

- 1 -

Expansible plug

The invention relates to an expansible plug according to the preamble of claim 1.

DE-A1 40 26 944 discloses an expansible plug which has an expansible shank divided into two in the longitudinal direction. Disc-shaped expansible elements project inwards from both sections of the shank and overlap one another, thus forming a closed expansible shank with a cylindrical outer surface. The disc-shaped expansible elements are provided with eccentrically positioned bores which align coaxially as a fixing screw is screwed in, with the result that the expansible elements are laterally displaced. This process can be termed an expansion process since the outer surface of the expansion region is consequently widened or expanded. Such an expansible plug has universal application and achieves high holding values not only in solid building materials, but also in hollow building materials. The expansible elements arranged over a relatively long length of the expansible plug effect a uniform expansion over the entire expansion region. When used in a hollow building material, the projecting disc-shaped expansible elements engage the cavities so that an interlocking engagement in the masonry is achieved in each bounding wall of a cavity.

When used in solid building materials and in some cases also when used in hollow building materials, the expansible plug may become braced slightly in the drilled hole after only a comparatively short penetration depth, so that it can snap off at the top end of the expansion region outside the drilled hole. Under unfavourable circumstances, the expansible plug which has already been driven fully into a drilled hole

may also rotate with a fixing screw as this is being screwed in, with the result that screwing-in and expansion of the expansible plug is rendered particularly difficult.

The invention is based on the problem of producing an expansible plug that has, if possible, universal application, and which does not snap off as it is being driven through or into a bore.

This problem is solved by the features specified in Claim 1. The fact that the expansion region tapers conically towards the plug tip considerably facilitates driving of the expansible plug into a drilled hole. The slightly reduced shank diameter in the conical region has, however, virtually no influence on the holding values that can be achieved, since the expansible elements are displaced laterally, as a fixing screw is screwed in, over a comparatively long path which can be many times greater than the reduction in diameter in the conical region. The conical tapering of the expansion region enables the expansible plug to be inserted with relatively little resistance to a greater penetration depth into a drilled hole. The expansible plug is therefore stabilised in the drilled hole over a relatively long length, with the result that it has less tendency to snap off. In addition, the shank halves that form the expansion region are fixedly joined to the shank sleeve leading towards the plug opening, so that it is precisely in this critical transition region between the shank sleeve and the expansion region that improved rigidity is achieved for the expansible plug.

The expansible plug is preferably manufactured as a plastics material part in a single injection-moulding operation, the two shank halves being joined to one another by an injection moulded web in the region of the plug tip. After the injection-moulding operation,

one shank half merely has to be folded onto the other shank half, which is joined to the shank sleeve by means of a dovetail joint which is proof against rotation, bending and tension. Instead of a dovetail joint, a different interlocking connection or, of course, also an adhesive or welded connection can be used. An expansible plug of this construction is inexpensive to manufacture, yet nevertheless has the required stability as it is being driven into a drilled hole.

Outwardly projecting longitudinal ribs, which provide additional longitudinal stiffening in the transition region between the shank sleeve and a shank section of the expansion region, can be provided as anti-rotation elements at the expansion region and at the upper closed section of the shank (shank sleeve). If the longitudinal ribs are arranged offset in respect of their longitudinal position and in respect of their angular position at the circumference, then insertion of the expansible plug into a drilled hole can consequently be facilitated.

An impact barrier in the form of an annular collar which engages in a thread of a partially inserted fixing screw can furthermore be provided in the shaft sleeve. The expansible plug with a pre-mounted fixing screw can be driven into a drilled hole by way of the fixing screw, the transfer of force to the expansible plug being effected by way of the impact barrier. The fixing screw is here preferably inserted into the expansible plug sufficiently far for the tip of the screw to project slightly into the expansion region but not to expand this. This position of the screw thus reinforces the expansible plug in its upper region, so that there no longer need be any fear of the plug snapping off here.

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

Figure 1 shows an expansible plug with a pre-mounted fixing screw,

Figure 2 shows the section A-B and the section C-D indicated in Figure 1,

Figures 3 to 5 show the view A indicated in Figure 1 in the region of the join between the left-hand shank section of the expansion region and the upper shank sleeve, three different types of joint being illustrated.

The expansible plug 1 illustrated in Figure 1 consists of a shank sleeve 2 and an expansible shank 3 joined thereto, which is longitudinally divided and comprises a right-hand shank section 4 and a left-hand shank section 5. The two shank sections 4, 5 are joined to one another at the plug tip 6 by an injection moulded web 7. A fixing screw 9 is screwed into the plug opening 8 far enough for its tip 10 to project slightly into the expansion region 11. An impact barrier 12 in the form of an annular collar projects inwardly from the shank sleeve 2 and engages in a thread 13 of the fixing screw 9.

The expansion region 11 consists of expansible elements 14, 15 projecting from the shank parts 4, 5 like the teeth of a comb; each expansible element has a bore 17, 18 (Figure 2) arranged eccentrically with respect to the centre line 16 of the expansible plug.

If the fixing screw 9 is screwed in towards the plug tip 6 through the entire expansion region 11, the eccentrically arranged bores 17, 18 are coaxially aligned, with the result that the expansible elements 14, 15 are displaced substantially perpendicularly to the plane of the drawing of Figure 1. This is

described fully in DE-A1 40 26 944 mentioned in the introduction.

The shank section 4 is connected in one piece with the shank sleeve 2, whilst the shank section 5 is fixedly joined by additional fixing elements in the joining region 19 shown in Figure 3 to Figure 5.

Figure 3 shows a construction with an interlocking configuration 20 which is suitable for transferring rotary torque between the shank section 4 and the shank sleeve 2.

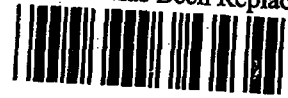
The joint shown in Figure 4 is a dovetail joint 21, which is able to transfer tension, bending and rotary torque forces.

Finally, Figure 5 shows a welded joint 22, by which the shank sleeve 2 and the shank section 5 are permanently joined to the another.

As shown in Figure 1, longitudinal ribs 23 to 25 are arranged at intervals on the expansible plug, the longitudinal rib 24 additionally reinforcing the transition region 26 between the shank sleeve 2 and the shank section 3.

In the region of the plug tip 6, an additional expansible portion 27 can be created by a slot 28, the expansion direction of which is oriented at 90° to the expansion direction of the expansion region 11.

It is essential that the expansion region 11 has a slight conical taper towards the plug tip 6; the expansible portion 27 can then have a cylindrical outer surface again.



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Patent Claims

1. An expansible plug with a closed shank section in the form of a shank sleeve, which has a screw channel and continues as a longitudinally divided expansible shank, the two shank halves of which have staggered expansible elements that interlock to form a closed expansion region, the expansible elements being offset with respect to one another and having bores arranged eccentrically with respect to the centre line of the expansible plug, which bores overlap in such a way that the overlapping region forms a constricted screw channel, characterized in that the expansion region (11) tapers conically towards the plug tip (6) and there is a secure joint (20, 21, 22) in the joining region (19) between one shank half (5) and the shank sleeve (2).

2. An expansible plug according to claim 1, characterized in that the shank sleeve (2) and one of the two shank halves (4) form a one-piece plastics material part and the other shank half (5) is joined to the shank sleeve (2) by means of a dovetail joint (21) or a different interlocking joint in a manner proof against rotation, bending and tension.

3. An expansible plug according to claim 1 or 2, characterized in that from the shank sleeve (2) and from the two shank halves (4, 5) forming the expansion





- 7 -

region (11) there projects outwardly at least one respective longitudinal rib (23-25) as an anti-rotation element.

4. An expansible plug according to claim 3, characterized in that the longitudinal ribs (23-25) are arranged offset in respect of their longitudinal position and in respect of their angular position.

5. An expansible plug according to one of the preceding claims, characterized in that a longitudinal rib (24) is arranged at the transition region (26) between the shank sleeve (2) and one shank half (4).

6. An expansible plug according to one of the preceding claims, characterized in that an impact barrier (12), in the form of an annular collar or similar construction, for an inserted fixing screw (9) projects from the shank sleeve (2).

7. An expansible plug according to one of the preceding claims, characterized in that a front expansible portion (27) is formed at the plug tip (6), the expansion direction of which is oriented offset through 90° with respect to the expansion direction of the expansion region (11) defined by the expansible elements (14, 15).

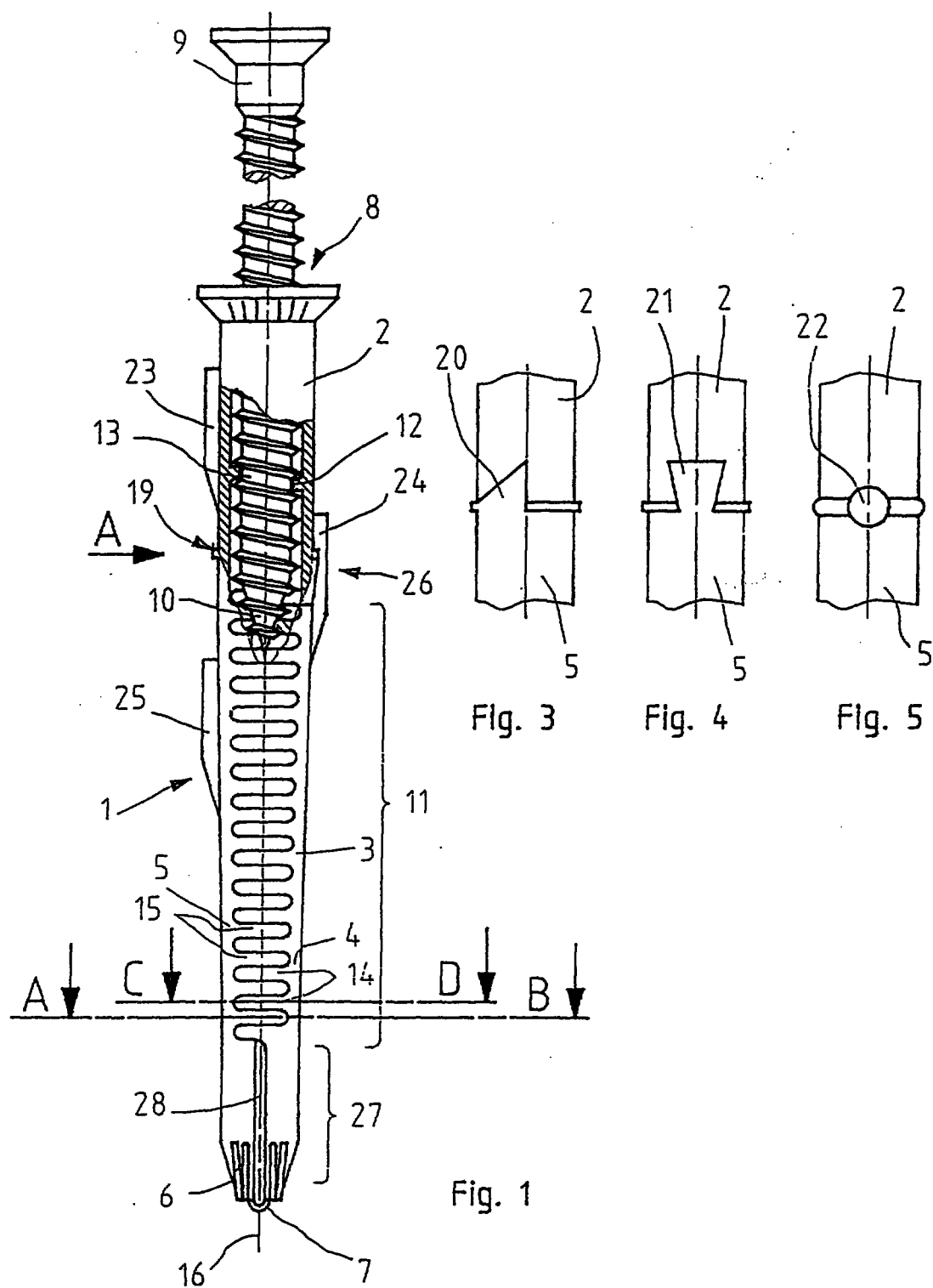
8. An expansible plug according to one of the preceding claims, characterized in that the expansible plug (1) is manufactured from plastics material as an opened-out part in a single injection moulding operation, and the two shank halves (4, 5) are joined at the plug tip (6) by means of an injection-moulded web (7).



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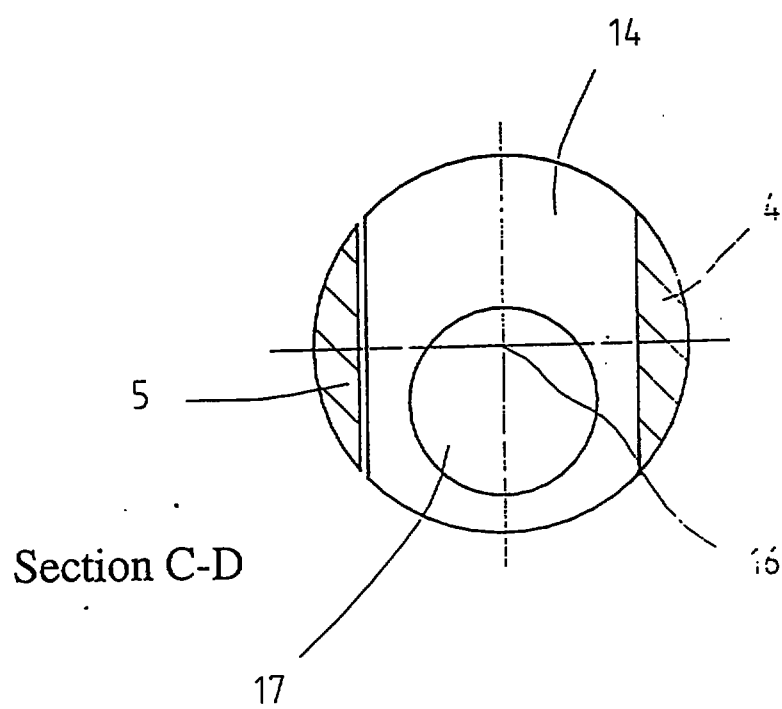
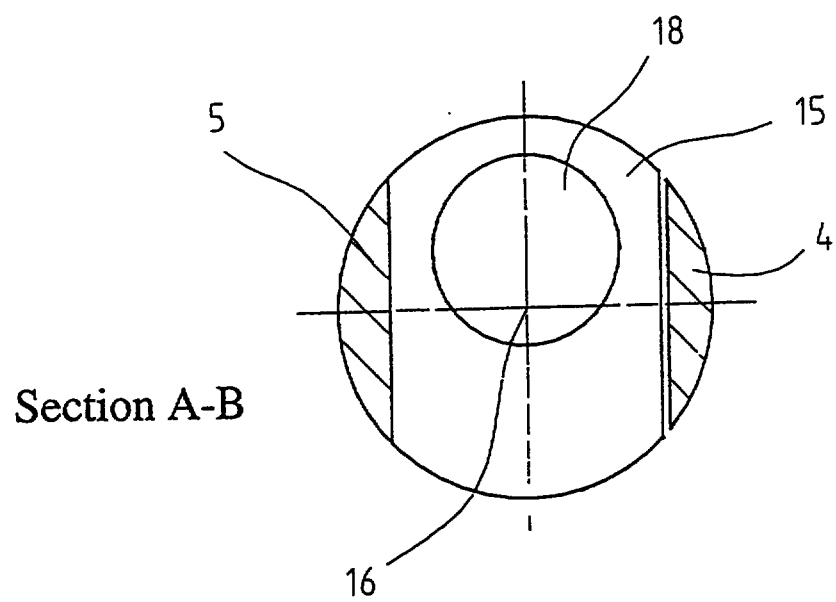


Fig. 2

Abstract

An expansible plug (1) which has a longitudinally divided expansion region (11) is provided. A shank section (5), which forms one half of the expansion region (11), is joined by dovetailed or other joining means in a joining region (19) to a shank sleeve (2) extending to the plug opening (8). The other shank section (4) of the expansion region (11) can be connected in one piece with the shank sleeve (2). (Figure 1).

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Patent Claims

1. An expansible plug, comprising a closed shank section formed as a shank sleeve provided with a screw channel and a longitudinally divided expansible shank, said shank being formed by two shank halves provided with staggered expansible elements which interlock to form a closed expansion region, said expansible elements being offset relative to one another and having bores arranged eccentrically relative to a center line of the expansible shank and overlapping so that an overlapping region forms a constricted screw channel, said expansion region tapering conically toward a plug tip, and one of said shank halves being connected to said shank sleeve in a joining region by a secure joint, said shank sleeve and said one shank half forming a one-piece plastic part, wherein another of said shank halves is connected with said shank sleeve to form a one-piece plastic element, said one shank half being connected to said shank sleeve by a dovetailed joint which forms said secured joint, in a manner proof against rotation, bending and tension.

2. An expansible plug, comprising a closed shank section formed as a shank sleeve provided with a screw channel and a longitudinally divided expansible shank, said shank being formed by two shank halves provided with staggered expansible elements which interlock to form a closed expansion region, said expansible elements being offset relative to one another and having bores arranged eccentrically relative to a center line of the expansible shank and



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04 NOV 1997

Substitute sheet - 3 November 1997

overlapping so that an overlapping region forms a constricted screw channel, said expansion region tapering conically toward a plug tip, and one of said shank halves being connected to said shank sleeve in a joining region by a secure joint, said shank sleeve and said one shank half form a one-piece plastic part, wherein another of said shank halves is connected with said shank sleeve to form a one-piece plastic element, said one shank half being connected to said shank sleeve by an interlocking joint which forms said secured joint, in a manner proof against rotation, bending and tension.

3. An expansible plug, comprising a closed shank section formed as a shank sleeve provided with a screw channel and a longitudinally divided expansible shank, said shank being formed by two shank halves provided with staggered expansible elements which interlock to form a closed expansion region, said expansible elements being offset relative to one another and having bores arranged eccentrically relative to a center line of the expansible shank and overlapping so that an overlapping region forms a constricted screw channel, said expansion region tapering conically toward a plug tip, and one of said shank halves being connected to said shank sleeve in a joining region by a secure joint; and a plurality of ribs projecting respectively from said shank sleeve and from said two shank halves which form said expansion region, so as to form an anti-rotation elements.

4. An expansible plug as defined in claim 3, wherein said longitudinal ribs are offset relative to



04 NOV 1997

Substitute sheet - 3 November 1997

8

one another in the longitudinal direction and also in an angular direction.

5. An expansible plug as defined in claim 3, wherein said longitudinal ribs include a first longitudinal rib arranged at a transition region between said shank sleeve and said one shank half.

6. An expansible plug, comprising a closed shank section formed as a shank sleeve provided with a screw channel and a longitudinally divided expansible shank, said shank being formed by two shank halves provided with staggered expansible elements which interlock to form a closed expansion region, said expansion elements being offset relative to one another and having bores arranged eccentrically relative to a center line of the expansion shank and overlapping so that an overlapping region forms a constricted screw channel, said expansion region tapering conically toward a plug tip, and one said shank halves being connected to said shank sleeve in a joining region by a secure joint; and a further expansible region formed at said plug tip and having an expansion direction which is offset relative to an expansion direction of said expansible region by 90°.

7. An expansible plug comprising a closed shank section formed as a shank sleeve provided with a screw channel and a longitudinally divided expansible shank, said shank being formed by two shank halves provided with staggered expansible elements which interlock to form a closed expansion region, said expansible elements being offset relative to one another and having bores arranged eccentrically relative to a center line of the expansible shank and



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04 NOV 1997

- 9 - Substitute sheet - 3 November 1997

overlapping so that an overlapping region forms a constricted screw channel, said expansion region tapering conically toward a plug tip, and one of said shank halves being connected to said shank sleeve in a joining region by a secure joint, said shank sleeve and said shank halves together forming a one-piece injection molded plastic element which includes an injection molded web connecting said shank halves with one another at said plug tip.

8. An expansible plug as defined in claim 7; and further comprising an impact barrier projecting from said shank sleeve for a fixing screw insertable in said shank sleeve.

9. An expansible plug as defined in claim 8, wherein said impact barrier is formed as an annular collar.

