THREAD-GUIDE ASSEMBLY FOR BOBBIN-WINDING MACHINES

Filed Jan. 16, 1967

Fig.1

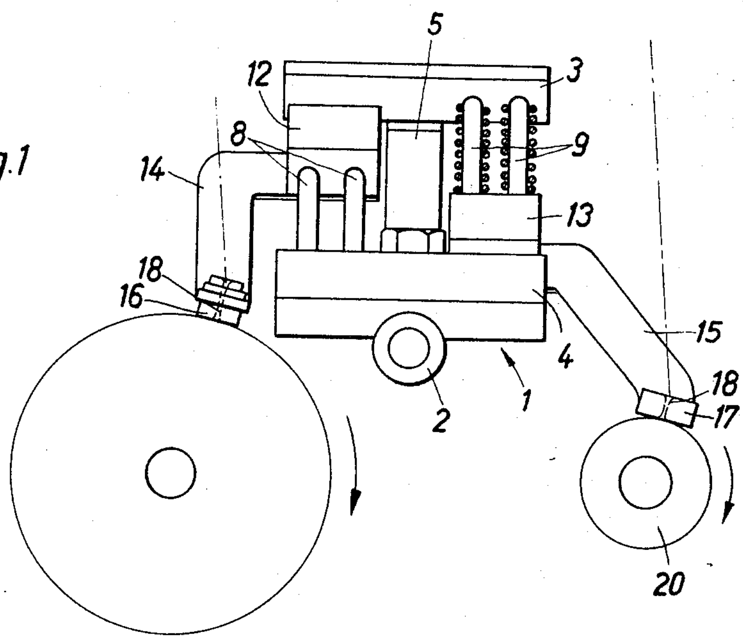

Fig.2

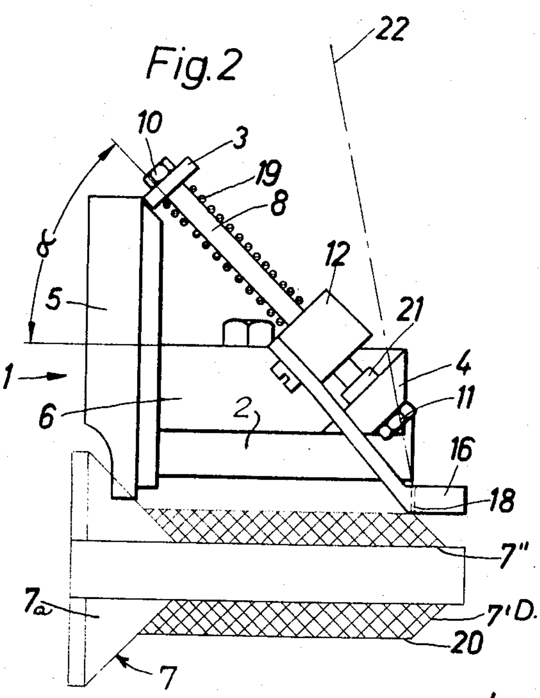

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Fig. 3

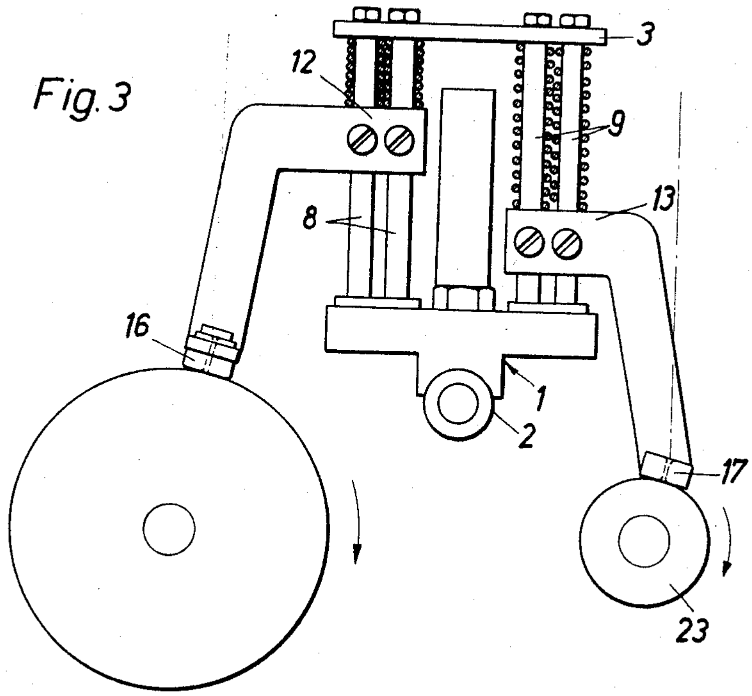

Fig. 4

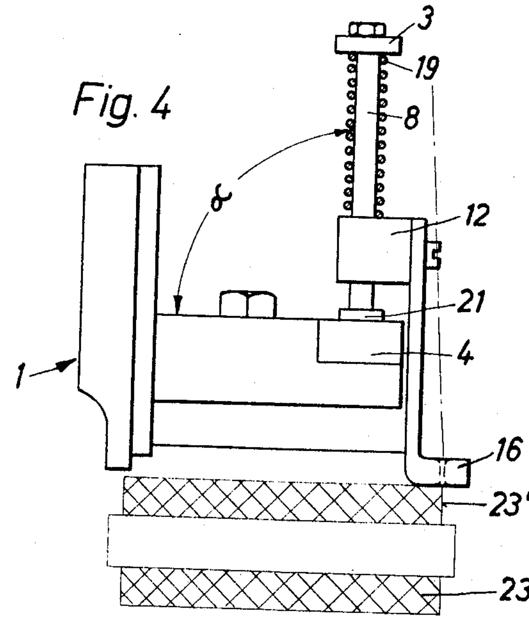

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Fig. 5

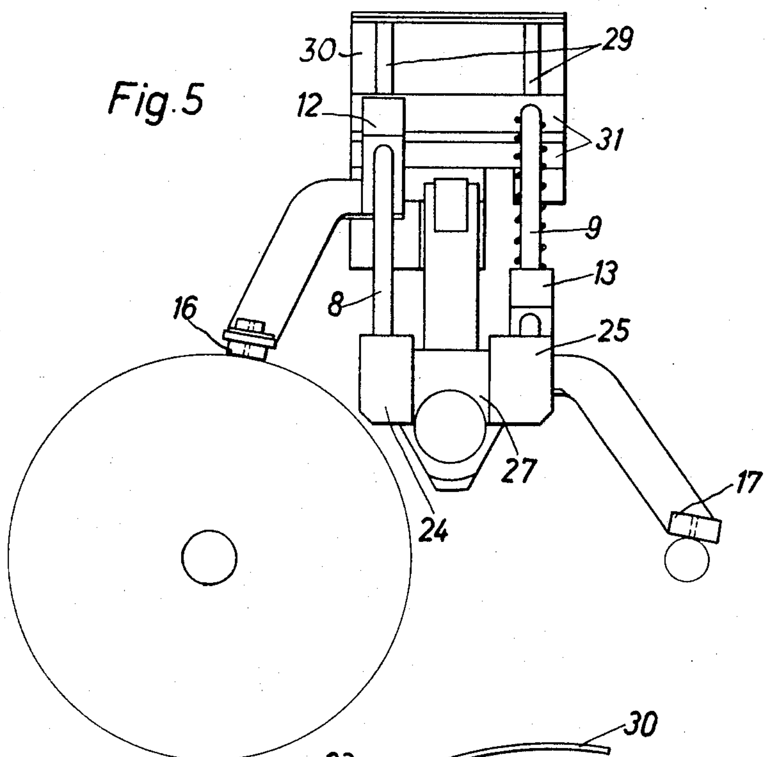

Fig. 6

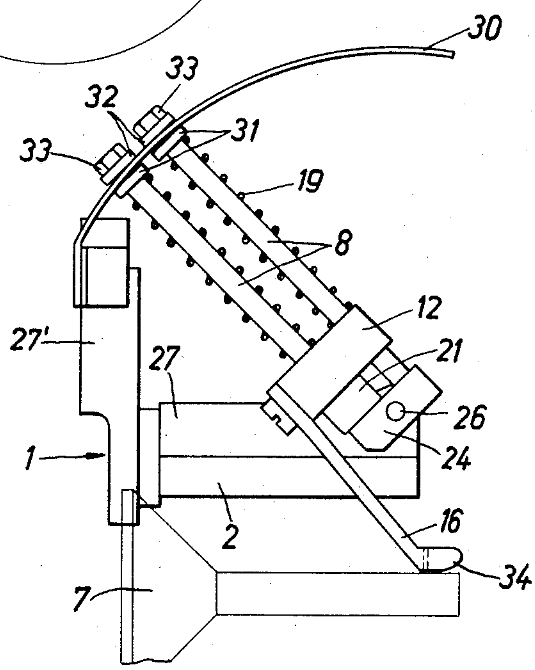

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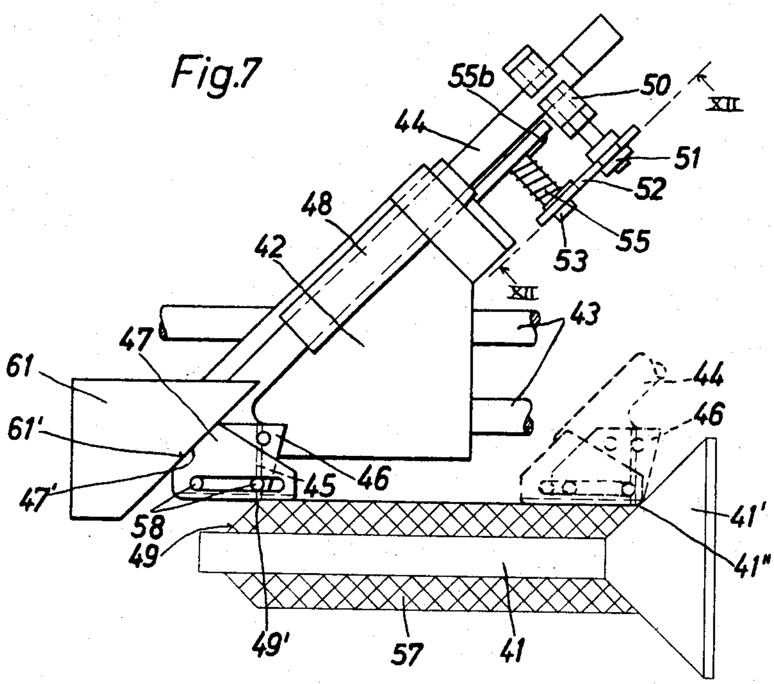
Fig.7



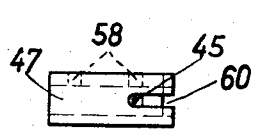


Fig.8

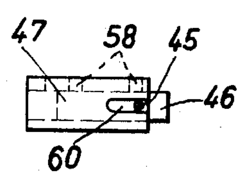


Fig.9

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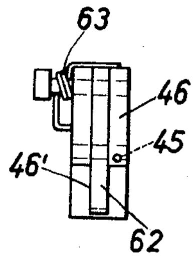

Fig.10

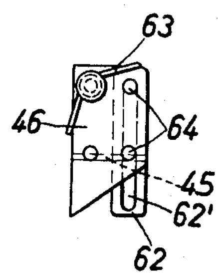

Fig.11

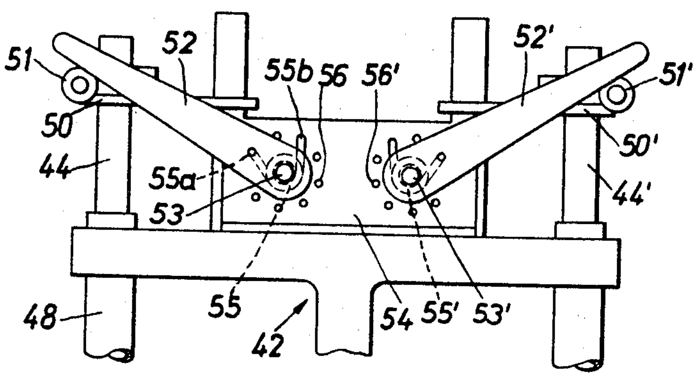

Fig.12

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THREAD-GUIDE ASSEMBLY FOR BOBBIN-WINDING MACHINES

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U.S. Cl. 242—26.5 12 Claims

ABSTRACT OF THE DISCLOSURE

A thread-guiding assembly for a bobbin-winding machine has a reciprocating carriage with a guide rod or sleeve slidably supporting a shoe which contacts the peripheral surface of a coil wound on a bobbin, the guide rod or sleeve being parallel to the nearest generatrix of a conical (or, in a limiting case, flat) face of the bobbin base whereby a thread passing through an orifice on the shoe is wound into a coil with either tapered or flat ends.

This invention relates to thread guides for bobbin-winding machines.

In particular, it concerns a thread guide for bobbin-winding machines suitable for the production of cross-wound or parallel-wound bobbins whose coils or thread packages have either tapered or flat ends, and which comprises a thread-guide support, arrnged to be driven in a reciprocating manner parallel to the longitudinal axis of a bobbin to be wound, and a thread-guide element arranged on the thread-guide support and incorporating a thread eyelet, wherein an axial shift of the thread-deposition stroke corresponding to the desired slope of the edge of the coil to be wound on the bobbin occurs in dependence on increasing coil diameter.

In one known form of thread guide of the above-mentioned type for a bobbin-winding machine the thread-guide element is fixedly secured to the thread-guide support, with the result that both members execute not only the reciprocating movement necessary for the deposition or winding of the thread on the bobbin but also the additional axial displacement necessary for obtaining the desired slope of the edge of the coil to be wound on the bobbin. In this known thread guide the axial displacement is effected by means of a comparatively complicated control system which can be suitably adjusted. Furthermore, it is also known that in order to produce bobbin with tampered coils ends one can control the thread guide or the bobbin by means of a coil-sensing control device in such manner that the thread guide or the bobbin is axially displaced in accordance with the increasing coil diameter. In both cases comparatively complicated control systems are used for obtaining the additional axial displacement of the thread-deposition stroke, such control systems being not only comparatively expensive and troublesome, but also adaptable only with difficulty to a particular pitch desired.

It is therefore an object of the present invention to provide a thread-guide for bobbin-winding machines suitable for the production of cross-wound or parallel-wound bobbins having either tapered or flat ends which is not subject to the above-mentioned drawbacks, but which on the contrary is of simple construction requiring no additional control system for automatically establishing the desired slope and which can, without difficulty,

be used with or adapted to normal bobbin-winding machines executing a reciprocatory movement.

This is achieved in accordance with the present invention in that the thread-guide element is displaceably mounted on guide means extending parallel to the desired end surface and including a slide shoe by means of which it is slidingly displaceable on the surface of the coil wound on the bobbin.

In this manner, the slide shoe which preferably contains the thread-guide eyelet controls itself, as it were, by its permanent engagement with the surface of the coil wound on the bobbin, since with increasing diameter of the coil the shoe undergoes an additional axial displacement corresponding to the desired slope of the end of the coil or thread package wound on the bobbin, in consequence of which the thread-deposition stroke arising from the reciprocating movement of the thread-guide support, the thread-guide element and the slide shoe mounted thereon is correspondingly shifted without the thread-guide support itself being thereby displaced. A special control system for achieving the axial shift of the thread-deposition stroke is therefore unnecessary. The advantage of the invention for bobbin wound with flat-topped coils is that the thread guide moves outwardly linearly with increasing coil diameter and does not describe an arcuate path which would cause the angle between the thread-guide and the bobbin to change by too large an amount. If the thread-guide is moved radially in an axial plane of the bobbin, then the thread-winding angle remains constant over the entire length of the bobbin.

According to one embodiment of the invention, the thread-guide element includes a slide member carrying the slide shoe which in turn contains the thread-guide eyelet, the slide member being displaceable on a guide rod in opposition to the action of spring means arranged on the guide rod. The slide member is preferably held permanently by a coil spring located on the guide rod in a position in which the slide shoe rests against the coil wound on the bobbin. It has been proved that the quality of bobbins wound in this manner is improved, since on account of the reciprocating sliding movement of the slide shoe over the surface of the coil wound on the bobbin an ironing effect takes place which results in a corresponding smoothing of the wound coil.

If the thread guide of the present invention is to be used for bobbin-winding machines on which bobbins having the same end-surface slope are to be wound for a long period of time, then the guide rod or rods may be arranged to be unadjustable after being initially set at the angle of inclination required for the desired slope of the end surface. On the other hand, with bobbin-winding machines which need to be frequently adjusted for varying types of bobbins, the guide rods may be mounted for pivotal adjustment about an axis extending transversely to the longitudinal axis of the bobbin, in order that they can easily be adapted to the production of bobbins with different slopes of their end surfaces. At least in this case, the slide shoes preferably have a bearing or support surface which is rounded to correspond to the range of said pivotal adjustment.

With thread-guides which include two such thread guide elements arranged on a common thread-guide support and respectively associated with two adjacent bobbin-winding stations, preferably the guide means comprises a pair of guide rods for each slide member mounted for pivotal movement on opposite sides of a carrier arm resting on the thread-guide support, the free upper ends of the guide rods being adjustably secured in slot guides provided in a curved retaining member which extends concentrically about the pivotal axis of said guide rods.

If the slide shoe which contains the thread-guide eyelet is arranged rigidly on the thread-guide element, the slide shoe always describes the same path of movement as the thread-guide element. This is sometimes, however, disadvantageous, since the guidance of the slide shoe on the coil wound on the bobbin in the region of the edge of the coil is uncertain, especially when working with fine thread materials, particularly with synthetic yarn. This disadvantage can, however, be reliably overcome in a comparatively simple manner by arranging, according to a further feature of the invention, that the slide shoe is displaceably mounted on an extension of the thread guide element for limited displacement parallel to the longitudinal axis of the bobbin. This ensures that the thread guide, even in its position of reversal in the region of the coil edge, can always lie sufficiently far on the surface of the coil by means of the slide shoe mounted for limited axial displacement on the thread-guide extension so that a safe guidance or support of the thread guide on the bobbin coil is guaranteed for all phases of the winding operation.

The slide shoe may under these circumstances be formed in a different manner. Thus, for example, it may consist of a U-section member or yoke having its arms extending upwards one on each side of the guide extension, one of said arms having a guide slot formed therein to receive two guide pins extending laterally from the extension, and the base of the U-section member having an open-ended slot formed therein for the thread emerging from the thread-guide eyelet in that extension.

A stationary stop member having a stop surface extending parallel to the edge of the coil to be wound on the bobbin may be arranged at the end of the bobbin remote from the foot thereof for engagement by the yoke member at one end of its path of movement. This ensures that the stop surface provided on the stop member always displaces the slide shoe in the direction of the coil, independently of the particular diameter of the coil, by a fixed amount relative to the thread-guide extension containing the thread-guide eyelet, in consequence of which an adequate support of the slide shoe on the coil is ensured.

The slide shoe may alternatively consist of a slide tongue mounted for limited displacement in a longitudinal slot formed in the thread-guide extension, the tongue being urged by a spring mounted on the extension into a position where it extends beyond the forward end of that extension containing the thread-guide eyelet. In this case a special stop member for the displacement of the slide tongue is not required. Its displacement occurs, on the contrary, only in the position of thread-guide reversal at the foot of the bobbin, where the slide tongue strikes against the conical foot of the bobbin and thereby lags relative to the projecting extension.

According to a further feature of the invention, a spring is arranged to urge the shoe of the thread-guide element against the surface of the coil wound on the bobbin, the spring acting on the thread-guide element through a lever having a variable effective length so that the pressure of the slide shoe on the coil remains constant, or is even reduced, with increasing diameter of the coil. Thus, while retaining the favorable ironing effect of the slide shoe on the coil, changes in the pressure exerted by the slide shoe on the coil for changing coil diameters are avoided, with the result that the winding of the yarn on the bobbin is completed satisfactorily. As mentioned above, the pressure of the slide shoe on the coil thus remains the same or is even reduced with increasing coil diameter, and this is particularly advantageous since in the winding process the thread tension increases with increasing coil diameter. The spring acting on the lever may be adjustable to different tensions in accordance with the particular thread material being wound.

In order that the invention may be clearly understood, a number of embodiments thereof will now be described in detail by way of example and with reference to the accompanying drawings in which:

FIGS. 1 and 2 show, respectively, a front elevation and a side elevation of a first embodiment of a thread guide in accordance with the invention for use in the winding of a coil on a bobbin having a conical end plate, the coil having a tapered head with an edge sloping at an angle of about 45°;

FIGS. 3 and 4 show, respectively, a front elevation and a side elevation of a second embodiment of a thread guide in accordance with the invention for use in the winding of flat-topped coils on cylindrical bobbins;

FIGS. 5 and 6 show, respectively, a front elevation and a side elevation of a third embodiment of a thread guide in accordance with the invention having guide rods which are pivotally adjustable;

FIG. 7 is a side view of a winding station showing a thread guide which includes a slide shoe capable of limited axial displacement and which can be used for the winding of a coil on a bobbin having a conical end plate, the coil having an edge sloping at an angle of approximately 45°;

FIGS. 8 and 9 are bottom plan views of the slide shoe of FIG. 7 which is displaceably mounted on the lower end of the thread-guide element, these two views showing the shoe in its limiting position, corresponding to that of FIG. 7;

FIGS. 10 and 11 are, respectively, a bottom plan view and a side elevation of a further form of slide shoe, this shoe being displaceably mounted for limited movement on the lower end of the thread-guide element; and

FIG. 12 a partial view of the thread guide shown in FIG. 7 taken on the line XII—XII thereof.

The thread guide shown in FIGS. 1 and 2 includes a thread-guide support or carriage indicated generally at **1** which comprises, basically, a guide shaft **2**, two spaced beams **3** and **4** extending transversely to the shaft **2**, and support members **5** and **6** arranged at right angles to one another and interconnecting the two beams **3** and **4** which are respectively secured to these support members. The shaft **2**, also known as a traverse bar, is fitted on a driving rod (not shown) of the bobbin-winding machine, by means of which the carriage **1** is reciprocated parallel to the longitudinal axis of a bobbin **7**, having a conical foot or base **7***a* at one end of a cylindrical core **7**; with a thread-deposition stroke corresponding to the axial length of the coil to be wound on the bobbin. On the support **1** and between the two beams **3**, **4** there are arranged pairs of guide rods **8** and **9** disposed symmetrically with respect to the support members **5** and **6**. The guide rods **8** and **9** are inclined at an angle α corresponding to the desired slope of the end surface **7′** of the coil, i.e., the guide rods **8**, **9** extend parallel to a generatrix of this conical surface **7′** and of the similarly shaped base **7***a*. The guide rods **8**, **9** have their upper and lower ends secured to the beams **3** and **4** by means of screws **10** and **11**, respectively.

On the guide rods **8** and **9** are fitted slide blocks **12** and **13**, respectively, which form the thread-guide elements proper. The slide blocks **12** and **13** have outwardly extending arms **14** and **15** respectively secured thereto and these arms form respective slide shoes or coil feelers **16** and **17** at their lower ends. Thread-guide eyelets **18** are formed in the slide shoes. The slide blocks **12** and **13** are subject to a downward force exerted by coil springs **19** located on the guide rods **8** and **9** and thus hold the slide shoes **16** and **17** carried by the slide blocks in constant contact with the peripheral surfaces of the coils **20** wound on the two bobbins located at the winding station. Furthermore, at the lower ends of the guide rods **8** and **9** there are provided adjustable stops **21** for adjusting the limits of movement of the slide blocks **12** and **13** in accordance with the particular bobbin diameter. In this way, the extent of movement of the shoes **16**, **17** radially of the bobbins is also limited to enable empty bobbins **7** be automatically delivered to the bobbin-winding station without interference from the outrigger arms **14, 15.**

At the beginning of the winding process, the shoes **16** and **17** rest on the cores **7″** of the two bobbins **7.** Upon actuating the winding drive mechanism which sets the bobbins **7** into rotation (arrows, FIG. 1) and causes the support **1** to begin its reciprocating movement, threads **22** running through the respective eyelets **18** in the slide shoes are wound on the bobbins in the form of either cross-wound or parallel-wound coils. As the diameter of the coils wound on the bobbins increases, the slide blocks **12** and **13** slide upwardly on the guide rods **8** and **9** against the force of the coil springs **19** on account of the movement of the slide shoes radially outwardly of the bobbins. This leads to a corresponding axial shifting of the thread-deposition stroke effected by the slide shoes, with the result that the desired sloping coil surface **7′** is obtained without difficulty. The increase in the tension of the springs **19** which is thus caused by the radially outward displacement of the blocks **12** and **13** in general causes no trouble. This may, however, if desired, be compensated for without any difficulty, for example by correspondingly raising the upper seating surface for the springs **19** by means of a control mechanism or the like.

The thread guide illustrated in FIGS. 3 and 4 is of basically the same construction as the threaded guide described above with reference to FIGS. 1 and 2. It includes, as does the embodiment shown in FIGS. 1 and 2, a thread-guide support or carriage **1** mounted on a thread-guide shaft **2**, guide rods **8** and **9** arranged in pairs on either side of the beams **3** and **4**, and slide blocks **12** and **13** slidingly displaceable on the guide rods **8, 9** and having coil-feeling shoes **16, 17** associated therewith. The only difference in this embodiment is that the guide rods **8** and **9** are not inclined at an angle but are arranged vertically on the lower beam **4** of the support **1** so as to lie in a radial plane of the bobbin whereby cylindrical coils **23** with flat transverse end surfaces **23′** can be wound on the bobbins, i.e. coils whose end surfaces lie at an angle α of 90° with respect to the longitudinal axes of the bobbins. Because of this arrangement of the guide rods **8** and **9** in a plane perpendicular to the longitudinal bobbin axis the shoes **16** and **17** of this embodiment are only displaced radially against the force exerted by the springs **19** upon an increase in the diameter of the coils wound on the bobbins, with the result that the thread-deposition stroke is thus subject to no axial displacemnt, i.e. the axial shift is zero.

According to the embodiment of the invention illustrated in FIGS. 5 and 6, the guide rods **8** and **9** carrying the slide blocks **12** and **13** are mounted on the support **1** so as to be pivotally adjustable about an axis extending skew to the longitudinal bobbin axis. This pivotal movement is effected by means of adjustment elements **24** and **25** respectively associated with the pairs of rods **8** and **9** and rotatable about a pivot shaft **26** of a support arm **27.** At their free upper ends the guide rods **8** and **9** are adjustably secured in guide slots **29** formed in a curved retaining element **30** which extends concentrically about the axis of the pivot shaft **26**, the adjustable securing of the guide rods in these slots **29** being effected by means of washer elements **31** and **32** which are locked by nuts **33.** The curved retaining element **30** is secured to an upwardly extending rear portion **27′** of the support arm **27.** Because of the pivotal adjustability of the guide rods **8** and **9,** the shoes **16** and **17** in this case have a coil-contacting surface **34** which is rounded to correspond to the range of pivotal adjustment. By simply releasing the locking nuts **33** one can then readily adjust the guide rods **8** and **9** for the blocks **12** and **13** to the desired slope of the coil end.

The thread guide illustrated in FIG. 7 essentially comprises a carriage **42** arranged to be reciprocated parallel to the longitudinal axis of the bobbin **41** and mounted on drive rods **43** of the bobbin-winding machine; a slide bar **44,** forming the thread-guide element, is provided with an extension **46** containing a thread-guide eyelet **45**; and

a slide shoe **47** mounted on the extension **46** for limited axial displacement. The slide bar **44** is mounted so as to be slidingly displaceable within a guide sleeve **48** of the carriage **42,** and is positioned at an inclination which corresponds to the desired slope of the conical end surface **49** of the coil wound on the bobbin **41.** The slide bar **44** is also displaceable parallel to the nearest generatrix of this conical surface **49.**

As can be seen from FIG. 12, two identical symmetrically arranged slide bars **44** and **44′** are provided on the thread-guide support **42.** These two bars **44** and **44′** effect the deposition of thread at two adjacent bobbin-winding stations by means of their shaped extensions **46** and slide shoes **47.** At the upper ends of the slide bars **44,** respective and **44′** rollers **51** and **51′** are fixed by means of clamping members **50** and **50′,** respectively. The free upper ends of two rotatable levers **52** and **52′** rest on the rollers **51** and **51′,** respectively, these levers being mounted on pins **53** and **53′** which are secured in a plate **54** forming part of the carriage **42.** The rotatable levers **52** and **52′** are each biased by a torsion spring **55, 55′,** respectively, one end **55*a*** of each torsion spring being secured in a hole in the associated lever, and the other end **55*b*** of each torsion spring being inserted into one of a plurality of socket holes **56, 56′** arranged in a circle around the mounting pins **53** and **53′.** By inserting these other ends **55*b*** of the torsion springs into two differently positioned sockets of the respective arrays **56, 56′,** the torsion springs **55, 55′** can be set to different tensions suited to the particular thread material to be used. As can be seen from FIG. 12, upon upward movement of the slide bars **44, 44′** which occurs as the diameters of the coils **57** wound on the bobbins increase, an increase in this effective lever-arm length of the levers **52, 52** occurs by virtue of an increase in the distance between the respective mounting pins or fulcro **53, 53′** and the points of contact between the levers and the rollers **51, 51′,** with the result that the moments of force upon the slide bars **44, 44′** developed by the torsion springs **55, 55′** can be maintained constant, or even be reduced in certain cases, in spite of the rising spring tension.

The slide shoes **47,** mounted for limited axial displacement at the lower ends of or on the extensions **46** of the slide bars **44, 44′,** may be constructed in various ways. In one form, which is illustrated in FIGS. 7 to 9, the slide shoe **47** consists of a U-section element or yoke having a flat base and vertical side walls extending upwardly one on each side of the extension **46** of the slide bar **44.** One side wall of the U-section element has a guide slot **59** cut therein, this slot receiving the ends of two guide pins **58** extending laterally from the thread-guide extension **46.** The flat base of the U-section element is provided with an open-ended slot **60** for the thread emerging from the eyelet **45** in the extension **46.** The yoke-shaped shoe **47** is provided at its end remote from the open-ended slot **60** with a sloping edge **47′** which co-operates with a stop surface **61′** formed on a stationary abutment **61,** this stop surface **61′** extending parallel to the desired core surface **49** of the coil to be wound on the bobbin. As is shown in FIG. 7, the sloping edge **47′** of the slide shoe **47** strikes the stop surface **61′** shortly before the support **42** reaches its position of reversal of movement at surface **49,** with the result that after the slide shoe **47** is arrested the carriage **42** and thus also the thread-guide extension **46** continue moving until the left-hand pin **58** is stopped by the slot **59** and the eyelet **45** reaches its terminal position above the ridge **49′** of the coil **57** wound on the bobbin. In this position of reversal of the thread guide the slide shoe **47** still extends sufficiently far over the surface of the coil **57** that correct position of the thread guide on the coil periphery is ensured. In the other position of reversal at the foot of the bobbin, the slide shoe **47** strikes against a conical foot **41′** of the bobbin **41,** with the result that the slide shoe **47** is shifted into its other extreme position relative to the extension **46** containing the orifice **45,** so that proper winding or deposition of the thread onto the sloping surface **41''** of the conical foot **41'** of the bobbin is ensured. The relative proportions of the various elements are shown correctly in FIG. 7.

As can be seen from FIGS. 10 and 11, the slide shoe may alternatively consist of a sliding tongue **62** mounted for limited displacement in a longitudinal slot **46'** in the thread-guide extension **46**. This tongue **62** is urged by a torsion spring **63**, mounted on the extension **46**, into a first position as shown in FIG. 11 where it projects beyond the front end of the extension **46** which contains the orifice **45**. Guidance of the sliding tongue **62** is effected by means of a slot **62'** formed there into which two spaced pins **64** of the piece **46** project. In this embodiment, the tongue **62** normally takes up the aforementioned first position relative to the piece **46** as illustrated in FIG. 11, which it maintains even at the sloping coil surface **49**, with the result that a correct positioning of the thread guide on the coil **57** is guaranteed even at this terminal position without requiring a special stop member **61** as for the slide shoe shown in FIG. 7. The tongue **62** is displaced into its alternate second position relative to the piece **46** only upon striking against the conical foot **41'** of the bobbin, whereby the eyelet **45** can again travel without hindrance to the end **41''** of the coil **57** and the thread can be properly deposited on the conical foot of the bobbin.

It will be appreciated that with the U-section form of slide shoe **47** shown in FIG. 7 a spring may be provided between the slide shoe **47** and its carrier **46** instead of using the stationary stop member **61**, such a spring acting in the same manner as the torsion spring **63** (FIGS. 10 and 11) by tending to hold the slide shoe **47** relative to the piece **46** in the position illustrated at the left-hand side of FIG. 7. Instead of the torsion spring **63** which is shown, one can alternatively use some other spring element if desired, for example, a tension spring, a compression spring, or a leaf spring.

We claim:

1. A thread-guiding assembly for a bobbin-winding machine having mechanism for rotating a bobbin with a base and a core adapted to have a coil of thread wound thereon in contact with a face of said base, comprising:

a carriage reciprocable parallel to the bobbin axis by a distance substantially corresponding to the length of said core;

a linear guide member on said carriage extending in a direction parallel to said face;

a slider mounted on said guide member for displacement in said direction and provided with feeler means engageable with the peripheral surface of the bobbin during reciprocation of said carriage, said feeler means having an orifice for the guiding of said thread in winding the coil;

and biasing means bearing upon said slider for urging said feeler means into contact with said coil.

2. An assembly as defined in claim **1** wherein said face is conical, said guide member being inclined at an acute angle to the bobbin axis and being parallel to the nearest generatrix of the cone.

3. An assembly as defined in claim **2** wherein said

guide member is tiltable about a pivotal axis skew to the bobbin axis for varying said acute angle.

4. An assembly as defined in claim **1** wherein said slider is provided with an extension proximal to the bobbin, said feeler means being mounted on said extension with freedom of limited relative movement parallel to the bobbin axis between a first and a second position, said orifice being formed on said extension adjacent an end of said feeler means projecting toward said base in said position during a stroke of said carriage in a direction approaching said base, said projecting end being repressible by said face into said second position at the termination of said stroke.

5. An assembly as defined in claim **4**, further comprising a stationary abutment in the path of said feeler means for restoring the latter to said first position at the termination of a return stroke of said carriage.

6. An assembly as defined in claim **5** wherein said abutment and said feeler means have confronting contact edges inclined in a direction parallel to said guide member.

7. An assembly as defined in claim **4**, further comprising resilient means on said extension permanently urging said feeler means into said first position.

8. An assembly as defined in claim **4** wherein said guide member is a sleeve and said slider is a rod nested in said sleeve.

9. An assembly as defined in claim **8** wherein said face is conical, said sleeve being inclined at an acute angle to the bobbin axis and being parallel to the nearest generatrix of the cone.

10. An assembly as defined in claim **1** wherein said biasing means comprises a spring-loaded element bearing upon said slider.

11. An assembly as defined in claim **10** wherein said element is a lever fulcrumed on said carriage and provided with an extremity bearing upon said slider at a point of contact whose distance from the fulcrum of said lever increases with outward travel of said slider along said member in response to increasing coil diameter, thereby substantially counterbalancing the effect of an increasing spring force acting upon said lever.

12. An assembly as defined in claim **11** wherein said biasing means includes a torsion spring centered on said fulcrum, said carriage being provided with a plurality of sockets arrayed about said fulcrum, said torsion spring having an end secured to said lever and another end selectively receivable in any of said sockets for adjusting said spring force.

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