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(54) **MOLDED SURFACE FASTENER AND CUSHION BODY FORMED INTEGRALLY WITH THE MOLDED SURFACE FASTENER**

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(57) **ABSTRACT**

The invention provides a molded surface fastener and a cushion body formed integrally with it wherein a molded surface fastener has first resin invasion preventing means of an expandable resin material for molding a cushion body on each of right and left side edge portions along a longitudinal direction of a thermoplastic-resin base member surface, a number of engaging elements provided between the invasion preventing means, and second resin invasion preventing means for sectioning the engaging elements into desired number of regions along the longitudinal direction of the base member and extending in a width direction between adjacent sectioned regions, the second resin invasion preventing means comprising a function for engaging/disengaging a mating engaging element, thereby the molded surface fastener securing a required binding force.

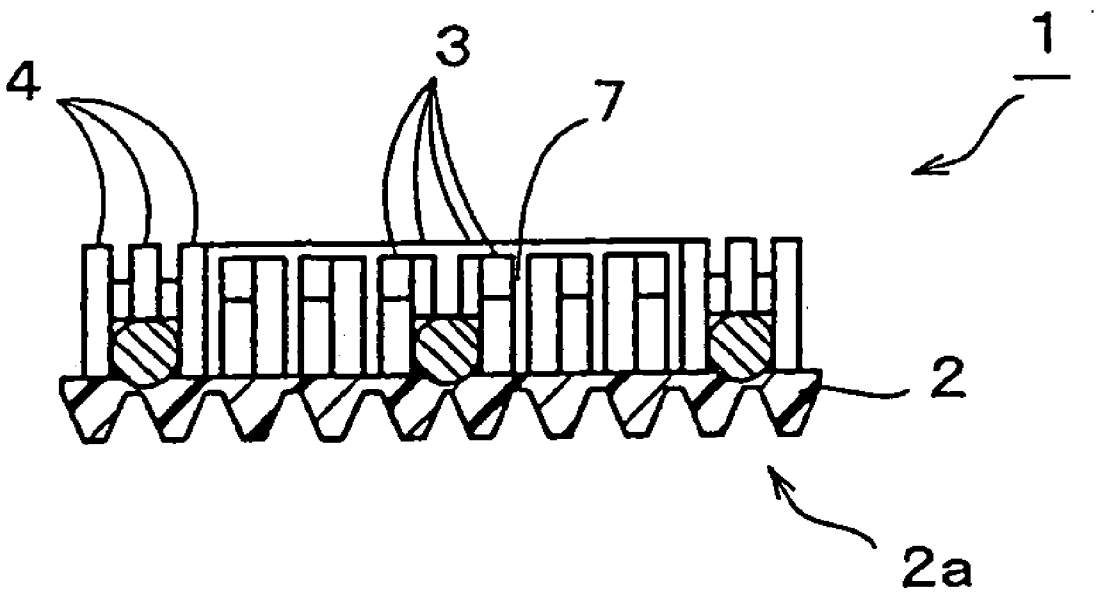

FIG. 1

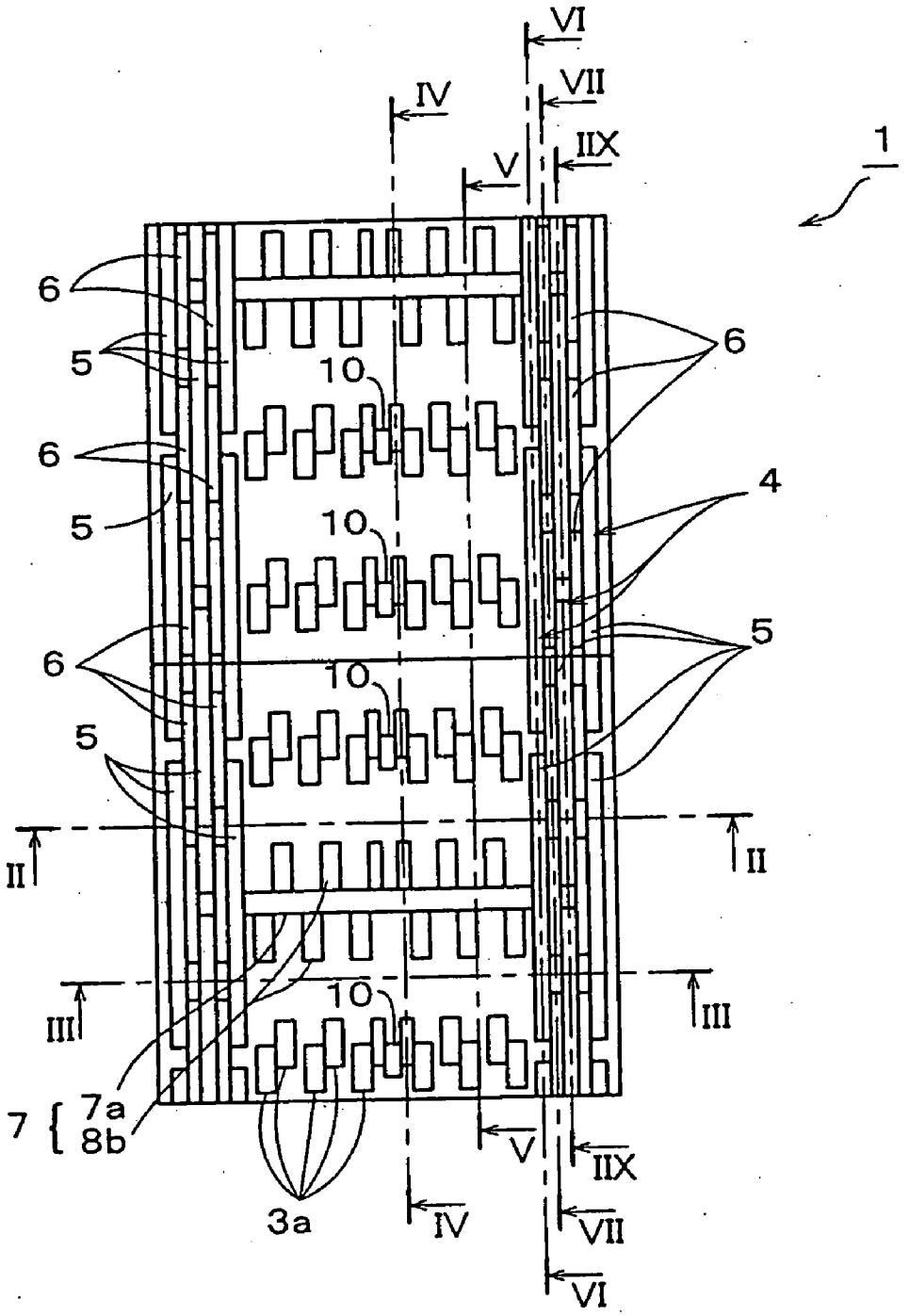
VI
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FIG. 2

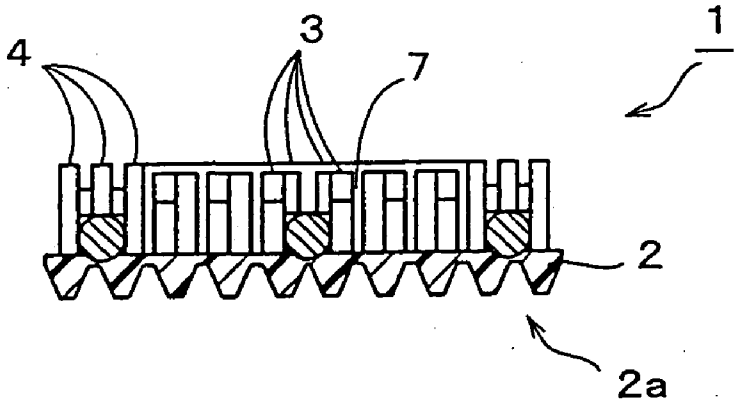


FIG. 3

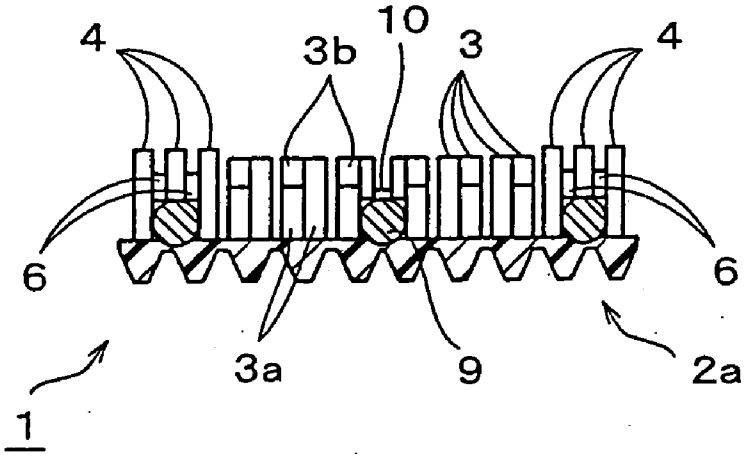


FIG. 4

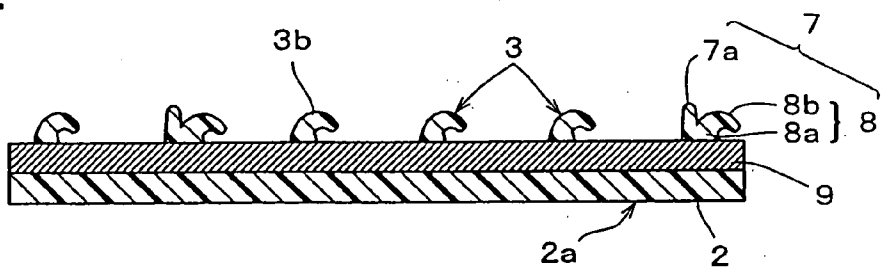


FIG. 5

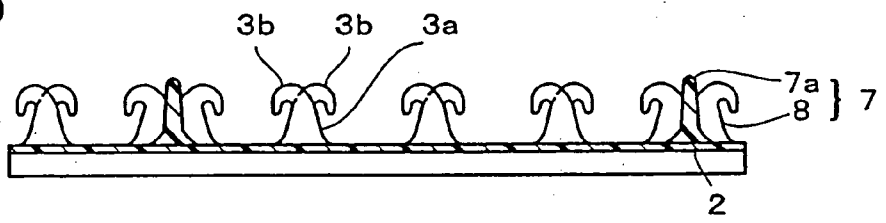


FIG. 6

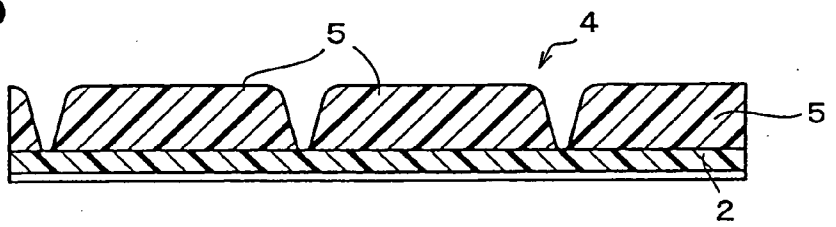


FIG. 7

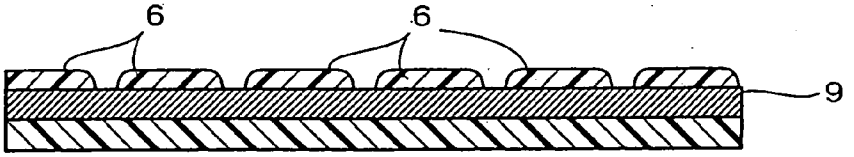


FIG. 8

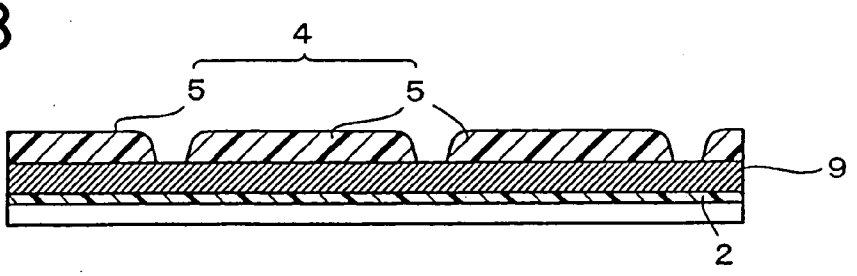


FIG. 9

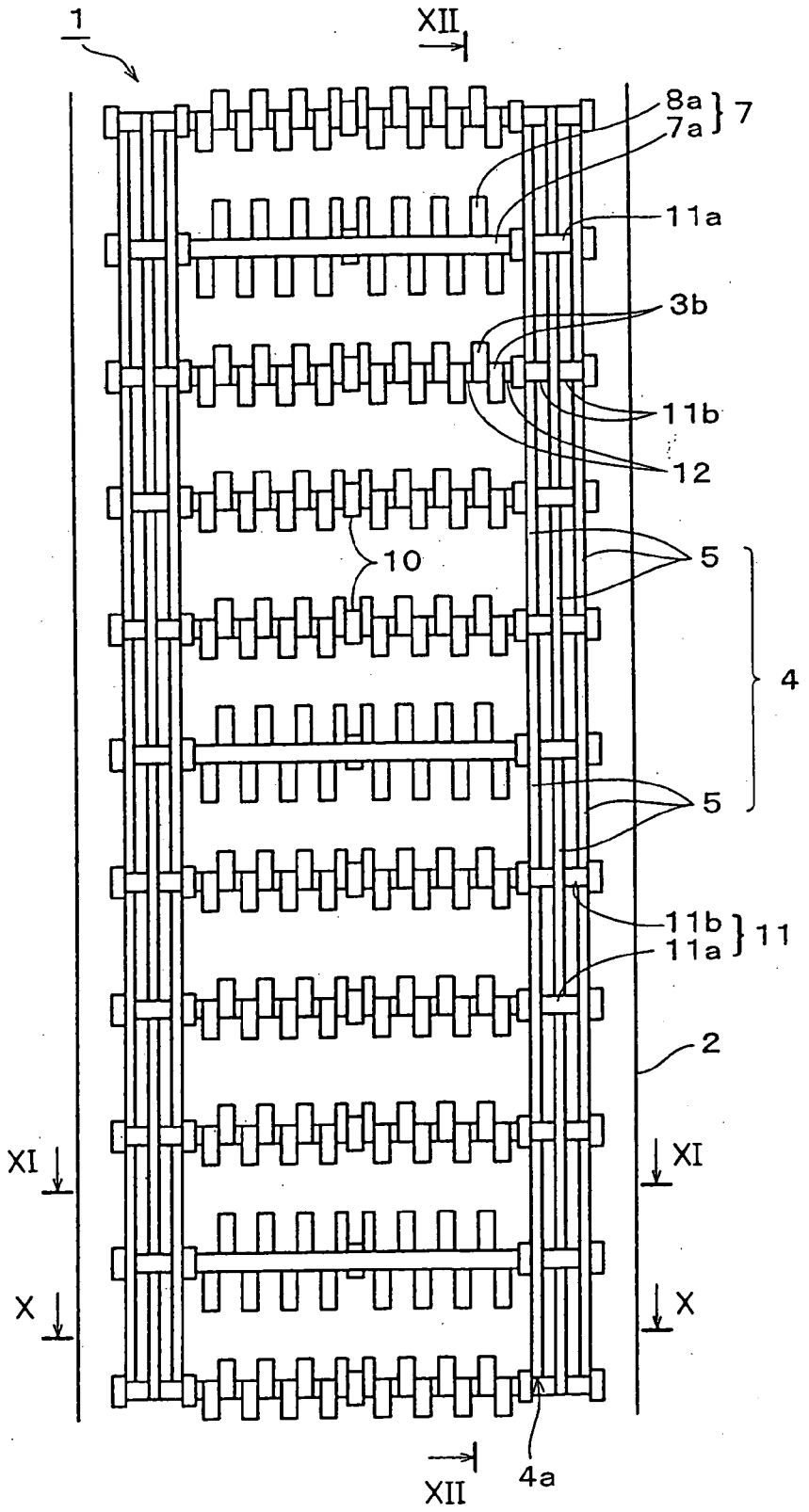


FIG. 10

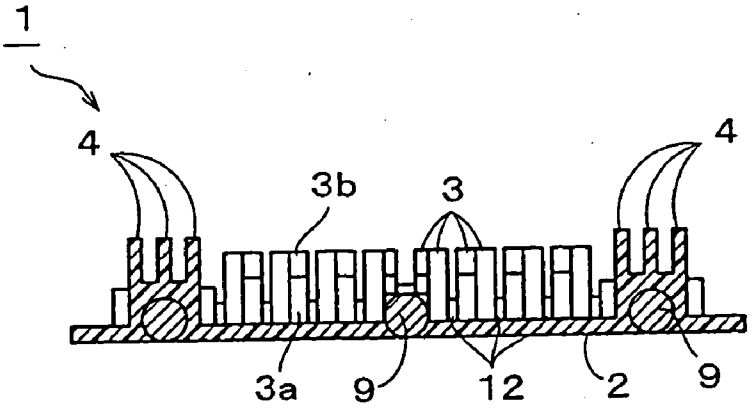


FIG. 11

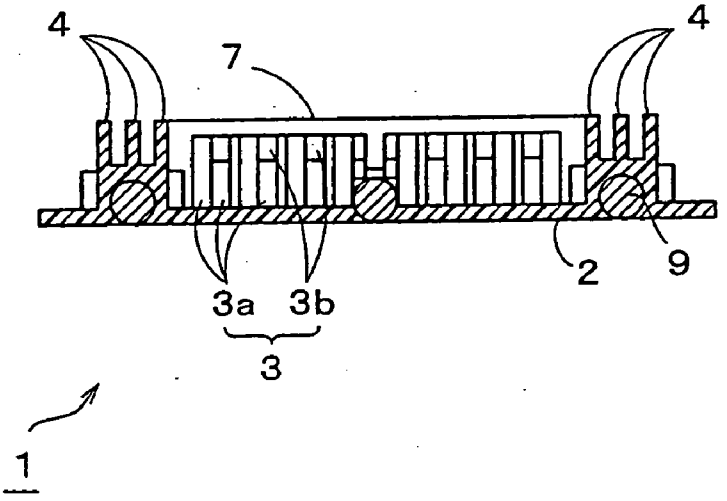


FIG. 12

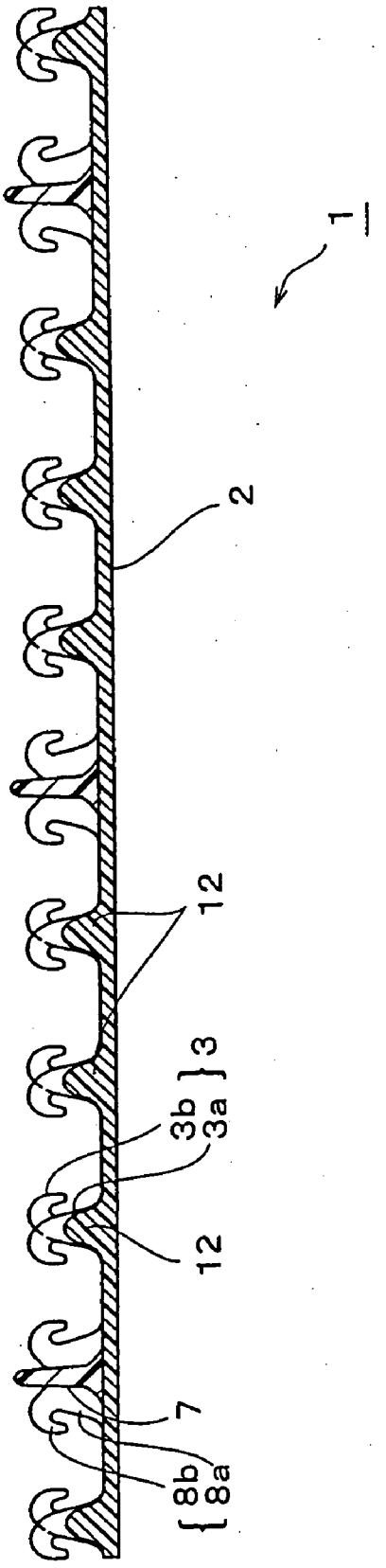


FIG. 13
PRIOR ART

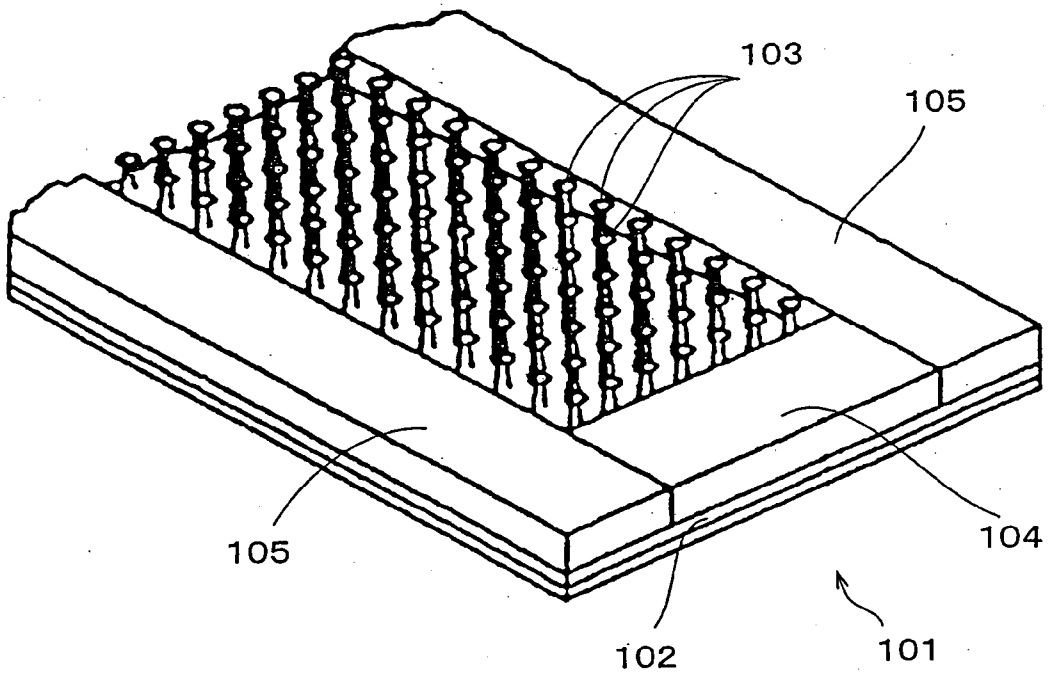
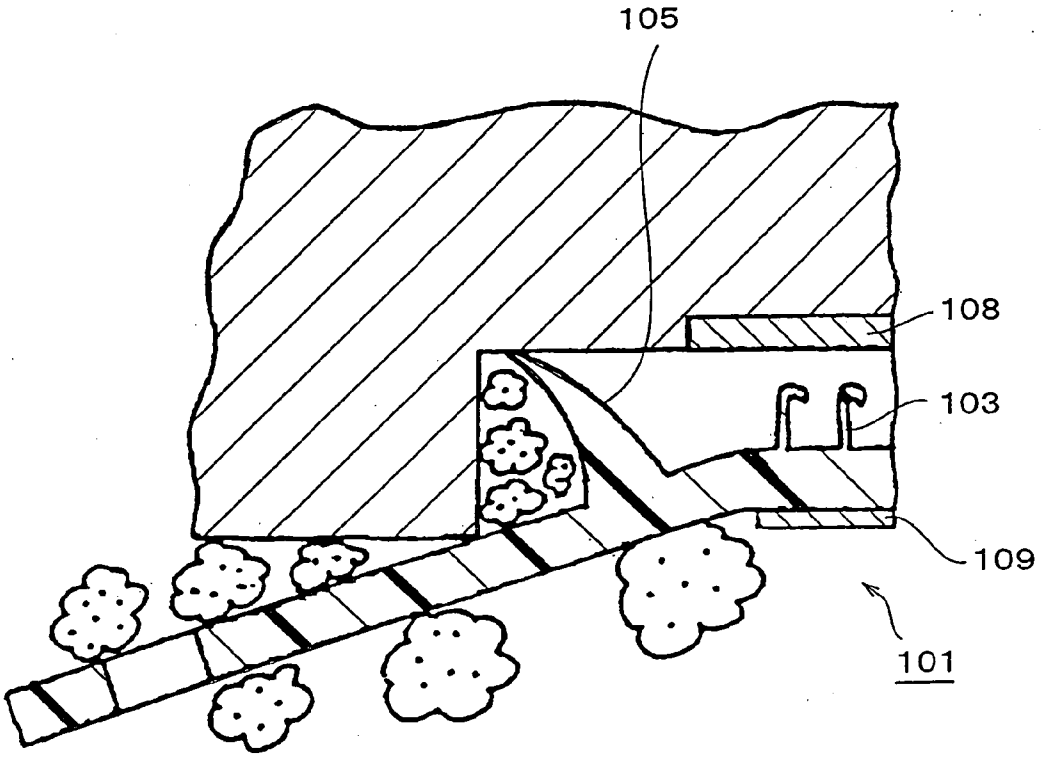


FIG. 14
PRIOR ART



MOLDED SURFACE FASTENER AND CUSHION BODY FORMED INTEGRALLY WITH THE MOLDED SURFACE FASTENER

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a surface fastener having male engaging elements composed of plural hook pieces which engage mating loop-like female engaging elements on one surface of its flat base member and invasion preventing means at least along right and left side edge portions in a longitudinal direction of the base member for blocking an invasion of a molding resin material into an engaging-element forming region when this product is molded.

[0003] 2. Description of Related Art

[0004] Passenger seats of automobiles or trains, and various kinds of sofas and office chairs have a cushion body inside their surface skin materials. As this cushion body, so-called rock wool, which is obtained by entangling stiff fibers such as palm fibers and flax or synthetic fibers and hardening with rubber or the like, or molded bodies made of various kinds of expandable resin materials are used. These cushion materials have a curved face composed of convex and concave shapes satisfying human engineering factors in order to maintain a seating posture which provides no fatigue despite a long-hour seating. If it is intended to effectively manufacture the cushion materials having such a complicated surface shape in large quantities considering its cushion performance, the aforementioned rock wool that requires a number of manufacturing processes cannot meet the demand. Contrary to this, cushion bodies of expanded resin have been used widely because it can be manufactured in a single process and diversified shapes can be obtained easily. That is, the cushion body of expandable resin is molded into a desired shape at a same time when an expansion is induced by pouring an expandable resin material such as expandable urethane resin into a mold.

[0005] Various kinds of fiber cloth or natural or synthetic leather surface skin material are applied to and integrated with the surface of the cushion body formed in this way. For this integration, there is employed means in which an expandable resin material is poured into a mold with a surface skin material adsorbed along a mold surface so as to integrate a cushion body with a rear surface of the surface skin material at a same time as molding is executed, or means in which, after the cushion body is formed of an expandable resin material with a mold, the surface skin material is applied to its surface and fixed thereto.

[0006] According to an above method of an integral molding, when the surface skin material is set along an inner surface of the mold, it is adsorbed by means of adsorption means. When the surface skin material is deformed following a surface of a cushion body having a complicated configuration, the surface skin material needs to be itself of material having an excellent potential to be stretched. However, because there is a limit to be stretched depending on a material, many wrinkles are likely to occur particularly between a seating surface and a peripheral side surface and up to now, great efforts have been made to remedy this phenomenon.

[0007] Further, since this integral molding integrates the cushion body and the surface skin material throughout their entire surfaces, if, for example, a strong force is applied in a direction in which the surface skin material deflects on the surface of the cushion body during actual usage, a shearing force is generated between the surface skin material and the cushion body, the cushion body is often partially torn and then, the surface skin material is separated. The material to be used as the surface skin material is automatically limited in order to exclude an occurrence of such wrinkles, and it is preferable to allow a slight motion between the surface skin material and the cushion body so that any excess force is not applied between them. For the reason, instead of integrating the surface skin material at a same time when the cushion body is molded, a method of applying the surface skin material onto a cushion body molded preliminarily has become popular.

[0008] As a general method for applying the surface skin material onto the cushion body made of an expandable resin material, an engaging-element forming surface of a surface fastener is placed and fixed on a projecting surface portion on a bottom of a mold corresponding to a concave surface of a cushion body so that the engaging-element forming surface is opposed to the projecting surface portion and then an expandable resin material is poured in the mold so as to mold the cushion body in an expanded state while the surface fastener is buried in and integrated with the concave surface of the cushion body with the engaging elements exposed outside. At a time of this expansion molding, the expandable resin material is prevented from flowing into an engaging-element forming region. The surface skin material made of various kinds of materials such as pile woven/knit fabric, natural leather and synthetic leather formed in a shape of a bag corresponding to an outer shape of the cushion body is applied to the cushion body molded by the above-mentioned way. Then, female engaging elements disposed on a rear surface of the surface skin material are pressed against the engaging-element forming surface of the surface fastener integrated with the cushion body so that the surface skin material is bonded and fixed along the concave surface of the cushion body and prevented from rising from the cushion body.

[0009] To prevent the expandable resin material from invading into the engaging-element forming region of the surface fastener when the cushion body is molded, expandable resin material invasion preventing walls **104**, **105** are usually provided integrally along a periphery of a base member **102** of a surface fastener **101** so as to surround a number of engaging elements **103** as disclosed in, for example, U.S. Pat. Nos. 5,061,540 and 5,766,723 and as shown in **FIGS. 13 and 14**. Same designations and similar reference numerals are attached to corresponding designations and reference numerals.

[0010] On the other hand, recently, the surface fastener has been formed continuously in a form of a tape. Even in this case, longitudinal invasion preventing walls are formed integrally along right and left side edge portions in a width direction of a surface fastener so that a number of engaging elements formed on a single side of a flat base member are surrounded from right and left sides in the same way as in the U.S. Pat. No. 5,766,723. Consequently, invasion of an expandable resin material is prevented from invading into an engaging-element forming region from a lateral (width)

direction, and additionally, the engaging-element forming region is sectioned along a longitudinal direction and a second invasion preventing wall is formed between adjoining sections so that it extends in the width direction so as to prevent the expandable resin material from invading from a length (longitudinal) direction of the surface fastener. A height of the invasion preventing walls for the expandable resin material is set larger than a height of the surrounded engaging elements.

[0011] When the cushion body is molded, as described above, the surface fastener is placed such that its engaging-element forming surface is directed to the projecting surface portion on the bottom of the mold and fixed thereto and then, the expandable resin material is poured into the mold. When the expandable resin material is poured, invasion of the expandable resin material is blocked by the invasion preventing wall erected for surrounding the engaging elements in each section and as a consequence, the expandable resin material is prevented from invading into the engaging-element forming region. The surface fastener to be integrated with the cushion body by molding is bonded to and integrated with the cushion body through the rear surface of its base member and an outer wall surface of the invasion preventing wall. Consequently, no expandable resin invades into the engaging-element forming region and thus, a bonding function of the surface fastener is exerted securely. To secure a bonding strength between the cushion body and the surface fastener, when the surface fastener is molded, its rear surface is formed into an uneven surface or unwoven fabric is integrated with the rear surface.

[0012] To place and securely fix the engaging elements at a predetermined place of the projecting surface portion on the bottom of the mold, a permanent magnet is usually provided on the base member of the surface fastener or a permanent magnet **108** is buried in a portion of the mold corresponding to a surface-fastener placing portion while a magnet body **109** is provided on the base member of the surface fastener as in the U.S. Pat. No. 5,766,723. Consequently, the surface fastener **101** is positioned and fixed accurately at a placing position of the surface fastener **101** by using a magnetic attraction force of the magnet **108**. The permanent magnet or magnetic body is usually formed in a form of a tape, linear shape or stripe, and a material that is excellent in plasticity such as synthetic resin mixed with a ferrite magnet or magnetic powder is used. As the magnetic body, a thin tape material or wire made of steel is used and this material is buried in the base member at the same time when the surface fastener is molded.

[0013] As described above, the longitudinal invasion preventing walls of the expandable resin material of the surface fastener disclosed in the U.S. Pat. Nos. 5,061,540 and 5,766,723 are formed continuously along both side edge portions in a width direction of the engaging-element forming surface of the base member and a lateral invasion preventing wall is provided to section every predetermined number of engaging elements formed in the engaging-element forming surface of the base member along the longitudinal direction of the base member, so that it is formed between adjoining sections. This lateral invasion preventing wall is not always limited to one but two lateral invasion preventing walls may be formed in parallel. Due to the existence of the longitudinal and lateral invasion preventing walls, invasion of the expandable resin material from the longitudinal and lateral directions is blocked when the cushion body is expansion-molded. As a result, the invasion into the engaging-element forming region is completely blocked.

[0014] As described, in recent years, generally a number of engaging elements and the invasion preventing walls have been formed integrally and continuously on the surface of a tape-like base member by injecting or extruding continuously molten resin to a peripheral surface of a die wheel comprising cavities for molding a number of engaging elements and expandable resin material invasion preventing walls, the die wheel being rotated in a single direction. However, even if a molded surface fastener obtained by this way is long, because an interval of the lateral invasion preventing walls is determined depending on an outer diameter of the die wheel, a specified pattern of the interval repeats.

[0015] On the other hand, for example, in a passenger seat of an automobile, an uneven surface composed of an appropriate curved surface is formed on a surface of the seat in order to secure a seating posture thought to be most favorable from human engineering viewpoints. A configuration of this uneven surface, particularly a length thereof is not constant but varies. The molded surface fastener is integrated with a cushion body along the concave surface portion of a seating surface of the cushion body having the uneven surface. When covering the cushion body with the surface skin material, by joining a female fastener region comprising the female engaging elements on the rear surface of the surface skin material with the engaging-element forming region of the surface fastener under a pressure, the surface skin material is mounted on the cushion body such that it is tightly stretched.

[0016] If it is intended to mount a tape-like molded surface fastener molded continuously by the above-mentioned way corresponding to a length of the concave surface portion of the cushion body which is different in length, the long molded surface fastener needs to be cut out to a predetermined length before use. Since a cutting position at this time is determined depending on the length of the concave surface portion, a cutting length is not always same. Consequently, the surface fastener often has to be cut out within the engaging-element forming region in a section partitioned by the lateral invasion preventing wall with a predetermined number of engaging elements. If the surface fastener is cut out within the engaging-element forming region, the expandable resin material invades into a cut engaging-element forming region and thus, the engaging elements in the region are buried in the expandable resin. Thus, the engaging elements in the region in which the expandable resin material invades loses its function as engaging elements and as a consequence, a binding force originally demanded as a surface fastener cut into a predetermined length cannot be secured.

[0017] Particularly, in conventional surface fasteners disclosed in the above-described U.S. Pat. Nos. 5,061,540 and 5,766,723, intervals between the lateral invasion preventing wall formed in adjacent sections and adjoining engaging elements interposing the lateral invasion preventing wall is usually equal to an interval between the engaging elements formed in the engaging-element forming region. Further, since no engaging element exists in these intervals and the

lateral invasion preventing wall is thick, no binding force is exerted. As a result, it becomes more difficult to obtain a desired binding force.

SUMMARY OF THE INVENTION

[0018] Accordingly, the present invention has been achieved to solve these problems and an object of the present invention is to provide a tape-like continuously molded surface fastener capable of suppressing an invasion of an expandable resin material into an engaging-element forming region to its minimum extent even if it is cut at an arbitrary position in a longitudinal direction so as to secure an absolutely necessary binding force.

[0019] The above-mentioned object is achieved by a molded surface fastener comprising first resin invasion preventing means for an expandable resin material used for molding a cushion body, the first resin invasion preventing means provided on right and left side edge portions along a longitudinal direction of a surface of a base member of thermoplastic resin in a flat shape, a number of engaging elements provided between a right first resin invasion preventing means and a left first resin invasion preventing means, and second resin invasion preventing means for sectioning the engaging elements into a desired number of regions along the longitudinal direction of the base member, the second invasion preventing means extending in a width direction of the base member between adjacent sectioned regions and comprising engaging elements, the molded surface fastener being integrated with the cushion body at a same time when the cushion body is molded.

[0020] More specifically, the second resin invasion preventing means comprises a lateral wall portion extending continuously in the width direction of the base member surface and plural engaging heads provided on a top portion of the lateral wall portion and extending backward and forward from a front and rear wall surfaces in the longitudinal direction of the base member.

[0021] Preferably, a height of the lateral wall from the base member surface is larger than a height of a vertex of each of the engaging heads extending from the lateral wall, and the height of the vertex of the engaging head formed on the lateral wall from the base member surface is substantially equal to the height of the vertex of an engaging head of an engaging element formed in a sectioned region from the base member surface.

[0022] In addition, it is desired that the engaging heads extending in the back and forth directions of the lateral wall so as to adjoin each other in the width direction of a surface of the base member in the flat shape extend backward or forward alternately along the width direction, and further it is preferable that the engaging elements formed in the sectioned region and arranged in line in the width direction of the base member are joined together successively through at least partial side surfaces of rising portions thereof.

[0023] According to the present invention, the first resin invasion preventing means formed on the right and left side edge portions along the longitudinal direction of the base member surface comprises two or more rows of longitudinal wall portions arranged in line with an interval in the width direction of the base member, and the interval formed between the longitudinal wall portions on adjacent rows is formed as an aisle having a predetermined length in a passage direction of the expandable resin. Then, preferably, respective wall portions of two or more rows of the longitudinal wall portions are divided at a predetermined pitch in the longitudinal direction of the base member by gaps, and the gaps between the respective wall portions adjoining in a row direction are arranged in a houndstooth shape.

[0024] Further, preferably, a first wall portion of two or more rows of the longitudinal wall portions is disposed adjacent to the sectioned engaging elements, a height of the first wall portion from the base member surface is substantially equal to a height of the lateral wall portion which is the second resin invasion preventing means from the base member surface, and a height of part of a longitudinal wall portion disposed outside the first wall portion is set equal to or less than the height of the first wall portion. The molded surface fastener having such a structure is preferably integrated with the cushion body of an automobile seat, a sofa and an office chair in particular.

[0025] The molded surface fastener of the invention is preferred to comprise a magnetic body or a magnet. As a preferred embodiment, a magnetic body or a magnet is buried in the base member so as to extend continuously in the longitudinal direction of the base member. The present invention is not restricted to such an embodiment, but it is permissible to mix a composition resin material of the molded surface fastener with a magnetic body or power material composed of a magnetic body or it is permissible to mix the resin material with a magnetic body or power material composed of a magnetic body and coat an exposed portion of the molded surface fastener with this.

[0026] Since the second resin invasion preventing means of the present invention comprises the engaging elements, reduction in binding force due to an existence of the lateral invasion preventing wall which can be seen in a prior art can be eliminated.

[0027] Because the second resin invasion preventing means comprises the lateral wall portion extending continuously in the width direction of the base member surface and plural engaging heads provided on the top portion of the lateral wall portion and extending backward or forward from the front and rear wall surfaces in the longitudinal direction of the base member, the lateral wall portion blocks the invasion of the expandable resin into the engaging-element forming region and the engaging heads having a same configuration as those of the engaging elements formed in the engaging-element forming region is bound with female engaging elements on a rear surface of a surface skin material. Consequently, a required binding force is secured by complementing a bonded portion that does not conventionally exist.

[0028] If the height of the lateral wall portion from the base member surface is set larger than the height of a highest vertex of the engaging elements extending from the lateral wall portion while the height of the vertex of plural engaging heads formed on the lateral wall portion from the base member surface is set substantially equal to the height of the vertex of the engaging heads of engaging elements formed in the sectioned region from the base member surface, the expandable resin trying to invade into the engaging-element forming region adjoining across the lateral wall portion can be blocked securely by the lateral wall portion. At a same

time, the engaging elements extending from the lateral wall portion also engage the female engaging elements provided on the rear surface of the surface skin material with a same engagement ratio as engaging elements formed in other sectioned regions.

[0029] If the engaging heads adjoining in the width direction of the base member surface extending backward and forward of the lateral wall portion are extended backward and forward alternately with respect to the width direction, directions of engagements with mating female engaging elements in the lateral wall portion are of two directions, i.e. forward and backward. AS a result, an engagement ratio is increased correspondingly and at a same time, an engagement force is also improved. Further, if at least partial side surfaces of rising portions of the engaging elements formed in the sectioned region and aligned in the width direction of the base member are combined successively, the respective engaging elements can be prevented from falling down in a lateral direction effectively.

[0030] The first resin invasion preventing means formed on the right and left side edge portions along the longitudinal direction of the base member surface comprises two or more rows of longitudinal wall portions arranged in line with the interval along the width direction of the base member and the interval formed between the respective longitudinal wall portions of adjoining rows is formed as an aisle having a predetermined length in the passage direction of the expandable resin. In this case, each wall portion of each of two or more rows of longitudinal wall portions is divided by the gaps at a specified pitch in the longitudinal direction of the base member and gaps between the respective division wall portions adjoining in the row direction are arranged in the houndstooth shape. As a result, the expandable resin material invades through intervals formed between the respective rows and the gaps between the division wall portions in the longitudinal wall portion, and it is combined and integrated with the division wall portions so as to engulf each division wall portion. Consequently, because the cushion body and the molded surface fastener are bonded through the rear surface and an external wall portion of the longitudinal wall portion, and further they are bonded so as to surround the respective division wall portions of each row, the binding strength between the cushion body and the molded surface fastener is improved.

[0031] In the case of that the first wall portion of two or more rows of the longitudinal wall portions is disposed adjacent to the sectioned engaging elements, the height of the first wall portion from the base member surface is substantially equal to the height of the lateral wall portion which is the second resin invasion preventing means from the base member surface, and the height of part of the longitudinal wall portion disposed outside the first wall portion is set less than the height of the first wall portion, a low longitudinal wall portion is surpassed by the invading expandable resin material and covered by and integrated with the expandable resin material, thereby improving the binding strength between the cushion body and the molded surface fastener.

[0032] If the magnetic body or the magnet extending continuously in the longitudinal direction is buried in and integrated with the base member, the molded surface fastener can be placed and fixed accurately at a surface-fastener setting position in the mold for the cushion body using a magnetic attracting action. The magnetic body or magnet can be integrated with the molded surface fastener easily by introducing a linear or tape-like magnetic body or magnet in a peripheral direction at a portion of a die wheel in which the base member is to be formed when the molded surface fastener is continuously molded. If the base member of the molded surface fastener is thin, the linear or tape-like magnetic body or magnet is more likely to be separated from the base member. However, a thickness of the base member at a portion with which the magnetic body or magnet is integrated is increased, or the longitudinal wall portion is erected on the portion, the magnetic body or magnet is buried completely in the base member so that a possibility of a separation is eliminated. If the magnet is buried in the mold, it is permissible to mix magnetic powder composed of alloy such as iron, cobalt, nickel or the like in at least part of the base member, the engaging elements and the longitudinal wall portion.

[0033] When the molded surface fastener is placed on a surface of the mold for molding the cushion body, the molded surface fastener can be positioned and fixed accurately in the mold by a magnetic attracting action between the magnet or magnetic body provided in the molded surface fastener and the magnet provided in the mold. Additionally, the molded surface fastener is prevented from moving from its position when the expandable resin material expands and any gap is prevented from being generated between the longitudinal wall portion and the lateral wall portion and the surface of the mold.

[0034] The cushion body integrated with the molded surface fastener of this kind can secure a specified binding force with respect to the surface skin material and respond to a slight deflection.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] **FIG. 1** is a top view partially showing a molded surface fastener according to a first embodiment of the present invention;

[0036] **FIGS. 2 and 3** are sectional view seen in directions of arrows along the lines II-II and III-III in **FIG. 1**;

[0037] FIGS. **4** to **8** are sectional view seen in directions of arrows along the lines IV-IV to IIX-IIX in **FIG. 1**;

[0038] **FIG. 9** is a top view partially showing a molded surface fastener according to a second embodiment of the present invention;

[0039] **FIGS. 10 and 11** are sectional view seen in directions of arrows along the lines X-X and XI-XI in **FIG. 9**;

[0040] **FIG. 12** is a sectional view seen in a direction of an arrow along the line XII-XII in **FIG. 9**;

[0041] **FIG. 13** is a partial perspective view showing an example of a surface fastener integrated with a conventional cushion body; and

[0042] **FIG. 14** is a partial sectional view at a time of expansion molding showing another example of the surface fastener integrated with a conventional cushion body.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0043] Hereinafter, embodiments of the present invention will be described specifically with reference to the accompanying drawings. FIGS. **1** to **8** show a first embodiment of the present invention.

[0044] As shown in **FIG. 1**, a number of engaging elements **3** in a hook-like shape are formed in an engaging-element forming region except both side edge portions on one surface of a base member **2** in a flat shape of a molded surface fastener **1** in a tape-like shape of this embodiment, and three rows of longitudinal wall portions **4** are erected as first resin invasion preventing means of the present invention on both side edge portions of the base member **2** along a longitudinal direction such that they are arranged linearly in parallel. As shown in **FIGS. 1-3**, **6** and **8**, these longitudinal wall portions **4** are constituted of a number of division wall portions **5** divided at a predetermined pitch along the longitudinal direction. The three rows of the longitudinal wall portions **4** are deflected about half a pitch in terms of their division positions and gaps formed between the division wall portions **5** in the longitudinal direction are arranged in a houndstooth shape between adjoining rows. According to this embodiment, as shown in **FIGS. 1-3** and **7**, division wall pieces **6** having a lower height are disposed in the longitudinal direction as the first resin invasion preventing means of the present invention in each interval between the rows of the longitudinal wall portions **4** arranged in three rows.

[0045] The interval formed between the rows of the longitudinal wall portions **4** and the gaps formed between the adjacent division wall portions **5** serve as aisles for an expandable resin material poured into a mold (not shown) at a time of molding of a cushion. The expandable resin material gradually invades through the gaps and intervals from a width direction of the molded surface fastener **1** around each division wall portion **5** toward the engaging-element forming region. Before it reaches a first longitudinal wall portion **4***a* nearest the engaging-element forming region, it hardens in an expanded state and does not reach the engaging-element forming region. As a result, it bonded and fixed in such a manner that it surrounds all the division wall portions **5**. At this time, because the division wall pieces **6** are lower than the division wall portions **5**, the expandable resin material invading into the longitudinal wall portions **4** surpasses the division wall pieces **6** and then invades into the interval formed inside the division wall pieces **6** between the longitudinal wall portions **4**. As a consequence, the division wall pieces **6** are buried in the expandable resin material. Consequently, the division wall pieces **6** are buried in the cushion body, so that fixing strength between the molded surface fastener **1** and a cushion body (not shown) is increased by a so-called anchor effect.

[0046] A number of the engaging elements **3** formed in the engaging-element forming region are erected in plural lines across the width direction of the base member **2**. As shown in **FIG. 1**, three rows thereof are defined as a section by a lateral wall portion **7** which is a feature portion of the present invention. As shown in **FIGS. 1 and 5**, each of the engaging elements **3** comprises a rising portion **3***a* which rises upward and an engaging head **3***b* which is extended in the longitudinal direction of the base member **2** while its front end is curved downward from a top end of the rising portion **3***a*, thereby entirely forming a hook-like configuration. In this embodiment, as shown in **FIGS. 1 and 5**, two engaging elements **3** adjacent in the width direction of the base member **2** have engaging heads **3***b* which extend in opposite directions, back and forth along the longitudinal direction. A pair of these engaging elements **3** is integrated through side surfaces of the rising portions **3***a* having a same shape. Six pairs of the engaging elements **3** are erected in line in the width direction of the base member **2**. Of course, the shape of the engaging elements **3** are not restricted to an indicated example and further, a number of the engaging elements arranged in line is not restricted to the indicated example.

[0047] In the lateral wall portion **7** which is the feature of the present invention, as shown in **FIGS. 1, 4** and **5**, a lateral wall **7***a* extends linearly across the base member **2** between the longitudinal wall portions **4** erected on both side edge portions in the width direction of the base member **2**. A height of the lateral wall **7***a* from a base member surface is equal to a height of the longitudinal wall portions **4**, and a maximum height of the longitudinal wall portions **4** and the lateral wall **7***a* is set slightly larger than a height of a vertex of the engaging head **3***b* of the engaging element **3**. Part of a rising portions **8***a* of engaging elements **8** having a same shape as the above-described pair of engaging elements **3**, and whole engaging heads **8***b* are integrally attached to front and rear wall surfaces of the lateral wall **7***a* in the longitudinal direction of the base member such that front ends of the respective engaging heads **8***b* are directed alternately in opposite directions in the back and forth direction. A height of the engaging heads **8***b* are equal to the height of the engaging heads **3***b* of the aforementioned engaging elements **3** formed in the engaging-element forming region.

[0048] According to this embodiment, three linear magnetic bodies **9** are fused integrally with side edge portions in the width direction of the base member **2** and the engaging-element forming surfaces on a central portion of the base member **2** such that they extend linearly in the longitudinal direction. As the linear magnetic bodies **9**, a mono-filament of synthetic resin mixed with magnetic powder composed of an alloy such as iron, cobalt or nickel is used. Although, according to this embodiment, the aforementioned linear magnetic bodies **9** are employed assuming that a magnet is placed at a surface-fastener installation position of a mold for molding the cushion body, it is permissible to use narrow tape-like metallic foil instead of a linear body. If no magnet is placed in the mold for molding the cushion body, a linear or tape-like magnet may be fixed directly to the base member **2** instead of the magnetic body.

[0049] If part of the linear magnetic bodies **9** are integrated with the base member **2** so as to be exposed on a surface of the base member **2** for securing a base member strength, the linear magnetic bodies **9** are likely to be separated from the base member **2** if a slight external force is applied. Thus, according to this embodiment, regions of the base member **2** with which the linear magnetic bodies **9** are to be integrated are formed thick in the longitudinal direction. According to the embodiment, as shown in **FIGS. 2 and 3**, thick portions on both side edge portions are formed within the division wall pieces **6** lower than the longitudinal wall portions **4** and three rows of the longitudinal wall portions **4** in the width direction of the base member **2**, and one of the thick portions in a central portion in the width

direction of the base member **2** corresponding to one of the linear magnetic bodies **9** is provided with two pairs of engaging elements **3**. The engaging heads **3***b* of the two engaging elements **3** disposed outside of these two pairs of engaging elements **3** are extended in a same direction while the two engaging elements **3** disposed in a middle are extended in an opposite direction to the aforementioned engaging elements, and proximal end portions of the two adjoining engaging elements **3** located in the middle are combined and integrated with a block piece **10**.

[0050] The linear magnetic bodies **9** disposed on both side edge portions in the width direction of the base member **2** is respectively surrounded by and integrated with the division wall portions **5** and the division wall pieces **6** and as a consequence, the division wall portions **5** and the division wall pieces **6** form the thick portions of the base member **2** so as to prevent the linear magnetic bodies **9** from being separated from the base member **2**. Therefore, the division wall portions **5** and the division wall pieces **6** have a function for blocking an invasion of the expandable resin material at the time of molding the cushion body and a function for preventing the linear magnetic bodies **9** from being separated from the base member **2**. On the other hand, a partial peripheral surface of the linear magnetic body **9** disposed in the central portion in the width direction of the base member **2** is surrounded by and integrated with the two pairs of engaging elements **3** and the block piece **10** connecting the engaging elements **3**. As a consequence, the thick portion of the base member **2** is formed by the two pairs of engaging elements **3** and the block piece **10**, thereby preventing the linear magnetic body **9** from being separated from the base member **2**. Since the linear magnetic bodies **9** attached to the base member **2** is attracted by a magnetic attraction force of the magnet (not shown) attached to the mold (not shown) for molding the cushion body, the molded surface fastener **1** in a tape-like shape is positioned and fixed to a predetermined position accurately and securely.

[0051] In the meantime, the magnetic body does not have to be the linear shape and may be, for example, a tape-like metallic thin sheet. Alternatively such magnetic body may be attached separately. Further, instead of the magnetic body, a magnet may be used. To attach this magnetic body or magnet to the molded surface fastener **1**, it is permissible to form a magnetic film layer on the base member **2** by coating a rear surface of the base member **2** with magnetic resin such as a resin adhesive agent or resin paint mixed with magnetic powder, or form a surface laminate by mixing the magnetic powder into any one of the base member **2**, the engaging element **3**, the longitudinal wall portion **4** and the lateral wall portion **7**, or laminate a resin layer containing the magnetic powder on a top surface of the lateral wall portion **7**. As described above, these treatments are not restricted to the magnetic body, but the same treatments are possible for the magnet.

[0052] The molded surface fastener **1** having such a structure of this embodiment can be manufactured continuously and effectively. As its basic manufacturing method, for example, a method disclosed in U.S. Pat. No. 5,620,769 can be employed. Its detailed description of the aforementioned US patent specification is omitted here and a manufacturing apparatus and manufacturing method for the molded surface fastener will be described simply without any reference of drawings.

[0053] A continuous injection nozzle for molten resin is provided to oppose a peripheral surface of a die wheel which is rotated in a single direction. A number of cavities for forming the engaging elements are formed in a central region of the peripheral surface of the die wheel, and plural rows of cavities for forming the division wall portions **5** and the division wall pieces **6** are formed on both side edge portions in an axial direction of the peripheral surface such that they extend intermittently. Further, plural cavities for forming the lateral wall portions **7** are formed in a region in which the cavities for the engaging elements **3** are to be formed. The cavities for the lateral wall portions **7** extend in parallel to a rotation axial line of the die wheel with a predetermined phase angle in a peripheral direction. On the other hand, continuous supply portions for the linear magnetic bodies **9** are provided at an upstream side of a peripheral portion of the die wheel in the rotation direction that is opposing the injection nozzle. Then, the linear magnetic bodies **9** are supplied continuously to positions opposing the injection nozzle of the die wheel from the supply portions. Coolant is supplied inside the die wheel to always cool the die wheel. Further, the lower half portion of this die wheel is immersed in a coolant bath disposed below.

[0054] In a continuous manufacturing apparatus of the molded surface fastener having an above-described structure, a molten resin material is continuously injected to the peripheral surface of the die wheel from the continuous injection nozzle. At this time, the die wheel is rotated in a single direction, and the base member **2** of the surface fastener is continuously formed of the molten resin injected on the peripheral surface in a gap between the injection nozzle and the die wheel. At a same time, the engaging elements **3**, the longitudinal wall portions **4**, the division wall pieces **6** and the lateral wall portions **7** are formed successively with respective cavities. At this molding time, the linear magnetic bodies **9** are introduced to injection positions from the upstream side in the rotation direction of the die wheel relative to an injection position of the molten resin injected from the injection nozzle. According to this embodiment, since substantially ⅔ of each of the linear magnetic bodies **9** is exposed on the surface of the base member **2**, three guide grooves for three linear magnetic bodies **9** are formed continuously in the peripheral direction in the peripheral surface of the die wheel in addition to the above-described cavities.

[0055] Thus, in the surface of the base member **2** of the molded surface fastener **1** which is in a continuous tape-like shape and formed in the above-described manner, the surface having the engaging elements formed thereon, a lower ⅓ of each of the linear magnetic bodies **9** is buried below the surface of the base member **2**, and a top surface portion of each of the linear magnetic bodies **9** are locally covered with any of the engaging elements **3**, the longitudinal wall portions **4**, the division wall pieces **6** and the lateral wall portions **7**. The linear magnetic bodies **9** are continuously fixed to and integrated with the surface of the base member **2** at a same time when the molded surface fastener **1** is molded. The molded surface fastener **1** is supported by the peripheral surface of the die wheel and carried half a turn with a rotation of the die wheel. While being carried, it is cooled and hardened, separated from the peripheral surface of the die wheel by a take-up roll and then carried to a subsequent winding process.

[0056] In the indicated example, the rear surface of the engaging-element forming surface of the base member **2** is formed as an uneven surface **2***a*. The reason for this is to increase a bonding area with respect to an expanded resin so as to intensify a bonding force. The uneven surface **2***a* can be formed easily by installing a pressing roll (not shown) having a lot of unevenness in its peripheral surface in such a manner that the pressing roll opposes to the peripheral surface of the die wheel via the molded surface fastener after molding. Although the pressing roll may be rotated with a moving of the molded surface fastener, it is better to drive it synchronously with a rotation speed of the die wheel. Of course, the rear surface may be formed in flat instead of the uneven surface **2***a*.

[0057] To integrate the molded surface fastener **1** of the present invention manufactured in this way with a cushion body (not shown) made of the expandable resin material, the molded surface fastener **1** in a long continuous tape-like shape is cut in a desired length, and a cut piece is placed such that the surface on which the engaging elements **3** are formed is directed to a projecting surface portion in a mold (not shown) corresponding to a concave portion in the cushion body. A magnet (not shown) is buried in the projecting surface portion of the mold, and if the molded surface fastener **1** is placed on the projecting surface portion, the molded surface fastener **1** is attracted by an attraction force of the magnet through the linear magnetic bodies **9** and then, the molded surface fastener **1** is automatically adsorbed and fixed to the projecting surface portion with a desired posture.

[0058] An expandable resin material is poured into the mold and flows from the rear surface to the longitudinal wall portions **4** and the lateral wall portions **7** of the molded surface fastener **1**, spreading over an entire surface of the mold while an expansion starts. At this time, the molded surface fastener **1** is positioned and fixed due to the attraction force of the magnet in the mold and its position is not moved by a flow and an expandable pressure of the expandable resin material. Although a fluid expandable resin material tries to invade into a forming region of the engaging elements **3** from the width direction of the molded surface fastener **1** through the gaps between the division wall portions **5** of the longitudinal wall portions **4** composed of plural rows and gaps between the division wall piece **6** as described above, it is blocked by the division wall portions **5** and the division wall pieces **6** and thus, its expansion and hardening are completed before reaching the engaging-element forming region. On the other hand, as for the longitudinal direction of the molded surface fastener **1**, an obtained long molded surface fastener **1** needs to be cut to a predetermined length, as described above. It is desirable if the lateral wall portion **7** can be cut into two sections in the longitudinal direction at that time. However, a required length of the cut piece is not always same. Further, in a surface fastener formed continuously as described above, the interval between the lateral wall portions **7** cannot be changed arbitrarily. Therefore, the molded surface fastener **1** is often cut within the forming region of the engaging element **3**.

[0059] As a result, a remainder region in which only the engaging elements **3** are formed without any lateral wall portion **7** exists on a sheared end side of the cut molded surface fastener **1**. However, if the interval between the lateral wall portions **7** is adjusted, it is possible to prevent affecting the entire length of the cut molded surface fastener **1**. If, after the cut molded surface fastener **1** is placed and fixed in the mold, the expandable resin material is poured as described above, the expandable resin material invades into the reminder region in which the engaging elements **3** exist through a cut end of the molded surface fastener and sometimes reaches a nearest lateral wall portion **7**. Due to this invasion, the engaging elements **3** existing in the remainder region are buried in and integrated with the interior structure of an expanded body.

[0060] As a result, the engaging elements existing in the remainder region are favorable because the fixing strength of the molded surface fastener **1** to the cushion body is intensified by the anchor effect. The expandable resin material after reaching the lateral wall portion **7** is prevented from flowing further by the lateral wall portion **7** and thus, it does not reach the engaging elements within the engaging-element forming region surrounded by the longitudinal wall portions **4** and the lateral wall portions **7**. The cushion body after the molded surface fastener **1** is fixed to and integrated with a desired place is covered with the surface skin material according to a specified method. By pressing a mounting portion of the molded surface fastener, the molded surface fastener engages female engaging elements on a rear surface of the surface skin material so that the surface skin material do not rise from the cushion body, thereby being mounted accurately and fittingly along a curved surface of the cushion body.

[0061] In the present invention, since the lateral wall portion **7** is not a simple wall but has engaging elements **8** in a hook-like shape on its top surface, there is no region without any engaging elements, unlike a conventional molded surface fastener. Consequently, an almost entire surface of the molded surface fastener **1** engages the female engaging elements formed on the rear surface of the surface skin material, an engaging strength is improved remarkably. As a result, even if a force in a deflecting direction is applied to a seating section of the surface skin material, the surface skin material is not detached easily. Further, a binding between the molded surface fastener **1** and the surface skin material can follow up a slight motion between the surface skin material and the cushion body, different from a binding with a high strength yarn or thread and thus, the cushion body is protected from a damage.

[0062] FIGS. **9** to **12** show a second embodiment of the present invention. This second embodiment is different from the first embodiment in structures of the division wall pieces **6** and the engaging elements **3** disposed in a pair such that they are arranged in the width direction. Because another structure is substantially not different from the first embodiment, the same designations and reference numerals as the first embodiment are used as designations and reference numerals of components other than the different ones in a following description.

[0063] According to this embodiment, instead of the division wall pieces **6**, a block piece **11** equal to the block piece **10** for joining two pairs of engaging elements **3** disposed in the central portion in the width direction of the molded surface fastener **1** of the first embodiment is formed. As shown in **FIGS. 9 and 11**, two rows of the division wall portions **5** on outermost and innermost sides of the three

longitudinal wall portions **4** located on extensions of the engaging elements **3** extending in the width direction of the base member **2** and the lateral wall portion **7** are joined together with a first block piece **11** and further, three rows of the division wall portions **5** are joined together with a second block piece **11**. The block piece **11** is buried in the cushion body so as to increase the fixing strength of the molded surface fastener **1** due to the anchor effect like the division wall pieces **6** of the first embodiment and prevents the linear magnetic body **9** from being separated from the base member **2**.

[**0064**] According to the first embodiment, the engaging elements **3** disposed in a pair along the width direction of the base member **2** are provided independently. According to this embodiment, as shown in **FIGS. 9 and 10**, the side surfaces of the rising portions of the engaging elements **3** disposed in a pair along the width direction of the base member **2** are combined and integrated with a reinforcement rib **12**. If the pair of engaging elements **3** arranged in the width direction of the base member **2** are combined with each other with the reinforcement rib **12** in this way, each engaging element **3** do not fall down laterally when the surface skin material (not shown) is pressed against the engaging-element forming surface of the molded surface fastener **1** and its rising posture does not collapse. As a result, the engaging elements **3** are more likely to be caught by mating female engaging elements, thereby increasing the engagement ratio to lead to an increase in an engagement force.

[**0065**] Other operation and effect are same as the first embodiment. When the molded surface fastener **1** is integrated with the cushion body at a time of formation by molding, the expandable resin material is prevented from invading into the engaging-element forming region of the molded surface fastener **1** surrounded by the longitudinal wall portions **4** formed on the molded surface fastener **1** and the lateral wall portions **7** having a structure peculiar to the present invention. Further, the engaging heads **8***b* of the surface fastener formed integrally with the lateral wall portion **7** eliminate a generation of an engaging element missing section on a substantial engagement surface of the molded surface fastener, thereby improving a strength of engagement with the surface skin material largely.

[**0066**] Typical embodiments of the present invention have been described above. However, the present invention is not restricted to the indicated examples and for example, it is permissible to adopt various kinds of conventional well-known configurations for the engaging elements, and it is permissible to form a recess in the surface of the base member and erect the engaging elements from a bottom surface of the recess so as to secure plasticity of the molded surface fastener and consequently lower the heights of the engaging elements, the longitudinal wall portions and the lateral wall portion, thereby reducing a thickness of an entire molded surface fastener.

What is claimed is:

1. A molded surface fastener comprising first resin invasion preventing means for an expandable resin material used for molding a cushion body on right and left side edge portions along a longitudinal direction of a surface of a base member of thermoplastic resin in a flat shape, a number of engaging elements provided between a right first resin invasion preventing means and a left first resin invasion preventing means, and second resin invasion preventing means for sectioning the engaging elements into a desired number of regions along the longitudinal direction of the base member, the second resin invasion preventing means extending in a width direction of the base member between adjacent sectioned regions and comprising engaging elements, the molded surface fastener being integrated with the cushion body at a same time when the cushion body is molded.

2. The molded surface fastener according to claim 1, wherein the second resin invasion preventing means comprises a lateral wall portion extending continuously in a width direction of a base member surface, and the lateral wall portion has a lateral wall and a plurality of engaging heads extending in back and forth directions from front and rear wall surfaces of the lateral wall.

3. The molded surface fastener according to claim 2, wherein a height of the lateral wall from the base member surface is larger than a height of a vertex of each of the engaging heads extending from the lateral wall.

4. The molded surface fastener according to claim 2, wherein a height of a vertex of each of the engaging heads formed on the lateral wall from the base member surface is substantially equal to a height of a vertex of an engaging head of an engaging element formed in a sectioned region from the base member surface.

5. The molded surface fastener according to claim 2, wherein the engaging heads extending in the back and forth directions of the lateral wall so as to adjoin each other in the width direction of the base member surface extend backward and forward alternately along the width direction.

6. The molded surface fastener according to claim 1, wherein the engaging elements formed in a sectioned region and arranged in line in the width direction of the base member are joined together successively through at least partial side surfaces of rising portions thereof.

7. The molded surface fastener according to claim 1, wherein the first resin invasion preventing means formed on the right and left side edge portions along the longitudinal direction of the base member surface comprises two or more rows of longitudinal wall portions arranged in line with an interval in the width direction of the base member, and the interval formed between the longitudinal wall portions on adjacent rows is formed as an aisle having a predetermined length in a passage direction of an expandable resin.

8. The molded surface fastener according to claim 7, wherein respective wall portions of two or more row of the longitudinal wall portions are divided at a predetermined pitch in the longitudinal direction of the base member by gaps, and the gaps between division wall portions adjoining in a row direction are arranged in a houndstooth shape between the rows.

9. The molded surface fastener according to any one of claims **7** and **8**, wherein a first wall portion of two or more rows of the longitudinal wall portions is disposed adjacent to sectioned engaging elements, a height of the first wall portion from the base member surface is substantially equal to a height of a lateral wall portion which is a second resin invasion preventing means from the base member surface, and heights of part of the longitudinal wall portion and a division wall piece disposed outside the first wall portion are set less than the height of the first wall portion.

10. The molded surface fastener according to claim 1, wherein the molded surface fastener comprises a magnetic body or a magnet.

11. The molded surface fastener according to claim 10, wherein the magnetic body is buried in a base member so as to extend continuously in a longitudinal direction of the base member.

12. The molded surface fastener according to claim 10, wherein the magnet is buried in a base member so as to extend continuously in a longitudinal direction of the base member.

13. A cushion body formed integrally with the molded surface fastener according to any one of claims **10** and **11**.

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