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# (54) COLUMN SHOE

PFAHLSCHUH

SABOT DE COLONNE

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#### Description

#### Background of the invention

[0001] The object of the invention is a column shoe according to the preamble of claim 1.

[0002] The invention relates to column shoes which are used in lower end corners and sides of steel concrete columns or corresponding concrete element columns for securing the column to the bolts in the column base structure.

[0003] From publication FI 118186 a column shoe for securing steel concrete columns to a base is known. The column shoe comprises a baseplate provided with a bolt hole and a sideplate secured to the baseplate by welding in order to form a bolt housing. The column shoe further comprises main attachments fixed to the bolt housing for securing the column shoe and the steel concrete column together. Column shoes of this type are also known from publications FI 95164 and SE 511 606.

[0004] One problem with these known column shoes is the eccentricity between the anchor bolt and the reinforcement bars serving as main attachments of the column shoe. Eccentricity generates horizontal forces on steel concrete column, which horizontal forces have to be encountered by adding reinforcement to the column. Eccentricity also increases internal stresses in the column shoe and creates need for rear attachment when column shoe is under compressive load. One further problem with these known column shoes is the connection between baseplate and sideplate, which is a welded connection and which for this reason generates stress peaks.

#### Brief description of the invention

[0005] The aim of the invention is to solve the above problems.

[0006] The object of the invention is obtained by the column shoe according to independent claim 1.

[0007] Preferred embodiments of the invention are described in dependent claims.

[0008] The invention is based on the idea that, since the bolt housing is fabricated by casting such that the bolt housing comprises a single-piece casting comprising a baseplate and a sideplate, no stress peaks are generated between the baseplate and the sideplate. This is because as a result of casting there is created a joint of uniform quality between the baseplate and the sideplate.

[0009] Another advantage obtained by the solution according to the invention is that, since a hole is formed in the bolt housing for securing the attachment unit to the bolt housing, which hole is coaxial with the bolt hole in the baseplate of the bolt housing, no rear attachment is in practice needed in the column shoe according to the invention in order to transfer forces. In general, such rear attachments must be used in order to transmit to the steel concrete column the lower horizontal force of the horizontal force couple generated by the eccentric position relative to the bolt situated at the location of the attachment unit and the bolt hole. In the solution according to the invention, due to the coaxiality of the hole and the bolt hole, the attachment unit, such as a reinforcement bar and underlying vertical anchor bolt arranged to the base, will at least partly, more preferably entirely, be situated substantially on the same axis, whereupon no eccentricity will be formed between the anchor bolt and the

10 reinforcement bar. Since there is no eccentricity between the anchor bolt and the attachment unit, such as a reinforcement bar, there is no need for additional hooks in steel concrete column in order to take horizontal forces caused by eccentricity when column shoe is tension load-

15 ed. Thus, reinforcement of steel concrete column is reduced and simplified.

[0010] Due to the coaxiality column shoe has no stresses caused by eccentricity. This results in that the static model of the bolt housing is simplified. This also results

20 in that the shape and dimensions of the bolt housing may be optimized from new and more simple starting points. Moreover, the capacity of the column shoe may be proved easily in a simple axial tension test without casting the product into the concrete.

25 [0011] Due to the coaxiality rear attachment is not needed for taking horizontal force caused by eccentricity when the column shoe is under compression load. Since rear attachment is not needed and since the shape and dimensions of the bolt housing may be optimized, the 30 amount of steel in the column shoe is reduced and man-

ufacturing costs of the column shoe are reduced. **[0012]** Since the wall structure of the bolt housing is tapering in direction of the sleeve structure according to the invention, the steel may be positioned in an advan-

35 tageous way in relation to forces, so that a dome-like structure is formed, wherein forces follow the shortest path. In consequence the structures are not exposed to additional stresses. In that case also savings may be made in the amount of materials.

40 [0013] By the solution of the invention it is possible to make a combination of column shoe-bolt with height of one storey, wherein the attachment unit of the column shoe serves simultaneously as column's main bar and coupler bolt. Total amount of steel in the column is re-

45 duced since no overlappings of reinforcement bar between column shoes, attachment unit of the column and anchor bolt are needed.

[0014] During transport and stocking bolt housings and column shoes take only little space.

50 [0015] Column shoe may be fabricated entirely without welding. A threaded reinforcement bar may serve as main attachment, or a rebar coupler pressed onto the reinforcement bar may be threaded in the threadings of the hole in the upper structure of the bolt housing. Alter-

natively the reinforcement bar serving as main attachment may be pressed directly in the hole of the upper structure of the bolt housing.

[0016] The bolt housing may include one or more at-

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tachment lugs formed during casting. Attachment lugs may also allow to increase bolt housing rigidity and to enhance attachment to the concrete. Lugs may also be used to secure column shoes together, for example by means of plates, such as hole plates, spiral rods, round rods, reinforcement bars or cable loops.

**[0017]** Bolt housings and their attached reinforcement bars may also be used as draw couplers of the bar like elements.

# List of Figures

**[0018]** Preferred embodiments of the invention will now be further described with reference to the accompanying Figures, in which:

Fig. 1 shows a first preferred embodiment of the bolt housing of column shoe obliquely from above;

Fig. 2 shows the bolt housing of column shoe shown in Fig. 1 obliquely from below;

Fig. 3 shows the bolt housing of column shoe shown in Fig. 1 directly from side;

Fig. 4 shows the bolt housing of column shoe shown in Fig. 1 directly from front;

Fig. 5 shows the bolt housing of column shoe shown <sup>25</sup> in Fig. 1 directly from above;

Fig. 6 shows the bolt housing of column shoe shown in Fig. 1 sectioned along line A-A of Fig. 5;

Fig. 7 shows the bolt housing of column shoe shown in Fig. 1 sectioned along line B-B of Fig. 5;

Fig. 8 shows a second preferred embodiment of the bolt housing of column shoe obliquely from above; Fig. 9 shows the bolt housing of column shoe shown in Fig. 8 obliquely from below;

Fig. 10 shows the bolt housing of column shoe shown <sup>35</sup> in Fig. 8 directly from side;

Fig. 11 shows the bolt housing of column shoe shown in Fig. 8 directly from front;

Fig. 12 shows the bolt housing of column shoe shown in Fig. 8 directly from above;

Fig. 13 shows the bolt housing of column shoe shown in Fig. 8 sectioned along line A-A of Fig. 12;

Fig. 14 shows the bolt housing of column shoe shown in Fig. 8 sectioned along line B-B of Fig. 12;

Fig. 15 shows a third preferred embodiment of the bolt housing of column shoe obliquely from above; Fig. 16 shows the bolt housing of column shoe shown in Fig. 15 obliquely from below;

Fig. 17 shows the bolt housing of column shoe shown in Fig. 15 directly from side;

Fig. 18 shows the bolt housing of column shoe shown in Fig. 15 directly from front;

Fig. 19 shows the bolt housing of column shoe shown in Fig. 15 directly from above;

Fig. 20 shows the bolt housing of column shoe shown in Fig. 15 sectioned along line A-A of Fig. 19;

Fig. 21 shows the bolt housing of column shoe shown in Fig. 15 sectioned along line B-B of Fig. 19;

Fig. 22 shows a fourth preferred embodiment of the bolt housing of column shoe obliquely from above; Fig. 23 shows the bolt housing of column shoe shown in Fig. 22 obliquely from below;

Fig. 24 shows the bolt housing of column shoe shown in Fig. 22 directly from side;

Fig. 25 shows the bolt housing of column shoe shown in Fig. 22 directly from front;

Fig. 26 shows the bolt housing of column shoe shown in Fig. 22 directly from above;

Fig. 27 shows the bolt housing of column shoe shown in Fig. 22 sectioned along line A-A of Fig. 26;

Fig. 28 shows the bolt housing of column shoe shown in Fig. 22 sectioned along line B-B of Fig. 26;

Figs. 29 and 30 show the bolt housing of column shoe according to Fig. 1, to which an attachment unit in the form of a reinforcement bar is secured;

Figs. 31 and 32 show the bolt housing of column shoe according to Fig. 1, to which an attachment unit in the form of a reinforcement bar is secured and on the baseplate of which an anchor bolt is secured;

Figs. 33 and 34 show the bolt housing of column shoe according to Fig. 1, to which an attachment unit in the form of a reinforcement bar is secured and on the baseplate of which an anchor bolt is secured and wherein the edge of the baseplate is moreover provided with holes for securing the hole plates;

Figs. 35 and 36 show the bolt housing of column shoe shown in Figs. 33 and 34 in a state in which hole plates are secured to the baseplate; and

Fig. 37 shows the connection point between the steel concrete column and the base partly sectioned.

## Detailed description of the invention

**[0019]** The object of the invention is a column shoe (not referenced) for securing steel concrete columns 1 such as concrete column elements to a base 2, such as a foundation of building or corresponding load-bearing structural element.

**[0020]** The column shoe comprises a bolt housing 3, which comprises a baseplate 5 provided with a bolt hole 4, and an upper structure 6 which is connected to a baseplate 5 and to which at least one attachment unit 7 is

<sup>45</sup> connected for securing the column shoe and the steel concrete column 1 together by casting the attachment unit 7 to the steel concrete column 1. Also a portion of the bolt housing 3, especially a portion of the upper structure 6 of the bolt housing 3, is casted in this same occasion to the steel concrete column 1.

**[0021]** Figs 29 and 30 show an example of the column shoe.

**[0022]** Fig. 37 shows partly sectioned an example of the connection point between the steel concrete column 1 and the base 2, wherein column shoe has been used for securing the steel concrete column 1 to the base 2. In Fig. 37 the vertical anchor bolt 8, partly cast to the base 2, traverses the bolt hole 4 in the baseplate 5 of the

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bolt housing 3. Anchor bolt 8 is provided with threadings (not referenced), to which nuts 9 and washers 10 are arranged in order to secure the column shoe to the vertical anchor bolt 8 in the base 2. In Fig. 37 the column shoe is secured to the steel concrete column 1 by casting the attachment unit 7 to the steel concrete column 1 and by casting the bolt housing 3 partly to the steel concrete column 1.

**[0023]** The column shoes shown in Figs. 1 to 37 comprise a bolt housing 3, the upper structure 6 of which comprises a sleeve structure 12 which is formed integrally with the upper structure 6 and on which the hole 11 for the attachment unit 7 is formed and which upper structure 6 comprises a wall structure 13, by which the sleeve structure 12 is connected with the baseplate 5 and which wall structure 13 is tapering in direction of the sleeve structure 12.

**[0024]** Figs. 1 to 28 show four different bolt housings 3 of column shoe, wherein Figs. 1 to 7 show a first embodiment of the bolt housing 3 of column shoe, Figs. 8 to 14 show a second embodiment of the bolt housing 3 of column shoe, Figs. 15 to 21 show a third embodiment of the bolt housing 3 of column shoe, and Figs. 22 to 28 show a fourth embodiment of the bolt housing 3 of column shoe. It is in common to all of these embodiments that the wall structure 13 is tapering in direction of the sleeve structure 12.

**[0025]** The bolt housing 3 is fabricated by casting such that the upper structure 6 of the bolt housing 3 and the baseplate 5 form a single-piece casting. The casting is preferably, but not necessarily, fabricated from cast steel or cast iron. The bolt hole 4 of baseplate 5 may be formed in connection with casting or may be at least partly machined after casting.

**[0026]** A hole 11 is formed in the bolt housing 3 for the attachment unit 7. The hole 11 is substantially coaxial with the bolt hole 4 of the baseplate 5. This results in that, provided a rectilinear attachment unit 7 such as a rectilinear reinforcement bar is used in the column shoe, as shown in Figs. 30 to 37, and provided a rectilinear anchor bolt 8 is used in the base 2 of steel concrete column 1 during mounting, the reinforcement bar and the anchor bolt 8 may be located substantially on the same axis whereupon no eccentricity is formed between the reinforcement bar and the anchor bolt 8. The hole 11 may be formed in connection with casting or may be at least partly machined after casting.

**[0027]** Further holes (not shown in Figures) may be formed in bolt housing 3, such as in the upper structure 6 of the bolt housing 3, for further attachment units (not shown in Figures), but more preferably only one hole 11 is formed in the bolt housing 3 for a single attachment unit 7, which hole 11 is substantially coaxial with the bolt hole 4 of the baseplate 5, as shown in Figures.

**[0028]** The upper structure 6 of the bolt housing 3, as shown in Figures 1 to 28, comprises a sleeve structure 12 which is formed integrally with the upper structure 6 and on which the hole 11 for the attachment unit 7 is

formed. The upper structure 6 of the bolt housing 3, as shown in Figs. 1 to 28, comprises a wall structure 13 by which the sleeve structure 12 is connected with the base-plate 5.

<sup>5</sup> [0029] The upper structure 6 of the bolt housing 3 is such that it is tapering in direction of the sleeve structure 12. Such bolt housings 3 are shown in Figs. 1 to 28.
[0030] In case the upper structure 6 of the bolt housing

3 comprises a wall structure 13, the wall structure in the upper structure 6 of the bolt housing 3 may be at least

partly arcuate in shape so that it is tapering in direction of the sleeve structure 12. Such bolt housings 3 are shown in Figs. 1 to 28. In case the wall structure 13 in the upper structure 6 of the bolt housing 3 is at least partly

<sup>15</sup> arcuate in shape, it may at least partly have a parabolic shape. An advantage of this kind of arcuate, such as parabolic shaped wall structure 13 of upper frame 6 compared to a conventional vertical one is for example that it may better compensate forces and tensions in the bolt <sup>20</sup> housing.

**[0031]** In case the upper structure 6 of the bolt housing 3 comprises a wall structure 13, the wall structure 13 in the upper structure 6 of the bolt housing 3 may be comprised of a plurality of separate wall structure portions 14 by which the sleeve structure 12 is connected with the

baseplate 5. Figs. 8 to 14 show a bolt housing 3, the wall structure 13 of which is comprised of two separate wall structure portions 14. The wall structure portions 14 may be arranged symmetrically in relation to the bolt hole 4
and the hole 11.

**[0032]** Alternatively the upper structure 6 of the bolt housing 3 may comprise a wall structure 13, on which a hole 11 is formed for the attachment unit 7. Then, the wall structure 13 in the upper structure 6 of the bolt hous-

<sup>35</sup> ing 3 may be such that it is tapering in direction away from the baseplate 5. Alternatively, the wall structure 13 in the upper structure 6 of the bolt housing 3 may be at least partly arcuate in shape so that it is tapering in direction away from the baseplate 5. In case the wall struc-

<sup>40</sup> ture 13 in the upper structure 6 of the bolt housing 3 is at least partly arcuate in shape, it may at least partly have a parabolic shape.

**[0033]** The bolt housing 3 may consist of a single-piece casting, as shown in Figs. 1 to 28.

<sup>45</sup> [0034] The attachment unit 7 of column shoe comprises preferably, but not necessarily, a reinforcement bar.
 Figs. 29 to 36 show column shoes, in which one reinforcement bar serves as attachment unit 7. The reinforcement bar is preferably, but not necessarily, substantially
 <sup>50</sup> rectilinear.

**[0035]** In case the attachment unit 7 is a reinforcement bar, the diameter of the hole 11 is preferably, but not necessarily, such that it substantially corresponds to the diameter of the reinforcement bar.

<sup>55</sup> **[0036]** In case the attachment unit 7 is a reinforcement bar, the hole 11 may be provided with inner threads (not shown in Figures) and the reinforcement bar may be provided with outer threads (not shown in Figures) which

are adapted to cooperate with the inner threads of the hole 11 so that the reinforcement bar is secured to the bolt housing 3 by screwing the reinforcement bar to the hole 11 of the bolt housing 3. In case there is one reinforcement bar as attachment unit 7, the reinforcement bar is preferably, but not necessarily, substantially rectilinear and substantially circular in cross-section so that the reinforcement bar is substantially coaxial with the bolt hole 4 in the baseplate 5 of the bolt housing 5.

**[0037]** The attachment unit 7 may be secured to the bolt housing 3 by pressing the bolt housing 3 into engagement with the attachment unit 7 arranged in hole 11 by pressing the bolt housing 3 at the location of the hole 11.

**[0038]** The attachment unit 7 may be secured to the hole 11 by means of a sleeve (not shown in Figures), which is arranged into the hole 11 and on which the attachment unit 7 is arranged so that for example a crimp connection is formed between the hole 11 and the sleeve and respectively between the sleeve and the attachment unit 7.

**[0039]** Attachment lugs 15, which protrude from the bolt housing 3, may be formed by casting to the bolt housing 3. Such bolt housings 3 are shown in Figs. 14 to 28. Attachment lugs 15 may be provided with holes 18, as shown in Figs. 22 to 28. Attachment lugs 15 are used for enhancing the fastening of the bolt housing 3 to the steel concrete column 1. Such attachment lugs 15 also permit to increase the rigidity of the bolt housing 3. During assembly phase of the column shoe, a wire or a reinforcement bar may be passed through the eventual holes 18 of the attachment lugs 15 in order for example to secure a plurality of column shoes together.

[0040] Holes 16 may be formed in the edge of the baseplate 5 of the bolt housing 3 for securing at least one hole 35 plate 17. Hole plates 17 are shown in Figs. 33 and 34 and Figs. 35 and 36. Such hole plate 17 permits for example a plurality of column shoes to be secured together or a column shoe to be secured to for example a cast 40 mold or equivalent during mounting, when the column shoe is at least partly cast to the steel concrete column 1. [0041] Figs. 1 to 7 show a first embodiment of the bolt housing 3 of column shoe. In Figs. 1 to 7 the bolt housing 3 comprises a baseplate 5 provided with a bolt hole 4. To the baseplate 5 is connected an upper structure 6, on 45 which a hole 11 is formed for the attachment unit 7. The hole 11 is substantially coaxial with the bolt hole 4 of the baseplate 5. In Figs. 1 to 7 the upper structure 6 a sleeve structure 12 which is formed integrally with the upper structure 6 and on which the hole 11 for the attachment 50 unit 7 is formed. In Figs. 1 to 7 the upper structure 6 of the bolt housing 3 comprises a wall structure 13 by which the sleeve structure 12 is connected with the baseplate 5. In Figs. 1 to 7 the wall structure 13 in the upper structure 6 of the bolt housing 3 is at least partly arcuate in shape 55 so that the wall structure 13 in the upper structure 6 of the bolt housing 3 is tapering in direction of the sleeve structure 12. In Figs. 1 to 7 the bolt housing 3 consists

of a single-piece casting.

**[0042]** Figs. 8 to 14 show a second embodiment of the bolt housing 3 of column shoe. The bolt housing 3 shown in Figs. 8 to 14 differs from the bolt housing 3 shown in

 Figs. 1 to 7 in that the upper structure 6 of the bolt housing 3 comprises a wall structure 13, which is comprised of two wall structure portions 14 by which the sleeve structure 12 is connected with the baseplate 5.

[0043] Figs. 15 to 21 show a third embodiment of the
bolt housing 3 of column shoe. The bolt housing 3 shown in Figs. 15 to 21 differs from the bolt housing 3 shown in Figs. 1 to 7 in that two attachment lugs 15, which protrude from the bolt housing 3, are formed by casting to the bolt housing 3. Attachment lugs 15 are used for enhancing

<sup>15</sup> the fastening of the bolt housing 3 to the steel concrete column 1.

**[0044]** In Figs. 22 to 28 is shown a fourth embodiment of the bolt housing 3 of the column shoe. The bolt housing 3 shown in Figs. 22 to 28 differs from the bolt housing 3

<sup>20</sup> shown in Figs. 15 to 21 in that two attachment lugs 15 provided with holes 18 are formed by casting to the bolt housing 3.

[0045] It is obvious to a person in the art that as technology advances, the inventive concept can be imple<sup>25</sup> mented in various ways. Therefore the invention and the embodiments thereof are not limited to the examples shown hereinbefore but may vary within the frames of the claims.

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#### Claims

 Column shoe for securing steel concrete columns (1) to a base (2), wherein the column shoe comprises;

a bolt housing (3), which comprises a baseplate (5) provided with a bolt hole (4); and

an upper structure (6) which is connected to the baseplate (5) and to which at least one attachment unit (7) is connected for securing the column shoe and the steel concrete column (1) together;

#### characterized in that

the bolt housing (3) is fabricated by casting such that the upper structure (6) and the baseplate (5) form a single-piece casting,

a hole (11) is formed in the bolt housing (3) for the attachment unit (7), and

the hole (11) is substantially coaxial with the bolt hole (4) of the baseplate (5),

the upper structure (6) of the bolt housing (3) comprises a sleeve structure (12) which is formed integrally with the upper structure (6) and on which the hole (11) for the attachment unit (7) is formed, and the upper structure (6) of the bolt housing (3) comprises a wall structure (13) by which the sleeve structure (12) is connected with the baseplate (5), and the wall structure (13) of the bolt housing (3) is tapering in direction of the sleeve structure (12).

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- 2. Column shoe according to claim 1, **characterized in that in that** the wall structure (13) in the upper structure (6) of the bolt housing (3) comprises a plurality of wall structure portions (14) by which the sleeve structure (12) is connected with the baseplate (5).
- **3.** Column shoe according to claim 2, **characterized in that** wall structure portions (14) are arranged symmetrically in relation to the bolt hole (4) and the hole (11).
- 4. Column shoe according to one of claims 1 to 3, characterized in that the wall structure (13) of the bolt housing (3) is at least partly arcuate in shape so that the wall structure (13) of the bolt housing (3) is tapering in direction of the sleeve structure (12).
- Column shoe according to one of claims 1 to 4, characterized in that the wall structure (13) of the bolt housing (3) is tapering in direction away from the baseplate (5).
- 6. Column shoe according to one of claims 1 to 5, characterized in that the wall structure (13) in the upper structure (6) of the bolt housing (3) is at least partly arcuate in shape so that the wall structure (13) of the bolt housing (3) is tapering in direction away from the baseplate (5).
- 7. Column shoe according to one of claims 1 to 6, **char**acterized in that the attachment unit (7) is a reinforcement bar.
- Column shoe according to claim 7, characterized <sup>35</sup> in that the diameter of the hole (11) corresponds substantially to the diameter of the reinforcement bar.
- Column shoe according to claim 8, characterized 40 in that the hole (11) is provided with inner threads and that the reinforcement bar is provided with outer threads which are arranged to cooperate with the inner threads of the hole (11) for securing the reinforcement bar to the upper structure (3) of the bolt 45 housing (3) by screwing.
- 10. Column shoe according to one of claims 7 to 9, characterized in that the reinforcement bar is substantially rectilinear and substantially circular in cross-section so that the reinforcement bar is substantially coaxial with the bolt hole (4) in the baseplate (5) of the bolt housing (3).
- Column shoe according to one of claims 1 to 10, characterized in that the attachment unit (7) is secured to the bolt housing (3) by pressing the bolt housing (3) into engagement with the attachment

unit (7).

- **12.** Column shoe according to one of claims 1 to 11, **characterized in that** the attachment unit (7) is secured to the hole (11) by means of a sleeve, which is arranged into the hole (11) and on which the attachment unit (7) is secured.
- **13.** Column shoe according to one of claims 1 to 12, **characterized in that** attachment lugs (15), which protrude from the bolt housing (3), are formed by casting to the bolt housing (3) for enhancing the fastening of the bolt housing (3) to the steel concrete column (1).
- 14. Column shoe according to one of claims 1 to 13, characterized in that holes (16) are formed in the edge of the baseplate (5) of the bolt housing (3) for securing at least one hole plate (17) to the bolt housing (3).

## Patentansprüche

 <sup>25</sup> 1. Stützenschuh zum Befestigen von Stahlbetonstützen (1) an einer Unterlage (2), wobei der Stützenschuh umfasst:

> ein Bolzengehäuse (3), das eine mit einem Bolzenloch (4) versehene Grundplatte (5) umfasst; und

eine obere Struktur (6), die mit der Grundplatte (5) verbunden ist und mit der mindestens eine Anbaueinheit (7) verbunden ist, um den Stützenschuh und die Stahlbetonstütze (1) zusammen zu befestigen;

## dadurch gekennzeichnet, dass

das Bolzengehäuse (3) durch Gießen gefertigt ist, so dass die obere Struktur (6) und die Grundplatte (5) ein einstückiges Gussteil bilden,

im Bolzengehäuse (3) ein Loch (11) für die Anbaueinheit (7) ausgebildet ist und

das Loch (11) im Wesentlichen koaxial zum Bolzenloch (4) der Grundplatte (5) ist,

- die obere Struktur (6) des Bolzengehäuses (3) eine Hülsenstruktur (12) umfasst, die einstückig mit der oberen Struktur (6) ausgebildet ist und an der das Loch (11) für die Anbaueinheit (7) ausgebildet ist, und
- die obere Struktur (6) des Bolzengehäuses (3) eine Wandstruktur (13) umfasst, durch welche die Hülsenstruktur (12) mit der Grundplatte (5) verbunden ist, und
- die Wandstruktur (13) des Bolzengehäuses (3) sich in Richtung zur Hülsenstruktur (12) hin verjüngt.
- 2. Stützenschuh nach Anspruch 1, dadurch gekenn-

**zeichnet, dass** die Wandstruktur (13) in der oberen Struktur (6) des Bolzengehäuses (3) mehrere Wandstrukturabschnitte (14) umfasst, durch welche die Hülsenstruktur (12) mit der Grundplatte (5) verbunden ist.

- 3. Stützenschuh nach Anspruch 2, dadurch gekennzeichnet, dass Wandstrukturabschnitte (14) symmetrisch zum Bolzenloch (4) und zum Loch (11) angeordnet sind.
- Stützenschuh nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, dass die Wandstruktur (13) des Bolzengehäuses (3) mindestens teilweise bogenförmig ist, so dass die Wandstruktur (13) des Bolzengehäuses (3) sich in Richtung zur Hülsenstruktur (12) hin verjüngt.
- Stützenschuh nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, dass die Wandstruktur (13) des Bolzengehäuses (3) sich in der von der Grundplatte (5) wegführenden Richtung verjüngt.
- Stützenschuh nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, dass die Wandstruktur (13) in der oberen Struktur (6) des Bolzengehäuses (3) mindestens teilweise bogenförmig ist, so dass die Wandstruktur (13) des Bolzengehäuses (3) sich in der von der Grundplatte (5) wegführenden Richtung verjüngt.
- Stützenschuh nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, dass die Anbaueinheit (7) ein Bewehrungsstab ist.
- Stützenschuh nach Anspruch 7, dadurch gekennzeichnet, dass das Durchmesser des Loches (11) im Wesentlichen dem Durchmesser des Bewehrungsstabs entspricht.
- Stützenschuh nach Anspruch 8, dadurch gekennzeichnet, dass das Loch (11) mit einem Innengewinde versehen ist und dass der Bewehrungsstab mit einem Außengewinde versehen ist, das so angeordnet ist, dass es mit dem Innengewinde des Loches (11) zusammenwirkt, um den Bewehrungsstab an der oberen Struktur (3) des Bolzengehäuses (3) durch Einschrauben zu befestigen.
- 10. Stützenschuh nach einem der Ansprüche 7 bis 9, <sup>50</sup> dadurch gekennzeichnet, dass der Bewehrungsstab im Wesentlichen geradlinig ist und im Wesentlichen einen runden Querschnitt aufweist, so dass der Bewehrungsstab im Wesentlichen koaxial zum Bolzenloch (4) in der Grundplatte (5) des Bolzenge-<sup>55</sup> häuses (3) ist.
- 11. Stützenschuh nach einem der Ansprüche 1 bis 10,

dadurch gekennzeichnet, dass die Anbaueinheit (7) am Bolzengehäuse (3) durch Aufpressen des Bolzengehäuses (3) auf die Anbaueinheit (7) befestigt ist.

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- Stützenschuh nach einem der Ansprüche 1 bis 11, dadurch gekennzeichnet, dass die Anbaueinheit (7) am Loch (11) mittels einer im Loch (11) angeordneten Hülse befestigt ist, an welcher die Anbaueinheit (7) befestigt wird.
- **13.** Stützenschuh nach einem der Ansprüche 1 bis 12, dadurch gekennzeichnet, dass Anbaustege (15), die vom Bolzengehäuse (3) überstehen, durch Anguss an das Bolzengehäuse (3) ausgebildet werden, um die Befestigung des Bolzengehäuses (3) an der Stahlbetonstütze (1) zu verstärken.
- 14. Stützenschuh nach einem der Ansprüche 1 bis 13, dadurch gekennzeichnet, dass in der Kante der Grundplatte (5) des Bolzengehäuses (3) Löcher (16) ausgebildet sind, um mindestens ein Lochblech (17) am Bolzengehäuse (3) zu befestigen.

#### Revendications

 Sabot de colonne pour fixer des colonnes en béton armé (1) à une base (2), ledit sabot de colonne comprenant :

> un boîtier de boulon (3) comprenant une plaque d'assise (5) pourvue d'un trou à boulon (4); et une structure supérieure (6) qui est reliée à la plaque d'assise (5) et à laquelle est reliée au moins une unité d'attache (7) pour fixer ensemble le sabot de colonne et la colonne en béton armé (1);

## caractérisé en ce que

le boîtier de boulon (3) est réalisé par coulée de sorte que la structure supérieure (6) et la plaque d'assise (5) forment une pièce de fonderie monobloc,

un trou (11) est ménagé dans le boîtier de boulon (3) pour l'unité d'attache (7) et

ledit trou (11) est essentiellement coaxial au trou à boulon (4) de la plaque d'assise (5);

la structure supérieure (6) du boîtier de boulon (3) comprend une structure de douille (12) qui est formée solidairement de ladite structure supérieure (6) et sur laquelle est ménagé le trou (11) pour l'unité d'attache (7) et

la structure supérieure (6) du boîtier de boulon (3) comprend une structure de paroi (13) par laquelle la structure de douille (12) est reliée à la plaque d'assise (5) et

la structure de paroi (13) du boîtier de boulon (3) se resserre dans la direction vers la structure

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de douille (12).

- Sabot de colonne selon la revendication 1, caractérisé en ce que la structure de paroi (13) dans la structure supérieure (6) du boîtier de boulon (3) comprend une pluralité de segments de structure de paroi (14) par lesquels la structure de douille (12) est reliée à la plaque d'assise (5).
- Sabot de colonne selon la revendication 2, caractérisé en ce que des segments de structure de paroi (14) sont disposés symétriquement par rapport au trou à boulon (4) et au trou (11).
- 4. Sabot de colonne selon l'une des revendications 1 à 3, caractérisé en ce que la structure de paroi (13) du boîtier de boulon (3) est au moins partiellement arquée de sorte que la structure de paroi (13) du boîtier de boulon (3) se resserre dans la direction vers la structure de douille (12).
- Sabot de colonne selon l'une des revendications 1 à 4, caractérisé en ce que la structure de paroi (13) du boîtier de boulon (3) se resserre dans la direction s'éloignant de la plaque d'assise (5).
- Sabot de colonne selon l'une des revendications 1 à 5, caractérisé en ce que la structure de paroi (13) dans la structure supérieure (6) du boîtier de boulon (3) est au moins partiellement arquée de sorte que la structure de paroi (13) du boîtier de boulon (3) se resserre dans la direction s'éloignant de la plaque d'assise (5).
- Sabot de colonne selon l'une des revendications 1 <sup>35</sup> à 6, caractérisé en ce que l'unité d'attache (7) est une barre d'armature.
- Sabot de colonne selon la revendication 7, caractérisé en ce que le diamètre du trou (11) correspond 40 essentiellement au diamètre de la barre d'armature.
- 9. Sabot de colonne selon la revendication 8, caractérisé en ce que le trou (11) est pourvu de filetages internes et que la barre d'armature est pourvue de <sup>45</sup> filetages externes agencés pour coopérer avec les filetages internes du trou (11) afin de fixer par vissage la barre d'armature à la structure supérieure (3) du boîtier de boulon (3).
- 10. Sabot de colonne selon l'une des revendications 7 à 9, caractérisé en ce que la barre d'armature est essentiellement rectiligne et essentiellement à section ronde de sorte que la barre d'armature soit essentiellement coaxiale au trou à boulon (4) dans la plaque d'assise (5) du boîtier de boulon (3).
- 11. Sabot de colonne selon l'une des revendications 1

à 10, **caractérisé en ce que** l'unité d'attache (7) est fixée au boîtier de boulon (3) par engagement par pression du boîtier de boulon (3) sur l'unité d'attache (7).

- 12. Sabot de colonne selon l'une des revendications 1 à 11, caractérisé en ce que l'unité d'attache (7) est fixée au trou (11) à l'aide d'une douille qui est disposée dans le trou (11) et à laquelle est fixée l'unité d'attache (7).
- 13. Sabot de colonne selon l'une des revendications 1 à 12, caractérisé en ce que des talons d'attache (15) faisant saillie sur le boîtier de boulon (3) sont coulés avec le boîtier de boulon (3) pour renforcer la fixation du boîtier de boulon (3) sur la colonne en béton armé (1).
- 14. Sabot de colonne selon l'une des revendications 1 à 13, caractérisé en ce que des trous (16) sont ménagés dans le bord de la plaque d'assise (5) du boîtier de boulon (3) pour fixer au moins une tôle perforée (17) au boîtier de boulon (3).
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FIG 3





B-B FIG 5:

FIG 4

















FIG 10

FIG 9



FIG 11





B-B FIG 12:

11-





FIG 13





FIG 17





A-A FIG 19:









FIG 21



FIG 22



FIG 24









B-B FIG 26:











FIG 29







FIG 32





FIG 33

FIG 34





FIG 35

FIG 36



FIG 37

# **REFERENCES CITED IN THE DESCRIPTION**

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