

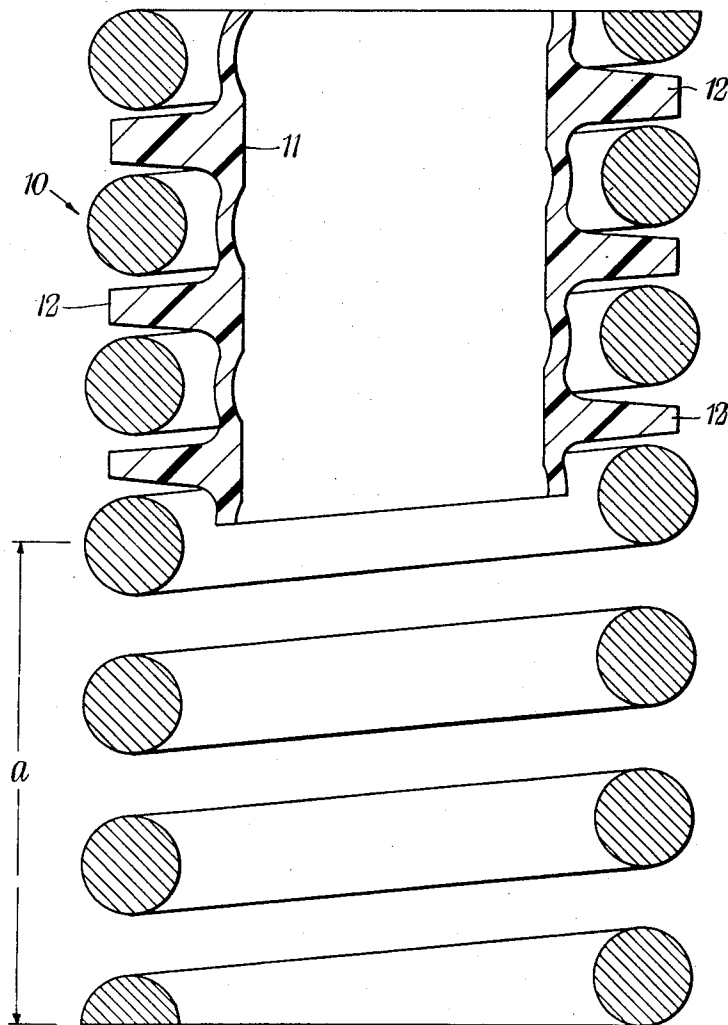
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COIL SPRINGS

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## COIL SPRINGS

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1 Claim. (Cl. 267—60)

This invention relates to coil springs.

For many suspension purposes there is a need of a variable rate coil spring and hitherto proposals have been made for providing springs of variable pitch between the coils, the arrangement being such that as the spring deflects it will become progressively coil bound thereby raising the rate of deflection. However, springs of the form indicated are subject to certain disadvantages. In the first place they are difficult to manufacture because for full efficiency the pitch variation must be held to very close limits and secondly when they are coil bound the inevitable rubbing between the coils results in surface damage which weakens the spring and shortens its working life. Furthermore coil to coil metallic contact creates objectionable noise.

It is the chief object of the present invention to provide for a variable rate coil spring which will not be subjected to the disadvantage indicated and in accordance therewith it is proposed to insert between a preselected number of coils of a coil spring a helical rib of rubber, plastic or other material. Conveniently, the rib may be of tapering section or of progressively decreasing or increasing thickness so that as a spring to which such strip is applied is deflected the coils will be progressively locked in turn. By suitable dimensioning of the strip it will be possible to provide a completely progressive spring rate or one, two, three or more changes of rate at given deflections of the spring.

In order that the said invention may be clearly understood and readily carried into effect the same will be hereinafter more fully described with reference to the accompanying drawing which illustrates one embodiment by way of example.

Referring now to the drawing 10 denotes a conventional coil spring while 11 denotes a moulding of rubber or plastic material comprising a sleeve of bellows like formation having an external helical rib 12 which is of progressively tapering thickness. In the embodiment illustrated the moulding does not extend over the full length of the spring so that the coils designated *a* will comprise what may be termed full deflection coils which will function in a perfectly normal manner. It will be appreciated however that those coils of the spring between which the rib 12 is present will upon deflection or compression of the spring be locked up or rendered inactive so that effectively the rate of the spring will be varied. By virtue of the progressive tapering of the rib as shown the coils between which said rib is present will be locked up progressively. While tapering of the rib is advantageous such a feature is not however essential and said rib may well be of constant thickness throughout its length.

It may be mentioned here that with an arrangement such as is illustrated in the drawing it may be necessary

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to provide some means for maintaining the moulding in position within the spring.

As an alternative it may be feasible to provide a sleeve like moulding of rubber or plastic material so dimensioned as to be capable of being applied over a coiled spring to sheath the latter for a preselected portion of its length and in such a case the helical rib would be formed internally of such sleeve like moulding so as to project between the spring coils.

Instead of either of the arrangements indicated above it may be feasible to introduce a helical rib between a predetermined number of coils of a spring and to retain such rib in the required position by means of two tubular elements or equivalent retaining means which are arranged concentrically on an end cap applied to the spring, one of such elements being adapted to project into the spring coaxially therewith while the other surrounds said spring. Again in place of such retaining means it may be feasible to mould, bond or otherwise attach the rib to the selected coils on one side of the latter, or alternatively the helical rib might be of some elastic material which is bonded to adjacent coils so that in the free position of the spring it will be under tension while on deflection of the spring it will be subjected to compression until it is the equivalent of a solid rib which will render the particular spring coils inactive.

In yet another embodiment a helical rib may be provided between the coils of a variable pitch spring, such rib being of either tapering or constant section.

It may be mentioned here that depending upon the particular mode of application the rib for insertion between the coils of any selected spring may be of rubber, plastic, or any other material which will withstand the frictional wear satisfactorily and give adequate fatigue life.

Whichever way the helical rib is located in the spring it can be designed and made to ensure that any preselected number of coils will be rendered ineffective at any particular deflection of the spring. Thus it is possible to provide either a completely progressive variable rate spring or alternatively one, two, three or more changes of rate at given deflections.

We claim:

A variable rate spring comprising a constant rate coil spring and a substantially cylindrical element concentrically disposed with respect to said coil spring, said cylindrical element being provided with a helical rib adapted to be interposed between a preselected number of convolutions of said coil spring, said helical rib having a progressively tapered axial thickness and being operable to preclude the movement of certain of said convolutions upon the application of a predetermined force on said coil spring.

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