MACHINE FOR PRODUCING COIL SPRINGS

Inventor: Joachim Huhnen, Blankensteinstr. 24, D-7141 Steinheim, Germany

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ABSTRACT

Winding machine for producing coil springs, with at least one pair of rollers for feeding spring wire and with winding pins for the guiding and plastic deformation of the spring wire which is fed by the pair of rollers. The pair of rollers non-rotatably clamp the spring wire for twisting purposes, and are arranged for rotation about the axis of the associated portion of wire; for this purpose, the rollers may be mounted for rotation within a driven drum. An overhead reel assembly is adapted to feed spring wire into the rollers, and has facilities for paying out the wire from a coiled bundle. The reel assembly, which is located a relatively large distance from the winding machine, imparts a suitable pre-twist to the portion of the wire between the reel assembly and the winding machine to prevent excessive plastic deformation of the wire.

9 Claims, 2 Drawing Figures
MACHINE FOR PRODUCING COIL SPRINGS

The invention relates to a winding machine for producing coil springs, with at least one pair of rollers for feeding the spring wire and with winding pins for the guiding and plastic deformation of the on-running spring wire pushed forwards by the pair of rollers.

Apart from winding machines of this type, winding machines are known which have a winding mandrel for drawing in the spring wire and which allow the manufacturer to draw springs with a considerable inwound initial tension, but also of compression springs with equally good properties. In that, by means of a twisting apparatus, they twist the spring wire prior to winding it, up to the plasticity limit so that the torsion additionally occurring in the wire during winding results in its plastic deformation.

However, no successful attempts are known which would have indicated the application of this principle to winding machines of the type mentioned at the outset.

The invention is therefore based on the problem of providing a winding machine which permits of twisting of the spring wire. In the case of a winding machine of the type mentioned at the outset, this problem is resolved according to the invention in that the pair or rollers clamps the spring wire in non-rotatable manner for twisting purposes and can be rotated about the axis of the portion of wire which is located in the region of the pair of rollers.

As the example of embodiment shows, this solution can be relatively simply implemented, so that there is now also a possibility of producing by winding coil springs with improved properties by twisting and subsequent plastic deformation of the spring wire.

Additionally, it may be desirable to impart a suitable pre-twist to the portion of the spring wire between an associated pay-out reel and the winding machine to prevent premature plastic deformation of the incoming wire. For this purpose, the reel assembly may have facilities similar to those described, e.g., in U.S. Pat. No. 3,807,211, issued to J. Huhn on Apr. 30, 1974. Such facilities are preferably located at a relatively large distance from the winding machine.

The invention will be explained in greater detail hereinafter with reference to an example of embodiment of the winding machine according to the invention, which is illustrated in the attached drawings, in which:

FIG. 1 is a longitudinal section through a winding machine constructed in accordance with the invention, without a reel, with part broken away; and

FIG. 2 is a diagrammatic side elevation of an overhead reel assembly which may be associated with the arrangement of FIG. 1.

FIG. 1 shows how even otherwise conventional feed rollers 100 for a spring wire 29 are mounted to rotate in a twisting drum 107. The rollers are disposed in pairs and are coupled to one another by a connecting gear 104 so that the rotary speeds coincide. The rollers 100 are driven through two bevel gears 101, one of which is mounted on the shaft of one of the rollers 100 while the other is located at one end of a hollow shaft 108 which receives the wire 29 and which is mounted by means of ball bearings 109 at one end in an end flange 160 of the twisting drum 107 and at the other is rotatably mounted on a frame 161; the hollow shaft 108 also carries a driving gearwheel 102. The twisting drum 107 is driven through a gearwheel 103 which is constructed on the end flange 160. The ratio of rotary speeds of the gearwheels 102 and 103 determines the ratio between the speed and twisting of the wire 29. The wire 29 which is fed by the feed rollers 100 and which is simultaneously twisted is pushed by wire guides 105 disposed inside and outside the twisting drum 107 against winding pins 106 and is consequently bent to form spring coils.

So that this winding machine can process not only straight pieces of wire and so that the twisting of the wire 29 does not create any excessive plastic deformation due to twisting in the portion of wire which has not yet been coiled into a spring. FIG. 2 shows, located at the greatest possible distance from the twisting apparatus in FIG. 1, a so-called overhead reel 46, with a bundle of wire 47 resting on a reel flange 48 and being held by fingers 49. The reel flange 48 is driven by a geared motor 50 and also has an imbalance compensating device 51 for constant equalisation of the imbalance of the reel flange which varies as the wire 29 is unwound from the bundle. The reel flange 48 rotates on a displaceable sub-frame 52 which is attached to the floor on a pin 55 by means of a telescopic spring arm 53 which is laterally braced by a spring 54. This horizontal, elastic mounting can also be achieved by other means, e.g. by means of two elastic links disposed at 90°. Projecting over the reel flange 48 and provided with a captor ring 57 is a jib arm 56 which is provided at its free end with a further twisting device which has two loose guide rollers 58 which are rotatably clamp the spring wire 29 and which are rotatable, by means of a twisting drum 59 which mounts the guide rollers 58, about the axis of the portion of wire located in the region of the drum 59, which can be driven by an electric motor 16.

The part of the machine shown in FIG. 2, in order to avoid an inelastic torsion deformation of the portion of wire fed to the twisting apparatus in FIG. 1, operates in the following manner:

If the rear flange 48 were stationary, then when one turn were withdrawn from the bundle of wire 47, natural twisting would produce one complete rotation of the wire about its longitudinal axis. The reel flange 48 is then continuously rotated at such a speed and direction of rotation that it supplies not only the quantity of wire which is to be fed to the winding pins 106, but also imparts to the wire an additional twist which is to be added to the natural twist. The total twist resulting from these added effects conforms exactly, in degree and direction of rotation, to the twist produced during winding of a spring by the actual twisting apparatus, shown in FIG. 1. Any difference in the twisting speed which may exist is determined by the number of rotations of the twisting drum 107, which this drum 107 would perform during the stoppage time required for cutting off wire 29, that is if it were to continue running. This difference in number of rotations ensures that the further rotation of the reel flange 48 occurring during stoppage of the twisting drum 107 results in a complete relaxation of the spring wire 29. The twisting drum 59 at the reel 46 is likewise continuously rotated, the speed and direction of rotation being so selected that it accurately follows the total twist of spring wire 29 created by the reel flange 48, so that the portion of wire between the reel flange and the twisting drum 59 is free from elastic torsion stresses, so as to prevent the
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loop of wire formed by the portion tilting over and necessitating an interruption in production.

Nevertheless, it is not necessary, apart from one rotating reel flange, to provide a second twisting apparatus according to FIG. 2 and a considerable length of wire between the bundle of wire and the twisting apparatus shown in FIG. 1, if times during which the twisting apparatus in FIG. 1 is stopped for cutting off a completed coil spring are avoided. This can be achieved simply by using a flying cutter, so that a continuous production process is possible. Also in this case the total twist created by the reel coincides with the twist created by the twisting apparatus according to FIG. 1, which follows it exactly and which does not therefore give rise to any further torsion, so that the portion of wire between the reel and the twisting apparatus according to FIG. 1 does indeed rotate about its longitudinal axis, but is not subjected to torsion. The effective twisting of the spring wire thus takes place only in the portion between the twisting apparatus according to FIG. 1 and the winding pins.

Although the invention is illustrated and described with reference to one preferred embodiment thereof, it is to be expressly understood that it is in no way limited to the disclosure of such a preferred embodiment, but is capable of numerous modifications within the scope of the appended claims.

I claim:

1. Winding machine for producing coil springs from spring wire, comprising at least one winding pin for guiding and plastically deforming the on-running spring wire, at least a first pair of rollers for pushing forward the spring wire in a straight line to the said winding pin, said first pair of rollers clamping the spring wire for twisting purposes thereby lockingly holding it against rotation relative to the pair of rollers, and means for rotating the first pair of rollers about the axis of the portion of wire located in the region of said first pair of rollers.

2. Winding machine according to claim 1, wherein the first pair of rollers are mounted on a driven drum which is rotatable about the axis of the portion of wire located in the region of the first pair of rollers.

3. Winding machine according to claim 2, wherein the drum is freely rotatably mounted on a hollow shaft receiving the spring wire and comprising a first bevel gear mounted on the hollow shaft, the first bevel gear meshing with a second bevel gear affixed to the shaft of one of the rollers.

4. Winding machine according to claim 3, wherein the drum has an end flange which is constructed as a gear wheel.

5. Winding machine according to claim 1 comprising a reel carrying a bundle of wire from which the spring wire is fed, the reel being constructed as an overhead reel, and comprising a second pair of loose guide rollers located on the overhead reel and clamping the spring wire, thereby lockingly holding it against rotation relative to the two loose guide rollers.

6. Winding machine according to claim 5, wherein the second pair of rollers are jointly rotatable about the axis of the portion of wire which is located in the region of them.

7. Winding machine according to claim 5, wherein the overhead reel is drivable and is mounted to rotate about the axis of the bundle of wire.

8. Winding machine according to claim 5, comprising an arrangement for the equalization of the imbalance of the reel which, normally occurs as the wire is unwound from the bundle.

9. Winding machine according to claim 5, wherein the portion of wire between the second pair of rollers and the bundle of wire is maintained free from plastic deformation.

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