A flange forming drill means for drilling a hole through the side of a pipe or the like and for forming a hole encircling flange. The drill means comprises: a body (1), a drive shaft (2) rotatably journaled to the body, a drill rod with its drill bit (5) mounted on the end of the drive shaft (2), forming members (6) partly fitted within the drill rod (5), an adjustment member (7), by turning of which around the drill rod the forming members (6) can be made to project beyond the jacket surface of the drill rod (5), supporting legs (8) by which the device can be supported against a work piece (10) and which are fitted on the body (1) on either side of the drive shaft (2) in parallel relationship therewith, a feeding nut (13) mounted on the supporting legs (8) and which can be opened and closed for removal from and engagement with a feeding screw (14) formed on the drive shaft (2). When the drive shaft (2) is rotating and the feeding nut is in the closed position, the supporting legs (8) project outwards from the body (1) resulting in rising of the projecting forming members (6), rotating along with the drill rod (5), from below the edges of the hole and thus forming a flange. The feeding nut (13) is arranged to close automatically by means of a link mechanism (16-20) when the supporting legs (8) have moved a certain distance into the body (1). To the supporting legs (8) are secured brake bits (11) at such a level that they respond to the adjustment member (7) when the supporting legs (8) have moved said certain distance into the body (1). Thereby said brake bits (11) turn the adjustment member (7) relative to the drill rod (5) and effect the extension of the forming members (6) substantially simultaneously with the closure of the feeding nut (13).
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A flange forming drill means

The present invention relates to a flange forming drill means for drilling a hole through the side of a pipe or the like and for forming a hole encircling flange, said means comprising: a body, a drive shaft rotatably journaled to the body, a drill rod and a drill bit fitted on the end of the drive shaft, an adjustment member which can be turned around the drill rod to thereby extend forming members beyond the jacket surface of the drill rod, supporting legs capable of supporting the device against the piece to be worked on and which are fitted on the body on either side of the drive shaft in parallel relationship therewith, a feeding nut secured to the supporting legs and which can be opened and closed for removal from and engagement with a feeding screw mounted on the drive shaft, whereby in the closed position of the feeding nut and with the drive shaft rotating the supporting legs project from the body outwards thus making the projecting forming members, which rotate along with the drill rod, to rise from below the edges of the hole and to form a flange this way.

Such a flange forming drill means is disclosed in US patents 3 592 038 and 3 714 808. That device has proven very useful when it is necessary to form a flanged hole through the side of a pipe e.g. for connection of a branch.

The object of this invention is to further develop the said device, so that after the drilling operation shifts, without interruption in the operation, automatically to the flange forming step.

This object is achieved with the above-mentioned type of device in such a manner that the feeding nut is arranged to close automatically by means of link mechanism when the supporting legs have moved a certain distance into the body. Thus, an essential feature in the invention is the utilization of the movement of the supporting legs for automatic closing of the feeding nut.
Since also the forming members must be extended from the drill rod, after the hole has been drilled, simultaneously with the closure of the feeding nut, according to a preferred embodiment of the invention, this has been arranged to happen automatically in such a manner that to the supporting legs have been secured brake bits at such a level that they respond to the adjustment member when the supporting legs have moved said certain distance into the body, whereby the brake bits turn the adjustment member with respect to the drill rod and effect the extension of the forming members substantially simultaneously with the closure of the feeding nut.

In the following specification the invention is illustrated in more detail with reference made to the accompanying drawings, in which:

fig. 1 shows a device of the invention in side view and partially sectioned in a position where the hole drilling is finished and where the automatics according to the invention is ready to work.

fig. 2 shows a device of figure 1 in a condition in which the automatics have worked after the drill means has been urged a small distance downwards from the position of figure 1,

fig. 3 is a section taken along the line III-III in figure 1,

fig. 4 is a section taken along the line IV-IV in figure 1, and

fig. 5 is a section taken along the line V-V in figure 2.

The device comprises a body 1 to which is rotatably journalled a drive shaft 2 with a toothed gear 3 in its upper end rotated by means of a drive motor, not shown. To the lower end of the drive shaft 2 is connected a head portion 4 of the drill means, comprising a drill rod with its drill bit 5, through the drill rod crosswise extending forming pins 6 as well as an externall
smooth protective shield 7 enclosing an adjustment cone which can be turned around the drill rod thus extending the pins 6 so as to project from the drill rod or to be retracted into the drill rod, as described in more detail in the parallel patent application No. ........ The shield 7 is in working contact with the adjustment cone therein, so that the forming pins 6 can be retracted and extended by turning the shield 7 with respect to the drill rod 5. Turning of the protective cone 7 is possible after lifting said protective cone 7 slightly upwards in axial direction.

To the body 1 on either side of the shaft 2 there are slidably journaled supporting legs 8 whose hook-shaped ends 9 can be brought to engage the piece 10 to worked for supporting the drill means with respect to said piece to be worked on. Supporting legs 8 are fitted with brake bits 11 which, after the hole has been drilled through the piece 10 to be worked on, lean against the conical lower face of the protective shield 7. With continued downward pressing of the drill means, the brake bits 11 lift the shield 7 in axial direction upwards and thus, by the action of the friction, upon rotation of the device, between the brake bits 11 and shield 7, the protective shield 7 together with associated adjustment cone turns with respect to the drill rod 5 and effects the projection of the forming pins 6 from the rod 5, as depicted in figure 2.

Upper ends of the supporting legs 8 are secured to each other by means of a plate 12 which carries the feeding nut 13 which, on the other hand, can be brought to contact with a feeding screw 14 provided on the shaft 2. Nut 13 consists of two halves turning around an axis 15 and a spring 24 urges the halves of nut 13 towards a closed position, i.e. to engagement with the screw 14. The ends of the nut 13 halves, disposed opposite to each other relative to the axis 15, are designed as counter members for a cam portion 16, which in the first position depicted in figure 4 retains the halves of nut 13 open or disengaged from the screw 14 and in the second position shown in figure 5 allows the spring 24 to urge the halves of nut 13.
together and into engagement with the screw 14. A latch 25 connected with the cam portion 16 keeps the nut closed and a spring 26 connected with an arm 17 urges the cam portion 16 towards said second position (figure 5) for forced closure of the nut 13. By means of the arm 17 the cam portion 16 is in working engagement with a pivotable lever 18 whose ends are designed as gripping means 19 by which the lever 18 is manually pivotable to the first position (figure 4), in which the cam portion 16 opens the feeding nut 13. The cooperative counter faces of the cam portion 16 and feeding nut 13 are so designed that under the combined effect of spring 24 and spring 26 the cam portion 16 and lever 18 tends to turn in forced manner into its second position in which the nut 13 is allowed to close and the latch means 25 keeps it that way. For retaining the cam portion 16 and lever 18 in their first position (figure 4) there is fitted a retainer pin 20 which is longitudinally slideable in a guide means 21 connected with the body 1 and urged downwards by means of a spring 22 in such a manner that the limiting flange 23 responds to the top surface of the plate 12. With the supporting legs 8 in the figure 1 position, the retainer pin 20 keeps, by means of lever 18 and cam portion 16, the feeding nut in the position depicted in figure 4. When the drill means urged still further down from the position of figure 1, the plate 12 associated with the supporting legs 8 lifts the pin 20 upwards with respect to the body 1, whereby the lever 18 is released and the feeding nut 13 closed into the position of figure 5. Thus, the rotating feeding screw 14 and feeding nut 13 begin to push the supporting legs 8 out of the body 1. The body 1 pulls therealong the rotating drill bit with projecting forming means 6 upwards from the work piece 10, the edges of the hole bending upwards and forming a collar flange.

It is important to appreciate that in the device according to the invention the movement of the supporting legs 8 is used for automation of two different functional steps. First of all, with the shield 7 responding to the brake bits 11, the forming pins 6 project from the drill rod and, secondly, almost
simultaneously thereafter the pin 20 loosens itself from the lever 18 and the feeding nut 13 closes. Both actions occur substantially simultaneously after drilling of the hole, when the drill means is pressed still a slight distance downwards with respect to the supporting legs 8.
Claims

1. A flange forming drill means for drilling a hole through the side of a pipe or the like and for forming a hole encircling flange, said means comprising: a body (1), a drive shaft (2) rotatably journalled to the body, a drill rod with its drill bit (5) mounted on the end of the drive shaft (2), forming members (6) partly fitted within the drill rod (5), an adjustment member (7), by turning of which around the drill rod the forming members (6) can be made to project beyond the jacket surface of the drill rod (5), supporting legs (8) by which the device can be supported against a work piece (10) and which are fitted on the body (1) on either side of the drive shaft (2) in parallel relationship therewith, a feeding nut (13) mounted on the supporting legs (8) and which can be opened and closed for removal from and engagement with a feeding screw (14) formed on the drive shaft (2), whereby in the closed position of the feeding nut, with the drive shaft (2) rotating, the supporting legs (8) project outwards from the body (1) resulting in rising of the projecting forming members (6), rotating along with the drill rod (5), from below the edges of the hole and thus forming of a flange, characterized in that the feeding nut (13) is arranged to close automatically by means of a link mechanism (16-20) when the supporting legs (8) have moved a certain distance into the body (1).

2. A flange forming drill means according to claim 1, characterized in that to the supporting legs (8) are secured brake bits (11) at such a level that they respond to the adjustment member (7) when the supporting legs (8) have moved said certain distance into the body (1), said brake bits (11) turning the adjustment member (7) relative to the drill rod (5) and effect the extension of the forming members (6) substantially simultaneously with the closure of the feeding nut (13).

3. A flange forming drill means according to claim 1 or 2,
characterized in that the link mechanism comprises a lever (18) pivotally journalled to the body and associated with a cam portion (16) disposed between the halves of the feeding nut (13) and which, in the first position of lever (18), opens the feeding nut (13) and, in the second position, closes the feeding nut and that the lever (18) is retained in its first position by means of a retainer means (20) on which the movement of the supporting legs (8) relative to the body (l) is arranged to act in such a manner that, with the supporting legs moved over a certain distance into the body, the retainer means (20) releases the lever (18) and the cam portion (16) from the first position (figure 4) to the other position (figure 5).

4. A flange forming drill means according to claim 3, characterized in that a spring (24) urges the halves of the feeding nut (13) towards the closed position, and that another spring (26) tends in forced manner to turn the cam portion (16) from the first position to the second.

5. A flange forming drill means according to claim 4, characterized in that the counter faces of the cam portion (16) and feeding nut (13) are so designed that also the closing spring (24) of the feeding nut (13) tends to urge the cam portion (16) from the first position to the second.

6. A flange forming drill means according to claim 3, characterized in that the ends of the lever (18) are designed as gripping means (19), by which the lever (18) can be manually turned from the second position to the first.

7. A flange forming drill means according to claim 3, characterized in that the cam portion (16) is provided with a latch (25) which in the second position of the cam portion grips in a shape-lock manner the halves of the feeding nut (13) and keeps the feeding nut (13) closed.

8. A flange forming drill means according to claim 4,
characterized in that the lever (18) is connected to the cam portion (16) by means of an arm (17) which is engaged by said second spring (26).

9. A flange forming drill means according to claim 3, characterized in that the retainer means comprises a spring-loaded, axially directed pin (20) which the axial movement of the supporting legs (8) relative to the body (1) shifts in axial direction against the force of the spring (22), and that the free end of the pin (20) is in cooperation with the lever (18).
INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC 3

B 21 C 37/29, B 21 D 39/04 // B 23 B 47/18

II. FIELDS SEARCHED

Minimum Documentation Searched 4

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Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 6

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT 14

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<td>A</td>
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<td>A</td>
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<td>A</td>
<td>DE, A1, 2 434 498 published 1975, February 6, Granger Maurice</td>
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* Special categories of cited documents: 16

"A" document defining the general state of the art
"E" earlier document but published on or after the International filing date
"L" document cited for special reasons other than those referred to in the other categories
"O" document referring to an oral disclosure, use, exhibition or other means

IV. CERTIFICATION

Date of the Actual Completion of the International Search 8

1981-05-08

International Searching Authority 1

Swedish Patent Office

Date of Mailing of this International Search Report 9

1981-05-20

Signature of Authorized Officer 18

Leif Hagström

Form PCT/ISA/210 (second sheet) (October 1977)
II. Fields Searched (continuation)

US Cl 29/157, 523
      72/67, 68, 71, 74, 81, 112, 117, 325
      77/65
      408/14

National Cl 7b19

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE

This international search report has not been established in respect of certain claims under Article 17(2) (4) for the following reasons:
1. □ Claim numbers ........., because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claim numbers ........., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This International Searching Authority found multiple inventions in this international application as follows:

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. □ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

Remark on Protest
□ The additional search fees were accompanied by applicant's protest.
□ No protest accompanied the payment of additional search fees.