Therefore, the object is to further develop an anchor dowel of the aforementioned type to the effect that it can absorb higher forces than anchor dowels known so far.

This object is solved by an anchor dowel according to claim 1 as well as by a concrete component according to the independent claim 8. Further embodiments of the invention are the subject matter of the dependent claims.

An anchor dowel according to the invention is used for the insertion into a castable, hardening mass. For example, concrete can be such a castable, hardening mass. Other castable, hardening masses, for example synthetic materials, can also be used with the anchor dowel according to the invention.

The anchor dowel comprises a receiving portion for a member to be held by means of the anchor dowel, in particular a joining member. Such a joining member can be, *inter alia*, a bolt, a screw, a threaded bore or the like. The member can be fixed in the anchor dowel by means of the receiving portion. The member can be an object to be held or a connection, e.g. a bolt, for example, to a strut or the like.

According to the invention, it is provided that the anchor dowel has a surface facing in a tensile force direction, which is essentially concavely curved. Such a configuration of the surface facing in the tensile force direction causes forces that are introduced via the member into the anchor dowel and the mass surrounding the anchor dowel, for example concrete, to be distributed over a large surface. This reduces stress peaks and thus local overloads of the material surrounding and holding the anchor dowel such that the material, particularly when it is brittle, will not start to selectively burst. Instead, the introduced tensile force is distributed over the surface. Therefore, the force deflection is more homogeneous than in known anchor dowels.

In particular, the tensile force direction can coincide with the surface normal of the mass, into which the anchor dowel is inserted.

According to a first possible further embodiment of the anchor dowel, the concave curvature can be realized by a conic section, in particular a parabolic or a hyperbolic contour.

According to a possible further embodiment of the anchor dowel, the surface facing in the tensile force direction can be essentially rotationally symmetrical. Due to such a rotationally

A surface 4 of the anchor dowel 2 is also rotationally symmetrical. The anchor dowel 2 has a receiving portion 6. The receiving portion 6 is arranged centrally, i.e. also rotationally symmetrically with respect to the same symmetry axis.

The receiving portion 6 is configured as a through-hole. A nut 8 is arranged on the bottom side, i.e. the side opposite the surface 4. The nut 8 serves to tightly screw a joining member.

The anchor dowel 2 is made of a synthetic material, in particular a glass fiber reinforced synthetic material. A possible suitable material can be PA6 GF30, i.e. polyamide 6 with 30 % glass fiber.

Fig. 1B shows a cross section through the anchor dowel 2 along the sectional line A-A according to Fig. 1.

The surface 4 aligned in the tensile force direction Z is concavely curved. If a tensile force occurs in the tensile force direction Z, the concave curvature causes a rotationally symmetrical and even load on the surrounding concrete in that a rotationally symmetrical compressive stress ring is formed. Tensile stress resulting from the tensile load is in part prestressed, and a higher load capacity of the anchor dowel 2 is achieved.

The nut 8 is arranged from a bottom side 10 aligned opposite the tensile force direction Z. For this purpose, a depression 12 is configured in the surface 10, into which the nut 8 has been inserted. Alternatively, the nut can be completely embedded in the anchor dowel 2.

The anchor dowel 2 has a face 14 which can be installed with the concrete in a flush-mounted or recessed manner.

Fig. 2A shows a plan view of an anchor dowel 2‘ according to the invention in a second embodiment.

In addition to the anchor dowel 2 according to Figs. 1A and 1B, two recesses 9 are configured in the surface 4, which are provided for abutting a reinforcement.

Fig. 2B shows a sectional view along the sectional line A-A of the anchor dowel 2‘ from Fig. 2A.

In the figure, a reinforcement 38 is arranged in the recesses 9.

Forces acting upon the wall construction 20 are deflected via the strut 26. The forces act in the tensile force direction Z. The counterforces are absorbed by the anchor dowel 2 and the double wall 22. Due to the concave surface 4 of the anchor dowel 2, which lies in the concrete, the counterforces are distributed in the concrete over a large surface, which is why the maximally absorbable load increases.

Fig. 5 shows a sectional view through the wall construction with an anchor dowel 2‘ according to the invention in the second embodiment.

In addition to the features already described with regard to Fig. 4, a reinforcement 38 is arranged in the double wall 22 in this embodiment such that it abuts the surface 4 of the anchor dowel 2. A more ductile load deflection behavior can be achieved thereby, and thus the load-bearing capacity of the anchor dowel 2 further increases.

Figs. 6A to 6D show phases of manufacturing a concrete component according to the invention for two different embodiments of the invention.

According to Fig. 6A, an anchor dowel 2 is arranged in a steel formwork 40 by means of a nailing plate 32. The bottom of the steel formwork 40 defines the outside of the concrete component to be cast, and therefore the nailing plate 32 will be arranged in the concrete component in a flush-mounted manner at first. After casting, the nailing plate 32 is removed, and the resulting hole can be filled with a suitable cement.

Fig. 6B shows that the steel formwork 40 is filled with concrete 42. The anchor dowel 2 is dimensioned such that its bottom side 10 protrudes from the concrete 42 so as to prevent the nut 8 from being contaminated with concrete and thus being made unusable. Alternatively or additionally, the nut can be protected from contamination by means of a cover made of adhesive tape, for example.

Figs. 6C and 6D show the manufacturing of a concrete component according to the second embodiment. Before or after positioning the anchor dowel 2‘ by means of a nailing plate 32, a reinforcement 38 is inserted, which abuts the surface 4 of the anchor dowel 2‘ in the recesses 9.

After that, concrete 42 is filled in, as is shown in Fig. 6D.

List of Reference Numerals

2, 2‘	Anchor dowel
4	Concave surface
6	Receiving portion
8	Nut
9	Recess
10	Bottom side
12	Depression
14	Face
20	Wall construction
22	Double wall
24	Concrete component
26	Strut
28	Top anchorage
30	Base anchorage
32	Nailing plate
34	Joining member
34.1	Plate
34.2	Through-hole
34.3	Flange
36	Screw
38	Reinforcement
40	Steel formwork
42	Concrete

Z	Tensile force direction
F	Surface normal

Patent Claims

1. An anchor dowel provided for being cast into a castable, hardening mass, in particular concrete (42), having a receiving portion (6) for a joining member (34, 36) to be held by means of the anchor dowel (2, 2‘),wherein the anchor dowel (2, 2‘) has a surface (10) facing away from a tensile force direction (Z) and a surface (4) facing in the tensile force direction (Z), which surface (4) facing in the tensile force direction (Z) is essentially concavely curved to the effect that introduced tensile forces are distributed over the surface along the castable, hardening mass, wherein the anchor dowel (2, 2‘) consists essentially of a synthetic material, the receiving portion (6) has an internal thread (8) for screwing with the joining member (36), and the internal thread is part of a nut (8) arranged at the surface (10) facing away from the tensile force direction (Z).

2. The anchor dowel according to claim 1, characterized in that the concave curvature is realized by a conic section, in particular a parabolic or a hyperbolic contour.

3. The anchor dowel according to claim 1 or 2, characterized in that the surface (4) facing in the tensile force direction (Z) is essentially rotationally symmetrical.

4. The anchor dowel according to one of the preceding claims, characterized in that the receiving portion (6) has a through-hole.

5. The anchor dowel according to one of claims 1 to 4, characterized in that a bolt, in particular a threaded bolt or a screw (36), is inserted into the receiving portion (6).

6. The anchor dowel according to one of the preceding claims, characterized in that a guide sleeve is inserted into the receiving portion (6).

7. The anchor dowel according to one of the preceding claims, characterized in that at least one recess (9) is provided in the surface (4) for abutting a reinforcement (38).

8. A concrete component having at least one anchor dowel (2, 2‘) according to one of the preceding claims.

9. The concrete component according to claim 8, characterized in that one face (14) of the anchor dowel (2, 2‘) is flush with the concrete component (22), or said anchor dowel is

recessed in the concrete component (22).

10. The concrete component according to claim 8 or 9, characterized in that a reinforcement (38) abuts the surface (4) of the anchor dowel (2, 2‘).

11. The concrete component according to claim 8, 9 or 10, characterized in that it comprises a double wall (22) wherein two concrete shells form a cavity and wherein the anchor dowel (2) is mounted in the double wall.