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(54) **Attachment for coupling to jackhammer or hammer drill to form a post driver, post driver and method thereof**

(57) The invention relates to an attachment (2) for coupling to a jackhammer or hammer drill so as to form a post driver. The attachment (2) comprises an end part (4) placeable in a bit holder of the jackhammer or hammer drill and provided with coupling means (16) for coupling

the attachment to the bit holder of the jackhammer or hammer drill, and a head part (6) connected to the end part (4) and having at least one upright wall (8) which defines a space (10) for receiving therein an outer end of a post or a part of a wall.

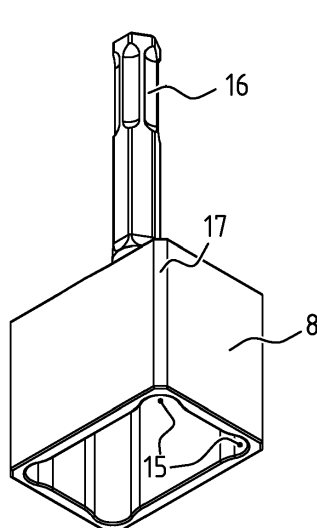


FIG. 1A

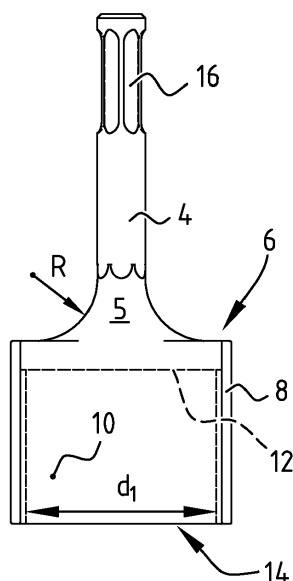


FIG. 1B

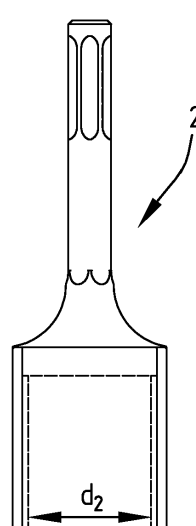


FIG. 1C

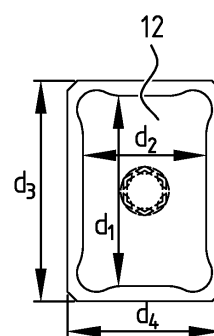


FIG. 1D

Description

[0001] The invention relates to post drivers. A post can be driven into the ground using a post driver, for instance for the purpose of placing a fence, fencing or other structure.

[0002] Conventional post drivers operate on the basis of air pressure, making the use of a compressor necessary. This makes the use of these post drivers laborious. These post drivers also require transport of both a post driver and the compressor to the desired location. Post drivers are moreover known in practice which operate with a gas cylinder. These have the drawback however that the gas cylinder becomes empty through the use of the post driver. Replacing the gas cylinder is laborious and time-consuming.

[0003] Conventional post drivers are moreover difficult for one person to handle due to their relatively large size.

[0004] An object of the invention is to obviate or at least reduce the above stated problems and to provide a post driver without a compressor being necessary here or gas cylinders having to be provided.

[0005] This object is achieved with the attachment (also hammer head) according to the invention for coupling to a jackhammer or hammer drill so as to form a post driver. The attachment comprises:

- an end part placeable in a bit holder of the jackhammer or hammer drill and provided with coupling means for coupling the attachment to the bit holder of the jackhammer or hammer drill;
- a head part connected to the end part and having at least one upright wall which defines a space for receiving therein an outer end of a post or a part of a wall.

[0006] A jackhammer is an apparatus in which a tool such as a chisel is moved upward and downward with force, for instance for the purpose of demolishing walls or tiles.

[0007] A hammer drill is an apparatus in which a drilling movement is combined with a hammering movement. Many hammer drills have a setting in which only the hammer function is performed, i.e. without a rotation. In the case the attachment according to the invention is applied in a hammer drill, the hammer drill is preferably switched to this hammer setting so that only a hammer function takes place. The hammer head according to the invention is however preferably applied in combination with a jackhammer.

[0008] A jackhammer is also referred to as a wrecking hammer, demolition hammer, chisel hammer or chipping hammer. The term hammer drill is sometimes used in practice to denote a jackhammer. In order to avoid confusion the term "jackhammer" is used in the context of the invention for an apparatus in which only a hammer function can be performed (up and downward movement), and hammer drill for an apparatus in which a ham-

mer function can optionally be performed in combination with a drilling function (rotation), wherein a setting can optionally be selected for the hammer function alone.

[0009] A jackhammer can comprise a pneumatic, hydraulic, electric or electropneumatic drive, or a drive with a petrol motor. Electropneumatic is understood to mean the electrical generation and/or control of air pressure. Use is usually made here of an electrically driven cylinder/piston combination.

[0010] In other words, the attachment according to the invention is an attachment for coupling to a mechanically driven impact tool, such as a jackhammer or hammer drill, in order to form a post driver.

[0011] The attachment according to the invention is preferably used in combination with an electropneumatic jackhammer or hammer drill so that a compressor is not necessary. The attachment according to the invention is however likewise suitable for use with a jackhammer or hammer drill which makes use of one of the other stated drives.

[0012] The jackhammer or hammer drill can for instance perform 800-2000 strokes per minute.

[0013] A jackhammer or hammer drill can be converted to a post driver in effective manner by means of the attachment. This renders a separate post driver unnecessary.

[0014] The attachment comprises an end part which is placeable in a bit holder (also "tool-holding fixture") of the jackhammer or hammer drill. The bit holders of jackhammers and hammer drills are for instance provided with a snap system, such as the SDS system from Bosch or the TE system from Hilti. The coupling means provided on the end part of the attachment can be adapted for coaction with one or more of these systems.

[0015] The head part of the attachment is provided with a space for receiving an outer end of a post or a part of a wall, such as a part of a sheet piling. In use the outer end of a post or a part of a wall is placed in the space in the head part. The head part can hereby be placed firmly on the outer end of the post/the wall part. The attachment can hereby not shoot off the post or wall during driving of the post or the wall into the ground. Safety is hereby thus enhanced.

[0016] In other words, the head part comprises an inlet opening for receiving an outer end of a post or a part of a wall.

[0017] The attachment is preferably suitable for coupling to a portable jackhammer or hammer drill. The attachment is preferably suitable for coupling to a jackhammer or hammer drill which can be handled by one person.

[0018] Such apparatus typically have a weight of 30 kg or less. In an alternative embodiment according to the invention the attachment is however suitable for heavy jackhammers, in particular heavy hydraulic jackhammers, which are carried by a crane, excavator or other machine. An attachment according to the invention can for instance be applied to a jackhammer with a weight of more than 30 kg, for instance more than 50 kg, wherein

more than 100-250 kg is even possible.

[0019] The space has for instance an inner diameter of a minimum of 40 mm for receiving a post or wall part with a diameter or thickness of up to 40 mm. The space has for instance an inner diameter of a minimum of 50 mm, a minimum of 60 mm, a minimum of 70 mm, a minimum of 80 mm, a minimum of 90 mm or a minimum of 100 mm. For a hammer head which defines a rectangular, square or polygonal space the diameter is defined as the shortest distance between two opposite parallel walls of the space.

[0020] The wall thickness is preferably 10-30 mm, more preferably 10-25 mm, still more preferably 10-20 mm and most preferably 12-18 mm, for instance 15 mm

[0021] The weight of the attachment is preferably less than 11 kg, more preferably less than 10 kg, still more preferably less than 9 kg, still more preferably less than 8 kg and most preferably less than or equal to 7 kg. This makes the attachment easy to handle.

[0022] In a preferred embodiment the end part and the head part are manufactured as one component. In other words, the end part and head part are integral, i.e. manufactured as one whole without welding, glueing, screwing or other connection method. The impact energy of a jackhammer or hammer drill is usually 30-70 Joules, whereby the attachment must be able to absorb great forces. Embodying the end part and head part as one component increases the strength of the attachment and thereby guarantees a long lifespan.

[0023] The attachment preferably has a gradual transition from the end part to the head part. The width of the attachment preferably increases gradually from the end part to the head part.

[0024] In a preferred embodiment the head part is provided with an element of an elastic material which is arranged in the space. The surface of the post or wall part to which the attachment transmits the impact force of the jackhammer or hammer drill may be uneven. This unevenness can be partially compensated by providing an element of elastic material, so resulting in a uniform distribution of forces.

[0025] The element is preferably embodied as a releasable element, for instance in the form of a sleeve slidable over the at least one upright wall. The user can him/herself determine whether he/she wishes to place the elastic element in the space. Elements are for instance provided with different thicknesses of the elastic material. The space can hereby be partially filled with the elastic material. The post or the wall part is hereby enclosed in the space of the attachment, wherein different thicknesses of post/wall part can be accommodated by applying elements of differing thickness.

[0026] In an alternative embodiment the attachment comprises adjustable bounding means for adjusting the dimensions of the space. The adjustable bounding means comprise for instance a screwable element arranged through the at least one upright wall. The outer end of the screwable element forms a boundary which

bounds the movement of the post or wall in the space. This boundary can be adjusted by means of screwing.

[0027] In a preferred embodiment the at least one upright wall forms a continuous upright edge for enclosing in use an outer end of a post placed in the space. In other words, the upright wall has a tubular form so that the outer end of the post can be placed in this tube. The movement of the outer end of the post is in this way bounded in all directions by the wall. This increases the safety of the attachment, since it cannot shoot off the post during use.

[0028] In a preferred embodiment the edge which encloses the space comprises a recess on its inner side. The recess is for instance a groove or a channel. The recess is for instance suitable for receiving a tool such as a screwdriver.

[0029] In the case a part of a post becomes jammed in the head part a tool can then be inserted into the head part via the recess in order to remove the part of the post from the head part.

[0030] In the case of a rectangular, square or polygonal space such a recess is preferably provided in every corner. When a post of corresponding cross-section is placed in this space, some clearance remains around the corner points of the post. This prevents the post becoming jammed in the head part.

[0031] The recess preferably takes a substantially round form. It is in that easily possible to drill into the jammed part of the post, since the recess provides space for a drill head.

[0032] The space is for instance obtained by milling a round, rectangular, square or polygonal space in a solid head part and subsequently milling a recess into the inner wall of the head part.

[0033] The at least one upright wall of the head part preferably defines a space with a substantially basic rectangular shape, wherein the space in at least one corner point of the basic shape is enlarged by a recess for the purpose of providing space around a corner of a rectangular post received in use in the space of the attachment. In other words, the head part comprises a space basically having a rectangular form but extending beyond this rectangular basic form at one or more corner points so that additional space is created at the corner points for the corners of a post of substantially rectangular cross-section to be placed in the space.

[0034] Additional space is preferably created at each of the corner points of the basic rectangular shape by means of such a recess.

[0035] Rectangular is also understood according to the invention to mean square.

[0036] The additional space created by the recesses at the corner points of the rectangular receiving space of the attachment makes it possible to control a post while it is being driven into the ground. The post may tend to rotate while the post is being driven into the ground. With the invention the user can however exert a counterforce by applying a torsional force while driving the post into

the ground. Because the corners of the post in the receiving space of the attachment do not make contact with the inner wall of this receiving space, these torsional forces are prevented from causing damage to the corners of the post.

[0037] In a preferred embodiment the at least one upright wall defines a passage with two open sides for receiving a part of a wall in the space during use, so that this wall part extends through these open sides. The head part has for instance a U-shaped cross-section, wherein two upright walls of the attachment form the legs of the U-shape which can be placed on either side of a wall part. It hereby becomes possible to drive wall parts such as sheet piling into the ground.

[0038] In a preferred embodiment the end part and the head part are manufactured from high-grade steel. The high-grade steel for instance comprises steel with molybdenum (Mo steel or 4XXX), steel with chromium and molybdenum (CrMo steel or 41XX) or steel with nickel and chromium (NiCr steel or 3XXX).

[0039] The steel preferably has a hardness of 48-62 HRC (Rockwell hardness), more preferably 50-60 HRC, still more preferably 52-58 HRC and most preferably 54-56 HRC.

[0040] The steel preferably has a tensile strength of 800-1500 N/mm², more preferably 900-1400 N/mm², still more preferably 1000-1300 N/mm² and most preferably about 1100-1200 N/mm².

[0041] Practical tests have shown that steel of such a hardness is able to withstand the impact force of the jackhammer or hammer drill.

[0042] The invention also relates to a post driver comprising a jackhammer or hammer drill with a bit holder and an attachment as described above, which can be coupled to the jackhammer or hammer drill by placing the end part in the bit holder of the hammer drill.

[0043] The same advantages and effects as described above in respect of the attachment also apply for such a post driver.

[0044] The jackhammer or hammer drill is preferably an electric or electropneumatic jackhammer or hammer drill. This has the advantage that a compressor is not necessary, which makes the post driver exceptionally easy to transport and handle.

[0045] In a preferred embodiment the post driver comprises at least one element of an elastic material for the purpose of covering the inner wall of the space with the element. As described above in respect of the attachment, this increases safety. The elastic element is preferably releasable. The at least one elastic element is preferably slidable over the at least one wall of the attachment.

[0046] In a further preferred embodiment the post driver comprises at least two elements of an elastic material with different dimensions for accommodating different thicknesses of post and wall. Depending on the thickness of the post or the wall he/she wishes to drive into the ground, the user can select the suitable element with the

correct thickness for sliding over the attachment such that the outer end of the post or the wall part fits closely in the space.

[0047] The invention further relates to a method for manufacturing an attachment as described above, comprising of manufacturing the end part and the head part connected thereto and providing the head part with the upright wall such that it defines the space for receiving an outer end of the post or a part of a wall.

[0048] The same advantages and effects as described above for the attachment and the post driver according to the invention also apply for such a method.

[0049] The end part and the head part connected thereto are preferably manufactured integrally. The attachment is more preferably milled integrally from a metal block. This increases the strength of the attachment.

[0050] In a further embodiment the method comprises of heat-treating the attachment. This increases the hardness of the metal. The metal is for instance heated, after which it is cooled in a short time. The metal is then optionally heated again to a temperature lower than the first temperature, so that the metal becomes less brittle. Steel is for instance used for the attachment.

[0051] In a first step steel is for instance heated to 990-1020°C for 25-35 min, preferably to 1000-1010°C for 30 minutes. The steel is then cooled rapidly (quenched). In a second step, the tempering step, the metal is for instance twice heated to 500-550°C for two hours, preferably to 525°C for two hours, and then cooled slowly.

[0052] Finally, the invention relates to a method for driving a post or wall into the ground, comprising of:

- providing a jackhammer or hammer drill with a bit holder;
- providing an attachment as described above;
- coupling the attachment to the jackhammer or hammer drill by placing the end part in the bit holder;
- placing the head part of the attachment round an outer end of the post or round the wall part; and
- activating the jackhammer or hammer drill.

[0053] The same advantages and effects as described above for the attachment and the post driver according to the invention also apply for this method.

[0054] Further advantages, details and effects of the invention will be explained on the basis of exemplary embodiments, wherein reference is made to the accompanying figures.

- Figures 1A-1D show a first embodiment of the attachment according to the invention;
- Figures 2A-2B show a second embodiment of the attachment according to the invention;
- Figures 3A-3B show a third embodiment of the attachment according to the invention;
- Figure 4 shows a fourth embodiment of the attachment according to the invention which is a variant of

the third embodiment;

- Figure 5 shows an attachment according to the first embodiment in which a rubber insert part is provided;
- Figure 6 shows an attachment according to the third embodiment in which a rubber insert part is provided;
- Figure 7 shows a variant of the third embodiment of the attachment according to the invention; and
- Figures 8-9 show an embodiment of the attachment according to the invention of a square cross-section.

[0055] Attachment 2 (figures 1A-1D) comprises an end part 4 and a head part 6. Head part 6 comprises an upright wall 8 which defines a space 10. Space 10 further comprises a base 12 and an opening 14 arranged opposite thereto. In use an outer end of a post or a part of a wall is inserted into space 10 via opening 14 so that it is placed against base 12. In the shown embodiment the space for receiving the post is rectangular. The space has a length d1 of 100 mm and a width d2 of 65 mm. The outer dimensions of wall 8 are: length d3 is 115 mm and width d4 is 80 mm. The wall thickness is therefore 15 mm, wherein the wall thickness is slightly smaller close to the corners.

[0056] End part 4 of attachment 2 comprises a number of recesses 16 so that end part 4 can be coupled into a jackhammer or hammer drill. Following coupling to a jackhammer or hammer drill, the attachment can perform an up and downward movement in the direction of its longitudinal axis through activation of the jackhammer or hammer drill, wherein base 12 of space 10 strikes the part of the post or wall inserted into space 10 in order to drive it into the ground.

[0057] Space 10 varies from a strictly rectangular shape in that recesses 15 are arranged in the inner wall of wall 8 in the corners of the space. Recesses 15 take a round form in the shown embodiment. If a part of a post gets stuck in head part 6, a tool can be introduced into recesses 15, and the post can be prised loose. The round form also enables the use of a drill to drill away the part of a post which is jammed. A post is moreover prevented from becoming jammed by creating clearance at the corner points of a post placed in head part 6. Corners 17 of outer wall 8 are flattened or rounded in order to increase safety.

[0058] The transition from end part 4 to head part 6 is continuous, i.e. the width of attachment 2 increases gradually from end part 4 in the direction of head part 6. The transition does not display any abrupt increase in width here. Breaking of attachment 2 is hereby prevented. In the shown embodiment the transition from end part 4 to head part 6 follows a curvature of constant radius R. It is also possible according to the invention to give the transition another form.

[0059] End part 4 preferably transposes smoothly into transition part 5. As shown, it is possible according to the invention for attachment 2 to have a sharp transition where transition part 5 transposes into end part 6. The width of attachment 2 does not however increase abruptly

ly there but just remains constant. The transition from transition part 5 to end part 6 is alternatively also smooth (not shown).

[0060] Attachment 2 is embodied with an upright wall of rectangular cross-section. Other cross-sections are however possible. Figures 2A-2B show attachment 102 in which head part 106 has a round cross-section. Upright wall 108 takes a cylindrical form here. A round post can be introduced via opening 114.

[0061] Upright wall 108 has an outer diameter of 92 mm, an inner diameter of 75 mm and a wall thickness of 17 mm

[0062] Attachment 202 according to a third embodiment is provided for driving walls into the ground (figures 3A-3B). Head part 206 comprises two upright walls 208 which define a passage 214 in which a part of the wall can be placed. In other words, head part 206 has a U-shaped cross-section, wherein the walls 208 forming the legs of the U-shape can be placed on either side of a part of a wall. It is noted that attachment 202 is also suitable for driving posts into the ground, since these also fit into space 214.

[0063] The shown examples are all embodied from high-grade steel, wherein attachment 2, 102, 202 is milled integrally from a steel block. The steel has a hardness of 54 HRC.

[0064] Attachment 302 according to a fourth embodiment comprises a wall 308 in which a nut 318 is arranged. Space 310 can be made smaller and larger by adjusting the nut 318. In the shown embodiment there is one nut 318. A plurality of nuts or screws can also be provided according to the invention.

[0065] Nut 318 is preferably provided close to the outer end of wall 308. An opening for a nut or other fastening means is preferably made in each of two opposite walls 308.

[0066] Figure 5 shows an insert part in the form of a rubber sleeve 20. Sleeve 20 can be placed in space 10 of attachment 2 for the purpose of making the space smaller. Sleeve 20 comprises a closed bottom (not shown) which lies against the base 12 of attachment 2. Alternatively, the sleeve has no bottom.

[0067] Figure 6 shows an insert part in the form of rubber mat 220 which can be placed against the base 212 of attachment 202.

[0068] Alternatively, a wooden insert part can be applied instead of a rubber mat 220.

[0069] Hammer head 402 (figure 7) is a variant of hammer head 202 of figures 3A and 3B. Hammer head 402 has an end part 404 provided with recesses 416 for coupling to a jackhammer or hammer drill. Head part 406 comprises an upright wall 408 which defines a space for receiving a plank or wall part via opening 414 on the underside of head part 406. The outer ends of wall 408 are chamfered, thus forming narrowed portions 420.

[0070] The head part of the attachment can have any desired form. The cross-section of the head part is preferably basically rectangular. In the context of the inven-

tion rectangular also includes square. Figure 8 shows a hammer head according to the invention, the head part of which has a substantially square cross-section. That is, the space for receiving a post is substantially square. Figure 9 shows a cross-section along line IX-IX in figure 8. The basic square shape can be clearly identified in figure 9. Recesses are once again provided in the corners of the square form of the space in the head part for the purpose of forming clearance around the corners of an introduced post. These recesses have a substantially round form in the shown embodiment, but can also take a different form.

[0071] A method for driving a post into the ground will be described hereinbelow with reference to figure 1.

[0072] The user has a jackhammer or hammer drill. The user then places the outer end of attachment 2 into the bit holder of the jackhammer or hammer drill so that recesses 16 can co-act with the snap system of the bit holder. As soon as the attachment has been coupled to the jackhammer or hammer drill, the user places head part 6 over the outer end of the post which has to be driven into the ground. The outer end of the post is therefore situated in space 10. The jackhammer or hammer drill is activated so that the attachment performs an up and downward striking movement. Use is preferably made here of only a hammering movement, wherein rotating movement is not performed.

[0073] The invention is by no means limited to the above described preferred embodiments thereof. The rights sought are defined by the following claims, within the scope of which many modifications can be envisaged.

Claims

1. Attachment for coupling to a jackhammer or hammer drill so as to form a post driver, comprising:

- an end part placeable in a bit holder of the jackhammer or hammer drill and provided with coupling means for coupling the attachment to the bit holder of the jackhammer or hammer drill;
- a head part connected to the end part and having at least one upright wall which defines a space for receiving therein an outer end of a post or a part of a wall.

2. Attachment as claimed in claim 1, wherein the end part and head part are manufactured as one component.

3. Attachment as claimed in claim 1 or 2, wherein the head part is provided with an element, preferably of an elastic material, which is arranged in the space, wherein the element is preferably embodied as a releasable element.

4. Attachment as claimed in any of the foregoing

claims, comprising adjustable bounding means for adjusting the dimensions of the space.

5. Attachment as claimed in any of the claims 1-4, wherein the at least one upright wall forms a continuous upright edge for enclosing in use an outer end of a post placed in the space.

6. Attachment as claimed in any of the claims 1-4, wherein the at least one upright wall defines a passage with two open sides for receiving a part of a wall in the space during use such that this wall part extends through these open sides.

7. Attachment as claimed in any of the foregoing claims, wherein the end part and the head part are manufactured from high-grade steel.

8. Attachment as claimed in any of the foregoing claims, wherein the at least one upright wall of the head part defines a space with a substantially basic rectangular shape, wherein the space in at least one corner point of the basic shape is enlarged by a recess for the purpose of providing space around a corner of a rectangular post received in use in the space of the attachment.

9. Post driver, comprising:

- a jackhammer or hammer drill with a bit holder; and
- an attachment as claimed in any of the claims 1-8 which can be coupled to the jackhammer or hammer drill by placing the end part in the bit holder of the hammer drill, wherein the jackhammer or hammer drill is preferably an electric or electropneumatic jackhammer or hammer drill.

10. Post driver as claimed in claim 9, comprising at least one element, preferably of an elastic material, for the purpose of covering the inner wall of the space with the element.

11. Post driver as claimed in claim 10, comprising at least two elements, preferably of an elastic material, with different dimensions for accommodating different thicknesses of posts and wall parts.

12. Method for manufacturing an attachment as claimed in any of the claims 1-8, comprising of:

- manufacturing the end part and the head part connected thereto; and
- providing the head part with the upright wall such that it defines the space for receiving an outer end of the post or a part of a wall.

13. Method as claimed in claim 12, wherein the end part

and the head part connected thereto are manufactured integrally, wherein the attachment is preferably milled integrally from a metal block.

14. Method as claimed in claim 13, comprising of heat-treating the attachment. 5

15. Method for driving a post or wall into the ground, comprising of:

- providing a jackhammer or hammer drill with a bit holder; 10
- providing an attachment as claimed in any of the claims 1-8;
- coupling the attachment to the jackhammer or hammer drill by placing the end part in the bit holder; 15
- placing the head part of the attachment round an outer end of the post or round a part of the wall; and 20
- activating the jackhammer or hammer drill.

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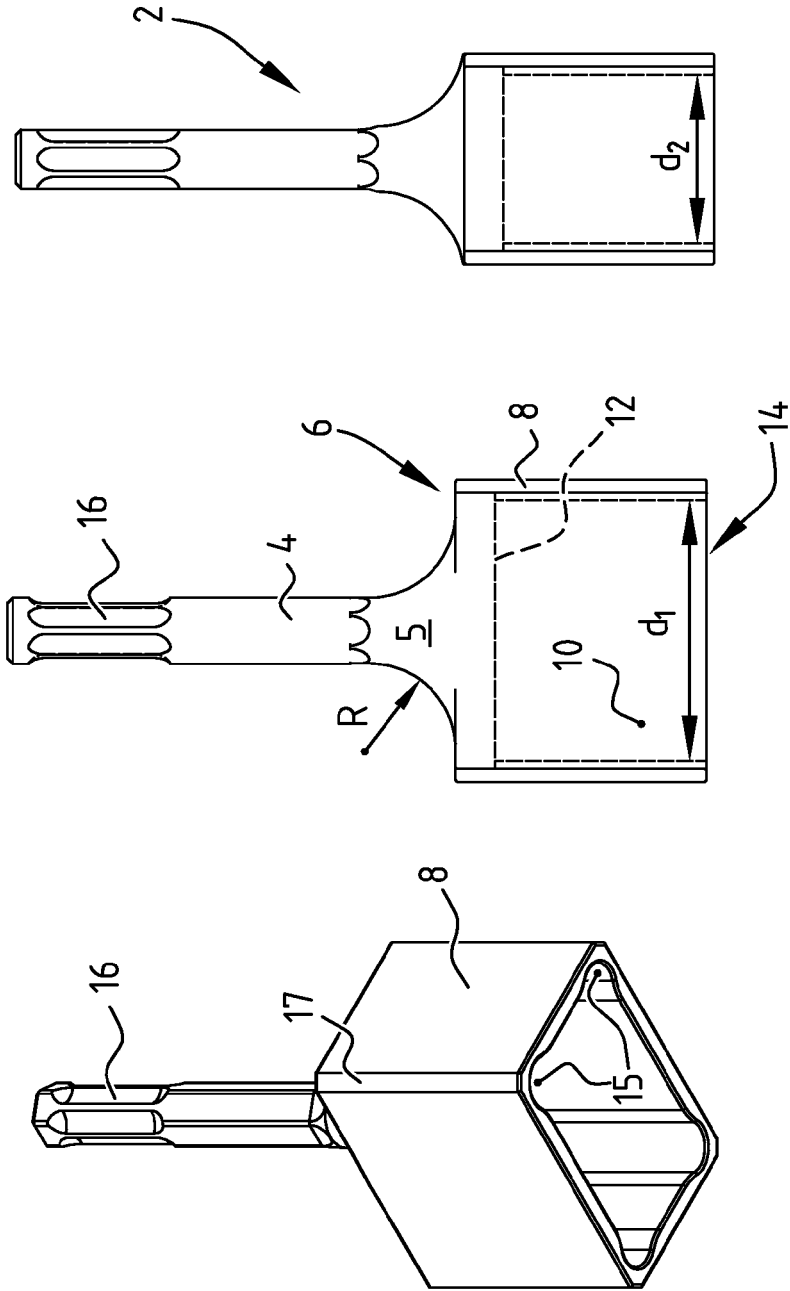
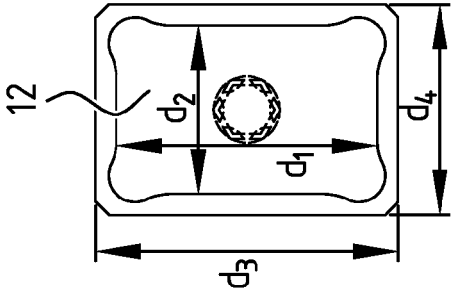


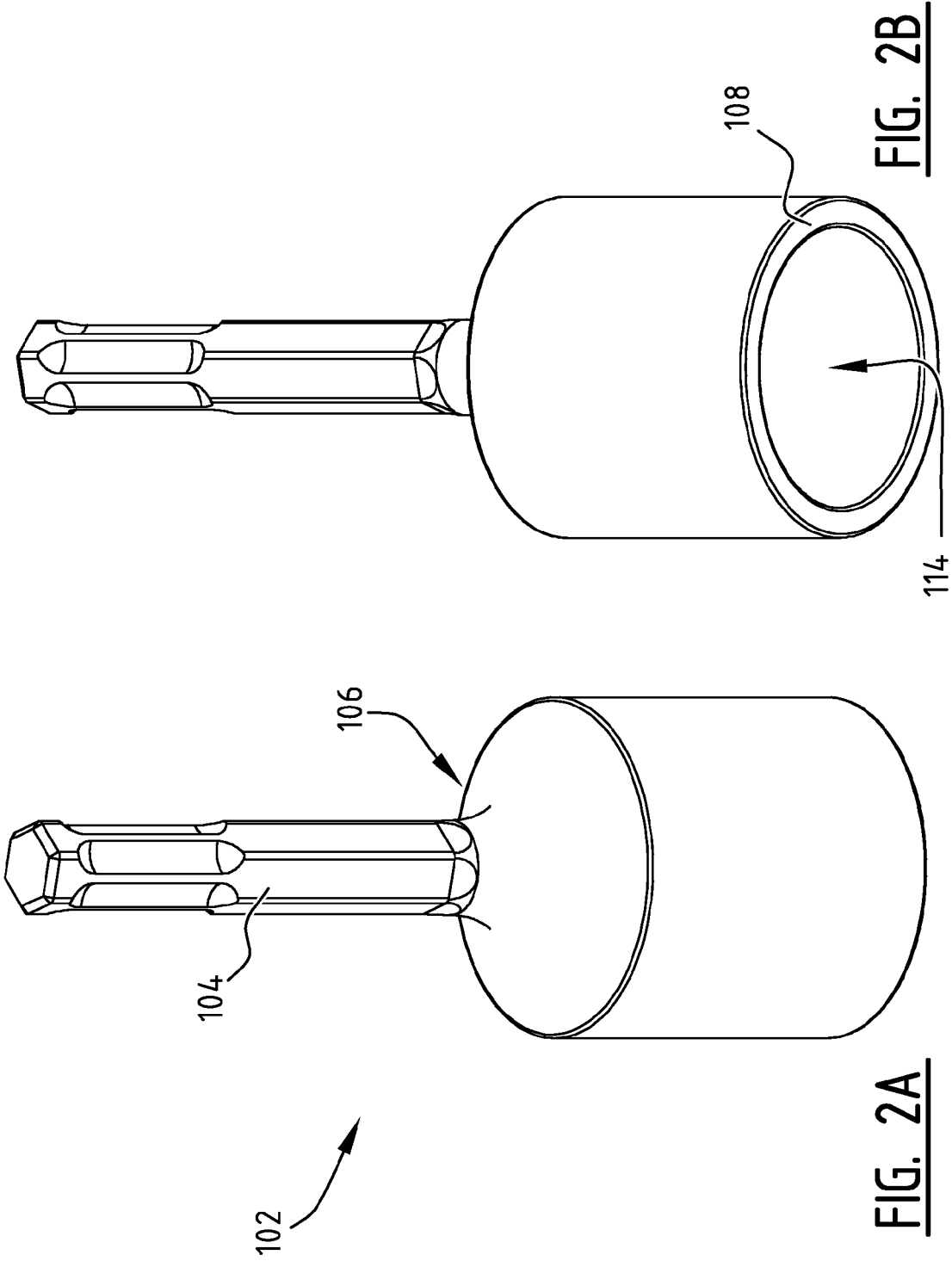
FIG. 1A

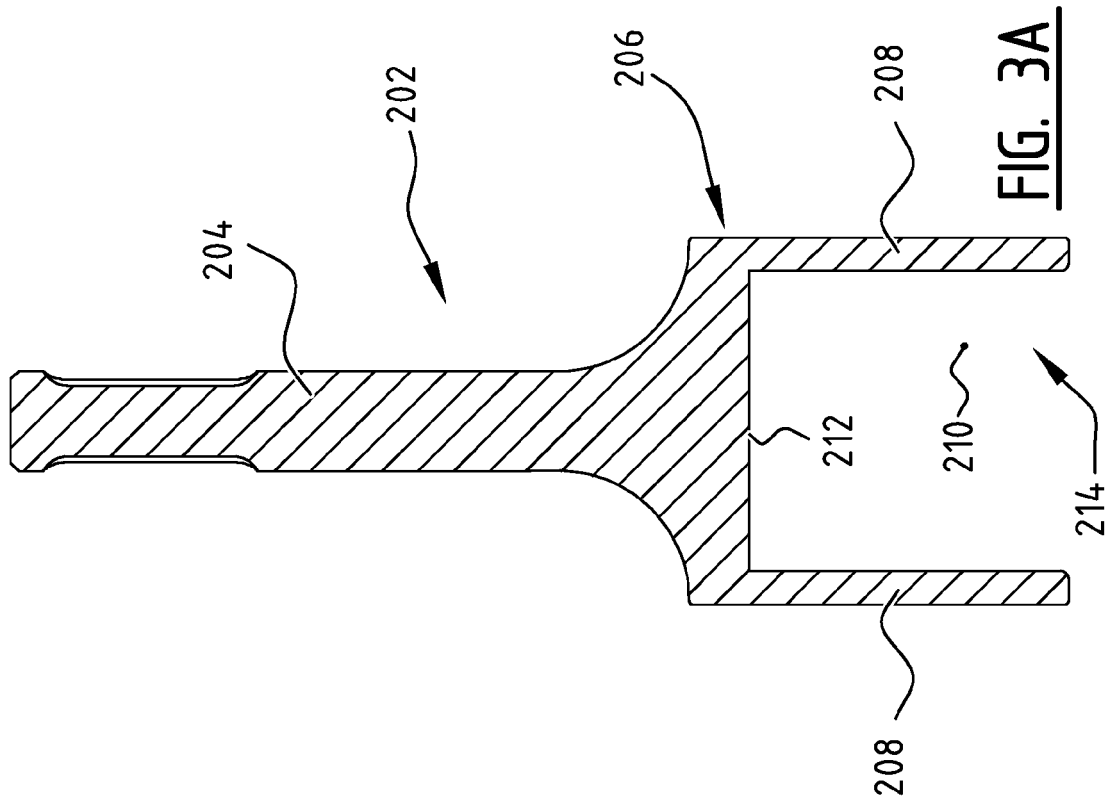
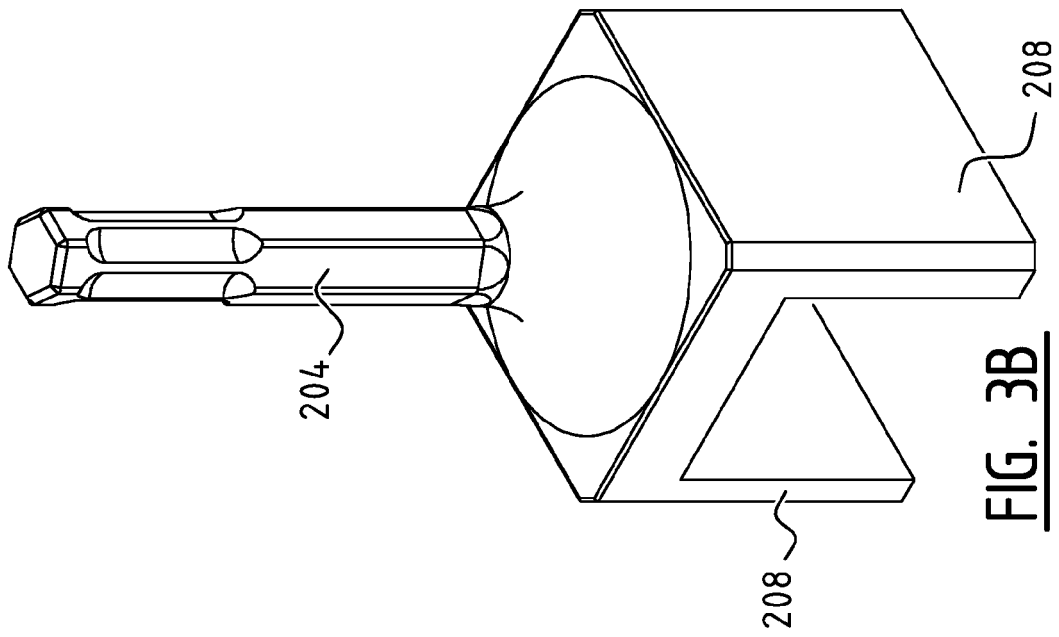
FIG. 1B

FIG. 1C

FIG. 1D







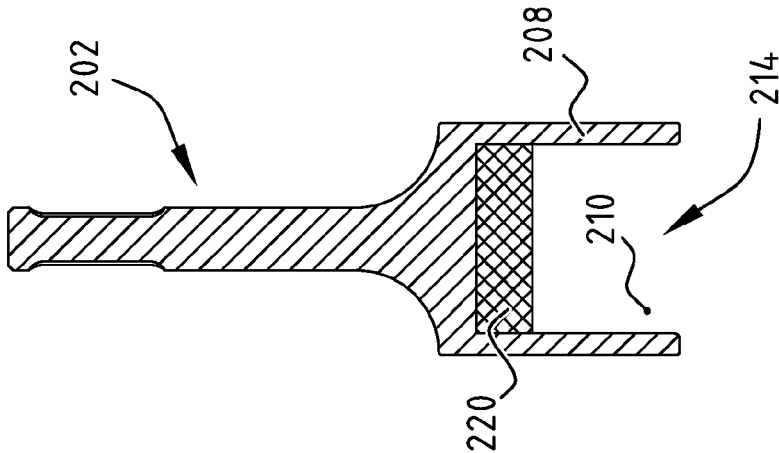


FIG. 6

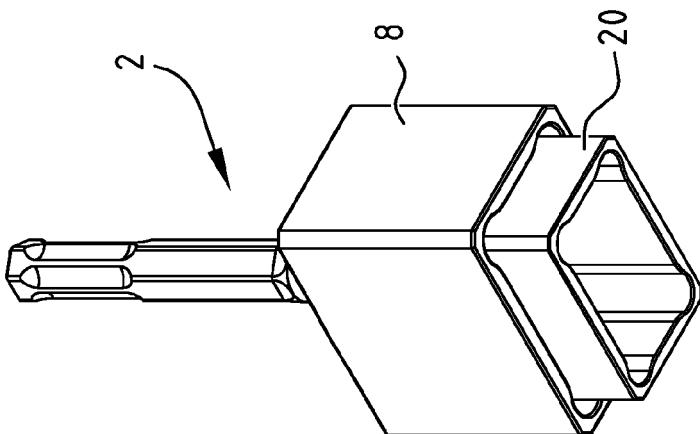


FIG. 5

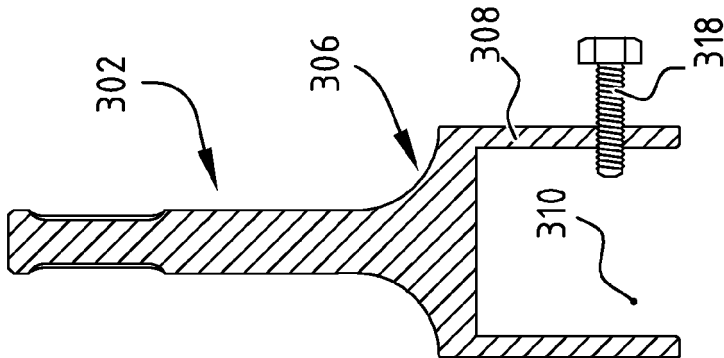
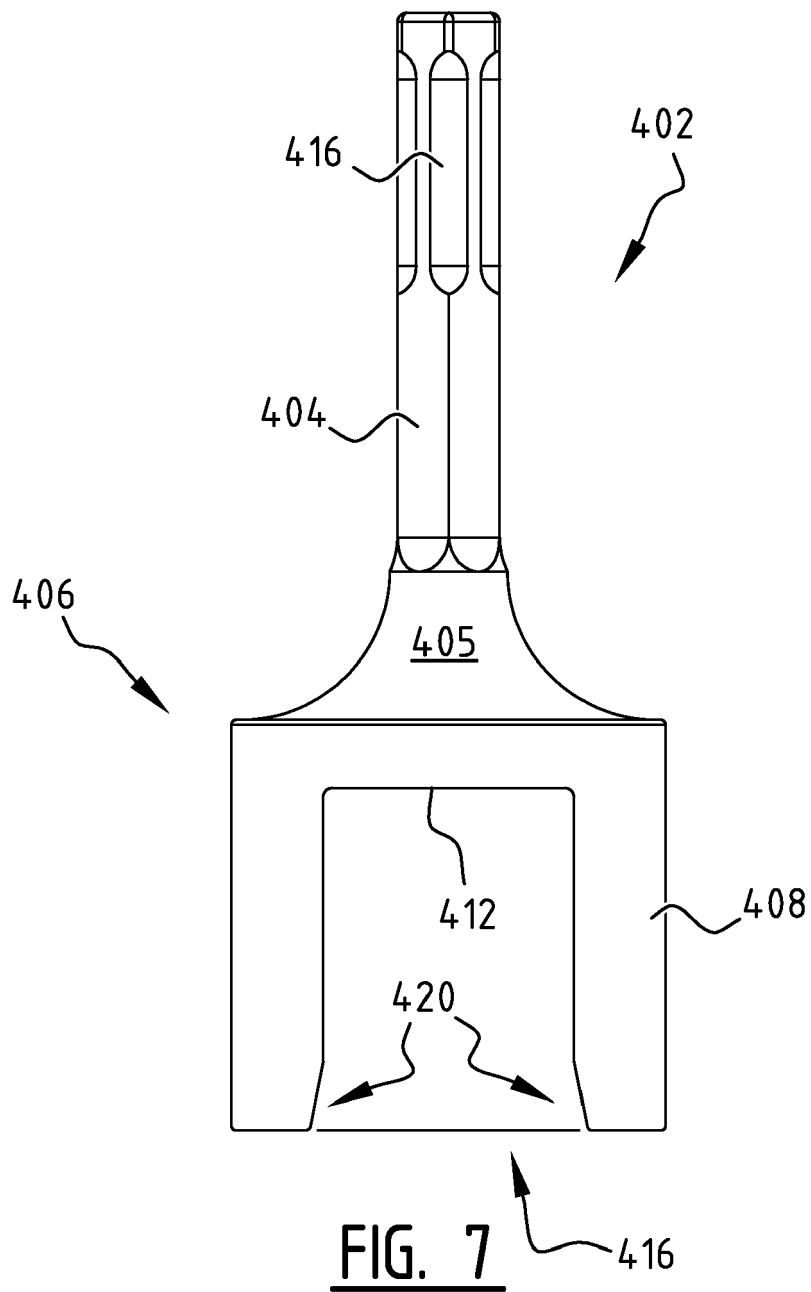


FIG. 4



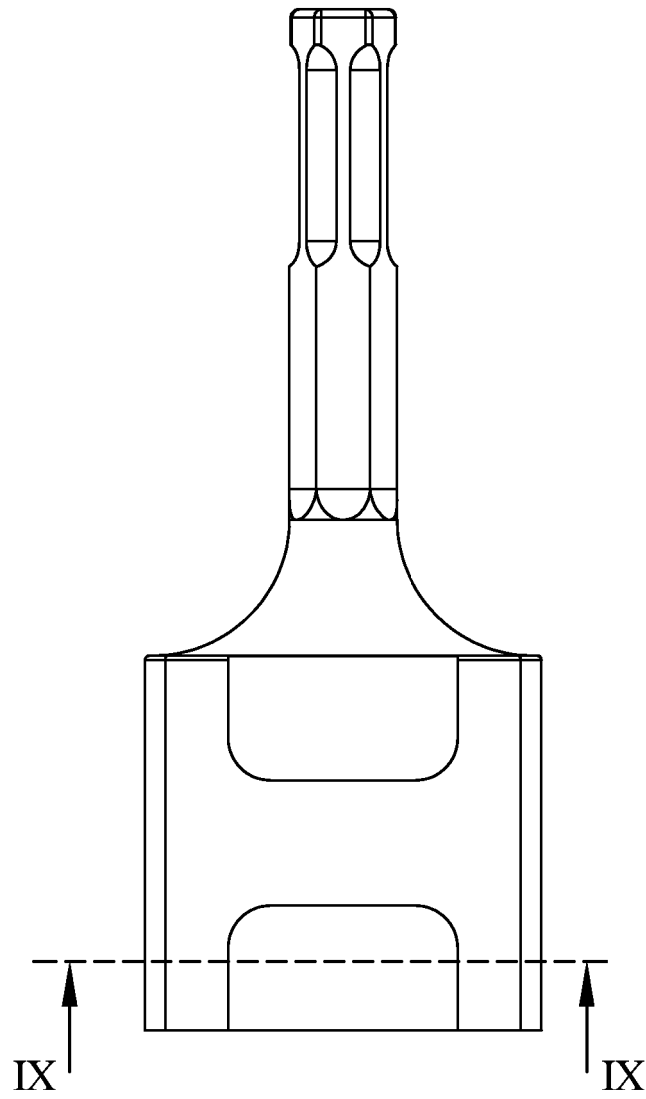


FIG. 8

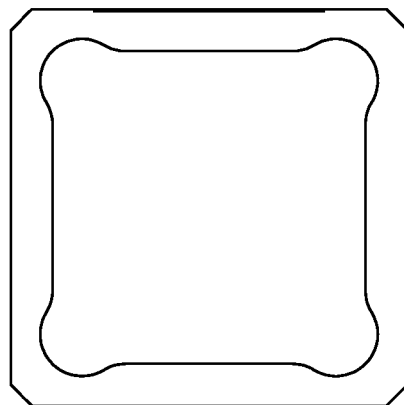


FIG. 9



EUROPEAN SEARCH REPORT

Application Number
EP 14 17 6753

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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