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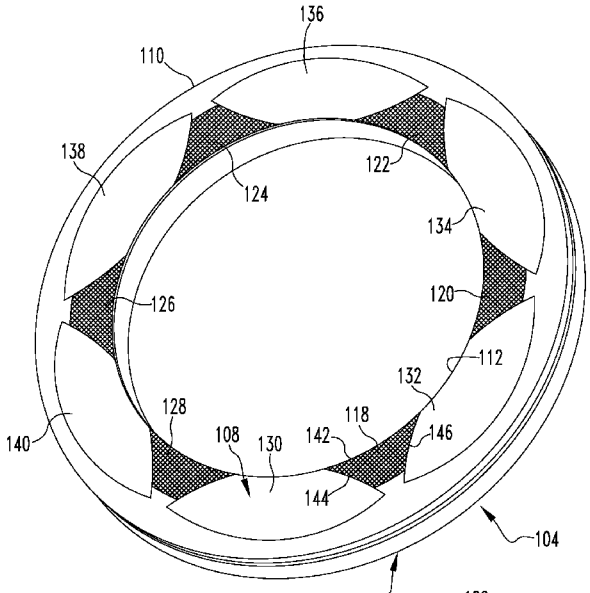

FIG.8

(57) Abstract: A blanking tool is provided for cutting blanks from a sheet of material. The sheet of material includes a product area where the blanks are located, and a web area, which is the area between the blanks. The blanking tool includes a shear having first and second opposing sides, an outer diameter, and an inner diameter. A plurality of contact surfaces are disposed on the second side of the shear. The contact surfaces engage only the web of the material. A tooling assembly is also disclosed, which includes first and second tooling coupled to first and second opposing portions, respectively, of a press and being structured to cooperate to engage the sheet of material therebetween. The blanking tool is coupled to the first tooling, and the shear of the blanking tool cooperates with a portion of the second tooling to cut the blanks from the material.

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TOOLING ASSEMBLY, BLANKING TOOL THEREFOR AND ASSOCIATED METHOD

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority from United States Provisional Patent Application Serial No. 61/312,316, filed March 10, 2010, entitled "TOOLING ASSEMBLY, BLANKING TOOL THEREFOR AND ASSOCIATED METHOD."

BACKGROUND

Field

The disclosed concept relates generally to tooling assemblies and, more particularly, to tooling assemblies for forming containers. The disclosed concept also relates to blanking tools and associated methods.

Background Information

It is generally well known to draw and iron a sheet metal blank to make a thin walled container or can body for packaging beverages (e.g., carbonated beverages; non-carbonated beverages), food or other substances. Tooling assemblies for forming cups or container bodies have conventionally involved forming material (e.g., without limitation, a sheet metal blank) conveyed between the punch and the die of a press. Typically, the blank is cut (e.g., sheared) from a substantially flat sheet of material (e.g., without limitation, aluminum; steel), which is typically supplied in a coil or stacked sheets. The punch then extends downwardly into the die, forming the blank into a cup or can body. See, for example and without limitation, in U.S. Patent Nos. 7,124,613 and 7,240,531, which are hereby incorporated herein by reference.

Figures 1A and 2, for example, show a conventional blanking tool 2 having a 4-point shear 4 for cutting or shearing blanks 6 from material 8 (e.g., without limitation, sheet metal), as shown in Figure 3. Specifically, the material 8 is conveyed to a press (not shown), and the shear 4 is compressed against the material 8 to cut or shear the blanks 6 (Figures 3 and 4). In doing so, the shear 4 and, in particular, a number of high points 10,12,14,16,18,20,22,24 (e.g., surfaces which extend outwardly from the

bottom of the blanking tool 2, as best shown in Figure 2) of the shear 4, engage and are compressed against the material 8. The contact areas, or locations at which the high points 10,12,14,16,18,20,22,24 engage the material 8, are best shown in Figure 3. Specifically, it will be appreciated that high points 10,12,14,16 at least partially engage, and are compressed against, the product area 26 of the material 8, whereas high points 18,20,22,24 engage the web 28 (e.g., the area of scrap material between blanks 6, sometimes referred to as the "skeleton") of the material 8. The product area 26 is the area which is subsequently formed into a cup 30 (Figure 5). Thus, the high points 10,12,14,16 can undesirably scratch or otherwise blemish (e.g., without limitation, scuff; mar) the blank 6 (Figure 4), which can translate into a defect in the cup 30 (Figure 5), and ultimately cause a problem with the finished product (e.g., without limitation, beer/beverage can; food can) (not shown)). For example, see blemished area 32 in the cup 30 of Figure 5, resulting from the contact area 10 (Figures 3 and 4) of the shear 4 engaging and damaging the blank 6 (Figures 3 and 4) during the blanking process. It will be appreciated that such damage can occur on the opposite side (e.g., outside) of the cup 30 (i.e., bottom side of the blank 6) by the material 8 being engaged and compressed on the opposite side of the high points 10,12,14,16 by the stock plate (not shown) of the press (not shown).

As shown in Figures 6A, 6B and 7, the same problems are associated with conventional blanking tools 52 (Figure 6A) having a 6-point shear 54 (Figure 6A). Specifically, the 6-point shear 54 includes a number of high points 60,62,64,66,68,70,72,74,76,78,80,82, which engage and are compressed against the material 8' when forming blanks 6', as shown in Figure 7. That is, high points 60,62,64,66,68,70 engage, and are compressed against, the product area 26' of the web 8' during the blanking process. High points 72,74,76,78,80,82, on the other hand, engage the web 28' (e.g., the area of scrap material between blanks 6') of the material 8'. Accordingly, like the 4-point shear 4 discussed hereinabove with respect to Figures 1A-4, portions of the 6-point shear 54 also engages and, therefore, can scratch or otherwise blemish (e.g., without limitation, scuff; mar) the blank 6' (Figure 7).

There is, therefore, room for improvement in tooling assemblies, as well as in blanking tools and associated methods for making cups and containers.

SUMMARY

These needs and others are met by embodiments of the disclosed concept, which are directed to a tooling assembly, blanking tool and associated method. Among other benefits, the blanking tool effectively shears blanks without contacting the blanks themselves and potentially causing damage (e.g., without limitation, scratched or otherwise blemished).

As on aspect of the disclosed concept, a blanking tool is provided for cutting a number of blanks from a sheet of material. The sheet of material includes a product area corresponding to the area of the material where the blanks are located, and a web area corresponding to the area of the material between the blanks. The blanking tool comprises: a shear including a first side, a second side disposed opposite the first side, an outer diameter, and an inner diameter; and a plurality of contact surfaces disposed on the second side of the shear. The contact surfaces are structured to engage only the web of the material.

As another aspect of the disclosed concept, a tooling assembly is provided for a press. The press is structured to receive a sheet of material to perform a number of machining operations thereto. The tooling assembly comprises: first tooling structured to be coupled to a first portion of the press; second tooling structured to be coupled to a second portion of the press opposite the first tooling, the first tooling and the second tooling being structured to cooperate to engage the sheet of material therebetween; and a blanking tool coupled to the first tooling, the blanking tool comprising: a shear including a first side, a second side disposed opposite the first side, an outer diameter, and an inner diameter, and a plurality of contact surfaces disposed on the second side of the shear. The shear of the blanking tool cooperates with a portion of the second tooling to cut a number of blanks from the material. The material includes a product area corresponding to the area of the material where the blanks are located, and a web corresponding to the area of the material between the blanks. The contact surfaces of the blanking tool engage only the web.

As a further aspect of the disclosed concept, a method for forming blanks comprises: providing a press including first tooling and second tooling disposed opposite

the first tooling; coupling a blanking tool to the first tooling, the blanking tool comprising a shear including a first side, a second side disposed opposite the first side, and a plurality of contact surfaces disposed on the second side; feeding a sheet of material between the first tooling and the second tooling; and actuating the press to engage the sheet of material with the shear, thereby cutting a number of blanks from the material. The sheet of material includes a product area corresponding to the area of the material where the blanks are located, and a web corresponding to the area of the material between the blanks, and the contact surfaces of the blanking tool engage only the web.

BRIEF DESCRIPTION OF THE DRAWINGS

A full understanding of the disclosed concept can be gained from the following description of the preferred embodiments when read in conjunction with the accompanying drawings in which:

Figure 1A is a bottom plan view of a blanking tool having a 4-point shear;

Figure 1B is a plan view of the contact areas of the 4-point shear of Figure 1A;

Figure 2 is an isometric view of the 4-point shear of Figure 1B;

Figure 3 is a top plan view of a sheet of material, showing the location where blanks are formed and the areas where the 4-point shear contacts the material and the blanks;

Figure 4 is top plan view of one of the blanks of Figure 3, showing a blemished area caused by tool contact;

Figure 5 is a simplified isometric view of a finished cup having been formed from the blemished blank of Figure 4;

Figure 6A is a bottom plan view of a blanking tool having a 6-point shear;

Figure 6B is a plan view of the contact areas of the 6-point shear of Figure 6A;

Figure 7 is a top plan view of a portion of a sheet of material, showing the location where blanks are formed and the areas where the 6-point shear contacts the material and the blanks;

Figure 8 is an isometric view of a blanking tool, in accordance with an embodiment of the disclosed concept;

Figure 9A is a bottom plan view of the blanking tool of Figure 8;

Figure 9B is a plan view of the contact points of the blanking tool of Figure 9A;

Figure 10 is a top plan view of a portion of a sheet of material, showing the location where blanks are formed and the areas where the blanking tool contacts only the skeleton (i.e., scrap area, or web) of the material, in accordance with an embodiment of the disclosed concept;

Figure 11 is a bottom plan view of the blanking tool of Figure 9A, also showing a grinding wheel in simplified form;

Figure 12 is a section view taken along line 12-12 of Figure 11;

Figure 13 is a section view taken along line 13-13 of Figure 1A;

Figure 14 is a section view taken along line 14-14 of Figure 9A;

Figure 15 is a side elevation section view of a press incorporating a tooling assembly and blanking tool therefor, in accordance with an embodiment of the disclosed concept; and

Figure 16 is an enlarged view of a portion of the press and tooling assembly and blanking tool therefor of Figure 15.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

For purposes of illustration, embodiments of the disclosed concept will be described as applied to cutting (e.g., shearing) blanks from a sheet of material (e.g., without limitation, sheet metal) to subsequently form cups and containers (e.g., without limitation, beverage/beer cans; food cans) from the blanks, although it will become apparent that they could also be employed to suitably cut (e.g., shear) blanks of any known or suitable material for a wide variety of different purposes and uses.

It will be appreciated that the specific elements illustrated in the figures herein and described in the following specification are simply exemplary embodiments of the disclosed concept, which are provided as non-limiting examples solely for the purpose of illustration. Therefore, specific dimensions, orientations and other physical

characteristics related to the embodiments disclosed herein are not to be considered limiting on the scope of the disclosed concept.

Directional phrases used herein, such as, for example, left, right, front, back, top, bottom, upper, lower and derivatives thereof, relate to the orientation of the elements shown in the drawings and are not limiting upon the claims unless expressly recited therein.

As employed herein, the terms "fastener" and "fastening mechanism" refers to any suitable connecting or tightening mechanism for securing one component to another expressly including, but not limited to, bolts and the combinations of bolts and nuts (e.g., without limitation, lock nuts) and bolts, washers and nuts.

As employed herein, the statement that two or more parts are "coupled" together shall mean that the parts are joined together either directly or joined through one or more intermediate parts.

As employed herein, the term "number" shall mean one or an integer greater than one (i.e., a plurality).

Figures 8 and 9A show a blanking tool 102 for use with a tooling assembly 300 (Figure 15) of a press 400 (Figure 15). In the example shown and described herein, the blanking tool 102 is a six-point shear 104 (i.e., cutedge), although it will be appreciated that the disclosed concept could be employed with a shear (not shown) having any known or suitable alternative number, shape and/or configuration of points (e.g., without limitation, a four-point shear (not shown)).

The example shear 104 includes opposing first and second sides 106,108, an outer diameter 110, and an inner diameter 112. The specific dimensions of the outer diameter 110 and the inner diameter 112 are not meant to be limiting aspects of the disclosed concept. It will be appreciated, however, that the inner diameter 112 of the shear 104 is generally the same size as the diameter of the blanks 6″ (Figure 10), which are cut (e.g., sheared) by the shear 104. A plurality of contact surfaces 118,120,122,124,126,128 (six are shown) are disposed on the second side 108 of the shear 104. The contact surfaces 118,120,122,124,126,128 constitute high points, or locations which extend outwardly from the second side 108 of the shear 104. In the non-limiting example shown and described herein, the contact surfaces

118,120,122,124,126,128 are formed by machining (e.g., without limitation, grinding) the second side 108 of the shear 104 to form a plurality of machined surfaces 130,132,134,136,138,140, each of which is disposed between a corresponding pair of the aforementioned contact surfaces 118,120,122,124,126,128. In other words, by grinding or otherwise suitably machining the surfaces 130,132,134,136,138,140, for example and without limitation, using a grinding wheel 200 (shown in simplified form in Figures 11 and 12) material is removed from the second side 108 of the shear 104 to form the desired configuration of high point contact areas 118,120,122,124,126,128.

It will be appreciated, therefore, that the disclosed concept involves selective machining of the blanking tool 102 to control the manner in which the shear 104 engages the material 8″ (Figure 10) from which blanks 6″ (Figure 10) are made. The contact areas 118,120,122,124,126,128 (e.g., pattern and/or location of contact) of the shear 104 (Figures 8, 9A, 11, 12, 14 and 15) with respect to the material 8″ (Figure 10), are best shown in Figures 9B and 10. It will be appreciated, with reference to Figure 10, that as a result of the blanking process, the material 8″ will include a product area 26″, corresponding to the area of the material 8″ where the blanks 6″ are located, and a web or skeleton 28″, corresponding to the area of scrap material between such blanks 6″. The disclosed blanking tool 102 and, in particular, the contact areas 118,120,122,124,126,128 of the shear 104, engage only the web 28″ of the material 8″. In this manner, the disclosed blanking tool 102 advantageously avoids contacting, and thus scratching or otherwise blemishing (e.g., without limitation, scuffing; marring) or damaging the blanks 6″. That is, unlike prior art blanking tools (see, for example, 4-point shear 4 of Figures 1A and 2; see also 6-point shear 54 of Figure 6A), the disclosed shear 104 (Figures 8, 9A, 11, 12 and 15) does not contact the product area 26″ of the material 8″. Therefore, the blanks 6″ are effectively sheared, without being contacted or damaged (e.g., without limitation, scratched or otherwise blemished). Accordingly, problems known to be associated with the prior art, such as damage caused to blanks (see blanks 6 of Figures 3 and 4; see also blanks 6′ of Figure 7) by the shear (see shear 4 of Figures 1A and 2; see also shear 54 of Figure 6A), or by the stock plate (see, for example, stock plate 306 of Figures 15 and 16), during the blanking process resulting in a defect in the cup (see, for

example, blemished cup 30 of Figure 5), and ultimately in a potentially flawed finished product (e.g., without limitation, can body (not shown)), is eliminated.

As shown in Figure 10, the shape of each contact area 118,120,122,124,126,128 of the shear 104 is preferably shaped substantially similarly to the web or skeleton 28″ of the material 8″. Specifically, in the non-limiting example shown in Figures 9B, 10 and 11, contact area 118, for example, includes three arcuate sides 142,144,146. The first arcuate side 142 is substantially flush with respect to the inner edge of the shear 104, which defines the inner diameter 112 thereof, as shown in Figure 11. The second arcuate side 144 is shaped substantially similarly to, and is generally parallel with respect to, the opposing corresponding arcuate portion of the web 28″ , which is defined by the removal of the blank 6″ adjacent to side 144. Similarly, the third arcuate side 146 is shaped substantially similarly to, and is generally parallel with respect to, the opposing corresponding arcuate portion of the web 28″, which is defined by the removal of the blank 6″ adjacent to side 146. In other words, in the example shown and described herein, the contact area 118 generally has a triangular shape corresponding to the generally triangular shape of the corresponding portion of the web 28″ of material 8″, wherein each of the arcuate sides 142,144,146 is concave, as shown. It will, however, be appreciated that any known or suitable alternative number, shape and/or configuration of contact areas (not shown) could be employed to engage only the web 28″ of the material 8″ in accordance with the disclosed concept.

Figures 11 and 12 show a grinding wheel 200 (shown in simplified form in phantom line drawing; also shown in Figure 12 in an alternative vertical orientation) machined (e.g., without limitation, grinding) surface 130 to form the desired high-point contact areas 118,128 (Figure 11) by removing material from the second side 108 of the shear 104, between the contact areas 118,128, as previously discussed. As shown in Figures 12 and 14, the machined surfaces, for example surface 130, between contact areas, for example contact areas 118,128, is preferably machined to have a desired predetermined shear angle 190 (best shown in the enlarged section view of Figure 14). Comparing the shear angle 190 of Figure 14 to the shear angle 90 of the prior art blanking tool 2 of Figure 13, it will be appreciated that the machined surface 130 follows, or is disposed at, the shear angle 190, whereas the prior art shear 4 of Figure 13 has no

equivalent machined surface, and does not follow the shear angle 90 but rather includes an additional high point or contact area (see, for example, high point 10 of shear 4 of Figures 1A and 2). In the example of Figure 14, the shear angle 190 is greater than the shear angle 90 of the prior art shear of Figure 13, although it will be appreciated that the specific dimension of the shear angle 190 is not meant to be a limiting aspect of the disclosed concept. For example and without limitation, the shear angle 190 in accordance with one non-limiting embodiment of the disclosed concept could be up to about 30 degrees.

Figures 15 and 16 show the disclosed blanking tool 102 employed with a tooling assembly 300 of a press 400 (partially shown in section view), in accordance with a non-limiting embodiment of the disclosed concept. The tooling assembly 300 includes first tooling (e.g., upper tooling from the perspective of Figures 15 and 16, indicated generally by reference 302) and second tooling (e.g., lower tooling from the perspective of Figures 15 and 16, indicated generally by reference 304), which is disposed opposite from the upper tooling 302. The aforementioned sheet of material 8″ (shown in simplified form in phantom line drawing in Figures 15 and 16) is fed into the press 400 between the upper tooling 302 and lower tooling 304. The shear 104 is coupled to the upper tooling 302 using any known or suitable fastening mechanism. For example and without limitation, the shear 104 shown and described herein, includes a number of bolt holes 114,116 (shown in Figures 9A, 11 and 12; not shown in Figure 8 for simplicity of illustration) for bolting the blanking tool 102 to the upper tooling 302.

In operation, the sheet of material 8″ is fed into the press 400, for example from a coil (not shown) or stack of such sheets (not shown), and the press 400 is actuated to advance the upper tooling 302 and, in particular, the shear 104, toward the lower tooling 304 and, in particular the stock plate 306, such that the material 8″ is engaged and cut (e.g., shears) the material 8″ to form the aforementioned blanks 6″ (Figure 10). The stock plate 306 supports the material 8″ as it is fed through the tooling assembly 300 (e.g., without limitation, die set). During such blanking process, the aforementioned contact areas 118,120,122,124,126,128 (all shown in Figures 9A-11) of the shear 104 contact only the web or skeleton 28″ of the material 8″, as shown in Figure 10 and as previously described hereinabove with respect thereto. The stock plate 306 is resilient

(e.g., without limitation, supported by springs, pneumatically, or hydraulically) to allow it to move downward as the shear 104 pushes against it, with the material 8″ trapped therebetween. After the blanking process, the stock plate 306 helps to lift the web or skeleton 28″ (Figure 10) portion of the material 8″ while the blank 6″ (Figure 10) is drawn down through the blank and draw die 308 to form a cup (not shown, but see cup 30 of Figure 5).

It will be appreciated that a further advantage of the disclosed blanking tool 102 is longer tool life. That is, in operation, the prior art shear (see, for example, shear 4 of Figures 1A and 2) impacts the stock plate 306 (with material 8″ sandwiched therebetween) at relatively high speeds and tonnage, such that areas of the stock plate 306 opposite certain high points (see, for example, high points 18,20,22,24 of Figures 1A-3) of the shear 4 (Figures 1A and 2) become worn. The disclosed shear 104, on the other hand, employs fewer contact areas 118,120,122,124,126,128 (six are shown), wherein each of the contact areas 118,120,122,124,126,128 has a relatively large surface area (compare, for example, the relatively small surface area of high points 18,20,22,24 of shear 4 of Figures 1A and 2, to the relatively large surface area of high points 118,120,122,124,126,128 of the disclosed shear 104 (Figures 8, 9A and 11)). This improved design, with increased surface area, advantageously provides greater and more even load distribution of the impact load form the shear 104 than the prior art design. Accordingly, less wear to the stock plate 306 occurs.

To further reduce wear, the blanking tool 102 may optionally further include a carbide ring 310 inserted into the shear 104, as shown for example and without limitation in Figure 16. That is, because carbide is very hard, the cutting or blanking edge of the tool 102 will last longer if the carbide ring 310 is employed. It will be appreciated that the carbide ring 310 preferably does not have any bearing on the geometry of the blanking tool 102.

Accordingly, the disclosed blanking tool 102 provides a shear 104 for effectively cutting (e.g., shearing) blanks 6″ (Figure 10), without engaging any portion of each blank 6″ (Figure 10). Therefore, damage (e.g., without limitation, scratching or otherwise blemishing) of the blank 6″ during the blanking process is eliminated, thereby eliminating the potential for contact defects in the cup (see blemished cup 30 of Figure 5)

or end product (e.g., without limitation, container; beer/beverage can; food can (not shown)) formed from the blank 6″, which is known to be associated with prior art blanking tools (see blanking tool 2 of Figures 1A and 2; see also blanking tool 52 of Figure 6A).

While specific embodiments of the disclosed concept have been described in detail, it will be appreciated by those skilled in the art that various modifications and alternatives to those details could be developed in light of the overall teachings of the disclosure. Accordingly, the particular arrangements disclosed are meant to be illustrative only and not limiting as to the scope of the disclosed concept which is to be given the full breadth of the claims appended and any and all equivalents thereof.

What is claimed is:

1. A blanking tool for cutting a number of blanks from a sheet of material, said sheet of material including a product area corresponding to the area of said material where said blanks are located, and a web area corresponding to the area of said material between said blanks, said blanking tool comprising:

a shear including a first side, a second side disposed opposite the first side, an outer diameter, and an inner diameter; and

a plurality of contact surfaces disposed on the second side of said shear,

wherein said contact surfaces are structured to engage only said web of said material.

2. The blanking tool of claim 1 wherein each of said contact surfaces is shaped substantially similarly to the web area of said sheet of material.

3. The blanking tool of claim 2 wherein the inner diameter is defined by an inner edge of said shear; wherein said contact surfaces include three arcuate sides; wherein the first arcuate side is substantially flush with respect to said inner edge; wherein the second arcuate side is shaped substantially similar to an opposing portion of said web area, which is defined by the removal of a corresponding one of said blanks; and wherein the third arcuate side is shaped substantially similar to another opposing portion of said web area, which is defined by the removal of another corresponding one of said blanks.

4. The blanking tool of claim 1 wherein said contact surfaces are defined by a plurality of machined surfaces; and wherein each of said machined surfaces is a recessed area disposed between a pair of said contact surfaces, in order that said contact surfaces comprise high points on the second side of said shear.

5. The blanking tool of claim 4 wherein said high points are disposed in a plane; and wherein said machined surfaces are disposed at a shear angle of between 0 degrees and 30 degrees with respect to the plane of said high points.

6. The blanking tool of claim 1 wherein said shear has a total of six contact surfaces.

7. A tooling assembly for a press, said press being structured to receive a sheet of material to perform a number of machining operations thereto, said tooling assembly comprising:

first tooling structured to be coupled to a first portion of said press;

second tooling structured to be coupled to a second portion of said press opposite said first tooling, said first tooling and said second tooling being structured to cooperate to engage said sheet of material therebetween; and

a blanking tool coupled to said first tooling, said blanking tool comprising:

a shear including a first side, a second side disposed opposite the first side, an outer diameter, and an inner diameter, and

a plurality of contact surfaces disposed on the second side of said shear,

wherein said shear of said blanking tool cooperates with a portion of said second tooling to cut a number of blanks from said material,

wherein said material includes a product area corresponding to the area of said material where said blanks are located, and a web corresponding to the area of said material between said blanks, and

wherein said contact surfaces of said blanking tool engage only said web.

8. The tooling assembly of claim 7 wherein the inner diameter of said shear is defined by an inner edge of said shear; wherein said contact surfaces include three arcuate sides; wherein the first arcuate side is substantially flush with respect to said inner edge; wherein the second arcuate side is shaped substantially similar to an opposing portion of said web, which is defined by the removal of a corresponding one of said blanks; and wherein the third arcuate side is shaped substantially similar to another opposing portion of said web, which is defined by the removal of another corresponding one of said blanks.

9. The tooling assembly of claim 7 wherein said contact surfaces are defined by a plurality of machined surfaces; and wherein each of said machined surfaces is a recessed area disposed between a pair of said contact surfaces, in order that said contact surfaces comprise high points on the second side of said shear.

10. The tooling assembly of claim 9 wherein said high points are disposed in a plane; and wherein said machined surfaces are disposed at a shear angle between 0 degrees and 30 degrees with respect to the plane of said high points.

11. The tooling assembly of claim 7 wherein said shear has a total of six contact surfaces.

12. The tooling assembly of claim 7 wherein said blanking tool further comprises a plurality of holes in said shear and a plurality of fasteners; and wherein each of said fasteners extends through a corresponding one of said holes to fasten said shear to said first tooling.

13. The tooling assembly of claim 7 wherein said second tooling comprises a stock plate; wherein said stock plate is structured to support said material as said shear cuts said material to make said blanks.

14. The tooling assembly of claim 13 wherein said stock plate is structured to move downwardly as said shear presses against it with said material clamped therebetween; and wherein, after said shear cuts a corresponding one of said blanks, said stock plate is structured to move upwardly, thereby lifting said web of said material.

15. The tooling assembly of claim 7 wherein said blanking tool further comprises a carbide ring; wherein said carbide ring is disposed on the second side of said shear around the inner diameter; and wherein said carbide ring comprises the blanking or cutting edge of said blanking tool.

16. A method for forming blanks, the method comprising:

providing a press including first tooling and second tooling disposed opposite the first tooling;

coupling a blanking tool to said first tooling, said blanking tool comprising a shear including a first side, a second side disposed opposite the first side, and a plurality of contact surfaces disposed on the second side;

feeding a sheet of material between the first tooling and the second tooling; and

actuating the press to engage said sheet of material with said shear, thereby cutting a number of blanks from said material,

wherein said sheet of material includes a product area corresponding to the area of said material where said blanks are located, and a web corresponding to the area of said material between said blanks, and

wherein said contact surfaces of said blanking tool engage only said web.

17. The method of claim 16 wherein said shear further includes an inner edge defining an inner diameter; wherein said contact surfaces include three arcuate sides; wherein the first arcuate side is substantially flush with respect to said inner edge; wherein the second arcuate side is shaped substantially similar to an opposing portion of said web, which is defined by the removal of a corresponding one of said blanks; and wherein the third arcuate side is shaped substantially similar to another opposing portion of said web, which is defined by the removal of another corresponding one of said blanks.

18. The method of claim 16 wherein said contact surfaces are defined by a plurality of machined surfaces; wherein each of said machined surfaces is a recessed area disposed between a pair of said contact surfaces, in order that said contact surfaces comprise high points on the second side of said shear; wherein said high points are disposed in a plane; and wherein said machined surfaces are disposed at a shear angle of between 0 degrees and 30 degrees with respect to the plane of said high points.

19. The method of claim 16, further comprising:

said second tooling comprising a stock plate, and

supporting said material on said stock plate, between said stock plate and said shear as said shear cuts said material to make said blanks.

20. The method of claim 19, further comprising:

deflecting said stock plate downwardly responsive to said shear pressing against it with said material clamped therebetween, and

after said shear cuts a corresponding one of said blanks, moving said stock plate upwardly, thereby lifting said web of said material to remove said corresponding one of said blanks.

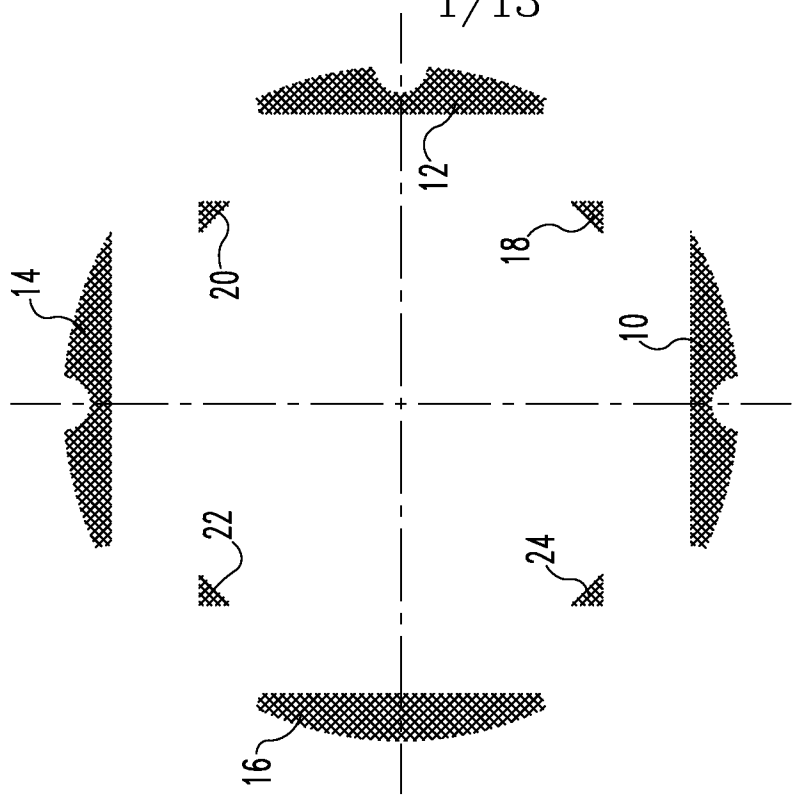


FIG.1B
PRIOR ART

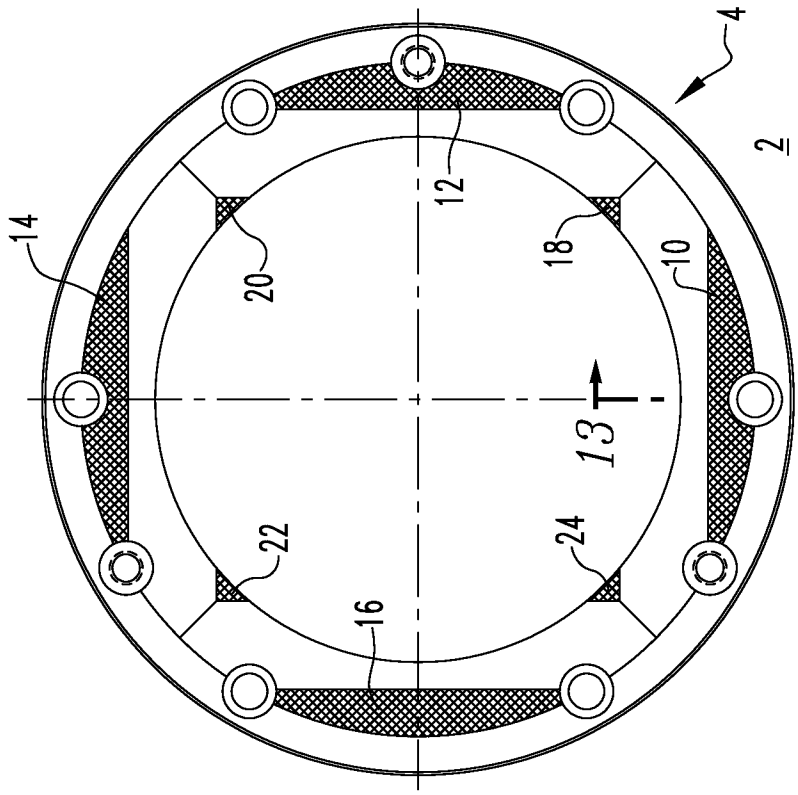


FIG.1A
PRIOR ART

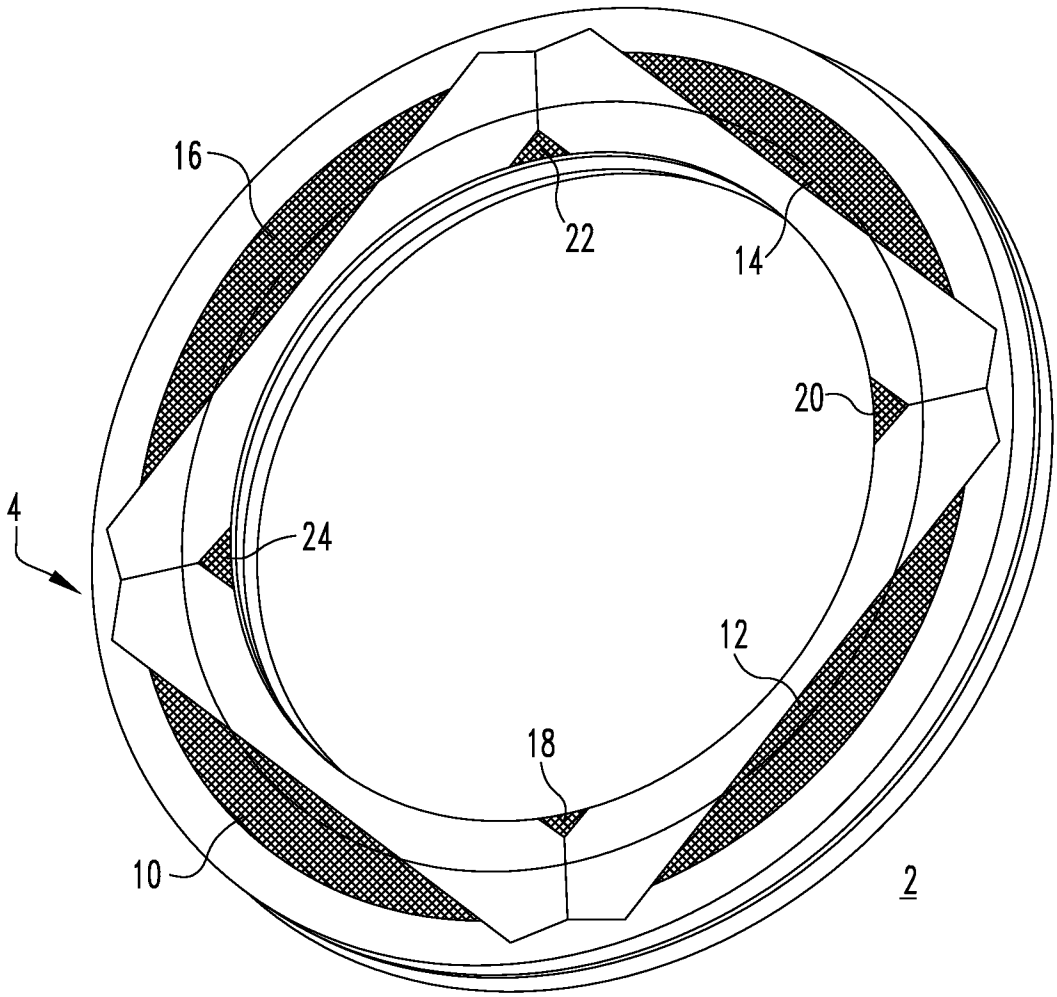


FIG.2
PRIOR ART

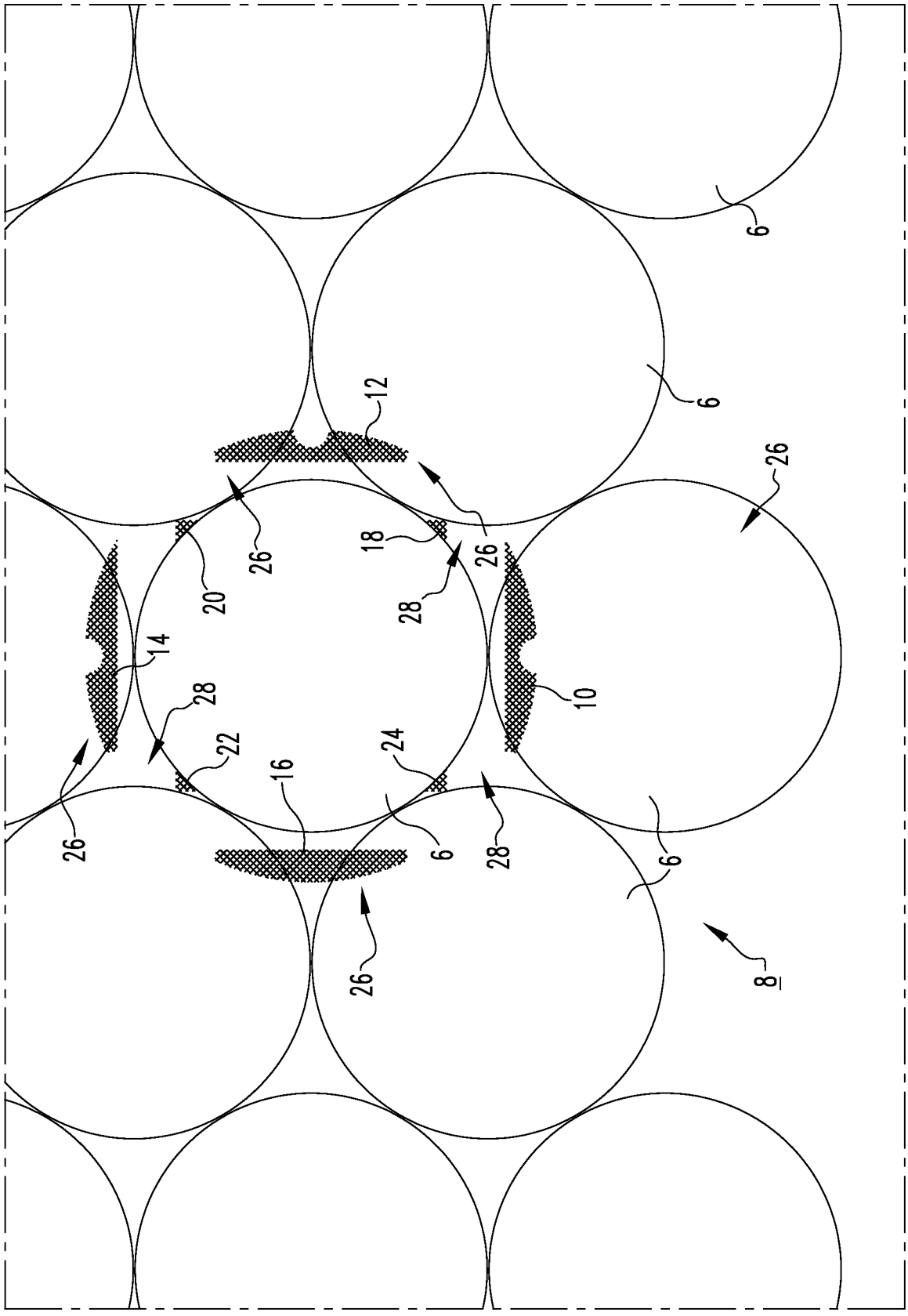


FIG.3
PRIOR ART

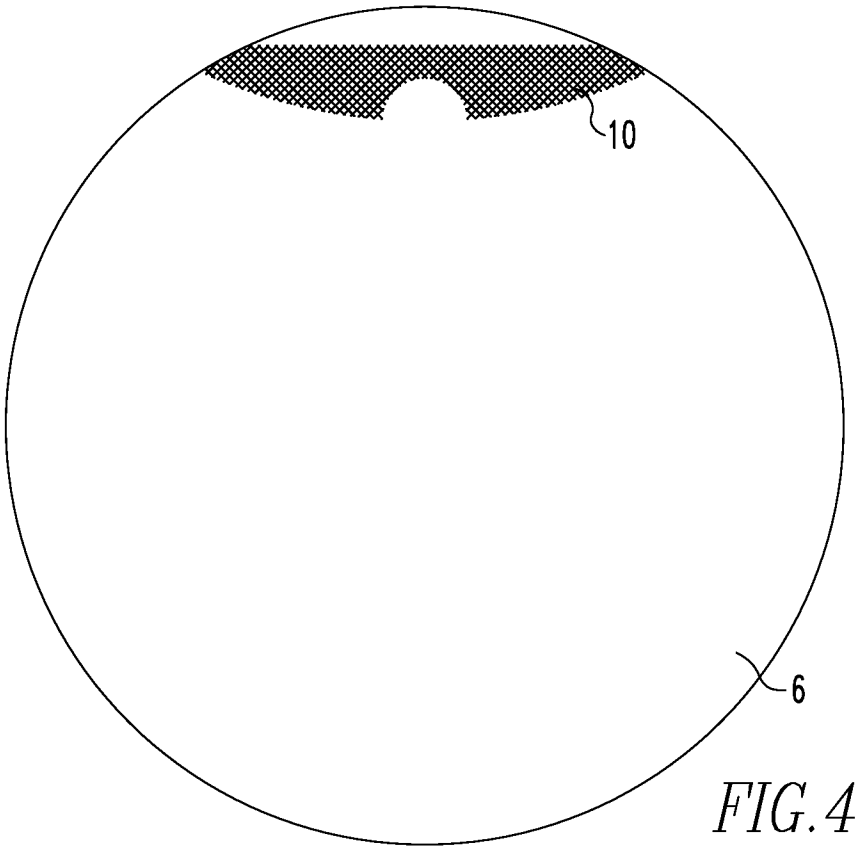


FIG.4

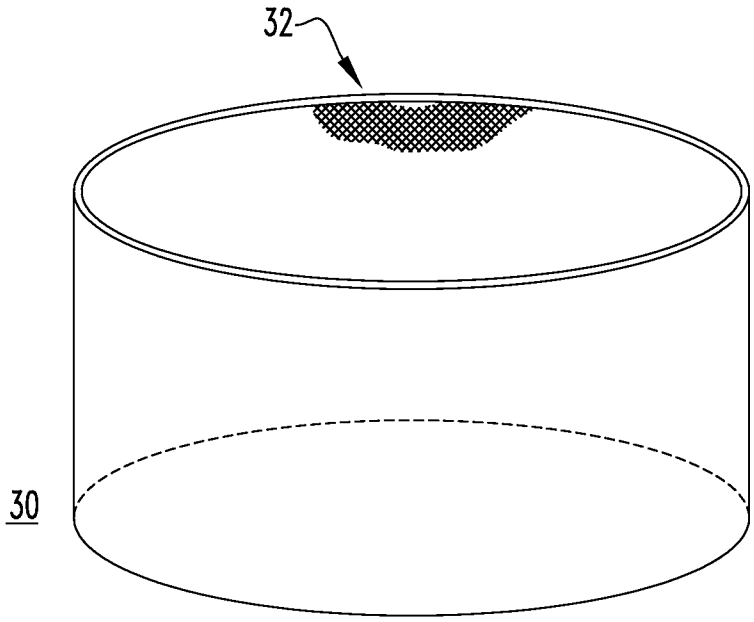
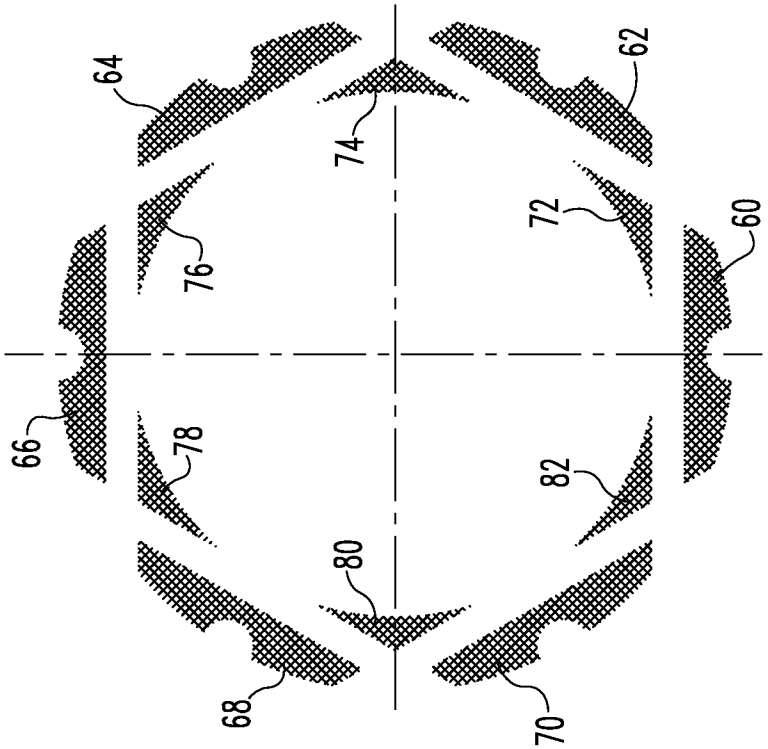


FIG.5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80
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70

FIG.6B

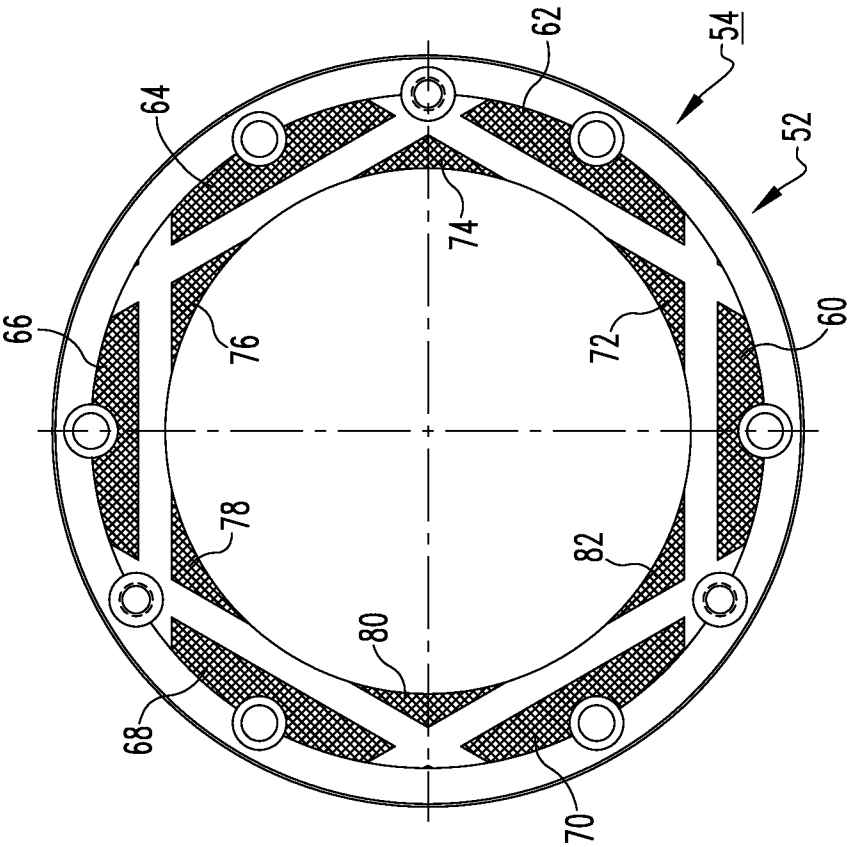
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FIG.6A

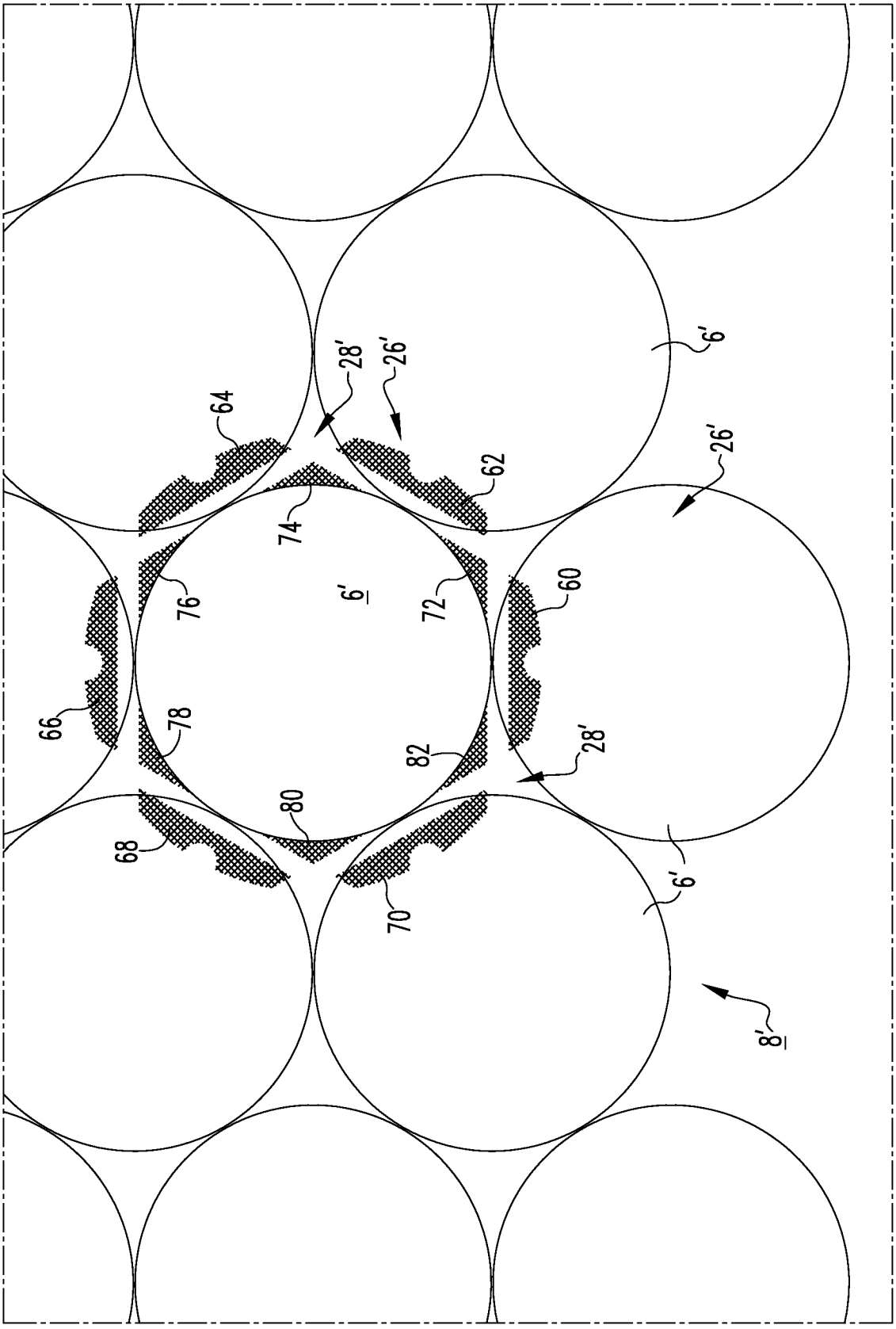
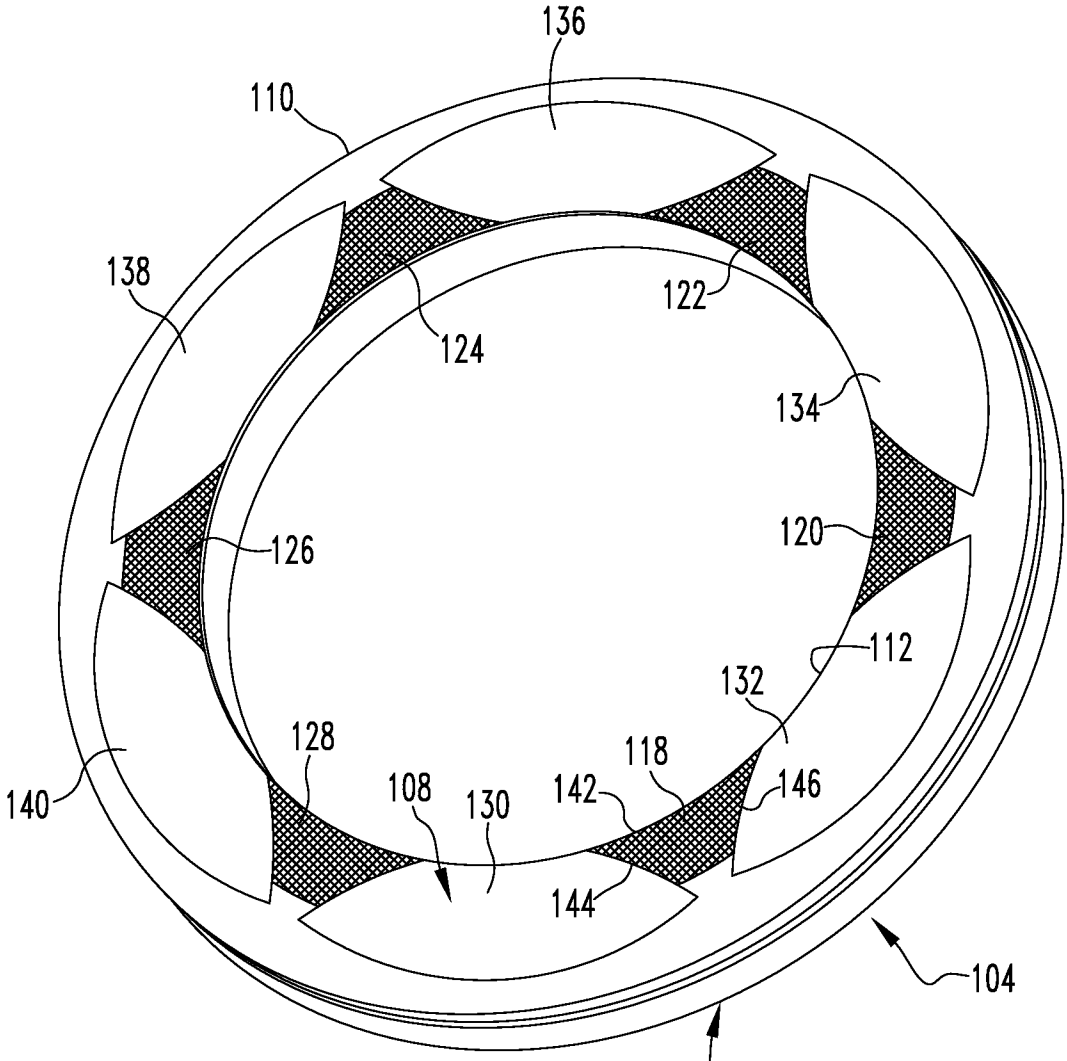


FIG. 7
PRIOR ART


136
110
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124
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126
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112
132
128
118
140
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144
104
106
102

FIG.8

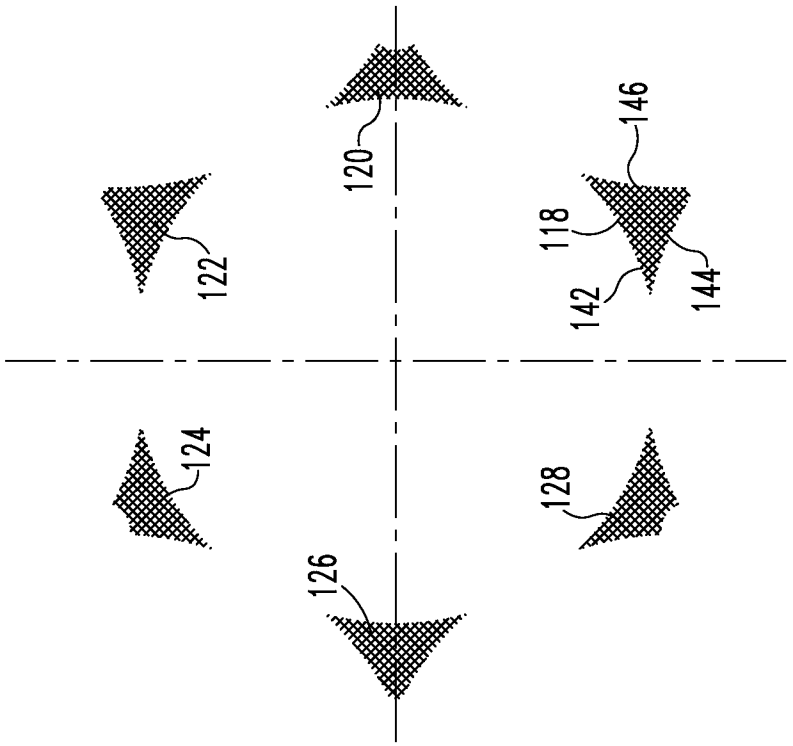
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FIG. 9B

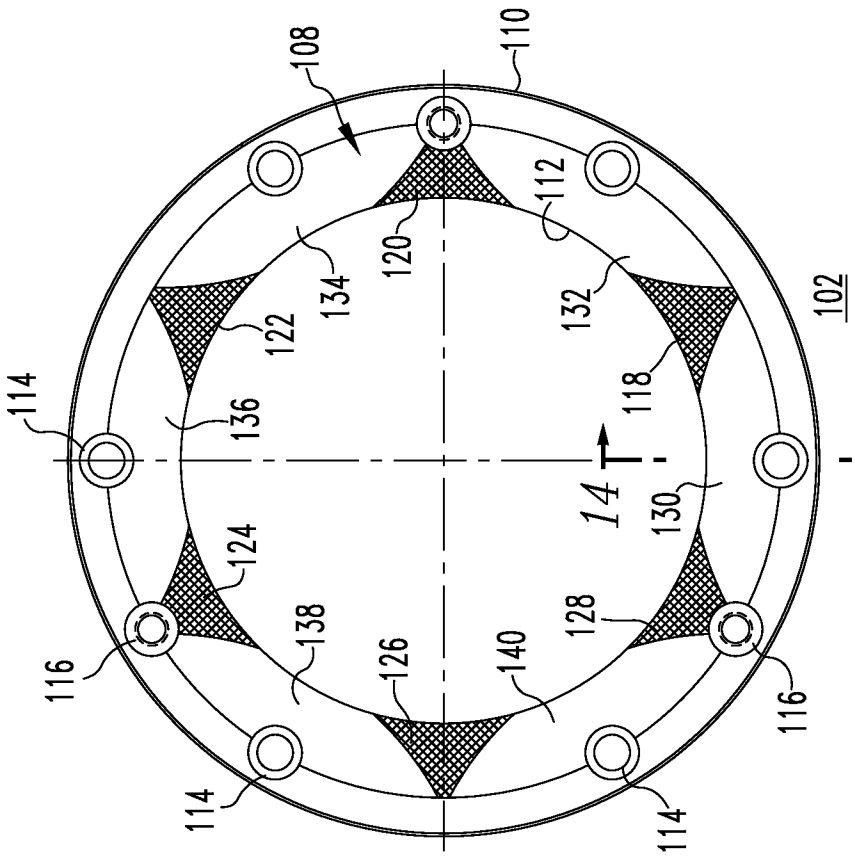
108
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FIG. 9A

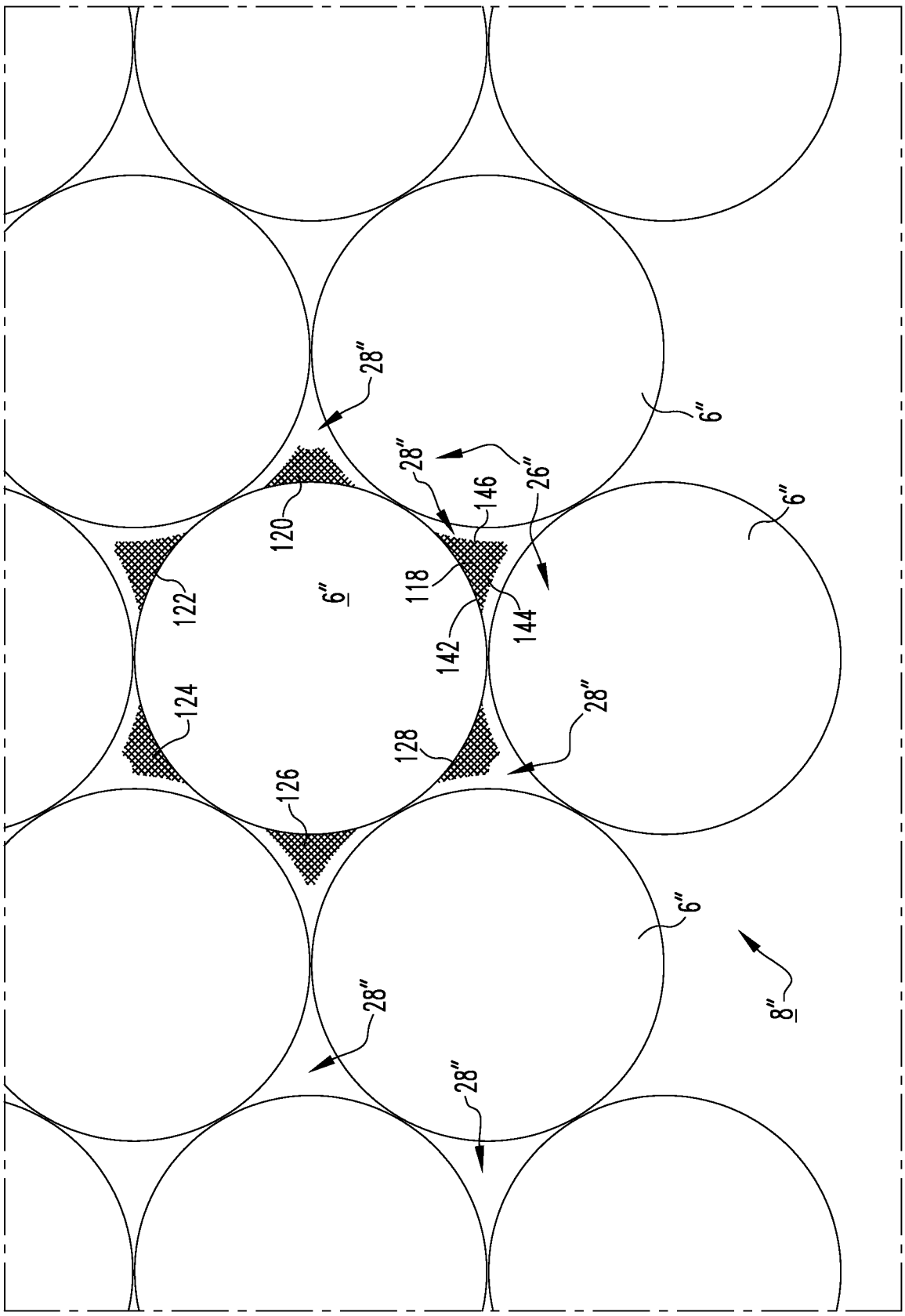
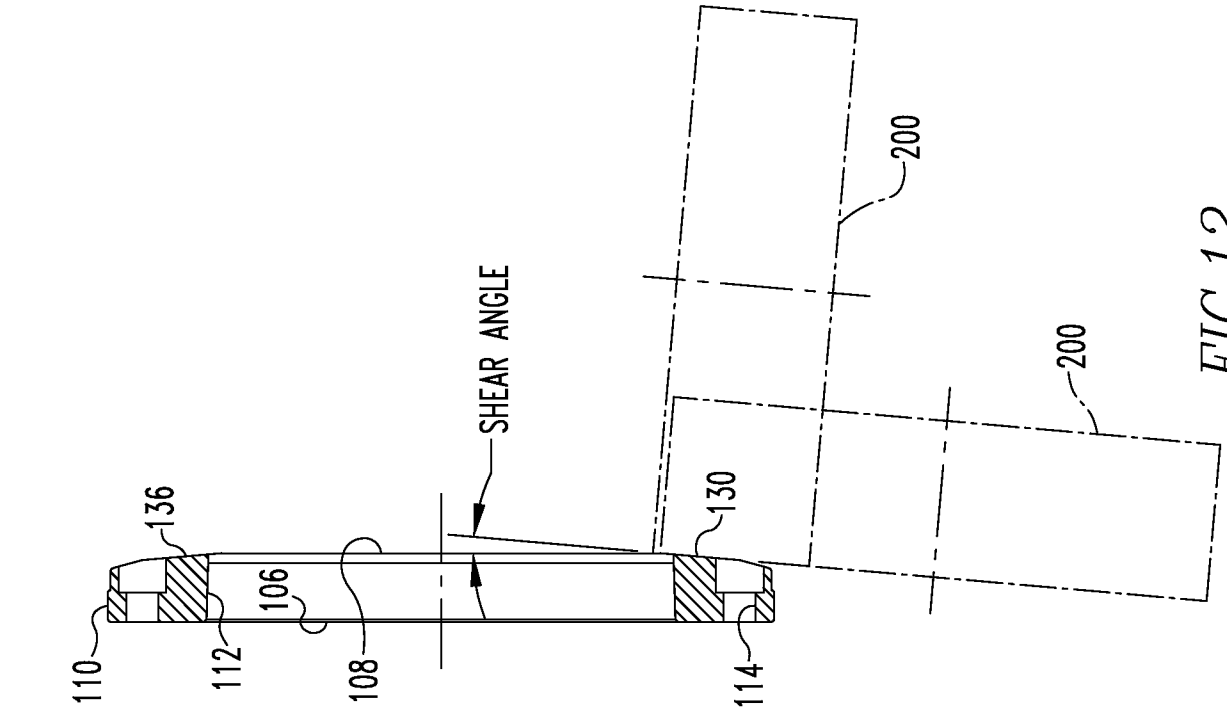


FIG.10


SHEAR ANGLE
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200
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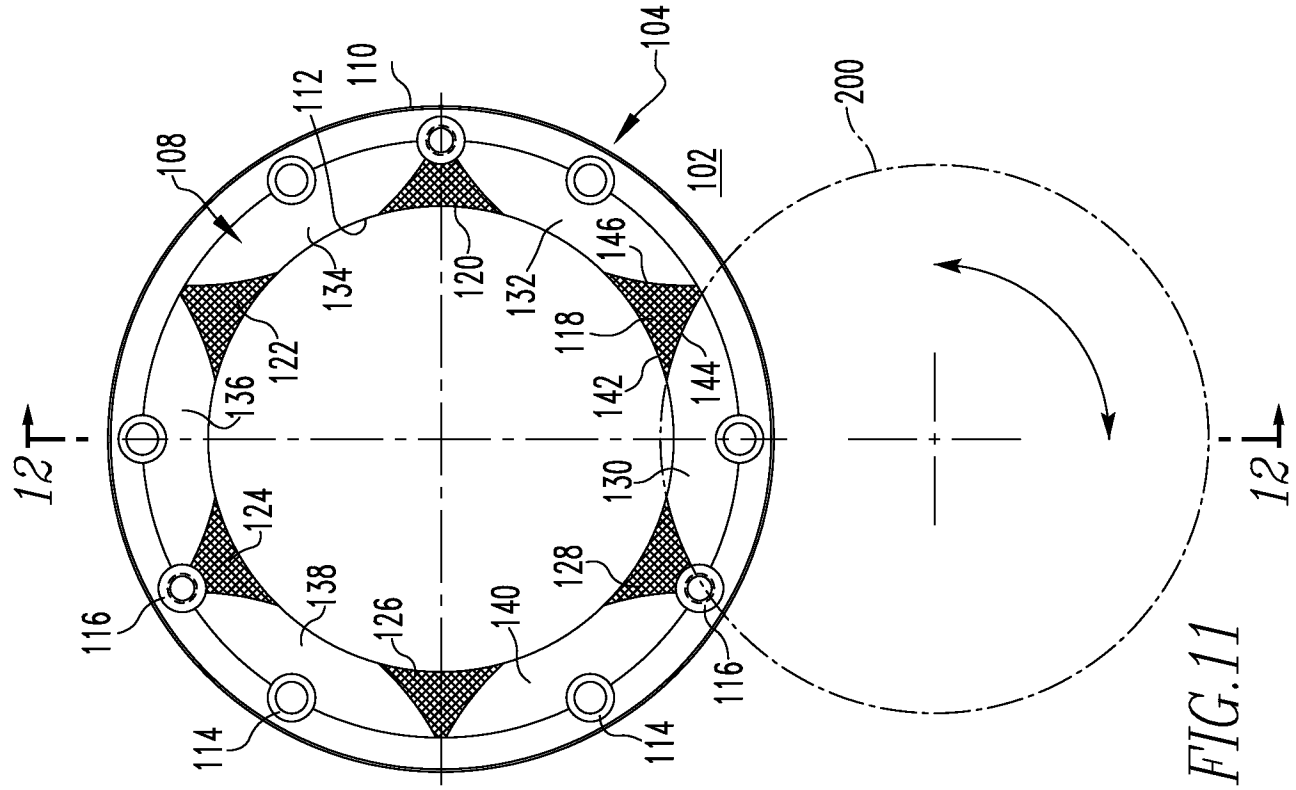
106
130
110
112
108
114

FIG.12


104
102
200
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120
132
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12

FIG.11

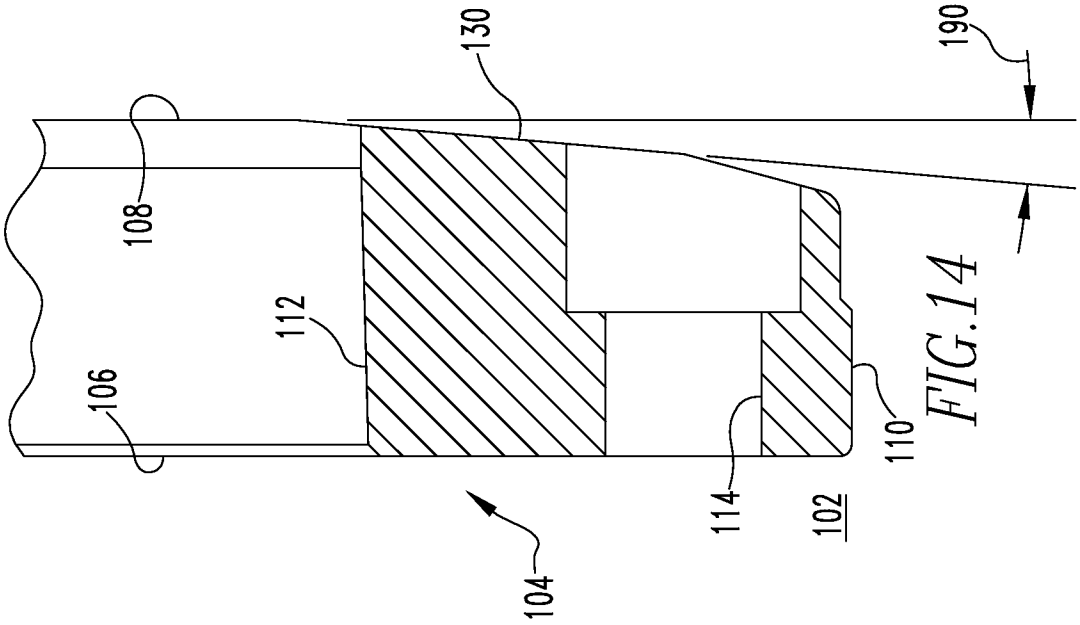

FIG.14

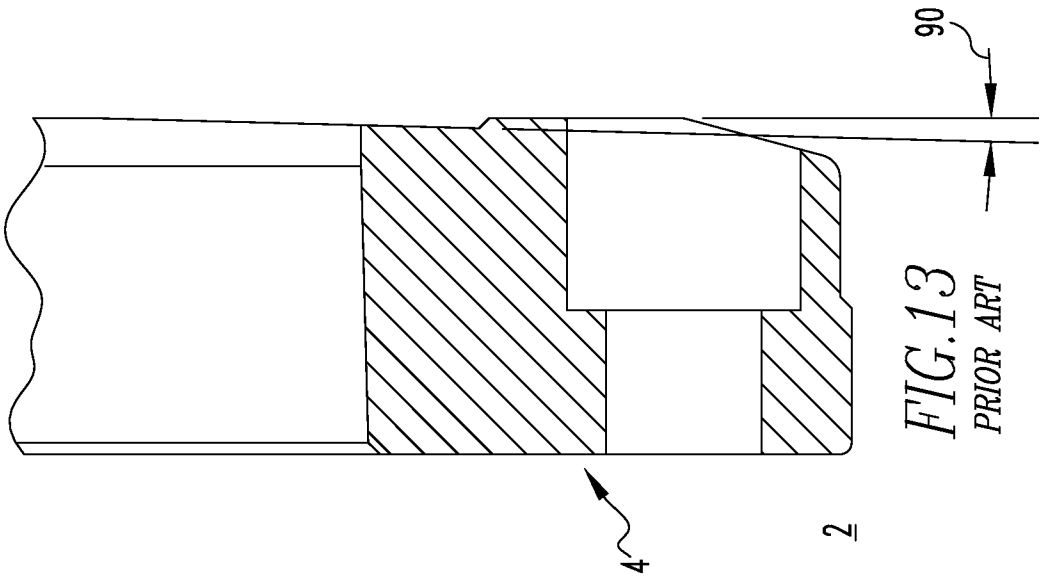

FIG.13
PRIOR ART

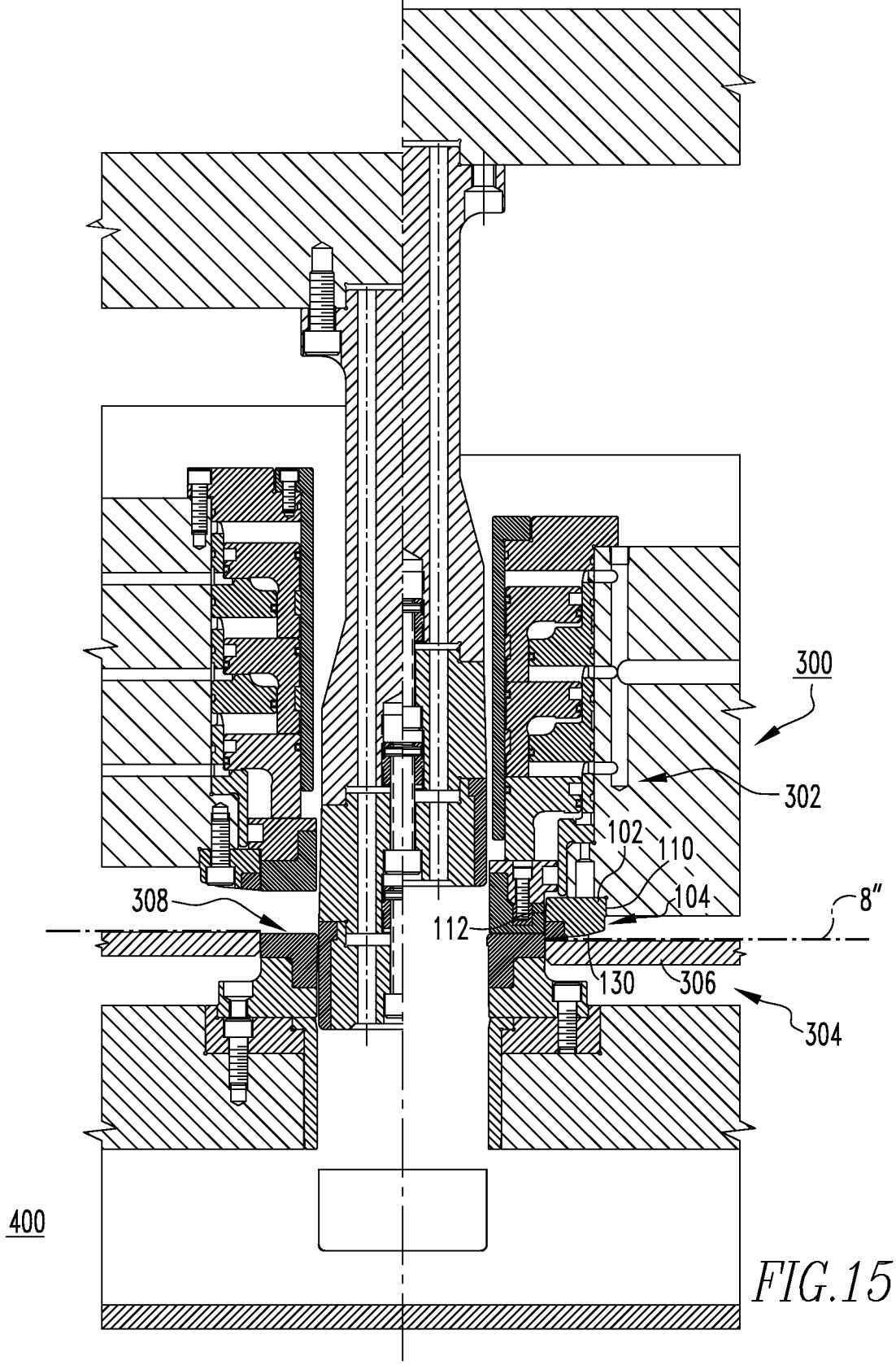

FIG.15

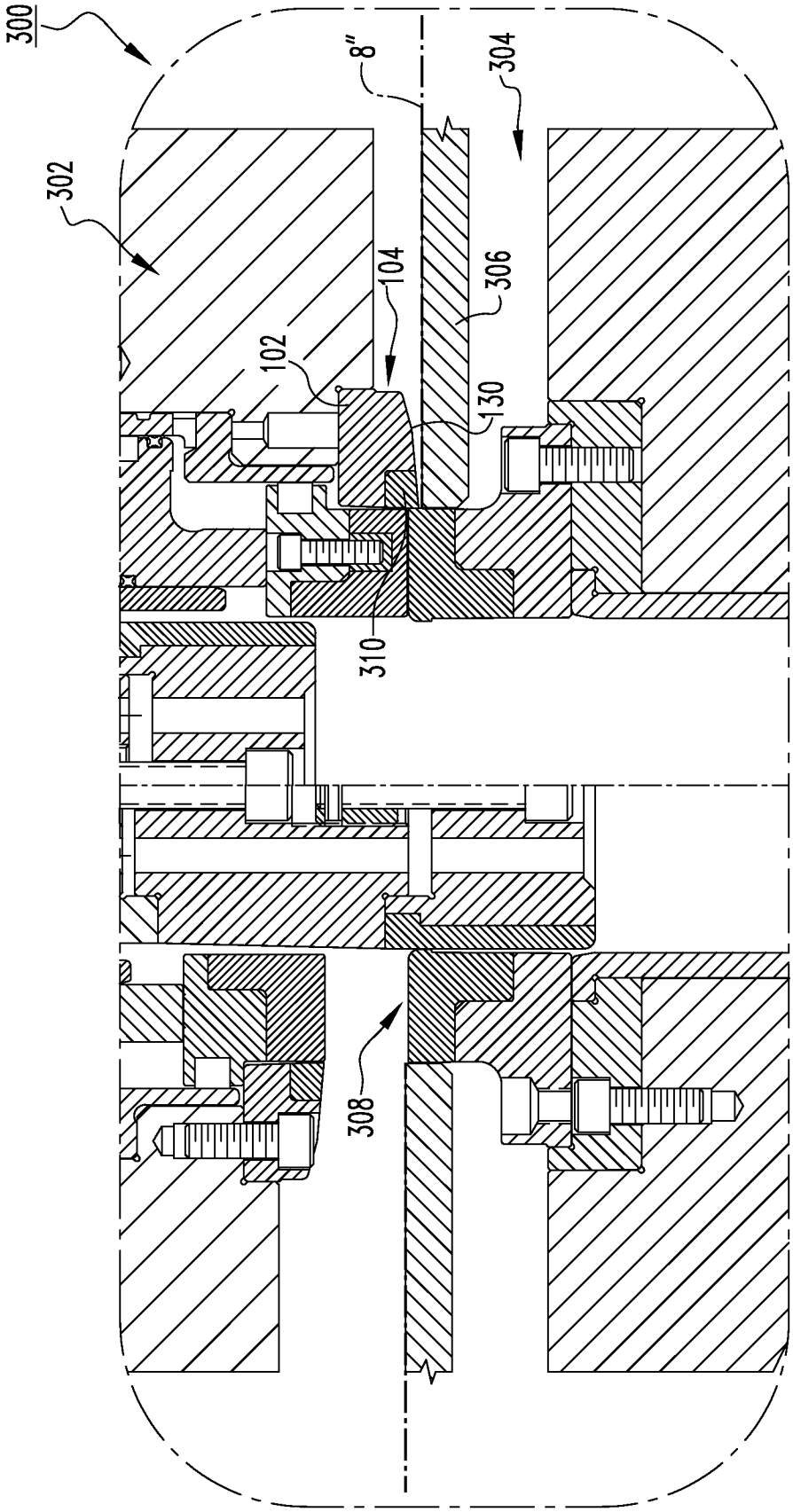

FIG.16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/026438

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B21D 28/06 (2011.01)
USPC - 83/40
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - B21D 22/20, 22/22, 22/28, 24/04, 28/02, 28/06, 28/22 (2011.01)
USPC - 72/324, 326, 329, 330, 336, 337, 343, 347; 83/40, 50, 55

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
MicroPatent, Google Patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2009019832 A1 (GODA et al) 12 February 2009 (12.02.2009) entire document	1-20
Y	US 5,052,207 A (PORUCZNIK) 01 October 1991 (01.10.1991) entire document	1-20
Y	US 5,604,044 A (MCCABE et al) 18 February 1997 (18.02.1997) entire document	1-20
Y	JP 1284433 A (OGAWA et al) 15 November 1989 (15.11.1989) entire document	3, 8, 15, 17
Y	US 4,846,033 A (UEHLINGER et al) 11 July 1989 (11.07.1989) entire document	4, 5, 9, 10, 18
Y	JP 56053827 A (NAKAMURA et al) 13 May 1981 (13.05.1981) entire document	12-14, 19, 20
Y	US 5,423,240 A (DETORRE) 13 June 1995 (13.06.1995) entire document	15

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 April 2011	14 APR 2011
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)