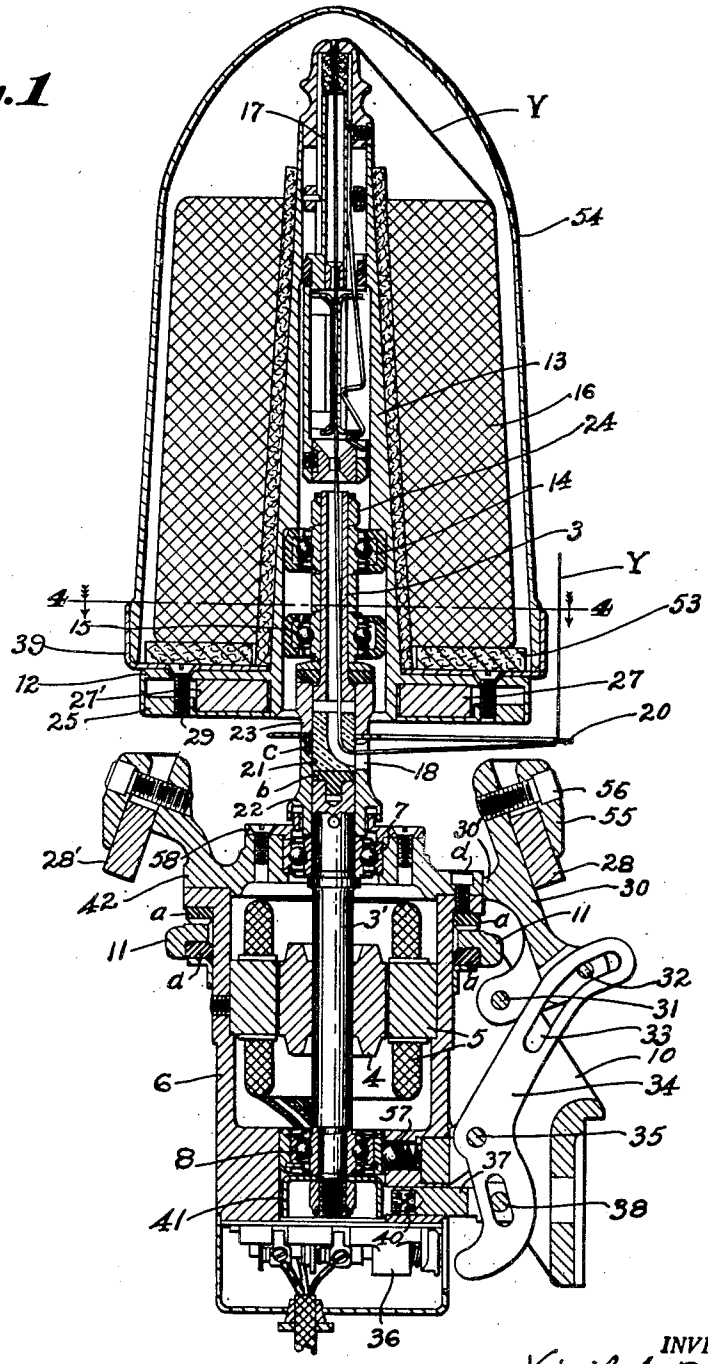
Nov. 12, 1946. V. A. BURNHAM 2,411,126

TWISTER FRAME

Filed March 2, 1945 2 Sheets-Sheet 1

Fig. 1



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TWISTER FRAME

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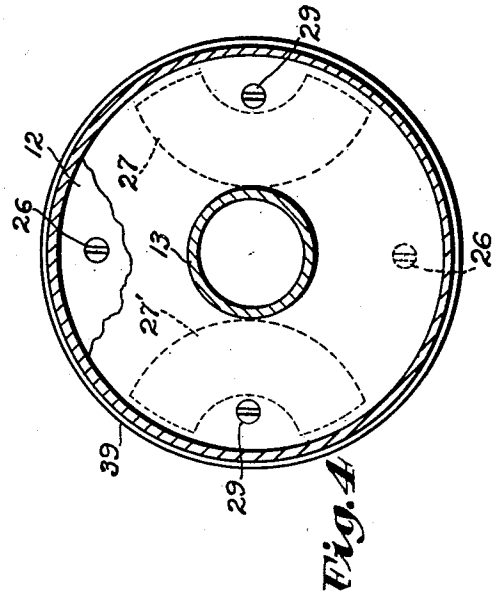


Fig. 4

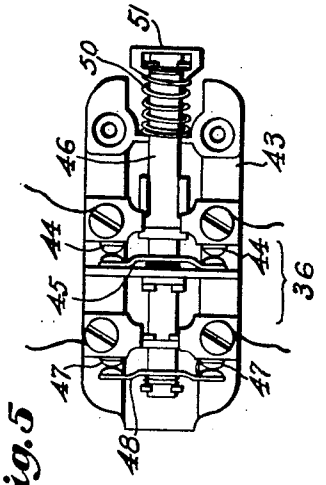


Fig. 5

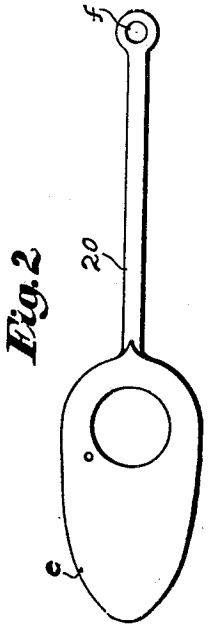


Fig. 2

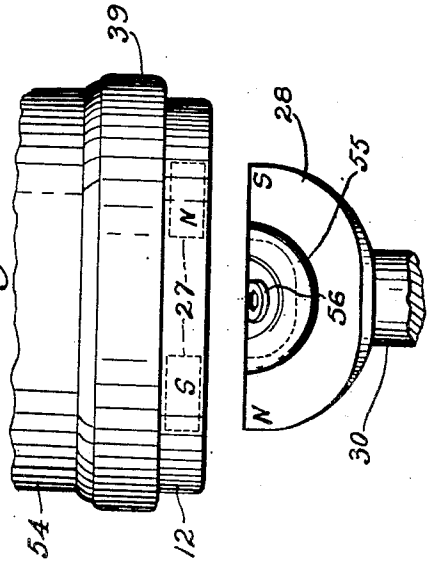


Fig. 3

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UNITED STATES PATENT OFFICE

2,411,126

TWISTER FRAME

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Application March 2, 1945, Serial No. 580,657

9 Claims. (Cl. 57—58)

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This invention relates to textile twisting machines of the so-called "2 for 1" type.

In Patent No. 2,374,085, issued April 17, 1945, and assigned to the assignee of the present invention, a novel form of twister of this type is shown and described which represents a very important advance in machines of this general character. While 2 for 1 twisters have been known for almost a century, and much effort has been expended in an endeavor to perfect them and make them available for general commercial use, they have never become at all common, primarily because they are inherently dangerous machines. The application above referred to includes a disclosure of automatic stop mechanism operating on the magnetic principle, which makes the machine entirely safe to operate, and that invention, therefore, overcomes the very serious handicap which has always attended the use of these machines.

The present invention aims further to improve and perfect the machine shown in the patent above identified with a view to simplifying its construction, reducing the cost of manufacture, making the machine more adaptable to the requirements of different mills and varying conditions, and generally improving the construction and operation of that machine.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Fig. 1 is a vertical, sectional view, partly in elevation, illustrating a preferred embodiment of my invention;

Fig. 2 is a plan view of a flier included in the machine shown in Fig. 1;

Fig. 3 is a fragmentary right-hand elevation of portions of the machine shown in Fig. 1;

Fig. 4 is a sectional view of the yarn package carrier, the view being taken substantially on the line 4—4, Fig. 1; and

Fig. 5 is a bottom view of the switch forming one element of the control mechanism shown in Fig. 1.

Referring first to Fig. 1, the machine there shown includes a hollow spindle blade 3 integral with the shaft 3' of an electric motor individual to the machine. The motor includes a rotor 4 secured rigidly to the shaft 3', a field structure 5, and a frame 6 carrying upper and lower ball bearings 7 and 8, respectively, in which the shaft is supported. A bracket 10, shaped to be bolted

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to a bar or rail of a twister, or similar machine, carries a ring 11 on which the motor frame 6 is mounted, and these parts are isolated from each other by resilient rings or bushings *a*—*a*.

In order to support the vertical load on the shaft 3', the ball bearing 7 is selected from the type adapted to take vertical thrust, as well as radial load, and the shaft is provided with a shoulder cooperating with the inner race of the bearing to transmit the load applied primarily to it.

The yarn package carrier, indicated in general at 12, comprises a horizontal plate-like member and an integral central tapered sleeve 13, the bore of which is stepped, and one of the internal shoulders so formed rests on the upper of two ball bearings 14 and 15, respectively, which are mounted on the spindle. This upper bearing affords vertical support for the carrier and the load transmitted through it, while both bearings cooperate to center the carrier radially on the axis of the spindle. They support the former for rotative movement around the spindle or, more properly, they permit the carrier to remain stationary while the spindle revolves inside of it.

The yarn supply body 16 is removably mounted on the carrier and yarn drawn from this body is led upwardly to the top of a tension unit 17 which is removably supported in the upper tubular section 13 of the carrier. It comprises two plates spring-pressed together, between which the yarn passes downwardly in to the upper hollow portion 3 of the spindle blade and then out through an aperture 18 in the side of the blade to the guide eye of a flier 20. From this point the yarn travels upwardly to some suitable form of wind-up mechanism.

At the lower end of the hollow yarn-guiding section of the spindle it is slotted laterally from one side to the other to receive snugly a rectangular thread-guiding block 21 having a curved passage therethrough and preferably made of porcelain, or some equivalent material offering very little resistance to the travel of the yarn. This block rests on a rubber bushing *b* set into the spindle at the bottom of the slot and these parts and the flier are locked in place by and between lower and upper sleeves 22 and 23, respectively, both encircling the spindle. The former is pinned to the spindle blade at its junction with the shaft 3'; a pin *c* positions the flier with respect to it; the latter sleeve 23 bears on the flier, and all of these parts, together with the inner races of the bearings 14 and 15 are clamped on the spindle by a nut 24 threaded on the upper

end of the blade section 3. Intermediate washers and spacers are provided for this purpose.

In order to hold the yarn package carrier 12 stationary, two magnets 27 and 27', Figs. 1 and 4, are mounted in the base of the carrier 12 in diametrically opposite positions, as shown in Fig. 4, with their pole faces just inside the downwardly extending circumferential flange of the carrier. They are held in place by a bottom plate 25 which fits in the space between said flange and the central tube 13 of the carrier body, the plate being secured to the main body of the carrier by two screws 26—26, Fig. 4, and also by two additional screws 29—29 which secure the supplemental carrier plate or cup 39 to the carrier base assembly. Preferably the carrier body is a die casting made of a non-magnetic metal composition. Also, parts 25 and 39 are non-magnetic.

These two magnets 27 and 27' cooperate with two normally stationary magnets 28 and 28', respectively, mounted on the motor frame and having their poles positioned in juxtaposed relationship to the poles of the upper magnets, but located immediately under the latter and in nearly a right-angle relationship to them. The poles, however, are reversed so that the north and south poles of each upper magnet are positioned close to, and in opposed relationship to, the respective south and north poles of the lower magnets. This relationship of the magnets 27 and 28 is clearly shown in Fig. 3, and the other magnets 27' and 28' are similarly positioned with reference to each other. Consequently, the magnets of each pair exert a strong magnetic pull on each other and both pairs cooperate to hold the carrier 12 normally against rotation.

Also, the poles of the two magnets on the carrier are reversed circumferentially with reference to each other, as in the arrangement shown in the application above referred to, the two north poles being diametrically opposed and the two south poles also being diametrically opposite each other. Consequently, if any substantially rotative movement of the carrier 12, Fig. 3, should occur, two poles at opposite sides of the carrier would be brought into opposed relationship to two stationary poles, respectively, of the same polarities, where they would exert a repulsive action, each upon the other. Moreover, due to the reversed relationship of the poles on the carrier, if this member should be revolved through an angle of 180°, then both poles of the magnet 27 would be brought into opposed relationship to both poles of the magnet 28, and a very strong repulsive action then would be produced. Such rotation of the carrier occurs only when something has gone wrong in the relation between the carrier and the spindle and when, therefore, it is absolutely essential to the safety of those in the immediate vicinity of the machine that it be shut down.

The present invention makes use of the repulsive effort created between the magnets at this time, together with the action of gravity, to stop both the motor and the spindle. For this purpose the magnet 28, Fig. 1, is secured rigidly on the upper end of an arm or lever 30 fulcrumed at 31 on the bracket 10, the arm having a flat face against which the magnet 28 is clamped by a cover plate 55 and a screw 56 passing therethrough and through the space between the arms of the magnet into the rearward portion of said arm 30. Also, the cover plate is provided with a central boss that fits between the arms of the magnet. The arm carries a pin 32 which extends into a cam slot 33 in another lever 34 fulcrumed at 35 on said bracket. If the magnet 28 is repelled, as above described, it will swing in a clockwise direction about its fulcrum point 31 and it quickly gains momentum due to the action of gravity, thus carrying the pin 32 into contact with the lower surface of the slot 33 where it operates to swing the lever 34 also in a clockwise direction. The lower end of this lever is arranged to engage the plunger of a switch 36, which controls the flow of current to the motor, and it opens this switch, thus cutting off power to the motor. At the same time a plunger 37, having a pin and slot connection 38 with the lower end portion of the lever 34, is forced inwardly, and the inner end of this plunger carries a brake shoe 40 which engages the outer surface of a brake drum 41 secured rigidly to the lower end of the motor shaft 3'. The result, therefore, is to stop the rotation of both the motor shaft and the spindle. While the knock-off action is initiated mainly by the mutual repulsive action of the magnets 27 and 28, the kinetic energy of the falling mass of the magnet 28 and its arm are relied upon chiefly to operate the lever 34 and subsequently to set the brake 37 and open the switch 36.

The parts of this stop mechanism may be reset merely by swinging the upper end of the arm 30 back into its normal position, as shown in Fig. 1, where it is held by magnetic attraction, with the stop lug 30' resting against the motor frame. Also, when the stop mechanism has been operated, as above described, the weight is so related to the pivot points that the parts will remain in their knocked-off position until manually re-set.

The other magnet 28' is mounted in a fixed position on an arm projecting upwardly and laterally from the motor cap 42, this cap being secured by several screws, one of which is shown at *d*, Fig. 1, to the main body 6 of the motor frame or housing. This cap may conveniently consist of a die casting made of some non-magnetic material, such as an aluminum alloy, or the like, so as to isolate the magnets from other parts in the base of the machine.

The motor used preferably is of a three-phase, high frequency type commercially available and capable of driving the spindle and flier at speeds of at least 10,000 R. P. M. Fig. 5 shows a switch (not of my invention) which is suitable for controlling the motor, although other forms of switches may be substituted for it. It comprises an insulating body 43 provided with stationary contacts 44—44 adapted to be engaged by additional contacts formed on the opposite ends of a bar 45 mounted on a plunger 46. Another pair of contacts 47—47 are similarly supported for engagement with those of a second bar 48 also mounted on said plunger. Normally a spring 50 holds the plunger in position to close the circuits of two phases through the contacts 44 and 47, but when the lower end of the lever 34 strikes the head 51 of the plunger 46 and forces it toward the left, Fig. 5, it opens both circuits. This shuts down the motor, regardless of the fact that the third circuit or phase still remains connected to the field winding. As soon as the stop mechanism or knock-off mechanism is re-set, the two circuits previously opened are closed again by the spring 50.

It will be observed that in this machine the magnetic gaps between the upper and the lower sets of magnets are vertically disposed, with

the lateral limits of the machine base, instead of being located horizontally, as in the construction shown in the application above referred to. This arrangement is of advantage in reducing the lateral over-all width of the entire machine very substantially which, in turn, reduces the "gauge" of the machine, or, in other words, the necessary distance between centers of spindles located in a line along one side of a twister frame.

Also, because the section of the yarn in which the balloon is formed does not pass through the magnetic gap, it is possible to reduce the width of this gap and thus to produce a more efficient operation of the magnetic apparatus. While the flier **20** revolves in the plane of the magnetic gap, the yarn is always under tension as it passes from the outlet **18** of the guide block **21** to the eye of the flier, so that the width of gap required merely to accommodate these parts is relatively narrow. In addition, the flier itself is made thin and flat. As shown in Fig. 2, it is provided with a balancing enlargement *e* opposite to the eye *f*.

A further advantage of this arrangement of magnets is that it permits modifications of the yarn package carrier necessary to support yarn packages having a greater radius than that shown in Fig. 1. This frequently is highly desirable from an operating standpoint. It is primarily for this reason that the supplemental carrier plate or cup **39**, above referred to, is provided. As above stated, this member is held in place by the two screws **29**, but by removing them another carrier plate, having a greater radius, may be substituted for it and secured in its operative position by the replacement of the same screws **29**. Such removal of these screws does not disturb the other parts in the carrier base because they are still held in place by the screws **26—26**.

As will be evident to those skilled in this art, the yarn Y has one turn of twist put in it as it travels from between the stationary plates of the tension device **17** to the outlet of the guide **21**. A second turn of twist is put into it between this point and the wind-up mechanism with each revolution of the flier **20**. The supply package **16** simply rests on a disk of felt **53** and is centered by the tubular section **13** of the carrier. It is enclosed in a removable cover **54** which protects it from dust and the windage of the surrounding balloon when the machine is in operation.

For convenience in assembling and dis-assembling the parts, both the lower bearing **8** for the motor shaft **3'** and also the brake drum are made of a smaller radius than that of the armature rotor **4**. Consequently, by removing the screws *d* which secure the cap **42** to the frame **6**, the whole assembly of revolving parts, either with or without the carrier **12**, may be lifted out of the frame for repair, servicing or replacement, and the latter operation may be performed by a reversal of that just described. Because this arrangement means that the socket for the lower bearing **8** must permit the bearing holder to slide vertically into and out of it, a spring-pressed ball **57**, Fig. 1, is provided to enter a vertical groove formed in the outer surface of said holder where it prevents rotation of the holder itself with the bearing elements.

It may also be observed that the upper bearing **7** for the motor shaft sets into a circular recess in the cap **42** which is shouldered to limit the downward movement of the outer race of the bearing, and that a plate **58** is provided to clamp this race in place, the plate being secured to the cap **42** by screws.

Important advantages of this invention are that it provides a construction which is simpler in construction, can be manufactured more economically, occupies less space, and is easier to service and to operate.

While I have herein shown and described a preferred embodiment of my invention, it will be evident that the invention may be embodied in other forms without departing from the spirit or scope thereof. Also, that the magnetic mechanism for holding the carrier normally in a stationary position, and the means associated therewith for stopping the rotation of the spindle under emergency conditions, are also applicable to spindles driven in other ways than by an electric motor as herein shown.

Having thus described my invention, what I desire to claim as new is:

1. In a twister of the character described, the combination of a spindle, an electric motor including a rotor associated with said spindle to revolve the latter around its own axis, a normally stationary carrier for a yarn body, said carrier being mounted for rotation around the axis of said spindle, a flier secured to said spindle between said carrier and said motor, means for guiding yarn drawn from said body to said flier, whereby the flier revolves the yarn around said axis, a switch controlling the flow of current to said motor, a brake mechanism for stopping the rotation of said spindle, means for normally holding said carrier in its stationary position including a magnet on said carrier and another magnet supported in a normally stationary position immediately below said carrier with the poles of the two magnets positioned to operate by mutual attraction to maintain the carrier normally stationary but to be relatively moved by the rotation of the carrier out of said position into mutually repelling relationship, and means operated by said repelling action to actuate both said switch and said brake to stop the rotation of said motor shaft and said spindle.

2. In a twister of the character described, the combination of a spindle, an electric motor including a rotor associated with said spindle to revolve the latter around its own axis, a normally stationary carrier for a yarn body, said carrier being mounted for rotation around the axis of said spindle, a flier secured to said spindle between said carrier and said motor, means for guiding yarn drawn from said body to said flier, whereby the flier revolves the yarn around said axis, a switch controlling the flow of current to said motor, a brake mechanism for stopping the rotation of said spindle, means for normally holding said carrier in its stationary position including a magnet on said carrier and another magnet supported in a normally stationary position immediately below said carrier with the poles of the two magnets positioned to operate by mutual attraction to maintain the carrier normally stationary but to be relatively moved by the rotation of the carrier out of said position into mutually repelling relationship, a pivoted arm supporting said normally stationary magnet for swinging movement when so repelled, and connections for transmitting motion from said arm to said switch and said brake to open the switch and to set the brake when said magnet is repelled.

3. In a twister of the character described, the combination of a spindle, an electric motor including a rotor and a vertical shaft driven thereby, said spindle being associated with said shaft for rotation around the common axis of said shaft

and spindle, a normally stationary carrier for a yarn body mounted for rotation around the axis of said spindle, means normally holding said carrier stationary, a flier secured to said spindle, means for guiding yarn drawn from said body to said flier whereby the flier revolves the yarn around said axis, a frame supporting the stationary elements of said motor and having upper and lower bearings for the motor shaft, an automatic stop mechanism for said motor and said spindle including a brake drum mounted on the lower end of said shaft, said bearings, drum, and rotor being so assembled with said shaft and so supported in said frame as to be removable therefrom as a unit, and means for normally securing said assembly in its operative position in said frame.

4. In a twister of the character described, the combination of a spindle mounted for rotation around its own axis, a normally stationary carrier for a yarn body, said carrier being mounted for rotation around the axis of said spindle, means for normally holding said carrier against rotation comprising a plurality of magnets including one mounted on said carrier and another in a normally stationary position under said carrier, said magnets having poles positioned to operate by mutual attraction to hold said carrier normally in a stationary position, said carrier comprising a base assembly in which one of said magnets is included as an element, a supplemental yarn support, and means removably securing said supplemental support on said carrier base assembly, whereby it may be removed therefrom and replaced with a similar support of a different size.

5. In a twister of the character described, the combination of a spindle, a normally stationary carrier for a yarn body, said carrier being mounted for rotation around the axis of said spindle, a flier secured to said spindle, means for guiding yarn drawn from said body to said flier, whereby the flier revolves the yarn around said axis, and means for normally holding said carrier stationary comprising a magnet mounted on said carrier and another supported in a normally stationary position immediately below said carrier and in approximately a right-angle relationship to said first magnet with the north and south poles of one magnet positioned in juxtaposed relationship to the south and north poles, respectively, of the other magnet.

6. In a twister of the character described, the combination of a spindle, an electric motor including a rotor associated with said spindle to revolve the latter around its own axis, a normally stationary carrier for a yarn body, said carrier being mounted for rotation around the axis of said spindle, a flier secured to said spindle between said carrier and said motor, means for guiding yarn drawn from said body to said flier, whereby the flier revolves the yarn around said axis, a switch controlling the flow of current to said motor, means for normally holding said carrier in its stationary position including a magnet on said carrier and another magnet supported in a normally stationary position immediately below said carrier with its poles extending upwardly toward the bottom of said carrier, the poles of the two magnets being positioned to operate by mutual attraction to maintain the carrier normally stationary but to be relatively moved by the rotation of the carrier out of said position into mutually repelling relationship, and means operated by said repelling action to actuate both said switch and said brake to stop the rotation of said motor shaft and said spindle.

7. In a twister of the character described, the combination of an upright spindle, an electric motor including a rotor fast on said spindle for revolving the latter around its own axis, a normally stationary carrier for a yarn body, said carrier being mounted for rotation around the axis of said spindle, a flier secured to said spindle between said carrier and said motor, means for guiding yarn drawn from said body to said flier, whereby the flier revolves the yarn around said axis, a frame supporting the stationary elements of said motor, including upper and lower bearings for the motor shaft, an automatic stop mechanism for said motor and said spindle including a brake drum mounted on said shaft, a switch controlling the flow of current to said motor, means for normally holding said carrier in its stationary position including a magnet on the carrier and a second magnet supported on said frame and normally stationary but mounted for swinging movement downwardly out of its normal position, said magnets being located to operate by mutual attraction to maintain the carrier normally stationary but to be relatively moved by the rotation of the carrier into non-attracting relationship causing said second magnet to fall, and a lever connected with the latter magnet to be operated by said falling movement, said lever being so associated with said brake and said switch as to apply the brake and open the switch when the magnet falls.

8. In a twister according to preceding claim 7, a construction in which a brake operating element is connected with said lever and is mounted in the frame to engage said drum and said switch is positioned immediately below said drum so that the lever operates both said brake element and said switch substantially simultaneously when the magnet falls.

9. In a twister of the character described, the combination of a spindle mounted for rotation around its own axis, a normally stationary carrier for a yarn body, said carrier being mounted for rotation around the axis of said spindle, means for normally holding said carrier against rotation comprising a plurality of magnets including one mounted on said carrier and another in a normally stationary position under said carrier, said magnets having poles positioned to operate by mutual attraction to hold said carrier normally in a stationary position, said carrier comprising a base assembly in which one of said magnets forms an element, means for securing the parts of said assembly together, a supplemental yarn support, additional means for removably securing said supplemental support on said carrier base assembly, whereby it may be removed therefrom and replaced with a similar support of a different size, said supplemental support having a flanged rim, and a cover supported on said rim and substantially enclosing said yarn body.

VIRGIL A. BURNHAM.