(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 November 2002 (14.11.2002)

PCT

(10) International Publication Number
WO 02/090027 A2

(51) International Patent Classification[7]: B23B 51/02

(21) International Application Number: PCT/US02/14525

(22) International Filing Date: 7 May 2002 (07.05.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/850,891 8 May 2001 (08.05.2001) US

(71) Applicant *(for all designated States except US)*: **ALLIED MACHINE & ENGINEERING CORP.** [US/US]; P.O. Box 36, Dover, OH 44622 (US).

(72) **Inventors; and**
(75) **Inventors/Applicants** *(for US only)*: **MAST, Wendell, E.** [US/US]; 10577 Walnut Creek Bottom Road NW, Dundee, OH 44624 (US). **STOKEY, Timothy, G.** [US/US]; 115 Poolside Lane, Dover, OH 44622 (US). **NUZZI, Joseph, P.** [US/US]; 3244 Blacksnake Hill Road, Dover, OH 44622 (US).

(74) **Agents: CLARK, Robert, J.** et al.; Hahn Loeser & Parks, LLP, Twin Oaks Estate, 1225 West Market Street, Akron, OH 44313-7188 (US).

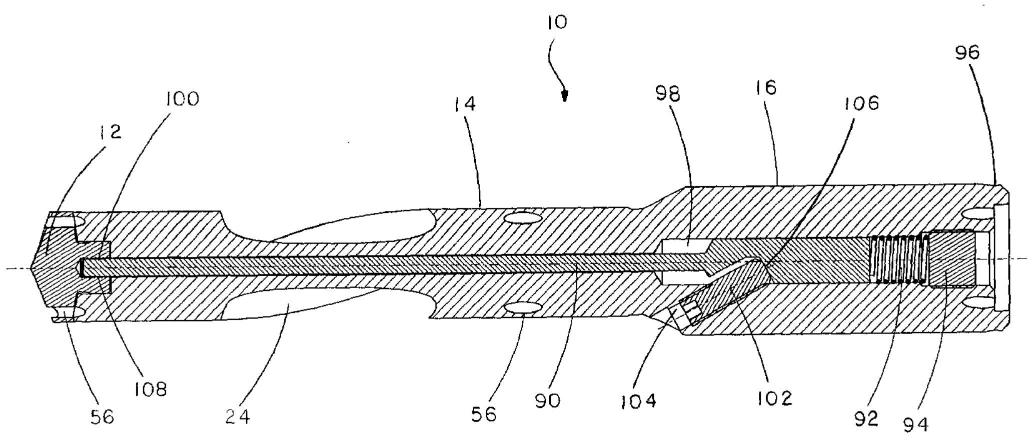
(81) **Designated States** *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) **Designated States** *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** CUTTING TOOL ASSEMBLY WITH REPLACEABLE CUTTING HEAD



(57) **Abstract:** A cutting head (12) has a cutting portion forming a leading end, a pilot portion (32) forming a trailing end, and a cutting head mounting portion (36) adjacent the trailing end of the cutting head (12). A tool body (14) has a cutting head receiving portion (60) and a pilot recess (84) to matingly receive the pilot portion (32) of the cutting head (12) of the cutting head (12). A fastener (90) may be disposed in the tool body (14) along its longitudinal axis where it matingly engages the pilot portion (32) of the cutting head (12).

WO 02/090027 A2

CUTTING TOOL ASSEMBLY WITH REPLACEABLE CUTTING HEAD

TECHNICAL FIELD

[0001] The present invention relates to a cutting tool assembly for rotary cutting and/or machining, comprising a tool body and a replaceable cutting head. More particularly, the present invention relates to a cutting tool having a replaceable cutting head retained on a tool body by a retaining system, wherein the cutting head comprises a unique mating surface configuration enabling an increased retention force on the cutting head while providing optimized torque transferability.

BACKGROUND OF THE INVENTION

[0002] It is previously known to provide rotary cutting tools, such as drills, with replaceable cutting heads or drill tips. These tips have been retained on a tool body by many methods including radial set screws secured through lands provided on the tool body, press fit connections using dove-tail profiles, axial screws and drawbars, etc. While each method has different advantages and disadvantages, none of these tools can be easily and quickly replaced while maintaining optimized torque transferability, high feed rates, and a secure mounting to the tool body. Some prior tools of this type have worked well but have not been generally usable in aggressive machining operations, which produce high stress on the connection of the cutting head to the tool body.

[0003] Several examples of prior art configurations use a dovetail profile to connect the cutting head to the tool body. The cutting head is inserted into a recess generally having at least one radial base surface. The cutting head is then rotated such that a dovetail profile on the cutting head engages a dovetail recess of the tool body. This engagement is typically an interference fit type arrangement such that the cutting head is prevented from rotating in a disengaging direction. In order for the interference fit to provide sufficient retaining force, high stresses result at the tool body interface with the cutting head and in some cases, a special tool is needed to connect and disconnect the cutting head. Another problem with such a connection is that the feed force during operation of the tool pushes the cutting head downward into the tool body, which can lessen the retaining force of the dovetail connection and permit the cutting head to loosen.

[0004] Other examples of connecting the cutting head use an axial engagement bar to secure the cutting head to the tool body. Although attempting to clamp the head to the body, the high stress at the interface again may result in loosening of the connection and/or make the tool susceptible to eccentric and other loads.

[0005] It is also found in various tools with replaceable cutting heads, that it may be impossible to change the cutting head while the tool is mounted in an associated tool holder or machine. Thus, it is required that the entire tool be removed from the tool holder or machine, the cutting head then being replaced, and the tool being reintroduced into the machine for continued operation. Such a process adds labor and time, and detracts from the advantages of having the replaceable insert, and from the machining speeds achievable.

[0006] Accordingly, there remains a need in the art for a new drill assembly utilizing a replaceable cutting head which combines the advantages of a replaceable cutting head with the ability to be used in aggressive machining operations in which high stress conditions will exist. There also remains a need to provide drill assembly utilizing a replaceable cutting head which allows the cutting head to be replaced while the tool is mounted in the tool holder or machine to simplify and speed up this process.

SUMMARY OF THE INVENTION

[0007] It is therefore an object of the present invention to provide a new cutting tool assembly comprising a replaceable cutting head and a tool body having a common longitudinal axis and mating peripheral surfaces. The cutting head has a cutting portion forming a leading end, a pilot portion forming a trailing end, and a cutting head mounting portion adjacent the trailing end of the cutting head. The tool body has a cutting head receiving portion formed at a leading end of the tool body and a pilot recess disposed in the leading end of the tool body to matingly receive the pilot portion of the cutting head. The cutting head mounting portion and the cutting head receiving portion of the tool body each have at least two coupling portions. The cutting head coupling portions and the tool body coupling portions are bound by their peripheral surfaces and generally mate in shape and dimensions. Each coupling portion has a pair of base surfaces, including upper and lower surfaces. The base surfaces extend transversely to the longitudinal axis and provide support of the cutting head in the tool body. A torque transmission wall extends between the upper and lower base surfaces from the pilot portion surface in a generally transverse direction relative to the longitudinal axis and oriented transversely to the base surfaces. A fastener may be disposed in the tool body along its longitudinal axis where it matingly engages the pilot portion of the cutting head and exerts an axial force on the cutting head for pressing the cutting head mounting portion against the cutting head receiving portion of the tool body.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Fig. 1 is an exploded perspective view of the cutting tool assembly of the present invention along its longitudinal axis A;

Fig. 2 is a perspective view of the cutting head and leading end of the tool body in accordance with the present invention of Fig. 1;

Fig. 3 is a perspective view of the cutting head which is inclined along longitudinal axis A revealing the pilot portion at the trailing end of cutting head and the cutting head mounting portion in accordance with the present invention of Fig. 1;

FIG. 4 is an end view of the trailing end of the cutting head in accordance with the present invention of Fig. 1;

Fig. 5 is a perspective view of the leading end of the tool body which is inclined along longitudinal axis A revealing the tool body coupling portions on opposite sides of the recess in accordance with the present invention of Fig. 1;

Fig. 6 is an end view of the leading end of the tool body in accordance with the present invention of Fig. 1;

Fig. 7 is a perspective view of the cutting head mounted on the leading end of the tool body in accordance with the present invention of Fig. 1;

Fig. 8 is a cross-sectional view of the cutting tool assembly in an assembled state taken along longitudinal axis A;

Fig. 9 is an exploded perspective view of an alternate embodiment of the present invention which includes a cutting head assembly comprising a cutting head shown inclined along longitudinal axis A and a threaded insert which is matingly attached within the threaded recess of the cylindrical pilot portion; and

Fig. 10 is a cross-sectional view of the cutting head assembly of Fig. 9 in an assembled state showing the threaded insert matingly attached within the recess in the cylindrical pilot portion.

DETAILED DESCRIPTION

[0009] Referring now to the drawings, wherein similar reference characters designate corresponding parts throughout the several views, there is generally indicated at **10** a cutting tool assembly according to the present invention, for use in drilling operations. Referring now to Fig. 1, cutting tool assembly **10** having a longitudinal axis A, comprises a replaceable cutting head **12**, a tool body **14** formed on a tool shank **16**, and a fastening assembly **18** to facilitate retention of the cutting head **12** on tool body **14**. The cutting head **12** and the tool body **14** are formed with chip flute sections **20**, and **22**, respectively, that, when the cutting tool is assembled, form continuous, preferably helical, flutes **24** which extend from the cutting head **12** to the trailing end **26** of the tool body **14**.

[0010] As illustrated in Figs. 2-4, the cutting head **12** has a cutting portion **28** formed on a leading end **30** of the cutting head **12**, a generally cylindrical pilot portion **32** forming a trailing end **34** of the cutting head **12**, and a cutting head mounting portion **36** adjacent the pilot **32** of the cutting head **12**. The cutting portion **28** of the cutting head **12** will not be described herein since it does not constitute the subject matter of the present invention. However, it should be noted that the cutting portion **28** of the cutting head **12** may have any appropriate design for the intended machining operation to be performed. The cutting head mounting portion **36** comprises a pair of diametrically disposed cutting head coupling portions **40** each bound by a land, or peripheral surface **38** and the chip flutes **20** and separated from each other diametrically by cylindrical pilot portion **32**. Each cutting head coupling portion **40** has a single-step configuration with a lower base surface **42** adjacent one chip flute section **20**, an upper base surface **44** adjacent the other chip flute section **20** and a torque transmission wall **46** therebetween, which all extend from the peripheral surface **38** of the cutting head mounting portion **36** transversely inward towards cylindrical pilot portion **32**. The lower base surface **42**, upper base surface **44**, and torque transmission wall **46** may extend either perpendicularly or at an angular orientation with axis A between peripheral surface **38** and pilot portion **32**. A pair of diametrically opposed flush channels **56** extend longitudinally from upper base surface **44** toward leading end **30** of cutting head **12**. The flush channels **56** enable high pressure coolant to be delivered in close proximity to the cutting surfaces to effectively remove generated chips and heat from the cutting area.

[0011] The lower base surface **42** and the upper base surface **44** of the cutting head **12** are oriented transversely to longitudinal axis A and obliquely to a radial plane through longitudinal axis A. Lower base surface **42** and upper base surface **44** are oriented obliquely inward in the radial direction and directed toward the trailing end **34** of the cutting head. Lower base surface **42** and upper base surface **44** may each be planar or formed as a curved surface, such as in a generally helical shape. Lower base surface **42** is oriented at an angle toward torque transmission wall **46** such that a first end **48** of the lower base surface **42**, which mates with torque transmission wall **46**, is lower with respect to leading end **30** than a second end **50** of lower base surface **42**, which terminates at flute **20**. Torque transmission wall **46**

may be oriented at an acute angle with respect to lower base surface **42**. Upper base surface **44** of the cutting head **12** may be oriented at a reverse angle from torque transmission wall **46** such that a first end **52** of the upper base surface **44** which mates with torque transmission wall **46** is lower with respect to the leading end **30** than a second end **54** of upper base surface **44**. Torque transmission wall **46** may be oriented at an acute angle with respect to upper base surface **44**. Upper base surface **44**, torque transmission wall **46**, and lower base surface **42** form a "sawtooth" engagement such that none of the base surfaces, **42**, **44**, are in a radial plane from longitudinal axis A and torque transmission wall 46 is oriented at an acute angle to both base surfaces **42**, **44**.

[0012] Referring now to Figs. 2, and 5-6, tool body **14** has a cutting head receiving portion **60** formed on the leading end **58** of the tool body **14**. Cutting head receiving portion **60** is formed to matingly engage cutting head mounting portion **36** and cylindrical pilot portion **32** of cutting head **12**. Referring again to Fig. 2, the cutting head receiving portion **60** comprises a pair of diametrically disposed tool body coupling portions **80** each radially bound by a land, or peripheral surface **78** and chip flutes **22**. Each cutting head receiving portion **60** has a single-step configuration with a lower base surface **62** adjacent one chip flute section **22**, an upper base surface **64** adjacent the other chip flute section **22** and a torque transmission wall **66** therebetween, which all extend from the peripheral surface **78** of the cutting head receiving portion **60**, generally transversely inward towards a cylindrical recess **84** formed between coupling portions **80**.

[0013] Lower support surface **62** and upper support surface **64** of the tool body **14** are both oriented transversely to longitudinal axis A and obliquely to a radial plane through longitudinal axis A. Lower support surface **62** and upper support surface **64** are oriented obliquely inward in the transverse direction and directed toward tool shank **16**. Lower support surface **62** and upper support surface **64** may be planar or formed as a curved surface, such as in a generally helical shape. Lower support surface **62** is oriented at an angle toward torque transmission wall **66** such that a first end **68** of the lower support surface **62** which mates with torque transmission wall **66** is lower with respect to a second end **70** of lower support surface **62** which terminates at flute **22**. Torque transmission wall **66** is oriented at an acute angle with respect to lower support surface **62**. Upper support surface **64** of the tool body **14** is oriented at a reverse angle from torque transmission wall **66** such that a first end **72** of upper support surface **64** which mates with torque transmission wall **66** is lower with respect to a second end **74** of upper support surface **64** which terminates at flute **22** and surface **76** which forms a transition portion from the tool body **14** to the cutting head **12**. As with the cutting head, torque transmission wall **66** is oriented at an acute angle with respect to upper support surface **64**. Upper support surface **64**, torque transmission wall **66**, and lower support surface **62** form a "sawtooth" engagement such that none of the support surfaces, **62**, **64**, are in a radial plane and torque transmission wall **66** is oriented at an acute angle to both support surfaces **62**, **64** of tool body **14**.

[0014] Cutting head **12** matingly engages tool body **14** as best shown in Fig. 7. The sawtooth engagement of the cutting head **12** on tool body **14** assists in retaining cutting head **12** on tool body **14**. The angled engagement surfaces enable both torsional forces and axial forces imposed on the tool **10** in operation, to assist in securing the cutting head **12** on tool body **14**. Torsional forces are transmitted directly from torque transmission wall **46** of cutting head **12** to torque transmission wall **66** of tool body **14**. The opposing angled surfaces of torque transmission walls **46**, **66** act to draw the cutting head **12** toward tool body **14** in operation. In a similar fashion, lower base and support surfaces **44**, **64** are also angled relative to one another and the torque transmission walls **46**, **66** such that a portion of axial feed forces on cutting tool assembly **10** assists in drawing torque transmission wall **46** of cutting head **12** to torque transmission wall **66** of tool body **14** resulting in the additional retention force through the sawtooth engagement. In addition, the angled surfaces of the sawtooth engagement help ensure that cutting head **12** is properly aligned on tool body **14** during assembly.

[0015] Referring now to Figure 8, a cross-sectional view of the assembled cutting tool assembly is shown. A fastener assembly **18** facilitates retention of the cutting head **12** on tool body **14**. Fastener assembly **18** comprises a connection member **90**, a spring **92**, and a spring retainer plug **94**. In operation, connection member **90** is inserted into a corresponding cylindrical cavity **98** along the longitudinal axis A of tool body **14**. Spring **92** is then inserted into axial cavity **98** through an opening at the trailing end **96** of tool shank **16** and retained in the cavity **98** by spring retainer plug **94**. Spring retainer plug **94** threadably engages the walls of cavity **98** such that spring **92** biases connection member **90** toward the leading end of the tool body **14**. Connection member **90** comprises a threaded portion **108** on a leading end of the connection member **90**, which matingly engages a threaded recess **100** within cylindrical pilot portion **32** of cutting head **12**. The connection member **90** is drawn backwards towards a trailing end **96** of tool shank **16** by an adjusting mechanism **102**. Adjusting mechanism **102** may comprise a set screw, which is adjustable in a direction transverse to longitudinal axis A within an aperture **104** in tool shank **16** which extends through from the perimeter of the tool shank **16** to cavity **98**. Set screw **102** engages an angled mating surface **106** in connection member **90** thereby drawing connection member **90** towards the trailing end **96** of tool shank **16** and securing cutting head **12** thereon. Set screw **102** is adjusted to provide sufficient tension on connection member **90** to obtain a predetermined preload. In general, the preload on the connection member should be greater than the elastic deformation of the tool holder **14** and shank **16**. This will help ensure that a cutting head **12** is retained on the tool body **14**.

[0016] Drill assembly **10** is intended to be used such that the cutting head **12** can be replaced while the tool shank **16** remains in the tool holder (not shown). The method of replacing cutting head **12** comprises the steps of first loosening set screw **102** such that connection member **90** moves longitudinally toward the leading end of tool body **14** under the biasing force of spring **92**. The cutting head **12** is either pushed away from the tool body mating surface or is rotated slightly to disengage the sawtooth engagement and allow cutting head **12** to move longitudinally under the bias force of spring **92**. Once the set screw **102** has been loosened to a predetermined position, the cutting head **12** is removed from the leading end **108** of connection member **90** by rotating cutting head **12**. Once cutting head **12** is sufficiently disengaged such that the cutting head mounting portion **36** of cutting head **12** and cutting head receiving portion **60** of tool body **14** do not interfere with each other, the cutting head **12** is disengaged from connection member **90**. To install the replacement cutting head **12** while the tool shank **16** remains in the tool holder, the opposite procedure is used. The pilot portion **32** is axially aligned with the recess **84** in a manner that the insert **12** is axially aligned with the tool body **14**. The cutting head **12** is aligned such that the threaded recess **100** in cylindrical pilot portion **32** is directly over the leading end **108** of connection member **90**. The cutting head **12** is then rotated in the appropriate direction until the base and support surfaces **42**, **64** of the cutting head **12** and tool body **14** approach each other. The cutting head **12** is generally aligned such that the base surfaces **42**, **44** of cutting head **12** and support surfaces **62**, **64** of tool body **14**, respectively, are aligned, and the cutting head **12** is then rotated as the head **12** is drawn toward the support surfaces **62**, **64** until matingly engaged. The cutting head **12** is then rotated slightly such that torque transfer walls **46** of cutting head **12** register against torque transfer walls **66** of tool body **14**. While the cutting head is in position, set screw **102** is then rotated in an appropriate direction such that connection member **90** is moved longitudinally toward the trailing end **96** of tool shank **16** until a predetermined amount of retention force is applied on cutting head **12** against tool body **14** to provide a preload on connection member **90**. As previously mentioned, the retention force is generally sufficient such that the preload on the connection member is greater than the elastic deformation of the tool holder **14** and shank **16**. This will help ensure that a cutting head **12** is retained on the tool body **14**.

[0017] Turning to Figs. 9 and 10, cutting head **12** is typically made of a hard material, such as hardened carbide, high-speed steel, ceramic material or any other suitable material. In an alternate embodiment, cutting head **12'** further comprises a thread insert **110** which is inserted into threaded recess **100** on the cylindrical pilot portion **32** of cutting head **12**. Thread insert **110** is used to protect the threads of connection member **90** from being worn down by the threads of tool material of the cutting head **12** while different cutting heads **12** are being repeatedly removed and replaced. The thread insert **110**, being of larger diameter, will provide additional strength in the connection with cutting head **12**, and will more accurately engage the retention assembly **18**.

[0018] It should be recognized from the foregoing that the present invention provides distinct advantages in the use of a replaceable cutting head, while allowing operation in aggressive machining environments. The configuration of the connection between the cutting head **12** and tool body **14** provides an assembled tool which performs substantially as a unitary construction, while providing the benefits of a replaceable cutting head. In the preferred form, the base surfaces **42**, **44** and support surfaces **62**, **64** are configured such that the mating relationship between the surfaces is angled inwardly so feed thrust will force the insert toward the torque transmission wall to more firmly secure the cutting head **12** on the tool body **14**. Further, the sawtooth connection of the preferred form provides a forward directed leading edge which creates a downward axial force vector which forces the cutting head **12** against the support surfaces **62**, **64**, also resulting in a more secure connection. The combination of these structures work synergistically to provide a connection which effectively removes any relative movement between the cutting head **12** and tool body **14**, resulting in an assembled tool which performs in the desired manner.

[0019] Although the present invention has been described above in detail, the same is by way of illustration and example only and is not to be taken as a limitation on the present invention. Accordingly, the scope and content of the present invention are to be defined only by the terms of the appended claims.

CLAIMS

What is claimed is:

1. A cutting tool assembly comprising:

a replaceable cutting head and a tool body having a common longitudinal axis and mating peripheral surfaces;

said cutting head having a cutting portion forming a leading end, a pilot portion forming a trailing end, and a cutting head mounting portion adjacent said pilot of said cutting head;

said tool body having a cutting head receiving portion formed at a leading end of said tool body and a recess disposed in said leading end of said tool body to matingly receive said pilot portion of said cutting head;

said cutting head mounting portion and said cutting head receiving portion of said tool body each having at least two coupling portions, said cutting head coupling portions and said tool body coupling portions being bound by said peripheral surfaces and generally mating in shape and dimensions;

each coupling portion having a pair of surfaces, comprising an upper and a lower surface, said surfaces extending transversely to said longitudinal axis and providing support of said cutting head in said tool body,

a torque transmission wall extending between said upper and lower surfaces from said pilot portion surface to said peripheral surface in a generally transverse direction relative to said longitudinal axis and oriented transversely to said surfaces,

a fastener centrally disposed in said tool body along said longitudinal axis and engaging said pilot portion of said cutting head and exerting an axial force on said cutting head for pressing said cutting head mounting portion against said cutting head receiving portion of said tool body.

2. The cutting tool of claim 1 wherein at least one of said pair of surfaces is oriented obliquely in relation to a radial plane from said longitudinal axis.

3. The cutting tool of claim 1 wherein said pair of surfaces are oriented obliquely in relation to a radial plane from said longitudinal axis.

4. The cutting tool of claim 1 wherein at least one of said pair of surfaces is circumferentially oblique in relation to a radial plane from said longitudinal axis.

5. The cutting tool of claim 1 wherein said pair of surfaces is circumferentially oblique in relation to a radial plane from said longitudinal axis.

6. The cutting tool of claim 1 wherein at least one of said pair of surfaces is oriented such that a portion of a force acting longitudinally along said cutting tool is directed at least partially toward said torque transmission wall to assist in said retention of said cutting head upon said tool body.

7. The cutting tool of claim 1 wherein said fastener engages a threaded recess formed in a trailing end of said pilot portion of said cutting head.

8. The cutting tool of claim 1 wherein said fastener engages a threaded insert positioned in a recess formed in a trailing end of said pilot portion of said cutting head.

9. The cutting tool of claim 1 wherein said cutting head is made of a material selected from the group consisting of hardened carbide, high speed steel, ceramic, cemented carbide or combinations thereof.

10. The cutting tool of claim 1 wherein said cutting head is made by molding of a material into the desired final configuration.

11. The cutting tool of claim 1 wherein said fastener further comprises a connection member, a spring, a spring retainer plug and means for applying a preload on said connection member.

12. The cutting tool of claim 11, wherein said means for applying a preload on said connection member provides a preload which is greater than the elastic deformation of the tool holder during operation of the cutting tool.

13. The cutting tool of claim 11 wherein the cutting head is removable from the connection member by rotation of the cutting head to a position that it is sufficiently disengaged such that the cutting head mounting portion of the cutting head and cutting head receiving portion of the tool body do not interfere with each other, and disengaging the cutting head from the connection member.

14. The cutting tool of claim 11, wherein the cutting head is replaceable with the tool body positioned operatively in a tool holder for performing a cutting operation, wherein the pilot portion is axially aligned with the tool body such that the pilot portion is directly over a leading end of the connection member, and wherein the cutting head is rotatable into engagement with the connection member until the mounting portion of the cutting head and cutting head receiving portion of the tool body approach each other and such that the mounting portion of the cutting head and cutting head receiving portion of the tool body are generally aligned, wherein the cutting head is then rotatable such that said torque transmission walls of the at least two coupling portions register against one another.

15. The cutting tool of claim 14, wherein the means for applying a preload on said connection member is operated once the torque transmission walls of the at least two coupling portions register against one another.

16. A method of mounting and replacing a replaceable cutting head of a cutting tool assembly comprising the steps of:

1) providing a cutting tool having a replaceable cutting head and a tool body having a common longitudinal axis and mating peripheral surfaces, said cutting head having a cutting portion forming a leading end, a pilot portion forming a trailing end, and a cutting head mounting portion, and said tool body having a cutting head receiving portion formed at a leading end of said tool body and a recess disposed in said leading end of said tool body to matingly receive said pilot portion of said cutting head, wherein said cutting head mounting portion and said cutting head receiving portion of said tool body each having at least two coupling portions, each coupling portion having a pair of surfaces extending transversely to the longitudinal axis of the cutting tool and providing support of said cutting head with said tool body and having a torque transmission wall extending between said pair of surfaces in a generally transverse direction relative to said longitudinal axis and oriented transversely to said surfaces, and a fastener centrally disposed in said tool body along said longitudinal axis,

2) axially aligning the pilot portion with the tool body such that the pilot portion is directly over a leading end of the fastener,

3) engaging said pilot portion of said cutting head with said fastener,

4) rotating the cutting head into engagement with the fastener until the mounting portion of the cutting head and cutting head receiving portion of the tool body approach each other and such that the mounting portion of the cutting head and cutting head receiving portion of the tool body are generally aligned,

5) rotating the cutting head further such that said torque transmission walls of the at least two coupling portions register against one another, and

6) using the fastener to exert an axial force on said cutting head for pressing said cutting head mounting portion against said cutting head receiving portion of said tool body, whereby the cutting head is replaceable by

providing a replacement cutting head and repeating steps 2 through 6 while the tool body is positioned in a tool holder associated with a cutting operation.

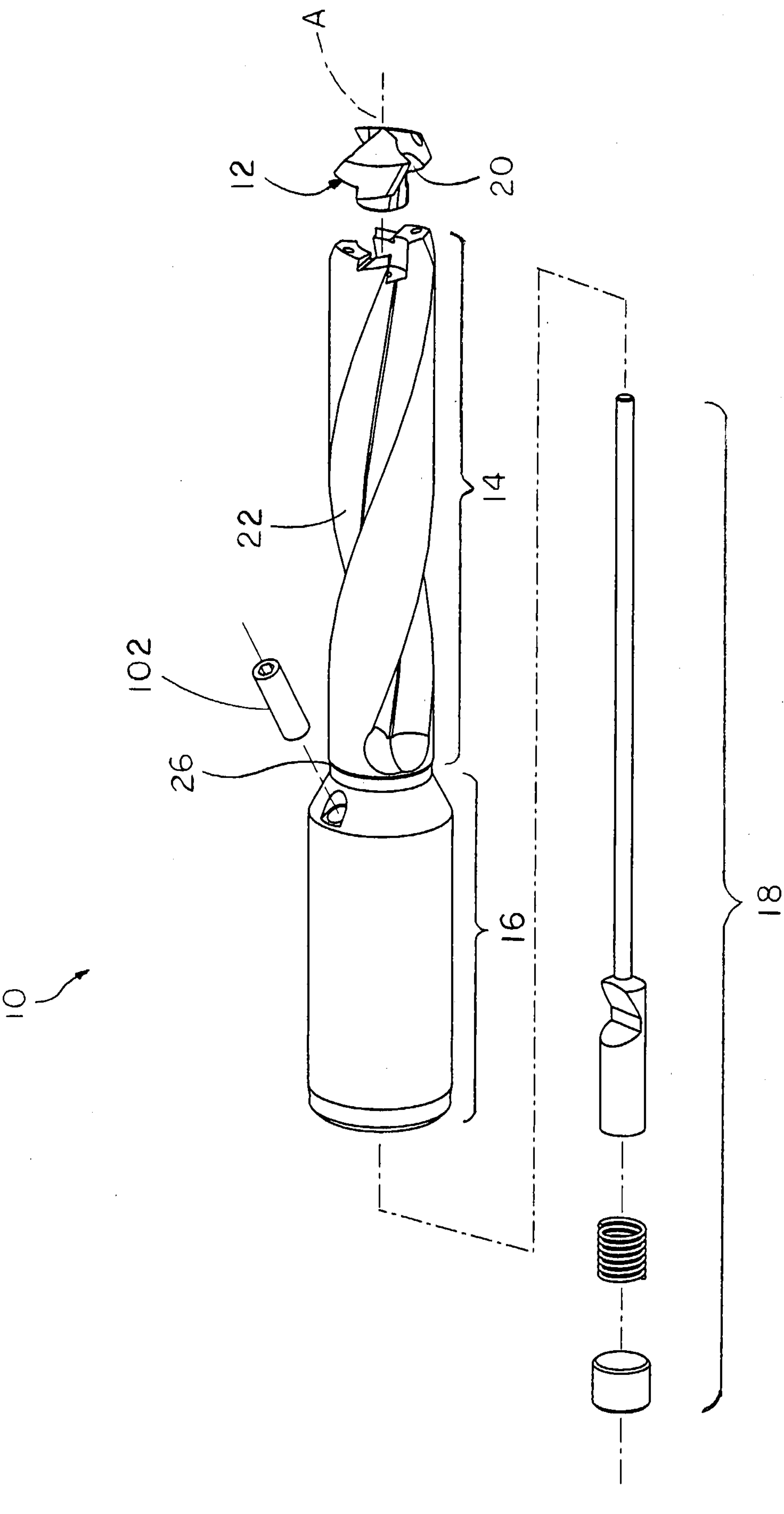
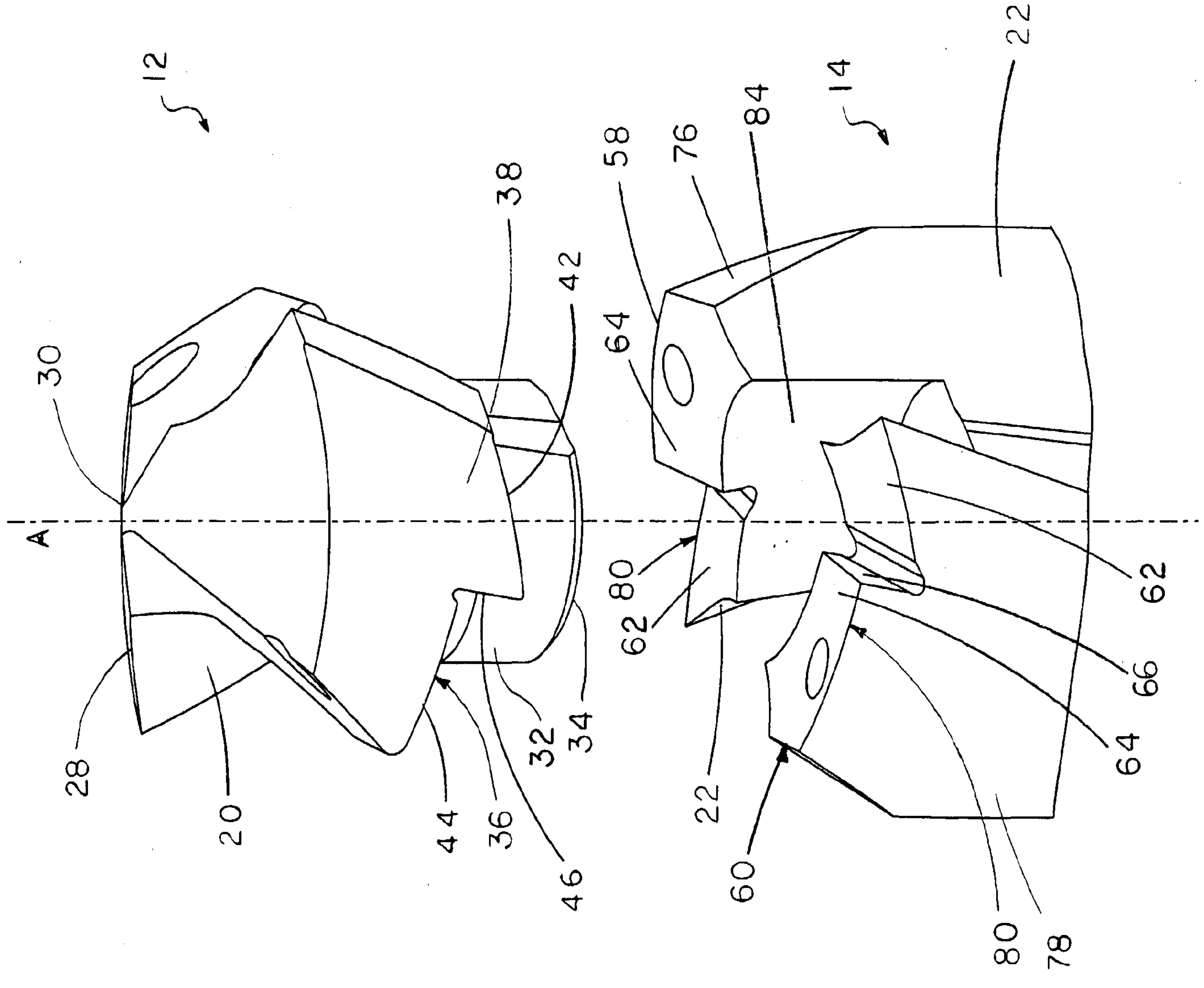


FIG. 1

FIG. 2



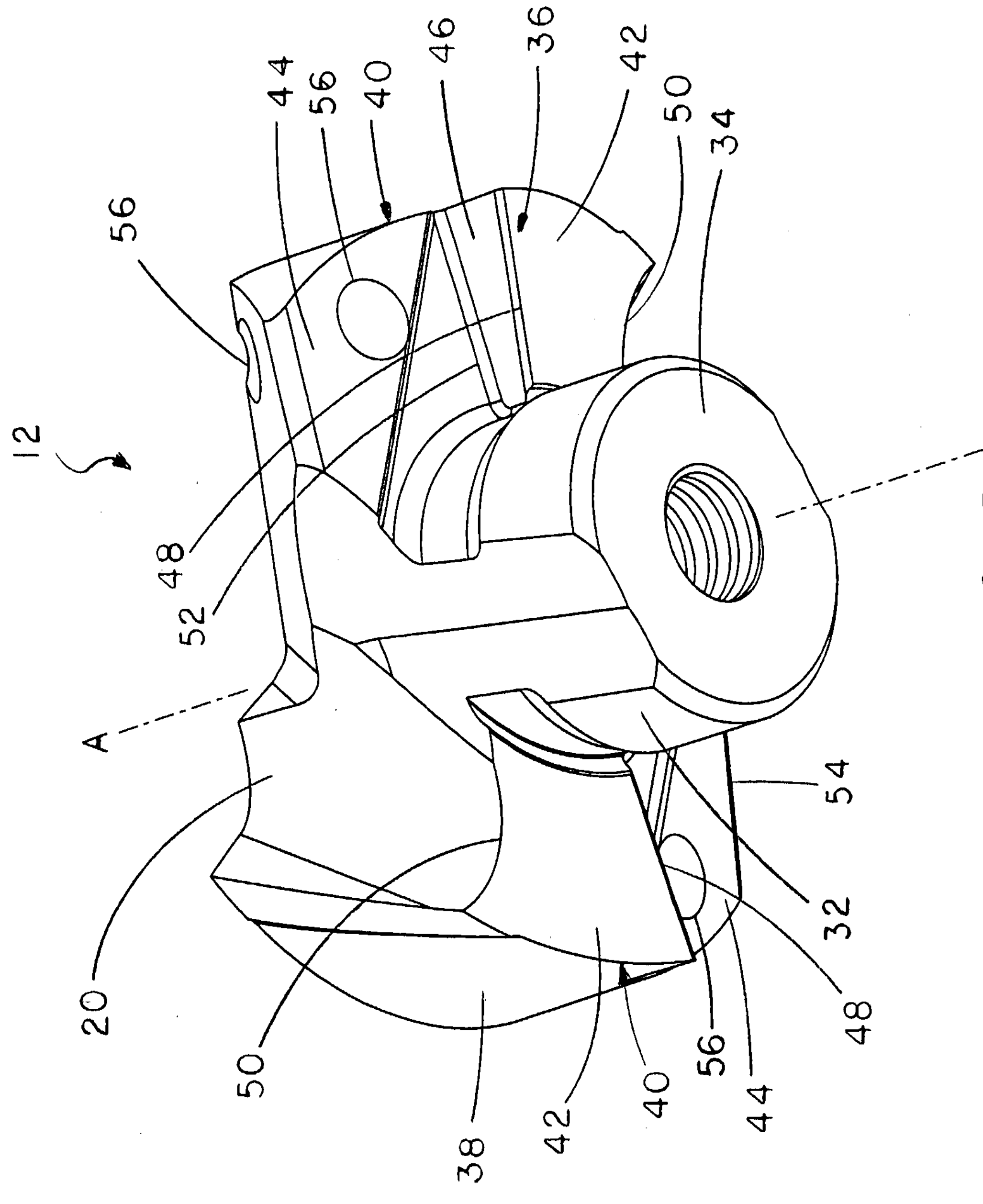


FIG. 3

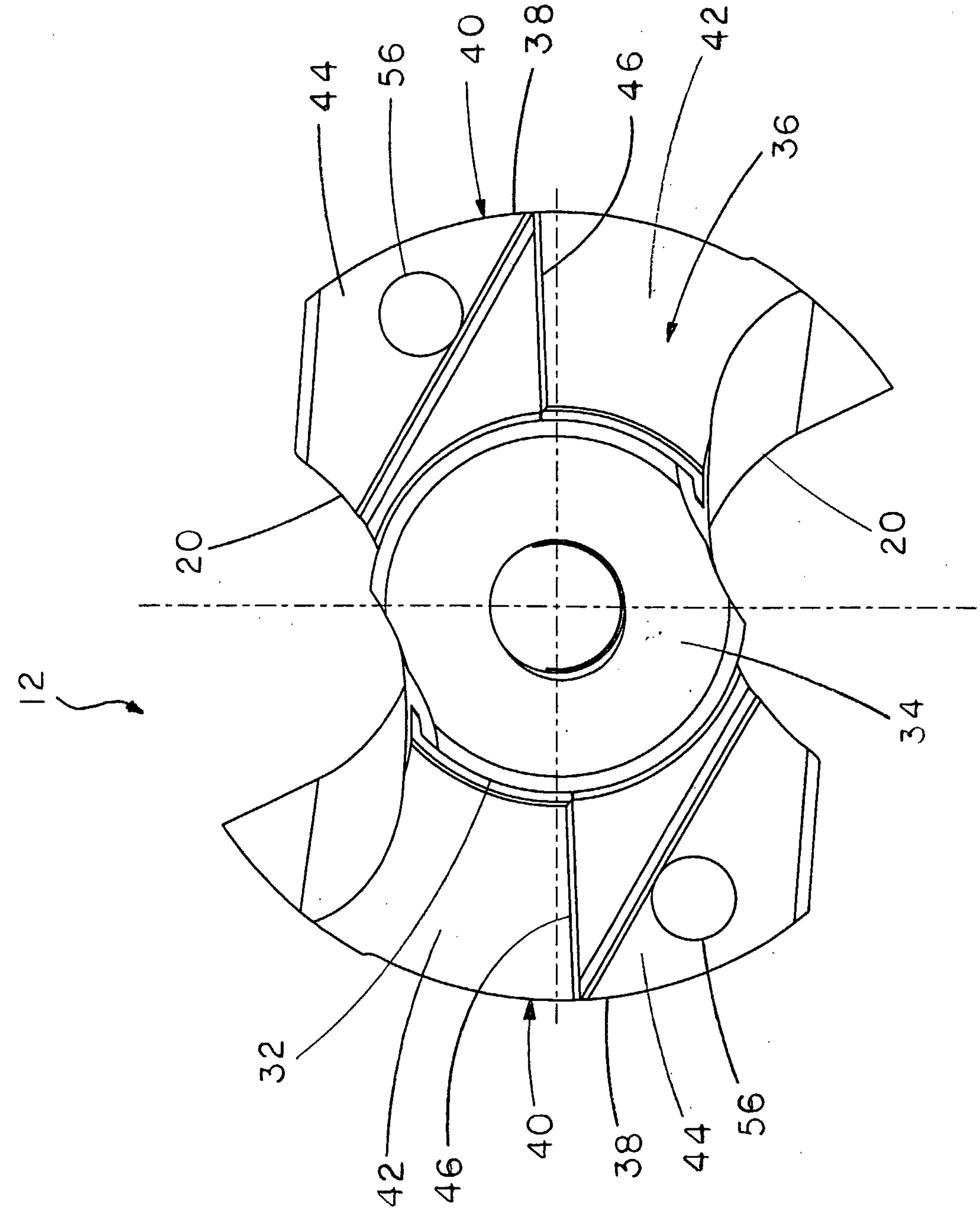


FIG. 4

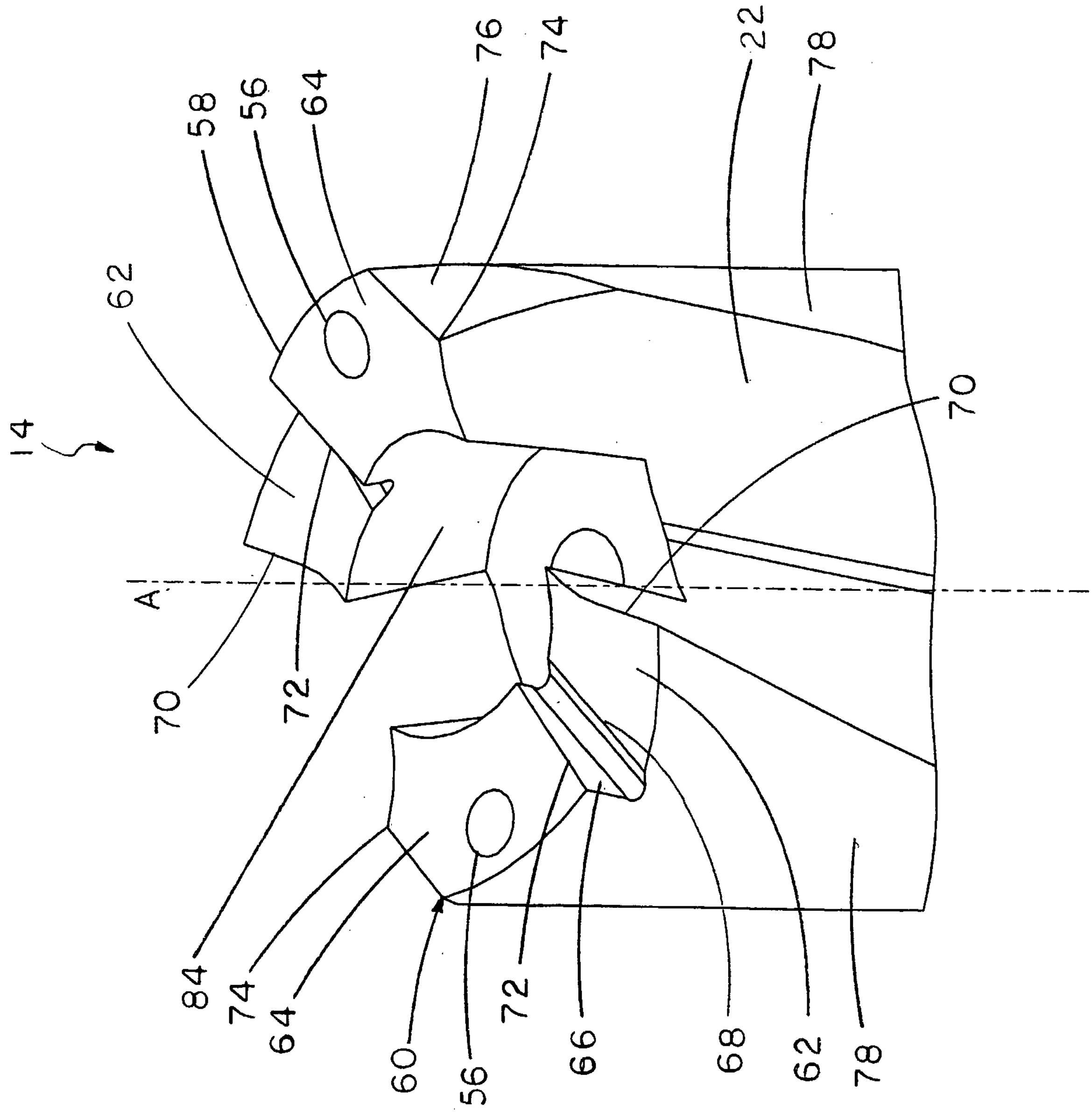


FIG 5

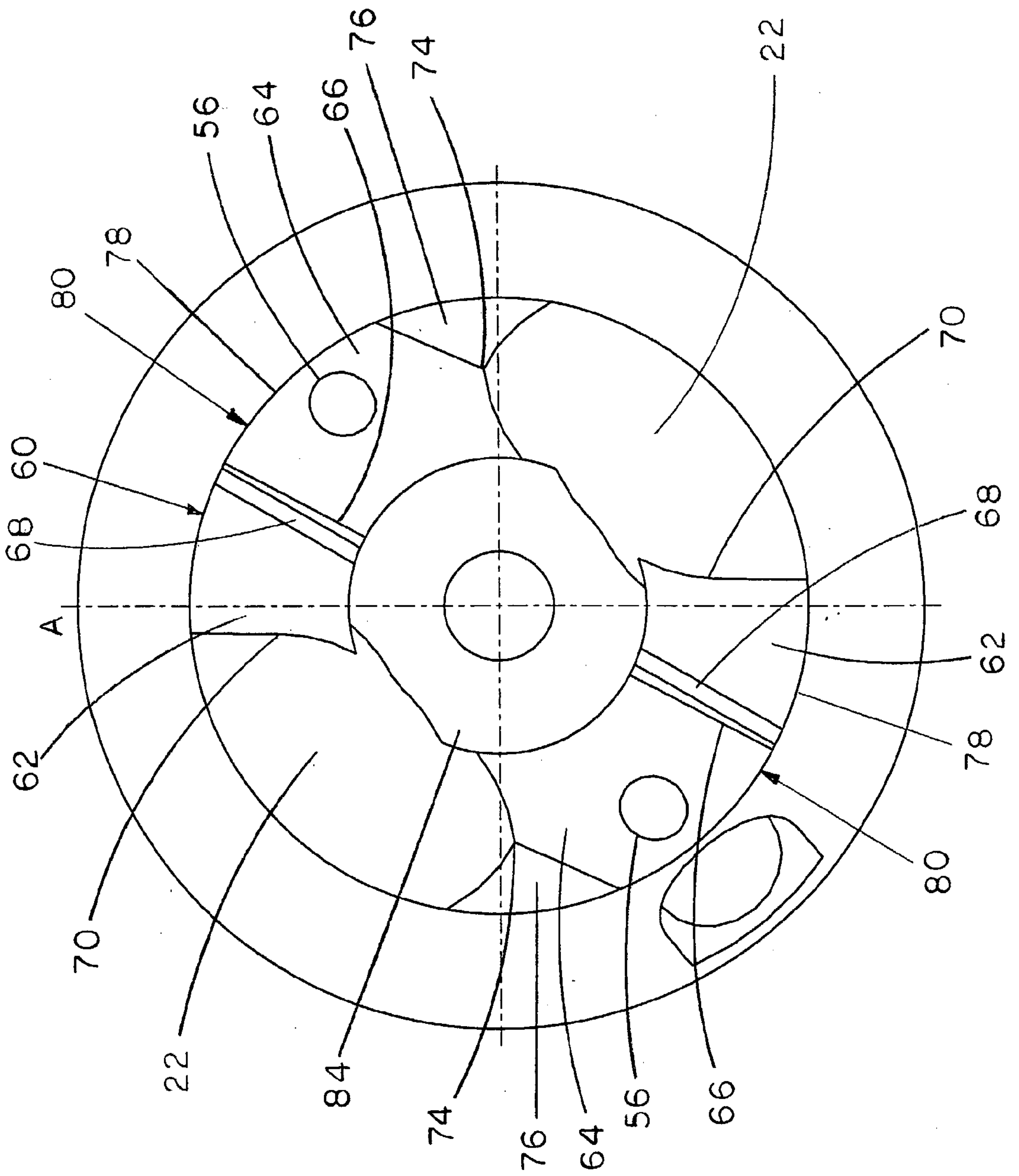


FIG. 6

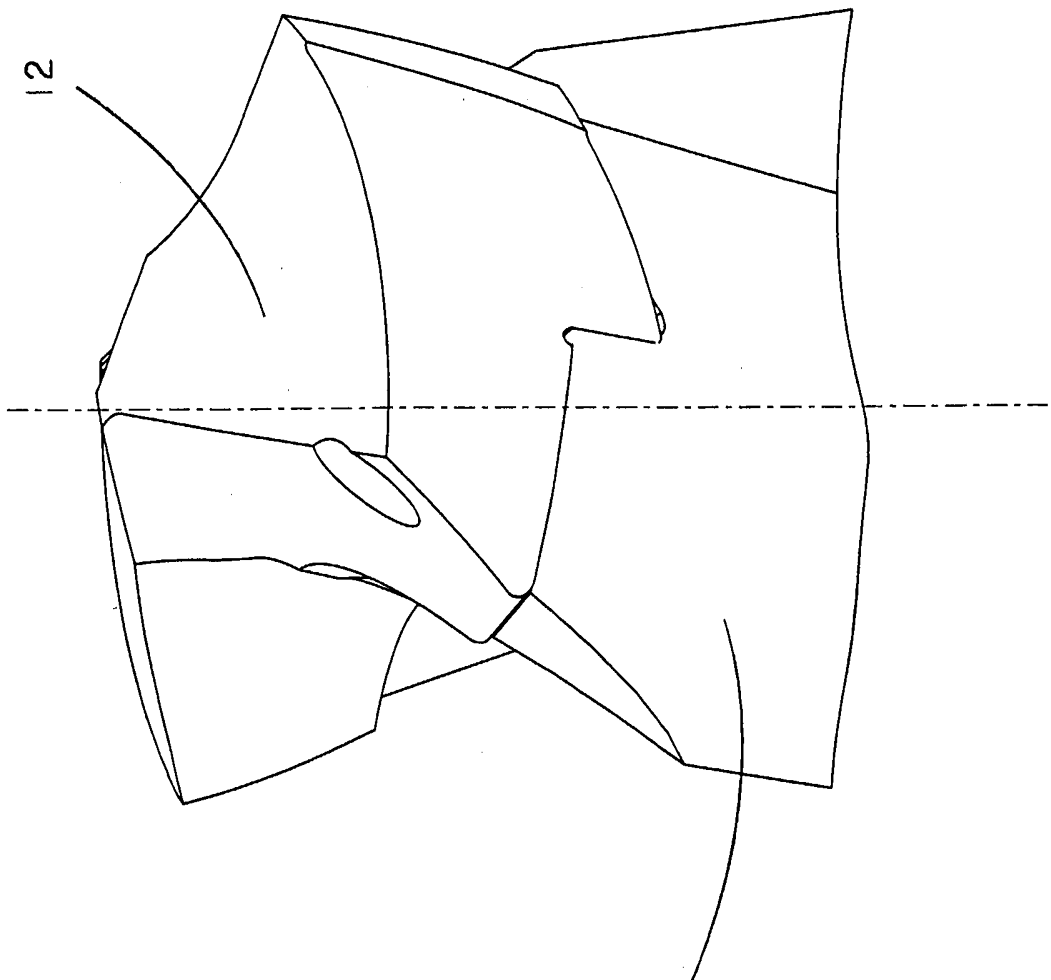


FIG. 7

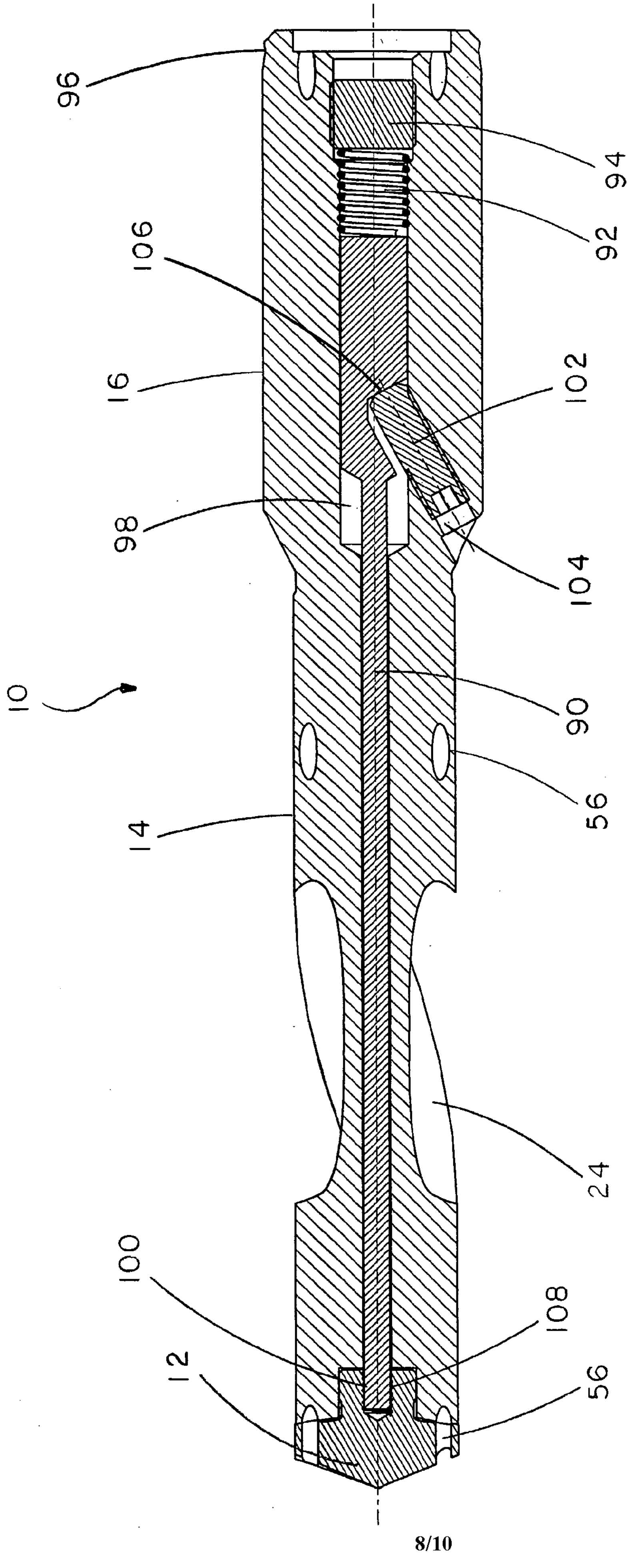


FIG. 8

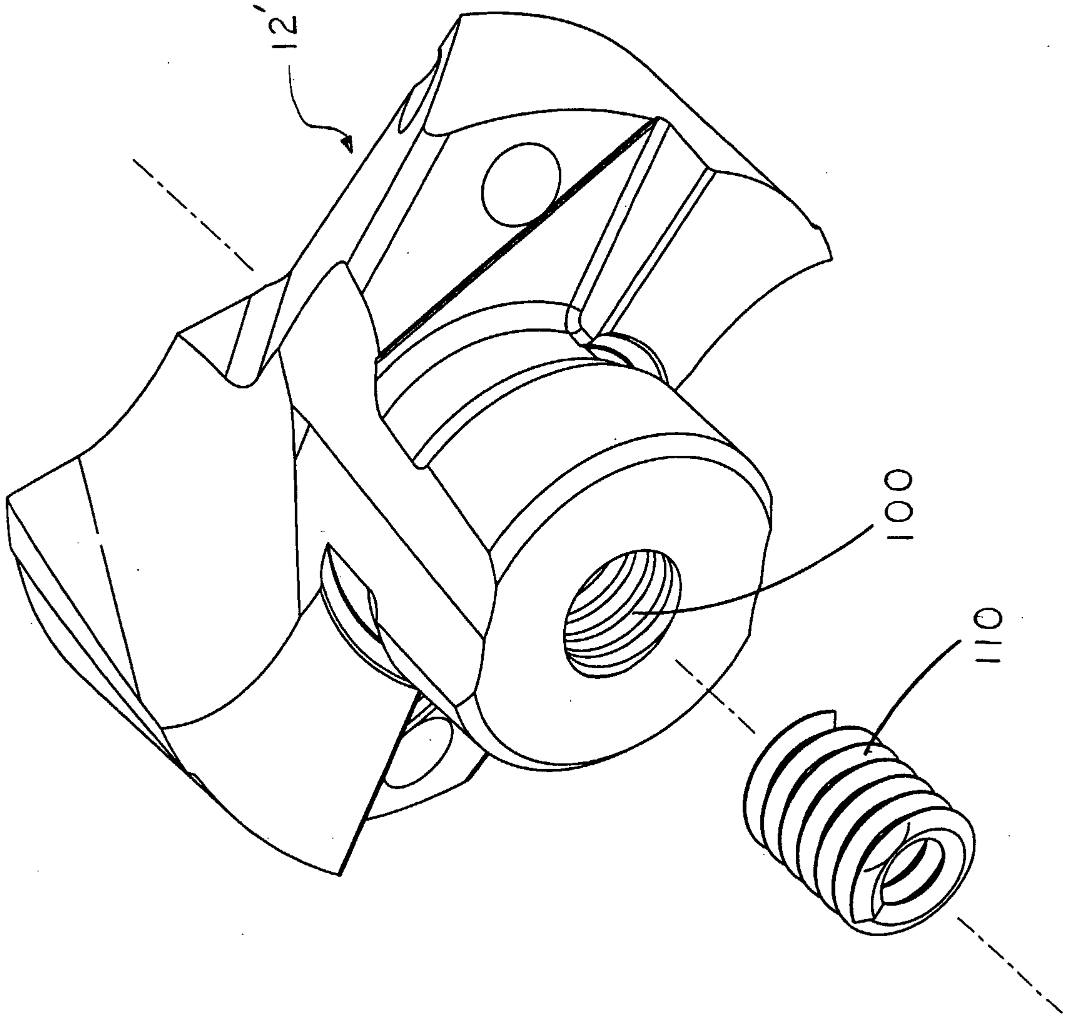


FIG. 9

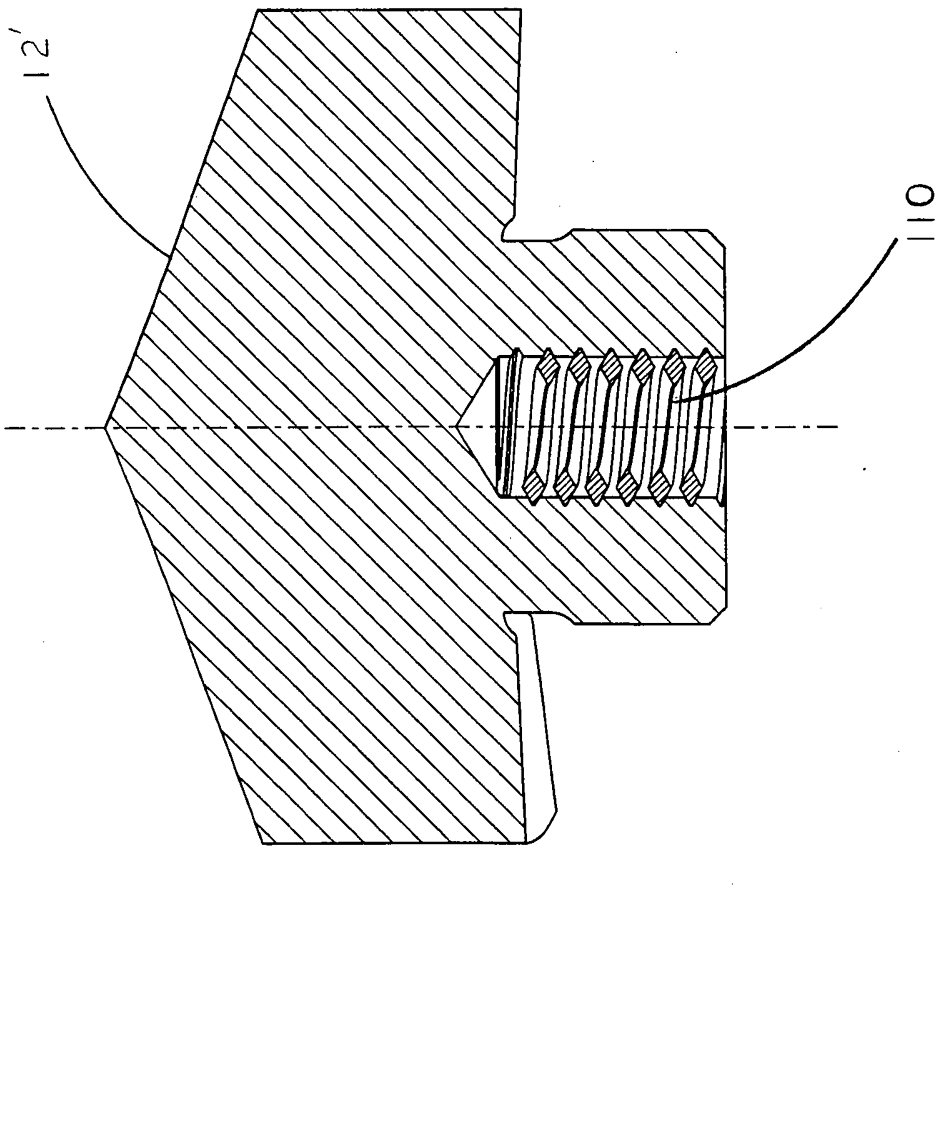


FIG. 10