Dec. 7, 1954 J. L. KANE 2,696,226

SPRING ASSEMBLING MACHINE

Filed June 27, 1951 6 Sheets-Sheet 1

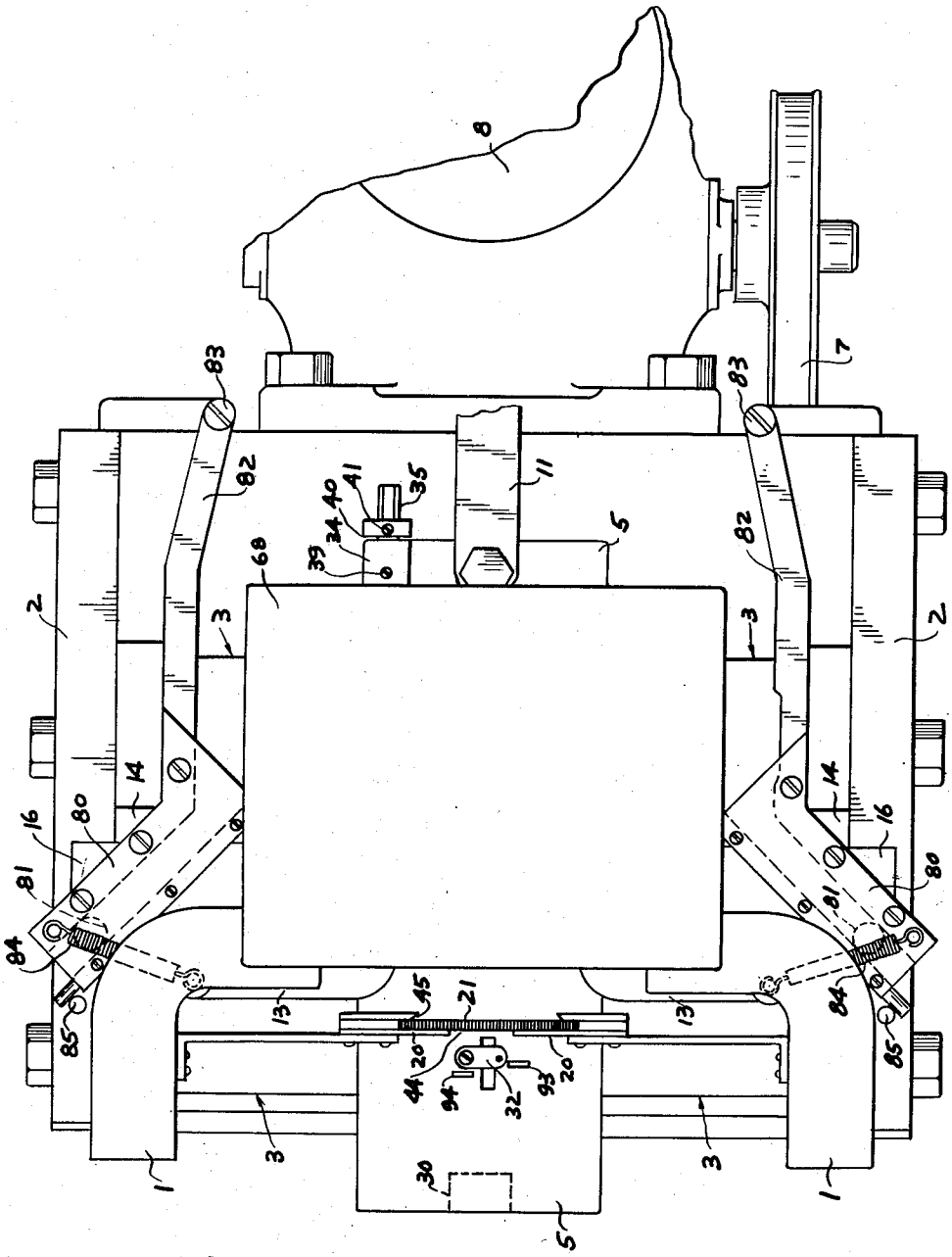


FIG. 1

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SPRING ASSEMBLING MACHINE

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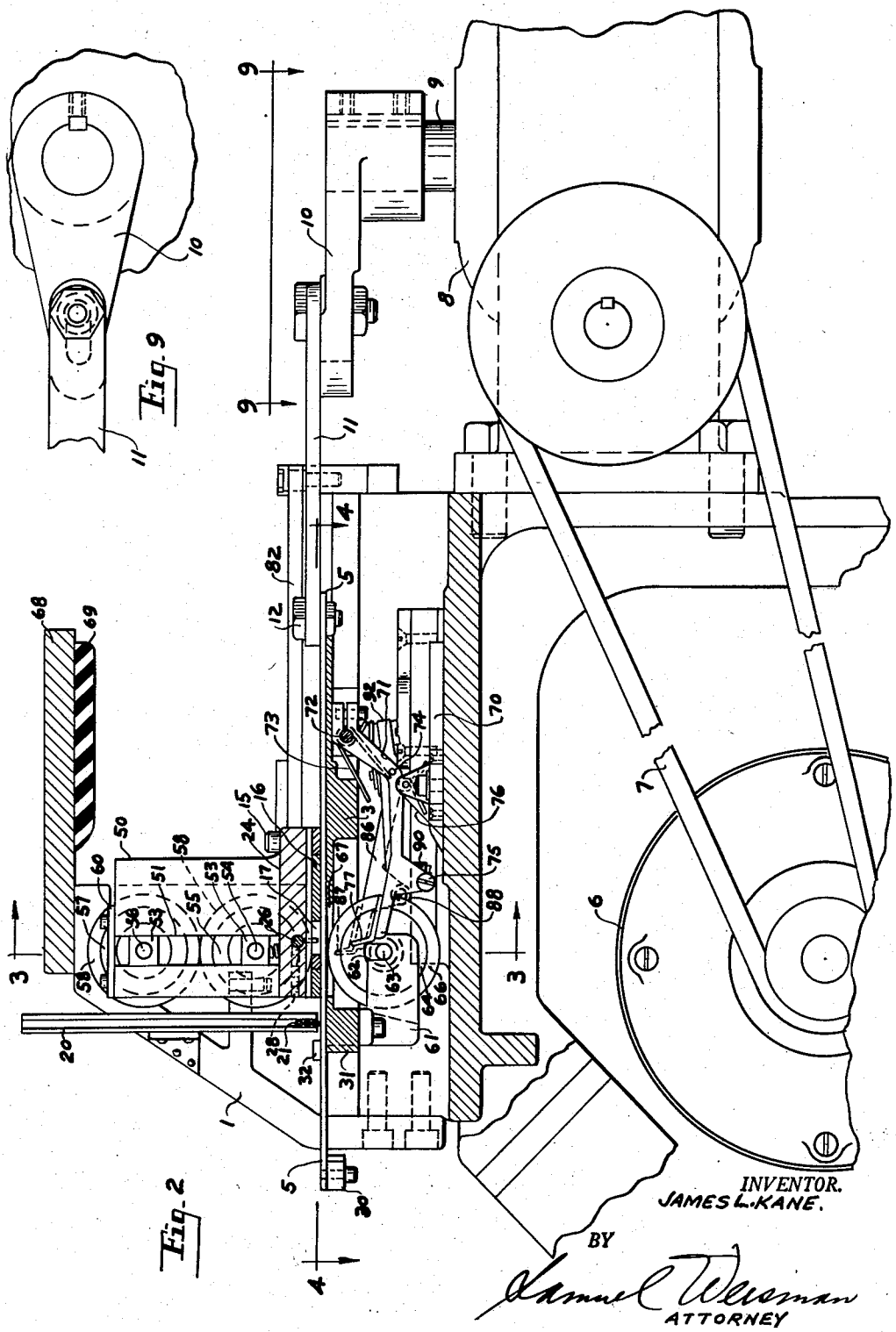


Fig. 9

Fig. 2

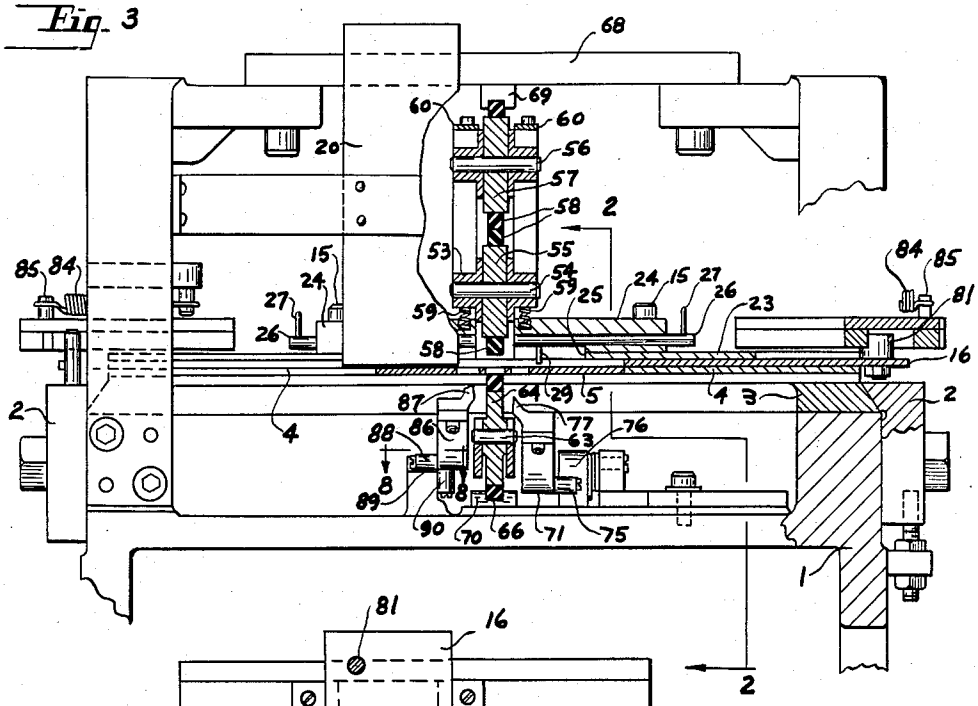
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SPRING ASSEMBLING MACHINE

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Fig. 3



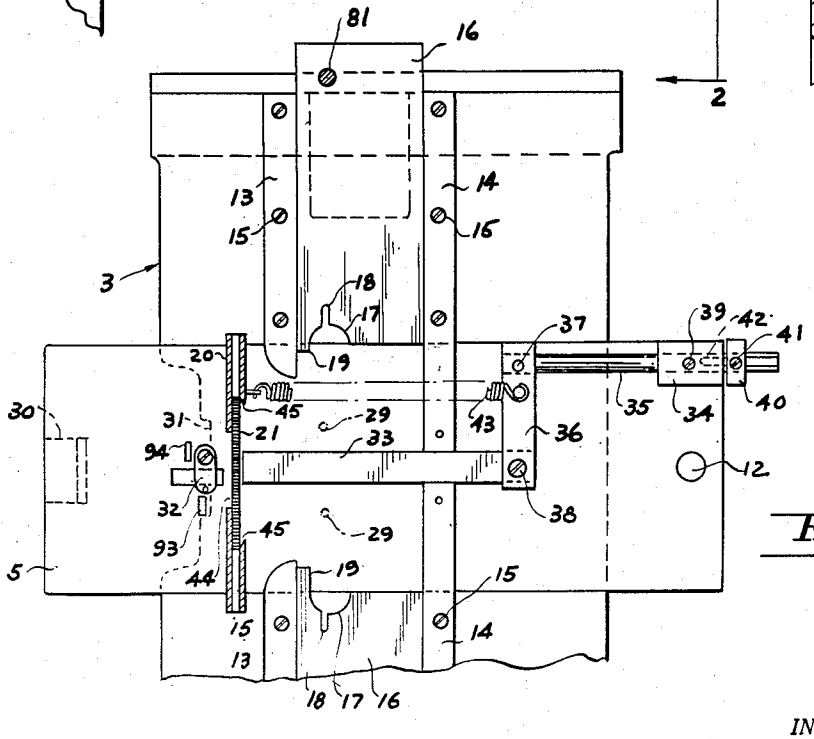


Fig. 4

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SPRING ASSEMBLING MACHINE

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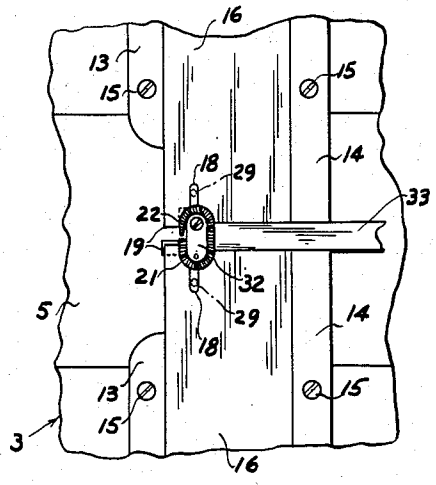


Fig. 6

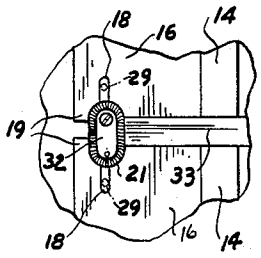


Fig. 7

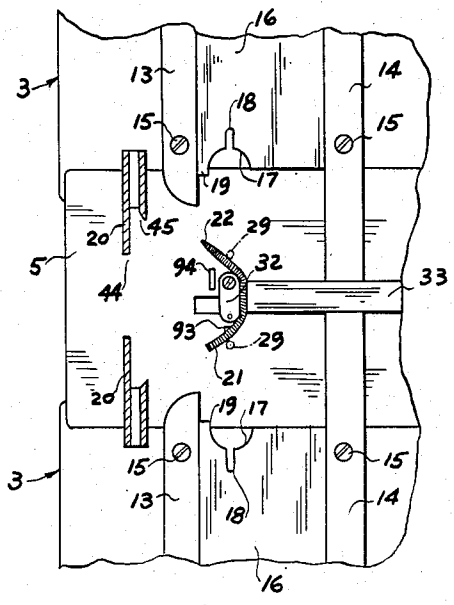


Fig. 5

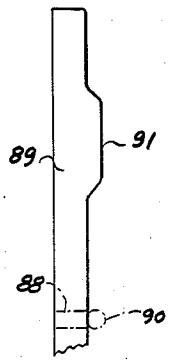


Fig. 8

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SPRING ASSEMBLING MACHINE

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Fig. 10

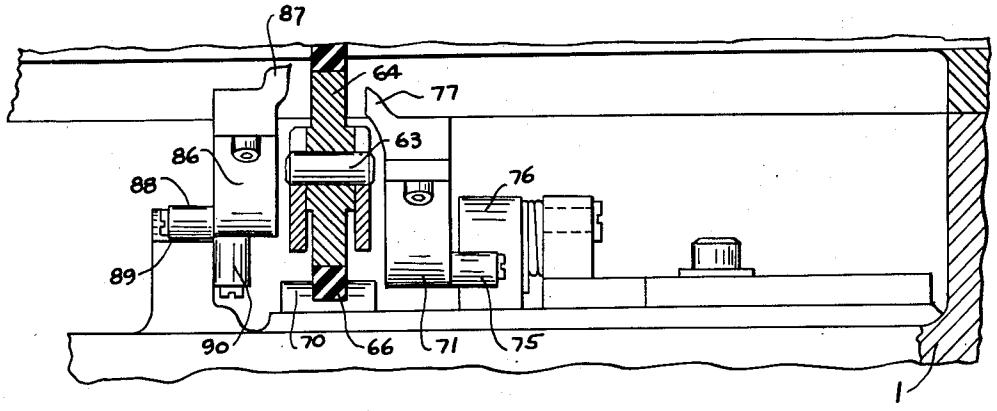
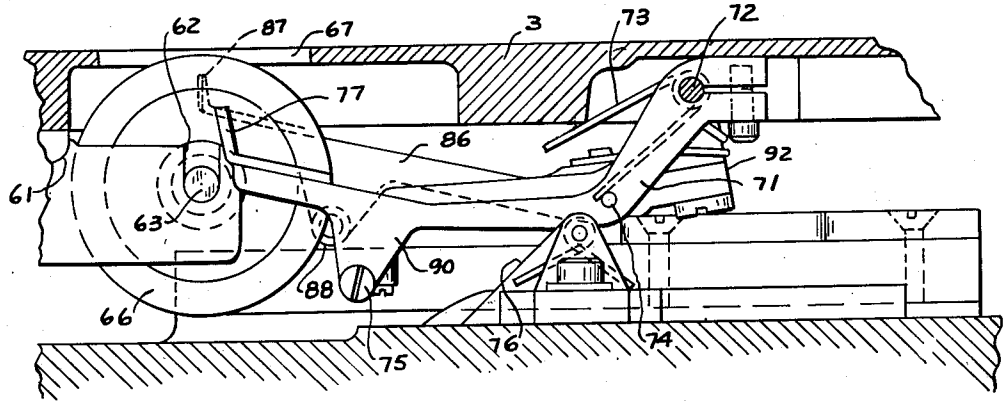


Fig. 11



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SPRING ASSEMBLING MACHINE

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Fig. 12

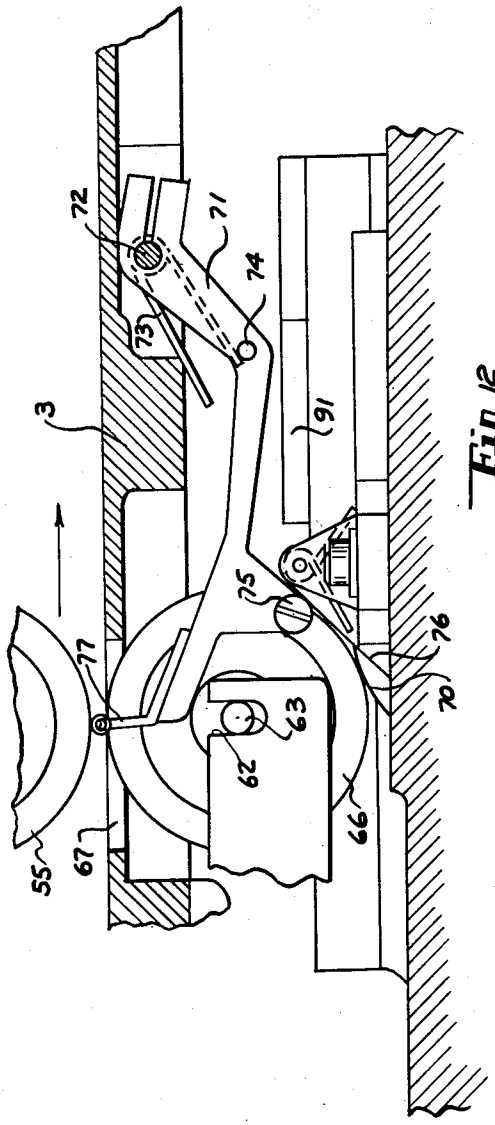
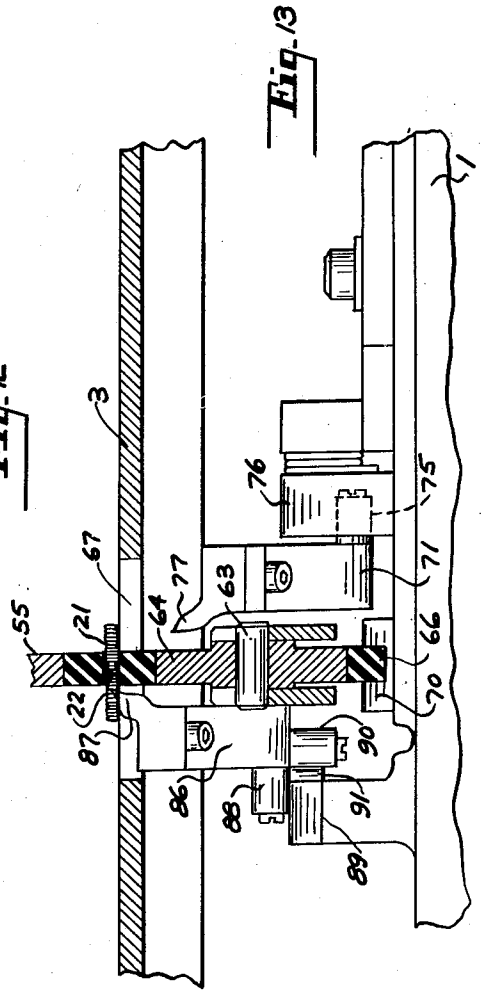


Fig. 13



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United States Patent Office

2,696,226

Patented Dec. 7, 1954

2,696,226

SPRING ASSEMBLING MACHINE

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Application June 27, 1951, Serial No. 233,899

11 Claims. (Cl. 140—88)

The present invention pertains to a novel machine for assembling O-springs by screwing one end onto the other end which is of reduced dimensions. This operation is frequently performed manually.

The principal object of the invention is to provide a machine that brings the ends of the spring opposite each other but spaced apart to introduce a portion therein, brings the ends into engagement with each other, and finally releases the twisting force so that one end screws on the other.

In the accomplishment of this object, the machine includes a sliding carriage and a slide mounted on the carriage in such a manner that the slide, being actuated by suitable mechanism, first takes a free movement and then engages and drives the carriage. The springs are delivered singly to the slide from a suitable chute or hopper, or may be applied manually. A member on the slide moves a spring against a pair of spaced pins extending from the carriage structure. The spring is preferably slightly bowed in this position.

The carriage supports a pair of opposed jaws slidable in the transverse direction or in alinement with the pins. The jaws are actuated when the carriage begins to move and are shaped to bend the spring around the member and bring the ends opposite each other in spaced relation. At this time a pair of rollers engage the spring to twist it while one end becomes anchored so that the spring will not merely roll. Another mechanism now comes into action to bring one end against the other. When the twisting force is released, the torsion introduced in the spring causes the ends to screw together.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings in which:

Figure 1 is a plan view of the machine, with parts removed;

Figure 2 is a longitudinal section;

Figure 3 is a section on the line 3—3 of Figure 2;

Figure 4 is a plan section on the line 4—4 of Figure 3;

Figures 5, 6 and 7 are detail plan sections showing successive stages in the operation of the machine;

Figure 8 is a section on the line 8—8 of Figure 3;

Figure 9 is a plan section on the line 9—9 of Figure 2;

Figure 10 is an enlarged detail of Figure 2;

Figure 11 is an enlarged detail of Figure 3;

Figure 12 is a detail of the same figure as Figure 11, showing an advanced position of the parts, and

Figure 13 is a detail of the same figure as Figure 10, showing a still further advanced position of the parts.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

The parts of the fixed frame structure are designated throughout by the numeral 1. To the longitudinal sides of the frame are secured ways 2 for a carriage 3 mounted on the table portion of the frame 1. A pair of spaced strips 4 is mounted lengthwise on the carriage and between them is positioned a slide 5. A motor 6 attached to the frame is connected by a belt 7 to a reducer 8 having a vertical shaft 9. A crank 10 on the shaft 9 is joined by a link 11 to one end of the slide 5 at a pivot 12 for reciprocating the slide as will presently appear.

Guide strips 13 and 14 are mounted in transverse and spaced relation on the carriage 3 and are secured by screws 15. A pair of jaws 16 are mounted between the guides and are adapted to move toward the longitudinal center of the slide 5 for a purpose that will presently appear. The inner end of each jaw is formed with a substantially semi-circular recess or face 17 from which a slot 18 extends outwardly. At corresponding edges of the faces 17 the jaws are formed with inwardly extending fingers 19.

At the rear end of the machine a vertical chute 20 is secured to the frame structure and is shaped to hold a tier of straight coil springs 21 lying transversely of the machine. These springs are tightly coiled and elongated to be assembled in circular form as O-springs by the operation of the machine. The springs are tubular, and one end is tapered at 22 to be screwed into the opposite end, whereby the O-shape is maintained.

A wear plate 23 is laid upon the jaws 16, and upon this plate is mounted a block 24. Both the wear plate and the block are secured to the carriage 3, and the previously mentioned screws 15 may be used for this purpose. A recess 25 is cut in the wear plate and in the lower surface of the block and extends both lengthwise and transversely at the longitudinal center of the slide 5. The width of the recess is substantially equal to the spacing between the jaws 16 as shown in Figure 3.

Two rods or shafts 26 are mounted in the block 24 and are alined transversely of the machine and spaced apart at their inner ends. A finger 27 is provided on the outer end of each shaft for adjusting it lengthwise, and the adjustment is maintained by a set screw 28 for each shaft. The inner end of each shaft carries a pin 29 extending downwardly into the recess 25 without engaging the slide 5. The pins are alined with the slots 18 for a purpose that will presently appear.

At the rear edge of the slide 5 is secured a pusher block 30 extending downwardly and positioned rearwardly of this edge. In the retracted position of the slide, the pusher is spaced a substantial distance from the center 31 of the rear edge of the carriage 3. Thus, in the initial forward movement of the slide, the carriage does not move until engaged by the pusher 30.

Across the longitudinal center of the slide is secured a clamp member 32 which lies directly over the edge 31 when the slide is fully retracted. At this time the member 32 lies somewhat rearward of the chute 20.

The complementary clamp member is a longitudinal strip 33 mounted freely on the slide 5 and guided between the forward alined guides 14. A boss 34 (Figure 4) at one of the forward corners of the slide receives a rod 35 extending rearwardly and joined to the forward end of the strip 33 by a link 36 attached to the respective parts by pivot pins 37 and 38. A set screw 39 in the boss 34 secures the adjustment of the rod 35. The rod is further secured against undesired inward movement by a nut 40 on its outer end secured by a set screw 41 received in a slot 42 in the rod. A coil spring 43 joins the link 36 to a fixed part of the structure, such as the chute 20, to bias the strip 33 in the rearward direction.

On the initial forward movement of the slide 5, before the edge 31 is engaged, the member 32 clamps the bottom spring 21 against the member 33 and pulls it out of the chute while pushing the strip forward against the tension of the spring 43. The bottom of the chute is relieved at 44, 45 to permit removal of the bottom spring.

The distance from the pusher 30 to the edge 31 is somewhat greater than the distance from the chute 20 to the pins 29 in the fully retracted position of the slide.

Thus, when the pusher 30 engages the edge 31 and the carriage begins to move in the ways 2, the bottom spring has been moved to a bowed position between the pins 29 as shown in Figure 5. At this time, the slide 5 and carriage 3 and parts carried thereby begin to move forwardly as a unit.

On the carriage 3 or block 24 is mounted a pair of vertical bearing plates 50 spaced transversely across the longitudinal center line of the machine. The plates are slotted vertically at 51 to receive upper and lower bearing blocks 53 slidable therein. The lower blocks carry a shaft 54 with a wheel 55 thereon, and the upper blocks similarly carry a shaft 56 with a wheel 57 thereon tangent to the wheel 55. The wheels are preferably fitted with suitable friction tires 58. An upward pressure is exerted

on the lower bearings 53 by coil springs 59 (Figure 3) seated in the block 24, and the upper ends of the slots 51 are closed by plates 60.

A pair of lugs 61 (Figure 2) at the bottom of the carriage 3 are slotted at 62 from their upper edges to receive another shaft 63 which carries a similar wheel 64 directly below the wheel 55. The tire 66 of the wheel is exposed in a slot 67 in the surface of the carriage.

An overhead portion 68 of the fixed frame structure carries a pad 69 engageable by the upper roller 57 after the carriage has moved forward some distance. The frame 1 also carries a similar pad 70 directly below the pad 69 and engageable by the bottom wheel 64. The effect of the pads is to move the roller 64 upward against the lower roller 55 through the slot 67 and recess 25. It will be seen by examination of the drawings (Figure 3) that the several rollers are somewhat to one side of the center line between the pins 29. The two lower rollers come together against the spring bowed between the pins 29 and, turning in the same direction tend to twist the spring on its axis in the uncoiling direction. In order that the spring will not merely roll, it is held fast at one point by means that will now be described.

A lever 71 (Figure 2) has its forward end pivotally mounted on a horizontal axle 72 below the surface of the carriage 3. A hair pin spring 73 coiled on the axle bears against the carriage and downwardly against a pin 74 on the lever to hold the lever downward. The lever carries a horizontal roller 75 which rides up on a cam 76 as the carriage advances. The rear end of the lever is pointed upward and sharpened at 77 so that it wedges into the spring (Figure 12) and holds the spring fast at that point to permit the previously described twisting of the spring. The twisting occurs preferably nearer the unpointed end of the spring as a result of the off-center position of the pressure rollers.

At the outer ends of the jaws 16 are cam tracks 80 attached to the frame structure. The tracks converge in the forward direction and receive rollers 81 mounted on the jaws. The cam tracks are carried by levers 82 pivotally attached to the frame at 83 and are drawn inward by coil springs 84 against stop pins 85. As the carriage 3 advances, the cam tracks bring the jaws 16 toward the pins 29 and against the bowed spring. The non-rigid mounting of the cam tracks prevents breakage of machine parts in case of jamming of springs at the pins 29.

The faces 17 of the jaws receive and bend the ends of the bowed spring, the movement being completed by the accommodation of the pins 29 in the slots 18. Such bending of the spring, emphasized by the projected fingers 19 (Figure 6), brings the ends of the bowed spring opposite and in alinement with each other, so that one may be screwed into the other.

The jaws 16, rollers 57, 55 and 64, and the plates 24 move with the carriage 3. The pins 29 move with the plates 24 and therefore with the carriage. The spring 21 is clamped (Figure 5) at the pins 29 which are at the contacting area of the rollers 55 and 64. Therefore the rollers hold the spring from untwisting during operation of the bending and closing jaws 16.

The assembling of the O-spring is completed by advancing the unsecured end into the secured end and reversing the twisting force so that the latter end, by untwisting, will screw itself on the unsecured end. For these operations another lever 86 is mounted on the axle 72 and also has an upwardly pointed rear end 87 (Figure 3) to engage the spring. This lever carries a horizontal roller 88 engaging the arched upper surface 89 of a compound cam to project the point 87 into the spring as the rollers continue their movement to the right in Figure 12 to the position shown in Figure 13. A vertical roller 90 on the lever 86 then engages a laterally projecting surface 91 of the compound cam to move the corresponding end of the spring toward the other end. The lever 86 has a swivel mounting 92 on the axle 72 to permit the lateral movement. Meanwhile the roller 75 rides off the cam 76, withdrawing the point 77 which, by its wedge shape, has retracted the adjacent end of the spring to prevent overlapping of the ends. The wedging action is now obviously removed.

On the return movement of the carriage, the spring is twisted in the reverse direction. Thus the turning, unpointed end of the spring is screwed on the other end, and the point 87 is finally withdrawn by the reverse action of the compound cam.

Any suitable means may be provided for unloading the assembled spring. For example, the machine may be mounted so that its table surface slopes downwardly to the rear at a substantial angle. A fixed wedge may lie directly over the table surface and behind the assembled spring to be engaged by the spring and lifted off the member 52 on the reverse movement of the slide. The slope of the slide then causes the spring to slip downward into a receptacle.

Although a specific embodiment of the invention has been illustrated and described, it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention as indicated by the appended claims.

What I claim is:

1. A spring assembling machine comprising a frame, a carriage slidably mounted thereon, a slide on said carriage and slidable in the same direction, means for reciprocating said slide, a pusher on said slide and engageable with a spaced portion of said carriage, whereby said slide has an initial movement independent of said carriage and subsequent movement with said carriage, a clamping member on said slide, said slide being adapted to receive springs in front of a chute secured to said frame and positioned to deliver coil springs to said slide in front of said member in the retracted position of the slide, a pair of spaced pins extending from said carriage and straddling the path of the first member, the distance from said pusher to said portion being at least as great as the distance from the first member to said pins in the retracted position of said slide, whereby a spring advanced by the first member is brought against said pins, a pair of jaws slidable transversely on said carriage transversely adjacent to said pins and having faces shaped to bend said spring around the first member with the ends of the spring opposite each other, means for sliding said jaws by movement of said carriage, means operable by movement of said carriage for engaging and twisting a spring held against said pins, anchoring means movable through said slide and operable by movement of said carriage for securing an end of the spring while being twisted, another means movable through said slide and operable by movement of said carriage for moving the other end of the spring toward the first end, whereby said ends screw together on reversal of said twisting means.

2. A spring assembling machine comprising a frame, a carriage slidably mounted thereon, a slide on said carriage and slidable in the same direction, means for reciprocating said slide, a pusher on said slide and engageable with a spaced portion of said carriage, whereby said slide has an initial movement independent of said carriage and subsequent movement with said carriage, a clamping member on said slide, said slide being adapted to receive springs in front of a chute secured to said frame and positioned to deliver coil springs to said slide in front of said member in the retracted position of the slide, a pair of spaced pins extending from said carriage and straddling the path of the first member, the distance from said pusher to said portion being at least as great as the distance from the first member to said pins in the retracted position of said slide, whereby a spring advanced by the first member is brought against said pins, a pair of jaws slidable transversely on said carriage transversely adjacent to said pins and having faces shaped to bend said spring around the first member with the ends of the spring opposite each other, means for sliding said jaws by movement of said carriage, rollers on said carriage above and below said slide, the lower roller projecting through said slide at said first member, whereby to engage and twist a spring held against said pins, anchoring means movable through said slide and operable by movement of said carriage for securing an end of the spring while being twisted, another means movable through said slide and operable by movement of said carriage for moving the other end of the spring toward the first end, whereby said ends screw together on reversal of said rollers.

3. A spring assembling machine comprising a frame, a carriage slidably mounted thereon, a slide on said carriage and slidable in the same direction, means for reciprocating said slide, a pusher on said slide and engageable with a spaced portion of said carriage, whereby said slide has an initial movement independent of said carriage and subsequent movement with said carriage, a clamping member on said slide, said slide being adapted to receive springs in front of a chute secured to said

frame and positioned to deliver coil springs to said slide in front of said member in the retracted position of the slide, a pair of spaced pins extending from said carriage and straddling the path of the first member, the distance from said pusher to said portion being at least as great as the distance from the first member to said pins in the retracted position of said slide, whereby a spring advanced by the first member is brought against said pins, a pair of jaws slidable transversely on said carriage transversely adjacent to said pins and having faces shaped to bend said spring around the first member with the ends of the spring opposite each other, means operable by movement of said carriage for sliding said jaws by movement of said carriage, means for engaging and twisting a spring held against said pins, a prong pivotally mounted on said carriage and movable through said slide for securing an end of the spring while being twisted, means for projecting said prongs through said slide by advance movement of said carriage, another means movable through said slide and operable by movement of said carriage for moving the other end of the spring toward the first end, whereby said ends screw together on reversal of said twisting means.

4. A spring assembling machine comprising a frame, a carriage slidably mounted thereon, a slide on said carriage and slidable in the same direction, means for reciprocating said slide, a pusher on said slide and engageable with a spaced portion of said carriage, whereby said slide has an initial movement independent of said carriage and subsequent movement with said carriage, a clamping member on said slide, said slide being adapted to receive springs in front of a chute secured to said frame and positioned to deliver coil springs to said slide in front of said member in the retracted position of the slide, a pair of spaced pins extending from said carriage and straddling the path of the first member, the distance from said pusher to said portion being at least as great as the distance from the first member to said pins in the retracted position of said slide, whereby a spring advanced by the first member is brought against said pins, a pair of jaws slidable transversely on said carriage transversely adjacent to said pins and having faces shaped to bend said spring around the first member with the ends of the spring opposite each other, means for sliding said jaws by movement of said carriage, means operable by movement of said carriage for engaging and twisting a spring held against said pins, a prong pivotally mounted on said carriage and movable through said slide for securing an end of the spring while being twisted, means for projecting said prongs through said slide by advance movement of said carriage, another prong having a swivel mounting on said cariage and movable through said slide for engaging the spring and movable toward the other end of the spring, and means operable by movement of said carriage for projecting the second prong through said slide and moving it toward the first end of the spring on movement of said carriage, whereby said ends screw together on reversal of said twisting means.

5. A machine as defined in claim 2, further characterized by means for applying pressure on said rollers toward each other on advance movement of said carriage and for relieving pressure on the retracting movement.

6. A machine as defined in claim 1, wherein the means for sliding said jaws is a pair of cam tracks on said frame converging in the advancing direction of said carriage and receiving parts of said jaws.

7. A machine as defined in claim 1, wherein the means for sliding said jaws is a pair of cam tracks yieldably mounted on said frame converging in the advancing direction of said carriage and receiving parts of said jaws.

8. A machine as defined in claim 1, wherein said jaws have slots extending from said faces in the transverse direction and alined with said pins to receive them on the approaching movement of the jaws.

9. A spring assembling machine comprising a frame, a carriage slidably mounted thereon, a slide on said carriage and slidable in the same direction, means for reciprocating said slide, a pusher on said slide and engageable with a spaced portion of said carriage, whereby said slide has an initial movement independent of said carriage and subsequent movement with said carriage, a clamping member on said slide, said slide being adapted to receive springs in front of a chute secured to said frame and positioned to deliver coil springs to said slide in front of said member in the retracted position of the slide, a complementary clamping member yieldably mounted in front of the first member, a pair of spaced pins extending from said carriage and straddling the path of the first member, the distance from said pusher to said portion being at least as great as the distance from the first member to said pins in the retracted position of said slide, whereby a spring advanced by the first member is brought against said pins, a pair of jaws slidable transversely on said carriage transversely adjacent to said pins and having faces shaped to bend said spring around the first member with the ends of the spring opposite each other, means for sliding said jaws by movement of said carriage, means operable by movement of said carriage for engaging and twisting a spring held against said pins, anchoring means movable through said slide and operable by movement of said carriage for securing an end of the spring while being twisted, another means movable through said slide and operable by movement of said carriage for moving the other end of the spring toward the first end, whereby said ends screw together on reversal of said twisting means.

10. A spring assembling machine comprising a supporting surface, a pair of spaced pins adjacent thereto, means for advancing a coil spring into contact with said pins and for exerting pressure on the springs, between said pins, for a preliminary bending of the spring between the pins, a carriage slidable on said surface on engagement by said slide, means operable by movement of said carriage for bending the ends of the spring toward each other, means operable by said carriage for securing one end of the spring, means operable by said carriage for twisting the other end of the spring, and means operable by movement of said carriage for bringing one end into engagement with the other, whereby said ends are screwed together on reversal of said twisting means.

11. A spring assembling machine as set forth in claim 10, wherein said bending means comprises a pair of opposed jaws alined with said pins and with each other and movable toward the respective pins by movement of said carriage.

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