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(54) **Process for the fabrication of interconnecting elements of a slide fastener**

(57) Method for manufacturing interconnecting elements (14) for a slide fastener (10), comprising the steps of producing interconnecting half-elements (20) provided

with a predetermined three-dimensional shape, by means of punching of said half-elements from a sheet, and forming said interconnecting elements (14) by joining together respective pairs of half-elements (20).

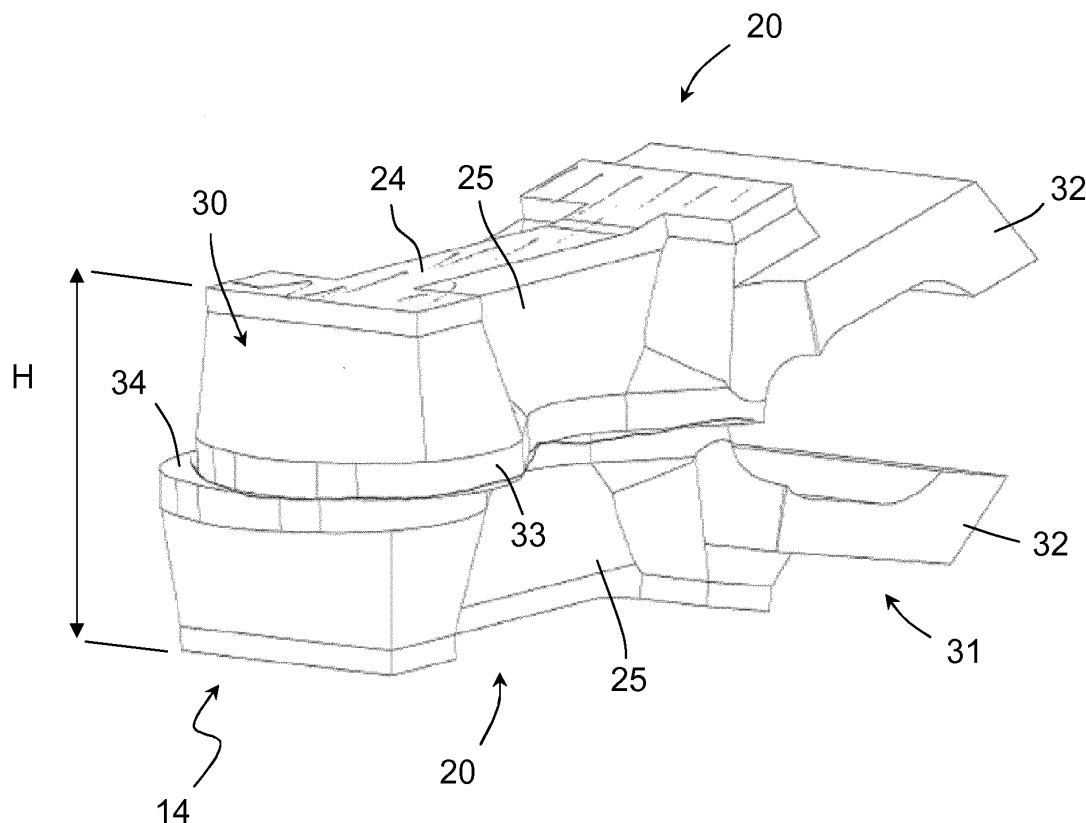


FIG. 5

Description

Field of application

[0001] The invention relates to the manufacture of interconnecting elements for a slide fastener (zip fastener). The invention in particular relates to the manufacture of interconnecting elements which have a complex shape, for aesthetic purposes or for personalization of the slide fastener.

Prior Art

[0002] A slide fastener as known comprises essentially two flanking strips which carry respective rows of interconnecting elements, commonly called teeth or tines, and a slider for engaging and disengaging the aforementioned elements. The fastener may also comprise a top stop and a bottom stop for stopping the slider.

[0003] Punching is a widely used technique for manufacturing interconnecting elements, especially if they are made of a metallic material. The prior art in the field essentially envisages that each element is punched as a single piece from a flat metal sheet, also termed plate. Punching is generally performed in several stages; prior to punching and associated separation from the sheet, it is also known to make some machining steps involving a plastic deformation of the strip, such as drawing or coining, in order to obtain particular shapes, such as projections and recesses for engagement between one element and another.

[0004] A major advantage of the punching process is the provision of huge production volumes at a low cost. Typically a punching press can perform thousands of strokes per minute and produce tens of teeth per stroke. This remarkable productivity is highly appreciated in the manufacture of items like teeth of a slide fastener, which have small dimensions and are produced in a large number. Moreover, there are some materials, such as brass, which are unsuitable for other processes (e.g. injection moulding) and for which punching is particularly suitable. Punching from a brass strip is common in the field.

[0005] Production by means of punching from a flat sheet still has, however, a major drawback being unsuitable for making interconnecting elements with a complex shape. In fact, the elements have surfaces corresponding to the thickness of the strip which, after punching, are necessarily flat. In the prior art, in particular, the visible surfaces of the interconnecting elements are precisely the aforementioned flat surfaces cut in the thickness of the strip. Moreover, the various drawing, coining and other machining steps are easily performed only on the two parallel faces of the sheet, and do not allow obtention of complex three-dimensional shapes.

[0006] Subsequent machine-finishing of the teeth is not convenient because it would require processing one-by-one a large number of parts with small dimensions of

the order of a few millimetres. A partial solution to the problem would consist in starting from a shaped sheet, but this solution is not appealing because it would involve very high plant costs.

[0007] For these reasons, in the prior art, production of a complex three-dimensional shape by means of punching is not considered to be feasible. Other machining techniques are known (e.g. machine-tool processing, precision casting, etc.) which can obtain elements of various shapes, but these techniques do not have the production capacity of punching and involve higher costs.

[0008] Another limitation of punching consists in the difficulty of punching a strip with a large thickness. In the prior art punching is used normally for a small thickness, usually not greater than about 1-1.5 mm; punching from a strip of large thickness (e.g. > 2 mm) is difficult and may cause deformation of the teeth. This deformation may be unpleasant and/or may adversely affect operation.

[0009] There is a constantly growing demand for slide fasteners with interconnecting elements made of high-quality material and/or with a complex three-dimensional shape, in particular for aesthetic purposes. For example, there is an increasing demand for slide fasteners equipped with interconnecting elements having a customized or recognizable shape, or reproducing a logo or brand. This requirement is frequent particularly for slide fasteners intended for articles of clothing, bags, fashion articles, etc. The demand for personalization relates in particular to surfaces of the teeth which remain visible when the fastener is closed. Production by means of punching is not considered able to meet this market demand in a satisfactory manner.

[0010] The technical problem forming the basis of the invention emerges even more clearly when considering Figs. 8 and 9 which show an interconnecting element or tooth 100 punched according to the prior art. The tooth 100 comprises a head portion 101 intended to engage with another tooth by means of a projection 103 and an opposite recess 104, said projection and recess being obtained by plastic deformation of the plate. The base portion comprises two arms 102 which may be crimped onto a peripheral edge of the flanking strip. Broken lines in Fig. 9 indicate the sheet of material B; the working direction of the cutting punch is indicated by the arrow T.

[0011] It can be understood that, since the surface 105 is cut within the thickness s of the sheet, it cannot be shaped or customized for aesthetic purposes unless expensive machining operations are subsequently performed on each single element. In substance, the element 100 may be conveniently shaped only in the direction perpendicular to the plane of the metal sheet, for example making the projection 103 and the recess 104 shown in the figure. This means that the teeth have necessarily an engaging direction (that is the sliding direction of the slider in the finished fastener) which is parallel to the punching direction T (Fig. 9), leaving the smooth surfaces 105 visible. Moreover, as mentioned above, a

processing as seen in Fig 9 is applicable in practice only when the plate thickness is small (about 1 mm), thus having a limited versatility.

Summary of the invention

[0012] The invention is aimed to solve the abovementioned problem by providing a method for manufacturing interconnecting elements for a slide fastener, by means of which it is possible to obtain elements with complex three-dimensional shapes, while maintaining the production capacity and the low costs of the known process of punching from a flat sheet.

[0013] The idea underlying the invention is to obtain, by means of punching, parts forming a half of a single interconnecting element. This ensures a greater freedom in definition of the shape of the elements, compared to punching in a single piece.

[0014] The aim of invention is therefore achieved by means of a method for manufacturing interconnecting elements for a slide fastener, **characterized in that** it comprises the steps of:

- producing interconnecting half-elements provided with a predetermined three-dimensional shape by means of punching of said half-elements from a sheet;

- forming said interconnecting elements by joining together respective pairs of half-elements.

[0015] Advantageously, said sheet of material is a flat sheet or plate with a rectangular cross-section.

[0016] More specifically, the method comprises preferably one or more steps of plastic deformation of said sheet of material, in order to define the geometry of the half-elements prior to punching step and corresponding separation from the sheet. The geometry of the half-elements is defined while respecting the necessary aesthetic and functional constraints (meshing). For example, surfaces of the half-elements are formed on the sheet with a suitable pitch (relative distance) by means of coining, drawing or other machining operations which precede final punching of the workpiece (half-element).

[0017] Preferably the punching is performed in a heightwise direction of the interconnecting element, said heightwise direction being defined as a front-rear direction of the slide fastener, which is perpendicular to the plane of the flanking strips when the element is applied to the fastener itself. In this way punching defines a flat bottom face of the half-elements which corresponds to a bottom face of the sheet and which can be used for the joining. In other words, the joining plane of two half-elements is preferably a middle plane which coincides with the plane of the flanking strips of the slide fastener and is also substantially parallel to the direction of engagement of the teeth and sliding direction of the slider.

[0018] In some embodiments of the invention, the half-

elements are identical to each other. In other embodiments, first half-elements and second half-elements with a different, preferably symmetrical, shape are produced, each element being formed by joining a first half-element with a second half-element. The first half-elements and the second half-elements may be obtained, respectively, from a first and a second sheet of material along separate punching lines and then fed to a joining machine or line.

[0019] Joining the pairs of half-elements is performed preferably with one of the following techniques, which are indicated by way of a non-exhaustive example: welding; brazing; gluing; mechanical fixing.

[0020] Conventional welding (without any filler material) may be applied for example by performing a spot-welding. Brazing is performed using a filler material with a lower melting point than material of the teeth, and is particularly preferred because it does not cause local melting of the teeth, nor does it modify their shape, which as is known must be precise to ensure operation and smooth action of the slide fastener. Mechanical fixing, if used, may be performed for example using screws, rivets or cusps/seats. Mechanical fixing may be preferred for elements of a large size.

[0021] The material of the interconnecting elements may be any material suitable for punching. Particularly preferred are metallic materials or metal alloys suitable for punching, including brass or even silver and gold, for use in exceptional luxury articles.

[0022] The joining of pairs of half-elements may be followed by further finishing operations which hence are carried on the already formed interconnecting elements, and which may comprise galvanization, polishing or other.

[0023] The great advantage of the invention is that the interconnecting elements may have complex three-dimensional shapes, practically without limitation, while continuing to use the punching process and the related advantages of high productivity and low cost. In fact, the half-elements can be made with a complex shape, comprising inclined surfaces, curved surfaces, parts tapered from bottom to top, etc. If punching the interconnecting elements as single pieces, as in the prior art, these shapes would not be possible. The invention does not require the use of a shaped sheet, but on the contrary allows realization of sophisticated shapes starting from a flat strip, owing to the manufacture of the elements as two halves.

[0024] Another advantage consists in that, by punching the half-elements separately and subsequently joining them together, it is possible to provide interconnecting elements with a size (corresponding to the thickness of the original strip) which is twice that possible with the prior art, for a given maximum thickness compatible with the punching.

[0025] The invention therefore expands the possibilities of aesthetic personalization of the slide fastener, while maintaining a low industrial cost and a proven and reliable process, that is the punching process. This will

emerge more clearly hereinbelow, with the aid of examples which are shown by way of a nonlimiting example.

Description of the drawings

[0026]

Fig. 1 shows some parts of a generic slide fastener.

Fig. 1A is a detail of Fig. 1 which shows the interconnecting elements or teeth of a generic slide fastener.

Fig. 2 shows a perspective view of an example of an interconnecting half-element which can be obtained with the present invention.

Fig. 3 is a top plan view of the half-element according to Fig. 2.

Fig. 4 is a view of the half-element according to Fig. 2 from a different angle.

Fig. 5 shows an interconnecting element obtained from joining together of two half-elements according to Fig. 2.

Fig. 6 is a block diagram illustrating a method for manufacturing the strip portions of a slide fastener, which includes the manufacture of the interconnecting elements according to the present invention.

Fig. 7 is an alternative diagram to that shown in Fig. 6 for the manufacture of different half-elements joined in pairs to form the interconnecting elements.

Figs. 8 and 9 show an interconnecting element obtained by means of punching according to the prior art.

Detailed description

[0027] Fig. 1 shows a typical slide fastener or zip fastener indicated generally by 10. The slide fastener 10 comprises two flanking strips 12 with rows 13 of interconnecting elements (teeth) 14. A slider 15 and a top stop 16 are also shown.

[0028] For the purposes of the description of the invention, the height of an interconnecting element 14 is defined as the dimension of the element in an inner-to-outer direction H of the slide fastener, which is perpendicular to the plane of the flanking strips 12 when the slide fastener is ideally arranged as shown in Fig. 1. The length L of an element 14 is defined in a transverse direction of the flanking strips 12, and the width W of an element is defined in the longitudinal direction of the flanking strips 12 (Fig. 1A).

[0029] The interconnecting elements 14 are each made by joining together two half-elements obtained by

means of punching from a sheet or plate which is advantageously flat.

[0030] Figs. 2-4 show a half-element 20 according to one of the modes of implementing the invention. Said half-element 20 comprises essentially a flat bottom face 21 (Fig. 4) which defines a joining plane for joining with another half-element; a head portion 22, a root portion 23, a top face 24 and tapered sides 25.

[0031] The head portion 22 of the half-element is intended to form (together with another half-element) the head of the interconnecting element 14 that is the part intended for meshing. The root portion 23 is intended to form the base of the element that is the part for fixation to flanking strips 12.

[0032] The sides 25, as can be noted in the figures, connect the bottom face 21 to the top face 24 and are formed, for example, by a plurality of inclined and/or curved faces, providing the half-element with a complex three-dimensional shape. Preferably the sides 25 are tapered in the heightwise direction H of the half-element 20, perpendicular to the flat bottom face 21.

[0033] Fig. 3 shows the punching edge 26, the punching being performed perpendicularly to the plane of said Fig. 3.

[0034] The complex shape of the half-element 20, in particular the sides 25 and the root portion 23, is generated by means of plastic-deformation machining performed directly on the sheet before punching and/or by means of suitable shaping of the cutting punch and die. For example, the root portion 23 may be shaped by means of coining the sheet from below.

[0035] Fig. 5 shows an example of an interconnecting element or tooth 14 obtained by joining together two half-elements 20. The element 14 has a head portion 30 and a substantially Y-shaped root portion 31, with two arms 32 to be crimped onto the flanking strips 12 or onto a suitable cord, in accordance with details which are known per se. For the purposes of the present invention it must be pointed out that the engagement between the elements occurs substantially in the middle zone of the head 30, in the vicinity of the joining plane. The faces 24, which are defined by the tapering of the sides 25, have practically a free shape, which may have an aesthetic function, reproducing for example a logo, a brand name or part thereof.

[0036] It must also be noted that the shape of the element 14, as a whole, could not be obtained by means of conventional punching from a flat sheet (cf. Figs. 8, 9) since it would be practically impossible to form the two tapered sides 25 and the inclined shaped portions 23.

[0037] The example shown in Fig. 5 relates to an embodiment in which the two half-elements 20 are identical, but are slightly staggered, such that the head of the tooth has laterally a projection 33 and a recess 34. In accordance with various embodiments, the two half-elements which form a tooth 14 may be identical or different from each other, preferably symmetrical.

[0038] Fig. 6 is a block diagram illustrating a mode for

manufacturing a slide fastener according to the invention. Block 50 represents the manufacture of suitably shaped half-elements 20 by means of punching from a flat sheet of material, for example brass. Block 51 represents the joining together of pairs of half-elements 20 using a suitable technique such as brazing, welding, gluing, mechanical fixing or other technique. Block 52 represents one or more treatments for finishing the elements 14 thus obtained, such as coating, polishing, etc., which may be performed depending on the requirements. Block 53 represents the application of the finished elements onto the flanking strips 12.

[0039] Fig. 7 shows a variant where each interconnecting element 14 is formed by two half-elements 20a, 20b with a non-identical shape, which are for example symmetrical. The elements 20a, 20b may be produced separately using two punching lines 50a, 50b and converge in a joining line 51. Said line 51 for example comprises a suitable matrix or template which allows correct positioning of an element 20a and an element 20b for joining together, for example by means of brazing, gluing, etc.

Claims

1. Method for manufacturing interconnecting elements (14) for a slide fastener (10), **characterized in that** it comprises the steps of:

- producing interconnecting half-elements (20) with a predetermined three-dimensional shape by means of punching of said half-elements from a sheet;
- forming said interconnecting elements (14) by joining together respective pairs of half-elements (20).

2. Method according to claim 1, wherein said sheet of material is a flat sheet or plate with a rectangular cross-section.

3. Method according to claim 1 or 2, also comprising one or more steps for plastic deformation of said sheet of material so as to obtain three-dimensional shaping of said half-elements (20) before the punching step.

4. Method according to any one of the preceding claims, wherein punching of the half-elements (20) from said sheet of material is performed along a heightwise direction (H) of the interconnecting element, said direction being a front-rear direction which is perpendicular to the plane of the flanking strips (12) when the interconnecting element (14) is applied to the slide fastener.

5. Method according to claim 4, wherein the joint between half-elements is performed by joining together

joining surfaces (21) perpendicular to said heightwise direction.

6. Method according to any one of the preceding claims, wherein the half-elements (20) are identical to each other.
7. Method according to any one of claims 1 to 5, wherein differently shaped first half-elements (20a) and second half-elements (20b) are made and wherein each interconnecting element (14) is formed by joining a first half-element (20a) together with a second half-element (20b).
8. Method according to any one of the preceding claims, wherein the joining together of half-elements (20; 20a, 20b) is performed using one of the following techniques; welding, brazing, gluing or mechanical fixing.
9. Method according to any one of the preceding claims, the material of said sheet being a metal or metal alloy suitable for punching.
10. Interconnecting element for a slide fastener, **characterized in that** it is obtained by means of a method according to any one of the preceding claims and comprising two half-elements made by means of punching and joined together.
11. Interconnecting element according to claim 10, comprising a portion or a surface (24) which reproduces a logo, a brand name or part thereof.
12. A slide fastener or an article comprising a slide fastener, said fastener comprising interconnecting elements according to claim 10 or 11.

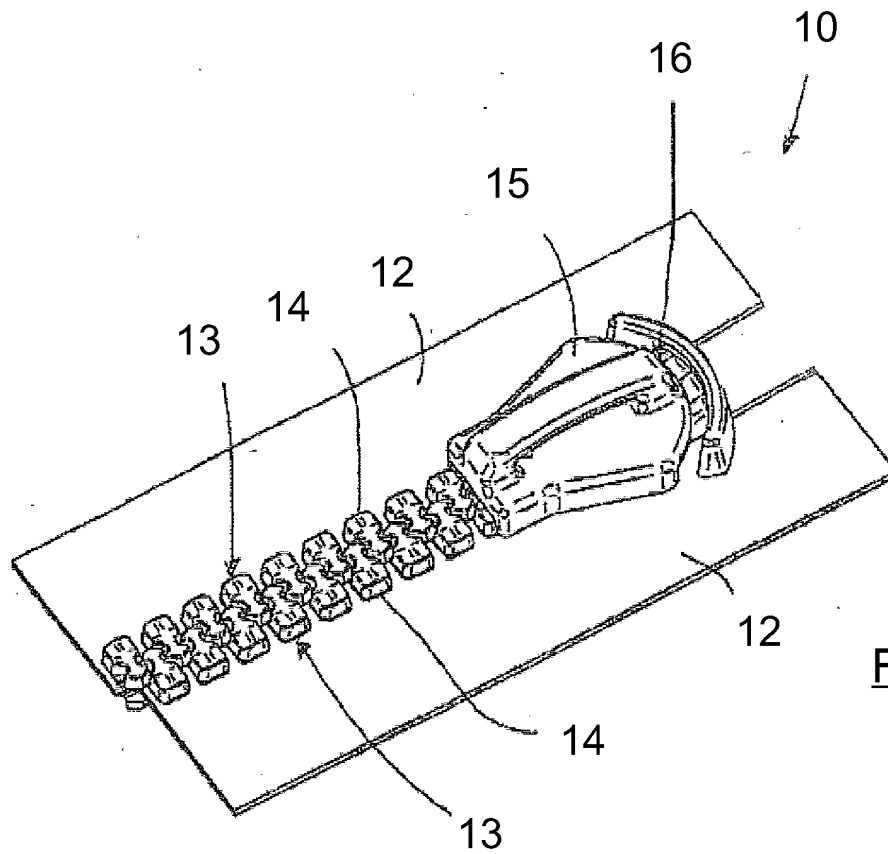


FIG. 1

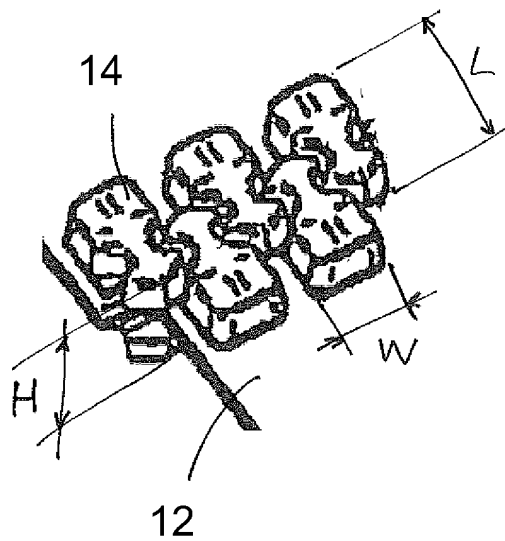


FIG. 1A

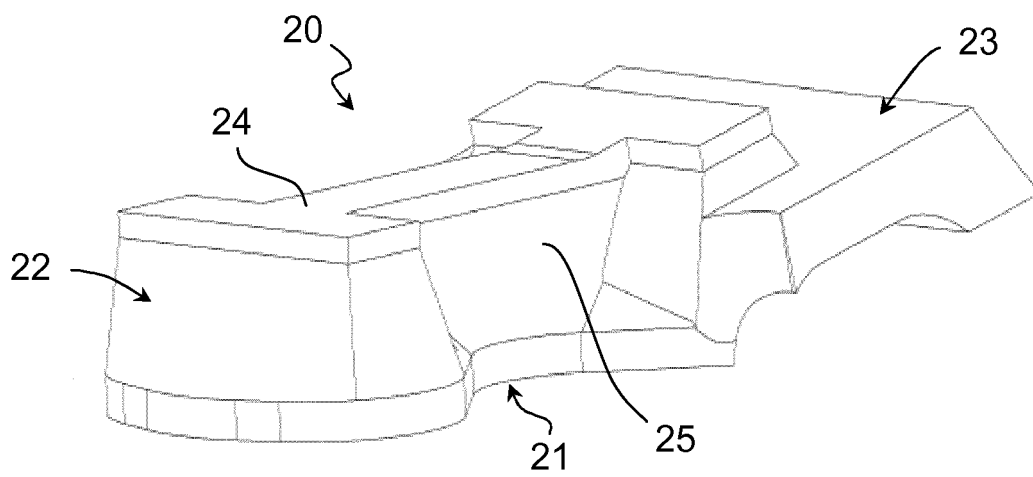


FIG. 2

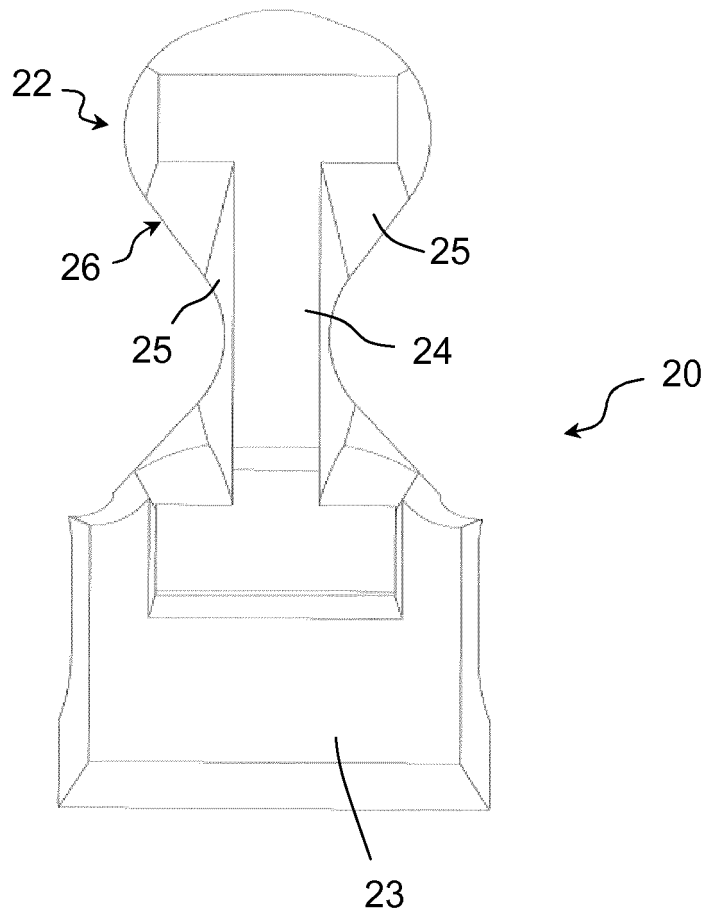


FIG. 3

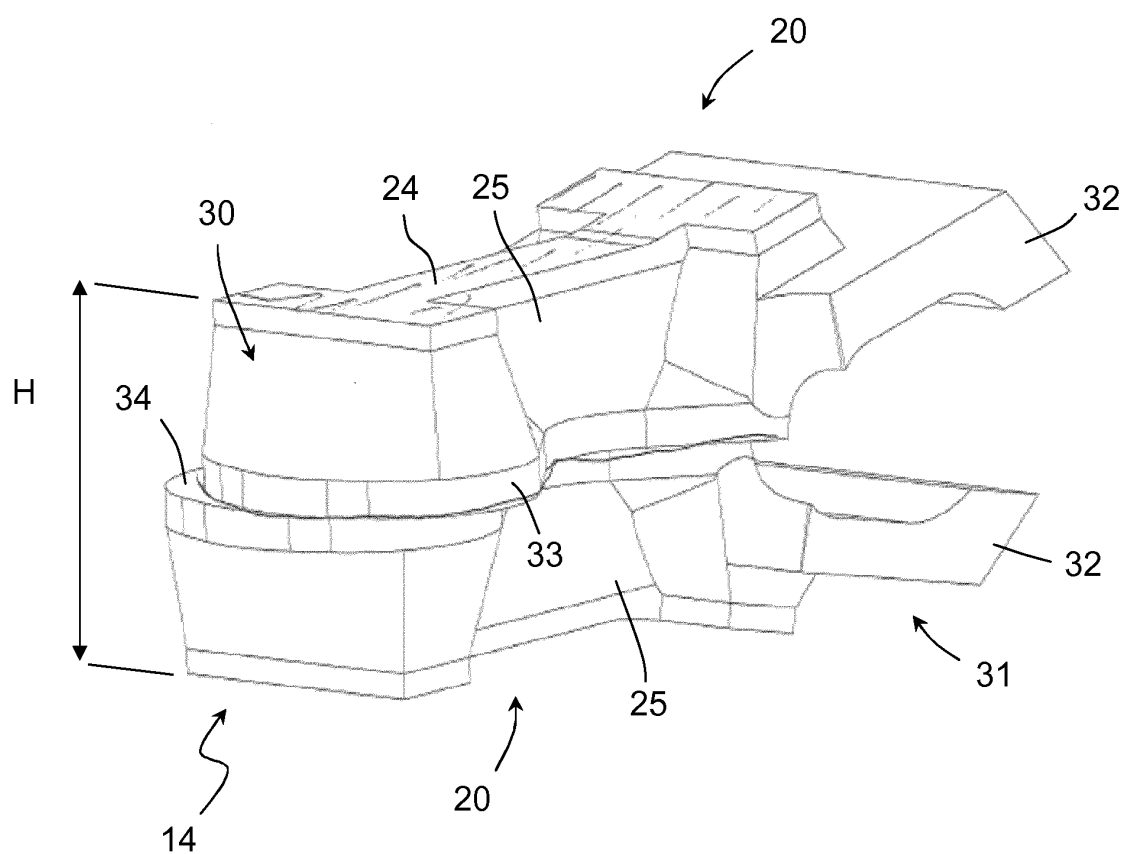
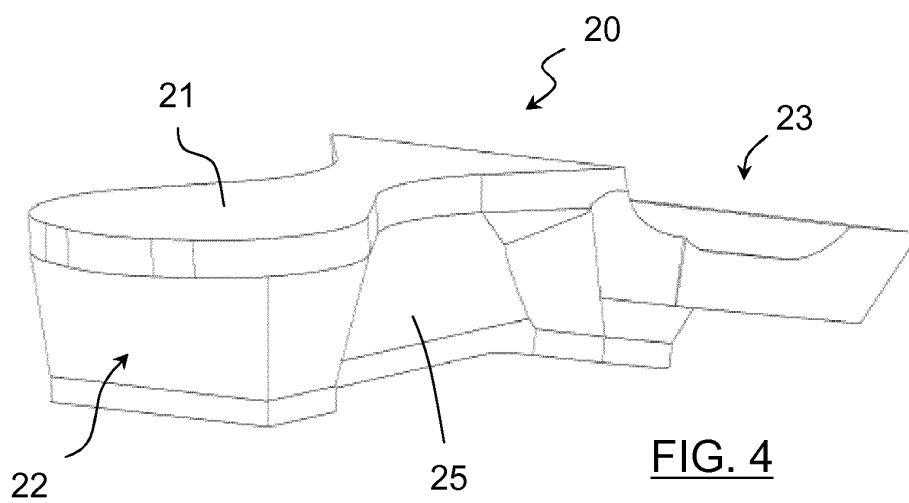


FIG. 5

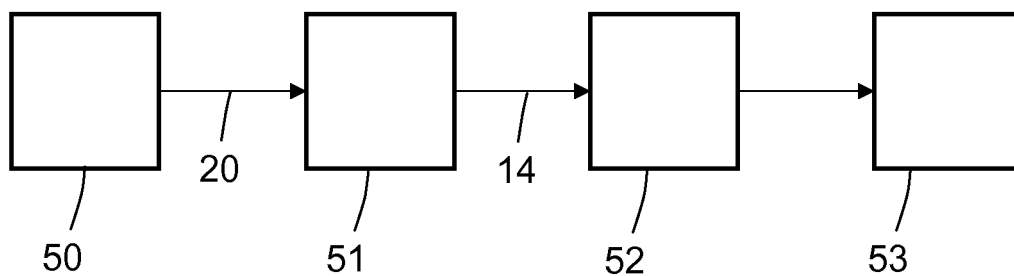


FIG. 6

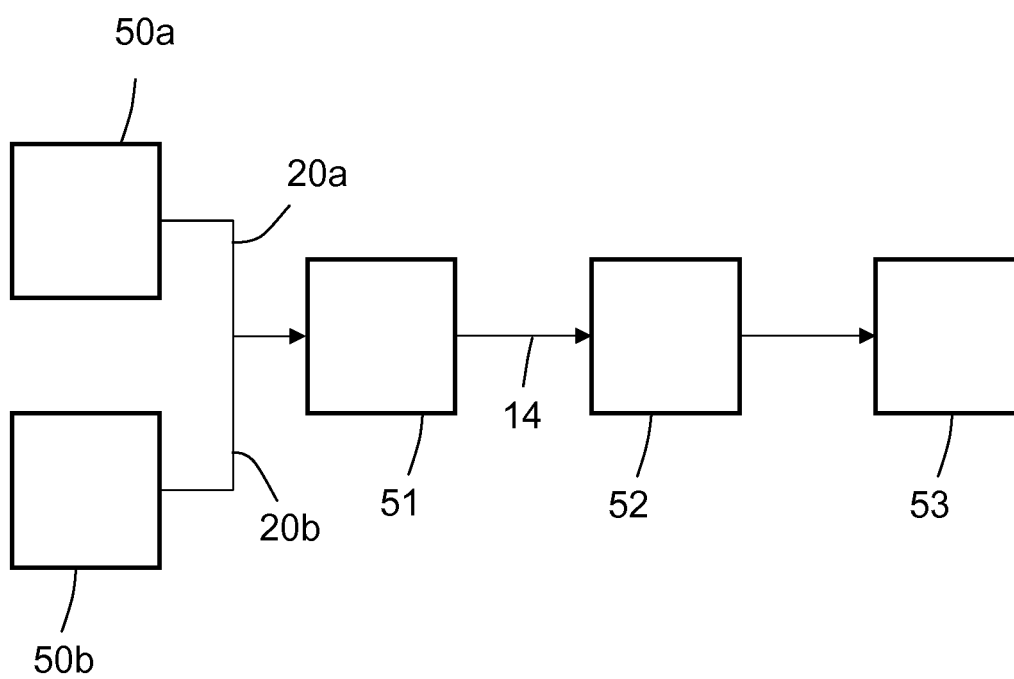


FIG. 7

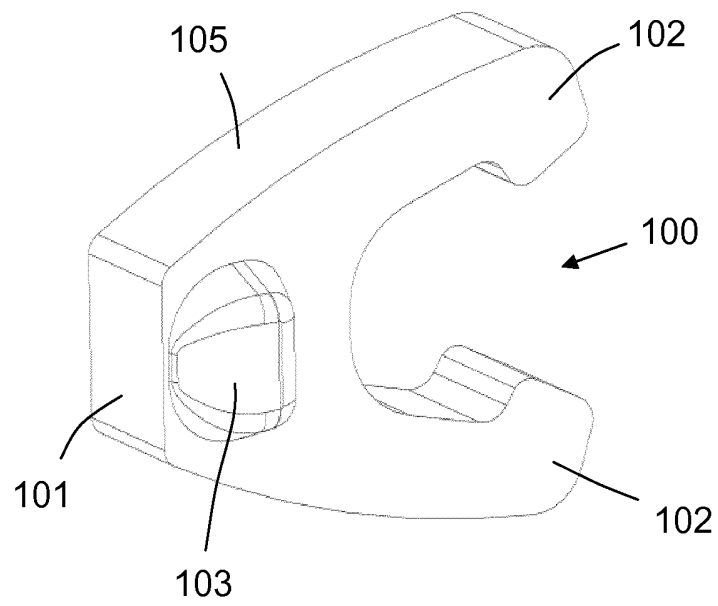


FIG. 8 (PRIOR ART)

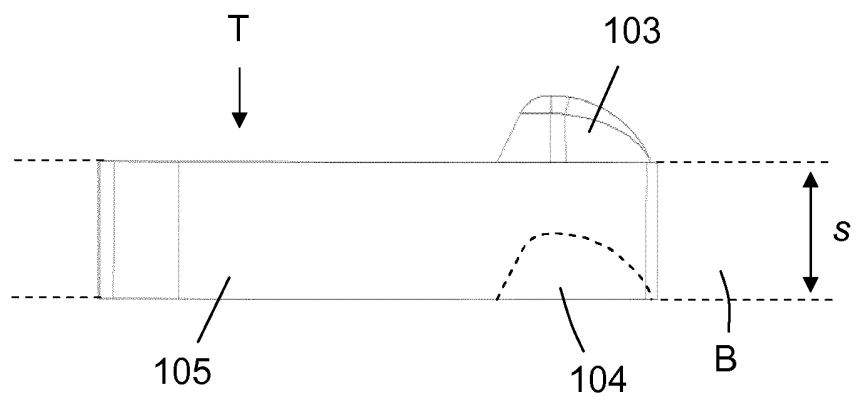


FIG. 9 (PRIOR ART)



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Place of search The Hague		Date of completion of the search 17 January 2013	Examiner Simpson, Estelle
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