United States Patent [19]

Deyoung

[11] **3,757,904**

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[54] **SPOOL RELEASE MECHANISM**

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[52] **U.S. Cl.** **188/82.3**, 188/82.84, 192/47

[51] **Int. Cl.** **F16d 63/00**

[58] **Field of Search** 188/82.3, 82.34, 188/82.84, 82.8; 192/27, 47, 38

[56] **References Cited**

UNITED STATES PATENTS

2,962,128 11/1960 Luenberger 188/82.84

FOREIGN PATENTS OR APPLICATIONS

1,032,632 4/1953 France 188/82.84

1,011,898 12/1965 Great Britain 188/82.3

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[57] **ABSTRACT**

Mechanism for controlling the rotation of a spool of strand material on a strand fabricating machine having a "work center" toward which a tensioned strand from a spool is incrementally released. The spool is carried by a spindle of a spool holder having a base with a case housing the mechanism. The mechanism develops a frictional locking force against rotation of the spool which is selectively released for let off of a strand of material from a spool.

3 Claims, 6 Drawing Figures

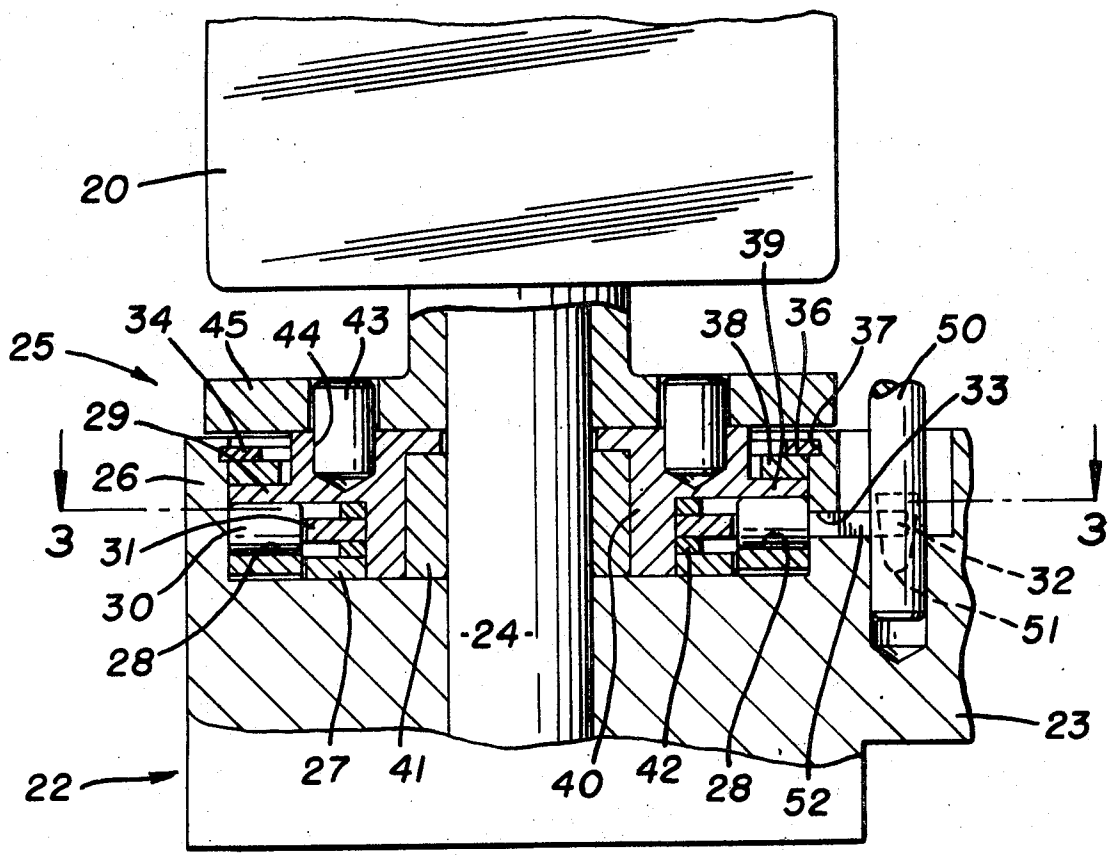
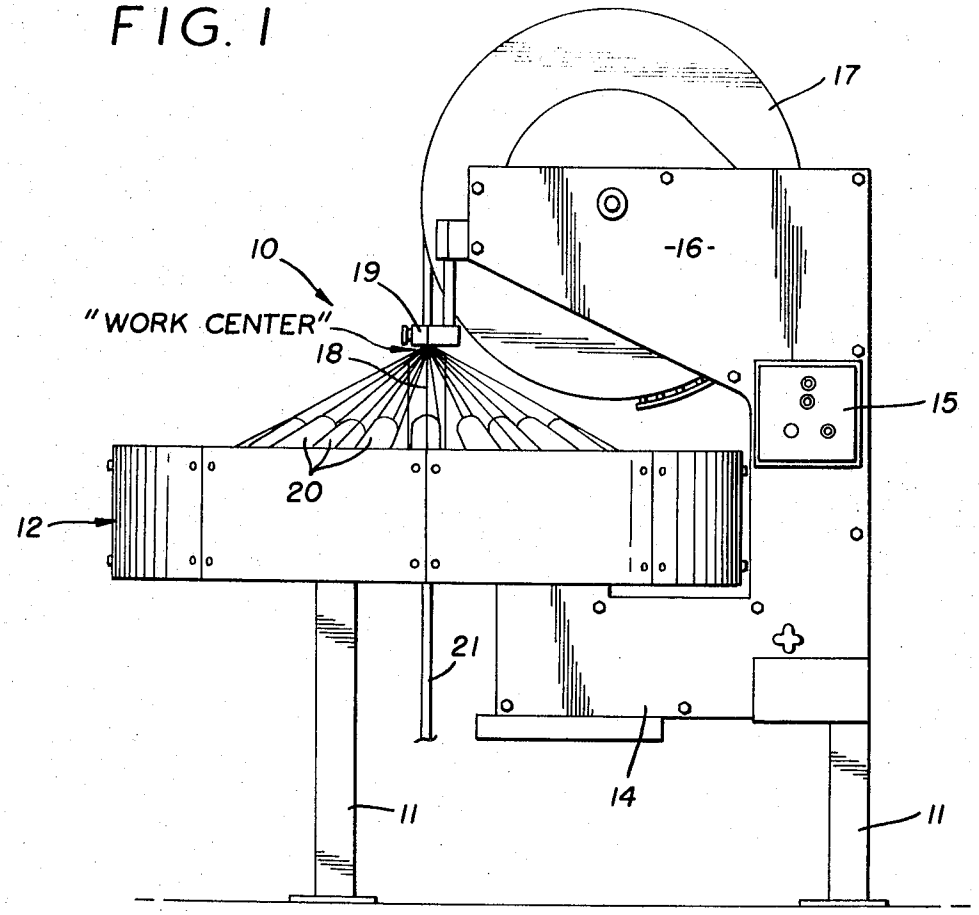


FIG. 1



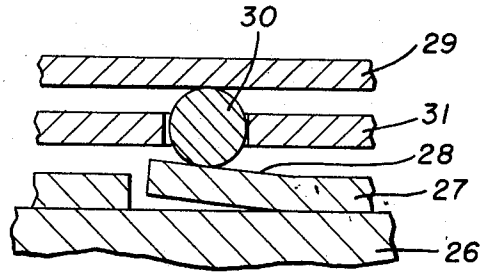


FIG. 4

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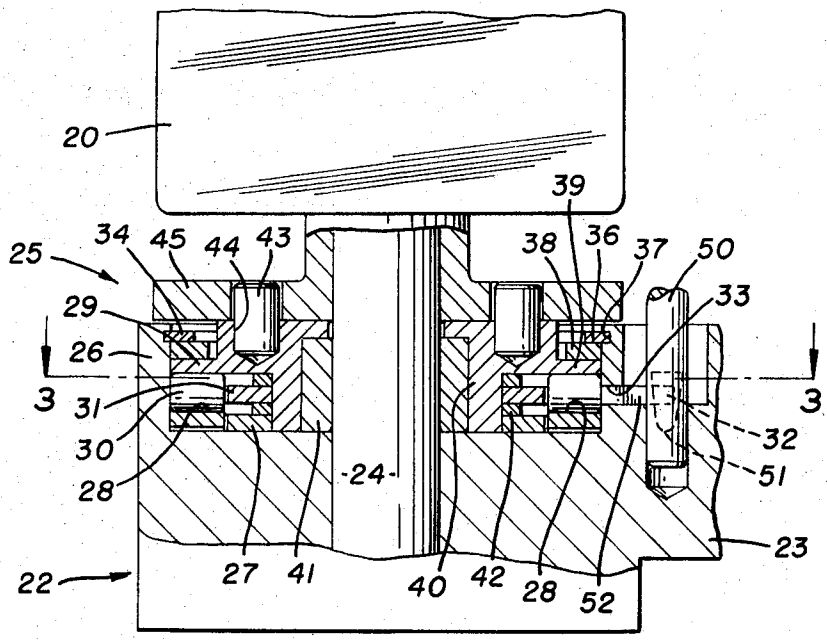

FIG. 2

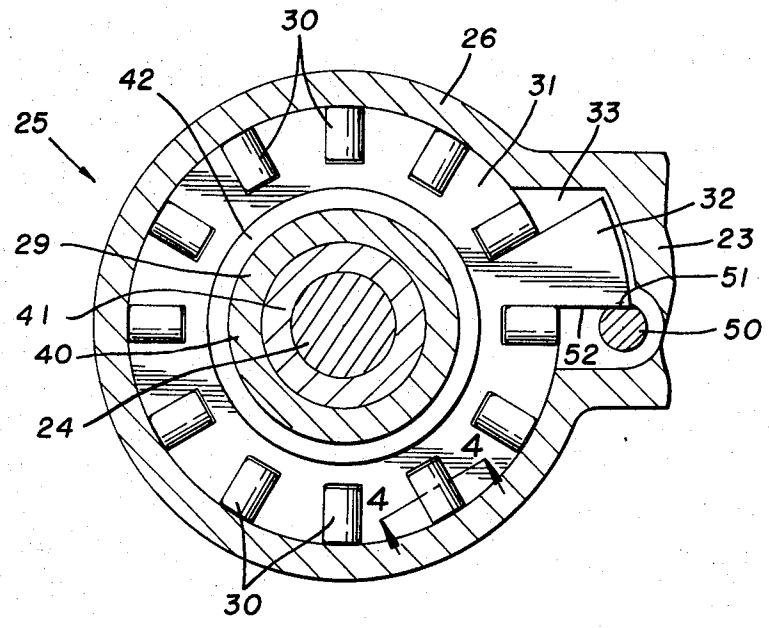

FIG. 3

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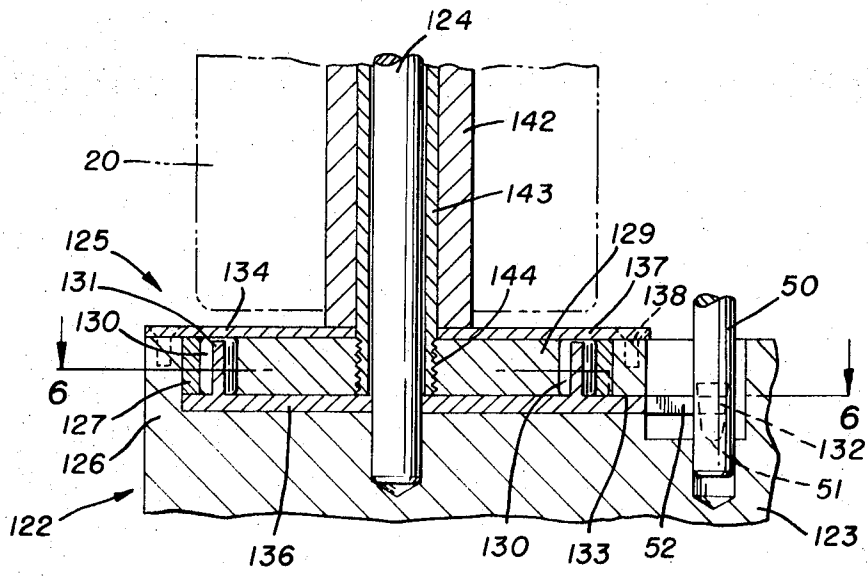

FIG. 5

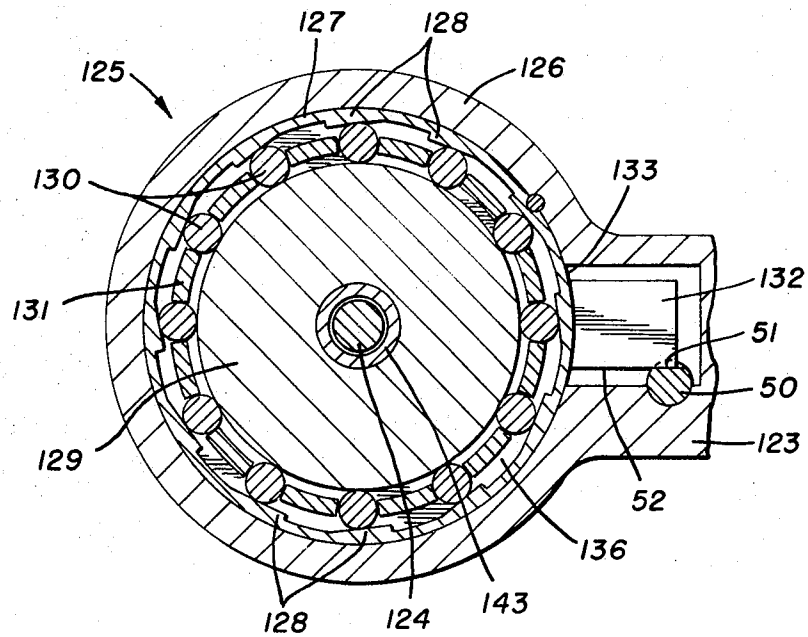

FIG. 6

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SPOOL RELEASE MECHANISM

CROSS-REFERENCE TO RELATED APPLICATIONS

The subject matter of this invention is related to the subject matter of co-pending application Ser. No. 193,128 filed 10/27/71.

BACKGROUND OF THE INVENTION

Strand fabricating machines utilizing the present invention have sets of spool carriers which are moved along circular paths in opposite directions relative to the "work center" of the machine toward which tensioned strands from the spools are incrementally released. The tensioned strands may be interlaced, woven, braided or spiralled as to each other or around a core member.

Various mechanisms are known in the prior art for controlling the rotation of spools of strand material. See, for example, U. S. Pat. No. 3,362,282.

The prior art has typically used a ratchet element selectively disengaged from a set of ratchet teeth by a spring clutch permitting rotation of the spool. Such ratchet and spring clutch mechanisms have the disadvantages of being subject to excessive wear, a low speed of operation, a high noise level of operation, and susceptible to abusive or intentional damage.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved mechanism for controlling the rotation of spools of strand material on a strand fabricating machine having a "work center" toward which a tensioned strand from a spool is incrementally released.

It is further an object to provide a spool release mechanism permitting spool rotation in infinitely variable increments.

Still further, it is an object to provide a spool release mechanism which is not subject to excessive wear of the component elements, which will have a high speed of operation, which will have a low noise level of operation, and with component elements protected from abusive or intentional damage.

These and other objects of the present invention, and the advantages thereof, will be apparent in view of the Detailed Description of the Invention as set forth below.

In general, a spool release mechanism according to the invention is used with a spool holder having a base adapted for mounting on a strand fabricating machine and a spindle extending from the base for carrying a spool of strand material.

A spool release machanism according to the invention is characterized in that a spool release mechanism case is carried by the base coaxially of the spindle. The case has an annular socket seating an actuating disc to expose a surface thereon having a series of sequentially spaced inclined planes. The case also houses a rotatable locking disc spaced apart from the actuating disc to provide an annular recess. A series of cylindrical rollers and a roller retaining plate are positioned within the recess. The plate retains the rollers in a spacing corresponding to the spacing of the inclined planes on the actuating disc. The plate also has associated therewith a movable release flange which projects through an opening in the wall of the case. The rollers are maintained in position for contact with the inclined planes

on the actuating disc by a lock means associated with the case.

A spool attached to the locking disc will rotate against a frictional locking force caused by the impingement of the rollers between the locking disc and the inclined planes on the actuating disc. The locking force is released by movement of the roller retaining plate relative to the locking disc via selective movement of the release flange.

In the embodiment of FIGS. **2, 3 & 4,** the spool release mechanism is further characterized in that the rollers are arranged within the annular recess so that the axes thereof are transverse to the axis of the spindle. In the embodiment of FIGS. **5 & 6,** the axes of the rollers are parallel to the axis of the spindle.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side view of a strand fabricating machine having thereon the mechanisms to control rotation of spools according to the invention;

FIG. **2** is a fragmentary view in section of one form of mechanism according to the invention;

FIG. **3** is a plan view taken substantially as indicated on line **3—3** of FIG. **2**;

FIG. **4** is another view in section taken substantially as indicated on line **4—4** of FIG. **3**;

FIG. **5** is a fragmentary view in section of another form of mechanism according to the invention; and,

FIG. **6** is a plan view taken substantially as indicated on line **6—6** of FIG. **5.**

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1,** a strand fabricating or braiding machine is indicated generally by the numeral **10.** As shown, the braiding machine **10** is operating in a vertical plane although the machine **10** could be operated in a horizontal or an inclined plane.

The braiding machine **10** has a structural frame with support members **11** for floor mounting. The machine **10** includes a braiding mechanism indicated generally by the numeral **12,** a drive housing **14,** a control box **15,** a capstan support housing **16,** a capstan **17,** an interior braiding point retainer **18,** and an exterior braiding point retainer **19.** The "work center" of the machine **10** is in the area between the retainers **18** and **19.**

The braiding mechanism **12** includes a set of spools indicated generally by the numeral **20.** A material strand from each spool **20** is let off toward the "work center." The strands are subjected to tension by the capstan **17** and are braided as to each other or around a core member **21** introduced coaxially of the braiding mechanism **12.**

Referring to FIGS. **2, 3 & 4,** a spool **20** is carried by a spool holder, indicated generally by the numeral **22,** having a base **23** adapted for mounting on the braiding mechanism **12** of a machine **10.** The spool holder **22** also has a spindle **24** extending from the base **23.**

A spool release mechanism, indicated generally by the numeral **25,** is housed within a case **26** carried on the base **22** coaxially of the spindle **24.** As shown, the case **26** is formed integrally in the end of the holder **22** facing the spool **20.** However, the mechanism **25** could be assembled as a unitary structure and thereafter attached to the holder **22.** In either construction, the side wall and bottom of the case **26** define an annular socket seating an actuating disc **27.** The actuating disc **27** has

an exposed surface with a series of sequentially spaced inclined planes **28**.

The mechanism case **26** also houses a rotatable locking disc **29** spaced apart from the actuating disc **27** to provide an annular recess. A series of cylindrical rollers **30** and a roller retaining plate **31** are positioned in the recess between the discs **27** and **29**. The plate **31** retains the rollers **30** in a spacing corresponding to the spacing of the inclined planes **28** on the actuating disc **27**. The plate **31** also has associated therewith a movable release flange **32** projecting through an opening **33** in the wall of the case **26**. The rollers **30** are maintained in position for contact with the inclined planes **28** of the actuating disc **27** by a lock means **34** associated with the case **26**.

As shown, the lock means **34** comprises a split ring **36** inserted in a groove **37** in the wall of the case **26** and engaging an annular spacer **38**. The spacer **38** in turn engages a peripheral flange **39** of the locking disc **29**. The locking disc **29** also has an axial hub **40** providing an inner recess for seating a bearing **41** to facilitate rotation of the locking disc relative to the spindle **24**. The radially outer surface of the disc hub **40** also provides a stop surface for annular spacers **42** used to maintain the position of the rollers **30** in the annular recess between the discs **27** and **29**.

Also as shown, a spool **20** may have a hub member **45** with a peripheral flange overlying the locking disc **29** and suitably attached thereto as by torque pins **43** inserted in disc sockets **44**. A spool **20** carried on the spindle **24** and attached to the locking disc **29** will tend to rotate as a strand of material being led to the "work center" of the machine **10** is subjected to tension by the capstan **17**.

Referring to FIGS. **5** and **6**, a spool **20** is carried by a spool holder, indicated generally by the numeral **122**, having a base **123** adapted for mounting on the braiding mechanism **12** of a machine **10**. The spool holder **122** also has a spindle **124** extending from the base **123**.

A spool release mechanism, indicated generally by the numeral **125**, is housed within a case **126** carried on the base **122** coaxially of the spindle **124**. As shown, the case **126** is formed integrally in the end of the holder **122** facing the spool **20**. However, the mechanism **125** could be assembled as a unitary structure and thereafter attached to the holder **122**. In either construction, the side wall of the case **126** defines an annular socket seating an actuating disc **127**. The actuating disc **127** has an exposed surface with a series of sequentially spaced inclined planes **128**.

The mechanism case **126** also houses a rotatable locking disc **129** spaced apart from the actuating disc **127** to provide an annular recess. A series of cylindrical rollers **130** and a roller retaining plate **131** are positioned in the recess between the discs **127** and **129**. The plate **131** retains the rollers **130** in a spacing corresponding to the spacing of the inclined planes **128** on the actuating disc **127**. The plate **131** also has associated therewith a movable release flange **132** projecting through an opening **133** in the wall of the case **126**. The rollers **130** are maintained in position for contact with the inclined planes **128** of the actuating disc **127** by a lock means **134** associated with the case **126**.

As shown, the release flange **132** projects from a rotatable plate **136** seated on the bottom of the case **126**. The flange plate **136** also carries the retaining plate **131** to maintain the position of the rollers **130** in the annular recess between the discs **127** and **129**. The lock means **134** comprises a top plate **137** secured to the case **126** as by screws **138**.

Also as shown, a spool **20** may have a hub member **142** fitted coaxially over and suitably attached, as by frictional engagement or by mechanical means (not shown), to an elongated tube element **143**. The tube **143** is located coaxially around the spindle **124** and is suitably attached, as by mating threads **144**, to the locking disc **129**. A spool **20** carried on the spingle **124** and attached to the locking disc **129** will tend to rotate as a strand of material being led to the "work center" of the machine **10** is subjected to tension by the capstan **17**.

In both embodiments of a spool release mechanism (**25** or **125**) according to the invention, the rotation of a spool **20** attached to a locking disc (**29** or **129**) will tend to cause the locking rollers (**30** or **130**), captivated by the roller retaining plates (**31** or **131**), to simultaneously ramp up the inclined planes (**28** or **128**) on the actuating disc (**27** or **127**). The normal force developed by impingement of the rollers produces a frictional locking force which increases as the torque load on the locking disc increases. The locking force is released by movement of the roller retaining plate relative to the locking disc.

In both embodiments of a spool release mechanism (**25** or **125**), the frictional locking force developed by simultaneous movement of the locking rollers (**30** or **130**), in one rotational direction, is released by selective movement of the release flange (**32** or **132**) in the opposite direction. The present invention contemplates that the release flange may be actuated by any suitable means responsive to conditions or forces developed by or present on a strand of material from a spool **20** being led to the "work center" of the machine **10**.

As shown in FIGS. **2, 3, 5 & 6**, the spool release actuator means may include a reciprocating actuator rod **50** having an inclined surface **51** thereon intended for sliding engagement with a planar surface **52** on a release flange **32** or **132**. For such further details as are necessary to understand the operation of an actuator rod **50**, reference may be made to the related U.S. application Ser. No. 193,128 filed 10/27/71.

What is claimed is:

1. A spool release mechanism; a spool holder having a base adapted for mounting on a strand fabricating machine, a spindle extending from said base carrying a spool of strand material, said spool having a hub member, a spool release mechanism case carried by said base coaxially of said spindle, said case having an annular socket seating an actuating disc to expose a surface thereon having a series of sequentially spaced inclined planes, a rotatable locking disc within said case and spaced apart from said actuating disc to provide an annular recess, said locking disc being positively attached to a spool hub member fitted coaxially around said spindle, a series of cylindrical rollers and a roller retaining plate positioned within said recess, said plate retaining the rollers in a spacing corresponding to the spacing of the inclined planes on said actuating disc and having associated therewith a movable release flange projecting through an opening in the wall of said case, said rollers being maintained in position for contact with said inclined planes on said actuating disc by a lock means associated with said case,

whereby, a spool having a hub member attached to said locking disc will rotate against the frictional locking force caused by impingement of said rollers between said locking disc and the inclined planes on said actuating disc, said locking force being released by movement of said roller retaining plate relative to said locking disc via selective movement of said release flange.

2. A spool release mechanism according to claim 1, further characterized in that, said rollers are arranged within said annular recess so that the axes thereof are transverse to the axis of said spindle.

3. A spool release mechanism according to claim 1, further characterized in that, said rollers are arranged within said annular recess so that the axes thereof are parallel to the axis of said spindle.

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