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Replaceable wear pad, as well as method for manufacturing wear pads for a crawler track

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(56) Related Art
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Summary

Replaceable wear pad, as well as method for manufacturing wear pads for a crawler track

In a replaceable wear pad (1) for a crawler track (2) of a tracked vehicle, in particular for construction machinery, where the crawler track (2) shows several base plates (4) for the purpose of accommodating a wear pad (1), where the wear pad (1) is suitable for being fastened to a base plate (4) in a detachable manner, the wear pad (1) shows a tread (14), as well as a bottom side (16) lying opposite to the tread (14) and facing the base plate (4), the wear pad preferably contains at least one reinforcing element (18), and the reinforcing element (18) is moulded-in by the wear pad material (18), it is provided that the reinforcing element (18) shows at least two holes (22) arranged at a distance to one another, and that the wear pad (1) shows cavities (30) that run coaxially to the holes (22) of the reinforcing element (18) and, coming from the bottom side (16), end above the reinforcing element (18) and at a distance to the same, with the cavities (30) serving the purpose of accommodating fastening devices (26, 28) which are suitable for being fastened to the reinforcing element (18) in the wear pad (1).

(Fig. 2)

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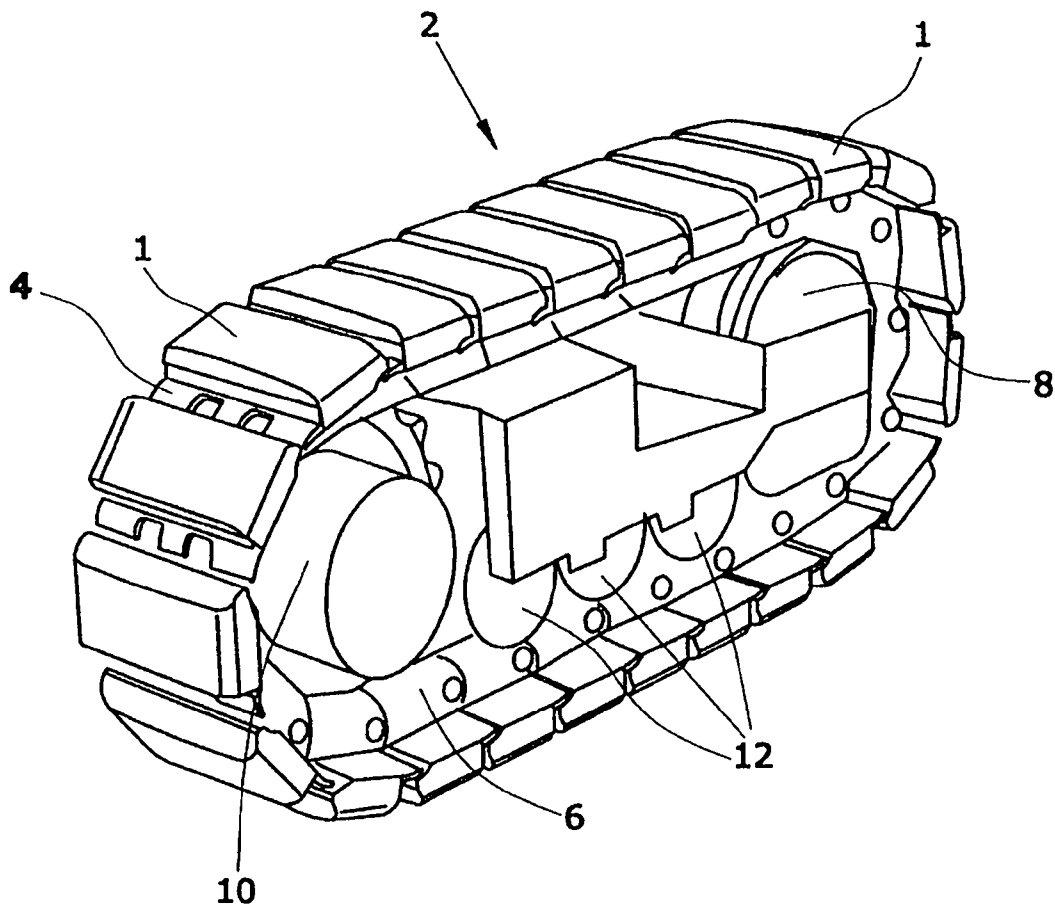


Fig. 1

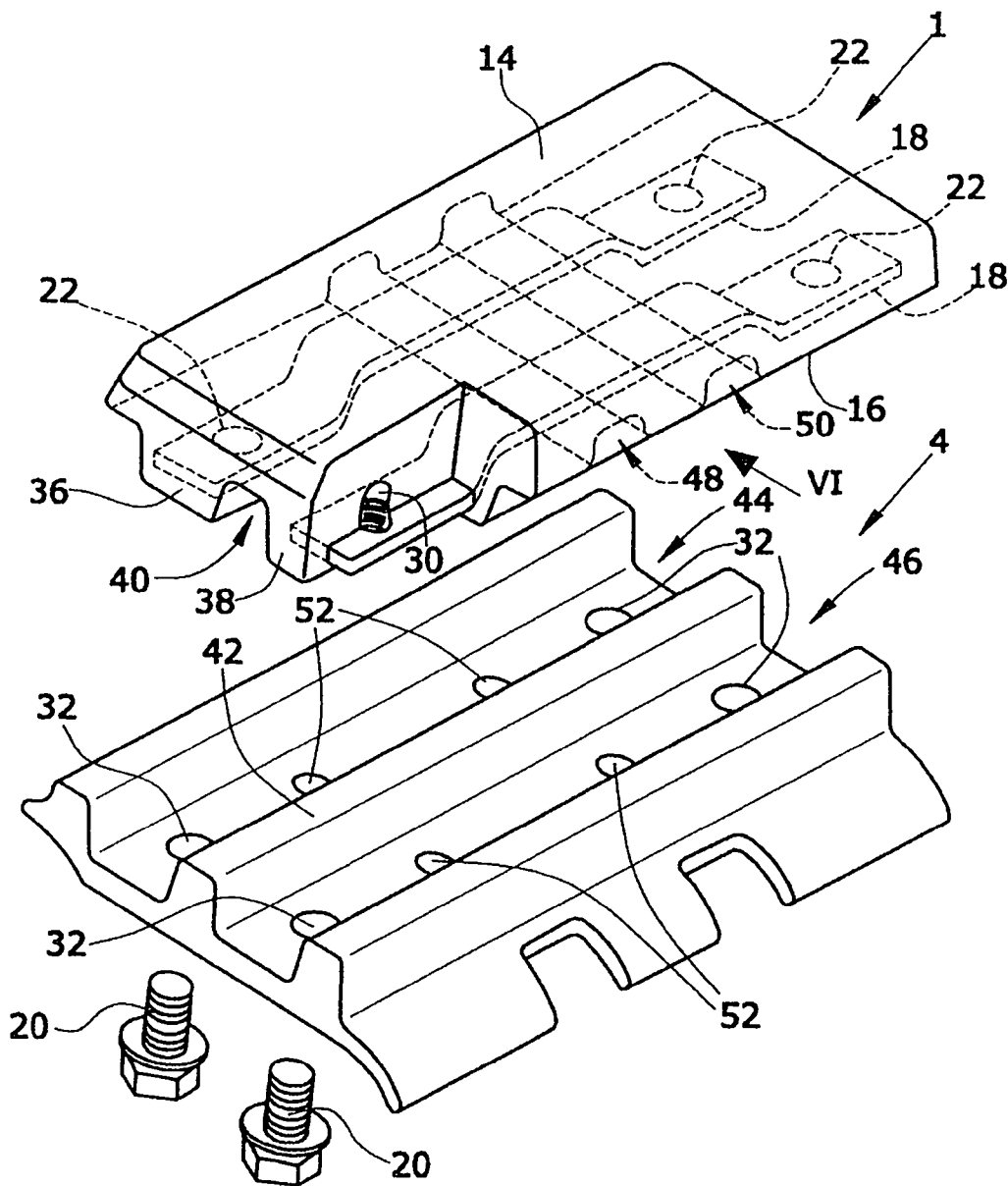


Fig.2

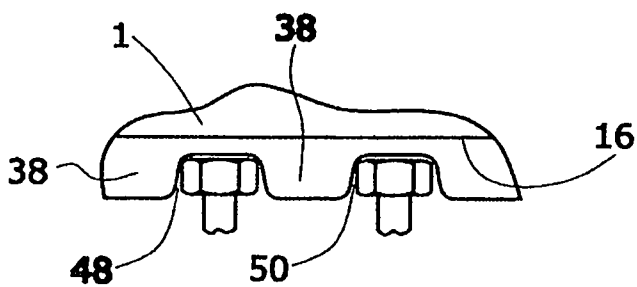


Fig.6

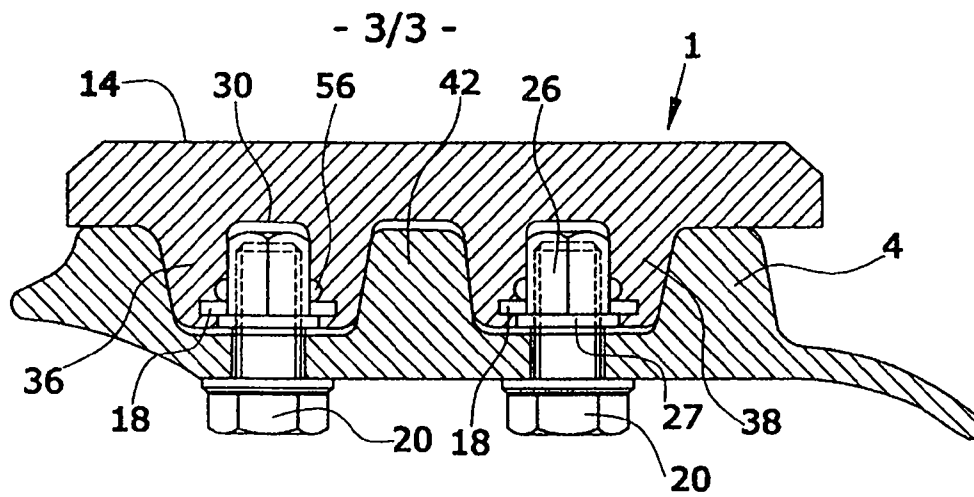


Fig.3

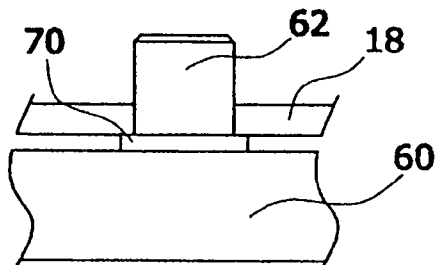


Fig.4a

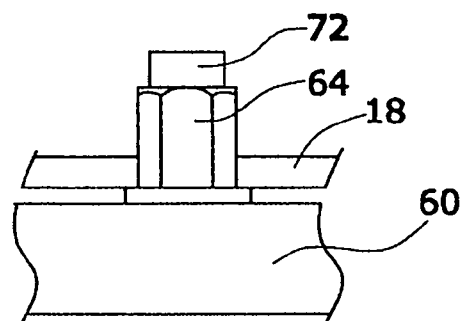


Fig.4b

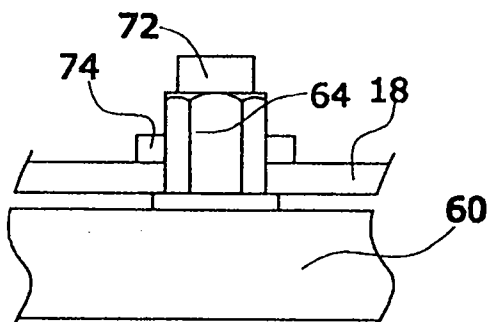


Fig.4c

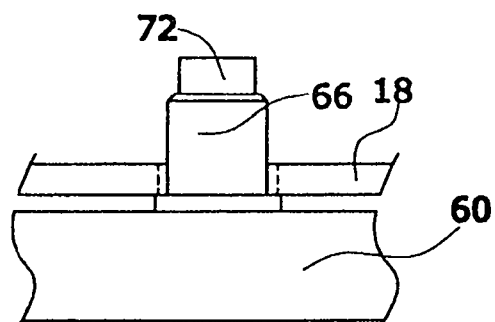


Fig.4d

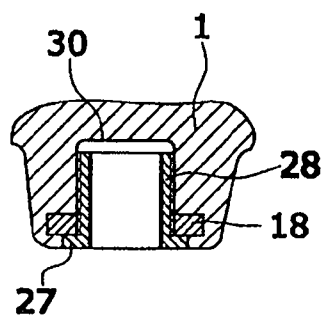
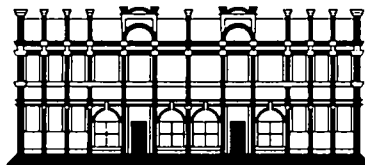


Fig.5

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WIRTGEN GMBH

**COMPLETE SPECIFICATION
STANDARD PATENT**

Invention Title:

*Replaceable wear pad, as well as method for manufacturing wear
pads for a crawler track*

The following statement is a full description of this invention including the best method of performing it known to us:-

The invention relates to a replaceable wear pad for a crawler track of a tracked vehicle, in particular for construction machinery in accordance with the pre-characterizing clause of claim 1, as well as a method for manufacturing wear pads for a crawler track in accordance with the pre-
5 characterizing clause of claim 22.

Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is solely for the purpose of providing a context for the present invention. It is not to be
10 taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this application.

15 Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

20

Replaceable wear pads for crawler tracks are known from prior art, which are suitable for being fastened to a base plate of the crawler track in a detachable manner.

25 The wear pads include, for instance, two reinforcing bars running in longitudinal direction of the wear pad, with two screw threads of retaining screws projecting from the said reinforcing bars towards the bottom side of the wear pad. The retaining screws are guided through holes of the reinforcing bars and are secured against twisting in a suitable manner.

30

When manufacturing these wear pads, the reinforcing bars with retaining screws inserted through corresponding holes at their ends are therefore moulded-in by the wear pad material.

35 A disadvantage of this design is that the wear pad material also accumulates beneath the reinforcing bar during the moulding-in operation.

This has the disadvantage that the bolted connections with the base plate loosen again during operation because of the soft polyurethane material between the reinforcing bar and the base plate, so that the bolted joints must be retightened on a regular basis. The reason for this being that the
5 polyurethane layer between the reinforcing bar and the base plate prevents that the pre-tension of the bolted joint can be permanently maintained. It is understood that, with up to 50 wear pads per crawler track unit and with four crawler track units per machine, a considerable time effort results for retightening the bolted joints, which results in increased costs and an
10 increased time requirement.

A further disadvantage of the stud bolts projecting from the wear pads is that they cause an increased transport volume and that the thread of the stud bolts may be damaged during transport.
15

A further disadvantage of the wear pads with projecting stud bolts is that care must be taken during moulding to protect the thread of the stud bolt from being coated with the polyurethane material during the moulding operation.
20

It is desirable to create a wear pad for a crawler track of the type first mentioned above, as well as a method for manufacturing such a wear pad, which are capable of simplifying the manufacture and, as a result, of reducing the manufacturing costs, the maintenance costs, the transport
25 costs and the time effort.

Alternatively, it is desirable to create useful alternatives, of the above mentioned wear pad and method.

30 According to the one aspect of the invention, there is provided a replaceable wear pad apparatus for a crawler track of a construction machine, the crawler track including a plurality of base plates, the apparatus comprising:

(a) a wear pad molded from a wear pad material, the wear pad including:

- (1) an upper tread surface;
- (2) a bottom surface;
- 5 (3) a length;
- (4) a width; and

(5) first and second downward projections extending parallel to the length of the wear pad, each of the downward projections including an intermediate recess interrupting the projections;

10 (b) first and second reinforcing elements fixedly embedded in the first and second projections, respectively, each reinforcing element including:

- (1) upper and lower sides;
- (2) an intermediate portion lying in an upper plane located

15 above the intermediate recess of the respective downward projection of the wear pad;

(3) first and second outer portions each lying in a lower plane lower than the upper plane, the outer portions being on opposite sides of the intermediate portion;

20 (4) at least one hexagonal recess defined in each of the outer portions; and

(5) a peripheral edge completely embedded in the wear pad material;

(c) a plurality of nuts, each of the nuts including:

25 (1) a hexagonal outside contour received in one of the hexagonal recesses;

(2) a nut surface engaging the upper surface of its associated reinforcing element; and

30 (3) a threaded bore extending upward above the reinforcing element; and

(d) a plurality of bearing collars, each one of the bearing collars extending downward from one of the reinforcing elements below one of the holes and terminating essentially flush with the bottom side of the wear pad, a lower end of each bearing collar being free of any wear pad

35 material; and

(e) wherein the wear pad includes a plurality of blind cavities defined therein, each of the cavities being co-axial with and above one of the threaded bores of one of the hexagonal nuts.

- 5 The overall disclosure provides in an advantageous manner that the reinforcing element of the wear pad shows at least two holes arranged at a distance to one another, that the wear pad shows cavities or recesses that run coaxially to the holes of the reinforcing element and, coming from the bottom side, end above the reinforcing element and at a distance to the
10 same. The cavities or recesses serve the purpose of accommodating fastening devices which are suitable for being fastened to the reinforcing element in the wear pad.

- During manufacture, the reinforcing elements are held by projecting
15 mandrels of a mould tool, where the mandrels pass at least partially through the holes provided in the reinforcing elements.

- The disclosed wear pad in accordance with the invention does not show any projecting stud bolts. As no stud bolts project from the wear pads,
20 transport is simplified and the transport volume is reduced significantly. After manufacture of the wear pad, a fastening device can be fastened to the reinforcing element in the cavity formed by the mandrels of the mould tool.

- 25 As the fastening devices are installed later and in mounted condition rest immediately on the base plate, retightening the bolted joint at regular intervals can be dispensed with. An inspection of the bolted joints is, at least, required after considerably longer time intervals only. The direct abutting of the fastening means

against the base plate provides a firm rest and support, wherein the reinforcing element is completely imbedded into the wear pad material, such that it would not be detached from the wear pad even if high shear forces occur.

5

The subsequently installed fastening devices do preferably not project vis-à-vis the bottom side of the wear pads and are essentially flush with the bottom side of the wear pad.

- 10 It is provided that the reinforcing element may be flattened, at least in the area of the holes, preferably parallel to the tread. Flattening is of advantage in particular when blind rivet nuts are used as fastening devices.

- The reinforcing element and/or the wear pad may show an anti-twist
15 protection for the fastening device. The holes of the reinforcing element may, for instance, show a cross-sectional shape that is adapted to the cross-sectional shape of the fastening device.

- It is preferably provided that the holes of the reinforcing element and/or
20 the recesses of the wear pad show a cross-sectional contour that is adapted to the outside contour of the fastening devices. This may, for instance, be a hexagonal contour.

- The recesses of the wear pad preferably show a cavity that extends beyond
25 the length of the fastening devices to be inserted. The said cavity serves the purpose of accommodating the free end of a retaining screw that interacts with the fastening device of the wear pad.

- The bearing collar of the fastening device of the wear pad may rest, on the
30 one hand, against that side of the reinforcing element that faces the base plate and, on the other hand, on the base plate. It is thus ensured that there is no wear pad material between the fastening device and the base plate.

- 35 The bearing collar may terminate essentially flush with the bottom side of the wear pad on that side of the wear pad that faces the base plate.

The reinforcing elements run transversely to the moving direction of the wear pad in operation. At the same time, the reinforcing elements extend in longitudinal direction of the wear pad.

- 5 The reinforcing elements may be made of a high-strength material, and preferably of metal.

The wear pad may show projections on the bottom side that run transversely to the moving direction, the said projections engaging with
10 mutually adapted channels of the base plate.

At the same time, the reinforcing elements are preferably integrated into these projections.

- 15 The projections may show in their longitudinal direction at least two recesses extending into the wear pads, the said recesses forming a space for fastening devices of the base plate in mounted condition of the wear pad. Screw heads of screwing devices for fastening the base plate to the crawler track may, for instance, extend into these recesses.

20 Arranging the fastening devices for the base plate in recesses provided on the bottom side of the wear pads offers the advantage that the tread does not show any through-holes for the fastening devices of the base plates and can therefore offer increased resistance to wear and tear, with the
25 additional advantage resulting that there are no fastening devices present that are accessible from the tread and can be soiled during operation so that their accessibility is impaired.

The recesses for the fastening devices of the base plate may adjoin the
30 reinforcing elements.

The recesses for the fastening devices of the base plate may additionally extend across the entire width of the projections.

- 35 Each of the reinforcing elements integrated into the wear pads may consist of one piece and run in at least two planes, namely in a plane close to the bottom

side of the wear pads in the area of the recesses for the fastening devices, and in a plane removed into the interior of the wear pad in the area of the recesses of the projections. Both planes preferably run parallel to the tread.

- 5 The space between the projections in longitudinal direction of the wear pad may accommodate, with narrow fit, a central stud of the base plate for the purpose of centring the wear pad on the base plate. This means that the space, in connection with the central stud, specifies a clearly defined seat of the wear pad. It goes without saying that the base plate may show
10 several studs, even though a narrow fit exists between the central stud and the space between the projections only.

- The wear pad may project vis-à-vis the base plate at least towards the outer side of the crawler track. In this way, the base plate is protected
15 against damage on the one hand, and on the other hand damage caused by the base plates to, for instance, kerbs is also prevented.

- The material of the wear pad may consist of an elastomer, and preferably of a polyurethane.
20 The material of the wear pad may be through-coloured with a light luminescent colour, preferably Signal Yellow, in accordance with one particularly preferred embodiment.

- 25 The fastening devices in the recesses of the wear pad preferably consist of blind rivet nuts. After the riveting operation, the blind rivet nuts form a deformed annular bead which rests immediately on that side of the reinforcing element that faces the tread. In conjunction with the bearing collar, a firm connection is thus created between the blind rivet nut and the
30 reinforcing element, with no wear pad material weakening the stability of the connection.

- Alternatively, the fastening device in the recesses of the wear pad may consist of insert nuts, in which case the holes of the reinforcing element
35 consist of threaded holes, and the insert nuts are suitable for screwing into the threaded holes of the reinforcing elements. The insert nuts may, in case of holes, also show a self-cutting or self-tapping external thread.

In the following, embodiments of the invention are explained in more detail with reference to the drawings.

- 5 The following is shown:

- Fig. 1 a crawler track with wear pads in perspective view,
 Fig. 2 a perspective illustration of a wear pad with a base plate of the crawler track,
 Fig. 3 a cross-section of an assembly of the wear pad with the base plate,
 Fig. 4a the mandrel of a mould tool with reinforcing element fitted in position,
 Fig. 4b a further embodiment of a mandrel of the mould tool,
 Fig. 4c the mandrel in accordance with Fig. 4b, with elastic annular sleeve fitted in position,
 Fig. 4d a further embodiment of a mandrel for an insert nut,
 Fig. 5 an insert nut, and
 Fig. 6 a partial view of the recesses in the projections of the wear pad.

Fig. 1 shows an embodiment of a crawler track 2 that runs on replaceable wear pads 1. Such crawler tracks are required in the travel drive units of a tracked vehicle, for instance, a road construction machine. The wear pads 1 are fastened to base plates 4 in a detachable manner, with the base plates themselves being fastened to chain links 6 of the infinitely rotating crawler track 2. The crawler track 2 with its chain links 6 rotates around two deflection rollers 8 and 10, one of which is driven. Several support rollers 12 are arranged in the lower return side of the crawler track 2, which support the machine weight and run on the chain links.

Fig. 2 shows a perspective view of the wear pad 1 with the subjacent base plate 4 and two of the total number of four retaining screws 20 for fastening the replaceable wear pad 1 on the base plate 4.

The wear pad 1 preferably consists of an elastomeric material like, for instance, polyurethane, which is through-coloured with a light luminescent colour, preferably Signal Yellow, in accordance with one particularly preferred embodiment.

The wear pad 1 shows completely moulded-in reinforcing elements 18 that preferably run in longitudinal direction of the wear pad 1. In the embodiment, two such reinforcing elements 18 are arranged at a lateral distance to one another in the wear pad 1. The reinforcing elements 18 are provided with holes 22 close to

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their free ends, having a distance in longitudinal direction of the wear pads, by means of which fastening devices 26,28 of the wear pad can be fixed in the holes after manufacture of the wear pads 1.

The wear pads 1 have a tread 14 on their outer side, as well as a bottom side 16 facing the base plate 4.

Above the holes 22, cavities or recesses 30 extend in the direction of the tread 14 that serve the purpose of accommodating fastening devices 26,28. The recesses 30 run coaxially to the holes 22 of the reinforcing element 18. These recesses 30 are adapted to the fastening devices to be inserted. The fastening devices may consist of blind rivet nuts 26 or insert nuts 28, with the insert nuts 28 showing both an internal thread as well as an external thread. The fastening devices 26, 28 are suitable for accommodating retaining screws 20 that are suitable for screwing in from the bottom side 16 of the wear pad, as indicated in Fig. 2. For this purpose, the base plates 4 show suitable through-holes 32 which run coaxially to the fastening devices 28, 28 and the holes 22 of the wear pad 1. It is essential that the fastening devices 26, 28 rest immediately on the base plate 4 in the mounted condition of the wear pad 1.

In the embodiment, the two reinforcing elements 18 in the wear pad 1 run in projections 36, 38 that are parallel to one another and project from the bottom side 16 of the wear pad 1, leaving a space 40 between them. The space 40 between the projections 36, 38 co-operates with a central stud 42 of the base plate 4 in such a manner that the central stud 42 forms a seat for the space 40 between the projections 36, 38, and that the central stud 42 of the base plate 4 is capable of centring the wear pad 1 essentially without play on the crawler track 2. A narrow fit may be chosen between the central stud 42 and the space 40 so as to ensure that the wear pad 1 sits on the base plate 4 essentially without play.

The projections 36, 38 lie in channels 44, 46 on the base plate 4 and can rest in the said channels. The outer faces of the projections 36, 38 do, however, have sufficient play with the outer lateral faces of the channels 44, 46 so that the wear pad 1 is centred by the central stud 42 of the base plate 4 only. The projections 36, 38 extending in longitudinal direction of the wear pad 1 are interrupted by two recesses 48, 50 running in transverse direction that create a free space for

screw heads of fastening devices which connect the base plate 4 with the chain links 6 through the through-holes 52. As can best be seen from Fig. 6, these fastening devices are therefore covered by the wear pad 1 in mounted condition and will not become clogged or damaged by road material.

As can be seen in Fig. 2, the strip-shaped reinforcing elements 18 run in a plane that is offset in a parallel manner in relation to the tread 14 in the area of the recesses 48, 50.

In longitudinal direction of the wear pad 1, the same projects vis-à-vis the base plate 4 on the outer side of the crawler track 2. Kerbs, for instance, are protected in this way against the metallic base plates 4, and on the other hand the base plates 4 are also protected against damage.

Fig. 3 shows the wear pad 1 mounted on the base plate 4 in a plane that passes through the axes of the holes 22. The recesses 30 of the wear pad 1 accommodate blind rivet nuts 26 which are firmly fastened to the reinforcing elements 18 in the holes 22 of the reinforcing elements 18 by shaping of an annular bead 56 that forms on account of the riveting operation. The blind rivet nuts 26 preferably rest on the base plate 4 with a bearing collar 27.

Figs. 4a to 4d show different possibilities of designing the recesses 30 for the purpose of accommodating fastening devices 26, 28. A part of the mould tool 60 can initially be seen in Figs. 4a to 4d, with a mandrel 62, 64 or 66 respectively projecting from the said mould tool. With a wear pad 1 in accordance with Fig. 2, the mould tool 60 shows four such mandrels 62, 64, 66. The reinforcing elements 18 are fitted in position on the mandrels 62, 64, 66 with their holes 22, with the reinforcing elements 18 resting on an annular collar 70, the shape of which is adapted to the bearing collar 27 of the blind rivet nut 26 or the insert nut 28. In the embodiment of Fig. 4a, the mandrel 62 is of circular cylindrical shape.

In the embodiment of Fig. 4b, the mandrel 64 has a hexagonal cross-section and can be inserted in a hexagonally shaped hole 22 of the reinforcing element 18. The mandrel 64 is lengthened by, for instance, a cylindrical appendage 72 which extends beyond the length of a blind rivet nut 26 or an insert nut 28. This cre-

ates additional free space for the free end of a retaining screw 20. The appendage 72 may alternatively also show a different cross-sectional shape.

An annular sleeve 74 consisting of an elastic material like, for instance, foam rubber is additionally fitted in position in the embodiment shown in Fig. 4c, as compared to the embodiment shown in Fig. 4b. This elastic sleeve 74, which sits directly on the reinforcing element 18, forms a soft annular zone after completion of the wear pad 1, on that side of the reinforcing elements 18 that face the tread 14, in such a manner that the annular bead 56 of the blind rivet nut 26 that forms because of the blind riveting operation is not hindered in its deforming process.

Alternatively, it is also possible to rework the wear pad 1 and to undercut an annular groove for the annular bead 56 of a blind rivet nut 26 in the area behind the hole 22 when using, for instance, a cylindrical mandrel in accordance with Fig. 4a.

Fig. 5 shows the use of an insert nut 28 as fastening device. The insert nut 28 is provided with an external and an internal thread so that the insert nut 28 is suitable for screwing into the holes 22 of a reinforcing element 18 if the holes 22 are designed as threaded holes. Alternatively, the insert nut may show a self-cutting or self-tapping external thread that produces a thread in the holes 22 by itself when being screwed into the holes 22.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A replaceable wear pad apparatus for a crawler track of a construction machine, the crawler track including a plurality of base plates, the apparatus comprising:

5 (a) a wear pad molded from a wear pad material, the wear pad including:

(1) an upper tread surface;

(2) a bottom surface;

(3) a length;

10 (4) a width; and

(5) first and second downward projections extending parallel to the length of the wear pad, each of the downward projections including an intermediate recess interrupting the projections;

(b) first and second reinforcing elements fixedly embedded in the
15 first and second projections, respectively, each reinforcing element including:

(1) upper and lower sides;

(2) an intermediate portion lying in an upper plane located above the intermediate recess of the respective downward projection of the
20 wear pad;

(3) first and second outer portions each lying in a lower plane lower than the upper plane, the outer portions being on opposite sides of the intermediate portion;

(4) at least one hexagonal recess defined in each of the outer
25 portions; and

(5) a peripheral edge completely embedded in the wear pad material;

(c) a plurality of nuts, each of the nuts including:

(1) a hexagonal outside contour received in one of the
30 hexagonal recesses;

(2) a nut surface engaging the upper surface of its associated reinforcing element; and

(3) a threaded bore extending upward above the reinforcing element; and

35 (d) a plurality of bearing collars, each one of the bearing collars extending downward from one of the reinforcing elements below one of the

holes and terminating essentially flush with the bottom side of the wear pad, a lower end of each bearing collar being free of any wear pad material; and

- (e) wherein the wear pad includes a plurality of blind cavities
5 defined therein, each of the cavities being co-axial with and above one of the threaded bores of one of the hexagonal nuts.

2. The apparatus of claim 1 , wherein each of the nuts comprises a blind rivet nut.

10

3. The apparatus of claim 1 or claim 2 wherein each of the bearing collars comprises an integral part of one of the nuts.

4. A replaceable wear pad apparatus for a crawler track of a
15 construction machine substantially as hereinbefore described with reference to the accompanying drawings.

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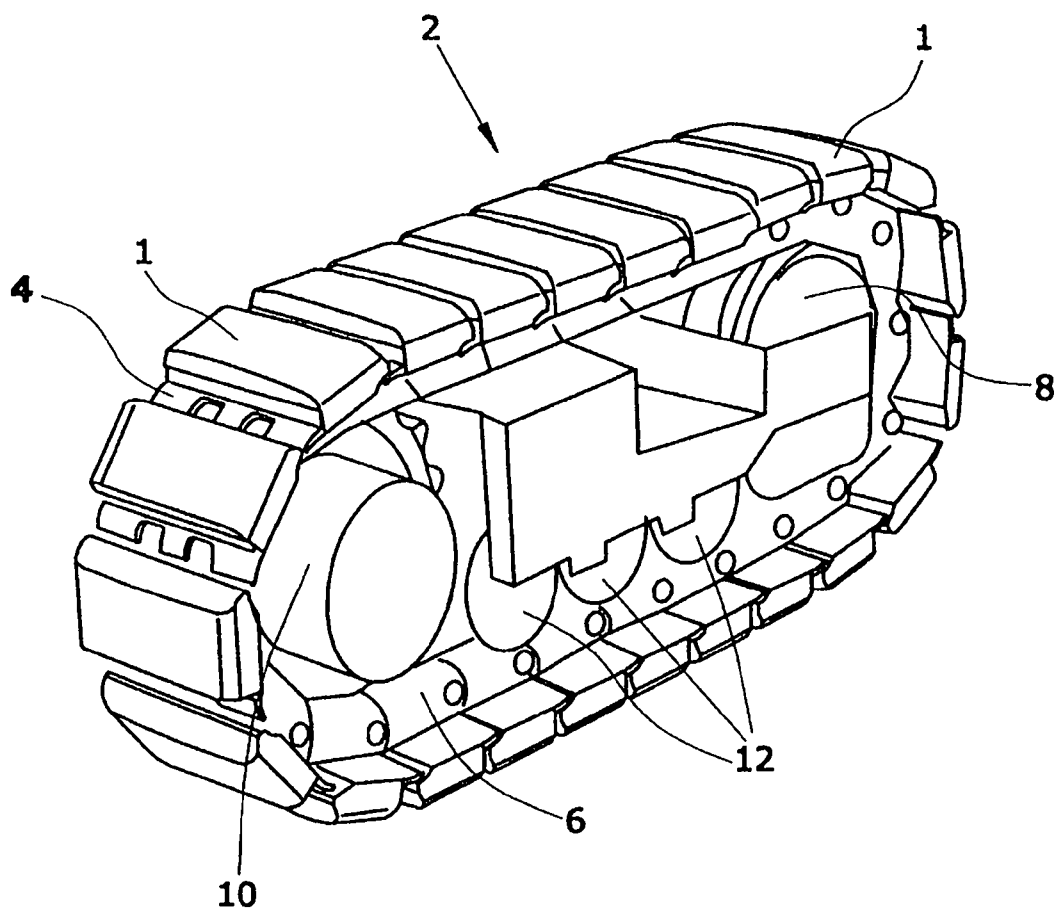


Fig.1

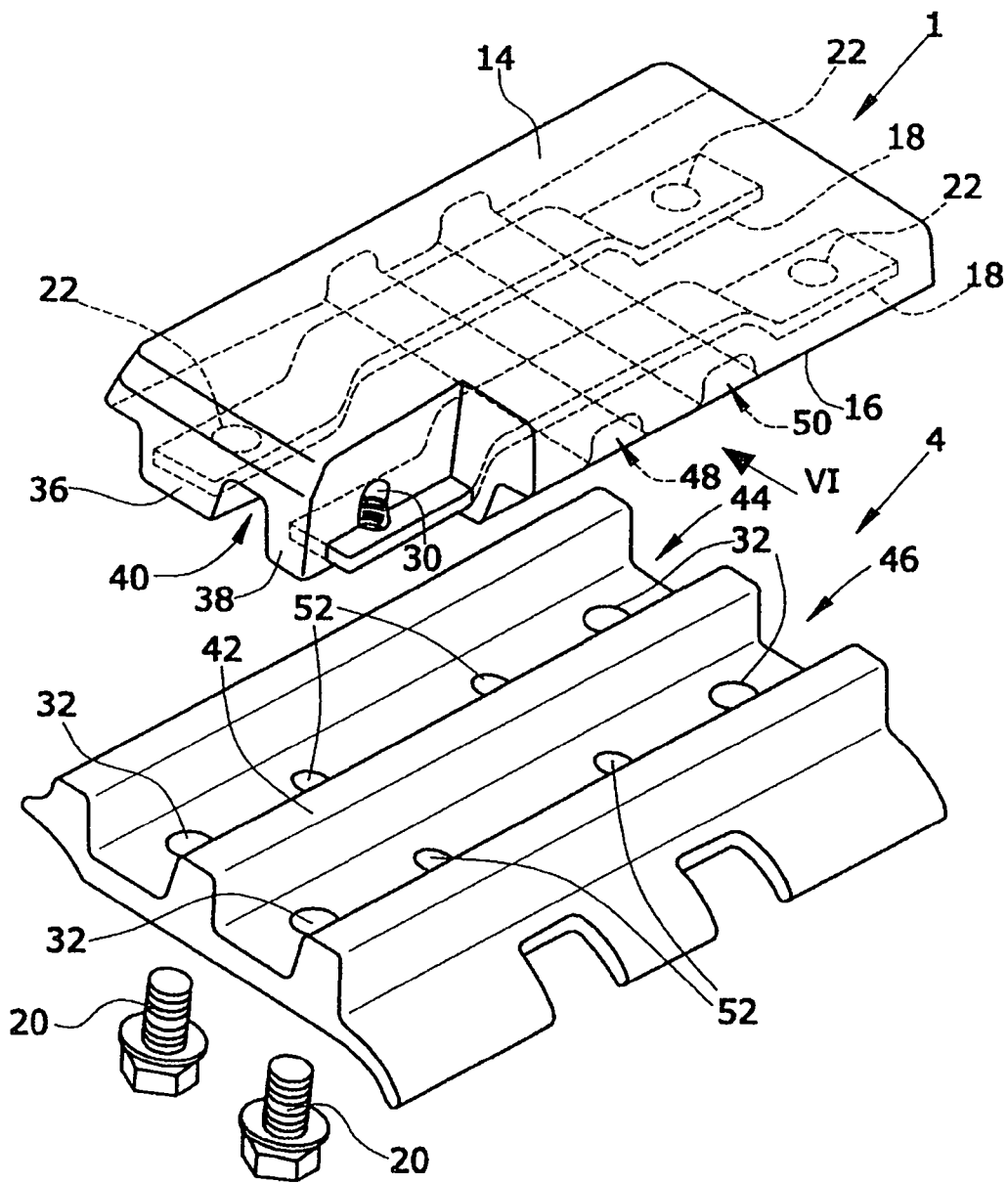


Fig.2

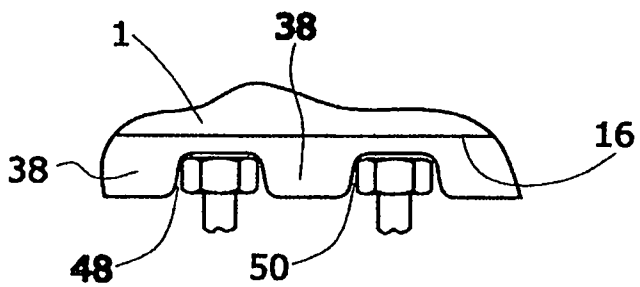


Fig.6

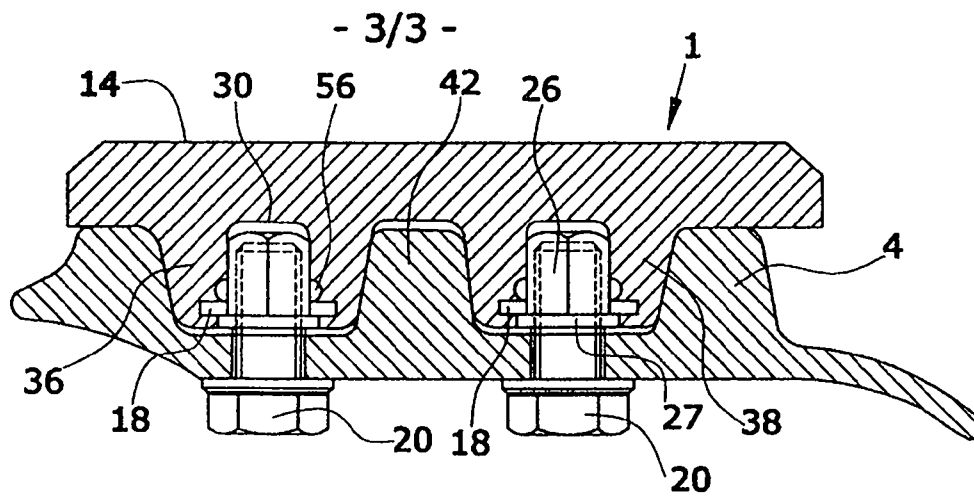


Fig.3

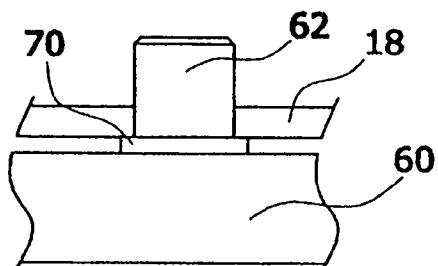


Fig.4a

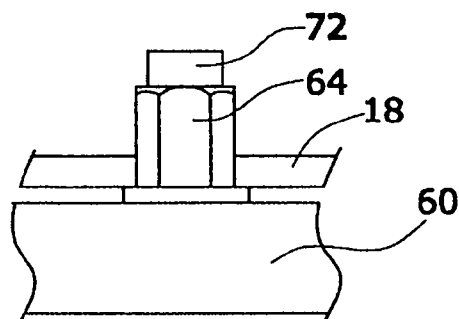


Fig.4b

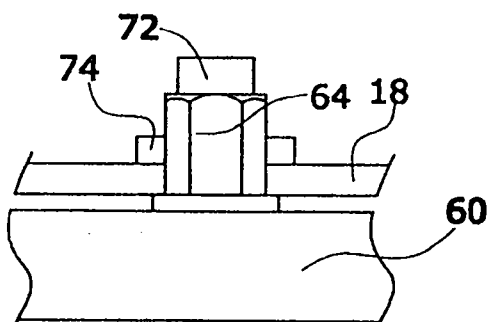


Fig.4c

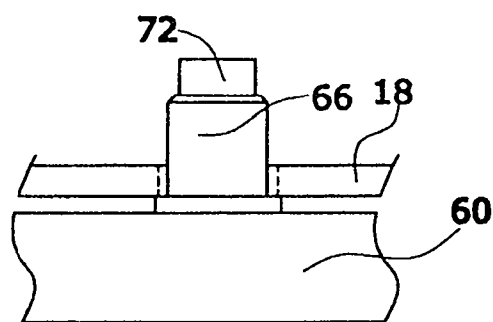


Fig.4d

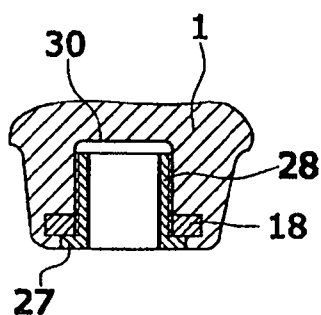


Fig.5