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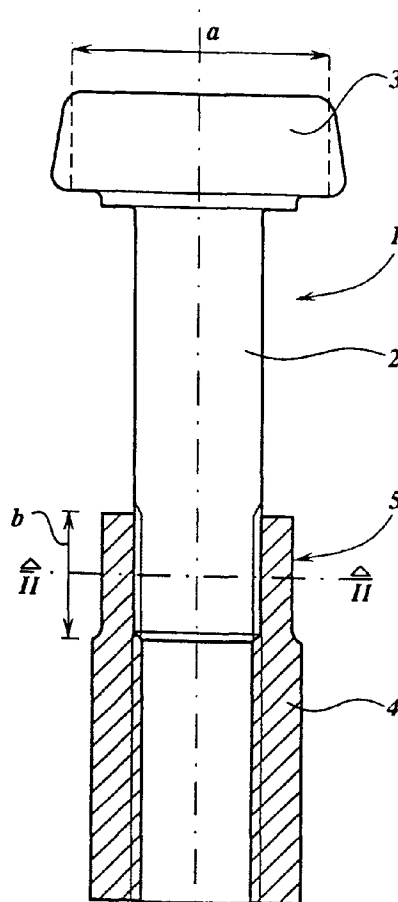
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1062 XK Amsterdam (NL)**(54) **Method of making a fixing cramp, as well as a fixing cramp**

(57) The invention relates to a method of making a fixing cramp comprising a bolt-shaped nail (1) and a tubular sleeve (4) which fixing cramp can be incorporated in concrete when said concrete is being poured. Such cramps are used in large numbers. It is important to keep the cost price of such cramps as low as possible, and to achieve a maximum the load-bearing capacity of the fixing cramps. The bolt-shaped nail (1) is made by means of the tools and in accordance with the method used for producing hexagonal head bolts, whereby the forming of the hexagon is not carried out for the fixing cramps. The head (3) is substantially cylindrical, and it has a diameter which is at least twice that of the nail shank (2).

**Fig. 1****EP 0 835 972 A1**

Description

The invention relates to a method of making a fixing cramp. Fixing cramps are known, inter alia from EP 0 698 702, and they are frequently used in transporting and mounting concrete elements. It is important, therefore, that the cost price of the fixing cramps be kept as low as possible. In the construction shown in EP 0 698 702 a specially made cramp shank 3 is used, on which a sleeve 6 is mounted. The manufacture of a special cramp shank is a relatively costly affair, however, which is an impeding factor with regard to the use of these fixing cramps.

In another embodiment, articles which are manufactured in large quantities, such as fasteners, are used in the production of such cramps in an attempt to reduce the cost price. A usual construction of said fixing cramps consists of a standardised hexagon head bolt with a cylindrical sleeve mounted and pressed thereon.

The object of the invention is to achieve a further reduction of the cost price of these known fixing cramps, and in order to accomplish that objective the method of making a fixing cramp comprises the following steps:

forming a metal wire having a circular section into a straight nail having a substantially cylindrical head with a diameter which is at least twice that of the wire, by working the cylindrical metal wire in a combination of straightening, upsetting and cutting-off operations, without finishing of the upset cylindrical head;
forming screw thread on at least part of the portion of the metal wire that has not been upset;
screwing an internally threaded sleeve onto the screw thread; and
locking the cylindrical sleeve in position on the screw thread.

According to the present method, by not finishing the cylindrical head of the straight shank in order to form a hexagonal head, the cost of the finishing operation is saved and the cost price is further reduced.

In accordance with a further improvement of the invention, the nail and/or the sleeve are plastically deformed when said locking takes place, in such a manner that the outer circumference of the fixing cramp becomes unround over at least part of its length, seen in cross-sectional view.

The result of this is that a single operation results in the cylindrical sleeve being locked in position on the screw thread and the fixing cramp being given such a shape that, once the fixing cramp is incorporated in the concrete, the shape of the fixing cramp prevents the fixing cramp from rotating along in the concrete, for example when a lifting lug is being screwed into the sleeve. Carrying out these steps in one operation will also result in a saving in costs.

The invention furthermore relates to a fixing cramp

composed of a bolt-shaped nail comprising a shank, which has the same dimensions as a standardised hexagon head bolt, and of a tubular sleeve screwed onto said shank.

Such fixing cramps are known, whereby a standardised hexagon head bolt is selected for the bolt-shaped part, and such fixing cramps are frequently used in concrete. The strength of the fixing cramp in the concrete is inter alia determined by the manner in which the head is fixed in the concrete. Since the hexagonal head of the bolt has been designed to have an area suitable for fitting steel parts together, this area is relatively small, and as a result of this the head is not very suitable for transmitting a sufficiently large load to the concrete, whilst another drawback of the hexagonal shape is the fact that the corner points of the hexagon load the concrete in a disadvantageous manner.

The object of the fixing cramp according to the invention is to eliminate the above drawbacks, and in order to accomplish that objective the head of the nail is substantially cylindrical, with a minimum dimension which corresponds with the largest dimension of the head of the standardised hexagon head bolt.

Making the head substantially cylindrical leads to a maximisation of the area which is capable of exerting pressure on the concrete in the direction of pulling, whilst the basic area is nevertheless equal to that of a hexagon head bolt, which permits a lower cost price, whilst the cylindrical shape of the head furthermore leads to fewer stress concentrations in the transition area between metal and concrete, as a result of which the cramp can be loaded more heavily.

In accordance with another improvement of the invention the bolt-shaped nail and/or the tubular sleeve are provided with rotation-preventing means comprising plastically deformable portions of the nail and/or the sleeve surfaces. In this manner a fixing cramp is obtained at low cost which will not rotate along with for example a lifting lug when said lifting lug is being screwed into the fixing cramp.

In accordance with another improvement of the construction according to the invention said rotation-preventing means consist of a multilaterally deformable outer circumference of the sleeve.

As a result of this the sleeve will be deformed simultaneously with being locked in position on the shank by being pressed thereon, in such a manner that the outer circumference of the deformed sleeve becomes irregular, as a result of which the cramp is prevented from rotating in the concrete.

According to another embodiment of the invention said rotation-preventing means consist of a non-circular section of the shank.

The shank is for example flattened on two sides thereby, as a result of which the cramp is prevented from rotating.

The invention will be explained in more detail hereafter with reference to a few embodiments, which are

illustrated in a drawing. In the drawing:

Fig. 1 shows a first embodiment of a fixing cramp according to the invention;
 Fig. 2 is a sectional view along line II-II in Fig. 1;
 Fig. 3 shows a second embodiment of a fixing cramp according to the invention; and
 Fig. 4 is a sectional view along line IV-IV in Fig. 3.
 Like parts are numbered alike as much as possible in the Figs.

Figs. 1 and 2 show a first embodiment of a fixing cramp according to the invention. A nail 1 comprises a shank 2 and a head 3, which is formed by deforming material having the same diameter as shank 2 without material removal. First stretching of the material takes place, which material is for example supplied in the shape of a wire present on a coil, or, when larger wire diameters are used, in the shape of a bar. Then head 3 is formed by deforming the material without removing any material, which head 3 has a minimum diameter a , which is at least twice that of the wire, for example, so that it would be possible to form a hexagonal head at a later stage by means of finishing operation, whereby the head comprises the standardized dimensions for the wire diameter in question.

The deformation without material removal may be carried out on cold material, possibly the material is heated, so that deformation will take place more easily with larger diameters. Costly moulds are used for this deformation without material removal. It is preferred, therefore, to use moulds which are used for normal mass-produced articles, such as hexagon head bolts.

After head 3 has been formed on nail 1, and nail 1 has been separated from the unworked material, screw thread is formed on shank 2, for example by means of a rolling operation.

The production steps for the production of standardized hexagon head bolts are identical to the steps indicated above, and head 3 is given its hexagonal shape by means of a mechanical operation, for example after the screw thread has been formed. Head 3 is not worked during the forming of nail 1. The other operations are identical, as a result of which the cost price of nail 1 can be kept low, because tools are used which are also suitable for the series-production of bolts.

An internally threaded sleeve 4 is screwed onto nail 1. The diameter of the material and the allowable stress of sleeve 4 result in a force to be maximally transmitted by sleeve 4, which force preferably corresponds more or less with the force to be maximally transmitted by shank 2, whereby different materials as well as different diameters may be used for sleeve 4 and shank 2. The force being exerted on sleeve 2 by an attachment screwed into sleeve 2 is transmitted to shank 2, which transmits said force, via head 3, to the concrete in which the cramp is fixed.

Sleeve 4 may become detached from the screw

thread of shank 2 during the pouring of concrete, whereby the fixing cramp is subject to vibrations caused by the compacting of the concrete. If this were to happen, the holding force of the fixing cramp may be considerably reduced without this being visible on the outside of the concrete. This is highly undesirable. In order to prevent this situation, sleeve 4 is pressed onto the screw thread of shank 2 all round over a deformed area 5 having a length b . Figs. 1 and 2 show how the outer circumference of sleeve 4 is deformed in longitudinal direction. The more or less corrugated surface obtained by the pressing step also prevents fixing cramp from rotating in the concrete. This deformation takes place as a result of a pressing force being exerted on the outer circumference of sleeve 4, transversely to the longitudinal direction thereof, by means of a tool being positioned round the outer circumference.

Figs. 3 and 4 show a second embodiment of the invention, wherein sleeve 2 is pressed onto the screw thread of shank 2 from two sides without a significant visible deformation of the outer circumference of sleeve 4 taking place, wherein shank 2 has likewise been flattened from two sides over an area 6, thus creating a deformed section 7, which is more or less rectangular, for example, or in any case non-circular, as a result of which the fixing cramp cannot rotate in the concrete.

Apart from the embodiments shown herein it is also conceivable to lock sleeve 4 in position on shank 2 of nail 1 in a different manner, for example by means of glue, and to prevent the fixing cramp from rotating in the concrete in a different manner, for example by changing or deforming the circular section of the fixing cramp locally into a non-circular section.

Also the above-described method of making nail 1 may be carried out in a different manner in practice, depending on the diameter of shank 2, for example. It is conceivable thereby to form the screw thread by means of a material-removing operation rather than by means of a rolling operation. What remains important, however, is the fact that the making of nail 1 is based on the forming of a comparable hexagon head bolt, whereby the operation of forming the hexagon on the head is not carried out.

Claims

1. A method of making a fixing cramp comprising the following steps: forming a metal wire having a circular section into a straight nail having a substantially cylindrical head with a diameter which is at least twice that of the wire, by working the cylindrical metal wire in a combination of straightening, upsetting and cutting-off operations, without finishing of the upset cylindrical head; forming screw thread on at least part of the portion of the metal wire that has not been upset; screwing an internally threaded sleeve onto the screw thread; and locking the cylin-

dricial sleeve in position on the screw thread.

2. A method according to claim 1, **characterized in that** the nail (1) and/or the sleeve (4) are plastically deformed when said locking takes place, in such a manner that the outer circumference of the fixing cramp becomes non-circular over at least part of its length, seen in cross-sectional view. 5
3. A fixing cramp composed of a bolt-shaped nail (1) comprising a shank (2), which nail has the same dimensions as a standardised hexagon head bolt, and of a tubular sleeve (4) screwed onto said shank, **characterized in that** the head (3) of the nail is substantially cylindrical, with a minimum dimension (a) which corresponds with the largest dimension of the head of the standardised hexagon head bolt. 10 15
4. A fixing clamp according to claim 3, **characterized in that** the bolt-shaped nail (1) and/or the tubular sleeve (4) are provided with rotation-preventing means comprising plastically deformable portions (5; 6) of the nail (1) and/or the sleeve (4) surfaces. 20
5. A fixing clamp according to claim 4, **characterized in that** said rotation-preventing means consist of a multilaterally deformable outer circumference (5) of the sleeve (4). 25
6. A fixing clamp according to any one of the claims 4 - 5, **characterized in that** said rotation-preventing means consist of a non-circular section (7) of the shank (2). 30

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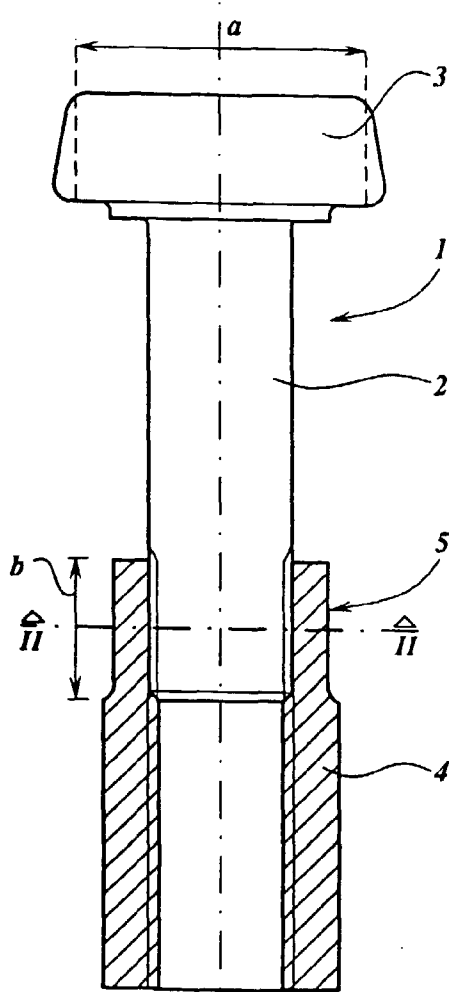


Fig. 1

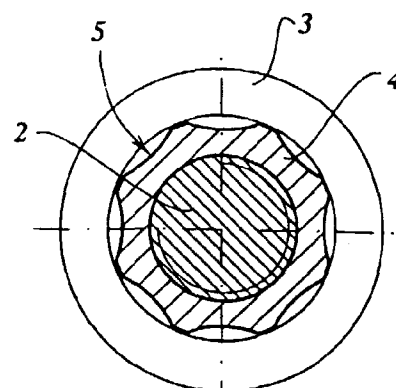


Fig. 2

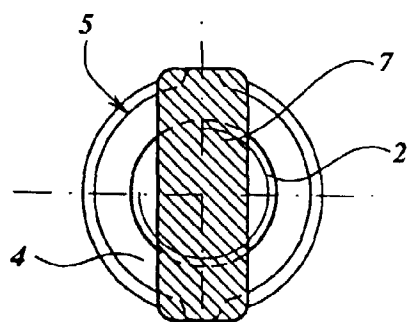


Fig. 4

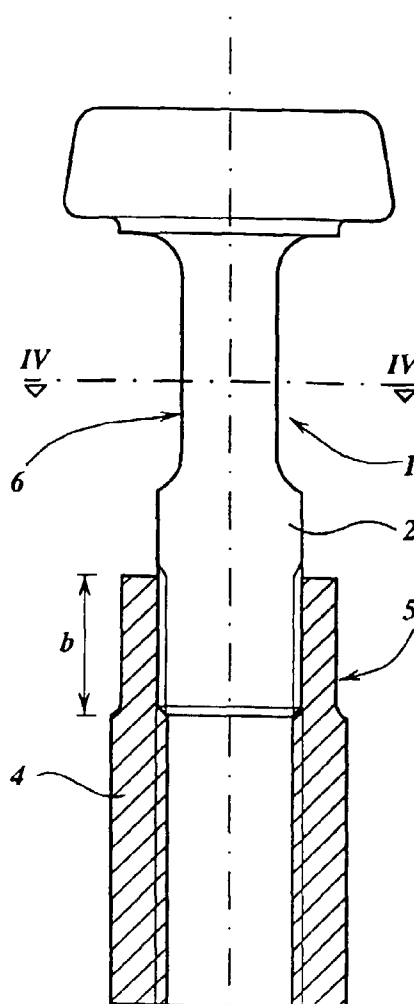


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 3094

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	DE 33 38 762 A (SCHNABEL) 9 May 1985 * claims; figures *	1	E04G21/14
A	EP 0 158 944 A (DEHA BAUBEDARF) 23 October 1985 * page 2 - page 3; figures *	1	
A	GB 1 442 987 A (G.K.N. BOLTS & NUTSW) 21 July 1976	1	
A	DE 43 10 022 A (PFEIFER SEIL- UND HEBETECHNIK) 7 October 1993		
A	DE 87 05 508 U (ILLE) 19 June 1987		
A	FR 2 289 269 A (GORKOVSKOE PROIZVODSTVENNO-KONSTRUKTORSKOE OBIEDINENIE) 28 May 1976		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E04G B21K
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 9 January 1998	Examiner Vijverman, W
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