July 23, 1963 W. SPÜHL 3,098,510

APPARATUS FOR MANUFACTURING INTERCONNECTED SPRINGS

Filed June 12, 1961 3 Sheets-Sheet 1

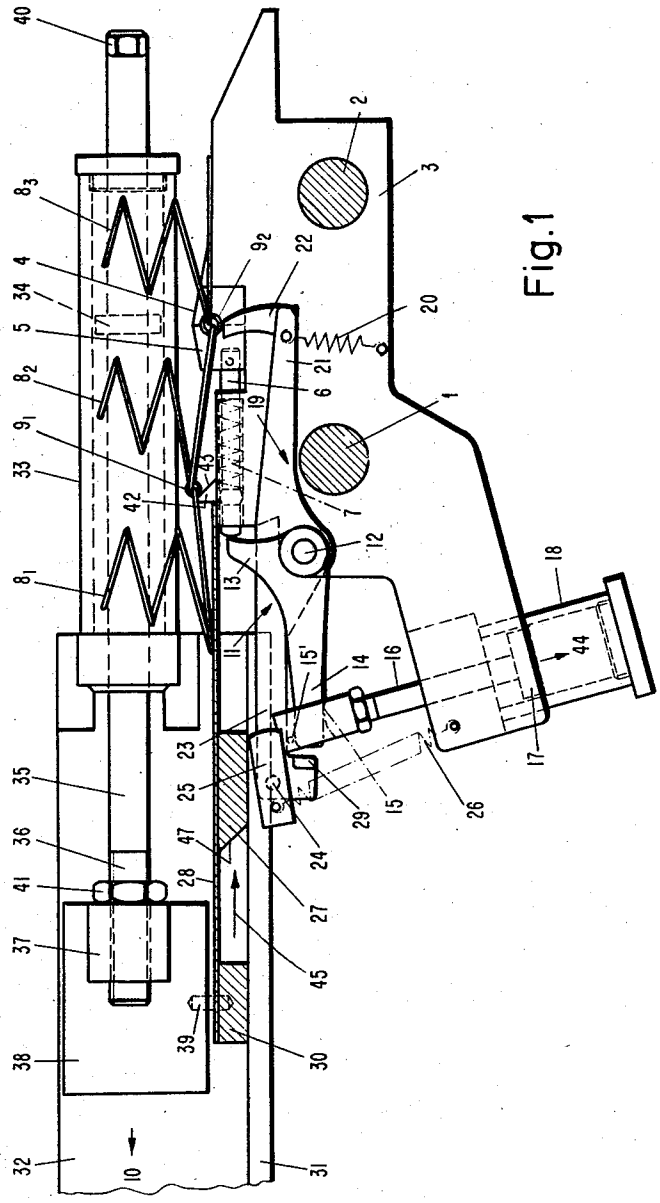


Fig.1

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Filed June 12, 1961 3 Sheets-Sheet 2

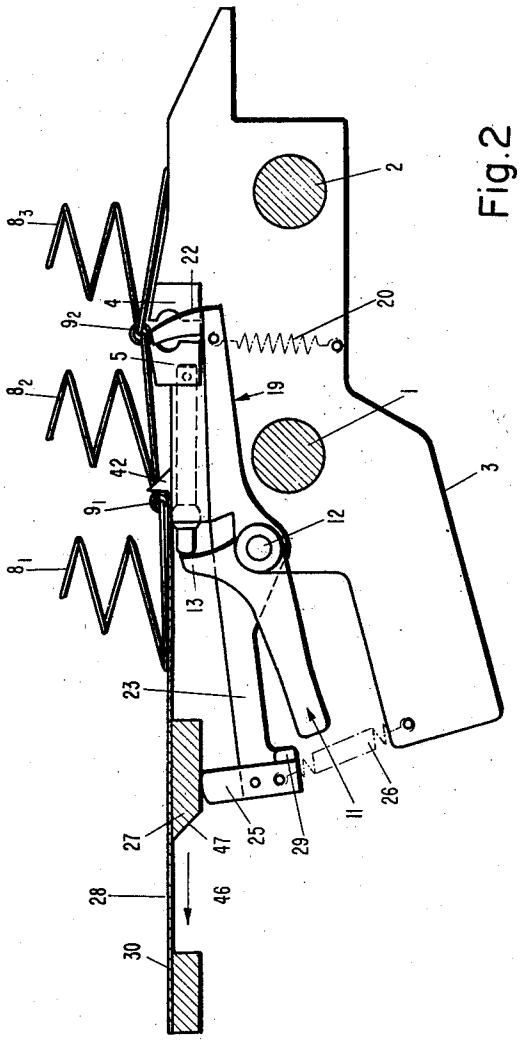


Fig.2

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July 23, 1963 W. SPÜHL 3,098,510

APPARATUS FOR MANUFACTURING INTERCONNECTED SPRINGS

Filed June 12, 1961 3 Sheets-Sheet 3

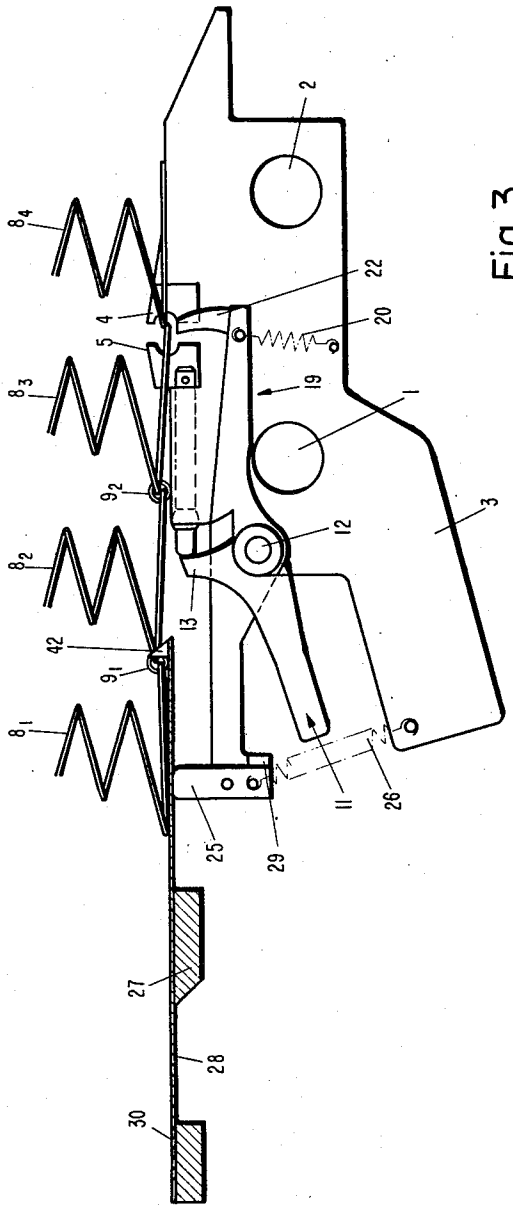


Fig. 3

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APPARATUS FOR MANUFACTURING INTERCONNECTED SPRINGS

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8 Claims. (Cl. 140—92.8)

The present invention relates to apparatus for use in manufacturing assemblies of coil springs, i.e. coil springs interconnected in such a manner as to enable them to be used as interiors for mattresses, cushions and the like. Such assemblies are hereinafter referred to as "spring interiors." The invention relates more particularly to apparatus for use in the interconnection of coil springs to make spring interiors.

It is already known in such apparatus to provide one series of pairs of tongs opposite another series of pairs of tongs for holding the springs whilst they are interconnected and to provide means whereby the springs after being interconnected are ejected from the tongs and automatically advanced to allow the sequence to be repeated. Such apparatus is described in German Patent No. 1,084,681. This already known apparatus, though particularly suitable for the mass production of spring interiors for mattresses, cushions and the like, can only be used however for coil springs of a single predetermined end winding diameter. This restriction is due to the fact that the displaceable tong of each of the individual pairs of tongs is required not only to grip and clamp the springs fed to a particular station at which the springs are interconnected, but are also required to advance the already interconnected springs. Since the stroke of the displaceable tong between the open position and the closed position is invariable, the advance stroke which is proportioned to this stroke, and which must be equal to the diameter of the end winding, is also invariable. The known apparatus is thus not suitable for the interconnecting of coil springs of different end diameters and is therefore not suitable for the production of comparatively small batches of interconnected springs of different end diameters.

According to one feature of the invention an apparatus for holding coil springs in the manufacture of spring interiors comprises a series of clamping means, such as separable pairs of tongs, adapted to hold an end winding of each of the springs whilst the end windings of such springs are interconnected, expeller means co-operating with each of said clamping means and adapted to expel the interconnected springs from said clamping means, and means for advancing said expelled springs, said advancing means including rigidly interconnected elements movable in an advance direction in positive driving engagement with the spring interconnections to advance the expelled springs and movable in a return direction out of positive engagement with the spring interconnections.

According to a further feature of the present invention an apparatus for holding coil springs in the manufacture of spring interiors comprises one series of pairs of tongs opposite another series of pairs of tongs for holding both end windings of each of the springs whilst the end windings of such springs are interconnected, an expeller co-operating with each pair of tongs and adapted to expel the interconnected springs from said pairs of tongs when open and means for advancing said expelled springs, said advancing means including a plurality of rigidly interconnected elements which are capable of adjustable joint reciprocating movement comprising an advance movement in positive driving engagement with the spring interconnections to advance the expelled springs and a return movement out of positive engagement with the spring

interconnections, adjustment of the reciprocating movement of said elements enabling the advance of the expelled springs to be adjusted.

The invention will be further described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a cross section through an apparatus for holding coil springs in the manufacture of spring interiors constructed according to the present invention and shows a pair of tongs in the closed position;

FIG. 2 is a detail of the apparatus of FIG. 1 showing the tongs in the open position and the expulsion of the interconnected springs from the tongs by an expeller; and

FIG. 3 is a detail corresponding to FIG. 2 showing the position of certain parts after the advance of the interconnected springs.

Referring to the drawings, apparatus for use in interconnecting coil springs, which includes clamping means as hereinafter described, has two parallel bars 1 and 2, on which a series of tong supports 3 (only one of which is shown) are mounted at predetermined spaced intervals in known manner. Each pair of tongs comprises a tong 4 rigidly connected to the support 3 and a displaceable tong 5 which is mounted on a ram 6. The ram 6 is axially displaceably mounted on the support 3 and is biassed by a spring 7 which tends to move the tong 5 to the left in FIG. 1, that is in the opening direction of the pair of tongs.

Each pair of tongs 4, 5 serves to clamp the lower end windings of two adjacent coil springs 8_3 and 8_2, only one coil in a given series of similarly disposed coils being shown in the drawings.

Normally the apparatus will be used to interconnect double conical springs which are of minimum diameter at their mid-length; consequently their upper end windings will also be gripped by correspondingly arranged upper series of pairs of tongs opposite to the tongs 4, 5. The upper series of tongs has been omitted from the drawings for the sake of simplicity.

When the tongs 4, 5 are in their closed position (FIG. 1.) the lower end windings of the springs 8_3 and 8_2 respectively, are held therebetween; similarly to the other springs of the series. In this position the held lower and upper helical spring end windings can each be connected together in known manner by a wire helix 9_2 adapted to be screwed forward substantially parallel to the rods 1 and 2; the helix 9_2 is shown in FIG. 1 as a circle. The two series of coil springs of which springs 8_3 and 8_2 are members respectively are connected together at their upper and lower ends by two wire helices of which, in accordance with the above description, only the lower helix 9_2 is shown. By successively connecting adjacent series of such coil springs, a spring interior is produced of advantage in the manufacture for example of mattresses or uphlostered furniture.

In FIG. 1 the coil spring 8_1 of a preceding series of coil springs is illustrated the series of springs of which spring 8_1 is a member being connected to the series of coil springs of which spring 8_2 is a member by an upper wire helix and a lower wire helix 9_1.

The spring interior being manufactured must, after the interconnection of two series of coil springs, be advanced forward in the direction of the arrow 10 (FIG. 1) and, in order to render this possible, the end windings already connected together by the wire helix 9_2 must first be expelled from the tongs 4, 5 (FIG. 2). When the advance has been effected, the lower end winding of a new coil spring 8_4 must be inserted by hand in the opened tongs 4, 5 (FIG. 3).

In known forms of apparatus the ends of the coil springs are extracted from the tongs by hand, the already intercon-

nected springs being then advanced by hand an amount corresponding to the diameter of the end winding, a feature which is irksome and needs practice; in the present invention the above movements are effected automatically.

A bell crank lever 11 is mounted on the support 3 to pivot about a pin 12. One arm 13 of the bell crank lever 11 is in contact with the free end of the ram 6, while the other arm 14 of the lever 11 extends to a position between abutment surface 15 and a pin 15' provided on one end of a piston rod 16, the double-acting piston 17 of which is displaceable in a pneumatic cylinder 18. The pneumatic cylinder 18 is mounted on the support 3, its connections not being shown.

Another lever 19, which is biassed clockwise by a spring 20 is pivotally mounted on the pin 12. Mounted on the end of an arm 21 of the lever 19 is an expeller 22 which, when the lever 19 is pivoted anti-clockwise, ejects the already interconnected end windings of the coil springs 8_2 and 8_3 and the wire helix 9_2 from the tongs 4, 5 (FIG. 2).

Pivotably mounted on a pin 24 towards the end of an arm 23 of the lever 19, is a cam 25 which is biassed anti-clockwise by a spring 26.

When the apparatus is in the position shown in FIG. 1, the swinging of the cam 25 by the spring 26 is prevented, because the force exerted by the cam 25 on the lever 19 is too small to overcome the force of the spring 20. Pivotal movement of the cam 25 when effected by the spring 26 (FIG. 2) is in any case limited by contact with an abutment 29 which is also provided on the end of the lever arm 23 and which extends perpendicularly to the pivotal plane of the lever 19. Firmly located under a forwardly and backwardly displaceable table top 28 is a control bar 27, and also a driving bar 30 parallel to the control bar 27. The bars 27 and 30 extend under the table top 28 for either the entire length of the rods 1 and 2 or of the row of pairs of tongs 4, 5 mounted thereon. The ends of the bars 27 and 30 are displaceable on a horizontal rail 31 secured to each side wall 32 of the frame of the apparatus, preferably with the interposition of rollers (not shown).

Mounted on each side wall 32 of this frame is a horizontal pneumatic cylinder 33 in which a double-acting piston 34 is displaceable. The piston 34 is located upon a piston rod 35 extending from the cylinder 33 at both ends thereof.

The rear end of the piston rod 35 is provided with a thread 36 by which it is screwed into a lug 37 welded to a rectangular plate 38. The plate 38, which is horizontally guided along the side wall 32 in a manner which is not described, is connected at its lower edge by a pin 39 to the driving bar 30.

The forward end of the piston rod 35 is provided with a hexagon 40 which makes it possible to turn the piston rod 35 by means of a spanner and thereby to screw it into the lug 37 to a greater or lesser extent. A lock nut 41 serves to maintain the adjusted screwed position of the rod 35. At its front edge the table top 28 is provided with a series of hooks 42 each of which has an inclined lifting or contact surface 43.

The described apparatus operates as follows:

When the wire helix 9_2 has been screwed tightly for a distance equivalent to the length of the rods 1 and 2, so that all the coil springs of a series of which spring 8_2 is a member are connected to the series of coil springs of which spring 8_3 is a member and to one another, all the pistons 17 are moved by pneumatic control in the direction of the arrow 44 (FIG. 1). The lever 11 is swung anti-clockwise by the pin 15' so that the displaceable tong 5 moves to the left under the influence of the spring 7 and thus the tongs 4, 5 are opened. During this movement, the table top 28 is moved forwardly by the two side pistons 34, i.e. the top 28 is moved in the direction of the arrow 45, the contact surface 43 of the hook 42 sliding under the helix 9_1 and lifting it over the point of the hook.

During the further forward movement of the table top 28, the bar 27 slides over the cam 25, whereafter the latter pivots anti-clockwise under the influence of the spring 26 until stopped by the abutment 29 so that it stands perpendicularly to the lever arm 23. Then the movement of the table top 28 is reversed (arrow 46 in FIG. 2), the cam 25 first running on to an inclined contact surface 47 of the control bar 27 and, because of its erected position urges the lever 19, against the force of the spring 20, to effect a pivotal movement in the anti-clockwise direction. With this pivotal movement, the expeller 22 ejects the helix 9_2, and end windings of the coil springs 8_2 and 8_3 connected thereby, out of the open tongs 4, 5 and holds it above these tongs until, upon the further rearward movement of the table top 28 the hook 42 engages the helix 9_1 interconnecting the series of coil springs which include springs 8_1, 8_2. Thus the advance of the interconnected springs is commenced and continues until the piston 34 has reached its (rear) end position of its advance stroke. The cam 25 slides off the front of the control bar 27 so that the lever 19 is pivoted back again by the spring 20 out of its "ejecting" position.

The position of the table top 28 shown in FIG. 3 and consequently of the hooks 42 and the helix 9_1, at the end of the rearward movement, i.e. the advance stroke of the piston 34, depends on the adjustment of the thread 36 in the lug 37. This adjustment is effected according to the diameter of the end winding of the coil springs so that the part of the lower end winding of the coil spring 8_2 diametrically opposite the helix 9_2 falls into the open tongs 4, 5. The lower end winding of the next coil spring 8_4 is inserted by hand into these tongs 4, 5. The piston 17 is actuated in the reverse direction to that of the arrow 44 so that the abutment surface 15 brings the bell crank lever 11 into the position shown in FIG. 1 and the tongs 4, 5 are thereby closed. A new wire helix can now be screwed through each pair of the closed lower or upper tongs and around the springs clamped therein.

After the table top 28 has been moved rearwardly in the direction of arrow 46 (FIG. 2) (i.e. the advance direction), the temporarily upright cam 25 becomes released from the control bar 27 so that the lever 19 under the influence of the spring 20, assumes the position shown in FIG. 3. In the next forward movement of the table top 28 (arrow 45 in FIG. 1) the cam 25 is reversed back into the position shown in FIG. 1 by its abutment with the control bar 27.

Compared with the above mentioned already known apparatus which also operates with automatic feed, the described apparatus has the advantage that it can be adjusted or adapted to coil springs of various end winding diameters merely by the screwing of the two lateral piston rods 35 into the corresponding lugs 37 to a greater or lesser extent. The hooks 42 are disposed, in the forward end position of the table top 28, according to the adjusted rear end position of the table, to a varying degree in front of the helix 9_1, but this is immaterial since the hooks 42 execute an idling stroke during their rearward movement until they engage the helix 9_1 adjacent the lower end winding of the coil springs 8_2. The advance stroke begins only from this moment, the extent of said advance stroke, as is apparent from the above, being adjustable.

Furthermore, the movement of the expellers 22 may be controlled in a much simpler manner than in the case of the known apparatus, namely, by the control bar 27, and the cams 25 being mounted to pivot on the levers 19, instead of, for example, by a swivel shaft on which actuating levers for the expellers are mounted at the relative spaced intervals of the pairs of tongs. This feature of the present invention also renders possible much faster modification of the apparatus to accommodate other relative spaced intervals between individual supports 3, since the supports 3 are displaceable along the rods 1 and 2 and yet can be locked by clamping screws (not shown) thereon, i.e. a more rapid accommodation to other relative

spaced intervals of the series of coil springs due to different end coil diameters.

When the spacing between the springs in a series is changed, apart from the corresponding displacement of the supports 3 only the relative spaces between the hooks 42 need be changed. The hooks 42 are secured to the table top 28 so as to be easily detachable, several series of connecting holes (not shown) being provided therein if desired at relatively different spaced intervals.

Instead of changing the feed by adjusting the connection between the table top 28 and the piston 34, the hooks 42 in the table 28 could also be adjusted in the direction of movement of said table top, e.g. by providing further series of securing holes, a feature however which would require much greater change-over time.

Compared with the known apparatus there is the disadvantage that the new coil springs supplied from a charging position are not automatically gripped by the tongs. This disadvantage, however, apart from rare cases in which only coil springs of a single dimension are used, is not important compared with the advantage of versatility in the manufacture of spring bodies from coil springs of different dimensions and different spaced intervals. Moreover the construction of apparatus according to the present invention is found to be simple and relatively cheap.

It should also be observed that the expeller 22 is illustrated in the drawings as being constructed to straddle the tongs 4, 5; the expeller is therefore located immediately adjacent to the tongs 4, 5. Naturally, however, the tongs 4, 5 may have recesses therein so that the expeller can extend through said recesses to expel the end windings after connection by the helix 9_2.

I claim:

1. In apparatus for manufacturing spring interiors, in which apparatus two series of coil springs are held side by side whilst they are interconnected; the combination comprising a series of supports, a series of clamping means mounted respectively on said supports and adapted to hold an end winding of each of the springs whilst the end windings of said springs are interconnected, means for opening and closing said clamping means, an expeller element co-operating with each of said clamping means and adapted by an expel movement to expel the interconnected springs from said clamping means when open, a reciprocable table serving to receive the interconnected springs, a series of elements secured to said table extending parallel to said series of clamping means and serving to engage the spring interconnections, means for imparting a reciprocating movement to said table, said reciprocating movement comprising an advance movement with said elements in positive driving engagement with said spring interconnections to advance the expelled springs and a return movement with said elements out of positive engagement with the spring interconnections, a lever pivotably mounted on each of said supports and having two arms, one of said arms comprising said expeller element, a cam pivotally mounted on the other of said arms, first spring bias means biassing said lever against said expel movement, second spring bias means weaker than said first spring bias means biassing said cam to an erect position, and a control bar on said table extending parallel to said series of clamping means and adapted to co-operate with said levers to actuate said expellers in synchronism with movement of said table, said cam, during a part of the return movement of the table top, being held in a non-erect position by the control bar against said second spring bias means and said cam, during a part of the advance movement of the table top, exerting in its erect position a force on the lever sufficient to pivot the lever against said first spring bias means to effect said expel movement.

2. The combination according to claim 1 in which the control bar has an inclined surface adapted to contact the pivotable cam to effect said expel movement.

3. The combination according to claim 1 in which said supports are displaceable for adjusting the relative spacing therebetween, said elements being mounted for correspondingly adjustable spacing on the table top.

4. The combination according to claim 1 in which said elements secured to said table are constructed as hooks with a lifting surface enabling the hooks to slide past the spring interconnections during movement in said return direction.

5. The combination according to claim 1 in which said means for imparting a reciprocating movement to said table is adjustably connected thereto to enable the advance of the springs to be adjusted.

6. The combination according to claim 5 in which said means for imparting a reciprocating movement comprises a pneumatic cylinder, a double acting piston displaceable therein, a piston rod carrying said piston, and a screw connection between said piston rod and said table.

7. The combination according to claim 6 in which said screw connection comprises a lug screw threaded on said piston rod, a plate member to which said lug is secured and a driving pin connection between said plate member and said table.

8. In apparatus for manufacturing spring interiors in which apparatus two series of coil springs are held side by side whilst they are interconnected: the combination comprising a series of supports, a series of pairs of tongs mounted on said supports and adapted to hold an end winding of each of the springs whilst the end windings of said springs are interconnected, one tong of each pair being fixed on its support and the other being movable relatively thereto, a longitudinally displaceable ram on which said movable tong is secured a pneumatic cylinder mounted on each said support, a double acting piston displaceable in said cylinder, a bell crank lever acting on said ram, abutment means on said piston in operative engagement with said bell crank lever, spring means biassing said movable tong in a direction tending to open the tongs, expeller means co-operating with each of said pairs of tongs and adapted to expel the interconnected springs from said tongs when open, a table adapted to receive the interconnected springs, a series of hooks secured to an edge of said table extending parallel to said series of pairs of tongs, said table being reciprocable towards and away from said tongs, and means for imparting a reciprocating movement to said table, said reciprocating movement comprising an advance movement directed away from said tongs with said hooks in driving engagement with the spring interconnections to advance the expelled springs and a return movement with said hooks out of positive engagement with said interconnections, said hooks each having a bevelled lifting surface enabling the hooks to slide past the spring interconnections during said return movement.

References Cited in the file of this patent

UNITED STATES PATENTS

2,470,812	Gauci et al.	May 24, 1949
2,840,118	Gail	June 24, 1958
3,026,914	Turley	Mar. 27, 1962