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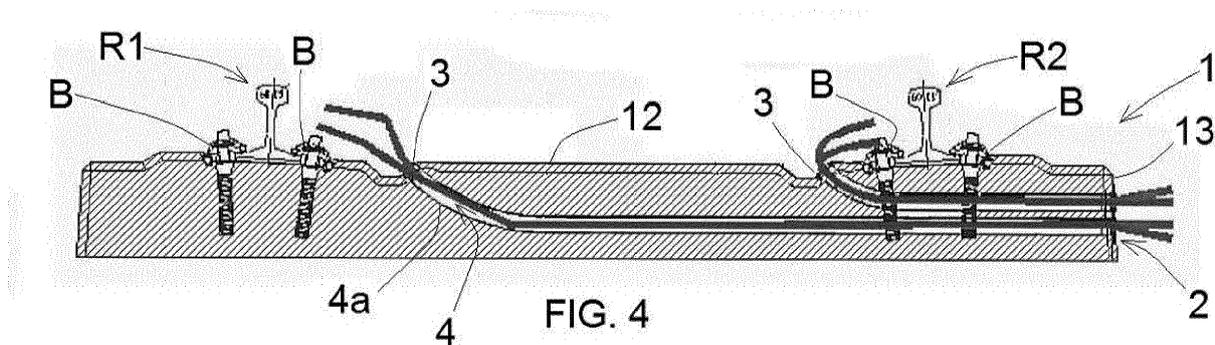
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(54) **RAILWAY TIE**

(57) A concrete railway tie (1) comprising two opposite end platforms (10) whereon end portions of rails (R1, R2) are rested ; said railway tie (1) comprising longitudinal ducts (4a) made with pipes (4a) of plastic material and an identical pair of trapezium-shaped transverse grooves (11), with the lower base facing downwards; said

ducts (4) being provided with an inlet (40) obtained in one of the ends (13) of the railway tie and an outlet (41) ending in one of the lateral edges (11 b) of the transverse grooves (11); said ducts (4) substantially having a horizontal rectilinear trajectory, except for the end portion provided with an upward trajectory.



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## Description

**[0001]** The present application patent for industrial invention relates to a concrete railway tie that is suitable for passing electrical cables used to operate the track circuit.

**[0002]** As it is known, train circulation is assisted by automatic control systems intended to monitor in real time the train speed, the traffic conditions, and the status of the railway lines and transmit the information to the train operators in order to improve the safety and the organization of train circulation.

**[0003]** Such automatic systems are composed of a track electric circuit that is powered by a current generator and is used to collect the information detected by measurement instruments.

**[0004]** The track circuit is composed of two parallel rails connected with ties. The two rails of the track are electrically connected to the current generator and to the measurement instrument. Therefore the rails are crossed by electrical current that passes from the current generator to the rails and from the rails to the measurement instrument.

**[0005]** The passage of a train on the track puts the two rails in electrical contact and interrupts the passage of electrical current in a section of circuit wherein the measurement instrument is inserted, which consequently detects the presence of the train on the track.

**[0006]** In order to pass the electrical cables safely, they are inserted in suitable ducts drowned in the ties.

**[0007]** In standard railway ties made of wood or precompressed reinforced concrete, the electrical cables are arranged and fixed on the external wall of said ties.

**[0008]** Reinforced concrete ties are known, which are provided with ducts used to concealedly pass said electrical cables, wherein said ducts are made of plastic pipes embedded in concrete casting.

**[0009]** In particular, each duct is provided with an inlet hole at one end of the tie and an outlet hole in the vicinity of the area whereon the rails are arranged and fixed.

**[0010]** When the electrical cables are passed through said ducts, the mouth of the plastic pipe or the surrounding concrete area is often damaged and broken into pieces due to the high friction caused when the cables coming out of said ducts are given a curvilinear trajectory.

**[0011]** Moreover, each longitudinal duct ends on the lateral wall of a vertical manhole, from which the cable must be pulled upwards, then bent horizontally and finally taken to the point where it must be welded to the rail.

**[0012]** Such a manhole is normally closed on top by a cover that protects the manhole and at the same time forcedly holds the electrical cables that are bent in a substantially horizontal position.

**[0013]** Therefore the electrical cables must make a first curve in order to be arranged vertically and pulled out from the manhole, and a second curve in order to be arranged horizontally when they are pulled out of the manhole in order to be connected to the rail.

**[0014]** Being the cables hard and difficult to bend, these operations are difficult and uncomfortable, thus slowing the laying of the cables.

**[0015]** CN204224931 discloses a concrete railway tie comprising an upper surface provided with two opposite end platforms whereon the rails are to be locked. Said railway tie is internally provided with longitudinal ducts for passing electrical cables.

**[0016]** The purpose of the present invention is to overcome the drawbacks of the prior art by disclosing a railway tie that is resistant and provided with suitable means for simplifying the extraction/insertion of the cables from/into the ducts and their direction towards the rail.

**[0017]** Another purpose of the invention is to disclose a railway tie with the aforementioned characteristics, which is free from the risk of breaking the concrete around the mouth of said ducts, where high friction between the cable and the mouth is generated because of the sharp bending that must be given to the cable in order to take it towards the rail whereon it must be welded.

**[0018]** The railway tie of the invention is made of concrete and traditionally comprises two opposite end platforms on the upper surface whereon the rails are rested and locked in position with traditional locking clamps, i. e. the so-called couplings.

**[0019]** The first peculiarity of the railway tie of the invention consists in the fact that it is provided with a first and a second transverse groove obtained on the upper surface of the tie in the vicinity of said platforms. Each groove has a trapezium-shaped cross-section, with the lower base facing downwards, so that a horizontal bottom wall and two inclined downward-converging lateral edges can be identified.

**[0020]** The railway tie is internally provided with at least two, preferably four, longitudinal ducts for passing the electrical cables, substantially having a rectilinear horizontal trajectory, except for the end portion provided with an upward trajectory.

**[0021]** The inlet of said ducts is obtained at one end of the railway tie, whereas the outlet is arranged in one of the inclined edges of said transverse grooves.

**[0022]** The second peculiarity of the railway tie of the invention consists in the fact that it comprises metal plates arranged both at the inlet and at the outlet of said ducts, in order to cover and protect the concrete in the areas where the friction with the cables against the tie is more vigorous and more harmful.

**[0023]** More precisely, each metal plate is provided with metal bushes wherein plastic tubes are inserted, internally covering said ducts.

**[0024]** The bushes are internally provided with a stop surface against which the plastic pipes are stopped. The stop surface is disposed in backward position with respect to the inlet and the outlet of the ducts and each bush slightly protrudes from the plate whereon it is fixed, in such manner to avoid any direct friction between the electrical cables and the mouths of the plastic pipes, thus protecting said mouths from harmful stress.

**[0025]** Moreover, each metal plate is suitably dimensioned to cover the majority of the inclined edge of said transverse grooves where the ducts used to pass the electrical cables end.

**[0026]** The advantages of the railway tie according to the present invention are evident, wherein damage to the plastic pipes and to the concrete is prevented because of the provision of said metal plates with metal bushes, which are respectively situated at the beginning and at the end of each duct.

**[0027]** An additional advantage of the railway tie of the invention consists in the fact that it makes it easier to bend the electrical cables coming out from said ducts in order to guide the electrical cables towards the rail whereon they are fixed, thanks to the provision of the outlet of the duct in one of the inclined edges of each trapezium-shaped transverse groove.

**[0028]** For the sake of clarity, the description of the railway tie of the invention continues with reference to the attached drawings, which have a merely illustrative, not limiting value, wherein:

Fig. 1 is an axonometric view of a railway tie according to the invention,

Fig. 2 is an axonometric view of the railway tie of Fig. 1, overturned on a horizontal plane by 180°,

Fig. 3 is a cross-sectional view of the railway tie of Fig. 2, sectioned along a section plane III-III of Fig. 2, Fig. 4 is the same as Fig. 3 except for it shows the rails fixed to the tie and the electrical cables inserted in the tie,

Fig. 5 is a front view of the end of the railway tie wherein the inlet of the longitudinal ducts is obtained, Figs. 6A and 6B are two axonometric views that show from different angles the plate provided with bushes to be applied in correspondence of the transverse grooves,

Fig. 7 is an axonometric view of the plate provided with bushes to be applied in correspondence of the end wherein the inlet of the longitudinal ducts is obtained;

Fig. 8 is a sectional view of a bush fixing to a plate and containing the inlet of a pipe of the tie of Fig. 1.

**[0029]** With reference to Figs. 1 and 2, a railway tie according to the invention is disclosed, which is generally indicated with reference numeral (1).

**[0030]** The concrete railway tie (1) is made of concrete and is provided with two opposite end platforms (10) on its upper surface (12), whereon rails (R1, R2) are rested and locked in position with locking clamps (B), as shown in Fig. 4.

**[0031]** The railway tie (1) is internally provided with four longitudinal ducts (4) for passing electrical cables. The ducts (4) are made with pipes (4a) of plastic material, preferably PVC, and are drowned in concrete during casting.

**[0032]** The longitudinal ducts (4) have an inlet (40) ob-

tained in one of the ends (13) of the railway tie and an outlet (41) ending in grooves (11) with transverse direction with respect to the longitudinal axis of the tie (1) and situated in the vicinity of the end platforms (10) whereon the rails (R1, R2) are rested. Each end platform (10) is disposed outside said transverse grooves (11).

**[0033]** Starting from the inlet (40), the ducts (4) have a substantially horizontal rectilinear trajectory, except for the end portion in correspondence of the outlet (41), which has an upward trajectory, as shown in Fig. 4.

**[0034]** The transverse grooves (11) are identical and provided, when sectioned along a longitudinal plane passing by the longitudinal axis of the tie, with the shape of an isosceles trapezium, with the lower base directed downwards. Each transverse groove (11) comprises a horizontal bottom wall (1 a) and two inclined downwards-converging lateral edges (11 b), said ducts (4) ending in one of said two lateral edges (11 b).

**[0035]** The provision of transverse grooves (11) with inclined lateral edges (11 b) favors the bending of the electrical cables that come out from said ducts in order to direct them towards the rail whereon they are to be fixed. More precisely, bending can be obtained by slightly curving the cables when the rail (R1) is situated before the outlet (41) of said ducts (4), or by curving the cables without making any sharp corners when the rail (R2) is situated behind the outlet (41), as shown in Fig. 4.

**[0036]** The railway tie (1) also comprises a metal plate (2) that externally covers the end section of the tie wherein the inlet (40) of said ducts (4) is situated. The metal plate (2) is provided with four metal bushes (20) having a suitable diameter to be exactly inserted until they are externally stopped in the inlet of the plastic pipes (4a) that internally cover said ducts (4).

**[0037]** Each of said bushes (20) has a first end (20a) disposed inside the railway tie (1) and a second end (20b) fixed to the metal plate (2).

**[0038]** The railway tie (1) comprises two additional metal plates (3) arranged at the outlet (41) of the ducts (4).

**[0039]** Each of said metal plates (3) has suitable dimensions to cover the corresponding lateral edge (11 b).

**[0040]** As shown in Figs. 6A, 6B and 8, the metal plates (3) arranged at the outlet (41) of the ducts (4) have an "L" shape in cross-section, comprising a first side (31) that covers the lateral edge (11 b) of the transverse groove and a second side (32) that covers the section of the upper surface (12) of the railway tie joined with the lateral edge (11 b).

**[0041]** The first side (31) and the second side (32) of each of said plates (3) subtend an obtuse angle.

**[0042]** Each metal plate (3) arranged at the outlet (41) of the ducts (4) is provided with two metal bushes (30), which are identical to the bushes (20) fixed to the plate (2) arranged at the outlet (40) of the ducts (4) and have a suitable diameter to be exactly inserted, until they are externally stopped in the mouth of the plastic pipes (4a) that internally cover said ducts (4), as shown in Fig. 8.

**[0043]** Each pipe (4a) comprises an inlet end section

arranged in the duct (4) in correspondence of the inlet (40) of the duct and an outlet end section arranged in the duct in correspondence of the outlet (41) of the duct. The inlet end section of each pipe (4a) is inserted in one of the bushes (20) of the plate (2) arranged at the inlet (40) of the ducts (4) and the outlet end section of each pipe (4a) is inserted in one of the bushes (30) of one of the plates (3) arranged at the outlet (41) of the ducts (4).

**[0044]** In particular, each bush (20, 30) is internally provided with an annular stop tooth (23, 33) against which the end section of the plastic pipe (4a) is stopped. Each bush (20, 30) slightly protrudes outside the plate (2, 3) whereon it is fixed, in such manner that no direct friction is generated between the electrical cables and the mouths of the pipes (4a).

**[0045]** The bushes (20, 30) are welded to the metal plates (2, 3) and the corresponding end sections of the pipes (4a) are inserted in the bushes (20, 30).

**[0046]** Said plates (2, 3) are arranged inside a mold so that, after casting the concrete, said plates (2, 3) are flush to the concrete surface of the tie and are respectively arranged at the end (13) of the tie and in the inclined lateral edge (11 b) of each transverse groove (11). The pipes (4a) are inserted into the mold in such manner to follow a substantially rectilinear trajectory with an upward end section in correspondence of the lateral edge (11 b) of each transverse groove (11). After casting the concrete, said pipes (4a) will form the ducts (4).

**[0047]** Then concrete is cast into the mold and the mold is removed when concrete has set.

## Claims

1. A concrete railway tie (1) comprising two opposite end platforms (10) on its upper surface (12), whereon rails (R1, R2) are rested and locked in position with locking clamps, said railway tie (1) being internally provided with longitudinal ducts (4) for passing electrical cables, said ducts (4) being obtained with pipes (4a) drowned in concrete during casting, said longitudinal ducts (4) ending in the vicinity of the end platforms (10) whereon the rails (R1, R2) are rested; railway tie (1) **characterized in that** said pipes (4a) are made of plastic material and **in that** said railway tie (1) comprises an identical pair of trapezium-shaped transverse grooves (11), with the lower base facing downwards; each transverse groove (11) comprising a horizontal bottom wall (11 a) and two inclined downwards-converging lateral edges (11 b); said end platforms (10) being disposed in external position with respect to said transverse grooves (11); said ducts (4) being provided with an inlet (40) obtained in one of the ends (13) of the railway tie and an outlet (41) ending in one of the lateral edges (11

b) of the transverse grooves (11); said ducts (4) substantially having a horizontal rectilinear trajectory, except for the end portion provided with an upward trajectory.

2. The railway tie (1) of claim 1, comprising metal plates (3) arranged at the outlet (41) of said ducts (4); each of said metal plates (3) being provided with metal bushes (30) having a suitable diameter to be inserted outside the mouth of the plastic pipes (4a) that cover the ducts (4) internally; said metal plates (3) having suitable dimensions to cover the lateral edge (11 b) of the transverse grooves (11) where the ducts (4) end.
3. The railway tie (1) of claim 2, wherein each metal plate (3) arranged at the outlet (41) of said ducts (4) has an "L" shape in cross-section, comprising a first side (31) that covers the lateral edge (11 b) of the transverse groove (11) and a second side (32) that covers the upper surface (12) of the railway tie, where the two sides (31, 32) of the "L" form an internal obtuse angle.
4. The railway tie (1) of any one of the preceding claims, comprising at least one metal plate (2) arranged at the inlet (40) of said ducts (4); said metal plate (2) being provided with metal bushes (20) having a suitable diameter to be inserted outside the mouth of the plastic pipes (4a) that cover the ducts (4) internally.
5. The railway tie (1) of claim 4 when depending on claim 2, wherein the bushes (20, 30) have an annular stop tooth (23, 33) against which the pipes (4a) are stopped and each bush (20, 30) protrudes outside of the plate (2, 3) whereon it is fixed.
6. The railway tie (1) of claim 4 or 5 when depending on claim 2, wherein the metal plates (2, 3) cover the concrete surface of the railway tie (1) while being flush thereto.

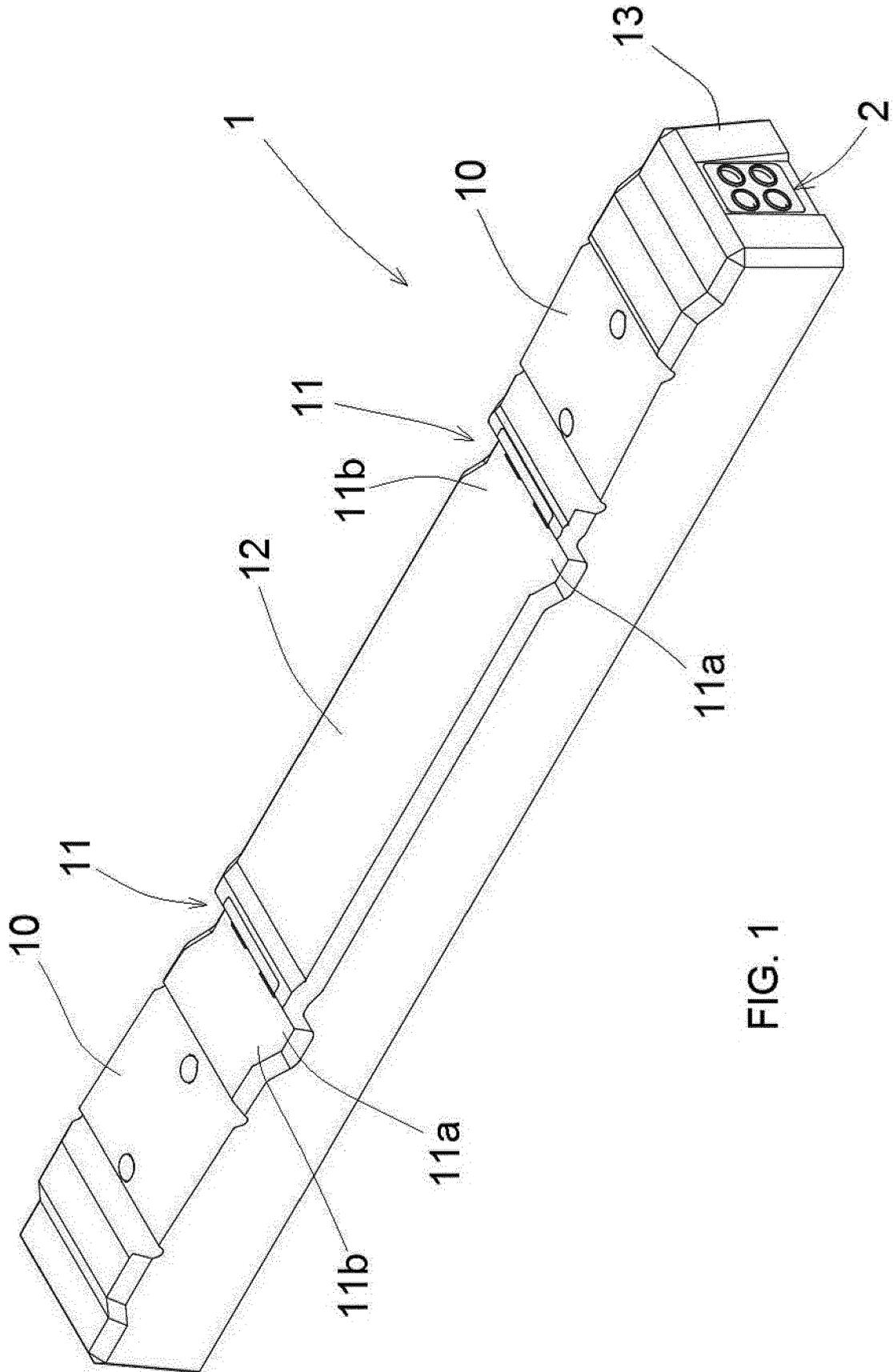


FIG. 1

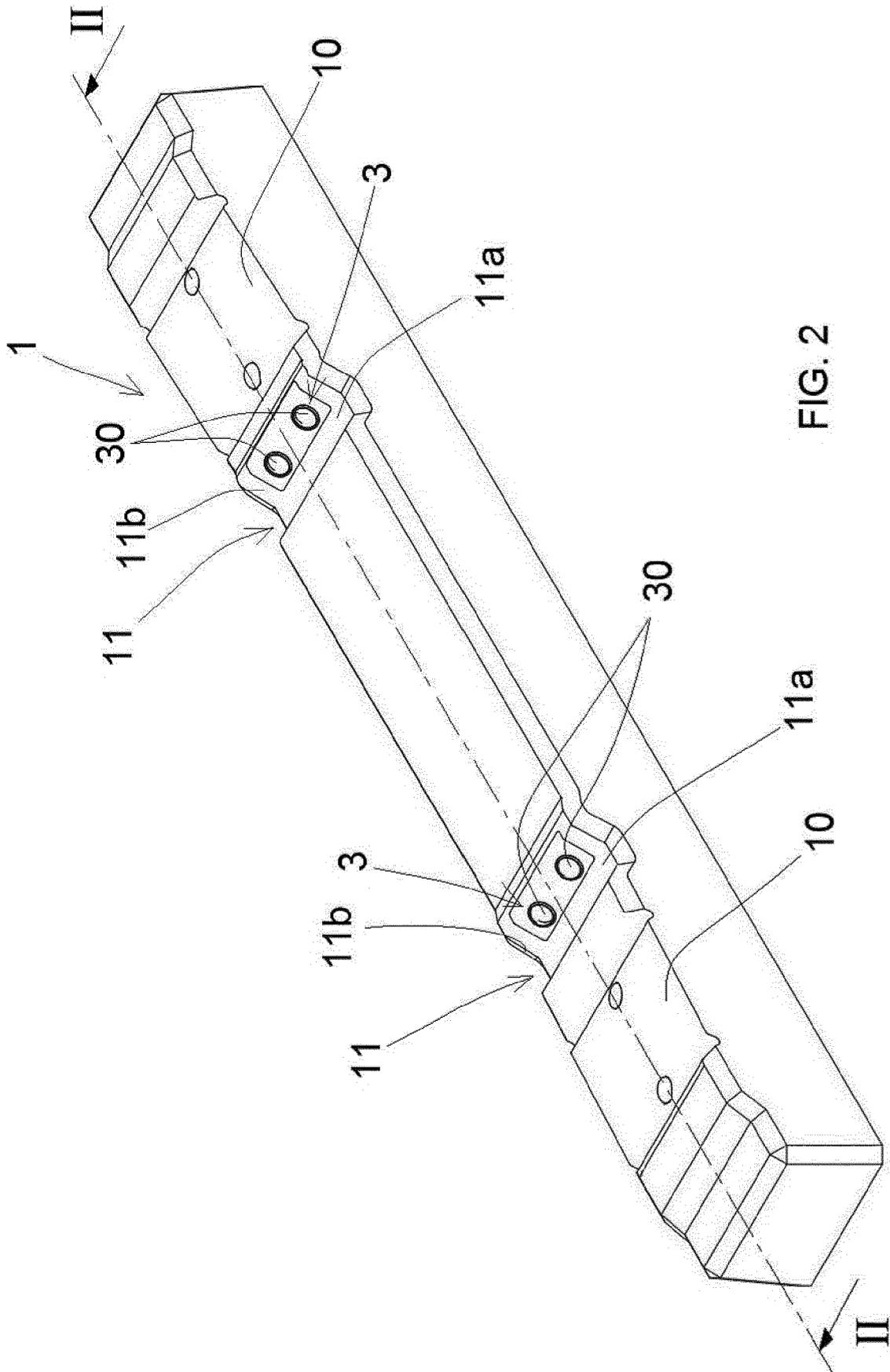


FIG. 2

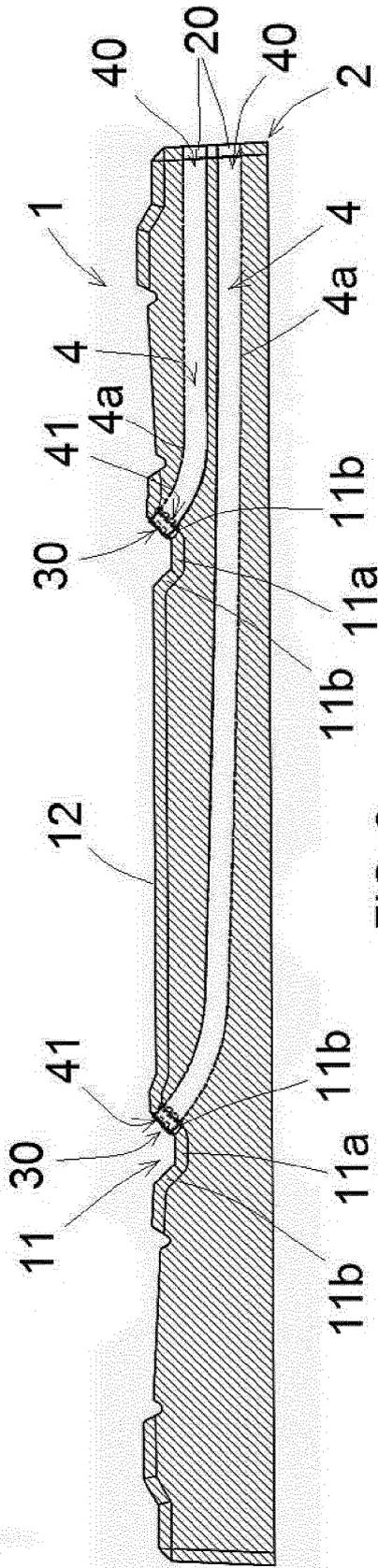


FIG. 3

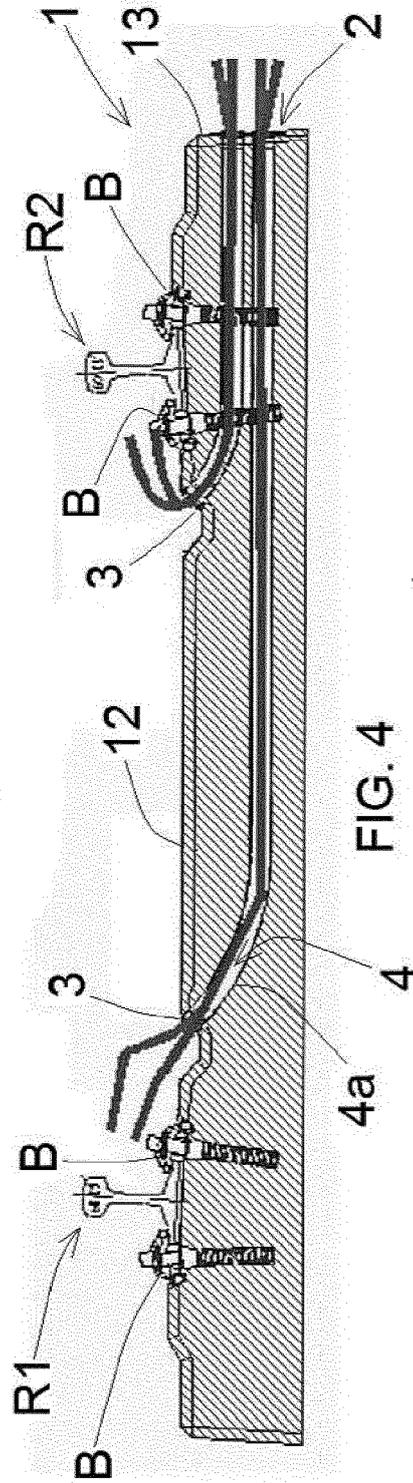


FIG. 4

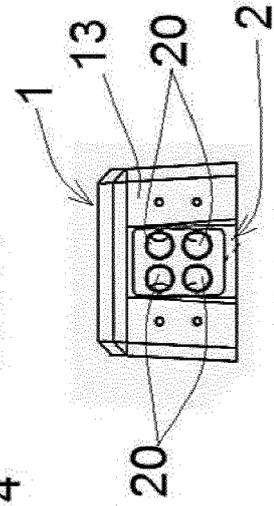


FIG. 5

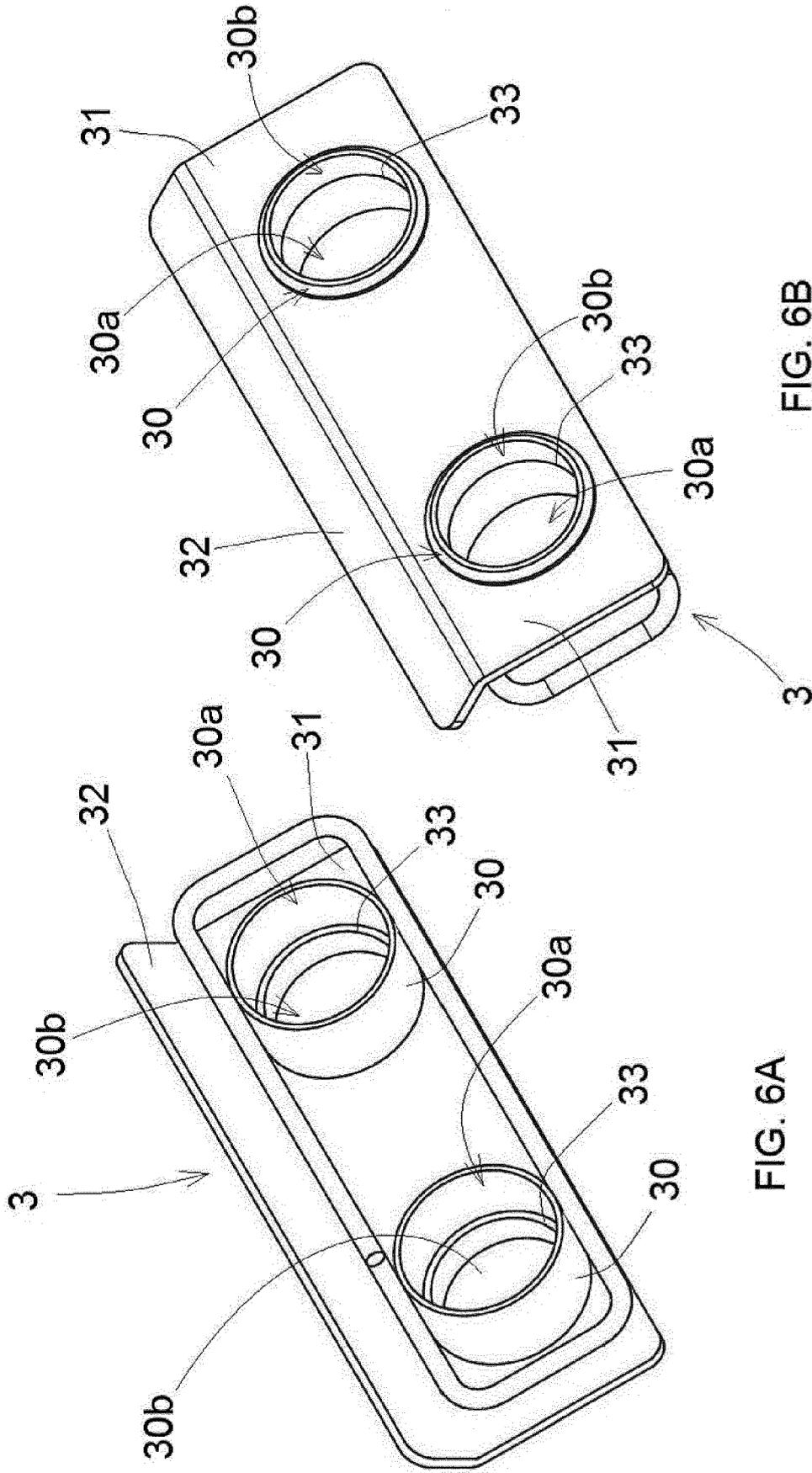


FIG. 6A

FIG. 6B

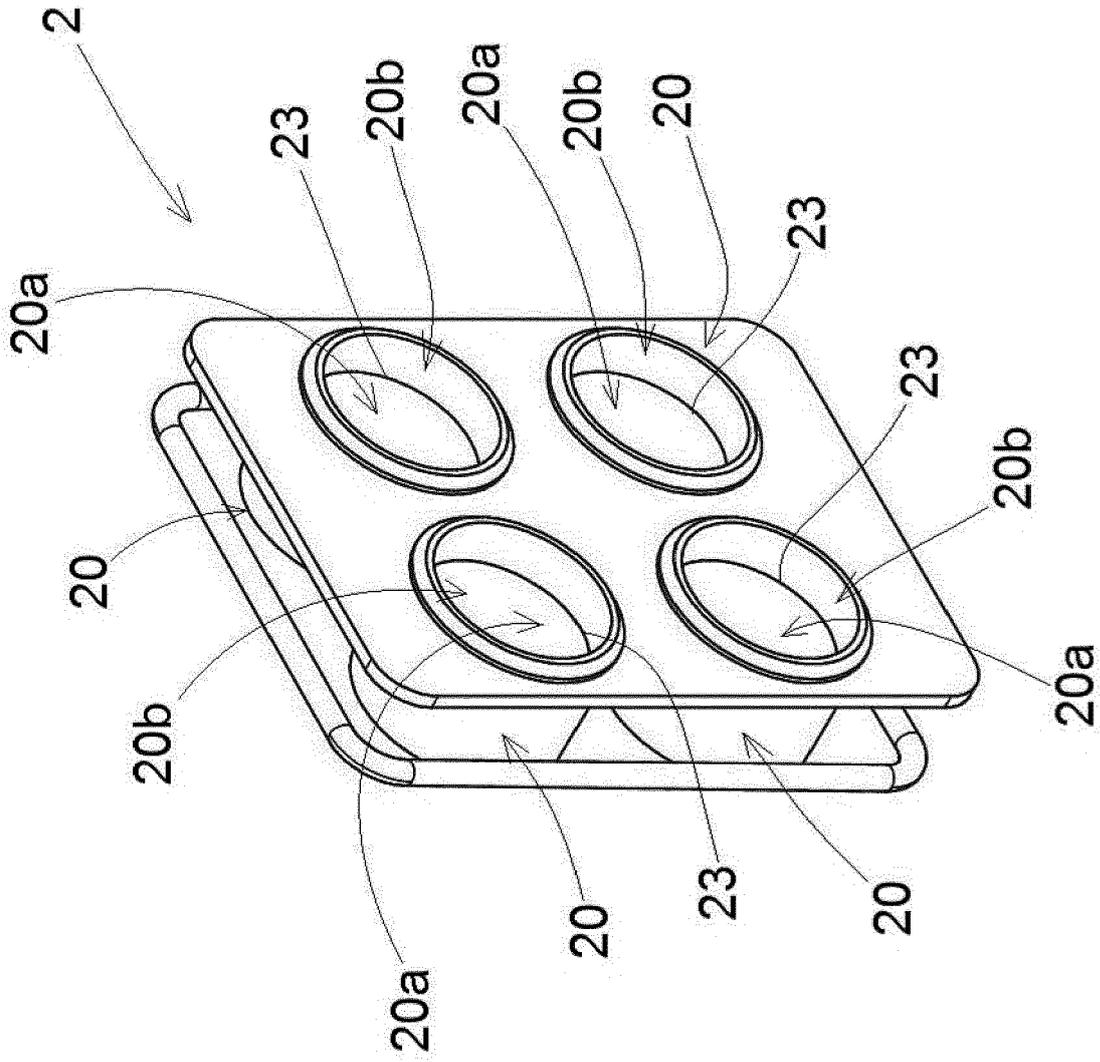


FIG. 7

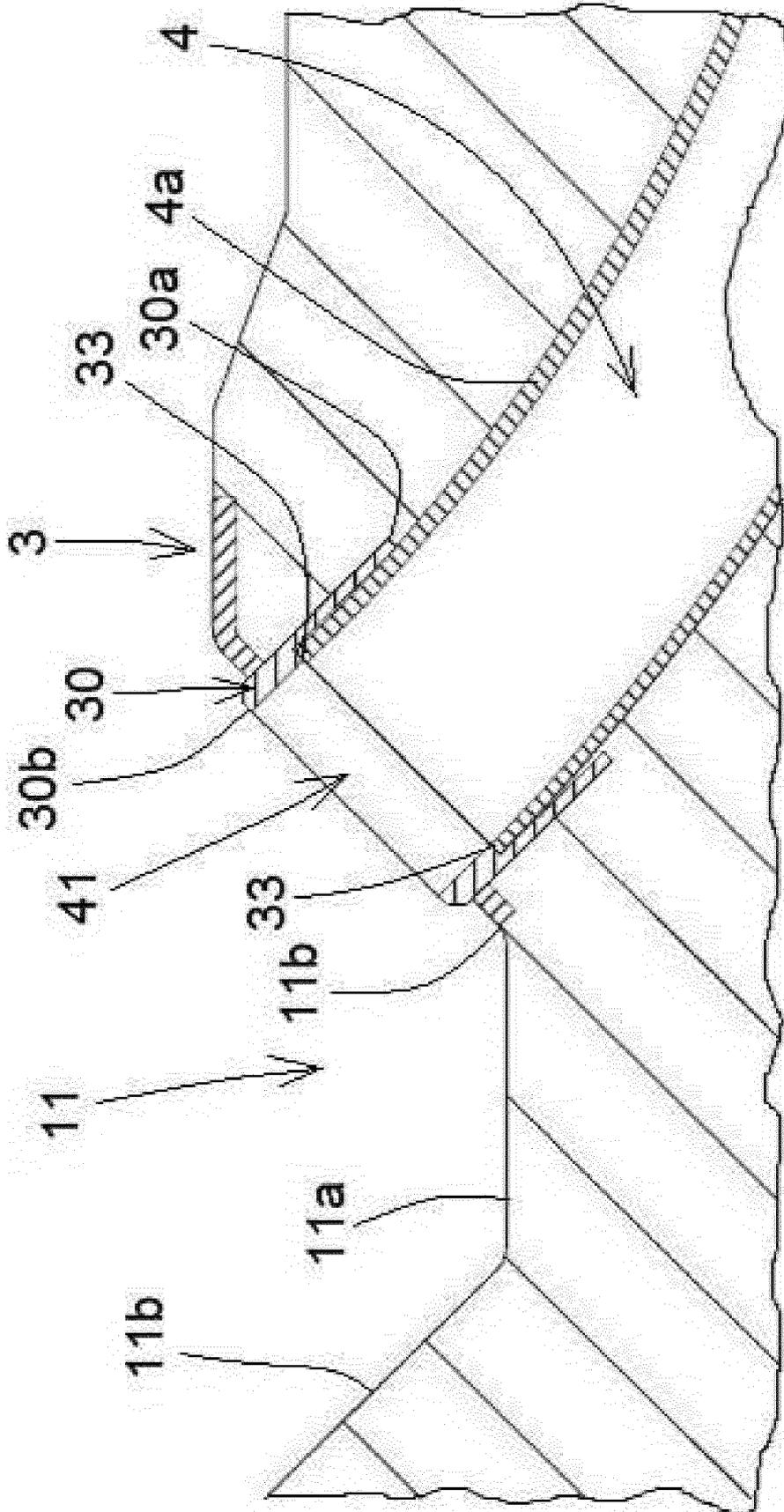


FIG. 8



EUROPEAN SEARCH REPORT

Application Number  
EP 16 19 0059

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>13 February 2017</b>	Examiner <b>Movadat, Robin</b>
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ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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13-02-2017

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