United States Patent [19]

Higgins

[11] **3,916,463**

[45] **Nov. 4, 1975**

[54] **METAL SLAT BOX SPRING ASSEMBLY**

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[73] Assignee: **Leggett & Platt, Incorporated,** Carthage, Mo.

[22] Filed: **Apr. 17, 1974**

[21] Appl. No.: **461,745**

[52] **U.S. Cl.** ..... **5/264 R;** 5/246; 267/93

[51] **Int. Cl.**[2] **A47C 23/02;** A47C 23/04

[58] **Field of Search** ..... 5/246, 263, 264 R, 245, 5/256; 267/93

[56] **References Cited**

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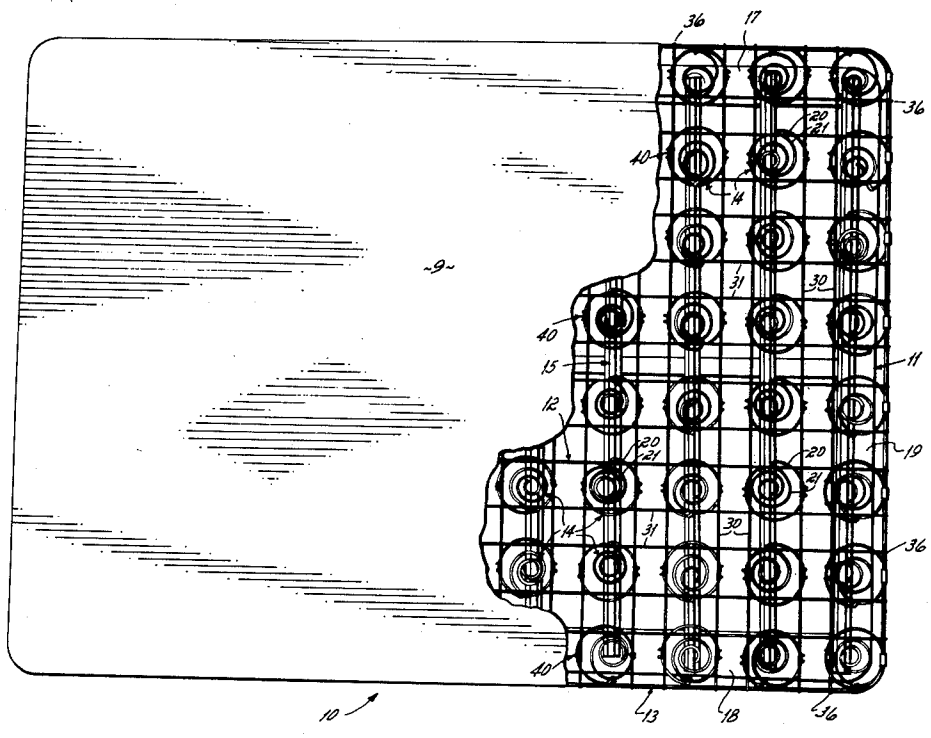
Primary Examiner—Paul R. Gilliam

Attorney, Agent, or Firm—Wood, Herron & Evans

[57] **ABSTRACT**

A box spring assembly comprising a base frame, a series of metal slats mounted upon the base, and a series of springs connected at their lower ends to the metal slats and tied together by helical wires or wire grids at their upper ends. The metal slats are preferably made from sheet metal shaped so as to form a rigid rib which extends for the length of the slats.

1 Claim, 6 Drawing Figures



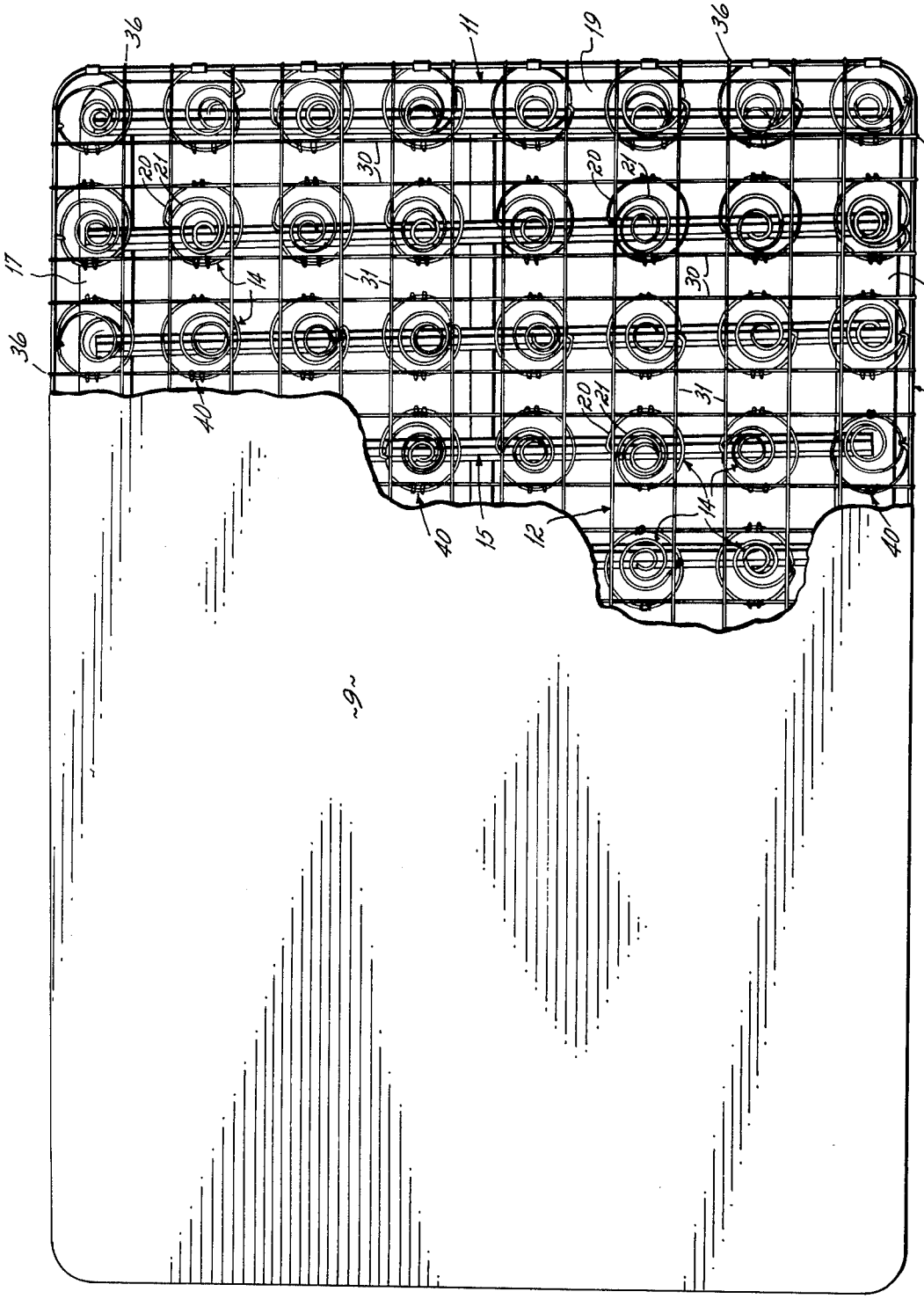


Fig. 1

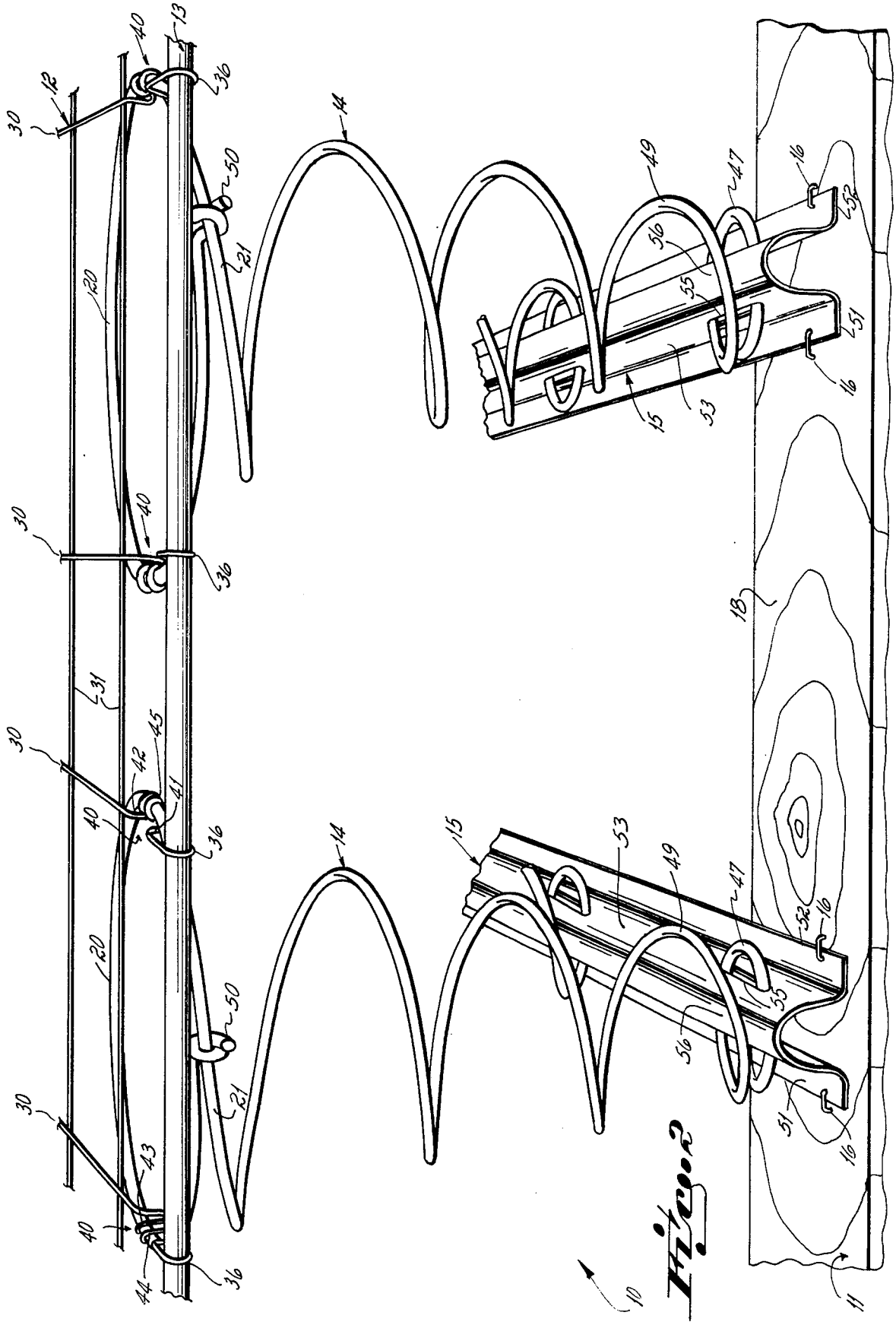

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Fig. 2

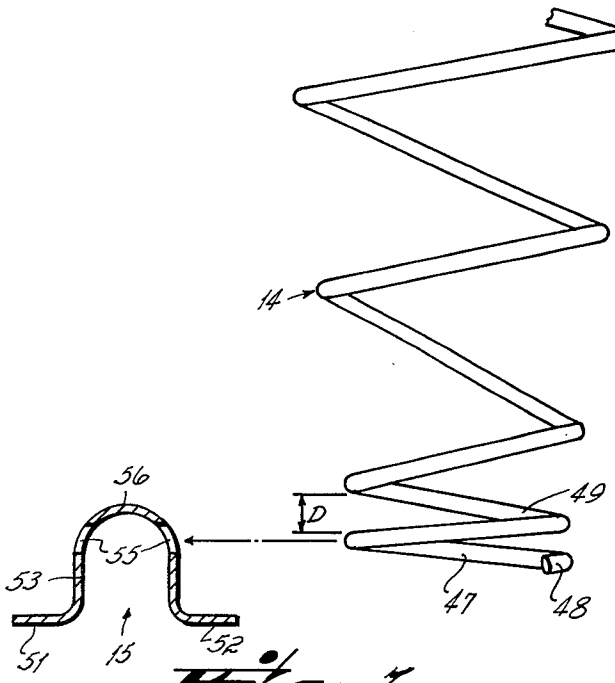


Fig. 5

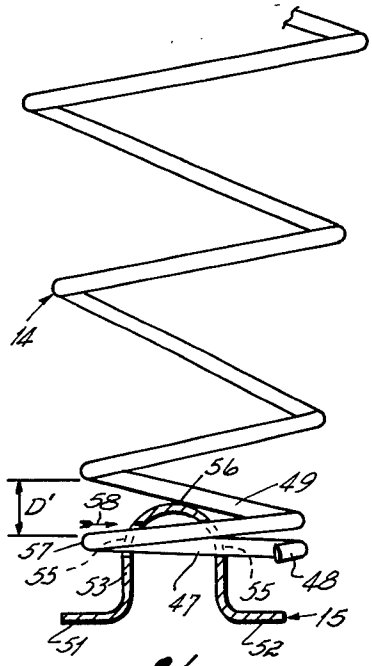


Fig. 4

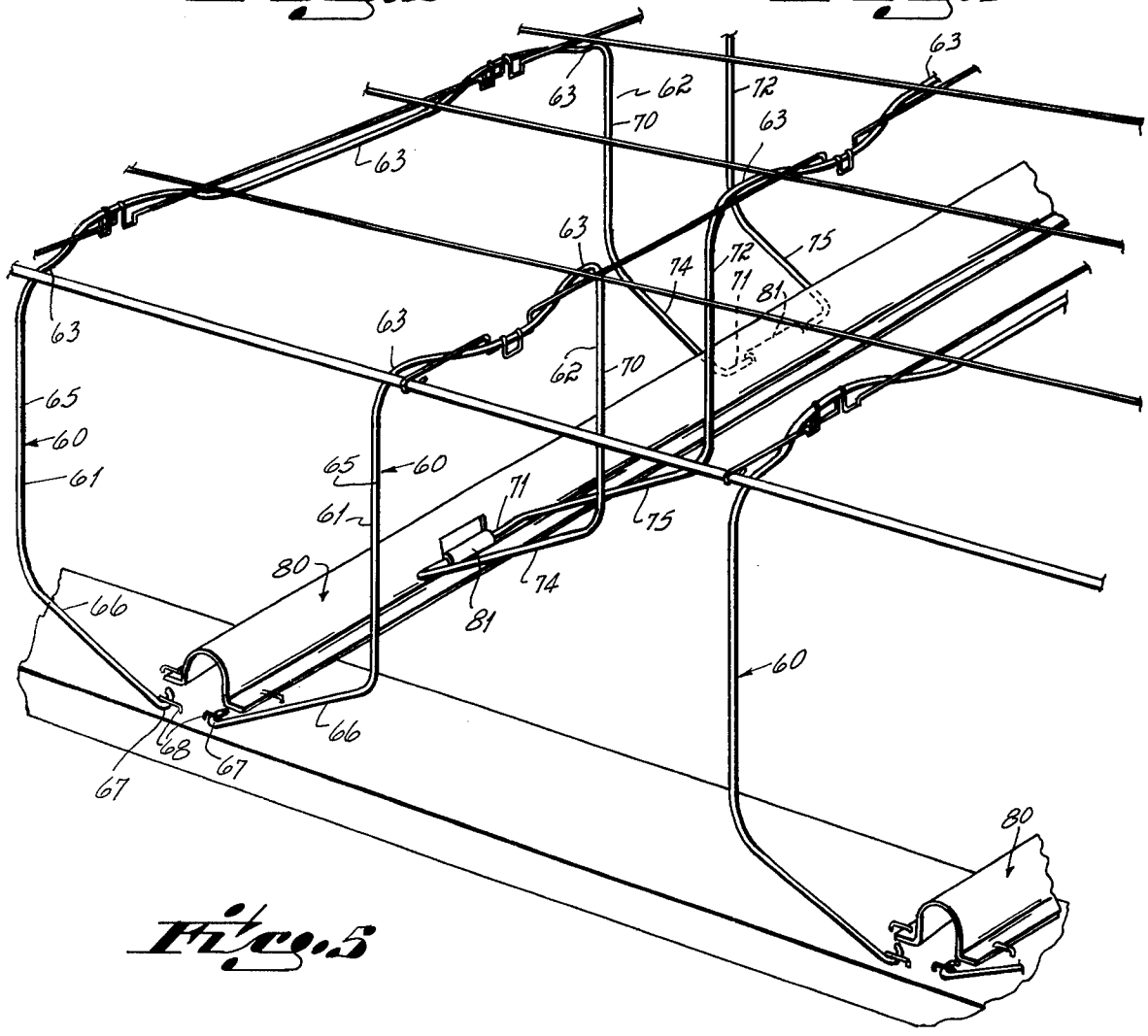


Fig. 5

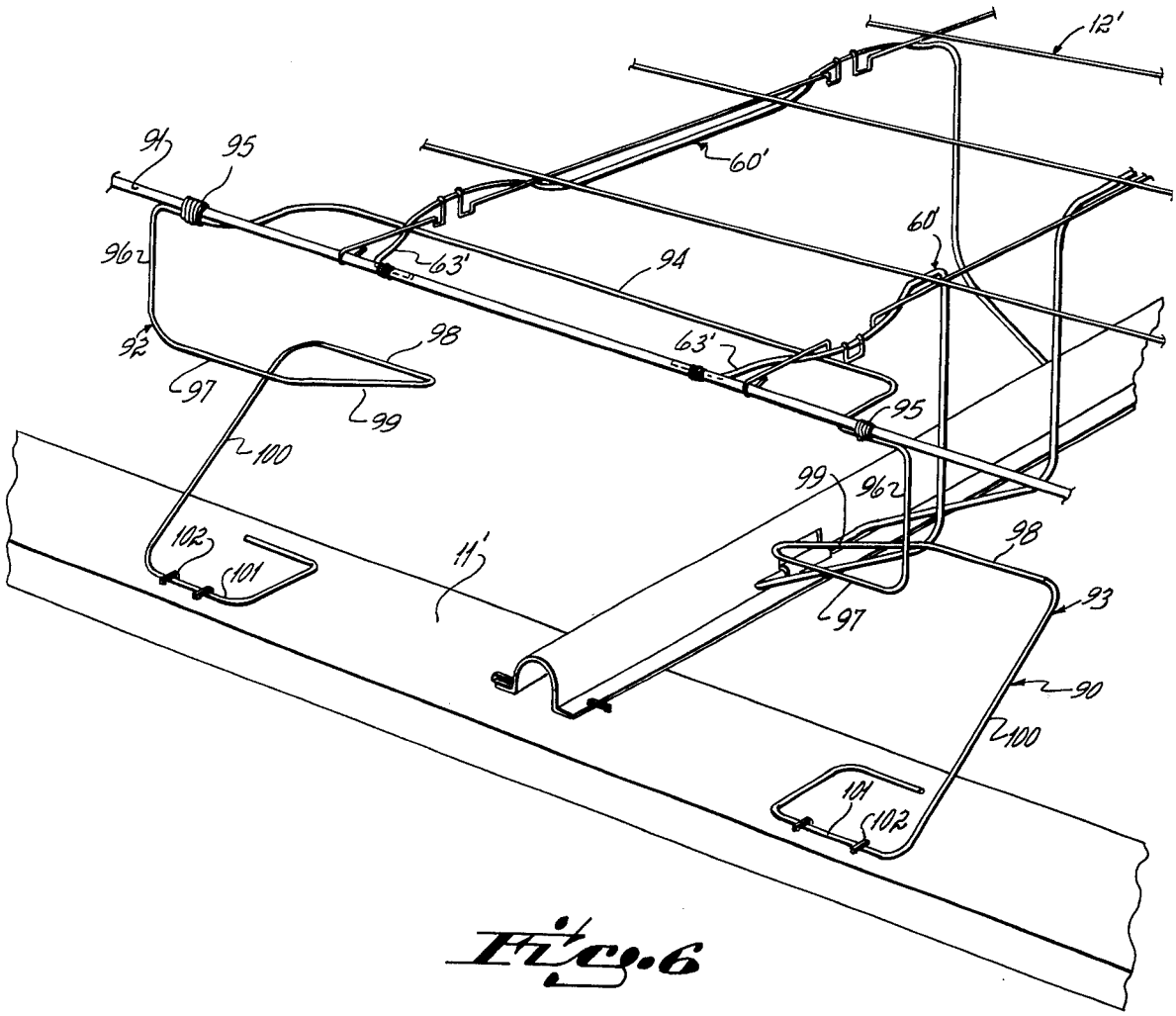

12'
91
95
60'
60
96
63'
94
92
98
63'
97
99
95
100
99
96
102
11'
98
101
97
93
90
100
101
102

Fig. 6

METAL SLAT BOX SPRING ASSEMBLY

This invention relates to bedding foundations, or so called box springs of the type commonly employed as a foundation base for a bed mattress.

Box spring assemblies generally comprise a wooden base frame across which extend a plurality of transverse wooden slats. A plurality of helical springs are generally mounted atop these wooden slats and the tops of the springs are generally interconnected by a series of wires, either in the form of helical wire extending between the top convolutions of the helical springs, or welded wires extending between and interconnecting the tops of the springs. The assembly is completed by placing a cushion or fabric pad over the top of the assembly and then enclosing it within upholstered fabric.

The manufacture of these conventional box springs involves a large percentage of hand or manual labor, which the bedding industry has tried to minimize or eliminate whenever it became economical to do so. Generally, though, those efforts to automate the manufacture of box springs have met with limited success because the construction of commercial box spring assemblies does not lend itself to automatic assembly and manufacture.

In general, the quality of the box spring assembly and the price which it commands on the market is a function of the firmness of the assembly and its expected useful life. This latter quality is measured in terms of its ability to withstand abuse in use and to measure that quality of durability, special machines have been developed and standardized in the industry.

Firmness is generally a function of the quantity of metal employed in the helical springs of the assembly. In other words, the heavier gauge metal wire employed in the springs of the assembly and the more helicals employed over a selected area, the more firm is the assembly and therefore the higher price it commands as a quality product.

It has been a primary objective of this invention to provide an improved box spring assembly which is of high quality both in firmness and in durability, but with fewer helical springs and of smaller gauge wire in the helical springs than has been heretofore possible.

Another objective of this invention has been to provide a box spring which is firm and which has a long projected useful life but with less metal in the springs than has been heretofore possible.

It has been another objective of this invention to provide a box spring assembly which meets the highest standards of firmness and useful life while still providing an assembly which may be manufactured and assembled with a minimum of hand labor.

The box frame assembly of this invention which accomplishes these objectives comprises a wooden bottom frame to which are connected metal slats so configurated as to be very rigid and having spring connectors formed therein so that the springs may be attached to the metal slats by a machine or with a minimum of manual labor. In the preferred embodiment, the metal slats are formed from sheet metal and have a rigidifying rib shaped into the metal so that the slat, even though of minimum metal content, is very rigid.

The primary advantage of the box spring assembly of this invention which incorporates this metal slat in the bottom of the box spring is that it provides a more rigid bottom for the assembly than is provided by wooden

slats. Consequently lighter springs may be used in the metal slatted box spring than may be employed in comparable firmness wooden slat box spring.

In one preferred embodiment of the invention, the springs are conically shaped helical springs in which the last or lower convolution of the spring is retained attached to the slat by forcing the last convolution of the spring into a flat horizontal plane of a slot formed in the slat. This results in the spring being stressed and being retained in the slots by the stress on the spring.

In another preferred embodiment of the invention, the springs are single strand modular springs which extend transversely across the assembly and have spring units formed into the single strand as illustrated and described in U.S. Pat. No. 3,725,964. In this modification, each spring is attached to the metal slat by flaps formed or cut and bent from the metal slat and bent over a section of a spring.

These and other objects and advantages of this invention will be more readily apparent from the following description of the drawings in which:

FIG. 1 is a top perspective view of a box spring assembly incorporating the invention of this application.

FIG. 2 is a side perspective view of a portion of the box spring assembly of FIG. 1.

FIG. 3 is a diagrammatic side view, partially in section, of a metal slat and helical spring illustrating the condition of the spring prior to assembly of the spring and slat.

FIG. 4 is a view similar to FIG. 3 but illustrating the condition of the spring and the slat after attachment of the spring to the slat.

FIG. 5 is a perspective view of a portion of a second modification of a box spring assembly incorporating the invention of this application.

FIG. 6 is a perspective view of a portion of a third modification of a box spring assembly incorporating the invention of this application.

Referring first to FIGS. 1 and 2, it will be seen that the box spring 10 comprises a bottom frame 11, a top grid 12 surrounded by a border wire 13, a series of helical springs 14 extending between the top grid 12 and a plurality of transverse metal slats 15 and a fabric cover 9. The ends of the slats 15 are secured to the wooden frame 11 by nails or staples 16.

The bottom frame comprises a pair of side boards 17, 18 nailed or otherwise fixedly secured to a pair of end boards (only one of which is shown at 19). The metal slats 15 extend transversely between the side boards 17 and 18.

The border wire 13 is located immediately above and is spaced from the outer circumferential edge of the bottom frame 11 of the assembly 10. It is connected to and supported by the wooden frame through the helical spring 14, as is explained more fully hereinafter.

The top grid 12 comprises a series of parallel transverse wires 30 and a parallel series of longitudinal wires 31. The ends of all these transverse and longitudinal wires 30, 31 of the top grid are secured to the border wire 13 by being welded to the border wire and wrapped around it, as illustrated at 36. The longitudinal and transverse wires 30, 31 of the top grid may be welded at all of their intersections so as to further stabilize the box spring assembly and increase its firmness as well as its resistance to side sway.

Referring to FIG. 2, it will be seen that there are a plurality of three pronged channels 40 transversely spaced across each of the transverse wires 30. Each one

of the transverse channels **40** is open to the bottom of the top grid. Each of these three pronged channels **40** comprises a pair of reversely bent fingers or prongs **41, 42** located in a common vertical plane and interconnected by transverse bends **43, 44** to a central reversely bent prong or finger **45.** The central finger is also located in a vertical plane but is spaced from the vertical plane of the fingers **41, 42** so that a channel is defined between them. The uppermost convolutions **20** of the springs **14** are received within these channels **40** and are locked therein by bending the central finger **45** beneath the wire of the top convolution **20.** A more detailed description of the configuration of the three pronged channels **40** may be found in the above identified U.S. Pat. No. 3,725,965.

Referring now to FIGS. **2, 3,** and **4,** it will be seen that in the preferred embodiment each of the helical springs **14** is conical in shape and has a lower end convolution **47,** an upper end convolution **20,** and a series of intermediate convolutions of increasing diameter. In the illustrated preferred embodiment, the lower convolution **47** of the springs **14** has its endmost portion **48** bent out of a spiral configuration so that it is located closely adjacent the convolution **49** immediately above it. The uppermost convolution **20** is bent out of the spiral configuration into a single horizontal plane and has its end **50** formed into a knot or pigtail which is wrapped around the upper end of the next adjacent convolution **21.** This upper convolution forms a planar circular convolution for attachment to the grid **12.**

While the springs **14** have been illustrated in this preferred embodiment as being conical in overall configuration, the shape forms no part of the invention of this application, and the springs could, as well, be shaped as an hourglass with large diameter convolutions at the ends and smaller diameter convolutions at the center, or the springs could be cylindrical as is common in many box spring assemblies.

The metal slats **15** are formed from sheet metal which is shaped as an inverted U and has horizontal flanges **51, 52** extending outwardly from the bottom of the inverted U-shaped central section **53.** This inverted U-shaped central section forms a rigidifying rib which extends for the full length of the slat **15.** As may be seen most clearly in FIG. **2,** the ends of the flanges **51, 52** rest atop and are secured to the top of the side boards **17** and **18.** The securement in the preferred embodiment consists of staples **16** which are nailed through an aperture in the end of the slats and into the end boards **17** and **18.**

In order to secure the springs **14** to the slats, each slat has a plurality of horizontal slots **55** formed in it. The spacing of these slots is identical to the centerline spacing of the springs **14,** as may best be seen in FIG. **2.** In order to secure and retain the lowermost convolution **47** of the springs within the slots **55,** the slots are located a sufficient distance beneath the top **56** of the slat that when the lowermost convolution is inserted into the slot **55,** it causes the distance D (FIG. **3**) between the lowermost convolution **47** and the next adjacent convolution **49** to be increased to the distance D' (FIG. **4**) so as to place the last two convolutions of the spring under stress. This stressing of the lowermost convolutions of the spring and the forcing of the generally nonplanar lowermost convolution **47** into a horizontal planar configuration retains the spring under stress and assembled to the slat. Irrespective of how the box spring assembly is subsequently loaded or shifted, the last two convolutions remain under stress and cannot be displaced from the slots **55.** The only way that the springs can be dislodged from the slots **55** is by physically engaging that portion **57** of the spring which protrudes from the slot and pushing it in the direction indicated by the arrow **58** in FIG. **4.** Of course when the box spring assembly is covered by padding and upholstery **9** (FIG. **1**) there is no possibility of anyone engaging the point **57** of the lower convolution **47** and physically disconnecting it from the slat.

The primary advantage of the box spring assembly of FIGS. **1–4** resides in the rigidity of the box spring assembly imparted by the configurated metal slats **15** and the ease with which the springs may be secured to the slats. This added rigidity is greater than that of conventional wooden slats of equal cost so that with lighter springs the box spring assembly depicted in FIGS. **1–4** has the same rigidity as that of the conventional wood slat box spring but with springs **14** of heavier gauge metal or in greater numbers.

Referring now to FIG. **5,** there is illustrated a second preferred embodiment of a box spring assembly incorporating the invention of this application. In general, this box spring assembly is very similar to that depicted in FIGS. **1–4.** It departs from that first preferred embodiment in that it utilizes a different type of spring in lieu of the helical spring **14** of the first embodiment, and it utilizes a different form of connector between the spring and the metal slat. Specifically, it substitutes a modular single wire spring **60** for a series of helical springs **14.**

The modular spring unit **60** of this second embodiment is completely described in Smith et al U.S. Pat. No. 3,725,965, which issued on Apr. 10, 1973 and which is assigned to the assignee of this application.

In this embodiment, each modular spring unit **60** comprises a single strand of wire within which there are formed several individual springs. In the illustrated embodiment, there are two end springs **61** (only one of which is illustrated) formed in each modular unit **60,** as well as several intermediate springs **62** (only one of which is shown for each modular spring unit **60**). Each of these end springs and intermediate springs is separated from the adjacent spring by a generally horizontally extending straight section **63** of the wire strand.

The end springs **61** each comprise a straight vertical leg **65** which extends downwardly from the endmost straight section **63** of the wire strand. This section terminates at its lower end in an arcuate section **66,** the lower end of which is bent into a closed loop **67.** In the illustrated preferred embodiment, the arcuate section **66** is bent out of the vertical plane of the leg **65** through an angle of approximately 60°. It is this arcuate section which provides the resiliency of the end springs **61.** The loop **67** at the end of the spring **61** is secured to the side board of the frame by a staple **68.**

The intermediate springs **62** in each of the modular spring units **60** each comprise a vertical leg **70** which extends downwardly from one of the generally straight, horizontal co-linear sections **63,** a loop section **71** located at the lower end of the vertical leg **70,** and a vertical **72** which extends back upwardly from the loop **71** to one of the straight sections **63.** In the illustrated embodiment, the loop portions **71** of the individual spring units are bent out of the common vertical plane of the legs **70, 72** through an angle of approximately 60°. It is the bent sections **74, 75** of the loop portion of the individual springs which provide the resiliency in each

spring.

The angle defined by the bend in the individual springs is not critical to the operation of the invention. In fact, an angle which varies anywhere from approximately 30° to and through 90° is bound to be satisfactory so long as sufficient radius is provided on that portion **74, 75** of the bend which interconnects the loop **71** to the legs **70, 72.** This angle and radius of the arc within which it is located are determinative of the resiliency of the spring.

In the illustrated embodiment, the outermost ones of the intermediate springs in each modular spring unit **60** are spaced different distances from the ends of the modular spring unit. Consequently, the modular spring units may be used in pairs, with one unit reversed end for end from the other and with arcuate bends **74, 75** of the individual modules facing each other. When paired in this manner, the intermediate springs **62** of one of the pairs are equidistantly spaced from or interleaved through the intermediate springs of the other modular spring unit of the pair. Consequently, there is a very even distribution of resiliency of the total box spring assembly.

In this embodiment, the springs **62** of the individual modular spring units **60** are connected to the metal slats **80** by sections of the slats which are punched from the sidewalls of the U-shaped portion so as to form tabs **81** which are bent over the loop sections **71** of each individual spring **62.** This connection of the springs to the metal slat provides an inexpensive connector which facilitates automatic manufacture of the box spring assembly.

In this second preferred embodiment, as in the first, the formed sheet metal slats provide added firmness to the box spring assembly which is not achievable with conventional soft wood slats now commonly in use. Additionally, the connectors which are formed in the slats, and which have been illustrated in the preferred embodiments of the invention, facilitate automated manufacture of the box spring assembly.

Referring now to FIG. **6** there is illustrated still a third embodiment of the invention of this application. In general, this embodiment is very similar to the embodiment illustrated in FIG. **5,** and accordingly, those portions of this embodiment which correspond to the embodiment of FIG. **5** have been given corresponding numeral designations but followed by a prime mark.

This FIG. **6** modification distinguishes from the modification of FIG. **5** principally in that it substitutes "fishmouth" spring units **90** for the end springs **61** of the modular spring units **60.** Applicant has found that in some applications, additional support in the form of fishmouth springs between the border wire **91** of the unit and the wooden boards of the bottom frame **11'** better reinforces the edgewise portions of the spring assembly and precludes the border wire from being deformed to such an extent that it takes a permanent set.

Each fishmouth spring unit **90,** of which there are several located around the periphery of the spring assembly, comprises a single strand of wire configurated so that each stand defines a pair of transversely spaced fishmouth springs **92, 93** interconnected by a horizontally extending upper section **94** of the unit **90.** The upper section **94** is generally U-shaped in configuration and is wired or clipped to the border wire **91** by wrappings or clips **95.** Between the wraps or cliips **95,** the upper section **94** of the spring is offset inwardly beneath the horizontal straight sections **63'** of the modular springs and beneath the upper wire grid **12'.** Because of this offset, the fishmouth spring units **90** support the lateral extremities of the modular springs **60'** as well as the edge border wire **91.**

From the wrapping or connection **95** of the spring unit to the border wire, each fishmouth spring **92, 93** has a straight section **96** extending vertically downwardly. This straight section **96** is connected at its lower end to an inwardly turned horizontally extending section **97.** At the end remote from the vertical section **96,** the horizontally extending section is bent downwardly at an angle of approximately 45° to a horizontally extending torsion bar section **98.** The end of the torsion bar section **98** remote from the inclined section **99** then is bent downwardly and outwardly at an angle of approximately 45° to the horizontal plane of the top surface of the wooden border frame **11'.** The lower end of this second inclined section **100** terminates in a U-shaped section **101** which is stapled to the top surface of the wooden frame by staples **102.**

Each of the spring units **92, 93** is referred to as a "fishmouth" spring because when viewed in side elevation the two inclined sections **99, 100** extend in opposite directions from the torsion bar **98** and give the appearance of an open V-shaped fishmouth. It is this open fishmouth section which is resilient and which enables the edge portion of the spring unit to be deflected but still reinforced by a substantial spring.

While I have described only a single preferred embodiment of my invention, persons skilled in the art to which it relates will readily appreciate numerous changes and modifications which may be made without departing from the spirit of my invention. Therefore, I do not intend to be limited except by the scope of the following appended claims.

Having described my invention, I claim:

1. A box spring assembly comprising

a generally rectangular bottom frame,

a plurality of spaced parallel cross slats extending between and connected to opposite sides of said rectangular bottom frame,

a plurality of helical springs each terminating at one end in a generally planar lower round and at the opposite end in a generally planar upper round,

means interconnecting and securing said upper rounds of said helical springs in a common plane,

each of said slats being formed from metal shaped to define transversely spaced flat bottom surfaces resting upon said opposite sides of said bottom frame and a transversely extending rib having opposed spaced side walls and a top surface located between said flat bottom surfaces, and

connector means formed in said ribs of said slats for connecting said lower rounds of said helical springs to said slats, said connector means comprising slots formed in said opposed walls of said ribs of said slats, said bottom rounds of said helical springs being frictionally secured within said slots by forcing said bottom rounds of said helical springs away from the adjacent helical round as said bottom round is inserted into a slot and by maintaining said bottom and adjacent rounds of said spring under stress with said bottom round physically contacting said slot and the adjacent round physically contacting said top surface of said rib.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,916,463

DATED : November 4, 1975

INVENTOR(S) : Larry Higgins

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 11, "wire" should be --wires--

Col. 1, line 48, after "spring" insert --assembly--

Col. 2, line 15, "3,725,964" should be --3,725,965--

Col. 4, line 18, "wood" should be --wooden--

Col. 4, line 62, after "vertical" insert --leg--

Col. 5, line 16, after "with" insert --the--

Col. 5, line 61, "stand" should be --strand--

Col. 5, line 66, "cliips" should be --clips--

Signed and Sealed this

second Day of *March 1976*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks