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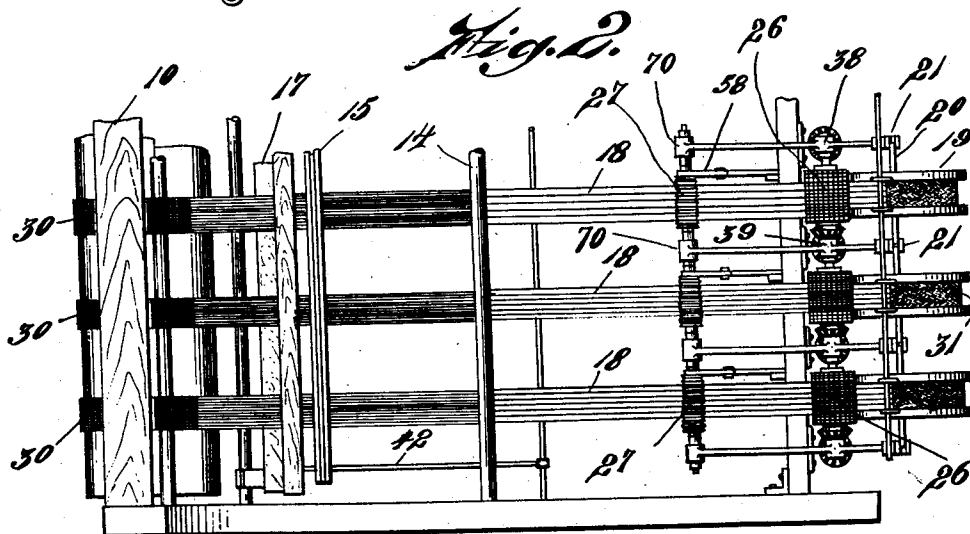
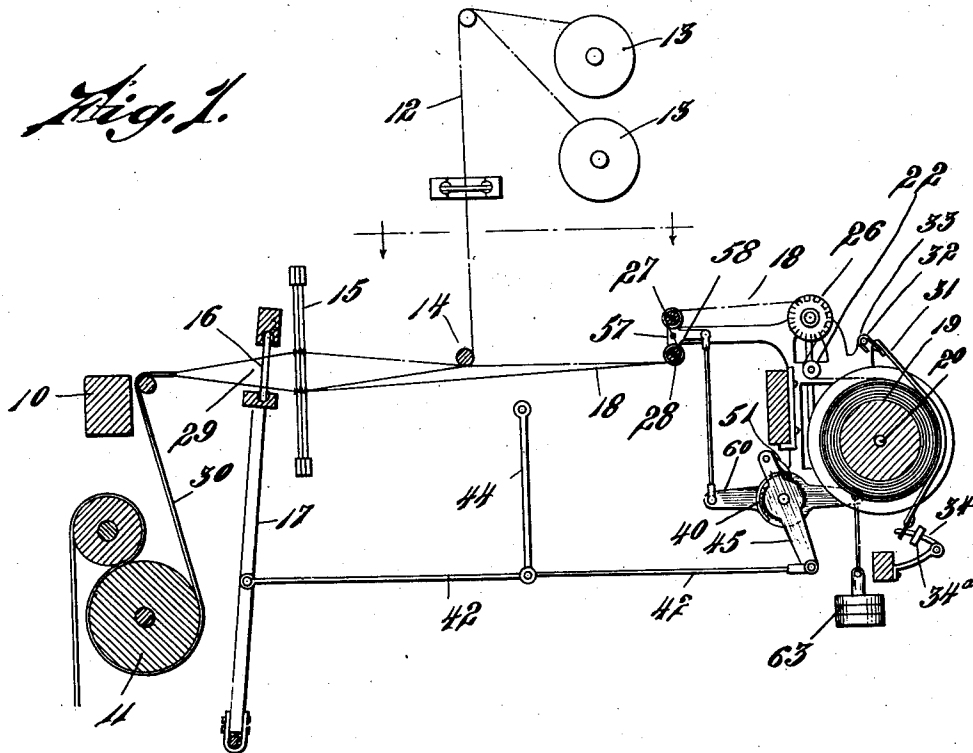
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1,781,817

TENSIONING DEVICE FOR ELASTIC THREADS

Filed Feb. 1, 1928

3 Sheets-Sheet 1



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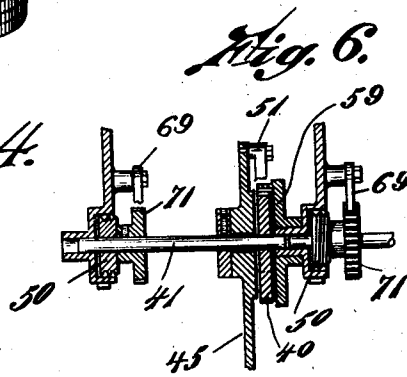
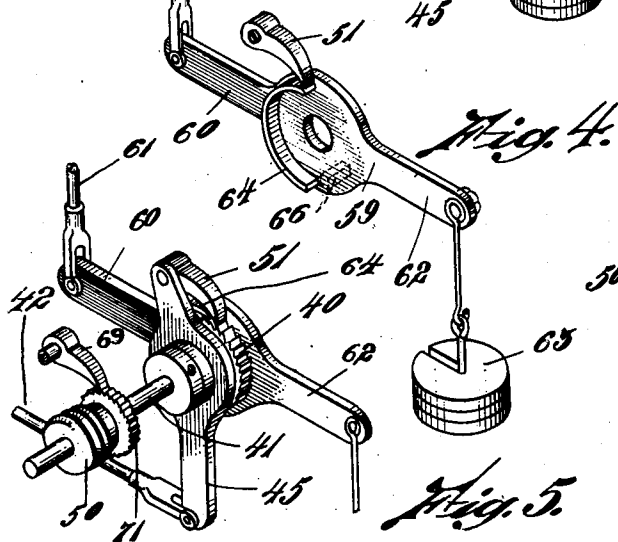
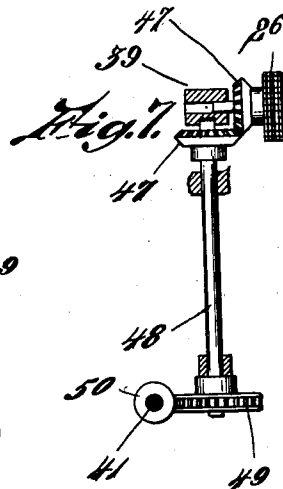
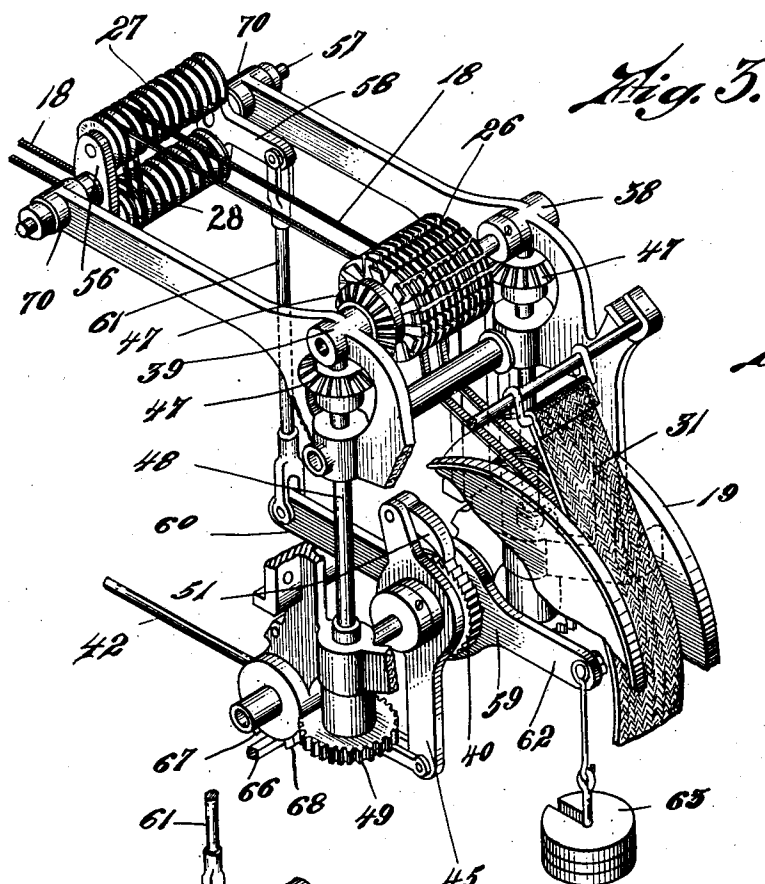
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TENSIONING DEVICE FOR ELASTIC THREADS

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3 Sheets-Sheet 2



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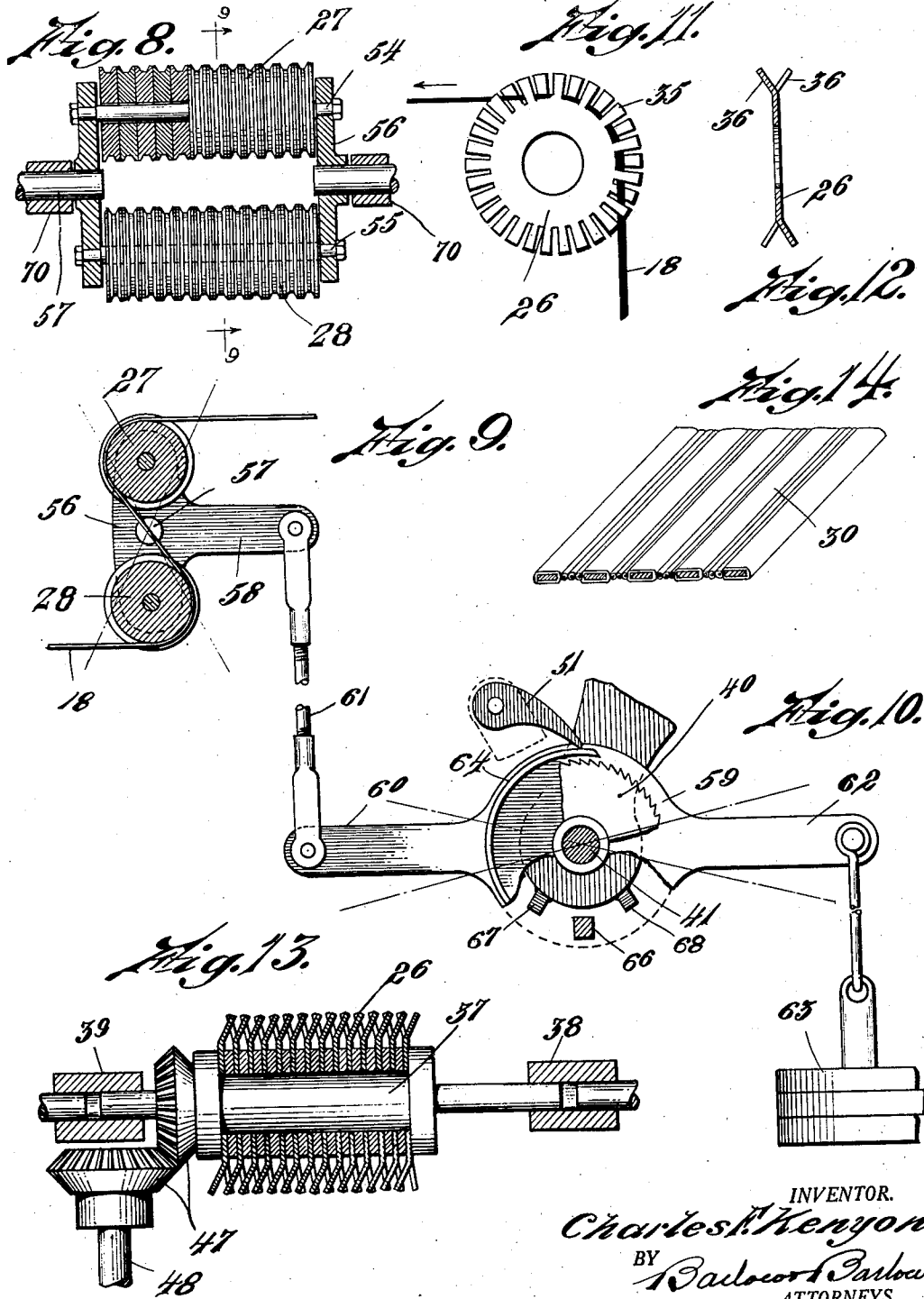
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TENSIONING DEVICE FOR ELASTIC THREADS

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3 Sheets-Sheet 3



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TENSIONING DEVICE FOR ELASTIC THREADS

Application filed February 1, 1928. Serial No. 251,057.

This invention relates to an improved means for applying tension to rubber threads while being covered with yarn or the like; and the object of this invention is to provide a tensioning device of this character which may be applied to a loom, a braiding machine or other machine for applying yarn to elastic threads, the tensioning device being located at a point intermediate a source of supply and the point of covering and being controlled in its thread feeding action by the degree of tension on the threads.

A further object of the invention is to provide a feeding device which is operated by the machine and a control device responsive in its action to changes in tension of the elastic threads for controlling the action of said feed device.

The invention further consists in the provision of adjustable means in the feeding device for controlling the degree of tension to be applied to the threads that shall be necessary for operating the feeding mechanism.

A still further object of the invention is to provide a step-by-step feed device which is operated by pawl and ratchet mechanism, the effective action of the pawl being controlled by the tension of the elastic threads.

The invention further consists in the provision of a group of thread-gripping feed wheels engaging a group of elastic threads with means controlled by the tension of the elastic for operating said wheels.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings:

Fig. 1 is a side elevation illustrating my improved elastic tensioning device as applied to a loom, a portion of the mechanism of which is shown in outline.

Fig. 2 is a top view illustrating a plurality of sets of my improved tensioning devices each of which is applied to a set of elastic threads shown as being woven into elastic webbing.

Fig. 3 is a perspective view showing portions partly broken away and illustrating

the general arrangement of my improved elastic thread-tensioning device as a unit.

Fig. 4 is a perspective view of the pivoted weight lever showing the pawl guard thereon.

Fig. 5 is a group of mechanism showing the weight lever and the feed pawl and ratchet mechanism also the check pawl and ratchet.

Fig. 6 is a sectional elevation illustrating the pawl and ratchet driving mechanism.

Fig. 7 is an elevation showing the upright shaft through which the rotation drive is communicated from the ratchet drive to the thread feed wheel.

Fig. 8 is a front view partly broken away showing the series of thread tension control rolls as rotatably mounted on a shaft in the pivot frame.

Fig. 9 is a section on line 9—9 of Fig. 8 illustrating the pivot frame in which these tension control rolls are loosely mounted.

Fig. 10 is a view showing the pivoted balancing lever arm carrying the pawl guard and arranged at one end to be connected to the tension control roll frame and at its other end to a set of adjustable weights.

Fig. 11 is a side elevation of one of the feed wheels showing a thread as woven in and out between its radially disposed teeth or fingers.

Fig. 12 is a sectional edge view of one of the feed wheels.

Fig. 13 is a sectional elevation showing a group of these wheels as mounted on and fixed to a feed control shaft.

Fig. 14 is an enlarged perspective view showing a short section of one form of elastic webbing which is formed by the use of my improved device.

By the old method of weaving elastic webbing a broad faced friction band formed of cotton was arranged to bear against the surface of the rubber threads wound on the supply reel or spool and a weight was applied to the band to produce friction and so the proper amount of tension or resistance to the let-off rotation of the spool. It was found in practice, however, that rubber is very hygroscopic or sensitive to the action of moisture, as it collects moisture very rapidly and in depositing

this moisture upon the friction band the frictional action of the band upon the rotating spool of rubber threads was materially increased. In other words, by the old method the friction on the feeding rubber was caused to vary with the degree of moisture in the atmosphere and as this moisture is never uniform the stretch of the rubber threads varied greatly during the weaving operation rendering the material thus woven quite ununiform.

Further, it is found in practice that ordinarily the working stretch of the rubber threads while being covered should be somewhere between 100% and 500% according to the class of webbing being made so that as the silk weft yarn is woven on to these rubber threads in their stretched condition this yarn will lie slightly spaced apart across the elastic threads and when the tension on the elastic is released to contract, the spaces between these silk yarns are closed causing the yarn to lie side by side without spaces between them. If the elastic is not stretched sufficiently during the weaving operation the spaces between the silk yarns will not close when the elastic is released which will permit the rubber threads to be seen through between the silk yarns, which effect greatly reduces, and in some cases destroys the value of the webbing. On the other hand, if the elastic is stretched excessively the yarn will pile up or become superimposed one upon the other when the elastic is released producing a loss in length or yardage sometimes to the extent of 25% or more, which produces wrinkles in the webbing and spoils its appearance, the excessive stretching also prevents the flat strands of rubber from spreading to their normal width when released thereby again failing to produce the desired effect in the web, and further this puckering of the web also serves to distort any figure which may be woven in the fabric of the web. From the above it is shown to be extremely desirable that the proper amount of tension be applied to the elastic threads at all times during the covering operation and that friction means applied to the rubber which is affected by the constantly changing atmospheric conditions cannot be relied upon for this purpose. Applicant has accomplished these desired results by the provision of mechanism which is positively driven by action of the machine and this driving mechanism is controlled in its action by the tension of the rubber strands themselves, whereby when tension or stretch of the strands is increased above a certain percentage, the feeding speed of the elastic threads is increased to reduce this tension and when the tension or stretch of these elastic threads is decreased beyond a predetermined percentage, the speed of the feed is automatically decreased to increase the tension to the desired degree;

and the following is a detailed description of the present embodiment of my invention and showing one means by which these advantageous results may be accomplished:

I have herein shown my improved device as applied to a loom, and with reference to the drawings, 10 designates the breast beam of the loom and 11 the take-up rolls therein, the textile warp threads 12 which are designed to lie parallel with and fill in the space between the elastic threads and also limit the stretch of the fabric, are conducted from the supply spools 13 around the roll 14 through the heddles 15 and reed 16 on the lay 17 while the elastic threads 18 are carried on the spool or reel 19 mounted on the shaft 20 in the side brackets 21. These elastic threads extend from the spool 19 around the guide pulley 22 and are then woven in and out between the radially-disposed teeth or fingers on the feed wheel 26 thence these threads are carried over the upper set of tension control rolls 27 and then around the lower tension control roll 28 from whence they are led through the heddles and reed to be covered at a point 29 and woven into the elastic webbing 30.

Many groups of elastic threads are employed in a web weaving loom, a few of which are illustrated in Figure 2. Each group being woven into its particular webbing 30.

In operating my improved tensioning device, I first preferably apply a very light tension to the spool 19 itself by the application of a fabric band 31 to the surface of the elastic on the spool. The upper end 32 of this band is hooked over the rod 33 while the lower end is applied to a weight arm 34, the weight 34^a serving to exert a very light tension on the spool to prevent it from overrunning as the elastic threads are drawn therefrom during the weaving operation. The feed wheels 26 for the elastic threads may be made in any suitable way but I have herein shown a set of these wheels as formed from sheet stock having radially-disposed fingers 35 set alternately in staggered relation as at 36, in Figure 12. I preferably weave the elastic thread 18 back and forth through these staggered fingers so that when the thread is drawn down into position, it is gripped by these fingers and is prevented from being drawn or slipped therethrough. In other words, it would require an extreme tension at the end of the thread to draw or slip the thread endwise through these fingers owing to the fact that the untensioned portion of the thread is materially larger than that portion under tension and this larger portion thus materially resists being drawn between these teeth. Therefore the driving speed of a roll formed by these feed wheels nicely controls the feeding speed of these threads and as best illustrated in Figure 13, I have mounted a series of these feed wheels on a shaft 37, and have mounted this shaft

in bearings 38 and 39 and I drive this series of feed wheels through mitre gears 47 and upright shaft 48, which shaft is itself driven through the worm wheel 49 and worm 50, the worm being fixed on the shaft 41 and this shaft 41 is driven by a step-by-step action of the drive pawl 51 and ratchet tooth wheel 40 fixed to the shaft 41. The pawl receives its oscillating motion from the lay 17 through the connecting rods 42 and the rocker arm 45 on which this pawl is mounted. One end of these connecting rods 42 and 43 is supported in the depending arm 44 which carries the weight thereof. Ordinarily, it will be seen that the stroke of the lay would cause the pawl 51 to take a predetermined number of teeth of the ratchet wheel 40 and so through the mechanism above described rotate the feed wheels 26 at a constant rate, but it is found that a constant rate of feed of the rubber threads is not at all times desirable but that the feed of these threads must vary and must be controlled by the tension of the threads. Therefore, I have applied mechanism which is operated by the tension of the threads for controlling the effective feeding action of this drive pawl 51. To accomplish this in a simple and effective way, I have provided two sets of tension control rolls 27 and 28, each mounted on its respective shaft 54 and 55 in the frame 56, which frame is pivotally mounted on the pin 57 in bearings 70 and is provided with a rearwardly-extending arm 58.

A weight controlled lever 59 is loosely mounted on the shaft 41 and has one end 60 connected through the adjustable rod 61 to the frame 58 while its opposite end 62 is connected to the weights 63, the number and weight of which may be varied and regulated to balance the tension required on the set of elastic bands to which the weight is applied. Extending laterally from the face of the enlarged portion of this lever is an arcuately shaped pawl guard 64 so arranged that when the elastic threads 18 become slackened beyond a predetermined degree the arms 58 and 60 which are connected by rod 61 will lift and carry this pawl guard beneath the pawl 51 and so reduce the number of teeth in the ratchet 40 it is permitted to engage on each of its forward feeding strokes and when the tension of the elastic threads becomes greater than a predetermined degree both the arms 58 and 60 swing downwardly and withdraw this pawl guard from beneath the pawl 51 permitting the pawl to engage more teeth during its forward or feeding stroke. In other words, the tension of the elastic threads controls the number of teeth that the pawl shall take on each of its forward feeding strokes and thereby automatically control the speed of rotation of the feed wheels 26. That is, when the threads are too slack the rate of feed or supply is

reduced until this slack is taken up or the tension restored by the weaving operation, and when the threads become too tight this tension serves to act upon the mechanism above described to speed up the feeding of the threads, and so this mechanism is constantly working back and forth to maintain the predetermined tension required on the elastic threads.

In order to limit the extent of swing of this pawl guard arm 59 a stop lug 66 is provided on the arm to engage either of the lugs 67 and 68 on the frame to limit the swing of this arm 59 in either direction.

A detent pawl 69 is also arranged to engage a ratchet wheel 71 fixed on the shaft 41 to prevent that shaft from turning backward when the feed pawl 51 is lifted from engagement with its ratchet wheel 40 or when the pawl 51 swings backward after each forward feeding stroke.

My improved feed device for elastic threads is very simple in construction and practical in its operation and by its use I am enabled to automatically obtain the desired tension on any individual group of elastic threads in the loom throughout an entire weaving operation irrespective of the amount of humidity in the air or other conditions which have heretofore affected this tension, thereby providing an elastic webbing which is uniform in tension and appearance throughout its length.

I have herein shown and described my improved device as applied to a loom for covering the elastic threads but it is understood that the device may be operated in connection with a braiding machine or any other device which is adapted to cover these threads.

The foregoing description is directed solely towards the construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claims.

I claim:

1. In a machine for covering elastic threads, a support for a package of elastic threads, means for applying a covering of yarn to these threads as fed through the machine, means operated by action of the machine for separately engaging and feeding each individual thread, means responsive to the tension of a group of said threads for controlling the action of the feed device for that group, and means on the feed device for controlling the degree of tension to be applied to said thread group necessary for operating said feeding mechanism.

2. In a loom, a support for a supply package of elastic threads, means for weaving a covering of yarn about a set of said threads, feeding means including means for engaging each individual thread located inter-

mediate the supply package and the point where the covering of yarn is applied to said threads, means for positively operating said feeding means, and means affected by the tension on said threads for controlling the effective action of the feeding means.

3. In a loom, means for weaving a covering of yarn about a set of elastic threads, separate means for engaging each individual thread, positively actuated means for moving said thread-engaging means to feed the elastic threads, and a balancing device responsive in its movement to the degree of tension of the elastic threads engaged by it for controlling the effective feeding action of said feeding means.

4. In a loom, means for weaving a covering of yarn about a set of elastic threads, positively actuated means for feeding the elastic threads, a pivoted roll frame, a pair of rolls in said frame about which said threads are led and tensioned, a weight acting on said frame to balance the tension of the elastic threads whereby a change in the tension moves the frame to affect the feeding action of said feeding mechanism.

5. In a loom, means for weaving a covering of yarn about a set of elastic threads, a thread gripping wheel for each elastic thread, means for rotating said wheel to feed the thread, and means responsive to the change in tension in said threads for controlling the feeding action of said wheel.

6. In a loom, means for weaving a covering of yarn about a set of elastic threads, a thread gripping feed wheel for each elastic thread, pawl and ratchet mechanism for rotating said wheel to feed the thread, and means positioned by tension of the thread for controlling the effective feeding action of the pawl.

7. In a loom, means for weaving a covering of yarn about a set of elastic threads, a pawl actuated feed for said threads, a pivoted frame carrying a pair of guide rolls about which the threads are led, a pivoted lever connected at one end to said frame, a weight acting on the other end of said lever, a pawl guard carried by said lever positioned to lift the pawl from feeding engagement when the tension on the thread has dropped below a predetermined degree permitting the weight to move the guard beneath the pawl.

8. In a loom, a support for a package from which elastic threads are led through the loom, means for weaving a covering of yarn about said threads, a step-by-step mechanism for feeding said threads, a balancing tension device about which the threads are led, and means including said device responsive to the tension of the rubber threads for controlling the effective action of said feeding mechanism.

9. In a loom, means for feeding textile warp threads, means for engaging elastic

warp threads individually to feed the same, means for covering both said warp threads, and means responsive to variation in tension of said elastic threads for controlling the feeding means for the elastic threads to maintain their uniform tension.

10. In a loom, means for feeding a set of textile warp threads, means unaffected by atmospheric conditions for feeding a set of elastic warp threads, said means including structure for individually engaging the elastic warp threads of the set, means for covering both sets of said warp threads, and means responsive to variation in tension of said set of elastic threads for controlling the feeding means for the elastic threads to maintain their uniform tension.

11. In a loom, a support for a group of textile threads, a support for a group of elastic warp threads, means in the loom for weaving a covering of yarn over each group of said threads as fed simultaneously through the loom, means for gripping and positively feeding said group of elastic threads, and means responsive to change in stretch of said elastic threads located between said covering and feeding means for controlling the action of said feeding means.

12. In a loom, a supply spool for a group of textile threads, a supply spool for a group of elastic threads, means for weaving a covering of yarn simultaneously over both groups of threads, means independent of said supply spools for maintaining each elastic thread in stretched condition, and means independent of said supply spools for feeding said elastic threads to the machine and responsive in its action to the degree of tension on the threads.

13. In a loom, a support for a group of textile warp threads, a support for a group of rubber warp threads, weaving means for applying a covering of yarn over both groups of threads simultaneously, and a positively operated tension control device cooperating with the yarn covering means arranged to individually engage the rubber threads to automatically control the stretch of said threads by controlling their feeding speed.

14. In a loom, a supply package of textile warp threads, a supply package of elastic warp threads, means for applying a covering of yarn to both of these threads simultaneously, and a positively operated step-by-step feed device independent of the supply package for the elastic threads controlled in its action by the operation of the loom for automatically controlling the stretch of said elastic threads.

15. In a loom, a supply package of textile warp threads, a supply package of elastic warp threads, means for applying a covering of yarn to both of said threads simultaneously as fed, a pawl and ratchet actuated tensioning device independent of either supply package for positively controlling the feeding

speed of said elastic threads, and means operated by the machine for controlling said feeding speed.

16. In a loom, a spool for a group of textile warp threads, a spool for a group of elastic threads, means for weaving a covering of yarn about both sets of threads, means for maintaining a predetermined tension on said elastic threads, a feed for the elastic threads independent of either spool including pawl and ratchet mechanism, and means affected by the stretch of the elastic threads for controlling the effective action of the feed pawl.

17. In a loom, a package of textile warp threads, a package of elastic warp threads, means for weaving a covering of yarn about both sets of threads simultaneously, a feed for the elastic threads independent of the package of elastic threads including pawl and ratchet mechanism, means in the loom for imparting a feeding action to said pawl, and means affected by the tension of the elastic threads for controlling the effective action of said feed pawl.

18. In a loom, means for feeding textile warp threads, a supply spool of elastic warp threads, means unaffected by atmospheric conditions and independent of said supply spool for feeding elastic warp threads, said feeding means including structure for separately engaging said elastic warp threads, means for weaving a covering over both said warp threads simultaneously, and means responsive to variation in tension of said elastic threads for controlling the feeding means for the elastic threads to maintain their uniform tension.

19. In a loom, means for feeding each of a plurality of spaced groups of textile warp threads, supply spools of elastic warp threads, means independent of said supply spools for feeding each of a plurality of spaced groups of elastic warp threads, means for covering both sets of warp threads in each group, and means responsive to stretch of said elastic threads of each group for controlling the feeding means for the elastic threads of that group to maintain their uniform stretch.

20. In a loom, means for feeding textile warp threads, means unaffected by atmospheric conditions for feeding elastic warp threads, a rotating member in said elastic thread feeding means for engaging said elastic threads individually, means for covering both said warp threads, and means responsive to variation in elongation of said elastic threads for controlling the feeding means for the elastic threads to maintain their uniform elongation.

21. In a loom, means for feeding textile warp threads, means for feeding elastic warp threads, means in said elastic thread feeding means for gripping said elastic warp threads individually, means for covering both said warp threads, and means responsive to varia-

tion in elongation of said elastic threads for controlling the feeding means for the elastic threads to maintain their uniform elongation.

In testimony whereof I affix my signature.
CHARLES FRANKLIN KENYON.

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