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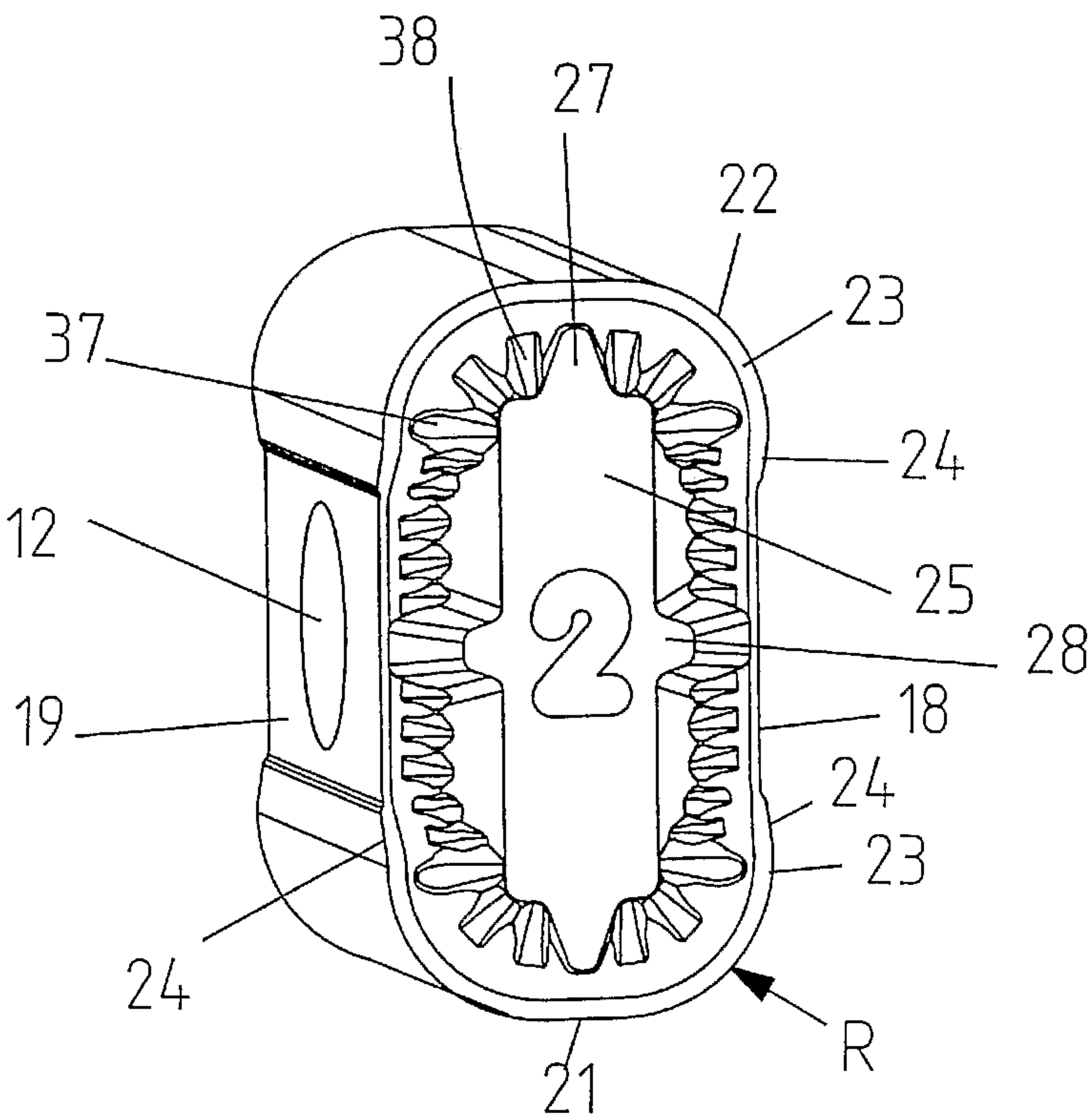


(57) Abrégé/Abstract:
The invention relates to a cutting element for machining metallic workpieces, especially wheelsets, said element comprising an upper surface and a lower surface, at least one, preferably both, of said surfaces being embodied as faces, and a respectively perpendicular lateral surface for connecting the upper surface and the lower surface and forming, together with a face, cutting edges that can be used for machining and are provided with cutting corners connecting respectively parallel long, linear cutting edge sections, respectively parallel short, linear cutting edge sections, and respectively adjacent long and short cutting edge sections. According to the invention, at least part of the long linear partial edge sections is lowered by a measure in relation to the adjacent edge sections and meshes with a measure thereof.

Abstract

The invention relates to a cutting element for machining metallic workpieces, especially wheelsets, said element comprising an upper surface and a lower surface, at least one, preferably both, of said surfaces being embodied as faces, and a respectively perpendicular lateral surface for connecting the upper surface and the lower surface and forming, together with a face, cutting edges that can be used for machining and are provided with cutting corners connecting respectively parallel long, linear cutting edge sections, respectively parallel short, linear cutting edge sections, and respectively adjacent long and short cutting edge sections. According to the invention, at least part of the long linear partial edge sections is lowered by a measure in relation to the adjacent edge sections and meshes with a measure thereof.

CUTTING ELEMENT

The invention relates to a cutting element for the machining of metallic workpieces, in particular of wheel sets, having an upper and a lower face, of which at least one, preferably both, are designed as mounting faces, and having a side face that connects the upper and the lower face and that is respectively perpendicular to them, that forms, together with the face, cutting edges usable for machining that possess longer linear cutting edge sections that are respectively disposed in parallel to each other and short linear cutting edge sections that are respectively lying to each other as well as cutting corners that connect respectively adjacent longer and short cutting edge sections.

Such cutting elements correspond to the norm DIN 4987LNUX. The advantage of such cutting elements is that they can be used for combined longitudinal and transverse turning works due to the existing longer cutting edges and the shorter cutting edges, of which adjacent ones are connected with each other by a cutting corner. However, the chip formation in the embodiments known in the prior art is not always satisfying, particularly in turning, chips are often formed with insufficient thicknesses, that have the disadvantage that the chips are breaking poorly, what in extreme cases can lead to a dangerous formation of snarl chips. Indeed, it is possible to increase the thickness of the chip by means of the advance of the tool to some degree, however, thereby the machining forces that operate on the cutting edge increase, that can result in an undesired premature wear of the cutting edge to the point of the breaking of the cutting edge.

Hence, objective of the present invention is to provide a cutting element that possesses a high cutting edge stability and that allows as well machining works with sufficient chip thickness, in particular in the machining of wheel sets or other coarse machining works due to the new design.

This objective is solved by the cutting element according to claim 1. According to the invention, at least one part of the longer linear cutting edge sections is lowered by a measure (a) in relation to the adjacent edge sections as well as indented by a measure (b). The measure (a) of the lowering is 0.01 x H to 0.2 x H, preferably 0.02 x H to 0.1 x H, wherein H is the total height of the cutting element, the measure (b) of the indentation is 0.005 x B to 0.1 x B, preferably 0.008 x B to 0.05 x B, wherein B is the total width of the cutting element. The lowering is to be understood in relation to the cutting edge plane, in relation to which this part of the longer cutting edge sections is disposed such that it is displaced in the height. It is substantial for the present invention that at least one part of the longer linear cutting edge section is both lowered and indented, i.e. that this arrangement differs, due to the combination of both mentioned features, from embodiments known in the prior art, that in part exclusively disclose lowering of cutting edges, such as by indentations, that penetrate the cutting edge or cutting edges with cutting edge sections of different heights that are connected by transition areas. Surprisingly, it was found that the combination of the lowering as well as the indentation of a cutting edge part in turning works, in which this part is used as an active cutting edge, enables the formation of a chip which breaks substantially more easily as it is for example possible with a linear cutting edge. In particular, the chip is curved according to the shape of the cutting edge of the longer cutting edge already when it is detached also in the cross section, that enables the easier breaking of the chip.

Further designs of the invention are described in the dependent claims.

Thus, preferably the indented and lowered part of the cutting edge section is - apart from transition areas - disposed in parallel to adjacent cutting edge sections. Ascending flank sections abut on the indented and lowered cutting edge sections as transition areas, respectively preferably in an angle of 10° to 90°, preferably of 40° to 50°. These flank sections serve for the formation of a chip that is curved in the cross section.

Preferably, the cutting edge corners possess a corner radius (R) of 0.05 x B to 0.5 x B, preferably of 0.1 x B to 0.4 x B, wherein B corresponds to the total width of the cutting element.

According to another design and as known in the principle from the prior art, the cutting element preferably possesses a center plateau that is embossed on the face in relation to the planes defined by the cutting edges and that is disposed in a distance to the cutting edges. In embodiments in which faces are provided on both the upper and the lower side, the respective center plateaus serve as support faces.

According to another design of the invention, the center plateau has projections, the longitudinal axis of which points in direction of a cutting corner or of a short and/or longer cutting edge section. These projections serve as chip breakers, that curve the chip, that is being detached, towards the "top" and thus make it break. In particular favorable for the breaking of the chip are center plateaus, that merge into the face areas that are situated around this center plateau via descending flanks. These descending flanks are ascending flanks for curving up the chip that is being detached.

Further measures for forming and guiding the chip are realized by rib-shaped elevations, that are disposed in symmetry to a bisecting line of a cutting corner or lying in its direction in the face and the height of which is minor than that of the center plateau. These rib-shaped elevations can reach directly until this descending flank of the center plateau or, respectively, abut on it or end in front of this flank area. The rib-shaped elevations end on the other side in a distance to the cutting edge or of a phase that is provided there.

According to another embodiment of the invention, further projections can originate from the center plateau that point in direction of the longer cutting edge sections and/or are of a minor height than the center plateau. Preferably, these further projections merge into the adjacent surrounding face areas via descending flanks and/or are designed crowned, i.e. convex.

According to another embodiment of the invention, also the short cutting edge section can be lowered recessed centrally at a part that merges via ascending flanks into the adjacent cutting edge sections. The cutting edge thus possesses only one lowering in this area. Additionally to the rib-shaped elevations that have already been described, also hutches can be provided as chip-breaking elements in a distance to the cutting edge, that are in particular designed in a sickle-shape on the face.

Alternatively or additionally to the rib-shaped chip-breaking elements, also chip-breaking elements can be provided that are trapezoidal in the cross section and that have a distance to the cutting edge that increases as height increases, that reach preferably to the center plateau. These embossed chip-breaking elements extend wedge-shaped in direction of the cutting edge and constitute a kind of "seizing ramp" for the chip that is detached, by means of which the chip gets a certain pre-curvature until it meets the ascending ramps of the center plateau.

According to another design of the invention, the cutting elements have reflection symmetry in relation to a longitudinal center axis and/or a transverse center axis and/or a diagonal, so that every face is usable for counterclockwise as well as for clockwise turning works or, respectively, as indexable insert (by means of a rotation of 180° of the cutting element). In the case of the upper and lower face additionally respectively designed as mounting faces, a further reflection symmetry in relation to a longitudinal center plane results or, respectively, a cutting element that possesses two usable faces with respective pairs of longer and shorter cutting edge sections.

Further advantages and examples of designs of the invention will be explained on the basis of the drawings, wherein

FIG. 1 shows a schematic view of a cutting element known in the prior art with a lowered cutting edge area during the operation of turning a wheel set profile,

FIG. 2 shows a top view of a cutting element with an indented, but not lowered cutting edge area,

FIG. 3 shows a cutting element according to the present invention that has an indented and lowered cutting edge area and

FIG. 4 shows a front view of this cutting element towards the lowered and indented cutting edge.

As it is evident from the figures 1 to 4, the shown cutting elements possess at least one face 10, preferably two faces 10 that are disposed in parallel to each other and that are lying in a distance on opposite sides, wherein these two faces are connected with each other via a side face 11 that is disposed vertically thereto. For fixing the cutting element, a through bore 12 is provided, that penetrates the side face 11 on opposite sides. This bore serves for the reception of a tensioning element by means of which the cutting element is fixed in a (tool post) die carrier.

From FIG. 1 results the use of the cutting element in the turning of a wheel set 13, wherein the cutting element is guided in direction of the arrow 14. The area 15 that is to be detached is indicated by means of dashes. In the shown example of design, the longer cutting edge is lowered along a part (but not indented), so that seen from the top view, a linear course of the active cutting edge section 16 results. Due to the additional indentation according to the invention of the center part of the longer cutting edge, that will be described below, a course of the cutting edge results in combination with the transition area that is angled, seen from the top view in relation to that, that leads, in combination with the course of the cutting edge that is caused by the lowering, to the fact hat the detached chip receives in the cross section S-shaped curvatures in directions that are orthogonal to each other, due to which the chip can break more easily.

FIG. 2 shows in a top view an indented cutting edge section 17, that is formed by indenting back the adjacent free surface in this area. As it can be seen from FIG. 3, the indented area 17 as well as the lowered area are combined to a cutting edge section 18 in a particular embodiment, wherein the areas of the lowering of the cutting edges (in relation to the plane of the face or, respectively, parallels lying thereto) as well as the indentations (by setting back the free areas) completely overlap. The free area that is set back is marked by reference number 19.

As it can be seen from FIG. 2 to 4, the cutting element possesses longer linear cutting edge sections 20 that are respectively parallel to each other as well as shorter linear cutting edge sections 21 that result in a longitudinal oval course of the edges in a top view over cutting corners 22 that connect respectively adjacent cutting edge sections 20 and 21. A part of the longer cutting edge 20 is, in the form of an area 18, both lowered and indented. The respective connection areas 23, that are designed relatively short in the example of design according to FIG. 3, are parallel to the cutting edge section 18. On respectively both sides, ascending flank sections 24 abut on the indented as well as lowered cutting edge sections 18 as transition areas in an angle of 10° to 90°, preferably of 40° to 50°.

On the face, different embossed or hutch-shaped chip-breaking elements can be used as they are principally known in the prior art. As well, it is recommended to select on opposite sides designs of faces that possess a center plateau 25 that serves at the revolving of the cutting element as a support face in a cutting plate fit. This face plateau 25 can have the embodiments shown in FIG. 2 or 3 or other shapes. In particular, the plateau can possess projections 26, the longitudinal center axis of that points in direction of a cutting corner 22. Alternatively, also projections 27 and/or 28 (see FIG. 3) can be used, that point in direction of the center of the cutting edge of a short or, respectively, longer edge section. These projections can have edges that are rounded at the top or have also trapezoid designs. Preferably, these projections or also other areas of the plateau merge into the adjacent surrounding face areas via descending flanks 29 (see FIG. 2). The flank angle of the descending flanks 29 can for example be selected between 45° and 60° (in relation to the cutting plateau plane). In case of need, also further projections 30 or 31, there in minor height than that of the face plateau, can be provided. These projections, as well as rib-shaped elevations 32, if necessary having sickle-shaped hutches 33 between two rib-shaped elevations 32, serve as chip-breaking elements. As it is evident from FIG. 2, the short cutting edge 21 can also possess a lowered area 34 with ascending flanks 35 on respectively both sides. Such design is achieved by means of lowering of an area 36 of the face, that is designed as tapering to areas distant of cutting edges.

In the same manner, and as shown in the example of the cutting element according to FIG. 3, chip-breaking elements 37 or 38 can be provided that are designed trapezoid in the cross section and that have a height that increases as the distance to the respective cutting edge increases, so that a "seizing ramp" for the chip that is detached results in this area. These chip-breaking elements 37 and 38 end on the ascending flanks to the center plateau 25, but possess however a minor height.

As shown schematically in FIG. 3, the border lines, that limit the plateau 25, can have partially linear areas, curved areas, formed both convex and concave, or other combinations of curved and/or linear parts.

Claims

1. Cutting element for the machining of metallic workpieces, in particular of wheel sets, having an upper and a lower face of which at least one, preferably both, are designed as mounting faces, and having a side face (11) that connects the upper and the lower face and that is respectively perpendicular thereto, that, together with the face, forms cutting edges usable for machining, that possess longer linear cutting edge sections (20) that are disposed respectively parallel to each other and short linear cutting edge sections (21) that are lying respectively parallel to each other as well as cutting corners (22) that connect respectively adjacent longer and short cutting edge sections, characterized in that
at least one part (18) of the longer linear partial edge sections is lowered by a measure (a) in relation to the adjacent edge sections (23) as well as indented by a measure (b).

2. Cutting element according to claim 1, characterized in that in relation to the total height (H) and the total width (B) of the cutting element, the measure (a) of the lowering is 0.01 x H to 0.2 x H, preferably 0.02 x H to 0.1 x H, and the measure (b) of the indentation is 0.005 x B to 0.1 x B, preferably 0.008 x B to 0.05 x B.

3. Cutting element according to claim 1, characterized in that the indented and lowered part (18) of the cutting edge section

(20) is disposed in parallel - apart from transition areas (24) - to adjacent cutting edge sections (23).

4. Cutting element according to claim 1 or 3, characterized in that ascending flank sections (24) abut on the indented and lowered cutting edge sections (18) as transition area, respectively in an angle of 10° to 90°, preferably of 40° to 50°.

5. Cutting element according to one of the claims 1 to 4, characterized in that the cutting edge corners have a corner radius (R) of 0.05 x B to 0.5 x B, preferably of 0.1 x B to 0.4 x B, wherein B is the total width of the cutting element.

6. Cutting element according to one of the claims 1 to 5, characterized by a center plateau (25) that is embossed on the face in relation to the planes defined by the cutting edges and disposed in a distance to the cutting edges.

7. Cutting element according to claim 6, characterized in that the center plateau (25) has projections (26), the longitudinal center axis of which points in direction of a cutting corner (22) or of a short and/or longer cutting edge section (20, 21).

8. Cutting element according to claim 6 or 7, characterized in that the center plateau (25) merges into the face areas that are adjacent to and surround this center plateau via descending flanks (29).

9. Cutting element according to claim 6, 7 or 8, characterized by rib-shaped elevations (32) that are disposed in symmetry to a bisecting line of the cutting corners in the face or lying in its direction, the height of which is minor than the height of the center plateau (25) and that reach on the one hand to the descending flanks (29) of the center plateau (25), on the other hand however ending in front of the cutting edge (20, 21, 22).

10. Cutting element according to one of the claims 6 to 9, characterized in that further projections (30, 31) originate from the center plateau (25), that point in direction of the longer cutting edge sections (20) and/or are of a minor height than the center plateau (25).

11. Cutting element according to claim 10, characterized in that the further projections (30, 31) merge via descending flanks into the adjacent surrounding face areas and/or are designed crowned.

12. Cutting element according to one of the claims 1 to 11, characterized in that the short cutting edge section (21) is recessed centrally at a part (34) and merges via ascending flanks (35) into the adjacent cutting edge sections.

13. Cutting element according to one of the claims 1 to 12, characterized in that in a distance to the cutting edge chip-breaking hutches (33) are provided on the face, that are designed

in a sickle-shape preferably between two adjacent rib-shaped elevations (32).

14. Cutting element according to one of the claims 1 to 13, characterized in that chip-breaking elements (37, 38) are provided in a distance to the cutting edge that are trapezoid in the cross section and have a height that increases as the distance to the cutting edge increases, that preferably reaches to the center plateau (25).

15. Cutting element according to one of the claims 1 to 14, characterized in that the faces are designed such that they have reflection symmetry in relation to a longitudinal center axis and/or a transverse center axis and/or a diagonal.

16. Cutting element according to one of the claims 1 to 15, characterized in that the opposite faces are disposed and designed such that they have reflection symmetry in relation to a center longitudinal plane.

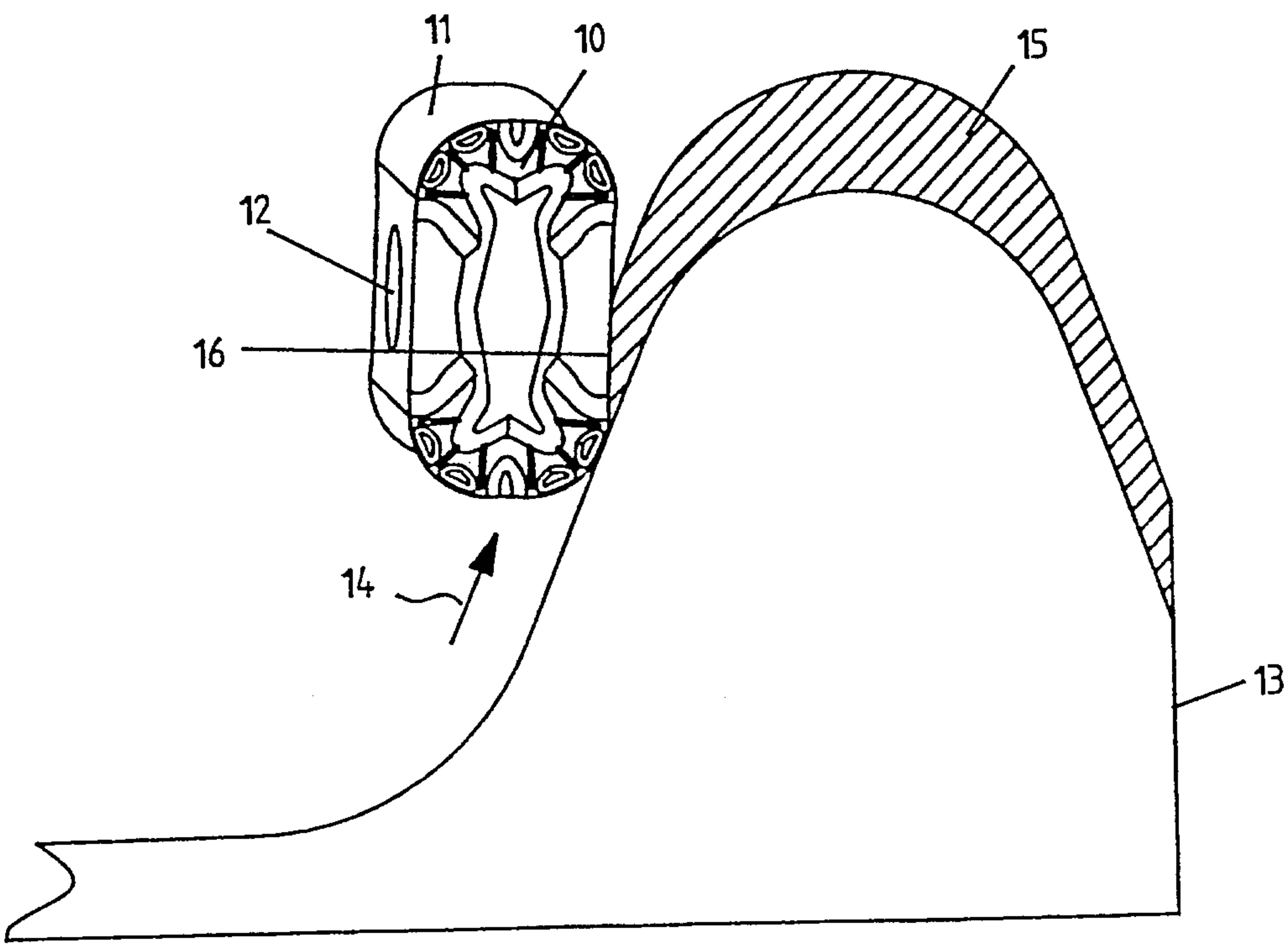


FIG.1

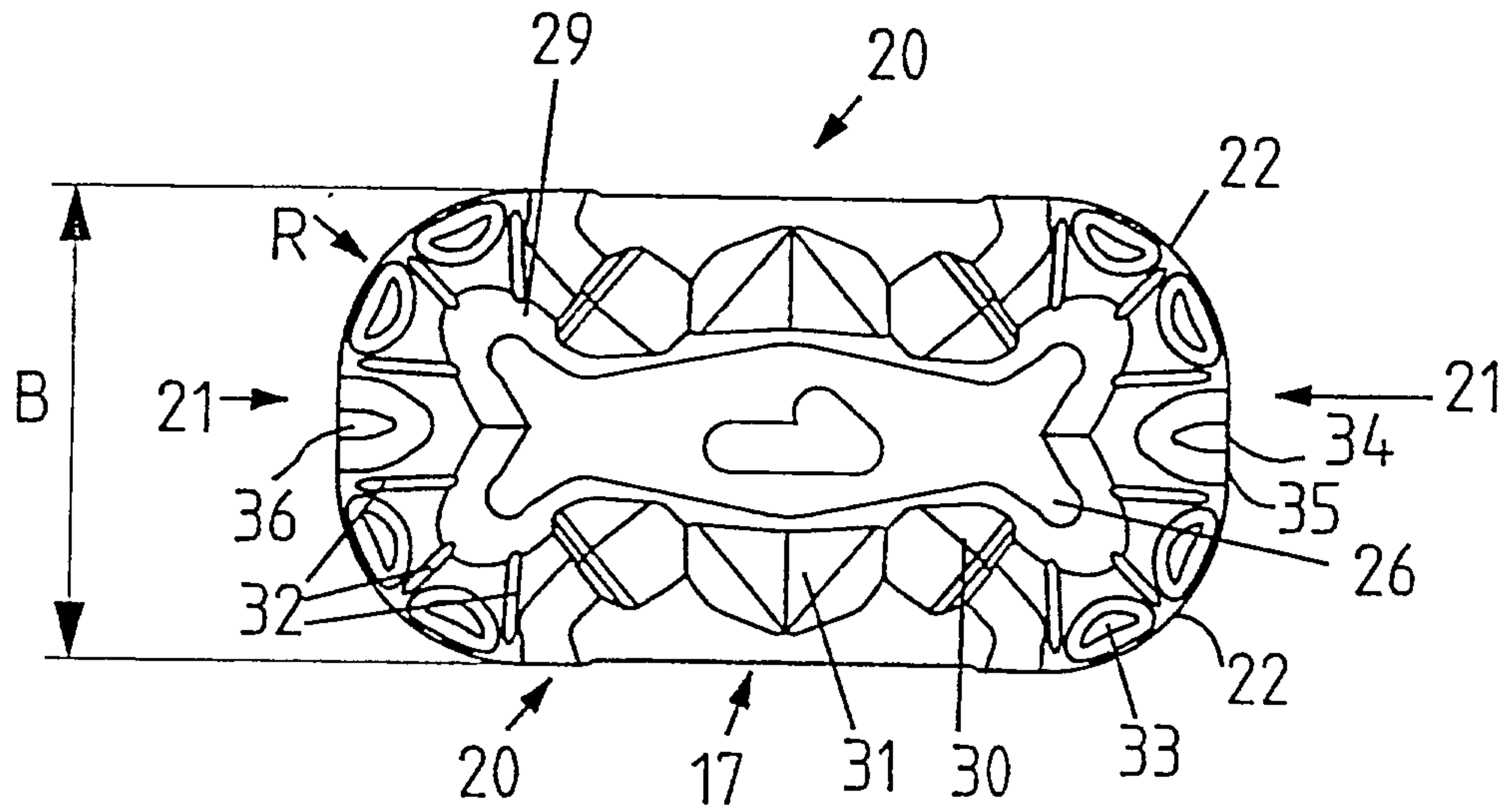


FIG.2

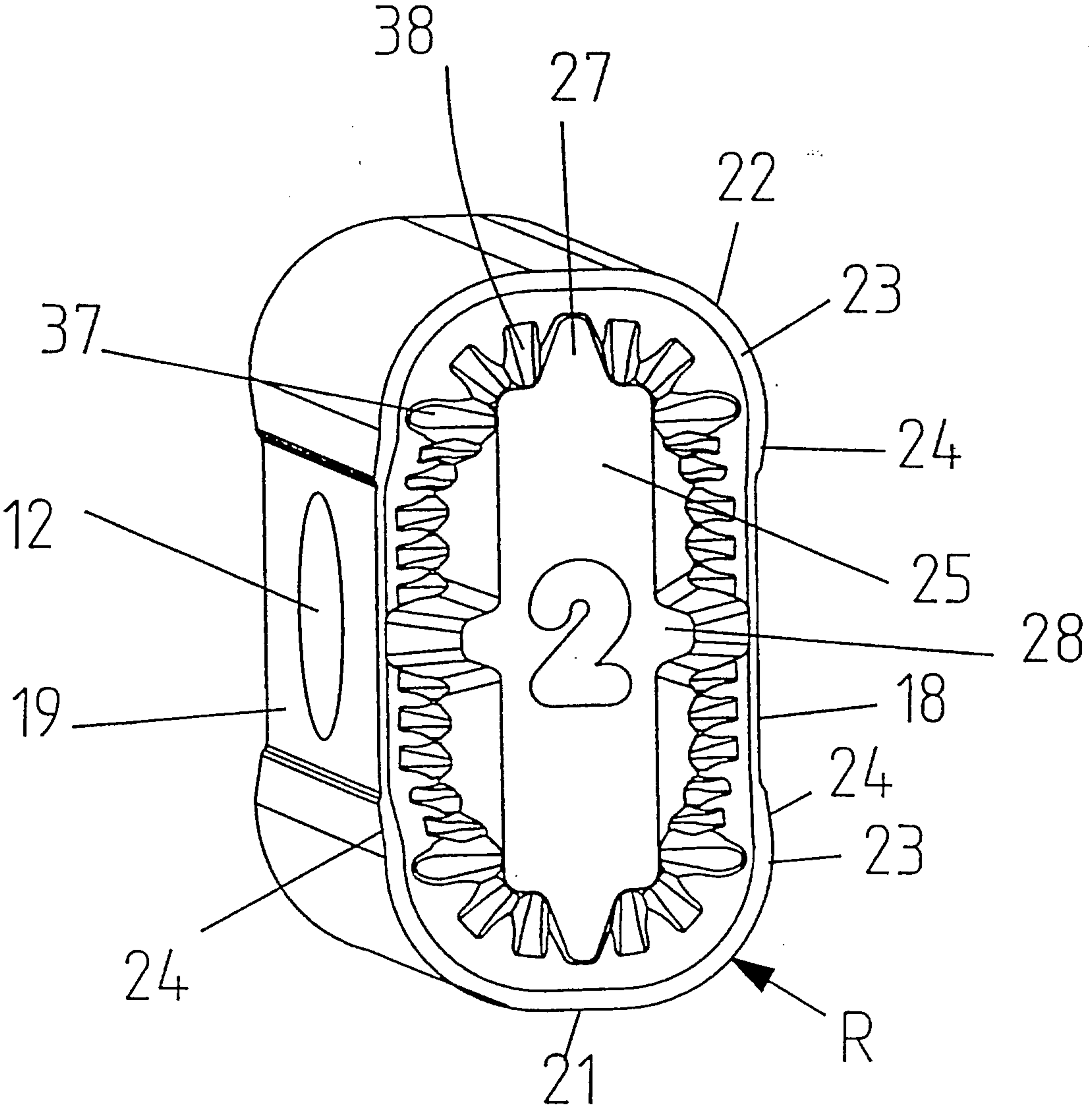


FIG.3

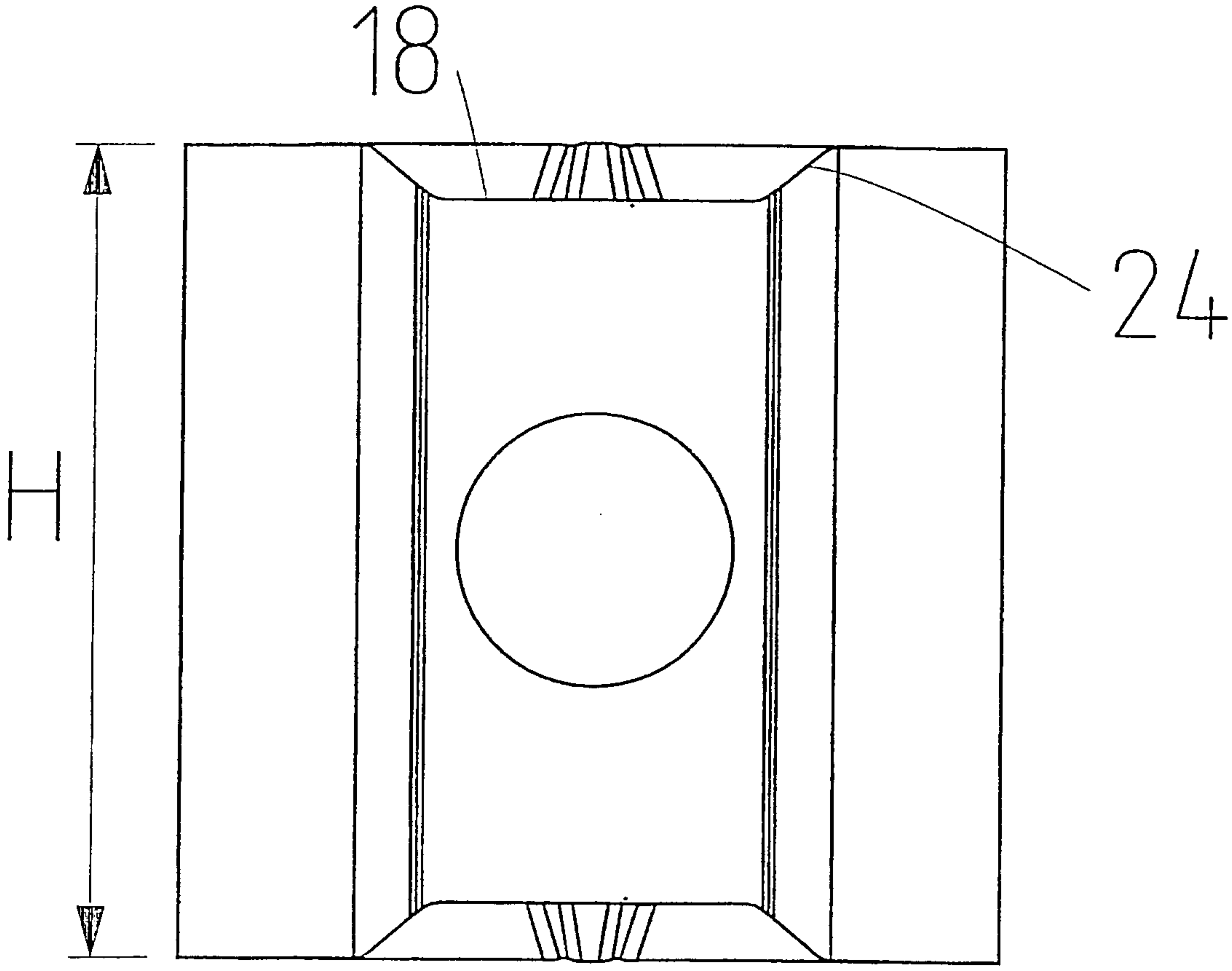
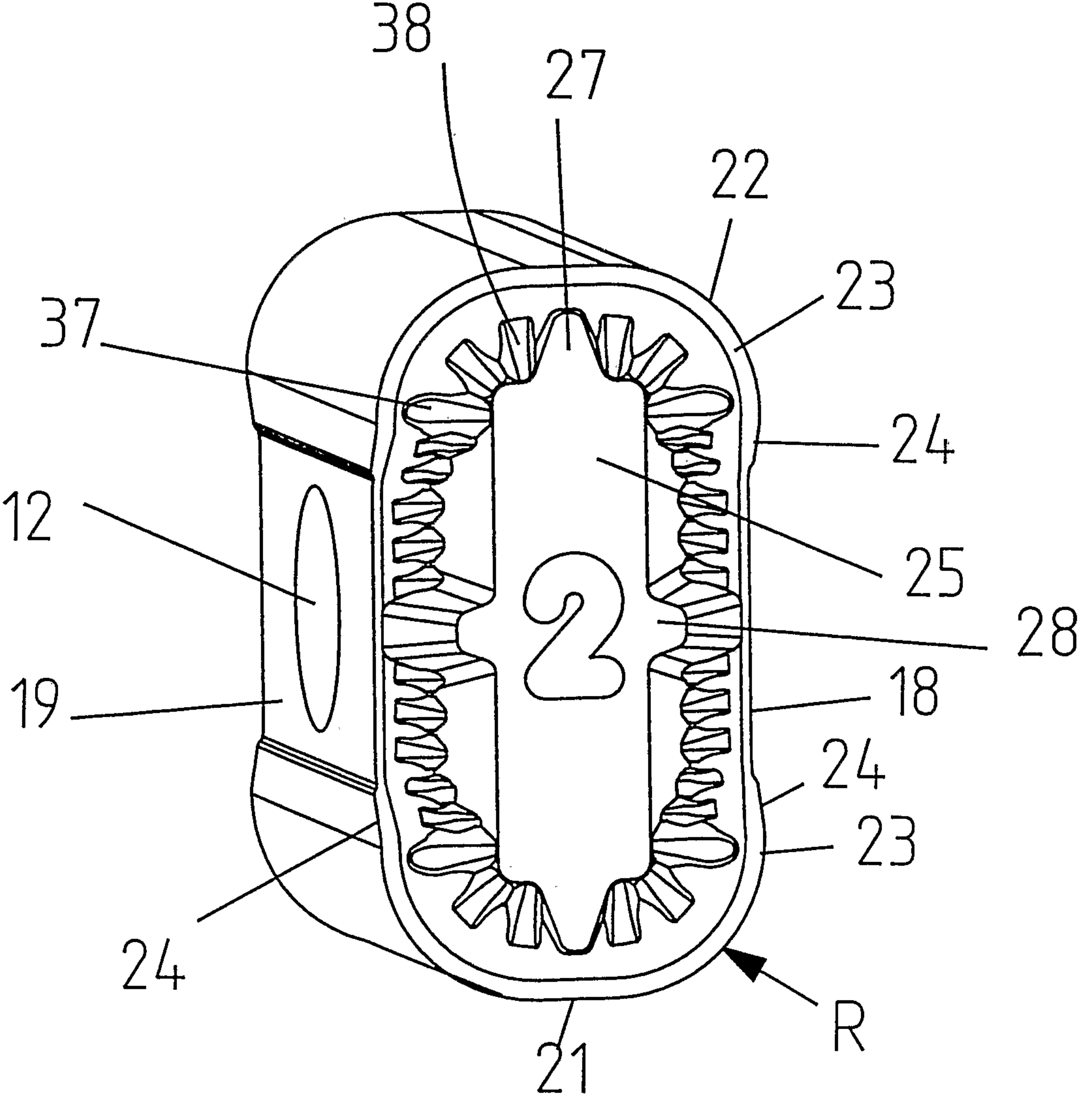


FIG. 4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