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MANUFACTURE OF SLIDE FASTENERS

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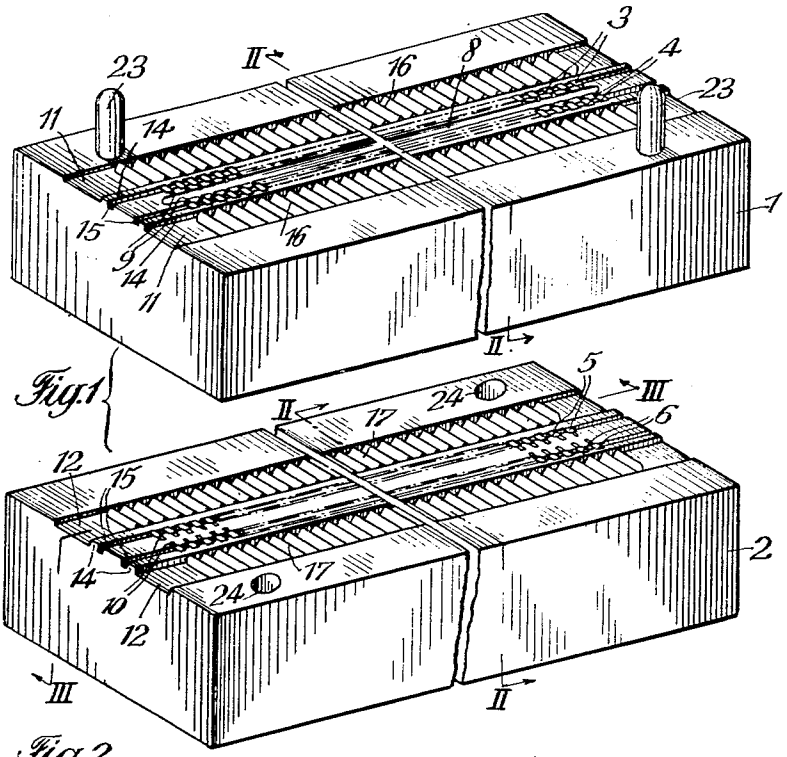


Fig.2

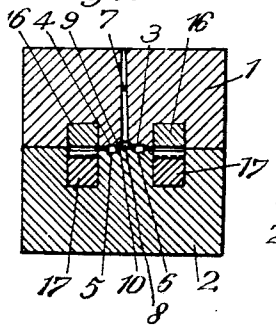


Fig.3

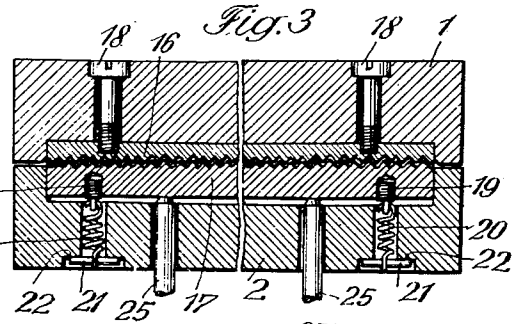


Fig.4

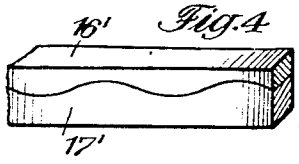
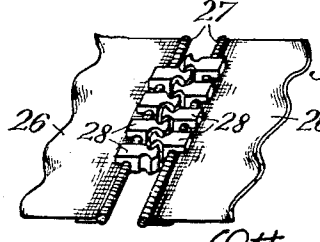


Fig.5



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MANUFACTURE OF SLIDE FASTENERS

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5 Claims. (Cl. 18—36)

My present invention relates to a method of and means for manufacturing slide fasteners, in particular to a method in which the stringer tapes are set into a die in which fastener elements are injection-molded in rows on the stringer tapes.

Slide fastener stringers, as heretofore made by die casting the rows of fastener elements directly on the stringer tapes by injection molding while the tapes are engaged between the two halves of a separable mold or die block, when removed from the mold, and also the closed slide fastener formed by interengaging the rows of fastener elements of two of them by the slider, are commonly found to be distorted causing them characteristically to take an objectionable transversely undulatory shape extending lengthwise of them. This undulation applicant has found is caused by the beaded edge portion of the stringer tape, on which edge portion the rows of fastener elements are cast, being subjected during the casting operation to high pressure between the mold halves, which high pressure is necessary effectively to seal the joint between such edge portion and the mold halves against leakage under the high pressure of the injected material of which the fastener elements are molded. This high pressure on the edge bead and immediately adjacent tape portion expands them longitudinally of the tape and therefore in effect stretches them longitudinally of the tape, with the result that when the stringer is removed from the mold upon completion of the casting operation the edge portion of the tape having the row of fastener elements is longer than the remaining portion, which latter was not subjected to pressure while the tape was within the mold. As a consequence of this difference in the lengths of the two portions of the tape, the stringer and two mating stringers engaged with each other by operation of the usual slider are distorted into the above mentioned objectionable undulatory shape. Such distortion is highly objectionable because not only does it cause objectionable wear on the fastener elements but from a commercial standpoint renders the fasteners unsalable and particularly so if the prospective purchaser should desire a slide fastener for use in women's dresses, blouses or the like of light weight material or from similar use.

Heretofore it has been attempted to eliminate the above described defects of fastener stringers made by prior methods of die casting the fastener elements directly on the stringers by resorting to subjecting the completed stringer to various rolling, stretching, pressing, steaming and ironing operations. These operations are expensive, and furthermore for the most part have proved more or less unsatisfactory.

According to the present invention, the above defects of prior slide fastener stringers are eliminated by in effect predeterminately longitudinally stretching a portion of the stringer tape opposite its portion on which the fastener elements are cast, and prior to casting them. It has been found that in this way compensation may be had for the above described stretching or longitudinal expansion of the edge portion of the tape on which the fastener elements are cast, with total elimination of the above described distortion in the completed stringer and in the closed slide fastener.

The means disclosed by my present invention for manufacturing slide fasteners, is shown, in one form and by way of example, in the accompanying drawing which

also serves for more fully explaining the method disclosed by my present invention. In the drawing

Fig. 1 shows a perspective view of the upper and lower portions of a two-part die having tape-stretching means,

Fig. 2 is a cross-section on the line II—II of Fig. 1,

Fig. 3 depicts a longitudinal section on the line III—III of Fig. 1,

Fig. 4 illustrates a modification of the stretching means, and

Fig 5 shows a perspective view of a fastener portion interlocked immediately after the molding operation and having stretched stringer-tapes.

Fig. 1 shows the upper portion **1** and the lower portion **2** of the two-piece die which is intended for insertion in an injection molding machine. In said die, the rows of fastener elements on both stringer-tapes are produced simultaneously. To produce the said elements, two rows of recesses **3** and **4** are provided in the upper die piece **1** and two corresponding rows of recesses **5** and **6** in the lower die piece **2**. The recesses **3—6** in the two assembled die pieces form the individual dies for molding the said elements. A supply gate **7** (Fig. 2) provided in the upper die piece **1**, opens into a sprue **8** which extends longitudinally through the upper die piece **1** and through the entire length of the rows of recesses **3** and **4**, and which serves for supplying to said individual dies the liquid or plastic material for producing the fastener elements.

For such latter purpose, the sprue **8** is provided with small branch channels **9** in the upper die piece **1**, which open to the recesses **3** and **4**. Corresponding channels **10** are provided in the lower die piece **2**, which communicate with the recesses **5** and **6**. Laterally of the two rows of recesses **3**, **4** and **5**, **6** there are provided in the two die pieces **1** and **2** shallow recesses **11** and **12** respectively, which extend through the entire length of the die and are destined to accommodate the stringer tapes of the fastener to be manufactured. Between these recesses **11**, **12** and along the channels **15** which extend across the rows of recesses **3**, **4** and **5**, **6**, lands **14** are provided. The latter serve as abutment for the two stringer tapes and seal the recesses **3**, **4** and **5**, **6**. The channels **15** are intended to accommodate the edge beads of the stringer tapes.

The recesses **11** and **12** are deepened on a portion of their length, and in these deepened portions are arranged rack-shaped stretchers **16** and **17** respectively, which latter are destined for stretching a portion of the outside edges of the stringer-tapes. The stretchers **16** are secured in the deepened portions of the recesses **11** of the upper die piece **1** by means of screws **18**. Each of the two stretchers **17** disposed in the deepened portions of the recesses **12** of the lower die portion **2**, is engaged by two grub screws **19** which are provided with a connecting ring. In each of these rings is attached a tension spring **20** which is situated in a bore of the lower die piece **2**. The free ends of the springs **20** through pins **21** are supported on shoulders **22** of the said bores (Fig. 3). The depth of the deepened portion in the two recesses **12** of the lower die piece **2** is such that the two stretchers **17** in the assembled die structure do not entirely fill the said deepened portions but on account of the springs **20** are resiliently held with play in the lower die piece **2**.

To produce a slide fastener with the aid of the two-piece die structure **1** and **2**, the stringer bases are inserted in the recesses **11**, the tape edge-beads being accommodated in the channels **15**. The upper die piece **1** then is mounted on the lower die piece **2** so that two diagonally-opposite guide studs **23** fixed to the upper die piece **1** are engaged in corresponding bores **24** of the lower die piece **2** in order to fix the two die pieces in their relative position.

The two die pieces thus assembled, between which are disposed the inserted stringer tapes, are pressed together in this position by suitable means. To mold the fastener elements, the die structure or block is set in a conventional injection molding machine (not shown) on a resilient die support. The latter comprises a plurality of rigid pressure studs **25** which project through

bores in the lower die piece **2** and through their conically tapered ends push the stretchers **17**, against the action of the springs **20**, against the corresponding stretchers **16** so that the tapes are clamped between the rack-like stretchers **16** and **17**. The tape edge-beads thus are positioned in the channels **15**, and the tapes are gripped in the die block outside of the rack-like stretchers **16** and **17**. By clamping the respective tape portions between the stretchers, these tape portions become stretched. The fastener elements then are cast or molded in known manner.

The four stretchers, of which in the example described those two of the lower die piece are disposed resiliently and are vertically movable, could be fixed to or made integral with, the respective die pieces. The stretchers, however, also could be disposed resiliently movable in both die pieces.

The stretcher surfaces, instead of being toothed, could be shaped differently, for example undulated as shown on the two stretchers **16'** and **17'** of Fig. 4. A slide fastener made by means of a die block comprising undulated stretchers **16'**, **17'** is shown partly in Fig. 5. The stretched condition of the tape portions **26** within the edge beads **27** is still visible, but will disappear a short time after the stringer tapes studded with the fastener elements **28** have been removed from the die, due to the above-mentioned inevitable shrinkage. It will be readily appreciated that the stringer tapes, by virtue of such subsequent shrinkage, resume their original lengths. Thus, the pitch of the fastener elements **28** is not reduced.

What I claim as new and desire to secure by Letters Patent is:

1. In the manufacture of slide fasteners, in which an edge portion of a stringer tape is clamped under pressure in a separable die block wherein fastener elements are cast under pressure in rows on said edge portion by an injection molding operation, the improvement which comprises stretching longitudinally of the tape, prior to the casting operation, a portion of the tape positioned laterally of said edge portion by means disposed in the die block and operated by closure thereof on the tape for the purpose of preventing presence of undulations in the stringer when removed from the die block upon completion of the casting operation.

2. Apparatus for injection molding a row of spaced fastener elements on the beaded edge portion of a tape to form a slide fastener stringer, such apparatus comprising a separable two-piece die adapted to receive between the two die pieces a length of the tape and mold the row of fastener elements on said beaded edge portion; said die pieces being formed to provide, when the die is closed, a channel for receiving the bead of the tape and a row of spaced mold cavities intersecting said channel for molding said elements; said die pieces also being formed with cooperating portions which when said die pieces close on the tape linearly stretch for at least a portion of its width that part of the tape which is positioned at the side of said row of cavities opposite the bead of the tape.

3. Apparatus for injection molding a row of spaced fastener elements on the beaded edge portion of a tape to form a slide fastener stringer, such apparatus comprising a separable two-piece die adapted to receive between the two die pieces a length of the tape and mold the row of fastener elements on said beaded edge portion; said die pieces being formed to provide, when the die is closed, a channel for receiving the bead of the tape and a row of spaced mold cavities intersecting said channel for molding said elements; said die pieces also being formed with cooperating portions which when said die pieces close on the tape linearly stretch for at least the major portion of its width that part of the tape which is positioned at the side of said row of cavities opposite the bead of the tape.

4. Apparatus according to claim 3 in which the cooperating portions that stretch the tape for part of its width comprise a row of projections and alternate recesses on one die piece and a complementary row of the same on the other die piece for clampingly engaging the tape and deforming it linearly to stretch it.

5. Apparatus according to claim 3 in which the cooperating portions that stretch the tape for part of its width are constituted by narrow lands on the die pieces positioned to clamp between them the portion of the tape adjacent the row of cavities that mold the fastener elements, and by a row of projections and alternate recesses on one die piece and a complementary row of the same on the other die piece, which rows of projections and recesses are positioned at the sides of said lands opposite the row of cavities for clampingly engaging the tape to deform it linearly to stretch it.

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