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(54) Rail drilling machines and formers therefor

(57) A portable drilling machine for in situ drilling of a hole in the webs of a rail (10) for a railway track has a base (12), a drill (20) movable with respect to the base for drilling a hole in the web, a former (30) adapted to be received between the flanges of the rail to locate the machine on the rail and a clamping jaw (18) engageable with the opposite side of the rail web to clamp the machine on the rail.

The former (30) is rotatably mounted on the base (12) to a plurality of predetermined positions, in each of which the former offers a different profile, whereby the former can engage a plurality of different rail sections. The former may comprise two identical former templates (30), each of which is rotatably mounted on the base to a plurality of predetermined positions.

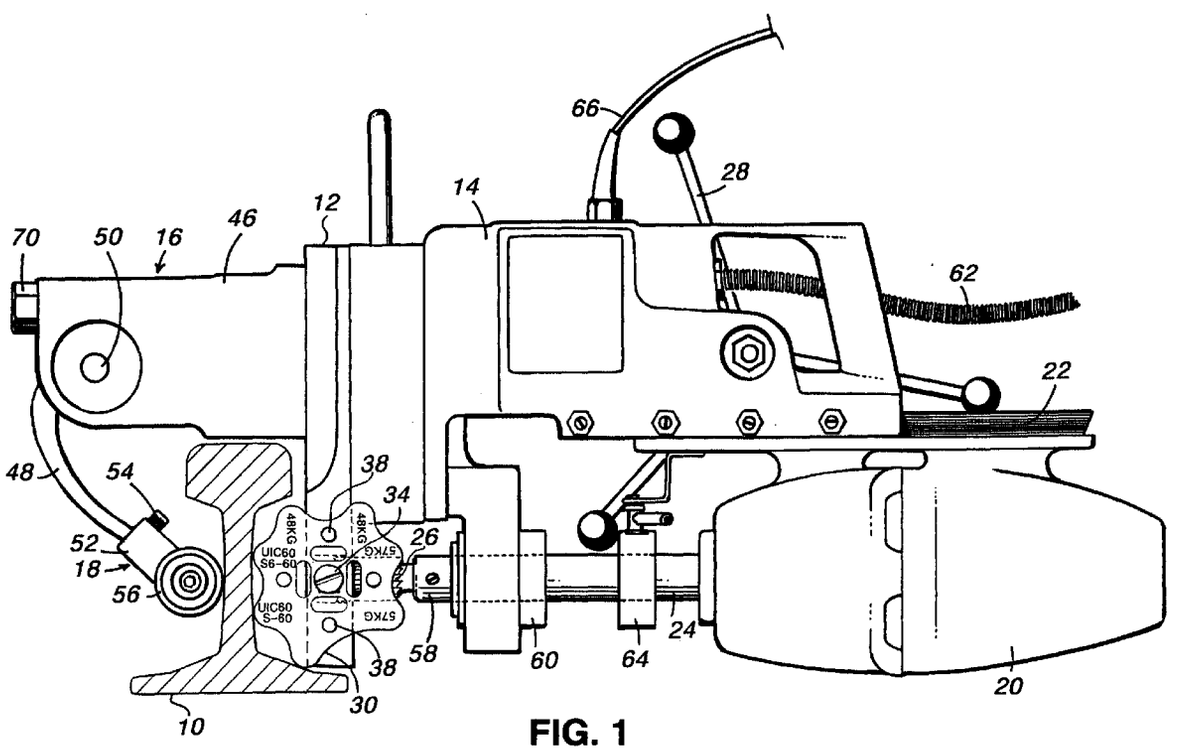

FIG. 1

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Description

The present invention relates to rail drilling machines, particularly (but not exclusively) for drilling holes in the ends of railway tracks to receive fishplate bolts and for drilling signalling connection holes, and to the formers for positioning the rail drilling machines correctly on the railway tracks.

One known rail drill, disclosed in GB-A-2211447, takes the form of a base from one side of which extends a column which is substantially horizontal in use, along which an electric drill is slidably displaceable for advancing and retracting a drill spindle and annular cutter with respect to the rail to be drilled. A former is located on the opposite side of the base and is shaped to be received between the flanges of the rail to be drilled. A clamping jaw is also connected to the base and is displaceable so as to engage the web of the rail on the opposite side of the web to the former and thereby clamp the base on the rail. The location of the former on the rail positions the base (and thus the rail drill) accurately with respect to the rail and ensures that the aperture is drilled at the correct, predetermined location on the web.

The aforementioned rail drill operates extremely satisfactorily. However, not all railway track rails are of the same profile and it is thus necessary to ensure that the correct former is secured to the base of the rail drill, otherwise the drill will not be located correctly on the rail. Thus, if there is a possibility that the drill may need to be used on more than one profile of rail or if an operator is unsure as to which profile of rail needs to be drilled, it is necessary to carry several formers, each former corresponding to a particular rail profile, and to attach the appropriate former to the base of the rail drill on site.

The formers are of sturdy construction and the weight of several formers is considerable. The fitting of the correct former may also result in a significant delay before drilling of the rail can take place, thereby increasing the cost of the operation. Moreover, because the formers are detachable from the base of the rail drill, there is a risk that one or more formers may be misplaced.

It is thus an aim of the present invention to provide a rail drilling machine and a former therefor which can be used with rails of more than one profile.

In accordance with a first aspect of the present invention, there is provided a portable drilling machine for in situ drilling of a hole in the web of a rail for a railway track, comprising a movable drill or annular cutter for drilling a hole in the web, a former adapted to be received between the flanges of the rail on one side of the rail to locate the machine on the rail and a clamping jaw engageable with the rail web on the opposite side to the former to clamp the machine on the rail, characterised in that the former is rotatable to a plurality of predetermined angular orientations in each of which the former presents a different profile, whereby the former can engage a plurality of different rail sections.

The present invention allows one rail drill to be used on rails of more than one profile and removes the need to carry separate formers to be fitted to the drill on site.

In a preferred embodiment, the former comprises two substantially identical spaced apart former templates, each of which is rotatable to a plurality of predetermined orientations. This arrangement greatly reduces the weight of the assembly and allows a relatively large number (typically three or four) of predetermined former orientations to be used.

The drilling machine may further comprise a base and the former is preferably rotatably mounted on the base.

The drilling machine may further comprise one or more apertures or recesses on the former or the base which receive a corresponding projection on the base or former respectively to retain the former in each of the predetermined angular positions. The former may be displaceable along its rotational axis to disengage the or each projection and recess.

The former may be adapted to engage the rail at three or more spaced apart locations and the former is preferably rounded at those locations. This assists in correct location of the former on the rail as the clamp is tightened.

The points of contact of the former may be formed as lobes and at least one lobe may be arranged to engage a rail in more than one of the predetermined orientations of the former.

The former may be designed to engage a plurality of different rail profiles in the same orientation of the former.

Preferably, the former is also held captive on the machine, to reduce the likelihood of loss of components and the risk and cost associated therewith.

In accordance with a second aspect of the invention, there is provided a former for a portable drilling machine of the type having a movable drill or annular cutter for drilling a hole in the web, a former adapted to be received between the flanges of the rail on one side of the rail to locate the machine on the rail and a clamping jaw engageable with the rail web on the opposite side to the former to clamp the machine on the rail, for in situ drilling of a hole in the web of a rail for a railway track characterised in that the former is rotatable to a plurality of predetermined angular orientations in each of which the former presents a different profile, whereby the former can engage a plurality of different rail sections.

By way of example only, a specific embodiment of the present invention will now be described, with reference to the accompanying drawings, in which:-

Fig. 1 is a side view of an embodiment of portable rail drilling machine in accordance with the present invention;

Fig. 2 is an enlarged perspective view of the former of the machine of Fig. 1;

Figs. 3 to 5 are cross-sections through rails of dif-

ferent profiles, showing the appropriate orientation of the former in each case; and

Fig. 6 is a cross-section through two rails of slightly different profiles, showing how the same orientation of the former can be used in both cases.

The drawings show a drilling machine in accordance with the invention positioned on and clamped to a rail 10 for drilling the bolt holes for fishplates. The machine comprises a base 12 with a horizontal column 14 thereon. Opposite the column 14 is a clamping mechanism 16 having a clamping jaw 18. An electric power drill 20 is mounted by a slide 22 on the column 14 and has a drill spindle 24 for supporting at its free end a drill bit 26. The column 14 has a handwheel 28 for advancing and retracting the electric drill 20 with its drill spindle 24. The base 12 has a hole through which the drill bit 26 can pass with clearance so as to engage the web of the rail.

The lower end of each of the lateral edges of the base 12 is provided with a planar former template 30. The two templates are identical and in the illustrated embodiment each is provided with seven lobes 32a-32g. Each template 30 is rotatably mounted about an axis extending perpendicularly to the plane of the template by means of a bolt 34 whose shank passes through an aperture 36 in the template and is threadedly received in an aperture in the lower end of the lateral edge of the base. Each template 30 may be secured in one of four predetermined angular positions, spaced apart by intervals of 90°, by means of two short metal dowels 38 projecting from the edge of the base 12, equally spaced from the securing bolt 34 and located diametrically opposite one another.

Each template 30 is provided with four identical through apertures 40a, to 40d equally angularly spaced around the axis of rotation of the template and equidistant from the axis, the spacing of each pair of apertures on opposite sides of the axis corresponding to the spacing of the dowels 38 and the diameter of the apertures 40 corresponding to the diameter of the dowels 38. Each template may thereby be oriented into one of four predetermined angular positions by slackening the securing bolt 34, withdrawing the template away from the edge of the base to disengage the dowels 38 and two of the apertures 40, rotating the template to align the appropriate diametrically opposed pair of apertures 40 on the appropriate dowels 38, engaging the dowels 38 and the two apertures 40 and securing the template in position by means of the securing bolt 34. Alternatively, the template may be provided with dowels in place of the apertures 40, for engagement in apertures in the base 12 instead of dowels. The correct orientation is aided by etching the appropriate rail profile on the template (e.g. 57KG, 48KG, UIC60 S-60, as illustrated). The markings may also be colour-coded, if desired.

In the illustrated embodiment, the templates 30 are normally held captive on the base 12 by means of the securing bolts 34. However, by removing the bolts 34 the templates 30 can also be removed, if desired. In other words, the templates need not be permanently rotatably mounted on the base. Instead, it is possible to manoeuvre the templates to the correct orientation independently of the rest of the drilling machine and then secure them in position by means of the dowels 38, apertures 40 and the securing bolts 34.

As illustrated in Figs. 3 to 5, the template is shaped so that in each angular orientation of the template three lobes of the template engage a track rail. The figures illustrate that by securing the template in three different orientations, angularly spaced apart by 90°, the template is designed such that three different rail profiles can be engaged by the template, three lobes of the template engaging the rail face in each case. (In fact, in the orientation shown in Figs.3 and 6, the three lobes are designed to operate with two similar but slightly different rail profiles by arranging for the lobes to contact the rail profiles at the points where the two profiles intersect.) Alternatively, by appropriate design of the templates 30, four or more lobes may contact the rail profile on one or more orientations.

The drilling machine is otherwise very similar to that described in GB-A-2211447, and a brief description is given below.

The clamping mechanism 16 comprises a housing 46 attached by one end to the base 12 and having adjacent its other end a lever 48 pivotable or swingable about an axle 50. The clamping jaw 18 comprises a body 52 articulated by a pivot pin 54 to the free end of the lever 48 whereby the body 52 can swing slightly relative to the rail 10. The clamping jaw includes two spaced rollers 56 which actually engage the web 40 at spaced points on directly opposite sides of the hole to be drilled. The dimensions and particularly the length of the lever 48 are such that the centre of action of the clamping force produced by the clamping mechanism 16 is substantially aligned with the drilling axis. The rollers 56 in conjunction with the pivot pin 54 ensure that the clamping action does not tend to cause the former templates 30 to cock over and thereby go out of position when clamping the machine to the rail. The spacing between the rollers 56 provides clearance for the drill bit 26 to break through the web 42 of the rail.

The clamping mechanism includes within the housing 46 an arcuate toothed member to which the lever 48 is firmly attached and which is journalled in the housing 46. A worm or screw meshes with its toothed periphery and in Figs. 1 and 2 may be rotated by applying a suitable tool such as a spanner to a head 70 on the forward end of the housing 46.

In practice, the drill bit 26 is not attached directly to the spindle 24 but to an arbor 58 which is attached to the spindle 24 by a screw thread and which is slidably and rotatably received in a guide bush 60 attached to the lower end of the column 14.

The drill bit 26 is an annular hole cutter such as one of the kind described in GB-A-1,403,041. An annular

hole cutter entails less metal removal than a conventional twist drill bit and thereby requires less power and a lower drilling thrust. When drilling is complete, a slug of metal remains in the annular hole cutter and this can be ejected either before or during subsequent retraction of the cutter. The annular hole cutter 26 has external flutes through which the chips can be discharged during cutting.

Since drilling is horizontal, gravity cannot be relied upon for supply of lubricant to the cutting edges of the bit 26. Therefore, a lubricant supply tube 62 leading from a pressurized container (not shown) is connected via a tap (also not shown), to a bush 64 arranged about the arbor 58, in the embodiment of Figs. 1 and 2. This bush 64 provides communication between the tube 62 and the interior of the arbor 58 which in turn communicates with the interior of the annular hole cutter 26.

An electric power supply cable 66 is attached to the column 14 which incorporates a control box having on/off buttons on its side which is concealed in Figs. 1 and 2 of the drawings and a further electrical connection (not shown) leads from the switches to the electric motor of the power drill 20.

In practice, the rail drilling machine, with the two former templates 30 mounted thereon, is transported to the rail drilling site. Depending on the profile of rail at the drilling site, the two former templates 30 are oriented so that the appropriate rail-engaging lobes can be presented to the web of the rail to be drilled. This is achieved by loosening the securing bolts 34, withdrawing the templates 30 away from their respective edges of the base, rotating the templates to the appropriate orientation to align the appropriate apertures 40 with the dowels 38, engaging the dowels 38 and the selected apertures and tightening the securing bolts 34. The drill may then be presented to the rail to be drilled and clamped in position on the rail by means of the clamp 16.

The rounded nature of the lobes allows a degree of realignment to take place as the clamp 16 is tightened, thereby ensuring that the drill is held at the correct position on the rail. If the lobes were formed into a sharp point at the point of contact, it might be more difficult for such realignment to take place, since the point might tend to "bite" into the rail.

Thus, in Fig.6, the former templates are oriented to engage either a UIC60 or and S-60 rail. As mentioned previously, although the profiles of these two rails are not identical, the lobes have been dimensioned and positioned so that they engage each rail profile at points which are coincident for the two profiles. In Fig.4, the former templates are oriented to engage a 57kg rail and in Fig.5, the former templates are oriented to engage a 48kg rail. The templates 30 can be oriented in a position spaced 180° from that shown in Fig.5, but in this embodiment the lobes in that position are not designed to engage a particular rail profile, although they could be designed to do so if required. Thus, the illustrated former template is locatable in any one of four predetermined positions, but is only designed to engage a rail in three of those positions.

The invention is not restricted to the details of the foregoing embodiment. For example, drills other than electrically - powered drills may be used. Moreover, the apparatus may be used to form holes for purposes other than those described.

Claims

1. A portable drilling machine for in situ drilling of a hole in the web of a rail (10) for a railway track, comprising a movable drill or annular cutter (26) for drilling a hole in the web, a former (30) adapted to be received between the flanges of the rail on one side of the rail to locate the machine on the rail and a clamping jaw (18) engageable with the rail web on the opposite side to the former to clamp the machine on the rail, characterised in that the former (30) is rotatable to a plurality of predetermined angular orientations in each of which the former presents a different profile, whereby the former can engage a plurality of different rail sections.

2. A drilling machine as claimed in claim 1, wherein the former comprises two substantially identical spaced apart former templates (30), each of which is rotatable to a plurality of predetermined orientations.

3. A drilling machine as claimed in claim 1 or claim 2, further comprising a base (12) on which the former is rotatably mounted.

4. A drilling machine as claimed in claim 3, further comprising an aperture or recess (40) on the former (30) or the base (12) which receives a projection (38) on the base (12) or former (30) respectively when the former is orientated to one of the said predetermined angular orientations to retain the former in the said predetermined angular orientation.

5. A drilling machine as claimed in claim 4, comprising a plurality of projections and recesses whereby the former is retained in each of the said predetermined angular orientations.

6. A drilling machine as claimed in claim 4 or claim 5, wherein the former is displaceable along its rotational axis to disengage the projection and recess.

7. A drilling machine as claimed in any of the preceding claims, wherein the former (30) is adapted to engage the rail at three or more spaced apart locations.

8. A drilling machine as claimed in claim 7, wherein

the former (30) is rounded at the points of contact.

9. A drilling machine as claimed in claim 7 or claim 8, wherein the points of contact of the former are formed as lobes (32a-32g) and wherein at least one lobe is adapted to engage a rail in more than one of the predetermined orientations of the former.

10. A drilling machine as claimed in any of claims 7 to 9, wherein the former is adapted to engage a plurality of different rail profiles in the same orientation of the former.

11. A drilling machine as claimed in any of the preceding claims, wherein the former (30) is held captive on the machine.

12. A drilling machine as claimed in any of the preceding claims, wherein the former (30) is marked in each of the predetermined orientations to identify the particular rail section to be engaged.

13. A drilling machine as claimed in claim 10, wherein the former (30) is colour-coded in each of the predetermined positions.

14. A former (30) for a portable drilling machine of the type having a movable drill or annular cutter (26) for drilling a hole in a rail web, a former (30) adapted to be received between the flanges of the rail on one side of the rail to locate the machine on the rail and a clamping jaw (18) engageable with the rail web on the opposite side to the former to clamp the machine on the rail, for in situ drilling of a hole in the web of a rail for a railway track, characterised in that the former (30) is rotatable to a plurality of predetermined angular orientations in each of which the former presents a different profile, whereby the former can engage a plurality of different rail sections.

15. A former as claimed in claim 14, comprising two substantially identical spaced apart former templates (30), each of which is rotatable to a plurality of predetermined orientations.

16. A former as claimed in claim 14 or claim 15, wherein the former is rotatably mounted on a base (12) forming part of a drilling machine.

17. A former as claimed in claim 16, further comprising a recess (40) or projection which engages a projection or recess (38) on the base (12) when the former is orientated to one of the said predetermined angular orientations to retain the former in the said predetermined angular orientation.

18. A former as claimed in claim 17, comprising a plurality of projections or recesses, whereby the former is retained in each of the said predetermined angular orientations.

19. A former as claimed in claim 17 or claim 18, wherein the former is displaceable along its rotational axis to disengage the projection and recess.

20. A former as claimed in any of the preceding claims, wherein the former (30) is adapted to engage the rail at three or more spaced apart locations.

21. A former as claimed in claim 20, comprising rounded points of contact.

22. A drilling machine as claimed in claim 20 or claim 21, wherein the points of contact of the former are formed as lobes (32a-32g) and wherein at least one lobe is adapted to engage a rail in more than one of the predetermined orientations of the former.

23. A former as claimed in any of claims 20 to 22, wherein the former is adapted to engage a plurality of different rail profiles in the same orientation of the former.

24. A former as claimed in any of claims 14 to 23, wherein each of the predetermined orientations is marked to identify the particular rail section to be engaged.

25. A former as claimed in claim 24, wherein each of the predetermined positions is colour-coded.

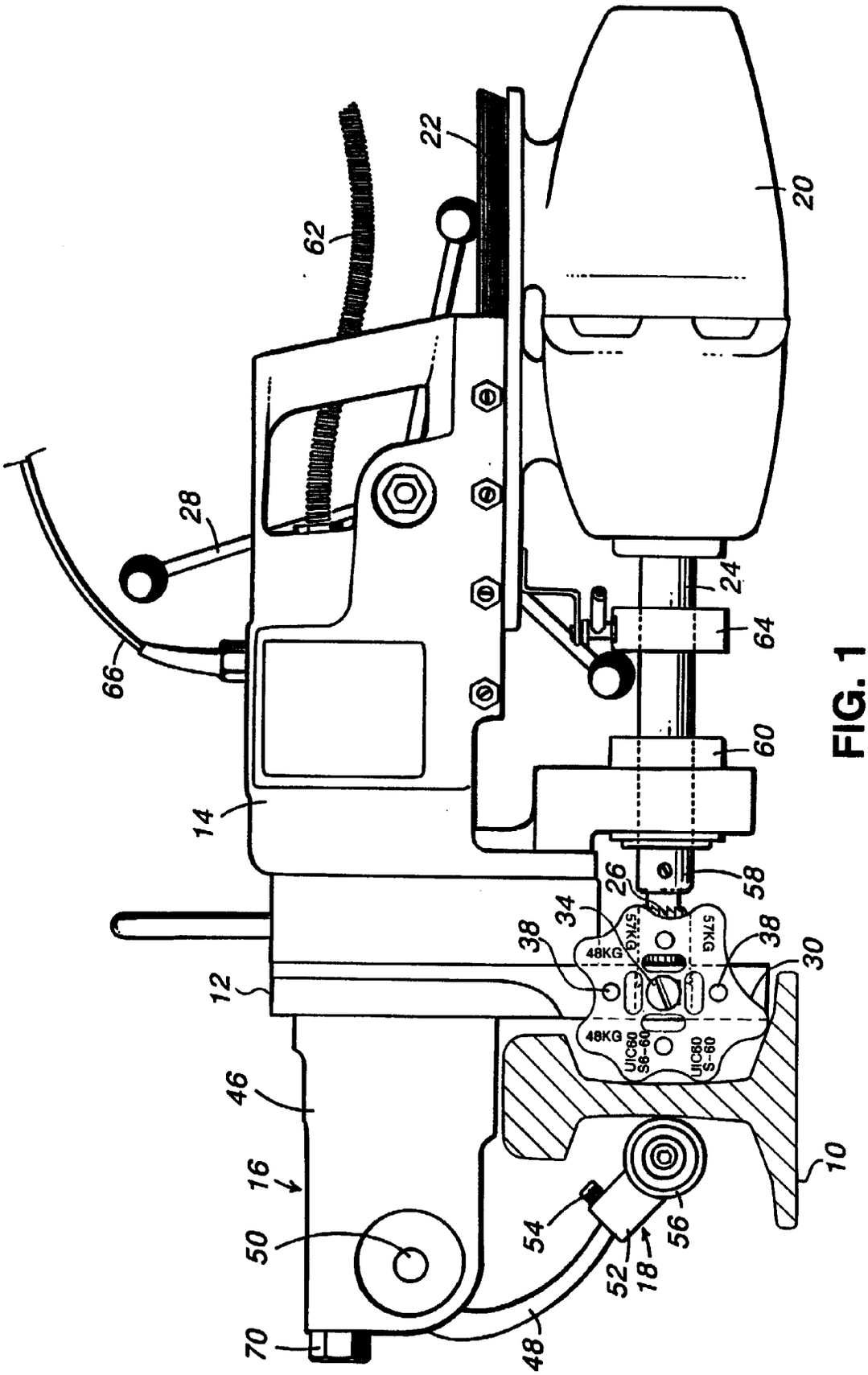
22
20
62
28
66
24
64
60
14
58
26
34
38
38
30
12
48KG
48KG
UIC60
S6-60
UIC60
S-60
46
16
50
54
56
52
18
70
48
10

FIG. 1

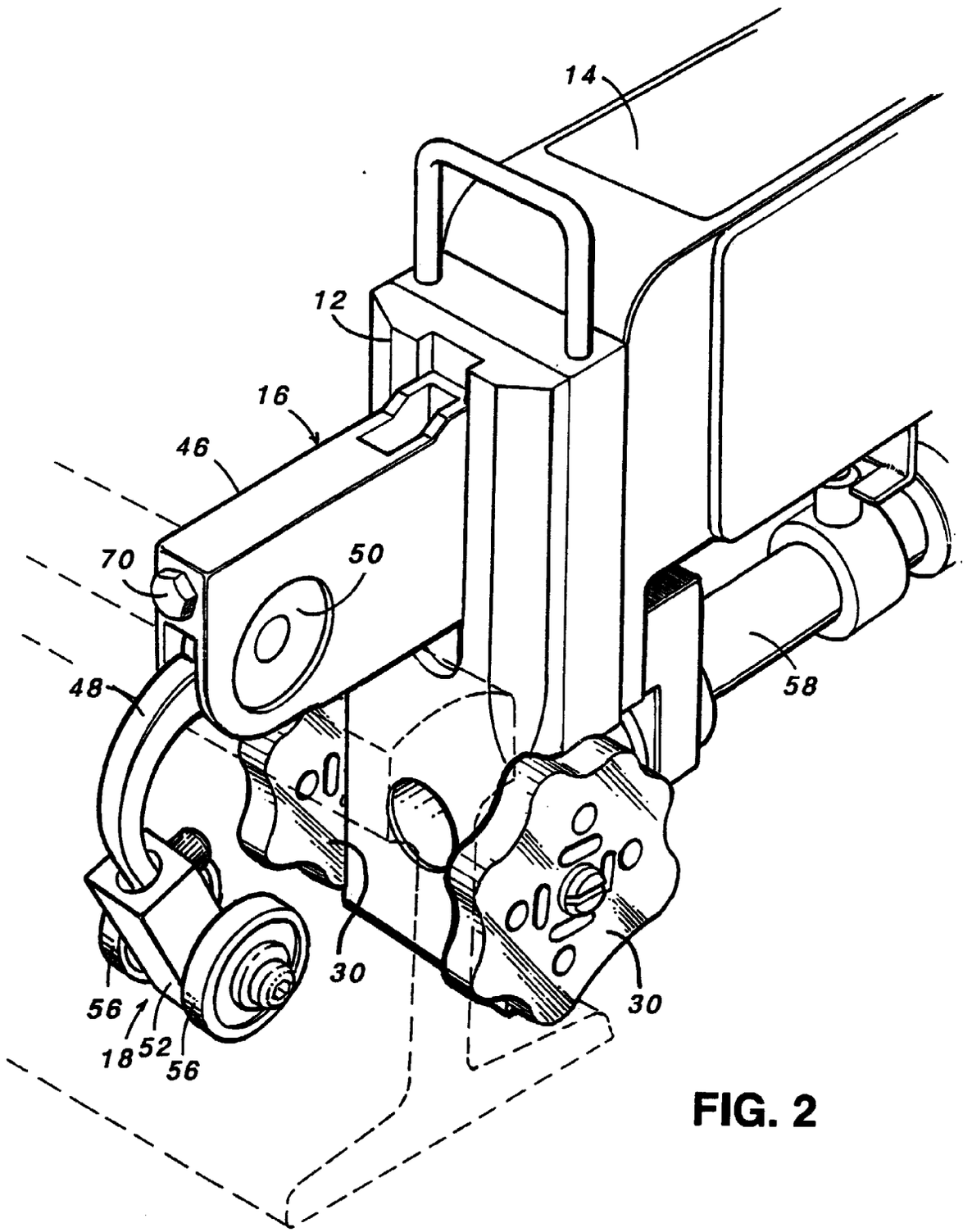

FIG. 2

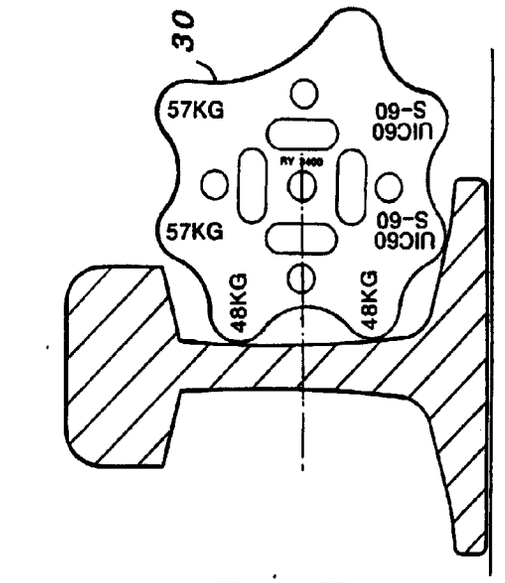

FIG. 5

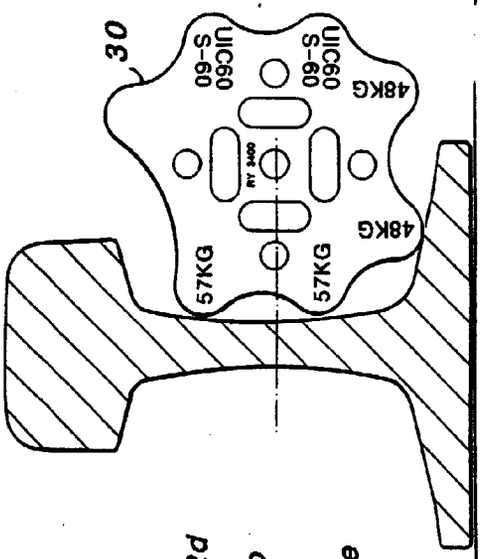

FIG. 4

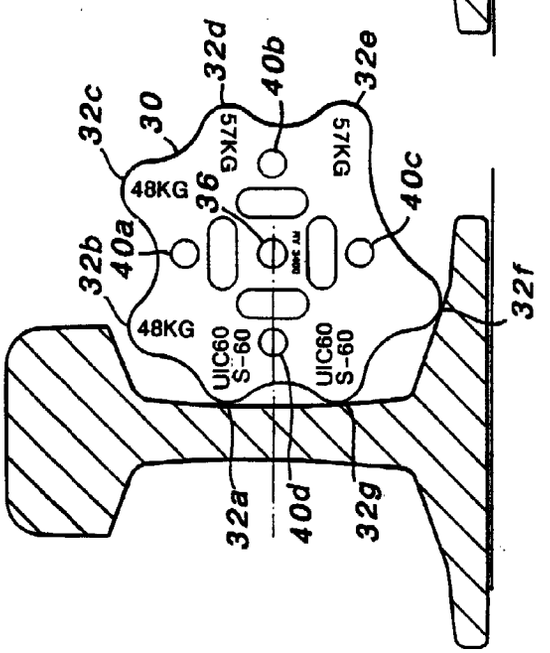

FIG. 3

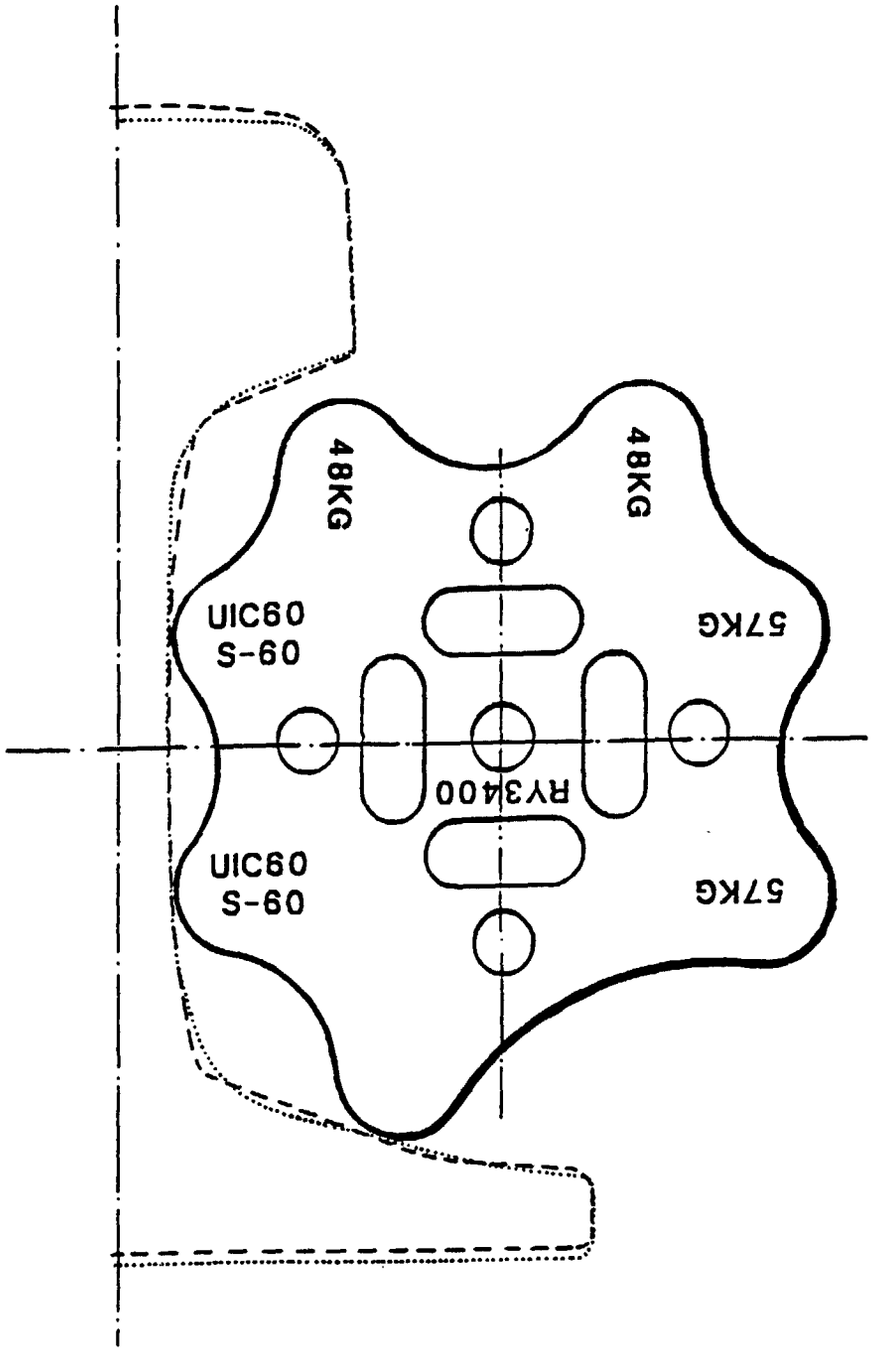

FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 30 2067

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.6)
A	US 4 753 556 A (SOLKO JOHN D) 28 June 1988 * abstract; figures *	1,14	E01B31/06
A	US 5 409 328 A (NODA HIROTOSHI) 25 April 1995 * abstract; figures *	1,14	
A	US 3 945 749 A (MCILRATH WILLIAM P) 23 March 1976 * abstract; figures *	1,14	
D,A	GB 2 211 447 A (ROTABROACH LTD) 5 July 1989 * abstract; figures *	1,14	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E01B
B25H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	5 June 1998	Blommaert, S

CATEGORY OF CITED DOCUMENTS

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