

PATENT SPECIFICATION (11)

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(54) DEVICE FOR SHAPING AND TRANSPORTING A COIL

(71) We, YOSHIDA KOGYO K.K., a corporation duly organized under the laws of Japan and existing at No. 1, Kanda Izumicho, Chiyoda-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates generally to apparatus for manufacturing a coil, especially a helically coiled continuous element for a sliding clasp fastener and more particularly to a device for shaping and transporting such fastener elements at a high rate of speed.

As is well known in the art, sliding clasp fastener elements in the form of a helical coil are formed by winding a starting linear filament around a mandrel in a coiling machine and set with heat while the filament is progressively advanced. A prior art device for this operation was provided generally with a pair of spaced, parallel screws rotatable on opposite sides of a mandrel and adapted to shape and advance the filament as the latter is progressively coiled around the mandrel. However, the device has suffered from the drawback that screws of the type described rely for their rotation on a relatively small drive member such for example as gear wheel, spindle and the like, which lacks sufficient mechanical strength to withstand high speed revolution. Another deficiency of this prior art device was that since the screws as well as the mandrel need be long enough to provide sufficient length of time for the heat-setting of fastener elements on these components when operated at high speed, the mandrel becomes susceptible to torsion and is further subjected to severe sliding friction when moving forward the fastener element. Therefore, such prior art device was not suitable for high-speed operation and imposed limitations to the size of the fastener element that can be produced thereby.

According to the invention there is pro-

vided a device for shaping and transporting a coil comprising a support body, a screw rotatably mounted in a first cavity formed in said body, rotating or circulating means having an endlessly toothed periphery and mounted in a second cavity formed in said body and communicating with said first cavity, and a mandrel interposed between said screw and said rotating or circulating means and extending in conformity with the periphery of said rotating or circulating means.

A preferred device embodying the invention includes a rotatable screw and oppositely disposed rotating or circulating means having an endlessly toothed periphery. Continuous convolutions formed helically from a linear filament are shaped between and transported by the rotatable screw and the rotating means. Upon departure or disengagement from the screw, the coiled filament continues to advance in driving engagement with the toothed periphery of the rotating means toward a suitable die wheel whereby it is finally set with heat. This arrangement makes it possible to reduce the length of the screw and at the same time increase its diameter. A mandrel around which the convolutions are continuously formed is arranged between the rotatable screw and the rotating means and has an extension extending along the toothed periphery of the rotating means. The portion of the mandrel which is located adjacent the screw can be also reduced in length and hence the torsion to which it is subjected can be held to an absolute minimum. This makes it possible to reduce the overall size of the mandrel to permit the production at high speed of continuous coiled fastener elements of relatively small size without breaking, deforming or otherwise damaging the mandrel.

The invention will be described by way of examples with reference to the accompanying drawings which illustrate by way of example preferred embodiments and in which like reference numerals or characters refer

to like parts throughout the views, and wherein:

Figure 1 is a longitudinal cross-sectional view of a device provided in accordance with the invention; and

Figure 2 is a longitudinal cross-sectional view of a modification of the device of Figure 1.

Referring now to Figure 1, there is shown a device 10 embodying the invention for shaping and simultaneously transporting a coil type sliding clasp fastener element, which device comprises a support body 11, a rotatable screw 12 having a threaded section 13 housed in a first cavity 14 formed in the body 11 and a blank shaft section 15 journaled for rotation in the body 11, and rotating means 16 rotatable within a second cavity 17 formed in the body 11 and communicating with the first cavity 14. The rotating means 16 is shown in the embodiment of Figure 1 as comprising a feed gear 18 mounted for rotation on a shaft 19 and disposed in opposed relation to the threaded section 13 of the rotatable screw 12. Formed around the periphery of the gear 18 are teeth 20 spaced apart from each other by a distance equal to a pitch between adjacent screw threads 21 of the threaded section 13 of the rotatable screw 12. A mandrel holder 22 in a filament coiling unit (not shown) has connected therewith a mandrel 23 interposed between the threaded section 13 and the gear 18, with its extension 23' disposed in a guide space 24 and curved in conformity with the periphery of the gear 18. Although not shown, there is a reinforcing or filter cord inserted in and throughout the entire length of the mandrel 23 to be transported with the coil element. The filament W is wound around the mandrel 23 by means of a schematically shown rotating member 25 operatively associated with the coiling unit and is thereby formed into continuous convolutions 26 which are introduced from a port 27 in the first cavity 14. Advancement of the convolutions 26 of the filament W is effected as the same is driven in meshing engagement between the threads 21 of the screw 12 and the teeth 20 of the gear 18. The portion of convolutions 26 which has moved past the terminal of the screw threads 21 is caught by the teeth 20 of the feed gear 18 and continues to advance through the guide space 24 into a shaping unit comprising for example a die wheel, not

shown, wherein the coiled fastener element is set with heat. Advantageously, the feed gear 18 being sectionally circular can forward the coiled filament smoothly to a similarly circular die wheel. The convolutions 26 of the filament W may conveniently be heated while travelling along and between the screw threads 21 and the teeth 20 to facilitate final heat setting treatment.

Fig. 2 shows another embodiment of the device 10a wherein a circulating endless belt 28 made of heat-resistant material such as for example an urethane resin and having teeth 29 formed on its outer surface and spaced by a distance equal to a pitch of screw threads 21 of the screw 12 is trained around a sprocket 30 supported for rotation about a shaft 31. This belt-and-sprocket arrangement has a function substantially similar to the feed gear 18 employed in the first embodiment of Figure 1 but advantageously provides more of the guide space 32 so that the convolutions 26 of the filament W can be more effectively set in shape.

WHAT WE CLAIM IS:—

1. A device for shaping and transporting a coil comprising a support body, a screw rotatably mounted in a first cavity formed in said body, rotating or circulating means having an endlessly toothed periphery and mounted in a second cavity formed in said body and communicating with said first cavity, and a mandrel interposed between said screw and said rotating or circulating means and extending in conformity with the periphery of said rotating or circulating means.
2. A device as defined in claim 1 wherein said rotating means comprises a feed gear having peripheral teeth spaced by a distance equal to the pitch of screw threads of said screw.
3. A device as defined in claim 1 wherein said circulating means comprises an endless belt having on its outer surface a succession of teeth spaced by a distance equal to the pitch of screw threads of said screw, and a sprocket adapted to drive said belt.
4. A device substantially as herein described with reference to and as illustrated in Figure 1 or Figure 2 of the accompanying drawings.

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to like parts throughout the views, and wherein:

Figure 1 is a longitudinal cross-sectional view of a device provided in accordance with the invention; and

Figure 2 is a longitudinal cross-sectional view of a modification of the device of Figure 1.

Referring now to Figure 1, there is shown a device 10 embodying the invention for shaping and simultaneously transporting a coil type sliding clasp fastener element, which device comprises a support body 11, a rotatable screw 12 having a threaded section 13 housed in a first cavity 14 formed in the body 11 and a blank shaft section 15 journaled for rotation in the body 11, and rotating means 16 rotatable within a second cavity 17 formed in the body 11 and communicating with the first cavity 14. The rotating means 16 is shown in the embodiment of Figure 1 as comprising a feed gear 18 mounted for rotation on a shaft 19 and disposed in opposed relation to the threaded section 13 of the rotatable screw 12. Formed around the periphery of the gear 18 are teeth 20 spaced apart from each other by a distance equal to a pitch between adjacent screw threads 21 of the threaded section 13 of the rotatable screw 12. A mandrel holder 22 in a filament coiling unit (not shown) has connected therewith a mandrel 23 interposed between the threaded section 13 and the gear 18, with its extension 23¹ disposed in a guide space 24 and curved in conformity with the periphery of the gear 18. Although not shown, there is a reinforcing or filter cord inserted in and throughout the entire length of the mandrel 23 to be transported with the coil element. The filament W is wound around the mandrel 23 by means of a schematically shown rotating member 25 operatively associated with the coiling unit and is thereby formed into continuous convolutions 26 which are introduced from a port 27 in the first cavity 14. Advancement of the convolutions 26 of the filament W is effected as the same is driven in meshing engagement between the threads 21 of the screw 12 and the teeth 20 of the gear 18. The portion of convolutions 26 which has moved past the terminal of the screw threads 21 is caught by the teeth 20 of the feed gear 18 and continues to advance through the guide space 24 into a shaping unit comprising for example a die wheel, not

shown, wherein the coiled fastener element is set with heat. Advantageously, the feed gear 18 being sectionally circular can forward the coiled filament smoothly to a similarly circular die wheel. The convolutions 26 of the filament W may conveniently be heated while travelling along and between the screw threads 21 and the teeth 20 to facilitate final heat setting treatment.

Fig. 2 shows another embodiment of the device 10a wherein a circulating endless belt 28 made of heat-resistant material such as for example an urethane resin and having teeth 29 formed on its outer surface and spaced by a distance equal to a pitch of screw threads 21 of the screw 12 is trained around a sprocket 30 supported for rotation about a shaft 31. This belt-and-sprocket arrangement has a function substantially similar to the feed gear 18 employed in the first embodiment of Figure 1 but advantageously provides more of the guide space 32 so that the convolutions 26 of the filament W can be more effectively set in shape.

WHAT WE CLAIM IS:—

1. A device for shaping and transporting a coil comprising a support body, a screw rotatably mounted in a first cavity formed in said body, rotating or circulating means having an endlessly toothed periphery and mounted in a second cavity formed in said body and communicating with said first cavity, and a mandrel interposed between said screw and said rotating or circulating means and extending in conformity with the periphery of said rotating or circulating means.

2. A device as defined in claim 1 wherein said rotating means comprises a feed gear having peripheral teeth spaced by a distance equal to the pitch of screw threads of said screw.

3. A device as defined in claim 1 wherein said circulating means comprises an endless belt having on its outer surface a succession of teeth spaced by a distance equal to the pitch of screw threads of said screw, and a sprocket adapted to drive said belt.

4. A device substantially as herein described with reference to and as illustrated in Figure 1 or Figure 2 of the accompanying drawings.

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