Aug. 14, 1973 M. POTIN 3,752,718

PROCESS FOR THE MANUFACTURE OF A SLIDE FASTENER

Filed March 26, 1971

Fig.1

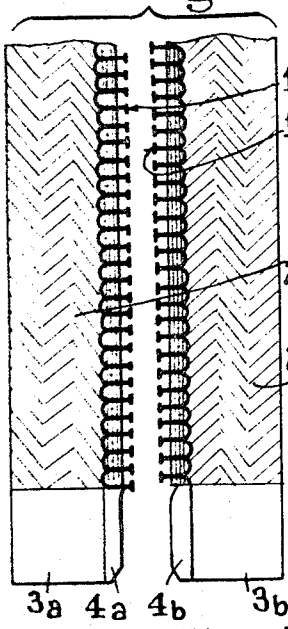


Fig.2

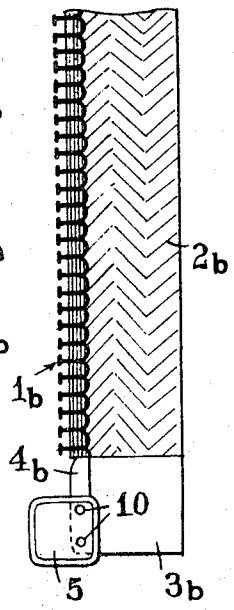


Fig.3

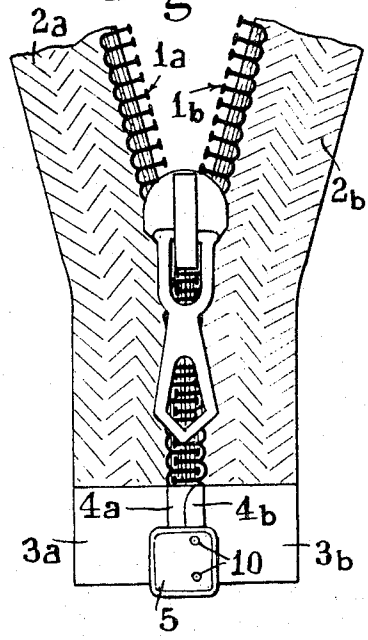


Fig.4

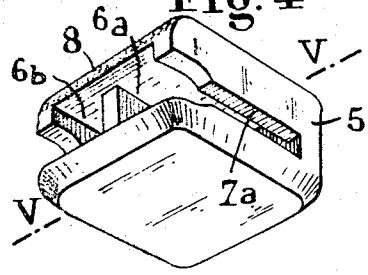


Fig.7

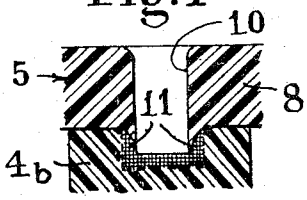


Fig.5

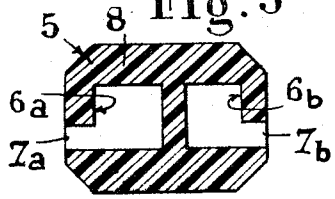


Fig.8

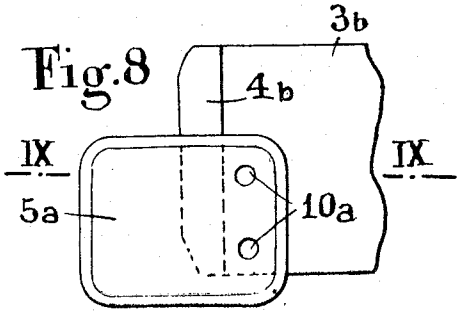


Fig.6

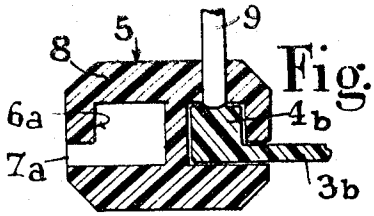
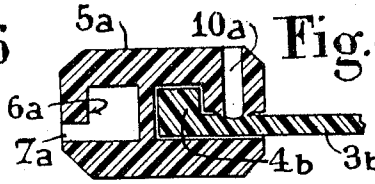


Fig.9



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PROCESS FOR THE MANUFACTURE OF A SLIDE FASTENER

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U.S. Cl. 156—66 7 Claims

ABSTRACT OF THE DISCLOSURE

A separable slide fastener includes two rows of fastener elements having at one of their ends a separable coupling device consisting of respective male and female members, said female member being in the form of a housing to receive the male member.

In a process for the manufacture of such a slide fastener, there are provided the steps of manufacturing the housing separately by moulding it from a thermoplastic material, engaging the housing onto an end of a supporting tape for a row of fastener elements, and securing said housing in position on said tape end by driving through a wall of said housing a means serving to force the material of said wall towards the inside of said housing.

The present invention relates to slide fasteners of the so-called "separable" type, i.e. fasteners of which the two rows of fastener elements can be rendered completely independent of each other, contrary to those of the customary type, in which the two rows of fastener elements are permanently attached to each other at their respective ends.

There is a wide field of application for fasteners of this type, as they offer the advantage of enabling the two parts of an article to which they are fitted to be completely separated from each other.

They are characterized by the fact that their two rows of fastener elements comprise separable coupling devices situated at the end from which the movement of the slider is effected in order to bring the elements together.

These coupling devices generally consist of a housing on the corresponding end of one of the rows of elements and a protuberance serving as a hooking device and added to the end of the other row and serving to engage the housing provided on the first row.

Various solutions have been adopted hitherto in order to provide the coupling devices of this type and affix them to the corresponding ends of the two rows of element of a fastener.

For example, certain separable fasteners comprise metal coupling devices added to the ends of their two supporting tapes and secured in position by setting or mounting them. This method, however, involves a number of drawbacks, particularly the risk that the coupling devices will be torn off in the course of use.

In other models at present known the two coupling devices are provided by moulding them, in a plastic material, directly onto the corresponding ends of the two tapes of the fastener. This method of manufacture enables the coupling devices to be faultlessly secured in position.

The construction of the "female" piece nevertheless entails a certain number of difficulties, owing to the fact that it has to assume the shape of a hollow housing.

Furthermore, the process of moulding this latter directly onto one of the tapes of a slide fastener cannot be effected at a high rate of output.

The object of the present invention is therefore to provide a new process for the production of coupling devices

for a separable fastener, this process being so designed as to eliminate the various drawbacks of those at present adopted.

For this purpose, the present process is characterized by the fact that the housing is manufactured separately, by moulding it from a thermoplastic material, and after it has been affixed to the corresponding end of the supporting tape of the respective row of elements it is fixed in position by driving through one of the walls of this housing one or more devices brought to a suitable temperature or subjected to ultrasonic vibrations, so that they drive the material of this wall towards the inside, thus setting or welding this housing in position.

As will be easily understood, the manufacture of the housing constituting the "female" coupling device no longer raises any particular problem, since the moulding of this piece is carried out independently.

Furthermore, the subsequent operation of securing this piece in position is carried out very easily and rapily thanks to the present process. Again, it is extremely efficient, so that there is no danger of this piece coming off when the fastener is in use.

The fact is that it is rendered fully integral with the end of the corresponding tape, precisely owing to the setting or mounting effect obtained by the operation of driving the material of the side of the housing towards the interior thereof. This operation of forcing it inwards causes an annular projection to form, constituting a highly effective setting or mounting means.

In addition, when the end of the corresponding tape bears a reinforcement member, made of a thermoplastic material, the housing is intimately sealed to this latter. Tihs welding effect is obtained by the partial melting of the material of the housing as a result of the temperature rise which it undergoes in the place where the driving means engaged in it are driven inwards. This renders the said coupling device fully integral with the reinforcement member.

Needless to say, the invention also relates to slide fasteners of the separable type which are constructed by means of the present process.

The various features and advantages of the subject of the invention will also emerge from the following description. The latter is provided with reference to the accompanying drawing, which is supplied purely by way of information, and in which:

FIG. 1 is a plan view, from above, of the ends of the two rows of fastener elements of a slide fastener, after the construction of a reinforcement plate provided on each row;

FIG. 2 is a plan view, from above, of one of the said two ends, after the "female" housing has been placed thereon and secured thereto;

FIG. 3 is a plan view, from above, of the corresponding ends of a separable fastener constructed by the present process;

FIG. 4 is a view, in perspective, of the "female" housing provided in accordance with the present process;

FIG. 5 is a cross sectional view of the said housing, along the line V—V of FIG. 4;

FIG. 6 is a sectional diagram, similar to the foregoing, and illustrating the operation of placing the said housing in position;

FIG. 7 is a partial section, in accordance with a similar plane but on a different scale, and illustrating the method by which the housing is rendered integral with the corresponding reinforcement plate;

FIG. 8 is a plan view, from above, of an alternative version of the said housing, after it has been secured in position;

FIG. 9 is a sectional view along the line IX—IX of FIG. 8.

As indicated above, FIG. 1 is a partial plan view, from above, of the two rows of fastener elements of a slide fastener of the separable type, before the completion of its manufacture by the application of the present process.

In this diagram, reference numbers **1***a* and **1***b* refers to the two rows of fastener elements of the corresponding fastener, while reference numbers **2***a* and **2***b* indicate the tapes by which they are supported. This diagram nevertheless only represents the end of these two rows of elements, where it is intended to provide the separable coupling devices.

The operation preferably commences by the addition, to the corresponding end of the two parts of the fastener, of two reinforcement plates **3***a* and **3***b*, of a thermoplastic material. These can be provided by directly moulding them onto the tapes **2***a* and **2***b*, after the corresponding ends of the two rows of fastener elements have been cut off in that position. However, these reinforcement pieces can also be provided by the welding of a fragment of thermoplastic material under the effect of ultrasonics. These reinforcement pieces, however, can be provided by any other suitable process.

A protuberance, of which the purpose is to provide the "male" coupling device of the fastener, is then provided, in a known manner, on one of the said plates, in the present instance on the plate 3*a*. This protuberance may with advantage consist of a longitudinal tenon **4***a*, substantially forming a prolongation of the corresponding row of elements. Needless to say, this tenon is then moulded in one piece with the adjacent plate **3***a*.

According to an essential characteristic of the present process, a projecting protuberance is also provided on the second reinforcement plate **3***b*. Furthermore, this protuberance may likewise take the form of a longitudinal tenon **4***b*, substantially forming an extension of the corresponding row of elements.

As will be easily understood, the provision of this tenon does not entail any difficulty of a technical nature. The fact is that, just like the tenon **4***a* serving as a "male" coupling device, it can be provided with a mould of a very simple shape moving perpendicularly to the plane of the corresponding tape.

Now the same did not apply in the case of the direct moulding of a housing onto the supporting tape of one of the two parts of a slide fastener, since in such cases it was necessary to use a mould comprising a number of pieces providing displacements in different directions.

According to a further characteristic of the present process, "female" coupling devices, intended to be added to the reinforcement plates **3***b* provided on one of the two parts of the slide fastener in course of manufacture, are produced independently.

Each of these two devices consists of a housing **5**, moulded from thermoplastic. The inside of this housing is provided with two parallel channels **6***a* and **6***b* which lead onto two opposite walls of the housing via two slits **7***a* and **7***b*. However, these two channels also lead to one of the ends of the housing, of which the other end is closed.

The shape and dimensions of the two channels **6***a* and **6***b* are such that the first can serve to accommodate the tenon **4** constituting the "male" coupling device of this fastener, while the second, **6***b*, can accommodate the tenon **4***b* provided on the reinforcement plate **3***b*.

Furthermore, in a subsequent phase of the manufacturing process according to the invention, the said housing is placed on the reinforcement plate **3***b* of one of the two parts of the fastener, in the course of manufacture, by causing the housing to engage the plate by inserting the projecting tenon **4***b* of the latter into the channel **6***b*. This is an easy operation to perform, as it suffices to place the open end of the housing **5** opposite the reinforcement plate **3***b* in such a way that the tenon **4***b* of the latter can enter the channel **6***b*.

When the housing has thus been positioned, it is rendered integral with the plate **3***b*.

The method by which this operation is carried out, moreover, forms one of the main original characteristics of the present process.

It is affixed thereto by driving through the upper wall **8** of the housing **5** one or more devices of which the purpose is to form holes in the said wall and to force part of the corresponding material towards the inside. These driving devices may consist, with advantage, of two metal rods **9**, to which ultrasonic vibrations are imparted, and which for this purpose are integral with a generator for such vibrations.

As shown in FIG. 6, these rods are then driven through the upper wall **8** of the housing **5**, in that part of the said wall which is situated above the channel **6***a* containing the tenon **4***b* borne by the reinforcement plate **3***b*.

Owing to the ultrasonic vibrations undergone by the two rods, they cause the thermoplastic material of which the upper wall of the housing **5** is made to heat up. Under these circumstances, the said material is softened, so that the two rods easily penetrate the wall **8**, producing two holes **10** therein.

At the same time, however, these two rods force part of the thermoplastic material towards the inside, causing an annular projection **11**, surrounding each of the hole **10**, to form on the internal surface of the wall **8**.

The formation of this ring-shaped projection is somewhat similar to the phenomenon which may be observed in certain cases when a hole is punched into a comparatively thick metal plate.

Now as will be easily understood, this annular projection forms on the surface situated opposite to the tenon **4***b* borne by the reinforcement plate **3***b*. Under these circumstances, the said annular projection sets or mounts the housing **5** on the said reinforcement plate. This enables the housing to be firmly held in place.

It should be noted, however, that the temperature rise undergone by the thermoplastic material of the upper wall of the housing, under the effect of the ultrasonic vibrations transmitted by the rods **9**, results in a localized partial melting of this material, thus welding it to the zones opposite the tenon **4***b*.

Under these conditions, annular junction zones **11** are formed between these two elements, as may be seen, moreover, from FIG. 7. The housing **5** is thus rendered fully integral with the reinforcement plate **3***b*, so that there is no danger that it will become detached during use.

As an alternative to the use of rods **9** undergoing ultrasonic vibrations for the purpose of driving in the thermoplastic material of the upper wall of the housing, this same operation can be performed by driving in metal rods brought to a suitable temperature.

In both cases the corresponding operation can be carried out with an extremely simple device, comprising, on the one hand, a die of which the purpose is to accommodate, temporarily, the reinforcement plate **3***b* with housing **5**, and on the other hand, two movable metal rods **9**, capable of being moved downwards in order to be driven through the upper wall of the housing. These rods are borne by an ultrasonic generator or by a support comprising suitable heating devices, such as electrical heating elements, as the case may be.

It should be noted that the insertion points **10** for these rods may occupy various positions. In the example shown in FIGS. 1–7, these insertion points are situated above the longitudinal tenon **4***b* of the reinforcement plate **3***b*. They may nevertheless be positioned beyond this longitudinal tenon, but in the immediate vicinity thereof, as is the case in the variant shown in FIGS. 8 and 9.

In ths alternative version the two holes **10***a*, made in the upper wall of the corresponding housing **5***a*, are situated opposite the reinforcement plate **3***b*, but in the im-

mediate vicinity of the longitudinal tenon 4*b*. This enables the housing to be secured in position in a fully satisfactory manner.

Needless to say, a different number of insertion points can be provided inside the upper wall of the housing. Possibly one single such point might suffice to enable the latter to be secured in position.

Furthermore, the devices used for the production of these insertion points may have cross-sections of any desired shape. Furthermore, it is obvious that these insertion points could be made through the lower wall of the housing **5** or **5***a*, instead of in its upper wall.

It also goes without saying that the process to which the invention relates can be applied in various other ways.

For example, the end of the tape **2***b* need by no means be provided in advance with a reinforcement plate **3***b*. If this tape contains fibres of a thermoplastic material, the housing will then be directly welded to it at the points where the rods **9** are driven into it. At all events, however, this housing is secured in position by the setting or mounting effect obtained by driving material forming part of its wall, by means of the rods **9** driven through it.

When the housing **5** or **5***a* has been secured in position, it may serve as a "female" coupling device for the corresponding ends of the two rows of fastener elements of the fastener. The channel **6***a* provided in this box can then accommodate the longitudinal tenon **4***b* which is provided on the reinforcement plate **3***b* and which constitutes the corresponding "male" coupling device.

The present process makes it possible to manufacture, under extremely advantageous conditions, slide fasteners of the separable type, from lengths cut off a continuous run of mutually complementary parts, each consisting of a row of fastener elements affixed to a supporting tape.

Needless to say, the invention also covers other slide fasteners which can be produced by this process. In this connection it should be noted that the fastener elements of these fasteners may be of any type.

I claim:

1. The process for the manufacture of a separable slide fastener including two separate rows of fastener elements, each row carried by a separate tape and each tape including a reinforcing plate and integral male coupling device at one end thereof comprising the steps of:

(1) molding a separate female member from thermoplastic material to form a housing;

(2) interconnecting said female member with one of said integral male coupling members;

(3) permanently securing said female member to said one male member by displacing a portion of said female member through itself and into a portion of said one male member under heat and pressure.

2. A process, as claimed in claim **1**, wherein the displacing means is heated.

3. A process, as claimed in claim **1**, wherein the displacing means is subjected to ultrasonic vibrations.

4. A process, as claimed in claim **1**, wherein said tape contains thermoplastic fibres, and wherein said female member is welded to said tape.

5. A process, as claimed in claim **1**, wherein said tape is provided with a thermoplastic reinforcement member and wherein said female member is welded to said reinforcing plate.

6. A process, as claimed in claim **5**, wherein said housing is provided with a recess to receive said reinforcement member.

7. A process, as claimed in claim **6**, wherein said reinforcing plate is provided with a longitudinal tenon, and wherein the cross-section of said recess corresponds to the cross-section of said tenon and a portion of the reinforcing plate.

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U.S. Cl. X.R.

24—205.11 F; 156—73