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(54) **METHOD AND DEVICE FOR PRODUCING LONGITUDINAL COMPONENTS OF METAL WITH HELICAL GROOVES, IN PARTICULAR SPIRAL DRILL BITS OR SCREWS**

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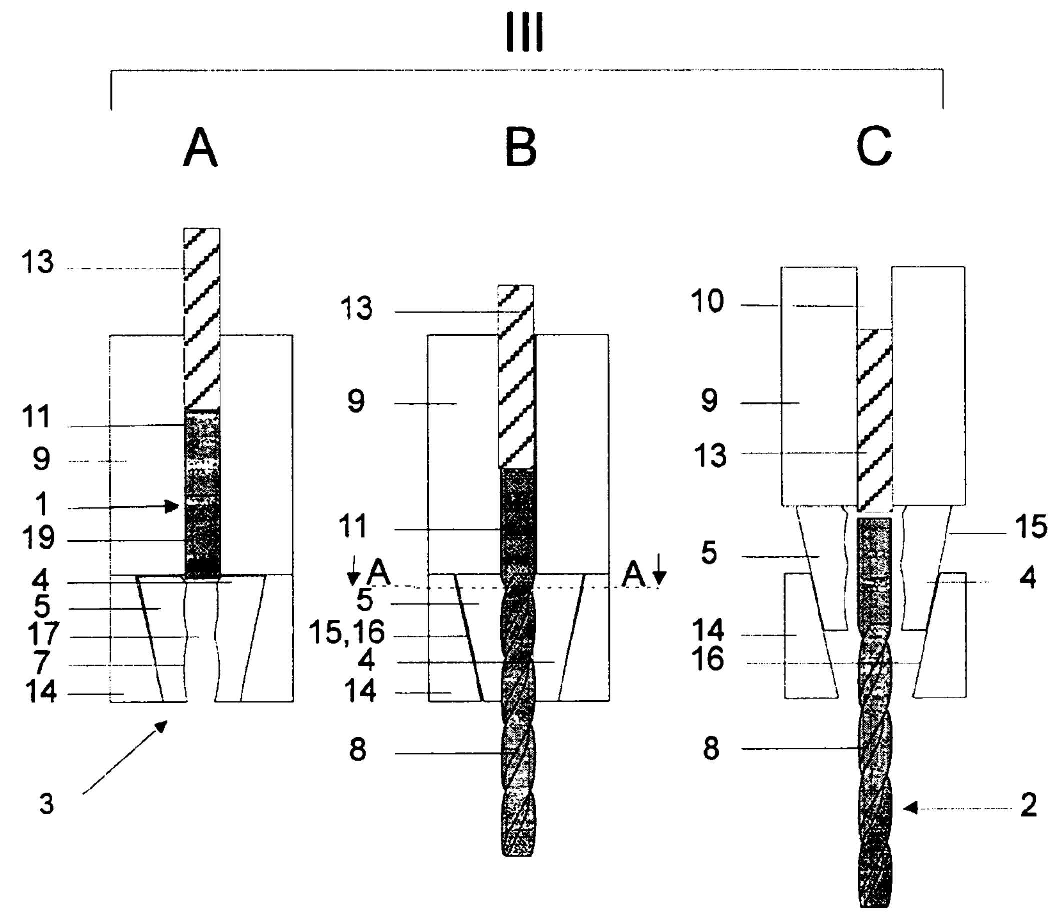
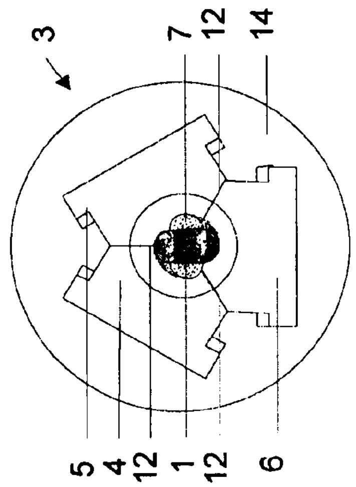
(57) **ABSTRACT**

A device and associated methodology for producing longitudinal components of metal with helical grooves, in particular spiral drill bits or screws, is provided. The method is suited for mass production and improves the cost effectiveness of production. The method includes providing at least one cold forming stage in which a blank is inserted in a guide mold and cold formed in a split mold with at least two movable jaws. The inner wall of the jaws includes at least one section with a contour designed as a negative of the helical grooves. By a heading tool which is movable in axial direction and which engages the free end of the blank positioned in the guide mold, the blank is pressed at least partially through the central opening of the closed split mold. Thus, helical grooves are produced during the contact with the mold contour by plastical cold forming.




3
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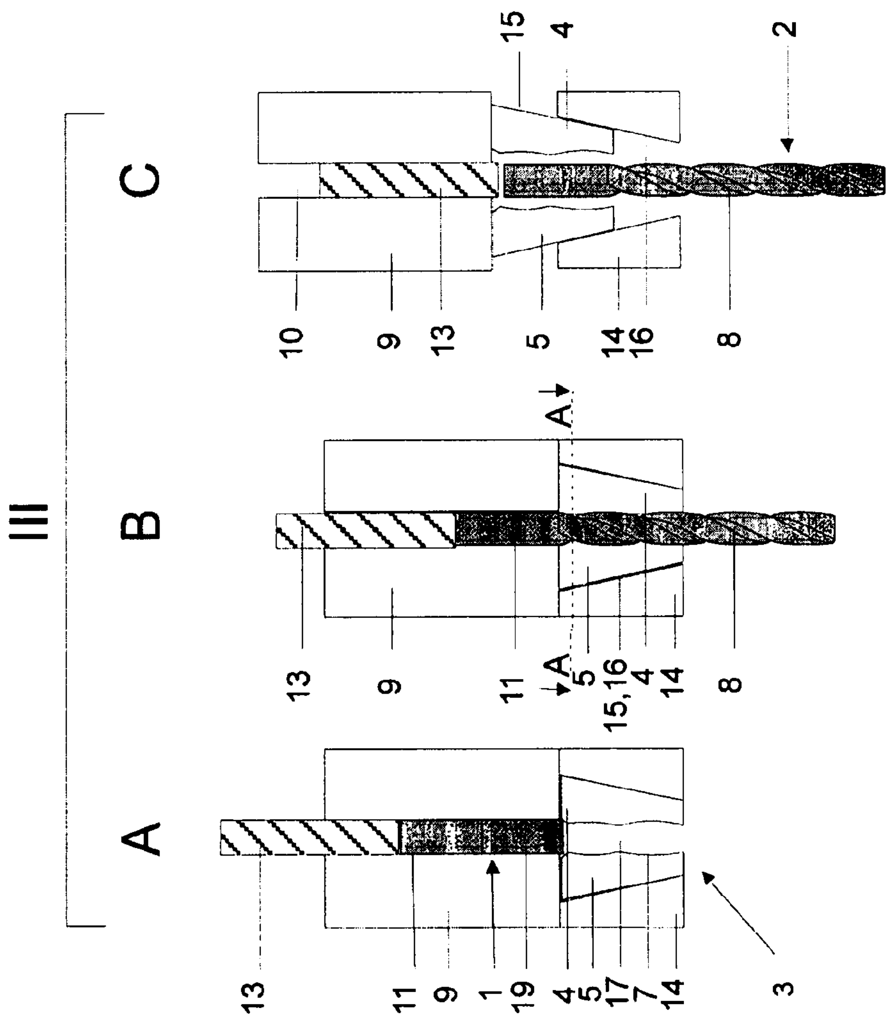
6

Fig. 2


III
A
B
C
13
11
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2

Fig. 1

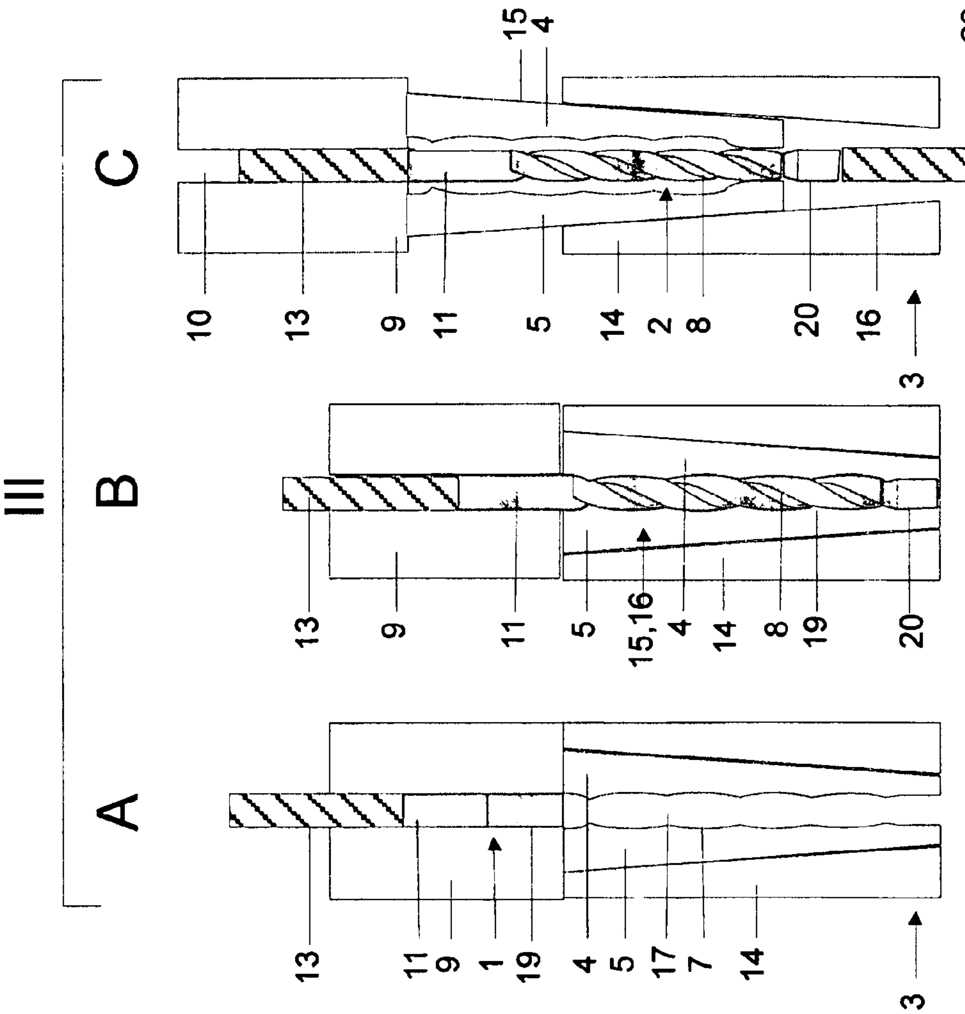

Fig. 4

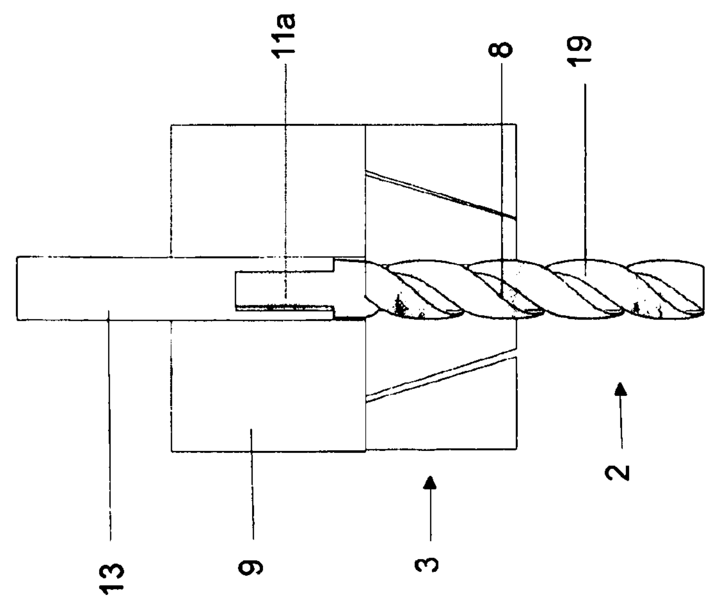

Fig. 3

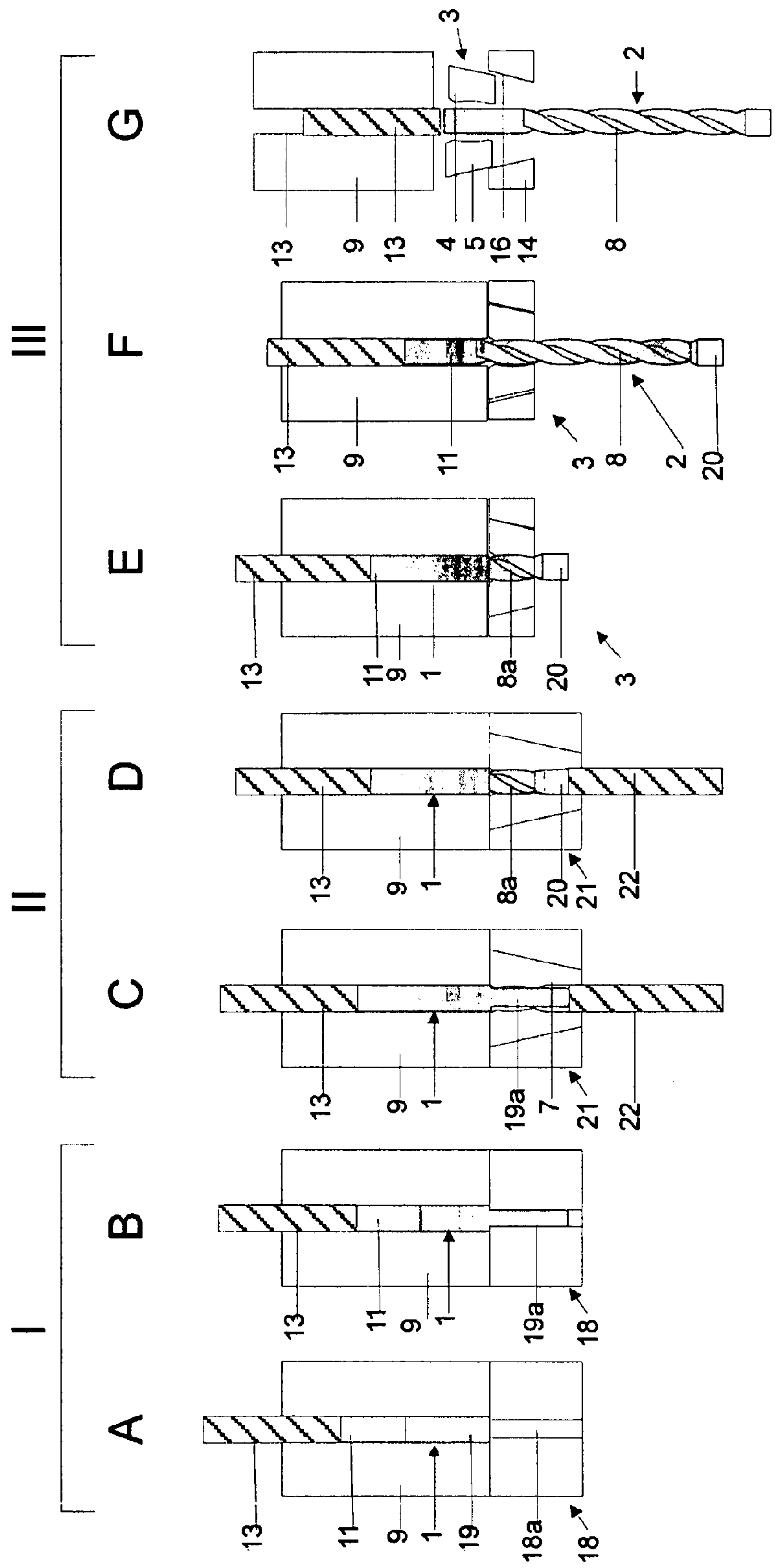

Fig. 5

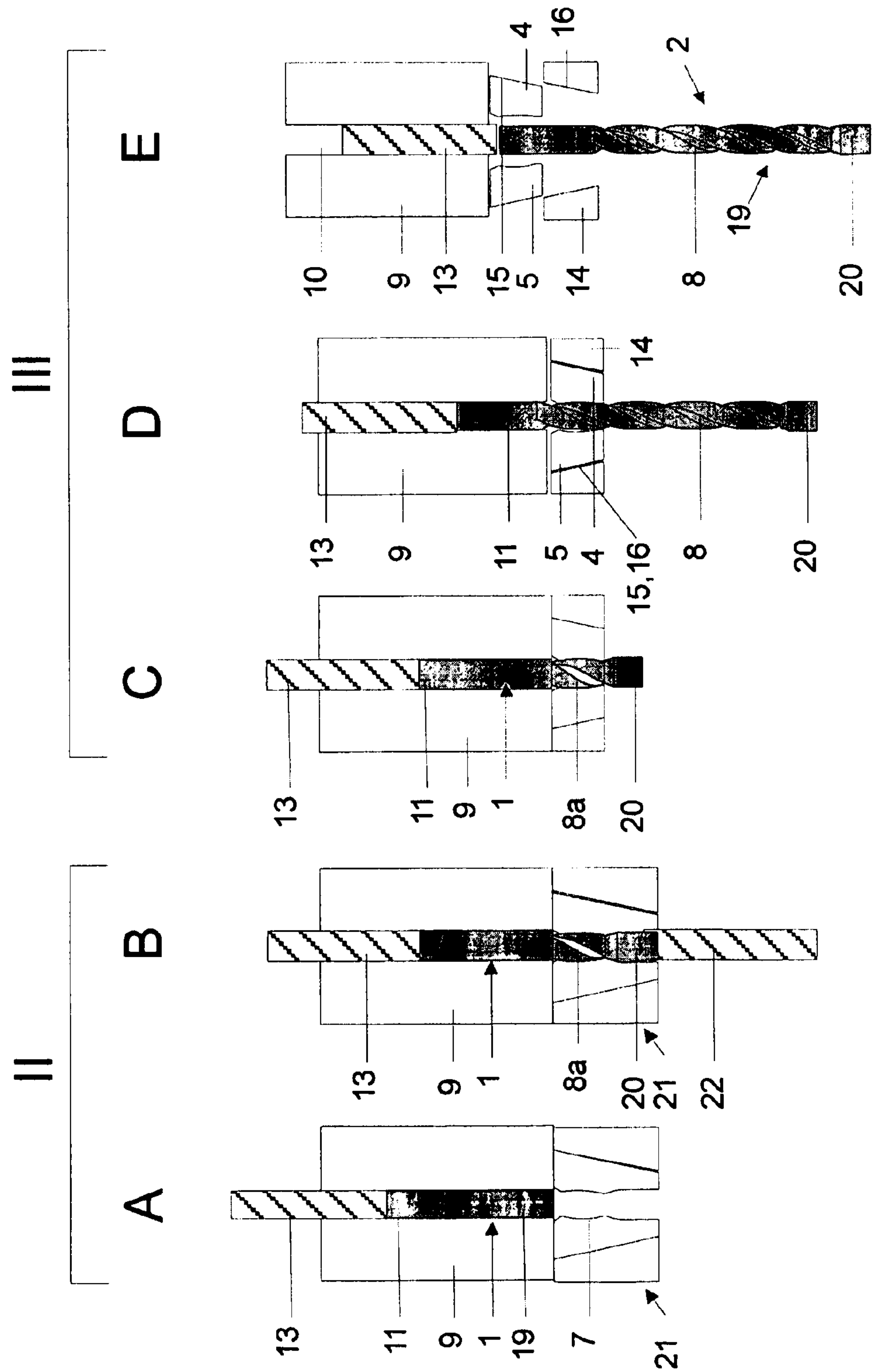

Fig. 6

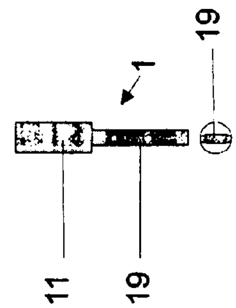

Fig. 8

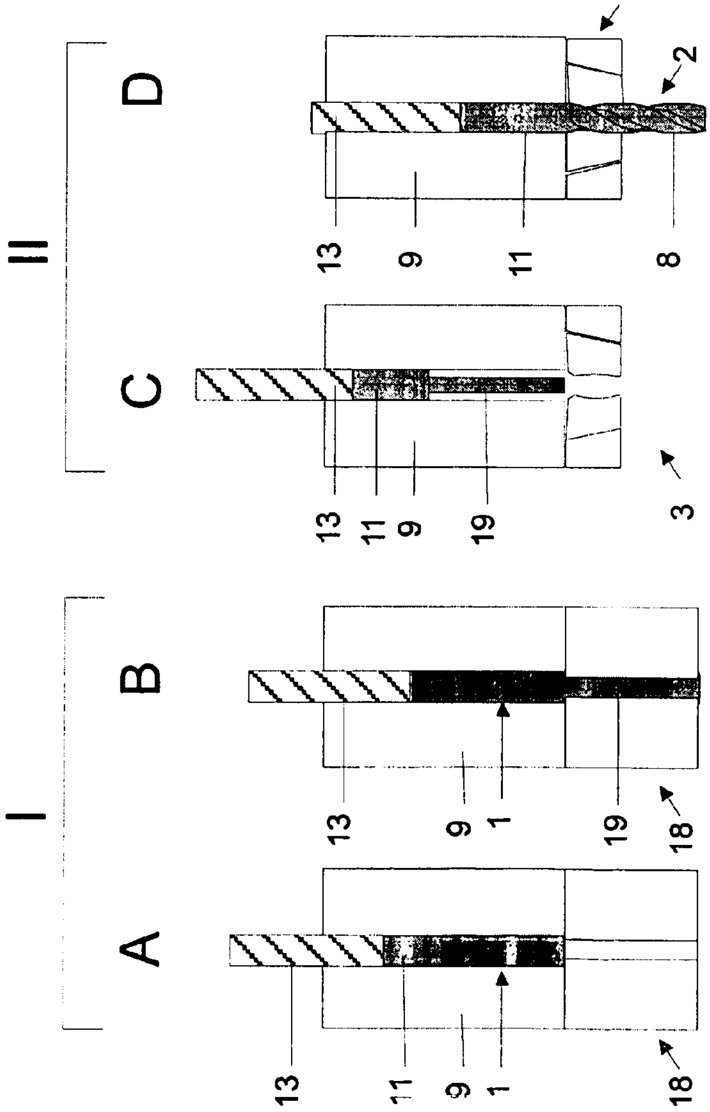

Fig. 7

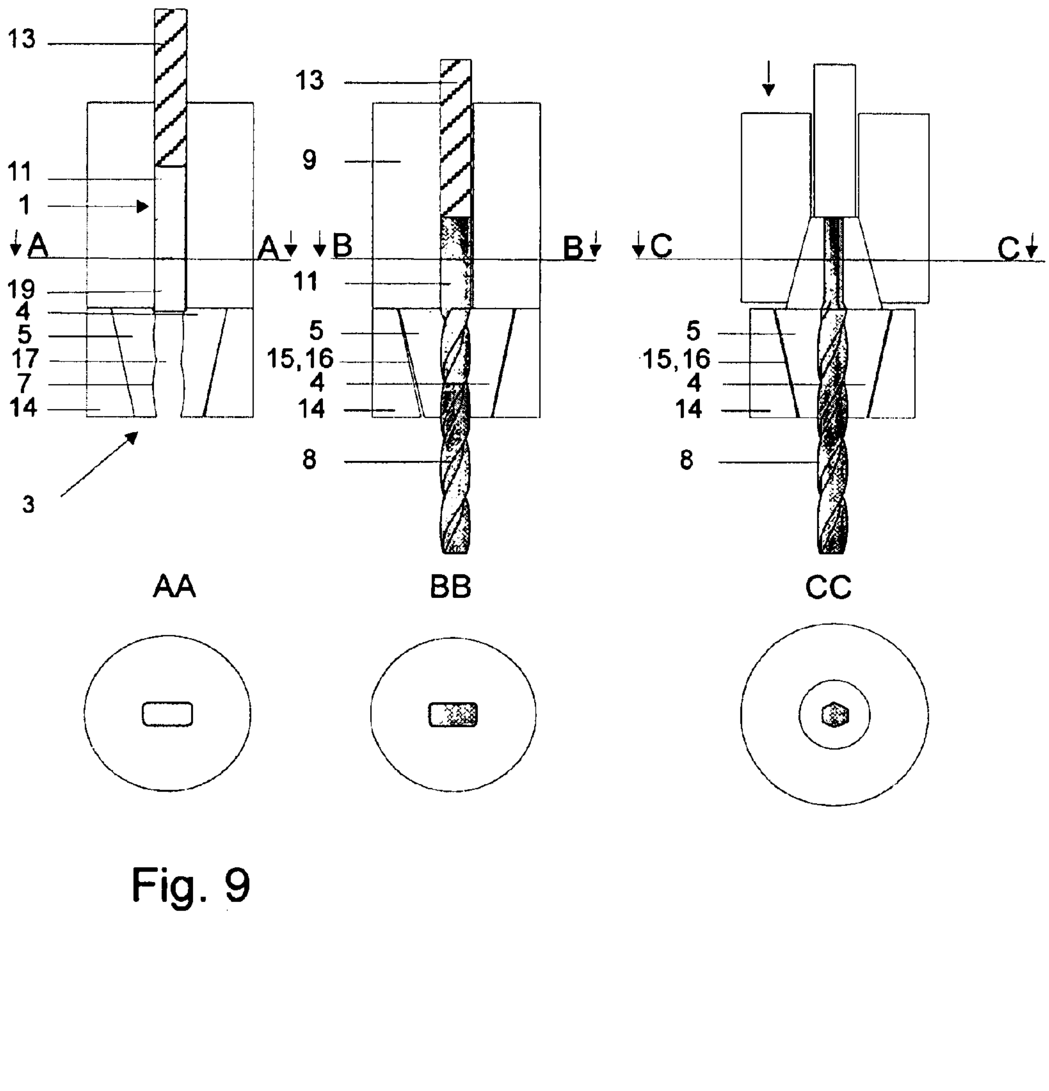
13
11
1
A
A
19
4
5
17
7
14
3
13
9
B
B
11
5
15,16
4
14
8
C
C
5
15,16
4
14
8
AA
BB
CC

Fig. 9

METHOD AND DEVICE FOR PRODUCING LONGITUDINAL COMPONENTS OF METAL WITH HELICAL GROOVES, IN PARTICULAR SPIRAL DRILL BITS OR SCREWS

[0001] The invention relates to a method for producing longitudinal components of metal with helical grooves, in particular spiral drill bits or screws, and to a device suited for performing the method.

[0002] Drill bits of common design comprise at their tip at least two cutting edges removing a chip or drill dust (stone, concrete) from the material to be processed. For discharging the chips or the drill dust, the drill bit comprises helical grooves via which the chips or the drill dust are transported in a direction opposite to the feed direction. At the end of the drill bit there is positioned a cylinder-shaped or multi-edged or specifically shaped shank for clamping into a chuck, for instance, of a drilling machine or of a drill hammer.

[0003] Drill bits such as, for instance, spiral or helical drill bits are produced in a per se known manner from solid matter, preferably steel, wherein the helical grooves are produced by metal-cutting processes or deformation processes such as rolling or cold or hot rolling, wherein the production technologies are different depending on the purpose of use of the drill bits. The cutting blades positioned at the tip or at the head of the drill bits may possibly be equipped additionally with hard metal discs.

[0004] From practice, the following processing methods for the production of drill bits are, for instance, known:

[0005] Stone drill bits with a hammer head are produced by pressing and subsequent rolling of the helical grooves, or by pressing and subsequent milling or grinding, respectively, of the grooves, or just by milling or grinding.

[0006] The helical grooves for stone drill bits with a cylindrical shank are rolled on a cylindrical blank or produced by milling and grinding.

[0007] For producing drill bits with a cylindrical shank of tool steel, the helical grooves are ground in a hardened cylindrical blank or formed by hot rolling in longitudinal direction and subsequent hardening and grinding.

[0008] Spirals may be produced by the twisting of longitudinally profiled blanks. The production of the drill bits pursuant to the afore-mentioned method is time-consuming and cost-intensive.

[0009] EP 0 865 847 B1 discloses a method for producing a drill bit. Starting out from a blank with a cross-sectional shape of a two, three or four-corner part, the blank is clamped at its shank and twisted at the drill head, possibly under tension, so that a spiral helix with a drilling dust removal groove is produced. The production may be performed by cold or hot forming. By the twisting process the length of the drill bit is shortened along with a simultaneous increase of the diameter and a cushion deformation. Screws in the meaning of the invention as filed are conveying screws or metering screws of metal, in particular steel, of smaller dimension and screws as force transmitting elements. Conveying or metering screws comprise, as a rule, a cylinder-shaped shank with helical grooves for the transportation of the material to be conveyed. The production methods for the aforementioned screws are approximately analogous to those of the production of drill bits.

[0010] DE 224576 discloses a method and a device for producing spiral drill bits, wherein a steel block heated to bright red heat or to white heat and thus moldable is used as a blank. In this method that has been known for more than a century the blank is, to be deformable at all, heated to a temperature of more than 900° C. Only from this temperature on is it possible to press the blank through a mold and to cause the shaping thereof. This method, however, has substantial disadvantages since a blank would above all have to be taken to an energy-intensive temperature level and would have to be kept there in a reliable manner during the entire deformation process. This is because in the case of an irregular cooling process a thermal shape distortion would occur which would necessitate a subsequent truing, if necessary by new heating, of the finished spiral drill bit. This known method further has the disadvantage that the finished spiral drill bits, due to the heating to more than 900° C., are subject to a scaling that would have to be removed after the production. Both the thermal and the mechanical post-processing, however, necessitate the further additional method step of quality checking.

[0011] It is an object of the invention to provide an alternative method for producing longitudinal components of metal with helical grooves, in particular spiral drill bits or screws. It is intended to be suited for mass production and to stand out due to an improved cost-effectiveness. Furthermore, a device suited to perform the method is intended to be provided.

[0012] In accordance with the invention, the object is solved by the features indicated in claim **1**.

[0013] Advantageous further developments of the method are the subject matter of claims **2** to **8**. The device intended for performing the method is the subject matter of claim **13**. Advantageous developments of the device are indicated in claims **14** to **27**.

[0014] In accordance with the method pursuant to the invention, at least one cold forming stage is provided in which the blank is inserted in a guide mold without previous heating and is subsequently cold formed in a split mold comprising at least two movable jaws the inner wall of which comprises at least one section with a contour designed as a negative for forming helical grooves.

[0015] The cold forming process is triggered by a heading tool which is movable in axial direction and which engages at the free end of the blank that is positioned in the guide mold.

[0016] Due to the existing pressure force the blank is pressed without previous heating at least partially through the central opening of the closed split mold. In so doing, helical grooves are produced on the shell of the blank during the contact with the mold contour due to plastical cold forming. After the termination of the cold pressing process, the split mold is opened and the blank that has been formed, for instance, to a drill bit or a screw is removed therefrom.

[0017] In addition, further, upstream cold forming stages may be provided in which the shank and/or the head of the blank are pre-formed. For instance, the head of the blank may be flattened or the diameter thereof may be reduced in order to apply a cutting plate to this section after the finishing of the drill bit. In practice, there are different possibilities of clamping, in particular for drill bits which require different shank shapes.

[0018] During the cold forming of the blank in one or a several forming stages the blank is guided at least partially, with its shank, in the guide mold assigned to the respective mold. Preferably, the forming force may be generated in the upstream forming stages by the axial movement of the heading tool.

[0019] In addition to the head and/or the shank of the blank, the intermediate section of the blank may also be cold formed in an upstream forming stage. It is, for instance, flattened (forming from a round cross-sectional shape to a slot-type or elliptic cross-sectional shape).

[0020] There is also the possibility of forming, in a cold forming stage, the head of the blank to a section with a strongly reduced pitch or without any pitch or helix, respectively, and to simultaneously produce helical grooves in the section between the shaft and the head.

[0021] In one of the upstream cold forming stages the bottom section of the blank may, for instance, be formed to a leveled or flattened section. On the adjacent section there is then only formed a helix or spiral, respectively, which is designed such that the mold can be closed without any problems in the subsequent cold forming stage.

[0022] To this end it is required to close the central exit opening of the split mold by means of a counter piece since the forming of this section is predominantly performed by means of compression. During the following pressing of the helical grooves only the section with the groove or spiral, respectively, is encompassed by the mold. The flattened section is positioned externally of the mold.

[0023] Preferably, at least the cold forming stage in which the helical grooves for the drilling dust removal are generated on the blank is performed in a multi-stage press. In so doing, a metal wire cut to length may be used as a starting material for the blank, said metal wire being formed to a blank in one or several impact extrusion or compression stages. In the multi-stage press, the closing force for the jaws of at least one of the forming molds or the force for the movement of the heading tool may be applied via the movable carriage of the press.

[0024] Also the afore-mentioned, upstream cold forming stages for the pre-forming of the blank may be performed in a multi-stage press. The pre-fabricated blank is then removed from the guide mold by means of a gripper and transported to the guide mold of the following processing station and inserted therein. In a multi-stage press, each of the three forming units I, II, III consists of a guide mold and the pertinent mold. By means of the production in a multi-stage press a high procedural economy is achieved since especially no heating of the blank to a particular temperature level is required.

[0025] The split molds are preferably designed such that at least one axially displaceable wedge or cone-shaped element engages at the shell of the jaws, via which the closing and opening movement of the jaws is performed.

[0026] With respect to the construction of the split molds, already known designs may also be resorted to. The movement of the jaws may also be performed radially via separate drive means.

[0027] For the production of longitudinal components with helical grooves in accordance with the invention it is basically possible to use any metals and metal alloys that are also suited for impact extrusion and cold forming. In particular applications it may, however, also be necessary to heat the blank prior to the pressing of the helical grooves wherein, however, no heat treatment with a structural change may take place.

[0028] Compared to the hitherto known methods for the production of drill bits or screws, the method for cold forming according to the invention stands out due to high cost effectiveness since almost all working processes, in particular the forming of the shank, the head, and the helix, may be performed in a multi-stage press and no complex temperature management is required. Another essential advantage of the present invention consists in that the drill bits or screws produced by means of the method according to the invention do not require any post-processing due to the cold forming. Rock drill bits may thus be produced without any further post-processing. Another advantage lies in the particular hardness of the cold formed drill bits and screws since no structural change takes place due to the cold forming and the cold hardening, and the longitudinal alignment of the crystalline lattice arrangement is maintained.

[0029] Another advantage of the present invention, in particular vis-à-vis known hot forming methods, consists in the tolerance and dimensional accuracy and the surface quality of the cold forming method.

[0030] A device suited for performing the method according to the invention comprises at least one cold forming unit consisting of a guide mold with a central opening for accommodating a blank, a split mold comprising at least two movable jaws that are adapted to be moved to an opening and a closing position, and an axially movable heading tool adapted to be inserted in the central opening of the guide mold.

[0031] In their closing position the jaws of the split mold are fixed by a locking pressure variable in its intensity. At the inner wall of the jaws, at least one section with a contour designed as a negative is positioned for forming helical grooves.

[0032] The section with a contour designed as a negative for forming helical grooves which is positioned at the inner wall of the jaws may be of short length only, e.g. correspond to half a pitch or to the length of the section to be cold formed.

[0033] Since, for particular applications, drill bits are equipped with a cutting tip, for instance, the bottom end of the split mold comprises a section with a strongly reduced pitch or without any pitch, for forming a flattened head on which a cutting tip can be fastened.

[0034] The method according to the invention may comprise further cold forming units destined to pre-form the blank.

[0035] Preferably, one of the upstream cold forming units comprises a multi-part split mold with an inner contour for forming a flat section at the head of the blank. The exit opening of the split mold is adapted to be closed by means of a counter tool to this end.

[0036] Another of the upstream cold forming units comprises a multi-part mold comprising an inner contour for modifying the cross-sectional shape of the section of the blank which is to be cold formed. It may, for instance, be flattened prior to the actual forming of the helical grooves.

[0037] The guide mold may be designed as one piece or be split in longitudinal direction, wherein the two parts are adapted to be moved in an opening and a closing position.

[0038] In accordance with a preferred embodiment of the present invention, at least the cold forming unit consisting of guide mold, split mold, and heading tool and intended for forming the helical grooves is arranged in a multi-stage press with a stationary mold holder unit and a carrier that is adapted to be displaced in the direction of the mold holder unit.

[0039] At least one additional impact extrusion or compression mold should also be integrated in the multi-stage press.

[0040] The split mold consists preferably of a one or multi-part external ring in which the jaws are mounted to be displaced radially. The shells of the jaws and the inner face of the ring are designed conically such that, on axial displacement of the ring or of the jaws, they are movable in the opening and closing position.

[0041] The split molds may also be equipped with a separate drive unit for the radial movement of the jaws in the closing and opening position.

[0042] The split mold may either be mounted on the mold holder unit or on the carrier of the multi-stage press. The carrier or the mold holder unit is equipped with an actuator via which the radial displacement of the jaws is performed.

[0043] Moreover, a shearing device and further extrusion or compression molds may be disposed in the multi-stage press.

[0044] Some preferred embodiments of the present invention will be explained in detail in the following. There show:

[0045] FIG. **1** the individual method steps A, B, and C for the production of a spiral drill bit according to the invention in a chronological order, in simplified illustration,

[0046] FIG. **2** an enlarged sectional representation in accordance with line A-A of the embodiment shown as method step B,

[0047] FIG. **3** a second embodiment for the production of a spiral drill bit according to the invention as longitudinal section,

[0048] FIG. **4** the individual method steps A, B, and C of a third embodiment for the production of a spiral drill bit, in a simplified illustration, as longitudinal section,

[0049] FIG. **5** the individual method steps A to G of a fourth embodiment for the production of a spiral drill bit, in a simplified illustration, as longitudinal section,

[0050] FIG. **6** the individual method steps A to F of a fifth embodiment for the production of a spiral drill bit, in simplified illustration, as longitudinal section,

[0051] FIG. **7** the individual method steps A to G of a third embodiment for the production of a spiral drill bit, in simplified illustration, as longitudinal section,

[0052] FIG. **8** the pre-formed blank in accordance with method step B in FIG. **7**, and

[0053] FIG. **9** alternative embodiments for the production of a spiral drill bit according to the invention.

[0054] FIG. **1** illustrates in a simplified manner the three method steps A, B, and C for the production of a spiral drill bit **2** according to the invention, with a three-part split mold **3**, starting out from a blank **1**. The three method steps A, B, and C are constituents of the cold forming stage III for producing the helical grooves **8** of the drill bit **2**. The blank **1** consists of a section constituting the shank **11** and of the section **19** that is to be formed as helical grooves. The blank **1** may, for instance, be designed as a cylindrical bar.

[0055] For the production of the drill bit, either an individual mold may be used, or the production is performed in a multi-stage press in which the blank **1**, starting out from a wire section that has been cut to length, is also pre-formed.

[0056] The multi-stage press that is not illustrated in detail comprises, in a per se known construction, a chassis with a displaceable carrier which are each equipped with mold holder units. Moreover, a shearing device and at least one impact extrusion or compression mold and a split mold **3** are arranged.

[0057] For pressing, the mold halves or jaws, respectively, are, by the movement of the carrier, moved in an opening or a closing position, and simultaneously the relative movement between the mold **3** and the heading tool **13** is triggered.

[0058] The wire that is fed as a starting material is cut to a predetermined length by means of a shearing knife that is not illustrated in detail, and the wire section that has been cut to length is positioned by means of a gripper or a transport device that is not illustrated in detail in front of the central opening **10** of the guide mold **9** and inserted therein by means of the heading tool **13**. The central opening **10** may be seen only in the illustration of method step C. As the case may be, it may be necessary that the wire section is calibrated or pre-formed before being inserted in the guide mold **9**.

[0059] The split mold **3** is positioned directly after the guide mold **9**. The split mold **3** consists of three jaws **4**, **5**, and **6** which are movable in radial and axial directions (FIG. **2**). At the inner wall of the jaws **4**, **5**, and **6** a section with a contour **7** which is designed as a negative is arranged for the forming of helical grooves **8**. The contour-forming section **7** extends in radial direction only over part of the length of the drill helix to be formed. In particular applications it may also be expedient that the contour-forming section **7** is designed to be longer.

[0060] The length of the contour-forming section **7** results as a function of the pitch of the helix wherein, depending on the profile, only part of a 360° helix is necessary. Since the illustrated example is intended for the production of a simple spiral drill bit **2** with a constant outer diameter, a one-piece design of the mold **9** is completely sufficient. The diameter of the central bore or opening **10** of the mold **9** is only slightly larger than the outer diameter of the blank **1** (tolerance in the range of hundredths). The guide mold **9** is necessary to prevent a possible bending of the blank **1** during the pressing or forming process.

[0061] As is illustrated in FIG. **1**, method step A, the split mold **3** is closed prior to the beginning of the cold forming process, the jaws **4**, **5**, and **6** are in contact with each other at their joint faces **12**.

[0062] The prefabricated, preferably cylinder-shaped, blank **1** is pushed by means of the heading tool **13** into the central opening **10** of the mold **9** until it gets into contact with the projecting mold inner contour **7**. The heading tool **13** is subsequently impacted with the required pressure force in axial direction, said pressure force being sufficiently large to push or press, respectively, the blank **1** along the mold inner contour **7** through the central opening or the cavity **17** of the split mold **3**, wherein the blank **1** is plastically cold formed with helical grooves **8** being produced on the shell thereof (method step B). Simultaneously, a sufficiently high locking pressure is exerted on the jaws **4**, **5**, and **6** so as to prevent the jaws **4**, **5**, **6** of the split mold **3** from opening or being pushed apart due to the high mold pressure existing. During the pressing process the blank is stretched or expanded, respectively, in longitudinal direction due to the plastical cold forming thereof.

[0063] During the forming of the helical grooves **8**, the section **19** on which the grooves **8** are formed is slowly rotated independently about its longitudinal axis.

[0064] The helical grooves **8** are formed only along a predetermined section **19** of the blank. Once this has been reached, as is to be seen in method step B, the pressure force of the heading tool **13** and the locking force of the jaws **4**, **5**, **6** are driven towards zero, and they are opened as is illustrated in method step C.

[0065] For ejecting the finished spiral drill bit **2**, the heading tool **13** is moved further in pressing direction. Depending on the mold concept, the drill bit **2** may also be removed from the mold in some other manner, e.g. by means of a separate ejector that is moved in opposite direction.

[0066] Both the required pressure force and the locking force may be generated by the aggregates or spring assemblies available in the multi-stage press. The split mold **3** consists in the illustrated embodiment of an outer ring **14** which is adapted to be displaced in axial direction and in which the three jaws **4**, **5**, **6** are mounted to be moved radially. The ring **14** is guided on a conical shell **15** of the jaws **4**, **5**, **6** which tapers in the direction of the opening movement, as is to be seen in method step C. The ring **14** comprises a conical inner face **16** corresponding thereto.

[0067] For opening the split mold **3**, the ring **14** is moved in pressing direction. In the case of an arrangement in a multi-stage press, the movement of the ring **14** is triggered via an engagement element that is not illustrated in detail by the feed movement of the carriage of the multi-stage press, for opening and closing the jaws **4**, **5**, and **6**. The opening and closing movement of the jaws **4**, **5**, and **6** may also be performed in some other kind and manner.

[0068] FIGS. **3** to **7** show various embodiment variants of drill bits which can be produced pursuant to the method according to the invention.

[0069] FIG. **3** shows a spiral drill bit **2** that differs from the drill bit illustrated in FIGS. **1** and **2** merely in that the upper section **11***a* of the shank has a smaller diameter than the outer diameter of the helical section **19**.

[0070] The shank **11***a* having a smaller diameter was already produced at the blank **1** in an up-stream pressing stage. The forming of the helical section **19** is performed in analogy pursuant to the method steps A to C in FIG. **1**.

[0071] FIGS. **4** to **6** show spiral drill bits **2** with a flattened section **20** at the head end which is designed free of grooves. At this section **20**, cutting tips are subsequently fastened as hard metal inserts. As will be explained in the following, the production of these drill bits may take place in different manners.

[0072] FIG. **4** shows the method steps A "charging of the mold", B "cold forming of the blank", and C "ejecting/removing of the produced drill bit" for the production of a spiral drill bit **2** the tip or head **20** of which is flattened. The shank **11** and the helical section **19** have similar outer diameters. In contrast to the previous Figures, the jaws **4**, **5**, **6** of the split mold **3** and their inner contour **7** are designed in a different manner. The jaws have the same length as the helical section **19** including the tip **20**. The inner contour of the bottom section of the jaws is designed such that a flattened tip **20** is formed. Above this section the jaws **4**, **5**, **6** are designed with a helical inner contour **7** over the entire lengths thereof.

[0073] After the closing of the split mold **3**, the blank **1** is pressed into the cavity of the split mold **3** by means of the header tool **13** (method step B), wherein the flattened tip **20** and the helical section **19** are formed by plastical deformation (method step B). Subsequently, the split mold **3** is opened and the drill bit **2** is ejected by means of a separate ejector **23** in a direction opposite to the pressing direction (method step C). The method steps A to C are constituents of the cold forming stage III.

[0074] In accordance with the method steps A to G illustrated in FIG. **5**, the preferably cylindrical blank **1** is initially cold formed in a separate two-piece mold **18** (first mold) such that the bottom part **19***a* of the section **19** that has to be cold formed has a smaller diameter than the other part of this section **19**. The blank **1** inserted into the guide mold **9** (method step A) is, by means of the header tool **13**, pressed into the cylindrical cavity **18***a* of the mold **18** which has a smaller diameter (method step B). The method steps A and B constitute an upstream cold forming stage I.

[0075] The outer diameter of the cold formed section **19***a* is dimensioned such that the jaws **4**, **5**, **6** of the subsequently added split mold **21** (second mold) may be closed without any problems without getting into contact with the shell of the section **19***a*. After the termination of the cold forming stage I the following cold forming stage II (method steps C and D) is performed on the next station of the multi-stage press. Here, a split mold **21** is used, the mold inner contour **7** of which is designed such that a helical groove or spiral section **8***a* and a flattened (non-helical) section **20** are produced (method step D). The central opening of the split mold **21** is closed by a counter tool **22** from the bottom. Pursuant to the next method step D, the heading tool **13** presses on the blank **1** with the necessary pressure force. By so doing, the bottom part **19***a* of the blank **1** is deformed such that a short helical groove or spiral section **8***a* and a flattened section **20** are formed. During the deformation the blank is compressed until the mold cavity has been completely filled. The counter tool **22** prevents a pushing through of the blank **1**.

[0076] After the opening of the second split mold **21**, the pre-formed blank is taken out of the guide mold **9** by means of a gripper, transported to the next station, the cold forming stage III, and inserted in the guide mold **9** belonging to this station.

[0077] In this cold forming stage III the helical grooves **8** are formed (method steps E to G).

[0078] The structure of the third split mold **3** used in the cold forming stage III corresponds to that of the split mold **3** illustrated in FIG. **1**. The jaws of the third split mold **3** are of such length or height, respectively, that they encompass in the closed condition only the helical groove section **8***a* (method step E). The head **20** of the blank **1** projects from the mold **3**. The jaws have a helical inner contour **7** in analogy to the split mold **3** illustrated in FIG. **1**.

[0079] Pursuant to method step F, the blank **1** is now pressed through the mold opening by means of the heading tool **13**, and in this process helical grooves **8** are produced on the remaining part of the section **19**. After the termination of the pressing process the split mold **3** is opened and the spiral drill bit **2** is ejected by further movement of the heading tool **13** in pressing direction (method step G).

[0080] The individual cold forming stages I, II, and III are each performed in a separate cold forming unit consisting of a guide mold **9** and the respective mold **18**, **21**, **3**.

[0081] Pursuant to a further method (FIG. **6**) a cylindrical metal rod is used as a blank **1**. It is pressed into a split mold **21** by means of the heading tool **13**, said split mold **21** being designed in analogy to the split mold **21** of FIG. **5** with a counter tool **22**. The method steps A and B constitute the cold forming stage II, and the method steps C to E constitute the cold forming stage III. The method steps B to E correspond to the method steps D to G illustrated in FIG. **5**. The head of the produced spiral drill bit **2** also has a flattened section **20**.

[0082] The split molds **21** and **3** are designed in analogy to that of FIG. **5**.

[0083] Pursuant to the method illustrated in FIG. **7**, the cylindrical blank **1** is, in an upstream pressing stage (cold forming stage I) by means of a mold **18**, deformed such that the section **19** that is to be equipped with drilling dust grooves is flattened, i.e. has a slot-type cross-sectional shape, as is illustrated in FIG. **8**. Pursuant to method step B, the preferably cylindrical blank is given the desired shape, as is illustrated in FIG. **8**, by means of the heading tool **13** by impact extrusion. After the opening of the mold **18**, the pre-formed blank **1** is taken out of the guide mold **9** of the cold forming stage I and fed to the guide mold **9** of the following station (cold forming stage III). In this station, the pre-formed blank **1** is, pursuant to the method step D, pressed by means of the heading tool **13** through a split mold **3** that is designed in analogy to the split mold illustrated in FIG. **1**. Due to the—already performed—cross-section reduction of the section **19** that has to be cold formed, smaller forming forces are required to form the drilling dust grooves. The produced spiral drill bit **2** has a constant outer diameter, from the shank to the head. The removal of the drill bit **2** from the mold is then performed in analogy to the above explanations.

[0084] According to a further embodiment of the present invention, the cross-sectional shape in the section **19** is, as shown in FIG. **9**, pre-profiled. Such a pre-profile has a polygon cross-section, it may in particular be, for instance, a triangle, a square (see sections AA and BB), a hexagon (see section CC) or an octagon (not illustrated). Likewise, polygon cross-sections of a star shape may be advantageous. This pre-profile in the section **19** yields among others the advantage that during the production of the spiral the forces to be applied may be less than with circular cross-sections of a cylindrical blank. The pre-profile reduces the forces in the heading tool **13** by a volume pre-distribution of the material and thus also the circumferential forces acting on the jaws and molds. When choosing the profiling it may be of advantage to match the number of the polygons to the number of the cutting edges and grooves. Thus, it is useful in accordance with the invention to choose a triangular cross-section as a blank in the case of a spiral drill bit with three cutting edges.

[0085] After the spiral has been produced in method steps AA and BB, the section that has not been formed to a spiral is, in method step CC, formed by means of cold forming, for instance, to a section that is suited to accommodate a drill bit in a drill chuck.

[0086] In a further method variant of the present invention, the entire blank is deformed in a cold forming pre-stage and, for instance, cold formed to a hexagonal cross-section. The hexagonal pre-deformation of the entire blank has in particular the advantage that, due to the volume pre-distribution of the hexagonal section which has already been performed, the circumferential forces in the section that is deformed to a spiral may be smaller than with cylindrical cross-sections. The section that is not cold formed to a spiral may be used as a clamping section for the later drill bit accommodation in the drill chuck.

[0087] This cold forming, as illustrated in FIG. **9**, CC, may be performed by means of jaws. It is also possible that the bar or wire-shaped starting material already has a polygon cross-section and that the blanks are not subject to any further cold forming.

REFERENCE SIGNS

[0088] **1** blank
[0089] **2** spiral drill bit
[0090] **3** split mold
[0091] **4** jaw
[0092] **5** jaw
[0093] **6** jaw
[0094] **7** mold inner contour
[0095] **8** helical groove
[0096] **8***a* groove section
[0097] **9** guide mold
[0098] **10** central opening of **9**
[0099] **11** shank or intake
[0100] **11***a* upper end of
[0101] **12** joint face
[0102] **13** heading tool
[0103] **14** ring
[0104] **15** shell
[0105] **16** inner face
[0106] **17** central opening or cavity of **3**
[0107] **18** two-piece mold (first)
[0108] **18***a* cavity
[0109] **19** section of **1** which is to be cold formed
[0110] **19***a* lower part
[0111] **20** flattened section at the head
[0112] **21** split mold (second)
[0113] **22** counter tool
[0114] **23** ejector

1-27. (canceled)

28. A method for producing longitudinal components of metal with helical grooves, in particular spiral drill bits or screws, wherein, starting out from a prefabricated blank, helical grooves are produced in said blank by a deformation process, wherein at least one cold forming stage is provided in which said blank is inserted in a guide mold and is subsequently formed by a multi-stage press with a split mold with at least two movable jaws an inner wall of which comprises at least one section with a contour designed as a negative for forming helical grooves, wherein a metal wire cut to length which is formed to a blank in one or several impact extrusion or compression stages is used as a starting material for said blank, which, by a heading tool which is movable in axial direction and which engages at a free end of said blank that is positioned in said guide mold, is at least partially pressed through a central opening of said closed split mold, and that in this process, during contact with the mold contour, helical grooves are produced by plastical cold forming, and that after termination of the pressing process the split mold is opened and the cold formed blank is removed therefrom, wherein a closing force for said jaws of at least one of said cold forming molds or a force for movement of said heading tool is applied via a displaceable carriage of the multi-stage press.

29. The method according to claim **28**, wherein a shank and/or a head of said blank are preformed in further, upstream cold forming stages.

30. The method according to claim **29**, wherein, during deformation of said blank in upstream cold forming stages, said blank is at least partially guided in another guide mold and a necessary forming force is generated by an axial movement of said heading tool.

31. The method according to claim **28**, wherein said section of said blank on which said helical grooves are formed is deformed in an upstream cold forming stage.

32. The method according to claim **28**, wherein said section of said blank on which said helical grooves are formed is deformed from a round cross-sectional shape to a slot type or elliptic cross-sectional shape.

33. The method according to claim **28**, wherein said helical grooves are formed and the cross-section of said head of said blank is reduced in a cold forming stage in one method step.

34. The method according to claim **29**, wherein, in one of said upstream cold forming stages, a cross-section of a bottom part of said blank is deformed, in particular to a section without a helical groove or spiral, and that a short piece of a spiral or helix is formed on an adjacent section, wherein during cold forming the central exit opening of said split mold is closed by a counter piece.

35. The method according to claim **28**, wherein the blank comprises a section that is not subject to any further cold forming or, after completion of groove, comprises a section that is subject to such cold forming, and that is designed such that it is suited as a clamping section for a drill chuck.

36. A device for producing longitudinal components of metal with helical grooves, in particular spiral drill bits or screws, comprising:

at least one cold forming unit including a guide mold with a central opening for accommodating a blank, a split mold with at least two movable jaws that are adapted to be moved in an opening and a closing position, at least one impact extrusion or compression tool and an axially movable heading tool that is adapted to be inserted in a central opening of said guide mold,

wherein, in the closing position, said jaws are fixed by a locking force that is variable in intensity, and wherein at least one section with a contour designed as a negative for the forming of helical grooves is disposed at the inner wall of said jaws, and the cold forming unit is arranged in a multi-stage press with a stationary tool holder unit and a carrier adapted to be displaced in the direction of the tool holder unit.

37. The device according to claim **36**, wherein a lower end of said split mold comprises a section of reduced pitch for forming said head.

38. The device according to claim **36**, wherein one of said upstream cold forming units comprises a multi-piece mold having an inner contour for modifying a cross-sectional shape of said section of said blank which is to be cold formed.

39. The device according to claim **36**, wherein said split mold is in communication with an external drive unit for radial movement of said jaws in the closing and opening position.

40. The device according to claim **36**, wherein said split mold is mounted either on said tool holder unit or said carrier of a multi-stage press, and that an actuator is disposed on said carrier or on said tool holding unit via which said jaws are radially displaceable.

41. The device according to claim **36**, wherein said blank comprises a section that is subject to a further cold forming, and that said section is designed such that it is suited as a clamping section for a drill chuck.

42. The device according to claim **36**, wherein the section of said blank has a polygonal, in particular hexagonal cross-section.

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