



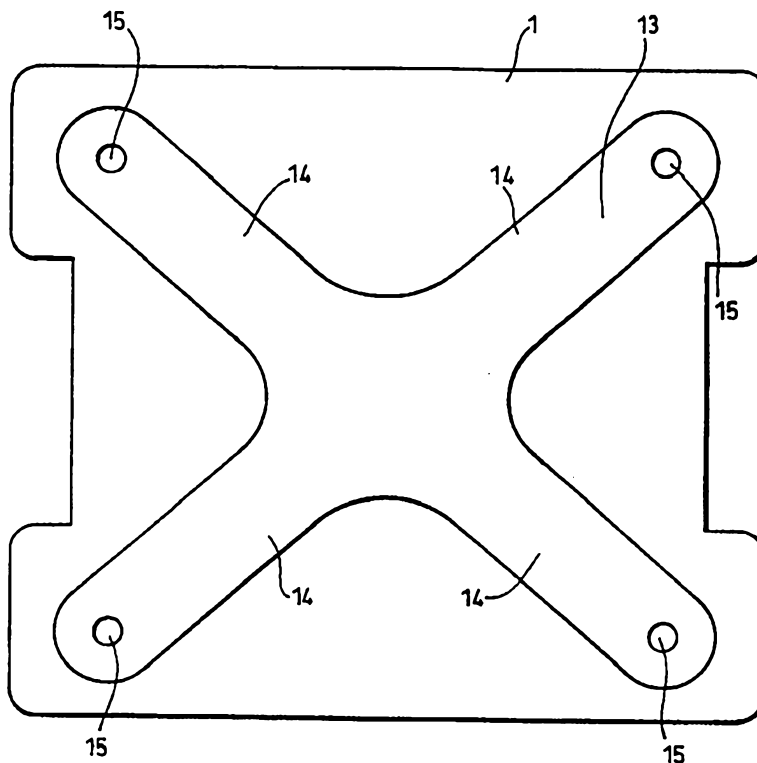
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : E01B 9/68</p>	<p>A1</p>	<p>(11) International Publication Number: <b>WO 98/41690</b> (43) International Publication Date: 24 September 1998 (24.09.98)</p>
<p>(21) International Application Number: PCT/GB98/00624 (22) International Filing Date: 13 March 1998 (13.03.98)</p> <p>(30) Priority Data: 9705396.1 14 March 1997 (14.03.97) GB 9800714.9 15 January 1998 (15.01.98) GB</p> <p>(71) Applicant (for all designated States except US): GLYNWED PIPE SYSTEMS LIMITED [GB/GB]; Headland House, New Coventry Road, Sheldon, Birmingham B26 3AZ (GB).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): WILDGOOSE, Thomas, William [GB/GB]; 5 Farringdon Close, Peterborough, Cambridgeshire PE1 4RQ (GB).</p> <p>(74) Agents: HUTCHINS, Michael, Richard et al.; Fry Heath &amp; Spence, The Old College, 53 High Street, Horley, Surrey RH6 7BN (GB).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> With international search report. With amended claims.</p>	

(54) Title: RAIL PADS

(57) Abstract

The invention provides an elastomeric rail pad (1) of generally rectangular plan configuration, the pad having an upper face (2) adapted to underlie the lower face of a rail, and a lower face (5) adapted to overlie a concrete rail foundation member characterised in that the pad includes a reinforcement means (13) which is generally parallel to its mean plane and extends at least between dispositions associated with generally opposing corners of the generally rectangular pad (1), said reinforcing means (13) having a tensile strength such as to resist, in use of the pad (1), forces from traffic passing across the rail disposed thereabove otherwise tending to stretch the pad (1) in the mean plane thereof.



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## RAIL PADS

This invention relates to rail pads. Such pads are interposed between the lower surface of a railway rail and a foundation member on which the rail stands and to which it is usually secured. The rail foundation member may, for example, be a concrete or steel sleeper extending across the railway track, or a slab or plate, for example, running along the length of the rail.

The purpose of the rail pad is to protect the foundation member from impulsive and other loads from passing rail traffic; to compensate for any unevenness in the foundation member; and, where the rail is electrical, to provide electrical insulation between the rail and the foundation member.

Such rail pads were from their working disposition, subject to considerable potentially damaging forces as railway traffic passes along the rail supported by the pads, and the recurrent common problem with such pads was the damage so caused, and the inevitable need for frequent replacement at substantial cost.

To alleviate this problem it has been established that the provision of an elastomeric rail pad of generally rectangular plan configuration having an upper surface adapted to underlie the lower face of a rail, and a lower face adapted to overly a concrete rail foundation member in which the pad is studded on the upper side (underlying the rail) will substantially improve the attenuation of the rail foundation member from forces exerted by the rail due to traffic passing thereacross.

Whilst such an arrangement has been singularly effective in reducing

damaging forces upon the pad and the foundation member therebelow, particularly when the foundation member or sleeper contains recesses or pockets to contain and position the pads under the rail. In this purpose-built assembly, pads are able to withstand high vertical and side loading whilst providing shock attenuation and minimising track damage with no possibility of extrusion caused by side loading.

The improved behaviour resulting from the use of rail pads in flat sleeper assemblies can be outweighed by the tendency of pads to be extruded and "lost" from under track by high side forces, this condition having particular effect when trains are negotiating bends in the track and when high axle loads are present.

It is especially to these conditions of track where sleepers do not have containment pockets for pads and also where high slide loads are present that the present invention is directed, and it is an object of the present invention to overcome or at least substantially reduce the problems identified above.

In accordance with the invention there is provided an elastomeric rail pad of generally rectangular plan configuration, the pad having an upper face adapted to underlie the lower face of a rail, and a lower face adapted to overly a concrete rail foundation member characterised in that the pad includes reinforcement means which is generally parallel to its mean plane, and extending at least between dispositions associated with generally opposing corners of the generally rectangular pad, said reinforcing means having a tensile strength such as to resist, in use of the pad, forces from traffic passing across the rail disposed thereabove otherwise tending to stretch the pad in the mean plane thereof.

The reinforcing means can be associated with the lower or upper faces of the pad, or elsewhere, but in one preferred embodiment may be

associated with the lower face of the pad.

The reinforcing means may be of a sufficient tensile strength plastic, such as nylon, or a metal such as steel, and may be disposed within the pad by forming the pad about such reinforcement, or may comprise a member attached to, for example, the base of the pad.

The reinforcement means may comprise a member of any appropriate configuration to achieve the desired result hereinabove specified, and in one embodiment may be in the form of a cruciform extending between corners of the generally rectangular pad.

The pad can have smooth lower and/or upper surfaces, or the upper and optionally the lower surface can have an array of grooves, ridges, studs or other protrusions or recesses for the purpose of improving the cushioning properties of the pad.

The pad, in a preferred embodiment, may be of a single sided nature in that a plurality of protrusions to improve the attenuation of the rail foundation member may be disposed solely on the upper face of the pad. In this case, the reinforcement means typically is recessed into the lower face of the pad so as not to increase to overall height of the assembly. In other embodiments the reinforcing means may be disposed within the pad which then may be again of a single upper face protrusion laden pad, or may be both upper and lower protrusion laden.

The generally rectangular plan configuration of the rail pad may have rectangular recesses (in plan view) along two opposed sides midway along those sides, thereby defining on each end of such recesses what can be termed "ear" portions of the pad which in use locate the pad with respect to the anchoring assembly thereof between the overlying rail and the underlying rail foundation member. In this case the reinforcing means may

be configured such as to extend into the wings, thereby providing stiffness thereto, with significant affecting practice and preventive movement of the pad from its required disposition between the rail and rail support member.

In a further aspect, the invention provides a method of protecting a foundation member for a railway rail from impulsive and other loads from rail traffic passing over the rail, which method comprises positioning between the foundation member and the railway rail an elastomeric rail pad as hereinbefore defined.

In a still further aspect, the invention provides a method of preventing extrusion of a rail pad from between a foundation member and a railway rail, which method comprises providing the rail pad with reinforcing means as hereinbefore defined.

In order that the invention may be more readily understood, one embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a top plan view of a rail pad to which the invention can be applied;

Figure 2 is a schematic side view of the rail pad of Figure 2;

Figure 3 shows the forces applicable upon a rail which affect a pad disposed therebelow;

Figure 4 shows the resultant stress and stretching of a pad disposed between a rail and a rail support member;

Figure 5 shows an underview of a pad incorporating the invention;

Figure 6 shows in more detail the reinforcing member illustrated in Figure 5;

Figure 7 shows in cross section a configuration of one of the bores within the reinforcing member of Figure 6.

Figure 8 is a plan view of a rail pad according to a second

embodiment of the invention;

Figure 9 is a sectional elevation along line I-I in Figure 8;

Figure 10 is a plan view of a rail pad according to a third embodiment of the invention:

Figure 11 is a sectional elevation along line II-II of Figure 10;

Figure 12 is a plan view of a rail pad incorporating the reinforcing member of Figure 6; and

Figure 13 is a sectional elevation along line III-III in Figure 12.

Referring now to Figure 1 and 2 a rail pad 1 is shown. This is formed of highly resilient vulcanised natural rubber (between 55% and 75% rebound value) or other appropriate elastomeric material having the same characteristics such as a plastics or synthetic rubber. Desirably the material from which the pad is formed will have an IRHD hardness of between 50 and 90.

The upper surface 2 of the pad is provided with a plurality of studs 3 each having a domed outer surface 4. Such arrangement of studs has been found to increase the attenuation provided by the pad between the overlying rail and the underlying foundation member during use as a result of the passage of rail traffic.

As can clearly be seen from Figure 2 the under side 5 of the pad is of plane configuration.

Figure 3 illustrates the vertical (8) and transverse (9) forces, very schematically, acting upon a rail 6 when a wheel 7 of rail traffic passing thereabove acts upon the rail.

As can be seen in Figure 4 this result in stresses 10 upon a rail pad 1 disposed between the rail 6 and a rail support member (not shown), the axis of the rail being along the line 11, and the upstream/downstream

direction being as shown by arrow 12 parallel to axis 11. It will be seen that the effect of the forces by traffic on the rail stretch and attenuate the rail pad 1 such as to deform the same and reduce its effectiveness.

Figure 5 illustrates schematically from below the underside of the rail pad 1 of Figures 1 and 2 the attachment of a cross-shaped member 13 (formed for example from a metallic material or a plastics material such as polyamide) which in practice is arranged to ensure, because of its relatively high tensile strength compared to that of the pad, that the stretching of the pad is very strictly limited compared to the situation illustrated in Figure 4. It will be seen that the cross-shaped support member 13 has apertures 15 at the ends of its arms 14, by means of which rivets or the like may attach the nylon reinforcement cross 13 to the base of the pad 1, which thereby holds the pad in place. As an alternative to rivets, the pad 1 can be moulded with lugs which protrude through the apertures 15 to hold the support member 13 in place.

Figure 6 is a somewhat more detailed plan illustration (still schematic) of the reinforcement member 13 illustrated in Figure 5. In addition to the end most apertures 15 at the ends of the limbs 14, a plurality of further apertures 16 (which can be of various shapes in addition to the shapes illustrated) are shown disposed along the arms of the reinforcement member 13. These apertures receive, without protrusion therebelow, securement rivets (not shown) to the rail pad to which they must be attached. By appropriate securement through several or all of the apertures in the limbs, a very secure engagement between the reinforcing member 13 and the pad 1 disposed thereabove can be obtained as is necessary in the circumstances. Again, as with the embodiment of Figure 5, the pad can be provided with protrusions or lugs which fit into the apertures to hold the reinforcing member in place, in place of rivets. Alternatively, the pad 1 can be moulded against the reinforcing member 13 such that the material from which the pad is formed penetrates and keys into the apertures 15 during the moulding

operation. In addition to (or instead of) the physical attachment provided by virtue of the rubber of the pad penetrating the apertures 15, securement of the reinforcing member can be achieved or assisted by the use of suitable adhesive bonding agents. A still further method of securing the reinforcing member 13 in place is to coat the member 13 with a chemical bonding agent which, when activated during vulcanization of the rail pad, will provide crosslinking at the interface between the member 13 and the pad 1.

By means of the invention, particularly as hereinabove illustrated, we have provided a reinforced rail pad where the resistance to displacement and/or distortion by forces from traffic passing thereover in use is most significantly increased, thereby increasing the useful life and the effectiveness of the rail pad concerned.

The reinforced rail pad of the present invention is able to provide a stable (non-extrudable) replacement for the multiplicity of existing pads which are in use in the United Kingdom and elsewhere. This enables a truly resilient pad with real and meaningful shock attenuation properties to be used. This enables a relatively inexpensive method of uprating track, which is advantageous in all track without pocketed concrete sleepers.

Amongst other things it is especially beneficial for high axle load use and especially where tight bends are involved. This is often encountered outside the United Kingdom and on private lines such as ore carrying trains etc.

In addition, pads according to the invention could be used on light rail and tramways.

The rail pad illustrated in Figures 5 to 7 represents one preferred embodiment of the invention in that the arrangement of studs on the upper surface has been found to be particularly effective in cushioning the railway

sleeper or other foundation member from the impulsive forces of rail traffic passing thereover. However, instead of having a plurality of stud-like protrusions on the upper surface thereof, the rail pad can have smooth upper and lower surfaces, or a grooved upper (and optionally lower) surface, and embodiments illustrating such arrangements are shown in Figures 8 to 13.

In the rail pad of Figures 8 and 9, both the upper surface 102 and lower surface 105 of pad 101 are smooth, and a cruciform reinforcing member 113 is recessed into the lower surface 105 and held in place by means of lugs or protrusions (not shown) from the pad locating and locking into apertures (not shown) in the reinforcing member. Such apertures can be tapered in the manner shown in Figure 7. Adhesives or crosslinking bonding agents can also be used to strengthen the securement of the pad to the reinforcing member if required.

In the rail pad of Figures 10 and 11, the lower surface 205 of pad 201 is smooth but across the upper surface 202 extends an array of parallel grooves 220. A cruciform reinforcing member 213 similar to that of the embodiments of Figures 5 to 9 is secured in a recess in the lower surface 205 by means of lugs or protrusions (not shown) from the pad as described above in relation to Figures 8 and 9. Although, in this embodiment, the lower surface 205 is shown as being smooth, it could if desired be provided with grooves similar to those found in the upper surface 202.

Figures 12 and 13 show an embodiment in which the reinforcing member 313 is moulded into the pad 301 such that it is entirely surrounded by the pad material. In this embodiment, the rubber is moulded through the apertures 315 and 316 in the reinforcing member 313.

It is to be understood that the foregoing is merely exemplary of rail pads in accordance with the invention and that modifications can readily be made thereto without departing from the true scope of the invention.

CLAIMS

1. An elastomeric rail pad of generally rectangular plan configuration, the pad having an upper face adapted to underlie the lower face of a rail, and a lower face adapted to overlie a concrete rail foundation member characterised in that the pad includes a reinforcement means which is generally parallel to its mean plane and extends at least between dispositions associated with generally opposing corners of the generally rectangular pad, said reinforcing means having a tensile strength such as to resist, in use of the pad, forces from traffic passing across the rail disposed thereabove otherwise tending to stretch the pad in the mean plane thereof.
2. An elastomeric rail pad according to claim 1 wherein the reinforcing means is associated with the lower face of the pad or the upper face of the pad.
3. An elastomeric rail pad according to claim 1 wherein the reinforcing means is associated with the lower face of the pad and, for example, is received within a recess in the lower face of the pad.
4. An elastomeric rail pad according to claim 3 wherein the reinforcing means comprises a member attached to the base of the pad.
5. An elastomeric rail pad according to claim 4 wherein the reinforcing member has a plurality of apertures disposed over its area, which apertures in use serve to grip elastomeric material of the rail pad
6. An elastomeric rail pad according to claim 1 wherein the reinforcing means is disposed within the pad by forming the pad thereabout.
7. An elastomeric rail pad according to any one of the preceding claims

wherein the reinforcing means is formed from a plastics material.

8. An elastomeric rail pad according to claim 7 wherein the plastics material is a polyamide.
9. An elastomeric rail pad according to claim 8 wherein the polyamide is nylon.
10. An elastomeric rail pad according to any one of the preceding claims wherein the reinforcing means is formed from a metal such as steel.
11. An elastomeric rail pad according to any one of the preceding claims wherein the reinforcing means is in the form of a cruciform extending between corners of the generally rectangular pad.
12. An elastomeric rail pad according to any one of the preceding claims having on the upper surface thereof, but not on the lower surface thereof, a plurality of protrusions to improve the attenuation of the rail foundation member.
13. An elastomeric rail pad according to claim 12 wherein the reinforcing means is attached to or recessed in the lower, flat, surface of the pad.
14. An elastomeric rail pad according to any one of the preceding claims wherein the reinforcing means is disposed within the pad, and either (i) the upper surface but not the lower surface have protrusions thereon, or (ii) both the upper and lower surfaces have protrusions thereon.
15. An elastomeric rail pad according to any one of the preceding claims wherein the generally rectangular plan configuration of the rail pad

may have rectangular recesses (in plan view) along two opposed sides midway along those sides, thereby defining ear portions of the pad on each end of such recesses, which ear portions in use locate the pad with respect to the anchoring assembly thereof between the overlying rail and the underlying rail foundation member.

16. An elastomeric rail pad according to claim 15 wherein the reinforcing means is configured such as to extend into the ear portions.
17. An elastomeric rail pad according to any one of the preceding claims wherein the pad is formed of an elastomeric material having from 50 to 90 IRHD hardness.
18. A reinforced elastomeric rail pad substantially as described herein with reference to the accompanying drawings Figures 5 to 13.
19. A method of protecting a foundation member for a railway rail from impulsive and other loads from rail traffic passing over the rail, which method comprises positioning between the foundation member and the railway rail an elastomeric rail pad as defined in any one of the preceding claims.
20. A method of preventing extrusion of a rail pad from between a foundation member and a railway rail, which method comprises providing the rail pad with reinforcing means as defined in any one of claims 1 to 18.

**AMENDED CLAIMS**

[received by the International Bureau on 11 August 1998 (11.08.98); original claims 1-20 replaced by new claims 1-21 (4 pages)]

1. An elastomeric rail pad of generally rectangular plan configuration, the pad having an upper face adapted to underlie the lower face of a rail, and a lower face adapted to overlie a concrete rail foundation member characterised in that the pad includes a reinforcement means (other than fabric reinforcement) which is generally parallel to its mean plane and extends at least between dispositions associated with generally opposing corners of the generally rectangular pad, said reinforcing means having a tensile strength such as to resist, in use of the pad, forces from traffic passing across the rail disposed thereabove otherwise tending to stretch the pad in the mean plane thereof.
2. An elastomeric rail pad of generally rectangular plan configuration, the pad having an upper face adapted to underlie the lower face of a rail, and a lower face adapted to overlie a concrete rail foundation member characterised in that the pad includes a reinforcement means in the form of a cruciform extending between corners of the generally rectangular pad, the reinforcing means being generally parallel to the mean plane of the generally rectangular pad and extending at least between dispositions associated with generally opposing corners of the generally rectangular pad, said reinforcing means having a tensile strength such as to resist, in use of the pad, forces from traffic passing across the rail disposed thereabove otherwise tending to stretch the pad in the mean plane thereof.
3. An elastomeric rail pad according to claim 1 or claim 2 wherein the reinforcing means is associated with the lower face of the pad or the upper face of the pad.
4. An elastomeric rail pad according to claim 1 or claim 2 wherein the reinforcing means is associated with the lower face of the pad and,

for example, is received within a recess in the lower face of the pad.

5. An elastomeric rail pad according to claim 4 wherein the reinforcing means comprises a member attached to the base of the pad.
6. An elastomeric rail pad according to claim 5 wherein the reinforcing member has a plurality of apertures disposed over its area, which apertures in use serve to grip elastomeric material of the rail pad
7. An elastomeric rail pad according to claim 1 or claim 2 wherein the reinforcing means is disposed within the pad by forming the pad thereabout.
8. An elastomeric rail pad according to any one of the preceding claims wherein the reinforcing means is formed from a plastics material.
9. An elastomeric rail pad according to claim 8 wherein the plastics material is a polyamide.
10. An elastomeric rail pad according to claim 9 wherein the polyamide is nylon.
11. An elastomeric rail pad according to any one of the preceding claims wherein the reinforcing means is formed from a metal such as steel.
12. An elastomeric rail pad according to claim 1 and any claim dependant thereon wherein the reinforcing means is in the form of a cruciform extending between corners of the generally rectangular pad.
13. An elastomeric rail pad according to any one of the preceding claims having on the upper surface thereof, but not on the lower surface thereof, a plurality of protrusions to improve the attenuation of the rail

foundation member.

14. An elastomeric rail pad according to claim 13 wherein the reinforcing means is attached to or recessed in the lower, flat, surface of the pad.
15. An elastomeric rail pad according to any one of the preceding claims wherein the reinforcing means is disposed within the pad, and either (i) the upper surface but not the lower surface have protrusions thereon, or (ii) both the upper and lower surfaces have protrusions thereon.
16. An elastomeric rail pad according to any one of the preceding claims wherein the generally rectangular plan configuration of the rail pad may have rectangular recesses (in plan view) along two opposed sides midway along those sides, thereby defining ear portions of the pad on each end of such recesses, which ear portions in use locate the pad with respect to the anchoring assembly thereof between the overlying rail and the underlying rail foundation member.
17. An elastomeric rail pad according to claim 16 wherein the reinforcing means is configured such as to extend into the ear portions.
18. An elastomeric rail pad according to any one of the preceding claims wherein the pad is formed of an elastomeric material having from 50 to 90 IRHD hardness.
19. A reinforced elastomeric rail pad substantially as described herein with reference to the accompanying drawings Figures 5 to 13.
20. A method of protecting a foundation member for a railway rail from impulsive and other loads from rail traffic passing over the rail, which

method comprises positioning between the foundation member and the railway rail an elastomeric rail pad as defined in any one of the preceding claims.

21. A method of preventing extrusion of a rail pad from between a foundation member and a railway rail, which method comprises providing the rail pad with reinforcing means as defined in any one of claims 1 to 19.

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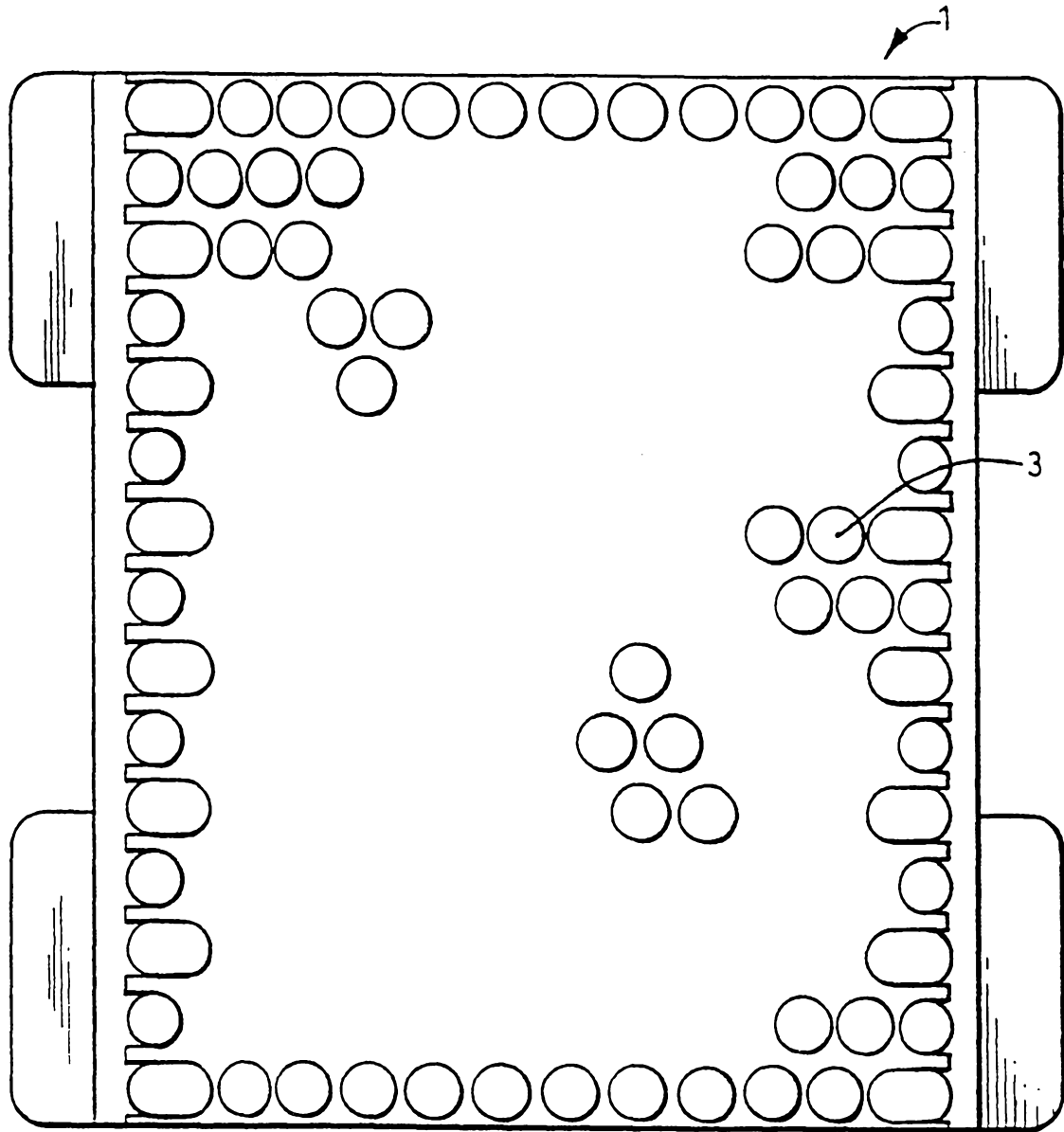


FIG. 1.

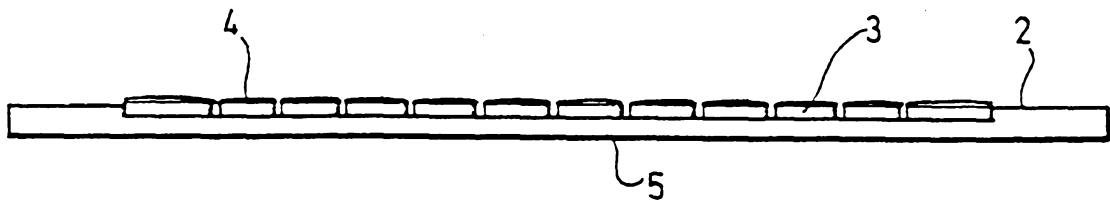


FIG. 2.

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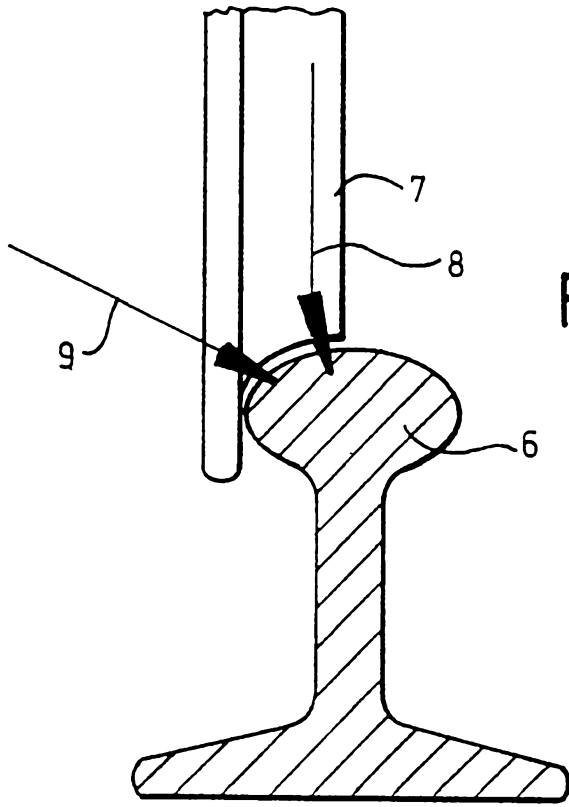


FIG. 3.

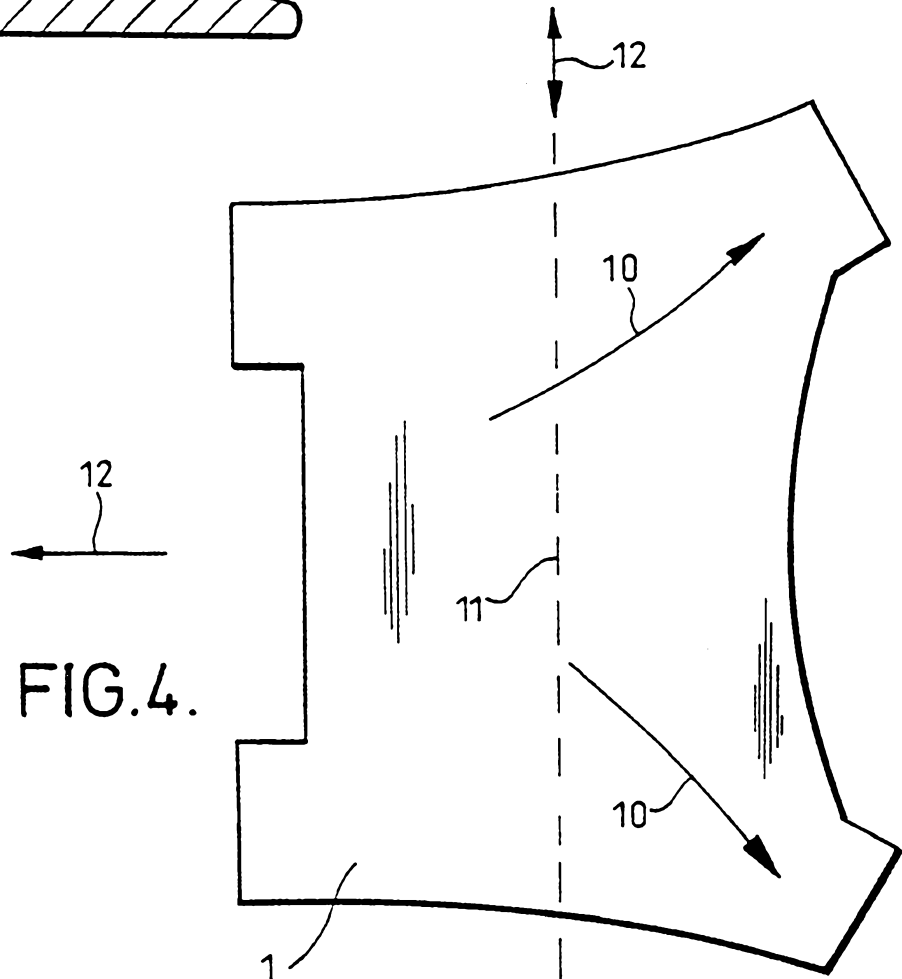
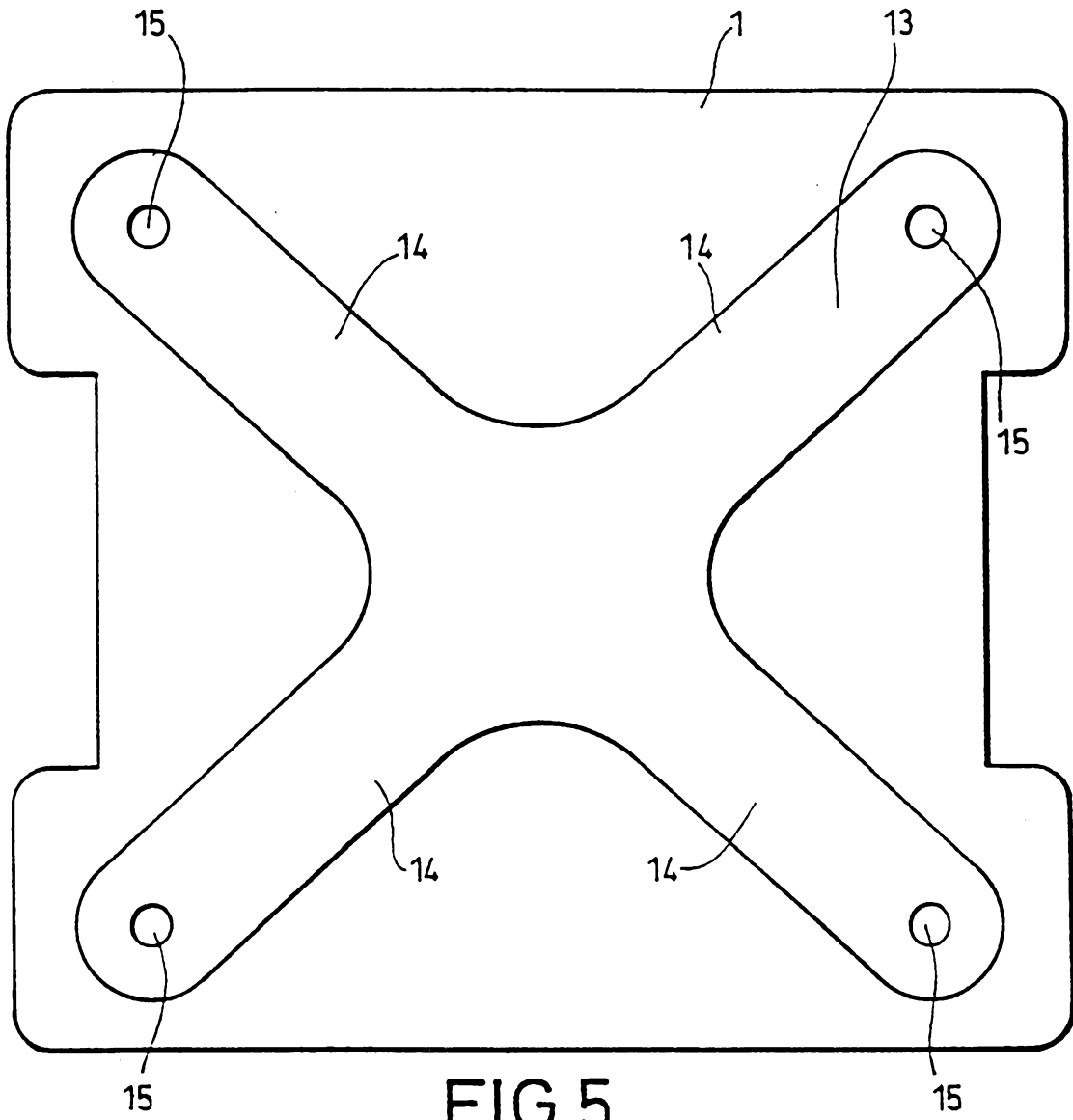


FIG. 4.



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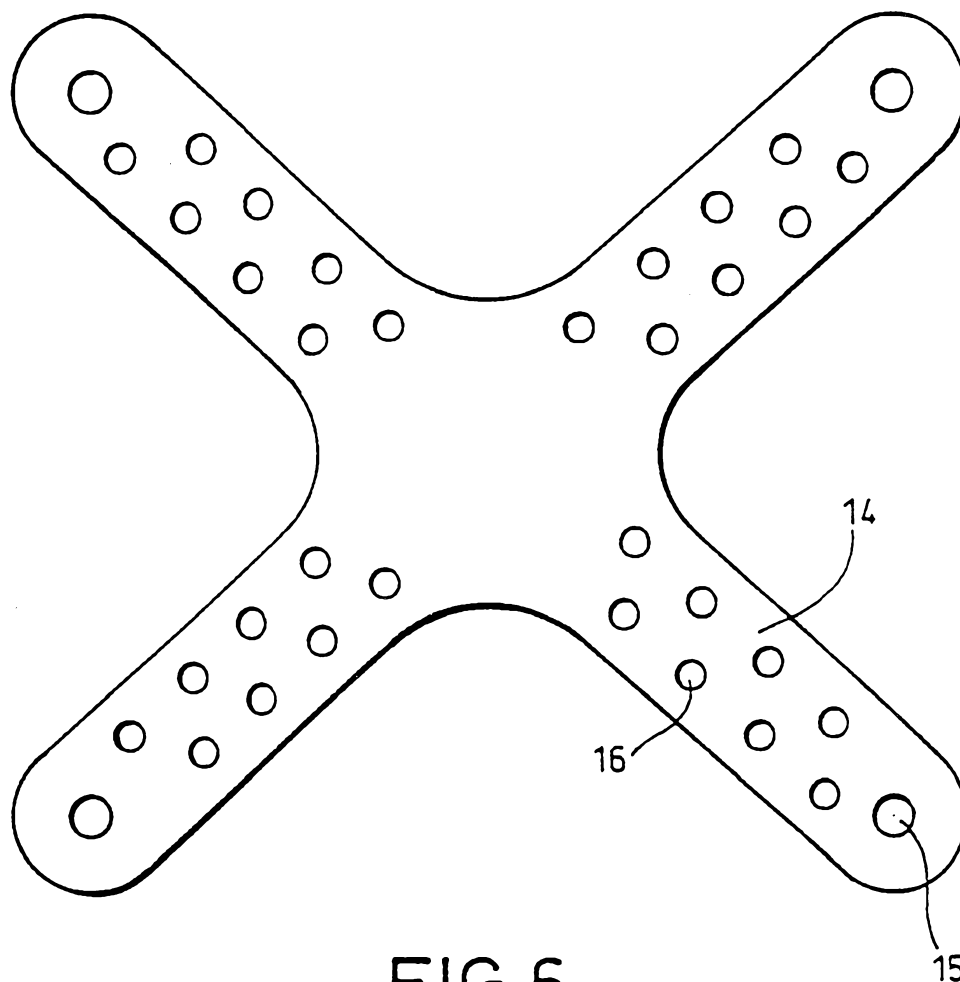


FIG. 6.

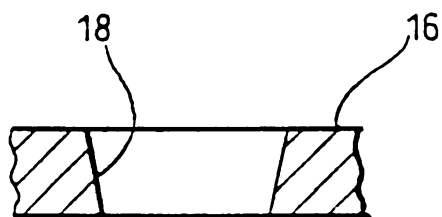


FIG. 7.

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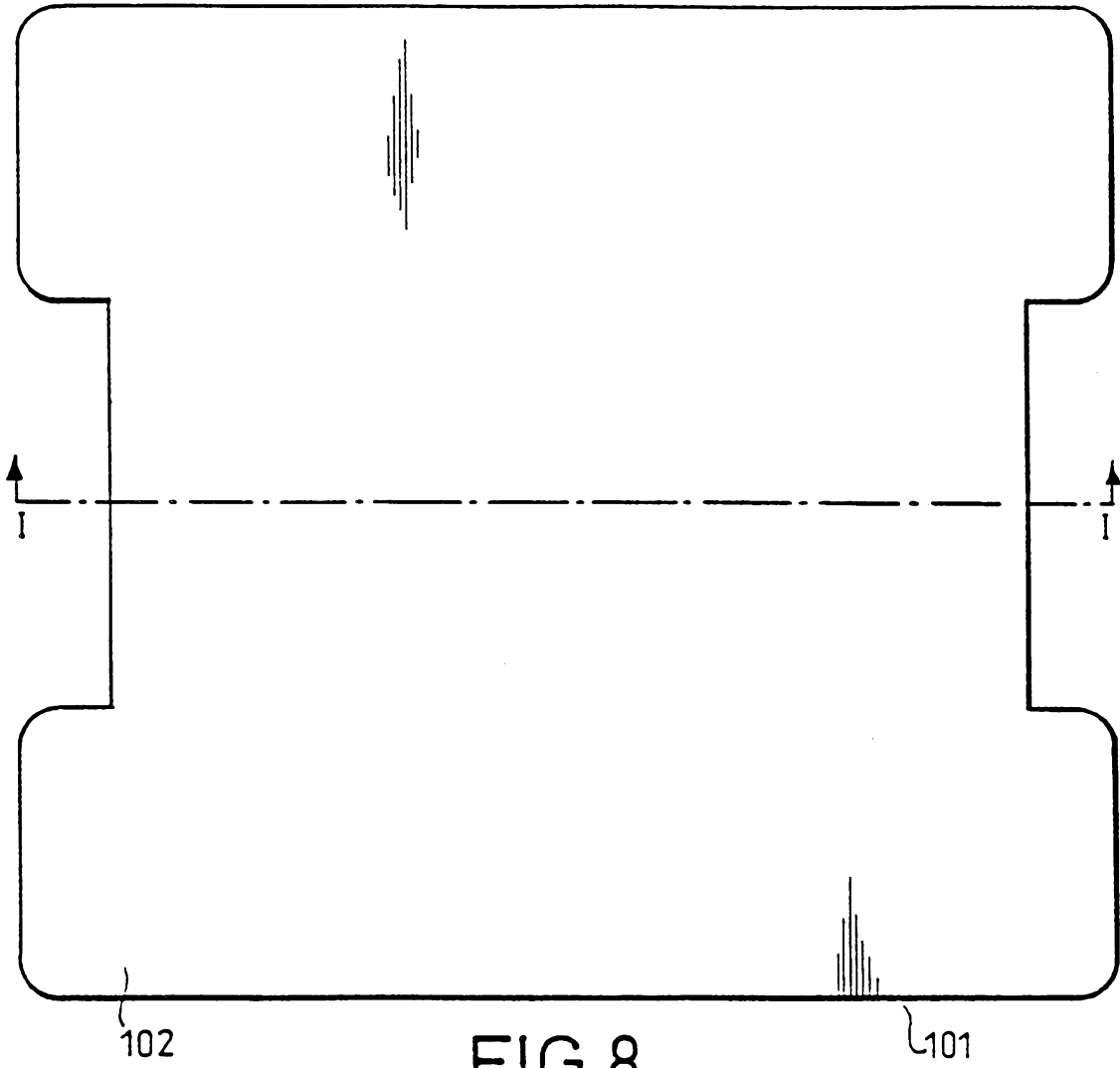


FIG. 8.

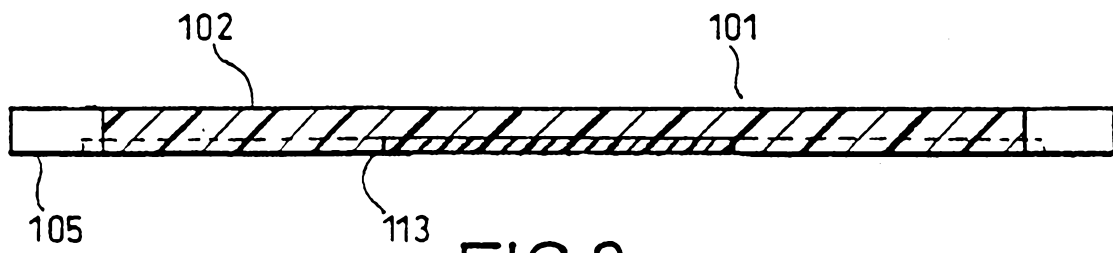


FIG. 9.

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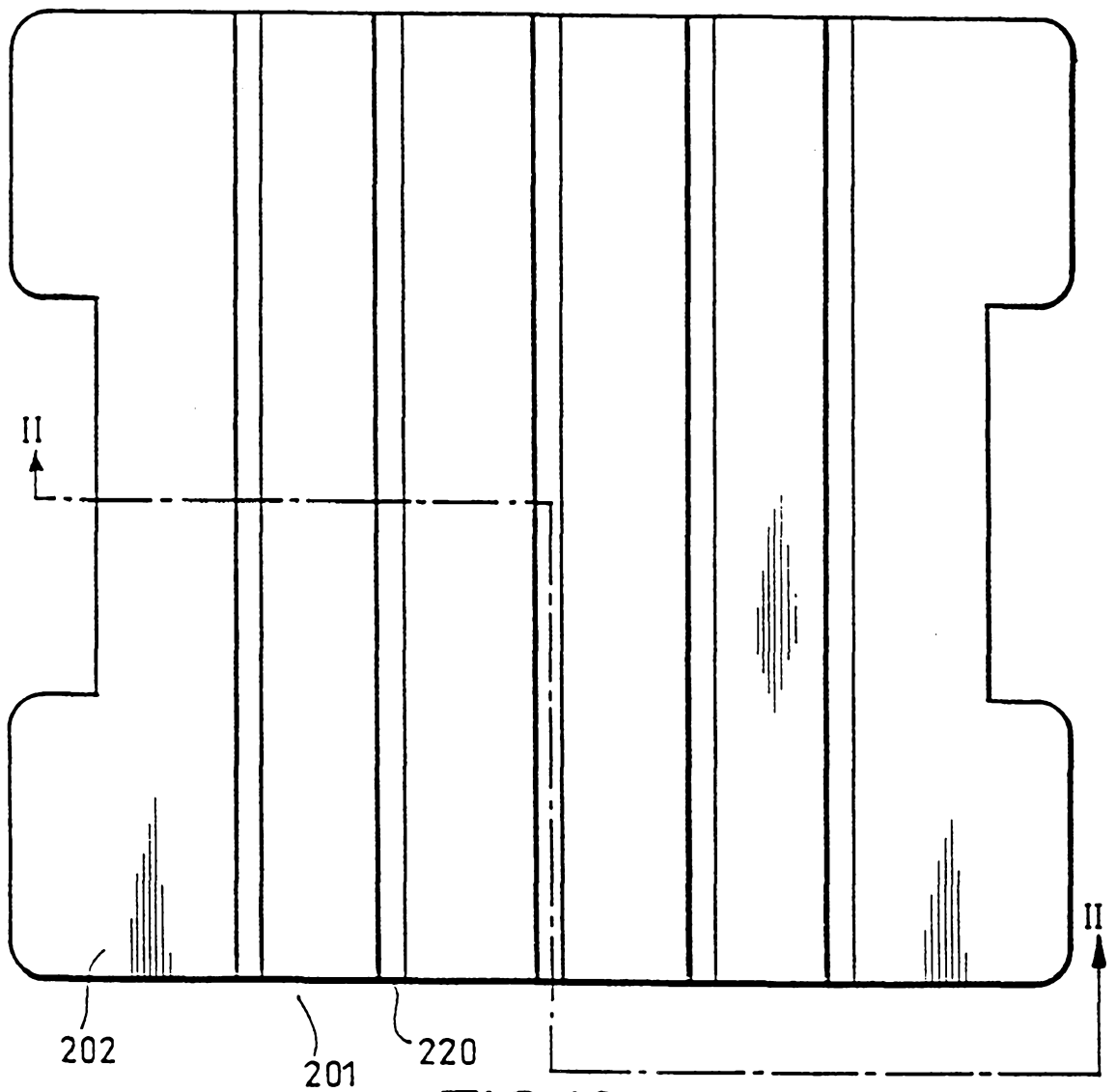


FIG.10.

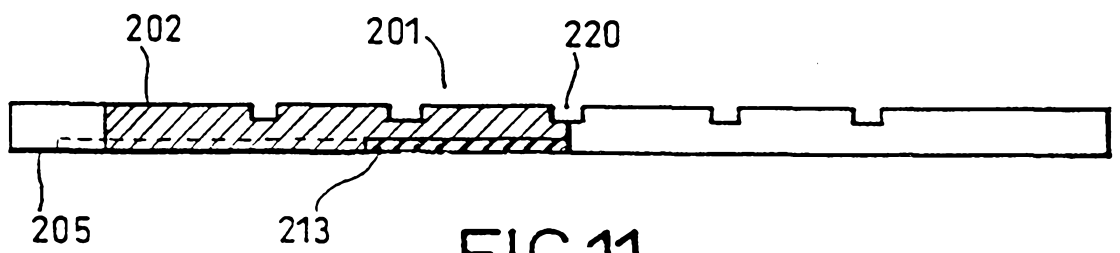
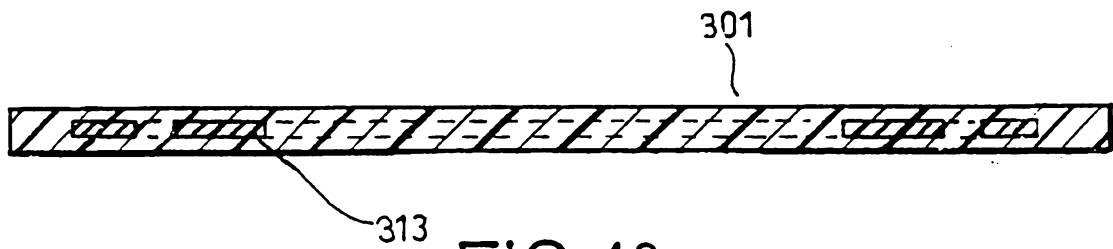
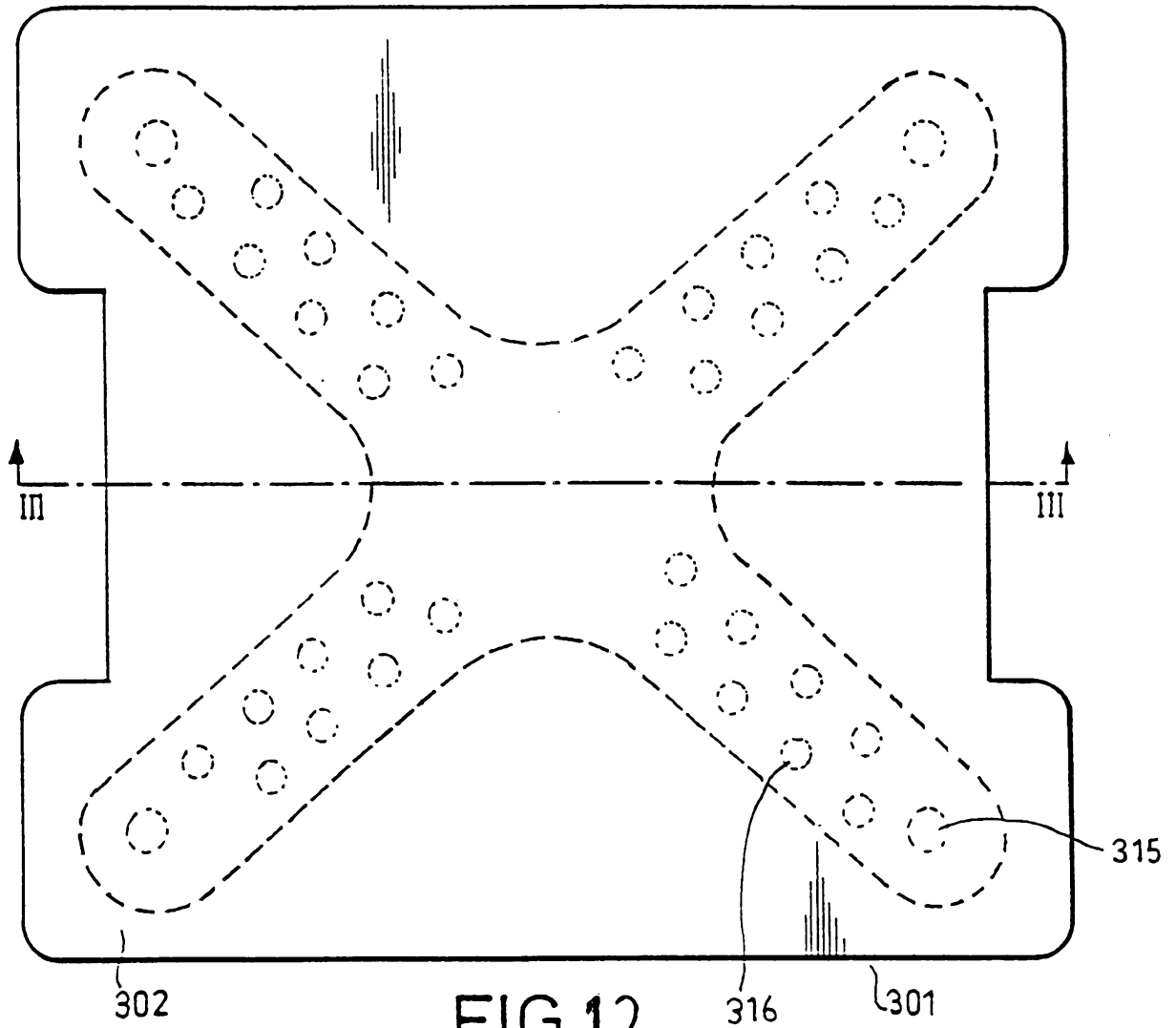


FIG.11.

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# INTERNATIONAL SEARCH REPORT

Int. .tional Application No

PCT/GB 98/00624

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 6 E01B9/68

According to International Patent Classification(IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 E01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 620 317 A (PANDROL LTD) 19 October 1994	1, 6-9, 12, 14-16, 18-20
A	see the whole document	10-12, 17
A	EP 0 191 308 A (CLOUTH GUMMIWERKE AG) 20 August 1986 see page 1, line 110 - page 3, line 60; figures 1-9	1, 11, 17-20
A	GB 2 152 119 A (MCKAY RALPH LTD) 31 July 1985 see page 3, line 11 - page 4, line 13; figures 1-3	1, 18-20

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

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Date of the actual completion of the international search

18 June 1998

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## INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/GB 98/00624

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