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APPARATUS FOR PRODUCING HELICAL COILS

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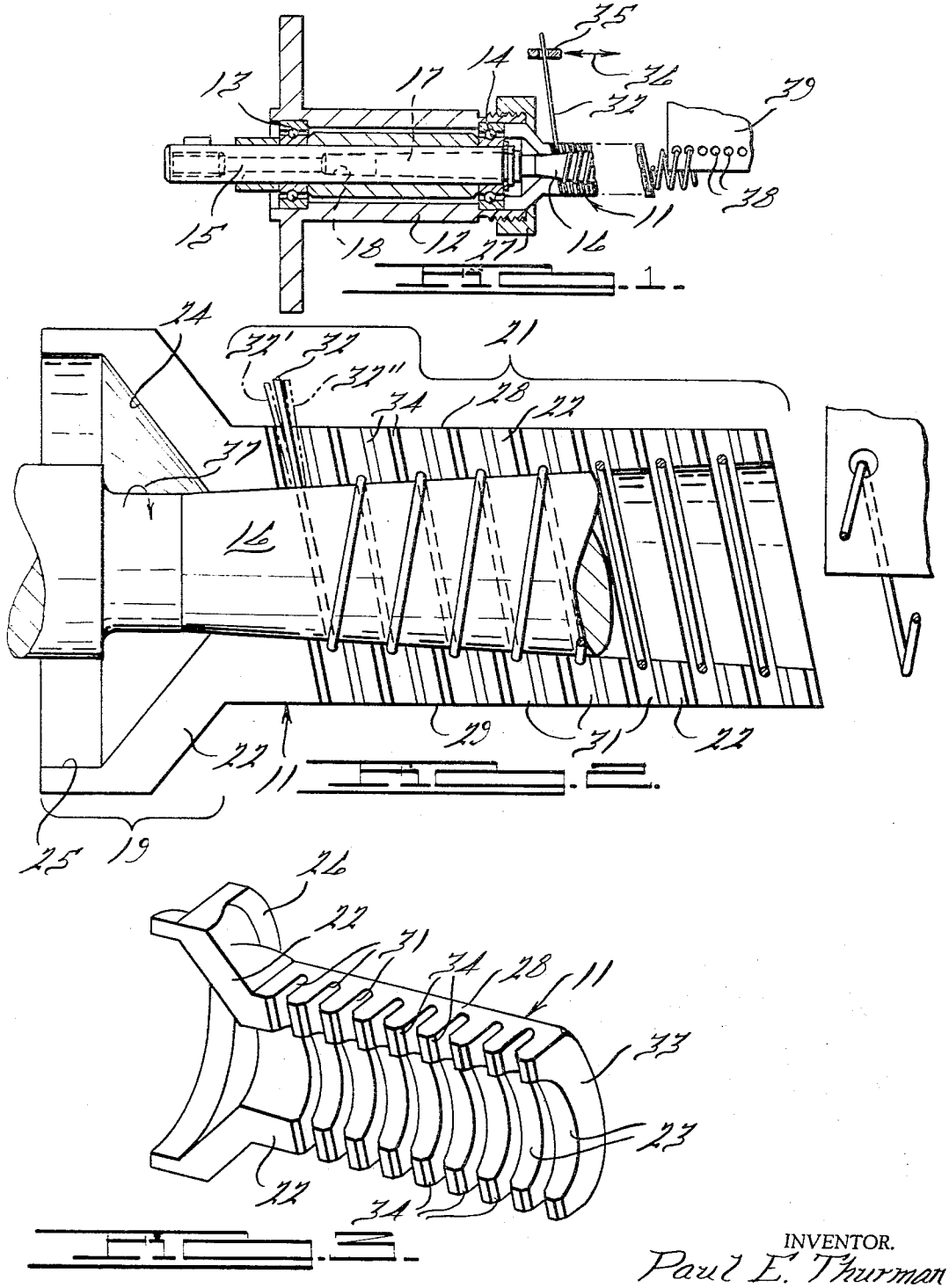

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APPARATUS FOR PRODUCING HELICAL COILS

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This invention relates to the production of helical wire coils for binding together the sheets of writing pads, pamphlets, books or the like which are perforated along one edge of the sheets and covers.

It is an object of the invention to provide a novel and improved method and apparatus for producing such coils, which will enable the user to make various pitches of spirals with a single tool assembly. Thus it will be much less expensive for the manufacturer of spiral bound books and pamphlets to provide himself with equipment for making different types and sizes of binders.

It is another object to provide an apparatus of this character which is of a relatively simple and inexpensive nature, and is compatible with existing equipment for the manufacture of spiral binders.

The manner of accomplishing the foregoing objects and other objects and features of this invetnion will become apparent from the following description of embodiments of the invention when read with reference to the accompanying drawings, in which:

FIGURE 1 is a cross-sectional view in elevation of a supporting head for the tool, showing the tool in position and with the mandrel and wire therein;

FIGURE 2 is an enlarged view in elevation of the tool and mandrel, the mandrel being partly broken away from purposes of clarity, and

FIGURE 3 is a perspective view of the tool, the mandrel being removed.

Briefly, the illustrated embodiment of the invention comprises a coiling tool of elongated shape having a mounting flange at one end. The main portion of the tool is roughly of semicylindrical shape, having a flat side with a recess extending therealong, and a convex side. The recess is flared, and adapted to receive a flared mandrel which is rotatably driven during use. The tool is also provided with a series of slots extending in from the flat side thereof and deep enough to go beyond the bottom of the recess. These slots are parallel to each other and disposed at an angle equal to the average pitch of the coils to be produced. The width of the slots is considerably greater than the wire thickness.

In use, the wire will be threaded through the slots and around the mandrel, and the mandrel will then be rotated. This will cause the wire to be driven through successive slots, the wire passing around the mandrel on its open side. By varying the angle at which the wire enters the first slot, a considerable variation in the pitch of the coil can be produced.

It has been found that the variations in pitch which can be produced with this construction, in which the mandrel is exposed and the wire unguarded around a substantial portion thereof, will be very much greater than the pitch variations which could be obtained with conventional tools, such as that shown in Patent No. 3,101,750, dated Aug. 27, 1963 and entitled "Apparatus for Producing Helical Coils." The exact reason for this unexpected difference is not at present known to me but is believed to have something to do with the extent to which the wire is "worked" or deformed in the initial phases of its passage around the mandrel and through the slots of the tool.

Referring more particularly to the drawings, the coiling tool is generally indicated at **11** and is adapted to

be mounted on one end of a stationary housing **12** of cylindrical shape. A pair of ball bearings **13** ad **14** are mounted within housing **12**, and rotatably support a shaft **15** which is driven by means not shown. A mandrel **16** has a tapered end **17** mountable within a complementary recess **18** in shaft **15**. Mandrel **16** is removable from shaft **15** so as to be replaced by a mandrel of different size, and is flared in a forward direction. The purpose of this flare is to insure proper release of the coiled wire from the mandrel in case it hits an obstruction, as described more fully in the aforementioned patent.

Tool **11** comprises a mounting portion **19** and a coiling portion **21**, as seen in FIGURE 2. The coiling portion is of generally semicylindrical shape, with the mounting portion flaring outwardly therefrom at one end. Both portions have in common a flat surface **22** which is interrupted by a forwardly flared concave recess **23** extending axially along the coiling portion **21**, and a sharper rearwardly flared concave recess **24** in mounting portion **19**, the latter recess terminating in a semicylindrical recess **25**. A flange **26** extends outwardly from the convex side of mounting portion **19**, and is adapted to be gripped by a fastening nut **27** threadably mounted on the outer end of housing **12**, as seen at FIG. 1.

The upper and lower surfaces, **28** and **29** respectively, of coiling portion **21** are flat. A series of transverse slots **29** are formed in coiling portion **21** of the tool, these slots being equidistantly spaced and parallel to each other, and penetrating surface **22** to a depth greater than the depth of recess **23**. The inclination of slots **29** is equal to the average inclination of the coils to be formed by the tool. The width of slots **31**, and their depth beyond the bottom of recess **23**, are substantially greater than the thickness of the wire **32** which is to be formed into the spiral coil, for example, about three times greater. The bottoms of slots **31** are flat and parallel to surface **22**. The distance between the slots is such that when wire **32** is coiled around mandrel **16**, it will, with constant pitch, leave the bottom of each slot and enter the top of the next slot, as seen in FIGURE 2.

Although the plane of surface **22** is a diametral one, that is, passing through the axis of recess **23**, this need not be so to accomplish the purposes of the invention. In other words, the portion of mandrel **16** which is surrounded by tool **11** could be slightly more or less than 180°. The flare angle of recess **23** is preferably the same as that of mandrel **16**. The forward face **33** of tool **11** is at the same angle as slots **29**. The intersections **34** of slots **31** with surface **22** are beveled, as seen best in FIGURE 3.

In operation, a guide indicated partially at **35** will be provided above tool **11** so that the lead angle of wire **32** may be varied. This guide may be shifted to the left or right as indicated by the double-ended arrow **36** in FIGURE 1, thereby shifting the feed angle of the wire as shown by the solid and dot-dash lines in FIGURE 2. The wire will be first manually threaded through slots **31** and around mandrel **16** until it is passed through all the slots.

Mandrel **16** will then be rotatably driven by shaft **15** in the direction of arrow **37** of FIGURE 2, the wire being formed into a spiral by its contact with the walls of slots **31**. The spiral wire will be fed outwardly from tool **11** and through the perforations **38** in a pack of sheets **39**.

By adjusting the position of guide **35**, it will be possible to obtain various pitches of spirals without changing tool **11** on mandrel **16**. In a typical example, it has been found that a tool body **11** with a slot pitch of five slots per inch can be used to produce a spiral with anywhere from four turns to six turns per inch. To produce five turns per inch, the wire would be fed at approximately the angle

shown in solid lines in FIGURE 2. To produce a coarser pitch, say four turns per inch, the angle of feed would be indicated by dot-dash position 32′ of wire 32. On the other hand, a production of a finer spiral pitch, for example, six turns per inch, can be achieved by the feed angle indicated at 32″.

While it will be apparent that the embodiment of the invention herein disclosed is well calculated to fulfill the objects of the invention, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a coiling tool construction for the production of spiral wire binders, an elongated body having a coiling portion of generally semicylindrical shape, a mounting portion extending outwardly from one end of said coiling portion, a concave recess on one side of said body extending the entire length thereof, a rotatable mandrel within said recess, the side of the mandrel facing away from said recess being exposed, and a series of parallel inclined slots in the coiling portion of said body extending inwardly from the side thereof having said recess and having a depth substantially greater than the depth of said recess, the width of said slots being substantially greater than the width of a wire to be formed into a spiral coil by said tool.

2. The combination according to claim 1, the side of said coiling tool with said recess having a surface in a diametral plane interrupted by the recess and said slots.

3. The combination according to claim 1, the said concave recess being outwardly flared toward the forward end of said coiling portion, said mandrel being provided with a corresponding flare.

4. The combination according to claim 2, said coiling portion having parallel sides at right angles to said surface, the intersections of said surface with said slots being beveled.

5. The combination according to claim 1, further provided with a guide adjacent said coiling tool and adjustable in the direction of the coiling tool axis, said wire passing through said guide before entering the first slot of said coiling tool, whereby the angle of feed of said wire may be varied.

6. The combination according to claim 1, the distance between said slots being such that a spiral wire of constant pitch may leave the bottom of one slot and enter the top of the next slot adjacent said mandrel.

7. The combination according to claim 2, the bottoms of said slots being flat and parallel to said diametral plane.

References Cited

UNITED STATES PATENTS

3,101,750 8/1963 Pfaffle ---------- 140—92.3

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