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SMOOTH TENSION SEWING MACHINE BOBBIN CASE AND BOBBIN

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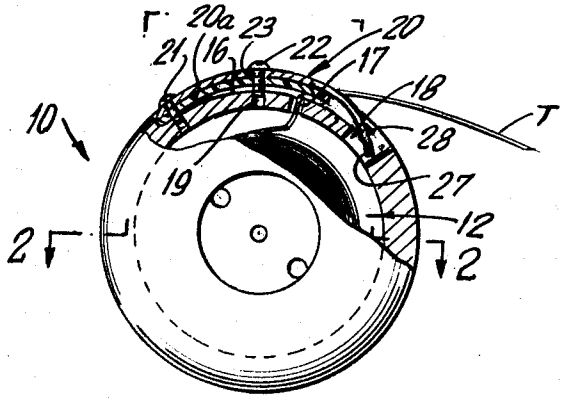


FIG. 1

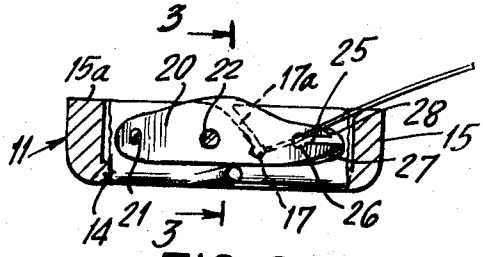


FIG. 2

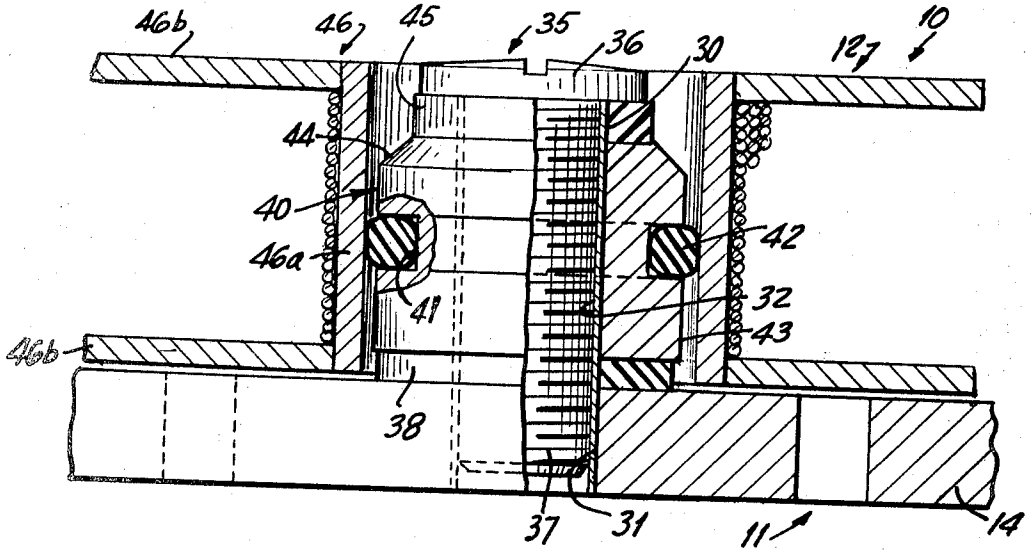


FIG. 3

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SMOOTH TENSION SEWING MACHINE BOBBIN CASE AND BOBBIN

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14 Claims

ABSTRACT OF THE DISCLOSURE

A sewing machine bobbin case and bobbin in which a center shaft fixed on the bottom of the bobbin case serves to rotatably mount a collar on which a bobbin is frictionally fitted, and in which means is provided to adjustably press friction elements against the collar to adjust the drag on the collar whereby to obtain even tension on the thread pulled from the bobbin.

BRIEF SUMMARY OF THE INVENTION

This invention relates to combination sewing machine bobbin case and bobbin.

Several means have heretofore been used to apply tension to the thread pulled from a bobbin, by restricting either the rotary motion of the bobbin or restricting the withdrawal of the thread from the bobbin case. One method of applying tension to the thread has been by means of a flat tension spring applied on the outside wall of the bobbin case with the spring pressing against the hole in the side of the bobbin case from which the thread exits. The pressure of the spring against the thread is varied to obtain the required tension. The objection to this method is that the area between the flat spring and the wall may accumulate lint, wax, or other matter removed from the thread and built up to a point where the tension against the thread by the spring is lessened or removed entirely. This lessening of tension at the spring causes the bobbin thread to be pulled to the top of the fabric being sewn, by the needle thread, thus causing unbalanced lock stitching which may be easily broken at the seam.

Another fault of this method of applying tension to the thread is that because of today's high speed sewing machines, fast removal of the thread from the bobbin case will cause the bobbin to continue to spin after the machine stops and this overspinning of the bobbin often causes a tangling of the thread within the bobbin case. This surplus thread caused by backlash or overspinning will often become entangled around the shaft on which the bobbin is mounted or around the outside of the bobbin case. To overcome these difficulties certain remedies have heretofore been attempted. One such remedy is to place a spring on the lateral side of the bobbin to be used as a drag against the rotation of the bobbin. Since ready wound bobbins and bobbin spools may be of varying heights or thicknesses, there is bound to be different amounts of tension applied against the lateral sides of the bobbin varying with the different heights of the bobbin.

Another way for restricting the rotational movement of the bobbin to prevent backlash has been the application of a spring tension against the outer peripheries of the bobbin side walls. This method is not effective on paper shell bobbin spools currently being used in the industry.

Another method to prevent backlash is to put a magnet in the bobbin case which restricts the rotational movement of a metal bobbin spool because of the polarity of the magnet. This method is, of course, not effective on non-magnetic bobbin spools or paper shell bobbin spools; and it has the disadvantage of creating a jerky rotational movement because of the greater magnetic attraction of the magnets at the North and South poles.

Furthermore, it has been found that bobbins which rotate on a fixed axis in the bobbin case do not rotate smoothly at a uniform rate of rotation whereby the tension on the thread being removed from the bobbin, varies. This is due to the fact that the internal diameter of the bobbin is not always uniform. This is true of free bobbins or metal bobbins or paper shell bobbins. The bobbins have too sloppy a fit on the fixed center shaft of the bobbin cases now in use to rotate smoothly since there is usually too much clearance between the bobbin and the shaft.

It is, therefore, an object of this invention to provide a combination bobbin case and bobbin construction in which the above mentioned difficulties are eliminated and in which the bobbin will rotate smoothly, the tension on the thread may be maintained uniform and in which backlash is prevented.

Another object of this invention is to provide a construction of the character described in which a collar is mounted for rotation on a fixed center shaft in the bobbin case, the construction being such that the bobbin may be frictionally fitted on the collar to rotate therewith, and in which means is provided to restrict the rotational movement of the collar to adjust tension on the thread and to prevent backlash.

Another object of this invention is to provide a construction of the character described which may use bobbins having either paper or metal spools or without a core or sides.

It will be understood that in accordance with the present invention the bobbin does not freely rotate on a fixed axis but is frictionally mounted on a collar riding on a fixed center shaft. The collar may have a precision rotary fit on a fixed shaft without too much clearance and the bobbin may be mounted on the collar by means of an O-ring in a groove in the collar and frictionally engaging the inner surface at the hole in the bobbin. The rotational restriction of the collar may be achieved by means of a screw screwed within an internally screw threaded center shaft on the bottom wall of the bobbin case with the head of the screw pressing one or more friction washers against the collar. The use of the tensioning device embodying this invention could also eliminate the need for the flat spring on the outer wall of the bobbin case which presses against the hole in the side of the bobbin case, thereby eliminating the faulty tensions and unbalanced stitching caused when a build up occurs under the flat spring.

In order to obtain a fine adjustment, a very fine screw thread is used for the screw and the internally threaded center shaft.

Yet a further object of this invention is to provide a strong, rugged and durable bobbin case and bobbin construction of the character described which shall be smooth and positive in operation, relatively inexpensive to manufacture, easy to maintain, and which shall yet be efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWING

In the accompanying drawing, in which is shown an illustrative embodiment of this invention;

FIG. 1 is a bottom view of a bobbin case and bobbin embodying the invention with parts broken away and in cross-section;

FIG. 2 is a cross sectional view taken on line 2—2 thereof; and

FIG. 3 is an enlarged, partial, cross sectional view taken on line 3—3 of FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

Referring now in detail to the drawing, **10** designates a bobbin construction comprising a bobbin case **11** housing a bobbin **12**. The case **11** may have a bottom wall **14** from which extends upwardly an annular peripheral wall **15**. The annular wall **15** may be formed with an outer peripheral recess **16**. It is also formed with a small radial opening **17** and with a larger radial opening **18** spaced from the opening **17**. It is also formed, for the purpose hereinafter appearing, with a small threaded opening **19**. These openings **17**, **18** and **19**, as well as the depression **16** are well known in the art. Wall **15** has an outer edge **15***a*.

The thread T from the bobbin passes outwardly through the opening **17**. Disposed within the recess **16** is a usual leaf spring **20** fixed at one end by means of a screw **21**. The leaf spring is arched so that a portion thereof between the ends thereof is spaced from the bottom of the recess **16**. A screw **22** has a shank which passes through an opening **23** in the spring and is screwed within the opening **19**. By adjusting the screw **22** the pressure of the spring **20** against the thread and against the outer surfaces of the recess is increased. The outer wall **15** of the case is formed with an inclined slot **17***a* extending from the opening **17** to the outer edge **15***a* of the wall **15**. This slot as well as the opening **17** are well known in the art. The outer end of the spring **20** is formed with a longitudinal slot **25** extending to an enlarged round opening **26** at its inner end. The slot **25** forms a pair of fingers **27** and **28**. The finger **27** is longer than the finger **28** and is bent downwardly into the hole **18**. The thread passing up through the opening **17** hooks over the outer wall **15** and extends to the opening **26**. The spring **20** serves to press against the thread and acts as a tensioning means for the thread.

The structure described to this point is old and well known in the art. The trouble with such structure has been that lint and other material gathering beneath the spring often causes the spring to loose its proper tension thus causing variation in the tension of the thread and also permitting the bobbin to overspin when the machine is suddenly stopped after operating at high speed.

A plastic spring strip **20***a* may underlie the spring **20** and has openings registering with openings **23** and with the screw threaded opening which receives the screw **21**.

In accordance with the present invention there is fixed to the bottom wall **14** a hollow tubular center shaft **30**. The center shaft **30** may be integral with the bottom wall **14**. Such shaft, however, may comprise a separate tube force-fitted into a central opening **31** in said bottom wall as shown in the drawing. The center shaft **30** is internally threaded as at **32**. The thread is preferably a very fine thread and may range from a number **2–53** thread to a number **2–64** thread. A screw **35** may be screwed into the shaft. The screw **35** has an enlarged head **36** at its upper end and a threaded shank **37**.

Received on the center shaft **30** and contacting the inner surface of the bottom wall **14** is a friction washer **38** which may be made of rubber or rubberlike material or any other suitable material. Also mounted on the center shaft **30** and resting on the washer **38** is a collar **40**.

The collar **40** has a smooth rotating fit on the center shaft. The lower end of the collar rests on the washer **38**. The collar may be made of metal and may be precision machined so as to rotate smoothly and uniformly on the center post. Said collar is formed with a central annular recessed groove **41** in which is mounted an O-ring **42** of rubber, neoprene or any other suitable frictional material. The O-ring projects radially outwardly of the outer annular surface **43** of the collar. The upper shoulder of the collar may be bevelled as at **44**. Mounted on the center shaft **30** and contacting the upper end of the collar is a spring washer **45** which may be made of metal, rubber or any suitable rubberlike, resilient friction material. The head **36** of the screw contacts the upper surface of the washer **45**.

The bobbin **12** may be of any suitable type. It is here shown as comprising a spool **46** on which the thread is wound. The spool **46** may comprises a central tubular core **46***a* on which annular side discs **46***b* are mounted. The thread is wound between the side discs **46***b*. The O-ring **42** frictionally engages the inner surface of the core **46***a*.

The bobbin, however, may have a metal spool or a paper spool or the bobbin may be free of a spool, but in any case the bobbin frictionally engages the O-ring **42** so as to rotate with the collar. By tightening the screw **45** the frictional restriction on the collar may be varied. The O-ring accommodates bobbins in which there is variation in the internal diameter of the bobbin hole. This is due to the fact that the O-ring is made of compressible, resilient material. Since the collar has a precision or smooth rotating fit on the center shaft **30**, the rotation of the bobbin and the collar will be smooth and uniform. If the bobbin has no spool then the inner surface of the bobbin at the bobbin hole engages the O-ring.

A constant uniform tension is applied to the thread so that the positive restriction of the rotational movement of the collar and bobbin eliminates backlash entirely. In fact the use of this tensioning device at the center of the bobbin could eliminate the need for the flat spring **20** entirely, and thus eliminate the faulty tensions and unbalanced stitches caused when a build up occurs under the flat spring.

It will now be understood that the bobbin does not freely rotate directly on a fixed center shaft but is frictionally fitted onto a collar rotatable on a fixed center shaft. Much smoother rotation of the collar is achieved. The internal diameter of the bobbin is not always the same. This is true of metal as well as paper bobbin spools. The core of the bobbin spool usually has too sloppy a fit on the shaft to rotate freely and smoothly since there is usually too much clearance, but the collar does have a smooth rotating fit to provide for smooth tension as opposed to a jerky tension.

It will thus be seen that there is provided an apparatus and article in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In combination, a bobbin case, a center shaft fixed on a wall of said case, a collar mounted for rotation on the center shaft, means on said collar to frictionally engage a bobbin mounted on said collar, and means to adjust the friction of the collar relative to the case, said means for adjusting the friction of the collar relative to the case comprising internal threads on the center shaft, a screw screwed into said shaft, and means on said shaft adapted to be pressed against the collar by the screw.

2. In combination, a bobbin case, a center shaft fixed on a wall of said case, a collar mounted for rotation on the center shaft and means on said collar to frictionally engage a bobbin mounted on said collar, in combination with a bobbin within said case and having a center hole through which said collar passes and engaging said means on the collar to frictionally engage the bobbin, and means to adjust the friction of the collar relative to the case, said means for adjusting the friction of the collar relative to the case comprising internal threads on said center shaft, a screw screwed into said center shaft, and means on said shaft adapted to be pressed against the collar by the screw.

3. The combination of claim **1**, said last means com-

prising a washer on said center shaft interposed between said collar and said wall.

4. The combination of claim 1, said screw having a head, said last means comprising a washer interposed between the head of the screw and said collar.

5. The combination of claim 4, and a washer interposed between the collar and said bottom wall of said case.

6. In combination, a bobbin case, a center shaft fixed on a wall of said case, a collar mounted for rotation on the center shaft, means on said collar to frictionally engage a bobbin mounted on said collar, in combination with a bobbin within said case and having a center hole through which said collar passes and engaging said means on the collar to frictionally engage the bobbin, in combination with means attached to the case and engage the thread of the bobbin to frictionally retard the withdrawal of the thread from the bobbin.

7. The combination of claim 2, said screw having a head, said last means comprising a washer interposed between the head of the screw and said collar.

8. The combination of claim 7 and a washer interposed between the collar and said bottom wall of the case.

9. In combination, a bobbin case, a shaft on a wall of said case, a sleeve rotatably mounted on the shaft, a bobbin having a central hole receiving and mounted on said sleeve, constant grip means on said sleeve to engage the bobbin for rotation of said bobbin and sleeve, together, on said shaft when thread is pulled from said bobbin, means to frictionally retard rotation of said sleeve relative to said case to apply tension to thread pulled from said bobbin, as said bobbin and collar rotate together on said shaft, and means to adjust said friction retard means to vary the degree of tension on the pulled thread, without varying the degree of grip of said sleeve on said

bobbin, said constant grip means comprising means on the outer periphery of said sleeve engaging the inner surface at the central hole in said bobbin with sufficient grip to overcome the friction of said friction retard means.

10. The combination of claim 9, said shaft being fixed to said wall of said case.

11. The combination of claim 10, said sleeve being rigid, said adjust means comprising a member screwed to said shaft, and means to increase retarding friction between said sleeve and said wall of said case upon screwing said member on said shaft in one direction.

12. The combination of claim 11, and washer means on said shaft and interposed between one end of said sleeve and said wall of said case.

13. The combination of claim 12, said member having a head and washer means on said shaft and interposed between the other end of said sleeve and said head.

14. The combination of claim 12, and said means to increase retarding friction between said sleeve and said wall of said case comprising a washer on said shaft, and means on said member to increase pressure on said washer upon screwing said member in said direction.

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