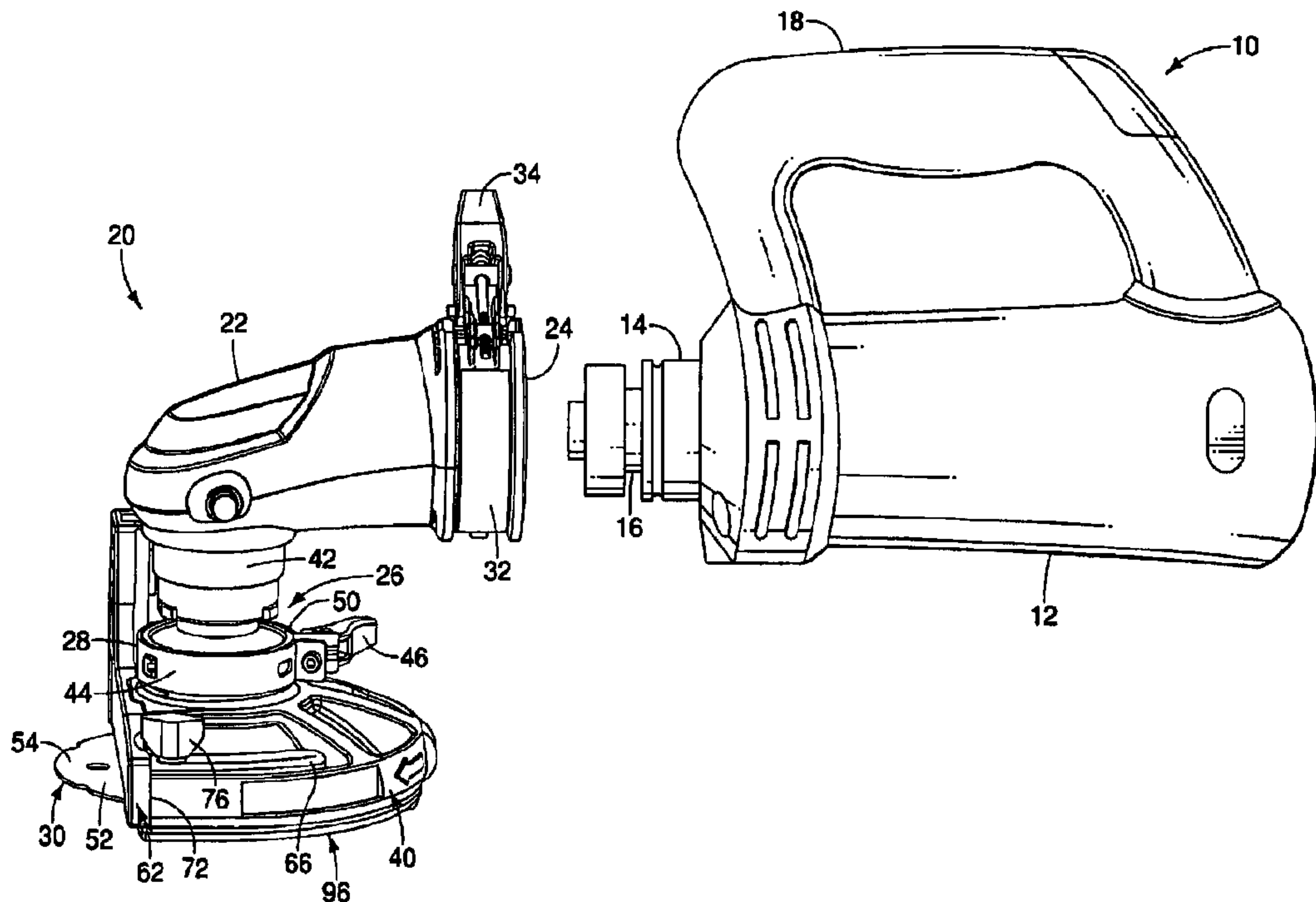




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(57) **Abrégé/Abstract:**

Embodiments of an accessory attachment (20) for a rotary power hand tool (20) are disclosed wherein the hand tool (10) is of the type which has a tool housing (12) with a preferably cylindrical nose portion (14), a motor having a motor drive shaft (26) with a mounting coupling extending forwardly from the nose portion for receiving a drive shaft, the attachment including a housing (22) having a first end portion configured to be mounted to the tool housing nose portion (14) and an input shaft (36) for coupling to the motor drive shaft, and having an enlarged second end portion oriented at a right angle relative to the first end portion and also having an output shaft (28) coupled to the input shaft (36) at a preferably right angle relative thereto, a rotary cutting wheel (30) mounted to the output shaft (28) and substantially disposed within the enlarged second end portion, excepting an exposed portion of the rotary cutting wheel (30) for engaging a work surface.



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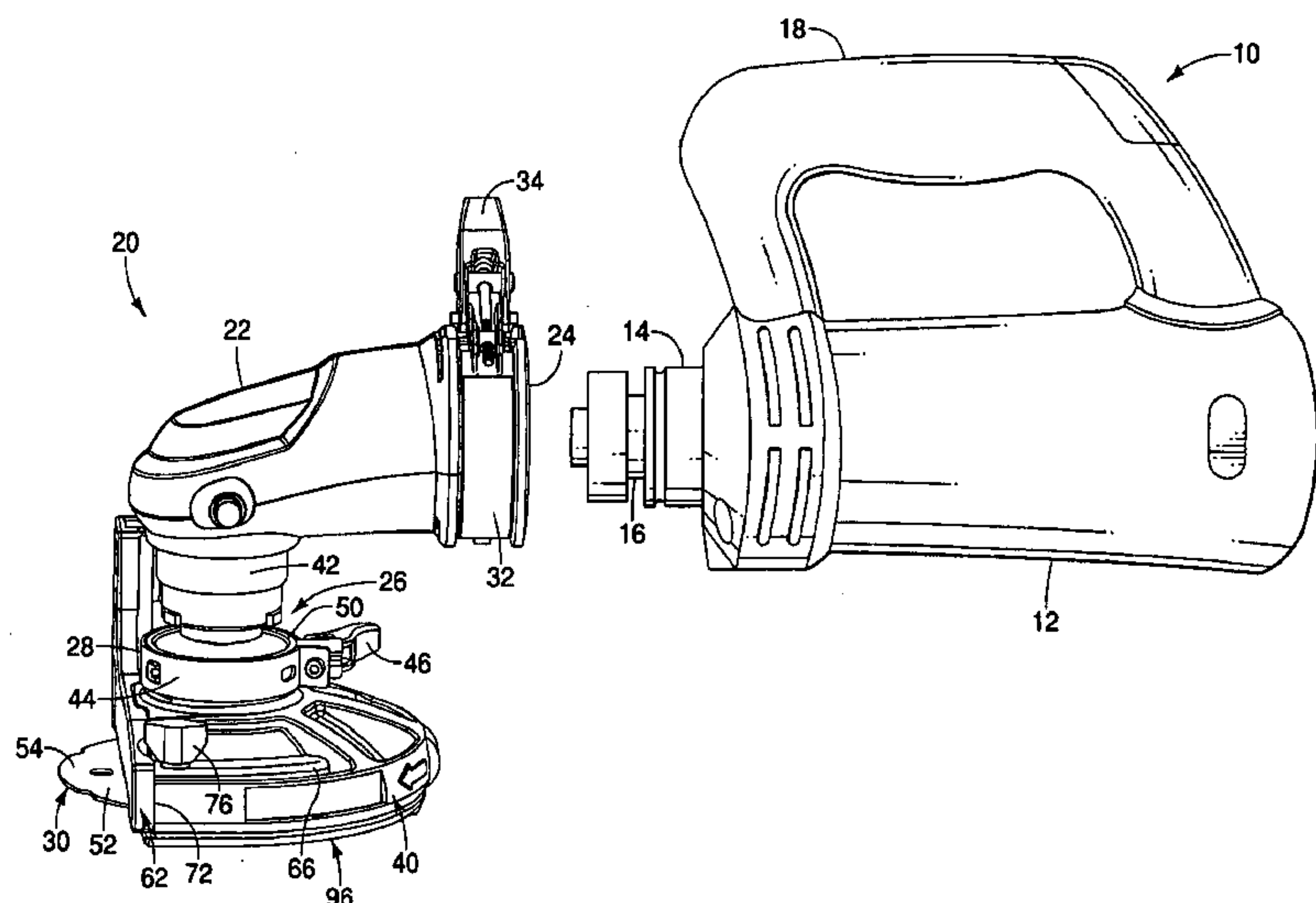
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(54) Title: CUTTING ATTACHMENT WITH A REMOVABLE COVER FOR ROTARY HAND TOOLS



(57) Abstract: Embodiments of an accessory attachment (20) for a rotary power hand tool (10) are disclosed wherein the hand tool (10) is of the type which has a tool housing (12) with a preferably cylindrical nose portion (14), a motor having a motor drive shaft (26) with a mounting coupling extending forwardly from the nose portion for receiving a drive shaft, the attachment including a housing (22) having a first end portion configured to be mounted to the tool housing nose portion (14) and an input shaft (36) for coupling to the motor drive shaft, and having an enlarged second end portion oriented at a right angle relative to the first end portion and also having an output shaft (28) coupled to the input shaft (36) at a preferably right angle relative thereto, a rotary cutting wheel (30) mounted to the output shaft (28) and substantially disposed within the enlarged second end portion, excepting an exposed portion of the rotary cutting wheel (30) for engaging a work surface.

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**CUTTING ATTACHMENT WITH A REMOVABLE COVER
FOR ROTARY HAND TOOLS**

1 **Background Art**

2 The present invention relates to small rotary hand tools, and more
3 specifically to cutting attachments for such rotary hand tools.

4 Undercut saws, or flush cut "jamb" saws, are used to trim door
5 jambs, baseboards and the like, to provide sufficient room to install materials,
6 such as wood flooring, carpeting and tile, underneath the jambs and
7 baseboards. There are many undercut saws on the market, but all known saws
8 are dedicated tools, in that they have few uses other than making the flush cuts
9 for which they were designed. While this exclusive use is welcomed by
10 artisans who use undercut saws on a regular basis and who want a tool that is
11 rugged and dependable, there are many woodworkers and occasional users that
12 would welcome having a tool with multiple uses, including performing flush
13 cuts.

14 Small rotary hand tools of the type that are marketed under the
15 Dremel[®] and Roto-Zip[®] brands, for example, typically include a generally
16 cylindrical housing that encloses only a motor with a rotary output shaft
17 extending from the nose end and a nose portion that is configured to connect to
18 various accessories or attachments. This simplicity affords tremendous
19 versatility, because it is capable of performing a multitude of additional tasks
20 depending on the particular accessory attachment that is attached to the tool.

21 Additionally, there has been continued innovation and
22 improvement in the design of accessories for such hand tools, particularly with
23 regard to the attachment of accessories that promote a particular, specialized
24 function of the rotary hand tool.

1 Disclosure Of Invention

2 Embodiments of an accessory attachment for a rotary power hand tool
3 are disclosed wherein the hand tool is of the type which has a tool housing with
4 a preferably cylindrical nose portion, a motor having a motor drive shaft with a
5 mounting coupling extending forwardly from the nose portion for receiving a
6 drive shaft, the attachment including a housing having a first end portion
7 configured to be mounted to the tool housing nose portion and an input shaft
8 for coupling to the motor drive shaft, and having an enlarged second end
9 portion oriented at a right angle relative to the first end portion and also having
10 an output shaft coupled to the input shaft at a preferably right angle relative
11 thereto, a rotary cutting wheel mounted to the output shaft and substantially
12 disposed within the enlarged second end portion, excepting an exposed portion
13 of the rotary cutting wheel for engaging a work surface, and a removable cover
14 configured to engage said enlarged second end portion to at least partially
15 enclose said rotary cutting wheel therebetween.

16

17 Brief Description Of The Drawings

18 FIGURE 1 is a side elevational view of a preferred accessory
19 cutting attachment with an exemplary rotary hand tool;

20 FIG. 2 is a bottom perspective view of the accessory cutting
21 attachment of FIG. 1;

22 FIG. 3A is a bottom perspective view of the accessory cutting
23 attachment of FIG. 1 without the optional cover;

24 FIG. 3B is a partial perspective view illustrating grit bonded to
25 the outer edge of the cutting wheel;

26 FIG. 4 is a top perspective view of the accessory cutting
27 attachment illustrated in FIG. 1;

28 FIG. 5 is a front perspective view of the accessory cutting
29 attachment illustrated in FIG. 1 shown with a straight edge guide;

30 FIG. 6 is an exploded front perspective view of the accessory
31 cutting attachment illustrated in FIG. 1;

1 FIG. 7 is a cross section of a portion of the attachment illustrated
2 in FIG. 1, showing the input and output shafts;

3 FIG. 8 is a top plan view of the domed cutting wheel of the
4 preferred embodiment of the accessory cutting attachment;

5 FIG. 9 is a side view of the domed cutting wheel shown in FIG.
6 8;

7 FIGS. 10 and 11 are perspective views of the mounting flange
8 used to attach the cutting wheel shown in FIGS. 8 and 9 to the preferred
9 embodiment of the accessory cutting attachment.

10

11 Best Mode of Carrying Out the Invention

12 Embodiments of the invention include an accessory cutting
13 attachment for a rotary hand tool that promotes a variety of cutting
14 applications. While it is contemplated that the accessory cutting attachment
15 may include mounting features configured to engage a variety of rotary hand
16 tools, FIG. 1 illustrates an exemplary rotary hand tool, designated generally at
17 10, to which the preferred embodiment of the attachment may be coupled. For
18 example, the rotary hand tool 10 may be of the type as those marketed under
19 the Dremel[®] and Roto-Zip[®] brands made by the Robert Bosch Tool
20 Corporation of Mount Prospect, IL.

21 Generally, as illustrated in FIG. 1, the rotary hand tool 10 is a
22 powered rotary hand tool of the type that includes a generally cylindrical
23 housing 12 preferably made of a rugged, impact resistant plastic material and
24 having a substantially cylindrical nose portion 14. Enclosed within the housing
25 12 is a motor (not shown) that drives a motor output shaft 16 that extends
26 through and from the nose portion 14. A detachable handle 18 is also
27 optionally provided with the hand tool 10.

28 FIGS. 1-7 illustrate an accessory cutting attachment, designated
29 generally at 20, according to a preferred embodiment of the invention. The
30 preferred cutting attachment 20 includes features promoting coupling of the
31 cutting attachment with the rotary hand tool 10. Advantageously, the preferred

1 cutting attachment 20 also includes a variety of features enabling a user to
2 perform a multitude of cutting applications. For example, when coupled to the
3 rotary hand tool 10, the preferred cutting attachment 20 may be used for
4 various undercutting applications, including door jamb cutting, as well as trim
5 and base board cutting for a predetermined adjustable depth, for example as
6 much as approximately 3/4 inch. Additionally, the preferred cutting attachment
7 20 includes features that promote use of the cutting attachment as a circular
8 saw when used in a vertical or other angled orientation.

9 More particularly, the preferred accessory cutting attachment 20
10 includes an attachment housing, designated generally at 22, having a coupling
11 end 24 configured to couple with the rotary hand tool 10, and an enlarged
12 cutting end, indicated generally at 26, disposed at a generally right angle to the
13 coupling end 24.

14 The attachment housing 22 is preferably composed of a rugged,
15 impact resistant plastic material and having an output shaft 28 and an input
16 shaft 36 that are interconnected by gears as shown in FIG. 7. The output shaft
17 28 is configured to drive a rotating tool, such as a rotary saw wheel, indicated
18 generally at 30. The output shaft 28 preferably has an upper flange 31 with a
19 threaded opening 33 for receiving a mounting flange 58 that clamps the wheel
20 30 to the upper flange 31. The upper flange 31 has an annular recess 35 that is
21 coextensive with a corresponding recess 126 in the mounting flange 58. The
22 upper flange 31 is securely mounted on the output shaft 28 by being press fit
23 thereon. The attachment housing 22 may be made from many materials, such
24 as nylon, ABS, or polypropylene, preferably 33% glass-filled nylon.
25 Preferably, the cutting attachment 20 includes two halves that matingly engage
26 one another in a clamshell engagement to form the single attachment housing
27 22, though it is contemplated that the attachment housing may be made of a
28 greater or lesser number of parts.

29 The coupling end 24 of the attachment housing 22 is generally
30 cylindrical in shape, and includes a generally circular opening that is sized and
31 configured to snugly and matingly receive cylindrical nose portion 14 of the

1 rotary hand tool 10. To maintain engagement of the attaching housing 22 to
2 the rotary hand tool, the coupling end 24 also preferably includes a locking
3 mechanism, such as an annular band clamp 32 disposed around an outer
4 circumference thereof. The annular band clamp 32 also preferably includes a
5 cam lock 34 such that the band clamp 32 may be tightened around the outer
6 circumference of the coupling end 24 and then locked into the tightened
7 position.

8 Coupling of the drive shaft 16 of the rotary hand tool 20 to the
9 input shaft 36 of the cutting attachment 20 may be accomplished in a variety of
10 ways. For example, a drive nut may be coupled to the motor drive shaft 16
11 which has a hexagonal or square opening that engages a suitable coupling on
12 the input shaft 36 in a manner that assured non slipping rotation, but sliding
13 decoupling when the attachment is removed from the tool 10 as is known to
14 those of ordinary skill in the art. Alternatively, the input shaft 36 of the cutting
15 attachment 20 may have a square or other noncircular configuration. In this
16 manner, the rotary hand tool 10 and cutting attachment 20 are mechanically
17 coupled, with the motor output shaft 32 of the rotary hand tool, and input shaft
18 36 of the cutting attachment properly aligned.

19 The enlarged cutting end 26 of the attachment housing 22 is
20 preferably configured to provide a variety of tasks, such as undercutting, flush-
21 cutting, as well as operating as a circular saw when the cutting attachment 20 is
22 used in a vertical or other angled orientation.

23 To this end, the enlarged cutting end 26 of the attachment
24 housing 22 includes a blade guard, indicated generally at 40, configured to
25 operationally enclose a substantial portion of the rotary cutting wheel 30.
26 While it is contemplated that the blade guard 40 may be unitary with the
27 enlarged cutting end 26 of the attachment housing 22, for purposes of
28 illustration, the blade guard is shown and described as being releasably secured
29 to a nose portion 42 of the enlarged cutting end, such as via a band clamp 44
30 and cam lock 46. It is further contemplated that alternative locking
31 mechanisms, such as a snap-fit or frictional engagement, may be provided in

1 place of the band clamp 44 and cam lock 46 without departing from the scope
2 of the invention.

3 The blade guard 40 is preferably bowl-shaped, with a concave
4 portion 48 for containing the rotary cutting wheel 30 therein. A generally ring-
5 shaped collar 50 extends upwardly from a surface of the blade guard 40
6 opposite the receiving portion to engage the nose portion 44 of the enlarged
7 cutting end 26, and it is around this collar 50 that the band clamp 44 and cam
8 lock 46 are preferably secured to releasably secure the blade guard to the
9 enlarged cutting end.

10 The rotary cutting wheel 30 is dome-shaped, having a preferably
11 smooth, but segmented annular flange 52 disposed around an outer
12 circumference thereof and having a cutting edge 54 and an offset center hub
13 portion 56. The rotary cutting wheel 30 is designed to cut through wood and
14 small nails, and its configuration enables the attachment 20 to make flush cuts
15 in a work surface. The segmented wheel 30 preferably has tungsten carbide
16 grit bonded to its perimeter surface 54, but not on either side face.
17 Alternatively, a grit containing diamond particles may be bonded to the surface
18 54.

19 The segmented wheel 30 is shown in detail in FIGS. 8 and 9. It is
20 segmented in that it has six dust evacuating recesses 110 equally spaced around
21 its circumference, all of which have a negative rake angle portion 112 that
22 merges with a generally cylindrical portion 114. The negative rake angle
23 portion 112 is provided for safety reasons so that if a user comes in contact
24 with the wheel during operation (and given the fact that the direction of
25 rotation is clockwise as shown in FIG. 8), it will be less likely that an edge will
26 tear the flesh of the user as severely as may otherwise occur. In this regard, if
27 the wheel were rotated in the counterclockwise direction, the intersection of
28 portion 114 with the outer cutting edge 54 presents a sharp corner that could
29 result in severe injury to a user.

30 The segmented wheel 30 preferably has Tungsten Carbide grit
31 bonded to the outside edge 54, including the negative rake portions 112, but

1 preferably not extending to the side walls or faces of the annular flange portion
2 52. In this regard, the thickness of the wheel 30 is preferably substantially
3 constant and is preferably made from standard 20 gauge sheet steel which has
4 been found to provide the necessary strength and stiffness during operation. If
5 thinner stock were used, there is a likelihood that instability, warping or
6 bending could occur that would detrimentally affect the quality of cuts that may
7 be made with the wheel 30. Also, the thickness of the annular flange 52 is
8 preferably minimized so that the kerf that is made during the cutting action is
9 minimized. The 20 gauge sheet metal that is preferred has a thickness T of
10 0.910 +/- 0.076 millimeters before painting.

11 With regard to the kerf, it is greatly preferred that the Tungsten
12 Carbide grit that is bonded to the perimeter not extend to the face because this
13 will significantly increase the kerf. Since this wheel and attachment may be
14 often used with a portable tool that may be driven by a battery pack, it is
15 important that the amount of power required to operate the attachment be
16 minimized to prolong battery life. When Tungsten Carbide grit is bonded to
17 the outer surface, the thickness increases to approximately 1.45 millimeters
18 because of some unavoidable outward extension of the grit. It has been found
19 that if grit were extended along the side faces of the annular flange 52, the
20 thickness is increased to 2.00 millimeters which results in 20% increased power
21 consumption during operation. This necessarily reduces the operating life
22 between charges of a battery pack by a significant amount. It has also been
23 found that when grit is applied only to the edge 54 that a better, smoother cut is
24 produced than that which occurs when grit is applied to the side faces of the
25 flange 52.

26 It has also been found that the configuration of the wheel for cut
27 off purposes, as contrasted with similarly shaped wheels for performing
28 grinding operations, that effective operation is achieved when the diameter of
29 the center hub 56 (D2 in FIG. 9) is within the range of 20-35% of the overall
30 diameter of the wheel (D3) as shown in FIG. 9. Additionally, the diameter
31 (D1) of an opening 116 be within the range of 10-15% of the overall diameter

1 D3 of the wheel 30. The center hub 56 portion is offset by an amount H as
2 shown in FIG. 9 and it is preferred that this dimension be within the range of 7-
3 13% of the overall diameter D3. The offset H is sufficient to enable the
4 mounting flange 58 which is shown in detail in FIGS. 10 and 11 to fit and not
5 interfere with flush cutting being performed by the wheel 30.

6 It is preferred that the overall diameter of the wheel be
7 approximately 98 millimeters. It is also preferred that the conical portion 118
8 be at an angle shown with a base diameter D4 that is approximately 55
9 millimeters with the center hub diameter being approximately 28 millimeters
10 and the height H being approximately 11 millimeters.

11 The wheel 30 is mounted on the attachment 20 by the mounting
12 flange 58 which is shown in detail in FIGS. 10 and 11. The mounting flange
13 58 has a threaded extension 120 that has approximately four threads 122 and a
14 reduced diameter portion 124 that is provided for better termination of the
15 threads 122. It also has an annular cavity 126, which in combination with the
16 annular cavity 35 of the upper flange 31, causes the flanges 58 and 31 to
17 function as relief flanges whereby an annular contact surface 128 (of mounting
18 flange 58 and a similar surface on upper flange 31) is provided for clamping
19 the wheel 30 to the attachment in a ring rather than a disk. This ring clamping
20 configuration is advantageous because it enables the mounting flange 58 and
21 upper flange 31 to be used with an organic reinforced wheel as well as a sheet
22 metal wheel 30 and still comply with the ANSI specifications for cutoff
23 wheels. Such relief flanges that clamp in a ring reduce the likelihood that an
24 organic reinforced wheel 30 will bend or crack. The thickness of the mounting
25 flange 58, i.e., the distance from the surface 128 and the top of the hexagonal
26 mounting portion 60 is preferably approximately 9 millimeters, which is
27 adequate to reliably hold the wheel in the attachment and not extend beyond
28 the plane of the annular flange 52 so as to interfere with flush cutting.

29 As shown in FIG. 11, the hexagonal mounting portion 60 enables
30 a wrench to be used to tighten or loosen the mounting flange 58. It also has a
31 hexagonal recess 130 that enables a hexagonal driver to be used for the same

1 purpose. Such dual drive systems provide more convenience to the user in
2 mounting and removing wheels 30 from the attachment 20. It is also noted that
3 the flange 58 is integrally formed in that the hex mounting portion 60 is
4 preferably formed simultaneously with the larger portion. This portion having
5 the annular face 128 is significantly larger than the size of the hex mounting
6 portion which desirably lowers the stress that is applied to the wheel 30. In this
7 regard, the diameter of the face 128 is preferably only slightly smaller than the
8 size of the center hub 56 of the wheel to maximize the bearing surface applied
9 to the center hub, as illustrated in FIG. 3A. This prevents damage to softer
10 materials by decreasing the pressure applied to the wheel 30 which can be
11 important if the wheel is made of organic or fibrous reinforced material.

12 It is contemplated that the cutting attachment 20 may be operated
13 at any angle between those designations known to those skilled in the art as
14 “vertical” and “horizontal,” where “horizontal” refers to operation of the
15 cutting attachment during undercutting and flush cutting applications where the
16 cutting plane of the wheel is horizontal and the wheel is flush cutting a vertical
17 surface such as a baseboard of a wall, for example. Vertical then means the
18 cutting plane of the wheel is generally perpendicular to a horizontal surface.

19 The preferred cutting attachment 20 also preferably includes
20 additional features to promote depth of cut adjustment, such as a pivoting foot,
21 designated generally at 62. Advantageously, the preferred pivoting foot 62
22 promotes a smooth, easy and user-friendly mechanism to determine and
23 maintain a desired depth of cut. The pivoting foot 62 is preferably configured
24 to be pivotably coupled to the blade guard 40 to permit the user to determine
25 and maintain the desired depth of cut.

26 As illustrated in FIGS. 1-6, the pivoting foot 62 is preferably an
27 elongated member 64 having an elongated extension 66 extending from one
28 end thereof, with the extension having a curved slot 67. At an end of the
29 elongated member 64 opposite the one end having the elongated extension 66,
30 a mounting bracket 68 is provided to fixedly couple the pivoting foot 62 to the
31 blade guard 40. The mounting bracket 68 is secured to the blade guard 40 via a

1 fastener 70, which may include a variety of fasteners, such as a shoulder rivet,
2 a plain rivet with a shaft retainer, a threaded connection or any number of
3 cylindrical-type fasteners, to name a few. The fastener 70 securing the
4 mounting bracket 68 to the blade guard 40 serves as a pivoting point for the
5 pivoting foot 62, whereas the elongated extension 66 is configured to be
6 selectively moveable with respect to the blade guard. By selectively pivoting
7 the pivoting foot 62 about the pivot point defined by the mounting bracket 68, a
8 user may determine the desired cutting depth.

9 More particularly, at maximum depth of cut, the elongated
10 member 64 is configured to be generally parallel to a generally squared end 72
11 of the blade guard 40. The blade guard 40 preferably includes a curved
12 channel 74 that is correspondingly configured to promote sliding reciprocation
13 of the elongated extension 66 therein, where the elongated extension may be
14 removably secured into a desired position via engagement of a wing nut 76 or
15 other fastener at a particular position along a length of the curved slot 67. At
16 the maximum depth, the elongated extension 66, with the wing nut 76 coupled
17 to an extreme lower end 78 of the curved slot 67.

18 The wing nut 76 may be loosened or removed to permit
19 reciprocation of the slot extension 66 relative to the wing nut and the curved
20 channel 74 until the pivoting foot 62 is placed in the desired position to obtain
21 the desired depth of cut. The wing nut 76 is then replaced and/or tightened to
22 lockingly secure the position of the pivoting foot 62 relative the blade guard 40.

23 The elongated member 64 is preferably configured to have an
24 outwardly facing planar surface that is configured at a lower edge 80 to expose
25 the rotary cutting wheel 30. More particularly, the lower edge 80 includes an
26 opening or aperture to permit extension of the rotary cutting wheel 30
27 therethrough when the pivoting foot 62 is coupled to the enlarged cutting end
28 26. Accordingly, as depth of cut is adjusted, increasingly larger portions of top
29 and bottom surfaces of the rotary wheel 30 are exposed via the lower edge 80
30 of the elongated member 64, thereby promoting correspondingly increasingly
31 larger depths of cut, as determined by the user.

1 In this manner, the pivoting foot 62 permits the user to determine
2 and maintain a depth of cut from a range of depths, such as from 0" to a
3 maximum of approximately ¾". Advantageously, the outwardly facing planar
4 surface of the pivoting foot 62 may also serve as a stable and secure base
5 during operation of the cutting attachment 20 as a vertical or otherwise angled
6 circular saw. In other words, the cutting attachment 20 may be used as a
7 circular saw.

8 The pivoting foot 62 may also be optionally configured to
9 include a straight edge guide, indicated generally at 82, which advantageously
10 promotes the accurate cutting of long, straight cuts when the cutting attachment
11 20 is used in the vertical orientation where there is a guide surface against
12 which the edge guide can follow.

13 More particularly, the pivoting foot 62 may include a slotted
14 bracket 84 in which to releasably secure the straight edge guide 82. The slotted
15 bracket 84 is generally rectangular in shape, with a generally rectangular
16 passage 86 therethrough.

17 It is contemplated that the slotted bracket 84 may be configured
18 to receive a straight edge guide such as the straight edge guide 82 shown in
19 FIG. 5. When provided, the straight edge guide 82 includes a generally
20 rectangular, elongated member 88 that is configured to fit in the rectangular
21 passage 86 of the slotted bracket 84 and be slidable with respect thereto. An
22 orifice 90 disposed within the rectangular passage 86 is configured to receive a
23 threaded fastener (not shown) that can be tightened when the straight edge
24 guide 82 is properly positioned. Thus, the elongated member 88 may be
25 slidably moved within the rectangular passage 86 until the desired position is
26 achieved, at which point the fastener is tightened within the orifice 90 and
27 holds the straight edge guide 82 in the desired position.

28 The straight edge guide 82 also preferably includes an alignment
29 member, indicated generally at 92, for alignment with an edge of the work
30 piece to be cut. For example, when the cutting attachment 20 is used in the
31 vertical position, a generally planar surface 94 of the alignment member 92,

1 which is oriented to be generally parallel with the annular flange 52, abuts the
2 work piece to guide the rotary cutting wheel 30 in a linear cutting path parallel to
3 the planar surface of the alignment member.

4 The preferred cutting attachment 20 may also optionally include a
5 removable cover, designated generally at 96, to protect the user from injury when
6 the cutting attachment 20 is operated in the vertical orientation. The cover,
7 indicated generally at 96, and the blade guard 40 are configured to engage one
8 another such that the cover and blade guard at least partially sandwich the rotary
9 cutting wheel 30 therebetween. The preferred cover 96 includes a pair of
10 diametrically opposed hooks 98 extending upwardly from a surface of the cover
11 oriented to face the rotary cutting wheel 30, as well as a locking member 100
12 extending upwardly from the surface of the cover oriented to face the rotary
13 cutting wheel toward an outer edge thereof, and at a position intermediate the pair
14 of hooks 98.

15 In the closed position, the hooks 98 engage correspondingly
16 configured locking recesses with shelves 99 disposed on opposite sides of the
17 blade guard 40, and the locking member 100 releasably clamps to a surface in
18 another recess 101 located near the mounting end portion of the of the blade guard.
19 On an external surface 102 of the cover 96, corresponding to the location of the
20 locking member 100, is a release button 104 which, when depressed, releases the
21 clamping force of the locking member, thereby permitting the user to quickly and
22 easily disengage the cover 96 from the blade guard 40.

23 While various embodiments of the present invention have been
24 shown and described, it should be understood that other modifications,
25 substitutions and alternatives are apparent to one of ordinary skill in the art. The
26 scope of the claims should not be limited by particular embodiments set forth
27 herein, but should be construed in a manner consistent with the specification as a
28 whole.

29 Various features of the invention are set forth in the following claims.

1 **CLAIMS:**

2

3 1. An accessory attachment for a rotary power hand tool of the type which
4 has a tool housing with a nose portion, a motor having a motor drive shaft with
5 a mounting coupling extending forwardly from the nose portion for receiving a
6 drive shaft, said attachment comprising:

7 a housing having first and second end portions, said first end portion
8 configured to be mounted to the tool housing nose portion and an input shaft for
9 coupling to the motor drive shaft, said second end portion oriented at an angle
10 relative to said first end portion and having an output shaft coupled to said input
11 shaft at an angle relative thereto;

12 a rotary cutting wheel mounted to said output shaft and substantially
13 disposed within said second end portion, excepting an exposed portion of said
14 rotary cutting wheel for engaging a work surface;

15 a mounting flange for clamping said rotary cutting wheel to said output
16 shaft of said accessory attachment, said mounting flange having a hexagonal
17 mounting portion, an enlarged flange portion having a contacting surface, a
18 threaded extension with a threaded end portion, said flange portion being
19 integrally formed with the hexagonal mounting portion; and

20 a removable cover configured to engage said second end portion to at
21 least partially enclose said rotary cutting wheel therebetween.

22

23 2. The accessory attachment of claim 1 wherein said removable cover and
24 said second end portion being configured to releasably and lockingly engage
25 one another.

26

1 3. The accessory attachment of claim 1 wherein said rotary cutting wheel
2 further comprises a dome-shaped wheel having an annular cutting flange and a
3 recessed hub.

4

5 4. The accessory attachment of claim 3 wherein said second end portion
6 further comprises a correspondingly dome-shaped outer configuration and
7 encloses a substantial portion of said rotary cutting wheel therein.

8

9 5. The accessory attachment of claim 1 wherein said cover has at least two
10 hooks located on opposite sides of the wheel, each of which engage a recess in
11 said second end portion, and a locking member for engaging a third recess in
12 said second end portion.

13

14 6. The accessory attachment of claim 5 further comprising a release button
15 operatively connected to said locking member, said release button releasing the
16 clamping force of the locking member when said release button is pressed.

17

18 7. The accessory attachment of claim 1 wherein said rotary cutting wheel
19 comprises a dome-shaped cutting wheel having a recessed hub portion with a
20 flat center hub portion in which a mounting opening is located and an annular
21 outer flange, said annular flange having side faces and an outer peripheral
22 cutting surface.

23

24 8. The accessory attachment of claim 7 wherein said outer peripheral
25 surface has tungsten carbide grit bonded thereto.

26

1 9. The accessory attachment of claim 7 wherein said annular flange has a
2 first predetermined diameter, said center hub portion has a second
3 predetermined diameter, said mounting opening has a third predetermined
4 diameter, said annular outer flange has a predetermined thickness and the plane
5 of said center hub portion is displaced from the plane of said outer flange by a
6 predetermined height.

7

8 10. The accessory attachment of claim 9 wherein said predetermined height
9 is within the range of about 7 to about 13% of said first predetermined
10 diameter.

11

12 11. The accessory attachment of claim 9 wherein said second predetermined
13 diameter is within the range of about 20 to about 35% of said first
14 predetermined diameter.

15

16 12. The accessory attachment of claim 9 wherein said third predetermined
17 diameter is within the range of about 10 to about 15% of said first
18 predetermined diameter.

19

20 13. The accessory attachment of claim 9 wherein said first predetermined
21 diameter is about 98 millimeters.

22

23 14. The accessory attachment of claim 9 wherein the predetermined
24 thickness of said outer flange is about 0.91 millimeters and said wheel is made
25 from steel.

26

1 15. An accessory attachment for a rotary power hand tool of the type which
2 has a tool housing with a nose portion, a motor having a motor drive shaft with
3 a mounting coupling extending forwardly from the nose portion for receiving a
4 drive shaft, said attachment comprising:

5 a housing having first and second end portions, said first end portion
6 configured to be mounted to the tool housing nose portion and an input shaft for
7 coupling to the motor drive shaft, said second end portion oriented at an angle
8 relative to said first end portion and having an output shaft coupled to said input
9 shaft at an angle relative thereto;

10 a rotary cutting wheel mounted to said output shaft and substantially
11 disposed within said second end portion, excepting an exposed portion of said
12 rotary cutting wheel for engaging a work surface; wherein said rotary cutting
13 wheel comprises a dome-shaped cutting wheel having a recessed hub portion
14 with a flat center hub portion in which a mounting opening is located and an
15 annular outer flange, said annular flange having side faces and an outer
16 peripheral cutting surface;

17 a removable cover configured to engage said second end portion to at
18 least partially enclose said rotary cutting wheel therebetween; and

19 a mounting flange for clamping said rotary cutting wheel to said output
20 shaft of said accessory attachment, said mounting flange having a hexagonal
21 mounting portion, an enlarged flange portion having a contacting surface, a
22 threaded extension with a threaded end portion, said flange portion being
23 integrally formed with the hexagonal mounting portion.

24

25 16. The accessory attachment of claim 15 further comprising an annular
26 cavity in said flange portion which causes said contacting surface to be ring
27 shaped.

1

2 17. The accessory attachment of claim 15 further comprising a reduced
3 diameter portion between said threaded end portion and said flange portion.

4

5 18. The accessory attachment of claim 15 further comprising a hexagonal
6 recess formed in said hexagonal mounting portion.

7

8 19. The accessory attachment of claim 15 wherein the outer diameter of said
9 flange portion is substantially the size of said center hub portion of said wheel.

10

11 20. A mounting flange for clamping a rotary cutting wheel to an output shaft
12 of an accessory attachment, said mounting flange comprising:

13 a hexagonal mounting portion,

14 an enlarged flange portion having a planar contacting surface,

15 an annular cavity in said flange portion wherein the flange portion
16 defines a wide ring shaped contacting surface that is configured to contact a
17 cutting wheel, a threaded extension with a threaded end portion extending
18 outwardly with respect to the flange portion and opposite the hexagonal
19 mounting portion, said flange portion being integrally formed with the
20 hexagonal mounting portion,

21 a reduced diameter portion between said threaded end portion and said
22 flange portion.

23

24 21. The mounting flange of claim 20 further comprising a hexagonal recess
25 formed in said hexagonal mounting portion.

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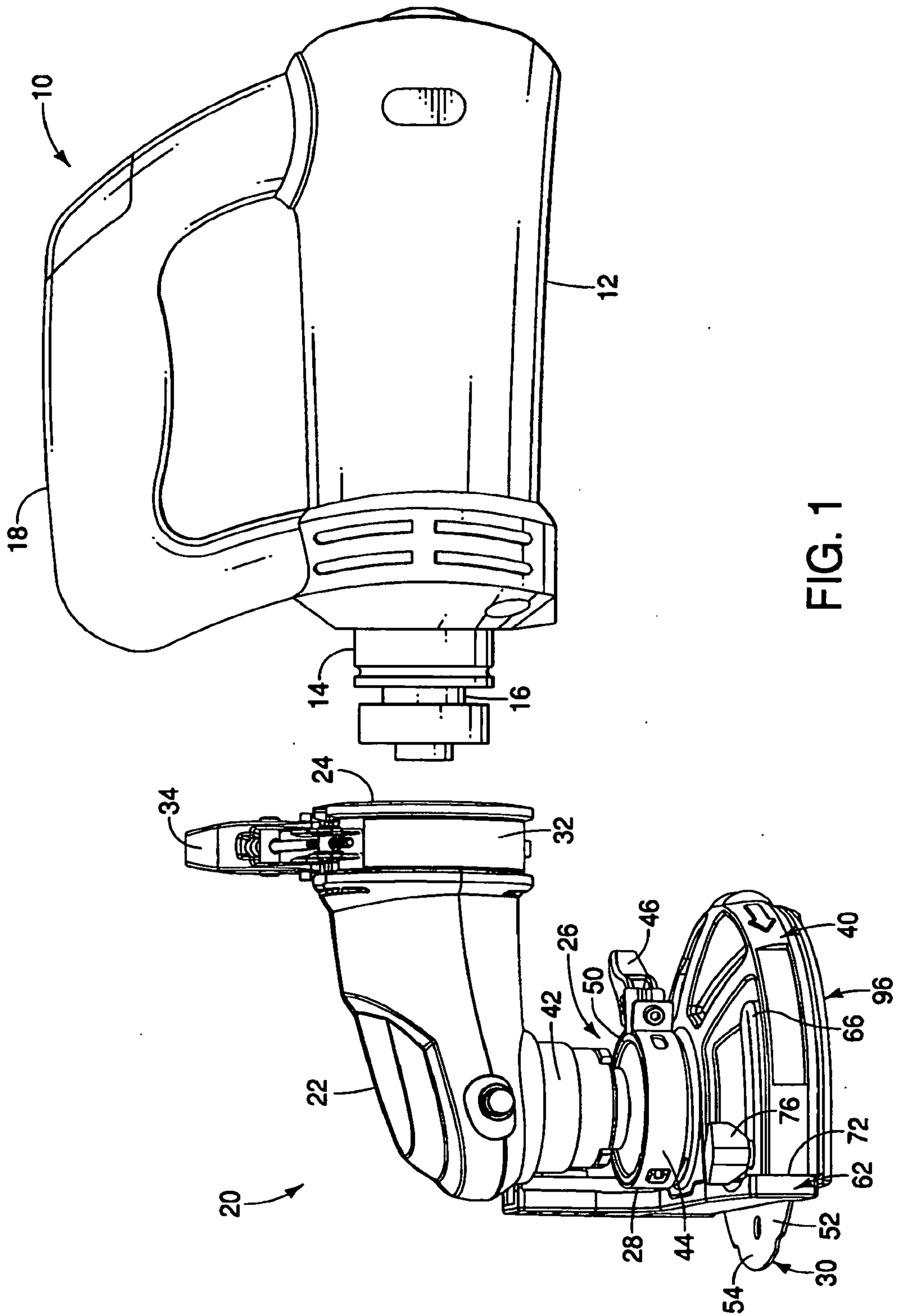
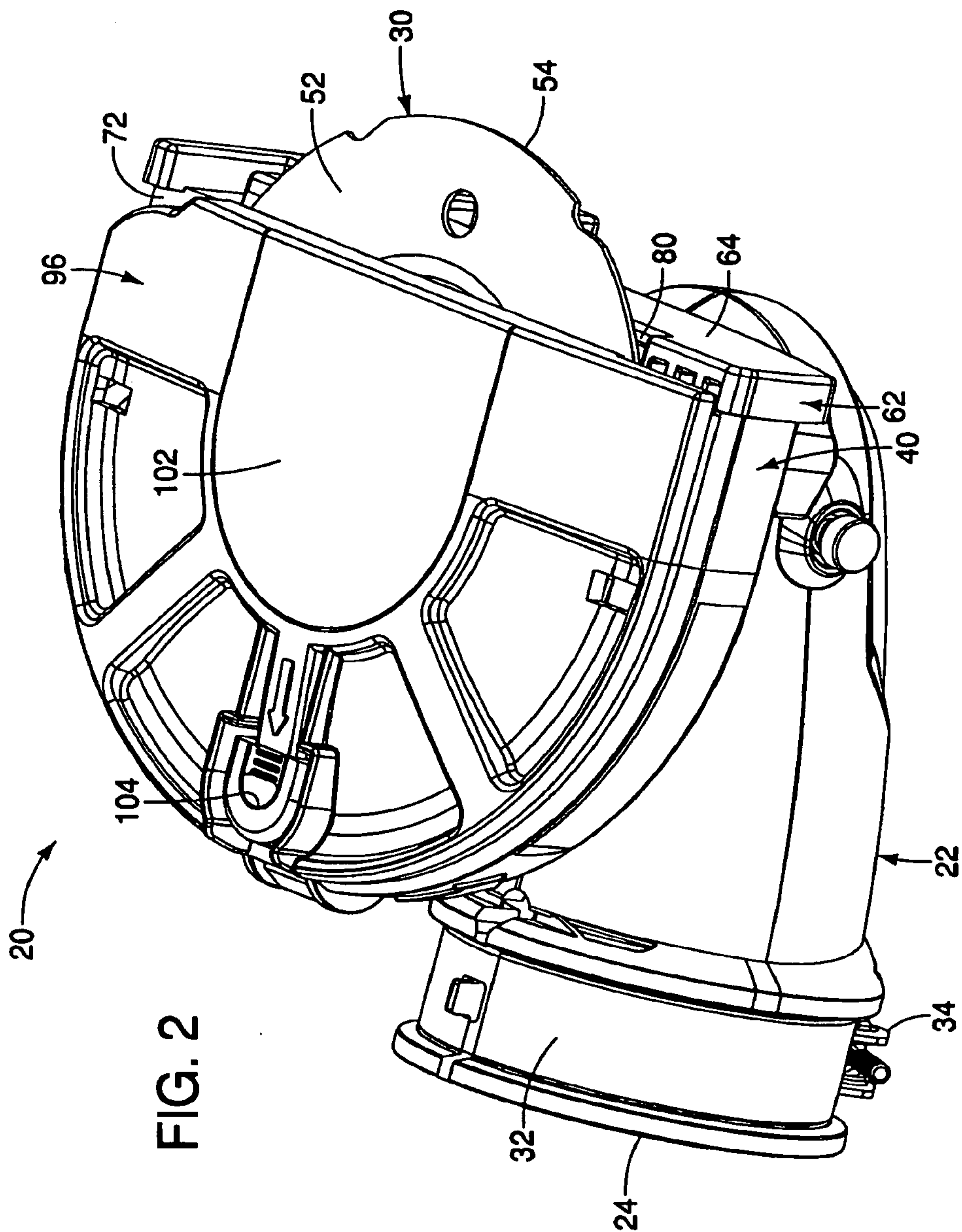


FIG. 1



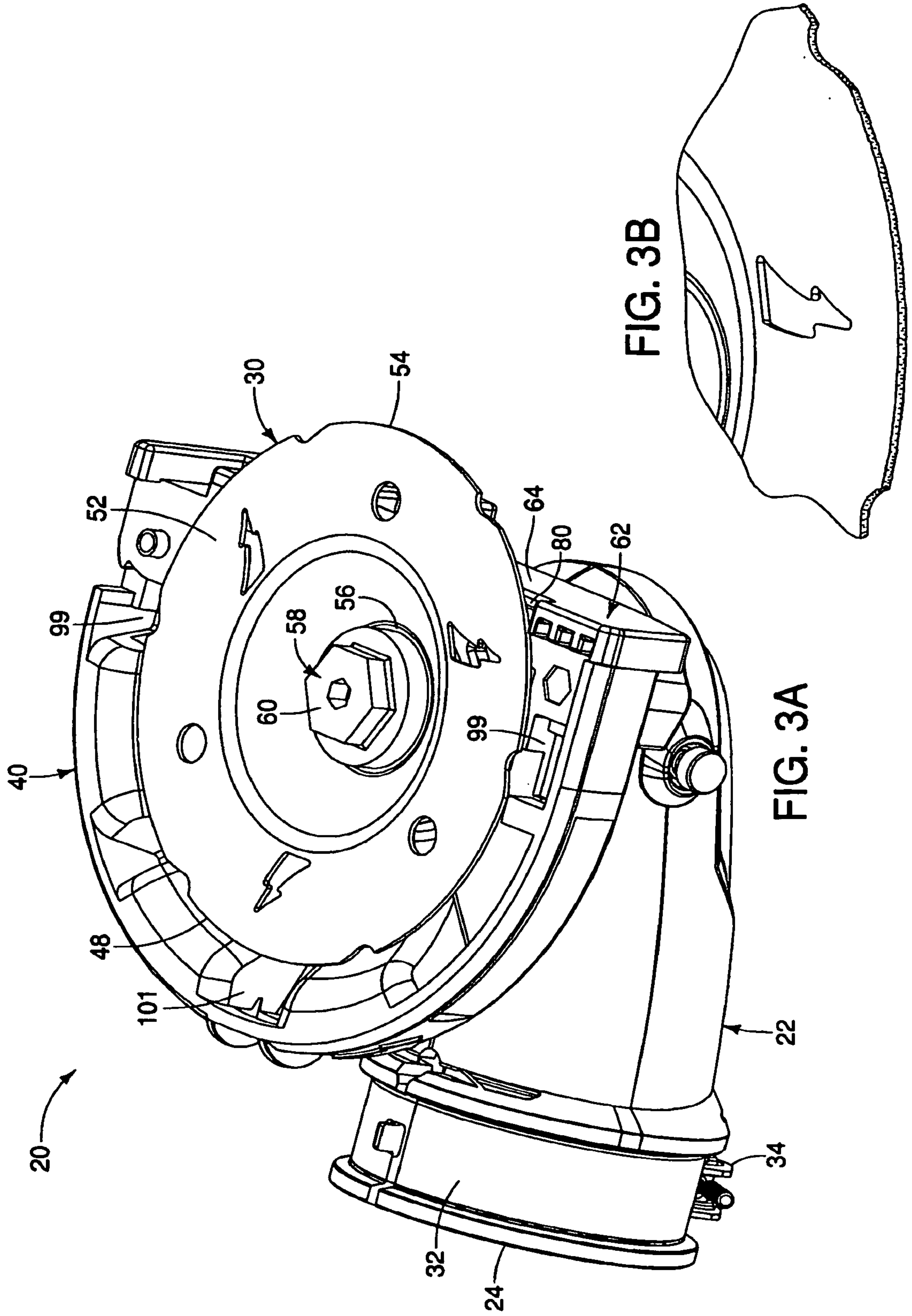
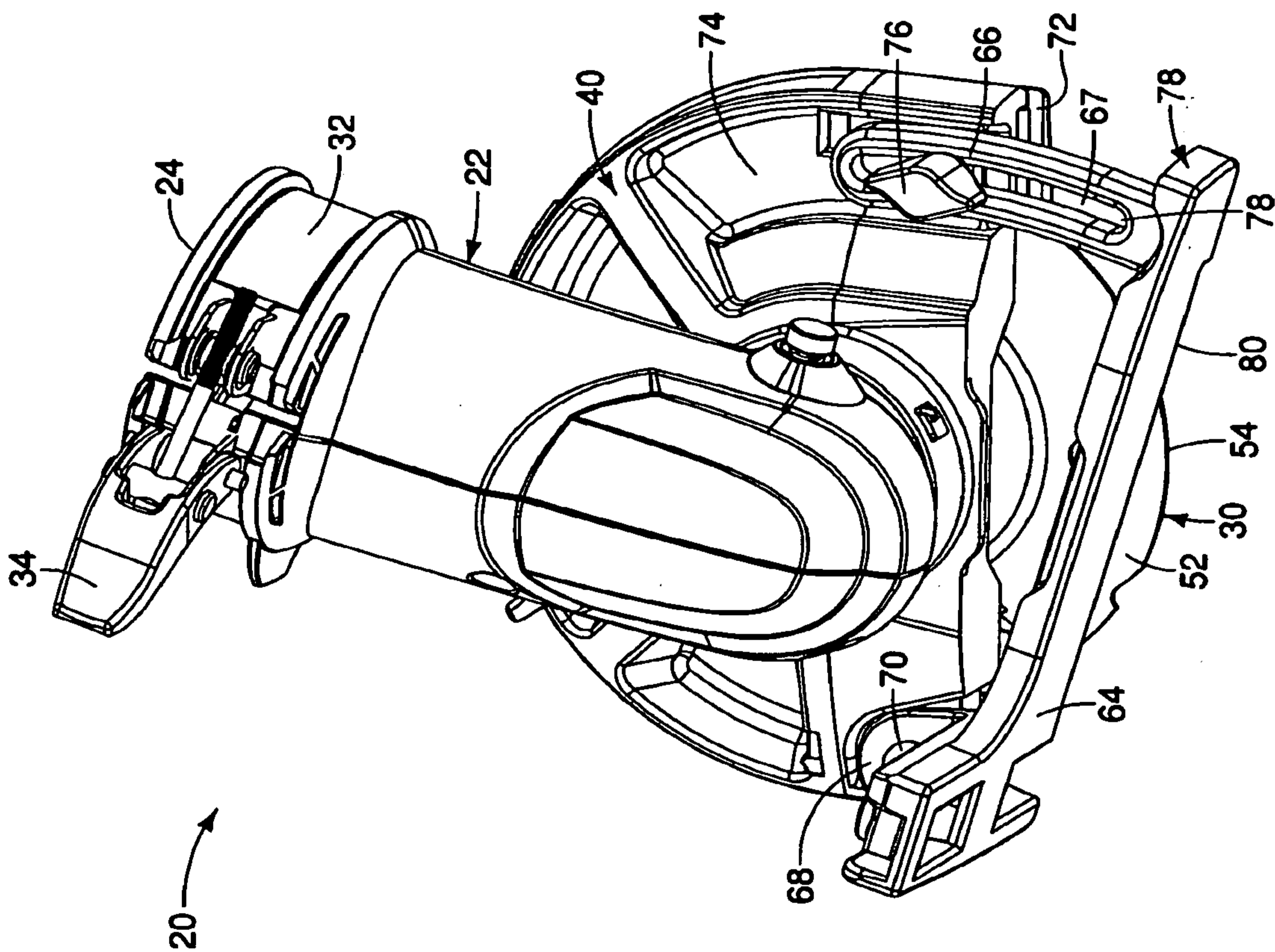


FIG. 3B

FIG. 3A

FIG. 4



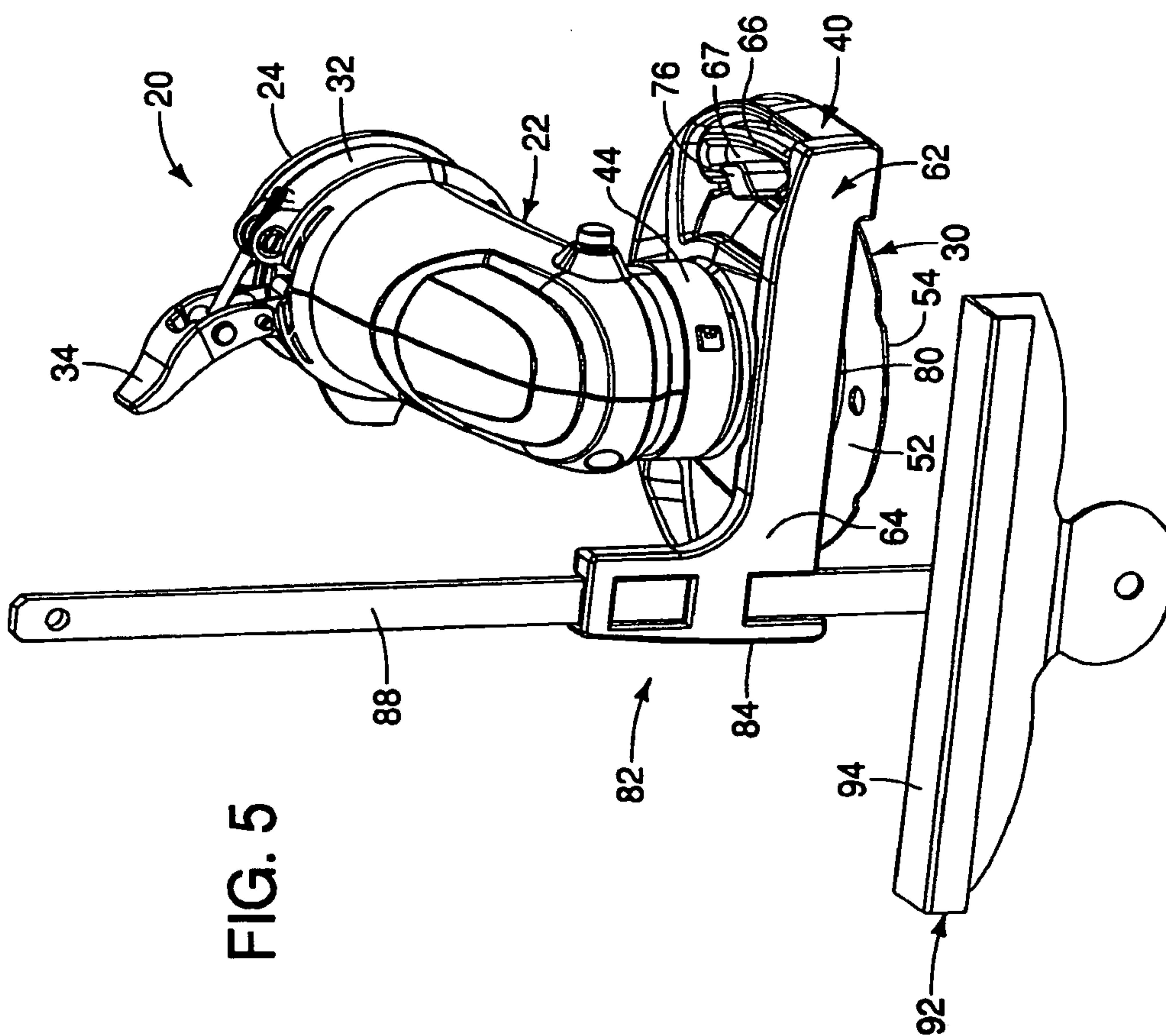
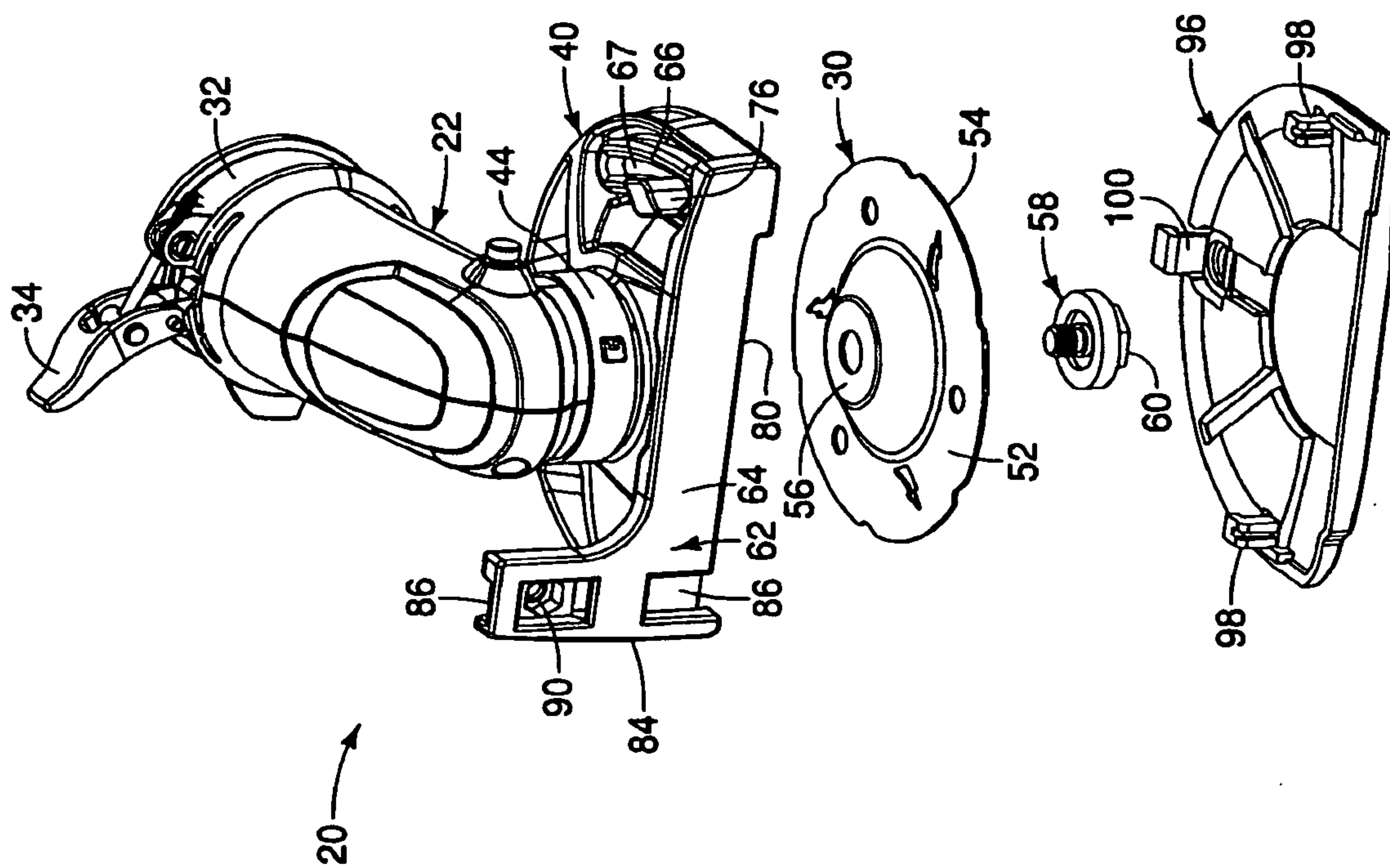
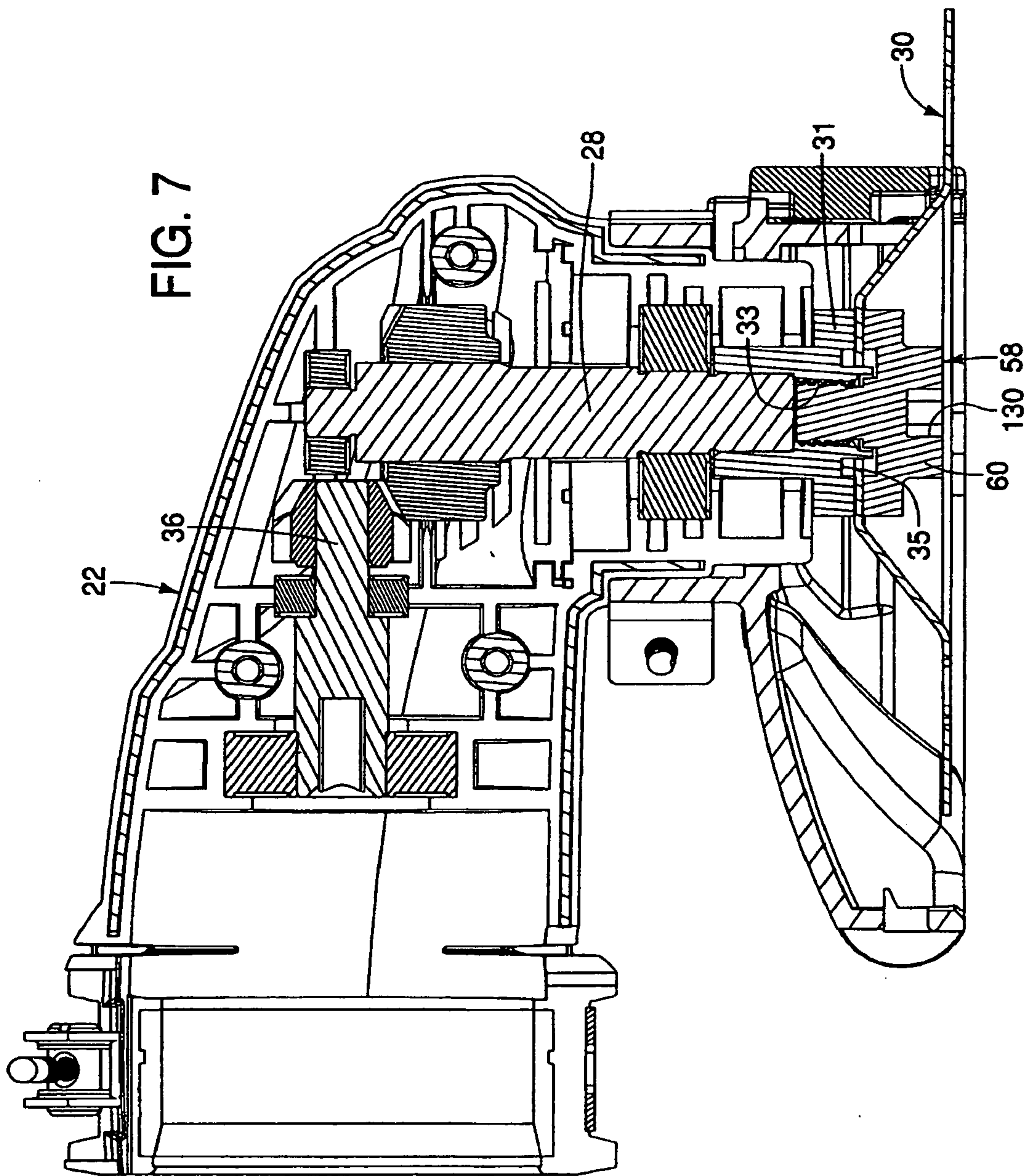


FIG. 5

FIG. 6





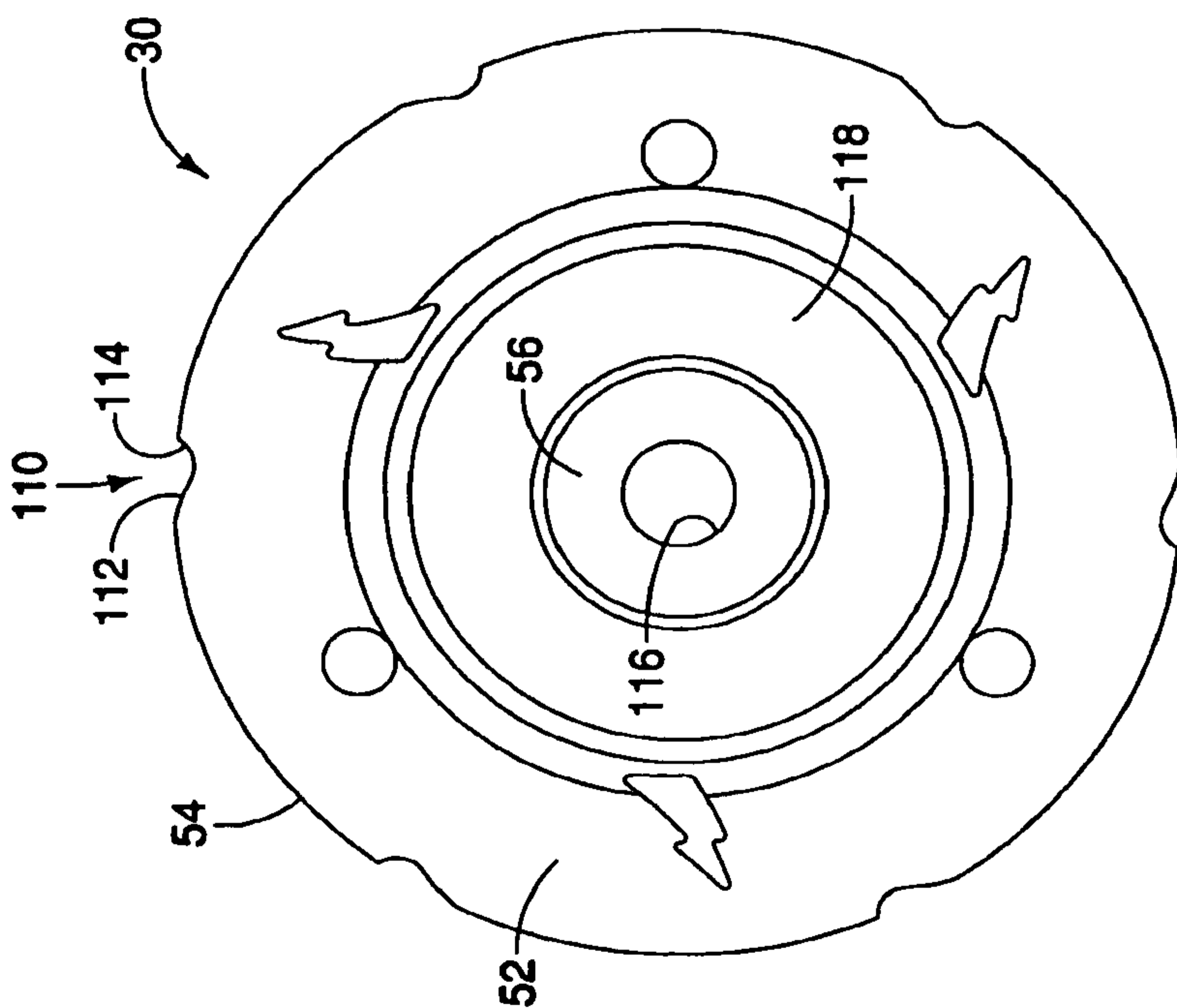


FIG. 8

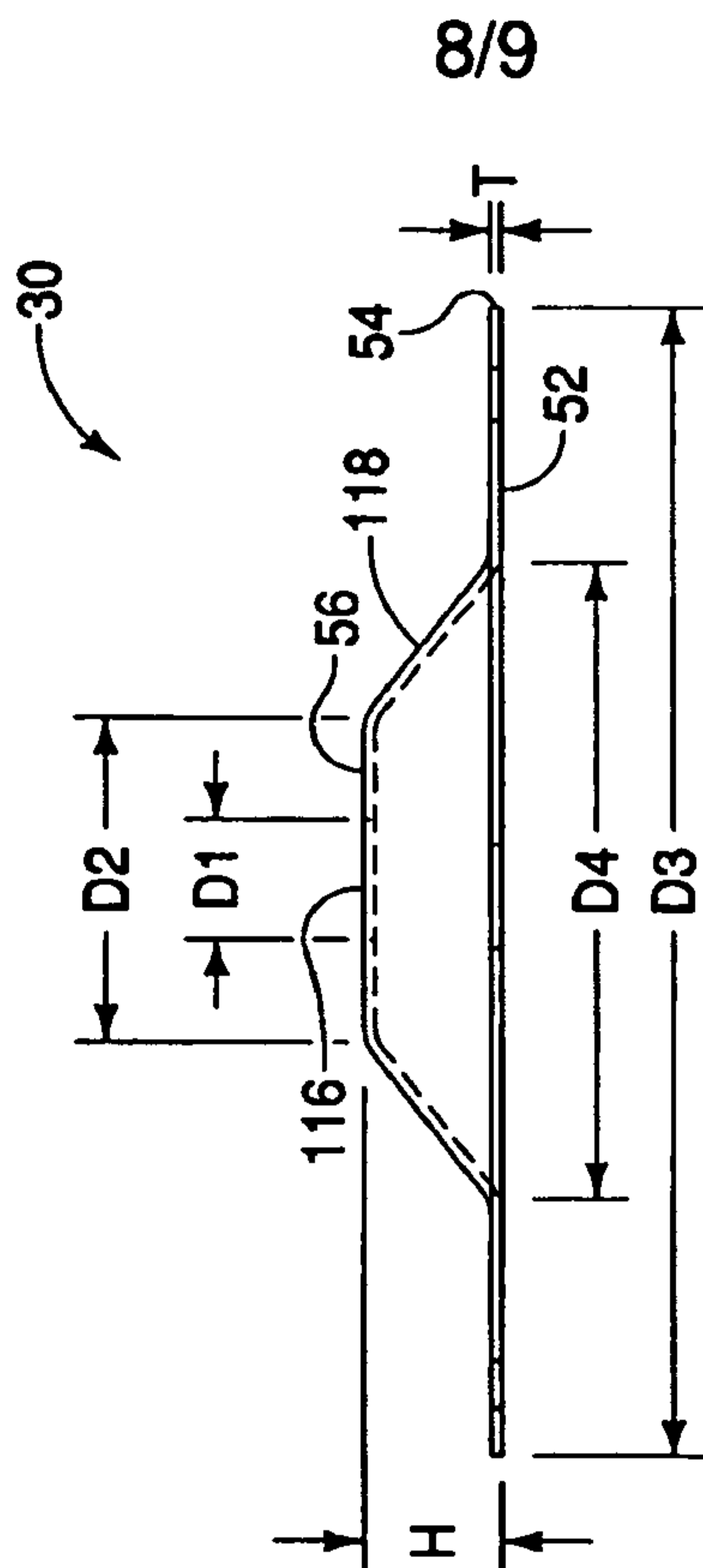


FIG. 9

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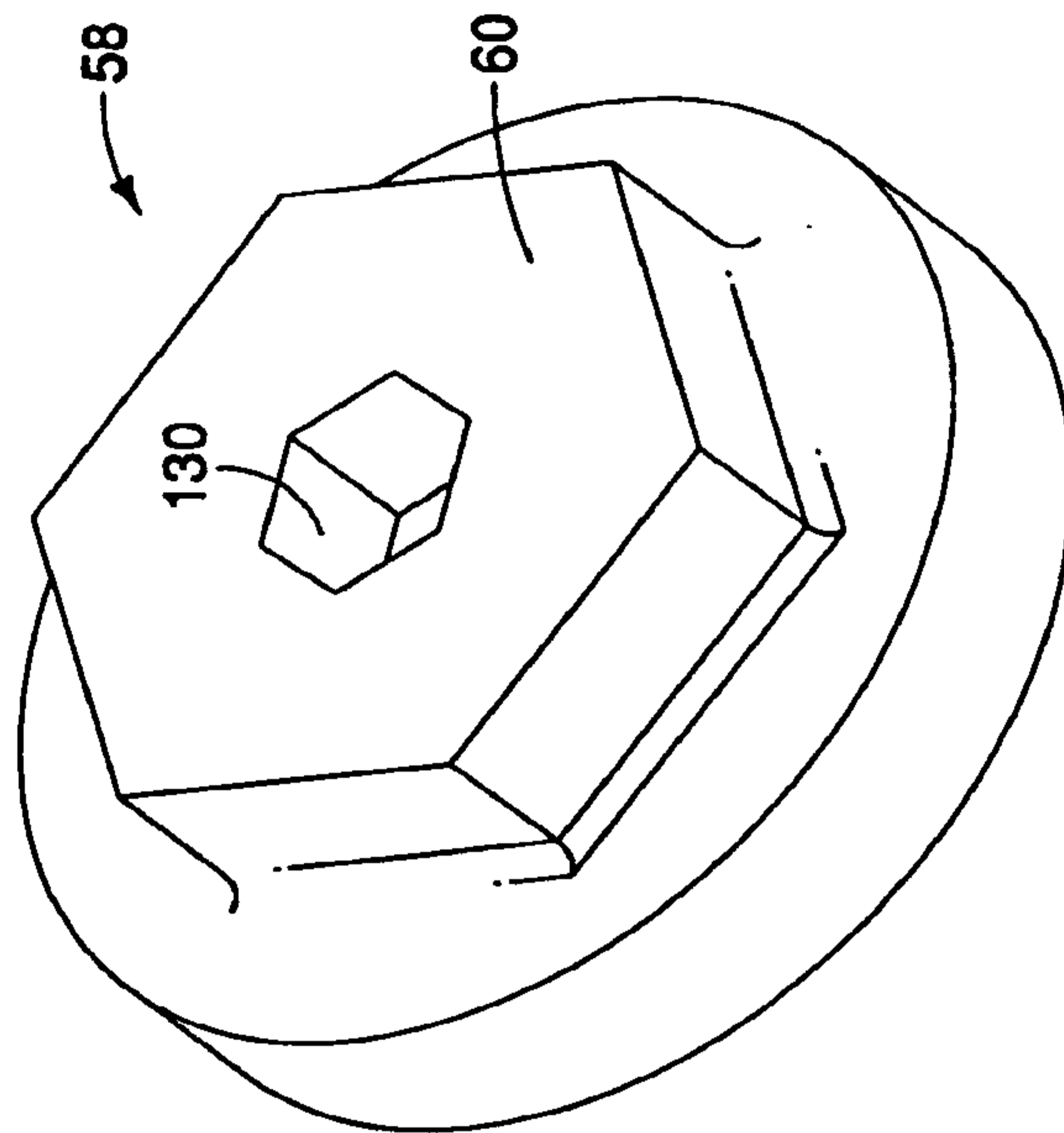


FIG. 11

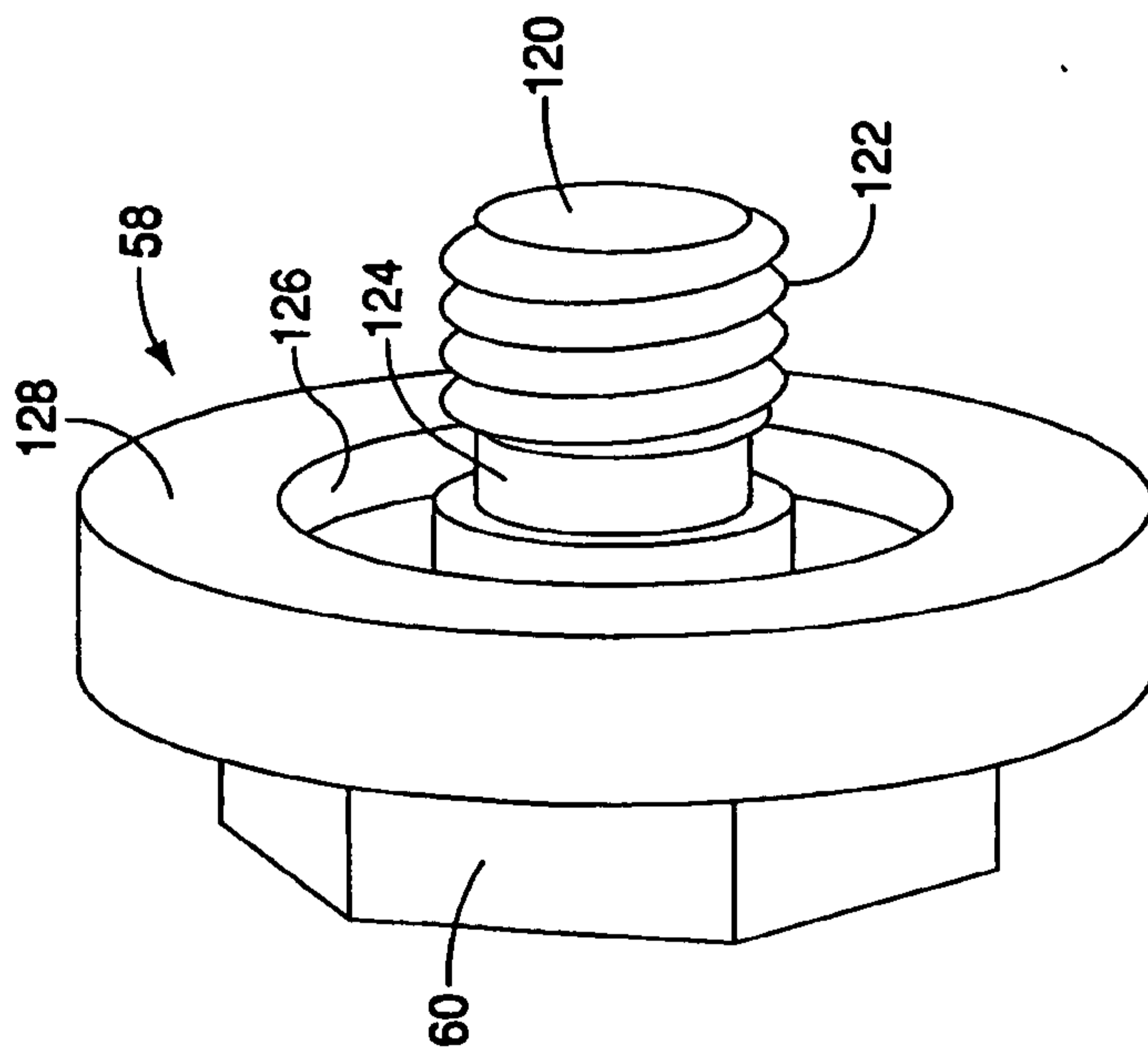


FIG. 10

