Feb. 27, 1951 C. H. PATTEN 2,543,595

RIDING RING FOR ROTARY CYLINDERS

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Fig.1.

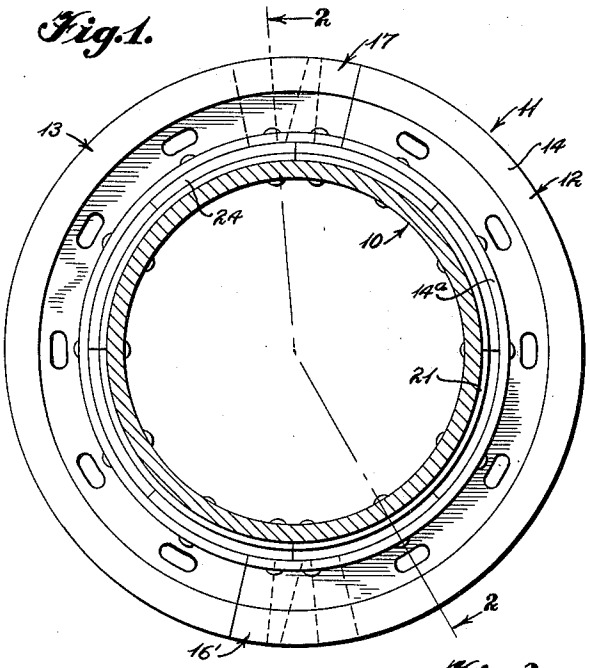


Fig.2.

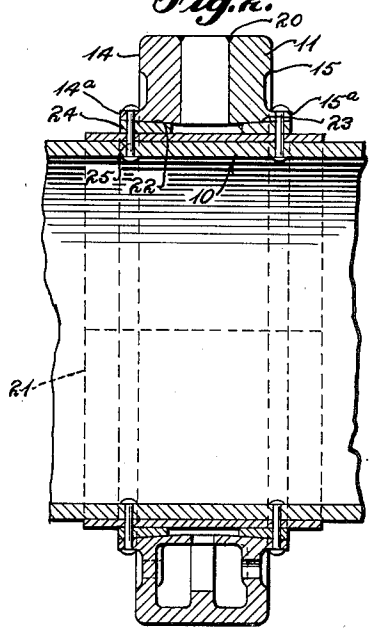
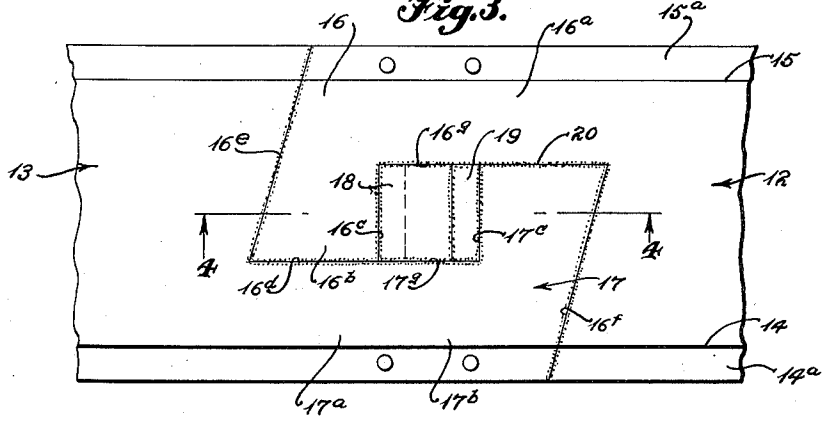


Fig.3.



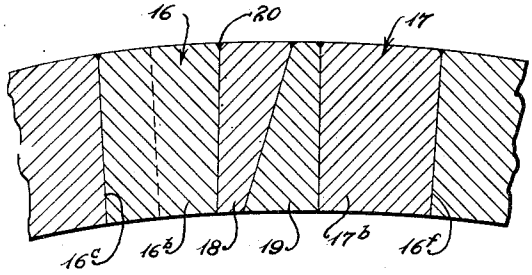


Fig.4.

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Fig. 5.

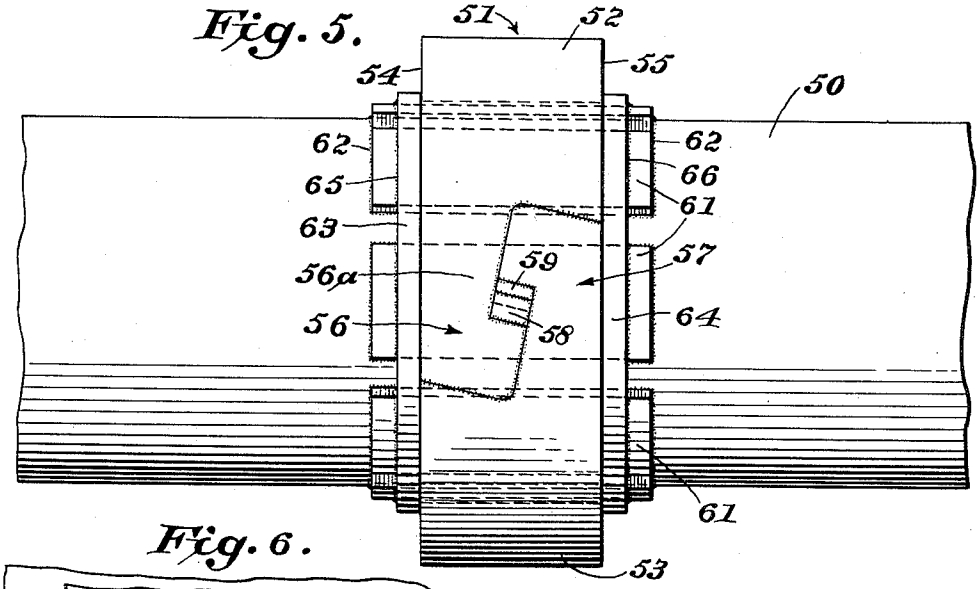


Fig. 6.

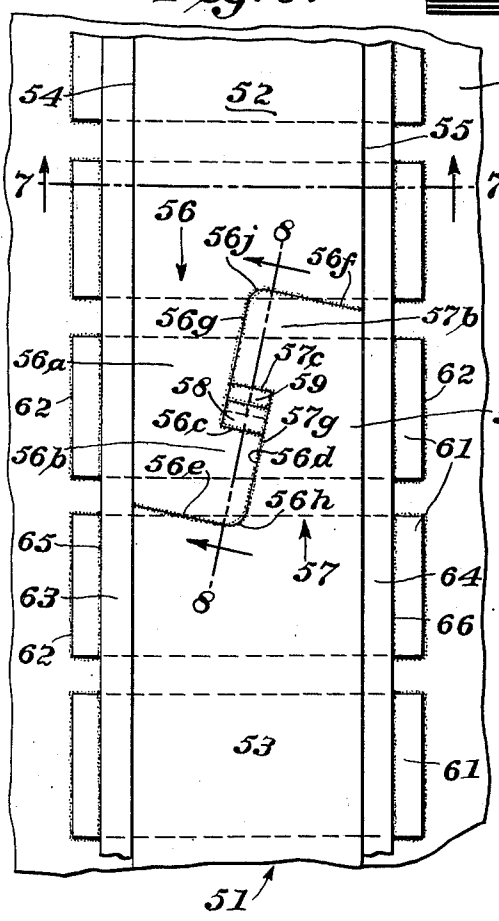


Fig. 7.

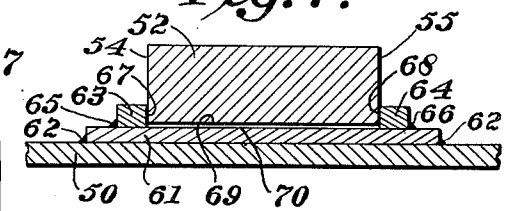
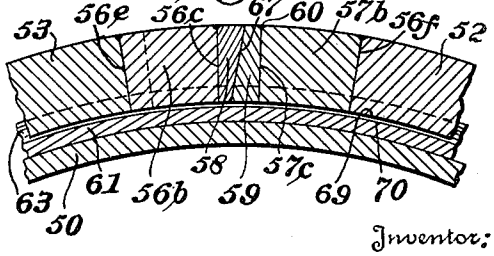


Fig. 8.



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RIDING RING FOR ROTARY CYLINDERS

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Application March 25, 1949, Serial No. 83,492

5 Claims. (Cl. 308—204)

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The present invention relates to riding rings for rotary cylinders.

This application is a continuation-in-part of my co-pending application Serial No. 749,613, filed May 21, 1947.

Rotary cylinders, such as the shells of rotary kilns, coolers, driers and grinding mills, are provided with a plurality of riding rings which rotate in fixed bearing elements to thereby rotatably support the cylinders. It has heretofore been the practice to form each riding ring of one piece of material and apply the rings by sliding them endwise along the cylinders. As a result, initial application of a ring, as well as replacement, involves a considerable period of time and labor.

An important object of the present invention is to provide a riding ring formed in sections so that it more readily can be applied to a cylinder.

A further object of the present invention is to provide a novel means for mounting a riding ring on a cylinder.

Other objects and advantages of the invention will be apparent from the following specification and accompanying drawings, wherein

Figure 1 is a side view of a ring, the view showing a cylinder in transverse section,

Figure 2 is a radial section through the ring and cylinder of Figure 1, the view being taken on the angled line 2—2 of Figure 1,

Figure 3 is a fragmentary face view of the ring of Figures 1 and 2, i. e., the view looking toward the ring in a radial direction and from above Figure 1,

Figure 4 is a detailed section on the line 4—4 of Figure 3,

Figure 5 is an elevation view of a modified form of a ring and a modified means for mounting the ring on the cylinder,

Figure 6 is a fragmentary face view of the ring shown in Figure 5,

Figure 7 is a sectional view taken on the line 7—7 of Figure 6 and,

Figure 8 is a sectional view taken on the line 8—8 of Figure 6.

Referring to Figures 1 to 4, the numeral 10 designates a rotary cylinder such as is provided in a calcining kiln or a similar structure and the numeral 11 generally designates the riding ring. The ring 11 is illustrated as formed of two sections 12 and 13, each of which comprises half of an annulus. However, it will be understood that the ring 11 may be formed of a greater number of sections. Each section includes side walls 14 and 15 lying in radial planes and flanges 14*a* and

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15*a* are provided at the inner edges of the respective walls.

As is best indicated in Figure 3, adjoining ends of the sections 12 and 13 are provided with cooperating or interengaging hook elements 16 and 17, respectively. In more detail, each end of the section 12 terminates in an extension, or shank, 16*a* of less axial width than the body of the section 12 having parallel side walls. At its outer end shank 16*a* carries an integral head portion 16*b* which has a greater axial width than the shank 16*a*. The inside face 16*c* of head 16*b* lies in a radial plane and the side face 16*d* of the head lies in a plane parallel to the side walls 14 and 15. As best shown in Figure 4, the walls 16*e* and 16*f* are formed by radii so that opposed surfaces of the hook elements 16 and 17 can engage each other. However, as shown in Figure 3, the outer face 16*e* of head 16*b* also extends at an obtuse angle with respect to the side wall 15 of the section 12. Also, the angle between the end wall 16*f* of section 12 and the side wall 14 is complementary to the angle between 16*e* and side wall 15.

It will be understood that the face 16*c* lies in a plane radial of the axial center of the section 12 and, therefore, will lie in a plane radial with respect to the axis of the cylinder 10.

The hook 17 provided on the section 13 has a form identical with that of the hook element 16 and parts of hook 17 corresponding to like parts of hook 16 bear reference characters including the same exponential letters. However, it will be understood that the hooks at the opposite ends of each section 12 and 13 will be laterally displaced. That is, and as indicated in Figure 1, the hook 16' at the opposite end of the section 11 will be axially displaced with regard to the hook 16 shown in Figure 3. By this arrangement, the adjacent hooks of two sections will fit together in a complementary manner as best shown in Figure 3.

As is clear from Figure 3, the shanks 16*a* and 17*a* are of greater length circumferentially of the ring than the heads 16*b* and 17*b*, thereby providing a space between the inner faces 16*c* and 17*c* of the heads and the inside walls 16*g* and 17*g* of the shanks. Wedges 18 and 19 are forced into this space to secure the sections together against axial (or sidewise) and circumferential movement. In more detail, and as best shown in Figure 4, the opposed faces of the wedges are inclined to a radius of the ring on angles which are respectively complementary. Hence, by first inserting wedge 19 in the space or pocket between

the two hooks 16 and 17 and then forcing the other wedge 18 in between wedge 19 and the inner face 16c of hook head 16b, the two sections will be held together.

It will be observed that surfaces 16c and 17c comprise detent surfaces acting to hold the sections against circumferential movement, and that surfaces 16e and 16f of hook 16 as well as the opposed surfaces of hook 17, form detent surfaces which hold the sections against circumferential and axial, or lateral, movement with respect to each other.

As is indicated at 20 in Figures 2, 3 and 4, the radially outward edges of all of the surfaces of the hooks and wedges may be bevelled so that after the sections have been assembled as described above, they can be welded. Any protuberances can be ground off so that the circumferential and side surfaces of the completed ring 11 will be smooth and circular.

Figures 1 and 2 illustrate a manner of supporting the ring upon cylinder 10. The supporting means comprises a plura'ity of plates such as 21 of greater axial width than the ring. Both the inner and outer surfaces of the plates 21 will be concentric with the axis of the ring and the inner surfaces of the plates will fit upon the outer surface of the cylinder 10. While the drawings show only four plates 21 surrounding the cylinder, it will be obvious that the number of plates may be greater or less except that it is desirable to use at least two p'ates so that they can be fitted upon the cylinder without the necessity of sliding them lengthwise of the cylinder.

As will be observed from Figure 2, the inner surface of each section of the ring is inclined adjacent its side edges, as indicated at 22 and 23. In other words, the inner surface of the ring diverges away from the cylinder toward the side edges of the ring. These divergent surfaces cooperate with inclined wedges or shims 24 forced in from opposite sides of the ring between the ring and the plates 21. The shims 24 may be relatively short in a circumferential direction. After the shims 24 have been fitted in place, rivets 25 may be passed through aligned apertures in the flanges 14a and 15a of the ring sections, shims 24, plates 21 and the wall of the cylinder 10, and then headed.

Instead of the arrangement of shims 24 and plates 21 just described to secure the ring 11 to the cylinder 10, the arrangement disclosed in the application of Richard Bernhard for Riding Ring Mounting for Rotary Cylinders, Serial No. 693,599, filed August 28, 1946, now Patent Number 2,449,198 issued September 14, 1948 may be used. If the arrangement of the Bernhard application is used, the inner surface of the ring sections would be cylindrical instead of inclined as indicated at 23 and 24 in Figure 2.

Referring to Figures 5 to 8, the numeral 50 designates a rotary cylinder similar to the above described cylinder 10. The numeral 51 generally designates a modified form of riding ring. The ring 51 is illustrated as formed of two sections 52 and 53, each of which comprises half of an annulus. However, it will be understood that the ring 51 may be formed of a greater number of sections. Each section includes side walls 54 and 55 lying in radial planes. Unlike the modification shown in Figures 1 to 4, the sections 52, 53 are substantially rectangular in cross section as shown in Figure 7 and are not provided with flanges.

Referring particularly to Figure 6, the adjoining ends of the sections 52 and 53 are provided with cooperating or interengaging hook elements 56 and 57 respectively. Each end of the section 52 terminates in an extension or shank 56a of a width in a direction paral'el to the axis of the cylinder less than the width of the body of the section 52 having parallel side walls. At its outer end the shank 56a carries an integral head portion 56b. The outer end face 56e and the inside face 56c of the head portion 56b and also the wall 56f are substantially parallel and are disposed at an angle with respect to the axial direction of the cy'inder 50. The side face 56d of the head 56b and the side face 56g of the shank 56a are substantially parallel and are perpendicularly disposed with respect to the faces or walls 56e, 56c and 56f. The edge 56h formed by the intersection of faces 56e and 56d is rounded as is also the edge 56j formed by the intersection of faces 56f and 56g.

As best seen in Figure 8, the walls or faces 56e, 56c and 56f lie in planes radially extending from the axial center of the section 52 and therefore, will lie in planes radial with respect to the axis of the cylinder 50.

The hook 57, provided on the sec'ion 53, has a form identical with that of the hook element 56 and parts of hook 56 bear reference characters including the same exponential letters. However, it will be understood that the hooks at the opposite ends of sections 52 and 53 will be radially displaced in the same manner as above described with respect to sections 12 and 13.

The shanks 56a and 57a are of greater length in a direction circumferentially of the ring than the heads 56b and 57b so as to provide a space between the inner faces 56c and 57c of the heads and the inside walls 56g and 57g of the shanks. Wedge 58 and 59 are forced into this space to secure the sections together against relative axial and circumferential movement.

As shown in Figure 8, the opposed faces of the wedges (indicated at 67) are inclined with respect to radius of the ring in the same manner as above described with respect to wedges 18 and 19. During assembly, the wedge 59 is first inserted in the space or pocket between the two hooks 56 and 57 and then the wedge 58 is forced in between wedge 59 and the inner face 56c of the hook head 56b so as to hold the two sections 52 and 53 together.

The radially outward edges of all of the surfaces of the hooks and wedges may be bevelled, as indicated at 60 in Figure 8, whereby the sections may be welded after assembly. The welding ridges may then be ground off so as to provide that the circumferential and side surfaces of the completed ring be smooth and circular.

The means for supporting the ring 51 on the cylinder 50 comprises a plurality of plates 61 of greater axial width than the ring. Both the inner and outer surfaces of the plates 61 will be concentric with the axis of the ring and the inner surface of the plates will fit upon the outer surface of the cylinder 50. As shown in this particular embodiment, the plates 61 are spaced from each other circumferentially around the cylinder 50 but it will be understood that they may be placed in contiguous abutting relation as are the plates 21. The plates 61 are preferably secured to the ring 50 by welding as at 62. Retainer bars 63 and 64 are secured to the plates 61 by welding as at 65 and 66, respectively. Each of the retainer bars 63, 64 may be in the form of an integral ring extending circumferentially

around the cylinder 50 but preferably each bar is in the form of an arcuate segment and a plurality of such segments are secured to the plates 61 so as to form an annular retainer collar adjacent each of the side walls 54, 55 of the ring 51. By thus providing that the retainer bars be in the form of segments rather than one integral circular pire, the necessity for sliding the bars axially of a long cylinder will be obviated during assembly.

As shown in Figure 7, the inner side walls 67 and 68 of the retainer bars 63 and 64 extend in radial planes and abut, respectively, the ring side walls 54 and 55 so as to retain the ring against axial displacement. It will be noted that the inner cylindrical surface 69 of the ring is of a diameter slightly greater than the exterior cylindrical surface 70 formed by the series of circumferentially disposed plates 61. There is thus provided a clearance between surfaces 69 and 70 so as to allow for thermal expansion of the cylinder 50. The side walls 54, 55 of the ring and the retaining walls 67, 68 of the retainer bars 63, 64 are substantially smooth and planar and it will be obvious that the ring 51 will be freely rotatable with respect to the cylinder 50 until thermal expansion of the cylinder 50 eliminates the clearance between surfaces 69 and 70 so as to provide a press fit between the ring 51 and the plates 61.

It will be understood that instead of the arrangement just described to secure the ring 51 to the cylinder 50, either of the arrangements disclosed in my co-pending application Serial No. 749,613 or the arrangement shown in Figures 1 and 2 of this application, or that shown in the Bernhard Patent No. 2,449,198, September 14, 1948, may be used. It will also be understood that the arrangement shown in Figure 7 for securing the ring 51 to the cylinder 50 may be used to mount the ring 11 of Figures 1 to 4 upon the cylinder 10.

As is indicated in Figures 1 to 4, the ring sections 12, 13 are shown to be hollow and provided with air passages and apertures and it will be understood that the ring sections 52, 53 may be similarly formed if so desired.

By providing that the detent surfaces 56c, 57c are at an acute angle with respect to the circumferential center-line of the ring, rather than perpendicular to the center-line as shown by detent surfaces 16c, 17c, the modified structure of Figures 5 to 8 eliminates all shoulders on the outer surface of the ring in a direction directly transverse to the direction of movement of the ring surface. It will thus be seen that as the shoulder formed by surface 56c or 57c moves into contact with a roller or other supporting means of the fixed bearing, only a limited length of the shoulder will be in contact with the roller at any particular instant. However, if the shoulders are transverse as shown in Figures 1 to 4, the entire length of the shoulder will contact the roller instantaneously as the rotation of the cylinder causes the shoulder to arrive at the position of the roller, rather than the gradual limited contact that is obtained in the modified structure of Figures 5 to 8. It will be obvious that the acute-angled position of the detent surfaces 56c, 57c tends to provide in effect a smoother cylinder bearing surface and tends to eliminate vibration and jarring during rotation of the cylinder, while at the same time obviating the necessity for extremely small tolerances when grinding the shoulders and welding material thereon down to the cylindrical surface of the ring.

The terminology used in the specification is for the purpose of description and not limitation, the scope of the invention being indicated in the claims.

I claim:

1. A rotary cylinder riding ring comprising a plurality of arcuate sections, the sections having their adjacent ends provided with respectively complementary hooks, each of said hooks including a shank portion having inner and outer side walls which is an extension of the ring section and a head at the outer end of the shank, said shanks having a greater length longitudinally of the ring section than the corresponding length of said heads, the outer surface of each head being inclined relative to the intersected outer side wall of said shank at an obtuse angle, each of said heads including a detent surface which lies at substantially a right angle to the intersected inner shank side wall, and securing means insertable between opposed detent surfaces to force said hooks together into locking engagement with each other.

2. The combination set forth in claim 1, wherein said securing means comprise complementary wedges.

3. The combination set forth in claim 1, wherein the inner annular surface of the ring diverges outwardly and away from the cylinder on which the ring is to be mounted and toward the side edges of the ring, and arcuate inclined wedges adjacent said divergent inner surface and adapted to be mounted on the cylinder for supportably mounting the ring thereon.

4. The combination set forth in claim 1, wherein the inner annular surface of the ring is in the form of a cylinder having a larger diameter than the diameter of the cylindrical supporting means on which the ring is to be mounted so as to provide clearance for thermal expansion of the cylinder, and annular retainer means adapted to be secured to the cylinder and abutting both side walls of the ring so as to limit axial displacement of the ring with respect to the cylinder, the abutting surfaces of said retainer means and said ring side walls being smooth and planar so as to allow the ring to rotate freely with respect to the cylinder.

5. The combination set forth in claim 1, wherein the inner shank side walls intersected by the detent surfaces are inclined relative to the circumferential center line of the ring by an angle which is less than a right angle.

CHARLES H. PATTEN.

REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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146,580	Great Britain	July 5, 1920