

May 20, 1958

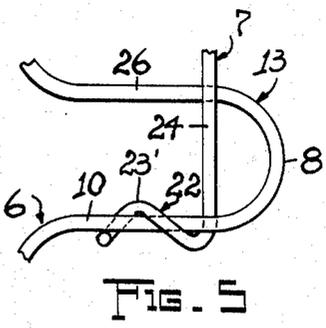
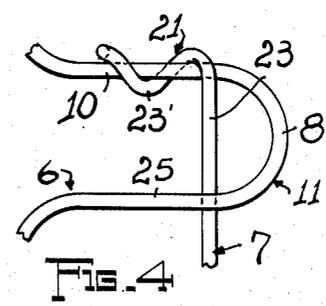
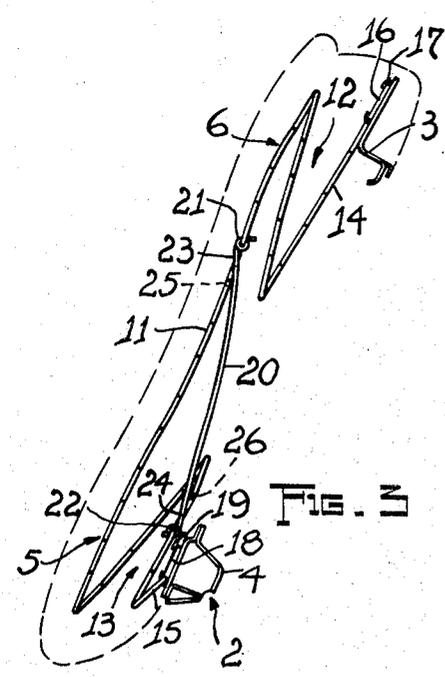
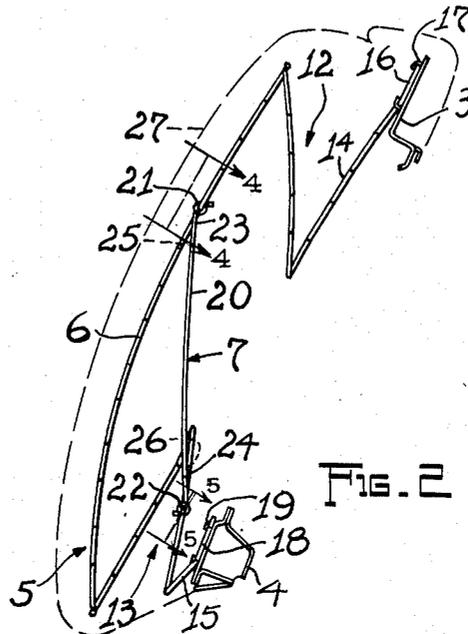
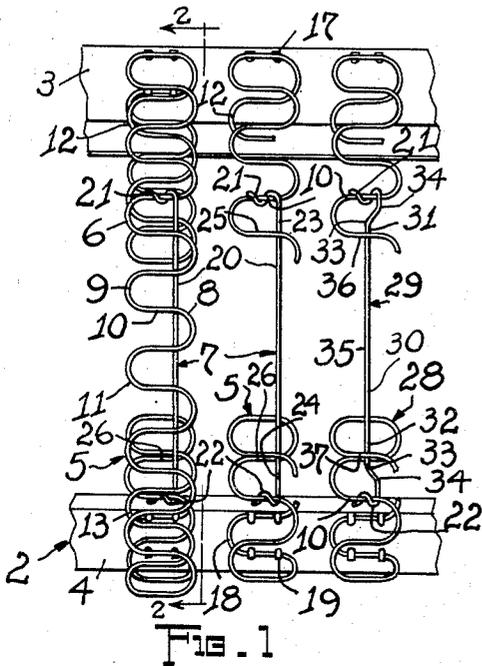
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2,835,312

WIRE SPRING STRUCTURE

Filed Feb. 16, 1956

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 6

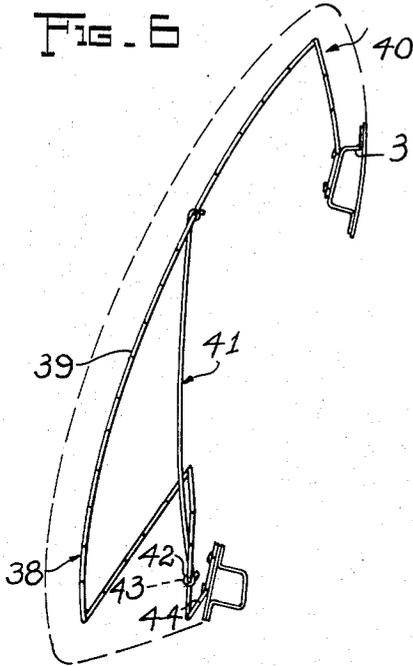


FIG. 7

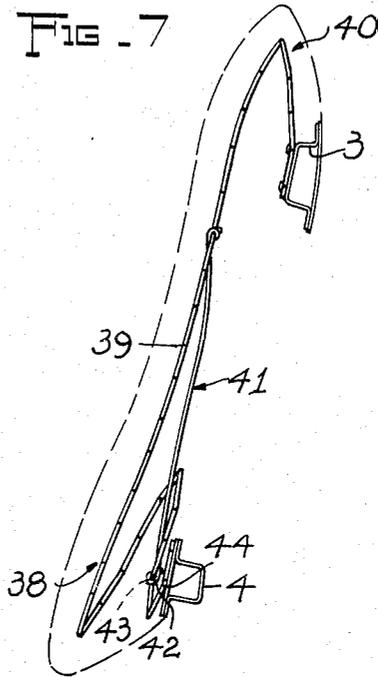


FIG. 8

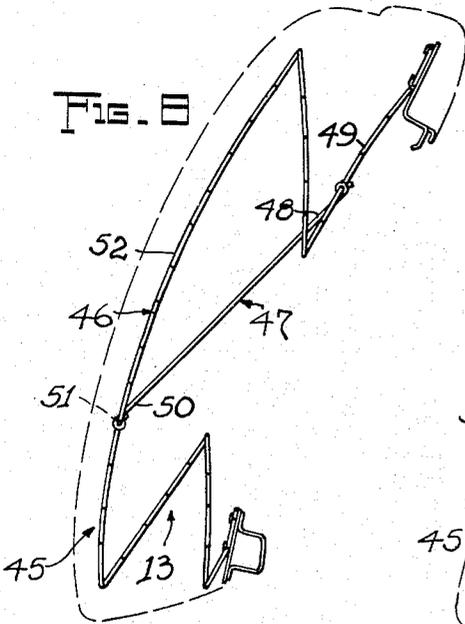
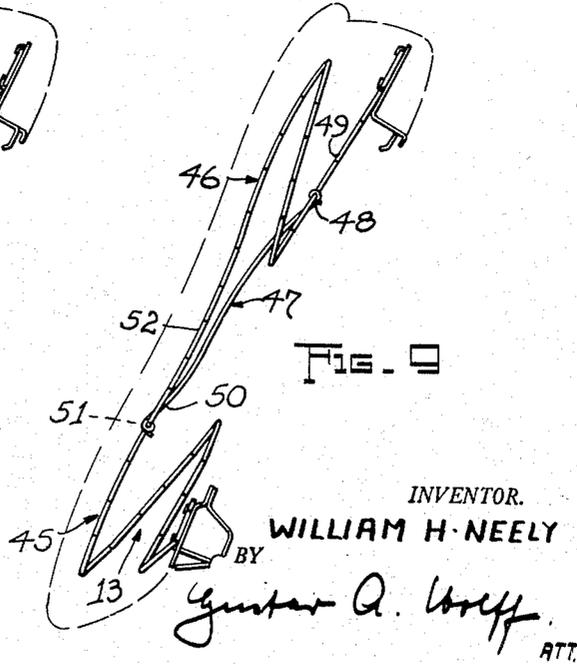


FIG. 9



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2,835,312

WIRE SPRING STRUCTURE

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6 Claims. (Cl. 155—179)

This invention relates in general to improvements in upholstered spring constructions assembled from zigzag-shaped or sinuously corrugated wire springs and, more particularly, to spring constructions with spring structures embodying zigzag-shaped wire springs reenforced by auxiliary wire spring members to effect shaping of the zigzag-shaped wire springs to desired contours, stiffening of such wire springs to increased resistance against load deformation and distributing of applied loads for best resting comfort of persons of various weights.

In prior art wire spring structures, the auxiliary wire spring members for the zigzag-shaped wire springs consist in general of wire struts including elongated straight wire bodies and angularly offset straight end portions formed by angle bends at opposite ends of the straight wire bodies. The wire struts are generally secured to the zigzag-shaped wire springs by U-shaped sheet metal clips encircling the angularly offset straight end portions of the struts and cross wire members of the zigzag-shaped wire springs. In some cases the angularly offset straight portions at one end of the wire struts are wrapped around single cross wires of zigzag-shaped wire springs, and at the other end are attached to single cross wires of the zigzag-shaped wire springs by U-shaped sheet metal clips. This arrangement permits attaching of the wire struts to zigzag-shaped wire springs by first wrapping the one ends of the struts around cross wires of the zigzag-shaped wire springs and then clipping the other ends of the struts to other cross wires of such zigzag-shaped wire springs.

The primary object of the present invention is the provision of an improved auxiliary spring member adapted to form with zigzag-shaped wire springs a wire spring structure in which the auxiliary spring member preferably embodies a substantially straight body and angularly offset corkscrew pigtails at opposite ends of the body, which corkscrew pigtails are coiled to freely and fully encircle loop-connecting cross wire members of zigzag-shaped wire springs by a spiral of approximately one and one-quarter turns having an axial length of approximately the length of the cross members to be encircled, all for the purpose of effecting a laterally stable pivotal connection of the auxiliary spring member to a wire spring by an anchorage which cannot readily be disengaged within normal deflections of the auxiliary spring members, that is, under installed, loaded or shock-loaded condition of the wire spring structure.

Such auxiliary spring members are well suited for stiffening and dampening the resilient action and counteraction of zigzag-shaped wire springs embodying elongated resting portions and angularly offset accordion fold-shaped supporting arms of V- or N-shape at one or both ends of the resting portions.

In wire spring structures according to this invention, the auxiliary spring members preferably encircle with their one corkscrew pigtail a cross member of the resting portion of zigzag-shaped wire springs in areas subjected to concentrated loads and with their other corkscrew pigtail a cross member in one of the accordion fold-shaped

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supporting arms in areas between the apexes thereof and preferably near the attachment of these arms to supporting frames. The resulting angular relation between resting portions of these springs and their auxiliary spring

5 members permits pivotal coupling of their corkscrew pigtails with the wire cross members and, under suitable load conditions, effects automatic change of such pivotal couplings to rigid couplings providing cantilever-like supporting action in areas of resting portions of the springs. This change in pivotal connections is facilitated when the ends of the substantially straight body portions of the auxiliary wire spring members are extended through the zigzag-shaped wire springs prior to encircling the cross members thereof by the corkscrew pigtails, particularly cross members in the resting portions of springs, to effect under loading of the resting portions a change of the pivotal connections between the zigzag-shaped wire springs and auxiliary spring members to rigid cantilever-like connections whenever the bodies of said auxiliary spring members are contacted by cross members adjacent to these pivotal connections. In some instances it is desirable to connect corkscrew pigtails of auxiliary spring members in cantilever-like fashion to accordion fold-shaped supporting arms of the zigzag-shaped wire springs, in which event, the one ends of the auxiliary spring member bodies are extended between adjacent wire cross members of the supporting arms of the zigzag-shaped wire springs, and the corkscrew pigtails adjacent to these one ends are sleeved upon one of these cross members to establish or permit contact of the bodies of the auxiliary spring members with opposite sides of the adjacent cross members.

In addition to the above described objects and construction assemblies, the invention has other marked improvements and superiorities which radically distinguish it from presently known structures. These improvements or superior characteristics embodying certain novel features of construction are clearly set forth in the appended claims, and several embodiments of the invention are hereinafter described with reference to the accompanying drawings forming part of the specification.

In these drawings:

Fig. 1 is a fragmentary plan view of a spring construction assembled of wire spring structures embodying zigzag-shaped wire springs and auxiliary wire spring members constructed in accordance with the invention.

Fig. 2 is a sectional view on line 2—2 of Fig. 1, the spring structure being pretensioned.

Fig. 3 is a sectional view similar to Fig. 2 showing the shape of the spring structure under normal load.

Fig. 4 is an enlarged fragmentary view of one of the coupling connections shown in Fig. 2, the view being taken on line 4—4 of Fig. 2; and

Fig. 5 is an enlarged fragmentary view of the other end of the coupling connections shown in Fig. 2, the view being taken on line 5—5 of Fig. 2.

Fig. 6 is a sectional view similar to Fig. 2 showing a spring structure with a zigzag-shaped gothic type spring member.

Fig. 7 is a view similar to Fig. 6 showing the shape of the spring structure under normal load.

Fig. 8 is a sectional view of a spring structure having the auxiliary wire spring member arranged differently than the spring structure shown in Figs. 1 and 2.

Fig. 9 is a sectional view similar to Fig. 8 showing the shape of the spring structure under normal load.

Referring now more particularly to the exemplified forms of the invention shown in the drawings, the seat back spring structure shown for illustration and especially adapted for automobile seat back constructions embodies a tubular frame 2 with a top rail 3 and a bottom rail 4 parallel to said top rail. Frame 2 is bridged by a plu-

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rality of wire spring structures 5 composed of sinuously corrugated wire springs 6 and auxiliary spring members 7 later to be described. The wire springs 6 are formed of sinuously corrugated wire with oppositely bent loops 8 and 9 successively connected by substantially straight wire cross members 10 and include slightly curved resting portions 11 and resilient V- or N-shaped supporting arms 12 and 13 extended from opposite ends of the resting portions therebeneath, which arms are attached with their end levers 14 and 15 to top and bottom rails 3 and 4.

The seat back spring structure shown in Figs. 1 through 5 embodies in each of its wire spring structures 5 a wire spring 6 in which the V-shaped supporting arm 12 has its end loop 16 releasably sprung into engagement with tongue-like struck up portions 17 in top rail 3, and the N-shaped supporting arm 13 has its end loop 18 releasably sprung into engagement with tongue-like struck up portions 19 in bottom rail 4.

The most preferable support of passengers' backs in traveling vehicles necessitates back spring constructions including less resilient supporting areas and more resilient supporting areas to yieldingly shape the spring constructions to the shape of passengers' backs and hugging these backs with the less resilient areas preferably located opposite to or near the lower edge of the shoulder blades of passengers and the more resilient areas extended from less resilient areas toward tops and bottoms of back spring constructions.

Back spring constructions furthermore must have predetermined contours to effect proportionate distribution of pressure to passengers' backs for full satisfaction of all comfort requirements of the passengers. These requirements, to wit: control of loading and contouring of the wire springs together with construction of spring structures of simple construction for economical manufacture, are satisfied by the auxiliary spring members 7, each of which comprises a substantially straight elongated body 20 preferably shaped at its opposite ends into corkscrew pigtails 21, 22 laterally extended from body 20 in preferably rectangular relation thereto. The auxiliary spring members 7 have their corkscrew pigtails 21, 22 dimensioned for engagement with loop-connecting straight wire cross members 10 of resting portions 11 and N-shaped supporting arms 13, and are extended below resting portions 11. These corkscrew pigtails 21, 22, which are either left or right-handed, preferably have their coils 23' limited to approximately one and one-quarter turns and with a pitch to fit the length of wire cross members 10, thus providing within the working range of auxiliary spring members 7 laterally stable pivotal anchor connections of arms 21, 22 with wire cross members 10 (see Figs. 4 and 5).

The auxiliary spring members 7 have opposite ends of their bodies 20 slightly extended through wire springs 6 to encircle with their corkscrew pigtails 21 the desired wire cross members 10 in resting portions 11 and with their corkscrew pigtails 22 the desired wire cross members 10 in N-shaped supporting arms 13. It will be observed that the end portions 23, 24 of bodies 20 contact the cross members 25, 26 adjacent to cross members 10 to permit changing of the described pivotal connections of auxiliary spring members 7 with wire springs 6 to cantilever-like connections whenever springs 6 are loaded. Thus, under load, the springs 6 engage with their cross members 25 end portions 23 of auxiliary spring members 7 to connect said latter end portions 23 in cantilever-like fashion to resting portions 11, and the end portions 24 of auxiliary spring members 7 engage cross members 26 of N-shaped supporting arms 13 to connect said latter end portions in cantilever-like fashion to N-shaped supporting arms 13.

Cantilever-like connections of the type referred to can be effected by preloading or reshaping of springs 6 and their auxiliary spring members 7. Fig. 2 shows the end portion 24 connected in cantilever-like fashion to

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N-shaped supporting arm 13 with the springs pretensioned by the cover 27, and Fig. 3 shows an S-shaped form assumed by the body 20 of an auxiliary spring member 7 while being subjected to normal load. Change of the pivotal connections of auxiliary spring members 7 with wire springs 6 to cantilever-like connections can be controlled by changing either the length or cross section of the auxiliary spring members 7 or changing the locations of these auxiliary spring members on the wire springs 6 to permit any desired load characteristics of the wire spring structures.

In wire spring structures embodying the invention, flexibility and resiliency is controlled by torsioning or twisting the loop-connecting cross members of the wire springs, whereas the auxiliary wire spring members provide the desired resistance at certain selected points of the resting portions of the wire spring structures to obtain a controlled contour. Under load this resistance of the resting portions spreads from originally selected points to progressively increasing areas of the resting portions.

As shown in the drawings, corkscrew pigtail arms 22 of auxiliary spring members 7 are attached to N-shaped spring supporting arms 13 by connecting these pigtail arms 22 to cross members in the said N-shaped spring supporting arms 13 located as near as practical to the end portions of these arms which attach the spring structures to the frame. This arrangement substantially reduces movements of end portions 24 of the auxiliary spring members 7 with respect to their end portions 23, and thereby expedites contact of the latter end portions of auxiliary spring members 7 with cross members 25 of resting portions 11, the said contact resulting in changing the pivotal connections between cross members 10 and corkscrew pigtails 21 to cantilever-like connections.

Mounting of corkscrew pigtail arms 22 on N-shaped supporting arms 13 in the manner described stiffens the spring structures by counteracting their axial and lateral movements and thus greatly stabilizes spring constructions assembled of spring structures of the type described.

When constructed in the manner disclosed in Fig. 1, auxiliary spring members, which generally extend their elongated bodies in planes arranged substantially vertical to the planes of the wire springs reinforced thereby, extend in planes intersecting the longitudinal axes of the wire springs. In this case, wire spring structure 28 includes auxiliary spring member 29 with a body 30 formed in its end portions 31, 32 with bends 33, 34 to extend the major portion 35 of body 30 in a plane axially intersecting the resting portion 11 of wire spring 6. Bends 33, 34 in body 30 are arranged to bring about contact of major body portion 35 with cross members 36, 37 adjacent to the cross members 10 pivotally connected to corkscrew pigtails 21, 22 of auxiliary spring member 29 to extend the major portion 35 in cantilever-like connection of auxiliary spring member 29 with the wire spring 6, that is, in loaded condition of the wire spring structure in a plane vertically and axially intersecting the plane of the wire spring structure 28.

Wire spring structure 38 (see Figs. 6 and 7) embodies a sinuously corrugated wire spring 39 with a gothic upper end 40 and an auxiliary wire member 41 somewhat greater in length than auxiliary wire members 7 previously described to permit attaching of corkscrew pigtail 42 to a wire cross member 43 located near end lever 44 of the corrugated wire spring 39 of the wire spring structure 38 which is shown in Fig. 6 pretensioned and in Fig. 7 compressed under normal load.

Wire spring structure 45 (see Figs. 8 and 9) embodies a sinuously corrugated wire spring 46 and an auxiliary spring member 47 similar to wire spring 6 and auxiliary spring member 7 previously described as elements of wire spring structure 5 having auxiliary spring member 7 attached to N-shaped supporting arm 13 at the bottom end of wire spring 6. However, in wire spring structure

45 auxiliary spring member 47 is attached with end 48 to the N-shaped supporting arm 49 at the upper portion of wire spring 46 and with end 50 to wire cross member 51 in the resting portion 52 of wire spring 46, otherwise wire spring structure 45 closely resembles the previously described wire spring structure 5.

Having thus described my invention what I claim is:

1. In the combination of a sinuously corrugated wire spring bent from a sinuously corrugated wire strip by twisting loop-connecting wire cross members thereof to form a wire spring with a resting portion and accordion fold-shaped supporting means, with an elongated straight wire member coupling the resting portion of the wire spring with the accordion fold-shaped supporting means thereof, said elongated straight wire member including an end portion extended through the resting portion of the wire spring between two adjacent cross members thereof and having a lateral extension on said end portion hooked over one of the two adjacent wire cross members to effect in a loaded condition of the wire spring contact of the end portion of the elongated straight wire member with the other one of the two adjacent wire cross members for cantilever-like coupling of the elongated straight wire member with the resting portion of the sinuously corrugated wire spring.

2. The combination described in claim 1, wherein the lateral extension of the elongated straight wire member is shaped to a corkscrew pigtail adapted to spirally encircle the said one wire cross member of the resting portion, and wherein such corkscrew pigtail extends over the entire length of the said one wire cross member to laterally non-shiftably couple the elongated straight wire member to said one wire cross member of the resting portion of the sinuously corrugated wire spring.

3. The combination described in claim 2, wherein the corkscrew pigtail embodies a spiral having approximately one and one-quarter turn over its entire length for release of the corkscrew pigtail from said one wire cross member by bending the resting portion within elastic limits of the wire of the sinuously corrugated wire spring.

4. In the combination of a sinuously corrugated wire spring bent from a sinuously corrugated wire strip by twisting loop-connecting wire cross members thereof to form a wire spring with a resting portion and accordion fold-shaped supporting means, with an elongated straight wire member coupling the resting portion of the wire

spring with the accordion fold-shaped supporting means thereof, said elongated straight wire member having one end portion extended through the accordion fold-shaped supporting means between two adjacent cross members thereof and including a lateral extension on said end portion hooked over one of the two adjacent cross members of the accordion fold-shaped supporting means to effect cantilever-like couplings of the straight wire member with the accordion fold-shaped supporting means of the sinuously corrugated wire spring.

5. In the combination of a sinuously corrugated wire spring bent from a sinuously corrugated wire strip by twisting loop-connecting wire cross members thereof to form a wire spring with a resting portion and accordion fold-shaped supporting means, with an elongated straight wire member extended through the resting portion between two adjacent cross members thereof and through the accordion fold-shaped supporting means between two adjacent cross members thereof arranged in spaced relation with respect to the apex of the accordion fold-shaped supporting means, said elongated straight wire member including at its opposite ends lateral extensions hooked over one of the two adjacent cross members of the resting portion and the accordion fold-shaped supporting means, and said elongated straight wire member arranged to contact the other one of the two adjacent cross members of the resting portion and the accordion fold-shaped supporting means when the sinuously corrugated wire spring is loaded to effect cantilever-like coupling of the elongated straight wire member with the resting portion and the accordion fold-shaped supporting means of the sinuously corrugated wire spring.

6. The combination as described in claim 5, including a frame having the accordion fold-shaped supporting means of the wire spring attached thereto and having the two adjacent cross members of the accordion fold-shaped supporting means arranged near the point of attachment to the frame to effect cantilever-like coupling of the elongated straight wire member with the resting portion and the accordion fold-shaped supporting means of the wire spring when small loads are applied to the wire spring.

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