



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.11.2003 Bulletin 2003/47

(51) Int Cl.7: **H01F 41/06, B65H 54/54**

(21) Application number: **03076203.3**

(22) Date of filing: **25.04.2003**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**
Designated Extension States:
AL LT LV MK

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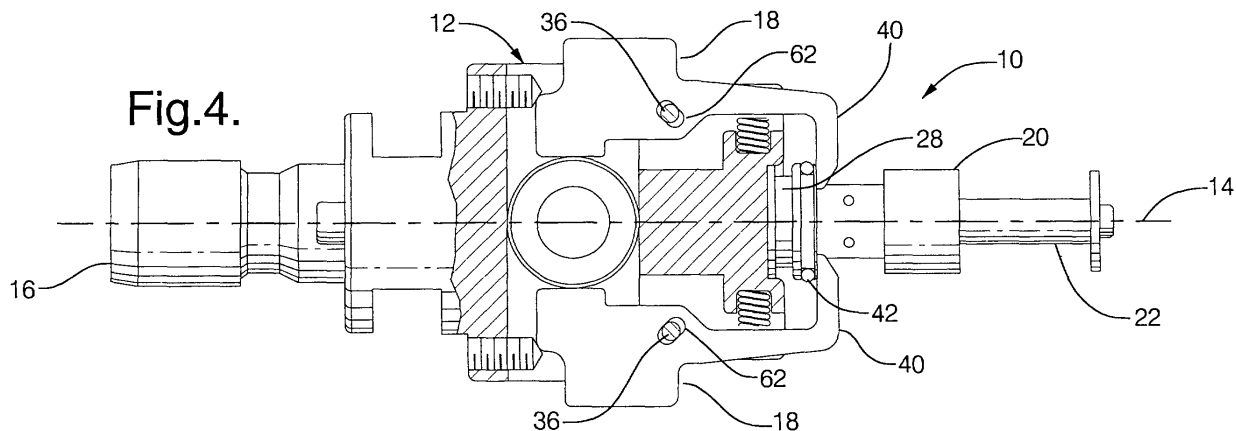
(30) Priority: **17.05.2002 US 150706**

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(54) **Apparatus for fixturing a spool on a wire winding machine**

(57) An apparatus (10) for fixturing a spool (20) on a wire winding machine. The invention provides a winding fixture (12) rotatably driven about a rotational axis (14) and receivably coupled to the spool (20). At least one jaw member (18) is connected to the winding fixture (12) and cooperatively engageable with the spool (20). The jaw member (18) is movable between a first clamped position, wherein the jaw member (18) is adjacent the spool (20), and a second clamped position, wherein the jaw member (18) engages the spool (20) and maintains the position of the spool (20) relative to the winding fixture (12) in response to a centrifugal force (64) created by the rotation of said winding fixture (12).

The jaw member (18) provides a slotted aperture (62) therein for cooperatively receiving a pivot pin (36) that is connected to the winding fixture (12). The jaw member (18) has an engaging end (78) adjacent the spool (20) and a weighted end (76) opposite the engaging end (78). In response to the centrifugal force (74) created by the rotation of the winding fixture (12), the weighted end (76) of the jaw member (18) moves outward away from the rotational axis (14) of the winding fixture (12) allowing the pivot pin (36) to move along the slotted aperture (62) in the jaw member (18) and allowing said engaging end (78) of the jaw member (18) to engage the spool (20).



Description

TECHNICAL FIELD

[0001] The present invention relates to wire winding machines, and more particularly, a wire winding fixture that provides a pair of jaw members that move in response to a centrifugal force to engage and secure a spool within the winding fixture during the rotation of the winding fixture.

BACKGROUND OF THE INVENTION

[0002] Wire winding machines are well known within the art. Such wire winding machines typically wind metallic wire onto a spool or a bobbin for use in sensors. In so doing, the wire winding machine typically provides a winding fixture for engaging and securing the spool during the rotation of the winding fixture. As the spool rotates with the winding fixture, wire is fed and coiled onto the spool.

[0003] In a known design, the winding fixture of a wire winding machine receives an end of a spool for which wire is wound on a central portion or opposite end of the spool. A pair of jaw members are pivotally attached to the winding fixture and pivot between an unclamped position, wherein the spool may be loaded and unloaded into the winding fixture, and a clamped position, wherein the jaw members overlap a flange on the spool to secure the spool to the winding fixture.

[0004] The flange on the spool is longitudinally spaced from the end of the spool that is received by the winding fixture. The distance between the flange and the end of the spool is designed to be a predetermined distance that correlates with the clamped position of the jaw members. However, since the jaw members are not adjustable, manufacturing variances from spool-to-spool of the distance between the flange and the end of the spool may create open spaces or gaps between the flange of the spool and the jaw members when the jaw members are in the clamped position. Such a gap prevents the spool from being tightly clamped to the winding fixture thereby causing the spool to wobble relative to the rotational axis of the winding fixture during the rotation of the winding fixture. The wobbling of the spool may strain the wire as the wire is wound onto the spool thereby causing causes an increase in the rejection and scrap rates of the wound spools which is undesirable in an industrial environment.

[0005] It would be desirable to provide a winding fixture of a wire winding machine that adjusts to the manufacturing variances of a spool to secure and maintain the position of the spool relative to the winding fixture during rotation of the winding fixture.

SUMMARY OF THE INVENTION

[0006] The present invention provides an apparatus

for fixturing a spool on a wire winding machine. The apparatus includes a winding fixture rotatably driven about a rotational axis and receivably coupled to the spool. At least one jaw member is operably connected to the winding fixture and cooperatively engageable with the spool. The jaw member is movable between a first clamped position, wherein the jaw member is adjacent the spool, and a second clamped position, wherein the jaw member engages the spool and maintains the position of the spool relative to the winding fixture in response to rotation of the winding fixture.

[0007] The jaw member provides a slotted aperture therein for operably receiving a pivot pin connected to the winding fixture. The slotted aperture in the jaw member provides a first end and a second end wherein the pivot pin is located at the first end of the slotted aperture when the jaw member is in the first clamped position. The pivot pin is located away from the first end of the slotted aperture, toward the second end of the slotted aperture, when the jaw member is in the second clamped position. The jaw member has an engaging end for engaging the spool and a weighted end opposite the engaging end. In response to the rotation of the winding fixture, a centrifugal force forces the weighted end of the jaw member to move outward away from the rotational axis of the winding fixture allowing the pivot pin to move toward the second end of the slotted aperture and allowing the engaging end of the jaw member to engage the spool.

[0008] The slotted aperture in the jaw member and the pivot pin on the winding fixture each have a longitudinal axis wherein the longitudinal axes are substantially perpendicular to one another. The longitudinal axis of the slotted aperture intersects the rotational axis of the winding fixture at an acute angle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The description herein makes reference to the accompanying drawings wherein like reference numerals refer to like parts throughout several views and wherein:

Fig. 1 is a top view of a prior art winding fixture for a wire winding machine.

Fig. 2 is a sectional view of a prior art winding fixture for a wire winding machine.

Fig. 3 is a sectional view of the wire winding fixturing apparatus of the present invention.

Fig. 4 is a sectional view showing the first and second clamped positions of the jaw members of the wire winding fixturing apparatus of the present invention.

Fig. 5 is a schematic showing the movement of the jaw member in response to rotation of the winding fixture of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0010] Referring to the figures, the present invention will now be described in detail with reference to a preferred embodiment.

[0011] Figs. 1 and 2 represent a prior art winding machine and Figs. 3-5 depict a wire winding machine fixturing apparatus 10 of the present invention. As shown in Figs. 3-5, the apparatus 10 is housed within a larger conventional wire winding machine (not shown) wherein a winding fixture 12 of the apparatus 10 is rotatably driven about a rotational axis 14 by a conventional motor or drive (not shown) provided in the wire winding machine. The motor or drive provides a drive shaft (not shown) which in turn is coupled to a driven end 16 of the winding fixture 12. The apparatus 10 also provides a pair of similar jaw members 18 that engage and secure a spool 20 seated within the winding fixture 12 of the apparatus 10. The spool 20 is rotated in conjunction with the winding fixture 12 thereby allowing a conventional wire (not shown) to be wound onto a wire holding portion 22 of the spool 20. Although the specification describes the apparatus 10 of the present invention as having a pair of jaw members 18, the present invention is not limited to two jaw members 18, but rather, any number of jaw members 18 may be utilized depending on the application

[0012] As seen in the prior art Figures of Figs. 1 and 2, the winding fixture 12 of the prior art is similar to that provided in the apparatus 10 of the present invention. At the driven end 16 of the winding fixture 12, the winding fixture 12 is coupled with and rotationally driven by the drive shaft of the motor, as previously described. At the opposite end 24 of the winding fixture 12, a recessed seat 26 is provided for receiving a fixtured end 28 of the spool 20. The winding fixture 12 has a substantially cylindrical configuration having a plurality of stepped diameters. A large central portion 30 of the winding fixture 12 has a slot 32 extending therethrough for receiving a portion 34 of a pair of jaw members 18.

[0013] The portion 34 of the jaw members 18 are each pivotally connected to the winding fixture 12 at a central portion of the jaw members 18 by pivot pins 36. The jaw members 18 have a leg shaped or L-shaped configuration wherein a smaller foot portion 38 of the jaw members 18 is substantially perpendicular to a longer leg portion 40 of the jaw members 18. The jaw members 18 oppose one another and each having a foot portion 38 extending inward toward the rotational axis 14 of the winding fixture 12. The pivot pins 36 allow the jaw members 18 to pivot between an unclamped position, wherein the foot portions 38 of the jaw members 18 move outward away from the rotational axis 14 of the winding fixture 12, and a clamped position, wherein the foot portions 38 of the jaw members 18 move toward the rotational axis 14 of the winding fixture 12. In the unclamped position, the spool 20 may be placed into or removed from the recessed seat 26 of the winding fixture 12, and

in the clamped position, the foot portions 18 of the jaw members 18 engage a circumferentially extending flange 42 provided on the spool 20 to prevent the spool 20 from being removed from the recessed seat 26 of the winding fixture 12.

[0014] The prior art structure discloses a manual release button 44 in the winding fixture 12 for moving the jaw members 18 between the clamped and unclamped positions. The manual release button 44 is disposed within a bore 46 provided in the large central portion 30 of the winding fixture 12, wherein the bore 46 intersects the slot 32 in the winding fixture 12. The manual release button 44 extends outward from a flat landing 48 provided on the central portion 30 of the winding fixture 12. A substantially conical structure 50 is connected to the manual release button 44 and is housed within the bore 46 of the winding fixture 12. A compression spring 52 is disposed within the bore 46 of the winding fixture 12 between the bottom of the bore 46 and the bottom of the conical structure 50 to bias the manual release button 44 outward away from the winding fixture 12. The conical structure 50 of the manual release button 44 is slidably disposed between an inner surface 54 of the leg portions 40 of the jaw members 18. When the inner surface 54 of the leg portions 40 of the jaw members 18 engage the wider portion of the conical structure 50 of the manual release button 44, the leg portions 40 of the jaw members 18 pivot outward away from the rotational axis 14 of the winding fixture 12, while the foot portions 38 of the jaw members 18 pivot inward toward the rotational axis 14 of the winding fixture 12 toward the clamped position. Set screws 56 are threaded into threaded apertures in the winding fixture 12 and engage a shoulder 58 provided on the leg portions 40 on the jaw members 18 to prevent the jaw members 18 from pivoting beyond a predetermined position. The set screws 56 may be adjusted to finely tune the position of the jaw members 18 in the clamped position. When the manual release button 44 is pushed inward toward the winding fixture 12, the narrow portion of the conical structure 50 of the manual release button 44 engages the inner surface 54 of the leg portions 40 of the jaw members 18. A pair of compression springs 60 each have an end connected to the winding fixture 12 and another end engaging the leg portions 40 of the jaw members 18 to bias the foot portions 38 of the jaw members 18 outward away from the rotational axis 14 of the winding fixture 12. The springs 60 bias the jaw members 18 toward the unclamped position when the manual release button 44 is depressed inwardly toward the winding fixture 12 thereby allowing the narrower portion of the conical structure 50 to engage the inner surface 54 of the leg portions 40 of the jaw members 18.

[0015] The present invention is an improvement and is distinct over the prior art in that it automatically adjusts to variations in the distance between the end 28 of the spool 20 and the flange 42 of the spool 20. As seen in Figs. 3-5, this is accomplished by providing a slotted ap-

erture 62 in each of the jaw members 18 to allow the jaw members 18 to move along the pivot pins 36 through the slotted apertures 62 in response to a centrifugal force 64 created by the rotation of the winding fixture 12. The slotted aperture 62 has a longitudinal axis 66 that is substantially perpendicular to a longitudinal axis of the pivot pins 36 and that forms an acute angle 68 with the rotational axis 14. The jaw members 18 may still move between the clamped position and the unclamped position, however, the jaw members 18 may now move between two clamped positions. In a first clamped position represented by Fig. 3 and the solid lines in Figs. 5, the pivot pins 36 are positioned in a first end 70 of the slotted apertures 62 in the jaw members 18. The first end 70 of the slotted aperture 62 is the furthest portion of the slotted aperture 62 from the rotational axis 14 of the winding fixture 12. The foot portions 38 of the jaw members 18 are adjacent the flange 42 of the spool 20, but the foot portions 38 will most likely not engage the flange 42 of the spool 20 since the jaw members 18 are designed to fit the majority of manufactured spools 20. Spools 20 that are manufactured on the larger end of the spools' tolerance range must also fit into the winding fixture 12, and therefore, the larger spools 20 may actually engage the foot portions 38 of the jaw members 18 when the jaw members 18 are in the first clamped position. In a second clamped position, as represented by Fig. 4 and the phantom lines in Fig. 5, the pivot pins 36 are located toward a second end 72 of the slotted apertures 62 away from the first end 70 of the slotted apertures 62. This allows the feet 38 of the jaw members 18 to engage the flange of the spool 20.

[0016] In order for the jaw members 18 to move from the first unclamped position to the second unclamped position, the jaw members 18 move along the pivot pins 36 in response to a centrifugal force 74 created by the rotation of the winding fixture 12. An end 76 of the jaw members 18 opposite the foot portion 38 is weighted so that it is heavier than an engaging end 78 of the jaw member 18 having the foot portion 38. This may occur by the weighted end 76 of the jaw members 18 simply being larger in structure than the engaging end 78 of the jaw members 18, or the weighted end 76 of the jaw members 18 may be created by adding a heavy material or mass to the end 76 of the jaw members 18. Either way, the rotation of the winding fixture 12 creates the centrifugal force 64 on the weighted end 76 of the jaw members 18 which forces the weighted end 76 of the jaw members 18 away from the rotational axis 14 of the winding fixture 12. When this occurs, the weighted end 76 of the jaw members 18 begins to move outward away from the rotational axis 14 of the winding fixture 12 thereby causing the pivot pins 36 to move away from the first end 70 of the slotted aperture 62 and toward the second end 72 of the slotted apertures 62 in the jaw members 18. The movement of the jaw members 18 along the pivot pins 36 causes the foot portion 38 of the jaw members 18 to move inward toward the flange 42 of the spool 20.

The centrifugal force 64 applied to the weighted end 76 of the jaw members 18 creates an inward force 80 applied by the foot 38 of the jaw members 18 to the flange 42 of the spool 20. The centrifugal force 64 on the weighted end 76 of the jaw members 18 increases with the rotation of the winding fixture 12 thereby increasing the force 80 applied by the foot portions 38 of the jaw members 18 to the flange of the spool 20. This aids in securing the spool 20 to the winding fixture 12 since the force 80 being applied by the foot portions 38 of the jaw members 18 to the flange of the spool 20 increases with the RPM's of the winding fixture 12.

[0017] In operation, the manual release button 44 is pushed inward toward the winding fixture 12 to allow the narrow portion of the conical structure 50 to engage the inner surface 54 of the leg portions 40 of the jaw members 18. The springs 60 bias the foot portions 38 of the jaw members 18 outward away from the rotational axis 14 of the winding fixture 12 so that the weighted end 76 of the jaw members 18 move inward toward the rotational axis 14 of the winding fixture 12. The end 28 of the spool 20 is then inserted and seated into the recessed seat 26 of the winding fixture 12. The manual release button 44 is biased outwardly from the winding fixture 12 by spring 52 such that the larger portion of the conical structure 50 of the manual release button 44 engages the inner surface 54 of the leg portions 40 of the jaw members 18 thereby forcing the weighted end 76 of the jaw members 18 outwardly away from the rotational axis 14 of the winding fixture. In turn, the foot portions 38 of the jaw members 18 move inwardly toward the rotational axis 14 of the winding fixture 12 and are positioned adjacent to or in contact with the flange 42 of the spool 20. Once the spool 20 is seated in the winding fixture 12, the motor to the wire winding machine is engaged to rotationally drive the winding fixture 12 about the rotational axis 14.

[0018] The rotation of the winding fixture 12 creates the centrifugal force 64 on the weighted end 76 of the jaw members 18 thereby causing the jaw members 18 to move outwardly away from the rotational axis 14 of the winding fixture 12. The pivot pins 36 travel from the first end 70 of the slotted apertures 62 toward the second end 72 of the slotted apertures 62 of the jaw members 18. This causes the foot portions 38 of the jaw members 18 to move inwardly until the foot portions 38 engage the flange 42 of the spool 20. The centrifugal force 64 applied to the weighted end 76 of the jaw members 18 is transferred to the inward force 80 applied by the foot portions 38 of the jaw members 18 to the flange 42 of the spool 20. As the RPM's of the winding fixture 12 increase, the centrifugal force 64 increases thereby increasing the force 80 applied by the foot portions 38 to the flange 42 of the spool 20. This secures and maintains the position of the spool 20 with respect to the winding fixture 12 so that wire can be properly wound on the spool 20. Once the wire has been completely wound on the spool 20, the winding fixture 12 is

stopped, and the manual release button 44 is pushed inwardly toward the winding fixture 12 to allow for the release of the jaw members 18 from the spool 20. The spool 20 is then removed from the winding fixture 12.

[0019] While the invention has been described with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiments, but on the contrary, it is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, the scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as is permitted under the law.

Claims

1. An apparatus (10) for fixturing a spool (20) on a wire winding machine, comprising:

a winding fixture (12) rotatably driven about a rotational axis (14) and receivably coupled to said spool (20); and

at least one jaw member (18) operably connected to said winding fixture (12) and cooperatively engageable with said spool (20), wherein said at least one jaw member (18) is movable between a first clamped position, wherein said jaw member (18) is adjacent said spool (20), and a second clamped position, wherein said jaw member (18) engages said spool (20) and maintains a position of said spool (20) relative to said winding fixture (12) in response to a centrifugal force (64) created by the rotation of said winding fixture (12).

2. The apparatus as stated in claim 1, further comprising:

at least one pivot pin connected to said winding fixture; and

said at least one jaw member having a slotted aperture therein for operatively receiving said at least one pivot pin.

3. The apparatus as stated in claim 2, further comprising:

said slotted aperture in said at least one jaw member having a first end and a second end wherein said at least one pivot pin is located at said first end of said slotted aperture when said jaw member is in said first clamped position, and said at least one pivot pin is located away from said first end of said slotted aperture toward said second end of said slotted aperture, when said at least one jaw member is in said

second clamped position.

4. The apparatus stated in claim 3, further comprising:

said at least one jaw member having an engaging end for engaging said spool and a weighted end opposite said engaging end, and in response to the centrifugal force created by the rotation of said winding fixture, said weighted end of said jaw member moves outward away from said rotational axis of said winding fixture allowing said pivot pin to move toward said second end of said slotted aperture of said jaw member and allowing said engaging end of said jaw member to engage said spool.

5. The apparatus as stated in claim 2, further comprising:

said at least one pivot pin having a longitudinal axis, and said longitudinal axis substantially perpendicular to said rotational axis of said winding fixture.

6. The apparatus as stated in claim 2, further comprising:

said slotted aperture in said jaw member and said pivot pin on said winding fixture each having a longitudinal axis, wherein said longitudinal axes are substantially perpendicular to one another.

7. The apparatus stated in claim 6, further comprising:

said longitudinal axis of said slotted aperture in said jaw member intersecting said rotational axis of said winding fixture at an acute angle.

8. An apparatus (10) for fixturing a spool (20) on a wire winding machine, comprising:

a winding fixture (10) rotatably driven about a rotational axis (14) and receivably coupled to said spool;

a pair of jaw members (18) each having a slotted aperture (62) therein;

a pair of pivot pins (36) connected to said winding fixture (10), and each of said pivot pins (36) operably received by one of said slotted apertures (62) in said jaw members (18); and

said jaw members (18) moving along said pivot pins (36) in said slotted apertures (62) between a first clamped position, wherein said pair of jaw members (18) are adjacent said spool (20), and a second clamped position, wherein said pair of jaw members (18) engage said spool (20) and maintain a position of said spool (20) rela-

tive to said winding fixture (10) in response to a centrifugal force (64) created by the rotation of said winding fixture (10).

9. The apparatus as stated in claim 8, further comprising:

said pair of jaw members diametrically opposing one another.

10. The apparatus as stated in claim 9, further comprising:

said slotted apertures in said pair of jaw members each having a first end and a second end wherein each of said pair of pivot pins are located at said first end of said slotted apertures when said jaw members are in said first clamped position, and said pivot pins are located away from said first end of said slotted apertures toward said second end of said slotted apertures when said jaw members are in said second clamped position.

11. The apparatus stated in claim 10, further comprising:

said pair of jaw members each having an engaging end for engaging said spool and a weighted end opposite said engaging end, and in response to the centrifugal force created by the rotation of said winding fixture, said weighted end of said jaw members moves outwardly away from said rotational axis of said winding fixture allowing said pivot pins to move toward said second end of said slotted aperture and allowing said engaging end of said jaw members to engage said spool.

12. The apparatus as stated in claim 8, further comprising:

said pair of pivot pins each having longitudinal axes, and said longitudinal axes substantially perpendicular to said rotational axis of said winding fixture.

13. The apparatus stated in claim 8, further comprising:

said slotted apertures in said jaw members and said pivot pins on said winding fixture each having a longitudinal axis wherein said longitudinal axes of said slotted apertures are substantially perpendicular to said longitudinal axes of said pivot pins.

14. The apparatus as stated in claim 13, further comprising:

said longitudinal axes of said slotted apertures intersecting said rotational axis of said winding fixture at acute angles.

15. An improved apparatus (10) for fixturing a spool (20) on a wire winding machine having a winding fixture (12) rotatably driven about a rotational axis (14), and a pair of jaw members (18) connected to said winding fixture (12) for operably engaging and securing said spool (20) to said winding fixture (12), the improvement comprising:

said pair of jaw members (18) each having a slotted aperture (62) therein;
a pair of pivot pins (36) connected to said winding fixture (12), and said pair of pivot pins (36) operably received by said slotted apertures (62) in said pair of jaw members (18); and said jaw members (18) moving along said pivot pins (36) in said slotted apertures (62) between a first clamped position, wherein said pair of jaw members (18) are adjacent said spool (20), and a second clamped position, wherein said pair of jaw members (18) engage said spool (20) and maintain a position of said spool (20) relative to said winding fixture (12) in response to a centrifugal force (64) created by the rotation of said winding fixture (12).

16. The improved apparatus stated in claim 15, further comprising:

said slotted apertures in said pair of jaw members each having a first end and a second end wherein each of said pair of pivot pins are located at said first end of said slotted apertures when said jaw members are in said first clamped position, and said pivot pins are located away from said first end of said slotted apertures toward said second end of said slotted apertures when said jaw members are in said second clamped position.

17. The improved apparatus stated in claim 11, further comprising:

said pair of jaw members having an engaging end for engaging said spool and a weighted end opposite said engaging end, and in response to the centrifugal force created by the rotation of said winding fixture, said weighted end of said jaw members move outward away from said rotational axis of said winding fixture allowing said pivot pins to move toward said second end of said slotted apertures and allowing said engaging end of said jaw members to move toward and engage said spool.

18. The improved apparatus as stated in claim 15, further comprising:

said slotted apertures and said pivot pins each having a longitudinal axis that are substantially perpendicular to one another. 5

19. The improved apparatus as stated in claim 18, further comprising:

said longitudinal axes of said slotted apertures intersecting said rotational axis at acute angles. 10

20. The improved apparatus as stated in claim 15, further comprising:

said pair of jaw members applying a force on said spool in said second clamped position during the rotation of said winding fixture, and said force increasing with the rotational velocity of said winding fixture. 15
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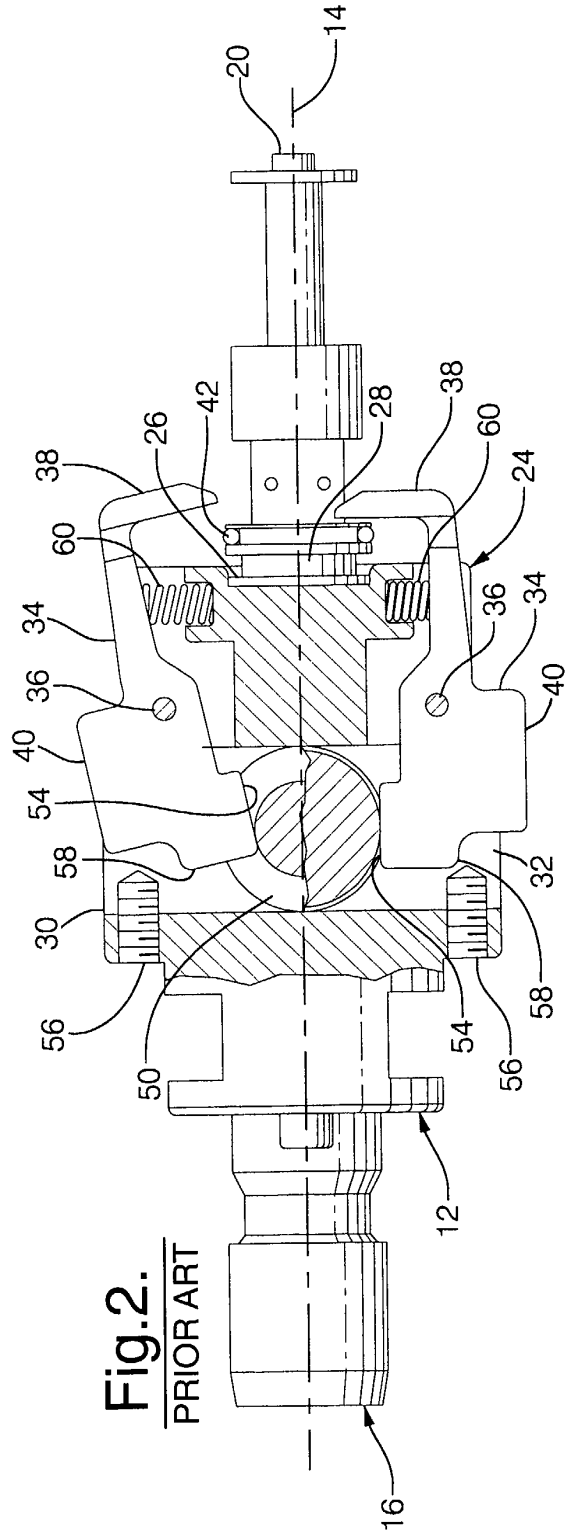
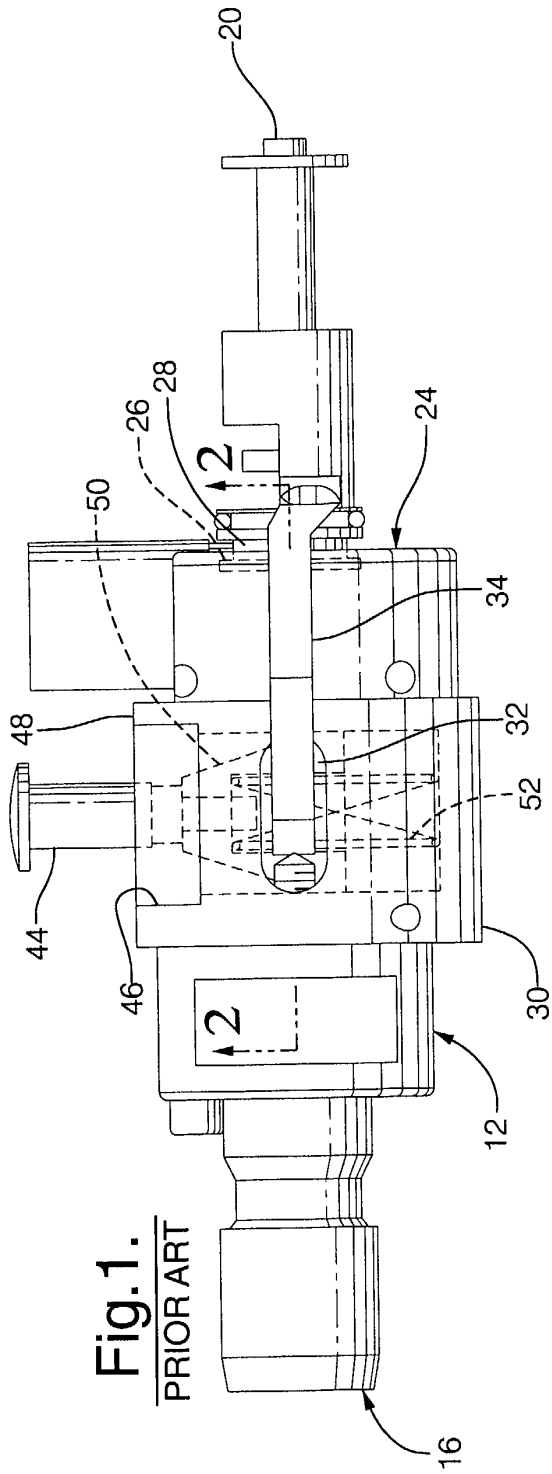
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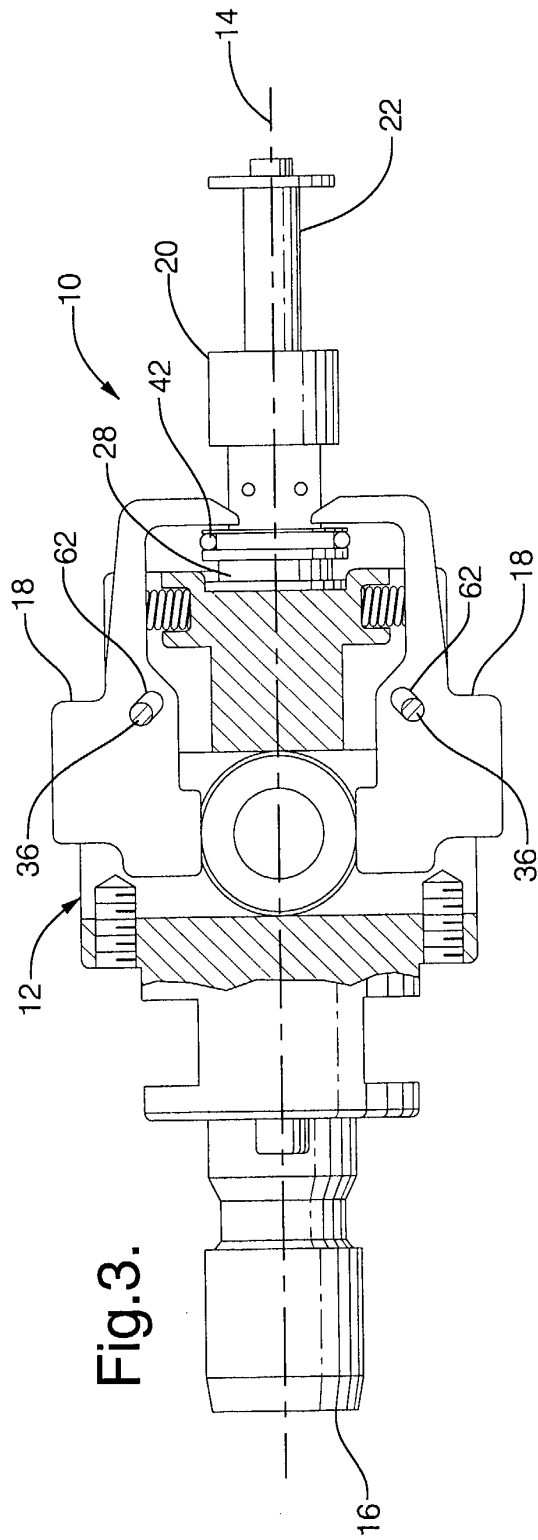


Fig. 3.

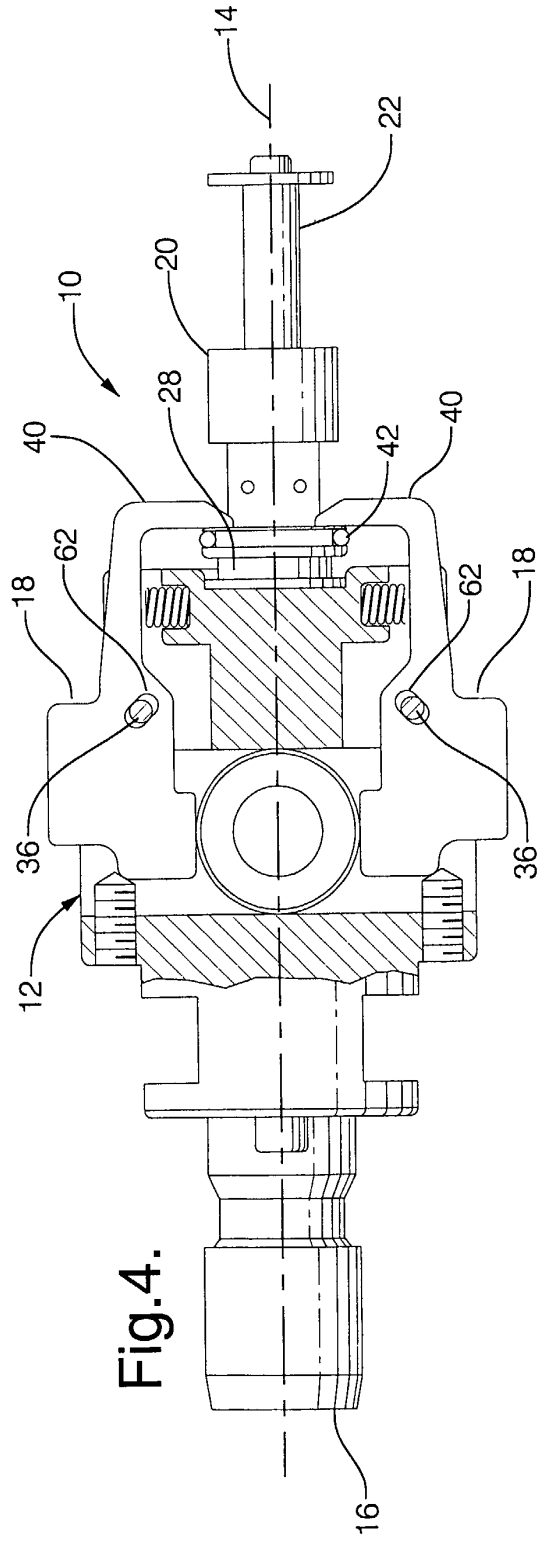
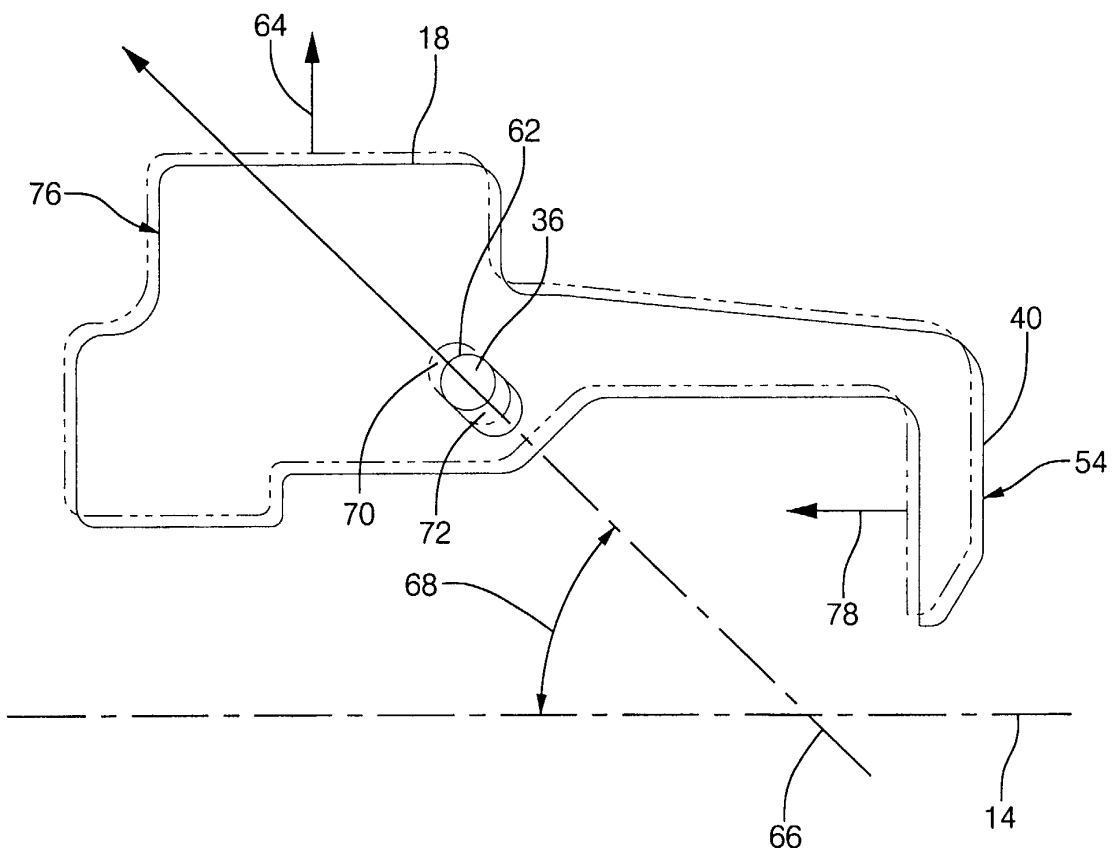


Fig. 4.

Fig.5.





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 07 6203

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|---|---|--|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.7) |
| Y | US 3 252 667 A (MILLER HARRY E) 24 May 1966 (1966-05-24) | 1 | H01F41/06 B65H54/54 |
| A | * column 1, line 68 - column 3, line 3; figures * | 8,15 | |
| Y | US 4 097 987 A (MILLER IMRICH M) 4 July 1978 (1978-07-04) | 1 | |
| A | * column 3, line 10 - line 37; figure 2 * | 8,15 | |
| The present search report has been drawn up for all claims | | | TECHNICAL FIELDS SEARCHED (Int.Cl.7) |
| | | | H01F B65H |
| Place of search | | Date of completion of the search | Examiner |
| THE HAGUE | | 8 August 2003 | Marti Almeda, R |
| CATEGORY OF CITED DOCUMENTS | | | |
| X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document | | T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document | |

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 07 6203

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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08-08-2003

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|--|------------------|-------------------------|------------------|
| US 3252667 A | 24-05-1966 | NONE | |
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82