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Nail having an expansion region.

The invention relates to a nail having an expansion region according to the preamble of Claim 1.

DE 33 45 331 A1 discloses a fixing element in the form of a nail which has an expansion region in the region of its front end face, the expansion region being formed by two outwardly bowed arms extending spaced apart from one another. Anchoring of such a fixing element is effected in that the shank of the fixing element is driven into a pre-drilled hole in masonry or similar material. As the shank is driven into the drilled hole, the expansible arms are compressed inwards by the wall of the drilled hole, wherein an increased pressure by the expansible arms against the wall of the drilled hole can be achieved by an insert located between the expansible arms. After the driving-in operation, the expansible arms of the fixing element are pressed by the plastic and/or resilient restoring force of the insert against the wall of the drilled hole, with the result that a correspondingly high holding force is achieved. Because of the insert, however, the resistance of the known nail to being driven in is very high.

The invention is based on the problem of providing a nail having an expansion region, which on the one hand can be inserted without difficulty into a hole drilled in masonry, and has high holding values.

This problem is solved by the features specified in Claim 1. The laterally projecting expansible arms formed by the longitudinal channel are pressed inwards by plastic and resilient deformation as the nail is driven into a drilled hole, and consequently form a frictional engagement with the wall of the drilled

hole. By virtue of the resilient and plastic deformation component of the expansion region, high holding values are achieved. The resilient deformation component also enables the nail to compensate for any widening of the drilled hole, for example, as a result of cracks forming, without significant loss of holding value. The longitudinal channel, which starts in the straight shank section lying before the expansion region and extends as far as the front end face of the nail, provides a high degree of flexibility at the transition zones to the expansion region, which considerably reduces the resistance of the nail to being driven in, in particular into narrow drilled holes. Furthermore, the longitudinal channel, which is open at the front end face of the nail, provides a means whereby the drilling dust present in the drilled hole is accommodated as the nail is being driven in. The longitudinal channel extending as far as the end face therefore prevents the drilling dust from accumulating at the end face of the nail and hampering or even preventing the operation of driving in the nail. The drilling dust filling the longitudinal channel further results in an increase in the holding values, since the drilling dust additionally acts as a friction-producing agent.

The expansion region is preferably formed by expanding the shank symmetrically by an indenting operation using a wedge, and at the same time the smooth transitions are moulded.

It is especially advantageous for the outer surface of the expansible arms to be of an approximately circular shape in cross-section, namely with a diameter slightly larger than that of the shank. The rounding in the expansion region thus corresponds approximately to the rounding of the shank and the wall of the drilled hole, with the result that a uniform,

face-to-face contact against the wall of the drilled hole is achieved also in the expansion region. The nail is consequently braced in the expansion region against the drilled hole not only in point-to-point contact but also in face-to-face contact, which produces considerably better holding values. Bevelling the longitudinal edges of the expansible arms facilitates bending in of the expansible arms as the nail is driven into the drilled hole.

The longitudinal channel may have a U-shaped cross-section which is achieved by using a suitable wedge for the indenting process. In the area of the bottom of the channel, the expansion region therefore has as uniform a cross-section as is possible, which imparts a high resilience to the bowed expansible arms.

A plastics material covering starting from the nail head and ending before the expansion region provides additional protection against corrosion in that it seals the drilled hole in the region of the mouth of the drilled hole.

Since the nail according to the invention, after being anchored in a drilled hole, can only be removed again therefrom with extreme difficulty, a development of the invention provides for the nail to have a nail head which is provided on its upper face with a centering indentation which is aligned centrically with respect to the centre line of the shank. The centering indentation enables the nail head to be drilled off exactly, using a drill bit, the diameter of which corresponds to the diameter of the shank. In this manner, for example, a board fixed to a wall can be removed without problem from the headless nail, if such a dismantling operation is required.

To improve the flow of the drilling dust into the longitudinal channel as the nail is being driven in, it

is expedient to provide the front end face of the nail with a slope to form a nail tip.

In a further construction of the invention, the expansion region of the nail can be provided with a longitudinal rib which is triangular in cross-section and which is arranged opposite the longitudinal channel. This longitudinal rib, which projects beyond the outer periphery of the expansion region, provides a further engagement in the drilled hole in addition to the two expansible arms, so that on the one hand a centering effect is produced by the three-point contact and on the other hand a greater pressing action by the expansible arms is achieved. The longitudinal rib also, through the triangular shape of its profile, compensates for tolerances in the drilled hole. In the case of relatively narrow drilled holes, the longitudinal rib digs deeper, and in the case of wider drilled holes it digs to a lesser extent into the wall of the drilled hole, so that constant friction of the expansion region is produced largely independently of the diameter of the drilled hole.

To facilitate introduction and driving-in of the nail-type plug having a longitudinal rib into the drilled hole, it is expedient for the longitudinal rib to terminate in a tapering point at a distance from the front end face of the nail.

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

Figure 1 shows a nail having an expansion region,

Figure 2 shows a plan view of the front end face of the nail,

Figure 3 shows a longitudinal section of the nail and

Figure 3a shows the rear side of the front part of the nail shown in Figure 1,

Figure 4 shows the plastics covering of the nail shown in Figure 1.

The nail 1 illustrated in Figure 1 has a shank 2 with an expansion region 3 and a nail head 4. The expansion region 3 is set back slightly from the front end face 5 of the nail so that a straight shank portion 6 is left between this end face 5 and the expansion region 3. A longer straight shank portion 7 extends between the expansion region 3 and the nail head 4.

The nail 1 made from metal is channelled in the expansion region 3 by an indenting process using a wedge, so that a longitudinal channel 8 of U-shaped cross-section is produced. The longitudinal channel 8 is bounded by lateral expansible arms 9, 10, which bow outwards and project from the shank 2. So that drilling dust can be guided more effectively into the longitudinal channel 8, which is open at the front end face 5, as the nail is being driven in, the end face 5 is provided with a slope 11.

The illustration according to Figure 2 shows the U-shaped channelling of the longitudinal channel 8. In the region of the bottom of the channel there is a uniform wall thickness for the expansion region 3, which results in a high resilience of the outwardly bowed expansible arms 9, 10. Bevelling of the longitudinal edges of the expansible arms 9, 10 promotes inward bending and positioning against the wall of the drilled hole.

The longitudinal section illustrated in Figure 3 shows the nail according to Figure 1, but rotated through 90°. The slope 11 at the front end face 5 of the nail runs from the open side of the longitudinal channel 8 at an acute angle to the bottom 12 of the longitudinal channel.

Figure 4 shows the nail 1 with a plastics material covering 13 in the area of the nail head 4 and the shank 2. Before the expansion region 3 is reached, the plastics material covering 13 terminates flush with the shank 2.

A centering indentation 14, which is aligned centrally with respect to the longitudinal axis of the shank 2, is stamped into the top face of the nail head 4.

Figures 2, 3 and 3a show the arrangement of a longitudinal rib 15 at the expansion region 3 of the nail 1. The longitudinal rib 15 has a triangular profile and is located opposite the longitudinal channel 8. For ease of insertion and to facilitate driving of the nail 1 into a drilled hole, the longitudinal rib 15 ends at a distance from the front end face 5 of the nail and is provided with a tapering point 16.

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Patent Claims

1. A nail having an expansion region formed at a distance from the front end face of the nail, from the shank of which nail in the expansion region there project laterally two bowed expansible arms, between which there runs in the shank a free space, and which continue at both ends of the expansion region as straight shank portions, characterized in that the free space is in the form of a longitudinal channel (8) which starts from the straight shank portion (7) lying before the expansion region and extends as far as the front end face (5) of the nail.

2. A nail according to claim 1, characterized in that the expansible arms (9, 10) are bowed outwardly by indenting the straight shank (2) symmetrically with respect to the longitudinal axis of the shank, and there is a smooth transition at both ends of the expansion region (3) to the straight shank portions (6, 7).

3. A nail according to claim 2, characterized in that the expansion region (3) is approximately circularly rounded in cross-section, and the expansible arms (9, 10) are bevelled at their longitudinal edges.

4. A nail according to claim 1, characterized in that the longitudinal channel (8) has a U-shaped cross-section.



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5. A nail according to claim 1, characterized in that the nail head (4) and the adjoining shank portion (2) has a plastics material covering (13), the wall of which terminates flush on the shank (2) before reaching the expansion region (3).

6. A nail according to claim 1, characterized in that the nail (1) has a nail head (4) having on its top face a centering indentation (14) that is aligned centrally with respect to the longitudinal axis of the shank (2).

7. A nail according to claim 1, characterized in that the front end face (5) of the nail has a nail tip formed by a slope (11).

8. A nail according to claim 1, characterized in that the expansion region (3) of the nail (1) is provided with a longitudinal rib (15) of triangular profile opposite the longitudinal channel (8).

9. A nail according to claim 8, characterized in that the longitudinal rib (15) terminates at a distance from the front end face (5) of the nail in a tapering point (16).

