Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2843103 C 2016/06/14

(11)(21) **2 843 103**

(12) BREVET CANADIEN / CANADIAN PATENT

(13) **C**

(86) **Date de dépôt PCT/PCT Filing Date:** 2012/08/28
(87) **Date publication PCT/PCT Publication Date:** 2013/03/07
(45) **Date de délivrance/Issue Date:** 2016/06/14
(85) **Entrée phase nationale/National Entry:** 2014/01/24
(86) **N° demande PCT/PCT Application No.:** EP 2012/066680
(87) **N° publication PCT/PCT Publication No.:** 2013/030191
(30) **Priorité/Priority:** 2011/08/30 (DE10 2011 053 098.3)

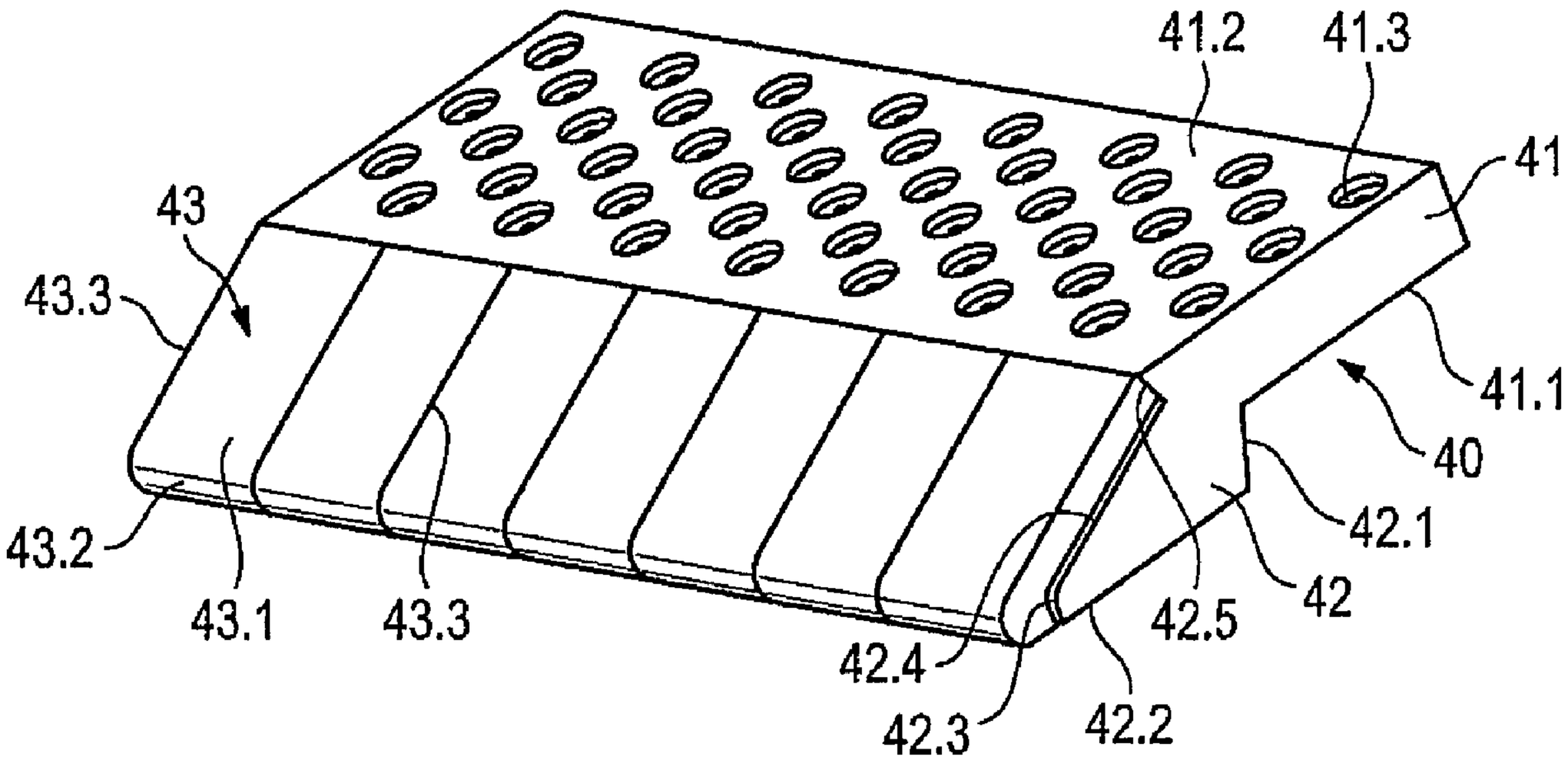
(51) **Cl.Int./Int.Cl.** ***E02F 9/28*** (2006.01)

(72) **Inventeur/Inventor:**
DETEMPLE, PASCAL, DE

(73) **Propriétaire/Owner:**
BETEK GMBH & CO. KG, DE

(74) **Agent:** NORTON ROSE FULBRIGHT CANADA LLP/S.E.N.C.R.L., S.R.L.

(54) **Titre : GODET D'EXCAVATRICE ET PROTEGE-BORD POUR LE BORD COUPANT D'UN GODET D'EXCAVATRICE**
(54) **Title: EXCAVATOR SHOVEL AND EDGE PROTECTOR FOR THE CUTTING EDGE OF AN EXCAVATOR SHOVEL**



(57) **Abrégé/Abstract:**
The invention relates to an edge protector (40) for the cutting edge of an excavator shovel with a support part (41) comprising or bearing a cutting edge carrier (42). n order to protect the cutting lip area of an excavator shovel effectively with such an edge protector, the cutting edge (43.2) of the cutting edge carrier (42) is formed according to the invention at least in part by one or more cutting elements (43) made of hard material, the cutting element (43) being mounted on a carrying section (42.4) of the cutting edge carrier (42).

Abstract

The invention relates to an edge protector (40) for the cutting edge of an excavator shovel with a support part (41) comprising or bearing a cutting edge carrier (42). in order to protect the cutting lip area of an excavator shovel effectively with such an edge protector, the cutting edge (43.2) of the cutting edge carrier (42) is formed according to the invention at least in part by one or more cutting elements (43) made of hard material, the cutting element (43) being mounted on a carrying section (42.4) of the cutting edge carrier (42).

EXCAVATOR SHOVEL AND EDGE PROTECTOR FOR THE CUTTING EDGE OF AN EXCAVATOR SHOVEL

The invention concerns an edge-guard for the cutting edge of an excavator shovel with a support plate that comprises or bears a cutting-edge carrier.

The invention further involves an excavator shovel with a blade body that features a frontal cutting edge, facing the advance direction.

From DE 195 00 38 A1 an excavation shovel is known which forms a blade body with wall elements. The lower horizontal edge of the bucket opening forms a cutting lip to which the digging teeth are attached. To protect the lip portions situated between the digging teeth, DE 195 00 38 195 A1 proposes hood-like edge-protection elements. Their shanks cover the front portions of the cutting lip.

From DE 34 15 260 another bucket is known, namely, a scraper body. In this instance, holders are mounted on the inside of the bottom at the blade body. By means of these holders, interchangeable cutting elements can be connected.

The object of the invention is to provide an edge-guard for the cutting edge of an excavator shovel, by means of which effective protection against wear of the bucket can be guaranteed.

It is a further object of the invention to provide a wear-optimized excavator shovel.

The edge-protection objective of the invention is achieved in that the cutting edge of the cutting-edge carrier is at least partly formed of one or more cutting elements made of hard material, whereby the cutting element is mounted on a carrier section of the cutting-edge carrier.

According to the invention, a cutting-edge carrier is used, which is plated with cutting elements in the particularly wear-endangered regions of the cutting edge. To ensure a

reliable attachment of these cutting elements, the cutting-edge carrier is provided with a carrier section. To the cutting-edge carrier a support plate is directly or indirectly connected. With the support plate the edge-guard can be easily and stably braced and/or secured to the excavator bucket.

A preferred embodiment of this invention provides that the support plate, in the region of its top face and/or in the region of a lead surface designed to abut the cutting element or elements, supports several hard elements, spaced apart and made of some hard material. The hard elements [referred to hereinafter as 'wear-preventers'] may be embedded in the top face and/or the lead surface and may be flush with it or protrude above it. The wear-preventers provide reinforcement to the top face or to the lead surface and protect it against erosive impact. By means of the spacing of the wear-preventers effective wear protection is provided during operation; in particular, it causes the regions of the edge guard between these harder elements to wear out faster than will the wear guards themselves. This uneven wear creates recesses that are filled with the digging material. In this way, a natural wear-protection is guaranteed.

A simple and reliable attachment of the wear-preventers is achieved when they are arranged in recesses, which are sunk into the top face of the support plate. This type of recessed mounting keeps the wear-preventers reliably in place even during impact loading.

One variant of the invention provides for the reliable transmission to the bucket of the working forces that routinely arise; it suggests a support plate featuring a flat contact surface directed downward. Using this contact surface, the edge-guard can be fitted flat onto the floor of a bucket. In order to fasten the edge-guard firmly, different types of connections may be used. Especially preferred, however, is welding the edge-guard to the bucket.

In order to provide a means to quickly and easily position and align the edge-guard on a cutting lip, even under the harsh conditions of a building site operation, one variant of the invention provides that the support plate feature an arrester that is disposed at an

angle to the contact surface. Over the angular range between the contact surface and the arrester, the edge-protector can be shoved to the edge of the cutting lip and subsequently affixed to it.

Particularly preferred is an embodiment that provides a carrier that features two or more cutting elements aligned along its carrier section. Through this segmentation of the cutting element, a fracture of the cutting edge is avoided even during highly impactive loading.

A reliable method of securing the cutting elements to the support plate is provided when the cutting element comprises a carrier, of which an extension forms the cutting edge. By means of the support plate, a large surface area is available to brace the cutting element to the carrier. The extension can be adapted to the particular wear volume and the position of the cutting edge of any application.

In particular, the extension may also project like a ledge with respect to the support plate, so as to protect the connecting region of the carrier from wear.

Particularly preferred is an embodiment where the cutting element features a drainage surface connected to the cutting edge, preferably also formed by the support plate. Over the drainage surface, the dug material can slide off neatly, whereby at the same time, wear protection is effected by means of the support plate.

Typically, cutting elements are made of hard metal. This material is very well suited to absorb compressive loads, but it is sensitive to torsional and bending stresses. For this reason, one variant of the invention provides that the carrier form a recessed fitting area into which the cutting elements are inserted. Within the recessed fitting area, the cutting elements can be reliably braced.

To achieve the objective of the invention with respect to the excavation shovel, a suggested solution consists of mounting one or more edge-guards according to claims 1 to 11 at the cutting lip of the blade body. Regarding the advantages of this design reference is made to the foregoing.

A particularly preferred variant of the invention provides that the support plate and/or the carrier feature an outer surface to which the inside or the outside of the floor of the blade body is directly or indirectly connected, and that, at least within that connection region, on the inside or on the outside of the floor, wear-protection elements be spaced at some distance, one from another; these wear-preventers shall protrude above the floor. The wear-preventers are fastened to the floor of the blade body and between them spaces are formed into which the digging material can enter and be pressed down during operational use. The material thus trapped forms a natural means of wear-protection (see above).

Since the wear-preventers are arranged in the immediate area of the edge-guard, effective wear-protection is achieved in this high-stress area; this provides the benefit of a long service life for the excavator shovel. It is particularly preferable that the ends of the wear-preventers facing away from the floor of the bucket are flush with the outer surface of carrier or support plate or [at least] approximately at the same level. Thereby abrupt dump transitions are avoided, which would lower the required machine performance as well as the wear-optimization function.

An excavator bucket according to the invention may be embodied so that, by means of a downwards facing outer surface, the edge-protector merges with an outer surface of the bottom of the blade body; in that case, the outer surface of the edge-protector forms an obtuse angle with the adjoining region of the bottom. Thus the bottom of the edge-protector extends some distance beyond the floor and forms a clearance angle, which frees the cutting lip area of the floor of the blade body of any erosive impact. With this simple measure, the connection area of the cutting lip with the floor is protected from erosion.

The invention is explained in more detail below with reference to embodiments shown in the drawings. The drawings show:

Figure 1 the front view of an excavator bucket of a backhoe in perspective;

Figure 2 the cutting line marked in Figure 3 with II-II;

Figure 3 a detail shown from above, labeled III in Figure 1;

Figure 4 the front view of the edge-protection in perspective;

Figure 5 the edge-protection according to Figure 4, in vertical section;

Figure 6 an excavator bucket, namely, a scraper body, in perspective, frontal view from above;

Figure 7 the bucket of Fig. 6 in perspective, front view from below;

Figure 8 a cutting line marked VIII-VIII in Figure 9;

Figure 9 a detail marked IX in Figure 6;

Figure 10 a detail labeled in Figure 7 with X;

Figure 11 the edge-protection in perspective, lateral view;

Figure 12 the edge-protection according to Figure 11, in lateral view from the left;

Figure 13 a modified embodiment of a bucket – similar to figure 1 – in perspective, from below;

Figure 14 a cutting line detail, marked with XIV-XIV in Figure 15; and

Figure 15 a detail, marked by XV in Figure 10.

Figure 1 shows an excavator bucket, 10, having a blade body, which is bounded by side walls, 11, and by a floor, 12. The floor, 12, features in the area of the shovel opening a cutting lip, 12.3, as can be seen in more detail in Figure 2. The cutting lip, 12.3, is formed in the area between the inside surface, 12.2, and the outside [or bottom?] surface, 12.1, of the floor, 12.

At the cutting lip, 12.3, [digging] teeth, 20, are attached in a conventional manner, whereby the floor, 12, is connected to retainers, 21, to which replaceable tooth holders, 22, are affixed. The teeth, 20, are spaced along the cutting lip, 12.3. In each of the spaces between the teeth, 20, an edge-guard, 40, is affixed. Figures 2 and 3 show in more detail the mapping of the edge-guard, 40, with respect to the bucket, 10. The detailed design of the edge-guard, 40, is shown in Figures 4 and 5. Further reference is made below to Figures 2 to 5.

According to Figures 4 and 5, the edge-guard, 40, consists of a flat support plate, 41 at the front of which a thickened carrier, 42, protrudes. On the underside of the support plate, 41, there is a contact surface, 41.1; parallel to and above it is its top face, 41.2. In the top face, 41.2, blind-hole bores are made, as can be clearly seen in Figure 5. Into these bore holes, elements made of hard, i.e., resistant materials [herein hereafter referred to as “resistant elements”], 41.3, are soldered, glued or otherwise adhesively attached. The resistant elements, 41.3, usually consist of carbide metal or a ceramic material. The resistant elements, 41.3, are dimensioned so that they are somewhat recessed within the holes and with respect to the top face, 41.2.

The carrier, 42, meets the contact surface, 41.1, of the support plate 41 at an angle, featuring an arrester, 42.1. Whereby the angle between the arrester, 42.1, and the contact surface, 41.1, is adapted to the angle geometry of the cutting lip, 12.3, as can be seen clearly in Figure 2. Beyond the arrester, 42.1, the carrier, 42, forms an outer surface, 42.2. This outer surface, 42.2, transitions by way of a rim section, 42.3, into carrier section 42.4. Finally the carrier section, 42.4, ends at a right angle in a heel, 42.5. The heel, 42.5, merges with the top face, 41.2, of the support plate, 41. The rim section, 42.3, of the carrier section, 42.4, with the heel, 42.5, forms a retainer for a cutting element, 43, consisting of some hard material, in particular, hard metal.

The cutting element, 43, is essentially constituted of a support body, 43.8, which is formed like a plate and along the front portion of which runs a thickened projection, 43.9. The band, 43.9, actually forms the cutting edge, 43.2, of the cutting element 43. The cutting element, 43, itself is fitted with an arrester, 43.4, to the rim section, 42.3. The opposite surface, 43.6, of the cutting element, 43, rests on the carrier section, 42.4. An arrester, 43.7, works in tandem with the heel, 42.5. In these three areas, the cutting element, 43, is supported relative to the carrier, 42. To affix the cutting element, 43, to the carrier, 42, a soldered connection or any other bond, for example an adhesive may be used.

As shown in Figure 4, several cutting elements, 43, arranged in a line, are connected with the carrier, 42, so as to produce a segmented blade. Thereby all cutting elements, 43, are of the same design. They have plane-parallel lateral surfaces, 43.3 by, which they are lined up flush with one another. As a result of this flush alignment any washout between the cutting elements, 43, is prevented. As shown in Figure 5, the projection, 43.4, of the rim section, 42.3, encloses and thus protects this area from wear. The lower surface of the stop, 43.5, is flush with the outer surface, 42.2, of the carrier, 42, so that no step is formed there.

The bonding of the edge-guard, 40, to the bottom, 12, of the bucket, 10, is achieved by means of welding. Thereby the support plate, 41, is welded to the inside, 12.2, of the bottom, 12. In addition, a welded connection can also be used in the coupling region of the carrier, 42, with the cutting lip, 12.3. This weld seam will then further protect the cutting lip, 12.3, from wear.

Figures 2 and 3 show that wear-preventers, 30, are mounted on the inside, 12.2, of the bottom, 12, of the bucket, 10. The wear-preventers, 30, are welded on the inside, 12.2, and feature wear-protection components consisting of hard materials. The wear-preventers, 30, are spaced some distance from one another, preferably arranged in a grid dimension. The ends of the wear-preventers, 30, that face away from the floor, 12, finish flush with the top face, 41.2, of the support plate, 41, so that abrupt transitions from the edge-guard, 40, to the drainage surface formed by the wear-preventers, 30, are avoided.

Figures 6 to 12 show a further variant of an edge-guard, 40, and an excavator bucket, 10, equipped with such an edge-guard, 40. The bucket, 10, shown in Figures 6 and 7 is designed as a scraper body and has basically a similar design to that of bucket, 10, in Figure 1. Accordingly, the blade body is again bounded by side walls, 11, and the front region of the floor, 12, wields a cutting lip, 12.3 (see Figure 8). In the area of the cutting lip, 12.3, there are teeth, 20; these consist of a retainer, 21, and a tooth socket, 22. Between any two teeth, 20, an edge-guard, 40, is affixed.

The design of the edge-guard, 40, is shown in greater detail in Figures 8 and 9, in particular, in Figures 11 and 12. As these drawings show, the construction is similar in principle to the conception for the edge-protection in accordance with Figures 1-5. Therefore, the edge-guard, 40, once more features a support plate, 41, with a top face, 41.2, and a contact surface, 41.1, on the bottom. In the top face, 41.2, once more holes are bored into which the resistant elements, 41.3, are secured. The resistant elements, 41.3, are again spaced some distance from one another, in a grid dimension.

The support plate, 41, is constituted as a separate component, which is welded to the carrier, 42 – also designed as a separate component. For this purpose, the carrier, 42, features a step-like accommodation recess, as can be seen Figures 1 and 12. The weld seam is marked 41.4. in the two Figures 11 and 12. In side view, the carrier, 42, has an approximately triangular shape. It again displays a rear arrester, 42.1, and an outer surface, 42.2, facing the floor. The outer surface, 42.2, and the arrester, 42.1, meet at an angle ß <90 ° in order to achieve a downward sloping outer surface, 42.2; this will be explained later in more detail. The front of carrier, 42, is formed identically with the embodiment given in Figures 1 to 5 as far as the reception area for the cutting elements, 43, is concerned; consequently, reference may be made to the above embodiments.

Likewise, the cutting elements, 43, fashioned with the edge-guards, 40, as shown in Figures 1 to 5 are configured identically as described above.

In contrast to the embodiment in accordance with Figures 1 to 5, however, in this embodiment the drainage surface, 43.1, of the cutting element, 43, aligns flush with a lead surface, 42.6, of the carrier, 42. The lead surface, 42.6, is arranged at an angle α with respect to the tilted top face, 41.2. In the lead surface, 42.6, blind holes are bored into which resistant elements, 41.3, are set. These resistant elements, 41.3, correspond to the resistant elements, 41.3, according to the embodiment of Figures 1 to 5 and are also firmly secured in the blind bores, preferably soldered in. With these resistant elements, 41.3, wear protection of the lead surface, 42.6, is achieved.

As can be seen in Figure 8, the outer surface, 12.1, of the floor, 12, is at an obtuse angle γ to the outer surface, 42.2, of the carrier, 42. Thus, the cutting lip, 12.3, which abuts the edge-guard, 40, is protected from abrasive wear.

Figures 13 to 15 display a modification of the excavation shovel, 10, shown in Figures 1-5. While, according to the Figures 1 to 5, the bucket, 10, bears an edge-guard, 40, on the inside, 12.2, of the floor, 12, in bucket, 10, as shown in Figures 13 to 15, an edge-guard, 40, is attached to both the inside, 12.2, as well as the outer side, 12.1, of the floor, 12.

The bucket, 10, of Figure 13 corresponds to the bucket, 10, of Figure 1, whereby it is only the region of the cutting lip, 12.3, that differs in its design. Accordingly, the edge formed by the cutting lip, 12.3, stands at right angles to the inner and outer sides, 12.2 and 12.1 respectively, of the floor, 12, as can be seen in Figure 14.

For the protection of the cutting lip, 12.3, an edge-guard, 40, is attached to both the inside, 12.2, and the outside, 12.1. Due to the rectangular arrangement of the cutting lip, 12.3, identical parts can be used for the edge-guards, 40, below and above. These components only have to be offset by 180° to each other, as the arrangement in Figure 14 shows.

This edge-guard, 40, is identical with the edge-guard, 40, shown in Figures 4 and 5, whereby only the arrester, 42.1, of the carrier, 42, is arranged perpendicular to the contact surface, 41.1, of the support plate, 41; this is done to achieve an adaptation to the geometry of the cutting lip, 12.3. Reference will be made to the above discussion of the embodiment and the arrangement and positioning of the cutting element, 43.

As the Figures 13 to 15 show, wear-preventers, 30, are once more soldered on the inside, 12.2, of the bottom, 12. In addition, beyond the edge-guard, 40, on the underside, wear-preventers, 30, of the original design are positioned on the outer side, 12.1, of the floor, 12. The arrangement of the wear-preventers, 30, corresponds to the arrangement of the wear-preventers, 30, according to the embodiment shown in Figures

1 to 5. Accordingly, the wear-preventers, 30, are spaced in a grid dimension and form a natural wear-protection system.

By the use of a double-sided edge-guard, 40, both the inner side, 12.2, and the outside, 12.1, of the floor, 12, is protected from wear.

Claims

1. An excavation shovel with a blade body, having a cutting lip (12.3), arranged in advance direction (V) at its front end, wherein the cutting lip (12.3) has an edge-guard (40) for a cutting edge of the excavation shovel with a support plate (41) having a cutting-edge carrier (42), the cutting edge (43.2) of the cutting-edge carrier (42) is at least partially formed by one or more cutting elements (43) made of a hard material, whereby the one or more cutting elements (43) are mounted on a carrier section (42.4) of the cutting-edge carrier (42), one of: the support plate (41); and the carrier (42), have an outer surface (41.2, 42.2, respectively) to which a floor (12) of the blade body is connected by means of one of: a blade body inside (12.2); and a blade body outside (12.1), and at least from one of the blade body inside (12.2) and the blade body outside (12.1), wear-preventers (30) protrude, spaced apart a distance from one another.

2. An excavation shovel with a blade body, having a cutting lip (12.3), arranged in advance direction (V) at its front end, wherein the cutting lip (12.3) has an edge-guard (40) for a cutting edge of the excavation shovel with a support plate (41) having a cutting-edge carrier (42), the cutting edge (43.2) of the cutting-edge carrier (42) is at least partially formed by one or more cutting elements (43) made of a hard material, whereby the one or more cutting elements (43) are mounted on a carrier section (42.4) of the cutting-edge carrier (42), and in the region of the cutting lip (12.3) has at least one edge-guard (40) has a support plate (41) on the inside (12.2) of a floor (12) of the blade body and at least one additional edge-guard (40) has a support plate (41) on the outside (12.1) of the floor (12).

3. The excavation shovel according to any one of claims 1 to 2, wherein the support plate (41), in one of: the region of a top side (41.2) of the support plate (41); and the region of a lead surface (42.6) that abuts the cutting

element(s) (43), includes wear-preventers (30), made of a hard material and spaced apart a distance from one another.

4 The excavator shovel according to claim 3, wherein
the wear-preventers (30) are arranged in receptacles recessed into a top face (41.2) of the support plate (41).

5. The excavator shovel according to any one of claims 1 to 4, wherein
the support plate (41) has a flat downward directed contact surface (41.1).

6. The excavator shovel according to claim 5, wherein one of:
the carrier (42); and the support plate (41) has an arrester (42.1) arranged at an angle to the contact surface (41.1).

7. The excavator shovel according to any one of claims 1 to 6, wherein
the carrier (42), at its carrier section (42.4), bears two or more cutting elements (43), aligned on a row.

8. The excavator shovel according to any one of claims 1 to 7, wherein
the cutting element (43) comprises a support body (43.8) and is connected to a projection (43.9) forming the cutting edge (43.2).

9. The excavator shovel according to any one of claims 1 to 8, wherein
the cutting element (43) beyond the cutting edge (43.2) has a drainage surface (43.1).

10. The excavator shovel according to any one of claims 1 to 9, wherein
the cutting element (43) covers with a projection (43.4) a rim section (42.3) that is arranged in advance direction (V) at the front of the carrier (42).

11. The excavator shovel according to claim 10, wherein
the projection (43.4) fits a lower surface of the projection (43.4) into a clear space (42.2) in the lower side of the carrier (42).

12. The excavator shovel according to any one of claims 1 to 11, wherein the carrier (42), by means of a heel (42.5), forms a recessed fitting space into which the cutting elements (43) are inserted.

13. The excavation shovel according to any one of claims 1 to 2, wherein
an outer surface (42.2) of the edge-guard (40) merges into an outer surface (12.1) of the floor (12) of the blade body, and with the outer surface (42.2) the adjacent region of the bottom (12) forms an obtuse angle (γ).

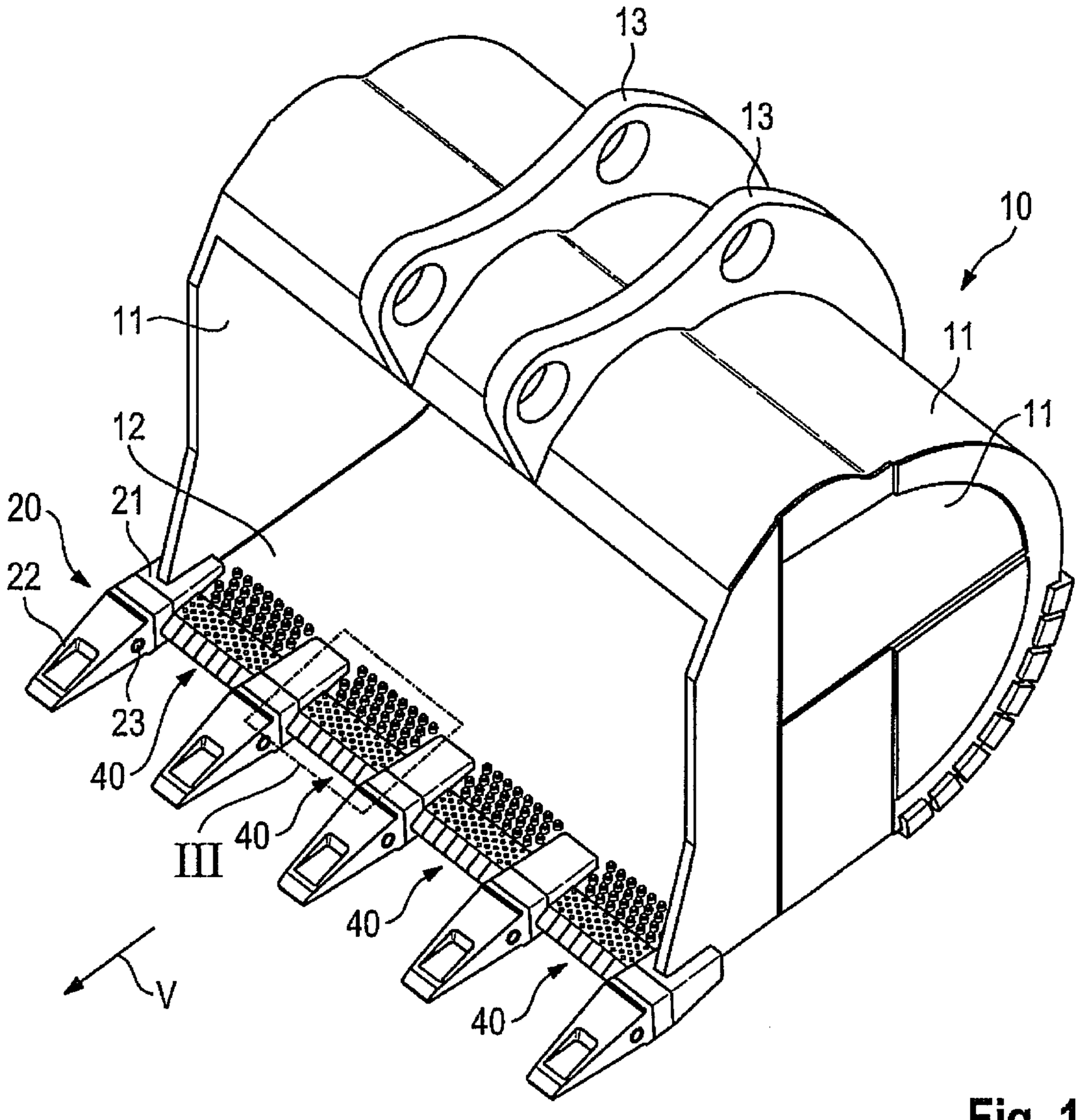


Fig. 1

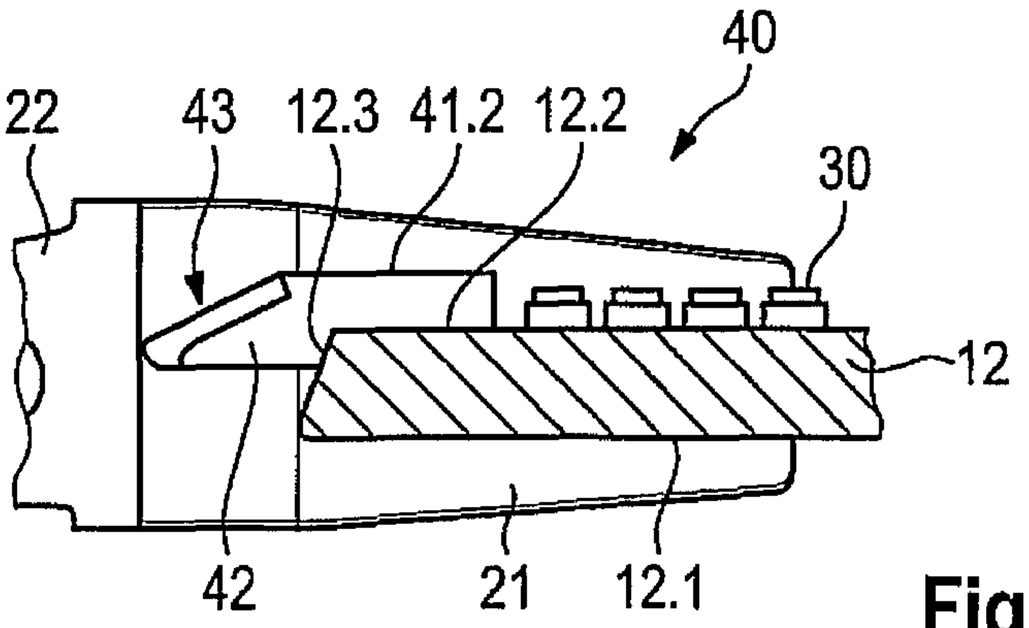


Fig. 2

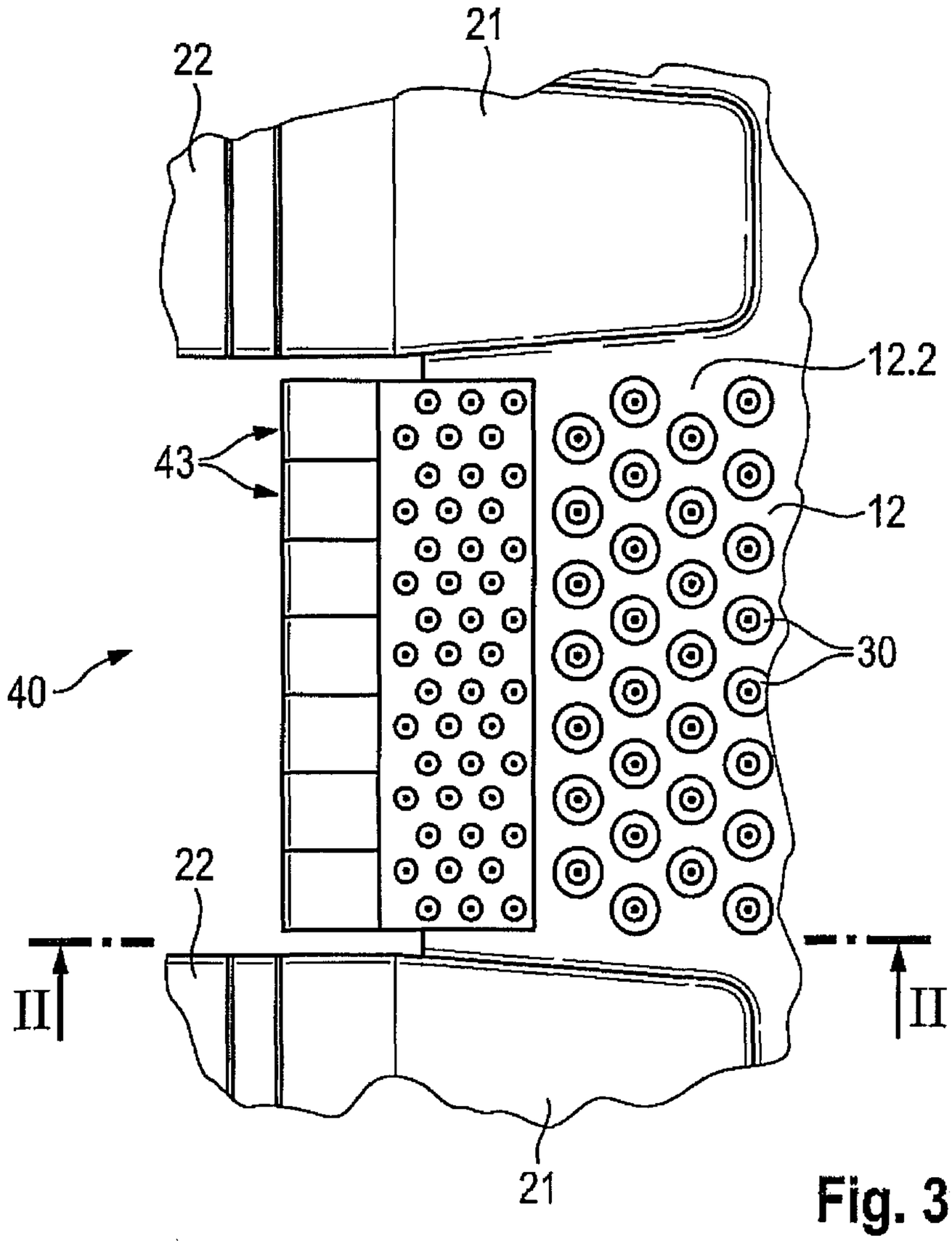


Fig. 3

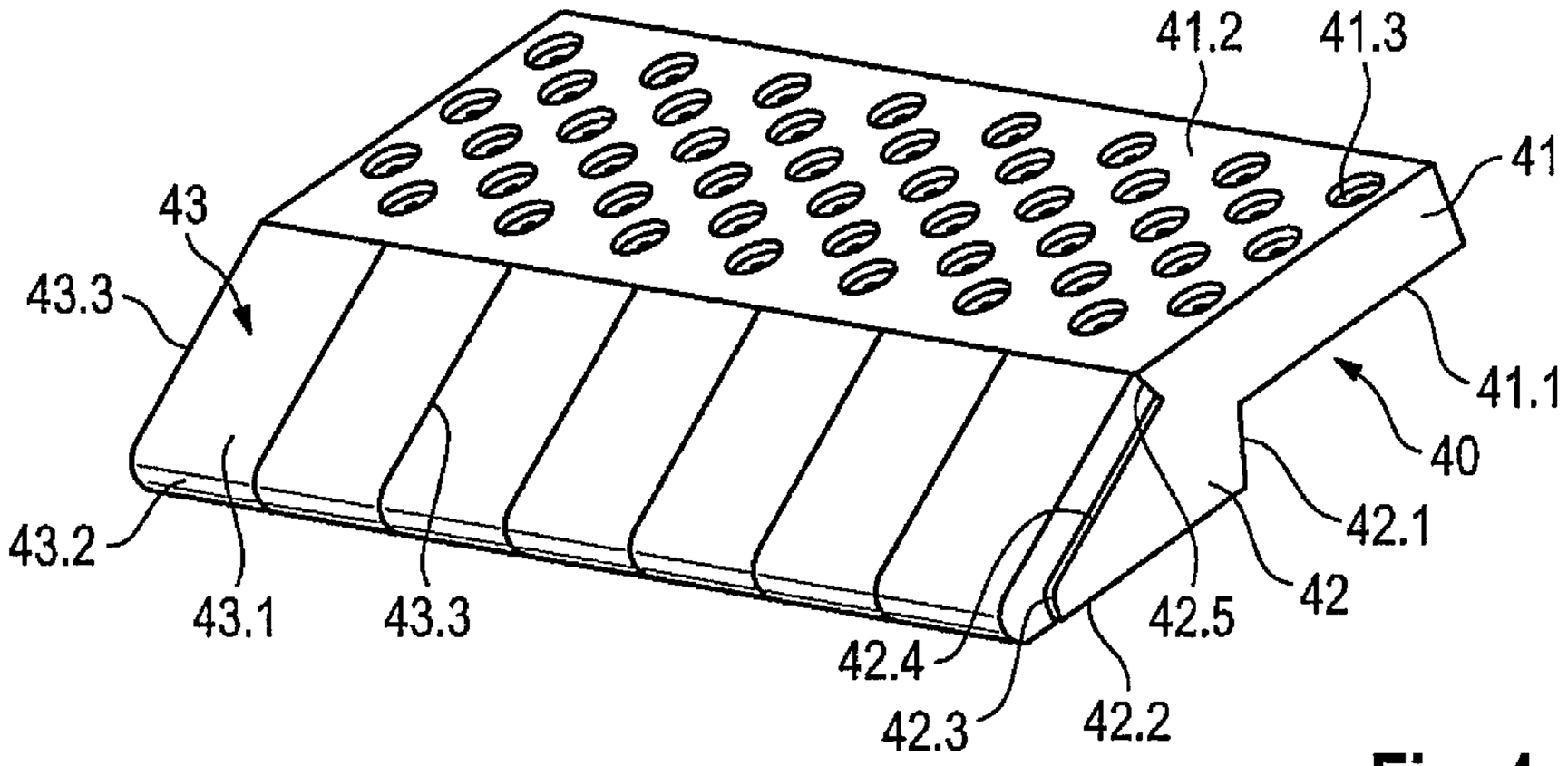

41.2
41.3
41
43
43.3
41.1
40
42.1
43.2
42
43.1
43.3
42.5
42.4
42.3
42.2

Fig. 4

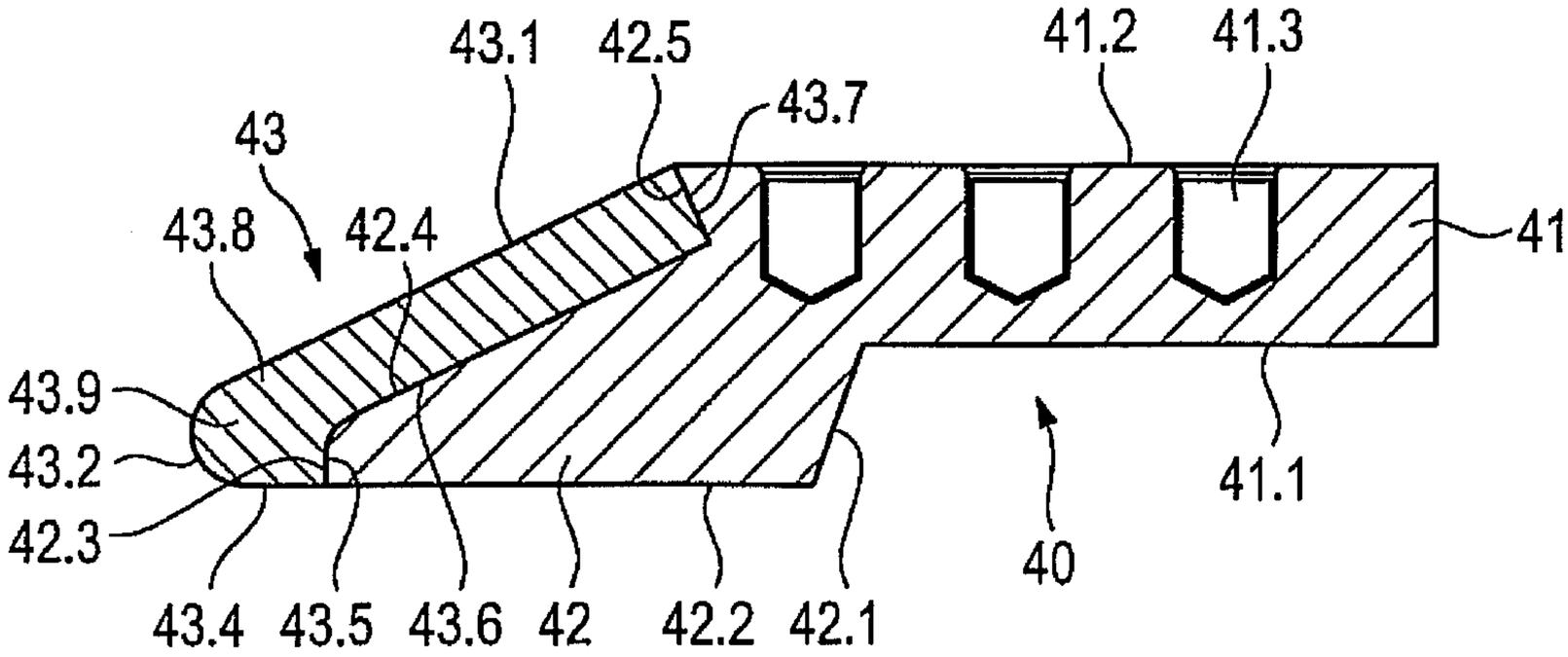

43.1
42.5
43.7
41.2
41.3
43
43.8
42.4
41
43.9
43.2
41.1
42.3
40
43.4
43.5
43.6
42
42.2
42.1

Fig. 5

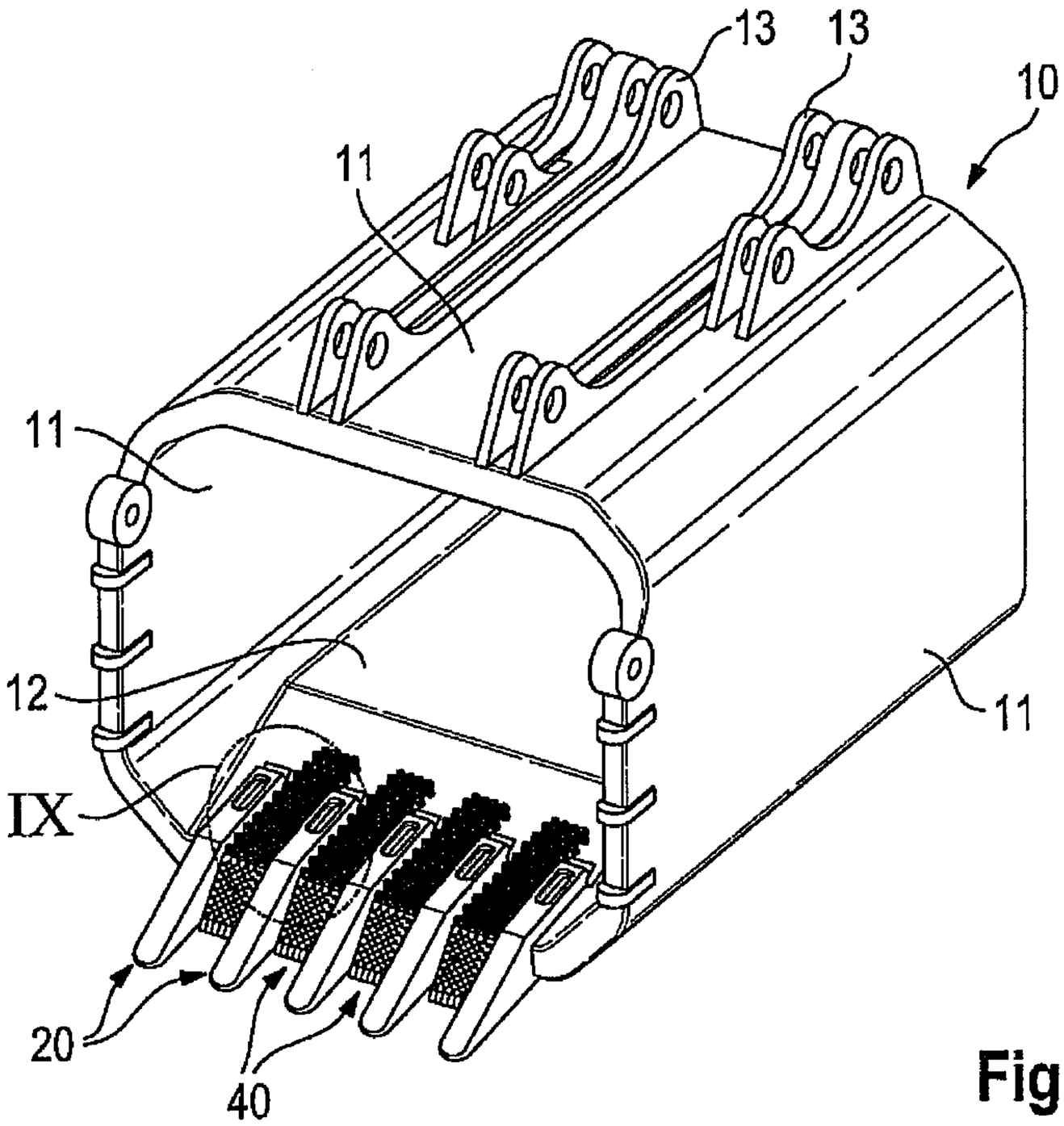


Fig. 6

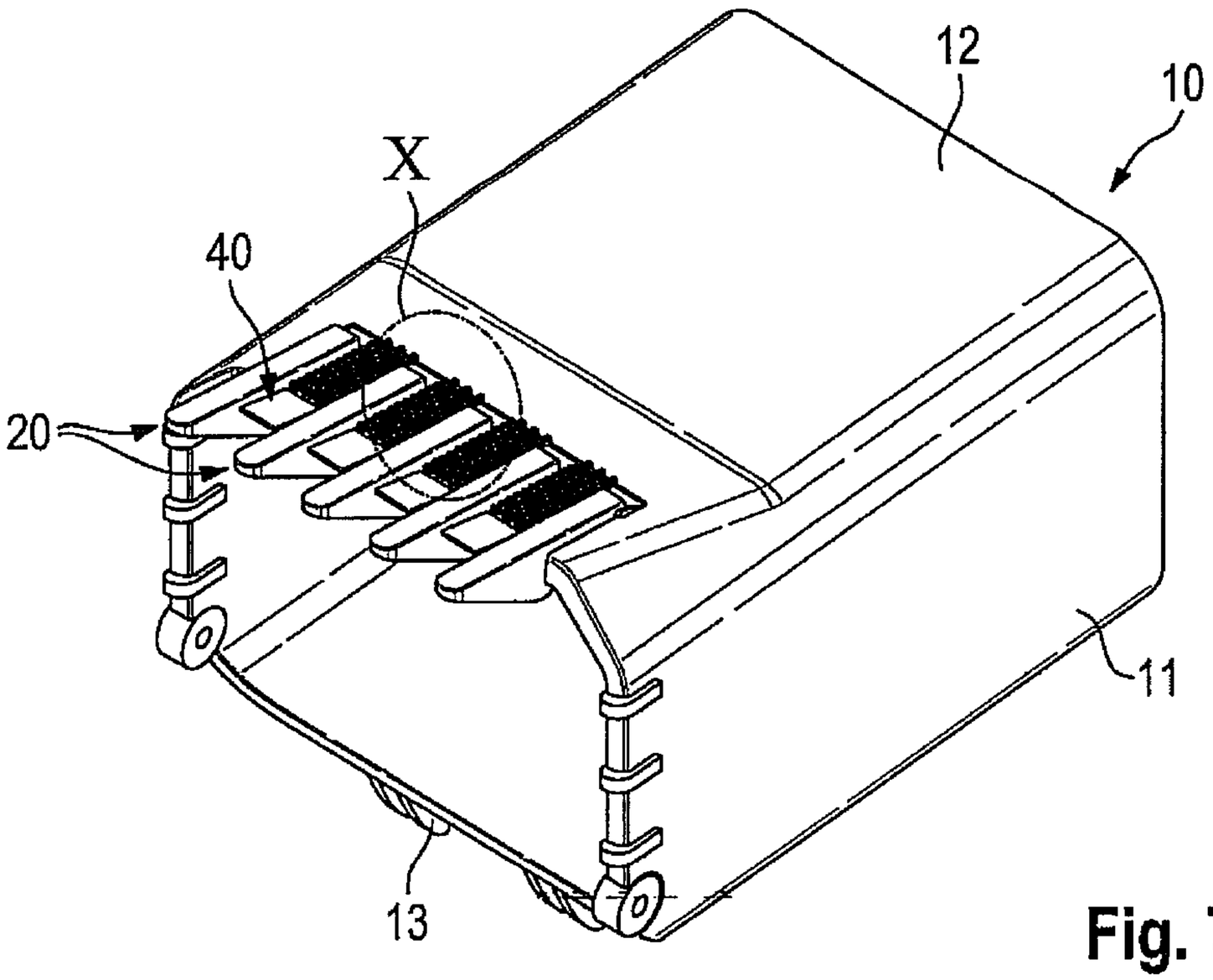


Fig. 7

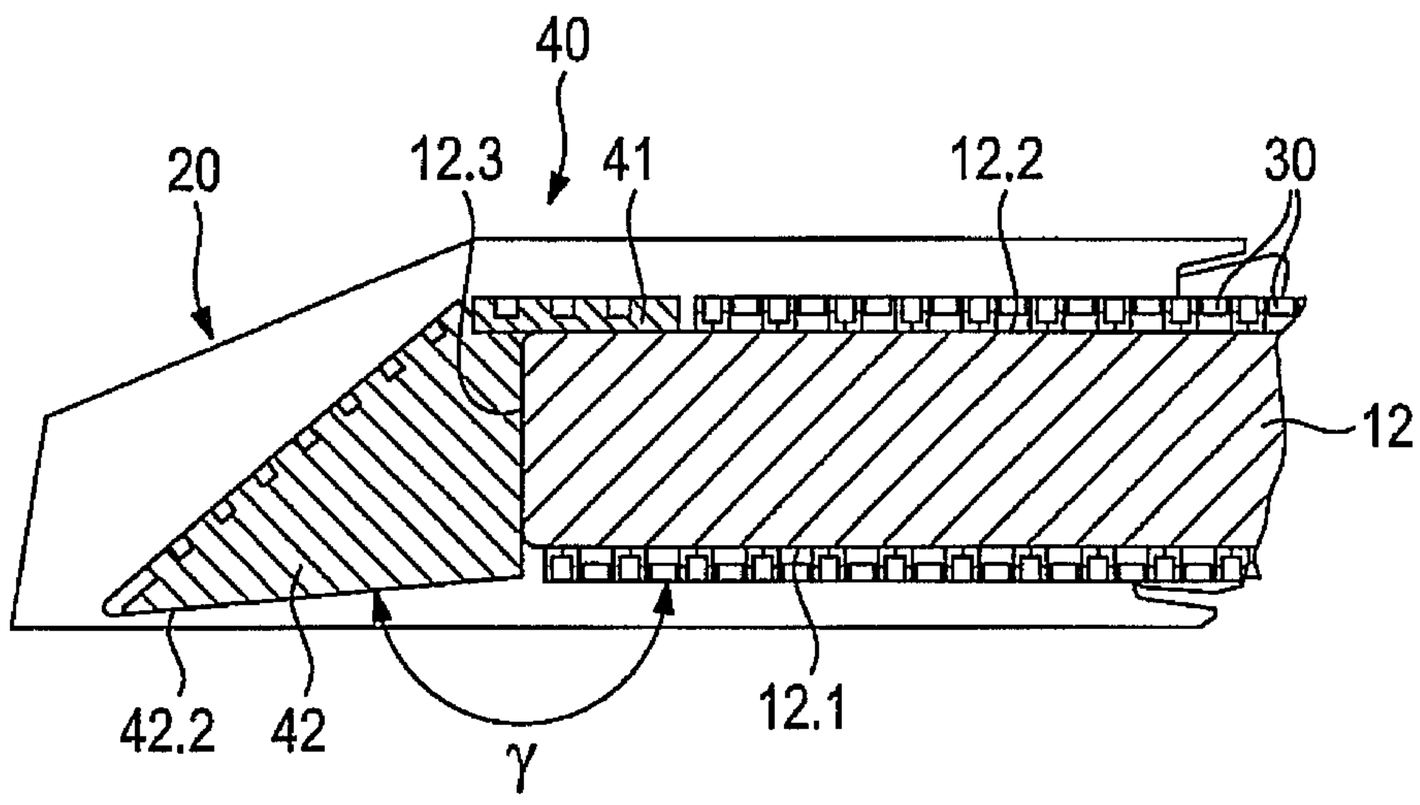

40
20
12.3
41
12.2
30
12
42.2
42
γ
12.1

Fig. 8

20
42
41
40
30
VIII
VIII
20
12.2
12

Fig. 9

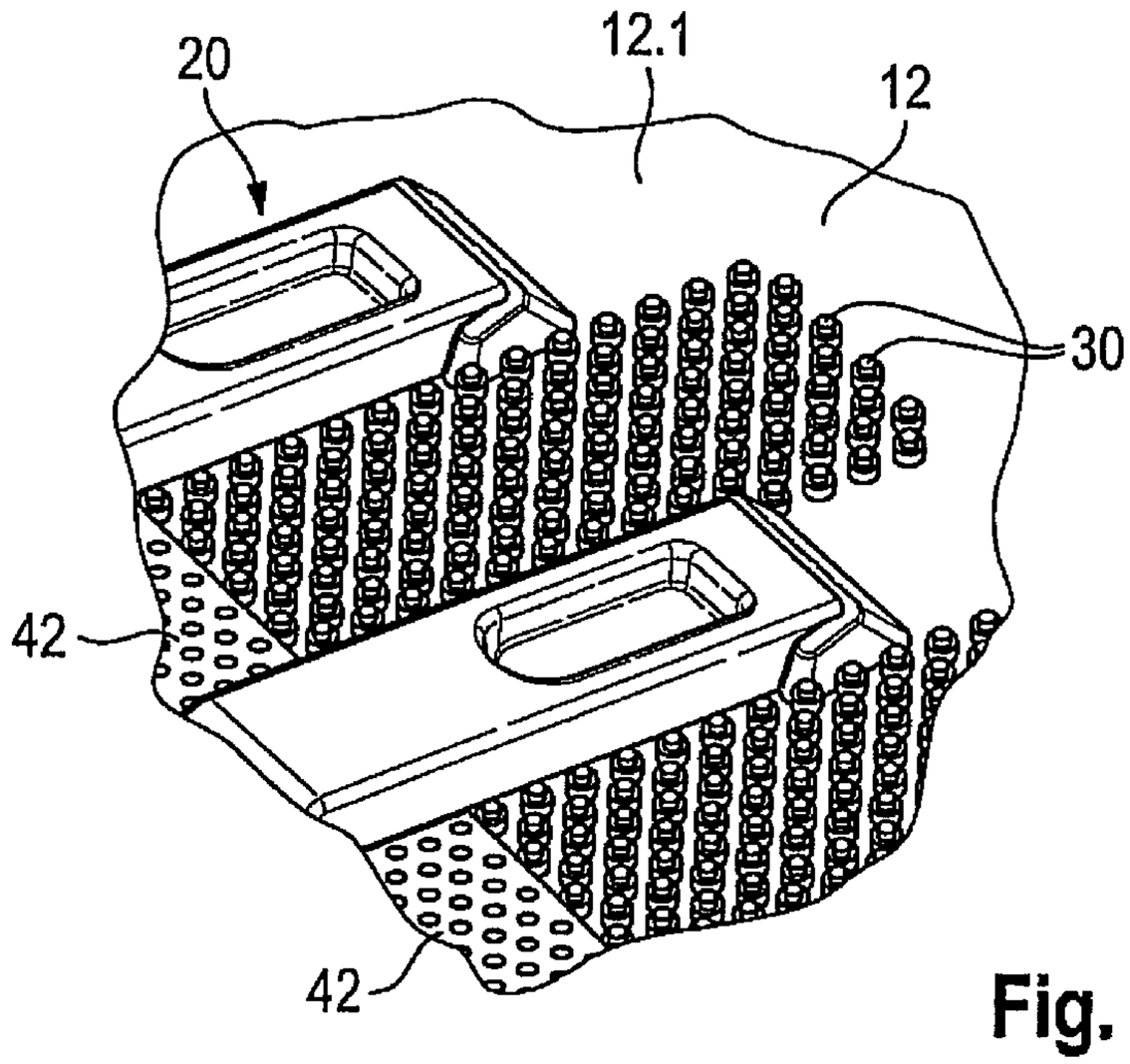

20
12.1
12
30
42
42

Fig. 10

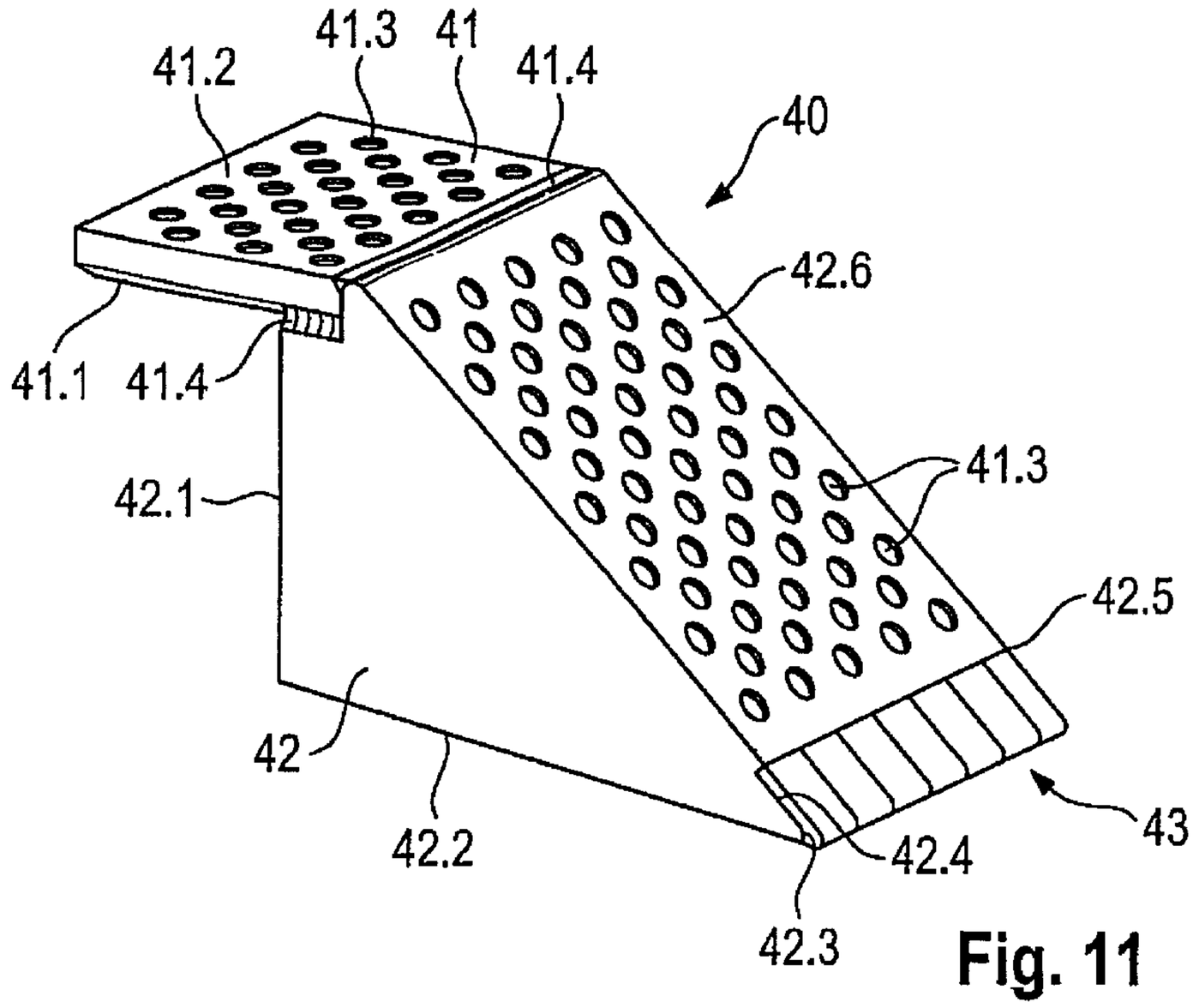

41.2
41.3
41
41.4
40
41.1
41.4
42.6
42.1
41.3
42.5
42
42.2
42.4
43
42.3

Fig. 11

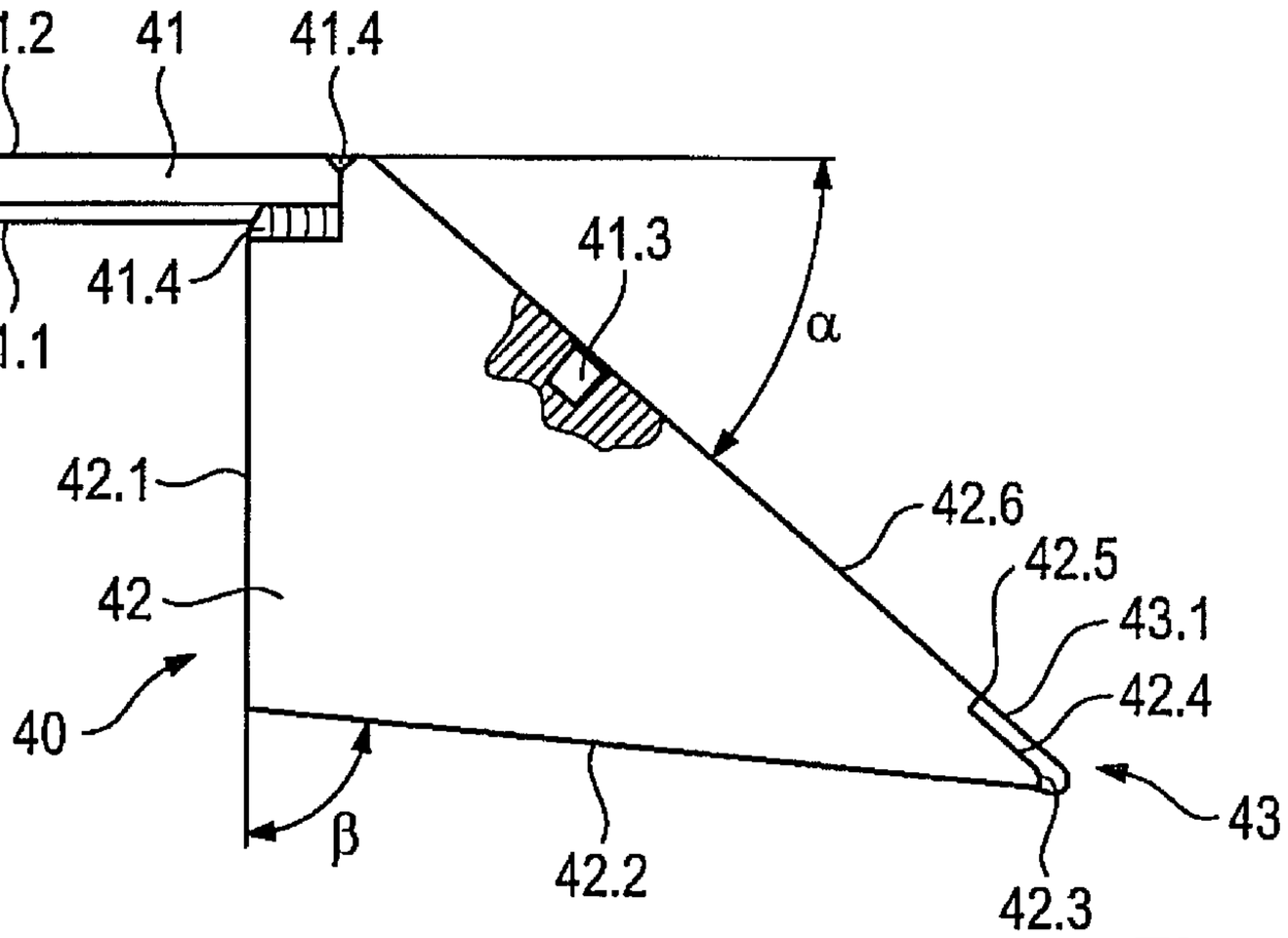

41.2
41
41.4
41.4
41.1
41.3
α
42.1
42.6
42.5
42
43.1
42.4
40
β
42.2
43
42.3

Fig. 12

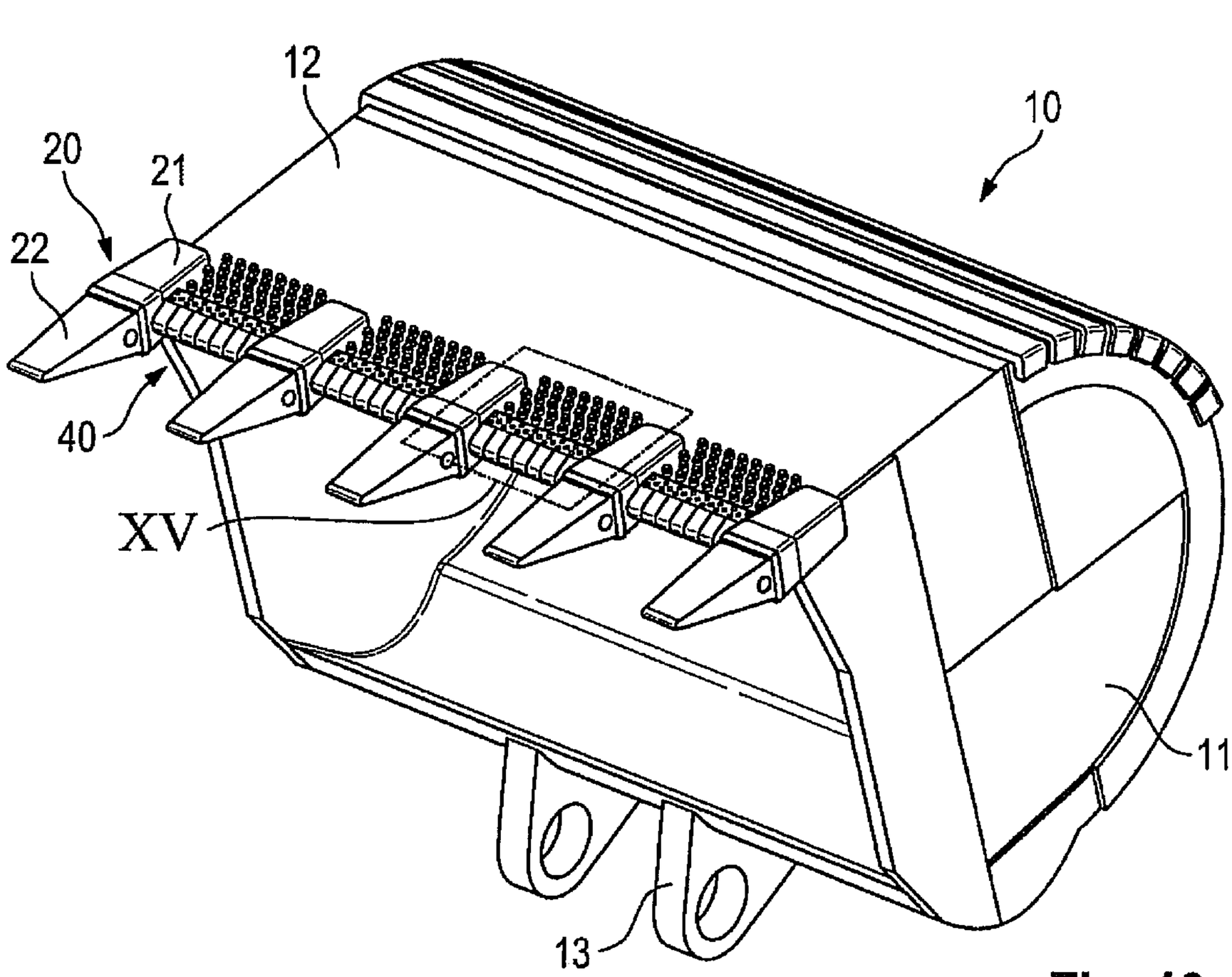

12
10
20
21
22
40
XV
11
13

Fig. 13

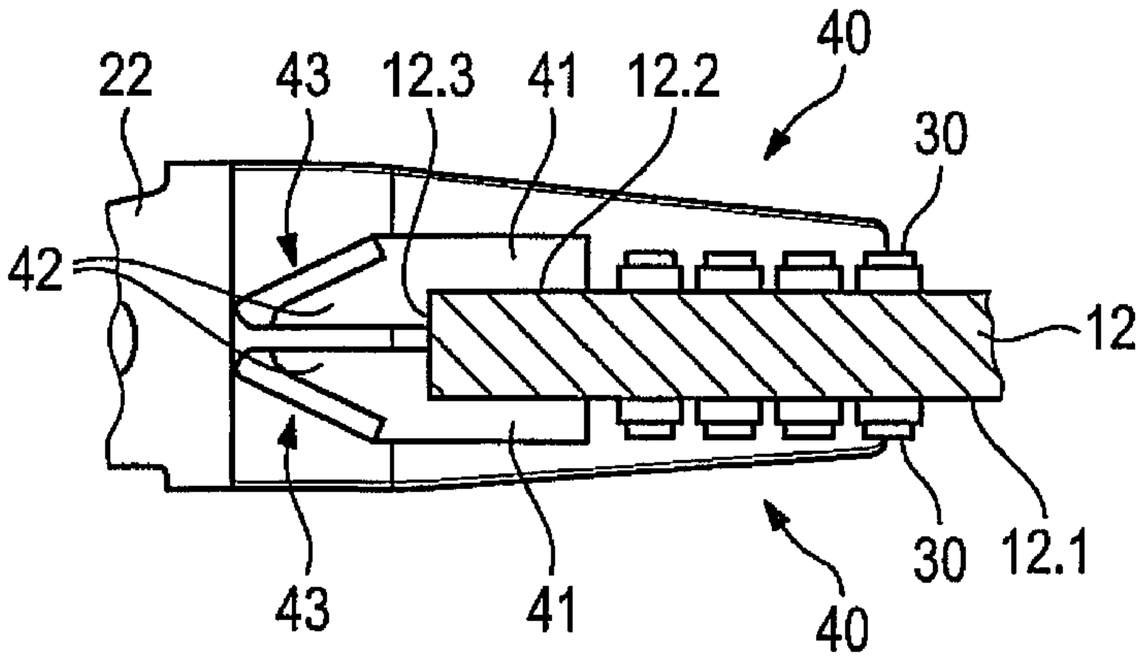

22
43
12.3
41
12.2
40
30
42
12
43
41
40
30
12.1

Fig. 14

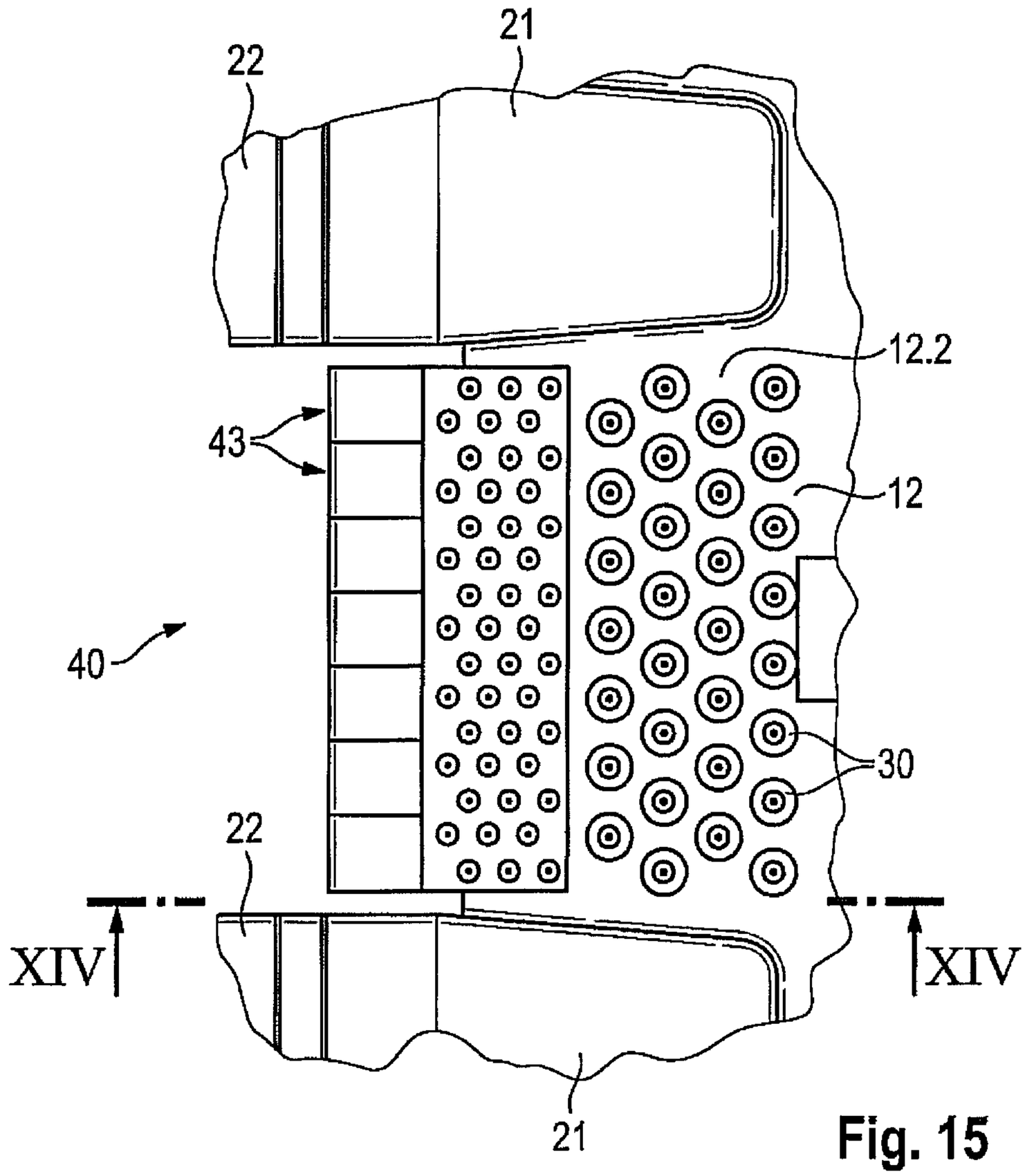
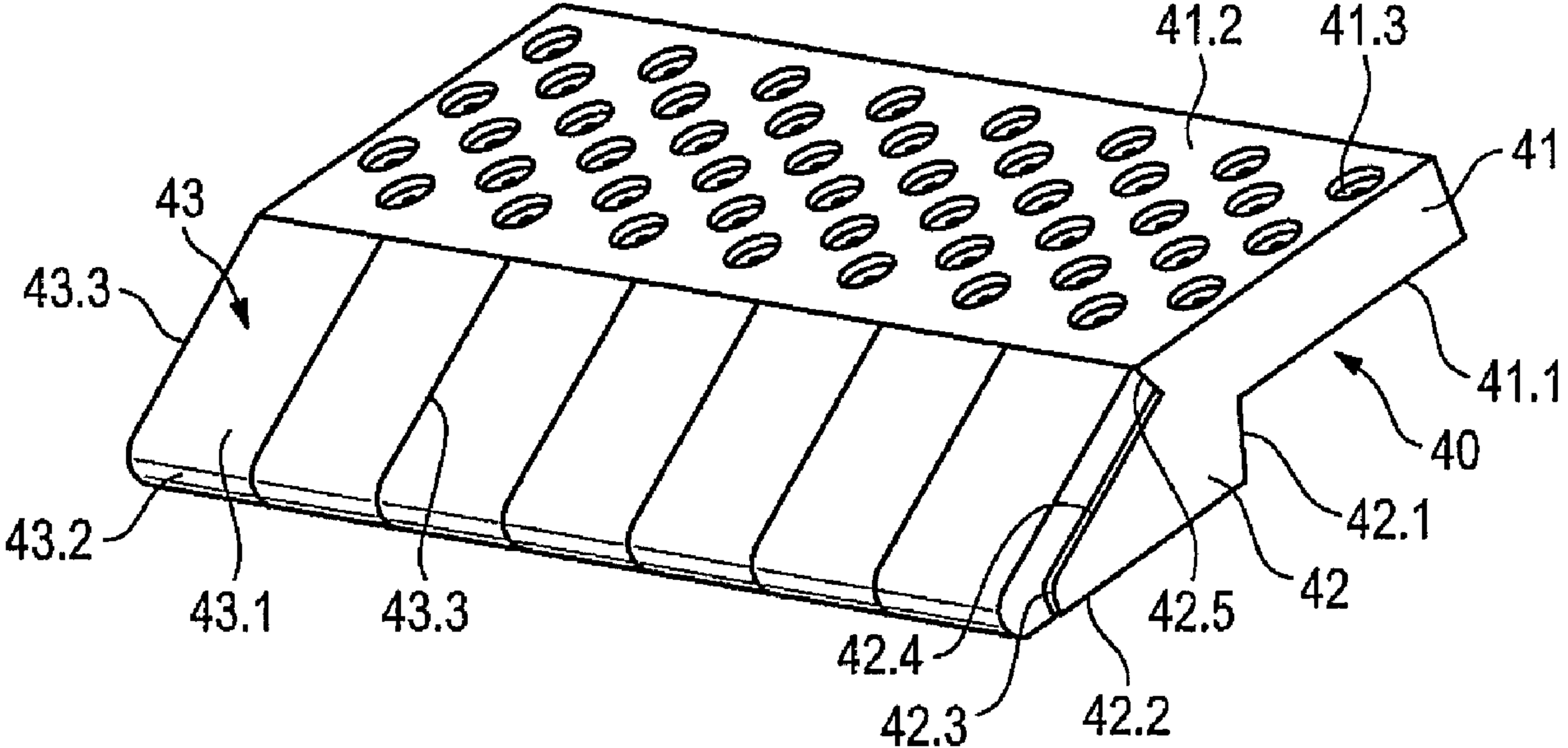

21
22
12.2
43
12
40
30
22
XIV
XIV
21

Fig. 15


41.2
41.3
41
43
43.3
41.1
40
43.2
42.1
43.1
43.3
42
42.5
42.4
42.3
42.2