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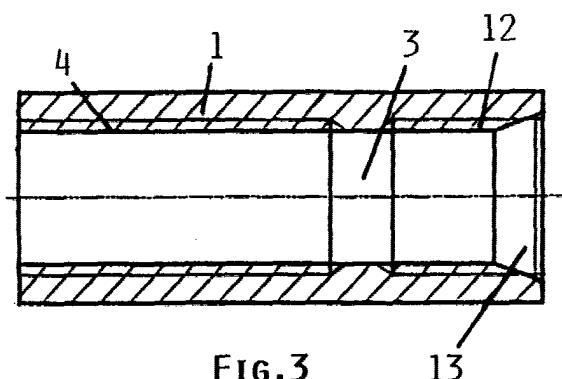
Remarks:

Amended claims in accordance with Rule 86 (2)
EPC.

(54) System and method for interconnecting two reinforcing bars and coupler

(57) A system for interconnecting two ends of reinforcing bars, comprising a coupler (1,2) and reinforcing bars the end of which are provided with screw thread. The coupler (1,2) being provided with a first hole (3) provided with internal screw thread (4), which can be screwed onto the end of one reinforcing bar, and a sec-

ond hole (6) provided with internal screw thread (7), which can be screwed onto the end of the other reinforcing bar. The coupler consists of two parts (1,2), which can be screwed together, wherein each part (1,2) includes a hole (3,6) provided with internal screw thread (4,7), which can be screwed onto an end of a reinforcing bar.



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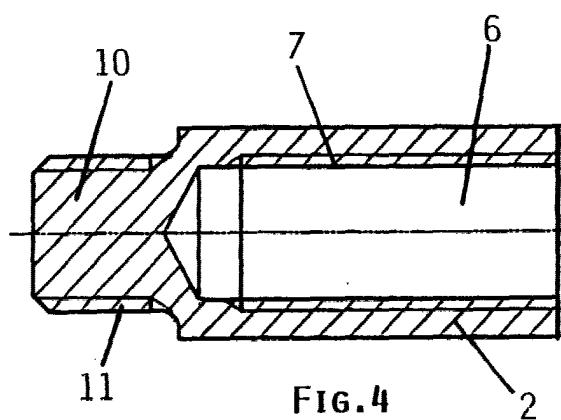


FIG.4

Description

[0001] The invention relates to a system for interconnecting two ends of reinforcing bars, comprising a coupler and reinforcing bars the end of which are provided with screw thread, the coupler being provided with a first hole provided with internal screw thread, which can be screwed onto the end of one reinforcing bar, and a second hole provided with internal screw thread, which can be screwed onto the end of the other reinforcing bar. Preferably the two holes are coaxial with respect to each other.

[0002] GB-A-2163194 discloses a system of this kind, whereby the coupler is screwed onto external screw thread which has been formed mainly into the ribs present on the surface of the reinforcing bar. Said coupler consists of a sleeve having an internally threaded hole at each end. With this coupler it is possible to make a connection between two reinforcing bars on a building site. This makes it possible to cut the reinforcing bars to the required length and interconnect them on the building site.

[0003] When the screw thread present at the end of the reinforcing bars is formed practically only in the ribs present on the surface of the reinforcing bar, the strength of the reinforcing bar is hardly affected, if at all, whilst it has appeared to be possible yet to make a sufficiently strong connection between the coupler and the reinforcing bar.

[0004] In practice it has become apparent that the screwing of the coupler onto the end of the reinforcing bar is a difficult job. Especially when the screw thread is present practically only in said ribs, the coupler must be kept in precise alignment with the reinforcing bar during screwing, especially initially, since otherwise the screw thread will be damaged. When the coupler is manually screwed onto the end of the reinforcing bar, the risk of damage is practically excluded, since such damage will be perceived immediately in the form of resistance during screwing.

[0005] When the coupler is being screwed onto the first reinforcing bar, no major problems present themselves yet, but problems do present themselves when the coupler is screwed onto the end of the second reinforcing bar when it is already fixed to the first reinforcing bar. In that case it is not simple to screw the coupler onto the other end without damaging the screw thread. Since the screw thread is easily damaged during said screwing, the connection that is made will be less reliable.

[0006] Another disadvantage of the system according to GB-A-2163194 is the fact that the coupler must be screwed onto the reinforcing bars over a relatively large distance to achieve a sufficient strong connection between the coupler and the reinforcing bar. In practice the distance is about 2.5 times the diameter of the screw thread. To reduce the number of revolutions of the two reinforcing bars with respect to each other when making the connection, GB-A-2163194 proposes to make use

of "two start" type screw thread, whereby the required number of revolutions is decreased. However, this type of screw thread is not preferred.

[0007] The object of the invention is to provide an interconnection of two reinforcing bars which can be made without any difficulty and in a reliable manner.

[0008] In order to accomplish that objective, the coupler consists of two parts, which can be screwed together, wherein each part includes a hole provided with internal screw thread, which can be screwed onto an end of a reinforcing bar. After each part has been separately screwed onto the reinforcing bar, the two parts are interconnected by means of their screwed connection, which may consist of a threaded rod fixed to one part and an internally threaded hole formed in the other part. Preferably the threaded rod and the hole are coaxial with the holes provided with internal screw threads, which can be screwed onto the ends of the reinforcing bars.

[0009] Said screwed interconnection of the two parts of the coupler can be made so that the risk of any damage being caused upon the making of the connection or of an incorrect connection being made in any other manner is practically excluded. Preferably, a conical portion (funnel shape) is thereby used at the entry of the hole.

[0010] The term threaded rod is understood to mean a rod-shaped, externally threaded metal part, also called threaded end.

[0011] The screw connection between the two parts of the coupler can be made such that the parts can be screwed together with a limited number of revolutions with respect to each other, because sufficient strength is achieved with a small length of the screw thread. The length of the screw thread can be substantially equal to the diameter of the screw thread and that means less than half the length of the screw thread of the connection between the coupler and the reinforcing bars.

[0012] A coupler for connecting reinforcing bars which consists of two parts which can be screwed together is known per se. Said parts are not screwed onto the ends of the reinforcing bars, however, but they are fixedly connected to the reinforcing bar by means of a forcing operation under deformation of the material. A coupler of this kind must be made of a special material which allows such a deforming operation, so that it is not possible to select an optimum material to ensure a strong and reliable connection. Moreover, it is difficult to make the connection on the building site, because special machines are required for the operation. Furthermore it is necessary to use a special tool for each different diameter of the reinforcing bar.

[0013] In one embodiment the diameter of the first hole is different from that of the second hole, which makes it possible to interconnect reinforcing bars having different diameters. In that case the two cutting portions will also cut screw threads having different diameters, of course.

[0014] The part provided with the smaller hole preferably comprises an externally threaded rod, which can

be screwed into internal screw thread of the other part so as to effect the screwed connection of the two parts of the coupler. The other part may be provided with a through hole in that case, into which hole both the internal screw thread for connection with the reinforcing bar and the internal screw thread for the interconnection of the parts have been formed, which internal screw threads can have substantially the same diameter.

[0015] When the two parts of the coupler have internal screw threads have different diameters, the diameter of the screw thread of the screwed connection between the two parts is preferably substantially the same or smaller than the diameter of the larger internal screw thread.

[0016] The coupler can have any suitable shape on the outside, for example circular (tubular), but preferably the coupler has an outside circumference of substantially hexagonal cross-section over at least part of its length, preferably over the entire length when the two parts are connected. The parts of the coupler can be screwed onto the ends of the reinforcing bars with a normal wrench in that case and be screwed together by means of the same wrench.

[0017] Preferably, the screwed connection between the two parts is positioned entirely between the screwed connections with the two reinforcing bars, seen in axial direction, so that the coupler can have a cross-sectional dimension which is slightly larger than the diameter of the reinforcing bar.

[0018] The invention furthermore relates to a coupler provided with a first hole provided with internal screw thread, which can be screwed onto the end of a reinforcing bar, and a second hole provided with internal screw thread, which can be screwed onto the end of another reinforcing bar, whereby the coupler consists of two parts, which can be screwed together, wherein each part includes a hole provided with internal screw thread, which can be screwed onto an end of a reinforcing bar.

[0019] The invention furthermore relates to a coupler member which can be used as part of the above-described coupler, which member includes a hole provided with internal screw thread, which can be screwed onto the end of a reinforcing bar, and a threaded rod coaxial with the hole which is provided with external screw thread which is spaced from the internal screw thread by some distance, seen in axial direction. The diameter of the external screw thread is thereby smaller than the cross dimension of the coupler at the location of the internal screw thread, and preferably said diameter is substantially equal to the diameter of the internal screw thread.

[0020] A coupler member of this kind can be used not only as part of the above-described coupler. Two such coupler members can jointly form a coupler for interconnecting two reinforcing bars. They are each screwed onto an end of a reinforcing bar, after which they are fixed together by means of a sleeve provided with internal screw thread, which is screwed onto the external screw thread of the two coupler members.

[0021] The threaded rod of one of the two coupler members can be made longer thereby, so that said sleeve can first be screwed entirely on said threaded rod and then be screwed back onto the other coupler member. An additional nut may be used to lock the sleeve against undesirable rotation.

[0022] The invention furthermore relates to a coupler member which can be used as part of the above-described coupler, which coupler member includes a hole provided with internal screw thread, which can be screwed onto the end of a reinforcing bar, and a hole coaxial with the aforesaid hole, which hole is provided with internal screw thread of a different type or having a different dimension than the aforesaid internal screw thread. A coupler member of this kind can be used not only as part of the above-described coupler. Two such coupler members can also jointly form a coupler for connecting to reinforcing bars. They are each screwed onto an end of a reinforcing bar, after which they are fixed together by means of a threaded rod which is screwed into the latter internally threaded hole of the coupling members. This makes it possible to interconnect two ends of reinforcing bars which are positioned further apart.

[0023] The invention furthermore relates to a method for interconnecting two ends of reinforcing bars, wherein a coupler including a first hole and a second hole, both provided with internal screw thread, is screwed onto the end of a reinforcing bar and subsequently onto the end of another reinforcing bar, wherein the coupler consists of two parts which each include an internally threaded hole, wherein each part is screwed separately onto the end of a reinforcing bar, after which the two parts are fixed together by means of a screwed connection.

[0024] In order to explain the invention more fully, embodiments of a coupler will be described hereafter with reference to the drawing.

Figures 1 and 2 are views of two parts which jointly form a coupler;
Figures 3 and 4 are sectional views of said coupler;
and
Figures 5 and 6 show a second embodiment of a coupler.

[0025] Figure 3 is a sectional view of the part 1 of coupler 1, 2 which is shown in elevation in Figure 1. The illustrated part 1 includes a through hole 3, which is provided with internal screw thread 4 on the left-hand side.

When an external screw thread is present on the end of a reinforcing bar, which screw thread is mainly present in the ribs which are present on the surface of the reinforcing bar so as not to reduce the strength of the reinforcing bar, part 1 can be screwed down on said end of the reinforcing bar by means of external screw thread 4.

[0026] Figure 4 is a sectional view of the part 2 of coupler 1, 2 which is shown in elevation in Figure 1. The illustrated part 1 includes a blind hole 6 provided with

internal screw thread 7. Like part 1, part 2 can be screwed down on the end of a reinforcing bar, on which a screw thread is present, which screw thread mates with internal screw thread 7.

[0027] After the parts 1 and 2 have been fixed to the two ends of the reinforcing bars, the two reinforcing bars are connected by screwing threaded rod 10, which is provided with internal screw thread 11, into the internal screw thread 12 of hole 3 until the two parts 1, 2 are firmly connected.

[0028] Part 1 includes a funnel-shaped portion 13, which makes it easier to screw the two parts 1, 2 together.

[0029] Each part 1, 2 can be fixed separately to the end of a reinforcing bar, which must be done with due care so as not to damage the screw thread present in the ribs of the reinforcing bar.

[0030] Figures 5 and 6 show a second embodiment, with Figure 5 showing a part 15 which is similar to the part 2 which is shown in Figures 2 and 4. Part 15 includes an internally threaded hole (not shown). Part 15 furthermore includes an externally threaded rod 18. The other part 17 of the coupler is different from the part 15 which is shown in Figure 5 in that its threaded rod 19 is longer. An internally threaded sleeve 20 is present on threaded rod 19. After the parts 15 and 17 have each been fixed to an end of a reinforcing bar, sleeve 20 is turned in the direction of part 15 until sleeve 20 surrounds threaded rod 18 as well as threaded rod 19, thus interconnecting the two parts 15 and 17. A locknut may be used to fix sleeve 20.

[0031] In this second embodiment parts 15 and 17 and sleeve 20 have a hexagonal outer circumference.

Claims

1. A system for interconnecting two ends of reinforcing bars, comprising a coupler (1,2) and reinforcing bars the end of which are provided with screw thread, the coupler (1,2) being provided with a first hole (3) provided with internal screw thread (4), which can be screwed onto the end of one reinforcing bar, and a second hole (6) provided with internal screw thread (7), which can be screwed onto the end of the other reinforcing bar, **characterized in that** the coupler consists of two parts (1,2), which can be screwed together, wherein each part (1,2) includes a hole (3,6) provided with internal screw thread (4,7), which can be screwed onto an end of a reinforcing bar.
2. A system according to claim 1, **characterized in that** ribs are present on the surface of the reinforcing bars and that the screw thread is provided mainly in said ribs.
3. A system according to claim 1 or 2, **characterized**

in that said first hole (3) and said second hole (6) have different diameters.

4. A system according to claim 3, **characterized in that** the part (2) provided with the smaller hole (6) includes an externally threaded rod (10), which can be screwed into internal screw thread (12) of the other part (1) so as to effect the screwed connection of the two parts (1,2) of the coupler.
5. A system according to claim 4, **characterized in that** the other part (1) is provided with a through hole (3), into which hole both the internal screw thread (4) for connection with the reinforcing bar and the internal screw thread (12) for the interconnection of the parts (1,2) have been formed, which internal screw threads (4,12) can have substantially the same diameter.
10. A system according to any one of the preceding claims, **characterized in that** the diameter of the screw thread (11,12) of the screwed connection between the two parts (1,2) is substantially the same or smaller than the diameter of the larger internal screw thread (4;7).
20. A system according to any one of the preceding claims, **characterized in that** at least part of the length of the coupler (1,2) has an outside circumference of hexagonal cross-section.
25. A system according to any one of the preceding claims, **characterized in that** the screwed connection between the two parts (1,2) of the coupler is positioned entirely between the screwed connections with the two reinforcing bars, seen in axial direction.
30. A coupler provided with a first hole (3) provided with internal screw thread (4), which can be screwed onto the end of a reinforcing bar, and a second hole (6) provided with internal screw thread (7), which can be screwed onto the end of another reinforcing bar, **characterized in that** the coupler consists of two parts (1,2), which can be screwed together, wherein each part (1,2) includes a hole (3,6) provided with internal screw thread (4,7), which can be screwed onto an end of a reinforcing bar.
35. A coupler member to be used as part of a coupler (1,2) of the system according to any one of the claims 1-8, which coupler member includes a hole (6) provided with internal screw thread (7), which can be screwed onto the end of a reinforcing bar, **characterized by** a threaded rod (10) coaxial with the hole (6), which is provided with external screw thread (11), which is spaced from the internal screw thread (7) by some distance, seen in axial direction.
40. A coupler provided with a first hole (3) provided with internal screw thread (4), which can be screwed onto the end of a reinforcing bar, and a second hole (6) provided with internal screw thread (7), which can be screwed onto the end of another reinforcing bar, **characterized in that** the coupler consists of two parts (1,2), which can be screwed together, wherein each part (1,2) includes a hole (3,6) provided with internal screw thread (4,7), which can be screwed onto an end of a reinforcing bar.
45. A coupler member to be used as part of a coupler (1,2) of the system according to any one of the claims 1-8, which coupler member includes a hole (6) provided with internal screw thread (7), which can be screwed onto the end of a reinforcing bar, **characterized by** a threaded rod (10) coaxial with the hole (6), which is provided with external screw thread (11), which is spaced from the internal screw thread (7) by some distance, seen in axial direction.
50. A coupler provided with a first hole (3) provided with internal screw thread (4), which can be screwed onto the end of a reinforcing bar, and a second hole (6) provided with internal screw thread (7), which can be screwed onto the end of another reinforcing bar, **characterized in that** the coupler consists of two parts (1,2), which can be screwed together, wherein each part (1,2) includes a hole (3,6) provided with internal screw thread (4,7), which can be screwed onto an end of a reinforcing bar.
55. A coupler member to be used as part of a coupler (1,2) of the system according to any one of the claims 1-8, which coupler member includes a hole (6) provided with internal screw thread (7), which can be screwed onto the end of a reinforcing bar, **characterized by** a threaded rod (10) coaxial with the hole (6), which is provided with external screw thread (11), which is spaced from the internal screw thread (7) by some distance, seen in axial direction.

11. A coupler member to be used as part of a coupler (1,2) of the system according to any one of the claims 1-7, which coupler member includes a hole (3) provided with internal screw thread (4), which can be screwed onto the end of a reinforcing bar, **characterized by** a hole (3) coaxial with the aforesaid hole (3), which hole is provided with internal screw thread (12) of a different type or having a different dimension than the aforesaid internal screw thread (4).

12. A method for interconnecting two ends of reinforcing bars, wherein a coupler (1,2) including a first hole (3) and a second hole (6), both provided with internal screw thread (4,7), is screwed onto the end of a reinforcing bar and subsequently onto the end of another reinforcing bar, **characterized in that** the coupler comprises two parts (1,2) which each include an internally threaded hole (3,6), wherein each part (1,2) is screwed separately onto the end of a reinforcing bar, after which the two parts (1,2) are fixed together by means of a screwed connection (11,12).

Amended claims in accordance with Rule 86(2) EPC.

1. A system for interconnecting two ends of reinforcing bars, comprising a coupler (1,2) and reinforcing bars the end of which are provided with screw thread being provided mainly in ribs which are present on the surface of the reinforcing bars, the coupler (1,2) being provided with a first hole (3) provided with internal screw thread (4), which can be screwed onto the end of one reinforcing bar, and a second hole (6) provided with internal screw thread (7), which can be screwed onto the end of the other reinforcing bar, **characterized in that** the coupler consists of two parts (1,2), which can be screwed together, wherein each part (1,2) includes a hole (3,6) provided with internal screw thread (4,7), which can be screwed onto an end of a reinforcing bar.

2. A system according to claim 1, **characterized in that** said first hole (3) and said second hole (6) have different diameters.

3. A system according to claim 2, **characterized in that** the part (2) provided with the smaller hole (6) includes an externally threaded rod (10), which can be screwed into internal screw thread (12) of the other part (1) so as to effect the screwed connection of the two parts (1,2) of the coupler.

4. A system according to any one of the preceding claims, **characterized in that** one of said parts (1) is provided with a through hole (3), into which hole

5 both the internal screw thread (4) for connection with the reinforcing bar and the internal screw thread (12) for the interconnection of the parts (1,2) have been formed, which internal screw threads (4,12) can have substantially the same diameter.

10 5. A system according to any one of the preceding claims, **characterized in that** the diameter of the screw thread (11,12) of the screwed connection between the two parts (1,2) is substantially the same or smaller than the diameter of the larger internal screw thread (4;7).

15 6. A system according to any one of the preceding claims, **characterized in that** at least part of the length of the coupler (1,2) has an outside circumference of hexagonal cross-section.

20 7. A system according to any one of the preceding claims, **characterized in that** the screwed connection between the two parts (1,2) of the coupler is positioned entirely between the screwed connections with the two reinforcing bars, seen in axial direction.

25 8. A method for interconnecting two ends of reinforcing bars, wherein a coupler (1,2) including a first hole (3) and a second hole (6), both provided with internal screw thread (4,7), is screwed onto external screw thread on the end of a reinforcing bar and subsequently onto external screw thread on the end of another reinforcing bar, both external screw threads being provided mainly in ribs which are present on the surface of the reinforcing bars, **characterized in that** the coupler comprises two parts (1,2) which each include an internally threaded hole (3,6), wherein each part (1,2) is screwed separately onto the end of a reinforcing bar, after which the two parts (1,2) are fixed together by means of a screwed connection (11,12).

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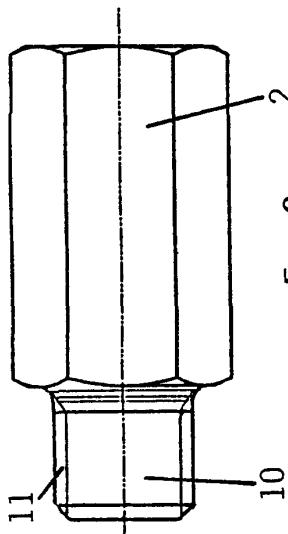


FIG. 2

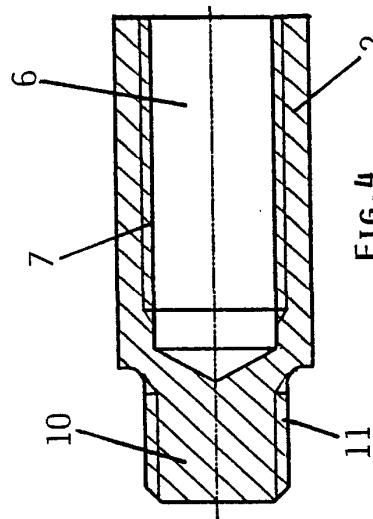


FIG. 4

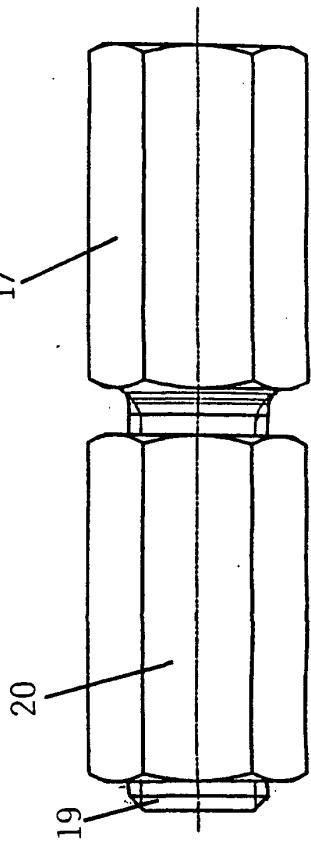


FIG. 6

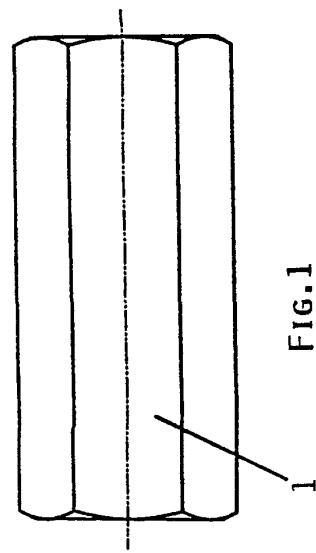
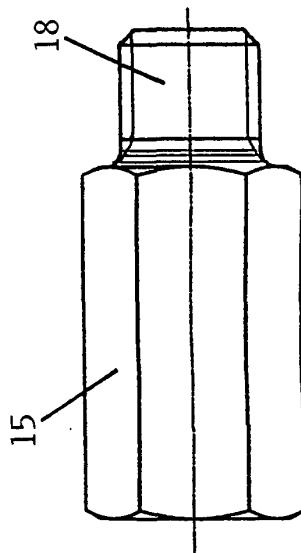


FIG. 5





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.7)	
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim		
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The present search report has been drawn up for all claims				
Place of search	Date of completion of the search	Examiner		
THE HAGUE	15 December 2000	Righetti, R		
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 20 3004

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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