July 28, 1942. H. M. BACON 2,290,935

METHOD OF ASSEMBLING, MOLDING, AND VULCANIZING ELEMENTS OF LUG STRAPS

Original Filed Oct. 28, 1940 2 Sheets-Sheet 1

FIG. 1

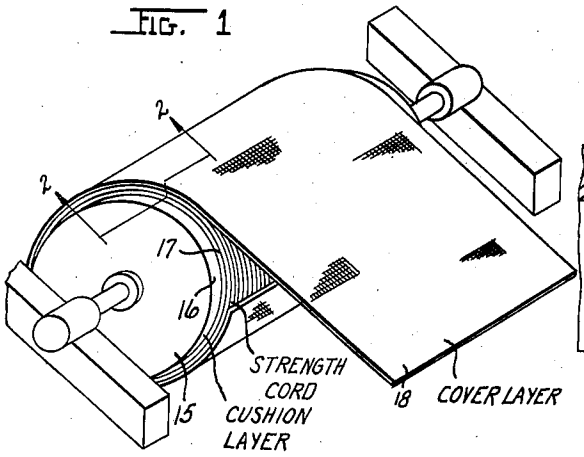


FIG. 2

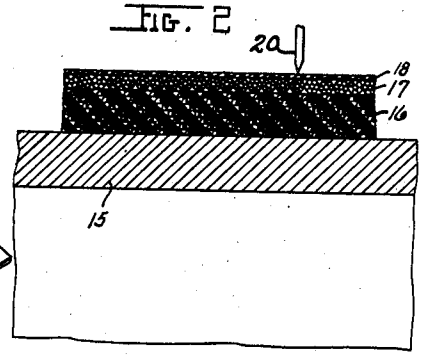


FIG. 3

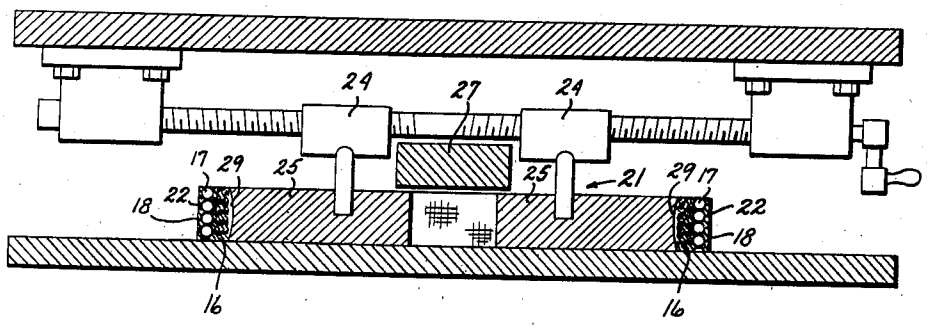
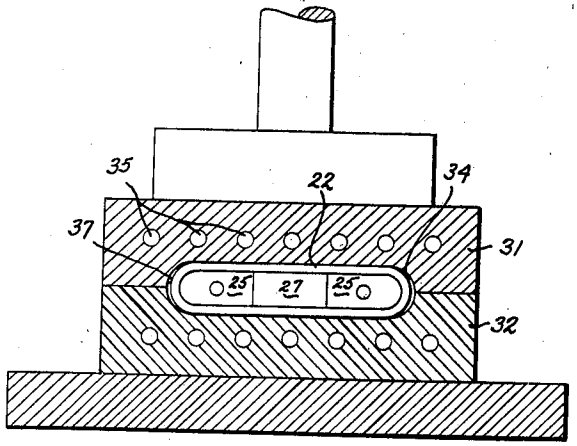


FIG. 4



INVENTOR
HENRY M. BACON
BY
ATTORNEYS

July 28, 1942. H. M. BACON 2,290,935

METHOD OF ASSEMBLING, MOLDING, AND VULCANIZING ELEMENTS OF LUG STRAPS

Original Filed Oct. 28, 1940. 2 Sheets-Sheet 2

FIG. 5

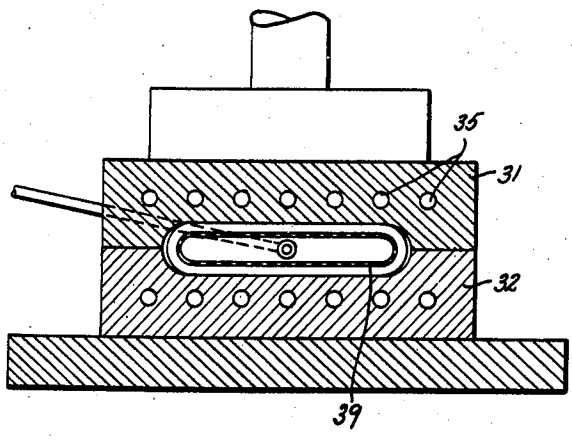


FIG. 6

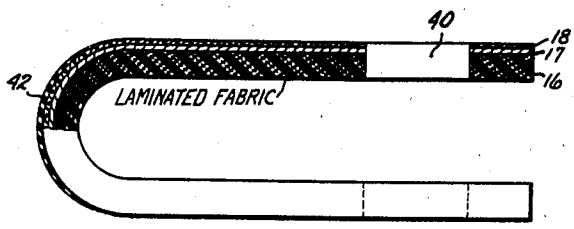


FIG. 7



FIG. 8

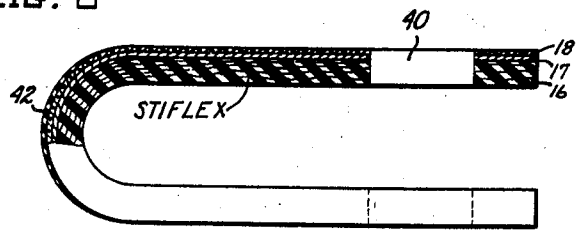


FIG. 9



FIG. 10

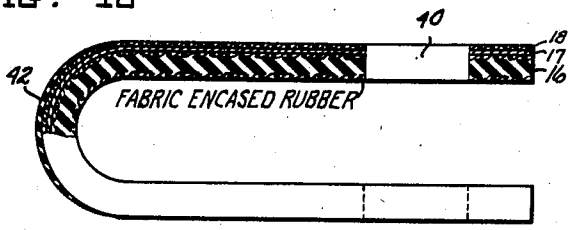
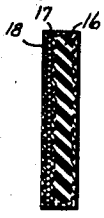


FIG. 11



INVENTOR
HENRY M. BACON
BY
ATTORNEYS

Patented July 28, 1942

2,290,935

UNITED STATES PATENT OFFICE

2,290,935

METHOD OF ASSEMBLING, MOLDING, AND VULCANIZING ELEMENTS OF LUG STRAPS

Henry M. Bacon, Dayton, Ohio, assignor to The Dayton Rubber Manufacturing Company, Dayton, Ohio, a corporation of Ohio

Original application October 28, 1940, Serial No. 363,121. Divided and this application May 31, 1941, Serial No. 396,034

7 Claims. (Cl. 139—153)

My invention relates to improvements in lug straps used in weaving looms or similar machinery.

One important object of this invention is to provide a lug strap which is constructed so as to possess improved strength and exhibit greater resistance to wear and failure by fatigue under the action of heat.

Another object is to devise an improved method of making a lug strap wherein the formation of wrinkles or folds in the laminations or layers forming the U-shaped strap is avoided during manufacture.

Another object is to provide an improved lug strap wherein the strength and cushion sections are located at the point where it is required to give the greatest resistance to wear or impact strain resulting from the picker stick action.

These and other objects and advantages will be apparent to those skilled in the art during the course of the following description.

This application is a division of my copending application, Serial No. 363,121, filed October 28, 1940.

In the drawings:

Figure 1 is a perspective view illustrating the method of fabricating my improved lug strap by winding the different layers forming the body of the strap on a surface of a drum preparatory to cutting the built-up sleeve body into a strap or plurality of straps of the desired width;

Figure 2 is a fragmentary sectional view taken through the drum surface and laminated sleeve body forming the body of the lug strap and taken substantially along the line 2—2 of Figure 1;

Figure 3 is a vertical sectional view illustrating the use of an expansible core and means for expanding same for forming the laminated band comprising a double lug strap into the desired shape whereby the same can be vulcanized to a tough, durable strap, after which the double strap can be severed to form a pair of lug straps;

Figure 4 is a sectional view taken through a mold showing the built-up sleeve forming the lug strap body mounted on an expanded core and arranged in a mold cavity for vulcanizing the sleeve into a finished double lug strap;

Figure 5 is a similar sectional view taken through a mold showing a modification wherein an air bag is used for applying pressure to the inner side of the double lug strap during molding and vulcanizing of the same;

Figures 6 to 11 are sectional views of a lug strap made according to this invention wherein different laminated constructions are used for forming the lug strap.

In general, the higher speeds and heavier loads of the modern weaving looms have made it necessary to increase the strength and quality of loom accessories and especially the lug straps. Lug straps of greater strength are required because the actual picking blow is far greater than heretofore due to the higher speed at which the looms are operated and the employing of heavier shuttles. The increased speed of operation, with the subsequent shortening of the rest periods, has required that the loom picker possess the property of substantially instantaneously or very rapidly recovering its resiliency and strength after each pick or blow. Further, due to the increased speed of operation, the "snap" or harshness of the pick or blow has been magnified resulting in bringing about a greater strain on the picker sticks, which, in turn, has placed an added importance on the cushion or resiliency of the lug strap.

To produce a lug strap having greater strength and resistance to fatigue and failure under the temperature and operating conditions of loom machinery, I have found that it is necessary to construct a lug strap wherein the strength section is localized at the point of the greatest strength need, which is adjacent to the outside of the strap. All of the power delivered to the strap is from the inside, and, consequently, any materials or fabrication placed on the outside of the strength section are of little value for adding strength to the lug strap. Furthermore, by localizing the strength or tension layer to a very thin area, the compressive forces which set up strains adjacent the neutral strength axis are reduced to a minimum.

When the strength section of the lug strap is localized in the outside layers of the lug strap the entire remaining body can be made to function as a cushion or resilient portion. This is very important because the cushioning obtained by compression is much better than that by tension or extension. There is also an added advantage in that a very rapid recovery of the lug strap to its normal resilient form is obtained by constructing the lug strap to provide cushioning of the picker blow by compression.

In order to produce a lug strap having the improved strength and uniformly distributed resistance to working stress and proper resiliency, it is necessary to eliminate any possibility of the formation of wrinkles, folds, buckles, or flow strains during the lamination and molding of the

lug strap. To this end, each section or layer forming the lug strap must retain its relative spacing and tension in the finished strap as in the unfinished stages. This has been the prime cause of failure when the conventionally made rubber lug straps were changed from a very hard to a softer composition. Wrinkled and buckled portions, always present in the conventional rubber lug straps, readily open up with the use of softer compositions or materials in the making of the lug strap. It has also been found that all the plies of a very hard conventional lug strap work as a unit because of the rigidity of the binder holding them together. With a softer binder, the buckled inner plies place an added strain on the outer plies which are already under stress producing an inferior lug strap.

My invention overcomes the defects mentioned and provides a strong, durable lug strap and a convenient and comparatively inexpensive method for manufacturing lug straps in large quantities with the minimum possibility of producing straps which are not uniform. The invention also provides a lug strap of improved structure made of materials which render the strap free from attack by rodents and wherein wrinkles, buckles, or folds in the laminated layers forming the lug strap, with their resultant detrimental effects, are entirely eliminated and a strap is produced wherein the stress is uniformly distributed throughout the body of the strap.

In the manufacture of lug straps embodying the improved construction, I have built up the lug strap in the form of a laminated sheet body on a drum or mandrel, such as shown at **15** in Figure 1. There is applied around the surface of the drum a layer of cushion stock, generally designated **16**, of desired thickness. This cushioning body portion may be formed of several layers of rubberized fabric such as illustrated in Figure 6. Over the resilient cushioning layer **16** is wound a cord layer forming the strength section **17**. The cord is wound on under proper tension so that each strand bears its full share of the load. If desired, the cord may be wound on slightly spiral. Over the cord layer **17** is applied a rubberized fabric covering to protect the cords from exposure. Sufficient rubberized fabric is placed under and over the cord layer to prevent the cords from separating. Preferably, strong, tough cords which are resistant to disintegration and wear are used.

The thickness of the resilient layer **18** is such as to provide the proper cushioning of the pick or blow and may be formed of any wear resistant resilient material. Other materials than rubber, such as glue, synthetic resin, or the like can be used for bonding the layers into an integral body. Any suitable combination of strength material and binder having the required thermoflowing and setting properties may be employed but I prefer to use rubberized fabric for this purpose. In this construction, the lug strap comprises a laminated body formed of rubberized fabric built up to the desired thickness which is molded and vulcanized to produce a U-shaped strap.

After a sleeve of sufficient width is built up on the drum or mandrel **15**, one or more lug straps of the desired width are cut therefrom by the application of a knife, or other suitable means, such as shown at **20** in Figure 2. The bands which are produced by cutting the sleeve circumferentially at spaced intervals form integral pairs of lug straps. In order to eliminate wrinkling or buckling of the body portion of the lug strap during subsequent forming and molding of the double straps, an expansible core member, generally designated **21**, is placed on the inner side of the double strap member **22**, as shown in Figure 3, and means is provided, such as the right and left movable screw head members **24** for expanding the core sections **25** to form the U-shaped double strap **22**. When the core portions **25** have been expanded to a proper amount the center member **27** is placed in position to maintain the core sections **25** in their expanded position, as illustrated in Figure 4. Other suitable means may be provided for expanding and maintaining the core **21** in its outermost position. The outer surface portions of the core sections **25** comprise an arcuate concave surface **29** so as to provide a rounded surface portion on the inner side of the bow or bend which is transverse to the longitudinal axis of the lug strap.

After positioning the core on the inner side of the double lug strap **22**, the core and lug strap are placed in a mold having suitable complementary dies **31** and **32** which are shaped to form the cavity **34** in which the lug strap and core are positioned for vulcanizing the strap to a hard, tough, resilient body. Suitable means, such as steam or hot water, is circulated through the passageways **35** in order to heat the mold sections **31** and **32** to the desired temperature for curing the lug strap body **22**. The mold parts **31** and **32** are shaped in such a manner as to leave a space **37** along the outer surface portion of the bend or bow of the lug strap so that the inner walls of the mold adjacent the outer surface of the lug strap at the bend do not contact the lug strap permitting proper expansion of the material during molding to equalize the stresses in this area and prevent the formation of wrinkles or buckles in the laminations.

In the modification shown in Figure 5, the metal expanding core is replaced by an air bag **39** which is expanded by fluid pressure during molding and vulcanization of the double lug strap. Other suitable methods may be employed for applying pressure to the inside of the lug strap during molding and vulcanization.

The essential feature in the molding of the lug strap is to apply the same pressure to the inside of the strap as to the outside so as to form a lug strap free from internal stresses such as would result from the formation of wrinkles or buckles in the body portion of the strap during shaping and molding of the strap. For convenience, a double strap is formed which, after shaping, is severed in the middle forming two separate U-shaped lug straps, as illustrated in Figures 6, 8 and 10. The usual slots **40** are made in the legs of the strap before or after severance of the double lug strap as desired. There may also be applied a cap **42**, preferably made of rubber, over the outside of the bend or bow surface portion of the lug strap, as illustrated in Figures 6, 8 and 10, so to improve the appearance of the lug strap. This gum cap, however, may be eliminated if desired without interfering with the working properties of the lug strap.

In Figures 6, 8 and 10 modifications in the construction of lug straps according to my invention are illustrated wherein the cushioning inner surface body of the lug strap is formed of different types of material, such as laminated rubber fabric, "Stiflex," or fabric encased rubber. The particular material used for forming the cushioning inner body portion of the lug strap is not important so long as the material is non-flowing

under the heat and humidity conditions to which the lug strap is subjected in service. When the lug strap is built up of thermo-flow resistant material, such as fabrics and the like, this difficulty is not encountered. However, with the use of a predominance of thermo-flowable material, such as heat flowable resin, rubber, and the like, it is necessary to reduce this flow to a minimum so as to localize it to small areas. This may be accomplished by semi-curing or setting the filler to the rubber or resin or encasing the same in non-flowable material such as a fabric jacket, similarly as shown in Figure 10. Another method is to load the heat flowable material with fibers or use "Stiflex." Coarse woven fabrics may also be used to prevent undue flowing of the soft materials forming the cushion part of the lug strap.

In the preferred embodiment of the lug strap wherein the lug strap is made up of rubberized fabric layers for forming the cushion and outer cord layer, there is produced a superior lug strap which is free from wrinkles and buckles in the layers and has an exceptionally long life. Comparative test results have shown that lug straps made according to my invention last many times longer than conventionally constructed straps.

It is to be understood that my invention is not limited to the exact details of construction and the method of shaping and molding the lug straps, since obvious modifications within the scope of this invention may be made by those skilled in the art.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The method of making a lug strap comprising winding a layer of cushioning material onto the surface of a mandrel of the desired diameter, winding thereover a cord layer to form the strength section of said lug strap, applying a covering material over said cord layer to protect said cords, cutting said built-up layers into a lug strap having the desired width, shaping and vulcanizing the material to form a circular strip, and severing the same to form a pair of lug straps.

2. The method of making a lug strap comprising fabricating the lug strap in the form of a double strap consisting of building up the lug strap by winding a cushioning layer on the surface of a drum or mandrel, laying a strength layer of cord thereover, covering said cord layer with a protecting sheet member, severing said built-up layer to form double lug strap members of the desired width, shaping and vulcanizing said double lug strap to form an integral unitary body, and thereafter severing said strap to form a pair of U-shaped lug straps.

3. The method of making a lug strap comprising laminated layers bonded by rubber consisting of winding a plurality of superimposed layers of rubberized fabric on the surface of a drum or mandrel of the desired diameter, winding a layer of cord over said cushioning layer, covering said cord layer with rubberized fabric, removing the built-up body from said mandrel, inserting an expansible core inside said body and expanding the same to form a double lug strap, placing said core and double lug strap body in a mold and vulcanizing the body to an integral tough, resilient double lug strap, and thereafter severing said double strap to form a pair of U-shaped lug straps.

4. The method of making a lug strap comprising superimposing layers of cushioning and strength material comprising substantially inextensible strands of material over the surface of a drum or mandrel, said strength material being arranged adjacent the outer surface of said laminated layers, removing said built-up layer of material from said drum, applying pressure to the inner surface walls of said built-up material to form a double lug strap, placing said expanded double lug strap member in a mold, applying pressure against the external straightaway sides of said double lug strap, vulcanizing the double lug strap to an integral resilient body, and thereafter severing the double lug strap to form a pair of U-shaped lug straps.

5. The method of making a lug strap comprising superimposing rubberized fabric layers on a mandrel surface to form a cushioning layer, winding over said cushioning layer a layer of cord material to form a strength or substantially inextensible layer, applying over said cord layer rubberized fabric, removing said built-up strap body from said mandrel, applying pressure to the inner walls of said built-up body to form a double lug strap, placing the expanded strap in a mold and vulcanizing the same to a hard resilient strap, and thereafter severing the strap to form a pair of lug straps.

6. The method of making a lug strap comprising superimposing rubberized fabric layers over a surface to form a cushioning body portion of said lug strap, winding over said cushioning layer cord material to form a strength section, applying a covering layer of rubberized fabric over said cord material, removing said built-up strap body from said surface, applying pressure to the inner wall portions of said body to shape the material into the form of a lug strap and vulcanizing the same to a hard resilient strap, and applying a moldable capping material to the external curved wall portion forming the bow or bend of said lug strap and uniting the capping material to said external fabric cover layer to form a finished lug strap.

7. The method of making a lug strap comprising superimposing rubberized fabric material around a mandrel surface to form the inner cushioning layer of said strap, winding thereover a layer of cord material to form a strength section, applying over said cord layer a rubberized fabric covering, cutting said built-up strap body into a strap or straps of the desired width, removing said cut strap material from said mandrel, applying pressure to the inner walls of said strap material to expand the same into a U-shaped double strap, placing the expanded double strap material in a mold, molding the double lug strap by applying pressure to the external straightaway sides of said double lug strap without contacting the bow or bend portion of said U-shaped double lug strap, applying a moldable resilient capping material to the external curved wall portion forming the bow or bend of said strap, integrally uniting the same thereto by vulcanization, and thereafter severing the double lug strap to form a pair of U-shaped lug straps.

HENRY M. BACON.