Feb. 7, 1939. F. HONIG 2,146,578

THREAD TWISTING APPARATUS

Filed Dec. 28, 1934

Fig. 1.

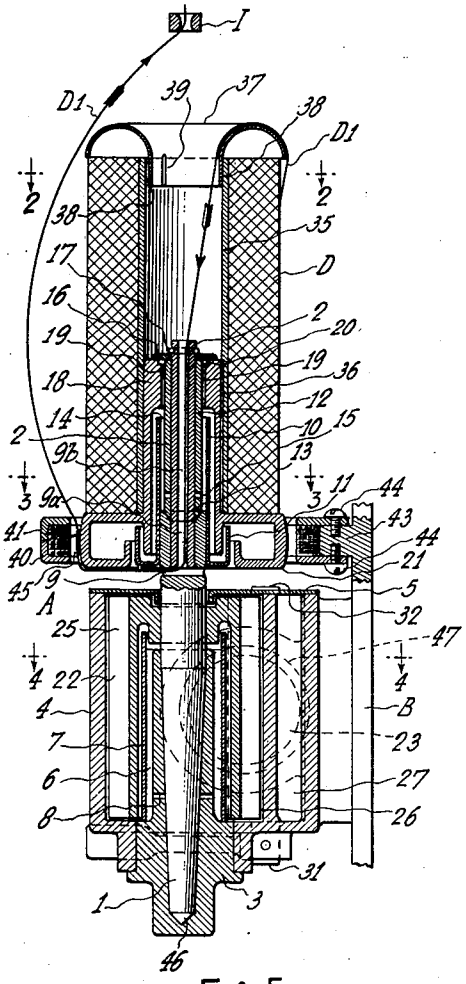


Fig. 2.

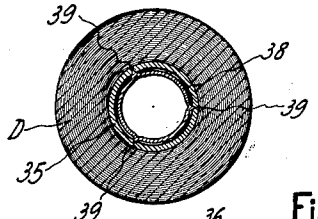


Fig. 3.

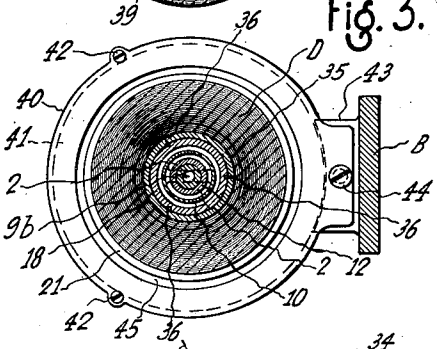


Fig. 4.

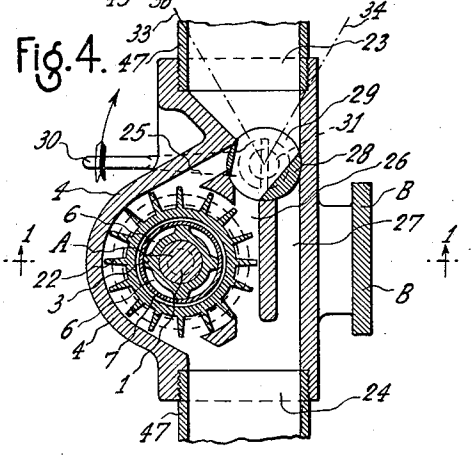
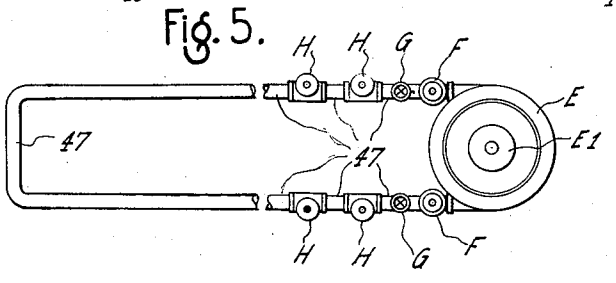


Fig. 5.



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THREAD TWISTING APPARATUS

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Application December 28, 1934, Serial No. 759,463

3 Claims. (Cl. 117—9.5)

The present invention relates to the manufacture of thread by the twisting of individual filaments, and particularly to an apparatus by which more than one twist can be imparted to the filament for each revolution of the spindle from which the filaments are unwound.

The apparatus according to my invention is constructed with a view to the elimination from the spindle driving mechanism of expensive and intricate gear drives and also, to the greatest extent possible, of bearings and other parts requiring oil, which might spatter upon and contaminate the filament being twisted into thread. It further contemplates the regulation while the machines are in operation not only of the speed of the spindles but of their direction of rotation, so that any desired number, or all of the operating spindles may be slowed down, reversed, or stopped entirely, without injury to themselves or to the filament.

Multiple twists may be imparted to filaments by two general methods: (1) by holding the thread against rotation between its ends and rotating the ends to the extent desired, (2) by holding the ends against rotation and imparting to the threads at some intermediate point or points the twists desired.

According to the present invention the two methods above referred to may be said to be combined, the supply spool according to the present invention being used in combination with a take-up spool as described in my copending application Serial No. 713,252, filed February 28, 1934, Patent No. 2,080,918, May 18, 1937, below identified. In this manner a total of three twists may be imparted to the filament for each revolution of the spindles. The first two twists will be imparted, as will presently appear, while the filament is in transit from the supply spool to the means for guiding the filament from the supply spool to the take-up spool, and the third and final twist just before the finished thread is wound on the take-up spool, as in the aforementioned copending application.

I prefer to drive the spindles by means of a gaseous fluid, preferably air which is caused to circulate through suitable channels by a pump and actuate impelling means mounted on the spindles which in turn actuate the latter. This method of operation serves to do away with expensive belt or gear driving means and the constant necessity of repair and replacement attendant thereon, and permits the spindles to operate at much higher speeds than would be practicable if gear or belt drives were used.

In the accompanying drawing I have illustrated merely those parts of the apparatus constituting the invention, the take-up spool being omitted as well as all parts of the machine frame except such as are absolutely necessary to make clear the connection of the subject matter of the present invention with the rest of the machine.

In the present application I claim the package holding means. In my co-pending application, Serial No. 209,349, filed May 21, 1938, I claim the spindle driving means.

In the drawing:—

Fig. 1 is a vertical cross section through the spindle according to my invention, taken on the line 1—1 of Fig. 4;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a section on the line 4—4 of Fig. 1;

Fig. 5 illustrates diagrammatically a machine according to my invention, showing a series of spindles from which filament is to be unwound and twisted and showing the attachment of the driving mechanism.

Referring to Fig. 1, the core supporting the filament to be twisted is mounted on the spindle A. While there is only one spindle illustrated in Fig. 1 it will be understood that more than one may be employed if it is desired to twist a plurality of filaments together to form the finished thread, as shown for example at G, H, in Fig. 5.

The spindle A of my invention is constructed preferably in two sections, a cylindrical section 2 and a section 1, partly cylindrical and partly tapered.

The tapered portion of the section 1 of the spindle A is mounted in bearing 3, which in turn is fitted into a housing 4, provided with cover plate 5 and suitably fastened to the frame B of the machine. To obviate frictional contact between the spindle 1 and bearing 3 I may provide the oil reservoir 6 located within the tube 7. Lubricant from this reservoir enters the bearing surfaces through the orifice 8. The cylindrical portion of the section 1 is provided with a radial passage 9, which cooperates with a central longitudinal passage 9a therein. That part of the section 1 above the opening 9 is mounted in a sleeve 10 flanged as at 11 and adapted to rotate with the spindle. The upper end of the section 1 is beveled to receive the end 13 of bearing 12 in which is mounted the portion 2 of the spindle. The portion 2 is provided with a central longitudinal passage 9b adapted to cooperate with the passage 9a in the section 1 of the spindle. The

section 2 is of smaller diameter than the section 1 of the spindle, the intermediate space 14 serving as an oil reservoir to which lubricant is introduced through the openings 15.

Any oil which might during the rapid rotation of the spindle tend to spatter upon and injure the filament will be caught and retained within the flanged portion 11 of the sleeve 10.

Mounted on the spindle 2 outside bearing 12 and attached to the upper end thereof by washer 16 and split spring ring 17 is the package support 18 adapted to receive a package of filament to be twisted into thread. Frictional contact between the support 18 and the bearing 12 is prevented by the oil reservoirs 19 to which oil may be admitted through openings 20. The package support 18 is enlarged and flanged at its lower end to form the oil retaining cup 21.

The spindle 1 may be actuated in any suitable manner, as by gear or pulley mechanism or by an electric motor, but I prefer to use a fluid operated mechanism such as shown at 22, which may be mounted directly on the spindle (see Fig. 4). To actuate the impeller I may introduce, by a suitable pump E (Fig. 5) air or similar fluid through the inlet 23, around the teeth of the impeller, and out through the exhaust 24. The air may pass from the inlet to the impeller through either of the air passages 25, 26 or 27 depending upon whether it is desired to rotate the spindle clockwise or counter-clockwise, or, where several spindles are used in series, to shut it off from the rest of the unit. The passage of air to the impeller is regulated by the valve 28 provided with the air orifice 29 and operated by handle 30, the shaft of which projects through the housing 4 at 31, 32. If for example, it is desired to rotate the spindle in a clockwise direction the valve 28 will occupy the position shown in Fig. 4 permitting the air to flow through the inlet 23, opening 29 of the valve, and passage 26 to turn the impeller. If it is desired to rotate the impeller in a counter-clockwise direction the handle 30 will be turned to the position shown by the dotted line 33, permitting the air to pass from the inlet 23 through the passage 29 of the valve and the passage 25 of the housing. If several spindles are being operated in series, and it is desired to eliminate one, the handle 30 may be turned to the position shown by the dotted line 34. With the valve 28 so positioned, the incoming air will not have access to the spindle 22 at all, but will pass through inlet 23 and passages 29 and 27 to the next spindle housing in the series, and the rotation of the spindle thus shut off will be arrested as long as the valve 28 remains in that position.

If now it is desired to reverse the direction of rotation of a spindle while it is in operation this may be done quickly and gradually without breaking or injuring the filament. The passages 25 and 26 are so located that, while the valve 28 is being turned, for example, from the position it occupies in Fig. 4 wherein the air reaches the impeller via passage 26 to the reverse position (wherein it reaches the impeller via passage 25), it will be seen that some air will flow through each passage, thereby gradually retarding the speed of the impeller during the change.

The package D of filament to be twisted is mounted on the core 35, which I prefer to positively lock to support 18 by edge-like inserts 36 on the support. An insert of the type illustrated will permit an empty core to be removed and a new one inserted and at the same time prevent rotation of the core while the spindle is rotating and the filament being unwound from it.

If desired I may also provide for the core a cap 37 of larger diameter than the core, to permit the filament to be freely unwound from the core. The cap 37 may consist of a hub portion 38 having inserts 39 adapted to grasp the core and hold the cap firmly against rotation with respect to the core while the thread is being unwound.

The support 18 is held against rotation with the spindle by magnet 40 having energizing coil 41. As shown in Figs. 1 and 3, the magnet is U-shaped in cross section but forms a complete smooth circular enclosure about and spaced from the member 21 for the passage of the filament. It may be preferable to make the magnet 40 in two sections, which may be united in any suitable manner as by screws 42 (Fig. 3). The magnet assembly may be fastened to the frame B of the machine by lug 43 and screws 44.

It has been found that if, as shown, the oil cup 21 is made larger than the magnet assembly 40, the effect of the magnet in preventing rotation of the package support 18 is increased by concentration of the flux in the air gap 45.

The pointed end 46 of spindle A serves as a thrust bearing to support the weight of the spindle and its attendant parts.

The operation of the device is as follows: The end D1 of the filament to be twisted is guided by the operator from the package D, over the conical top 38 through the passages 9, 9a, 9b, thence over the outside of the oil cup 21 to guide I, thence to the take-up spool. The pump E is then started, and the control valve 28 moved to a position determined by the direction in which it is desired to rotate the spindle. The magnet 40, being energized, will hold the package support 18 and core 35 but not the filament, against rotation with the spindle, with the result that the filament will be twisted once before it emerges from the passage 9. Then, due to continual change of position of the opening 9 through which the filament is issuing, a second twist will be imparted to the thread before it reaches the guide I. Finally as in my copending application Serial No. 713,252, filed February 28, 1934, a third twist will be imparted to the filament as it is being wound on the take-up spool as the finished thread.

It will be understood that the pump E by which air or other fluid is admitted to the impeller may be driven in any well known manner as by an electric motor (not shown).

Fig. 5 illustrates diagrammatically an assembly consisting of several twisting units in series connected by the tube 47. The pump for circulating the fluid by which the spindles are driven is indicated at E, the spindle units by G, H, while F denotes a speed control unit of any conventional type. When air is used for driving, the opening E^1 of the pump communicates directly with the outside atmosphere at all times so that any loss or displacement of air in the circulatory system is at once compensated by the entry of air from the outside through this opening.

While I prefer to use air or other gaseous fluid for driving the spindles because it is cheap, clean and non-injurious to the materials being treated, it will be understood that any fluid medium may be used without departing from my invention in certain of its aspects.

By the use of my invention, not only may the expense of operation be greatly reduced, but in addition the speed at which the apparatus may

be operated and the consequent output of finished product can thereby be greatly increased. I have found for example that a single spindle according to my invention can be operated at speeds as high as 50,000 to 75,000 revolutions per minute.

The invention may be variously modified and embodied within the scope of the subjoined claims.

I claim:—

1. In a mechanism adapted to operate on filamentary materials, a rotatable spindle, a package supporting device mounted on said spindle, a stationary magnet completely surrounding the spindle, said stationary magnet and said package supporting device having between them an annular space to permit orbital passage of the filament.

2. In a mechanism adapted to operate on filamentary materials, a rotatable spindle, a package supporting device mounted on said spindle and provided with an annular flange, and a stationary magnet completely surrounding the spindle and adapted to concentrate magnetic flux in said flange, an annular space being formed between said flange and said magnet to permit orbital passage of the filament.

3. In a device of the class described, a rotatable spindle, a package supporting device mounted on said spindle, and a stationary magnet which comprises a flanged annular ring member encasing an energizing coil adapted to act upon said package supporting device to hold it stationary.

FRANK HONIG.