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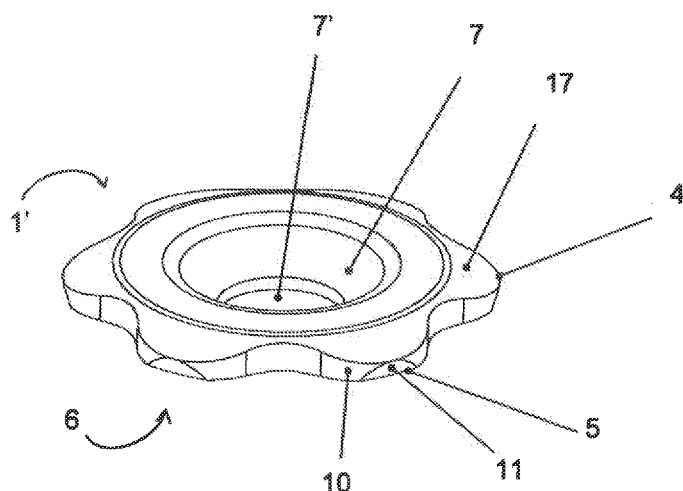


Fig.2

(57) Abstract: The washer according to the invention has a generally circular shape and is used for supporting a screw head, the shank of which penetrates the central hole (7') of the washer. When viewed from a planar perspective, the outer edges of the washer have a sinusoidal shape with depressions (9) and elevations (10).

(57) Abrégé : La rondelle selon l'invention a une forme généralement circulaire, elle est destinée à servir d'appui à une tête de vis dont le fût la traverse par son trou central (7'). Les bords extérieurs de la rondelle ont, vu en plan, une forme sinusoïdale présentant des creux (9) et des ventres (10).



WO 2017/212161 A1

SUPPORTING WASHER

BACKGROUND

Supporting washers made of metal or synthetic material have been known for a long time, having at their centre a hole intended to allow the stem of a connecting element comprising a head to pass through, for example a screw or a rivet, while still retaining the head of said connecting element, the
5 dimension of the hole being greater than or equal to that of the stem and less than that of the head. These known washers can comprise a bowl around the central hole for the purpose of housing the head of the connecting element.

These washers increase the surface on which the screw bears, preventing, in this way, the screw head from damaging the material placed
10 under it in the case where a supporting washer is not used, by distributing the force exerted by the screw over a larger surface.

This patent application has for purpose to improve these supporting washers that, such as they have been produced until now, have disadvantages when they are used.

15 These disadvantages occur only rarely in the case where the material placed under the washer is a metal, but occur more often in the case where this material is wood, a synthetic material, or an elastomer. Indeed the circumferential edge of known supporting washers is a surface perpendicular to the general plane of known washers, the lower edge of the circumferential edge
20 of known washers, formed by the meeting between said surface perpendicular to the general plane of said known washers and the lower surface plane of said known washers, exerts a shearing action in the material on which the known washers bear. This shearing is barely discernible or even non-existent, in the case where this material is a hard material, for example a metal material, but it
25 occurs as soon as the screw is tightened in the case where this material is a synthetic material, and even more in the case where this material is an elastomer. As mentioned hereinabove, this shearing can occur as soon as the screw is tightened or as soon as the rivet is applied, but even more when the

assembly assembled by means of the connecting element, using said known supporting washers, is subjected to forces being exerted in varied directions. An example of this is given in the field of elastomer junctions such as used to connect the ends of a conveyor belt. These reinforced elastomer junctions are
5 fixed at the ends of the conveyor belt using screws or rivets that successively pass through the upper plate of these junctions, the ends of the conveyor belt and the lower plate of these junctions.

French patent no. 2 803 836 shows this application. Note that in the case of this patent inserts embedded in the elastomer material of the plates of
10 the junction are used to receive the screw heads. But, during manufacture, the setting up, in particular that of the upper insert forming a bowl for the purpose of receiving the screw head, is expensive, and the inventor of this invention has tried to use a supporting washer as a replacement for the upper insert. But disadvantages, already described, were encountered with the known
15 supporting washers. This led to the utility of creating new supporting washers, able to eliminate these disadvantages.

In the same application for reinforced elastomer junctions intended to connect the ends of a conveyor belt, this shearing is even more accentuated due to the use, in the case of certain conveyor belts, of scrapers formed of
20 blades applied against the surface of the conveyor belt in motion, these blades being intended to remove the debris of the transported material remaining on said surface of the conveyor belt, for example coal or ore. These blades encounter the supporting washers and accentuate the shearing effect described hereinabove, all the more so that these blades are often provided
25 with tungsten steel edges, which are particularly aggressive.

SUMMARY

According to a technical aspect, the invention relates to a supporting washer for a screwed or riveted assembly, in particular for a conveyor belt
30 junction element, formed from a metal or synthetic material part of an approximately planar shape having at its centre a hole intended for the passage of a connecting element of the rivet or screw type comprising a stem

and a head, preferably a screw provided with a male thread or a female thread, of which the head, during the use of the washer, is supporting the edges of the central hole of the washer, remarkable in that the outer edge or edges of the part forming the washer have, seen from a planar perspective, a linear shape
5 that increases the length of the outer edge of the washer with respect to that of a washer of which the outer edge is strictly circular.

This particularity consists of the fact that the outer edges of the supporting washers are not circular but have, seen from a planar perspective, linear shapes that substantially increase the length of the outer edge, or of the
10 lower edge, of the washer with respect to a linear shape that is strictly circular such as that of the edge of a known supporting washer.

This increase in the length has for effect to reduce the impact of shearing exerted on the material placed under the washer, for example that of a conveyor belt junction.

15 It must however be noted that the new washer claimed by this patent application can be applied in cases other than the one of the junctions for conveyor belts when, due to its use, the washer can bite in the underlying material, under the effect of tilting, vibrations, or an excessively tight force.

Note that the edges of the central hole of the washer can be chamfered,
20 or deformed, so that the upper surface of the head is flush, at the end of screwing or riveting, with the upper surface of the washer adjacent to the central hole.

Another technical particularity of this invention is that the outer edge has, seen from a planar perspective, sinuositities comprising elevations and
25 depressions, the elevations being farther from the geometric centre of the washer and the depressions being closer to the geometric centre of the washer.

Another particularity of the washers according to this patent application is that the zones of the edge of the washer that are the farthest from the geometric centre of the washer comprise a rounded edge on the lower edge. In
30 other terms, according to this characteristics, the supporting washer comprises a lower edge, formed by the meeting between the lower surface of the washer and the outer edge of the washer, said lower edge having a rounded edge, at

least in the elevation portions of the sinuosities of the outer edge of the washer located the farthest from the geometric centre of the washer.

These rounded portions make it possible, during the use of the washer, to further reduce the effect of any shearing. Although tests have shown that this rounded edge is especially useful with regards to the portions of the lower edge that are farthest from the geometric centre of the washer, it is also possible that the entire lower edge of the edge of the washer be provided with such a rounded edge.

Finally the washers according to the patent application can have another particularity that is useful with regards to the application to the reinforced elastomer junctions used to connect the two ends of a conveyor belt.

Indeed, installations that use conveyor belts intended for transporting bulk materials, such as coal, ore and other materials, generally comprise scrapers. These scrapers tend to catch on the upper edge of the outer edge of the washer and pull off the washer along with the screw or the rivet. Such an incident has for consequence the obligation carry out a repair, which therefore also involves substantial losses in operating time.

That is why this invention provides to advantageously provide the upper surface of the washers according to this patent application with a conicity starting from the outer edge of the bowl that surrounds the central hole and terminates at the outer edge of the washer, this conicity resulting in a progressive tapering of the washer from the central zone to the outer edge of the washer. In other terms, according to this characteristic, the upper surface of the washer has a conical surface starting substantially from the edge of the bowl surrounding the central hole or from a circular surface surrounding the central hole of the washer and terminating at the outer edge of the washer, this conical surface driving a progressive tapering of the washer such that the upper edge of the outer edge of the washer is substantially flush with the surface whereon the washer is placed when the washer has been applied by riveting or screwing.

As such the scrapers do not risk encountering the upper edge of the outer edge of the washer, this edge being flush with the surface of the underlying junction, once the washer is installed.

5 BRIEF DESCRIPTION OF DRAWINGS

The invention is shown in the drawing, wherein:

- figure 1 shows a supporting washer according to prior art,
- figure 2 shows a preferred embodiment of the washer according to this patent application,
- 10 - figure 3 shows the washer of figure 2 comprising a screw of which the stem passes through the central hole,
- figure 4 shows the washer according to figure 3, applied to a screw of which the stem passes through the central hole, which is screwed onto an insert,
- 15 - figure 5 shows an example of a screw connection, according to prior art, drawn from figure 3 of French patent 2 803 836,
- figure 6 shows, as a cross-section, a screw connection using a washer according to this patent application, applied to a junction that connects the ends of a conveyor belt,
- 20 - figure 7 shows on the left a known washer and on the right a washer according to this patent application, applied on an upper plate of a conveyor belt junction.

DESCRIPTION OF EMBODIMENTS

25 The supporting washer 1 of figure 1 according to prior art, consists of a part with a round shape, comprising a circumferential edge 4, a lower edge 5, a lower planar surface 6, a central hole 7' of which the edges form a bowl 7 intended to receive a screw head 2, the stem 8 of the screw passing through the central hole 7'.

30 The supporting washer 1' of figure 2, according to a preferred embodiment according to this patent application, comprises, as the supporting washer 1 of prior art, a part with a generally round shape comprising an outer

edge 4', a central hole 7', a bowl 7, a lower edge 5, a lower surface 6; however, note that the outer edge 4' has, seen from a planar perspective, a sinusoidal shape having elevations 10 and depressions 9, the upper surface 17 is conical and the elevations comprise at their end a rounded edge 11, this rounded edge
5 being created on the lower edge 5.

The assembly shown in figure 3 is formed from a washer 1' and a screw.

Note the screw head 2, the screw stem 8, the depressions 9 and the elevations 10. The number of depressions and elevations is here 6, but this number can vary without leaving the scope of the invention. The depressions
10 and the elevations are symmetrical with respect to a virtual radius 12 of the washer. This means that the washer has a symmetry with respect to an axis carried by its virtual radius 12.

Figure 4 shows the same assembly as that of figure 3, with the same numerical references, the screw stem 8 being screwed on an insert 13.

Figure 5 shows as a cross-section an example of a screwed assembly of
15 the upper plate and of the lower plate of a junction for a conveyor belt of prior art, according to French patent 2 803 836. Note the female inserts 19 and the male inserts 20 respectively incorporated into the upper plate PS and into the lower plate PI, these plates surrounding the end E, of the conveyor belt.

Figure 6 is a cross-section along a vertical plane of an example of a use
20 of a washer according to this patent application, applied to a screwed assembly formed of the upper plate PS of the conveyor belt junction, the end E of the conveyor belt and the lower plate PI of the conveyor belt junction.

On this cross-section one can in particular see the conical surface 17 of
25 the washer shown by a line that is inclined with respect to the general plane of the washer, the screw head 2, the bowl 7 and the central hole 7', the rounded edge 11, the screw stem 8, the upper plate PS of the junction, the end E, of the conveyor belt, the insert 13, the lower plate PI of the junction. The enlargement of the zone comprising the rounded edge 11 surrounded by a circle in the figure,
30 makes it possible to observe said rounded edge 11 better.

Note in figure 7 that the end of the elevations 10 is flush with the surface of the upper plate PS of the junction for a conveyor belt. The rounded edge 11

(not visible in this figure) of the lower edge of the elevation 10 made it possible to not shear the material of the upper plate PS during screwing despite the slight sinking that occurs at the end of screwing. As such the scrapers mentioned hereinabove do not risk encountering the upper edge of the elevation and pulling of the washer and, because of this, the screw. On the contrary, the known washer exceeds the upper surface of the upper plate PS, and if this is screwed more tightly in order to sink the washer the absence of a rounded edge on the periphery provokes a shearing of the underlying material as soon as it is screwed and then accentuates it, during the operation of the conveyor belt.

The washer according to this patent application as such achieves all of the initially sought purposes, namely preventing the shearing effect and not giving hold to scrapers. The means used to achieve these purposes are described and illustrated. The following claims disclose the characteristics of the new washers.

Throughout the specification and the claims that follow, unless the context requires otherwise, the words "comprise" and "include" and variations such as "comprising" and "including" will be understood to imply the inclusion of a stated integer or group of integers, but not the exclusion of any other integer or group of integers.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgement of any form of suggestion that such prior art forms part of the common general knowledge.

In some cases, a single embodiment may, for succinctness and/or to assist in understanding the scope of the disclosure, combine multiple features. It is to be understood that in such a case, these multiple features may be provided separately (in separate embodiments), or in any other suitable combination. Alternatively, where separate features are described in separate embodiments, these separate features may be combined into a single embodiment unless otherwise stated or implied. This also applies to the claims which can be recombined in any combination. That is a claim may be amended to include a feature defined in any other claim. Further a phrase referring to "at

least one of" a list of items refers to any combination of those items, including single members. As an example, "at least one of: a, b, or c" is intended to cover: a, b, c, a-b, a-c, b-c, and a-b-c.

It will be appreciated by those skilled in the art that the invention is not
5 restricted in its use to the particular application described. Neither is the
present invention restricted in its preferred embodiment with regard to the
particular elements and/or features described or depicted herein. It will be
appreciated that the invention is not limited to the embodiment or embodiments
disclosed, but is capable of numerous rearrangements, modifications and
10 substitutions without departing from the scope of the invention as set forth and
defined by the following claims.

CLAIMS

1. A supporting washer for a screwed or riveted assembly for a conveyor belt junction element, formed from a metal or synthetic material part of an approximately planar shape having at its centre a hole intended for the passage of a connecting element of the rivet or screw type comprising a stem and a head, preferably a screw provided with a male thread or a female thread, of which the head, during the use of the washer, is supporting the edges of the central hole of the washer;

wherein the outer edge of the part forming the washer has, seen from a planar perspective, sinuosities comprising elevations and depressions, the elevations being farther from the geometric centre of the washer and the depressions being closer to the geometric centre of the washer, in such a way that this outer edge has a linear shape that increases the length of the outer edge of the washer with respect to that of a washer of which the outer edge is strictly circular;

the supporting washer comprises a lower edge, formed by the meeting between the lower surface of the washer and the outer edge of the washer, said lower edge having a rounded edge, at least in the elevation portions of the sinuosities of the outer edge of the washer located the farthest from the geometric centre of the washer; and

the upper surface of the washer has a conical surface starting from the edge of a bowl surrounding the central hole or from a circular surface surrounding the central hole of the washer and terminating at the outer edge of the washer, this conical surface driving a progressive tapering of the washer such that the upper edge of the outer edge of the washer is flush with the surface whereon the washer is placed when the washer has been applied by riveting or screwing.

2. The supporting washer according to claim 1 wherein the elevations and the depressions of the sinuosities of the outer edge of the washer have an approximately symmetrical shape with respect to a virtual radius starting from the geometric centre of the washer.

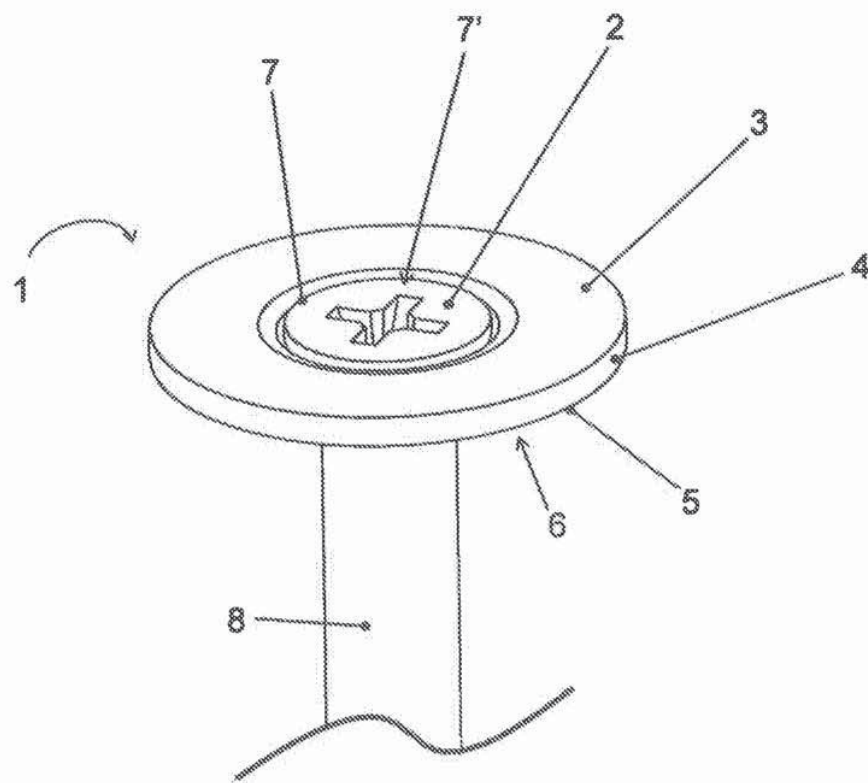


Fig.1

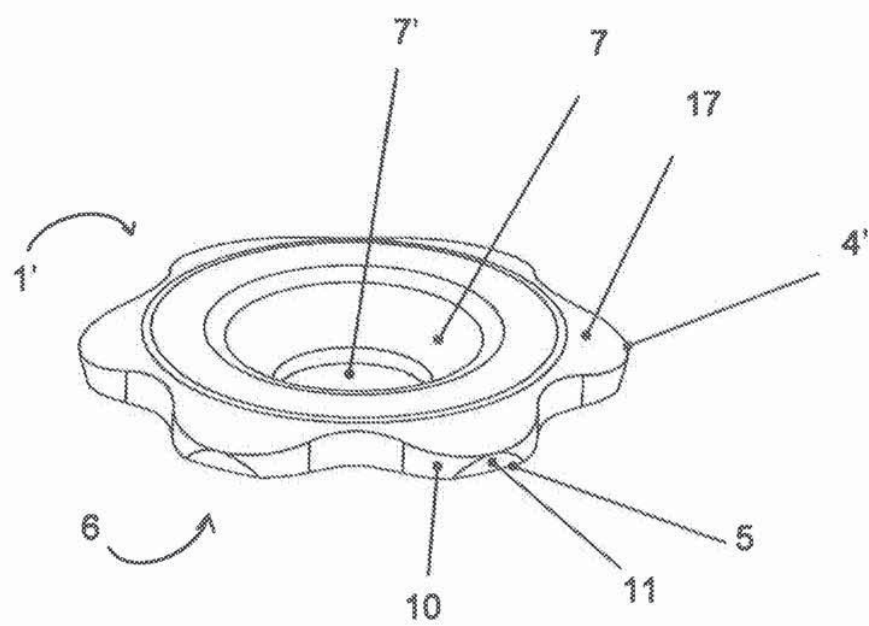


Fig.2

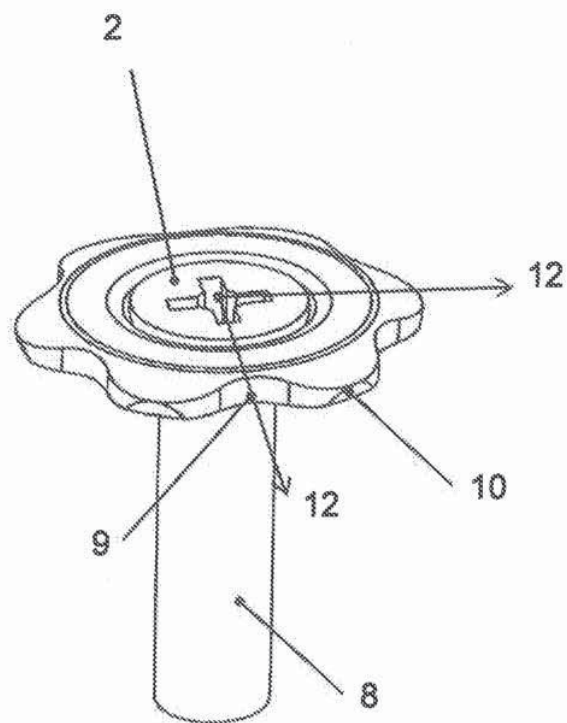


Fig. 3

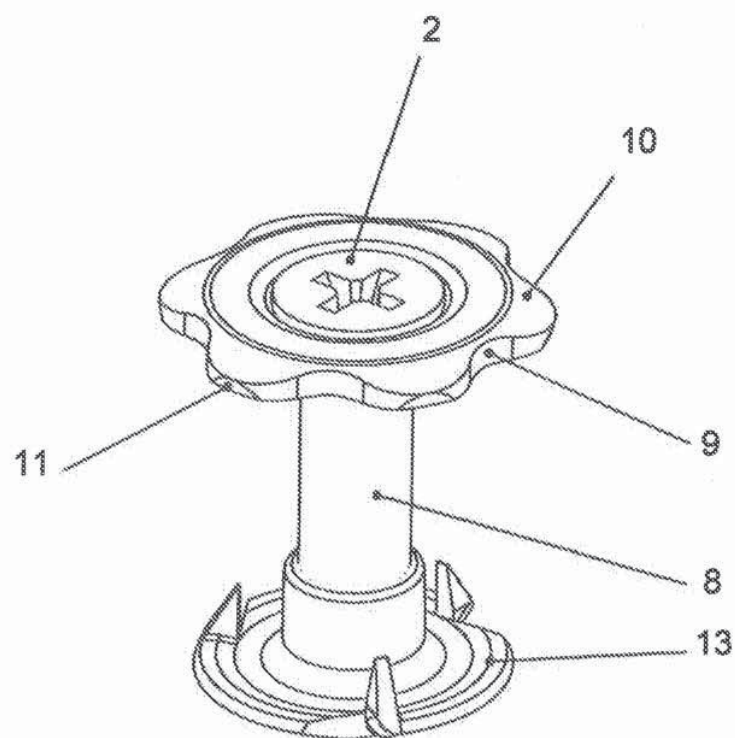
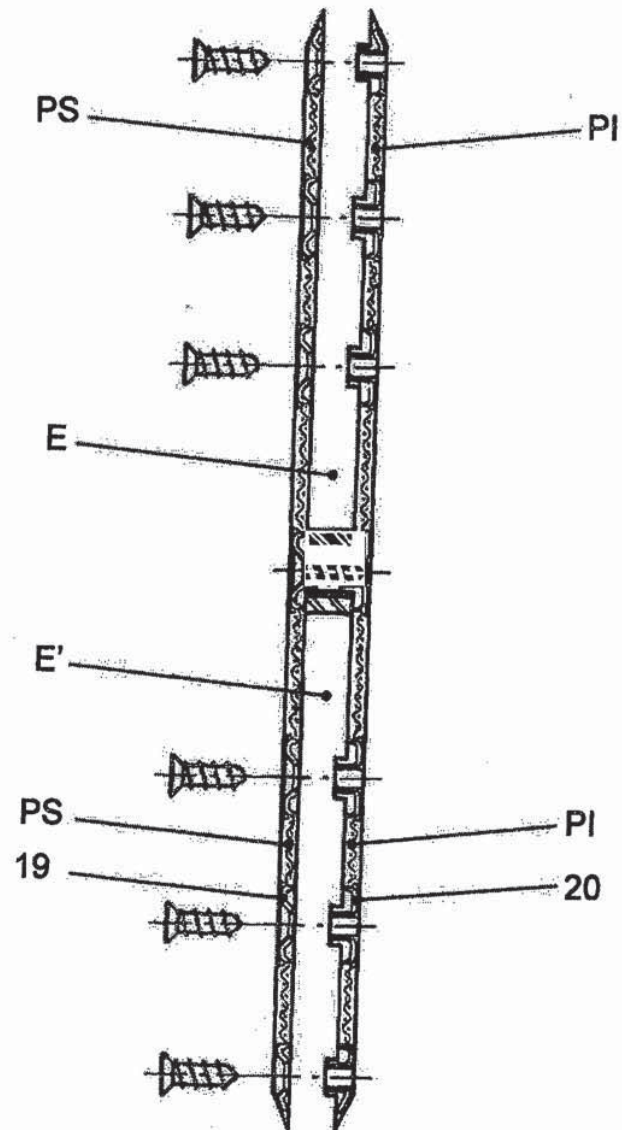


Fig.4



[Fig 5]

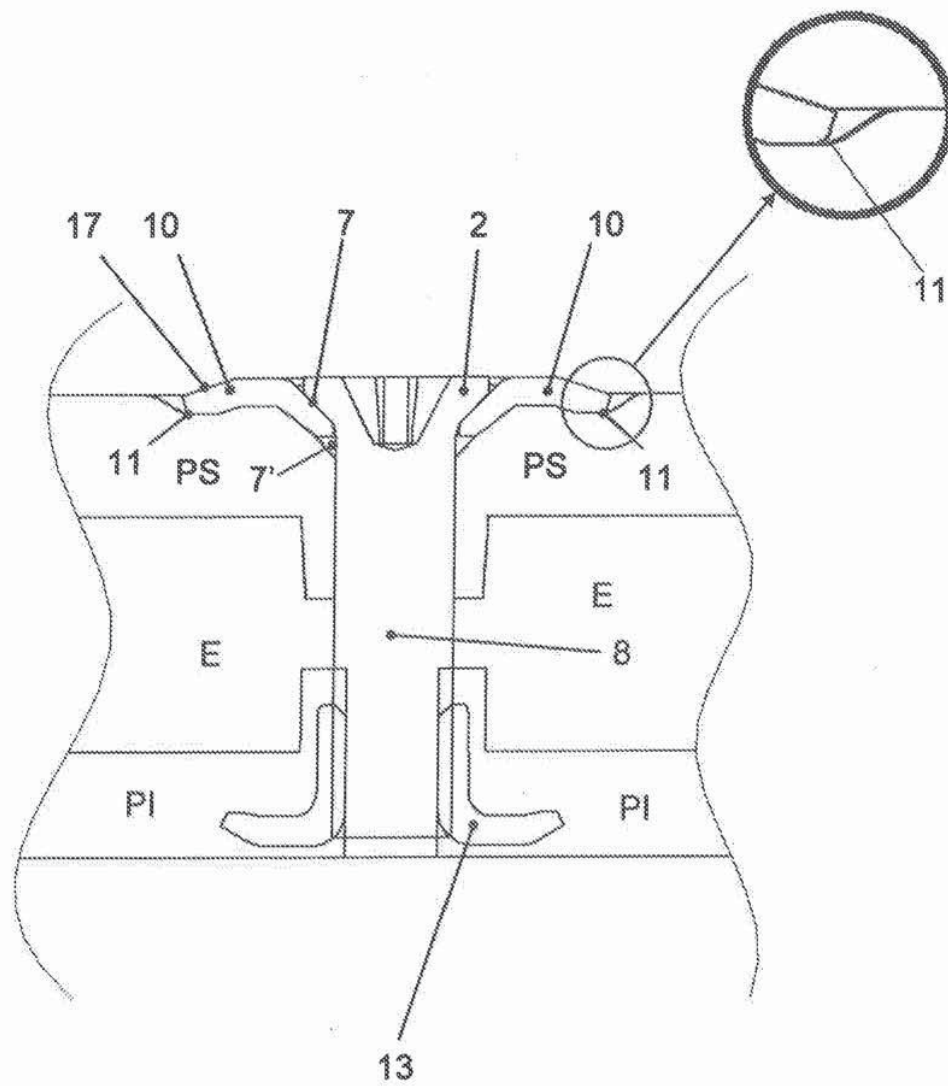


Fig.6

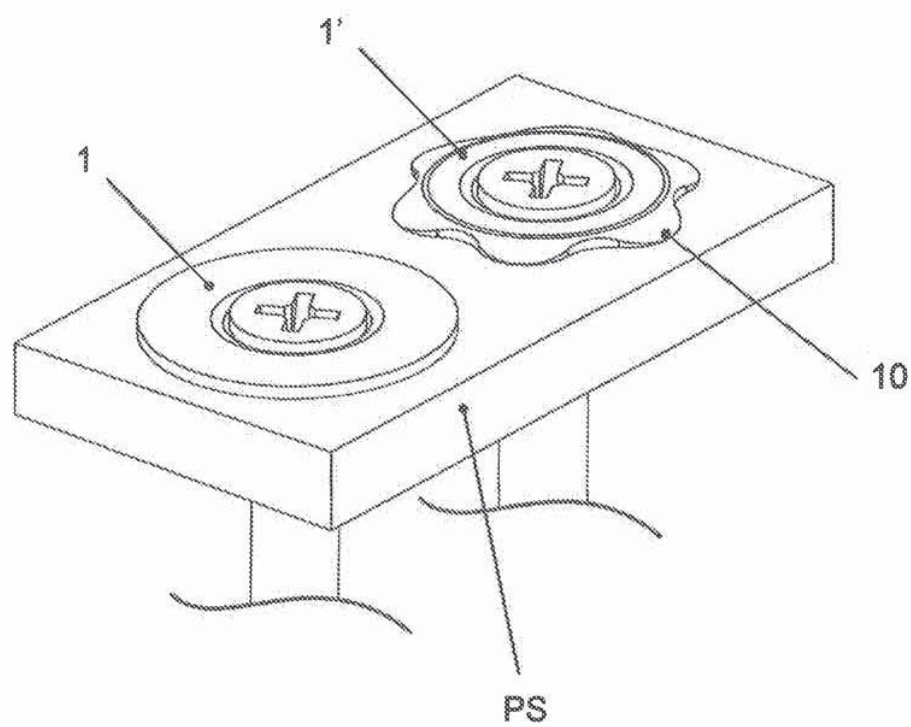


Fig.7