May 25, 1937. E. F. HATHAWAY 2,081,331

YARN SPOOL

Filed Nov. 4, 1933

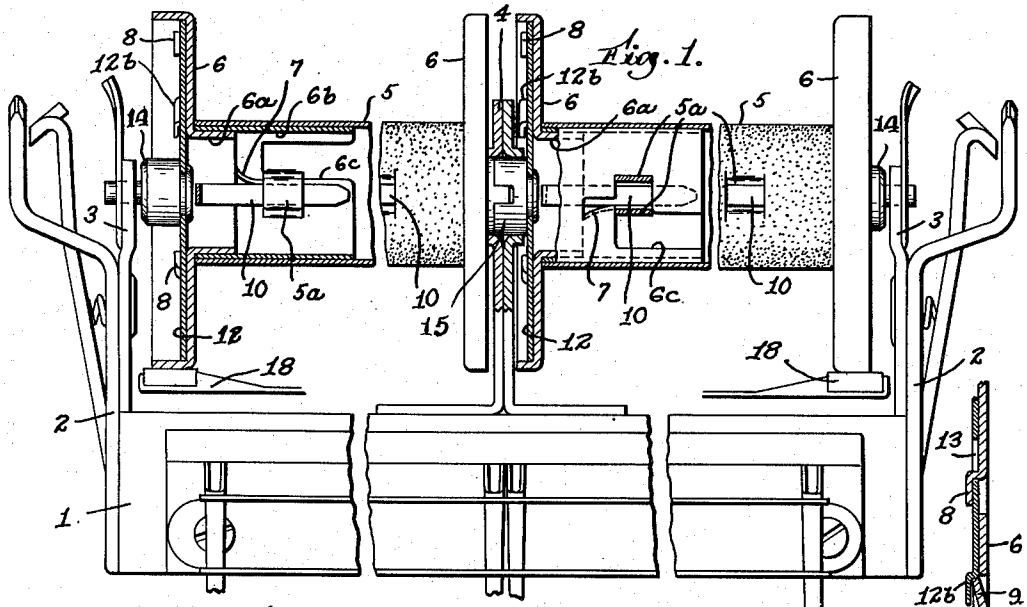


Fig. 1.

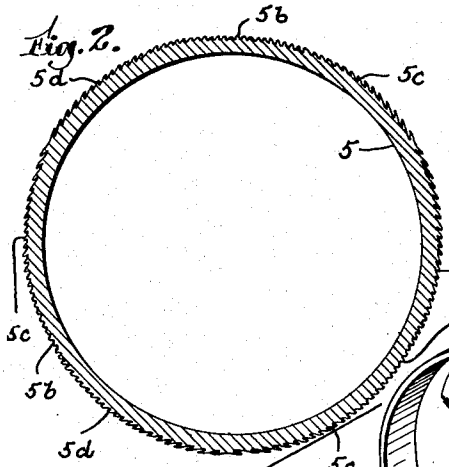


Fig. 2.

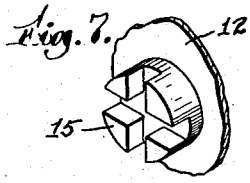


Fig. 7.

Fig. 5.

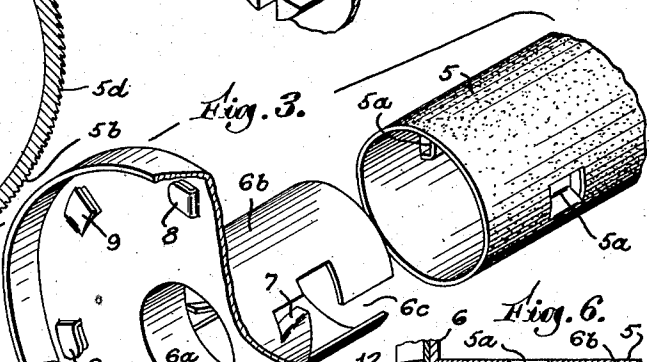
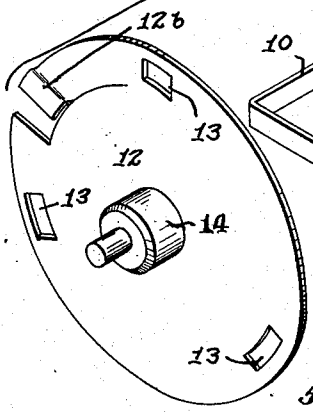


Fig. 3.



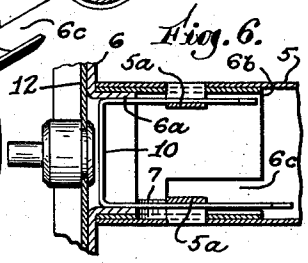


Fig. 6.

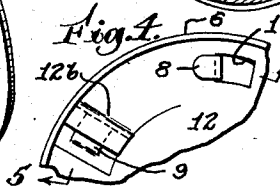


Fig. 4.

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YARN SPOOL

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12 Claims. (Cl. 242—124)

This invention is intended to improve the construction and serviceability of yarn spools and especially that type of yarn spool used for supplying the tuft yarn for weaving pile fabrics of the Axminster type, in which yarns of different colors are wound in a predetermined order or pattern arrangement on spools to be mounted in a tube frame to furnish the supply of tuft yarns in proper sequence to form the desired pattern.

While all-metal tube frame spools have in large measure supplanted commercially the older types of wooden barrel yarn spools, because of certain practical advantages, yet such spools are not wholly satisfactory by reason of the fact that it has been found difficult to secure proper adhesion or clinging of the inner yarn ends to the surface of the metallic barrel upon which the yarn is wound. In consequence of the tendency of the yarn to slip on the surface of the metallic barrel, it is not usually practicable to advantageously consume the last four or five turns of the yarn next to the barrel, since when the yarn lengths have been unwound to this point their slippage prevents proper tensioning of the yarn being delivered at this stage of exhaustion of the yarn supply of the spool. Accordingly, the practice has obtained of discarding the last few turns of yarn and this obviously involves a very substantial waste of expensive material when one considers the hundreds of yarn ends wound on a single spool and the hundreds of spools used in a single loom.

The mere roughening or pitting of the surface of the spool has not satisfactorily solved this difficulty, but I have found by experiment that the long desired clinging of the yarn to the surface of the spool may be secured by forming upon the periphery of the spool barrel numerous minute spines or barbs inclined at an acute angle to planes tangent to the peripheral part of the barrel where such spines are located. Preferably these minute hook-like barbs or spines should be inclined in opposite directions at different areas around the periphery of the spool so that the yarn will cling to the barrel when wound on it in either direction. Oftentimes when winding a yarn spool, by inadvertence, the pattern yarns are wound in the direction reverse to that required to form the intended pattern and, in order to avoid the expense of rewinding the spool either for a single tube frame or a multiple spool tube frame, the spool should be readily reversible end for end. It is also advantageous to be able to use a pattern spool not only in different positions in the same tube frame, but to use it in different looms that may have differently constructed or differently dimensioned bearing brackets for receiving the various types of spool journals or gudgeons that are in use and, to meet this situation, I have provided an improved construction embracing gudgeon discs detachably interlocking with end heads of the spools and, to increase the range of adaptability of the spools to different tube frames, I have provided a novel construction for interlockingly attaching the end heads themselves to the spool barrels.

In the accompanying drawing is illustrated practical embodiments of the aforesaid improvements, in which

Fig. 1 is a front elevation, partly in vertical section and partly broken away, to illustrate the novel features of construction embodying the principles of my invention.

Fig. 2 is a cross sectional view of a tubular spool barrel on an enlarged scale showing peripheral areas formed with yarn-engaging hook-like barbs for holding the yarns against slip around the spool, it being understood that for purposes of clear illustration the individual barbs are shown on a magnified or exaggerated scale.

Fig. 3 is a perspective view showing in separate relationship, but in coaxial alignment, one end of a spool barrel and its associated end head, locking key and reenforcing disc.

Fig. 4 is a detail showing in end elevation the interlocking attachment of the gudgeon disc to the end head.

Fig. 5 is a detail on the sectional line 5—5 of Fig. 4 further illustrating the interlocking construction between the end head and its gudgeon disc.

Fig. 6 is a central vertical section through one end of a spool on a plane at right angles to the plane of the corresponding portion of the spool in Fig. 1.

Fig. 7 is a perspective view illustrating one form of gudgeon disc that may be used on the opposite end of the spool barrel to that shown in Fig. 3.

In the practice of this invention according to the embodiment thereof illustrated in the drawing, I employ a tubular barrel 5 of cylindrical form having a novel external surface formation, as best illustrated in Fig. 2, characterized by a series of minute spines or barbs 5c covering longitudinal arcuate strips at intervals around the periphery. By preference a portion of the barbed areas of the surface of the spool has the barbs pointing in one direction, as shown at 5c, to form minute hook-like projections inclined in

a counterclockwise direction, while other peripheral areas are formed with barbs 5^d having the opposite inclination.

It will be noticed that the arcuate areas between two oppositely inclined barbed areas does not have the marked inclination of the barbs shown at 5^c and at 5^d. These intermediate areas 5^b interposed between two oppositely barbed areas are due to the method of producing this novel surface of the yarn spool barrel, which I have found advantageous and economical for the intended purpose. To secure this result I use an air blast apparatus having, in this case, three nozzles arranged at equal intervals about the periphery of an inserted tube and through these nozzles is directed a powerful air blast carrying minute particles of steel. The nozzles are set radially of the inserted tube and the tube is given an axial movement or traverse. As the air blast and its conveyed cutting particles flares outwardly toward the tube, it will be evident that those particles travelling on radial lines will simply pit the surface of the metal tube, while the particles that travel on lines oblique to the radii of the tube will slightly undercut or dig into the surface of the metal very slightly raising the upset portions of the metal into minute hook-like projections. Although these barbs, thus formed and inclined in opposite directions, are very minute, yet in practice they present a surface to which the yarn clings or adheres with sufficient tenacity to avoid the objectionable slip when the yarn has been exhausted to the last few turns around the barrel and thus it becomes possible to greatly reduce the loss or wastage of yarn, since the yarn still clings and holds its tension when exhausted down to the last single turn.

Since the apparatus for producing this novel yarn spool bearing forms no part of the present invention the same will not be illustrated or described in detail and it will be understood that I do not confine myself to the described method of producing a yarn spool barrel having circumferentially inclined barbs for engaging and holding the yarn. It will be understood that the barbs are of very minute dimensions and ordinarily are markedly visible only on inspection with a magnifying glass, although the direction of the barbs can readily be determined by the sense of touch. Since it is desirable that the yarn-engaging surface of the spool shall hold the yarn against slip when the yarn is wound on in either direction, the reverse inclination of the barbs of different barbed areas is highly advantageous.

To permit quick and easy reversal of the spool for different types of bearings in the same tube frame and to adapt each spool for use in differently dimensioned bearings in different tube frames, I have provided an end head construction having novel characteristics which make the spools capable of practically universal application, so that a very much smaller stock of pattern spools may be carried in stock than has been the case where spools having identical patterns must be multiplied in number to adapt them for use in differently constructed tube frames for different looms.

I will now describe the construction by which the end heads themselves are readily but securely detachably interlocked with the end of the tubular barrel. In Fig. 1 I have illustrated a conventional type of tube frame comprising the carrier bar **1**, the suspension ear or hanger **2** and the spool supporting bearing members **3** and **4**. The end head **6**, shown for the purpose of illustration, is of the well known flanged rim type and has its central portion struck-up into an offset cylindrical flange 6^a, which is preferably extended in length by welding, or otherwise firmly securing thereto, a tubular extension 6^b for the purpose of giving greater leverage to resist lateral strains upon the spool heads which the spools may incur in rather rough handling or otherwise.

The tubular extension or hub 6^b is dimensioned to fit snugly inside the bore of the spool barrel **5** and at its inner end at diametrically opposite points is formed with L-shaped slots 6^c forming the female members of a bayonet joint. At opposite points of the barrel are formed indented bosses or loops 5^a projecting inwardly and dimensioned to slide easily in the L-shaped slots 6^c. On the outer edge of the transverse portion of the L-shaped slots are struck-up at diametrically opposite points inwardly turned lips **7** forming stop shoulders, for a purpose presently to be described.

As will be understood by reference to Fig. 3, the hub 6^b, with its opposite slots 6^c aligned with the indented bosses or loops 5^a of the barrel, is pushed into place until the transverse notch or leg of the slot registers with the loop 5^a. Rotation of the barrel in a counterclockwise direction advances the boss 5^a into the circumferentially offset portion of the slot, so that the barrel is firmly held against longitudinal movement in relation to the end head, the parts being dimensioned so that the end edge of the barrel forms a close contact with the adjacent face of the end head **6** to avoid leaving any crack for the penetration of yarn. To lock the barrel against rotative movement on the end head, a U-shaped key **10** of pressed metal, with its opposite prongs dimensioned to slide along the inside of the hub 6^b in position to pass through the loops 5^a, is inserted as shown in Fig. 1 and Fig. 6.

The inserted key **10** is held against accidental removal by means of a gudgeon disc **12**, which is interlocked in face to face relationship with the outer flat face of the end head disc **6**. The end head is made of relatively soft steel or other metal, which can be readily drawn into the desired shape. Preferably, the gudgeon-carrying and reenforcing disc **12** is made of harder steel so as to oppose a strong resistance to deformation or distortion of the end head **6**, due to rough handling, accidents or the like. The end head disc has at three equidistant points near its outer edge three struck-up hook-like flanges or lips **8** in parallel offset relation to the plane of the end head disc. There is also provided a slightly upset lip **9** forming a stop shoulder pointing in a direction opposite to the free ends of the hooks **8**. The gudgeon disc **12** is provided at three equi-distant points near its periphery with punched out openings or apertures **13** dimensioned to fit over the offset hooks **8** and located to register therewith. Between two of these hook-receiving apertures **13** there is formed an arcuate tongue 12^b, partly severed from the body of the disc **12** and having its outer end slightly offset to form a short radially extending shoulder to engage the stop lip **9** of the end head disc **6**. To the central area of the gudgeon disc **12** there is riveted, welded or otherwise secured, any suitable form of gudgeon **14** appropriate to fit some known type of bearing bracket forming the support for the spool.

The assembling of the parts will be readily understood from an inspection of Fig. 3 of the drawing. The end head is telescoped into the end of the barrel **5** and, when it reaches the inward limit of its movement, it is rotated in a

clockwise direction to interlock with the loop bosses 5a. By this rotative movement the stop lip 7 is brought into alignment with the adjacent side portion of the loop, so that when the key 10 is inserted it passes through the side loops and has lateral engagement with the lip or shoulder 7, thereby preventing the rotative movement of the barrel in relation to the end head. Next, the gudgeon disc 12 is applied to the outer face of the end head disc 6 with the apertures 13 taking over the hooks or lips 8 and is then pressed firmly against the face of the end head and rotated in a clockwise direction as far as the overlapping hooks will permit. At this point the spring tongue 12b has its outwardly offset shoulder sprung into position behind the stop lip 9, so that the gudgeon disc is securely locked against rotation in either direction. This is important because the end heads usually retarded by the engagement of a spring pressed brake member 18 to produce the required tension on the yarn and it is important that the gudgeon disc should be securely interlocked with the end head, so that the two parts necessarily move in unison. Moreover, when the gudgeon disc is made of higher carbon steel to resist deformation of the head, it is desirable that it should be very snugly interlocked with the head for reenforcing purposes. Obviously different types of gudgeons may be secured to different discs. In Fig. 7 I have shown an interlocking style of gudgeon 15 secured to the gudgeon or reenforcing disc.

By the above described improvements I have made provision for largely eliminating the waste of yarn or the loss of tension on the last few windings on the spool and have made it practicable, without loss of efficiency, to carry in stock a greatly reduced number of spools of identical patterns, since each spool is readily adaptable for use in any other commercial type of tube frame, as well as in different positions in the same tube frame.

What I claim is:

1. A yarn spool comprising a yarn-supporting tubular barrel, end heads firmly secured thereto by releasable interlocking connection, and gudgeon-carrying discs releasably interlocked to the outside faces of the end-heads thereby permitting interchange of gudgeons and providing reenforcement for the end heads.

2. A yarn spool comprising a cylindrical tubular barrel provided near its ends with inwardly projecting locking members, end heads having annular hub members dimensioned to form telescopic engagement with the interior of the barrel and having angle slots extending from the inner ends of the hubs and positioned to register with said inward locking members of the barrel, and means insertable and removable through the bore of the hub to interlock with said inward members of the barrel to prevent rotation of the heads in relation to the barrel.

3. A tubular barrel having interior loop-like bosses, end heads having tubular hub members adapted to fit inside the barrel and having bayonet joint slots for receiving said loop members, and a key member insertable through the hub to pass through said loops and prevent rotation of the head relative to the barrel.

4. A yarn spool comprising a tubular barrel, end heads releasably secured to said barrel and having exterior hook-like members in offset relation to the outer faces of the end heads, and gudgeon-carrying discs provided with spaced apertures adapted to receive and form interlocking connection with said hook members to secure the gudgeon discs interchangeably to the respective end heads.

5. A yarn spool comprising a tubular barrel, end heads secured thereto and having offset locking hooks on their outer faces, reenforcing discs provided with apertures for receiving said hooks to permit interlocking of the discs by rotative movement of the apertured disc in relation to said hooks, and means for normally preventing reverse rotation of said discs.

6. In a yarn spool, the combination with a tubular metallic barrel whose peripheral surface is provided with reversely inclined barbs for holding the yarn wound thereon against slippage in either direction circumferentially of the spool, of end heads provided with interchangeable gudgeon discs permitting reversal of the spool end for end to allow unwinding of the yarn in either direction.

7. A yarn spool comprising a tubular metallic barrel whose peripheral surface is provided with reversely inclined barbs for holding the yarns wound thereon against slippage in either direction circumferentially of the spool, and interchangeable end heads firmly and releasably secured to the opposite ends of the barrel by means of interlocking members formed, respectively, on the end heads and on the barrel to permit reversal of the end heads to compensate for end to end reversal of the barrel.

8. A tubular metallic barrel for a yarn spool having portions of its peripheral surface provided with minute barbs inclined to the outer surface of the barrel, some of said barbs being inclined in one direction circumferentially of the barrel and others in the reverse direction to prevent circumferential slippage of yarn wound in either direction upon the barrel.

9. A yarn spool comprising a tubular cylindrical barrel having portions of its surface inwardly offset to form hollow bosses, an end head having inwardly projecting bayonet joint slots located to form interlocking engagement with said inwardly offset portions of the barrel to releasably interlock the end heads to the barrel, means for positively preventing rotative movement of the head in relation to the barrel, and a reenforcing gudgeon-carrying disc formed to have positive but releasing interlocking engagement with exteriorly offset hooks on the exterior faces of the end heads, whereby the end heads may be interchangeably interlocked with either end of the barrel and may be provided with appropriate supporting gudgeons.

10. A gudgeon member for rotatably supporting a yarn spool comprising a steel disc for reenforcing an end head of a yarn spool, said disc having permanently secured to its central area an axially disposed bearing gudgeon and being provided with circumferentially spaced recesses for receiving interlocking hooks on the face of the spool and head, said disc being provided with a spring tongue member arranged to releasably engage a stop on the end head to prevent accidental disengagement of the disc from the hooks.

11. A removable end head for a tubular yarn spool comprising a metallic disc provided with a laterally projecting tubular hub member formed with bayonet joint slots intersecting its outer end for interlocking with complementary members on the barrel of the stool, said hub members being provided with inwardly turned stop members for engagement with an inserted key, thereby preventing accidental release of the bayonet joint.

12. A barrel member for a yarn spool compris-

ing a metallic cylindrical tube whose peripheral surface is formed with minute pointed barbs inclined sharply to the surface of the barrel to prevent slippage of the yarn circumferentially of the barrel, said barrel having areas adjacent its ends inwardly depressed to form inwardly offset loops arranged to provide longitudinally opening passages adapted to form interlocking engagement with complementary members of detachable end heads.

EDGAR F. HATHAWAY.