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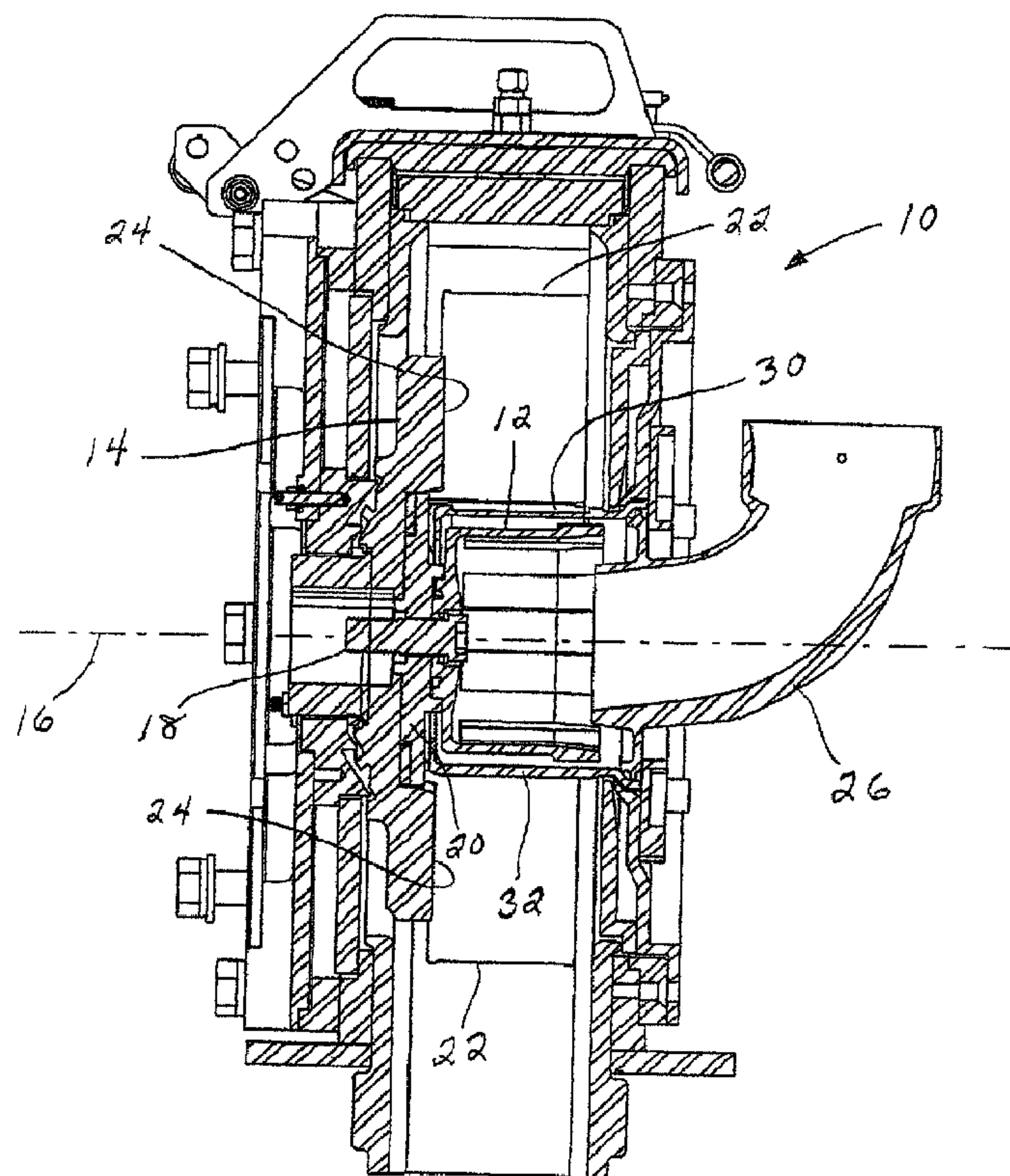
(71) Demandeur/Applicant:
CP METCAST, INC., US

(72) Inventeurs/Inventors:
PANZENHAGEN, CARL P., US;
CHAMBERLAIN, ARNOLD A., US

(74) Agent: BORDEN LADNER GERVAIS LLP

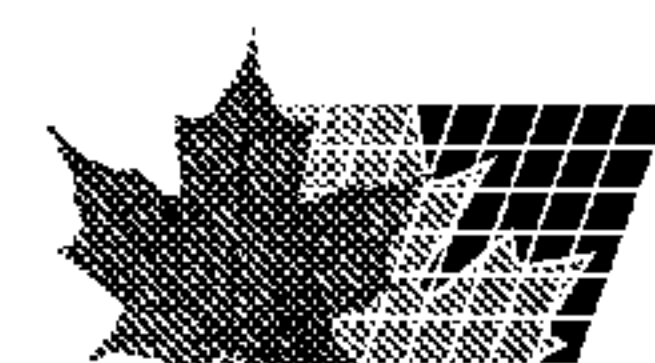
(54) Titre : HELICE DESTINEE A UNE ROUE DE GRENAILLAGE

(54) Title: IMPELLER FOR CENTRIFUGAL BLASTING WHEEL



(57) Abrégé/Abstract:

An impeller for a centrifugal blasting wheel includes a base plate, a support collar, and a plurality of spaced rotor blades interconnecting the base plate and support collar. A step is formed at the inner end of the collar and the outer ends of the rotor



(57) **Abrégé(suite)/Abstract(continued):**

blades which causes blasting shot to be discharged to the throwing blades of the blasting wheel in a relatively more radial direction to reduce wear of the throwing blades. The base plate also has a frustum-shaped central boss formed to minimize wear of the base plate by the blasting shot. The frustum-shaped central boss has a recess formed therein so that the head of the bolt that connects the impeller to the throwing wheel is located entirely within the recess to also reduce wear of the bolt head.

Abstract

An impeller for a centrifugal blasting wheel includes a base plate, a support collar, and a plurality of spaced rotor blades interconnecting the base plate and support collar. A step is formed at the inner end of the collar and the outer ends of the rotor blades which causes blasting shot to be discharged to the throwing blades of the blasting wheel in a relatively more radial direction to reduce wear of the throwing blades. The base plate also has a frustum-shaped central boss formed to minimize wear of the base plate by the blasting shot. The frustum-shaped central boss has a recess formed therein so that the head of the bolt that connects the impeller to the throwing wheel is located entirely within the recess to also reduce wear of the bolt head.

IMPELLER FOR CENTRIFUGAL BLASTING WHEEL

Background of the Invention

[001] The present invention relates to centrifugal throwing wheels, sometimes referred to as centrifugal blasting wheels or centrifugal shotblast wheels, used to project streams of abrasive particles against a workpiece to subject the surface of the workpiece to cleaning or abrading action. More specifically, the present invention relates to an impeller for the blasting wheel which is used to feed and distribute the abrasive particles to rotating blades of the blasting wheel.

[002] Installations equipped with centrifugal blasting wheels are typically used to remove scale or rust from the surface of metallic workpieces, or to clean the surface of metal castings. Centrifugal blasting wheels will typically employ a throwing wheel assembly having a plurality of radially extending throwing blades mounted on a rotatable wheel. The throwing blades are positioned to receive a stream of abrasive particulate material, sometimes referred to as blasting shot, and then throw the particulate material radially outwardly from the wheel at an appropriate discharge location. A rotary impeller is used to receive the blasting shot from a feed spout, and distribute the blasting shot to the rotating throwing blades.

[003] In a centrifugal throwing wheel of this type, sometimes referred to as an airless centrifugal throwing wheel, not all of the abrasive particles of blasting shot move radially outwardly from the impeller in a direction that is preferably tangential to, and as parallel as possible to, the surfaces of the throwing blades when they emerge from the openings in the distributing impeller. A considerable number of the abrasive blasting shot particles strike against the edges of the openings in the impeller, as well as other surfaces of the impeller, to cause the blasting shot to deflect or bounce back and forth, or reverberate in a ping-pong like manner, within the area housing the rotating throwing blades. Such action not only reduces the exit speed of the blasting shot, but also causes the blasting shot to be non-uniformly distributed over the surface of the workpiece being processed. Further, such action also

increases the degree of wear on the impeller, the throwing blades, and other components of the centrifugal throwing wheel that are subject to contact with the blasting shot particles.

[004] It is therefore an object of the present invention to reduce the degree of wear caused to components, such as the impeller and throwing blades, of a centrifugal blasting wheel by the abrasive blasting shot.

[005] Another object of the present invention is to improve the directional flow of the abrasive blasting shot as it exits the impeller to provide more efficient cleaning and abrading action for the centrifugal blasting wheel.

Summary of the Invention

[006] The present invention provides an impeller for feeding blasting shot to throwing blades of a centrifugal blasting wheel. The impeller receives blasting shot from a feed spout, and distributes or discharges at least some of the blasting shot in a relatively more radial direction to the rotating throwing blades. The result is more of the blasting shot exiting the impeller in the desired radial direction, and a reduction of the disadvantages discussed above with respect to prior impellers used with centrifugal blasting wheels.

[007] In one aspect, there is provided an improved impeller for a centrifugal blasting machine comprising: (a) a base plate adapted for rotation about a central axis of rotation, the base plate extending substantially perpendicularly from the axis of rotation, and having an outer circumferential end radially spaced from the axis of rotation; (b) a collar axially spaced from the base plate and circumferentially surrounding the axis of rotation, the collar defining an interior circumferential surface and an exterior circumferential surface; (c) a plurality of axially extending and circumferentially spaced apart rotor blades connecting the outer circumferential end of the base plate and the collar to thereby define a generally cylindrically shaped interior space and a plurality of axially and circumferentially extending openings therebetween to permit discharging of blasting shot therethrough from the interior space upon rotation, and each of the rotor blades defining an inner circumferential surface and an outer circumferential surface; and (d) the outer circumferential surfaces of the rotor blades being located radially inward of the exterior circumferential surface of the collar to

define a step for deflecting blasting shot exiting the interior space in a relatively more radial direction.

[008] In another aspect of the invention, the step is concavely-shaped. The concave shape is preferably shaped as an arc of a circle having a radius of from about 2 inches to about 6 inches, more preferably shaped as an arc of a circle having a radius of from about 3 inches to about 5 inches, and most preferably shaped as an arc of a circle having a radius of about 4.25 inches. This concavely-shaped surface improves the directional flow of the blasting shot by deflecting more of the blasting shot in a radial direction rather than in random directions.

[009] In yet another aspect of the invention, the base plate has an annular inner surface facing the interior space of the impeller which surrounds a frustum-shaped central boss projecting axially into the interior space. A bolt-receiving opening is formed through the central boss, and extends co-axially with the axis of rotation. The bolt-receiving opening has an annular recess formed therein for engaging a bolt head. The axial depth of the recess is such that the head of the bolt is located entirely within the recess so as to minimize wear of the bolt head during operation of the centrifugal blasting wheel.

Brief Description of the Drawings

[010] Figure 1 is a sectional side view in elevation of a centrifugal blasting wheel incorporating an impeller of the present invention;

[011] Figure 2 is an end view of the impeller looking into the interior thereof along its axis of rotation;

[012] Figure 3 is a side view of the impeller; and

[013] Figure 4 is a sectional view of the impeller.

Detailed Description of the Preferred Embodiments of the Invention

[014] Figure 1 illustrates a centrifugal blasting wheel assembly, generally designated by the number 10, incorporating an impeller 12 constructed in accordance with the present invention. The blasting wheel assembly 10 includes a throwing wheel 14 having an axis of rotation 16, and which is driven by a motor and drive shaft (not shown) via bolt 18. A hub 20 is affixed to throwing wheel 14 for rotation therewith, and impeller 12 in turn is centrally mounted to hub 20 for rotation with hub 20 and throwing wheel 14. A plurality of rotating throwing blades 22 are removably mounted on, and are generally perpendicular to, the inner face 24 of throwing wheel 14.

[015] The impeller 12 receives a stream of abrasive particulate blasting material, typically referred to as blasting shot, from a feed spout 26, and in turn feeds the blasting shot to the throwing blades 22. The impeller 12 is provided with a plurality of openings 28, hereinafter to be more fully described, for delivering the blasting shot through a discharge slot 30 provided in a stationary control cage 32 that surrounds the impeller 12 and in which the impeller 12 rotates. The blasting shot is thereby received at the inlet ends of the throwing blades 22 as the blades 22 rotate past the discharge slot 30 of control cage 32. The blasting shot is then accelerated as it moves radially outwardly along the surface of the throwing blades 22 until it is thrown from the distal end of the blades 22 at a desired discharge point against the surface of a workpiece.

[016] Turning now to Figures 2-4, the impeller 12 is illustrated in more detail. Impeller 12 includes a base plate 34 that extends substantially perpendicularly to the axis of rotation 16. Base plate 34 has an outer surface 36 that abuts against hub 20, and is mounted to hub 20 by bolt 18 for rotation therewith. Base plate 34 also has an annular inner surface 38 facing the interior of impeller 12, and as shown best in Figure 4, the annular inner surface 38 surrounds a frustum-shaped central boss 40 that projects axially into the interior of impeller 12. As shown best in Figure 4, the frustum-shaped central boss 40 includes an annular wall sloping axially inwardly from the annular inner surface 38 at an angle A with respect to the annular surface 38. Angle A is preferably between about 2 degrees to about 15 degrees, more

preferably between about 5 degrees to about 12 degrees, and most preferably about 10 degrees. Such angles minimize the amount of interference between the boss 40 and the blasting shot resulting in less wear of the base plate 34.

[017] The frustum-shaped central boss 40 has a bolt-receiving opening 42 formed axially therethrough, and which extends co-axially with the axis of rotation 16. As best shown in Figures 1 and 4, the bolt-receiving opening 42 includes an annular recess 44 formed therein for receiving the head of bolt 18 and engaging against the underside of the head of bolt 18 when bolt 18 is turned to tighten impeller against hub 20. Recess 44 thus forms a circular ridge or edge 46 along the apex of frustum-shaped central boss 40, and has an axial depth such that the entire head of bolt 18 lies within recess 44 when the underside of the head of bolt 18 engages recess 44 so that bolt 18 is completely seated therein. Preferably, the outside of the head of bolt 18 is flush with or slightly beneath the circular ridge or edge 46 formed by the apex of boss 40. Positioning the outside of the head of bolt 18 to be flush with or slightly beneath the apex of boss 40 substantially reduces interference between the head of bolt 18 and the blasting shot within the interior of impeller 12, and thus substantially reduces wear of the head of bolt 18 during operation of centrifugal blasting wheel 10.

[018] As shown best in Figures 3 and 4, impeller 12 also includes a collar or support ring 48 axially spaced from base plate 34. Collar 48 surrounds axis of rotation 16, and includes an interior circumferential surface 50 and an exterior circumferential surface 52. As shown best in Figure 4, interior circumferential surface 50 tapers outwardly towards the open end of impeller 12. In other words, the axially outer end of surface 50, i.e. the end of collar 48 that is closest to feed spout 26, as seen in Figure 1, is located radially at a greater distance from axis of rotation 16 than is the axially inner end of surface 50, i.e. the end of collar 48 that is furthest from spout 26, as seen in Figure 1. This taper of interior surface 50 helps to prevent the outer end of collar 48 from interfering with the feed spout 26, and helps to direct blasting shot into the interior of impeller 12.

[019] As shown best in Figure 3, impeller 12 further includes a plurality of axially extending and circumferentially spaced apart rotor blades 54 which connect the outer circumferential end of base plate 34 and the axially inner end of collar 48. Each rotor blade

54 defines an inner circumferential surface 56, which faces the interior of impeller 12, and an outer circumferential surface 58, which faces the exterior of impeller 12. The base plate 34, collar 48 and interconnecting rotor blades 54 thus form a generally cylindrically shaped interior space as well as the plurality of axially and circumferentially extending openings 28 located between each of rotor blades 54. As shown in Figure 3, openings 28 and rotor blades 54 are substantially rectangular in shape, and have an axial length that is about twice their circumferential width. As previously described herein, openings 28 permit the discharge of blasting shot therethrough from the interior space of impeller 12 to throwing blades 22 upon rotation of impeller 12.

[020] As shown best in Figure 4, the outer circumferential surface 58 of rotor blades 54 are disposed radially inwardly of the exterior surface 52 of collar 48 to define a step 60 that extends circumferentially around the entire inner end of collar 48. Step 60 is concavely-shaped, and is preferably shaped as an arc of a circle having a radius of from about 2 inches to about 6 inches, more preferably as an arc of a circle having a radius of from about 3 inches to about 5 inches, and most preferably is an arc of a circle having a radius of about 4.25 inches. The radius (R) is determined by the conventional formula: $R = H/2 + W^2/8H$ where W is the width or straight line distance of the arc between its beginning point and its ending point, and H is the height of the arc from the straight line drawn between the beginning and ending points of the arc and the apex of the arc.

[021] During operation of the centrifugal blasting wheel 10, some of the blasting shot exiting the interior of impeller 12 through openings 28 engages step 60. Due to its position and shape, step 60 causes the blasting shot to deflect in a relatively more radial direction, rather than in random directions, through the discharge slot 30 in control cage 32 to thereafter be picked up by throwing blades 22. The exit speed of the blasting shot at the distal ends of the throwing blades 22 is thereby increased, the blasting shot is more uniformly distributed to the surface of the workpiece, and wear of the throwing blades 22 is reduced due to less violent contact or collisions between the blasting shot and the surfaces of the blades 22.

CLAIMS:

1. An impeller for feeding blasting shot to a centrifugal blasting wheel, comprising:
 - (a) a base plate adapted for rotation about a central axis of rotation, said base plate extending substantially perpendicularly from said axis of rotation, and having an outer circumferential end radially spaced from said axis of rotation;
 - (b) a collar axially spaced from said base plate and circumferentially surrounding said axis of rotation, said collar defining an interior circumferential surface and an exterior circumferential surface;
 - (c) a plurality of axially extending and circumferentially spaced apart rotor blades connecting the outer circumferential end of said base plate and said collar to thereby define a general cylindrically shaped interior space and a plurality of axially and circumferentially extending openings therebetween to permit discharging of blasting shot therethrough from said interior space upon rotation, and each of said rotor blades defining an inner circumferential surface and an outer circumferential surface; and
 - (d) a step for deflecting blasting shot exiting said interior space in a relatively more radial direction, said step defined by the outer circumferential surfaces of said rotor blades being disposed radially inwardly of the exterior circumferential surface of said collar.
2. The impeller of claim 1 wherein said step is concavely-shaped.
3. The impeller of claim 2 wherein said step is an arc of a circle having a radius of from about 2 inches to about 6 inches.
4. The impeller of claim 2 wherein said step is an arc of a circle having a radius of from about 3 inches to about 5 inches.
5. The impeller of claim 2 wherein said step is an arc of a circle having a radius of about 4.25 inches.

6. The impeller of claim 1 wherein said base plate has an annular inner surface facing said interior space, and said annular inner surface surrounds a frustum-shaped central boss which projects axially into said interior space.
7. The impeller of claim 6 wherein the frustum-shaped central boss of said base plate has an axially extending bolt-receiving opening formed therethrough.
8. The impeller of claim 7 wherein said bolt-receiving opening includes an annular recess for engaging a bolt head.
9. The impeller of claim 8 wherein said annular recess has an axial depth such that the bolt head is located entirely within the recess.
10. The impeller of claim 6 wherein said frustum-shaped central boss includes an annular wall sloping axially inwardly from said annular inner surface at an angle of from about 2 degrees to about 15 degrees with respect to said annular inner surface.
11. The impeller of claim 6 wherein said frustum-shaped central boss includes an annular wall sloping axially inwardly from said annular inner surface at an angle of from about 5 degrees to about 12 degrees with respect to said annular inner surface.
12. The impeller of claim 6 wherein said frustum-shaped central boss includes an annular wall sloping axially inwardly from said annular inner surface at an angle of about 10 degrees with respect to said annular inner surface.

1/4

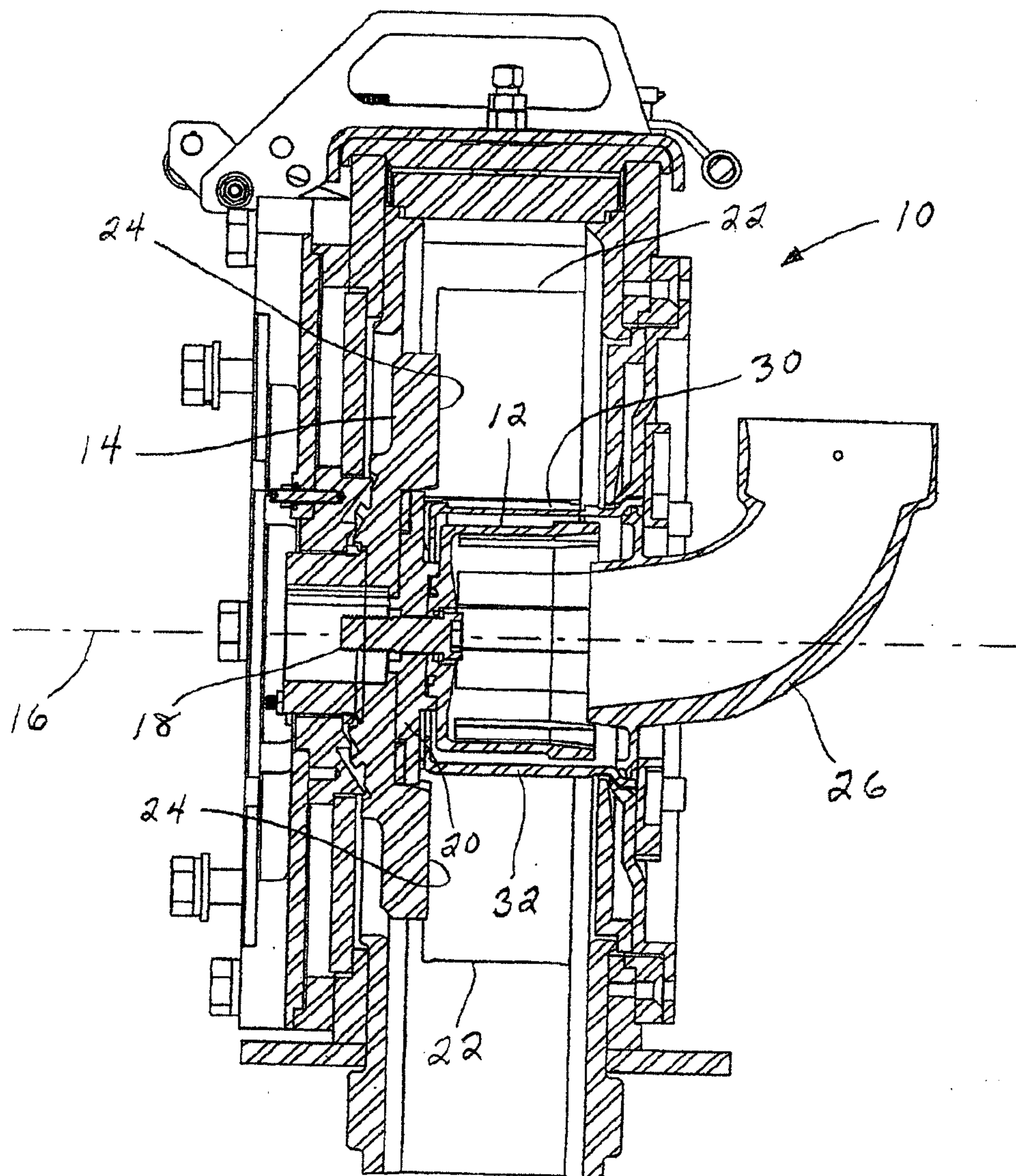


FIGURE 1

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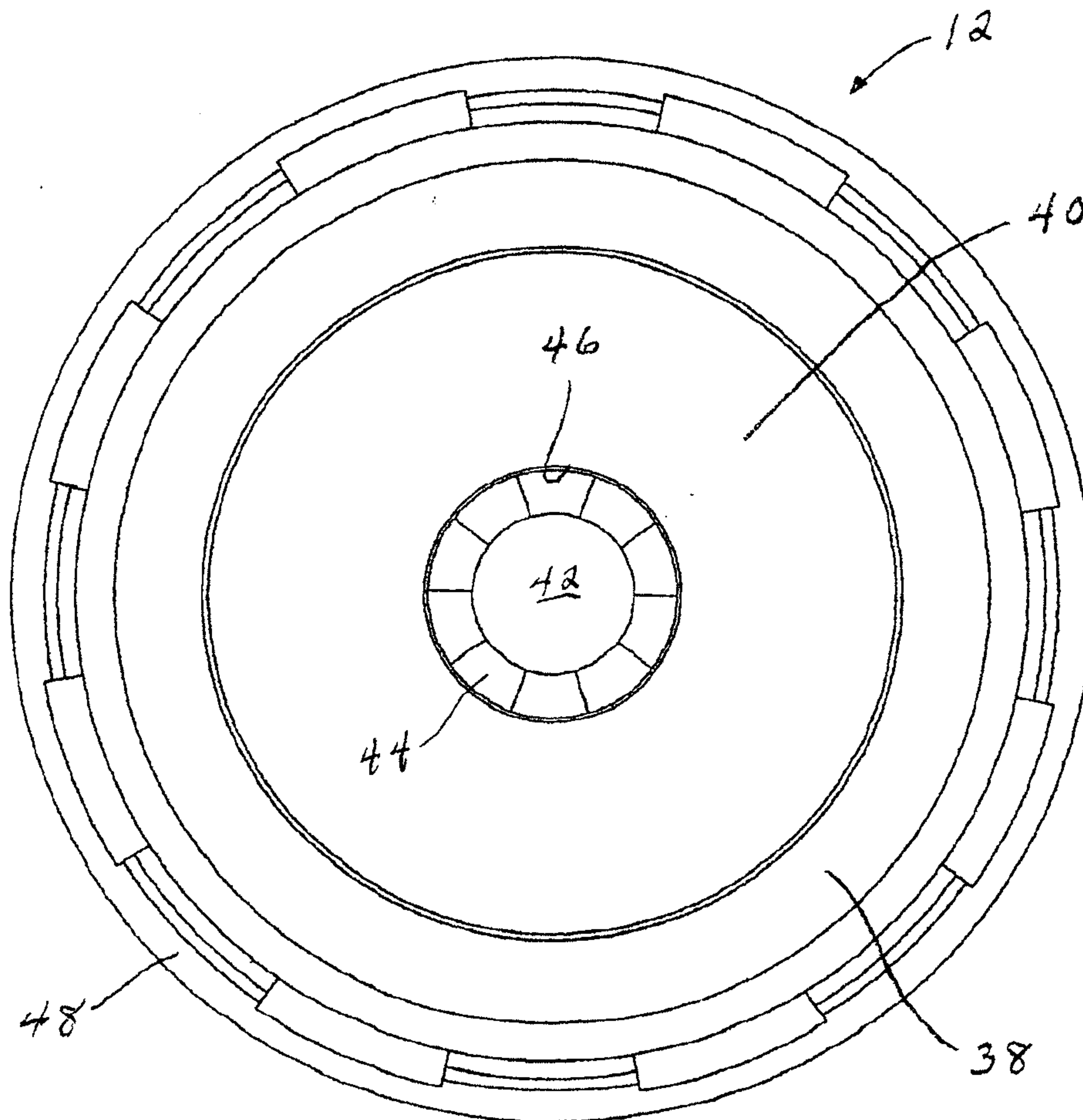


FIGURE 2

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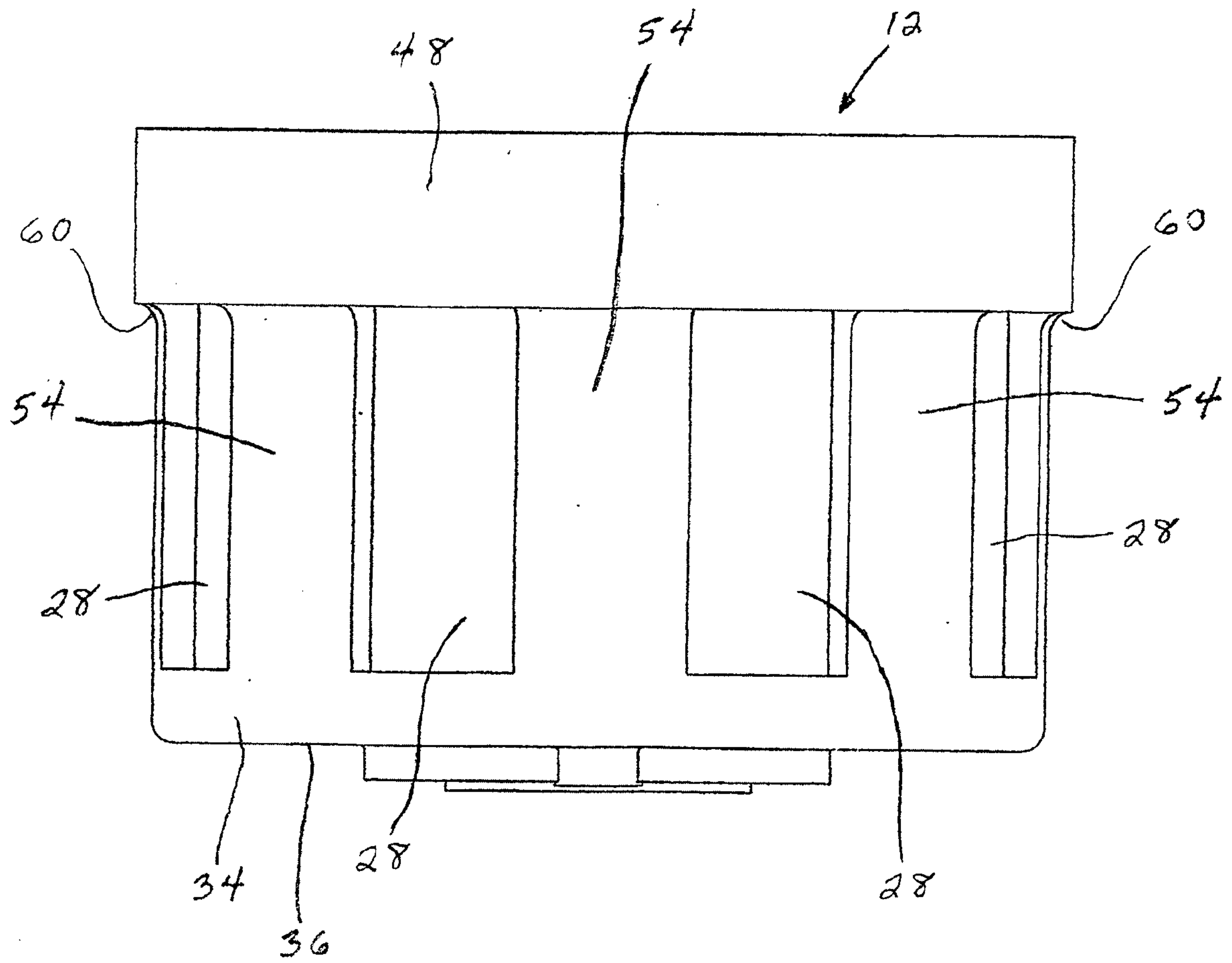


FIGURE 3

4/4

