion in said second end portion and being engageable with the cylinder wall.
4. The piston assembly of claim 3 wherein said primary piston section has two identical laterally spaced transverse openings therethrough, said piston assembly includes a pair of identical clutch members one pivotally mounted in each of said transverse openings, said spring means is interposed between said primary piston section and each of said clutch members, and said secondary piston section is engageable with each of said clutch members for pivoting the same out of wedging engagement with the cylinder wall under identical conditions.

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