

APPARATUS FOR STAMPING FILAMENTARY MATERIAL FOR HELICALLY
COILED SLIDE-FASTENER COUPLING ELEMENTS

This invention relates to an apparatus of a type for stamping a filamentary material for the production of a row of continuous coil coupling elements to be attached to slide fastener stringer tapes, particularly (but not necessarily solely) to an apparatus of such a type incorporating stamping means for continuously providing a coupling head portion, a turn portion, a stitching groove and the like at predetermined intervals along the length of a plastic filament prior to winding thereof on a mandrel.

Known stamping or forming tools are either of a rotary design or a punch design, but the former is preferred for high speed and accuracy of performance. Efforts have been paid to explore means for stamping a filamentary wire material during a course of travel up to the point of winding on a mandrel. In order to effect this stamping without causing twists or warps in the filament, it is imperative that the stamping means be installed as close to the mandrel as possible. This coupled with the necessity of enabling the stamping means to rotate on its own axis simultaneously as it makes an orbital movement poses a great difficulty in the designing, building and operation of such stamping apparatus.

According to a first aspect of the invention there is provided an apparatus of such a type comprising a rotor,

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a pair of inter-engaged stamping rolls rotatably mounted on the rotor, and a reel mounted coaxially with the rotor but rotative at a different angular speed from the rotor to permit the stamping rolls to turn on their own axes while making an orbital movement.

According to a second aspect of the present invention, there is provided an apparatus for stamping a filamentary material for the production of a row of continuous coil coupling elements to be attached to a slide fastener stringer tape, said apparatus comprising:

- (a) a frame;
- (b) a stationary shaft mounted on said frame and having a mandrel extending from one of its ends;
- (c) a rotor rotatably mounted on said stationary shaft;
- (d) a rotative ring member mounted at one end of said rotor and rotatable by a drive power derived from a same source of power as that for said rotor; and
- (e) a pair of mating stamping rolls pivotally connected to and lying in the same plane of rotation as said rotor, one of said stamping rolls being in driven engagement with said ring member, said rotor being adapted and arranged to rotate in use at a different angular speed from that at which said ring member rotates, so that the resulting speed differential in use makes said stamping rolls rotate on their own axes as they orbit about the axis of said rotor.

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According to a third aspect of the invention there is provided a ... ("method" to "apparatus" of claim 7)... according to the second aspect of the invention, ... ("wherein" to the end of claim 7).

5 The invention will be described by way of examples with reference to the accompanying drawings, wherein:-

Figure 1 is a front elevation of a stamping apparatus provided in accordance with the present invention;

Figure 2 is a side elevation of the same;

10 Figure 3 is a cross-sectional view on enlarged scale taken along the lines III-III of Figure 1.

Figure 4 is a diagrammatic view showing an important operative part of the apparatus;

15 Figure 5a is a diagrammatic view illustrating one form of a stamping roll embodying the invention;

Figure 5b shows a segment of a filament which has been formed by the stamping roll of Figure 5a;

Figure 5c is a diagrammatic view showing a coil or convolution formed from the filament of Figure 5b;

20 Figure 6a is a diagrammatic view showing another form of a stamping roll;

Figure 6b shows a segment of a filament stamped by the roll of Figure 6a;

25 Figure 6c diagrammatically illustrates a coil formed from the filament of Figure 6b;

Figure 7a is a diagrammatic view showing still another form of a stamping roll;

Figure 7b shows a segment of a filament which has been stamped by the roll of Figure 7a;

Figure 7c diagrammatically shows a coil formed from the filament of Figure 7b.

5 Referring now to the drawings and Figure 2 in particular, there is shown an apparatus embodying the present invention for providing a plastic filamentary material with deformations of specified form and dimensions. The apparatus generally comprises a frame 10 having mounted
10 at the lower portion thereof a drive unit 11 and at the upper portion an operating unit 12. The drive unit 11 includes a drive shaft 13 connected to a motor not shown and a first drive pull 14a mounted fixedly on one end of the drive shaft 13 for transmitting rotating power to the
15 operating unit via a first driven pulley 14b, the pulleys 14a and 14b being operatively connected by a drive belt 15. A second drive pulley 16a larger in diameter than the first drive pulley 14a is coaxially mounted on the other or
20 opposite end of the drive shaft 13 and operatively connected by a drive belt 17 to a second driven pulley 16b.

A horizontally mounted stationary shaft 18 is fixedly supported on the frame and has a bore 19 for guiding therethrough a supply of cord C.

An elongate cylindrical member 20 is rotatably mounted on the stationary shaft 18 via bearings 21 as better shown in Figure 3, and extends in parallel with the drive shaft 13. The member 20 may be integral as shown or connected at one end to the first driven pulley 14b. At the forward end of the stationary shaft 18 adjacent to the second driven pulley 16b, there is provided a winding mandrel 22 operatively associated with a forming screw and heat-set unit 23 as shown in Figure 3.

A rotor 24 which may be integral with the cylindrical member 20 as shown in Figure 3 is provided at the other end of the member 20 opposite to the first driven pulley 14b. A guideway 25 extends longitudinally through the cylindrical member 20 and through the rotor 24 for guiding the passage of a filamentary material F which is supplied via a guide arm 26. The filament F passes around a first guide roll 27 and horizontally straight through the guideway 25 and around a second guide roll 28 where it is oriented upwardly and passes around a third guide roll 29 and finally reaches the mandrel 22.

The apparatus of the character above described is a general construction utilized for feeding a

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filamentary material and forming the same into a row of continuous coils for attachment to stringer tapes in a well known manner. In accordance with the invention, there is provided a stamping tool 30 including a

5 rotative ring member 31 which is integral with the second driven pulley 16b and rotatably mounted via bearing 32 around the periphery of the rotor 24. As better shown in Figure 4, the ring member 31 is internally toothed as at 33 for meshing engagement with

10 one of a pair of mating gears 34 and 35. A pair of stamping rolls 36 and 37 are joined with the mating gears 34 and 35, respectively and rotatably mounted on respective pins 36a and 37a secured to the forward end of the rotor 24. The stamping rolls 36 and 37 that lie

15 in the same plane of rotation as the rotor 24 are each provided peripherally with stamping projections of the various forms illustrated in Figures 5a through 7a inclusive, the projections being spaced at predetermined intervals or pitches and those on one of

20 the rolls are positioned to register with the corresponding projections on the other. A first one 38 of such stamping projections provides upon contact with the filament F a deformation therein which corresponds to a coupling head H of a coil element E.

25 A second projection 39 provides a similar deformation which corresponds to to a turn or connecting portion T of each coil E. A third stamping

projection 40 is interposed between adjacent first and second projections 38 and 39 and adapted to provide a deformation which serves as a guide groove G in the coil for anchoring a sewing thread S.

5 The mating projections 38 on their respective stamping rolls 36, 37 that form the coupling heads H are timed to come into confronting relation or register in position with each other during travel of the filament F between the second guide roll 28 and the
10 third guide roll 29, and are so registered as the stamping rolls 36, 37 complete a full revolution on their own axes. In the presently illustrated embodiment, the rotor 24 rotates faster by angular speed than the ring member 31 with the resulting
15 difference in their angular speed utilized to effect the revolution of the stamping rolls 36, 37 on their own axes in opposite directions. Conversely, the rotor 24 may be rotated at a slower peripheral speed than that at which the ring member 31 rotates, in which
20 instance the direction in which the filament F is wound on the mandrel 22 will be reversed. A differential in angular rotating speed between the rotor 24 and the ring member 31 is calculated such that the stamping rolls 36, 37 rotate on their axes by degrees
25 corresponding to the distance between or the pitch of adjacent head-forming projection 38. Revolution of the rotor 24 causes the filament F to be wound on the

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mandrel 22, and one such revolution results in the formation of one convolution E of the coiled filament, during which time the stamping rolls 36, 37 rotate on their axes while orbitting about the axis of the rotor 24 and provide the various deformations; i.e. head H, turn T and groove G, on the filament F on feed travel towards the mandrel 22 as diagrammatically illustrated in Figures 5a - 7a.

The filament F can be stamped with high degree of accuracy because the ring member 31 carrying the stamping rolls 36, 37 is rotated at a constant speed by a drive power derived from the same source of power as that for the rotor 24 and thus can keep the rolls 36, 37 in accurate rotative and orbital movement. Because of such relationship between the rotor 24 and the ring member 31, the latter is an exact follower to the former regardless of the choice of speed for the winding of the filament F on the mandrel 22. In addition to these features, the present invention is advantageous in that the stamping station is located adjacent to the mandrel 22 to effect the stamping of the filament F immediately in advance of its winding on the mandrel 22 thereby holding the filament F thus stamped or deformed immune to objectionable twists or other physical changes.

Having thus described the invention, it will be understood that various changes and modifications may

be made in the specific embodiments herein advanced without departing from the scope of the appended claims. As for an instance, the arrangement of the apparatus may be modified so that the desired

5 differential in angular speed between the rotor 24 and the ring member 31 may be obtained by rotating the latter conversely faster.

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Claims:-

1. An apparatus for stamping a filamentary material for the production of a row of continuous coil coupling elements to be attached to a slide fastener stringer tape, said apparatus comprising:

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(a) a frame;

(b) a stationary shaft mounted on said frame and having a mandrel extending from one of its ends;

(c) a rotor rotatably mounted on said stationary shaft;

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(d) a rotative ring member mounted at one end of said rotor and rotatable by a drive power derived from a same source of power as that for said rotor; and

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(e) a pair of mating stamping rolls pivotally connected to and lying in the same plane of rotation as said rotor, one of said stamping rolls being in driven engagement with said ring member, said rotor being adapted and arranged to rotate in use at a different angular speed from that at which said ring member rotates, so that the resulting speed differential in use makes said stamping rolls rotate on their own axes as they orbit about the axis of said rotor.

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2. An apparatus as claimed in claim 1 wherein said stamping rolls are each provided peripherally with stamping projections which are spaced so as to register with each other as said stamping rolls complete a full revolution on their axes.

3. An apparatus as claimed in claim 1 or 2 wherein said rotor in use rotates faster by angular speed than said ring member.

4. An apparatus as claimed in claim 1, 2 or 3 wherein pairs of coaxially mounted pulleys are provided for driving said rotor and said ring member, respectively.

5. An apparatus as claimed in any preceding claim wherein said stamping rolls are located adjacent to said mandrel so as to effect the stamping of the filament immediately in advance of its winding on said mandrel.

6. An apparatus as claimed in any preceding claim wherein said ring member is internally toothed, and said stamping rolls have a pair of external gears, respectively, for corotation therewith, said gears being held in mesh with each other and one of said gears being held in mesh with said toothed ring member.

7. A method of stamping a filamentary material for the production of a row of continuous coil coupling elements to be attached to a slide fastener stringer tape by means of an apparatus as claimed in any preceding claim, wherein said rotor and ring member are rotated at different angular speeds so that the resulting speed differential makes said stamping rolls rotate on their own axes as they orbit the axis of said rotor.