

A method and a device for interconnecting objects

The invention relates to a connector which can be attached to the end of a metal bar-shaped object, which connector comprises a hole provided with internal screw
5 thread. If the end of said object is provided with external screw thread, said connector can be screwed onto said end.

10 Hereafter the interconnecting of the ends of lengths of reinforcing steel bars will be primarily discussed, although the invention is not limited thereto. For example also other bar-shaped objects such as tubes and pipes can be interconnected.

15 The interconnecting of the ends of reinforcing steel bars with a view to forming the reinforcement, prior to the pouring of concrete round said reinforcement, must take place in such a manner that relatively large pressure forces and/or tensile forces can be
20 transferred. Furthermore it must be avoided that the strength of the reinforcing bar is decreased as a result of a reduction of the cross-sectional area.

Especially at the building site, where the ends of
25 reinforcing bars must be interconnected, it is desirable that said interconnecting can take place in a quick, efficient and reliable manner, whereby it is advantageous when this can be done with a minimum amount of tools. In addition to this it is desirable that the
30 cut-off or sawn-off end of the reinforcing bar can be brought into engagement with a coupling element without any processing being required. Furthermore it is undesirable for the connector to take up too much volume in the poured concrete, especially in a direction
35 transversely to the reinforcing bar.

The object of the invention is to provide a connector by means of which two ends of reinforcing material can be interconnected and/or which can be attached to the end of a bar-shaped object, which can be fitted in a quick and reliable manner and which makes it possible to achieve any one or more of the above objects.

In order to accomplish that objective the connector is provided with a thread producing portion which co-axially adjoins said internal screw thread, which portion is positioned between said internal screw thread and the entrance of said hole. The term thread producing portion used herein is understood to mean a part which is integrally formed with said connector and which is capable of forming external screw thread, preferably by a material removing cutting operation.

In this manner it is possible to screw the connector onto the end of a bar shaped object such as a reinforcing bar or a tube or pipe in a very simple manner, whereby first screw thread is produced and subsequently the screw thread thus formed is brought into engagement with the internal screw thread of the connector. Preferably the screw thread is produced entirely or nearly entirely in the ribs which form the surface relief of the reinforcing bar. The hole may be a blind hole or a through hole.

In one preferred embodiment said hole is a through hole, which is provided with co-axially extending thread producing portions near each end, whilst the part of said hole extending between said portions is provided with internal screw thread. A connector of this kind may first be screwed onto the end of a first reinforcing bar, after which the end of a second reinforcing bar is screwed into the connector. Thus it is possible to form a simple, reliable and strong connection.

By forming the hole with two internally threaded portions, which each adjoin a screw thread producing portion, each end can be screwed into an internally threaded portion. The hole may thereby comprise a
5 constriction between said two portions, which constriction limits the depth to which each end can be screwed into the connector. Said thread producing portions may have different diameters thereby, so that they are capable of producing different screw threads,
10 and the adjoining, internally threaded parts may be provided with different threads in a corresponding manner.

Preferably at least part of the connector is externally
15 formed to have substantially the shape of a cylinder, which is co-axially oriented with respect to said hole. The surface of said cylinder may thereby be provided, at least partially so, with friction-increasing means, such as an axially oriented rib profile. This makes it easier
20 for the connector to engage when being rotated.

In one preferred embodiment at least part of the connector has an outer circumference in the shape of a hexagon, seen in cross-sectional view, so that the
25 connector is externally formed to have substantially the shape of a regular hexagon, whose six faces have parallel intersecting lines. In that case the connector can be rotated by means of conventional tools.

30 In another preferred embodiment at least part of the connector is provided with external screw thread, which extends co-axially with the internal screw thread. The connector may have a substantially cylindrical outside surface thereby, which is entirely provided with
35 external screw thread. Furthermore the connector may have a substantially cylindrical outside surface, part of said surface being provided with external screw

thread and the other part being provided with a hexagon, which lies entirely within the smallest cylindrical surface formed by the external screw thread.

5 When two ends of reinforcing bars are provided with such a connector, said two ends may be interconnected by first screwing a connecting part comprising an internally threaded through hole onto the screw thread of one connector and subsequently screwing back said
10 connecting part partly, so that said connecting part is also screwed onto the screw thread of the other connector.

In another preferred embodiment said connector is
15 provided with a flange at an axially oriented end thereof, which flange may have a square configuration and which may comprise holes near the corner points. In that case said connector can be screwed onto the end of a reinforcing bar, after which the flange is placed in
20 abutting relationship with the surface of a form, whereby it may or may not be fixed to said form, for example by driving nails through the holes. After the concrete has been poured and the form has been removed, the flange is present on the surface of the poured
25 concrete, so that the end of a reinforcing bar or any other object which is to be firmly secured can be attached to the flange, preferably in the hole present in the center of the flange.

30 In one preferred embodiment the connector is provided with an axially oriented, internally threaded hole at the axially oriented end that faces away from the end where the entrance of the hole with the adjoining thread producing portion is provided, without a thread
35 producing portion being present at that location. This makes it possible to attach an object to said connector

by means of a bolt, whilst the other end of said connector is attached to the end of a bar-shaped object.

5 In an other preferred embodiment the screw thread to be produced is a gastight and/or liquidtight thread, so that two pipes or tubes can be connected and gas or liquid can be transported through the two pipes or tubes. The exact fit of the external thread in the just produced internal thread is an advantage therewith.

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Preferably said connector is provided with an opening, which connects the outside surface with the interior of said hole, through which opening it is possible to see or feel whether the bar-shaped object extends into the
15 hole as far as said opening. When the end of the reinforcing bar is screwed into the hole it is possible to verify, either visually or by inserting a bar into said opening, whether said end extends sufficiently far into the connector. Preferably said opening is a hole
20 extending through the entire connector, so that it is possible to see through said hole whether an object is present in the connector at the location of said hole.

Preferably the entrance of said hole is configured to
25 have the shape of a funnel which extends as far as the location where said tapering part adjoins said thread producing portion. This facilitates the insertion of the end of a reinforcing bar.

30 Preferably the connector is substantially made of bar, and said bar has been locally hardened, by induction hardening, for example, at the location of said thread producing portion.

35 In one preferred embodiment said hole is a through hole, which is partially provided with right-handed internal screw thread and which is partially provided with left-

handed internal screw thread. This makes it possible to interconnect two ends of reinforcing bar by means of a single helical motion of the connector.

- 5 The invention furthermore relates to a system for connecting a bar-shaped object to another object, said system comprising the connector as described above and a connecting part comprising connecting means which are capable of engaging complementary connecting means of
- 10 the connector. The connecting means of the connecting part may comprise external screw thread, which are capable of mating with internal screw thread forming the connecting means of the connector.
- 15 The invention furthermore relates to a method for attaching one end of a bar-shaped object to another object, wherein a connector as described above is screwed onto said end. If the bar-shaped object is a reinforcing bar having a ribbed outside surface, and
- 20 screw thread is produced on said end by means of said thread producing portion, said screw thread is substantially formed in said ribs, so that the strength of said reinforcing bar is not affected. If the bar-shaped object is a pipe or tube, said screw thread is
- 25 preferably a gastight or liquidtight thread.

Furthermore the invention relates to a building, parts of which have been built by pouring concrete into a form, whereby reinforcing bars present in the concrete

30 are interconnected by interpolating connectors according to the invention.

Further aspects of the invention, which may be used both separately and in combination with each other, will be

35 described below with reference to the Figures and be defined in the claims.

Hereafter a few embodiments of a connector according to the invention will be described by way of illustration, whereby reference will be made to the drawing.

- 5 Figure 1 shows a first embodiment of a connector;
Figure 2A is an end view of said first embodiment;
Figure 2B is an end view of a second embodiment;
Figure 3 is a longitudinal sectional view of said second
embodiment;
- 10 Figure 4 shows a detail of said second embodiment;
Figures 5 and 6 shows the manner in which said connector
is attached to the two ends of concrete reinforcing
bars;
Figure 7 shows a third embodiment of a connector;
- 15 Figure 8 is a perspective view of the third embodiment;
Figure 9 shows another manner of connecting reinforcing
bars;
Figure 10 shows a portion of Figure 9 in more detail;
Figure 11 is a perspective view of a connector as shown
20 in Figures 9 and 10;
Figure 12 is a longitudinal sectional view of an other
embodiment of a connector, and
Figures 13 and 14 show connectors comprising a flange.
- 25 The Figures are merely diagrammatic illustrations,
wherein like parts in the various embodiments are
numbered alike.

Figure 1 shows a first embodiment of a connector 1
30 having a hexagonal outside surface 3 (figure 2A) and a
through hole 2. Near the entrance of said hole 2 a screw
thread cutting portion 4 is provided, which comprises
cutting parts 5 and six recesses 6.

35 Figure 2A is a side view of the connector according to
Figure 1. Figure 2B is a similar side view of a second

embodiment having a cylindrical outside surface and having five recesses 6.

- Preferably six recesses 6 or more are present to
5 increase the number of cutting parts 5. Furthermore the cutting parts 5 will be smaller so that the mechanical friction when cutting the screw thread is less.

- Figure 3 is a longitudinal sectional view of the second
10 embodiment of the connector 1. A through hole 2 is present in the connector 1, which hole 2 comprises internally threaded portions 8,9 on either side of the middle portion 16. The middle portion 16 forms a stop for the reinforcing bar when being screwed in the
15 connector 1. The thread cutting portion 4 comprising cutting parts 5 and recesses 6 is provided in adjoining relationship to each of said internally threaded portions 8,9.

- 20 Figure 3 shows two bores 11 extending between the outside surface of the connector 1 and the hole 2. Through the bore 11 it is possible to feel with a pin whether or not the end of the reinforcing bar 14,15 is screwed far enough in the connector. In case bore 11 is
25 a through bore, i.e. two co-axially bores, it is possible to look through said two bores in case the end of the bar 14,15 does not extend far enough into the connector, so to do the inspection without any-tool.

- 30 Figure 4 shows on a larger scale that the entrance of hole 2 is slightly tapered to provide a funnel-shaped configuration, thus facilitating the insertion of one end of an object. The funnel angle is indicated at 10. The angle is preferably less than 10%, for example about
35 5%.

Figures 5 and 6 show the manner in which said connector is provided between the two reinforcing bars 14,15, whose surface is provided with ribs 13. The screw thread is cut entirely or nearly entirely in said ribs 13.

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Figure 7 shows a connection, wherein two reinforcing bars 14,15 having different diameters are interconnected by a connector 1 comprising screw thread 18,19 as well as thread cutting portions 20,21 of mutually different diameters.

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Figure 8 is a perspective view of a connection which corresponds with the connection shown in Figure 7, wherein the outside surface of connector 1 is hexagonal. The reinforcing bars 14,15 shown in Figure 8 have been screwed out of connector 1, this has only been done for the purpose of illustration.

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In the embodiment according to Figure 9 each end of the reinforcing bar 14,15 is first provided with a connector 25 of the type shown in Figure 11, having a screw thread cutting portion at one side. Said connector has a substantially cylindrical external surface, which partially consists of external thread 26 and which is ~~partially~~ provided with a hexagonal 27, which can be engaged by a tool with a view to rotating said connector.

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After the two connectors 25 have been placed on the ends of the reinforcing bars 14,15, a connecting part 29 is first screwed entirely onto one connector 25, and then screwed back so as to be screwed onto the other connector 25, in order to obtain the situation shown in Figure 9.

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Figure 10 is a longitudinal sectional view of a connection which corresponds with the connection shown

in Figure 9, including a sectional view of the connector 25. Figure 11 is a perspective view of connector 25.

Figure 12 is a longitudinal sectional view of a
5 connector 1 provided with right-handed screw thread 32 on one side and with left-handed screw thread 33 on the other side, which screw threads each adjoin a corresponding thread cutting portions 34,35 near the two entrances of through hole 2. It is possible to
10 interconnect two reinforcing bars 14,15 by means of such connector, whilst the connector is only rotated in one direction.

Figures 13 and 14 show a connector comprising a flange
15 36 at its end, which flange is provided with four holes 37. The connector according to Figure 13 has a ribbed outside surface 38, so that it can be readily engaged in order to be rotated. The connector according to Figure 14 has a hexagonal outside surface, so that it can be
20 screwed down by means of a conventional spanner. However, the connector may have a substantially cylindrical outside surface without means for being engaged.

25 The invention may be implemented in many ways. In practice, the illustrated embodiments are only intended by way of illustration and are to be considered as examples, therefore.

CLAIMS

1. A connector which can be attached to the end of a bar-shaped object (14,15), which connector (1,25) comprises a hole (2) provided with internal screw thread (8,9;18,19;32,33), and with a thread producing portion (4;20,21;34,35) which co-axially adjoins said internal screw thread, which portion is positioned between said internal screw thread and the entrance of said hole (2).
2. A connector according to claim 1, characterized in that the thread producing portion (4;20,21;34,35) is a material removing cutter and that said thread producing portion is provided with recesses (6) for storing material which is removed from the surface of the bar-shaped object (14,15).
3. A connector according to any one of the preceding claims, characterized in that said hole (2) is a through hole, which is provided with co-axially extending thread producing portions (4;20,21;34,35) near each end of the hole (2), whilst the part of said hole (2) extending between said portions is provided with internal screw thread.
4. A connector according to any of the preceding claims, characterized in that said hole (2) is a through hole (2) comprising two portions with internal screw thread (32,33) at both sides of the middle portion (16) of the hole (2), said middle portion (16) having a smaller diameter than the largest diameter of the screw thread (32,33), so that it forms a stop for the bar-



shaped object (14,15) when being screwed into the connector (1).

5. A connector according to claim 3 or 4,
5 characterized in that said thread producing portions have mutually different diameters, so that they are capable of producing different screw threads, and in that the adjoining,
internally threaded parts are provided with
10 different threads in a corresponding manner.
6. A connector according to any one of the preceding
claims, characterized in that at least part of
the connector is externally formed to have
15 substantially the shape of a cylinder, which is co-axially oriented with respect to said hole (2).
7. A connector according to claim 6, characterized
20 in that surface of said cylinder is provided, at least partially so, with friction-increasing means, such as an axially oriented rib profile.
8. A connector according to any one of the preceding
25 claims, characterized in that at least part of the connector has an outer circumference in the shape of a hexagon, seen in cross-sectional view, so that the connector is externally formed to have substantially the shape of a regular
30 hexagon, whose six faces have parallel intersecting lines.
9. A connector according to any one of the preceding
claims, characterized in that at least part of
35 the connector (25) is provided with external screw thread (26), which extends co-axially with the internal screw thread.



10. A connector according to claim 9, characterized in that said connector (25) has a substantially cylindrical outside surface, which is entirely provided with external screw thread (26).
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11. A connector according to claim 9, characterized in that said connector (25) has a substantially cylindrical outside surface, part of said surface being provided with external screw thread (26)
- 10 and an other part being provided with a hexagon (27), which lies entirely within the smallest cylindrical surface formed by the external screw thread (26).
- 15 12. A connector according to any one of the preceding claims, characterized in that said connector (1) is provided with a flange (36) an axially oriented end thereof.
- 20 13. A connector according to claim 12, characterized in that said flange (36) is substantially square and is provided with holes (37) near the corners.
- 25 14. A connector according to any one of the preceding claims, characterized in that the screw thread producing portion produces a liquidtight or gastight screw thread.
- 30 15. A connector according to any one of the preceding claims, characterized in that said connector is provided with an opening (11), which connects the outside surface with the interior of said hole (2), through which opening (11) it is possible to see or feel whether the bar-shaped object extends
- 35 into the hole (2) as far as said opening (11).



16. A connector according to any one of the preceding claims, characterized in that the entrance of said hole (2) is configured to have the shape of a funnel (10), which extends as far as the location where said tapering part adjoins said thread producing portion (4).
17. A connector according to any one of the preceding claims, characterized in that said connector (1;25) is substantially made of steel, and that said steel is locally hardened at the location of said thread producing portion (4).
18. A connector according to any one of the preceding claims, characterized in that said hole (2) is a through hole (2), which is partially provided with right-handed internal screw thread (32) and which is partially provided with left-handed internal screw thread (33).
19. A system for connecting a bar-shaped object to another object, said system comprising a connector (25) according to any one of the preceding claims and a connecting part (29) comprising connecting means which are capable of engaging complementary connecting means (26) of said connector (25).
20. A system according to claim 19, characterized in that the connecting means of said connecting part (29) comprise external screw thread (26), which are capable of mating with internal screw thread forming the connecting means of said connecting part (29).
21. A system according to claim 19 or 20 for interconnecting two bar-shaped objects,



comprising two connectors (25) according to any one of the claims 1-18 as well as a connecting part (29) comprising connecting means which are capable of engaging complementary connecting means (26) of the two connectors (25) so as to interconnect said two connectors (25).

22. A system according to any of claims 19-21, comprising two connectors (25) according to any one of the claims 9-11 as well as a connecting part (29), which comprises a through hole (2) provided with internal screw thread which fits on the external screw thread (26) of the two connectors (25).

23. A method for connecting a connector (1;25) to the end of a bar-shaped object (14,15), whereby the connector (1;25) is screwed on said end, the connector (1;25) comprising a hole (2) provided with internal screw thread (8,9;18,19;32,33) and with a screw thread producing portion (4;20,21;34,35) which co-axially adjoins said internal screw thread, which portion is positioned between said internal screw thread and the entrance of said hole (2), whereby screw thread is produced on said end of said object (14,15) by said screw thread producing portion (4;20,21;34,35).

24. A method according to claim 23, characterized in that the screw thread is produced by a material removing cutting operation, whereby the removed material is stored in recesses (6) in the connector (1,25).

25. A method for attaching one end of a bar-shaped object to another object, wherein a connector



according to any one of the claims 1 - 18 is
screwed onto said end.

26. A method according to any of the claims 23-25,
5 characterized in that said bar-shaped object is a
reinforcing bar (14,15) having a ribbed outside
surface, wherein screw thread is produced on said
end by means of said thread producing portion,
which screw thread is substantially formed in
10 said ribs (13).
27. A method according to any of claims 23-26 for
interconnecting the two ends of bar-shaped
objects (14,15), wherein each of said ends is
15 provided with a connector (25) according to any
one of the claims 9 - 11, and wherein a
connecting part (29) comprising an internally
threaded through hole (2) is first screwed onto
the screw thread of one connector (25) and then
20 screwed back partially, so that said connecting
is also screwed onto the screw thread of the
other connector (25).
28. A method according to any of claims 23-26,
25 characterized in that a connector according to
claim 12 or 13 is screwed onto the end of a
reinforcing bar, after which said flange is
placed in abutting relationship with the surface
against which concrete is to be poured.
30
29. A building, parts of which have been built by
pouring concrete into a form, characterized in
that reinforcing bars present in the concrete are
interconnected by connectors according to any one
35 of the claims 1 - 18.

