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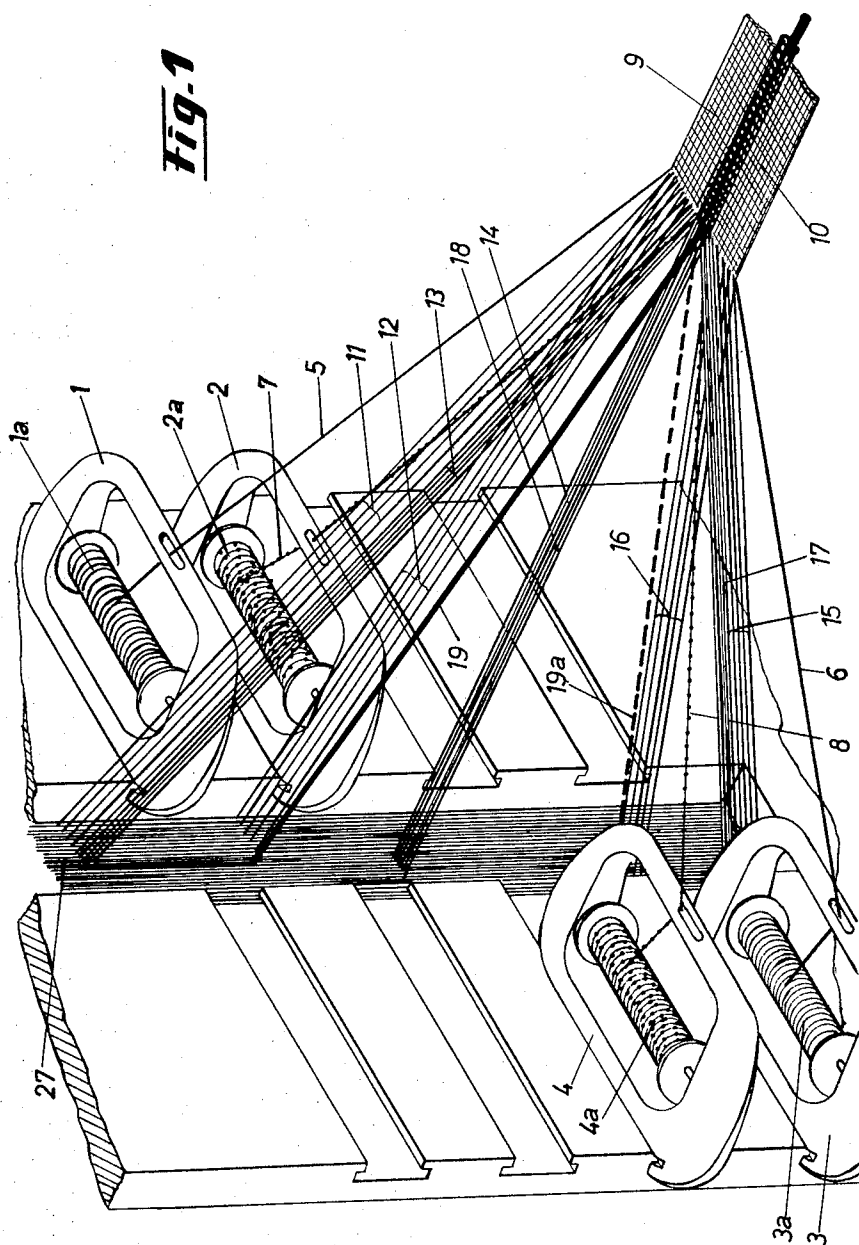
A. GERLACH ET AL

3,249,126

SLIDING CLASP FASTENERS

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4 Sheets-Sheet 1



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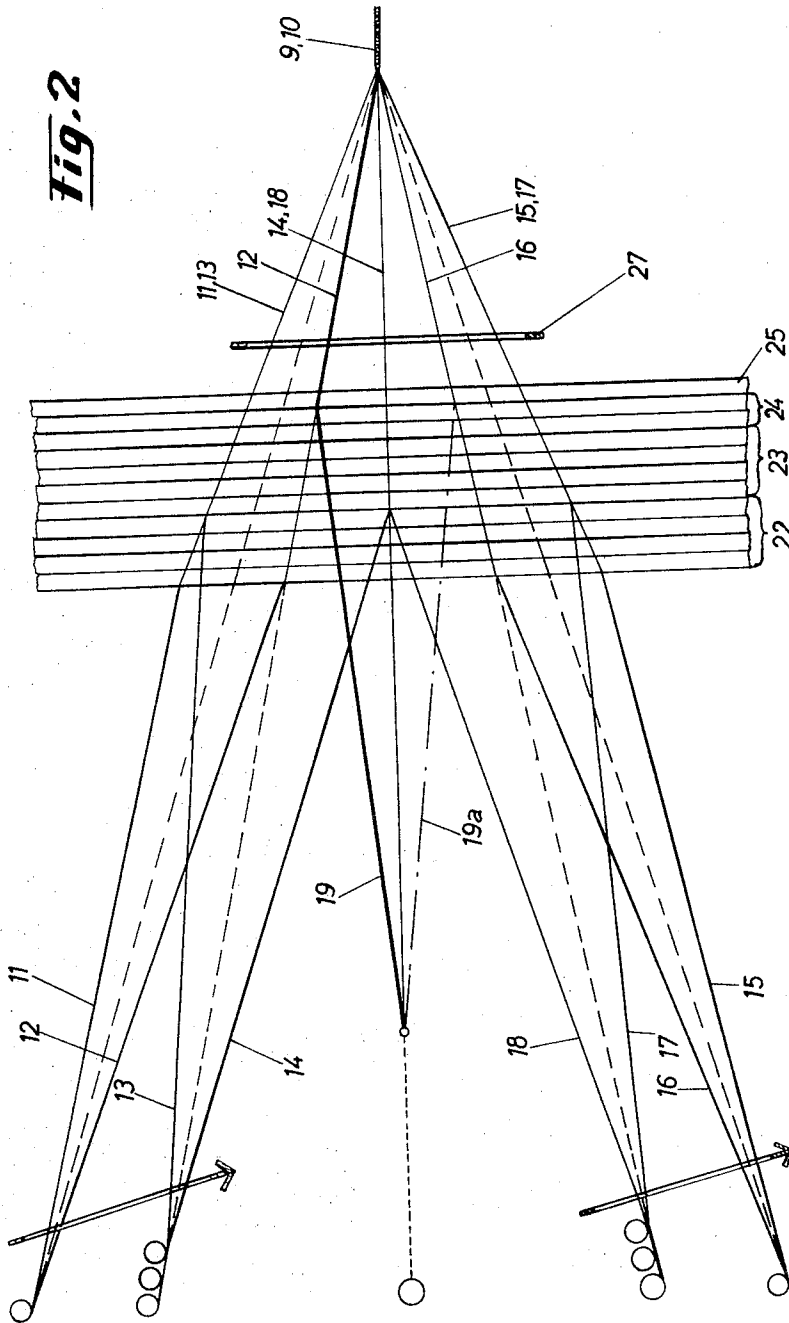
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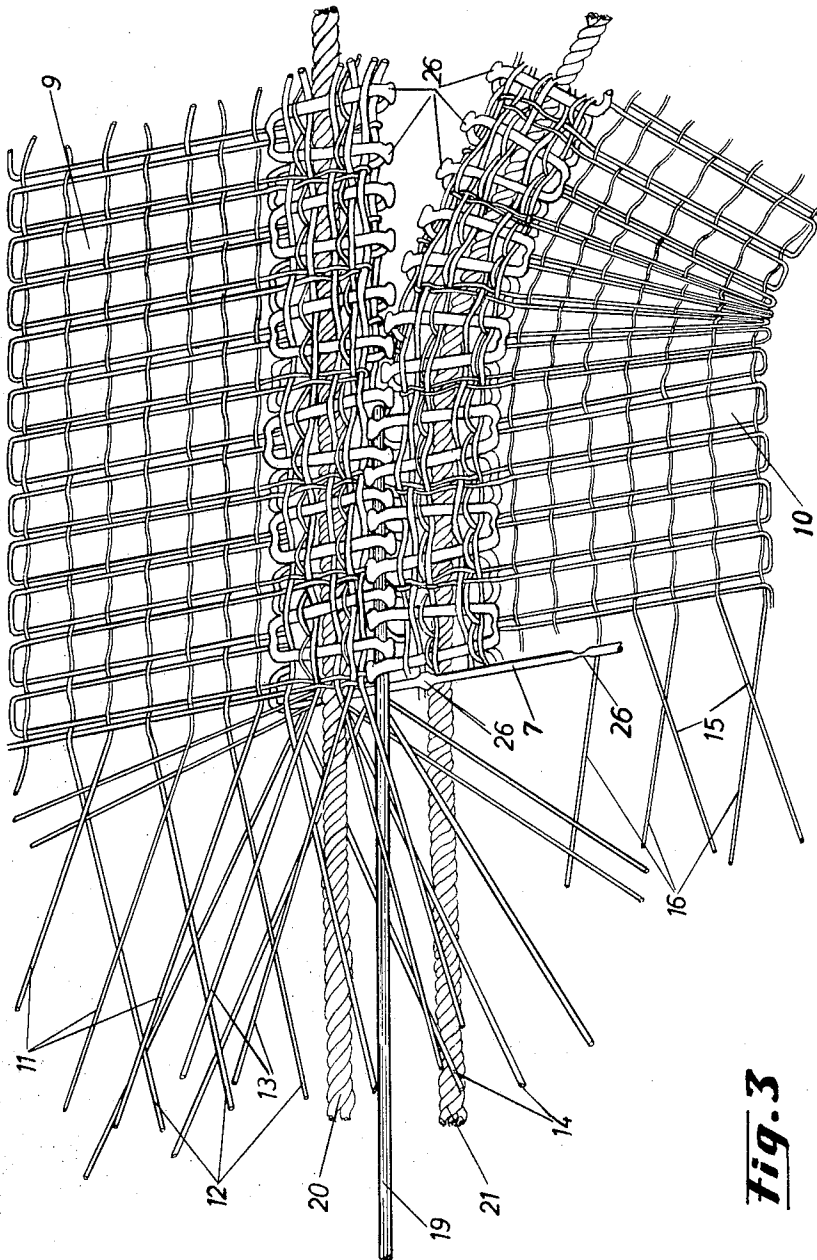


Fig. 3

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Fig. 4

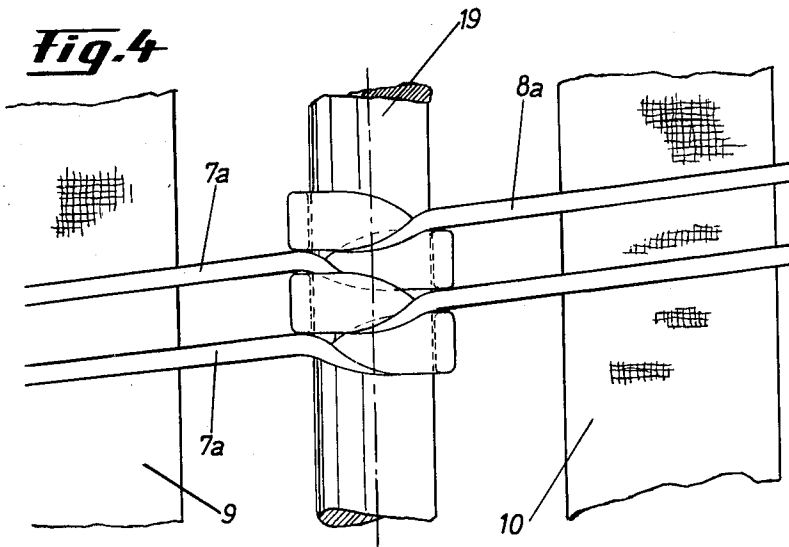
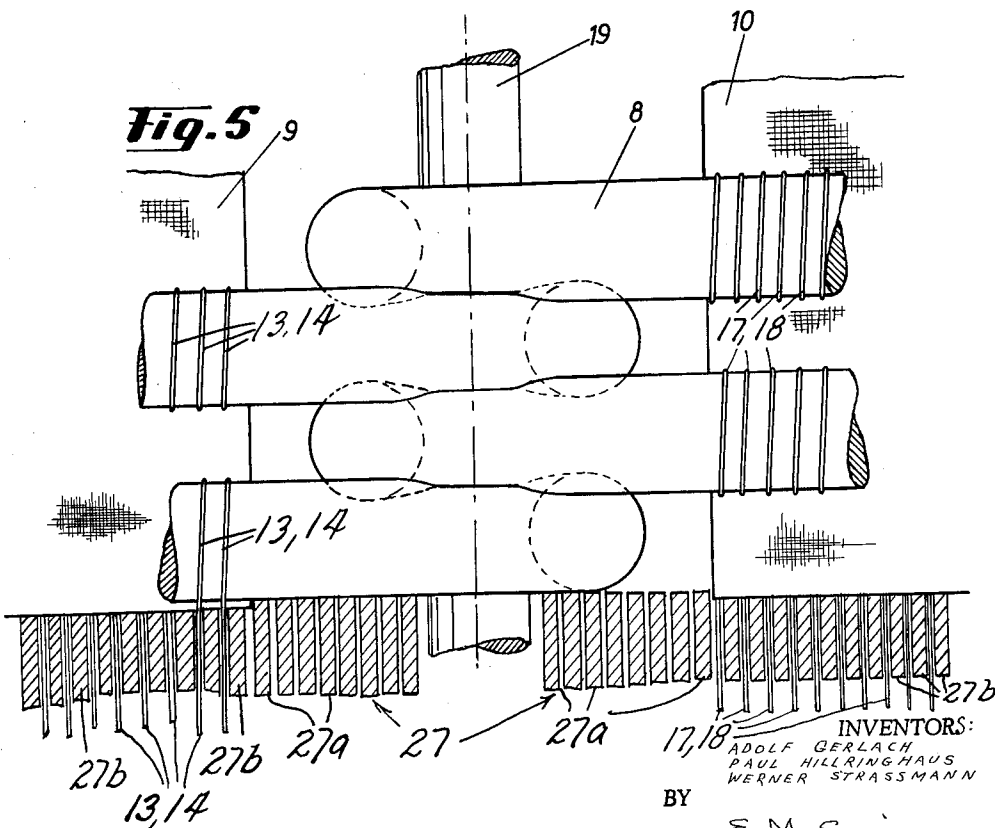


Fig. 5



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SLIDING CLASP FASTENERS

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2 Claims. (Cl. 139—22)

The present invention relates to a method for simultaneously weaving the two portions of a sliding clasp fastener that are to be interengaged on a ribbon loom, employing at least two pairs of shuttles. The fabric comprises monofilamentary fastener-forming weft threads of synthetic material which are included in the weave and which are looped around a common stationary wire, guided by the ply forming mechanism, in order to produce the interengaging coupling elements.

In this method two pairs of shuttles, i.e. four spools are used in a four-shuttle ribbon loom, two spools receiving the weft threads for making the two stringer tapes and two spools each receiving a monofilamentary thread of synthetic material which is woven into a certain portion of the width of the two tapes in the form of a flattened helix providing, along one tape edge, freely projecting loops with coupling surfaces, these constituting the fastener members. In the weaving operation the fastener-forming weft threads are looped around a common wire, pin, or the like, said pin or wire being located centrally between the two tapes to be woven, and in this process the wire is reversed by the heddle frame mechanism while the shuttle with the spools are alternately shot across the warp thread plies. When forming one of the bands the warp thread plies of the other band should remain open and the formation of two separate halves of the fastener requires an alternate vertical adjustment of the heddle frames as is necessary in ribbon looms of known type.

It is an object of the invention to increase the speed of production for the simultaneous manufacture of two engaging halves of a sliding clasp fastener, and at the same time eliminate all vertical movement of the shuttle boxes and thereby avoid the movement of large masses.

A further object is to weave the rows of fastener members to be produced by the weaving process, from a monofilamentary thread of synthetic material which is flat, round or polygonal in cross-section, and to produce the interengaging coupling surfaces of the fastener member in the course of the weaving operation.

Accordingly, the invention provides that the warp thread ply groups for the simultaneous formation of both halves of the sliding clasp fastener are arranged adjacent one another at different heights, and the shuttles with the fabric-forming weft threads for weaving each tape and the synthetic material threads for forming the fastener members of each half, are shot across the warp thread plies lying opposite one another without shifting the shuttle box positions, the wire around which the synthetic material weft threads of both halves are looped being reversed by vertical displacement of its anchored end to the corresponding vertical position by means of the ply-forming or heddle frame mechanism.

The warp thread ply groups for producing the two halves of the sliding clasp fastener are advantageously so arranged that for each shot to be made the lower warp thread of the upper ply group is located on the same or approximately the same, vertical level as the upper warp thread of the lower ply group.

The synthetic fastener-forming weft threads which are to be included in the tape half to be woven, may be provided with pre-formed longitudinally spaced transverse

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deformations acting as coupling surfaces after being woven into the tape, said deformations being so arranged that they determine the reversal of the monofilamentary weft threads, that is that the one transverse deformation is located in the apex of the loop around the wire and the next one is located in the opposite position being embodied in the woven tape.

Alternatively, synthetic material weft threads with a uniform and continuous flat, round or polygonal cross section may be used without previously forming the transverse deformations, in which case, it is necessary, according to the invention, to beat the monofilamentary weft threads with the lathe after each shuttle shot with such force that the flat, round or other sectioned threads become so deformed on the opposite resting points that cooperating coupling surfaces are thus produced. In order to effect this deformation it is advantageous to cause those reed bars of the front reed which come into contact in the area of the bendings or bends or deformations to be produced, to project, in relation to the other reed bars, in the direction of the finished part of the woven fastener. These reed bars may be broader than the other reed bars and therefore protrude beyond them.

The deformation of the monofilamentary weft threads, the synthetic material of which consists of a thermo plastic material such as, for example, polyamide, polyurethane or the like, can be assisted by plasticizing or softening the thread by the application of heat, for example by high frequency heating, radiant heat or any similar locally applied heat.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings, which illustrate a method and apparatus for practicing the invention, and in which:

FIGURE 1 shows a diagrammatic fragmentary perspective view of a ribbon loom operating with four shuttles,

FIGURE 2 shows a diagram of the ply formation for the ribbon loom according to FIGURE 1, in side elevation,

FIGURE 3 shows a diagrammatic partial view of a sliding clasp fastener woven on the ribbon loom according to FIGURE 1, using a plastic thread with pre-formed deformations,

FIGURE 4 shows a fragmentary view of a woven sliding clasp fastener, the fastener members of which are produced from a synthetic material weft thread having a flat section the deformations being formed after the throwing of the plastic thread, and

FIGURE 5 shows a fragmentary view of a woven sliding clasp fastener similar to FIG. 4, the fastener members of which are produced from a synthetic monofilamentary weft thread having a circular section.

In order to simultaneously weave two halves of a sliding clasp fastener according to the invention and as shown in the drawings, the procedure is as follows:

The ribbon loom to be used for the manufacture of the two halves of a sliding clasp fastener operates with four vertically fixed shuttles 1-4, of which shuttles 1 and 3 carry spools 1a and 3a with the spun or fabric-forming weft threads 5 and 6 and shuttles 2 and 4 carry the spools with the monofilamentary synthetic weft threads 7 and 8. It is also possible to operate more than four shuttles if the stringer tapes, i.e. the basic fabric parts 9 and 10, are to be woven in a special pattern.

The four shuttles 1-4 always operate in a constant vertical position being shot over or under the entire width of the warp. In order to weave the two separable halves of a sliding clasp fastener, only two main warp thread ply groups need be constituted, that is one main group for each half of the sliding clasp fastener, one warp

thread sub-group of each main group serving to bind the fabric-forming warp threads 5 or 6, to constitute the basic fabric of stringer tape 9 or 10, and the other warp thread sub-group serving to bind the synthetic monofilamentary weft thread 7 or 8.

In the embodiment shown, the warp threads 11 and 12 constitute the sub-group for forming stringer tape 9, and the warp threads 13 and 14 constitute the sub-group for binding the monofilamentary weft thread 7, which is interwoven with only a portion of the warp threads.

The warp threads 15 and 16 constitute the sub-group for forming the second stringer tape 10 and the warp threads 17 and 18 constitute the sub-group for binding the synthetic monofilamentary weft thread 8.

All warp thread ply groups lie adjacent one another in different constant vertical positions corresponding to the operating levels of shuttles 1-4, the warp threads of sub-groups 14 and 18 being preferably in the same or similar vertical position on the central plane, i.e., on the plane of the tape, and the main two ply-groups being located one on either side of a longitudinal vertical plane.

Alongside the warp threads, a wire 19 is used as a deflection pin, of limited length, which extends toward the right as viewed in FIG. 1 in front of the shafts of the loom, its left end being anchored and which is reversed by vertical displacement of its anchored end in the vertical longitudinal central plane between the two halves of the sliding clasp fastener, as will hereinafter be explained.

The warp thread of sub-group plies 13, 14 and 17, 18 may comprise a cord 20 or 21 as shown in FIGURE 3, this cord determining the shank spacing of the sliding clasp fastener member constituted by the monofilamentary weft threads 7 and 8, in relation to the plane of tapes 9 and 10. In the place of a cord 20 or 21, individual warp threads which are bunched together may also be used.

The shedding and reversal of the warp threads constituting the plies is carried out in the usual manner by the shafts and heddle frames of the ribbon loom, and according to the diagram shown in FIGURE 2, the sub-group warp threads (base threads) 11, 12, 15 and 16 are reversed by the heddle frames 22, the sub-group warp threads 13, 14, 17 and 18 (selvedge threads) are reversed by heddle frames 23, additional binding threads (not shown) for the further binding of the synthetic monofilamentary weft threads 7, 8 are reversed by heddle frames 24 and the locked wire 19 by frame 25 to which one end of the wire is anchored. Upon each reversal, the warp threads 11 or 15, assume the position of warp threads 12 or 16 and vice versa and the warp threads 13 or 17 assume the position of the warp threads 14 or 18 and vice versa.

The weaving of the two sliding clasp fastener halves then proceeds as follows:

The anchored wire 19 first assumes the position according to FIGURE 1 and then all four shuttles 1-4 are shot crosswise through the warp thread plies so that the two monofilamentary weft threads 7 and 8 are shot through beneath the wire 19. Then the reversal of all warp threads take place in the aforementioned manner and at the same time reversal of the wire 19 into position 19a so that upon the return shooting of shuttles 1-4, the monofilamentary weft threads 7 and 8 are shot through their warp threads above the wire 19a, i.e., the synthetic material weft threads 7 and 8 are passed or looped around the pin or wire 19 upon each to and fro shooting operation and constitute loops which freely project beyond the facing edges of the tape after passage beyond the free end of the wire (see FIGURE 3), these loops forming the so-called coupling elements which engage one another (in FIGURE 3 the coupling elements are beyond the free end of wire 19 are shown as separated from one another in order to make them more clearly visible). It is also possible to use monofilamentary weft threads 7 and 8 which have been previously stamped with coupling

surfaces 26 with a spacing such that one coupling surface or deformation 26 constitutes the coupling element in the apex of each loop and the next deformation is included in the reverse bend located within the woven tape. The stamping of the coupling surfaces 26, the planes of which may also be alternately perpendicular to one another facilitates bending of the thread material and the deformations therefore always assume the same position during the weaving process.

It is also possible, however, to use monofilamentary weft threads 7 and 8 having a flat, circular or other cross-sectional configuration without previously forming the deformations, as will hereinafter be explained.

After the to and fro cross shooting of shuttles 1, 2 and shuttles 3, 4, shuttles 1 and 2 remain stationary and shuttles 3 and 4 are shot backwards and forwards through the plies. The shuttles 3 and 4 remain stationary and shuttles 1 and 2 are shot through the plies. The cross-shooting of both shuttles 1, 2, and 3, 4 thus recommences.

After each shot the weft threads 5, 7, and 6, 8 are beaten-up in the direction of the finished side of both halves of the tapes 9 and 10 by the front reed 27 of the lathe, so that a firm fabric of tapes 9 and 10 and a certain juxtaposition of the fastener loops of the monofilamentary weft threads 7 and 8 is achieved, the coupling surfaces 26 of the synthetic threads 7 and 8 producing a coupling engagement of the two fastener rows after being released from wire 19.

This operation of the lay can, according to the invention, also be directly used to produce the deformations which provide the coupling surfaces if the monofilamentary weft threads 7 and 8, having a flat circular or other section, are used without previous deformation. In such a case the rods 27a (FIG. 5) of the front reed 27, which beats up on both sides of the anchored looping pin 19, between the pin 19 and the facing edges of tapes 9 and 10, are arranged projecting beyond the other reed rods 27b in the direction of the finished woven sliding clasp fastener, and these projecting reed rods 27a may be wider or broader than the remaining reed rods and therefore project beyond the other reed rods to the extent of such greater width. If a flat monofilamentary weft thread 7a, 8a is used, as shown in FIGURE 4, and the projecting reed rods of the lathe operate with greater beating up force in the direction of the finished fastener band, then the flat threads 7a, 8a, which are bound edgewise, will be bent and/or deformed by beating over the wire 19 so that the synthetic weft threads will lie flat where they pass around the pin or wire 19 and as a result of the bending before reaching the wire, will produce coupling surfaces for the mutual engagement of the rows of woven fastener members as shown in FIGURE 4.

Such a deformation for producing the coupling surfaces can also be obtained with synthetic weft threads having a continuous round or polygonal section, if the front reed is constituted in the aforementioned manner and is made to beat up in such a way that a thread with a round cross-section is deformed so as to have the fastener shape according to the partial view shown in FIGURE 5. A condition is obviously that the material of the synthetic weft thread 7 and 8 should be capable of being permanently deformed, and this deformation may be assisted by a local heating of the thermoplastic material of thread 7 and 8, for example by a high frequency heating or any other heating means.

After weaving of the connecting or engaging fastener portions, further heating of the two rows of fastener members may be effected in order to release the internal stresses within the synthetic weft threads 7 and 8, produced by the weaving process.

According to the invention it is, of course, possible so to guide and bind the synthetic weft threads 7 and 8 that they adopt a U-shaped curved line having a wavy configuration as shown in FIGURE 3 or also a flattened helical spring shape, or a combination of the two kinds.

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According to the preceding description of a weaving process, it is possible to produce engaging sliding clasp fastener portions of any desired length. For practical purposes, however, individual sliding clasp fasteners which are ready for use are made only in specified lengths. According to the aforementioned process and with the loom described, it is possible, while weaving stringer tapes 9 and 10 which are endless or of any desired length, to provide both tapes 9 and 10 with fastener members of synthetic weft threads which are woven thereto and according to the desired specific fastener length, and then to produce a portion of free stringer tapes with no members thereon, this being repeated so that an indefinite length of stringer tape is produced, carrying fastener members in discrete portions of specified lengths, with free tape between them. For this purpose the procedure is as follows:

As soon as the desired length of an individual sliding clasp fastener with fastener members woven thereto is produced, shuttles 2 and 4 with the synthetic thread spools 2a and 4a are stopped, e.g., by cutting out their drive. Thereby only the two tapes 9 and 10 will be woven, without fastener members, and after producing a desired length of tape without fastener members, shuttles 2 and 4 with the synthetic weft threads are once more set in operation to produce fastener members.

We claim:

1. The method for simultaneously producing two slide fastener tapes, each tape having coupling elements which engage the coupling elements of the other tape and are disengageable therefrom, said coupling elements being formed by projecting portions of continuous monofilamentary weft threads, said method comprising the steps of arranging at least four shuttles for throwing weft threads each at a separate fixed level; supplying first and second ones of said shuttles each with a monofilamentary thread for forming said coupling elements; supplying third and fourth ones of said shuttles each with fabric-forming thread; arranging four groups of warp threads with two groups for each tape, said warp threads being arranged with the threads of each group adjacent to those of at least one other group; positioning a wire with one end anchored against longitudinal displacement and the other end free; throwing said first and second shuttles alternately across said wire; displacing the anchored end of said wire vertically between successive throws of said first and second shuttles to cause said monofilamentary threads to be looped around said wires with the looped portions of one monofilamentary thread in lateral engagement with the looped portions of the other monofilamentary thread; shedding said warp threads of two of said groups to engage said monofilamentary weft threads adjacent to said wire whereby each monofilamentary weft thread is woven

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into a portion of one tape which is adjacent to the other tape; shedding said warp threads and throwing the third and fourth shuttles to form the basic fabric of each tape, advancing both tapes to free the interengaging looped portions of said monofilamentary threads from said wire; and beating said interengaging portions of said monofilamentary threads to form cooperating deformations therein.

2. A loom for the simultaneous weaving of two interengaging slide fastener tapes which comprises; warp thread supplying means; heddle frame means operatively associated with said warp thread supplying means; shuttle box means comprising four shuttles each thrown across the full width of the warp at a predetermined fixed level with respect to said warp thread supplying means; a wire member having one end connected for displacement in the direction of movement of said heddle frame means in proximity thereto, the other end of said wire member being free; first means included in said heddle frame means for shedding said warp threads to permit passage of a first shuttle over and under said wire; second means included in said heddle frame means for shedding said warp threads to permit the passage of a second shuttle over and under said wire; means for displacing said one end of said wire member to cause weft threads thrown by successive throws of said first and second shuttles to be looped around said wire with the looped portions of the two weft threads in laterally interengaging relationship, unlooped portions of each of said weft threads being woven into a portion of the fabric of a separate one of said tapes; means included in said heddle frame means for shedding said warp threads to permit weaving of each tape by the throwing of third and fourth ones of said shuttles; and reed means having projecting portions engageable with said looped portions of said two weft threads upon beating thereof to form cooperating deformations therein, whereby said looped portions constitute coupling elements for said slide fastener tapes.

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