CLAIMS

1.- A ~~deformation control device for a resonant spring in a~~ linear driving unit~~, of the type which comprises~~ comprising:

- a linear electric motor ~~(M)~~ formed by a motor housing ~~(C)~~, which is electrically excited and affixed to a fixed structure ~~(1)~~, and by a magnetic armature ~~(A)~~ which is coupled to a piston through coupling means and displaced by the electric excitation of the motor housing, in a reciprocating axial movement, said piston coupling means and magnetic armature defining a compression movable assembly, ~~;~~
- a helical resonant spring ~~(50),~~ having ~~um~~an end coupled to the fixed structure ~~(1)~~ and an opposite end coupled to the magnetic armature ~~(A),~~ in order to be displaced by the latter and elastically deformed, in a reciprocating axial movement, and operating as a guide for the axial displacement of the piston and also actuating on the compression movable assembly, jointly with the linear electric motor~~-~~,
- ~~characterized in that said deformation control device (60)~~ an energy absorbing means ~~is mounted~~ being provided directly and tightly, along and around one or more wire extension(s) of ~~to~~ the resonant spring ~~(50), in order to maintain contact with a surface extension of the resonant spring (50),~~ in respective specific regions which are subject to radial, lateral or torsional deformations upon the reciprocating axial movement of the resonant spring, in order to maintain direct contact with the surface of the wire extensions(s) in said specific regions of the resonant spring, producing, during the ~~which is~~

~~elastically and radially deformed upon the reciprocating~~ axial elastic deformation ~~movement~~ of said resonant spring ~~(50)~~, a generation ~~and to generate at least one of the conditions:~~ of friction with ~~said~~ the surface ~~extension~~ of said wire extension(s) of the resonant spring ~~(50);~~ and/or a generation of elastic deformation of ~~said deformation control device (60)~~ the energy absorbing means, caused by said ~~absorbing energy in a value sufficient to at least minimize said~~ radial, lateral or torsional ~~elastic~~ deformations of the resonant spring ~~(50)~~, being transmitted to the energy absorbing means.

~~2- The device, according to claim 1, characterized in that it is provided around and along a wire extension of the resonant spring (50).~~

2~~3~~.- The linear driving unit~~device~~, according to claim 1~~2~~, ~~characterized in that~~ wherein the energy absorbing means ~~it~~ is defined by a tubular coating ~~(61)~~ which surrounds, integrally and circumferentially, said wire extension(s) of the resonant spring ~~(50)~~, maintaining direct contact with the latter.

3.~~4~~- The ~~device~~linear driving unit, according to claim 2~~3~~, ~~characterized in that~~ wherein the tubular coating ~~(61)~~ is formed by a rubber which is vulcanized directly on said wire extension(s) of the resonant spring or by a ~~(50).~~

~~5- The device, according to claim 3, characterized in that the tubular coating (61) is formed in~~ plastic material provided directly on said wire extension(s) of the resonant spring ~~(50)~~, or by ~~.~~

~~6- The device, according to claim 5, characterized in~~

~~that the tubular coating (61) is formed in a~~ thermoretractable plastic material.

4.~~7~~ The ~~device~~linear driving unit, according to claim 1~~2~~, ~~characterized in that it~~ wherein the energy absorbing means is provided in helical development along said wire extension(s) of the resonant spring ~~(50)~~, maintaining direct contact with the latter.

5.~~8~~ The linear driving unit~~device~~, according to claim 4~~7~~, ~~characterized in that it~~ wherein the energy absorbing means is defined by a damping spring ~~(62)~~ in the form of a helical spring made of a cylindrical rod ~~(62b)~~ and which is helically mounted, directly and tightly, around said wire extension(s) of the resonant spring ~~(50).~~, or by

~~9- The device, according to claim 7, characterized in that it is defined by a damping spring (62) in the form of a strip (62a)~~ helically mounted around said wire extension(s) of the resonant spring ~~(50)~~.

6.~~10~~ The linear driving unit~~device~~, according to ~~any one of~~ claim 5~~s 8 or 9~~, ~~characterized in that it~~ wherein the energy absorbing means further comprises a tubular coating ~~(61)~~ which surrounds, integrally and circumferentially, the wire extension(s) of the damping spring ~~(62)~~ mounted around said wire extension(s) of the resonant spring ~~(50)~~.

7.~~11~~ The linear driving unit~~device~~, according to claim 6~~10~~, ~~characterized in that~~ wherein the tubular coating ~~(61)~~ is formed by a rubber which is vulcanized around the wire extension(s) of the damping spring, or by a ~~(62).~~

~~12- The device, according to claim 10, characterized in~~

~~that the tubular coating (61) is formed in~~ plastic material provided around the damping spring ~~(62)~~, or by ~~13. The device, according to claim 12, characterized in that the tubular coating (61) is formed in a~~ thermoretractable plastic material.

8.~~14.~~ The linear driving unit~~device,~~ according to claim 1, ~~characterized in that it~~ wherein the energy absorbing means is defined by a semi-tubular coating ~~(63)~~ which surrounds part of the circumferential contour of said ~~surface~~ wire extension of the resonant spring ~~(50)~~, maintaining direct contact with the latter, said semi-tubular coating ~~(63)~~ being defined, in a single piece, by a plurality of semi-annular segments ~~(63a)~~ which are spaced apart and connected to one another.

9.~~15.~~ The ~~device~~linear driving unit~~,~~ according to claim 8~~14~~, ~~characterized in that~~ wherein the semi-annular segments ~~(63a)~~ are sequentially and alternately interconnected by their ends.

10.~~6.~~ The linear driving unit~~device,~~ according to claim 9~~15~~, ~~characterized in that~~ wherein the semi-annular segments ~~(63a)~~ are parallel to each other and interconnected by small longitudinal segments ~~(63b)~~.

11~~7~~. The ~~device~~linear driving unit~~,~~ according to any one of claims 8, 9 or 10~~14, 15 or 16~~, ~~characterized in that~~ wherein the semi-tubular coating ~~(63)~~ is formed by one of the materials defined by metallic strip, metallic wire, plastic material, thermoplastic material and thermoretractable plastic material, provided directly on ~~said~~ the surface ~~extension~~ of the resonant spring ~~(50)~~.