Feb. 18, 1941. D. I. LEVINE 2,232,072

TIE WIRE FOR SPRING ASSEMELY AND METHOD OF MAKING SAME

Original Filed Nov. 2, 1937

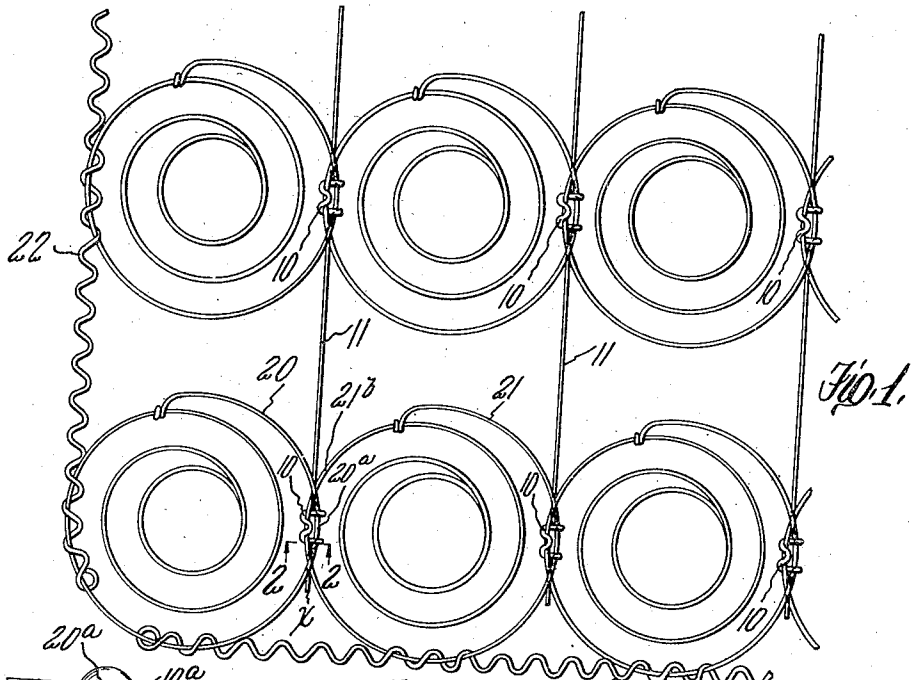


Fig. 1.



Fig. 2.

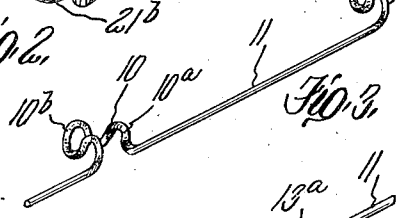


Fig. 3.

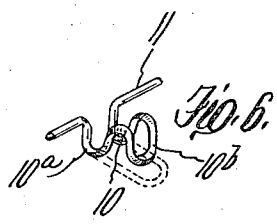


Fig. 6.

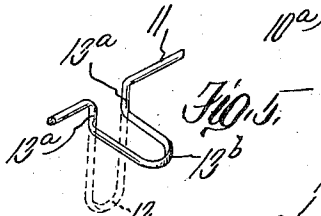


Fig. 5.

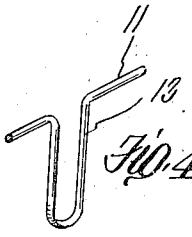


Fig. 4.

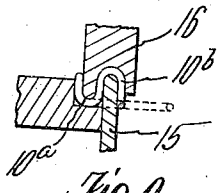


Fig. 9.

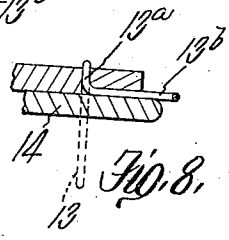


Fig. 8.

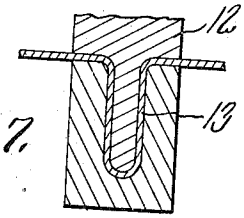


Fig. 7.

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TIE WIRE FOR SPRING ASSEMBLY AND METHOD OF MAKING SAME

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Original application November 2, 1937, Serial No. 172,363, now Patent No. 2,197,131, dated April 16, 1940. Divided and this application January 5, 1939, Serial No. 249,435

7 Claims. (Cl. 140—3)

This invention relates to a tie wire and a method of making the same. It deals more especially with a tie wire or tie wire elements adapted for assembling or tying together coil springs into a unitary structure or assembly possessed of the desired integrity and the desired resiliency or spring action. The spring assembly is designed for various purposes, for instance, as the resilient filling in mattresses, cushions, and chair seats or backs, and as the foundation in various structures for sustaining a person comfortably in seated posture and/or at repose.

In the spring assembly comprising the tie wires hereof, there are successive rows of juxtaposed coil springs; and the springs of one row are substantially aligned with the corresponding springs in the next row and the juxtaposed springs in one row are tied to the corresponding juxtaposed springs in the next row. The tie wire or tie wire elements hereof, which serve the purpose of tying together the juxtaposed springs in one row to the corresponding juxtaposed springs in the next row, assume a special form highly advantageous for such purpose, namely, a form substantially straight excepting for loops protruding at spaced regions thereof, each of the loops being substantially S-configured and protruding in its entirety on one side of the tie wire and one of the hook portions of the S-configured loop engaging an end convolution of a coil spring and the other hook portion of the S-configured loop engaging an end convolution of a juxtaposed coil spring. Because the hook portions of the S-configured loop can readily be closed or clamped together sufficiently to become for all practical purposes inseparably hooked onto the end convolutions of juxtaposed coil springs, it is hence seen that the tie wire of the present invention makes possible a simple and inexpensive spring assembly wherein the springs are hingedly interlocked to one another and are thus maintained in the desired substantially aligned or undistorted relationship while being freely compressible to afford the desired resiliency or spring action.

With the foregoing and other features and objects in view, the invention hereof will now be described in further detail with particular reference to the accompanying drawing wherein:

Figure 1 is a plan of a corner portion of a spring assembly embodying the tie wires of the present invention.

Figure 2 is an enlarged detailed section on the line 2—2 of Figure 1 and shows how juxtaposed springs in a row are hingedly interlocked by the tie wires hereof.

Figure 3 illustrates in perspective a fragment of tie wire hereof, such fragment comprising two S-configured loops, each of which protrudes in its entirety on one side of the tie wire.

Figures 4, 5 and 6 depict the successive stages of forming an S-configured loop in the tie wire hereof.

Figures 7, 8 and 9 illustrate diagrammatically and conventionally the dies or instrumentalities serviceable for creating the wire forms or shapes depicted in Figures 4, 5 and 6, respectively.

The tie wire elements or units hereof for the spring assembly may be formed readily as wire is progressively being withdrawn from a coil accumulation or the like. As the wire is thus being progressively withdrawn as a straight body, it may undergo at regularly spaced intervals a number of shaping operations designed to develop therein at such intervals S-configured loops 10 each protruding in its entirety on one side of the tie wire from the otherwise straight body 11, as appears best in Figure 3.

The first shaping operation may, as shown in Figure 7, involve passing the wire into a die 12 serving to create therein a loop or U-shaped bend 13, such as is depicted in Figure 4. The second shaping operation may involve upsetting the loop or U-shaped bend 13, as by the die 14 indicated in Figure 8, so that the upper portions 13a of the loop retain their substantial perpendicularity to the straight wire 11 whereas the remainder 13b of such loop is bent to a position of substantial perpendicularity to the portions 13a, as depicted in Figure 5. The third shaping operation may involve shaping the loop portions 13a and 13b in a multiple die 15, 16, such as is shown in Figure 9, which die serves to transform such loop portions into the S-configured loop 10 desired in the tie wire hereof, namely, a loop whose S-configuration is substantially perpendicular with relation to the directionality of the wire 11, as best appears in Figs. 3 and 6. It will be appreciated that the successive shaping or dieing operations are performed at successive stages of progress of the wire 10 as it is progressively being withdrawn from an accumulation and that when the desired number of S-configured loops have been formed therein at appropriately spaced intervals, it may be cut into elements or units of a length suitable for tying together all the aligned pairs of juxtaposed springs in the successive rows of a spring assembly.

The spring assembly wherein the tie wire elements hereof are used may assume the particular form illustrated in Figure 1. The assembly

there appearing comprises successive spaced rows of juxtaposed compression coil springs **20** and **21**, for instance, of the double-cone type. The assembly may be made by placing the coil springs, as ordinarily, on a suitable block or form equipped with pins for holding the springs in the desired relationship as they are being tied together at their end convolutions by the tie wire elements hereof. The tie wire hereof is preferably of such length that it extends from a point X beyond the neighboring portions of a pair of juxtaposed springs in one marginal row to a point (not shown) beyond the neighboring portions of a pair of juxtaposed springs in the opposite marginal row.

The tying together of the pairs of juxtaposed springs with their end convolutions in appropriately overlapping relationship in the successive rows is accomplished by inserting the end convolution **20***a* of a spring **20** of a pair of juxtaposed springs into one of the hook portions **10***a* of an S-configured loop **10** and by inserting the end convolution **21***b* of the spring **21** of the same pair into the other of such hook portions **10***b* of the same S-configured loop **10**. Once the end convolutions of the pairs of juxtaposed springs in the successive rows have been engaged in the successive S-configured loops **10** of a tie wire, it is a comparatively easy matter for the assemblyman to clamp together, as by pliers, the hook portions **10***a* and **10***b* of such loops so that such portions become in effect inseparably hooked onto the end convolutions, that is, without any tendency in actual practice for the end convolutions to escape through the hook portions. Indeed, the hook portions **10***a* and **10***b* of the loop **10** may be brought together so closely to constitute, in effect, eyes through which the end convolutions of the juxtaposed coil springs are threaded. Since the end convolutions of the juxtaposed coil springs are free to turn or rotate in the closed hook portions **10***a* and **10***b* when the spring assembly undergoes local compression, they may be considered as being hingedly interlocked to one another by the tie wires hereof, in consequence of which not only are the springs of the assembly maintained in the desired substantially aligned or undistorted relationship but the several springs of the assembly and the assembly as a whole are freely and substantially noiselessly compressible and hence make for the desired resiliency or spring action in the various structures in which the spring assembly is used.

Each side of the spring assembly preferably includes the tie wire elements hereof for tying together the end convolutions of juxtaposed springs in the successive rows, although it is possible to provide the tie wires hereof on only one side of the assembly and to employ other forms of tie elements on the other side of the assembly.

If desired, the marginal or outermost portions of the end convolutions of the border springs on either or both sides of the spring assembly may be flexibly interlocked, as by helical wires **22**, which are shown in Figure 1 as encompassing the marginal portions of the end convolutions of the border springs. The helical wires **22** thus serve in the spring assembly as rims or border elements tending to resist dislodgment or misalignment of the substantially aligned springs in the successive rows, especially when the assembly meets with blow or impact on the intermediate convolutions of its border springs.

An important feature of the spring assembly is that the juxtaposed coil springs of adjacent rows are so tied together by the tie wires hereof that while free compression of the springs readily takes place and they are free to turn to a considerable extent at their end convolutions under compressing and distorting forces, nevertheless, such compression and turning movements are not accompanied by tendency for the springs to separate or loosen from one another, since the end-convolution of one spring is firmly locked in place by the crimped hook portion **10***a* of a tie wire and the end-convolution of a juxtaposed spring is firmly locked in place by the crimped hook portion **10***b* of the same S-configured loop, indicated generally at **10**, in the tie wire. It can be said, therefore that the springs of the assembly are hingedly interlocked by the tie wires hereof to one another for free compression and relative turning movement at their end-convolutions while at the same time having no tendency to separate from one another during such compression and turning movement.

It is to be understood that the spring assembly and the tie wires hereof specifically described and illustrated are subject to variation and modification falling within the inventive principles hereof and, accordingly, that the protection to be afforded for the invention hereof should be ascertained from the appended claims whose terms should be construed as broadly as the prior art permits.

So far as concerns subject matter, this application is a division of my application Serial No. 172,363, filed November 2, 1937, now Patent 2,197,131, dated April 16, 1940, wherein I have claimed as part of a spring assembly or combination the tie wire element hereof.

I claim:

1. A tie wire adapted for spring assembly purpose comprising substantially S-configured loops each protruding in its entirety on one side of said tie wire at spaced regions thereof, the S-configuration of said loops being substantially perpendicular with relation to the directionality of said tie wire.

2. A tie wire adapted for spring assembly purpose comprising substantially S-configured loops each protruding in its entirety on one side of said tie wire at substantially regularly spaced regions thereof, the S-configuration of said loops being substantially perpendicular with relation to the directionality of said tie wire.

3. A tie wire adapted for spring assembly purpose comprising substantially S-configured loops each protruding in its entirety on one side of said tire wire at spaced regions thereof but said tie wire otherwise being substantially straight, the S-configuration of said loops being substantially perpendicular with relation to the directionality of said tie wire.

4. A tie wire adapted for spring assembly purpose comprising substantially S-configured loops each protruding in its entirety on one side of said tie wire at substantially regularly spaced regions thereof but said tie wire otherwise being substantially straight, the S-configuration of said loops being substantially perpendicular with relation to the directionality of said tie wire.

5. A method of making a tie wire adapted for spring assembly purpose and comprising substantially S-configured loops protruding at spaced regions thereof, which comprises subjecting wire at spaced regions thereof as it is being progressively withdrawn from an accumulation to a

number of successive shaping operations, including the shaping of each of such regions into a substantially U-shaped loop and the reshaping of said loop to S-configuration.

6. A method of making a tie wire adapted for spring assembly purpose and comprising substantially S-configured loops protruding at spaced regions thereof, which comprises subjecting wire at spaced regions thereof as it is being progressively withdrawn as a straight body from an accumulation to a number of successive shaping operations, including the shaping of each of such regions into a substantially U-shaped loop, the upsetting of said loop so that its portions next to the straight wire body retain their substantial perpendicularity to the straight wire body whereas the remainer of said loop is bent to a position of substantial perpendicularity to said portions, and the reshaping of said upset loop to S-configuration.

7. A method of making a tie wire adapted for spring assembly purpose and comprising substantially S-configured loops protruding at spaced regions thereof, which comprises subjecting substantially straight wire at spaced regions thereof to successive shaping operations, including the shaping of each of such regions into a substantially U-shaped loop and a reshaping of said loop to S-configuration.

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