(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 112 063**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **83307057.6**

(51) Int. Cl.³: **E 01 B 7/10**

(22) Date of filing: **18.11.83**

(30) Priority: **01.12.82 GB 8234214**

(43) Date of publication of application:
27.06.84 Bulletin 84/26

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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(54) Welded railway crossing.

(57) There is disclosed a welded railway crossing vee which comprises a pair of rails (10, 11) which are arranged side-by-side so as to define a gap therebetween which extends longitudinally of the rails and throughout the height of the rails between the upper and lower surfaces thereof. A spacer plate (12) is arranged in the longitudinal gap so as to define spaces (13, 14) above and below the upper and lowr edges of the plate, and these spaces are filled with weld material. The weld material is harder and more durable than the material of the rails, and fills the spaces to such an extent as to be substantially flush with the upper and lower surfaces of the rails. A crossing nose is formed at one end of the pair of rails (10, 11) by machining of the upper edges of the rails at the nose end to such an extent that the wheel engaging surface of the nose area is constituted solely by weld material.

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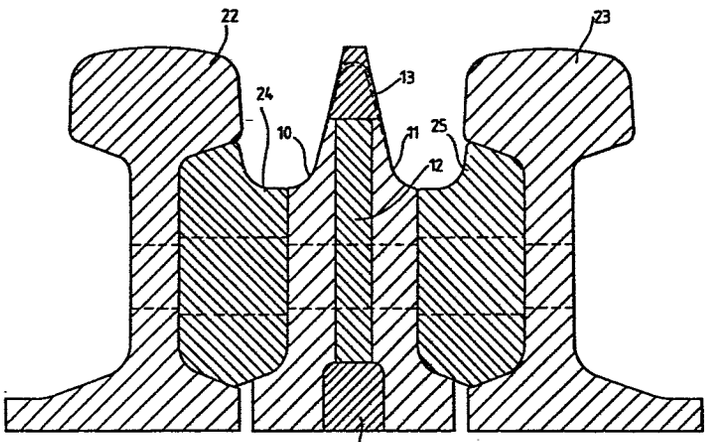


FIG.3.

Welded Railway Crossing

This invention relates to a welded railway crossing vee.

Evidently, railway crossings are subjected to substantial impact loads during travel of a rail vehicle over the crossing, and particularly at the point of transition or "nose" from one track to another. Further, if railway operators should require to operate with rail vehicles of greater weight than hitherto, and/or to travel over crossings at greater speed, then there would be commensurate increase in impact loadings applied to the crossings, especially at the points of transition or noses of the crossings.

It is known from GB 338,528 to provide a railway crossing or "frog" in which the rails which are joined to one side of the frog are provided with caps of wear proof material, and the rails which are joined to the otherside of the frog are provided with wear proof insertions placed in under cuts in the edge of the rails. A conventional spliced joint is used in the crossing i.e. drilled and bolted, and each cap is fitted and then retained by a fillet weld. This patent does not contain any disclosure about the formation of the usual crossing vee.

It is also known from GB 1,552,392 to provide a method of welding crossings into tracks where the crossing material and stock rail material are dissimilar in nature, and therefore are not suitable for direct welding together. This problem generally arises where crossings are manufactured from cast manganese steels which are incompatible with carbon steel rails. Therefore there is disclosed the use of an intermediate piece which is joined between the crossing and the stock rail. A cladding layer of manganese steel is applied to the surface of the intermediate piece by build-up welding, which joins the intermediate piece to the crossing (frog). To join the intermediate piece to the

stock rail, an austenitic Cr-Ni-Mn steel cladding layer is applied adjacent to the manganese steel cladding layer and extending over the surface of the adjacent end of the stock rail. The austenitic cladding layer then requires a hardened surface to avoid undue wear of the insert.

The welded connection disclosed in this patent takes place outside the crossing, and there is no disclosure of the manner by which a crossing vee is formed.

The invention, however, seeks to provide a crossing having improved resistance and durability to impact loading, and which comprises a crossing vee having its wheel engaging surface formed exclusively by weld material. This provides in simple manner a hard-wearing, tough surface at the crossing vee which is equivalent to that achievable by capping, but without additional components and labour and machining.

According to one aspect of the invention there is provided a welded railway crossing vee comprising a pair of rails which are arranged side-by-side so as to define a gap therebetween which extends longitudinally of the rails and throughout the height of the rails between the upper and lower surfaces thereof, a spacer plate arranged in said gap so as to define spaces above and below the upper and lower edges of the plate, weld material which is harder and more durable than the material of the rails and which fills the spaces to such an extent as to be substantially flush with the upper and lower surfaces of the rails, and a crossing nose formed at one end of the pair of rails by machining of the upper edges of the rails at said one end to such an extent that the wheel-engaging surface of the nose area is constituted solely by weld material.

According to a further aspect of the invention there is provided a method of forming a welded railway

crossing vee which comprises arranging a pair of rails side-by-side so as to define therebetween a gap which extends longitudinally of the rails and throughout the height of the rails between the upper and lower surfaces thereof, positioning a spacer in the gap so as to define spaces above and below the upper and lower edges of the spacer respectively, depositing weld material which is harder and more durable than the material of the rails, in said spaces until the material, when hardened, is substantially flush with the upper and lower surfaces of the rails, and forming a crossing nose at one end of the pair of rails by machining the upper edges of the rails at said end to such an extent that the wheel-engaging surface of the nose area is constituted solely by the weld material.

Any suitable commercially available weld material may be used, provided that it is harder and more durable than the material from which the rails are made. One example of a suitable weld material is obtained from 5% Cr ½% Mo type welding wire (A34), which has been found to provide an increased hardness above 330 HV with Grade A rail.

The spacer (plate) may be generally rectangular in shape, and arranged so that its upper and lower edges extend substantially horizontally. In order to further strengthen the construction of the nose, the spacer plate may be reduced in height in the region of the "nose" end of the rails, so that a greater volume of weld materials can be deposited above the spacer plate at the nose end than at the other regions of the weld space above the upper edge of the spacer.

Usually, in the region of the nose, two adjacent rails will be securely fastened to the nose, one on either side, in any convenient manner e.g. by bolts, with machinable blocks being positioned between the rails and the nose.

The welded crossing vee of the invention may

comprise part of an immovable or "common crossing", or may comprise a part of a movable "swing nose crossing".

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic view of a crossing nose layout incorporating a welded crossing vee according to the invention;

Figure 2 is a section view of a centre bar of the welded crossing;

Figure 3 is a transverse sectional view at the nose of the crossing;

Figure 4 is a transverse sectional view of an extended nose of the crossing, the section being taken at a distance of 63 mm from the nose for a 1 in 7½ crossing and at a proportionate distance for crossings of other angles;

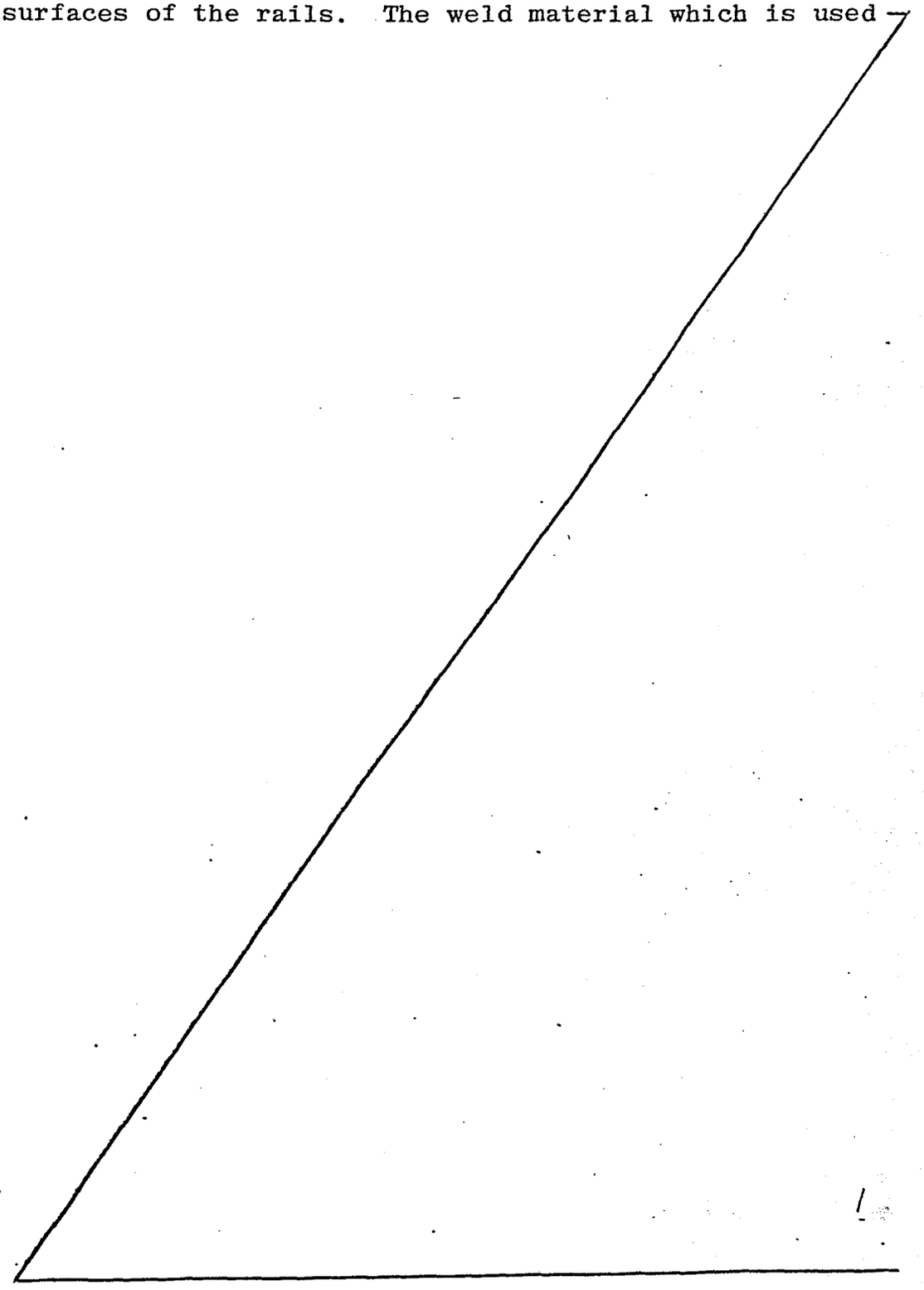
Figure 5 is a schematic view, similar to Figure 2, illustrating the manner by which an extended nose is formed at the end of two rails which are joined together to form the crossing; and

Figure 6 is a schematic illustration of a movable, swing-nose crossing incorporating a welded crossing vee according to the invention.

Referring now to the drawings, Figure 1 is a schematic plan illustration of a railway track arrangement 1, incorporating a welded crossing vee according to the invention. Figure 2 illustrates a centre bar of the crossing, in which a nose is formed at one end which has its entire surface constituted by the weld material. The crossing or frog 1 shown in Figure 1 is a fixed or "common crossing".

The nose of a welded railway crossing is formed by arranging a pair of rails side-by-side so as to define a gap therebetween which extends longitudinally of the rails and throughout the height of the rails between the upper and lower surfaces thereof.

A spacer plate is arranged in the gap so as to define spaces above and below the upper and lower edges of the plate, and weld material is deposited into these spaces to such an extent that the material when hardened, is substantially flush with the upper and lower surfaces of the rails. The weld material which is used



is carefully selected to be harder and more durable than the material from which the rails are made.

A crossing nose is formed at one end of the pair of rails by machining of the upper edges of the rails at this end to such an extent that the surface of the nose is constituted solely by weld material.

One preferred example of weld material is that obtained from 5%Cr ½%Mo type welding wire (A34) which provides an increased hardness above 330 HV with Grade A rail.

Referring to Figure 3, there is shown the manner of formation of the nose of the crossing. Thus, as shown in Figure 3, a pair of rails 10 and 11 are arranged side-by-side and define a longitudinal gap therebetween in which a longitudinal spacer plate 12 is positioned. The spacer plate defines spaces 13 and 14 above and below the upper and lower edges thereof, and weld material fills these spaces to such an extent as to be substantially flush with the upper and lower surfaces of the rails. Thereafter, as indicated above, a crossing nose is formed at one end of the pair of rails 10 and 11, by machining of the upper edges of the rails at this end to such an extent that the surface of the nose is constituted solely by the weld material, which is harder and more durable than the material from which the rails are formed.

Figure 2 illustrates in more detail the manner by which the nose is formed at the end of the pair of rails. Thus, as shown in Figure 2, weld material deposited in the space above the upper edge of the spacer plate 12 is shown at 15 , and subsequently the contour of the nose is formed by machining-away of the upper edges of the rails and partly through the weld material 15, along the contour line 16.

Referring now to Figures 4 and 5, there is shown the formation of an extended nose for the crossing, which is

obtained by providing a spacer plate which is reduced in height, relative to the remainder of the plate, in the region of the nose of the crossing. This reduction in height of the spacer plate allows a greater volume of weld material to be deposited at the nose end, thereby increasing the strength of the nose construction. The finished profile of the nose is shown by dashed line 17 in Figure 5, which is formed by machining through the head 18 of a rail indicated generally by reference numeral 19 having a web 20 and a foot 21. The foot of the wing rail is made to conform to the shape of the Vee foot, either by running-out, or shaping round the nose.

If desired, at least the nose extended region of the crossing may be formed by weld material which is built-up with suitable weld material such as Tensitrode 550 (ESAB) , or Migweld A33, prior to electro-slag welding.

Referring to Figure 3, the crossing is illustrated arranged between two adjacent rails 22 and 23 which are securely fastened to the nose with machinable blocks 24 and 25 positioned between these rails and the nose.

Particularly advantageous combinations of rail section material, and weld material, are as given below:

1. Any rail section with 1% (or thereabouts) chrome content with 2¼% chrome, 1% molybdenum welding wire.
2. Any rail section made of Grade A rail steel with 2¼% chrome, 1% molybdenum welding wire.
3. Any rail section made of Grade A rail steel with 5% chrome, ½% molybdenum welding wire.
4. Any rail section made of Grade B steel with 2¼% chrome, 1% molybdenum welding wire.
5. Any rail section made of Grade B steel with 5% chrome, ½% molybdenum welding wire.
6. Any rail section made of bainitic steel with 5% chrome., ½% molybdenum welding wire.
7. Any rail section made of bainitic steel with 2¼%

chrome, 1% molybdenum welding wire.

8. Any rail section made of low carbon austenitic manganese steel with 1% carbon, 12-14% manganese welding wire.

While there has been described above a welded crossing vee to be used in a fixed crossing (as shown in Figure 1), it should be understood that the invention also includes a movable or "swing nose" crossing which is provided with a welded crossing vee, generally similar to that described above and illustrated in Figures 2 to 5. However, the profile of the nose of the welded crossing vee will be altered, to suit the requirements of a swing nose crossing.

There is shown schematically in Figure 6 a swing nose crossing in which the welded crossing vee will be provided. The crossing is designated generally by reference 26, and comprises a swing nose 27 which is movable between a "through road" position shown in full lines in Figure 6 to a "turnout road" position shown in dotted lines.

The nose portion 28 of the swing nose comprises a welded crossing vee according to the invention, and is constructed generally similarly to that described above with reference to Figures 2 to 5 for a fixed crossing. Thus, the nose portion 28 is formed by a pair of rails arranged side-by-side so as to form a gap therebetween which extends generally longitudinally of the rails and throughout the height of the rails between the upper and lower surfaces thereof, a spacer plate arranged in the gap so as to define spaces above and below the upper and lower edges of the plate, and weld material which is harder and more durable than the material of the rail and which fills the spaces so as to be substantially flush with the upper and lower surfaces of the rails.

A nose is then formed which has its rail wheel engaging surface constituted solely by the (harder and

more durable) weld material, by machining the upper edges of the rails and into the weld material until the desired profile for a swing-nose is obtained.

The crossing has a usual sliding vee joint 29, and flexing point 30.

Claims:

1. A welded railway crossing vee comprising a pair of rails (10, 11) which are arranged side-by-side so as to define a gap therebetween which extends longitudinally of the rails and throughout the height of the rails between the upper and lower surfaces thereof, a spacer plate (12) arranged in said gap so as to define spaces (13, 14) above and below the upper and lower edges of the plate, weld material which is harder and more durable than the material of the rails and which fills the spaces to such an extent as to be substantially flush with the upper and lower surfaces of the rails, and a crossing nose formed at one end of the pair of rails by machining of the upper edges of the rails at said one end to such an extent that the wheel-engaging surface (16) of the nose area is constituted solely by weld material.

2. A welded railway crossing vee according to claim 1, in which the weld material is derived from 5% Cr ½%Mo type welding wire.

3. A welded railway crossing vee according to claim 1 or 2, in which the spacer plate (12) is generally retangular in shape, and arranged so that its upper and lower edges extend substantially horizontally.

4. A welded railway crossing vee according to claim 3, in which the spacer plate is reduced in height in the region of the nose end of the rails, and a greater volume of weld material is deposited above the spacer plate at the nose end than at the other region of the weld space above the upper edge of the spacer plate (Fig. 5).

5. A welded railway crossing vee according to any one of the preceding claims, in which two adjacent rails (22, 23) are securely fastened to the nose, one on either side thereof, with machinable blocks (24, 25) being positioned between each rail and the nose.

6. A welded crossing vee according to any one of the preceding claims, comprising a fixed crossing (Figure 1) or a movable crossing (Figure 6).

7. A method of forming a welded railway crossing vee which comprises arranging a pair of rails side-by-side so as to define therebetween a gap which extends longitudinally of the rails and throughout the height of the rails between the upper and lower surfaces thereof, positioning a spacer in the gap so as to define spaces above and below the upper and lower edges of the spacer respectively, depositing weld material which is harder and more durable than the material of the rails, in said spaces until the material, when hardened, is substantially flush with the upper and lower surfaces of the rails, and forming a crossing nose at one end of the pair of rails by machining the upper edges of the rails at said end to such an extent that the wheel-engaging surface of the nose area is constituted solely by the weld material.

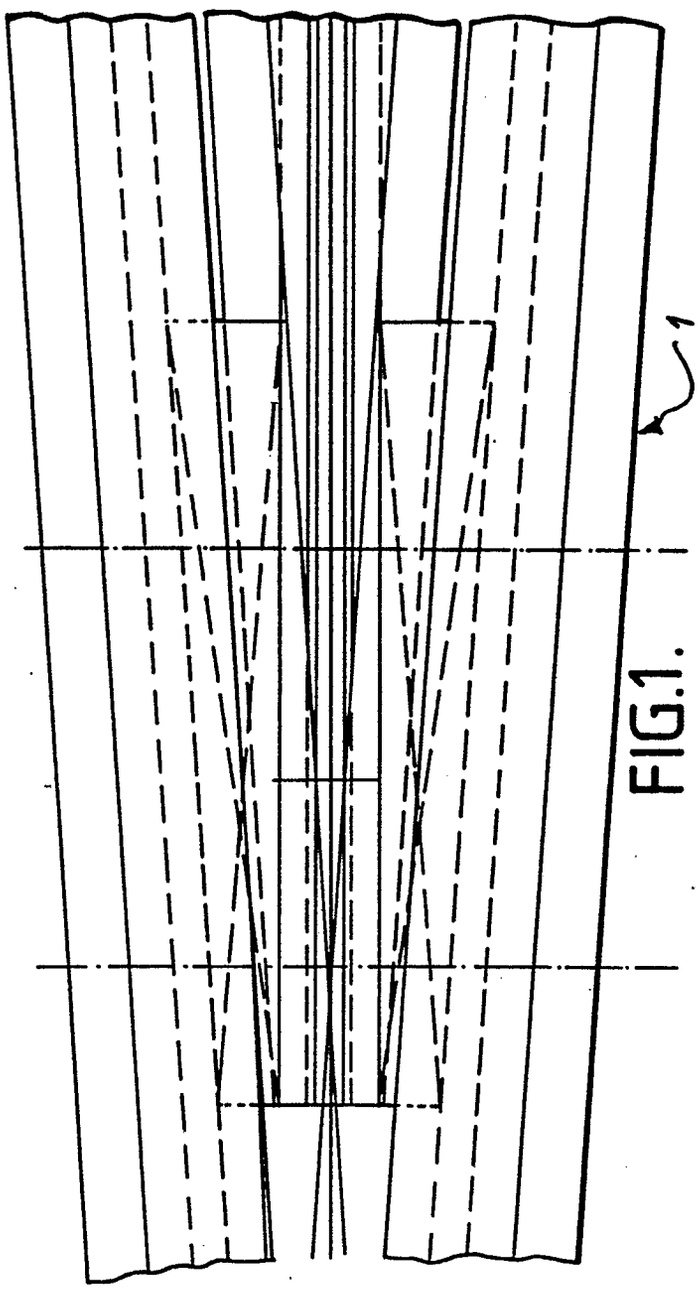
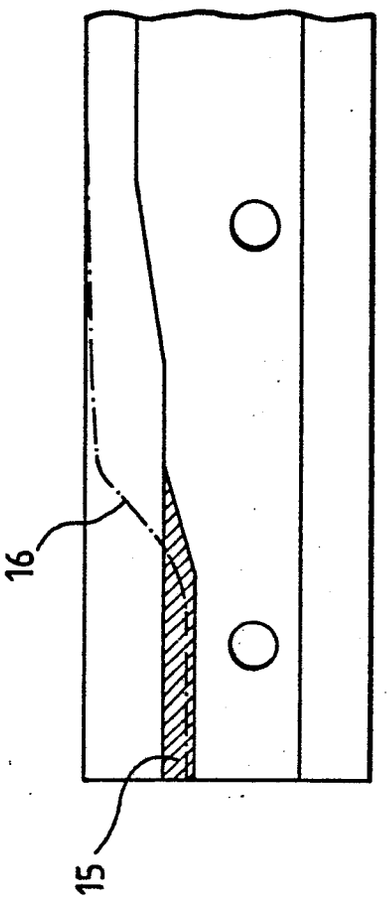


FIG.1.

FIG.2.



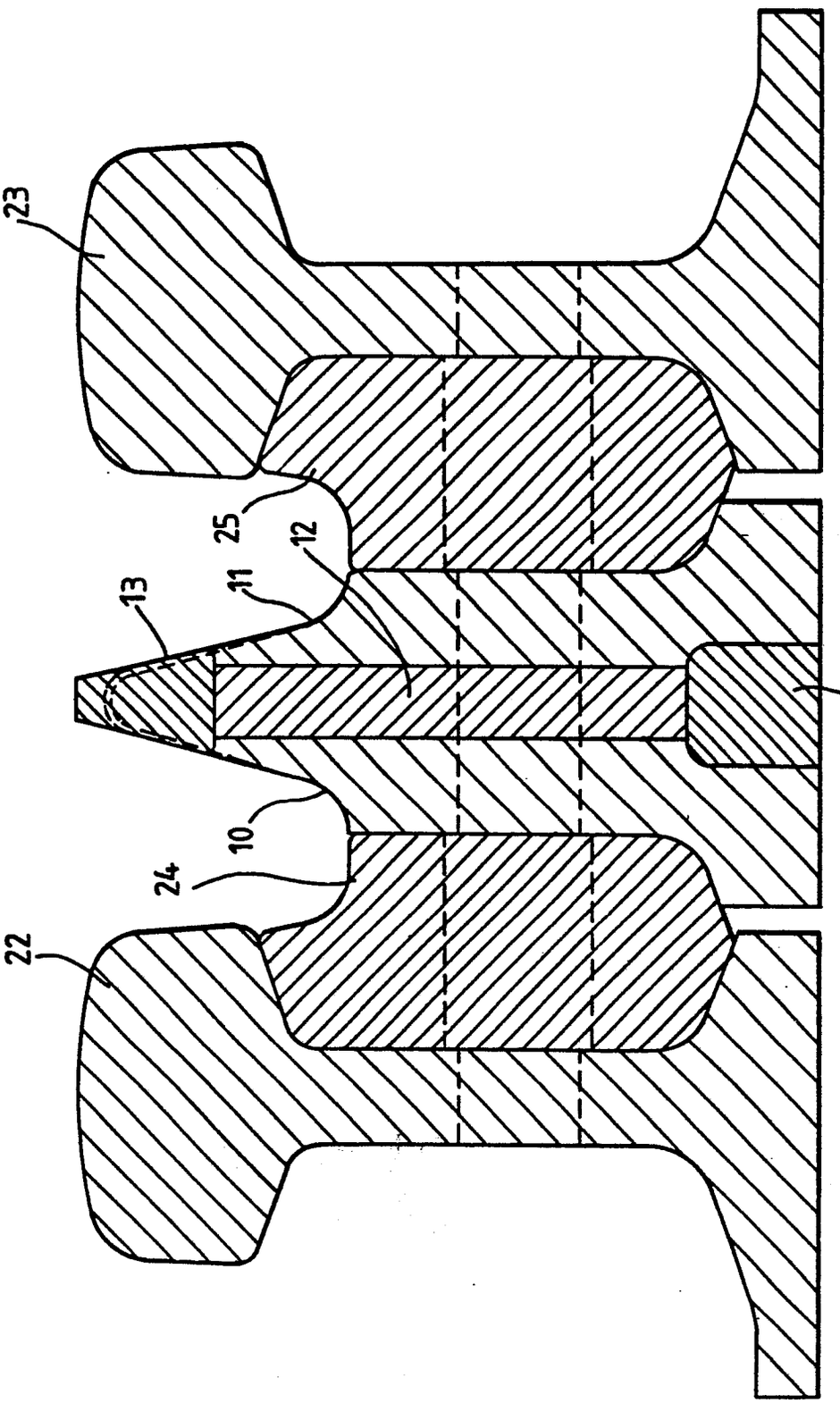


FIG.3.

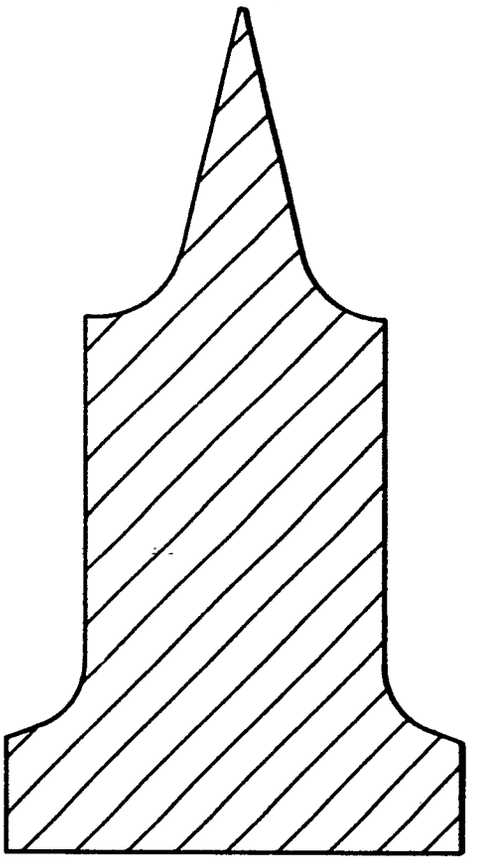


FIG.4.

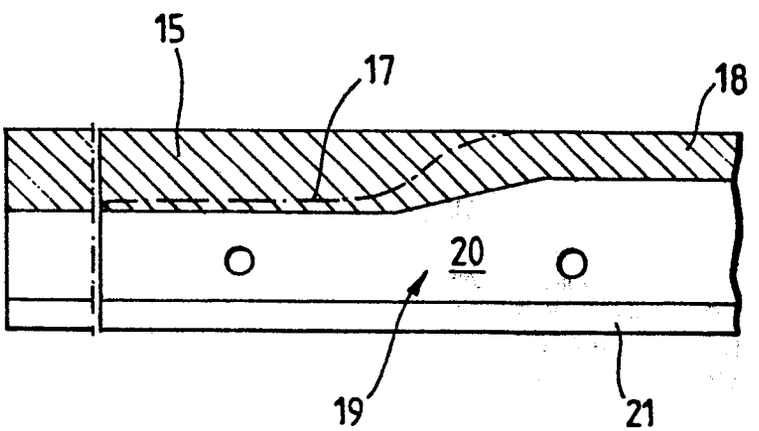


FIG.5.

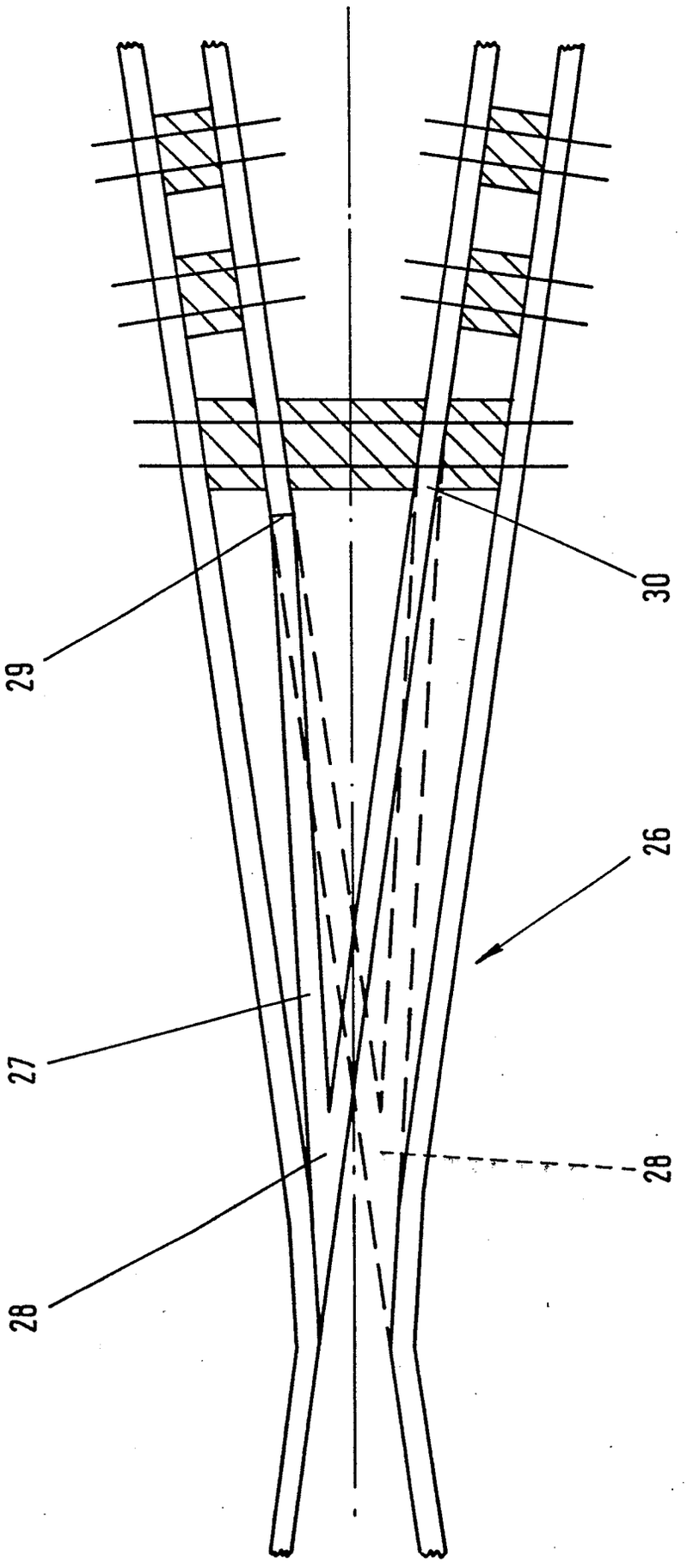


FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

0112063
Application number

EP 83 30 7057

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	DE-B-1 145 654 (MASCHINENFABRIK DEUTSCHLAND A.G.) * Column 1, line 35 - column 2; figures 1-4 *	1,3,5	E 01 B 7/10
A	DE-C- 512 791 (VEREINIGTE STAHLWERKE A.G.) * Page 1, line 51 - page 2, line 66; figures 1-3 *	1,5	
A	FR-A- 670 932 (GRAND) * Page 2, lines 61-92; figures 12-15 *	1	
A	AT-B- 343 712 (VEREINIGTE ÖSTERREICHISCHE EISEN- UND STANLWERKE)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			E 01 B 7/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	22-02-1984	PAETZEL H-J

CATEGORY OF CITED DOCUMENTS

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