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TRANSLATION OF THE INTRODUCTION TO THE SPECIFICATION AMENDED
DURING THE INTERNATIONAL PRELIMINARY EXAMINATION PROCEDURE

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10 Self-punching fastener which in a way safe against
and pressing out can be pressed into a metal sheet.

15 The present invention relates to a self-punching fastener,
which in a way safe against rotation and pressing out can be
pressed into a metal sheet having an annular body, the side
of which facing the metal sheet is having radially positioned
projections which are pressed into the metal sheet into the
20 surface thereof during the setting with an interior thread
being positioned in the centre thereof and which on the side
of the annular body facing the metal sheet in the set state
is having a surrounding annular depression into which the
metal sheet material displaced during the setting is pressed.

25 The closest prior art in this respect can be learnt from the
US-B-6 220 804 which already is showing the above-mentioned
features. Fasteners according to this prior art however can
be set merely in relatively small ranges of thickness of the
metal sheet, which means each an specially designed fastener
30 is needed for metal sheets with very little difference in
thickness. Further the safety against rotation and pressing
out is still not optimal in connection with fasteners accord-
ing to the prior art. Further, the fastener according to this
reference is having a polygone-shaped body (in the embodiment
35 each octagonal). The projections there in the vicinity of the
so-called "punching collar" are prominent and are flatly ta-
pering-off to the exterior.

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Starting out from the above prior art, it is the task to be solved the present invention to further develop such a fastener in such a way that with the same geometry a maximal or hinge of gauges of the metal sheet can be used with a high safety against rotation and pressing out without a previous punching and a previous special preparation of the holes into which the fastener is to be set being necessary.

This task according to the invention is solved by the features of the mainclaim 1. The subclaims are showing further advantageous embodiments of the invention.

According to the prior art, the known solutions were based on the assumption that an optimal safety against rotation and pressing out and a broad range of use of the fastener can be achieved if for the locking against rotation continuous ridges are provided within the annular depression and if the bottom of the annular depression is parallel to the surface of the metal sheets to be worked.

On the bottom side, the fastener 10 according to the invention is provided with an annular depression 12, the bottom face of which starting from its inner limitation - the punching collar 13 - is inclined to its outer limitation, i.e. the supporting collar 14. Within this annular depression 12 at the outer supporting collar 14 there are provided evenly distributed burl-shaped locking elements 15 in an annular array. The punching collar 13 is having an undercut 16 towards the axis 20 of the fastener 10 according to the invention and the supporting collar 14 is having an undercut 17 in the direction of the exterior enveloping face 18 of the fastener 10 according to the invention. The punching collar 13 is having a cutting edge 19.

Fig. 2 shows the fastener 10 according to the invention of Fig. 1 in a bottom view. The shape and the position of the burl-shaped locking elements 15 are clearly shown. The burl-shaped locking elements 15 are positioned at the outer supporting collar 14 and are forming a free-space towards the punching collar 13. In this representation (Fig. 2) the variant with annularly shaped burl-shaped locking elements 15 is shown.

Fig. 3 shows the fastener 10 according to the invention in an embodiment having sharp-edged (triangular) burl-shaped locking elements 25.

Fig. 4 shows the fastener 10 according to the invention in accordance to Fig. 1, 2 and 3 as well as the punching die 30 and the metal sheet member 40. From this representation it can be learnt that the metal sheet member 40 does not have a prefabricated hole and does not need any further preparation. The punching die 30 is having a cutting edge 31 and a swaging ring 32 having a special geometry 33. The exterior enveloping face 34 of the swaging ring 32 is running conically towards the central axis 20 of the punching die 30. This is ensuring that after the punching and pressing-in of the metal sheet

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member 40 into the annular depression 12 a jamming of the swaging ring 32 in the metal sheet member 40 is avoided.

5 Fig. 5 shows the fastener 10 according to the invention of Fig. 1 to 3 shortly after the finalization of the setting procedure. By the punching collar 13 in corporation with the cutting edge 31 of the punching die 30, a disk 41 has been punched out of the metal sheet member 40 and the material of the metal sheet member 40 has been swaged into the annular depression 12 by the swaging ring 32 enclosing the burl-shaped locking elements 15, 25. The stemmed out disk 41 is discarded downwardly from the punching die 30.

15 Fig. 6 is showing the fastener 10 according to the invention completely set in a metal sheet member 40. The action of the undercut 16, 17 at the punching collar 13 and at the supporting collar 14 is clearly shown. The annular depression 12 is filled with the material of the metal sheet member 40. The burl-shaped locking elements 14, 25 are embadded in the metal sheet member 40. The positive action of the bottom face of the annular depression 12 inclined to the exterior for enlarging the active length of the punching collar 13 and therefore for increasing the range of useable gauge ranges of the metal sheets for the fastener 10 according to the invention can be clearly noticed.

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TRANSLATION OF THE CLAIMS AMENDED DURING THE INTERNATIONAL
PRELIMINARY EXAMINATION PROCEDURE

CLAIMS

1. Self-punching fastener (10), which in a way safe against rotation and pressing out can be pressed into a metal sheet (40) having a body, which, on the side facing the metal sheet, is having radially positioned projections (15, 25), which during the pressing-in are pressed into the metal sheet member (40) and thereby are securing the fastener (10) against rotation, wherein in the centre there is positioned an interior thread (11) and, wherein on the side facing the metal sheet member (40) in the set state there is provided an annular depression (12), wherein the projections (15, 25) are positioned in said depression (12) equally distributed, characterized in that the projections (15, 25) are positioned at the interior rim of a collar (14) limiting the depression (12) and, in that said collar limiting the depression (12) at the exterior rim thereof is having an undercut (17) in the direction of the depression (12) to be able to receive metal sheet material for locking against an axial pressing out, the body and the depression (12) being annularly designed, wherein the annular depression (12) on the side facing the metal sheet member (40) is limited by a punching collar (13) in the direction of the interior thread (11) which is designed such that it is punching a hole with his diameter in the metal sheet member (40) during the setting of the fastener (10), with the punching collar (13) in the direction of the depression (12) is having an undercut (16) receiving metal sheet material occurring during the pressing-in to ensure a further locking of the fastener (10) against an axial pressing out.

2. Fastener (10) according to claim 1, characterized in that the punching collar (13) with respect to its height is adapted to the gauge of the respective metal sheet member (40) to be punched.

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3. Fastener (10) according to any of the claims 1 or 2, characterized in that the bottom face of the annular depression (12) is inclined from the interior to the exterior in the direction of the metal sheet member (40).

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