United States Patent

[11] **3,574,241**

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[54] **SPRING AND FRAME ASSEMBLY PARTICULARLY FOR BOX SPRINGS**
11 Claims, 6 Drawing Figs.

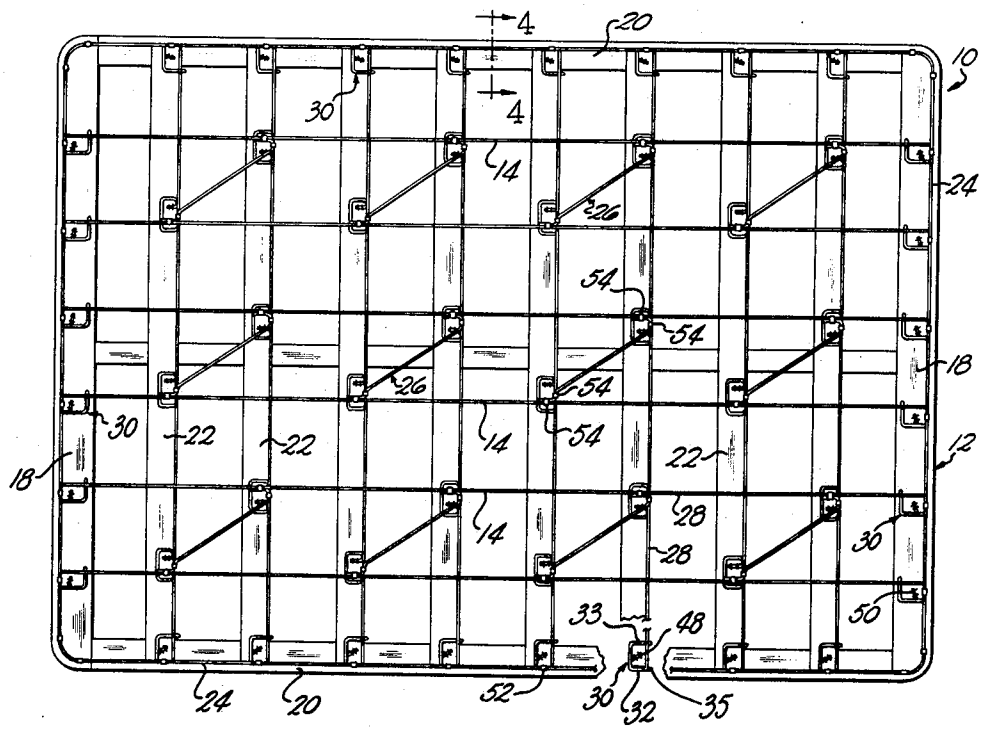
[52] **U.S. Cl.** **5/247,** 5/255
[51] **Int. Cl.** **A47c 23/02,** A47c 23/04
[50] **Field of Search** 5/247, 255, 246; 267/103, 107

[56] **References Cited**
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3,286,281	11/1966	Slominski	5/247
3,487,480	1/1970	Slominski	5/247

Primary Examiner—Bobby R. Gay
Assistant Examiner—James C. Mitchell
Attorney—Olsen and Stephenson

ABSTRACT: A spring and frame assembly, particularly for box springs for beds, consisting of a plurality of main springs arranged crisscross fashion on a rectangular supporting frame and internal support springs supported on the frame and secured to the main springs. Each of the main springs has a resilient end portion movable between an upwardly extending position when not loaded and a downwardly compressed position when under load, and each of these end portions includes a pair of generally upright spacer bars that function to limit the magnitude of the downward movement of the main spring when under load.



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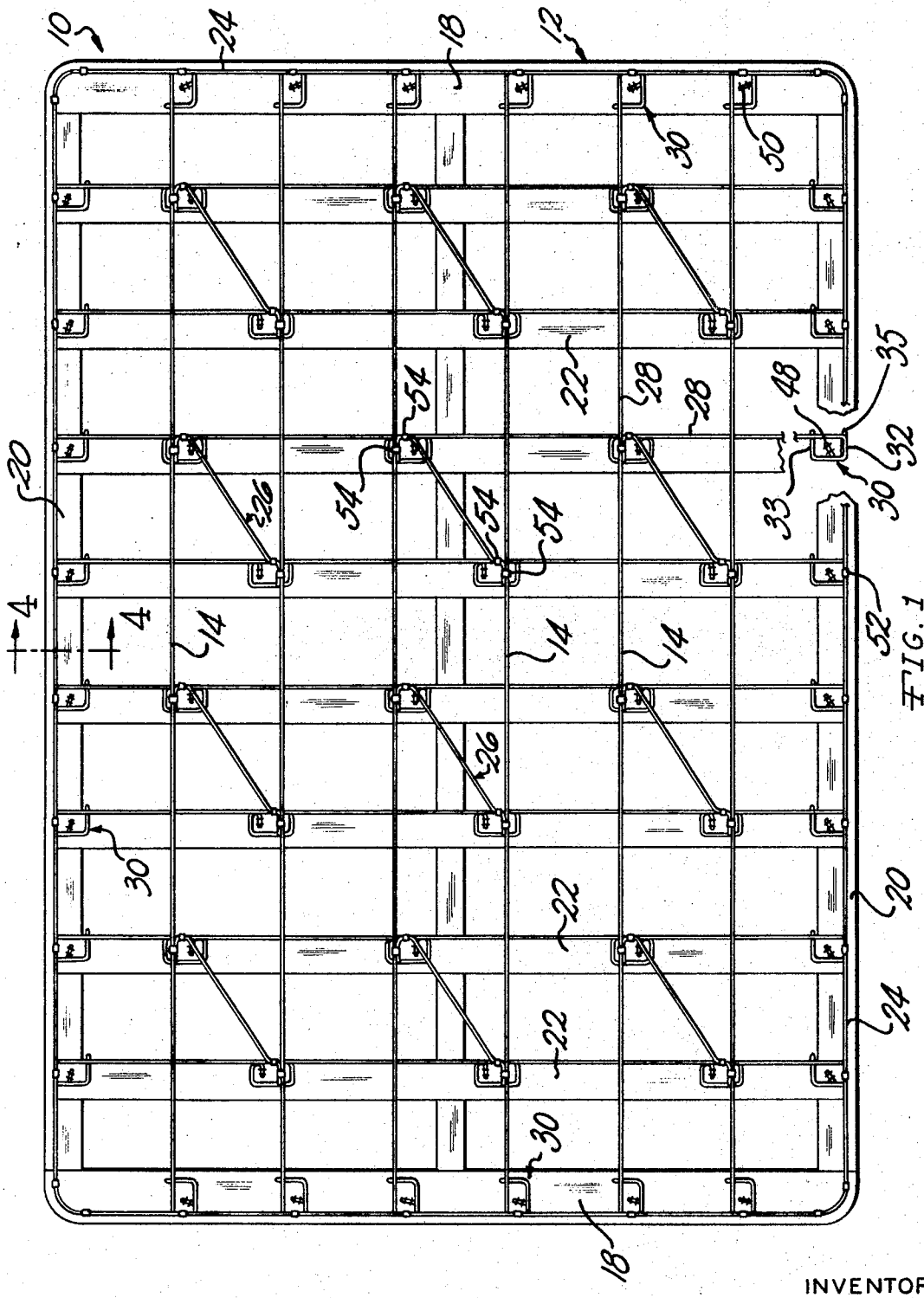


FIG. 1

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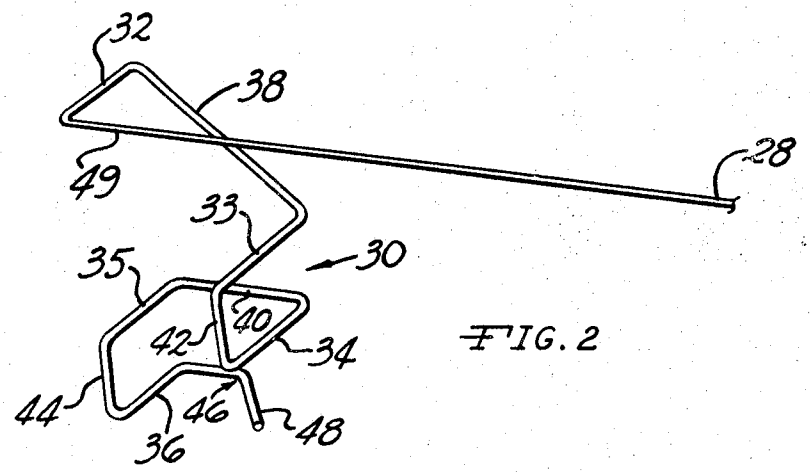


FIG. 2

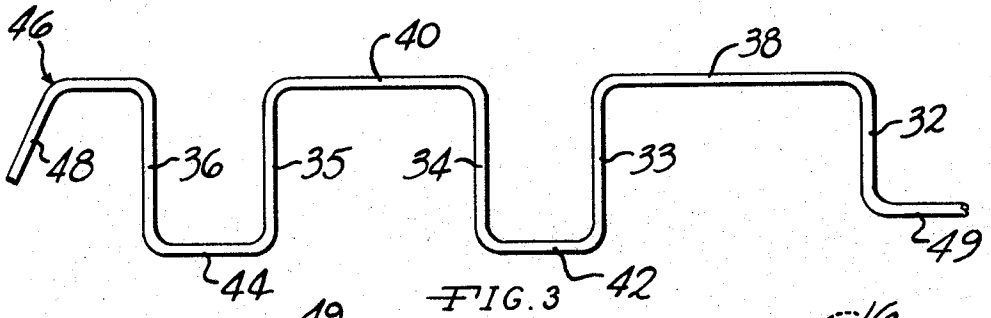


FIG. 3

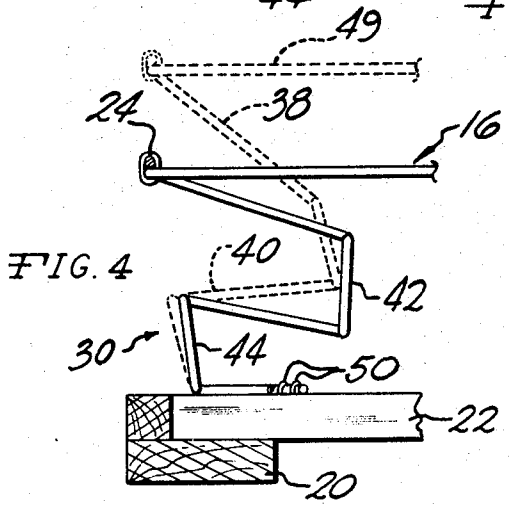


FIG. 4

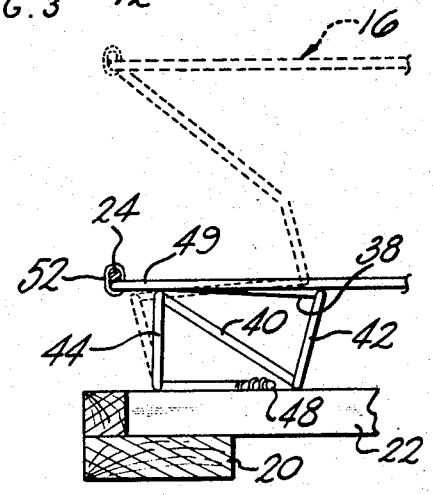


FIG. 5

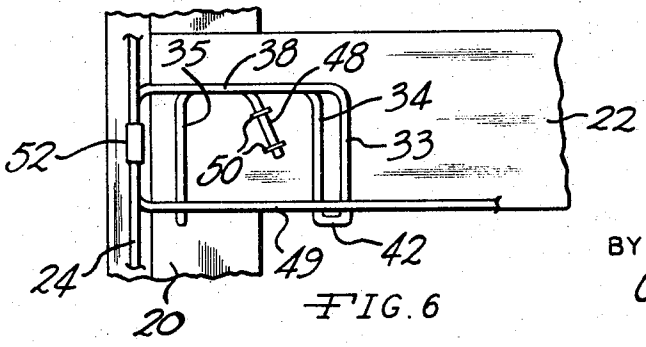


FIG. 6

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SPRING AND FRAME ASSEMBLY PARTICULARLY FOR BOX SPRINGS

The conventional box spring consists of a rectangular wood frame on which a plurality of coil springs and border wires are mounted, and a fabric cover and pad which are positioned over the spring and the border wires and attached to the frame. The spring and frame assembly of this invention, which is particularly adapted for box springs, eliminates the conventional coil springs and consists generally of a wood frame and a plurality of substantially identical mainsprings which extend crisscross fashion above the frame and have depending resilient end portions secured to the frame. Internal springs, are similarly mounted on the frame and are secured to the mainsprings intermediate their ends for strength purposes. In the construction of this type illustrated in applicant's prior U.S. Pat. No. 3,286,281, abnormally high and unusually concentrated loads on the spring assembly can result in movement of the spring assembly to an undesirable extreme position in which the spring assembly bottoms on the frame. In addition, prior constructions of this type were subject to taking substantial "set" during a prolonged service life because spring movement was concentrated in a small number of torsion bars.

The spring and frame assembly of this invention consists of a rectangular frame and transversely extending support members or slats which are mounted on the frame. The resilient end portions of the mainsprings are mounted on the frame so that they normally maintain the spring body portions at a predetermined elevation above the frame. When the springs are loaded, the resilient end portions are compressible to allow the body portions to move toward the frame. Each mainspring end portion includes a pair of generally upright spacer bars having transversely extending torsion bars at their upper ends. The torsion bars are located so that they extend transversely of the body portion at a position directly below the body portion. As a result, in the fully compressed position of the spring end portion, the frame limits downward movement of the spacer bars to a position in which the torsion bars at the upper ends thereof are engageable with the spring body portion to limit downward movement thereof. As a result, a maximum load on the spring assembly will only deflect the spring body portions to certain position, thus limiting the load on the spring components. Furthermore, each spring end portion is configured such that during deflection three of the torsion bars are moved through substantially the same angle so that they substantially equally divide resistance to the load. This eliminates load concentrations in one or two torsion bars causing these torsion bars to take a "set" thereby reducing the resiliency characteristics of the spring.

It is an object of the present invention, therefore, to provide an improved spring and frame assembly of the above-described type in which the springs have limited defection capabilities and improved resistance to loads.

Further objects, features and advantages of this invention will become apparent from a consideration of the following description, the appended claims, and the accompanying drawing in which:

FIG. 1 is a plan view of the spring and frame assembly of this invention;

FIG. 2 is a perspective view of a portion of a mainspring in the assembly of this invention;

FIG. 3 is a developed plan view of the spring portion shown in FIG. 2;

FIG. 4 is an enlarged transverse sectional view of a portion of the spring and frame assembly of this invention, as seen from substantially the line 4–4 in FIG. 1, showing the spring in a partially compressed position in solid lines and in an expanded position in broken lines;

FIG. 5 is a transverse sectional view, illustrated similarly to FIG. 4, showing the spring in solid lines in a fully compressed position and in broken lines in an expanded position; and

FIG. 6 is a fragmentary top view of the mainpsring of this invention in its fully compressed position shown in FIG. 5.

With reference to the drawing, the spring and frame assembly of this invention, indicated generally at **10**, is illustrated in FIG. **1** as including a rectangular support frame **12**, shown as being formed of wood, a plurality of mainsprings **14** which extend lengthwise of the frame **12** and a plurality of mainsprings **16** which extend transversely of the main frame **12**. A pair of end rails **18**, a pair of side rails **20**, and a plurality of spring-support members or slats **22**, mounted on the rails **20**, also form part of the frame **12**. A sectional border wire **24** is secured to the mainsprings **14** and **16** so that the border wire **24** is disposed above the frame rails **18** and **20**. A plurality of internal support springs **26**, illustrated as being 12 in number, support intermediate portions of the mainsprings **14** and **16** on the slats **22**.

The mainsprings **14** and **16** are substantially identical, differing only in that the springs **14** are longer than the springs **16**. Each mainspring **14** and **16** includes an elongated load-support or body portion **28**, illustrated as being a substantially straight length of wire, and end portions **30** which are right- and left-hand versions of each other and extend downwardly from the ends of the body portion **28**.

Each mainspring end portion **30** includes five torsion bars **32**, **33**, **34**, **35** and **36**, a connecting bar **38** which extends downwardly and inwardly from one end of the torsion bar **32** to one end of the torsion bar **33** in the expanded position of the end portion **30** shown in FIG. **2**, and a connecting bar **40** which extends downwardly and outwardly from one end of the torsion bar **34** to one end of the torsion bar **35**. The connecting bars **38** and **40** are disposed in substantially the same vertical plane, the significance of which will appear later. The end portion **30** also includes a pair of generally upright spacer bars **42** and **44**, which are also disposed in substantially the same vertical plane spaced from the plane in which the connecting bars **38** and **40** are disposed. The spacer bar **42** extends between the ends of the torsion bars **33** and **34** and the spacer bar **44** extends between the ends of the torsion bars **35** and **36**. A generally L-shape attaching foot **46** forms the lower end of the end section **30** and terminates in an attaching bar **48** which is inclined relative to the torsion bars **32—36**, for a purpose to appear presently.

In FIGS. **2** and **3**, a straight end section **49** of the mainspring body portion **28** is illustrated, and as there shown, the section **49** is located between the vertical planes described above. In other words, the end section **49** is disposed in a vertical plane located between the plane in which the bars **38** and **40** are located and the plane in which the bars **42** and **44** are located. Since the torsion bars **33** and **35** extend between these latter planes, they are engageable with the section **49** to limit downward movement thereof.

In the assembly of the mainsprings **14** and **16** with the frame **12**, the springs **14** are positioned so that the end portions **30** thereof are supported on the end rails **18**. The usual staples **50** are employed to connect the attaching bars **48** to the end rails **18** as shown in FIG. **1**. Likewise, the mainsprings **16** are extended transversely of the mainsprings **14** and positioned so that their end portions **30** are supported on the frame members **22**. As shown in FIG. **1**, the body portion **28** in each mainspring **16** is positioned in substantial vertical alignment with one edge of a frame member **22**. This locates the attaching foot **46** intermediate the edges of the support member **22** so that there is no danger of the attaching bar **48** extending beyond either edge of the support member **22**. The reduced length of the bars **48** relative to the torsion bars **33—36** facilitates this location.

The end torsion bars **32** in the mainsprings **14** and **16** are secured by clips **52** (FIG. **1**) to the border wire **24** which is of continuous rectangular shape corresponding to the shape of the frame **12**, and the body portions **28** for the mainsprings **14** and **16** are secured by clips **54** to the internal support springs **26**.

In the operation of the spring and frame assembly **10**, first assume that the assembly is not under load. In such case, all of the spring end portions **30** are in their upwardly expanded

positions illustrated in FIGS. 4 and 5 in broken lines in which the spring end portions 30 maintain the spring body portions 28 at a predetermined elevation relative to the frame 12. In the expanded position of the spring end portion 30, the connecting bars 38 and 40 are inclined relative to each other and the spacer bars 42 and 44 are substantially upright. Thus, the height of the spring body portions 28 relative to the frame 12 can readily be adjusted to a desired height by forming the spring end portions 30 with spacer bars 42 and 44 of the necessary length.

When the assembly 10 is loaded, the spring body portions 28 are moved toward the frame 12, as shown in full lines in FIG. 4. During such movement the border wire 24 must move straight down and it is important to note that the torsion bars 32, 33 and 35 are all subjected to substantially the same angle of twist. In other words, these torsion bars 32, 33 and 35 cooperate so that they provide substantially equal resistance to the load tending to compress the spring end portion 30. As a result, overstressing of a spring component is avoided to thereby avoid the danger of the spring taking a set in response to repeated loads.

The spring end portion 30 is constructed so as to limit deflection of the spring body portion 28, in the manner illustrated in FIG. 5. The spacer bar 42 will engage the frame member 22 when the spring end portion 30 has been fully compressed. In the position of the spacer bar 42 engaged with the frame member 22, the torsion bars 33 and 35 are located directly below the end section 49 of the spring body portion 28 so as to be engageable therewith and limit downward movement of the body portion 28. This location of the torsion bars 33 and 35 is achieved by constructing the spring end portion 30 so that the torsion bar 32 is of reduced length relative to the torsion bars 33—36, as shown in FIG. 3. As a result, the spring body portion 28 cannot snap over the end portion 30 and continuous downward movement toward the frame 12 is thus prevented. Thus, the configuration of the spring end portions 30 effectively limits deflection of the mainsprings 14 and 16.

Also, as shown in FIG. 5, the torsion bars 32, 33 and 35 have all been twisted through substantially the same angle, so that they continue to cooperate in sharing equally the load applied to the spring assembly. This is accomplished by inclining the connecting bar 38 relative to the horizontal at an angle on the order of 45° and by locating the connecting bar 40 so that it moves through an angle of substantially 45° between its expanded and compressed positions shown in broken and solid line positions, respectively, in FIG. 5. The result is a substantially equal twisting of the torsion bars 32, 33 and 35. It should be understood that when it is stated that the connecting bars 38 and 40 are moved through angles of approximately 45°, it is meant that the angle could vary substantially from this figure since a difference in angle of twist of several degrees will not be critical in the load sharing function of the torsion bars involved.

During compression of the spring end portion 30, the attaching foot 46 is urged downwardly tightly against the frame member 22. The inclining of the attachment bar 48 provides the leg 46 with improved resistance to pivoting of the spring end portion 30, thus providing an improved attachment base for the spring. In addition, this inclining of the attachment bar 48 enables the bar to be formed of a reduced length relative to the torsion bars 33—36. Thus, in the spring end portion 30 the reduced lengths of the torsion bar 32 and the attachment bar 48 also imparts advantageous economies in the manufacture of the spring and frame assembly 10.

From the above description it is seen that this invention provides an improved spring and frame assembly 10 in which the torsion bars 32, 33 and 35 cooperate, by virtue of the configuration of the spring end portion 30 to resist spring loads in a manner to preclude the end portion 30 from taking a set in response to repeated loads. Furthermore, by virtue of the reduced length of the torsion bar 32, and the cooperation therewith of the spacer bars 42 and 44, the spring end portion 30 has an inherent limited deflection characteristic which is desirable for spring life purpose. The inclined attachment bar 48 imparts added firmness to the mounting for the spring assembly 10, and all of these characteristics cooperate to provide an assembly 10 which can be economically manufactured and used comfortably over a prolonged service life.

It will be understood that the spring and frame assembly particularly for box springs which is herein disclosed and described is presented for purposes of explanation and illustration and is not intended to indicate limits of the invention, the scope of which is defined by the following claims.

I claim:

1. A spring and frame assembly comprising a generally rectangular and substantially horizontal frame, a plurality of wire springs arranged crisscross fashion on said frame, each of said springs including a body portion disposed in a spaced relation above said frame and at least one resilient end portion extending between said body portion and said frame so as to support said body portion on said frame, said end portion including relatively inclined connecting bars which are relatively movable to enable compression and expansion of said end portion with a corresponding movement of said body portion toward and away from said frame, a pair of substantially upright spacer bars and a plurality of torsion bars connecting to said connecting bars and said spacer bars, a pair of said torsion bars being located at the upper ends of said spacer bars, said spacer bars being engageable with said frame to limit downward movement of said end portion toward said frame, and said body portion being engageable with at least one of said pair of said torsion bars in said end portion to limit movement of said body portion toward said frame.

2. A spring and frame assembly according to claim 1 wherein one of said torsion bars is disposed at the lower end of said end portion in engagement with said frame, and a substantially L-shape attaching foot integral with said one torsion bar, said foot terminating in an attachment bar which is inclined with respect to said one torsion bar.

3. A spring and frame assembly according to claim 1 wherein one of said torsion bars in said end portion is integral with and extends transversely of said body portion at one end thereof, said one torsion bar being of a reduced length relative to the others of said torsion bars.

4. A spring and frame assembly according to claim 3 wherein said body portion is substantially straight and said spacer bars are disposed in a spaced relation in a direction along the length of said body portion.

5. A spring and frame assembly according to claim 4 wherein one of said connecting bars extends downwardly and inwardly from one end of said reduced length torsion bar, another one of said torsion bars extends transversely from the inner end of said connecting bar, one of said spacer bars extends downwardly from said one torsion bar, another one of said torsion bars extends from the lower end of said one spacer bar in a substantially parallel relation with said one torsion bar, another one of said connecting bars extends outwardly from said other torsion bar, and the other one of said spacer bars extends downwardly relative to the outer end of said other connecting bar.

6. A spring comprising a wire member shaped to form a body portion having a substantially horizontal and substantially straight end section and a resilient end portion which extends downwardly from said end section, said end portion being movable between an expanded position and a compressed position, said end portion in said compressed position providing for movement of said end section downwardly relative to the position thereof in said expanded position, said end portion including upright spacer bars and torsion bars connected to the upper ends of said spacer bars and extending transversely of said end section at a position directly therebelow, and connecting bars in said end portion movable relative to each other to enable said movement of said end portion between said positions.

7. A spring according to claim 6 wherein said end portion terminates at the lower end thereof in a substantially horizontal attachment bar which is inclined with respect to said torsion bars.

8. A spring according to claim 6 wherein said end portion further includes a torsion bar at the upper end of said end portion, one of said connecting bars extending downwardly and inwardly from said upper end torsion bar at an angle of about 45° in said expanded position of said end portion, one of said spacer bars being located at the lower end of said one connecting bar, another one of said connecting bars extending outwardly from the lower end of said one spacer bar, and the other spacer bar being located adjacent the outer end of said other connecting bar.

9. A spring according to claim 6 wherein said end portion torsion bars are arranged in a vertically spaced relation with the uppermost one of said torsion bars being of a reduced length relative to the ones of said torsion bars therebelow and being located at the end of said end sections.

10. A spring according to claim 9 wherein said connecting bars are disposed in a common vertical plane and said spacer bars are disposed in a common vertical plane spaced from the plane of said connecting bars, said planes being located on opposite sides of said straight end section.

11. A spring according to claim 10 wherein said end portion is shaped so that one of said connecting bars extends downwardly and inwardly underneath said body portion and the other connecting bar is disposed below said one connecting bar, a pair of said torsion bars being located at the inner ends of said connecting bars, and one of said spacer bars being connected to and extended between said pair of torsion bars.