ABSTRACT: A wire coiling tool for spiral wire binders comprising split hollow body halves each of which has a series of inwardly extending pins, the facing pin sets being offset by one-half the wire pitch. In a second embodiment, each body half has two sets of pins, the four sets of pins being spaced apart 90° and successive pins around the circumference being offset by one-quarter the wire pitch.
3,568,728

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WIRE COILING TOOL

This application is a continuation-in-part of copending application Ser. No. 700,786, filed Jan. 26, 1968, by William O. M. Veller and entitled, Wire Coiling Tool, now Pat. No. 3,520,334, said copending application being assigned to the same assignee as the present application.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to spiral binder applying machines for notebooks or the like, and particularly to wire coiling tools therefor. In such machines, a group of perforated sheets with covers is supported in alignment with the tool, through which a wire is fed and formed into a spiral which is at the same time threaded through the holes in the stack of sheets. The wire, which is fabricated of steel buy may be coated with a softer material such as brass or copper, is then severed at both ends of the spiral and crimped, the book being discharged and another stack of sheets placed in binding position.

2. Description of the Prior Art

Wire coiling tools in such machines are conventionally fabricated as a tubular member with internal grooves corresponding to the wire pitch. A mandrel rotates within this tool and because of its shape frictionally drives the wire around the spiral groove in the hollow body, the spiral being fed out at the open end of the body and threaded through the stacked sheets.

If the wire is coated as aforesaid, the friction between the wire and forming elements could create damage to these elements or the wire to the wire coating, and could also create harmful increases in the wire and tool temperatures, particularly when these parts are operated at high speed. Another disadvantage of the prior art type of coiling tool body, which is exemplified by that shown in application Ser. No. 503,704, filed Oct. 23, 1965, by Claus Ostermeier, now U.S. Pat. No. 3,407,851, is the fact that is is difficult to efficiently feed the wire through the coiling tool preparatory to starting a machine. A third drawback of the conventional tool has been the unavoidable rubbing action created on the mandrel surface because of the capstan effect of its cone shape. While a highly polished mandrel would reduce this rubbing action, which creates nearly imperceptible marks on the finished coil, it has heretofore been impractical to provide such a polished mandrel because of the danger of occasional stoppage of the coiling process due to lack of sufficient frictional transporting power.

SUMMARY OF THE INVENTION

Briefly, the invention comprises a hollow body made up of two split halves, and a flared coil mandrel rotationally mounted therein. The inner ends of the body halves are provided with flanges so that they may be firmly secured to a support. In a first embodiment, the body halves each carry a set of cylindrical pins, the facing pin sets being offset from each other by one-half the wire pitch. These pins, which have inner ends closely adjacent the mandrel surface, as act as guides during the coiling process while imposing a minimum of frictional resistance on the wire. It is therefore possible to use a highly polished mandrel without danger of loss of driving power, since it is unnecessary to overcome the excessive friction inherent in the prior art type of tool. In a second embodiment, each body half carries two sets of pins, the four sets being spaced apart 90° and successive pins around the circumference being offset from each other by one-quarter the wire pitch.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, parts being sectioned, of one embodiment of the wire coiling tool of this invention, having two sets of pins;
FIG. 2 is a top plan view of the tool taken in the direction of the arrow 2 of FIG. 1;

FIG. 3 is an end view of the tool taken in the direction of the arrow 3 of FIG. 2;
FIG. 4 is a detailed view of the flared mandrel;
FIG. 5 is a side elevational view, parts being sectioned or broken away, of a second embodiment of the wire coiling tool having four sets of pins; and
FIG. 6 is an end elevational view of the tool of FIG. 5 taken in the direction of the arrow 6 thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to the embodiment of FIGS. 1 to 4, the wire coiling tool is generally indicated at 11 and is carried by a cylindrical coiling tool housing 12 which encloses a coiling shaft 13 rotatably mounted therein by bearings 14. A coiling mandrel 15 is detachably connected to shaft 13 and extends outwardly therefrom. The construction of this mandrel is seen in FIG. 4, the mandrel having a cylindrical attaching section 16 extending within hollow shaft 13, and a flared driving portion 17 which may be highly polished.

The driving section 17 is disposed within a forming body generally indicated at 18 and comprising two element halves, a front forming element 19 and a rear forming element 21. The elements are of elongated shape and fit together to form an elongated hollow body which is shaped somewhat like a cylinder but with top and bottom portions cut away by parallel planes. The elements have semicircular flanges 22 and 23 which are held against the face 24 of housing 12 by a nut 25 threadably mounted on the housing. Semicircular hubs 26 and 27 fit into a bore of housing 12 to maintain the radial position of elements 19 and 21.

Elements 19 and 21 carry sets of guide pins 28 and 29 respectively, these pins extending radially toward the rear portion 17 of the mandrel from opposite sides. As seen in FIG. 2, the interior portions of elements 19 and 21 are removed to expose the inner portions of pins 28 and 29 to view. The pins of each set are in evenly spaced parallel relation, and are successively shorter in a direction toward the outer end of the mandrel. Furthermore, the end surfaces of pins 28 and 29 are shaped so as to be complementary to the flared and curved surface of the mandrel guide portion 17, and are closely adjacent the surface of the mandrel. Pin set 28 comprises six pins in the illustrated embodiment whereas pin set 29 comprises seven pins. The pins comprising set 28 are shifted axially from the pin set 29 by distance equal to one-half the pitch of the coil of wire 31 which is to be formed, and the spacing in each pin set is equal to the pitch of the wire.

The portions 32 of elements 19 and 21 adjacent flanges 22 and 23 about each other, and a tapered space 33 is formed in element 21 at the juncture of these abutting surfaces with the open portion of element 21. This opening 33 is to permit wire to be fed in at this point which is before the longest pin 29. Because of the open nature of the tool elements, the wire may then be manually threaded back and forth between adjacent pins 29 and 28 in the manner indicated. Another recessed portion 34 is formed at the outer end of element 19 to accommodate a wire cutting knife partially shown at 35, which operates close to the exit point of the wire at the end of the coil forming cycle.

A pair of locating pins 36 and 37 are fastened to the end surface of housing 12 and extend axially therefrom, fitting in notches 38 and 39 respectively in flange 23 of rear element 21. These pins will insure the proper mounting of elements 19 and 21 as far as their front and rear positions are concerned and will prevent accidental rotary shifting of the elements during a working cycle.

In operation, mandrel 15 will be rotated, thus fractionally driving the wire between the sets of pins 28 and 29 which serve to guide the wire so as to form a spiral which will be fed out at the right hand or exit end of the tool and threaded through the stacked sheets 36.

It will be noted that the frictional resistance created by pins 28 and 29 to the movement of the wire will be minimal since these pins will have only point contact with the wire. Thus, if
the wire is coated with softer material such as brass or copper, the possibility of damage to the coating by means of friction or of harmful increases in the wire and tool temperatures will be minimized.

It will also be possible to use a highly polished mandrel surface 17 thus avoiding the creation of marks on the surface of the wire, because the minimal frictional resistance offered by pins 28 and 29 will permit such a highly polished mandrel to still have a capstan effect.

FIGS. 5 and 6 show a second embodiment of the connection which is especially adapted for use with spiral binders of larger diameters. In this embodiment, a wire coiling tool is generally indicated at 101 and is carried by a tool housing 102 which encloses a coiling shaft (not shown) to which a coiling mandrel 103 is connected. As in the previous embodiment, the driving portion of mandrel 103 is flared.

The forming body is generally indicated at 104 and comprises two element halves, a front forming element 105 and a rear forming element 106. These elements are of elongated shape and fit together to form an elongated hollow body which is shaped somewhat like the cylinder with top and bottom portions removed so as to expedite manual threading of the wire 107. Elements 105 and 106 have semicircular flanges 108 and 109 respectively held against the face of housing 102 by a nut 111. A pair of locating pins 112 and 113 are fastened to the end surface of housing 102 and are received by notches 114 and 115 respectively of flange 109.

Element 105 carries two sets of guide pins 116 and 117, and element 106 also has two sets of guides pins 118 and 119. Sets 116 and 117 are spaced 90° apart as are sets 118 and 119, and all four sets are spaced with equal angularity. As in the previous embodiment, the pins in each set are evenly spaced in parallel relation and are successively shorter in direction toward the outer end of the mandrel. The end surfaces of the pins are shaped so as to be complementary to the flared and curved mandrel surface to which they are closely adjacent. In this embodiment each set has eight pins, and successive sets around the circumference are shifted axially from each other by a distance equal to one-quarter the pitch of the coiled wire 107 which is to be formed. Spacing in each set is equal to the wire spiral pitch.

The operation of the embodiment of FIGS. 5 and 6 will be similar to that of the previous embodiment. However, the four sets of pins will give additional support and stability to the spiral as it is formed, so that relatively large spiral diameters may be manufactured.

I claim:

1. In a wire coiling tool for forming spiral wire binders of relatively large diameter, a rotating axially fixed flared mandrel, a stationary body concentric with and surrounding said mandrel comprising front and rear forming elements outwardly spaced from the mandrel, said elements being of elongated shape and fitting together to form an elongated cylindrically shaped hollow body with top and bottom portions removed so as to expedite manual threading of the wire, semicircular flanges on said elements for mounting the elements on a housing, two sets of inwardly extending cylindrical guide pins on the front forming element, said sets being 90° apart, two sets of inwardly extending cylindrical guide pins on the rear forming element spaced 90° apart, all four sets being spaced with equal angularity and the pins in each set being evenly spaced in parallel relation with the tool axis and successively shorter in a direction toward the outer end of the mandrel, the undersurfaces of the pins being shaped so as to be complementary to the flared and curved mandrel surface to which they are closely adjacent, and successive sets around the circumference being shifted axially from each other by a distance equal to one quarter the pitch of the coiled wire which is to be formed, the spacing in each set being equal to the wire spiral pitch.