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Stahl

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[54] **MOLDED ELASTOMER BRAIDING MACHINE BOBBIN CARRIER**

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[52] **U.S. Cl.** **87/55**, 87/50

[51] **Int. Cl.** **D04c 3/14**

[58] **Field of Search** 87/37, 38, 50, 55, 87/57, 56

[56] **References Cited**

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[57] **ABSTRACT**

The base of braiding machine bobbin carriers is molded of an elastomer, polyurethane. Weight of the carrier is greatly reduced, wear of the guiding element in the customary multiple track braiding machine is decreased, and the most important effect is that noise is greatly reduced, for example by a factor of ten, (10 db), and even when braiders using the carrier are operated at top speed noise levels can be kept within legal limits.

4 Claims, 3 Drawing Figures

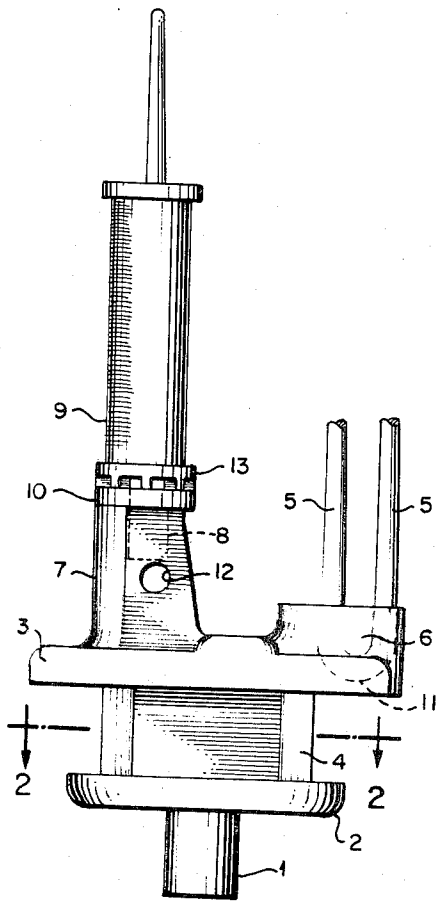


FIG. 1

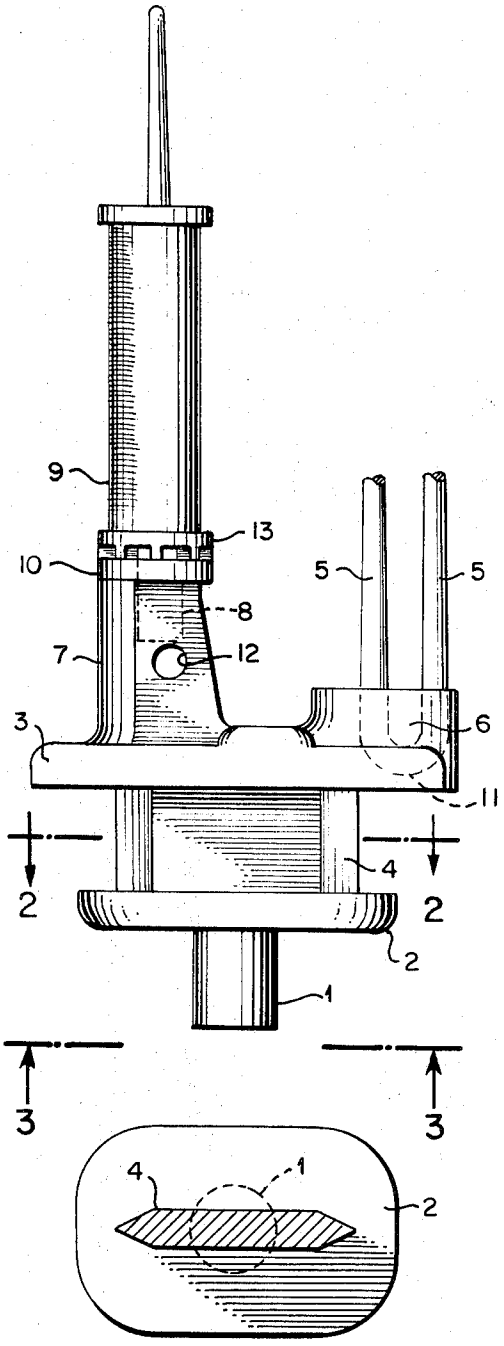
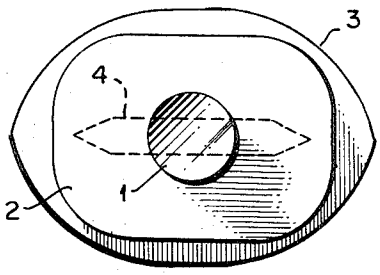


FIG. 2

FIG. 3



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MOLDED ELASTOMER BRAIDING MACHINE BOBBIN CARRIER

BACKGROUND OF THE INVENTION

Braiding machines rotate yarn or thread package bobbin carriers around a plate provided with tracks which cause the carriers to weave in and out as they move around and so effect the braiding.

In the past carriers have been usually made with cast iron bases and generally with metal pins or pillars. One of the pins constitutes a spindle which carries the thread or yarn package and, depending on the particular design of bobbin carrier, there may be one or two pins carrying tensioning means for the yarn. The tensioning means may be a sliding weight or in the so-called "Mosspeed" carriers the tension is provided by springs. Usually also there are means for holding the bobbins of thread either at the top or at the bottom.

Problems have arisen by reason of several factors. Cast iron bases are relatively very heavy, and in a high speed braider centrifugal force and the sudden changes of direction as the carrier bases are constrained by the tracks to move in and out create heavy vibration and require large power if the braider is to be operated at reasonably high speeds. Since the member or element of the conventional braider base which follows the tracks usually has wedge-shaped edges, the problem of wear is a very real one, for of course the pressure per unit of area on the edges of the wedge-shaped element following the tracks can be extremely high. Recently laws have set sharp upper limits on noise in factories, the upper limit being usually about 90 dba, in which the decibels are measured, as is conventional, from a fixed standard, which is normally considered to represent noise which is not sufficient to be ordinarily perceptible or audible. The db scale of measurement being logarithmic, 90 dba represents a noise or sound one hundred million times above the zero point. This upper limit was fixed by the recent law as that which could be tolerated by a workman on eight hour duty without causing eventual deafness. Conventional bobbin carriers with cast metal bases often produce a noise level of 98 to 100 dba and even higher, in other words, sounds ten times above the limit at which deafness of the worker can result. As ordinary braiders operated at reasonable speeds are now illegal, the noise problem is vitally important and could threaten continued operation of braiding machines except at speeds so low as to represent very high cost operation, which in some cases can be prohibitive. This factor is, therefore, even more important than excessive power requirements, high vibration or excessive wear.

The problem of weight of bobbin carrier has been approached in various ways. The Scanlon U.S. Pat. No. 2,960,905, describes a bobbin carrier in which much of the base is relatively thin metal with molded nylon covering. This in fact lightens the base by a significant amount and so reduces vibration and power requirements substantially. However, the nylon covering of the metal elements possesses drawbacks. Nylon is not an elastomer and is, therefore, not capable of elastic deformation under the usual loads, a particularly serious matter because it can result in looseness so that the carrier does not follow the tracks as precisely and this can result in increased vibration even though the carrier is considerably lighter. Similar steel reinforced nylon carriers have also been used in Japan, and there is a mention thereof, without any detailed description, on page 139 of the book "Braiding and Braiding Machinery," W. A. Douglass. The statement is made that there is little or no information on the working life of the carriers.

It is with an improved, relatively quiet running, long wearing carrier that the present invention deals. As it is only with the design of the carrier, or more properly carrier base, that the present invention deals, reference is hereby made to the Scanlon patent, particularly to FIG. 7 thereof, for a description of typical braider tracks and operations.

SUMMARY OF THE INVENTION

The present invention replaces the metal or part metal bobbin carrier bases with a molded base of a particular type of elastomer, preferably polyurethane. Tests show that brading machines with bobbin carriers having bases according to the present invention operate at maximum speed within the legal noise limits. Even at top practical braiding machine operating speeds the noise does not exceed 90 dba. At the same time the elastomer has very long life, and since it is a true elastomer the edges of the element following the track cushion sudden changes of direction as they occur; and there is a marked reduction in vibration, which is unquestionably one factor in the improvement in noise level. The great advantage of legally acceptable noise is not offset by other drawbacks. There is no serious additional cost as molded polyurethane, although more expensive per pound than cast iron, lends itself to very economical molding operations. As a carrier is normally about half the weight of a cast iron carrier, power loss in the braider is greatly reduced and maximum output, in some cases actual increased production output, is possible due to lower power loss. In other words, the extremely important noise reduction is accompanied not by offsetting drawbacks but actually by additional advantages.

An extremely important property of the elastomer is low crystallinity. Materials having high crystallinity tend to resonate, and this contributes greatly to the general noise level. Also, the base is molded in one unit and does not require metal inserts except, of course, the pillar on which the bobbin mounts and the rods on which the tensioning means slide.

It should be noted that the present invention is not directed broadly to replacing metal with plastics, not even some plastics which exhibit elastomeric properties. Thus, for example, carrier bases molded from vulcanized acrylonitrile-butadiene-styrene rubber when vulcanized to a sufficient degree to be structurally sound and of adequate stiffness still produce noise levels of 95 dba. Some other plastics, such as high density polyethylene, still do not meet noise level requirements as the noise is about 93 dba, and the material is useless because the parts are not structurally sound. After a few hours running the carriers chip and crack and so are practically useless. Cellulose acetate while it permits a noise level within legal standards is not useful as the parts are not sufficiently rigid to function properly.

The essential novelty of the present invention lies in the base of the bobbin carrier. Thread package or bobbin spindles may be of metal, either steel or, if desired to save weight, aluminum, which are molded into the polyurethane base, and the pins for tensioning and the like are likewise molded in. Any of the tensioning means, such as sliding weights, springs in the Mosspeed

type of carrier and the like, may be used. In the Scanlon patent to which reference has been made above a particular kind of weight actuated latch is used combined with springs. This was Scanlon's invention and it is possible to mold his complicated latch mechanism into polyurethane bases of the present invention, and so such unusual and elaborate carrier designs are not excluded. It is preferred, however, to use more conventional tensioning means which are less costly and operate satisfactorily. Scanlon shows nylon bushings on the pillar or spindle carrying the thread package, and of course these can be used either in the elaborate and complicated carriers of Scanlon or on more conventional designs. It is an advantage of the present invention that it is quite versatile and usable with various specific designs of bobbin carriers.

It is a further practical advantage that the molded carrier bases of the present invention readily accept bobbin pillars and pins for tensioning as inserts. They are held firmly in the final molding, which may advantageously be injection molding. Carriers thus produced are firm integral structures. The pillars and pins may be of any suitable metal as their volume is sufficiently small so that even when made of steel they do not add a great deal of weight. Where desired, lighter metals, such as aluminum, may be used to reduce the weight still further. However, steel lends itself to the attachments for tensioning and is somewhat cheaper.

The particular elastomer used, polyurethane or elastomers having similar physical properties, not only solves the problems of noise reduction, high wear resistance and low weight, but also has the further advantage as compared with certain rubbers that it has a high resistance to oils. Braiding machines are, of course, lubricated, and it is almost impossible to keep oil from striking the surface of a bobbin base.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an elevation with the tensioning pins partly broken away;

FIG. **2** is a section along the lines **2—2** of FIG. **1,** and

FIG. **3** is a plan view looking up of the button of the carrier base.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. **1,** the base is provided with a round projection **1** which encounters the conventional gears driving the carrier. Immediately above the pin is a flange **2** which is connected to an upper flange **3** which projects further. The two flanges, which are of somewhat different shape, as can be seen in FIG. **3,** are connected by a wedge-shaped portion **4,** which is shown in detail in the section of FIG. **2.** This is the element which contacts the braider tracks during operation. As the braiding machine itself is not changed by the present invention, it is not illustrated in order not to confuse the drawings but reference is made to FIG. **7** of the Scanlon patent for a typical arrangement of tracks.

At one side of the flange **3** two pins **5,** shown broken away, are the conventional pins for carrying yarn tensioning means. They are molded in an oval-shaped projection **6** on one side of the flange **3.** On the other side there is a higher round projection **7** into which there is molded the pillar **8** carrying a package or bobbin **9.** Both the pillar and the bobbin are shown partially broken away and they are, of course, of conventional design. The upper portion of the projection **7** carries a circular flange or shoulder **10** on which the ratchet carrier **13** rests when the package of yarn is placed on the pillar **8.**

The pins **5** are really a single U-shaped rod with a bottom portion **11** which is molded into the base and provides additional keying to the base and also contributes to the stiffness of the pins.

Since the present invention does not change the elements of a bobbin carrier, other than the base itself, the conventional locking lever and intermittent tensioning device is not shown in order not to confuse the drawings. The lever pivot extends through the circular opening **12** in the shoulder **10.** As is conventional, locking levers lock on a ratchet carrier **13** which is part of the bobbin. In the drawing the carrier illustrated is of the bottom locking type. The two pins **5** are illustrated as suitable for intermittent spring tensioning of the yarn as in the conventional Mosspeed carrier.

As in all braiding machines and as indicated in FIG. **7** of the Scanlon patent to which reference is made, there are a number of guide tracks which contact the edges of the member **4.** Arrangement of tracks depends, of course, on the design of braid to be produced. The Scanlon patent shows three circles of tracks but the number and shape is determined, of course, by braid design.

In operation, as the carriers are moved around by the projections **1** which encounter conventional braider horn gears, (not shown), one or other wedge edge of the part **4** of the carrier base moves along the various tracks. As it moves in and out it has to change direction, and wherever these sudden changes of direction occur the elasticity of the elastomer permits momentary slight deformation, which greatly reduces vibration and noise. When a carrier base passes the point of sudden change, elasticity of the portion **4** permits the wedge edges to resume their normal position. It should be understood that this momentary elastic deformation is very slight, but it is sufficient so that vibration and noise are greatly reduced.

The base described above was injection molded, with the pillar **9** and pins **6** held as inserts in the conventional manner. The polyurethane used was a composition sold by the Upjohn Company under their designation "Pellathane" with a hardness of 74 to 75D. Any other elastomer of the same properties may be used, but must have the properties of sufficient rigidity to operate satisfactorily at high speeds, low crystallinity to prevent resonance, and retain enough elasticity to permit the minute deformation which cushions vibration and helps reduce noise. It should be noted that the thicknesses of the various parts of the molded element, which measures several inches, result in a structure which is fairly stiff though still a true elastomer. The light weight of the carrier and the high abrasion resistance of polyurethane, and having low crystallinity to reduce resonance, contribute to the long life of the carriers of the present invention.

I claim:

1. In a brading maching having bobbin carriers, and carrier provided with a bobbin pillar, thread tensioning means and a base including a gear contacting driving pin and a portion having wedge ends to follow a braiding machine track, the improvement which comprises a base including the portions having wedge ends integrally molded of an elastomer having the structural ri-

gidity of polyurethane and low crystallinity, the bobbin pillar and tensioning pins being molded into the base and forming therewith a firm and unitary structure.

2. A braiding machine bobbin carrier according to claim **1** in which the base is molded of polyurethane.

3. A braiding machine bobbin carrier according to claim **1** in which two tensioning pins in the form of a U are molded into the base, the bottom of the U providing additional keying to the base.

4. A braiding machine bobbin carrier according to claim **3** in which the base is molded of polyurethane.

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