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SAFETY DEVICE FOR YARN TWISTING MACHINES

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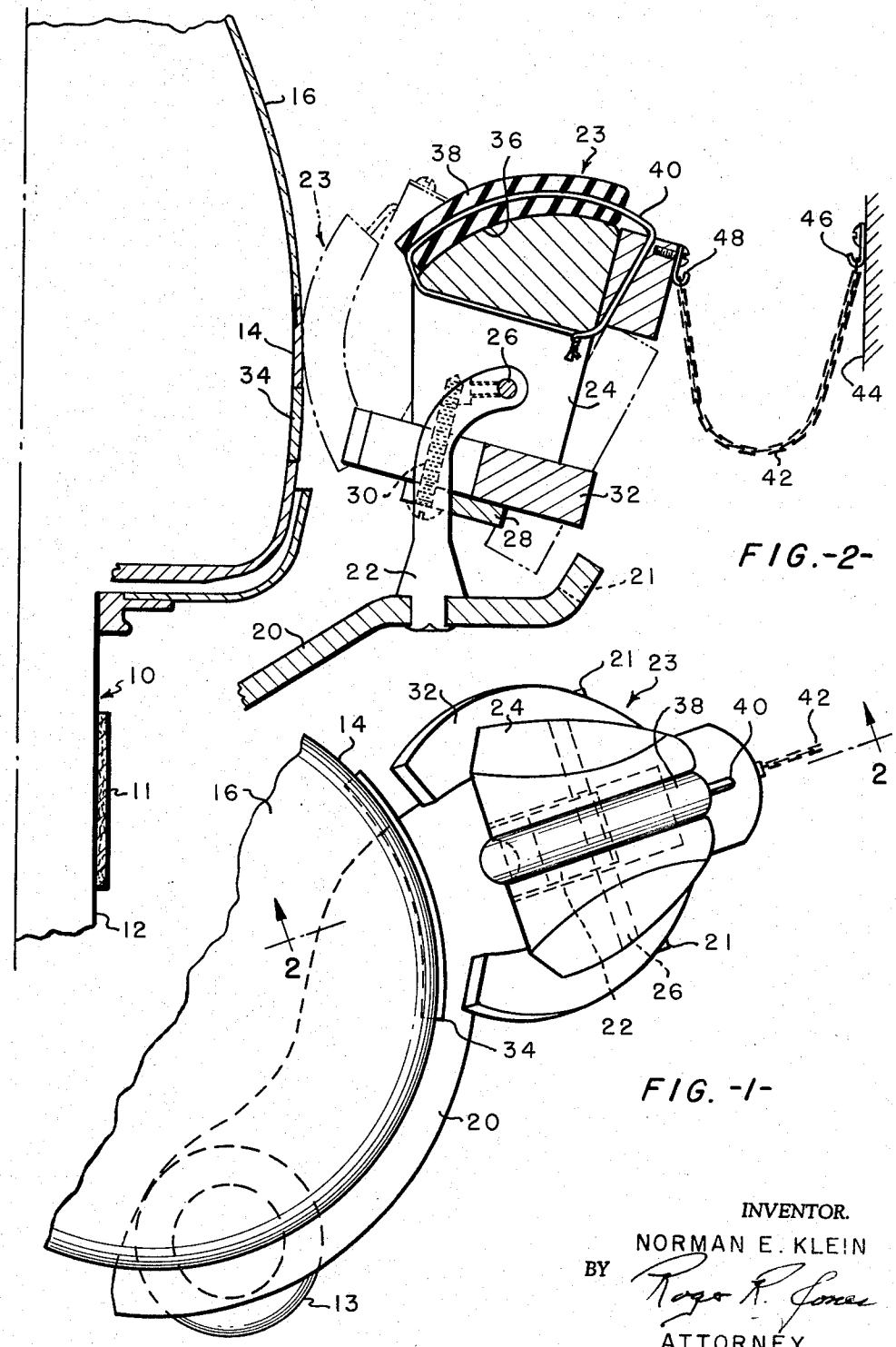


FIG.-2-

FIG.-1-

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SAFETY DEVICE FOR YARN TWISTING MACHINES

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5 Claims. (Cl. 57—58.76)

This invention relates to twisting machines of the type which impart two turns of twist to a yarn for each revolution of the twister spindle, and more particularly the invention relates to apparatus for preventing unintended rotation of a bobbin support member in a two-for-one twister. The present application is a division of U.S. application, Serial Number 244,812, filed September 1, 1951, now U.S. Patent 2,811,013.

A two-for-one twister generally comprises a rotatable spindle and a yarn package support member or platform carried by the spindle and stabilized against rotation therewith. The package support can be stabilized against rotation in a number of ways but is generally stabilized by eccentric weight distribution or by magnetic means. Two-for-one twisters can be either inflow or outflow twisters but both types utilize a stationary yarn package support and in both types an end of yarn is passed to or from a bobbin or the like, carried by the package support, and the spindle rotates the yarn balloon fashion about the stationary package support so that two turns of twist are inserted for each revolution of the spindle. Most two-for-one twister spindles for small denier yarns are designed to replace conventional one-for-one spindles in uptwister frames because most textile plants are equipped with conventional uptwisters and the conversion of existing equipment to two-for-one twisting results in an appreciable cost savings as compared to the purchase of completely new apparatus.

Substantially all two-for-one twisters are equipped with a safety device designed to prevent rapid rotation of the yarn package support in the event that the normal stabilization means should for some reason prove inadequate to prevent rotation. This is necessary because the yarn package support is not dynamically balanced and if the same should be rapidly rotated, due to excessive bearing friction, yarn entanglement, or for some other reason, this inevitably results in misalignment of or damage to the spindle or even in the almost complete destruction thereof. Further, if the yarn package support and the yarn package supported thereby are rotated at a rate even approaching that at which the spindle is normally rotated, flying parts from the twister can endanger the safety of attendant personnel.

While there are many different types of devices for preventing rapid rotation of the support platform of a two-for-one twister, no prior art device has proven completely satisfactory in all respects. A primary objection to many of the prior art devices for preventing rapid rotation of the bobbin support member is that the devices are exceedingly complicated and employ a large number of moving parts, and the more moving parts present in apparatus of this type, the greater is the chance that it might fail to operate properly. An objection to some types of prior art apparatus is that they are insufficiently compact to be readily added to a conventional downtwister frame or are of such nature that they so encumber the twister unit that it is difficult

to equip the same with a stop motion device to stop the spindle upon yarn breakage. Another disadvantage of many types of prior art devices for preventing dangerous rotation of the bobbin support is that the devices require a plurality of heavy magnets at least one or more of which must be carried by the bobbin support itself thereby adding unnecessary weight to the package support member and increasing its dynamic unbalance. Still another disadvantage of some types of devices is that they require an eccentric yarn balloon thereby decreasing the maximum rate at which the spindle can satisfactorily be operated.

It is a primary object of this invention to provide apparatus, for preventing undesired rotation of the yarn package support member in a two-for-one twister, which is simple in design, easily constructed, compact in nature and overcomes the other disadvantages of prior art devices as enumerated above.

It is another object of the invention to provide improved apparatus, for preventing undesired rotation of the yarn package support member in two-for-one twister, which acts directly upon the package support member rather than upon the spindle and which acts with sufficient force to prevent rotation of the spindle in the event that bearing failure or the like prevents relative rotation between the support member and the spindle. Some prior art devices act to prevent rotation of the bobbin support member by braking the rotation of the spindle and this is not advantageous since, in some instances, rotation of the platform, even for the period of time that is necessary to stop the rapid rotation of the spindle, can result in damage.

It is still another object of the invention to provide improved apparatus, for preventing undesired rotation of the package support member in a two-for-one twister, which is exceedingly rapid and positive in action.

According to this invention there is provided apparatus comprising a brake member, mounted adjacent the bobbin support member of a two-for-one twister, which is pivotable from an inoperative position to an operative position such that it frictionally engages the package support member to prevent its rotation, means urging said pivotable member from inoperative to operative position, and magnetic means to retain said pivotable member in an inoperative position during normal operation of the twister spindle. According to a preferred embodiment, the magnetic means to hold the brake member in an inoperative position constitutes the stabilizing means for preventing rotation of the bobbin support member during normal operation of the twister spindle.

One specific embodiment of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a top plan view of an apparatus according to this invention for preventing undesired rotation of the yarn package support platform of a two-for-one twister and,

Figure 2 is a cross sectional view taken substantially along the line 2—2 of Figure 1.

With reference to the drawings in greater detail, there is partially illustrated a two-for-one twister, which can be conventional in design, and which comprises a rotatable spindle generally indicated by the reference numeral **10** (see Figure 2 of the drawings). The spindle **10** has a whorl portion **12** which is designed to frictionally engage a drive belt **11** or the like and thereby rotate the spindle at a rapid rate. Preferably the spindle **10** is supported in a swing gate, indicated by the reference numeral **13** and only partially illustrated, so that it may readily be pivoted from operative position to result in the whorl portion **12** being removed from operative contact with the drive belt or other driving means.

Carried by the spindle 10 and relatively rotatable with respect thereto is a cup-shaped yarn package support platform or member 14 which is designed to support a bobbin or the like of yarn. The yarn package support 14 may be formed of any suitable non-magnetic material such as aluminum or a phenolic resin material but should not be formed of a magnetic material for reasons which will subsequently become apparent. The yarn package support 14 may also serve as a base for a suitable cover 16 to enclose the yarn package and to prevent entanglement or snagging of the yarn being twisted.

Extending from swing gate 13 is a support arm 20 having an upturned end with opposed transversely extending projections 21, and which carries an upstanding bracket 22 arranged adjacent the yarn support 14 (see Figure 2). Bracket 22 serves as a support for a package support brake which is generally indicated by the reference numeral 23 and which includes a slotted magnet support member 24 preferably formed, at least in large part, from a relatively heavy non-magnetic material such as brass. Support member 24 is mounted for limited rocking movement on the end of bracket 22 by means of a pin 26, and secured to the lower end of member 24 by means of a clamping plate 28 and screws 30 is a U-shaped permanent magnet 32 which is preferably of high permeability. Clamping plate 28 serves not only to hold magnet 32 in position but is so constructed that a portion thereof serves as a stop and abuts against bracket 22 to limit the extent to which support member 24 can be pivoted in a clockwise direction as viewed in Figure 2 of the drawings.

The center of gravity of support member 24, and the elements supported thereby, is appreciably above and slightly to the left of pin 26, as viewed in Figure 2 of the drawings, so that support member 24 is urged to rotate in a counterclockwise direction but is normally prevented from doing so by magnet 32. The yarn package support 14 is provided with an insert 34, formed of a magnetically permeable material such as iron, which is at approximately the same level as the poles of magnet 32 when support member 24 is pivoted to a maximum extent in a clockwise direction. When the spindle 12 is in operative position and the package support 14 is rotated such that insert 34 is adjacent the poles of magnet 32, the magnetic attraction of the magnet 32 for the insert 34 maintains the support 24 in the position illustrated in Figure 2 and at the same time overcomes the tendency of the yarn package support 14 to rotate with spindle 10.

The upper portion of the support member 24 has an arcuate surface 36 grooved to receive a strip of resilient material, such as rubber tubing 38, which provides a slip-resistant braking surface. The tubing 38 may be retained in position by means of a wire 40 threaded therethrough and passing about the transverse leg portion of member 24. The position of support member 24 is such relative to the yarn package support 14 that when support 24 is pivoted in a counterclockwise direction, rubber tube 38 engages the surface of package support 14, as shown by the broken line representation of brake 23 in Figure 2, to effectively prevent rotation of the package support, and since, as previously mentioned, the weight distribution of magnet support member 24 and magnet 32, relative to the axis of rotation of member 24, is such as to provide a means urging counterclockwise rotation of support member 24, such engagement is rapidly effected when insert 34 is moved beyond the magnetic field of magnet 32.

A chain 42 may be employed to connect the upper end of the magnet support member 24 with an appropriate frame member 44 by means of suitable fasteners 46 and 48. The length of chain 42, which effectively forms a lost motion connection between the pivoted brake 24, 38 and the frame member 44, is so selected that it will permit sufficient angular movement of the magnet support member 24 to effect a suitable braking action upon yarn package support 14, but becomes taut when the swing gate supporting spindle 10 and arm 20 is moved from an operative to an inoperative position. The chain 42 thereby causes the magnet support 24 to be rotated in a clockwise direction thereby making it automatically ready to again perform its magnetic stabilizing function.

In operation, magnet support member 24 is pivoted in a clockwise direction until plate 28 engages bracket 22, and yarn package support 14 is rotated until the magnetically permeable insert 34 is adjacent the poles of magnet 32. The swing gate 13 is then rotated until the whorl portion 12 of spindle 10 is in contact with the driving belt 11 so that spindle 10 is rotated at a rapid rate. Due to the magnetic attraction between magnet 32 and magnetically permeable insert 34 the magnet support member 24 remains in the position illustrated and yarn package support 14 is stabilized against rotation. In the event that excessive bearing friction, yarn entanglement, or the like forces yarn package support 14 to rotate in spite of the magnetic attraction between magnet 32 and insert 34, the insert 34 is moved from the magnetic field of magnet 32, and magnet support member 24 pivots in a counterclockwise direction to bring the surface of rubber tube 38 into contact with the yarn package support 14.

The braking force exerted by brake 23 upon package support 14 is sufficient to overcome the driving force upon spindle 10 and prevents rapid rotation of package support 14, even though the spindle 10 and the supply package support 14 become locked together as a unit. There are several reasons why this is true. In the first place, the surface of yarn package support 14 which is acted upon by brake 23 is considerably further removed from the axis of rotation of spindle 10 than is the surface of whorl 12 so that the braking force is exerted through a longer lever arm than is the driving force. Another factor contributing to the effectiveness of the brake 23 is the weight distribution of member 24 and the elements supported thereby. As previously mentioned, the center of gravity of member 24, and the elements supported thereby, is considerably above the pivot pin 26 so that as member 24 rotates in a counterclockwise direction, as viewed in Figure 2 of the drawings, the counterclockwise torque increases and is much greater when the brake 23 is in operative position than when the brake is in its usual inoperative position. Still another factor contributing to the effective action of brake 23 is the curvature of the brake shoe surface. When the rubber tubing 38 engages package support 14, the lengthwise curvature of the rubber tubing results in a wedge effect and any motion of the package support 14 acts to increase the magnitude of the braking action. A further factor which contributes to the effectiveness of the brake 23 is that, if arm 20 is made of magnetically permeable material, when the brake moves into operative position the poles of magnet 32 are attracted to arm 20 and particularly to the portions 21 of arm 20. This magnetic attraction urges further counterclockwise rotation of the support member 24 and thereby increases the magnitude of the braking action. Because of these considerations and the fact that the brake 13 rapidly becomes operative after only a slight rotation of yarn package support 14, there is substantially no chance of supply package support 14 being rotated at a rate which might result in damage.

Having thus described my invention what I desire to claim and secure by Letters Patent is:

1. A twister comprising a rotatable spindle, a normally stationary rotatably mounted yarn package support having its axis coaxial with said spindle axis, a support member swingably supporting said spindle and package support for movement about an axis offset from said spindle axis for movement of said spindle into and out of engagement with a drive means for said spindle, a package support brake pivotally mounted on said swing member for bodily swinging movement with and for pivotal movement relative to said swing member, and said brake being adapted for actuation upon rotation of said package sup-

port to brake said package support against rotation, and a frame member spaced from said brake, a lost-motion connection between said frame member and said brake, said connection having a lost-motion extent sufficient to enable said brake to move from normal inoperative non-braking position to operative braking position, but sufficiently short to reset said brake to inoperative position upon swinging movement of said spindle, package support and brake away from the drive means for said spindle.

2. Apparatus according to claim 1 wherein said lost-motion connection is a flexible connecting line.

3. In a two-for-one yarn twister including a rotatably driven spindle, a normally stationary package support member mounted on said spindle, a brake member mounted adjacent said yarn support member, said brake member being pivotable from an inoperative position to an operative position in frictional engagement with said package support member to prevent its rotation, said brake member being normally biased from inoperative to operative position, and magnetic means to retain said pivotal member in an inoperative position during normal operation of the twister spindle said brake shoe being externally convex, the entire unitary brake member being pivoted about an axis transverse to the axis of said package support member for angular movement toward and away from said package support member, the external braking surface of said brake shoe increasing in its effective distance from said pivot axis to form an effective braking wedge upon pivotal movement into braking position with said package support member.

4. In a two-for-one yarn twister including a rotatably driven spindle, a normally stationary package support

member mounted on said spindle, a brake member mounted adjacent said yarn support member, said brake member being pivotable from an inoperative position to an operative position in frictional engagement with said package support member to prevent its rotation, said brake member being normally biased from inoperative to operative position, magnetic means to retain said pivotal member in an inoperative position during normal operation of the twister spindle, and a flexible connecting line operatively connected to said brake member and limiting pivotal movement of said brake member.

5. Apparatus according to claim 4 further comprising a frame member, said flexible connecting line being operatively connected to said frame member at a point spaced from the pivot axis of said brake member, a swing member, said brake member being mounted for pivotal movement on said swing member and for bodily movement with said swing member in a direction toward and away from said frame member whereby said brake member may be automatically reset upon swinging movement of said swing member and brake member away from said frame member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,484,866	Borovoy	Feb. 26, 1924
2,085,611	Prince-Smith	June 29, 1937
2,374,085	Gwaltney et al.	Apr. 17, 1945
2,411,126	Burnham	Nov. 12, 1946
2,518,491	Pfeffer et al.	Aug. 15, 1950
2,731,786	Klein	Jan. 24, 1956