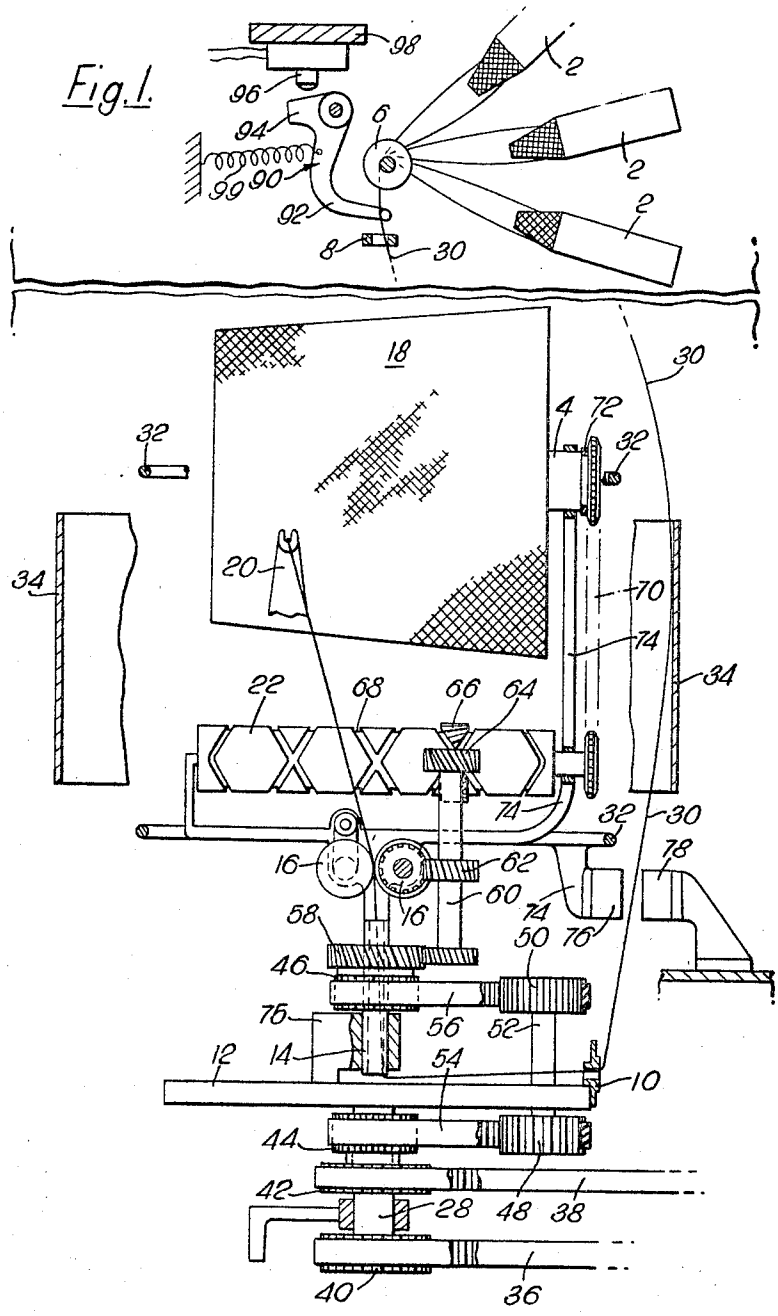
Aug. 9, 1966 J. K. P. MACKIE 3,264,813

TWO-FOR-ONE TWISTING OR SPINNING MACHINE

Filed Sept. 21, 1964 4 Sheets-Sheet 1

Fig. 1.



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Aug. 9, 1966 J. K. P. MACKIE 3,264,813

TWO-FOR-ONE TWISTING OR SPINNING MACHINE

Filed Sept. 21, 1964 4 Sheets-Sheet 2

Fig. 2.

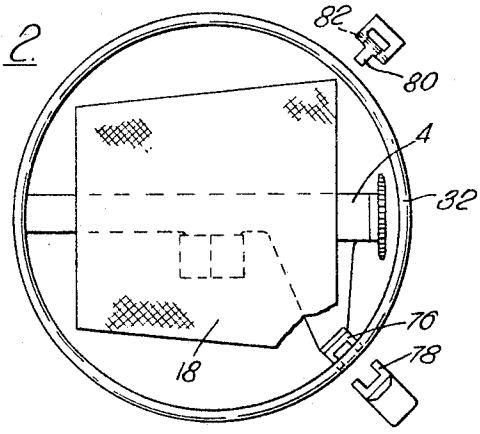


Fig. 3.

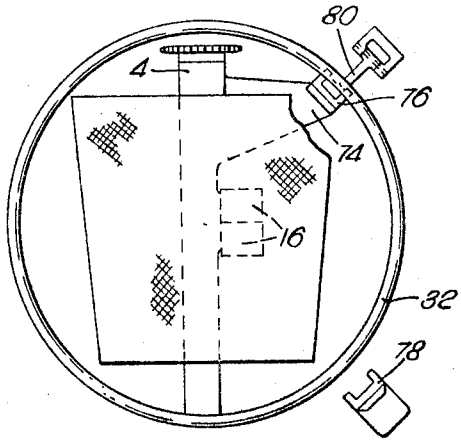
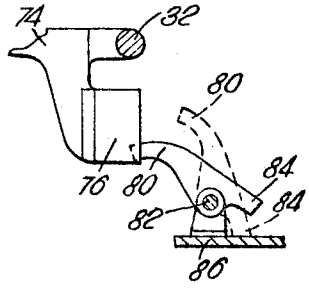


Fig. 4.



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Aug. 9, 1966 J. K. P. MACKIE 3,264,813

TWO-FOR-ONE TWISTING OR SPINNING MACHINE

Filed Sept. 21, 1964 4 Sheets-Sheet 3

Fig. 6.

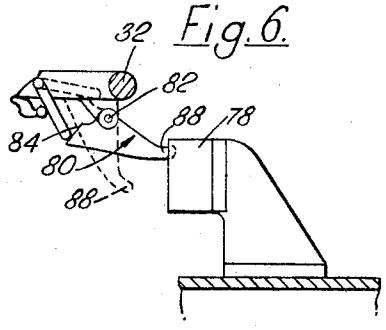
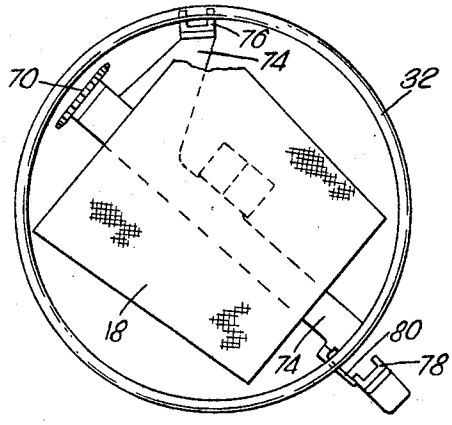


Fig. 5.



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Aug. 9, 1966 J. K. P. MACKIE 3,264,813

TWO-FOR-ONE TWISTING OR SPINNING MACHINE

Filed Sept. 21, 1964 4 Sheets-Sheet 4

Fig. 7

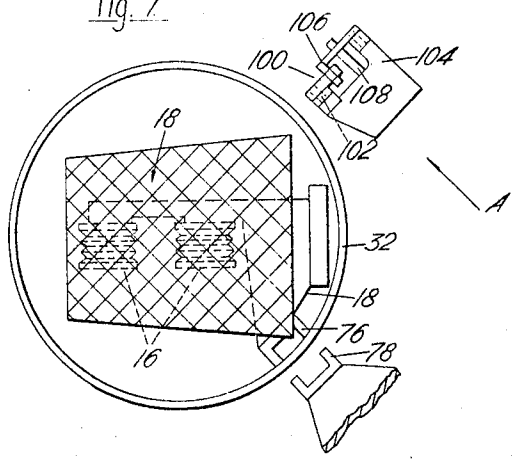


Fig. 8.

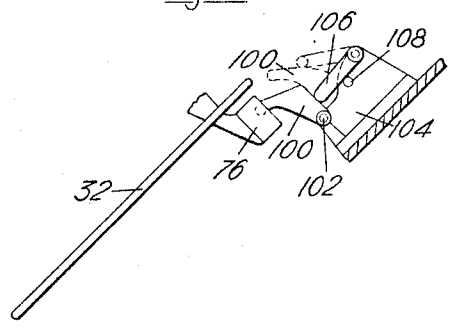
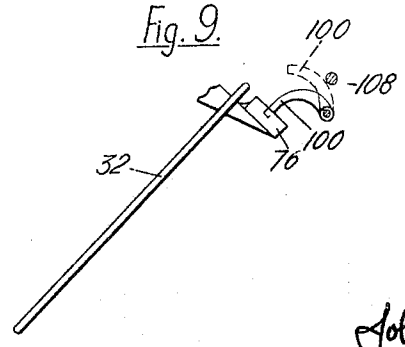


Fig. 9.



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United States Patent Office 3,264,813 Patented August 9, 1966

3,264,813

TWO-FOR-ONE TWISTING OR SPINNING MACHINE

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Filed Sept. 21, 1964, Ser. No. 397,953
Claims priority, application Great Britain, July 3, 1962, 25,464/62; Sept. 26, 1963, 37,975/63
8 Claims. (Cl. 57—58.76)

The present invention being a continuation-in-part of my copending application Serial No. 291,718, filed July 1, 1963, now abandoned.

This invention relates to machines for twisting or spinning yarns.

More specifically it relates to machines of the so-called "two-for-one" kind in which the material being worked on (yarn or sliver) is twisted by being ballooned at high speed around a package by a flyer having an eye through which the yarn passes. In the case of a twister, the machine can be either of the outflow type or the inflow type, that is to say that the package can be either a let-off or a take-up package respectively. In either case the let-off means or take-up means which are mounted on a bracket or the like within the balloon, must be held against rotation with the flyer. One way of solving this problem is to provide a magnet either on the bracket within the balloon or on the machine frame outside the balloon and a cooperating member on the frame or bracket respectively. The cooperating member may be a second magnet or it may be a ferrous metal armature. In either case the material of the balloon passes freely between the bracket and the machine frame across the magnetic field.

The holding force provided by the magnet(s) is, however, not positive, and there is a danger, particularly with an inflow-type machine where the take-up mechanism within the balloon may jam, that the magnetic force of attraction may be overcome and the bracket caused to rotate with a consequent danger of severe damage to the machine.

An object of the invention is to provide a machine of this type having a movable safety member provided on the bracket or the machine frame on the opposite side of the balloon to a magnet and remote from the cooperating member, the arrangement being such that on rotation of the bracket in either direction the member is caused by the magnet to move across the balloon path to stop further movement of the bracket. As the member lies across the balloon path the material of the balloon will be severed whereupon a stop motion operates to stop the machine or the drive for the particular spindle involved.

Preferably the safety member is so designed and arranged that once it has been attracted by the magnet it remains in the operative position even if no longer attracted by the magnet.

This has the effect of ensuring that even if the safety member does not engage the magnet or a part of the bracket or the machine frame, at the moment that the member is attracted to its operative position, due perhaps to "bounce" of the member against the magnet or to the bracket speed being unduly high, it remains positioned across the balloon path so that the material of the yarn in the balloon will be broken and the bracket stopped on the succeeding rotation.

The safety member may be positively held in its operative position by means of a latch device which comes into effect when the member is moved to that position against a bias tending to hold it clear of the bracket for normal machine operation. Alternatively or additionally, the

member may be so shaped and/or mounted that its weight tends to hold it in the operative position once in that position and conveniently also tends to hold it in the non-operative or normal position once in that position.

If the safety member is mounted on the bracket it can be so arranged that it will move out to the operative position to lie across the balloon path and to engage the machine frame or the magnet on the machine frame, as a result of the centrifugal forces acting on it when the bracket begins to rotate. Thus if the bracket reached such a speed that the safety member was not moved by the frame magnet, it would be caused to move by centrifugal force and thus stop the machine.

Normally the safety number will be pivoted about a horizontal axis but it could be arranged to slide horizontally across the balloon path when attracted by the magnet.

A magnet may be provided both on the bracket and on the machine frame in which case the movable member, such as a lever, may be carried either on the bracket or the machine frame as desired. If the lever is mounted on the bracket it will be moved, on movement of the bracket, when it lies opposite the fixed magnet on the machine frame. If the lever is mounted on the frame it will move when the bracket magnet is moved opposite to it.

An example of a two-for-one twister of the inflow type in accordance with the invention, will now be described by way of example, with reference to the accompanying diagrammatic drawings in which:

FIGURE 1 shows, somewhat diagrammatically, a single spindle of the machine;

FIGURE 2 is a diagrammatic plan view of the bracket of the spindle illustrating one arrangement of the magnets and movable safety member during normal operation;

FIGURE 3 is a view corresponding to FIGURE 2 but showing the bracket "held" after it had started to rotate;

FIGURE 4 is a diagram, to an enlarged scale, of the movable safety member of the machine illustrated in FIGURES 2 and 3;

FIGURE 5 is a diagrammatic plan view of the spindle of the machine illustrating an alternative arrangement of the magnets and movable safety member with the bracket in the held position;

FIGURE 6 is a diagram, to an enlarged scale, of the movable safety member of the machine illustrated in FIGURE 5;

FIGURE 7 is a diagrammatic plan view of the bracket of the spindle illustrating an alternative embodiment of a movable safety member during normal operation;

FIGURE 8 is a view to an enlarged scale in the direction of the arrow A of FIGURE 7 showing the bracket held after it had started to rotate; and

FIGURE 9 is a view corresponding to FIGURE 8 showing a further embodiment of safety member.

A number of supply packages such as cops **2** are provided for each spindle **4** of the machine (only one spindle being shown in the drawing), the yarn from the cops, after being plied, being wound on to the spindle. The yarn is led from the cops through a tensioning device **6** and a stationary guide eye **8** attached to the machine framework, to the eye **10** of a rotating flyer **12**. From the flyer, the yarn passes up a tube **14** arranged coaxially with the flyer axis, to a pair of driven take-up rollers **16** providing a positive nip so that they act to pull the yarn through the flyer eye. The yarn is laid on a package **18** carried by the spindle **4**, by a butterfly yarn guide **20** which is reciprocated by a rotated traverse scroll **22**.

The flyer which is in the form of a disc, has a shaft **28** which is rotated about a vertical axis. Rotation of the flyer causes the length of yarn between the flyer eye **10**

and the stationary eye 8 to billow into a balloon 30 and be whirled around the spindle 4, the take-up rollers 16 and the tube 14, between the inner and outer balloon guide rings 32 and 34.

For each revolution of the flyer two turns of twist are given to the yarn, one turn being inserted between the eye 10 and tension device 6 and the other between the flyer eye 10 and take-up rollers 16. Thus, if the flyer is rotated at a speed of 3000 r.p.m. there will be 6000 turns of twist inserted in the yarn per minute. The number of turns per inch in the yarn depends, of course, on the speed with which the yarn is taken up by the rollers 16.

The flyer 12 and the take-up rollers 16 are driven independently of each other through internally toothed belts 36, 38. The belt 36 drives a toothed pulley 40 on the flyer shaft 28 and the belt 38 drives a toothed pulley 42 which is rotatable on the flyer shaft and which is integral with one 44 of a pair of equal diameter sun wheels 44, 46, the other one 46 of which is carried by the tube 14 on the other side of the flyer and within the balloon. The sun wheels are connected together through a pair of coaxial toothed planet wheels 48, 50 of equal diameter and mounted one on each side of the flyer on a spindle 52 passing through and carried by the flyer. Each sun wheel is connected to the adjacent planet wheel by one pair of internally toothed belts 54, 56. Thus, rotation of the sun wheel 44 by the pulley 42 causes an equal rotation of the other sun wheel 46 within the balloon, irrespective of the speed of rotation of the flyer.

The sun wheel 46 is integral with a gear wheel 58 which drives a spindle driving shaft 60 offset from the axis of rotation of the flyer. The shaft 60 is provided between its ends with a spiral gear 62 meshing with a similar gear in driving connection with one of the take-up rollers 16. The other take-up roller is loaded so that the two rollers provide a positive non-slipping nip. The speed of rotation of the take-up rollers determines the speed at which the yarn is taken up by the package 18 and hence, for a given flyer speed, the twist per inch given to the yarn. The twist per inch in fact is dependent on the ratio of flyer speed to the speed of the take-up rollers. For a flyer speed of, for example, 3000 r.p.m., the speed of the take-up rollers can be adjusted to give any reasonable twist to the yarn for example a twist of between two and eight turns per inch can be inserted for one particular use.

The flyer and the take-up means can have independent drives to the belts originating outside the balloon so that the speed of the take-up means of all or of some of the spindles can be varied by a single operation. In other words, the take-up means are driven not in series with the associated flyer but rather in parallel therewith. The twist per inch imparted to the yarn wound on the spindles can be altered for some or all the spindles by a single adjustment, instead of separately adjusting each spindle drive. Such an arrangement forms the subject of our Patent No. 3,106,816.

The upper end of the spindle driving shaft 60 is also provided with a spiral gear 64 meshing with a corresponding gear 66 on the traverse scroll 22 so that the traverse scroll is driven directly by the spindle driving shaft. Rotation of the scroll causes the butterfly yarn guide 20, which engages in the traversing groove 68 of the scroll to be reciprocated parallel to the axis of the spindle so that the yarn is laid evenly on to the package 18 carried by the spindle. The spindle is driven from the shaft 60 through the scroll 22 to which it is connected by a chain driven 70 through a slipping clutch 72.

The gearing between the spindle and the take-up rollers is arranged so that the take-up speed of the package, with no clutch slippage, always exceeds the let-off speed of the rollers. In use, therefore, the clutch is continuously slipping so that the spindle is driven only at the correct speed to take-up the yarn delivered to it by the rollers 16. The pressure of the clutch determines the tension of the yarn between the rollers 16 and the package and this pressure is adjustable so that a correct yarn tension can be obtained for any yarn specification.

The spindle 4, traverse scroll 22, take-up rollers 16 and tube 14 together with the drive for the take-up rollers and spindle are carried by a common bracket diagrammatically shown at 74 within the balloon. The bracket is mounted on the tube 14 which in turn is mounted in bearings on a projection 75 extending from the upper side of the flyer.

The bracket 74 carrying the take-up rollers and the package has to be held from rotating with the flyer. This is done by securing a U shaped permanent magnet 76 to the bracket within the balloon and a cooperating U shaped permanent magnet 78 to the machine frame outside the balloon path. The two magnets are spaced slightly apart, so that during normal operation the ballooning material passes freely between them while the force of attraction exerted is sufficient to prevent the bracket from rotation with the flyer.

If the drive for the take-up rollers and package within the bracket should jam, or if for any other reason the magnetic force of attraction between the bracket magnet and the frame magnet is overcome so that the bracket rotates in either direction, the magnet on the bracket moves to a position opposite to a moveable safety member in the form of a lever 80 (see FIGURES 2, 3 and 4) mounted on a horizontal pivotal axis at 82 to the machine frame outside the balloon. The lever is weighted, so that in normal operation, as seen in FIGURES 1 and 2 and as shown in dotted lines in FIGURE 4, its toe 84 engages a stop plate 86 and its curved outer end 88 lies outside the balloon path.

When the bracket magnet 76, on rotation of the bracket, reaches a position opposite the lever, the lever which is wholly or partly of ferrous material is attracted so that its outer end 88 moves across the path of the balloon and engages the bracket magnet as seen in FIGURES 3 and 4. In this position the bracket is stopped from rotating and yarn in the balloon will strike the lever and be severed instantaneously. For some yarns which will not readily break it is necessary to provide the lever 80 with a knife edge arranged to sever the yarn when the lever lies across the balloon path. Once the yarn has broken, a standard stop motion device generally indicated at 90 in FIGURE 1 operates to stop the motor driving the machine.

The stop motion device can be of any standard type. That illustrated comprises a lever pivoted between its ends to the machine frame. One arm 92 of the lever is arranged so as normally to be engaged by the yarn to be twisted between the tensioning device 6 and the guide eye 8. The other arm 94 of the lever is positioned for engagement with the operating button 96 of a switch generally shown at 98. The lever is biased by a light spring 99 to the position in which the arm 94 depresses the button 96 to open the switch but it is held against this bias in the position shown in FIGURE 1 with the switch closed by reason of the engagement of its arm 92 with the yarn. When the yarn breaks, or is broken by the lever 80, the lever is no longer held out of contact with the switch and pivots to open the switch contacts to stop the motor driving the machine. If the machine is a multispindle machine it can be arranged that either all spindles will be stopped upon the yarn of any one spindle being broken, or only that spindle stopped.

Due to the inertia of the bracket, the speed which the bracket has reached by the time the bracket magnet 76 lies opposite to the lever 80 is fairly low and since the lever engages the magnet or a part of the bracket during its first revolution in either direction, no serious damage to the machine wil result.

It will be realised that the lever can readily be mounted on the bracket or on a part connected thereto instead of on the frame and be caused by the magnet 78 to move

across the balloon path to engage the frame, or the frame magnet 78, during movement of the bracket. An example of such an arrangement is illustrated in FIGURES 5 and 6 all the other parts of the machine remaining the same as the machine illustrated in FIGURES 1 to 4. In this example the lever 80 is suspended from the bracket 74 and is caused by the magnet 78 to swing out against a bias to a position as shown in full lines in FIGURE 6 where it engages the magnet and causes the yarn in the balloon to be broken.

The bias for the lever 80 in all arrangements is normally provided by the weight of the lever itself. However an additional light spring can be used if necessary to ensure that that lever is normally held clear of the balloon path.

The lever 100 of the safety member shown in FIGURES 7 and 8 is so shaped and its horizontal pivotal axis 102 is such that when it is in its attracted position lying across the balloon path as seen in FIGURE 8 its weight tends to hold it in that position. In order, however, to make sure that it is not bounced back to the nonoperative position the plate 104 on which it is mounted carries a latch device in the form of a member 106 which has its outer end pivoted about a horizontal axis to the plate 104. Its inner end, when the lever 100 is in the non-operative position rests on the back of the lever as seen in FIGURE 7. When the lever is in its attracted or operative position as seen in FIGURE 8, the latch member 106 falls down behind the back of the lever 100 to rest on a stop 108 on the plate 101, so that the lever is positively held in its operative position as shown in FIGURE 8 until the latch member is lifted.

In the modification shown in FIGURE 9 the latch member 102 is omitted. However, the shape of the lever 100 is such that its weight alone will hold it in the operative position and prevent it being accidentally "bounced" back to the inoperative position, once it has been attracted from its non-operative position. When the lever is deliberately positioned in its non-operative position as shown in dash lines in FIGURE 9 its own weight tends to hold it in that position so that the machine is not accidentally stopped.

If it is desired to have only a single magnet this can be fixed either to the bracket or to the machine frame and a ferrous metal armature provided in the place of the other magnet on the frame or bracket respectively. The lever would then be carried on the frame if the magnet was on the bracket and vice versa.

While the magnet would normally be a permanent magnet it will be appreciated that an electromagnet could be employed if desired.

I claim:

1. A two-for-one twisting or spinning machine comprising a machine frame, a yarn take-up package spindle, a bracket to support said spindle, a flyer at one end of said spindle to cause the material being worked on to form a balloon which is rotated around the bracket in a path between said bracket and the machine frame, a magnet carried by said bracket, a member for magnetic cooperation with said magnet said member being carried by the machine frame, a movable safety member carried on a horizontal pivot on the machine frame adjacent said bracket and remote from the cooperating member, said safety member being arranged, on rotation of the bracket in either direction, to be attracted by said magnet to move to an operative position in which it lies across the balloon path to stop the bracket rotating and to sever the material in the balloon, and a latch device positively to hold the movable safety member in the operative position.

2. A two-for-one twisting or spinning machine as claimed in claim 1 in which the latch device comprises a lever pivotally mounted on the machine frame and bearing against one face of the safety member and so arranged that it engages against a shoulder on the safety member when this has moved to the operative position to prevent the said safety member being moved to the inoperative position until the latch has been released.

3. A two-for-one twisting or spinning machine as claimed in claim 1 in which the cooperating member is a second magnet.

4. A two-for-one twisting or spinning machine as claimed in claim 1 including a stop motion device which, on severance of the material in the balloon, operates to stop the drive for the spindle.

5. A two-for-one twisting or spinning machine comprising a machine frame, a yarn take-up package spindle, a bracket to support said spindle, a flyer at one end of said spindle to cause the material being worked on to form a balloon which is rotated around the bracket in a path between said bracket and the machine frame, a magnet carried by said machine frame, a member for magnetic cooperation with said magnet, said member being carried by the said bracket, a movable safety member carried on a horizontal pivot on said bracket adjacent the machine frame and remote from the cooperating member, said safety member being arranged, on rotation of the bracket in either direction, to be attracted by said magnet to move to an operative position in which it lies across the balloon path to stop the bracket rotating and to sever the material in the balloon, and a latch device to hold the movable safety member in the operative position.

6. A two-for-one twisting or spinning machine as claimed in claim 5 in which the latch device comprises a lever pivotally mounted on the bracket and bearing against one face of the safety member and so arranged that it engages against a shoulder on the safety member when this has moved to the operative position to prevent the said safety member being moved to the inoperative position until the latch has been released.

7. A two-for-one twisting or spinning machine as claimed in claim 5 in which the cooperating member is a second magnet.

8. A two-for-one twisting or spinning machine as claimed in claim 7 including a stop motion device which, on severance of the material in the balloon, operates to stop the drive for the spindle.

References Cited by the Examiner

UNITED STATES PATENTS

2,411,126	11/1946	Burnham	57—58.76 X
2,640,310	6/1953	Roberts	57—58.76 X
2,731,786	1/1956	Klein	57—58.76 X
2,932,150	4/1960	Keith	57—58.83 X
2,961,825	11/1960	Klein	57—58.76
3,106,816	10/1963	Mackie	57—58.52

FOREIGN PATENTS

1,200,433	12/1959	France.
611,160	10/1948	Great Britain.

OTHER REFERENCES

Lenk, et al., German App. No. 1,010,880, Pub. June, 1957.

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