Dec. 3, 1968 H. BAGGEN ET AL 3,414,212

WARP BEAM FOR TEXTILE APPARATUS

Filed Dec. 20, 1966

FIG. 1

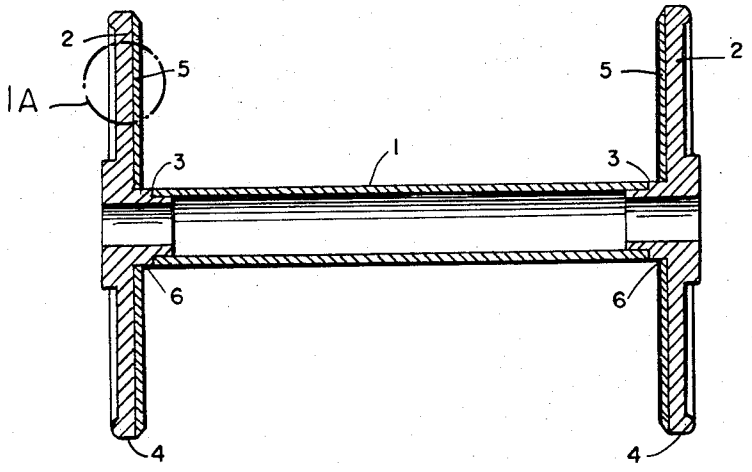


FIG. 2

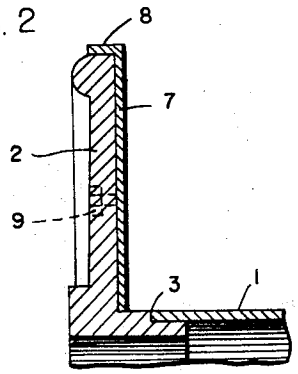


FIG. 3

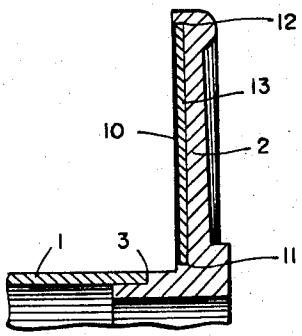


FIG. 4

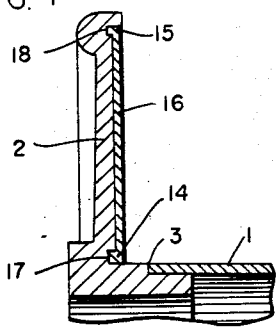
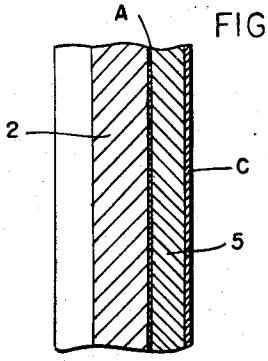


FIG. 1A



INVENTORS:
HUBERT BAGGEN
JOSEF EFFERN
WOLFGANG KAHLERT

BY: Marzall, Johnston, Cook & Root
ATT'YS

United States Patent Office 3,414,212 Patented Dec. 3, 1968

3,414,212

WARP BEAM FOR TEXTILE APPARATUS

Hubert Baggen, Oberbruch, Josef Effern, Heinsberg, and Wolfgang Kahlert, Oberbruch, Germany, assignors to Glanzstoff A.G., Wuppertal, Germany

Filed Dec. 20, 1966, Ser. No. 603,196
Claims priority, application Germany, Dec. 22, 1965, V 30,001
5 Claims. (Cl. 242—118.7)

ABSTRACT OF THE DISCLOSURE

A warp beam used for conveying threads or yarns in textile apparatus which consists of a tubular shaft with attached circular end flanges composed of a light metal with the inner facing surfaces of the flanges being covered by a thin steel plate to provide resistance to abrasion by threads being conveyed on the warp beam and to impact damage. The inner facing surfaces of the steel plate are preferably coated with a hard chrome layer.

It is well known that the flange inner surfaces of warp beams, sectional beams or the like must be in perfect condition in running off or conveying abrasive threads or yarns during textile operations. In general, such flanged warp beams consist of a light metal or metal alloy, i.e. a metal with a specific gravity of less than 5, and they are usually made by being cast or drop forged. The inner facing surfaces of the light metal flanges are always treated according to a special polishing process, because these surfaces must be extremely smooth and exhibit a very high degree of polish. However, it has been found that these surfaces have a quite unwished influence for the thread or yarn due to the abrasive effect and are easily damaged caused by impact during transportation of the empty warp beams, so that individual warp beams must often be removed from operation for a reworking of the surfaces.

Attempts have been made to protect the inner surfaces of the flanges against rubbing and corrosion and also to impart a certain degree of abrasion resistance to the surfaces by means of lacquers, eloxation or other similar treatment. However, these known treatments are unable to prevent the surfaces from being damaged, because they remain just as sensitive after such treatments as before with respect to the shock-like or impact effect on these surfaces. In this respect, it is not the surface characteristics of the flanges which are important but only the resistance to impact of the underlying substrate. Furthermore, the abrasion resistance achieved with known treating agents has been very slight and does not prevent abrasion and impact damage. Apart from the fact that the reworking or repolishing of the damaged warp beam surfaces has been very painstaking and time-consuming, textile operations are frequently hindered by severe damage to peripheral fibers on threads or yarns being run off the warp beam. Resurfaced flanges on the warp beams often possess minor flaws causing thread damage which could not be detected during such resurfacing.

One object of the present invention is to provide an improved warp beam structure in textile apparatus whereby it is possible to retain the essential lightness in weight of the warp beam while fully protecting the inner surfaces of the flanges from abrasion and impact damage.

Another object of the invention is to substantially reduce or completely eliminate the necessity of resurfacing the inner faces of the flanges on such warp beams.

These and other objects and advantages of the invention will become more apparent upon a detailed consideration of the following specification:

It has now been found, in accordance with the invention, that very satisfactory results in textile operations can be achieved by employing in combination with the textile apparatus for conveying threads, a warp beam consisting of a tubular shaft and two oppositely disposed circular flanges attached concentrically at either end of the shaft, both the shaft and flanges being composed of a light metal having a specific gravity of less than 5, and a thin steel plate connected to and covering the inner opposing faces of said flanges which are in running contact with thread conveyed thereover.

Surprisingly, it is possible to use a very thin steel plate with a thickness of about 0.5 to 3 mm., preferably 0.8 to 2 mm., as a means of protecting the flange inner surfaces without substantially influencing the economy of weight and proper functioning of the warp beam as achieved only by the use of a light metal. A very satisfactory impact resistance by using a steel which has a tensile strength of at least 60 kg./mm.^{2}.

Furthermore, the abrasion resistance of the steel surface can be best accomplished, for example, by means of a hard chrome coating. Thus, it has been established that a steel plate coated with a chrome layer having a thickness of 0.02 to 0.05 mm. is sufficient to avoid substantially all of the difficulties which are caused by thread or yarn abrasion and especially by impact damage during transportation of the empty beam. It is extremely important that the thickness of the steel plate with or without the chrome surface coating be kept as small as possible to avoid an excessive total weight of the warp beam. In this respect, the ratio by weight of the steel plate to the warp beam composed of a light metal must be maintained below a value of 1:15 to 1:10 depending from the warp beam size and length.

In order to attach the steel lining or face plate to the end flanges of the warp beam, any number of techniques can be used. The use of conventional metal-to-metal adhesives has proven to be most effective for adherence of the steel plate to the flange. However, it is also possible to stiffen the steel plate by ending and fitting it into corresponding grooves, bores or recesses in the light metal flange and then strongly fastening the plate to the flange by means of adhesives, soldering or welding or by means of suitably placed bolts which do not interfere with the smooth inner surface of the protective plate. Likewise, one can provide an inner steel plate lining bolted to the light metal flange and then adhere the outer protective steel plate to the inner lining by means of a metal-to-metal adhesive.

The invention is further illustrated in detail with reference to several different embodiments shown in the accompanying drawing wherein:

FIG. 1 is a cross-sectional view through the longitudinal axis of the warp beam constructed in accordance with one embodiment of the present invention;

FIG. 1*a* is a magnified section of one of the flanges shown in FIG. 1 so as to illustrate the presence of a hard chrome coating on the steel plate attached to the flange; and

FIGS. 2, 3 and 4 illustrate various other embodiments for attaching the steel plate to the flange on the warp beam.

Referring now to the drawing, the warp beam constructed in accordance with this invention consists first of all of the conventional structure of a central tubular shaft or spindle **1** and the opposing end flanges **2** which are connected with the shaft and are circular in shape so as to be mounted concentrically around the longitudinal axis of the shaft, for example by means of screw threads located at **3**. Of course, other conventional means can also be employed for attaching and fastening the end flanges

to the shaft. In all of the embodiments of this invention, the inner side or face of each of the flanges is covered with a circular ring-shaped steel plate **5**, which is preferably coated on its inner surface with a hard chrome layer C as indicated in FIG. 1*a*. The steel plate is most advantageously attached to the light metal flange by means of a convenitonal metal adhesive A as shown in FIG. 1*a*, and in this case the inner diameter **6** of the steel plate **5** extends up to the hub of the flange **2**, while the outer diameter of this steel plate is slightly smaller or bevelled inwardly from the outer periphery **4** of the flange **2**.

Another embodiment of the steel lining or protective plate is shown in FIG. **2** which generally corresponds with respect to its arrangement and inner diameter with the steel plate of FIG. 1. However, the outer rim **8** of the circular steel disk or plate is bent outwardly to fit over the outer periphery **4** of the flange **2**. In this instance, the steel plate can also be suitably fastened to the light metal flange with a known metal adhesive, but on account of the reinforcing or stiffening effect provided by the rim **8**, it is also possible to tightly screw the plate **7** by means of one or more suitable bolts **9** (shown in dotted lines) which are preferably strongly fastened on the outer or supporting side of the steel plate. In a similar manner, a steel inner lining can first be bolted to the flange and a second face plate made of steel adhered thereto.

A further embodiment is shown in FIG. 3, and in this case a circular portion on the inner face of the flange **2** has been cut away to form a circular recessed portion **13** with a depth corresponding to the thickness of the steel plate **10** which is then securely fastened in this recessed portion. The inner diameter of the circular steel disk or annular ring plate **10** is somewhat greater than the outer diameter of the warp beam shaft **1**, preferably about 5 to 20 mm. greater in diameter. At the same time, the outer diameter of the steel plate or ring is preferably about 10 to 50 mm. smaller than the outer diameter of the flange.

Still another embodiment similar to that shown in FIG. 3 is illustrated in FIG. 4. The circular steel plate **16** is similar in its dimensions to the plate **10** of FIG. 3, but an outwardly bent rim **14** and **15** is provided around the inner and outer diameters of the plate, respectively. These rims **14** and **15** fit into corresponding annular grooves recessed into the inner facing surface of the flange.

Other possible means of attaching the steel cover plate to the light metal flange will be readily apparent to one skilled in this art. For example, the plate can also be threaded or fitted onto the hub of the flange, e.g. by decreasing the diameter of the hub by an amount corresponding to a two-fold thickness of the plate and then providing a corresponding protuberance in the form of a sleeve or hub-like rim at the inner diameter of the plate so as to fit into the resulting recessed portion of the shaft which is normally extended by the hub of the flange. This inwardly projecting protuberance, sleeve or hub-like rim of the steel plate can be extended up to the point where it would join the shaft **1** at the edge **3** which previously contacted the hub of the flange. Also, this protuberance or sleeve can be threaded on its inner diameter to engage with corresponding threads on the hub of the flange.

It will be apparent that the means of fastening the steel plate or disk onto the inner face of the flange is not of decisive importance. Known means of fastening or connecting such thin plates can be used in every instance which will guarantee a strong joint and thereby remove any danger that the threads or yarns being wound on the warp beam will become damaged during running off or conveyance thereover. However, in accordance with the present invention, the use of metal-to-metal adhesives is especially advisable in order to ensure satisfactory results in preventing thread damage.

The construction of the warp beam in accordance with this invention permits considerable economies to be effected in carrying out textile operations continuously over a long period of time without any need for resurfacing the inner faces of the flanges or even replacing the protective steel plates. The warp beams function in a satisfactory manner even with the addition of these steel plates, and the damage caused by impact forces is reduced substantially as well as the possible damage which might otherwise be caused by abrasion.

The invention is hereby claimed as follows:

1. In textile apparatus for conveying threads, a warp beam consisting of a tubular shaft and two oppositely disposed circular flanges attached concentrically at either end of said shaft, said shaft and flanges being composed of a light metal having a specific gravity of less than 5, a thin steel plate having a thickness of 0.5 to 3 mm. and a tensile strength of at least 60 kg./mm.^{2} connected to and covering the inner opposing faces of said flanges which are normally in running contact with thread conveyed thereover, and a hard chrome layer of a thickness of 0.02 to 0.5 mm. coated onto the inwardly facing surface of each steel plate.

2. A warp beam in textile apparatus as claimed in claim **1** wherein said steel plate has a thickness of 0.8 to 2 mm.

3. A warp beam in textile apparatus as claimed in claim **1** wherein said steel plate is in the shape of a flat, circular, ring-shaped disk having an inner diameter which is 5 to 20 mm. larger than the outer diameter of said shaft and also having an outer diameter which is 10 to 50 mm. smaller than the flange outer diameter, and said plate is mounted in a recessed portion of the inner face of each of said flanges so as to be flush with said inner faces.

4. A warp beam in textile apparatus as claimed in claim **1** wherein said steel plate is connected to said flange by means of a metal-to-metal adhesive.

5. A warp beam in textile apparatus as claimed in claim **1** wherein the ratio by weight of the steel plate to the light metal warp beam is less than about 1:10.

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GEORGE F. MAUTZ, *Primary Examiner.*