Aug. 18, 1970 J. E. BURBANK 3,524,479

WOVEN ZIPPER STRINGER AND METHOD OF MAKING THE SAME

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Fig. 1.

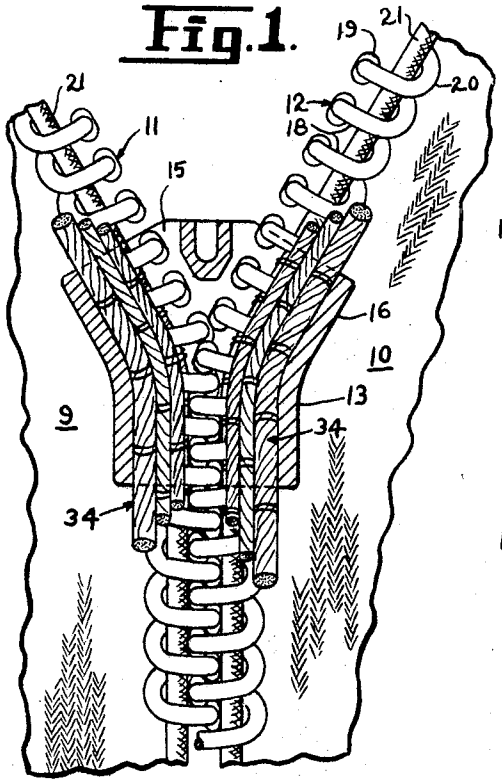


Fig. 3.

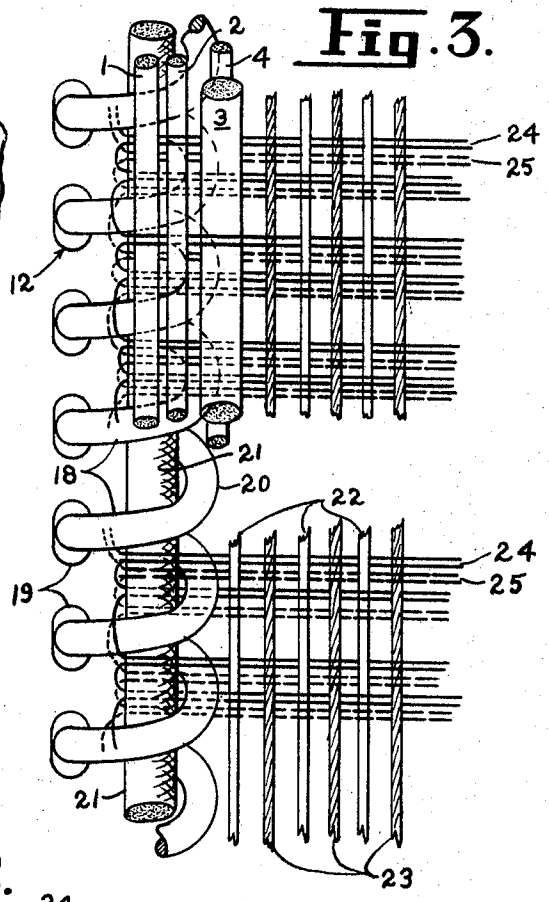
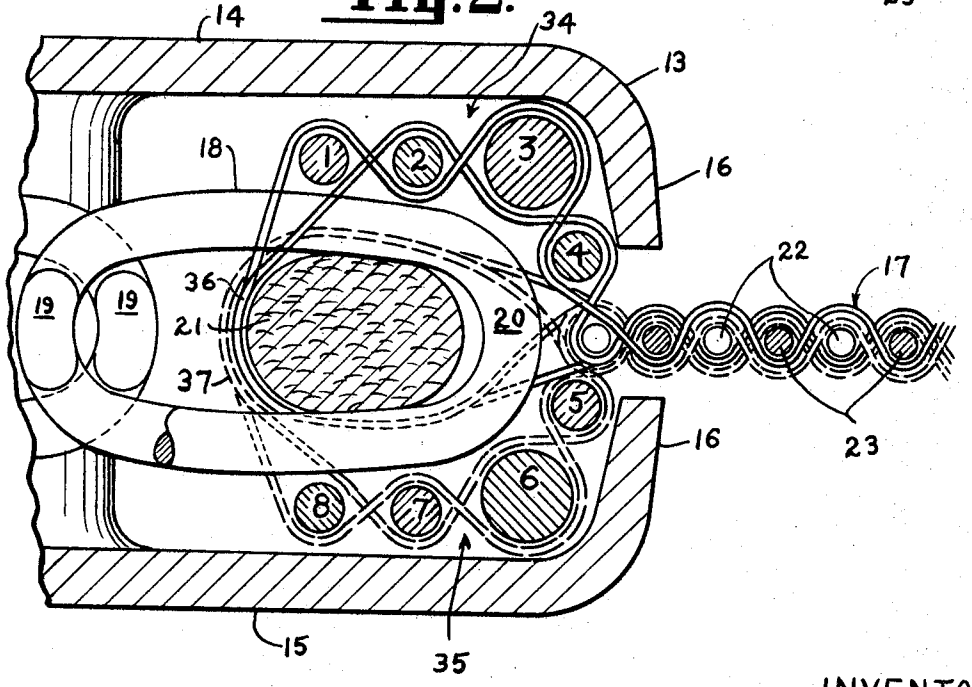


Fig. 2.



INVENTOR
John E. Burbank
BY Dallett Hopkins
ATTORNEY

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Fig. 4.

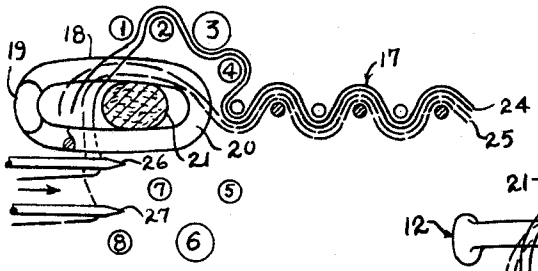


Fig. 5.

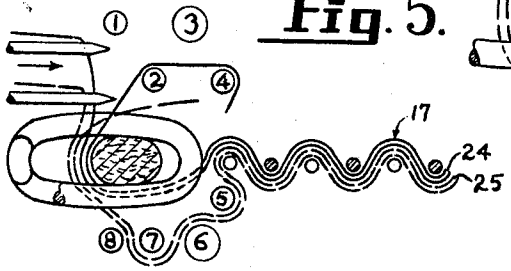


Fig. 12.

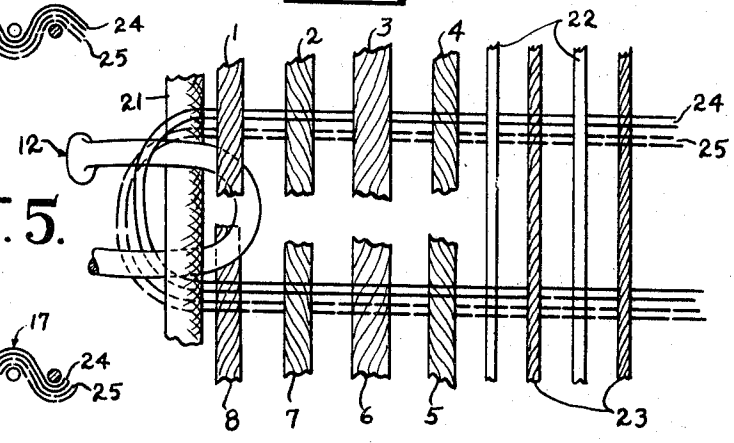


Fig. 6.

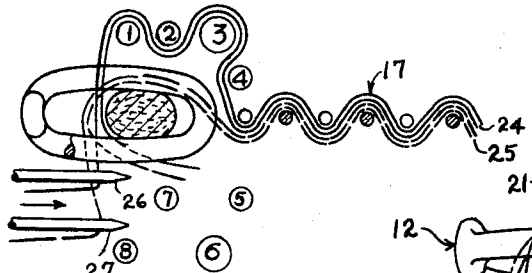


Fig. 7.

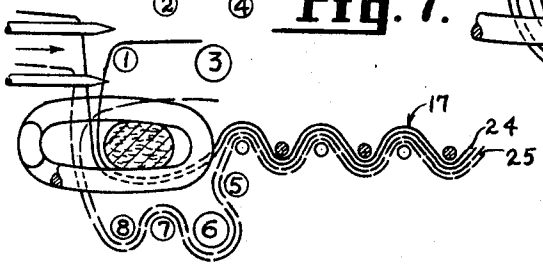
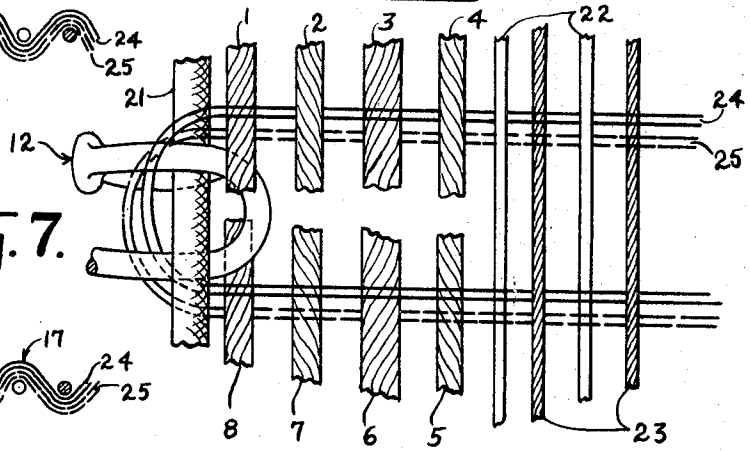


Fig. 13.



INVENTOR
John E. Burbank
BY Dallett Hopper
ATTORNEY

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Fig. 8.

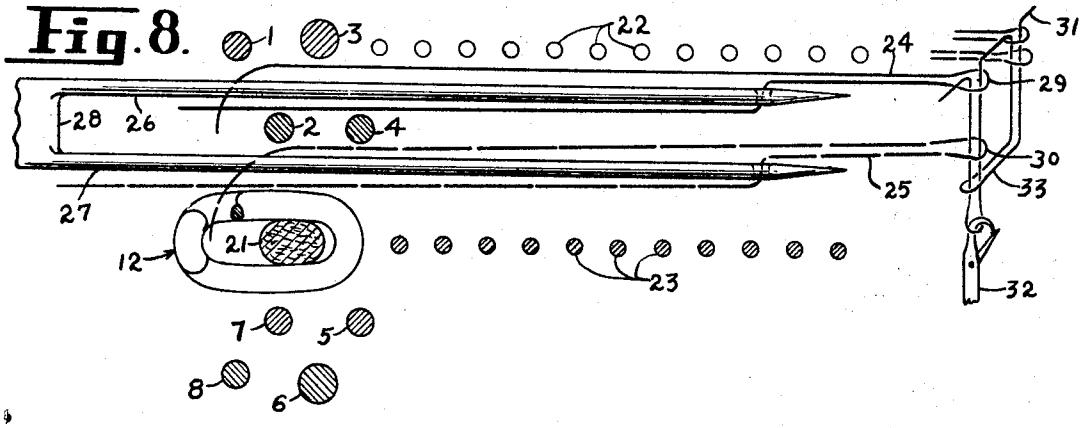


Fig. 9.

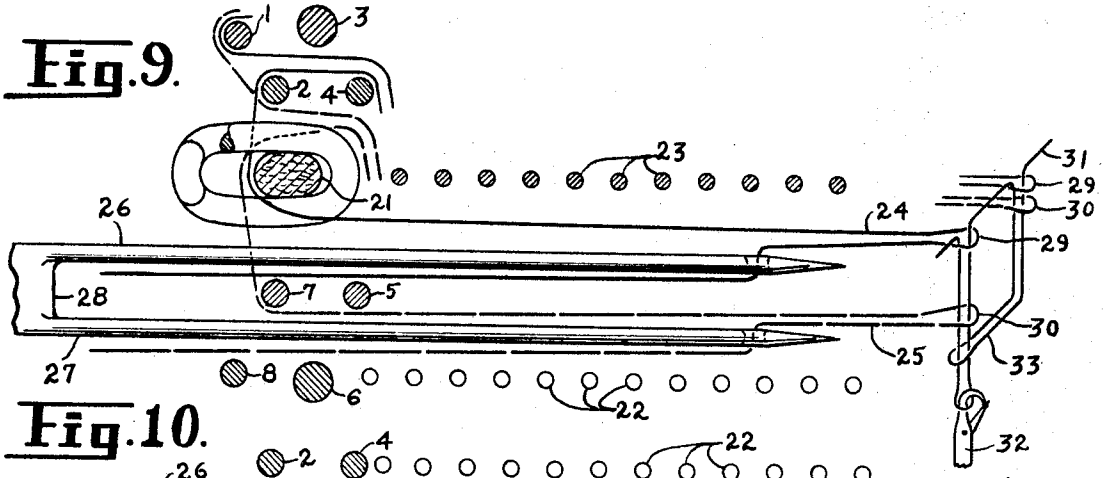


Fig. 10.

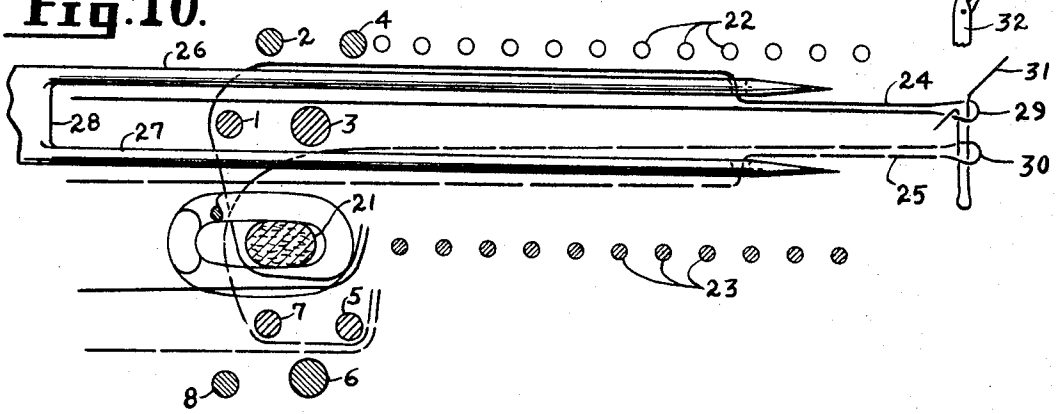
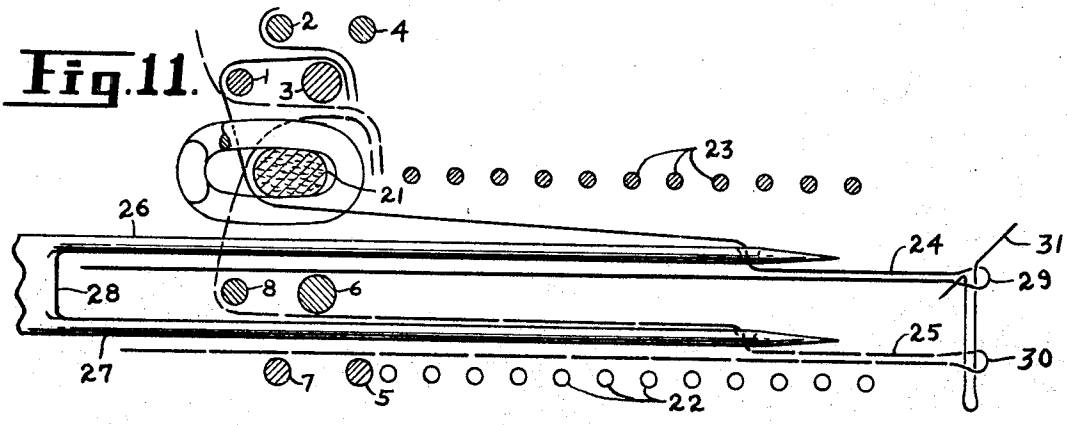


Fig. 11.



United States Patent Office 3,524,479 Patented Aug. 18, 1970

3,524,479

WOVEN ZIPPER STRINGER AND METHOD OF MAKING THE SAME

John Emerson Burbank, Middlebury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn., a corporation of Connecticut

Filed July 19, 1968, Ser. No. 746,081
Int. Cl. A44b 19/12
U.S. Cl. 139—384 5 Claims

ABSTRACT OF THE DISCLOSURE

By means of a new method of making an integrally woven zipper stringer, a new and improved product results, in which a slider track structure is made by two separate weft systems, one of which is interlaced with covering warps above a fastener element strip, and the other with lower covering warps. Each weft system passes around the connecting portions of the strip and then directing into a flat web or tape. Such "connecting portions" may include a cord inside a filamentary coil.

This invention deals with a new and improved integrally woven zipper stringer and the method of weaving it in a single operation. The fastener strip which is woven into the tape may be any of various kinds having head portions projecting outwardly from the web or flat portion of the tape and connecting portions adjacent the inner edge of such web. The fastener element strip shown and described is in the form of a coiled filament of plastic material and having a cord running through the coil. In cases where a cord is not employed, portions of the coil itself would be the connecting portions, whereas with the cord in the coil or with cords connecting separate fastener elements, portions of the cord itself becomes the "connecting portions."

The new method of weaving and the resulting product provide for the first time a combination of many advantageous features, only a part of which have been present in prior woven zipper stringers.

By reference to the closest known prior patents, Schwendt et al. 3,047,922, and Burbank 3,283,379, the novel aspects of this invention can be readily appreciated. The combination of advantages resulting from this invention may be briefly listed as follows:

(1) A rectangular track structure for guiding the slider with covering portions at the sides and over the top and bottom of the fastener strip, held in place firmly by weft threads passing vertically through the fastener strip.

(2) Weft threads going through the middle of the fastener strip directly into the web so that the tape will not pull away from the fastener strip and the whole structure will hold its shape better.

(3) There may be double the number of weft threads for holding the fastener strip to the tape and the size of the weft threads may be smaller.

(4) The weaving operation can be carried out with an ordinary high speed needle loom employing a single simple laying mechanism carrying two parallel needles built and operated almost as one.

(5) With two independent weft systems, one of which ties the upper covering or slider track portion, while the other ties in a similar lower portion and with both separate and independent weft threads interconnected at the outer edge of the web, the breakage of a single thread on one portion of the slider track structure will not result in unravelling of the fabric.

In my prior patent above referred to, some of these advantages are obtained but only at the expense of a more complicated loom employing a vertically acting weft needle as well as the usual horizontally acting one. In the Schwendt et al. patent, only a single weft system is employed and with the complicated structures shown in FIGS. 5, 6, and 7 of the patent, the possibility of manufacture with a simple high speed loom is not present. Furthermore, the structure does not have the advantage of covering portions held tightly against the fastener strip by threads passing vertically through and around the connecting portions of the strip.

Other objects and advantages of the invention will hereinafter more fully appear.

In the accompanying drawings, I have shown for purposes of illustration, one embodiment which the invention may assume in practice. From these drawings:

FIG. 1 is a general front view of a zipper fastener embodying my invention and showing the upper portion of the slider in cross-section;

FIG. 2 is a cross-section of one zipper stringer and a portion of the slider;

FIG. 3 is a diagrammatic view of a portion of one stringer with some of the covering warp threads omitted in the lower portion to facilitate illustration;

FIGS. 4, 5, 6 and 7 are diagrammatic views in cross-section indicating four different positions at which the double needles enter a shed, and indicating the last course of the weft which has been pulled up;

FIGS. 8, 9, 10 and 11 are diagrammatic views corresponding generally to the positions shown in FIGS. 4, 5, 6 and 7 respectively, and showing the various positions of the fastener element strip and all warps;

FIGS. 12 and 13 are diagrammatic views in plan to indicate two different positions of the two weft systems.

A portion of an assembled zipper fastener shown in FIG. 1 has a pair of stringers generally designated **9** and **10**, carrying fastener element strips **11** and **12** respectively and a slider **13** for opening and closing the fastener. As seen in FIG. 2, the slider has the usual upper and lower wings **14** and **15** with side flanges **16** turned inwardly at right angles. Each stringer has a flat woven web **17**, and each of the fastener element strips consists of a continuous filamentary coil made of suitable plastic material, having parallel leg portions **18**, head portions **19** projecting outwardly from the inner edge of the web **17**, heel portions **20** and a cord **21** running through the coil. The portions of cord between coil convolutions, and/or the heel portions **20** are herein referred to as "connecting portions."

The warp threads in the web portion may be shedded in groups to make any desired weave pattern, and as shown in FIGS. 8 to 11, may include an upper group of like size yarns **22** and a lower group **23** which, of course, reverse positions at each change of shed. While normally a web woven with a needle loom will always have a pair of weft threads laying side-by-side in each shed, the weave in the present case will have four such weft threads including a pair from each of two separate and distinct weft systems **24** and **25**. The resulting four threads laying side-by-side in the web are seen in the right-hand portion of FIGS. 12 and 13. The wefts **24** and **25** are carried by two parallel needles **26** and **27** respectively which may be integral with a single shank partially indicated at **28**. The loops **29** and **30** as projected through the shed are interconnected in any suitable manner. They may be knitted with a single vertically acting knitting needle catching two loops at once and interlacing them with another pair of loops. I prefer, however, to use an additional thread as indicated at **31** which is pulled through the loops **29** and **30** by a knitting needle **32** so as to interconnect the loops by means of a chain stitch, a portion of which is indicated at **33** in FIGS. 8 and 9.

The slider track structure is woven so as to present an approximately rectangular shape having an upper portion generally designated 34, and a lower portion 35. The upper portion may have covering warps 1 and 2, a corner warp 3 which is somewhat larger than the others, and a spacer warp 4 running along the side of the fastener element strip, whereas the lower portion of the track structure is symmetrical, with a spacer warp 5, a corner warp 6, and covering warps 7 and 8.

The method of weaving the fastener element strip, the upper and lower portions of the track structure, and the web will be best understood from the diagrams FIGS. 8, 9, 10 and 11. In the first position, the web warps 22 are above and 23 are below the needles, the fastener element strip is below the needles and all of the warps 5, 6, 7 and 8 are below both needles 26 and 27. The upper track structure warps are separately shedded so that 1 and 3 are above while 2 and 4 are below the path of needle 26 but, of course, all are above the path of needle 27. This means that the needle 27 has just pulled up a thread around the cord 21 and passes directly into the shed of warps 22 and 23 so that in the finished product it will line up with the middle of the fastener strip. The upper weft 24 is thus interwoven with the upper group of warps 1, 2, 3, and 4 and in the next pass of the needle as I indicated in FIG. 9, all warps as well as the fastener strip have shifted so that the weft 24 is carried around the cord 21 to enter directly into the shed formed by what are now the upper warps 23 and lower warps 22 so as again to pull directly against the middle of the fastener strip. At the same time, the lower needle 27 carries the weft 25 through a shed of the lower track structure warps 8, 7, 6, and 5 so as to inter-weave the weft 25 therewith. In FIG. 10, we again see the web warps and fastener strip shifted to the position of FIG. 8 but the upper track structure warps 1, 2, 3, and 4 have shifted relative positions. Likewise, in FIG. 11, the fastener strip and web warps shift back to the position of FIG. 9 but the track structure warps shift relative positions.

It will thus be seen that at every alternate pass of the two needles, the upper one will weave the weft 24 into the upper portion of the track structure and the lower needle 27 will weave the separate weft 25 into the lower structure while at the same time both weft systems will be woven into the web 17.

In the finished product, as may be best understood from FIGS. 3, 12 and 13, in one position the double weft 24 as laid by the needle 26 passes alternately over and under the upper warps 1, 2, 3, and 4 and over all of the lower warps 8, 7, 6, and 5, whereas the double weft 25 passes always under the warps 1, 2, 3, and 4 and alternately over and under the lower warps 8, 7, 6, and 5. At the same time, both wefts 24 and 25 with actually four threads side-by-side, pass alternately under and over the web warps.

As seen in FIG. 2, the resulting track structure of approximately rectangular cross section is ideal for guiding the slider. Furthermore, any side pull on the zipper fastener will be resisted by those weft threads which extend directly from the web to the middle of the fastener element strip. Thus, the side portions of the track structure, and specifically the warp threads 4 and 5, will not have the same tendency to pull into the space between the slider flanges 16. Again, it will be noted that all of these advantages are obtained in a structure which is tightly bound together by those portions 36 and 37 of both weft systems passing directly across the fastener strip around the cord 21, as best seen in FIG. 2. The novel product with all of its advantages and its inter-related novel weaving process, does not require complications in the loom construction or action so that the weaving can be done at comparatively high speeds with only slight modifications of known needle looms.

I claim:

1. An integrally woven zipper stringer comprising
   (a) a flat woven web having longitudinally extending warps;
   (b) a fastener element strip extending along an inner edge of said web, said strip having head portions projecting outwardly from the web and connecting portions adjacent said edge of the web;
   (c) a slider track structure having upper and lower portions extending above and below said inner edge of the web and having upper and lower groups of warps extending longitudinally along said fastener element strip;
   (d) a first weft system passing on a first pick from said web upwardly through said upper group of warps, around said connecting portions and directly through said web, and then on a subsequent pick passing around said connecting portions and directly through said web, and
   (e) a second and separate weft system passing on said first pick from said connecting portions directly through said web and on said subsequent pick passing through said lower group of warps, around said connecting portions and directly through said web.

2. The combination defined in claim 1 wherein said track structure is approximately rectangular in cross section with some warps above the web and some warps below the web running along the inner side of the fastener element strip, and still other warps running above the fastener strip and still others below the fastener element strip.

3. The combination defined in claim 1 wherein said fastener element strip is in the form of a filamentary coil with a cord extending through said coil and wherein both of said weft systems pass around said cord.

4. The combination defined in claim 1 wherein said first and second weft systems are interconnected at the outer edge of said web.

5. A method of making an integrally woven zipper stringer wherein a fastener element strip is joined to a web, which comprises
   (a) forming successive sheds of warp threads for the web;
   (b) feeding a fastener element strip alongside said shed;
   (c) inserting two separate weft threads simultaneously through each shed as formed, by means of vertically spaced weft laying needles acting together;
   (d) passing both weft threads around said strip while said needles are withdrawn from a shed; and
   (e) separately shedding upper and lower groups of warps along the inner edge of said web so that at each alternate weft insertion, the upper needle enters through said upper group of warps while the lower needle passes directly into said shed of web warps, and at the other alternate weft insertion, the lower needle enters through said lower group of warps while the upper needle passes directly into said shed of web warps.

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HENRY S. JAUDON, Primary Examiner

U.S. Cl. X.R.

139—116, 124; 24—205.1