June 29, 1965 H. S. CHAMBERS 3,191,346

BLASTING WHEEL CONSTRUCTION

Filed Aug. 9, 1961 2 Sheets-Sheet 1

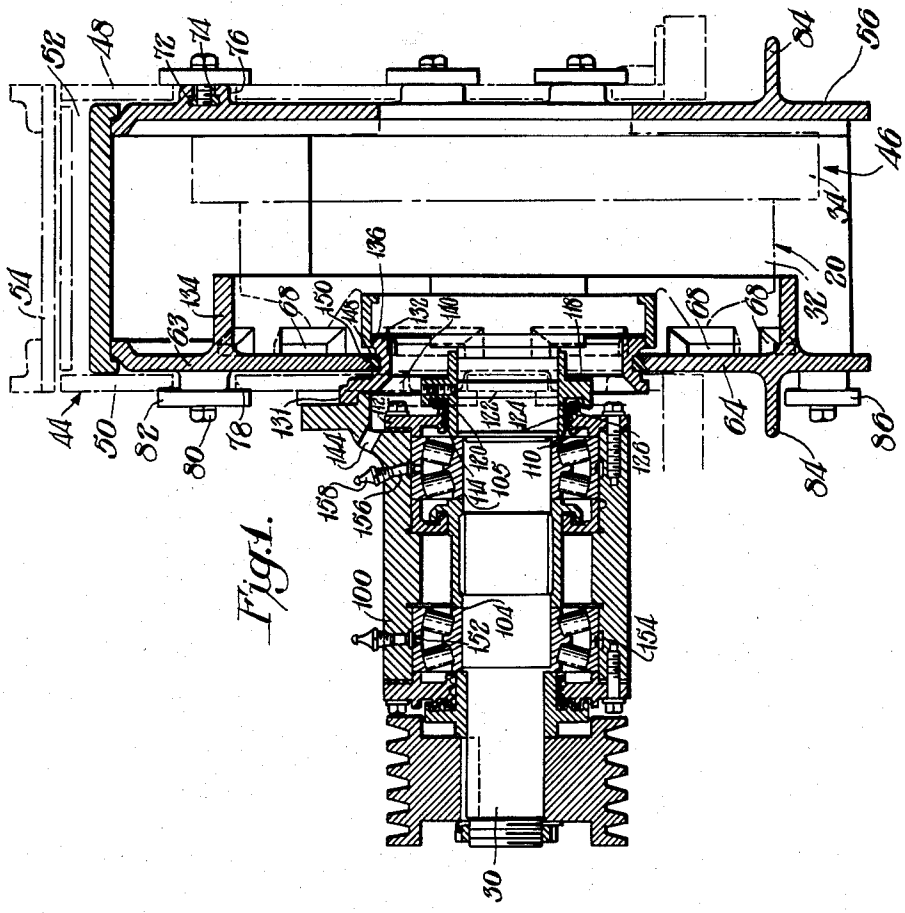


Fig. 1.

INVENTOR

Howard S. Chambers

BY

Connolly and Hutz ATTORNEY

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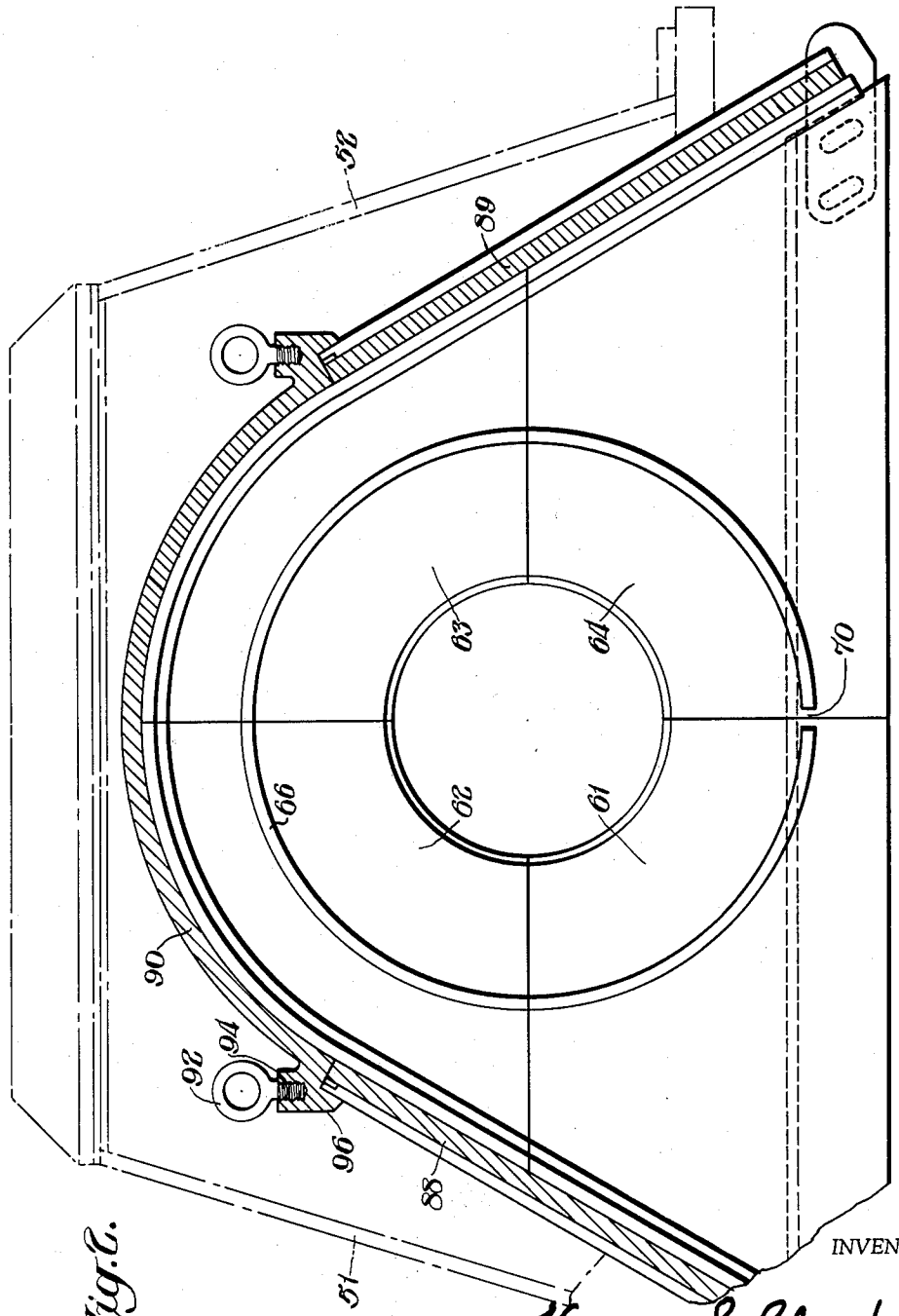


Fig. 2.

INVENTOR

Howard S. Chambers

BY

Connolly and Hutz ATTORNEY

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3,191,346

BLASTING WHEEL CONSTRUCTION

Howard S. Chambers, Chambersburg, Pa., assignor, by mesne assignments, to The Pangborn Corporation, Hagerstown, Md., a corporation of Delaware

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4 Claims. (Cl. 51—9)

The present invention relates to blasting wheels of the type used to rapidly project a stream of particles against work pieces for the purpose of abrading, cleaning, peening or otherwise working said pieces. A wheel of this type is shown, for example, in U.S. Patent 2,869,289 granted January 20, 1959.

Among the objects of the present invention is to provide an improved blasting wheel construction which is more desirable to manufacture, use and maintain.

The above as well as additional objects of the present invention will be more clearly understood from the following description of several of its exemplifications, reference being made to the accompanying drawings wherein:

FIG. 1 is a sectional view of a blasting wheel construction in acordance with the present invention, the section being taken along the axis around which the wheel rotates; and

FIG. 2 is a sectional view of the construction of FIG. 1 taken along the line **2—2**.

According to the present invention a blasting wheel assembly including a projecting wheel with outwardly extending propelling vanes, has a housing covering the wheel and guarding against the escape of blastant particles in any undesired direction, the interior of the housing being line with wear plate structure that is entirely supported by securing elements on the housing face of the wear plate structure and no securing elements are exposed to the projected particles.

The securing elements are preferably threaded members cast in place on the housing face of the wear plate structure, but they can also be in the form of cement adherently holding the wear plate against the housing walls.

A very effective form of wear plate for the above combination has a generally flat body portion shaped approximately as the segment of an annulus, with an arcuate rib protruding from the intermediate portion of one face and following the segmental form of the body, the body edge nearest the center of the annulus being tapered to a relatively thin line, and the body face opposite the ribbed face having two protruding spaced bosses each with a relatively soft steel nut locked in by casting, with the threaded portions of the nuts exposed for anchoring.

The wear plate of the present invention can also be used to help seal against leakage of blastant particles along the spindle upon which the wheel is journaled. Thus the wheel assembly having its spindle journaled in and projecting out from one end of a tubular housing with its throwing wheel secured to the projecting spindle end and its box housing around the wheel and fastened to the tubular housing, has a passageway in the box housing through which the spindle penetrates.

According to one aspect of the present invention, a sealing ring is clamped to the housing combination so as to encircle the spindle where it penetrates through the above passageway. A labyrinth sealing member is secured to the spindle and coacts with the sealing member to form a labyrinth seal that reduces the above leakage, and a gasket-type joint is made between the sealing ring and the box housing to further limit such leakage. This gasket-type joint is conveniently made by cementing a ring of sponge rubber, for example, in a groove that extends around the outer surface of the sealing ring, and

arranging the wear plate structure so that the edge of that structure tapers down to substantially a line and this edge is placed in compressive engagement with the rubber ring.

Another aspect of the present invention is the use of spindle bearings of the twin-row type with a lubricating connection from between the rows to a source of lubricant so that minimum amounts of fresh lubricant will keep each bearing row properly lubricated.

Turning now to the drawings, the apparatus of FIG. 1 shows a throwing wheel **20** having a spindle **30** rotatably mounted on suitable journals and carrying a runner head **32** upon which throwing vanes **34** are mounted. The spindle **30** is shown as provided at one end with an enlarged flange **36** to which the head **32** can be firmly secured as by means of bolts penetrating through the flange and runner head from either side. The runner head is desirably of relatively massive construction so that unsymmetrical erosion of the throwing vanes will not significantly unbalance the unit dynamically.

The vanes **34** can be held in place in any suitable manner such as shown in U.S. Patent 2,732,666 granted January 31, 1956.

In the opening **40** provided at the center of the runner head there is positioned a discharge-directing feed for blastant particles. This feed per se forms no part of the present invention and is accordingly not illustrated. It can be of the types shown in U.S. Patent 2,732,666, or of any other construction.

A box-shaped housing **44** is shown in FIG. 1 as surrounding the wheel **20** and is open at **46** to permit the blastant particles to be projected out from the wheel in the desired direction. The housing has a front wall **48**, a rear wall **50**, side walls **51**, **52**, and a cover **54**, all of which cooperate to prevent the escape of blastant particles in any other direction. The walls and cover are protected by wear plates made of material that is very highly abrasion-resistant and are readily replaceable. These plates can also extend out through opening **46** so as to form an extension of the housing, as indicated at **56**.

For the rear housing wall **50** the wear plate structure includes four separate wear plate segments **61**, **62**, **63** and **64**, which fit together to form a generally annularly-shaped assembly surrounding the spindle **30**. These segments have projecting from their exposed faces protruding arcuate rib sections **66**, which together form a ring baffle that extends close to the periphery of the runner head **32**. This reduces the passage of blastant particles into the place behind the runner head. The baffle ring can be provided with apertures such as the tapered passageways **68** and can also have a gap **70** at its lowest portion to help drain or permit throwing out of those blastant particles which manage to find their way into the space within the baffle ring.

The rear wear plate segments are secured to the rear housing wall **50** in the illustrated construction by providing the segments with nuts **72** that are cast in place on the segment faces that engage the housing. Such nuts can be made of ordinary relatively soft steel such as SAE1010 or a hardened form of such relatively soft steel. Each segment is cast of the extremely hard wear-resistant material and during the casting the nuts hold in appropriate position by means of threaded nut retainers or inserts that permit the cast metal to surround substantially the entire nut and leave essentially only its thread exposed. The insert itself blocks the cast metal from getting into the threaded portion of the nut and also leaves an access opening **74** through which the threaded portion can be reached. After the casting is completed, the nut retainers are unthreaded and without any machining operations whatever, the segments can then be fitted in place.

A boss or pad 76 is provided around each nut so as to project away from the main portion of the housing-engaging face of the segments, and these bosses are received in locating opening 78 in the housing wall. Bolts such as indicated at 80 can then be threadedly engaged in the nuts to anchor the segments against the housing wall. Washers 82 fitted under the heads of the bolts enable the use of standard size, relatively small heads.

The front housing wall 48 can have wear plate segments made in exactly the same way but without the baffle rib. Both the front and the rear wear plate assemblies can also have at their lowest portions outwardly directed ribs 84 which help in reducing warpage during the casting.

The wear plates 88, 89 used to protect the end walls 51, 52 of the housing, can be perfectly flat structures resting on mounting clips 86 secured as by bolting to the outermost portions of the lower edges of segments 61, 64, and to the corresponding locations of the front wall wear plates.

The wear plate assembly is completed by a cap plate 90 that is cast in arcuate form so as to rest on the arcuate tops of the front and rear wear plates. Also to provide lifting means, the cap plate 90 is fitted with lifting eyes 92. One very effective way to accomplish this is by having eyes 92 made of standard eye-bolts having threaded shanks 94 and casting the shanks in place in bosses 96. Before casting, the thread on shanks 94 is deformed sufficiently to prevent the eyes from subsequently being unscrewed without damaging the threads so badly as to destroy the locking engagement this thread supplies with the metal cast around it. One simple way to deform the thread in this manner is to place the threaded eye-bolt on an anvil and strike the exposed thread with a sledge hammer or punch press.

The box-like housing 44 surrounding the wheel 20 is secured as by bolting to a tubular housing 100 through which spindle 30 projects. Both of these housings are accordingly held as a unit and can consequently be mounted wherever the stream of blastant is to be applied, using a supporting plate for a common mounting member if desired. Twin row roller bearings 104 and 105 journal the spindle in place in tubular housing 100, and are protected by labyrinth seals to minimize the danger of fine particles working their way into the bearings. Bearing 104 is particularly susceptible to such damage because of the fairly direct communication from this bearing to the interior of the housing 44 through the opening 45 provided in the rear housing wall for passage of the spindle 30 as well as its flange 36.

In the illustrated construction a first labyrinth seal for bearing 104 is provided by a generally cylindrical collar 110 encircling the spindle and secured in position by an outwardly projecting flange 112 which is bolted to the tubular housing. The internal face of the collar 110 can have a number of grooves 114 spaced longitudinally from each other, and is positioned very closely around a sleeve 116 which is secured to the spindle. A central outwardly projecting rib 118 on the sleeve provides a socket 120 through which one or two set screws can be threaded and brought into tight fitting engagement with the spindle, or with the floor of a groove 122 appropriately located on it.

Rib 118 is also brought into close spacial relation with the forward edge 124 of collar 110, and this edge can be extended radially to improve the sealing action. The rib also overhangs the outer face 126 of this edge of the collar 110 as a still further improvement.

An additional seal for bearing 104 is provided by a sealing ring 130 which has a generally U-shaped wall section. One arm 131 of the U is made longer than the other and is shaped so as to be clamped between the tubular housing 100 and the box housing 44. The other arm 132 of the U is fitted very closely adjacent the periphery of spindle flange 36. An additional ring 134 is secured to the spindle flange 36 as by pressing around it,

and projects rearwardly sufficiently far to form a labyrinthine passageway 136 with arm 132.

In the above arrangement any particles that tend to reach the outwardly facing surface of ring 130 from the interior of the housing, will have to go through the labyrinthine passageway 136 before they reach the space 140 around the spindle where it passes through the box housing. This space 140 is of annular shape encircling the spindle but in its lowest portion it is open to the outside so that particles can drop out here. Another opening 144 can also be provided in the inner end of tubular housing 100 so that space 140 has another communication path to the outside.

A barrier against still further influx of particles into space 140 is established by a gasket-type seal between ring 130 and the housing 44. A ring-shaped gasket such as one made of sponge rubber 148, can be cemented in a groove around the ring 130 and into this gasket ring is pressed the circular inner edge of the rear wear plate assembly. For best sealing, this inner edge is tapered to a line 150.

To allow good pressing action, the openings in the rear housing wall 50 in which the nut-carrying bosses 76 are received, are made oversize. The rear wear plate segments can then be loosely secured by their fastening bolts 80, after which the plates can be slid into the desired engagement with the gasket ring and the bolts then tightened.

As an additional and very helpful protection for bearings 104 and 105, they are provided with a set of lubrication passageways 152 between the two rows of bearing rollers. These passageways 152 cooperate with a peripheral groove 154 and a supply passageway 156 in housing 100 to direct lubricant between the rows of bearings. The introduction of fresh lubricant will accordingly move old lubricant out towards the labyrinth seals and thereby assure most effective lubrication by flushing out any particles that happen to get as far as the lubricant and are there trapped. A grease fitting 158 permits convenient lubrication with every lubricating treatment giving the most efficient cleaning of both rows of bearings. A similar lubrication arrangement is provided for bearing 105 although in this location the bearing is not as vulnerable, and a labyrinth such as indicated will usually suffice with any type of lubrication.

The use of unbroken surfaces on the wear plates is very beneficial. Not only does this make it unnecessary to have expensive highly hardened fasteners otherwise needed because they are exposed to an intense blasting action, but in addition fine blastant particles readily penetrate into the thread of threaded fasteners exposed to the wheel, and tend to jam these threads. Furthermore in place of the countersunk flat head screws inserted from the interior of the housing as used in some of the most effective prior art constructions, the fasteners of the present invention are inserted from the outside of the housing and are therefore much more convenient to manipulate. Moreover the accessibility made possible by receiving the fastener bosses in housing openings, substantially completely avoids the groping otherwise needed to thread fasteners into heavy members that cannot be held by the same person doing the threading because of the intervening housing wall.

According to the present invention the wear members can be secured in place by cementing rather than bolting. This eliminates the fastening bolts and nuts, but the positioning bosses can be retained since they help position the plates for cementing and also help support the plates, thereby requiring less cement bond. The mounting bosses can also be eliminated if the cement bond is adequate to rely upon.

Although any type of cement suitable for use with metal is effective, the preferred cements are of thermoplastic nature since plates cemented with these cements are readily removed by merely melting the cement.

Shellac, polyamide resins such as nylon–66 and vinyl acetal resins fall in this category and give satisfactory results. Polyvinyl acetate and polyvinyl alcohol-acetate as well as polyvinyl chloride and polyvinyl propionate are other resins that are suitable.

The wear plates can also be held by merely interlocking them with each other and with suitable openings or other engagement surfaces in the housing. Thus by fitting the end plates and cap plate between the front and back plate assemblies, the front and back assemblies will be locked in place with their positioning bosses 76 held in their receiving openings in the housing walls. The segments of the front and/or back plate assemblies can be partially or completely combined in integral form to better assure such locking.

To secure the end plates, the front and back plates can have their side margins extended and curved inwardly so that they form a channel in which the end plates must be slid for mounting or removal. The top plate is conveniently held in place against the other wear plates by the top of the housing.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed:

1. A wear plate for a blasting wheel housing, said plate having a smooth unbroken imperforate inner face and a generally flat body shaped approximately as the segment of an annulus, said body having an inner edge and an outer edge with an intermediate portion between said edges, said inner edge being nearer to the center of the annulus than said outer edge, an arcuate rib protruding from the intermediate portion of one face and following the segmental form of said body, said inner edge being tapered to a relatively thin line, and the body face opposite the ribbed face having a plurality of protruding spaced bosses each with a relatively soft steel nut locked in by casting, said nuts having threaded portions exposed for anchoring.

2. A blasting wheel assembly for projecting a stream of blastant particles at work articles, said assembly including a projecting wheel with outwardly extending propelling vanes, a walled housing covering said wheel for guarding against the escape of particles in any undesired direction, wear plates lining said walled housing, each of said wear plates having a housing face disposed toward said housing

and an interior face disposed toward said wheel, said interior face being smooth and imperforate, spaced bosses on said housing face of each of said wear plates projecting through said walled housing and having cast in place nuts therein, and threaded fasteners secured to each of said nuts and to said walled housing.

3. The combination of claim 2 wherein the wear plate for the rear wall of said housing is in segmental form with individual segments positioned for slidable adjustment in the housing.

4. The combination of claim 2 wherein one of said wear plates is shaped approximately as the segment of an annulus, said segmental shaped wear plate having an inner edge and an outer edge with an intermediate portion between said edges, said inner edge being nearer to the center of the annulus than said outer edge, an arcuate rib protruding from said intermediate portion of said smooth surface and following the segmental form of said annulus, and said inner edge of said annulus being tapered to a relatively thin line.

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LESTER M. SWINGLE, *Primary Examiner.*

JOHN C. CHRISTIE, FRANK H. BRONAUGH, J. SPENCER OVERHOLSER, *Examiners.*