Oct. 28, 1952 T. E. BETNER ET AL 2,615,650

BOBBIN

Filed Oct. 23, 1948

Fig. 1

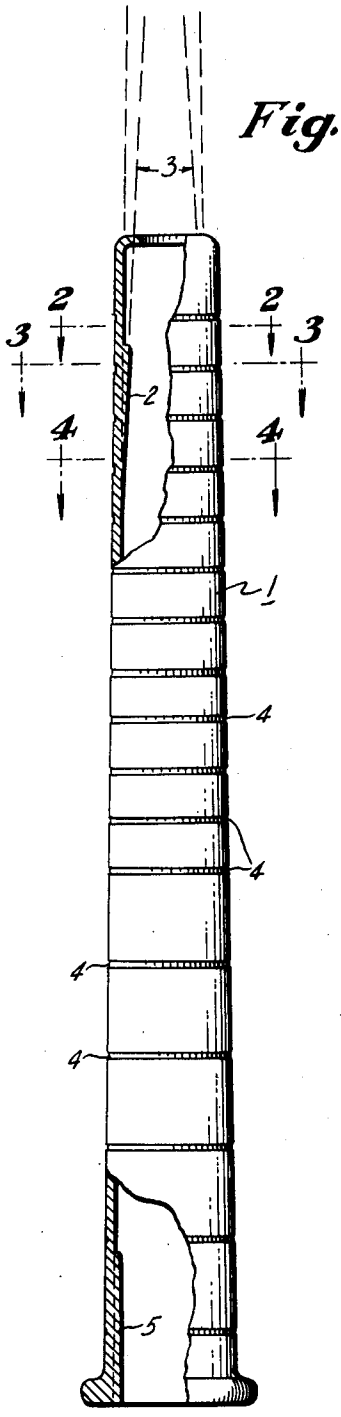


Fig. 2

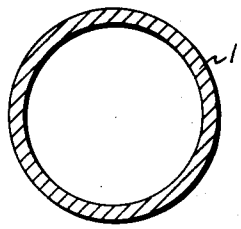


Fig. 3

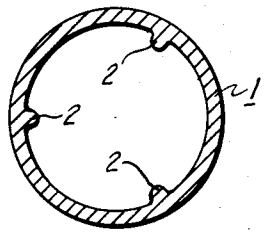


Fig. 4

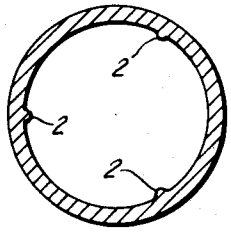
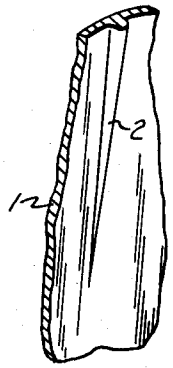


Fig. 5



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Patented Oct. 28, 1952 2,615,650

UNITED STATES PATENT OFFICE

2,615,650

BOBBIN

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Application October 23, 1948, Serial No. 56,234

2 Claims. (Cl. 242—119)

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This invention relates to bobbins used with textile machines such as spinning machines for spooling, twisting or winding of cotton, wool, nylon and other natural or synthetic yarns.

In use, as each bobbin is in turn filled, it is doffed or pulled off its rapidly revolving driving spindle and another empty bobbin is shoved into place on the spindle. Also when the yarn breaks, the operator or doffer must lift the bobbin from the revolving spindle, tie the broken ends of the thread and place the bobbin back on the spindle. It is essential that the bobbins be releasable by a light pull as otherwise it may be necessary to shut down the entire machine to avoid injury to the doffer. When it is recalled a single machine may have hundreds of spindles and that breakage of the threads is a frequent occurrence, it is apparent that the loss of operating time becomes intolerable if jammed bobbins enforce frequent stoppage. Moreover, the bobbins or the yarn thereon are usually badly damaged by forcible removal of jammed bobbins.

At present, there are in use a variety of paper or wood bobbins which, though when new are fairly satisfactory from the standpoint of easy doffing, are unsatisfactory for other reasons including their short useful life and their contamination of yarn by moisture and dye absorbed by the bobbin. In general, the short useful life of such bobbins is due to their dimensional instability; they are easily fractured, warped, worn, deformed or broken and so shortly lose their easy doffing characteristic. Consequently, use of such bobbins is accompanied by high replacement costs. An even more serious difficulty is that even though the deformation or denting of a wooden or paper bobbin may not be noticeable, it is so out of balance that the expensive spindle bearings are worn out in a short time. Attempts to use bobbins of aluminum, pressed steel, brass and the like to obtain dimensional stability have not proved commercially successful because of doffing difficulties.

In accordance with the present invention, the characteristics of easy doffing and dimensional stability are both obtained by making the bobbin of material, preferably molded Bakelite or other thermosetting material, which is sufficiently tough to resist deformation despite rough handling and which is impervious to moisture and dye. The dimensional stability of the bobbin insures long life of the spindle bearings, minimizing cost of their replacement and the incidental loss of operating time of the machine. To attain easy doffing, the tapered bore of the bobbin is preferably provided with a plurality of projections such as splines or ribs, spaced internally of the bore and of progressively increasing height toward the smaller end of the bore. In all cases the spindle-engaging face or faces of the bobbin lie in or define a surface of revolution whose apex angle is slightly greater than that of the bore taper. Within a rather limited range of difference between the tapers, it is possible to insure a firm driving engagement between the spindle and the bobbin which, however, can be readily broken by a slight pull. More specifically, the aforesaid splines, ribs or equivalent are disposed near the small end of the bore of the bobbin above its center of gravity.

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In some forms of the invention, there is a second set of splines or ribs formed integrally at the larger end of the bore to provide firm non-slipping driving engagement between the bobbin and unspooling mechanism used with it.

The invention further resides in features of construction hereinafter described and claimed.

For a more detailed understanding of the invention and for illustration of a preferred embodiment thereof, reference is made to the accompanying drawings in which:

Fig. 1 is an elevational view of the bobbin in part broken away to show its integral splines;

Fig. 2 is a section, on enlarged scale, taken on line 2—2 of Fig. 1;

Fig. 3 is a section, on enlarged scale, taken on line 3—3 of Fig. 1;

Fig. 4 is a section, on enlarged scale, taken on line 4—4 of Fig. 1; and

Fig. 5 is a partial view, in perspective, showing one of the tapered ribs of Fig. 1.

Referring to the particular embodiment shown in Fig. 1, the body 1 of the bobbin is a thin tubular shell, the taper of whose bore closely matches that of the driving spindle with which it is to be used. Usually the driving spindle is of metal although in some cases, the tapered portion thereof which engages the bobbin is of a suitably hard wood. Within the smaller end of the bobbin bore there is a set of projections or ribs 2, preferably three or four in number, equally angularly spaced circumferentially of the bore and so tapered each is of increasing height toward the smaller end of the bore. The maximum height of the projections 2 is exaggerated, for purpose of illustration, in the drawings; actually in a preferred construction it is less than .050 inch. The important feature is that the ribs, splines, or equivalent, shall define a spindle-engaging surface of revolution which is coaxial with the bore

and whose apex angle 3 is slightly greater than the angle of taper of the bore.

The difference between the angle of taper of the spindle-engaging surface of the bobbin and the taper angle of the spindle is quite critical in that if the difference is too slight it will be difficult to doff the bobbin either initially or after a short period of use. On the other hand, if the difference between the angles is too great, there will be a strong tendency for the bobbin to float on an air-cushion when dropped onto the spindle instead of effecting a firm driving engagement therewith. When it is recalled that the driving spindles rotate at speeds of the order of 8,000 revolutions per minute and higher, it is evident the operator should neither attempt to remove a jammed bobbin nor manually force a floating bobbin into driving engagement with the spindle. Moreover, either operation, in the aggregate, involves a substantial loss of time. With the proper difference in the taper angles, the bobbin may be released from the rapidly revolving spindle by a slight pull and yet firmly grabs the spindle when dropped over it. By way of example, the ribs 2 may be about an inch long and in that distance rise from their point of merger with the bobbin bore to about .025 inch.

The bobbin body 1 and the ribs 2, or equivalent, are preferably integrally formed of thermosetting material such as Bakelite, or other thermosetting material in an injection transfer die machine or press. Such materials are tough, resilient, wear-resistant and are impervious to, as well as immune to attack by, moisture and liquids to which exposed in textile processes. The ribs 2 because of thermoset material yield slightly when the bobbin is dropped or tossed down over the spindle and so provide a firm driving engagement without scoring or grooving the spindle as would occur with metal ribs. The thermoset material also has high resiliency and wear resistance with the result the ribs retain their shape after long continued used. In fact, bobbins so made have retained their characteristics of easy doffing and firm driving engagement after thousands of doffing operations. Though the line contacts between the ribs and the spindle strongly resist relative rotation or angular slip, they are readily broken by a light upward pull. There is no "freezing" of metal to metal or sticking due to scoring of the spindle or bobbin. As the ribs are formed integrally with the bobbin, it is insured that all bobbins shall have the same characteristics without need for any expensive machining operations, and these characteristics are retained because of the dimensional stability of the bobbins.

An important additional advantage of the bobbin described is that it has been possible to increase the speed of the spindles by 10 per cent or more with correspondingly increased output of the spinning machines. Despite the higher speed, there is no tendency for the bobbins to slip and no increase in wear of the spindle bearings. In this connection it should be noted that the ribs 2 are above the center of gravity so that at spindle speeds of 10,000 R. P. M. and higher, there is no tendency for the bobbin, empty or loaded, to wobble and so become loose on the spindle. The increase in output due to increased spindle speed is in addition to the increase of output due to the easy doffing characteristic of the bobbin which alone is about 10% or more without increase in spindle speed.

Although the projections which engage the driving spindle are, for manufacturing and other reasons, preferably ribs, as shown in the drawings, they may be a plurality of spaced lands of other regular or irregular shape, such as dimples, whose spindle-engaging tips or faces all lie in or define a surface of revolution whose apex angle is slightly greater than the taper of the bobbin bore.

As the surface of the bobbin is hard and smooth, the external or yarn-engaging surface may be provided with a plurality of grooves 4 to prevent the initial layers of yarn from slipping upwardly during the spooling operation. The grooves 4 are also formed concurrently with the molding of the body 1 and the ribs 2.

Because made of hard, tough thermoset material, the bobbins retain their shape despite rough handling and are not bent, fractured or dented when subjected to the usual dropping and rough handling incident to their use. Thus, excessive spindle wear due to inadvertent use of imperfect bobbins is practically obviated. Moreover, bobbins so constructed are not affected by exposure to highly humid and high-temperature conditions encountered in textile processes and do not retain dye of one spooling for contamination of the yarn of a subsequent spooling.

In many mills, the filled bobbins are unspooled by a Barker-Coleman machine having fingers or dogs which engage the inside of the bobbin to prevent its rotation. With the bobbin thus far described, the inner surface is so smooth and hard that such driving fingers cannot maintain a firm engagement with the bobbin with the result that it slips when subjected to the load of unspooling with consequent breakage of the yarn. This difficulty did not arise with new paper or wooden bobbins because they would deform when subjected to the pressure of the gripping fingers. Such deformation of the paper or wooden bobbins was, however, usually more or less permanent which further limited their useful life.

To maintain firm engagement between the dimensionally rigid bobbin body 1 and the driving fingers of a Barker-Coleman machine, there are provided, at the larger end of the bore, a second series or set of circumferentially spaced ribs 5 for engagement with the gripping fingers of the Barker-Coleman or similar unspooling machine. These ribs need not be tapered and may extend inwardly of the bore about .015 of an inch; they may, for example, be about 1/8" wide and about 1 inch long. Alternatively, the inner bore may be provided with a series of slight depressions or grooves to catch the driving fingers. As these ribs or depressions are integrally formed during molding of the body of the bobbin, no subsequent expensive machining operations are necessary.

As above stated, in the preferred form of the invention the bobbin body is of molded thermoset material and the off-taper, spindle-engaging structure such as ribs 2, is formed integrally therewith. Less desirably, the bobbin body may be of pressed metal, such as steel, brass or aluminum, and the spindle-engaging structure or structures either integrally formed during the pressing operation or attached to the bobbin as by spot-welding; or, the bobbin body may be of paper or wood and the off-taper spindle-engaging structure inserted therein. In all of such arrangements, as in the bobbin of Fig. 1, the spindle-engaging surface or surfaces of the bobbin should lie in or define a surface of revolution coaxial with the bobbin and whose apex angle

is slightly greater than the angle of taper of the spindle. However, such arrangements in general lack important features of the preferred construction: for example, the paper body bobbin with an off-taper insert is inherently dimensionally unstable, either initially or after short periods of use, with consequent shortened life of the spindle bearings.

It shall be understood the invention is not limited to the particular embodiment shown and that changes and modifications may be made within the scope of the appended claims.

What is claimed is:

1. A bobbin providing firm driving engagement with a tapered spindle of a textile machine and easily doffed therefrom, comprising a tubular body member having a bore adapting said body member for disposition over said spindle, and longitudinally extending axial ribs formed interiorly of said bore and spaced about said bore adjacent the upper end thereof for driving engagement with said spindle, said ribs defining at their inner faces a conical surface of revolution coaxial with the bore of said body member and having an apex angle that is slightly greater than the taper angle of said spindle.

2. A bobbin providing firm driving engagement with a tapered spindle of a textile machine and easily doffed therefrom, comprising a tubular body member having a tapered bore matching the spindle taper, longitudinally extending axial ribs formed interiorly of said bore and spaced regularly about said bore adjacent the upper end thereof, said ribs merging with the said bore at their lower ends and defining by their inner

faces a conical surface of revolution coaxial with said bore and having an apex angle that is slightly greater than the taper angle of said spindle, whereby when said tubular body is disposed over said spindle said ribs are adapted for seating readily in driving engagement therewith while spacing the remaining tapered bore of said tubular body against freezing on said tapered spindle, and additional circumferentially spaced longitudinal ribs formed interiorly of said tubular body bore adjacent the lower end thereof for engagement on an unspooling mechanism, said additional ribs having a taper corresponding to the taper of said tubular body bore and the extending faces of said additional ribs having a raised height interiorly of said bore not exceeding the spacing of said bore from said spindle by said first mentioned ribs.

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