

Description

The invention relates to an impact-type expansible plug consisting of an expansion sleeve and an expansion mandrel for anchorage in a cylindrical drilled hole according to the preamble of Claim 1.

From US-PS 1392108 an impact-type expansible plug of this type is known which has an expansion sleeve with a narrowing internal bore into which an expansion mandrel can be driven in order to anchor the expansion sleeve. The outer surface of the expansion sleeve of the known impact-type expansible plug tapers towards its insertion end as far as an annular collar which has a cutting edge. By means of a head flange arranged on the expansion sleeve, the front end of the expansion sleeve is located at a distance from the bottom of the drilled hole. It is thereby possible to press the annular collar, with the expansion mandrel which is to be driven in, into the wall of the drilled hole. By means of the head flange, the known impact-type expansible plug can be used only in such a manner that, during placing and anchoring, the impact-type expansible plug must be driven in through the object to be secured, and into the anchorage base. Thus the thickness of the object to be secured determines the depth of anchorage of the impact-type expansible plug in the anchorage base. Moreover, it is not possible to remove the object to be secured, from the anchorage base, without destroying the impact-type expansible plug.

Because of these drawbacks, impact-type expansible plugs without a head flange are customarily used. An impact-type expansible plug of this type, known from EP-A-0056854, needs, for expansion, the bottom of the drilled hole for the expansion sleeve to bear against while the expansion mandrel is being driven in. Because of the sharply

tapered bottom of the drilled hole and the simultaneous push in the direction of the bottom of the drilled hole when driving the expansion mandrel in, the expansion of the known impact-type expansible plug is hindered to a considerable extent. It is therefore scarcely possible to provide such an impact-type expansible plug with an annular collar having a cutting edge, and to press it into the wall of the drilled hole.

The problem underlying the invention is therefore that of providing an impact-type expansible plug for anchorage in a cylindrical drilled hole which makes possible an interlocking connection in a concrete part with a relatively low energy for driving in the plug.

The solution to this problem is obtained by means of an impact-type expansible plug having the features of Claim 1. The expansion sleeve has a tapering outer surface, on the free end of which projects an annular collar which has a radially directed circumferential cutting edge. On expansion, the annular collar penetrates with its cutting edge into the cylindrical wall of the drilled hole and thereby produces an interlocking connection between the impact-type expansible plug and the masonry. The expansion mandrel used for expansion has a conical extension, the outer surface of which extends at a flatter angle with respect to the central axis of the expansible plug than does the wall of the conically narrowing internal bore. The result achieved thereby is that the expansion mandrel, at the start of the expanding operation, comes to bear against the narrowing internal bore in the forward region, where the annular collar is situated. Thus, when the expansion mandrel is driven in, the expanding pressure takes effect directly on the annular collar from inside. By means of this measure, penetration of the circumferential cutting edge of the annular collar into concrete parts of very great solidity is possible. The angle of the outer surface may for example be 12° - 14° , and the wall of the

conical internal bore of the expansion region can then have an angle of approximately 15° - 18° . Especially favourable conditions are obtained with a conical extension angle of 13° and an internal bore angle of 16° .

5 By means of the spacer cap, consisting of plastics material, placed on the end face of the expansion sleeve, a receiving chamber is provided into which the conical extension of the expansion mandrel can penetrate during the expanding operation. In order to avoid unnecessary hind-
10 rance to the expansion of the expansion sleeve, a plastics material is selected for the spacer cap which has the best possible sliding properties. By means of such a spacer cap it is possible to dispense with a stop collar arranged on the expansible plug and bearing against the outer surface
15 of the object to be secured. On expansion, the expansible plug bears by way of the spacer cap against the bottom of the drilled hole, without hindering expansion. The impact-type expansible plug is thus universally usable and allows the securing, separate from the anchorage, of an object
20 which is to be fixed, to a concrete part.

The invention is explained in greater detail hereinafter with reference to an exemplary embodiment illustrated in the drawing, in which:

25 Figure 1 shows the expansible sleeve half in section, and

Figure 2 shows the expansible plug anchored in the drilled hole in a concrete part.

The expansible plug shown in Figure 1 consists of an expansible expansion sleeve 1 which merges into a fixing
30 part 2 with an internal thread 3. An expansion mandrel 4 with a conically tapering conical extension 5 lies in the expansion sleeve 1, the conical extension 5 extending into a narrowing internal bore 6 of the expansion sleeve 1. The expansion sleeve 1 has longitudinal slits 7 distributed
35 over the periphery.

The expansion sleeve 1 has a conically tapering outer

surface 8 which extends as far as an annular collar 10 formed on the free end 9 of the expansion sleeve 1. The annular collar 10 has a radially directed circumferential cutting edge 11, having a diameter which corresponds to the diameter of the shank 12 of the expansible plug.

Placed on the end face 13 of the expansion sleeve 1 is a spacer cap 14 which has a receiving chamber 15 into which the conical extension 5 can be driven.

The conical extension 5 has an outer surface 16 with an angle of inclination with respect to the central axis 17 which is less than the angle of inclination of the internal bore 6. Thus a bearing point 18 is produced in the forward region of the expansion sleeve 1.

The outer surface 16 is covered with a low-friction material 19, for example with a covering of plastics material, in order to improve the sliding properties of the expansion mandrel 4.

Figure 2 shows the expansible plug anchored in a drilled hole 20 in a concrete part 21. The expansion mandrel 4 has been driven by means of an impact tool into the position indicated by broken lines, and projects with a conical extension 5 into the receiving chamber 15 of the spacer cap 14. The annular collar 10 penetrates through the wall of the drilled hole into the concrete part 21. The expansible plug is thus securely anchored in the concrete part 21, so that an object 23 can be fastened to the wall surface 24 by means of a screw 22 in the manner illustrated.

The expansible plug with expansion sleeve 1 and fixing part 2 preferably consists of a one-piece, sleeve-like metal part. Instead of an internal thread, an external thread can also be formed on the shank 12, in which case the shank must of course be led far enough out of the drilled hole to enable an object 23 to be attached by means of a screw nut.

P A T E N T C L A I M S

1. Impact-type expansible plug consisting of an expansion sleeve (1) having an internal bore (6) narrowing towards the insertion end of the plug and an expansion mandrel (4) that can be driven into the internal bore (6), the outer surface (8) of the expansion sleeve (1) tapering towards its insertion end as far as an annular collar (10) which has a cutting edge (11), characterized in that the
5 expansion mandrel (4) has a conical extension (5) which during the expanding operation engages in the conically narrowing internal bore (6) of the expansion sleeve (1) and the outer surface (16) of which extends at a flatter angle with respect to the central axis (17) of the expansible
10 plug than does the conically narrowing internal bore (6) of the as yet unexpanded expansion sleeve (1), and in that on the end face (13) of the expansion sleeve (1) there is placed a spacer cap (14) of plastics material or some other material capable of sliding, which spacer cap has a receiv-
15 ing chamber (15) for the conical extension (5) of the expansion mandrel (4) that is driven in when the expansion sleeve is expanded.

2. Impact-type expansible plug according to Claim 1, characterized in that on the conically tapering outer
20 surface (8) of the expansion sleeve (1) there projects at least one additional annular collar with a circumferential cutting edge.

3. Impact-type expansible plug according to Claim 1 or 2, characterized in that the diameter of the annular
25 collar (10) in the unexpanded state is equal to the diameter of the shank (12) of the impact-type expansible plug.



4. Impact-type expansible plug according to Claim 1, characterized in that the outer surface (16) of the conical extension (5) extends at an angle of from 12° to 14° and the wall of the conical internal bore (6) extends at an angle
5 of from 15° to 18°.

5. Impact-type expansible plug according to Claim 1, characterized in that the conical extension (5) of the expansion mandrel (4), at the start of and during the expanding operation, is in contact with the forward portion
10 of the narrowing internal bore (6).

6. Impact-type expansible plug according to Claim 1, characterized in that the expansion mandrel (4) is coated with a low-friction layer (19).

