Aug. 20, 1957 H. C. LINDEMANN ET AL 2,803,106

SPINDLE STOP

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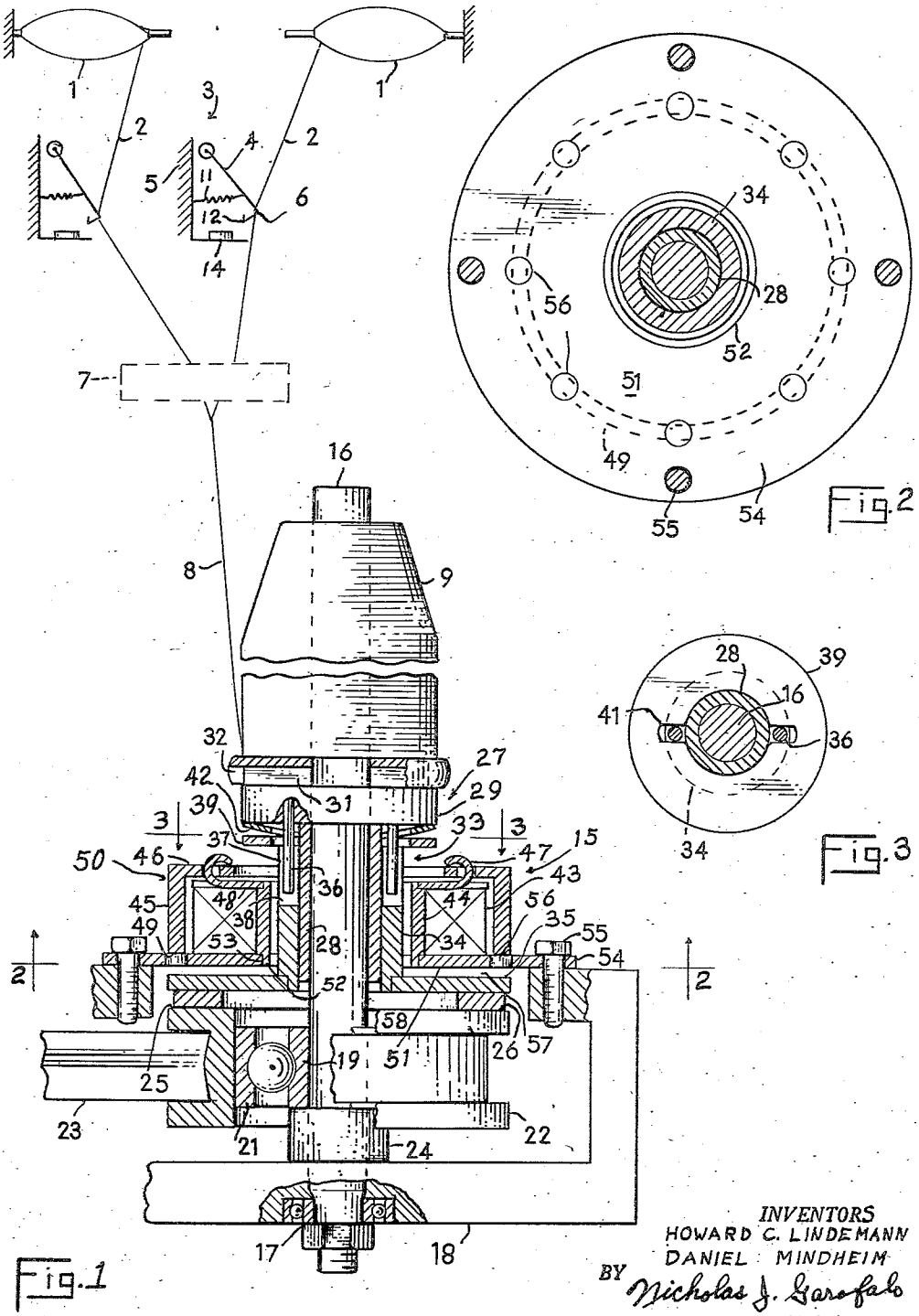

Fig. 1

Fig. 2

Fig. 3

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Fig. 7

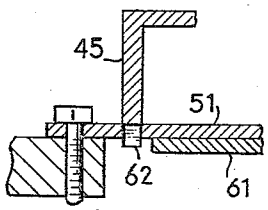
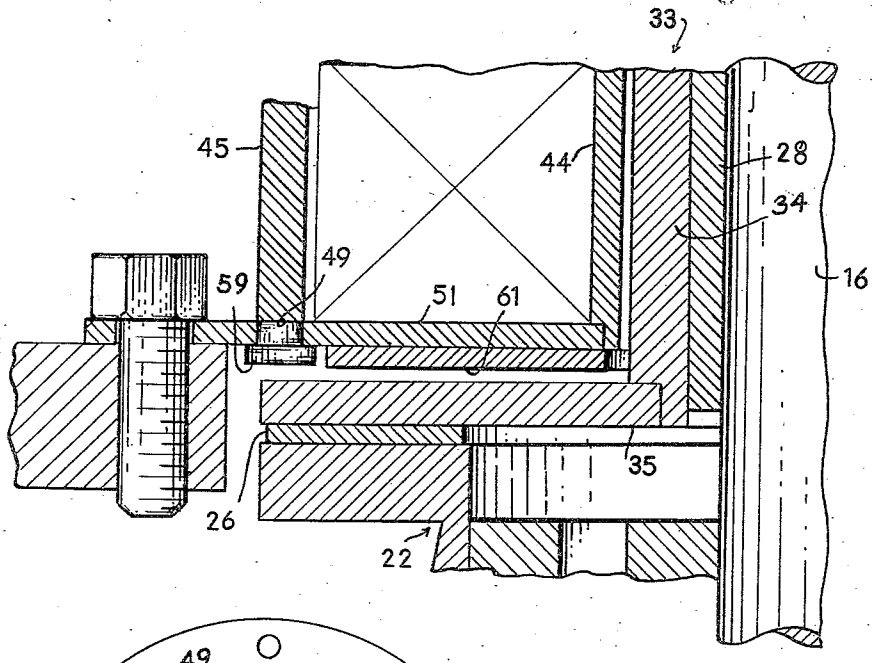


Fig. 4



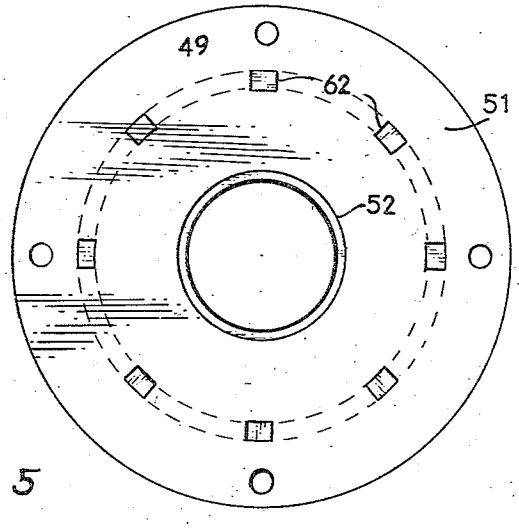
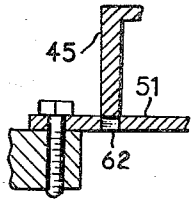


Fig. 5

Fig. 6



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SPINDLE STOP

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8 Claims. (Cl. 57—88)

This invention relates to thread winding apparatus of a type wherein strands of yarn are directed from a source to a rotating bobbin for winding upon the latter. It is more particularly concerned with novel and practical means for automatically stopping the winding operations when one of the strands breaks.

A further object of this invention is to provide in thread winding apparatus means for stopping rotation of the spindle carrying the bobbin on which the thread is being wound, without stopping the motor drive associated with the spindle.

The invention is subject to wide application. It is here illustrated in an arrangement including conventional yarn twisting mechanism. In this association, single strands of yarn are led from a plurality of packages over break detecting devices to the twisting mechanism. The several strands issue from the twister as a multi-ply thread which passes in usual manner for winding about a rotating bobbin. When a broken strand develops, the detecting mechanism operates to close a switch to energise an electro-magnetic device. The latter functions to stop rotation of the bobbin without stopping the motor driving the bobbin.

A feature of the invention is a particular arrangement of the spindle carrying the bobbin with the motor drive, whereby the spindle is readily and in a simple manner disengaged from the latter.

Another feature of the invention is an electro-magnetic arrangement which functions automatically when a break in a strand of yarn occurs, to not only disengage the spindle from the motor drive, but also to simultaneously stop the winding operation.

A more particular object of the invention is, therefore, to provide an electro-magnetic arrangement which functions upon the occurrence of a broken strand of yarn in a winding operation, to automatically disengage the spindle carrying the winding bobbin from an associated motor drive, and to simultaneously stop rotation of the bobbin.

Another object is to provide an electro-magnetic device having the foregoing functions, and which has a certain association and construction of components as to provide a novel, highly efficient and practical device for the purposes intended herein.

The advantages of the invention are many. It represents a decided advance in the art. In yarn twisting and winding apparatus wherein several strands issue as a single thread for winding about a bobbin, it is important to be able to immediately stop further winding as soon as a broken thread occurs. This avoids defective windings, and the necessity of unwinding the latter. The advantages of time, labor, and expense saved not only in avoiding defective windings, but also in stopping the winding operation without the necessity of stopping the motor drive, serve to speed operations and to result in better and more economical goods.

The invention further lies not only in the general organization and construction of its various components,

but also in their cooperative association with one another to effect the results intended.

The foregoing and other objects and advantages of this invention will appear more fully hereinafter from a consideration of the detailed description which follows, taken together with the accompanying drawings wherein an embodiment of the invention is illustrated. It is to be expressly understood, however, that the drawings are for purposes of illustration and description, and are not to be construed as defining the limits of the invention.

In the drawings:

Fig. 1 is a view of a thread winding apparatus embodying the invention;

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 sectional detail illustrating a modified arrangement in the electro-magnetic device;

Figs. 5 and 6 show further modifications in the electro-magnetic device; Fig. 5 being a bottom plan of the base plate; and Fig. 6 being a section in elevation further showing the modification; and

Fig. 7 is a section in elevation showing a further modification in the electro-magnetic device.

In the several drawings similar reference numerals serve to identify similar parts.

In describing the invention in further detail, reference is directed to the several drawings; now, particularly to Figs. 1 to 3 wherein a plurality of conventional yarn packages 1 are shown, from each of which leads a strand 2 of yarn. Each strand is individually led over a separate break detecting device 3. The latter includes a wire 4 pivoted to a support 5. The wire element has a crook or V bend 6 at its opposite end through which the yarn passes to conventional twisting mechanism, symbollically shown at 7. The several strands issue from the twister as a single multi-ply thread 8 which is directed for winding about a rotating bobbin 9. The various devices for guiding the yarn, keeping it tensioned, and the like in a winding operation are not shown, it being understood that such devices and their location are clear to those skilled in the art.

The tension provided in the winding process by a strand 2 on the wire element 4 of the associated detecting device pivots the latter against the tension of a light spring 11, so that the free end 12 of the wire element which serves as one contact member of a switch is clear of a second contact 14. The arrangement intends that when any one strand breaks, the tension of the broken strand will be relieved from the associated wire element, whereupon the latter will be drawn by its spring 11 to close on contact 14 and establish a circuit to energize an electro-magnetic device 15. The latter will thereupon effect immediate stoppage of the rotating bobbin 9 and further winding until repairs are made to the broken strand.

The bobbin 9 is carried by a vertically disposed spindle 16, which is journalled at its lower end 17 in a supporting standard 18. The spindle is fitted for rotation in the inner race 19 of a bearing member. Mounted for rotation on the outer race 21 of the bearing is a belt driven pulley 22. The drive belt 23 is driven by a suitable motor, not shown. A bushing 24 about the spindle spaces the bearing member and the associated pulley a desired distance above the base of the standard 18.

The pulley has a relatively broad annular top end 25 on which is bonded a friction ring 26. Located on the spindle in spaced relation to the pulley member is a bobbin support 27. This includes a cylindrical depending body portion 28, which is press fitted on the spindle for roation with the latter. Unitary with the top end of this body portion 28 is a platform or rest 29 of relatively greater diameter. The upper portion of the spindle projects axially through this platform sufficiently to permit

a bobbin 9 to be received thereon. The platform serves as a rest for the bobbin. It has a transverse rib 31 on its upper surface, which engages in a complementary slot 32 formed in the base end of the bobbin, whereby the bobbin rotates as a unit with the spindle.

The body portion 28 of the bobbin support depends down the spindle in close proximity to the pulley. Vertically slidable on the body portion 28 is a brake member 33. This comprises a cylindrical upper piece 34 which has a slide fit on member 28, and a disc plate 35 of relatively greater diameter jointed about the bottom end of the upper piece 34. The diameter of the disc plate 35 corresponds to that of the top end of the pulley member.

The disc plate 35 normally rests in frictional engagement with the friction ring 26 mounted at the top of the pulley. A pair of pins 36 depending from the underside of the bobbin platform 29 project freely into a pair of vertical slots 37 formed in diametrically opposed portions of the wall of the slide piece 34, whereby the slide member and spindle are locked for rotation as a unit. A space 38 normally exists between the ends of the pins and the bottom walls of the slots 37 so as to enable vertical slidable movement of the slide member 34. The upper end wall of the slide piece 34 is spaced below the underside of the bobbin rest 29, and provides a thickened wall on which rests a pressure plate 39. The latter has a pair of slots 41 to allow for free passage of the pins 36. Limited between the pressure plate and the underside of the bobbin rest 29 is an annular spring 42 which normally acts through the pressure plate upon the slide piece 34 of the brake member 33 so as to hold the disc plate of the latter in frictional engagement with the friction ring 26. By the foregoing arrangement, rotation of the pulley member is transmitted through the brake member 33 and pins 36 to the spindle 16.

The brake member 33 serves as the armature of the electromagnetic device 15. Energization of the latter lifts the brake member 33 free of the friction ring 26, whereupon the pulley continues to rotate on the outer race 21 of its bearing, disabled from transmitting rotary motion to the spindle shaft.

The electro-magnetic device includes a winding 43 about a hollow core 44. The latter freely surrounds the upper piece 34 of the brake member. The winding is confined about the core 44 in a shell or casing. The latter includes an outer surrounding cylindrical wall 45 and a covering top wall. The latter is formed of an inwardly radially extending flange 46 of wall 45 which is engaged by ears 47 of an underlying wall 48 projecting radially outward from the upper end of the core 44. The bottom end wall 49 of the outer wall 45 rests upon the surface of a base plate 51. The latter provides an axial opening which freely surrounds the upper piece 34 of the brake member. The annular bottom end wall 52 of the core member 44 extends through the axial opening in the base plate to the level of the undersurface of the latter. The core provides a cut 53 in its periphery in which the inner wall the base plate is jointed. The base plate is of relatively greater diameter than the surrounding wall 45 of the core member, and provides a marginal extension 54 which is rigidly mounted to the standard 18 as by bolts 55.

The spindle shaft 16 is preferably formed of hardened steel for reasons, among others, of obtaining high rotating efficiency and balance in its bearings. However, it is desired that when the electro-magnetic device is energized, the flux field will not spread to the spindle shaft. Magnetic flux in the spindle shaft is undesirable, as residual magnetism in the latter may affect the rotating efficiency of the spindle in its bearings. Accordingly, the bobbin support 27, as well as the upper piece 34 of the brake member, and the base plate 51 are formed of non-magnetic material, such as brass. The shell 50 of the electro-magnetic device, comprising the core 44, top

flanges 46, 48, and the surrounding wall 45 are of ferro-magnetic material, preferably of high permeability and low retentivity. The disc plate 35 of the brake member, as well as a ring of equally spaced plugs 56 press fitted in the base plate 51 are of similar magnetic material. The upper faces of the plugs are flush with the surface of the base plate and underlie the bottom end wall 49 of the shell 50. The plugs are desirably of slightly greater diameter than the thickness of the wall 49 so as to extend beyond opposite sides of the latter and to insure full contact with the wall 49. When the core winding is energized, the ring of plugs form one pole of an electro magnet, and the bottom end wall 52 of the core forms the other pole. A relatively short gap 57 separates the underlying disc plate 35 from the base plate 51, whereby energization of the core winding causes an instant attraction of the disc plate to the pole elements. The flux path created is confined to the disc plate 35 through the pole elements. To further avoid any flux field passing from the disc plate to the spindle, the inner annular wall of the disc plate is bonded by a joint, as at 58, to the peripheral surface of the upper piece 34 forming the other portion of the brake member.

Now, in the operation of the apparatus described, when the electromagnetic device is energized as a result of a broken strand of yarn causing one of the detecting devices 3 to close an energizing circuit, the brake member 33 is magnetically lifted upwards. This action, as previously stated, disengages the spindle shaft from the rotating pulley. Further, when the disc plate of the brake member is drawn to the poles of the magnetic device, the flat upper surface of the disc plate limits against the brass underside of the base plate 51, whereupon rotation of the brake member and the associated spindle shaft and bobbin members stops. The braking action on the spindle and bobbin is immediate, and further winding immediately ceases, so that there is no defective thread winding made upon the bobbin. The pulley member, though disabled from rotating the spindle shaft, nevertheless continues rotating under the power of its associated power driven belt. This enables the broken strand of yarn to be repaired without turning off the motor power.

Fig. 4 presents a modified form of the invention, wherein the plug members are varied in form, as indicated at 59, and a friction disc 61 is bonded to the underside of the base plate 51. In this arrangement, when the armature disc plate 35 is drawn upwards, it frictionally engages the added friction disc 61 and rotation of the disc plate 35 is brought to an abrupt halt. Because of the thickness of the added friction disc, and so as to maintain a close gap between the armature disc 51 and the poles of the magnetic device, the plug elements project below the base plate 51. They project a little short of the bottom level of the added friction disc, and are enlarged to provide a greater magnetic area to the armature disc. By this arrangement the armature disc 35 is attracted by the plug elements 59, and is frictionally engaged by the added friction disc without coming into rubbing contact with the plug elements.

In the variation shown in Figs. 5 and 6, the plug elements, indicated at 56 in Figs. 1 and 2, are replaced by tongues 62 depending from the bottom end 49 of the shell wall 45. These tongues fit into complementary slot openings in the base plate 51. They may extend into the slots so as to be flush with the underside of the base plate, as in Fig. 6; or they may depend below the base plate as in Fig. 7 wherein an added friction disc 61 is provided.

While an embodiment of the invention has been illustrated and described in detail, it is to be expressly understood that the invention is not limited thereto. Various changes can be made in the design and arrangement of the parts without departing from the spirit and scope of the invention, as the same will now be understood by those skilled in the art; and it is our intent therefore to claim the invention not only as shown and described,

but also in all such forms and modifications thereof as may be reasonably construed to be within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A spindle stop comprising a rotatable spindle, a power driven pulley, a brake member, a slide member carried by the spindle and disposed between the pulley and the brake member, the slide member having a normal position on the spindle engaging the spindle with the pulley for rotation of the spindle and having an actuated position on the spindle in the opposite direction engaging the spindle with the brake member in restraint of rotation of the spindle, and an electro-magnetic device, wherein the slide member is responsive to energization of the magnetic device to slide upon the spindle from its normal position to its actuated position.

2. A spindle stop comprising a bearing member having an inner race and an outer race, a spindle journalled in a standard and fitted in the inner race, a power driven pulley rotatably mounted on the outer race, a slide member longitudinally slidable on the spindle, means engaging the spindle with the slide member for rotation as a unit, the slide member having a normal position on the spindle in engagement with the pulley for rotation of the spindle with the pulley, a brake member in opposed spaced relation to the pulley, and the slide member having an actuated position on the spindle free of the pulley and in restrained engagement with the brake member whereby rotation of the spindle following freeing of the slide member from the pulley is restrained.

3. The apparatus comprising a bearing member having inner and outer races, a vertically disposed spindle journalled at its lower end in a standard and fitted in the inner race, a bobbin support fixed on the upper portion of the spindle and adapted to engage a bobbin passed over the upper end of the spindle for rotation of the bobbin with the spindle, a drive pulley rotatably mounted on the outer race of the bearing, a brake member spaced above the pulley, a slide member slidable on the spindle between the pulley and the brake member, means carried by the bobbin support engaging the slide member for rotation of the latter together with the bobbin support and spindle, the slide member having a normal position on the spindle in engagement with the pulley, the slide member having a moved position on the spindle free of the pulley and in restrained engagement with the brake member whereby the spindle and bobbin support are restrained against rotation, and electro-magnetic means operable to move the slide member to the latter position.

4. The apparatus according to claim 3, wherein a friction disc is bonded to the top end of the pulley, and the slide member has a complementary disc at its lower end normally engaged by the friction disc.

5. The apparatus according to claim 4, wherein the slide member carries at its lower end a disc of magnetic material normally frictionally engaged by the friction disc, and the brake member comprises a disc of non-magnetic material carrying magnetic elements forming the poles of the electromagnetic means, which poles are effective upon energization of the electro-magnetic means to draw the disc of the slide member free of the friction disc and to limit it against the disc and poles of the brake member.

6. The apparatus according to claim 3, wherein a friction disc is bonded to the top end of the pulley, a friction disc is bonded to the underside of the brake member, and the slide member carries a disc having a bottom face normally in frictional engagement with the friction disc atop the pulley and having an upper face engageable with the friction disc of the brake member when the slide member is moved to its other position.

7. The apparatus as in claim 3, wherein a spring load is provided to return the slide member to normal engaged position with the pulley when the electro-magnetic means has ceased to operate.

8. The combination in thread winding apparatus of the character described of: a yarn twisting device for twisting a strand from each of a plurality of yarn packages into a multi-ply thread, means for detecting a break in any one of the strands during travel of the strands from the packages to the twisting device, a rotatable spindle carrying a bobbin for receiving the thread from the twister, a power driven pulley, means normally engaging the spindle with the pulley for rotation of the spindle, and means responsive to the detecting means upon the latter detecting a broken strand of yarn to disengage the spindle from the pulley and simultaneously brake subsequent rotation of the spindle.

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