ABSTRACT

A spring device formed by a continuous strand to provide a series of helical coils interconnected by integral portions of the strand, each of the helical coils having a longitudinal axis and said coils being disposed such that the axis is generally perpendicular to the plane of the interconnecting strand portions and the device being in the shape of an annulus such that the axis is generally perpendicular to the plane of the annulus and whereby the device is particularly adapted for use in annular hydraulic servo motors as a piston return spring.

3 Claims, 6 Drawing Figures
MULTIPLE SPRING ASSEMBLY  
SUMMARY OF INVENTION

It has been found that individual springs utilized in prior art devices tend to fall out of place or become dislodged during assembly adding cost and delay in manufacture. The present invention overcomes this and other disadvantages by having a plurality of springs formed from a single piece of material. According to the invention, a spring device is formed of a continuous strand to provide a plurality of helical coils interconnected by integral portions of the strand, each of said helical coils having a longitudinal axis and said coils being disposed such that said axes are generally parallel.

BRIEF DESCRIPTION OF DRAWINGS

One particular embodiment of the invention will be described herein with reference to FIGS. 1 to 6 of the accompanying drawings in which:

FIG. 1 shows, in front elevation and partly in section, an assembly of members wherein an integral spring device is disposed in a groove;

FIG. 2 shows, in plan, a view along the line 2--2 of FIG. 1;

FIG. 3 shows, in plan view, a spring cluster before assembly as shown in FIGS. 1 and 2;

FIG. 4 shows, in front elevation, a view along the line 4--4 of FIG. 3;

FIG. 5 shows, in plan view, a modification of the spring cluster of FIGS. 3 and 4; and

FIG. 6 shows, in front elevation, a view along line 6--6 of FIG. 5.

Upon referring to the drawings, in particular FIG. 1, a cross-sectional view is presented of a hydraulic servomotor 5 of a type suitable for use in an automatic transmission to actuate a friction engaging device such as a clutch or brake. The servomotor 5 includes a piston 6 slidable in a cylinder 7. Friction discs 8 are provided adapted to be compressed into contact or engagement by fluid pressure acting on the upper side of the piston 6. An annular groove 9 is provided in piston 6 which is adapted to receive the abutting end of a multi-coil integral helical compression spring 10. Individual coil springs are normally used in this environment and are held in compression in said groove after assembly by means of a retainer or flange 11, said assembly being of the kind in which the only forces normally applied to said springs are compressive one directed along the axis of each helix and the function of the springs is to return piston 6 when fluid pressure is exhausted from the upper side thereof.

The several coil springs used in known assemblies of this type are replaced by the improved advantageous multi-coil integral spring 10 as illustrated in the drawings. Use of the spring 10 obviates the normal problem encountered in keeping the individual coil springs from falling out of place or being dislodged during assembly. The individual springs are mutually attached in a single unit and form (for example) from a continuous strand or wire having adjacent helically wound portions, 14 and 16, connected by integral bridging links 18. If desired, said spring 10 may be left with its ends free or said ends may be joined by welding or otherwise for form an annulus, so that the spring 10 may be disposed in the groove 9 as a unit before enclosing said spring between the groove 9 and the flange 11 in a subsequent assembly step, which will prevent ready displacement of the individual helical elements. The links 18 may (of course) remain after the final assembly, since they take no part in the action of the individual helical elements.

It will be apparent that the device 10 may be formed in shapes other than an annulus where the shape of the groove in which it is to fit is otherwise, for example elliptical or other closed configurations.

Referring specifically to FIGS. 3 and 4, it will be seen that each of the individual coils 14 or 16 has a longitudinal axis 28 and a central straight mid-portion 30. Above and below the mid-portion 30 is an upper section 32 and a lower section 34 wound in opposite rotational directions about axis 28 or, expressed another way, the sections 32 and 34 are of opposite hand. Further, the winding of the individual springs 14 and 16 must be in a direction that the connecting links 18 of the continuous wire enter adjacent coils at the same end, either the top or the bottom thereof, as illustrated in FIG. 4.

The individual coils 14 and 16 are disposed when the annulus shape of the spring device 10 is formed perpendicular to the plane of the annulus.

The winding arrangement of the helical portions 14 and 16 as shown in FIGS. 2, 3 and 4, results in a symmetrical disposition of the links 18. In the modified arrangement of the helical portions such as 20 and 22 as shown in FIGS. 5 and 6, the helical portions are interspersed between alternating tangential inner and outer integral link portions such as 24 and 26, respectively, which may be more suitably employed in certain assemblies.

From the above it will be apparent that the present invention has distinct advantages in that in the problem in assembly operations where a plurality of individual coil springs must be held in position during assembly is eliminated since all of the coils in the instant device are secured together. Further, other advantages are provided in that whereas it is often necessary to grind the faces of individual coil springs when used in the environment shown in FIG. 1 to prevent same from cocking when the device is in use with the integral form of spring device 10, such grinding is unnecessary since the integral nature of the device maintains the individual coils in their proper position during use.

I claim:

1. A spring device formed by a continuous strand to provide a series of helical coils interconnected by integral portions of the strand, each of said helical coils having a longitudinal axis and said coils being disposed such that said axis is generally perpendicular to the plane of said interconnecting strand portions, said device being in the shape of an annulus whereby said axis is generally perpendicular to the plane of said annulus.

2. A spring device as claimed in claim 1 wherein each of said helical coils includes a mid-portion and with the sections on either side thereof being of opposite hand.

3. A spring for use in an annular hydraulic servomotor, said spring formed by a continuous strand to provide a series of helical coils in an annular array interconnected by integral portions of the strand, said servomotor including a flat annular surface, said spring adapted to engage said flat annular surface, each of said helical coils having a longitudinal axis substantially perpendicular to said annular surface, and the longitudinal axis of each of said coils being generally parallel.