

The invention concerns a fixing device for fixing an object to a lightweight building material wall comprising an insert body which has an internal cavity for receiving a fixing element, a tool blade which is in the form of a flat bar and which projects beyond the insertion end of the insert body, with a boring tip for producing a cylindrical pilot bore in the lightweight building material wall for receiving the insert body, and a self-tapping external screwthread, and further comprising a setting tool which can be non-rotatably introduced into the cavity in the insert body.

10 EP-B1-165 674 describes a fixing device of that kind having an insert body which at the insertion end has an opening and a tool blade which projects beyond the insertion end of the insert body which is provided with a self-tapping external screwthread. The tool blade makes it possible to produce
15 a pilot bore for the external screwthread of the insert body during the setting operation by means of the tool blade arranged at the front end of the insert sleeve, in a lightweight building material. When a fixing element which is used as a screw is screwed in after the operation of setting the insert body into a lightweight building material of a material
20 thickness which is less than the length of the insert body provided with the external screwthread, the front end of the screw urges the tool blade laterally out of the way. For that reason the known insert body which manages without a pilot bore can only be used when it is longer than the thickness of the lightweight building material. Use thereof in a situation
25 in which there is only a blind hole and not a through hole is not possible because of the required lateral deflection movement of the tool blade.

DE-C-2 419 111 discloses an insert body for fixing an object in a lightweight building material wall, which is closed at the insertion end and which after the formation of a cylindrical pilot bore by means of a
30 drilling machine is screwed into the cylindrical pilot bore by means of a setting tool. In the operation of screwing it into the cylindrical pilot bore, the external screwthread of the insert body cuts into the soft lightweight building material, with the material remaining undisturbed
35 between the screwthread pitches. That permits anchorage, free from any spreading pressure, of a fixing element which, after setting of the insert body, is screwed into the axial cavity thereof, for fixing an object.

US-A-3 289 290 describes a method and a device for setting a fixing screw which requires a cylindrical pilot bore for the screwing-in operation, in
40 one working operation. The fixing screw, for example a wood screw, is for that purpose provided with a longitudinal bore which passes entirely through same and through which a conventional drill which is clamped in a drilling machine is passed in order to drill a hole into the fixing
45 material through the longitudinal bore in the screw. When the pilot bore has been produced, a screwdriver which is fixed together with the drill in the chuck comes into engagement with the head of the screw so that the latter can be screwed into the pilot bore which has just been produced without the drill having to be pulled out in a first working operation and
50 the screw having to be screwed in separately in a second working operation.

Taking that state of the art as the basic starting point the invention is based on the problem of providing a device of the kind discussed in the

opening part of this specification, which while saving on material permits quick and easy fitting in lightweight building materials of any thickness.

5 In accordance with the invention that problem is solved in that the tool blade is provided on the setting tool and can be advanced with its boring tip through the cavity of the insert body beyond the insertion end thereof.

10 Because the setting tool with its blade projects beyond the insertion end of the insert body, on the one hand it is possible in a single working operation when turning the setting tool firstly to produce by means of the tool blade a pilot bore into which the insertion end of the insert body engages in the course of the step of producing the pilot bore and cuts a screwthread as a result of the rotary movement by means of its external screwthread. On the other hand, after retraction of the setting tool into 15 the cavity which becomes free in the insert body, a fixing element and in particular a screw can be screwed in without the advance movement thereof being adversely affected by a tool blade provided on the insert body.

20 Desirable developments and configurations of the invention are set forth in the appendant claims and the following description of an embodiment of the invention with reference to the drawing in which:

- 25 Fig. 1 shows a perspective view of a setting tool according to the invention,
- Fig. 2 is a side view of the insert body according to the invention,
- 30 Fig. 3 is a view of the rear end of the insert body which is shown at the left in Fig. 2,
- Fig. 4 is a view of the insertion end of the insert body which is illustrated at the right in Fig. 2, viewing in the axial direction,
- 35 Fig. 5 shows the insert body with inserted setting tool whose tool mounting is clamped in the drilling chuck of a drilling machine and whose tool blade during the setting operation produces a pilot bore in a lightweight building material wall,
- 40 Fig. 6 is a view in section taken along line VI-VI in Fig. 5,
- 45 Fig. 7 is a partly sectional side view of the insert body and the setting tool after the operation of setting in a lightweight building material wall,
- Fig. 8 shows the insert body when inserted into the lightweight building material wall after screwing in a fixing screw for fixing an object to the lightweight building material wall, and
- 50 Fig. 9 is a view in cross-section through the insert body illustrated in Fig. 8 to show the position of the fixing screw in the cross-shaped cavity in the insert body.
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- Fig. 1 shows a perspective view of a setting tool 1 which can be clamped by its hexagonal tool mounting 2 in the drilling chuck of a drilling machine. Formed on the hexagonal tool mounting 2 is an intermediate portion 3 from which a tool blade projects. The intermediate portion 3 is conical in order to permit a better grip in the fitting operation. While the tool mounting 2 and the intermediate portion 3 preferably comprise plastics material, the tool blade 4 comprises a metal of sufficient hardness and abrasion resistance.
- The tool blade 4 is in the form of a comparatively flat bar of constant thickness and constant width and goes into a drilling tip 5 which is of a triangular configuration with a rounded-off tip, wherein the material thickness thereof decreases in a forward direction so that the tool blade 4 with its drilling tip 5 is of a dagger-like appearance.
- The rounded-off drilling tip 5 is also of a configuration which makes it possible for cross-slot screws to be screwed in or loosened with the setting tool 1. In that way the setting tool 1 can also be used as a makeshift screwdriver.
- The tool blade 4 is for example of a thickness of 1.3 millimetres and a length of about 40 millimetres. The intermediate portion 3 can be of a length of 10 millimetres and the tool mounting 2 can be of a length of 15 millimetres.
- The setting tool 1 serves for setting an insert body 7 which is shown in Fig. 2 and which is made from plastics material or die cast zinc. The insert body 7 has a cylindrical core portion 8 through which extends a slot 9 which can be seen in Fig. 2. The slotted cylindrical core portion 8 goes into a conical region 10 which terminates at the rear end of the insert body 7 in a collar 11.
- The cylindrical core portion 8 and the conical region 10 are surrounded by a screwthread 12 of large pitch, which is in the form of a self-tapping external screwthread so that, upon being screwed into a bore in a lightweight building material, the insert body 7 cuts a screwthread in which the insert body 7 finds a hold free from spreading pressure.
- The self-tapping screwthread 12 terminates at the location identified by reference 13 in front of the collar 11 at the rear end of the insert body 7 and terminates at the front end or insertion end 14 of the insert body 7 with a progressively decreasing screwthread height, as can best be seen from Fig. 4.
- Fig. 4 also shows that a plurality of openings 15 are provided in the screwthread flight of the screwthread 12, which is adjacent to the insertion end 14, so that a plurality of cutting edges 6 are formed, which make it easier for the screwthread 12 to cut into a lightweight building material, in particular a plasterboard panel. In that respect the conical region 10 consolidates the plasterboard panel at the rear end of the insert body 7 and thereby permits higher holding forces on the part of the fixing device.
- Fig. 3 shows a view of the rear end of the insert body 7 and the collar 11

which is annular in plan view. Both Fig. 3 and Fig. 4 show an internal cavity 16 of a cross-shaped cross-section, which extends in the axial direction through the insert body 7. The cross-shaped cavity serves after setting of the insert body 7 to accommodate a fixing element, in particular a screw 27 (Fig. 8) which can cut with its screwthread into the plastics material surrounding the cavity 16.

The cavity 16 comprises a wider groove portion 17 which extends almost horizontally in Figs. 2, 3 and 4 and a narrower groove portion 18 which extends almost vertically in Figs. 3 and 4. The wide groove portion 17 and the narrow groove portion 18 extend through the insert body 7 from the rear end at the collar 11 to the insertion end 14.

The wider groove portion 17 is of a width which corresponds to the core diameter of the screwthread 12 or the outside diameter of the cylindrical core portion 8. For that reason the wide groove portion 17 forms in the cylindrical core portion 8 the above-mentioned slot 9 which forms a first limb 19 and a second limb 20 which are mechanically stabilized by the flights of the screwthread 12 which are disposed around them, in such a way that the slot 9 does not result in any weakening effect worth mentioning in the insert body 7 in the front region.

The width of the tool blade 4 corresponds to the width of the wider groove portion 17 and therewith the diameter of the cylindrical core portion 18. That can be particularly clearly seen in Fig. 5.

Fig. 5 shows a lightweight building material wall 22, in particular a plasterboard panel, in which the tool blade 4 has produced a cylindrical pilot bore 21 extending almost therethrough, after the setting tool 1 has been passed from the collar 11 through the groove portion 17 of the insert body 7 until the intermediate portion 3 bears against the collar 11 and after the setting tool 1 which is clamped with its tool mounting 2 in a drilling chuck 23 of a drilling machine has been set rotating.

With the rotary movements produced by means of the drilling machine the tip 5 of the setting tool 1 firstly cuts through the upper layer, in particular a cardboard layer, of the lightweight building material panel 22. It then passes through the lightweight building material panel 22 and, as can be seen in Fig. 5, issues again at the opposite side of the lightweight building material panel 22.

Shortly thereafter the insertion end 14 of the cylindrical portion 8 whose diameter is equal to the width of the tool blade 4 passes into the pilot bore 21 which has just been produced in the lightweight building material 22 as soon as the first flight of the screwthread 12 comes into engagement with its cutting edges 6 with the material of the lightweight building material panel 22 so that the insert body 7 produces a screwthreaded hole in same.

Fig. 6 is a view in section taken along line VI-VI in Fig. 5 showing the geometrical conditions involved and illustrating in particular how the width of the tool blade 4 entirely fills the wider groove portion 17 and extends as far as the surface of the cylindrical core portion 8. In that arrangement the screwthread 12 produces a screwthread which extends as far as the broken-line circle 24.

After a few revolutions production of the screwthread in the lightweight building material panel 22 is concluded and the insert body 7 is screwed in, in the manner shown in Fig. 7. Instead of using a drilling machine, the setting operation can also be performed by means of a cross-slot screwdriver, for which reason the tool mounting 2 has an axial depression for the positively locking insertion of a cross-slot screwdriver. A conical recess 25 in the tool blade 4 is so arranged in the axial depression that the edge of the recess 25 comes into good engagement with the tip of the cross-slot screwdriver.

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Fig. 7 also shows in particular the ratio of the length L_1 of the insert body 7 to the length L of the tool blade 4 which projects out of the intermediate portion 3. The length of the tool blade 4 outside the intermediate portion 3 is about 1.5 to 3 times as great as the length of the insert body 7.

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When the assembly condition shown in Fig. 7 is reached the setting tool 1 can be withdrawn from the insert body 7 which has been screwed into the lightweight building material panel 22 in order to fix an object 26 by means of a screw 27 which can be screwed by means of the setting tool 1 through the object 26 to be fixed in the cavity 16 in the insert body 7. After the screw 27 has been screwed in, the object 26 is fixed to the lightweight building material panel 22 in such a way as to be free of spreading pressure, in the fashion shown in Fig. 8.

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Fig. 9 is a view in cross-section through the lightweight panel 22 and the insert body 7 and the screw 27 in order to show how the screwthread 28 of the screw 27 has cut into the plastics material between the wide groove portion 17 and the narrow groove portion 18.

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It will be apparent from the foregoing description that the insert body 7 can be set in a single working operation without the need for a separate working operation to produce the pilot bore 21. That affords quick and easy fitment with a low level of material expenditure.

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CLAIMS

1. A fixing device for fixing an object to a lightweight building material wall comprising an insert body which has an internal cavity for receiving a fixing element, a tool blade which is in the form of a flat bar and which projects beyond the insertion end of the insert body, with a boring tip for producing a cylindrical pilot bore in the lightweight building material wall for receiving the insert body, and a self-tapping external screwthread, and further comprising a setting tool which can be non-rotatably introduced into the cavity in the insert body, characterised in that the tool blade (4) is provided on the setting tool (1) and can be advanced with its boring tip (5) through the cavity (16, 17) of the insert body (7) beyond the insertion end (14) thereof.

2. A device according to claim 1 characterised in that the tool blade (4) is of a dagger-like configuration with a symmetrically tapering boring tip (5).

3. A device according to claim 1 characterised in that the tool blade (4) is of a rectangular cross-section and a length which corresponds to from 1.5 to 3 times the length of the insert body (7).

4. A device according to claim 1 characterised in that the tool blade (4) has a tool mounting means (2) at the end remote from the boring tip (5).

5. A device according to claim 4 characterised in that the tool mounting means (2) has a hexagonal portion and at the end of the tool blade (4) which is opposite the boring tip (5) an intermediate portion (3) as an abutment for the rearward end of the insert body (7).



6. A device according to claim 5 characterised in that the hexagonal portion is provided with an axial recess for positively locking insertion of a cross-slot screwdriver.

7. A device according to claim 6 characterised in that the flat bar extends with its end opposite the boring tip (5) into the axial recess in the tool mounting means (2) and is provided with a conical opening (25) for the positively locking engagement with the cross-slot screwdriver.

8. A device according to one of claims 1 to 7 characterised in that the core diameter (8) of the external screwthread (12) at the insertion end (14) is equal to the width of the tool blade (4) which can be advanced through the cavity (16, 17).

9. A device according to claim 8 characterised in that the core diameter (8) of the external screwthread (12) rises at the end opposite the insertion end (14) to a diameter (10) which is larger than the width of the tool blade (4).

10. A device according to one of claims 1 to 9 characterised in that the screwthread height of the self-tapping external screwthread (12) increases starting from the insertion end (14) at which the screwthread (12) comes to an end.

11. A device according to claim 10 characterised in that provided at the screwthread flight adjacent the insertion end (14) are tooth-like openings (15) which form cutting edges (6).

12. A device according to one of the preceding claims characterised in that the cavity (16) is cross-shaped in cross-section,



wherein the groove portion (17) which is wider in the radial direction is of a height corresponding to the thickness of the tool blade (4) and, forming a longitudinal slot (9), is of the width of the tool blade (4) and the core diameter (8) of the insert body (7) at the insertion end (14) while the narrower groove portion (18) which extends at a right angle to the wider groove portion (17) along the longitudinal axis of the insert body (7) is of a width which is everywhere smaller than the core diameter (8) of the external screwthread (12) of the insert body (7).