

[54] **SLEEVE CHUCK FOR THREAD WINDING DEVICE**

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[58] Field of Search 242/46.4, 46.2, 46.3, 68.4, 242/72

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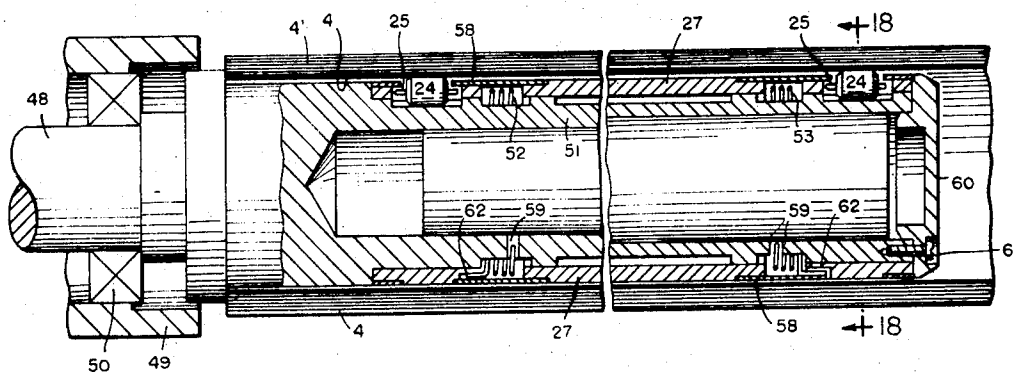
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Primary Examiner—Stanley N. Gilreath
Attorney, Agent, or Firm—Johnston, Keil, Thompson & Shurtleff

[57] **ABSTRACT**

A sleeve chuck in a textile winding device in which the winding shaft, adapted to hold or grip a bobbin or core sleeve, is made up of an inner shaft means freely rotatable within an outer cage means provided with openings to receive individual gripping elements in cammed engagement with the shaft means and also including spring means interconnecting the shaft and cage means to resiliently urge the gripping elements radially outwardly of the cage means.

7 Claims, 43 Drawing Figures



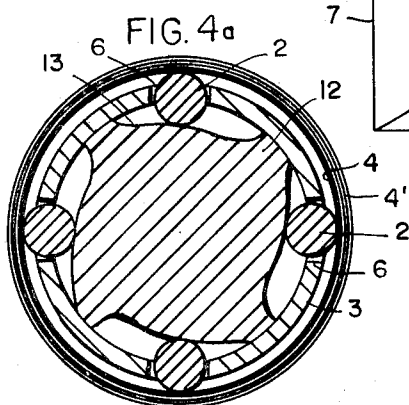
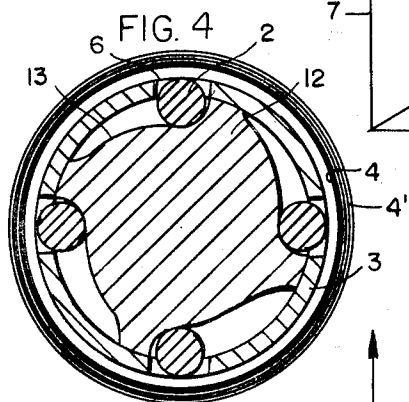
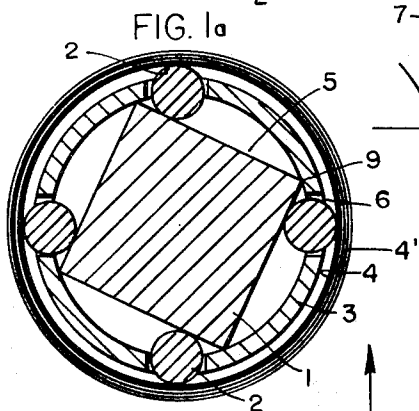
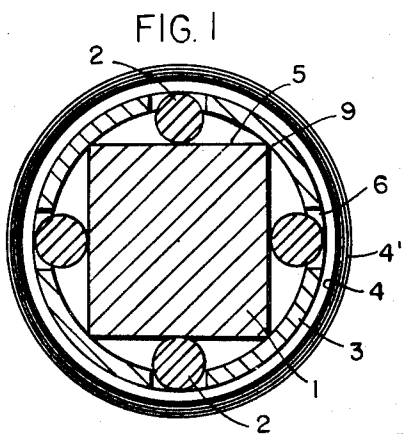


FIG. 3

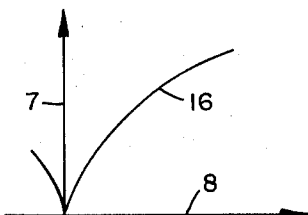


FIG. 6

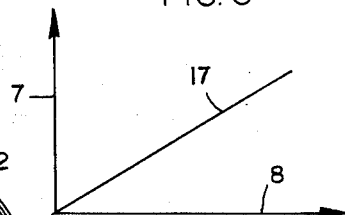
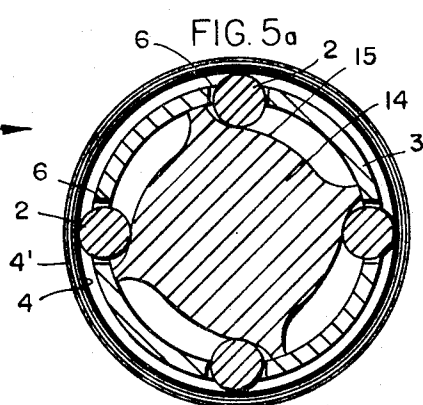
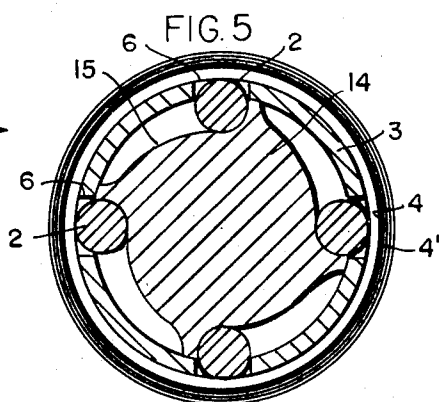
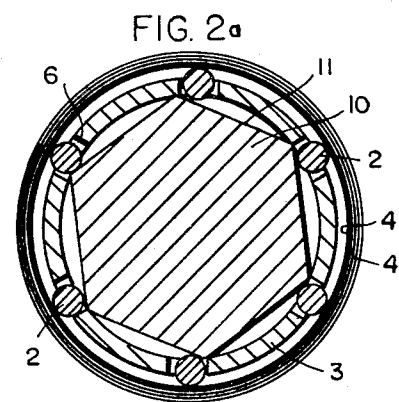
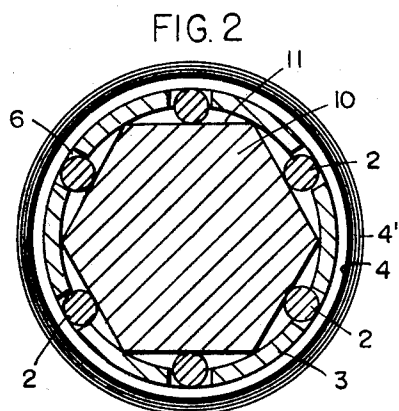
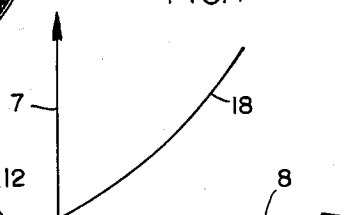


FIG. 7



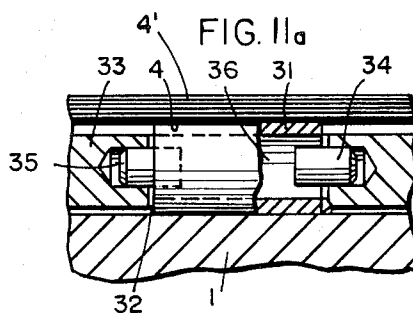
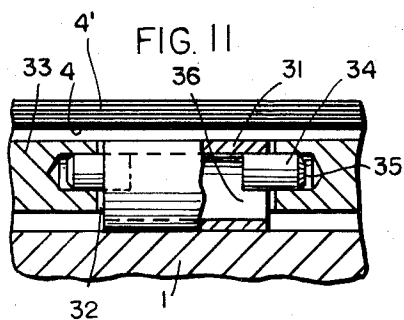
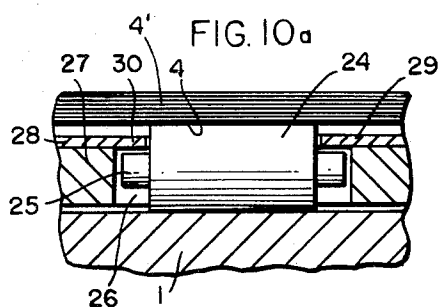
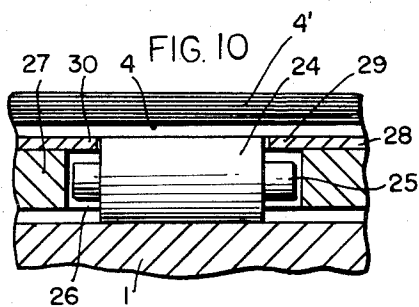
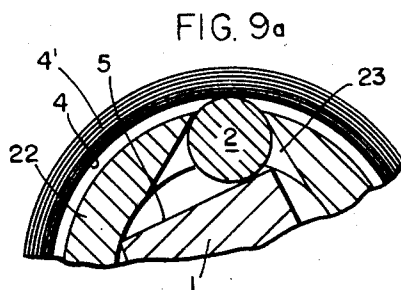
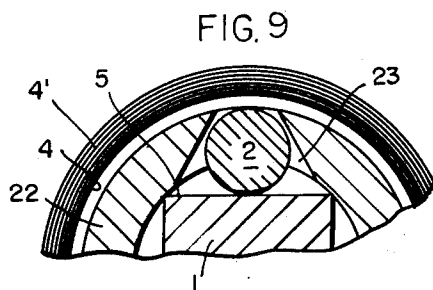
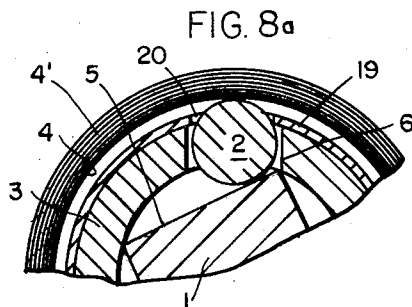
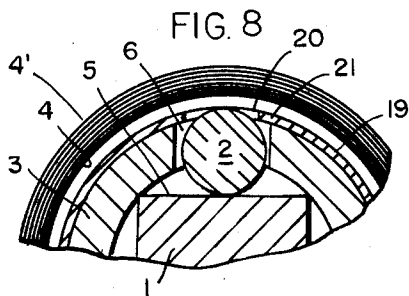


FIG. 12

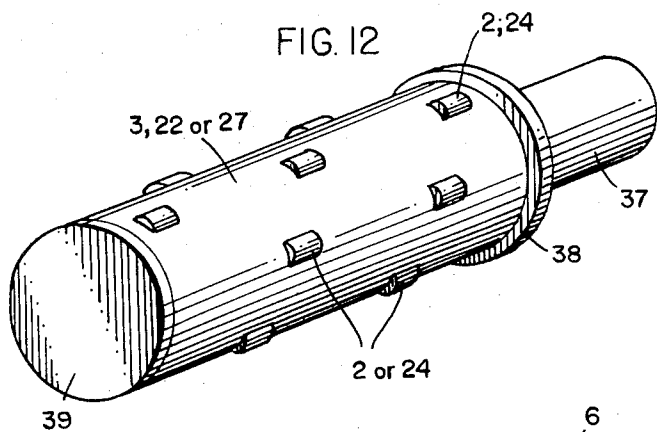


FIG. 13

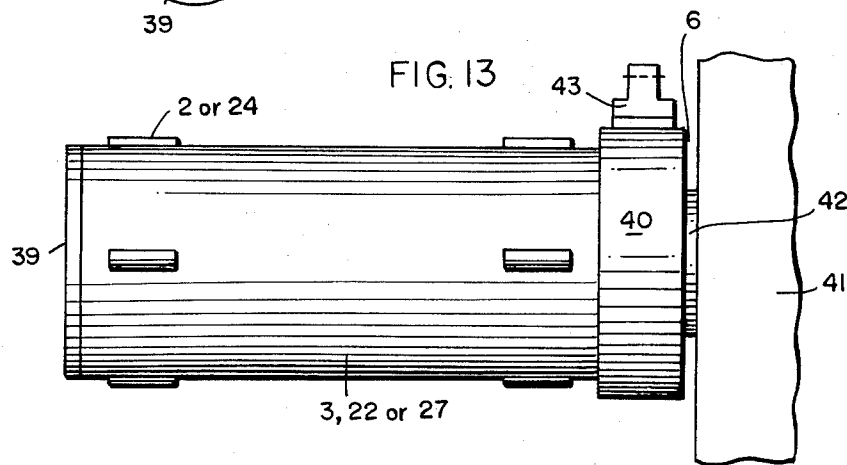


FIG. 14

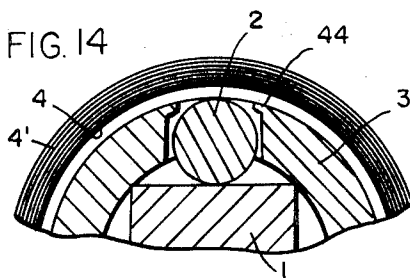


FIG. 14a

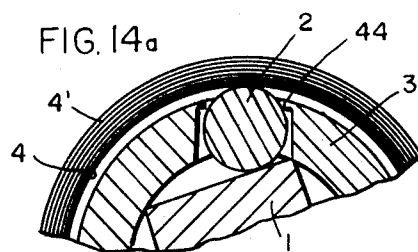


FIG. 15

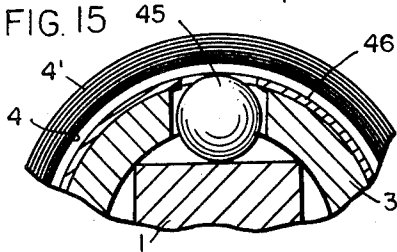


FIG. 15a

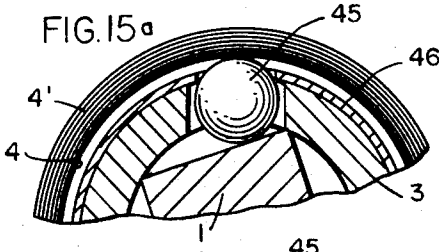


FIG. 16

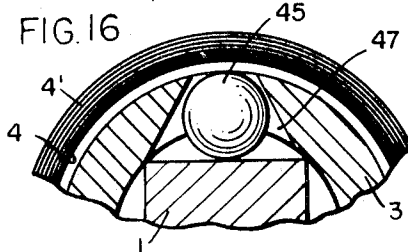
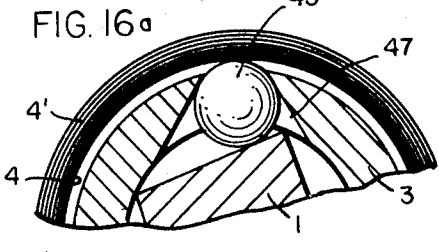


FIG. 16a



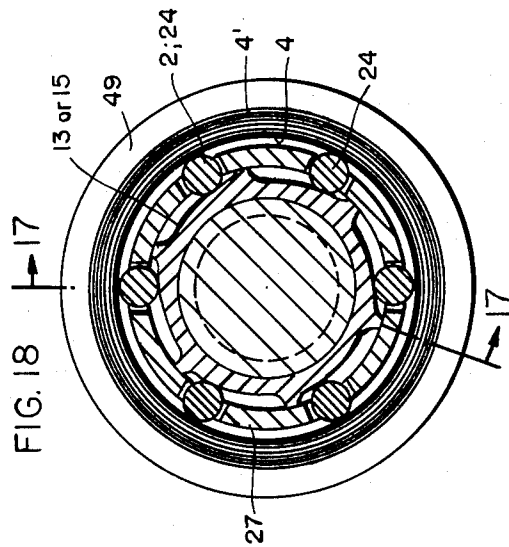
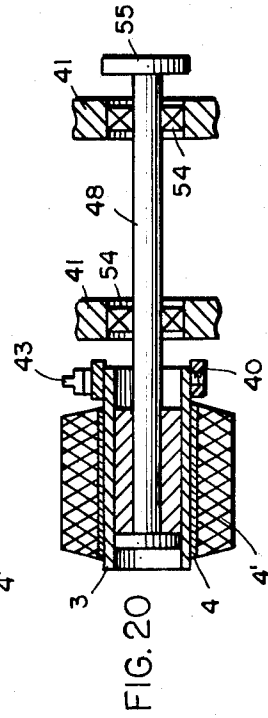
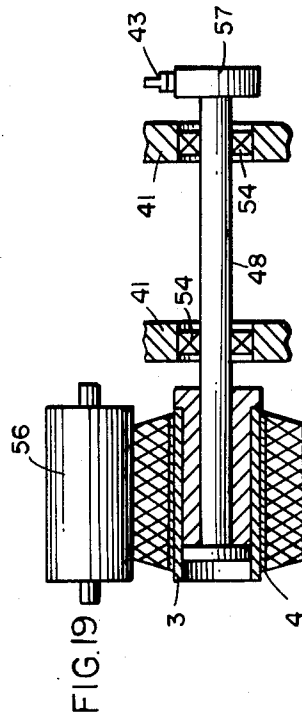
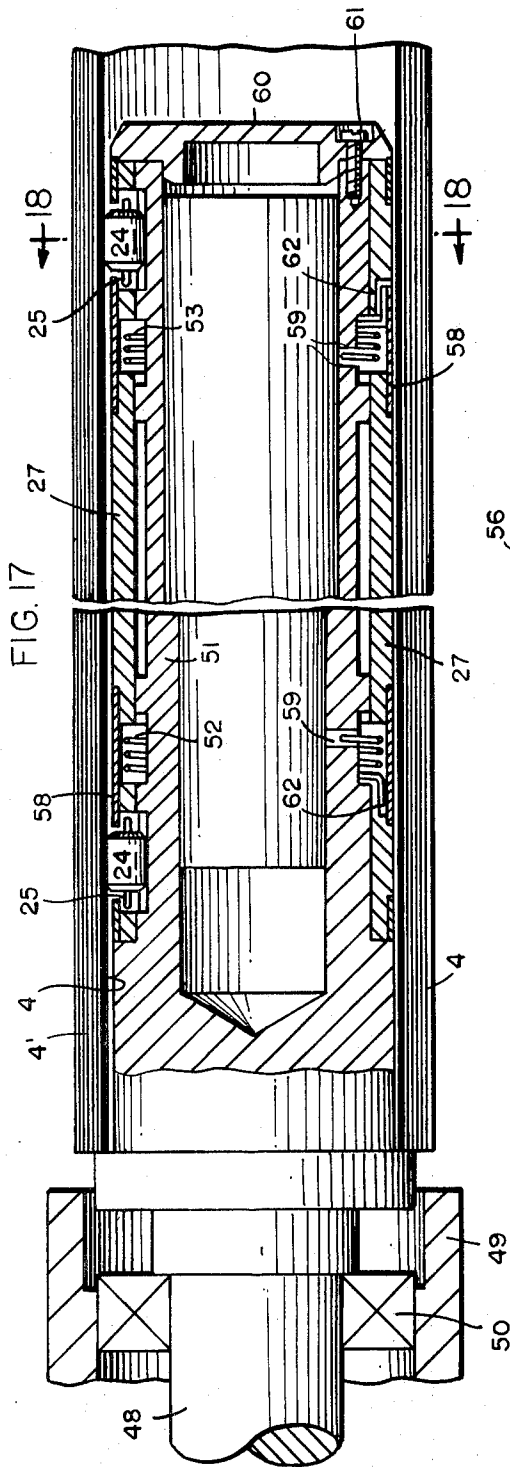


FIG. 21

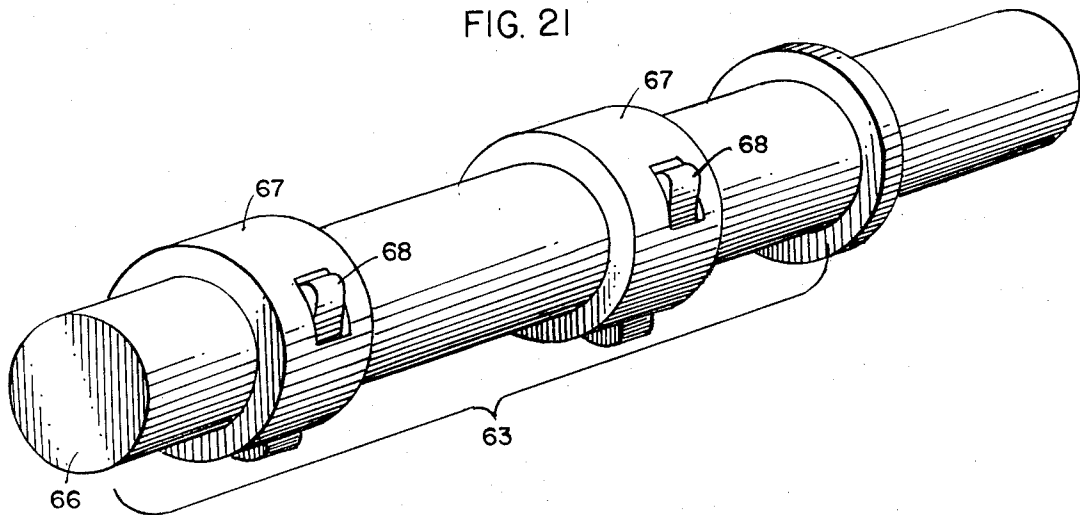


FIG. 22

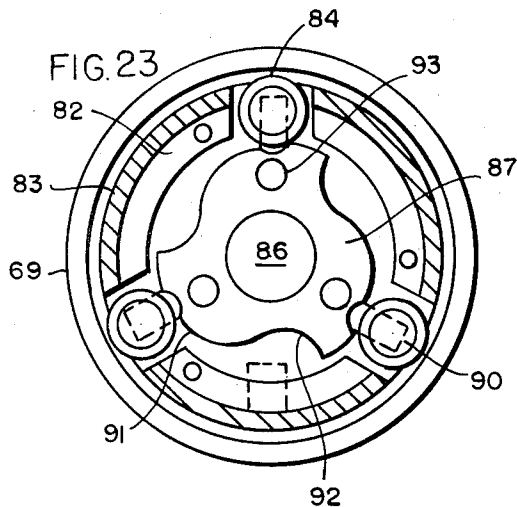
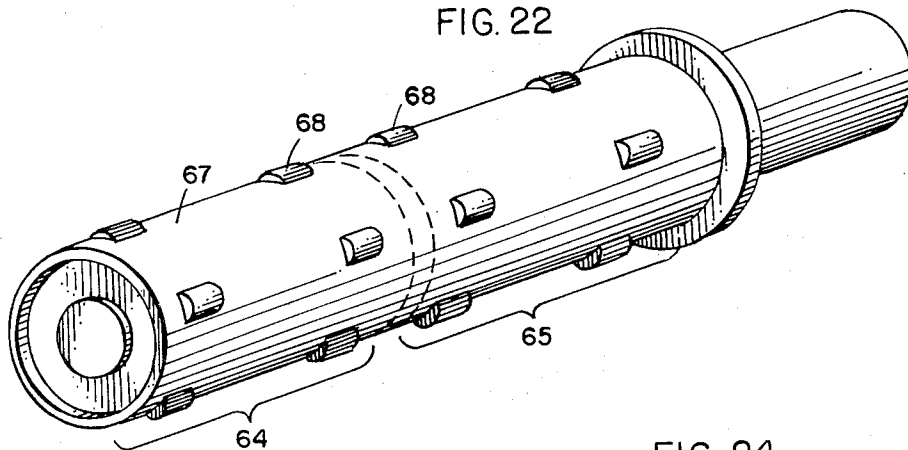


FIG. 24

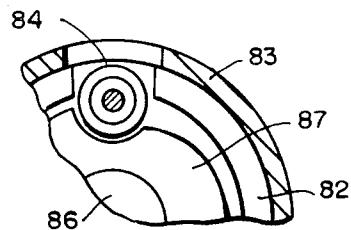
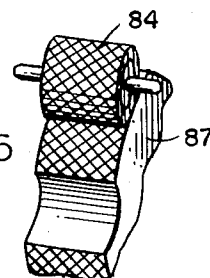


FIG. 25



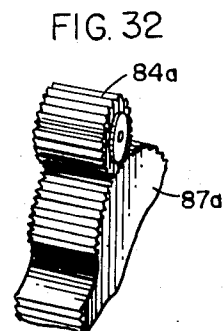
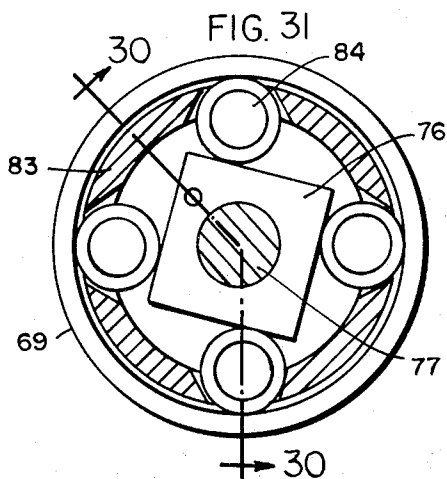
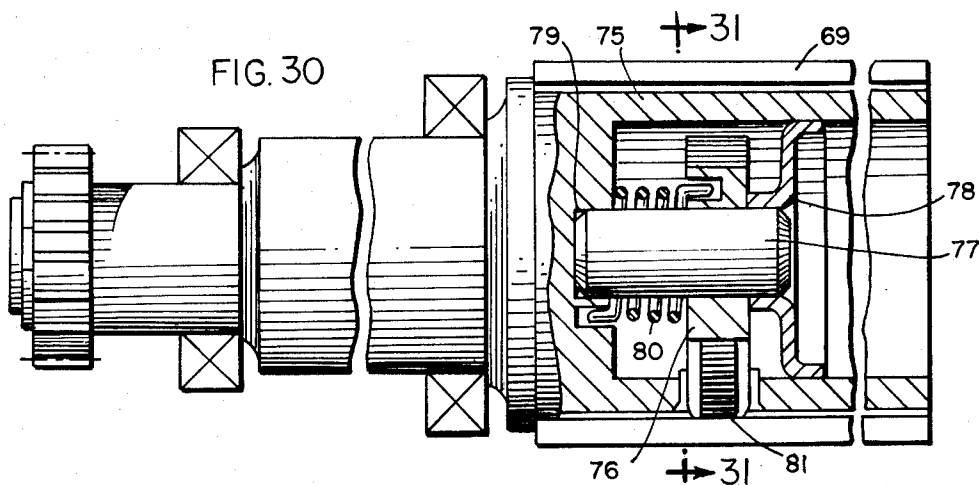
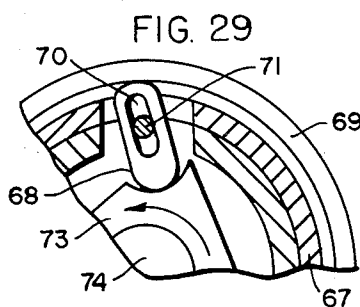
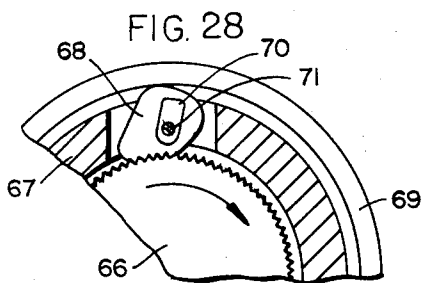
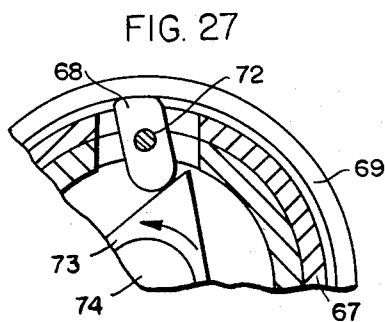
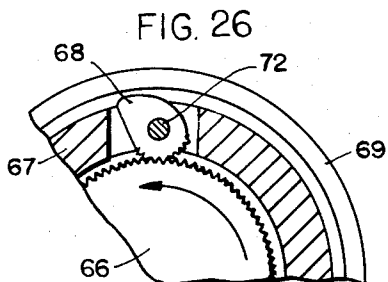
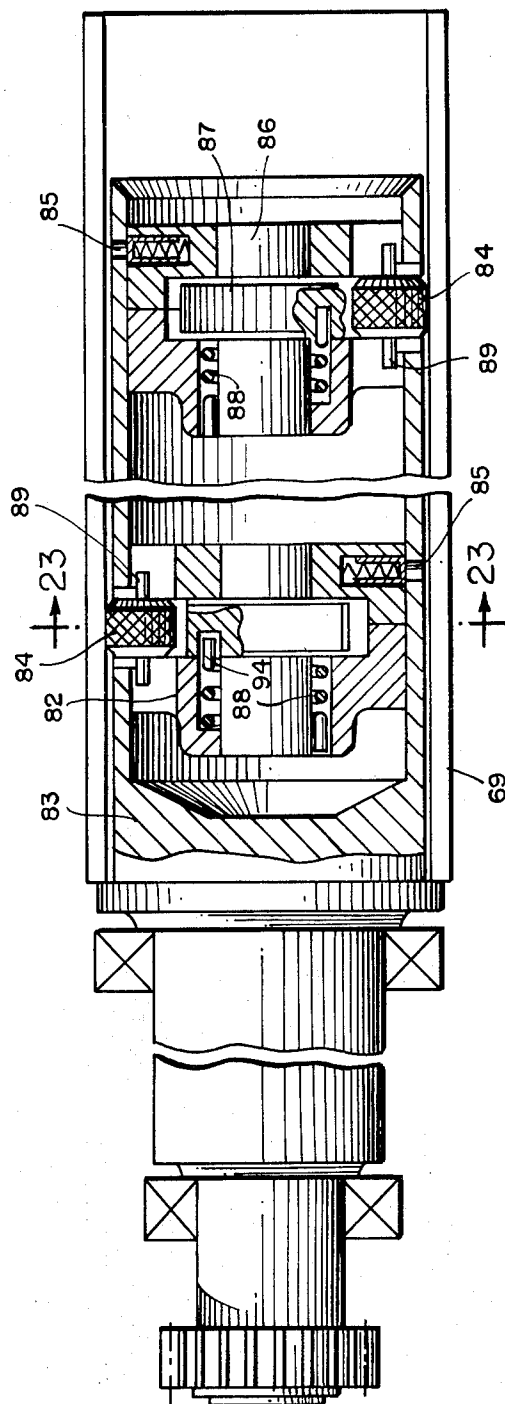


FIG. 33



SLEEVE CHUCK FOR THREAD WINDING DEVICE

This invention generally relates to sleeve chucks, especially expansible chucks, as the winding shafts on thread winding devices where threads, yarns, filaments or the like are wound onto a bobbin or core sleeve. In particular, the invention is concerned with such winding devices which are driven by a drive roller applied to the bobbin or winding, especially at high winding speeds with use of the so-called free-running or free-wheeling principle.

A number of different chuck constructions are known. They have in common as one essential feature that they are often operated through the axis of a hollow winding shaft, for example by a connecting rod arranged longitudinally and slidably in the axis of the winding shaft or by means of feeding in a fluid hydraulic or pneumatic pressure medium through the hollow shaft bore. All of these constructions possess considerable disadvantages.

Thus, in chuck construction with a tensioning load or chucking in a small inside diameter of the core sleeve or with constructed space relationships, there exists the problem that the tensioning bands or strips are so designed that the tensioning load cannot be released in case of rupture or breakage of a core sleeve. Particularly in the case of high winding speeds, i.e. at high turning rates, this releasing of the chuck tension is absolutely necessary because of the considerable danger of accident. Another construction, the so-called plate spring chucking system requires a relatively large amount of space. Pneumatic or hydraulic expansible chuck systems, in which there is provided an inflatable tube between the winding shaft and a core sleeve, has the disadvantage of relatively poor centering, which is most unfavorable and especially for high winding speeds because of the imbalances associated therewith.

A substantial drawback of some of the usual chuck constructions is the danger that on breakage of the inserted core sleeve the movable, tensioning elements of the chuck construction are centrifuged or thrown off from the shaft, something which is intolerable and especially in the case of high turning rates. Thus, for example, the chuck in which tension bands or strips are pressed radially outward at a standstill by means of an axially operated spring device, develops its full tensioning force only through the centrifugal force active during the winding process. The bands are held together radially only at both ends in each case by a weak spring ring. In the relaxed position of the apparatus during operational standstill, these rings furthermore have the function of pressing the bands inwardly so that the winding can be drawn off from the shaft. Now if a core sleeve breaks, which can occur primarily in the initial phase of the winding process in which an especially high turning rate is used, then the spring rings are destroyed due to the high centrifugal force exerted by the bands or strips and these are thrown out explosively.

Another considerable disadvantage of known chucks resides in the fact that the core sleeve wound with thread can creep downwardly of the shaft, especially when braking the winding shaft. Furthermore, is a number of known chucks the area of contact for the tension or gripping of the core sleeve is so small that a balancing of sleeve diameter variations and the drawing off of

the winding or completed bobbin is not always possible because of minor constrictions of the core sleeve.

One object of the present invention is to provide a winding shaft chuck for core sleeves, bobbins or the like which will operate effectively under all thread winding conditions, including a safe and positive insertion and withdrawal of interchangeable sleeves, either in the event of breakage or during normal loading and unloading of the bobbins.

Another object of the invention, especially for operation at high winding speeds and above all for core sleeves with small inside diameter, is to provide a chuck which assures easy insertion of the empty core and a simple removal of the wound core sleeve or bobbin while safeguarding against the flinging or throwing off of tensioning elements in case of sleeve breakage.

Still another object of the invention is to assure an exact centering of the bobbin or core sleeve in the direction of the winding shaft axis and also to provide a sufficiently great area of tension or gripping contact to compensate for the usual variations in core sleeve diameter. Also, in the case of occasionally occurring constrictions of the core sleeve, it must still be possible to draw off the bobbin or winding without it becoming stuck or wedged on the chuck.

These and other objects and advantages of the invention will become more apparent upon consideration of the following detailed specification.

It has now been found, in accordance with the invention, that a much improved and surprisingly effective winding operation can be achieved by providing a sleeve chuck for a thread winding device which is essentially a chuck with radially expanding elements to engage or grip selected interior portions of a core sleeve or bobbin tube under a continuing predetermined spring-tensioned pressure exerted by the gripping elements and supplied through a relatively simple resilient rotational movement between spring-connected shaft means and cage means concentrically arranged within each other to provide a cammed and guided engagement of the gripping elements. Otherwise, the tension or gripping force of the chuck is regulated by rotational speed of the winding shaft and the design of the cammed engagement of the gripping elements by the shaft means, an outer cage means preventing a complete radial removal of the gripping elements.

More particularly, the sleeve chuck of the invention essentially comprises a shaft means rotatable within and encircled by a concentrically positioned tubular cage having a plurality of openings at selected positions on its circumference; a plurality of individual gripping elements carried by said shaft means for movement radially thereof in each of said cage openings in response to the rotational movement of the shaft relative to the cage; means to retain each of said gripping elements at least partially within its cage opening while also permitting its radial movement outwardly beyond the circumference of said cage for engagement with an interchangeable thread winding core sleeve; and spring means interconnecting said shaft means and said cage and arranged to resiliently urge the cage to rotate relative to the shaft in the direction causing the radial outwardly gripping movement of said gripping elements.

Although the chuck of the invention proceeds from the generally known free-wheeling or so-called coaster principle in which outer and inner concentric cylindri-

cal members are freely rotatable with respect to each other, one member acting as the drive member while the other is the driven member by means of an intermediate wedge or key linkage, it should be recognized that the present invention also provides a resilient but positive radial engagement between the chuck as the inner member and a core sleeve for the winding as the outer member regardless of whether the device is at a standstill or is being rotated for conventional winding operations. It is especially preferred to provide a device in which the chuck is the driven member while the core sleeve or bobbin tube is the drive member and in turn is driven by a conventional drive roller on its circumferential surface.

The gripping elements of the invention can be constructed in the form of rollers or spherical balls, the latter balls avoiding the necessity of providing an axial parallel alignment as required for roller bodies. On the other hand, rollers offer the advantage that with equal gripping or expanding force, local stresses on the core sleeve of the bobbin can be kept smaller. It is advisable to provide cylindrical rollers which extend axially over not more than one-half of the core sleeve being gripped. Still another embodiment of the invention provides gripping elements which are in themselves provided with cammed surfaces for engagement with preferably a shaft means having a circular cross-section over its entire length or with shaft means which may also have irregular or cammed surfaces of gradually increasing radius as measured from the axis of rotation of the winding device. Other variations of such combinations are explained in greater detail hereinafter.

With use of the chuck of the invention on driven winding shafts, for example for the production of so-called precision windings, an embodiment is preferably adopted wherein the cage receiving the gripping elements is extended at one end, preferably toward the end closest to the machine frame, i.e. an extension beyond the zone of the core sleeve to be gripped, in such a way that it can be braked independently of the winding shaft through a circumferentially engaged braking means. In this manner the requirement for the trouble-free functioning of the device of the invention can be achieved also whereby the force acting inside the chuck toward a gripping expansion is not completely lost when starting or when braking the winding shaft or the bobbin.

Thus, according to the invention, the winding shaft is essentially formed in such a way that in the relative turning between the cage means and the shaft means, the gripping elements are shifted or forced either outwardly (first turning direction) or frees these elements again (second or opposite turning direction), i.e. a reversal of the turning allows the release of the gripping elements. In one of its simplest forms of execution, the shaft of the chuck has an equilateral polygonal cross-section, i.e. in the axial sections interacting with the gripping elements, for example with a cross-section in the form of an equilateral triangle, a square, a regular pentagon, etc. In each case, the center of the incircled circle or of the circumscribed circle of the polygon lies on the shaft axis, i.e. the axis of rotation of the winding. The corresponding edges of the polygons are preferably rounded, so that the circumscribing circle can be somewhat greater than the inside diameter of the surrounding cage receiving the gripping elements. In such embodiments of the sleeve chuck according to the in-

vention, the gripping elements are released when a line or plane through the winding axis and extending along the center line or axis of a gripping element stands perpendicular to the facing irregular or cammed surface of the engaging shaft, while a relative rotation to the right or left brings about an outward radial shifting of the gripping elements. This same effect can also occur where the gripping elements have cammed surfaces while the engaging shaft has a circular cross-section over its contacting axial length.

In order to assure that the core sleeve or bobbin tube is firmly seated on the chuck before starting the winding device, the invention provides spring means arranged between the shaft and cage of the chuck, i.e. a spring for actuating the gripping elements in such a way that the cage is turned with respect to the shaft in the direction that leads to the gripping effect or expansion of the chuck. In order to facilitate the sliding on or insertion of the bobbin tube, i.e. the empty core sleeve, the use of cylindrical rolls or the like as gripping elements with a sufficiently staggered or phased displacement is desirable so that with light rotation counter to the gripping or expansion direction, the bobbin tube can be easily slipped onto the winding shaft. The spring which tensions or resiliently urges the chuck into a light gripping engagement can be a helical spring, a leaf spring or a spiral spring, depending on the size of the gripping contact and the required rotation angle between the cage and shaft means.

It is possible, to be sure, to proceed in such a way that the surface configuration of the engaging shaft leads to clamping gaps bringing about a self-inhibition of the gripping effect or that at the end of the camming path of the gripping elements there are provided shallow depressions, which cause these elements to snap in place. These solutions, however, present certain disadvantages. Thus, self-inhibition leads to difficulties and causes undesirable stress on the winding when releasing the chuck, while a device causing a snapping in place of the gripping elements has the additional drawback that the inside diameter of the core sleeves being mounted must lie within very narrow tolerance limits.

FIGS. 1, 1a, 2, 2a, 4, 4a, 5 and 5a are cross-sectional views through the axis of the chuck and the bobbin or sleeve being mounted thereon for winding, illustrating various different embodiments of the chuck construction;

FIGS. 3, 6 and 7 are graphical representations of the characteristic tensioning or gripping curves of different chuck embodiments;

FIGS. 8, 8a, 9 and 9a are also partial cross-sectional views of a number of chuck embodiments to illustrate various retaining means to hold the gripping elements of the chuck to predetermined radial positions;

FIGS. 10, 10a, 11 and 11a are partial cross-sectional views taken along the axis or center line of two different individual gripping elements, illustrating still other examples of suitable retention means for these elements;

FIG. 12 is a perspective view of a preferred chuck assembly illustrating the location of gripping elements on spiral lines or paths on the outer chuck circumference;

FIG. 13 is a side elevational view of a chuck according to the invention wherein the winding shaft is driven, i.e. by direct drive over the shaft itself;

FIGS. 14, 14a, 15, 15a, 16 and 16a are further partial cross-sectional views of still other embodiments of gripping elements and retention means therefor;

FIG. 17 is a longitudinal sectional view along the axis of rotation of a chuck according to the invention to illustrate one embodiment of spring means interconnecting the chuck shaft and cage;

FIG. 18 is a cross-section of the same chuck taken on line 18-18 of FIG. 17;

FIG. 19 is a partly schematic view of a loaded sleeve chuck according to the invention in a thread winding device having a drive roller applied to the core sleeve or bobbin as it is wound;

FIG. 20 is a similar schematic view of another loaded sleeve chuck as in FIG. 19 but with direct drive over the axial shaft of the chuck itself;

FIGS. 21 and 22 are perspective views of still other sleeve chucks according to the invention, especially for receiving one long core sleeve or two short core sleeves on the same winding shaft;

FIGS. 23 and 24 provide cross-sectional views through chuck embodiments in which gripping elements are controlled by cammed plates on a circular shaft means;

FIGS. 25 and 32 are partial perspective views of the cooperating plate cam and cylindrical gripping element as alternative embodiments of the assembly shown in FIG. 24;

FIGS. 26 and 28 are partial cross-sectional views of chuck assemblies in which the gripping elements are irregular or developed on their circumference to provide cammed surfaces engaging a circular shaft;

FIGS. 27 and 29 are partial cross-sections of still other chuck assemblies in which both the gripping elements and shaft plate have cammed surfaces so as to be in snug or closed engagement;

FIG. 30 is a longitudinal section along the axis of rotation of a chuck, taken on line 30-30 of FIG. 31, illustrating a cammed plate on the shaft being interconnected by means of a helical spring with the encircling cage means;

FIG. 31 is a cross-sectional view taken on line 31-31 of FIG. 30 to further illustrate the gripping assembly pressing against an interchangeable bobbin tube or core sleeve; and

FIG. 33 is a longitudinal section along the axis of rotation of a chuck assembly with gripping elements being spring urged by a helical spring interconnecting shaft and cage means, illustrating a structural variation over the assembly shown in FIGS. 30 and 31.

Similar reference numerals are used in the drawings to identify similar or closely related parts of the winding device, it being understood that the invention is not limited to specific embodiments or common structural variations falling within the intended scope of the invention.

Referring now to the drawings, FIGS. 1 and 1a illustrate a simple square cross-section of the winding shaft 1 with sides 5, while FIGS. 2 and 2a show a similar shaft 10 with sides 11 forming a hexagonal cross-sectional, i.e. two embodiments of a cammed shaft member capable of engaging and radially shifting the rollers 2 as gripping elements against the inner wall surface of a core sleeve or tube 4 carrying a thread package 4'. Wherever two figures herein are identified by the same number, that figure without the designation a represents an open or non-gripping position of the

chuck while the designation a after the figure number represents a closed or gripping position of the chuck with reference to the wound thread package 4 and 4'.

The gripping effect in all winding shafts whose cross-section has the form of a regular polygon is in principle the same. The maximal course or development of the chucking or gripping force becomes smaller, however, as the number of sides of the polygonal cross-section increases with otherwise equal diameter of the circumscribing circle. It has proved advantageous to round the corners 9 of the polygonal shaft 1 so that the circumscribed circle of the polygon itself can be somewhat greater than the inside diameter of the cage 3 having openings 6 receiving the gripping elements 2.

The sleeve chuck with an equilateral polygon construction of the shaft cross-section is released or disengaged when a line or plane extending along the center or axis of each gripping element 2 is also perpendicular to the opposing surface 5 or 11 of the shaft 1 or 10, respectively. A relative rotation of the shaft to the right or left brings about a radially outward tensioning or displacement of the gripping element 2.

In the graph of FIG. 3, in which the turning or twist angle is measured along the abscissa 8 and the gripping or tensioning force is measured along the ordinate 7, the curve represented by 16 illustrates the course or development of the gripping force from zero (release position) up to a maximal force achieved at top winding speed. As the curve makes evident and as is also rather obvious, this curve runs equally in both turning directions in the case of an equilateral polygonal construction of the shaft cross-section.

In FIGS. 4, 4a, 5 and 5a, there are represented somewhat more complicated shaft cross-sections. In both cases, the cross-section of the shaft 12 or 14 is subdivided, in correspondence to the number of gripping elements 2, into four equal cammed portions in which the radial distance of the cam surfaces 13 and 15, respectively, from the shaft axis increases steadily counter to the direction of relative turning required for the gripping process. Thus, the increase in the gripping force from FIG. 4 to FIG. 4a is linear, which is expressed by the curve 17 shown in the graph of FIG. 6 illustrating the development of the gripping force. The cross-section provided by the shaft 14 represented in FIGS. 5 and 5a yields a cammed surface 15 in which the increase of the radius becomes steadily less in a direction counter to the relative turning required for the tensioning or gripping process, so that the gripping force rises increasingly with increasing relative rotation as shown by curve 18 in FIG. 7.

FIGS. 8 to 11a, inclusive, as well as FIGS. 14 to 16a, inclusive, show different possibilities for securing or retaining the gripping elements 2, 24 or 45 against centrifuging or being thrown outward radially away from the cage 3. In each set of figures, there is again represented in one illustration the relaxed or disengaged position of the chuck, and in the other illustration the tensioned gripping position of the chuck in the direct engagement of the gripping elements 2 with the core sleeve or bobbin tube 4.

FIGS. 8 and 8a show one possibility for securing or retaining the elements 2 by means of the sleeve 19 securely connected onto the cage 3. The openings 20 of sleeve 19 correspond in number and position to the cage openings 6 and, due to the overlap 21, have a

smaller transverse dimension than the diameter of the corresponding gripping element 2. On the other hand, the recesses in the cage 3 itself are large enough to permit the passage of the gripping elements 2. In the embodiment according to FIGS. 9 and 9a the cross-sections of the cage openings 23, taken on a plane perpendicular to the shaft axis, narrow or converge in a direction extending radially outwardly to such an extent that the passage of the gripping members 2 completely through the openings 23 is not possible.

In the embodiment shown in FIGS. 10 and 10a, a sleeve or tube 28 is arranged concentrically to the cage 27 and contains openings which correspond to the dimensions of the gripping elements 24. The gripping elements in this case are rollers provided with lugs or pins 25 which extend axially therefrom and engage in corresponding grooves or slots 26 in the cage 27, so that the gripping rollers 24 can move radially outwardly only until the pins 25 come to rest against the inside wall of the projecting portions 29 and 30 of sleeve 28. This gripping position is shown in FIG. 10a where roller 24 engages the core sleeve 4 of winding 4'.

A similar embodiment is shown in FIGS. 11 and 11a, but in this instance the pins 34 are inserted and fastened into recessed bores 35 of cage 33 on either side of the cage opening 32 while the gripping elements 31 are in the form of cylindrical tubular bodies with an axial bore 36 fitting very loosely over the fixed pins 35.

Still another form of construction of the retention means to prevent the roller gripping elements 2 from being thrown off to the outside is represented in FIGS. 14 and 14a. In principle this solution is the same as that represented in FIG. 8 where the sleeve 19 is applied onto the cage 3. In this case, the cage 3 consists of one integral piece with the shoulders 44 being formed in the production of the openings.

FIGS. 15 to 16a illustrate still other retention means with the use of spherical balls 45 as gripping elements. Thus, in FIGS. 15 and 15a, the cage 3 carries the sleeve 46, and while the balls 45 can pass outwardly through the cage openings, they are retained by circular openings of smaller diameter in the sleeve 46. In FIGS. 16 and 16a, the conically tapering openings 47 narrow to a diameter smaller than the balls 45 so as to guide and retain the balls in their radial outward movement.

FIG. 12 shows a preferred form of execution of the chuck according to the invention in which the cylindrical gripping elements 2 or 24 are relatively small in axial length and considerably shorter than the length of the bobbin or core sleeve to be inserted on the chuck. These gripping elements are axially aligned in a number of rows around the circumference of the chuck and also are positioned on two winding or helical lines as in a two-course screw pattern. The cage as represented by members 3, 22 or 27 can be fixed against the shaft 37 at both ends by the end cap 39 and the ring or collar 38. This is accomplished in a manner which is generally well known (see also FIGS. 17 and 18).

The embodiment of the chuck as shown in FIG. 13 is suited for thread winding devices with a directly driven winding shaft. For this purpose, the shaft 42 is rotatably borne in the machine frame or support 41 where it is driven by a conventional motor and drive means (not shown). The cage 3 (22 or 27) is provided at its rear end with a brake ring 40 in a zone extending beyond the winding area, i.e. the area occupied by the

inserted core sleeve or bobbin tube. A brake 43 supported on the machine frame 41 acts on this ring 40, e.g. in slowing and stopping the winding. In this manner, with a directly driven winding shaft, it is possible through suitable choice of the applied brake force of the brake 43 to maintain the direction of force inside the chuck operating according to the free-wheeling of coaster, i.e. so that the gripping force principle is not reversed and the core sleeve or bobbin tube is released only after stopping the winding shaft.

By way of example according to the embodiment of FIGS. 17 and 18, there is shown in detail the simultaneous centering and interconnection of the cage 27 with respect to shaft 51, including means to hold the cage in axial direction while still permitting a spring-urged rotation relative to the shaft. The cage 27 in the zone of each opening for the gripping members 24 has an annular cover sleeve 58 connected thereto, against which the pins 25 of the gripping members 24 come to rest. The cage 27 itself is installed with a slide fit on the winding shaft 51 in such a way that it can be easily turned therearound as a concentrically loaded member. In the winding shaft 51 there are also provided two radial bores 59, into which there is engaged one end of each of the two spiral springs 52 and 53 helically wound in opposite directions, while in each case the other end of each spring fits into corresponding recesses 62 in the cage 27. These helical springs 52 and 53 are pretensioned in such a way that the cage 27 is turned with respect to the shaft 51 in tensioning or gripping direction, e.g. clockwise in the present case. This means that the gripping rollers 24 are always urged outwardly, even at operational standstill, under the predetermined tensioning of the springs, thereby securing a constant and positive contact with the core sleeve 4. The securing of the cage 27 against axial displacement is accomplished by a cap member 60 which is fastened with the aid of screws 61 to the free end of the winding shaft 51.

In FIGS. 19 and 20, there is schematically represented the construction and operation of the chuck assembly for use with a drive roller 56 as the drive means (FIG. 19) and with a direct drive of the winding shaft 48 rotatably carried in machine frame supports 41 on bearings 54 and connected through wheel 55 or the like to a motor drive (FIG. 20). The sole distinction resides in the fact that in using the drive roller 56, the winding shaft is braked by means of the brake member 43 applied to the brake disk 57 (drive roller drive) and in using a direct winding shaft drive, the cage 3 is braked by the brake member 43 over the brake ring 40 connected with the cage member. (See FIG. 13). In this manner, it is assured that a reversal of the direction of the gripping or tensional force does not take place inside the chuck in a transition from drive to braking or vice versa. At the same time the spring means interconnecting the cage 3 and shaft 48 also prevents the wound bobbin or core sleeve 4 from becoming disengaged during braking or even after a complete stop. This combination is necessary to ensure completely safe and trouble-free operations.

In the remaining FIGS. 21-33 of the drawings, further embodiments of the invention are exemplified to show a number of variations in the construction and arrangement of useful cage and shaft means, including spring means to resiliently urge the gripping elements into tensioned or expanded contact with the core

sleeve or bobbin. In these embodiments at least one of the shaft means and the gripping elements have a cammed shaped or structure to provide the desired tensioning or gripping force, preferably with the use of a cylindrical shaft which may carry a cam plate or the like. A shaft with a circular cross-section over its entire length is not only more rigid but also maintains a more carefully balanced rotation, especially at high winding speeds.

In all instances, but especially where the gripping elements have an irregular or cammed cross-section, the surfaces of these elements and the corresponding surfaces of the shaft means in cammed engagement with each other are profiled or formed so as to provide a direct closed linkage contact, i.e. a frictional connection which is intensified, or else a form-closed connection where the shaft or cam plate and gripping elements are essentially maintained in a pivotal engagement. Thus, the gripping elements can be radially guided in a number of different ways, whether with a sliding or pivotal movement to extend outwardly of the cage circumference. Both the walls of the cage opening and/or additional guide means such as pins, pivot members or the like can be used to ensure the positive and carefully tensioned gripping movement of the gripping elements into contact with the bobbin or core sleeve.

As generally shown in FIGS. 21 and 22, very elongated chucks can be advantageously provided to receive a correspondingly greatly elongated bobbin tube over the entire chuck as indicated by the length 63 in FIG. 21 or else to receive two shorter bobbin tubes as indicated by the lengths 64 and 65 in FIG. 22. Each of these examples provides gripping elements arranged in ring or circular positions around the circumference of the chuck shaft.

In FIG. 21 the chuck shaft 66 consists of a round solid shaft on which there are slipped two concentric cages 67 retaining the gripping elements 68. These elements 68 are turnably fastened and preferably guided in radial direction. For example, the gripping elements can be constructed as shown in FIGS. 26 and 28.

In these FIGS. 26 and 28, the round shaft 66 over the entire length of the chuck is encircled by the cage or cages having openings to receive the individual gripping elements 68. The core sleeve or bobbin tube 69 is shown in the engaged position in these and other figures of the drawings.

The gripping elements 68 consist of cam members having a round sector and an adjacent sector with gradually increasing radius.

In FIG. 28, the sector or portion with steadily increasing radius intermeshes with the shaft 66. The gripping elements 68 is radially guided by means of a slot 70 and pin 71. Thereby, the rotary movement of the gripping elements responsive to shaft rotation is transformed into a radial clamping movement.

In FIG. 26, the round portion of the gripping element 68 intermeshes with the round shaft 66, while the portion having an increasing radius exerts the radial clamping movement in response to rotation of the chuck shaft. The gripping element as shown in FIG. 26 is borne turnably by means of the axle or pin 72 in the cage 67, but does not shift radially.

Both forms of execution according to FIGS. 26 and 28 have in common the feature that the cage 67 with respect to the chuck shaft 66 and/or the gripping elements 68 with respect to the cage 67 are connected by

means of springs (not shown in these examples), so as to bring about a pretensioned turning of the chuck shaft and a resilient urging of the gripping elements in the normal gripping or tensioning direction (as indicated by the arrows). The embodiments according to FIGS. 27 and 29 operate in a similar manner, but with cam plates 73 on the circular shaft 74.

According to FIGS. 30 and 31, the cage 75 acts as the winding shaft to receive the bobbin tube 69. The winding shaft is thus constructed in tubular form so as to permit one or more rotatable plate means 76 to be rotatably mounted as a quadrilateral plate on the axle 77 held on one side by flange 78 and on the other side by an oppositely situated bore 79. The turnable shaft plate 76 is held with respect to the winding shaft cage 75 by means of the torsion spring 80 which is pretensioned. The cage as in previous embodiments has over its circumference a plurality of openings in which clamping or gripping elements 81 are borne. Through the rotation of the quadrilateral plate 76 which is brought about by means of the torsion spring 80, the cylindrical gripping elements 81, are pressed and resiliently urged radially outward. Thereby the bobbin tube 69 is fixed in position both in circumferential direction and also in axial direction.

According to FIGS. 23 and 33, a plastic basket 82 is accommodated in the tubular winding shaft as cage means 83, this basket being divided in the middle for the reception of the gripping elements 84. The plastic basket 82 is fixed with respect to the cage 83 by a tensioning pin 85 pressed outwardly by means of a spring. The plastic basket 82 has a central hollow bore in which there is borne the axle 86 of a plate 87. The plate 87 consists in cross-section of three congruent sectors whose radius increases gradually with reference to the shaft axis. A spring 88, advantageously a torsion spring, is connected with the plastic basket 82 and the cammed disk or plate 87 and brings about a pretensioned turning of the plate 87 with respect to the basket 82 and thereby with respect to the cage or winding shaft 83. In order to guide the pins or axles 89 of the gripping elements 84, the plastic basket 82 has slots 90 on both sides of the openings in which the gripping elements are situated, as can be seen from FIG. 23. The gripping elements 94 are secured against dropping out by permitting their axles 89 to abut against the inner wall of the cage 83 adjacent the opening.

To facilitate installation both of the gripping elements 84 and also the other elements altogether, the plate 87 has at the beginning of each sector 91 of gradually increasing radius a recess 92 which is fitted to the circumference of the individual gripping element 84. For installation, the basket 82 with the plate 87 and the torsion spring 88 is completely mounted outside the tubular chuck or cage, and the plate 87 is turned with respect to the basket 82 in such a way that the recesses 92 lie just below the corresponding openings of the plastic basket 82. In this position the plate 87 can be fixed in position by means of a bolt which is introduced into the holes 93. Now the basket 82 with the inserted gripping elements 84 is introduced into the hollow cage 83, after which the bolt situated in one of the holes 93 is drawn out and the basket 82 is then slid into the place, until the pin 85 (FIG. 33) snaps into position. Thereby, the chuck is ready for operation.

Basket and gripping elements according to the invention are therefore advantageously constructed as a sin-

gle unit. This is of importance not only for the exchange of parts and for repairs, but also if a long shaft is to receive at will a long bobbin tube or else two or more short tubes, as is the case with the chuck according to FIG. 22.

FIG. 24 shows a partial cross-section of the chuck according to FIGS. 23 and 33 in the bobbin engaging position. In this position, the clamping or gripping elements can be installed and dismantled with a few manual operations. Obviously, the plates 87 subdivided into congruent sectors with gradually increasing radius can take on all forms of execution as described hereinabove with reference to any of the various cross-sections of shaft means, including plates, disks, etc.

As shown in FIGS. 25, the engaging surfaces of the plate 87 and the gripping elements 84 are preferably ribbed, knurled, scored or otherwise roughened, so that the coefficient of friction and thereby the clamping action is increased.

FIG. 32 shows a preferred execution of these cammed engaging surfaces in the form of parallel teeth or notches extending axially so that the bobbin tubes are held forceably in circumferential direction, but only with frictional force in the axial direction. Corresponding measures for increasing the coefficient of friction or for the production of a closed or tight engagement between bobbin tube, gripping elements and central plates or shafts are used to advantage in all forms of execution of this invention.

The plate mounted turnably in central position in the tubular cage can also have a circular cross-section. In this case the gripping elements should be cam units as illustrated above, e.g. in FIGS. 26 and 28, wherein the central plate 66 is rotatably mounted with respect to the tubular cage 67 and is tensioned by means of torsion springs in the direction of the arrows shown in the drawing, i.e. as in other similar embodiments so that the gripping elements 68 rotate about the pins 71 and 72 and bring about the clamping of the bobbin tube 69.

In FIGS. 27 and 29, the gripping elements 68 have a segment with gradually increasing radius which interacts to positively clamp the bobbin tube 69. On the other hand, the gripping elements are elongated in cross-section and this elongated part pivots or interacts as a closed linkage in FIG. 27 with the triangular plate 73 tensioned in the direction of the arrow by means of a torsion spring. In FIG. 29, the triangular plate 73 on shaft 74 is likewise tensioned in the direction of the arrow by means of a spring. Plate 73 has on each of its apices a large rounded opening or re-entrant curved recess by which the elongated end of the gripping element 68 is carried along. The gripping elements 68 are guided in this case by means of axles or pins 71 held in radial slots 70.

It should be mentioned that in all of the embodiments which provide a tubular cage acting as the chuck shaft with a plate as shaft means mounted concentrically within the cage, the use of a two-part basket for the reception of the gripping elements and the central bearing of the plate is also very expedient, as represented for example in FIGS. 23 and 33.

It is essential in achieving a trouble-free functioning of the sleeve chuck according to the invention to maintain the same relative direction of gripping force as between the winding shaft and the bobbin tube inserted thereon throughout all phases of the winding operation,

i.e. starting, winding, braking and stopping. Even a brief reversal of this direction of gripping force would cause a temporary loosening of the sleeve, something which cannot be tolerated to obtain safe operation.

Proper braking of the winding shaft is therefore important as well as providing torsional or pretensioned spring means to ensure positive engagement of the bobbin tube or core sleeve at all times. At the same time, it is desirable to permit easy loading and unloading of the chuck, and this can also be accomplished against the relatively resilient holding force of the spring means.

The chuck of the invention is more easily adapted to variations in the inside diameter of bobbin tubes, and again because of the resilient spring means cooperating in the gripping movement during a winding operation, there is little danger of a bobbin tube slipping down or out along the chuck. Also, tube breakage caused by rotational imbalances, gripping or clamping variations or the like are largely avoided. With separate chuck and spring means on the same winding shaft, these advantages are achieved whether winding a single long bobbin or two shorter bobbins.

The invention is hereby claimed as follows:

1. A sleeve chuck for a thread winding device which comprises:

a shaft means including a shaft of circular cross-section over its entire length rotatable within and encircled by a concentrically positioned tubular cage having a plurality of openings at selected positions on its circumference;

a plurality of individual gripping elements carried by said shaft for movement radially thereof in each of said cage openings in response to the rotational movement of the shaft relative to the cage, said gripping elements being constructed as cam members having at least one portion of gradually increasing radius and being mounted in said cage openings for engagement with said shaft;

means to retain each of said gripping elements at least partially within its cage opening while also permitting its radial movement outwardly beyond the circumference of said cage for engagement with an interchangeable thread winding core sleeve; and

spring means interconnecting said shaft means and said cage and arranged to resiliently urge the cage to rotate relative to the shaft in the direction causing the radial outwardly gripping movement of said gripping elements.

2. A device as claimed in claim 1 wherein said gripping elements are in direct contact with said shaft, with guide means to direct said gripping elements in a radial direction.

3. A sleeve chuck for a thread winding device which comprises:

a hollow shaft means with uniformly arranged openings over its circumference for receiving gripping elements;

individual rotatable plate members in the hollow bore of said shaft means;

individual rotatable gripping elements retained in said openings for radial outwardly gripping movement while being in circumferential contact with said plate members, at least one of said plate members and its contacting gripping elements having

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one or more portions of increasing radius to provide cammed engagement therebetween; and spring means interconnecting said shaft means and said plate members and arranged to resiliently urge the plate members to rotate relative to the shaft in the direction causing the radial outwardly movement of said gripping elements.

4. A device as claimed in claim 3 wherein said gripping elements are constructed as cam members having at least one portion of gradually increasing radius and are in direct contact with a plate member, with guide means to direct said gripping elements in a radial direction.

5. A device as claimed in claim 3 wherein each of said plate members is composed of a plurality of con-

gruent sectors of gradually increasing radius relative to the shaft axis, and each of said gripping elements is constructed as a body of revolution.

6. A device as claimed in claim 3 wherein individual shafts bearing said plate members are each rotatably mounted in a two-part basket member fixed within the hollow bore of said shaft, said spring means operatively connecting at least one of said plates and its associated gripping elements with said basket member.

7. A device as claimed in claim 3 wherein the individual gripping elements and their openings are arranged on a generatrix line of the cylindrical cage surface but are offset with respect to each other in the form of locations on a helical line of the cage surface.

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,815,836
DATED : June 11, 1974
INVENTOR(S) : MÜNNEKEHOFF et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Front page, under "Foreign Application
Priority Data": the second priority
date should be changed from "February 17,
1972" to --January 17, 1972--.

Signed and Sealed this

Fourth Day of July 1978

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

DONALD W. BANNER
Commissioner of Patents and Trademarks