

**2,585,097**

Filed Sept. 9, 1949

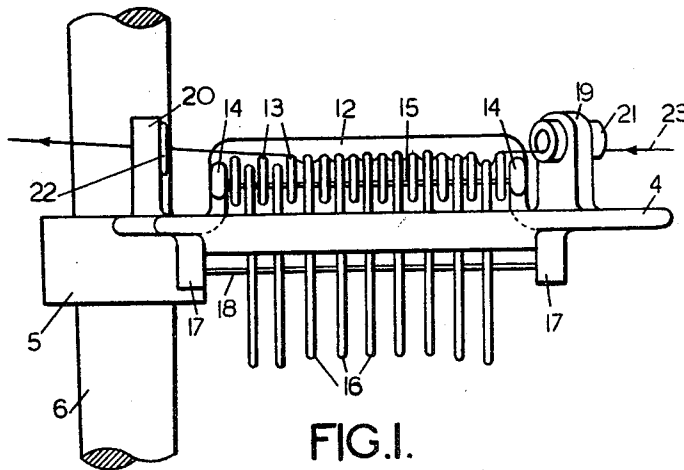


FIG. 1.

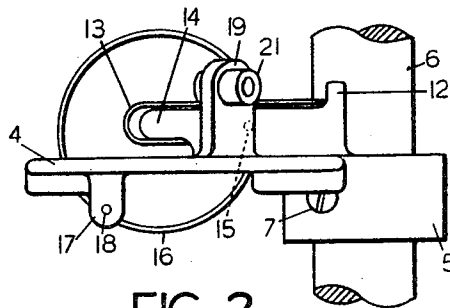


FIG. 2.

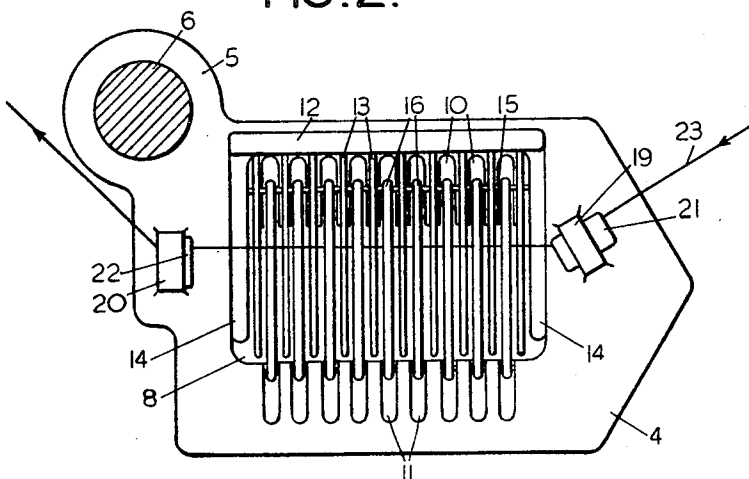


FIG.3.

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## UNITED STATES PATENT OFFICE

2,585,097

## TEXTILE APPARATUS

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Application September 9, 1949, Serial No. 114,762  
In Great Britain October 8, 1948

7 Claims. (Cl. 242—154)

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This invention relates to textile apparatus and particularly to yarn tensioning devices, and is especially concerned with yarn tensioning devices of the type in which a yarn is drawn past and in frictional contact with two series of elements alternating with one another on opposite sides of the yarn and constraining the yarn to follow a zigzag path.

According to the present invention a yarn tensioning device comprises a series of circular elements each presenting a surface of revolution across which, in a direction generally parallel to their axes of revolution, a yarn can be drawn, and a series of further elements alternating with said circular elements and adapted in conjunction therewith to constrain the yarn to follow a zigzag path, said circular elements being free to rotate about said axes. The freedom of the circular elements to rotate about their axes, while not reducing the effectiveness of the device for its primary purpose of applying a controlled tension to the yarn, assists in avoiding sudden irregularities of tension, particularly those arising from slight variations in the character of the yarn along the length thereof. While the device can be used for applying tension to yarns in general, it is particularly advantageous when used on twisted continuous filament yarns, especially those in which the twist is low. With such yarns, tensioning devices have a tendency to hold back the twist in the yarn, concentrating it behind the tensioning device until it has accumulated sufficiently to force itself through, a phenomenon which gives rise to irregularities in the tension applied to the yarn and sometimes even to breakages of the yarn. The provision of circular rotatable elements in accordance with the present invention apparently offers much less hindrance to the passage of the twist, and a more uniform tension results.

The further elements with which the circular rotatable elements alternate can be in the form of stationary horizontal bars over which the yarn can pass so as to carry, wholly or in part, the weight of the circular elements disposed between said bars.

The circular elements themselves are preferably in the form of a series of rings, independent of one another, through which the yarn passes so that the yarn makes frictional contact with the inner surfaces of the rings. Variations in the tension with which the yarn reaches the device are largely nullified by the rising and falling of the rings, so that the yarn leaves the device with a percentage range of tension variation that is much reduced by its passage through the device. The rings can be retained in the device

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by one or more bars or pins passing through them, out of contact with which the rings may be lifted when in action by the tension in the yarn.

The pins also serve, however, to limit the downward movement of the rings when in action and some of the rings, especially those first engaged by the yarn in its passage through the device, may rest in contact with the pins, part of their weight being carried by the pins. Stationary guides may be provided in association with the tensioning device to lead the yarn fairly into and away from engagement with the two series of alternating elements.

The yarn tensioning devices according to the invention are capable of general use for the application of tension to running yarns, e. g. for the purposes of subjecting the yarn to winding or re-winding or knitting operations. They are particularly useful, however, when a large number of yarns have to be handled simultaneously and when it is desirable that the tensions applied to the different yarns should be substantially equal and constant, as in warping and beaming operations, especially when carried out at high speeds.

By way of example one form of tensioning device in accordance with the invention will now be described in greater detail with reference to the accompanying drawing, in which:

Figure 1 is a side elevation,

Figure 2 is an end elevation, and

Figure 3 a plan view of the device.

The device comprises a die-cast light alloy body in the general form of a horizontal rectangular plate 4 about 3½ inches by 2½ inches in size, having a vertically bored boss 5 at one corner for mounting the device on a vertical rod or pillar 6 forming, for example, part of the frame of a creel for the supply of a large number of yarns. A set screw 7 is provided in the boss 5 to hold the device in position. A rectangular hole 8 is formed in the middle of the plate 4, and the two longer edges of the hole 8 are formed with nine U-shaped notches 10, 11 spaced at equal intervals. Parallel to one edge of the plate 4 and behind the notches 10 on that side is an upstanding wall 12 into which are cast or otherwise secured the ends of a series of ten stainless steel horizontal deflecting bars 13. Each bar 13 is formed of stainless steel wire, bent into hairpin shape and lying in a vertical plane, above and between the notches 10, 11 in the plate 4. Also projecting from the upstanding wall 12, at each end thereof, are two long horizontal lugs 14 of a profile similar to that of the deflecting bars 13. A horizontal pin 15 passes from one

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of the lugs 14 to the other and is threaded through a series of tension rings 16 about 1½ inches in diameter located between the deflecting bars 13 and occupying the notches 10, 11 in the plate 4, each ring 16 extending from the notch 10 on one side of the plate to the notch 11 on the other side. Below the plate 4 on the same side as the notches 11 are two depending lugs 17 between which extends a further horizontal pin 18 passing through the tension rings 16. Two upstanding lugs 19, 20, one on each end of the plate-like body 4 of the device carry porcelain guide eyes 21, 22 at a level slightly above the deflecting bars 13.

In the operation of the device the yarn, shown at 23, drawn over the end of a package in a creel is passed through the porcelain guide eye 21, the rings 16 are lifted by hand from below till they are located by the two pins 15, 18 passing through them, and the yarn is threaded through them and through the other porcelain guide eye 22 from which it proceeds to its destination, e. g. a warping reed.

Threading of the yarn 23 can be facilitated by the use of a length of wire having a hooked end which is passed from left to right through the guide eyes 21, 22 and the lifted rings 16, to catch the yarn and draw it back through the device. It is not necessary that all the rings 16 should be lifted and have the yarn 23 threaded through them; the tension to be applied by the device can be adjusted in accordance with the denier of the yarn 23 and other factors, by omitting to raise as many rings 16 as may be necessary for the purpose, these rings then resting idly on their retaining pins 15, 18 just below the level of the deflecting bars 13. The range of tensions dealt with by the device can also be varied by using rings 16 of different weights.

During the running of the yarn 23 through the device a very uniform degree of tension is applied to the yarn, not substantially affected by irregularities or slubs in the length of the yarn. When the machine to which the yarn is supplied is stopped, e. g., in the case of a beaming operation, for the purpose of leasing, the device retains a large measure of control over the tension in the yarn, loss of tension being quickly absorbed by the falling of the rings 16. Thus, during the stoppage (e. g. while leasing) and on re-starting the machine, there is little disturbance due to loss of tension. During running there is a tendency for the rings 16 to revolve slowly which not only, apparently, prevents twist being trapped behind the tension device, but also distributes the wear on the rings and considerably prolongs their life. The operation of the device is not substantially affected by yarn lubricant or by grit and the like carried by the yarn, and cleaning of the device can easily be carried out since all surfaces with which the yarn makes contact are freely accessible.

Having described our invention, what we desire to secure by Letters Patent is:

1. A yarn tensioning device comprising a series of circular rings through which in succession a yarn can pass so as to make frictional contact with the inner surfaces of said rings, and a series of elements alternating with said rings and adapted, in conjunction with said rings, to constrain said yarn to follow a zigzag path, said rings being freely rotatable in the planes of said rings about their centers.

2. A yarn tensioning device comprising a series of circular rings occupying parallel planes and

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freely rotatable in said planes about their centers, through which rings in succession a yarn can pass, and a series of fixed elements alternating with said rings, over which fixed elements said yarn can pass so as to be constrained to follow a zigzag path by the weight of said rings drawing said yarn downwards in loops between said fixed elements.

3. A yarn tensioning device comprising a series of fixed, parallel horizontal bars and a series of independent circular rings disposed in vertical planes alternating between said bars, said rings being free to rotate in said planes about their centers and to be suspended below said bars on loops of a yarn passing alternately over said bars and through said rings in succession.

4. A yarn tensioning device comprising a series of fixed, parallel horizontal bars, a series of independent circular rings disposed in vertical planes alternating between said bars, and at least one retaining member extending through said rings below said bars and fixed at each end, said rings being free to rotate in said planes about their centers and to be suspended below said bars on loops of a yarn passing alternately over said bars and through said rings in succession.

5. A yarn tensioning device comprising a series of fixed, parallel horizontal bars, a pair of fixed guide eyes disposed respectively before and after said series of bars, and a series of independent circular rings disposed in vertical planes alternating between said bars, said rings being free to rotate in said planes about their centers and to be suspended below said bars on loops of a yarn passing alternately over said bars and through said rings in succession.

6. A yarn tensioning device comprising a series of fixed, parallel horizontal bars, a pair of fixed guide eyes disposed respectively before and after said series of bars, and a series of independent circular rings disposed in vertical planes alternating between said bars, and at least one retaining member extending through said rings below said bars and fixed at each end, said rings being free to rotate in said planes about their centers and to be suspended below said bars on loops of a yarn passing alternately over said bars and through said rings in succession.

7. A yarn tensioning device comprising a plate having an aperture therein, means for fixing said plate in a horizontal position, a series of horizontal bars fixed to said plate and extending over said aperture, a pair of guide eyes fixed to said plate before and after said series of bars, a series of independent circular rings disposed in vertical planes alternating between said bars and extending into said aperture, and at least one retaining pin extending through said rings below the upper level of said bars and fixed at each end to said plate.

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