United States Patent

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[33] **Germany**
[31] **P 20 13 171.9**

[54] **APPARATUS FOR CONVEYING HELICAL WIRE SPRINGS**
11 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **198/33 AB,** 140/92.7
[51] **Int. Cl.** **B65g 47/24**
[50] **Field of Search** ..... 198/33 AB; 140/3 CA, 92.7

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Assistant Examiner—Alfred N. Goodman
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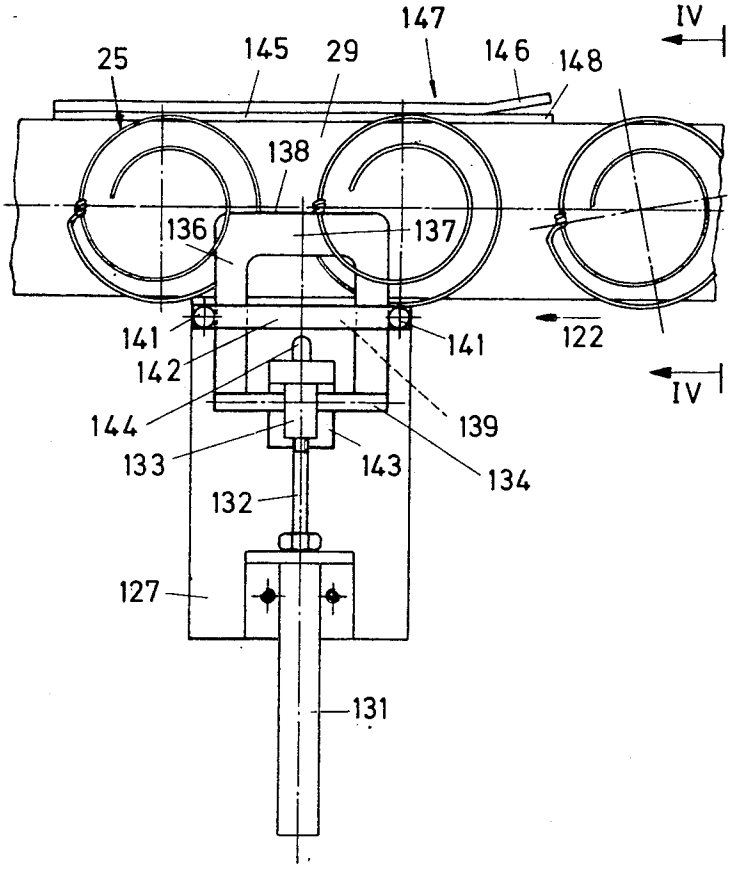
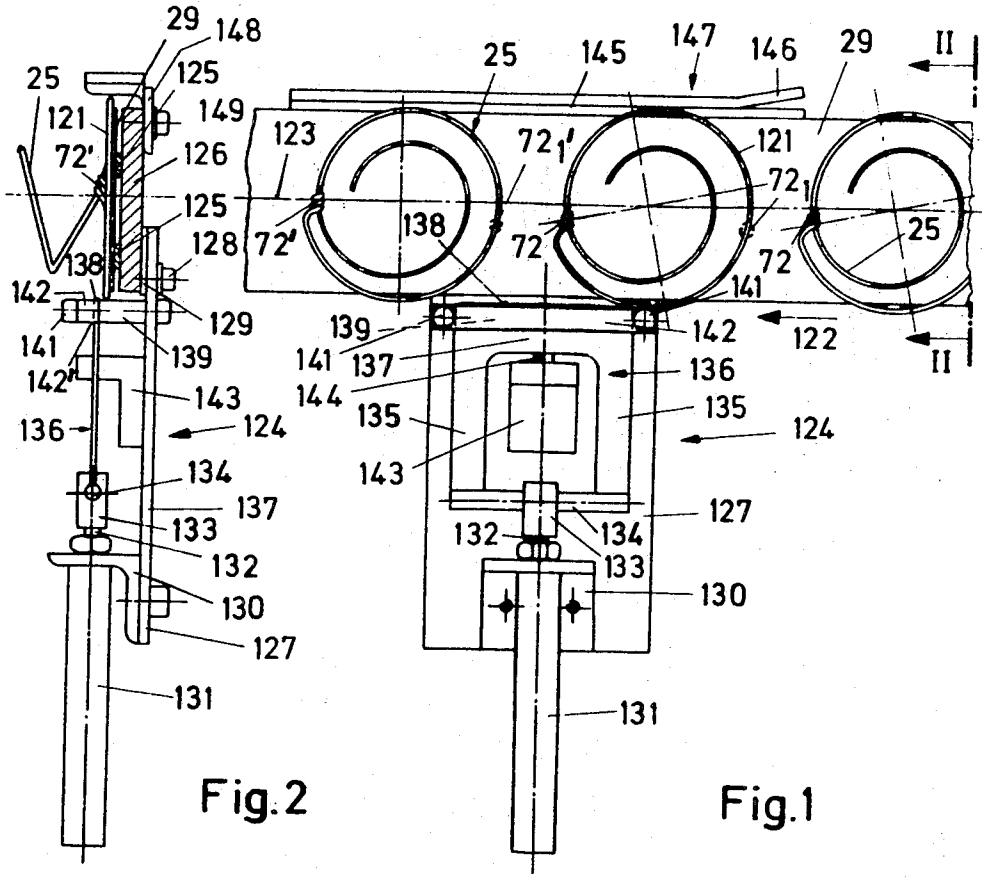
ABSTRACT: An apparatus for feeding helical wire springs to a machine for the manufacture of spring suspensions is provided with at least one alignment device on one of two stepwise driven belts, the alignment device comprising a slider which during each advance of the belts is operated to engage a joint of an end coil of a spring and produce a slight rotation of the spring to cause the joint to assume a precisely predetermined position at the centerline of the belt.

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72'1
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72'
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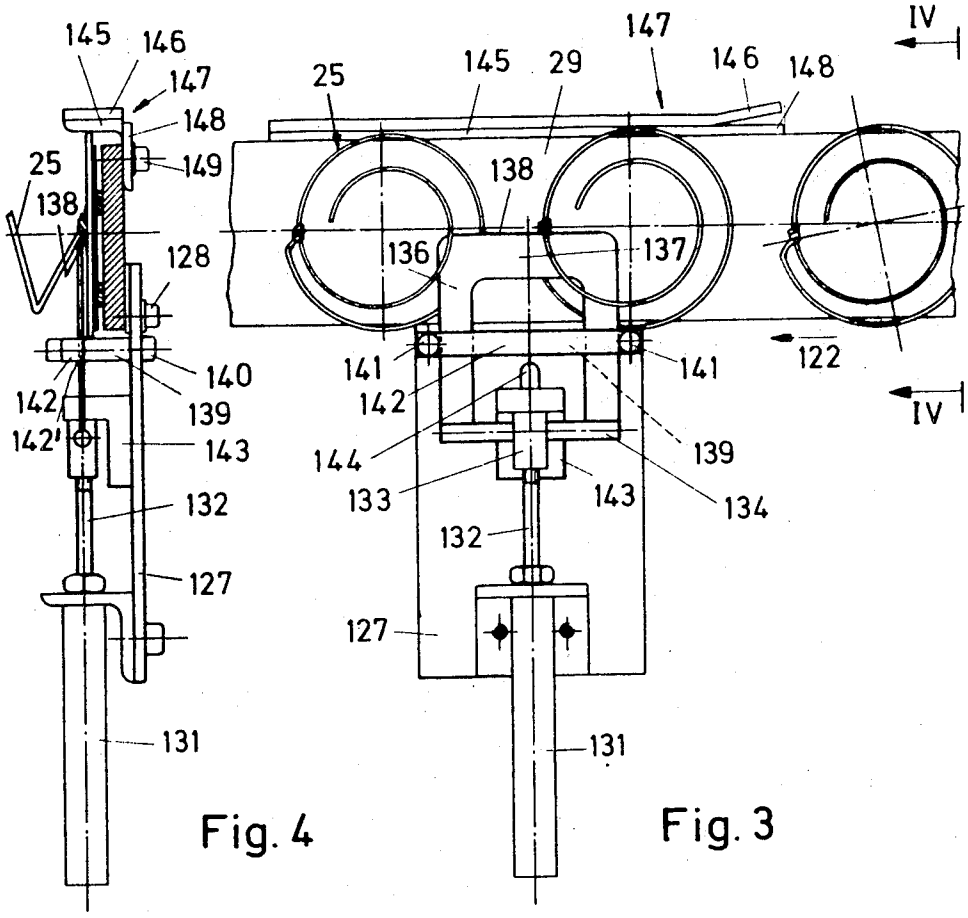
Fig.2

Fig.1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IV
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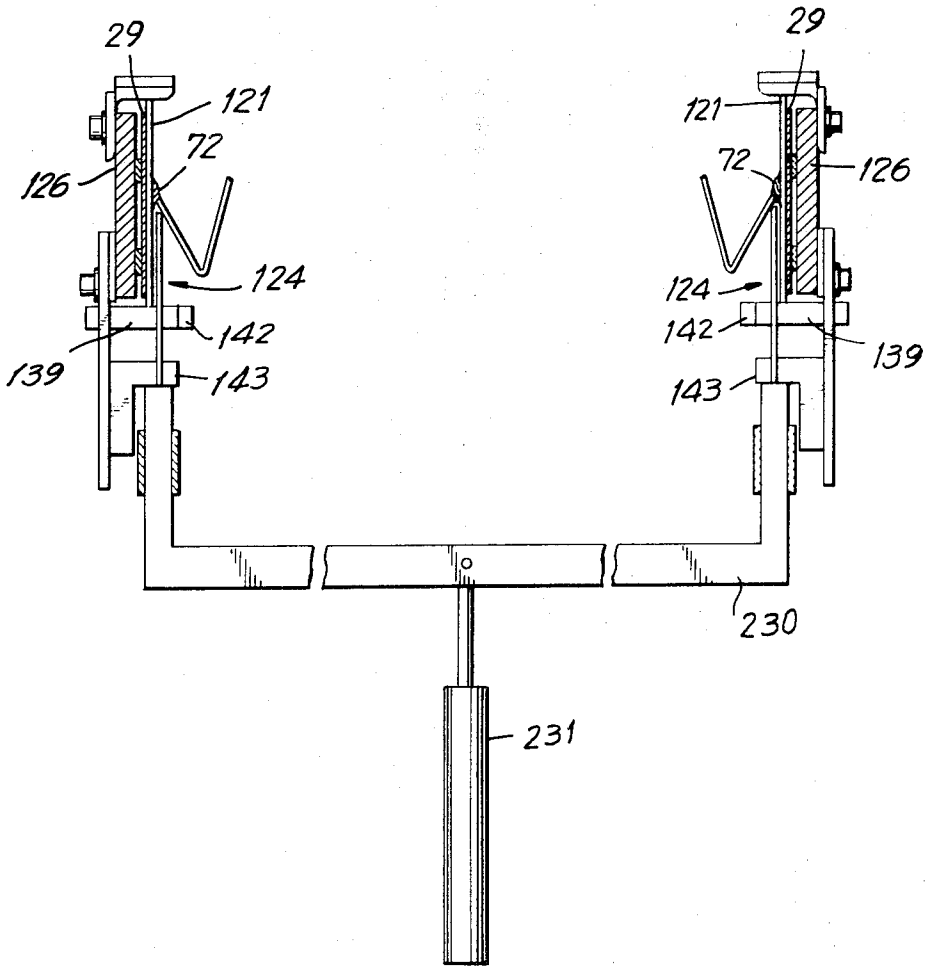
IV

Fig. 4

Fig. 3

FIG. 5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APPARATUS FOR CONVEYING HELICAL WIRE SPRINGS

BRIEF SUMMARY OF THE INVENTION

The invention relates to improvements in apparatus for conveying helical, wire springs from a spring manufacturing device to a machine for manufacturing spring suspensions. Apparatus is known for feeding helical wire springs from a spring making device to a machine for the production of spring suspensions. In the known apparatus, a hinged arm removes one spring after another at a collecting station of the spring making apparatus and inserts the springs between two continuous conveyor units running parallel to one other and driven stepwise, the springs being delivered to a device which places a row of the springs simultaneously into the said machine. In this apparatus, the hinged arm has a head provided with means for gripping, compressing and releasing the springs, which means is actuated in synchronism with the swing of the arm such that the springs are held in slightly compressed condition between two endless bands of the conveyor units against which the two end coils of the springs come to rest. The apparatus also includes a device for positioning a row of springs including a gripper beam with a row of pickup arms, the ends of which are guided in two caps in such a way that the pickup arms in one position of the gripper beam grip one row of springs brought from between the bands to the entry of the spring-suspension machine, and in another position inserts them into the input of that machine. Such known apparatus has already proven excellent in practice. However, in some cases troubles have arisen in the machine which produces the spring suspensions, for example, the end turns of adjacent springs to be joined by means of wire coils were not properly picked up by the pincers which have to tighten them together during the formation of the wire coils. Exhaustive investigations have shown that these troubles arise from nonuniformity in the position of joints in the coils of these springs and are fully eliminated by providing the feed device according to the invention with one aligning attachment at least at one of the endless belts, such attachment comprising a slider which during each stepwise advance of the belts is operated so that it engages the joint of an end coil of a spring lying between the belts, and by a slight rotation thereof, the joint is displaced to a precisely predetermined position.

Apart from the elimination of the enumerated trouble, the invention also assures an extremely accurate retention of the specified size of the spring suspensions namely the end coils of the springs are not exactly round, the suspensions are not, of course, always exactly the same length and breadth when the position of the joints is not uniform.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of a straightening device in a wire feed apparatus;

FIG. 2 is a section taken along line 11—11 in FIG. 1;

FIG. 3 is a plan view corresponding to FIG. 1 showing the apparatus in a different working position;

FIG. 4 is a section taken along line IV—IV in FIG. 3; and

FIG. 5 is a section similar to FIG. 4 but showing both ends of the wire feed apparatus and a modified drive of the straightening devices at the ends.

DETAILED DESCRIPTION

Referring to FIG. 1 therein is shown a feed apparatus for conveying springs 25 received from a gripper arm (not shown) associated with a spring-manufacturing apparatus (also not shown) in the direction of arrow 122 to a machine for producing spring suspensions.

In the manufacture of springs 25, there are formed joints 72 at the end coils 121 and it has been found that improper orientation of these joints in the known feed apparatus has a detrimental effect on the production of suspensions in the machine which produces same.

The apparatus of the invention obviates the above and positions the joints 72 on the centerline 123 as will be explained hereafter.

The feed apparatus comprises left and right belts 29 between which the springs 25 are conveyed stepwise in the direction of arrow 122. The end coils 121 of springs 25 are in contact with respective belts 29 such that the springs 25 are slightly compressed. The gripper arm, which removes the springs from the spring manufacturing apparatus and inserts them between the endless belts 29, is situated therefore to the right beyond FIG. 1, while the entrance of the machine for producing suspensions, at which a gripper support with gripper arms inserts a row of springs extracted from belts 29, is to the left outside the figure. The joints 72 of the end coils 121, when the springs are inserted between belts 29, lie somewhat below the horizontal center line 123, and are rotated upward by a straightening device 124, so that they come to rest on center line 123 as shown at 72'. In the spring 25 shown in FIGS. 2 and 4, the joint is shown in its final position 72'. The back of belt 29 travels along two sliding strips 125, which are fastened to a supporting strip 126 fixed firmly in the frame, which absorbs the pressure of the slightly compressed springs 25.

The straightening device 124 comprises a baseplate 127 secured by screws 128 to the supporting strip 126 with an adjustment fillet 129 interposed therebetween to compensate for the thickness of the spring wire. At the bottom end of baseplate 127, an angle member 130 is secured, to which an upright pneumatic cylinder 131 is fastened. At the top end of piston rod 132 of the piston mounted inside cylinder 131 there is secured a holding head 133 which supports a crossbar 134. To the ends of the crossbar 134, are welded the free ends of a web 135 of a U-shaped sheet metal slider 136, whose yoke 137 exhibits a horizontal upper edge 138. A primary guide strip 139 is secured to base plate 127 by means of two screws 140.

The slider 136 moves between the edge of strip 139 and a second guide strip 142 secured at its extremities by screws 141 to base plate 127. The guide strip 142 has shoulders 142' at its ends which serve as spacers corresponding to the thickness of slider 136 plus a slight tolerance.

An angular member 143 is adjustably secured to base plate 127 by means of screws (not shown) passing through an adjusting slot 144 and the member 143 limits the upward travel of piston rod 132 and thereby of slider 136 in the upward direction.

The straightening device 124 also comprises a still further upper retaining strip 145 which extends along the upper edge of belt 29 facing slider 136. At the inlet end of belt 29, the strip 145 has a slightly divergent end 146. The strip 145 with its end 146 is formed by a horizontal web of a strap 147, whose vertical leg 148 is fastened by screws 149 to the supporting strip 126.

The straightening device operates as follows: When the belts 29 are in stepwise motion, the piston rod 132 with the slider 136 is in its lowest position as shown in FIGS. 1 and 2. When a spring 25 enters at too high a level, its end coil 121 is engaged by the divergent end 146 of strip 145 and pressed downward, so that in the region of the slider 136, the end coils 121 of springs 25 are constantly guided between strips 139 and 145. At the end of a step when belts 29 are at rest in the position shown in FIG. 1, the cylinder 131 pushes piston rod 132 upward, so that the upper edge of slider 136 contacts the joint 72 as shown in FIGS. 3 and 4. As the retaining strip 145 prevents spring 25 from moving upward, the spring is rotated, the stop 143 being positioned so that the upward movement of the slider ceases when the joint reaches the position at 72', namely the centerline 123. At this point, the cylinder 131 pulls slider 136 downward into the position in FIGS. 1 and 2, so that the next step of advance of belts 29 can begin. It is preferred that a straightening device 124 can be attached to each of the belts 29, the two devices being arranged symmetrically on a yoke 234 as shown in FIG. 5 and operated synchronously by a common pneumatic cylinder 231 connected to yoke 234, so as

to bear directly on joints 72 of both end coils 121. In practice, however, it is sufficient in certain circumstances to employ a single straightening device for rotating the spring as a unit so that both joints at the end coils assume the proper position.

As known, it is advantageous if at least one spring of the series of springs is to be inserted into the spring-suspension machine at any particular time is turned around a vertical axis by 180°before being inserted between belts 29. It is obvious that with such springs, the joint assumes the position at 72_1 in FIG. 1, and upon upward movement of slider 136 such joint will also be brought to the centerline 123, that is to the position at $72_1'$.

The straightening device 124 operates with extraordinary precision in practice, so that the troubles mentioned earlier in the application are entirely eliminated. At the same time, the spring producing apparatus is naturally so adjusted that the joints of the end coils are always slightly beneath the centerlines 123 of belts 29 after insertion of the springs therebetween.

What is claimed is:

1. In a device for conveying helical, wire springs stepwise in succession in a row from a spring manufacturing apparatus to a machine for producing spring suspensions and wherein each spring has an end coil with a connection joint thereat, an improvement comprising an alignment device displaceable from a retracted position out of the path of travel of the springs to an extended position in which the alignment device engages the joint of a spring to rotate the spring and position the joint in a predetermined position, wherein the springs are advanced between two parallel belts, said alignment device being associated with one belt and including a reciprocal slider movable between the retracted and extended positions, and a fixed strip opposite said slider for engaging the end coil of the spring to prevent displacement thereof in the direction of travel of the slider from the retracted to the extended position.

2. A device as claimed in claim 1 comprising means limiting travel of said slider so that the predetermined position to which the joint is displaced is the centerline of said one belt.

3. A device as claimed in claim 2 wherein said alignment device further comprises piston and cylinder means coupled to said slider for moving the same, said means which limits travel of the slider comprising stop means engageable with said piston and cylinder means.

4. A device as claimed in claim 3 wherein said stop means is adjustable to regulate the stroke of the slider.

5. A device as claimed in claim 4 wherein said alignment device further comprises guide means engaging said slider to guide the travel thereof, between the retracted and extended positions.

6. A device as claimed in claim 5 wherein said piston and cylinder means comprises a pneumatic cylinder.

7. A device as claimed in claim 5 wherein said slider has an edge facing said fixed strip which is substantially parallel thereto.

8. A device as claimed in claim 1 wherein said fixed strip has an end ahead of said slider for passage of said springs towards said slider, said end of said strip being divergent.

9. A device as claimed in claim 1 wherein said device comprises a fixed support member along which each said belt travels, said alignment device being secured as an assembly associated with said one belt.

10. A device as claimed in claim 1 comprising a second alignment device associated with the other belt, and means coupled to both alignment devices to move the same in synchronism.

11. A device as claimed in claim 10 wherein said means coupled to both alignment devices comprises a common drive means for both said alignment devices.

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