Aug. 21, 1928. 1,681,356

A. LUCKWEIL

PROCESS AND APPARATUS FOR WEAVING TOGETHER THE ENDS OF SIMILARLY WOVEN BELTS AND BANDS

Filed Feb. 25, 1927

Fig. 1.



Fig. 2.

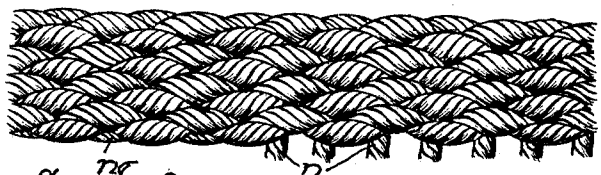


Fig. 3.

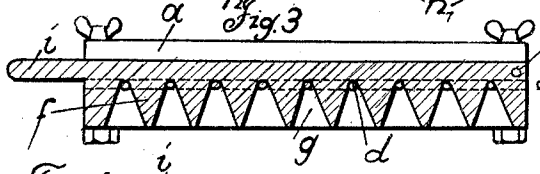


Fig. 4.

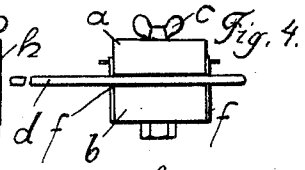


Fig. 6.

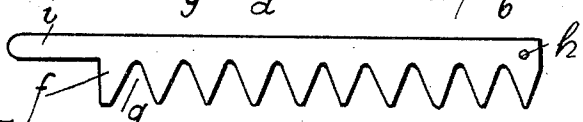


Fig. 7.

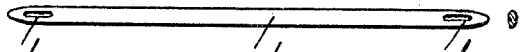


Fig. 5.

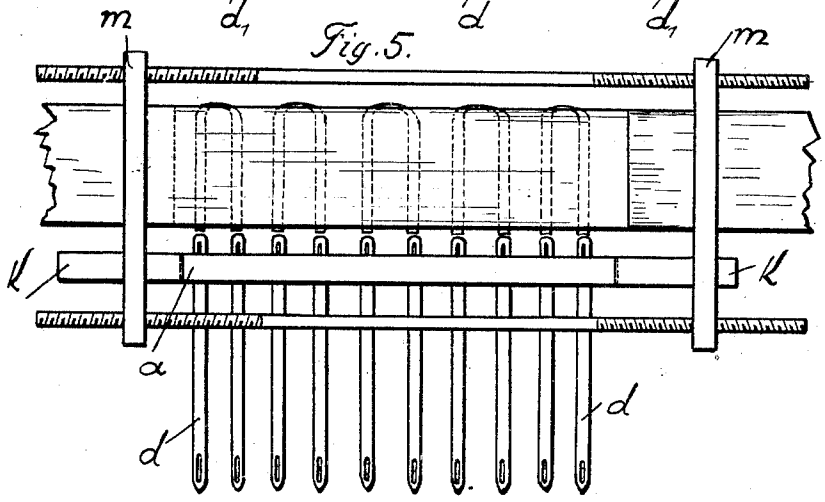


Fig. 8.

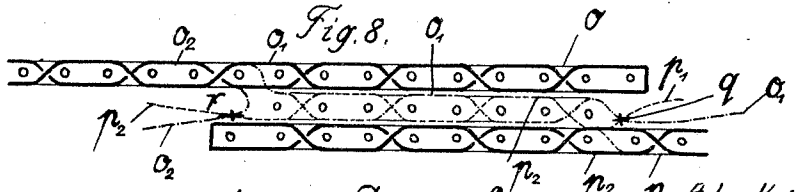
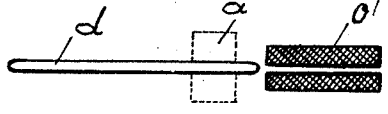


Fig. 9.



A. Luckweil
INVENTOR

By: Marks & Clark
Attys.

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UNITED STATES PATENT OFFICE.

ARTHUR LUCKWEIL, OF MANNHEIM-NECKARAU, GERMANY.

PROCESS AND APPARATUS FOR WEAVING TOGETHER THE ENDS OF SIMILARLY WOVEN BELTS AND BANDS.

Application filed February 25, 1927, Serial No. 170,966, and in Germany February 27, 1926.

The object of the present invention is to provide the possibility of weaving together the ends of tensioning members such as woven belts and bands, such for example as transmission belts and conveyer belts at the place where they are to be used, either for the formation of endless bands or for connecting such belts end to end, and to do this in the method of weaving with which the belt or band is woven. Hitherto it has not been possible to weave such belts and bands to one another or to weave their ends together to form endless bands in their own method of weaving at the place of use. Belts and bands have instead been joined at the ends either by riveting or butt-jointing, or by means of metallic connections such as bars, plates, claw fasteners, screws and so forth. Such connections, as is known, give rise to more or less serious shocks as the connecting point passes over the belt pulleys or rollers and thus increase the unreliability of these methods of connection, which already form a constant risk to the work and to the attendants. The possibility of weaving together the bands and belts at the place of use therefore constitutes a considerable improvement and supplies an urgent need.

According to the invention this is done by providing on the entire interweaving length of the ends of the belt or band that are to be woven together, a series of auxiliary bars running in the same direction as the wefts of the belt or band and spaced apart by the distance of the weft threads from one another, the warp threads or pairs of warp threads of the two ends being woven into these auxiliary bars alternately so as to correspond exactly to the weave of the belt warp threads and then knotted to the associated warp thread or pair of warp threads of the other end that has become free, whereupon, in place of the bars, a weft thread is drawn in, and the weave of the belt or band is thus accurately maintained, even at the point of connection. By this means a completely smooth and imperceptible transition from one belt or band member to the other is obtained. In the event of a lengthening of the belt or band taking place during use, a shortening thereof on the spot is possible, in the same manner and in a short time.

Such a connection, with is smooth, homogeneous transition from one part of the belt into the other, is of course available in the case of any kind of machine or gear, even where metallic or butt-jointed connections cannot be used, as in the case of dynamos and motors, which cannot bear any shocks, in the case of stretching-pulley gears, reversing drives, and conveyer-belt plant, in which the belts or bands for the most part have to run over pulleys or rollers with both sides.

Apparatus for carrying out the process, and the method of carrying it out, are illustrated by way of example in the accompanying drawings.

Fig. 1 shows in side elevation a belt or band fabric of the kind in question, in this case a twill fabric.

Fig. 2 is a plan thereof.

Figs. 3 and 4 show in side elevation and in end elevation respectively a device for making the connection.

Fig. 5 shows the arrangement during the making of a connection.

Figs. 6 and 7 are details, and

Figs. 8 and 9 show diagrammatically in front elevation and in side elevation respectively, the method of making the connection, Figure 8 being somewhat distorted for the sake of clearness.

The apparatus for making the connection of belts or bands according to the invention is of the simplest nature and consists of two strips or ledges a and b of any convenient dimensions. By means of screws with butterfly nuts c, which are passed through the strips a and b, the latter can be pressed against one another. Between the strips, bars d can be inserted, which are held by the strips after the latter are pressed together. The bars d are preferably constructed as needles with an eye d_1 at each end, as shown in Fig. 7. They are of eliptical cross section and are as thick as the weft threads of the belt or band in question, and must be somewhat longer than the breadth of the belt. To this device moreover there belong two templates f, which each consist of a strip of sheet metal provided with notches g, and which are arranged one at each side of the pair of strips a and b. The notches g of the two strips must register with one another. The spacing of the notches corresponds to the distance, which the needles d must be from one another after being clamped in the apparatus, and which must correspond in its turn exactly to the distance between the weft threads in the fabric. The two templates on the apparatus thus keep the

needles constantly at the correct distance apart and parallel to one another. In the case of wide belts such templates may also be inserted here and there during the progress of the weaving at one or more other places along the length of the needles for the purpose of keeping the needles parallel. The templates preferably have a pivoting eye *h* and a handle *i*, by which they can be pivoted to a pin on the upper strip, and rotated at will within range of the needles and swung out of reach again, or readily removed.

The interweaving of two belt or band ends may be effected at the place of use either on a table or directly between the belt-tensioner mounted on the belt. In the latter case the strips *a* and *b* are held fast between the clamping jaws *m* of the belt-tensioner by means of holders *k* fitted to the said strips.

The procedure for the interweaving is as follows: The ends of the belt or band is stretched in the belt-tensioner, overlapping one another by somewhat more than the contemplated interweaving length. The weft threads are cut through within the range of the interweave on one lateral edge at the points of reversal *n*, Figure 1, so that on this side only cut ends n_1 of weft threads still project, the fabric is opened, and the warp threads can be drawn away towards the side. The application of the weaving device, with the clamped needles, now takes place at the side of the overlapping ends of the belts, beside the severed weft threads, this being done in such a way that the points of the needles are directed exactly upon these threads, as shown in Figures 5 and 9.

The interlacing now takes place in such a manner that according to Figure 8 for example first the outside warp thread o_1 of the left-hand end *o* of the belt is pulled away from the cut weft threads right to the side and is pushed on to the needle points from left to right in the same method of weaving, as shown in dot-and-dash lines. The end of the thread o_1 is then knotted to the same associated warp thread p_1, likewise drawn away towards the side, of the end *p* of the belt, at about the point *q*, whereupon the ends still projecting are cut off. The next warp thread p_2 of the right-hand end *p* of the belt is now pulled away and pushed on to the needles in its turn in the correct weave, as shown in dotted lines, to be ultimately knotted at about the point *r* to the second warp thread o_2 of the left-hand belt end, which is likewise lifted out. The projecting free ends are then likewise cut off. Under some circumstances each pair of warp threads o_1, o_2 or p_1, p_2 may be lifted off at the same time, pushed over on to the needle points in their weave, and knotted at the point *q* or *r*.

The interweaving of the remaining warp threads or pairs proceeds in exactly the same manner, the odd warp threads or pairs from the left-hand belt or band end being pushed on to the needles from time to time in the current weave and then knotted to the odd threads or pairs of threads of the right-hand end, while from the right-hand belt or band end the even warp threads or pairs are pushed on to the needles from right to left and knotted to the even warp threads or pairs of the left-hand end. The needles are thus pushed into the fabric according to the measure of the pushing on of the warp threads, with temporary slackening of the wing nuts *c*. Hence the warp threads or pairs of warp threads of the left-hand and right-hand ends of the belt or band engage in the connecting piece of fabric alternately, so that a thoroughly firm texture is obtained. The knots on either side are preferably arranged in somewhat displaced or staggered relationship to one another.

When all the warp threads in question have in this manner been woven into the needles and spliced, the strips *a* and *b* are removed from the needles, which have temporarily formed a weaving framework and have had to assume the character of wefts. They are now replaced by a weft thread. The latter is inserted into one eye of the outermost left-hand or right-hand needle, and the latter after being turned into an edgewise position, as a result of which, owing to its elongated cross section, it forms a large shed, is then drawn out of the fabric, pulling after it the weft thread, which takes its place. This weft thread is then threaded through the adjacent eye of the next needle and is thereupon pulled into the fabric in place of the needle by the drawing out of the latter. The same procedure is then adopted with the following needles, so that finally all the needles are replaced by the weft thread, and the connecting place is executed in exactly the same weave as the belt or band and dovetails homogeneously into the latter. Any weave can of course be carried out in this manner.

In order to facilitate the work in the interweaving of the warp threads and to keep a check on the progress of the weaving at every point for the purpose of obviating faults in the weave it is necessary to distinguish the warp threads or pairs in question in some way as belonging to one another. According to the invention this is done by turning one warp thread or pair of warp threads to the left from time to time while the next warp thread or pair is turned to the right, the alternate turning of the warp threads being continued in this way over the entire breadth of the belt, so that the odd warp threads or pairs for example have a right-handed twist and the even ones a left-handed twist.

This ensures the correct warp threads or pairs always being knotted together and a faultless fabric being obtained even at the connecting place.

Having now thus described my invention,

what I claim as new and desire to secure by Letters Patent, is:—

1. The process for weaving together the ends of tensioning members of the same weave consisting in using upon the entire connecting length of the ends to be interwoven with one another a series of bars running in the same direction as the wefts and spaced apart by the same distances as the wefts into which the warp threads of the two ends are woven alternately exactly in accordance with the weave of the warp threads in the tensioning member, and then knotted to the associated warp threads of the other end which have become free, whereupon a weft thread is woven in, in place of the bars.

2. Apparatus for weaving together the ends of tensioning members comprising movable bars in the form of needles with eyes at both ends for drawing in the weft threads, clamps for movably mounting the said bars, wing screws for pressing the clamps together, guiding members rotatably mounted on one of the two clamps on both sides thereof and having notches for receiving the bars substantially as and for the purpose set forth.

ARTHUR LUCKWEIL.