Aug. 22, 1967 G. B. KECK 3,337,145

COIL WINDING APPARATUS

Filed April 9, 1965 2 Sheets-Sheet 1

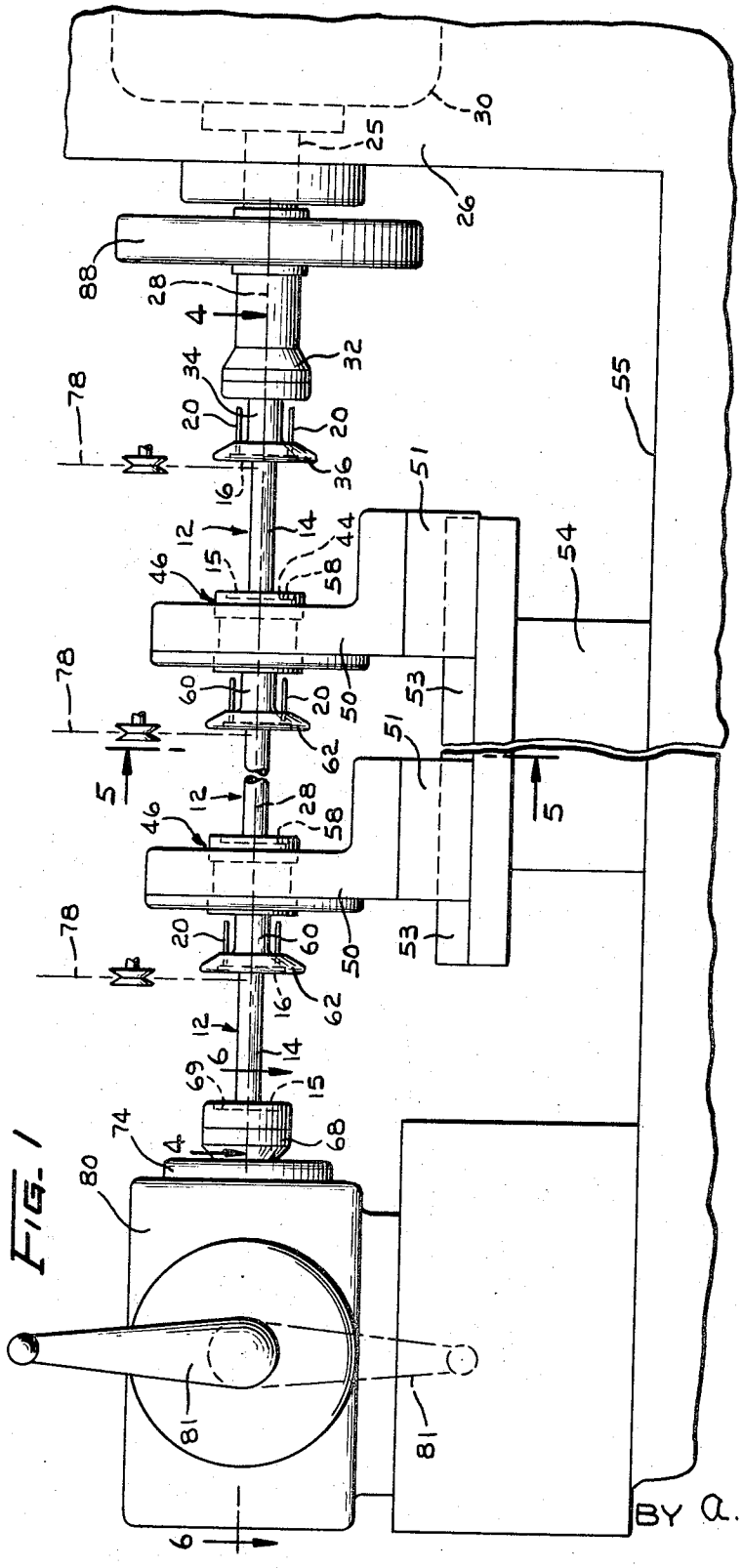

FIG. 1

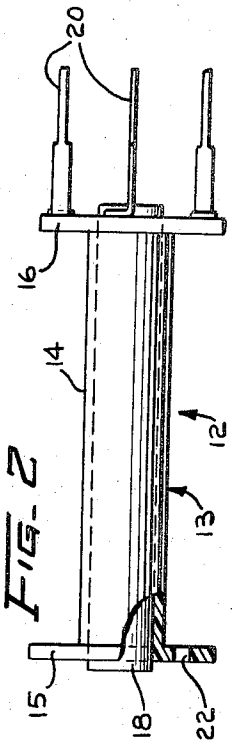

FIG. 2

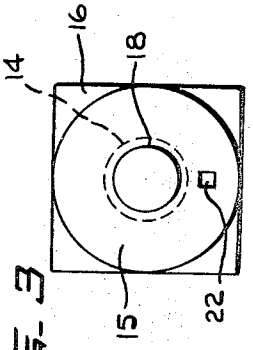

FIG. 3

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COIL WINDING APPARATUS

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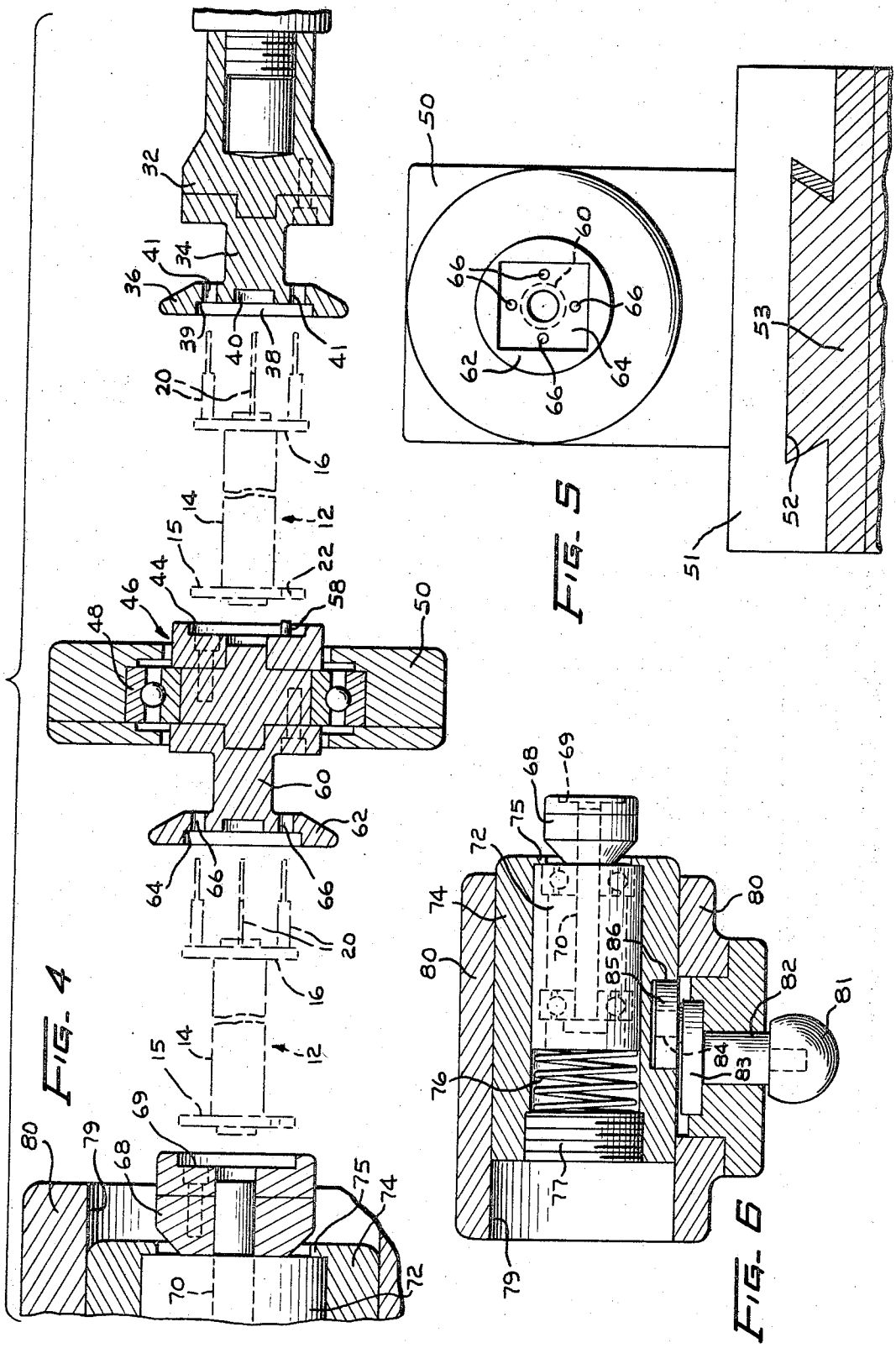

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COIL WINDING APPARATUS

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ABSTRACT OF THE DISCLOSURE

Apparatus for winding material onto spools wherein a plurality of arbor members are supported for rotation about an axis and for relative axial movement therebetween to receive and support spools between adjacent ones of the members and to effect a driving connection with the spools for rotation of the spools together in response to rotation of the end arbor member by a selectively operable drive therefor.

This invention relates to a coil winding apparatus, and more particularly to an apparatus for winding coils simultaneously on a plurality of coil supporting forms.

Heretofore, as far as is known, coils supported on a particular type of individual coil supporting form, such as spools having iron cores therein, were wound one at a time. Manifestly, this method of winding spool supported coils individually is time consuming and inefficient.

An object of the present invention is to provide an apparatus for winding simultaneously a plurality of coils on individual coil supporting forms.

An apparatus illustrating certain features of the invention for simultaneously winding coils on a plurality of spools may include a motor-driven headstock supported in a frame for rotation about a horizontal axis. The headstock has a seat for receiving and supporting one end of a spool for rotation about the axis and for effecting a driving connection therewith. Supported movably on a slide of the frame below the axis are brackets in each of which a coupling member is mounted for rotation about the axis and for axial movement with the bracket. One end of the coupling member is provided with a seat for supporting the other end of the spool and effecting a driving connection therewith.

The opposite end of the coupling member is provided with a seat for supporting the first end of another spool and effecting a driving engagement therewith. Several of such brackets and spool supporting coupling members may be provided to support a plurality of spools in a row in interconnected relation to one another. A tailstock is supported on the frame for rotation about the axis and for supporting the other end of the last spool of the row of spools. By means of a lever, the tailstock is moved toward the headstock to an operative position to effect the clamping of the spools between the headstock, the coupling members, and the tailstock for rotation together in response to rotation of the headstock.

Other objects, advantages and novel aspects of the invention will become apparent upon consideration of the following detailed description, in conjunction with the accompanying drawings, in which:

FIG. 1 is a fragmentary side elevational view of the coil winding mechanism embodying the present invention;

FIG. 2 is a side elevational sectional view of a coil supporting spool of a type on which a coil is to be wound in the present apparatus;

FIG. 3 is an end view of the coil shown in FIG. 2;

FIG. 4 is an enlarged fragmentary plan sectional view of the apparatus taken on the line 4—4 of FIG. 1;

FIG. 5 is a fragmentary vertical sectional view of the apparatus taken on line 5—5 of FIG. 1; and

FIG. 6 is a horizontal sectional view through the tailstock of the apparatus taken on line 6—6 of FIG. 1.

Referring to the drawings, the present apparatus is designed to wind simultaneously a plurality of coils on coil supporting forms such as composite spools **12**. Each composite spool **12** comprises a dielectric spool **13** having a sleeve **14** and round and square heads **15** and **16**, respectively, at opposite ends of the sleeve, and an iron core **18** supported within the sleeve and with the ends of the core projecting slightly beyond the spool. A plurality of terminals **20** are secured to the square head **16** and extend therefrom in a direction parallel with the axis of the spool. The round spool head **15** has an aperture **22** formed therein.

The coil winding apparatus comprises a drive shaft **25** which is supported in a frame **26** for rotation about a horizontal axis **28** and is driven by a motor **30**. Secured to the drive shaft **25** is a headstock **32** which serves as a holder for supporting the terminal end of a composite spool **12** for rotation about the axis **28**. The headstock has an axially directed shank **34** at the end of which is formed a circular flange **36**. The flange is provided with a recessed seat **38** having a square portion **39** for receiving the square head **16** of the spool and establishing a driving connection therebetween and having a portion **40** for receiving the projecting end of the core **18**. In addition, the flange is provided with clearance apertures **41** for receiving the terminals **20** of the spool **12**.

The opposite end of the spool is supported in a seat **44** of a holder or coupling member **46**. The coupling member is supported in a ball bearing **48** and is mounted therewith in a vertically disposed portion of an adjustable L-shaped bracket **50**. The lower portion **51** of the bracket is provided with a dovetail slot **52** (FIG. 5) and is mounted on a dovetail guide **53** for horizontal movement parallel to the axis **28**. The guide **53** is fixedly mounted on a spacer **54** which is secured to a horizontal portion **55** of the frame **26**.

The coupling member **46**, in the recessed seat portion **44** thereof, is provided with a projecting pin **58** (FIG. 4) which engages in the aperture **22** of the round head **15** of the composite spool **12** for effecting a driving connection therewith. At the opposite end thereof, the coupling member **46** has a shank portion **60** extending axially from the bracket **50**, and has a circular flange **62** formed on the end of the shank similar to the flange **36** on the headstock **32**. In like manner, the coupling member **46** is provided with a recessed seat **64** for receiving the square spool head **16** and effecting a driving connection therewith and for receiving the end portion of the core **18**, and is also provided with apertures **66** for receiving the terminals **20**.

A plurality of the adjustable brackets **50** and coupling members **46** is provided for supporting a plurality of the spools **12** between adjacent ones of the coupling members **46**.

A tailstock **68** is provided which has a recessed seat **69** for receiving the head **15** and end portion of the core **18** of the spool **12** and which cooperates with the adjacent coupling member **46** to support the last spool of the row of spools. The tailstock has a spindle **70** and is mounted therewith in a sleeve **72** for rotation and against axial movement relative thereto. The sleeve **72**, in turn, is mounted for axial movement in the bore of a cylindrical shell **74** and is stressed for movement toward the headstock **28** to a normal position against a ledge **75** of the shell by a spring **76** interposed between a threaded plug **77** in the shell and the sleeve **72**. The shell is supported

for limited axial movement in a bore **79** of a supporting bracket **80** which is fixedly secured to the frame **26**.

Mechanism under control of an operating lever **81** is provided for imparting axial movement to the cylindrical shell **74** to move the tailstock **68** to and from an advanced position in engagement with the end spool of a row of spools (FIG. 1) and a retracted position (FIG. 4). A shaft **82** is connected to and supports the lever **81** for pivotal movement on the supporting bracket **80** and has a crank disc **83** secured thereto. A crank pin **84** on the disc **82** has a roller **85** thereon which rides in a vertical slot **86** in the cylindrical shell for imparting axial movement of the shell and the tailstock in response to actuation of the lever.

As the lever **81** is moved to its operative position and the tailstock **68** is moved into engagement with the endmost spool **12**, the spring **76** is compressed and stresses the tailstock toward the headstock **32** to effect the movement of the spools **12** and the spool supporting members; namely, the headstock **32**, the coupling members **46**, and the tailstock **68**, into engagement with one another, and the clamping of the spools **12** between adjacent ones of the spool supporting members for rotation together.

A handwheel **88** is secured to the drive shaft adjacent the headstock for manual adjustment thereof to facilitate the placement of the spools **12** in winding position in the apparatus.

In the operation of winding coils onto the spools **12**, each of the spools to be wound has the leading end of a wire **78** (FIG. 1) from a supply thereof attached to a terminal **20** of the spool and wound partially around the spool sleeve and secured thereto adjacent the square head **16** by suitable means such as adhesive tape. It will be understood that the first bracket **50** has been moved previously to the left as viewed in FIG. 1 to provide clearance for the placement of the first spool **12** into the winding apparatus. The first spool is moved so as to insert the terminals **20** into the apertures **41** in the flange **36** of the headstock and to place the square head **16** and end of the core **18** in the seat **38** of the headstock and thereby establish a driving connection therewith. With the spool **12** held in alignment with the axis **28**, the adjacent bracket **50** is moved toward the headstock to bring the coupling member **46** into engagement with the spool **12** and effect the nesting of the round spool head **15** and core end in the seat **44** of the coupling member **46** and the insertion of the pin **58** in the recess **22** of the spool head **15**. The spool **12** is thereby interconnected with and supported by the headstock **32** and coupling member **46** for rotation therewith about the axis **28**.

Thereafter, the terminal end of successive spools **12** are inserted in the seat **64** of successive coupling members **46** and the cooperative adjacent brackets **50** are moved into engagement with the opposite end of the spools to effect the support and interconnection of the several spools **12** and coupling members **46**. After the terminal end of the last spool has been nested in the seat **64** of the last coupling member **46**, the lever **81** is moved to operative position to effect movement of the tailstock **68** to the advanced position in nesting engagement with the other end of the spool **12**, and the compression of the spring **76** of the tailstock to maintain the spools **12** and the spool supporting members **32**, **46** and **68** in interconnected relation to one another during the coil winding operation.

On completion of the winding of the row of coils, the lever **81** is moved to its starting position to effect the return of the tailstock **68** to its retracted position in disengaged relation to the endmost spool **12** and permit the removal of successive ones of the wound coils from the apparatus.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. An apparatus for winding material on spools, which compromises:

a plurality of spool supporting members;

means for mounting said members for rotation about an axis and for relative axial movement therebetween, the opposing end portions of adjacent ones of said members having means for supporting an end portion of a spool in coaxial alignment with said axis and for effecting a driving engagement therewith so that the spools may be placed between and supported by adjacent members and interconnected thereby for rotation together with said spool supporting members;

means for holding said members and the spools in interconnected relationship for rotation together; and

means for rotating one of said members to impart rotation to all of said members and the spools supported thereby.

2. An apparatus for winding material on spools, which comprises:

a plurality of spool supporting members;

means for mounting said members for rotation about an axis and for relative axial movement between said members, the opposing end portions of adjacent ones of said members having means for supporting a spool in coaxial alignment with said axis and effecting a driving engagement with the spool so that the spools may be placed between and supported by adjacent ones of said members and interconnected thereby for rotation together;

resilient means for stressing said members axially toward one another into engagement with the spools therebetween for rotation of said members and the spools together; and

means for rotating one of said members to impart rotation to all of said members and the spools supported thereby.

3. A coil winding apparatus, which comprises:

a rotatable first member having means at one end thereof for supporting for rotation therewith one end of a first spool on which material is to be wound;

a rotatable second member having means at one end thereof for supporting for rotation therewith the other end of the first spool and having means at the other end thereof for supporting for rotation therewith one end of a second spool;

a rotatable third member having means at one end thereof for supporting for rotation therewith the other end of the second spool;

means for supporting said members for rotation about an axis and for relative axial movement between said members to permit the first and the second spools to be placed between and supported by adjacent ones of said members;

means for moving said third member axially toward said first member to effect relative movement between said members and the spools therebetween into interconnected relationship for rotation of all of said members and the spools together; and

means for rotating one of said members to impart rotation to said members and the spools.

4. An apparatus for winding material on spools, which comprises:

a rotatable first member having means at one end thereof for supporting one end of a first spool;

a rotatable second member having means at one end thereof for supporting the other end of the first spool and having means at the other end thereof for supporting one end of a second spool;

a rotatable third member having means at one end thereof for supporting the other end of the second spool;

means for supporting said members for rotation about an axis and for relative movement between said members to permit the first and the second spools to be placed between and supported by adjacent ones of said members;

means for stressing said third member toward said first member to grip the spools between said members and be interconnected thereby for rotation of all of said members and the spools; together; and

means for rotating one of said members to impart rotation to said members and the spools.

5. An apparatus for winding coils on a plurality of spools, which comprises:

a first member mounted for rotation about an axis and against axial movement and having means at one end for supporting one end of a spool for rotation therewith;

a plurality of second members mounted for rotation about said axis and for axial movement toward and from one another and said first member, each of said second members having means at each end thereof for supporting one end of a spool for rotation therewith;

a third member mounted for rotation about the axis and for axial movement toward said second members and said first member and having a seat in one end thereof directed toward the adjacent second member for supporting one end of a spool for rotation therewith;

means for moving said third member axially toward said second members and said first member to clamp the spools therebetween and be interconnected thereby for rotation of all of said members and the spools together; and

means for rotating said first member.

6. An apparatus for winding material onto spools, which comprises:

a frame;

a first spool supporting member mounted on said frame for rotation about an axis and against axial movement, said member having means for supporting one end of a first spool for rotation about said axis and for establishing a driving connection therewith:

an element mounted on said frame for movement parallel to said axis;

a second spool supporting member mounted on said element for rotation about said axis and for axial movement with said element, said second spool supporting member having means at one end thereof for supporting the other of the first spool for rotation about the axis and for establishing a positive driving connection therewith and said second spool supporting member having means at the other end thereof for supporting one end of a second spool for rotation about the axis and for establishing a positive driving connection therewith and interconnecting the spools for rotation together;

a third spool supporting member;

means on said frame for supporting said third spool supporting member for rotation about said axis and for axial movement, said third spool supporting member having means for supporting the other end of the second spool for rotation about the axis, the arrangement of said spool supporting members being such as to permit the assembly and supporting of the first and the second spools between adjacent ones of said spool supporting members and the interconnection of all of said spool supporting means and the spools for rotation together;

means for moving said third spool supporting member axially to a position for holding the spools and said spool supporting members in engagement with one another; and

means for rotating said first spool supporting member to impart rotation to all of said members and the spools.

7. An apparatus for simultaneously winding coils on a plurality of headed spools, which comprises:

a plurality of spool supporting means;

means for supporting said plurality of spool supporting means for rotation about an axis and in axially spaced relation to one another, each spool supporting means having a first spool engaging means rotatable therewith at one end thereof for supporting one end of a spool and effecting a driving engagement between the spool and said spool supporting means and having a second spool engaging means rotatable therewith at the other end thereof for supporting the other end of another spool for rotation and for effecting a driving engagement between the spool and said spool supporting means, said first spool engaging means of one spool supporting means and said second spool engaging mean of an adjacent spool supporting means cooperating to support a spool therebetween, and said first and said second spool engaging means of adjacent spool supporting means being supported for relative axial movement therebetween to permit the insertion of a spool therebetween;

means for maintaining said first and said second spool engaging means in engagement with the spool; and

means for rotating one of said spool supporting means.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,337,145 August 22, 1967

George B. Keck

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 5, for "compromises" read -- comprises --; column 5, line 2, after "relative" insert -- axial --; line 9, for "spools;" read -- spools --.

Signed and sealed this 13th day of August 1968.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents