

July 12, 1955

R. R. CONE

2,712,804

THREAD PACKAGE

Filed Nov. 2, 1951

Fig. 1

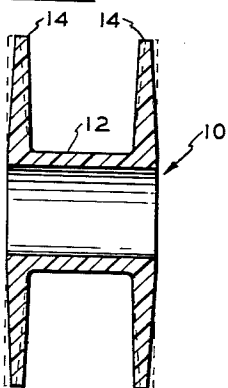


Fig. 2

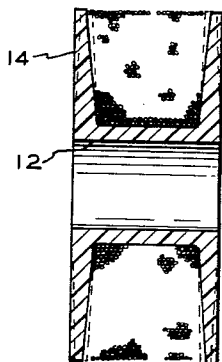


Fig. 3

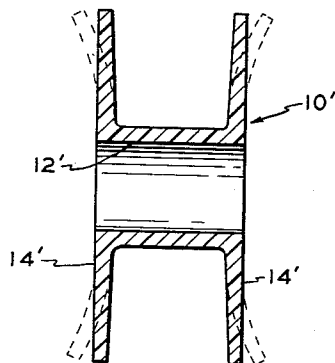


Fig. 4

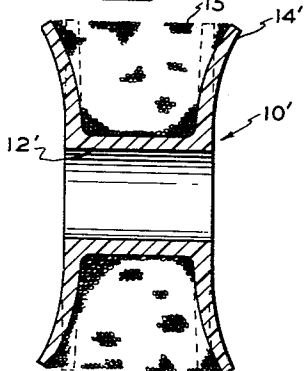


Fig. 5

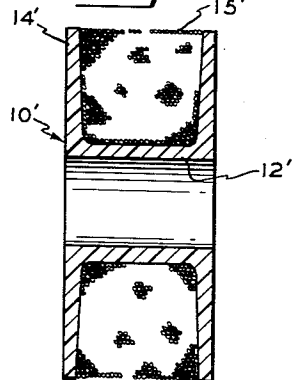


Fig. 7

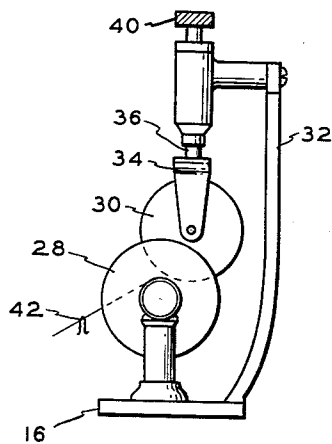
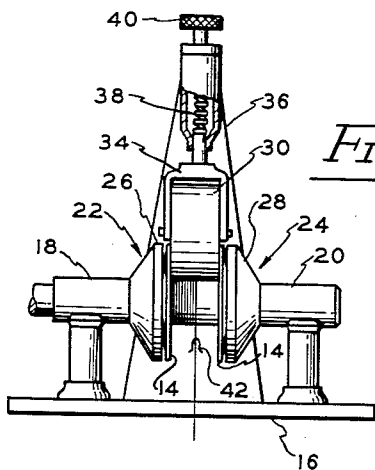


Fig. 6



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THREAD PACKAGE

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Application November 2, 1951, Serial No. 254,549

6 Claims. (Cl. 112-251)

This invention relates to thread packages, and to method and apparatus for making them, and particularly to filled bobbins for sewing machines.

It is a principal object of the invention to provide light weight wound bobbins having substantial amounts of thread yardage thereon and a method of manufacturing them.

A further object of the invention is to provide a bobbin of unitary construction which is inexpensive to manufacture so that the bobbin may be discarded after the thread has been removed therefrom, eliminating the necessity of bobbin rewinding in sewing rooms.

A further object is to provide disposable filled bobbins which are substantially unaffected by high humidity, having side flanges integral with the bobbin core, thus substantially reducing bobbin spoilage due to adverse weather conditions or rough handling.

Another object is to provide filled bobbins wherein the thread mass is substantially uniformly compacted throughout.

A further object of the invention is to provide wound bobbins for sewing machines wherein substantially uniform tension or drag on the thread is maintained as the thread package is unwound in its bobbin case.

It has been the constant endeavor of manufacturers of sewing machines and filled thread packages to provide small, strong, light weight sewing machine bobbins capable of recovering substantial thread yardage. Notwithstanding the many novel bobbins that have been described in patents and literature, substantially all of the commercially wound bobbins are of either the disposable paper wound type or the standard steel constructed bobbin.

Due to the high cost of the steel bobbin it has not been commercially feasible to sell filled steel bobbins in competition with the paper wound bobbin, and such bobbins have been generally used with sewing machines equipped with automatic winding mechanism adapted to wind a spare bobbin while the bobbin in the shuttle case of the machine is being used, thereby always assuring the sewing machine operator of a wound bobbin to put into the machine when it is needed. The steel bobbin, however, has two principal disadvantages. Firstly, substantially greater yardage of thread can be wound on a steel bobbin by thread manufacturers employing special bobbin winding equipment than can be placed upon the same bobbin by the sewing machine operator. This factor is of particular importance on the so-called "quality" sewing operations, where it is undesirable to have the bobbin thread exhaust in the middle of a seam, which necessitates a repaired seam adding substantially to the cost of manufacture. It is evident therefore that with bobbins having greater thread yardage the number of bobbin exhaustions and seam repairs is greatly lessened.

A second disadvantage, inherent in the standard steel bobbin, is its weight. For example, an empty steel bobbin of a particular style will weigh approximately 14 times as much as the same style bobbin of the paper shell

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type. The substantially greater weight of the steel bobbin greatly increases its tendency to overspin in the sewing machine bobbin case, as fundamentally overspinning is caused by the bobbin continuing to rotate after the operator has stopped the sewing machine. Overspinning is most evident in high speed sewing machine operations, which in commercial sewing is the rule rather than the exception.

The paper bobbin was developed primarily to overcome the above mentioned faults in the standard steel bobbin.

The light weight of the paper bobbin substantially reduces overspinning; its cheapness of manufacture permits the bobbin to be discarded when empty; and by winding the thread on a paper core of greater axial length than desired in the finished bobbin and thereafter compressing the core and the thread mass axially, substantial thread yardage is obtained thereon.

As above pointed out, the paper shell bobbin provided definite improvements over the steel bobbin in these aspects; however, it has been found that the paper shell bobbin has other fundamental disadvantages which have prevented its complete acceptance in the garment manufacturing industry.

For example, the paper bobbins are fragile compared to the steel bobbin and great care must be exercised to prevent the paper side flanges from coming off, or being torn and nicked. Since the thread is often guided across the inner edge of the bobbin side flanges, even small nicks and tears will cause breakbacks when defective bobbins are used.

A further disadvantage inherent in disposable bobbins of the paper shell construction now in use is the effect of humidity upon the bobbin. As hereinbefore described, in manufacturing the paper shell bobbin the thread is wound on a core and then the thread and core are compressed axially to nearly half of its original width, in a normally dry atmosphere. When these bobbins are exposed to moisture, the tightly compressed forms swell as the paper flanges do not have sufficient inherent strength to resist the pressure of the swelling thread mass, thus rendering the bobbin unfit for use.

It has been found that the above described advantages of the paper shell bobbin can be achieved, without its inherent limitations, by the filled bobbin of the invention and it will be seen that these and other objects and advantages of the thread packages, and of the method of producing them are obtained by the process of the invention, which generally comprises the steps of winding thread upon a plastic bobbin, comprising a longitudinal core and side flanges integral with the core at both ends thereof, under a pressure effective to warp the flanges from their unstrained position. The filled thread package of the invention generally comprises a plastic bobbin consisting of a core, side flanges integral with the core, and a cylindrical mass of thread wound upon said core under pressure whereby the side flanges exert a compressive elastic stress on the thread mass.

The invention will be more particularly described with reference to the illustrative embodiments thereof shown in the accompanying drawings in which:

Fig. 1 is a sectional view of an unfilled bobbin constructed in accordance with the principles of the invention;

Fig. 2 is a sectional view of the bobbin shown in Fig. 1 which has been filled in accordance with one form of the method of the invention;

Fig. 3 is a sectional view of a modified form of bobbin in the unfilled condition;

Figs. 4 and 5 are sectional views at various stages of filling the bobbin shown in Fig. 3;

Fig. 6 is a fragmentary front elevation of one form of the apparatus adapted to fill thread packages in accord-

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ance with the method of the invention, with portions broken away for clarity; and

Fig. 7 is a side elevation of the device shown in Fig. 6.

With reference to the drawings and in particular to Figs. 1 and 2, 10 is a sewing machine bobbin made in accordance with the principles of the invention, comprising a longitudinal core 12 having integral end flanges 14.

The spool or bobbin 10 may be molded, turned, or stamped from any suitable light weight plastic material having physical characteristics such that the spool will possess a high tensile strength, and a substantial degree of elasticity as will be hereinafter pointed out.

Highly satisfactory spools may be molded from polystyrene, a clear, tough and transparent thermoplastic. Polystyrene is one of the lightest plastics, having unusually good dimensional stability at room and slightly elevated temperatures with substantially no cold flow characteristics and an outstanding water resistance, and it has been found that excellent sewing machine bobbins may be constructed therefrom in accordance with the method of the invention.

Other plastic materials which may be used in the construction of the bobbins of the invention include nylon, the acrylic resins and the cellulose esters and ethers.

In the embodiment of the invention shown in Fig. 1 of the drawings, the side flanges 14 of the bobbin are tapered from the core outwardly, the taper preferably being greater on the outside surfaces of the flange so that the inner surfaces of the flanges are substantially perpendicular to the longitudinal axis of the core 12.

It will be evident, however, that the side flanges of the unstressed spool may be uniformly tapered on both surfaces, or they may have a substantially uniform cross section throughout their lengths. In the latter case, the unstressed flanges would not be perpendicular to the core 12 but would project inwardly at their periphery.

It will thus be seen that in either form, the side flanges must be forced progressively outwardly, from the core portion to the periphery of the flanges, in order to have the outer surfaces of the flanges substantially perpendicular to the axis of the core 12 of the spool, as is shown in dotted lines in Fig. 1 and full lines in Fig. 2 of the drawings.

It has been found that a spool constructed as above described, of a material such as polystyrene, having a high tensile strength and good dimensional stability, may be wound with thread under a pressure sufficiently great to place the side flanges under stress and to deflect the side flanges outwardly until the outer surface of the flanges are substantially perpendicular with the axis of the spool core, to provide a thread package having substantial thread yardage. The pressure of the thread winding operation is adapted to strain the flanges 14 outwardly so that the filled bobbin has flanges shaped substantially as desired in the finished product. In this way, it is possible to obtain the full advantages of all of the thread space of a bobbin formed in the conventional manner, but with the added advantage of having side flanges under stress and not readily susceptible to further outward flexure.

It has been found that with bobbins so constructed of polystyrene and wound under high pressure, it is possible to place as much as 105 yards of thread on a sewing machine bobbin of a given style, whereas the same style in the conventional paper shell construction will hold only about 80 yards of the same type of thread. However, allowing a large margin of safety both as to the stress upon the spool side flanges and the tension under which the thread may be wound without damage thereto, thread packages carrying from about 90 to 95 yards are easily obtainable.

In order to obtain the necessary winding pressure and the controlled deflection of the side flanges of the

spool, it has been found advantageous to use pressure rollers or pads to obtain the necessary compaction of the thread mass and to wind the bobbin with supplementary side supports. In Figs. 6 and 7, there is shown one form of an apparatus adapted to efficiently fill the thread packages of the invention. In the drawings, 16 is a base plate which supports the bobbin winding apparatus. Supported from the base plate are the headstocks 18 and 20 which form the bearings for the driver and driven centers 22 and 24, respectively. Each of the center members 22 and 24 is provided with flanges 26 and 28, of a diameter at least as great as the diameter of the side flanges of the bobbin spool to be wound. The flanges 26 and 28 thus form supports for the spool side flanges during the high pressure winding and also control the amount of deflection of said side flanges of the spool.

The pressure applying member in the preferred form of the invention is a roller 30 supported from the base 16 by a standard 32, and a bifurcated member 34, having a spindle 36 which is slidably supported in the standard. A spring 38 is adapted to urge the roller 30 into contact with the thread mass and may be provided with a pressure adjusting screw 40.

The roller 30 has a width slightly less than the minimum side clearance between the flanges 14 of the unstressed bobbin to prevent the side flanges from scraping the pressure roller. It will be noted therefore that the clearance between the roller and the side flanges of the bobbin will increase as the winding operation nears completion, due to the outward deflection of the side flanges 14. In the space thus formed between the side flanges of the spool and the pressure roller 30, the thread being wound is "out of control," that is, it is no longer under the influence of the thread traversing effect of the roller 30. The thread, therefore, has a greater tendency to make several rounds about the core of the bobbin before it comes back under the thread traversing control of the roller, thus forming a build-up section or fillet, at the side flanges. The build-up is very susceptible to bruising by the pressure roller causing damage to the thread. The degree of build-up under these conditions will vary substantially according to the size of the thread and to the size of the bobbin being wound. It has been found that this difficulty may be substantially eliminated and a level wind produced by adjusting the distance of the last thread guiding point 42, before the thread goes onto the bobbin and under the pressure roller 30. The further the distance between the guide 42 and the bobbin to be wound, the greater is the tendency to lose control of the thread, thus increasing the thread build-up. As the guiding point is moved inwardly of the bobbin the opposite effect is encountered, and at very short angles a hollowing effect may occur between the edge of the pressure roller 30 and the side flanges 14 of the bobbin.

While the form of the winding apparatus shown in Figs. 6 and 7 is adapted for winding a single bobbin, it is apparent that in the commercial application thereof various modifications and changes may be made, for example, the apparatus would be adaptable to wind many bobbins simultaneously and the pressure regulating means for the roller 30 may be automatically controllable to provide the necessary pressures for various thread diameters and the like.

It will be apparent from the foregoing description of the winding apparatus of the invention that substantially complete control over the degree of deflection of the side flanges of the bobbin of the invention may be obtained by merely varying the type and form of the guide flanges 26 and 28. Therefore, filled bobbins having stressed side flanges which are perpendicular to the axis of the core of the spool may be produced, or the side flanges may be deflected inwardly or outwardly therefrom. This provides the filled thread package of the invention with a specific advantage not obtainable in

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bobbins having unstressed side flanges, for the bobbin thus formed has a shape which changes as the unwinding of the filled bobbin progresses, providing a constantly varying frictional engagement with the side walls of the bobbin case. This is particularly important as constant thread tension is desired in sewing machines.

When the standard bobbin is full the unwinding tension on the thread is much less than when nearly empty, due to the greater diameter of the thread mass and the fewer revolutions required of the bobbin to produce a given thread yardage. However, by controlling the maximum deflection of the side flanges of the bobbin of the invention, it is apparent that a bobbin may be produced which will frictionally engage the side walls of the sewing machine bobbin case at the perimeters of the side flanges when the bobbin is full, and then slowly and progressively reduce the drag or frictional engagement with the bobbin case as the thread is unwound and the stress on the bobbin side flanges is released until the bobbin only engages the bobbin case at its core when the bobbin is nearly empty. Thus, while the tension required to remove the thread from the bobbin that is nearly empty increases due to the decreased thread mass diameter, it is compensated by the decreased frictional engagement of the bobbin side flanges with the bobbin case, thus providing a substantially uniform bobbin thread tension during the sewing operation.

With reference to Figs. 3 through 5 of the drawings, there is shown a modified form of the invention. In the drawing, 10' is a bobbin spool, comprising a core portion 12' provided with integral side flanges 14'.

The bobbin spool 10' may be molded, turned, or stamped as hereinbefore described with reference to the bobbin 10, of any suitable plastic material. However, molded spools of polystyrene have proved very satisfactory.

As is shown in the drawings, the side flanges 14' of the bobbin are tapered radially outwardly, the taper preferably being confined to the inside surface of the side flanges so that the outer surfaces of the bobbin are substantially perpendicular to the longitudinal axis of the core portion.

It will be evident, however, that the side flanges of the unstressed spool may be tapered on both surfaces, or that the side flanges may have a substantially uniform cross section throughout.

A bobbin constructed as above described, of a plastic material having a high tensile strength and good dimensional stability may be wound with thread or the like under a high pressure sufficiently great to place the side flanges under stress and to deflect them outwardly under controlled conditions substantially beyond the perpendicular with respect to the axis of the spool core. A bobbin so wound under high pressure is shown in Fig. 4 of the drawings with the original position of the unstressed side flanges of the bobbin shown in dotted lines. The pressure of the thread upon the side flanges during the winding or filling operation is adapted to urge the flanges 14' outwardly so that the filled bobbin has a substantially greater cross sectional area than is desired in the finished product.

The filled bobbin, having stressed and deflected side flanges, is then placed in a press having die faces which conform to the shape and size of the finished bobbin. The press is closed and the wound bobbin is placed under sufficient pressure to further compress the wound thread mass and to return the side flanges 14' to their original undeflected position as is clearly shown in Fig. 5 of the drawings.

While in the drawings the final pressing operation has compressed the thread mass 15 to eliminate substantially all of the deflection of the bobbin side flanges, it is evident that the pressing pressure may be varied substantially and that the side flanges of the finished bobbin may be at a position different from the original undeflected position.

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For example, a molded bobbin, as shown in Fig. 1, may be wound under sufficient pressure so that its side flanges are deflected substantially beyond the perpendicular with reference to the axis of the core portion, and the final compression of the thread mass may be adjusted to return the side flanges to a position which is perpendicular to the axis of the core.

The apparatus shown in Figs. 6 and 7 of the illustrative embodiments of the invention and hereinbefore described with reference to the bobbin shown in Figs. 1 and 2 may be used to obtain the necessary pressure on the thread and the controlled deflection of the bobbin side flanges. When this form of winding and supporting apparatus is employed the supporting flanges 26 and 28 of the device should be beveled radially outwardly to conform to the shape desired in the wound bobbin prior to the compressing operation, wherein the thread mass is compressed and some or all of the deflection of the bobbin side flanges is removed.

From the foregoing description it will be seen that improved thread packages and methods of making them are provided whereby the aims, objects and advantages of the invention are fully accomplished.

It will be evident that various modifications may be made in the construction and form of the thread package and in the methods and apparatus for making them. For example, it is contemplated that in commercial winding apparatus for the process of the invention a plurality of spools may be simultaneously wound on a common spindle, and only the outer side flanges of the end bobbins would have flange support members, as adjacent flanges of the inner bobbins would provide the necessary support for each other.

I claim:

1. In the production of thread packages the step comprising winding thread upon a plastic bobbin consisting of a longitudinal core, side flanges integral with the core at both ends thereof, and the inner and outer surfaces of said side flanges tapering from said core to the peripheral edges thereof under a pressure effective to deflect the side flanges from their unstrained position while providing support for the outer surfaces of said side flanges to limit the deflection thereof to a predetermined amount.

2. In the production of thread packages the step which comprises winding thread upon a plastic bobbin consisting of a longitudinal core and flanges integral with the core, the outer surfaces of which taper inwardly with respect to the radial plane at the end of the core, under a pressure effective to bring the side flanges into substantial alignment with the radial plane at the end of the core.

3. In the production of thread packages the steps comprising winding thread upon a plastic bobbin consisting of a longitudinal core and side flanges integral with the core at both ends thereof under a pressure effective to deflect the side flanges from their unstrained position and then axially compressing the wound bobbin to reduce at least a part of the deflection of the side flanges.

4. In the production of thread packages the steps comprising winding thread mass upon a plastic bobbin consisting of a longitudinal core and side flanges integral with the core at both ends thereof, under a pressure effective to deflect the side flanges from their unstrained position and then axially compressing the wound bobbin to return the side flanges to their undeflected position.

5. In the production of thread packages the steps comprising winding thread upon a plastic bobbin consisting of a longitudinal core and flanges integral with the core at both ends thereof under a pressure effective to deflect the side flanges outwardly of the radial plane at the end of the core, and then axially compressing the wound bobbin to return the side flanges into substantial alignment with the radial plane at the end of the core.

6. The invention defined in claim 2 wherein the thread

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is wound upon the bobbin while providing support for the outer surfaces of said side flanges to limit the outward deflection of said side flanges to a predetermined inward taper with respect to the radial plane at the end of the core.

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655,877
935,263
1,481,243
1,961,730
2,254,606

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Kissel et al. ----- Aug. 14, 1900
Chapelle ----- Sept. 28, 1909
Snyder et al. ----- Jan. 15, 1924
Baker ----- June 5, 1934
Gomez ----- Sept. 2, 1941

References Cited in the file of this patent

UNITED STATES PATENTS

260,734 Baker ----- July 11, 1882