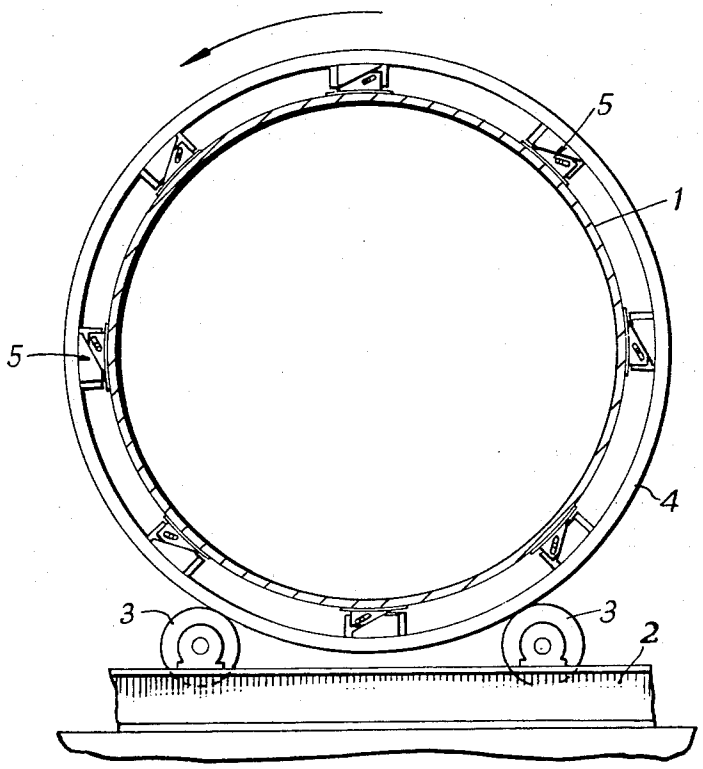
April 26, 1966 E. J. SIMS 3,247,601

ROTARY VESSELS

Filed March 23, 1962 2 Sheets-Sheet 1

Fig. 1.



April 26, 1966 E. J. SIMS 3,247,601

ROTARY VESSELS

Filed March 23, 1962 2 Sheets-Sheet 2

Fig. 2.

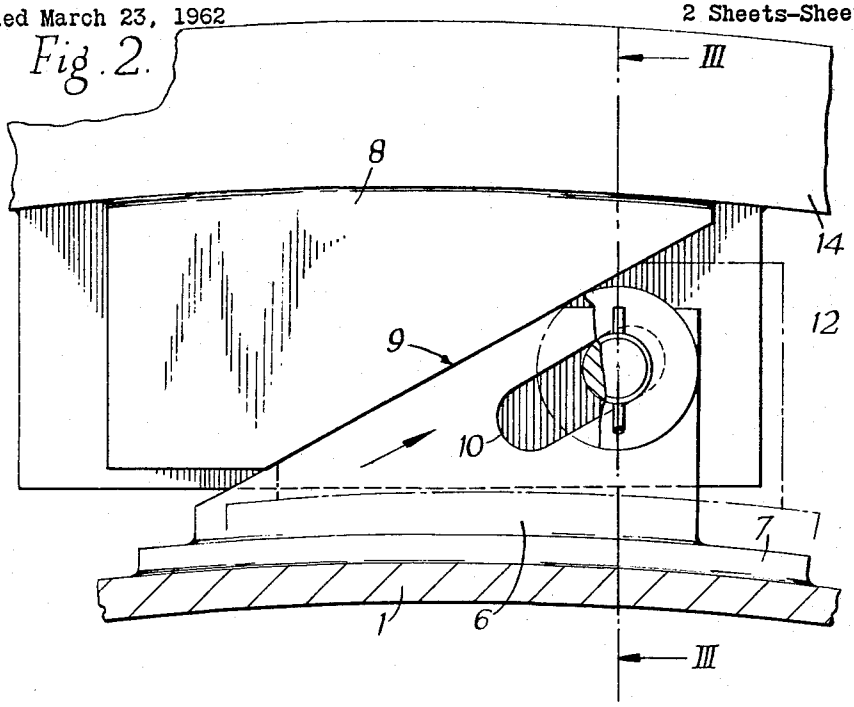
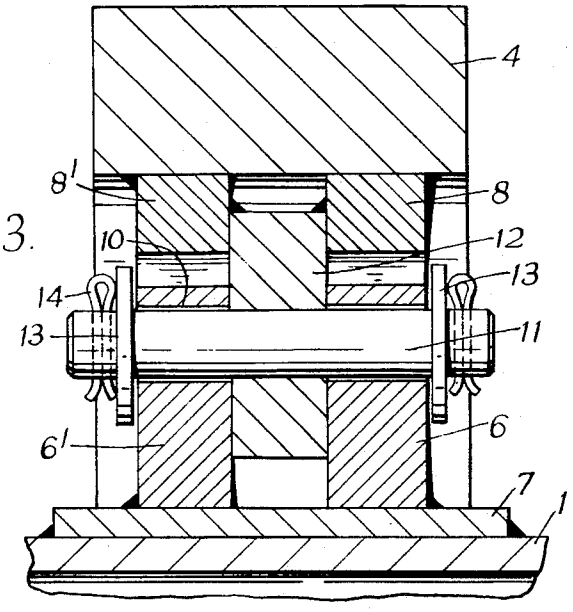


Fig. 3.



United States Patent Office 3,247,601 Patented Apr. 26, 1966

3,247,601

ROTARY VESSELS

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Filed Mar. 23, 1962, Ser. No. 182,032
6 Claims. (Cl. 34—108)

In general this invention relates to apparatus which includes a vessel which is adapted to be rotated for the handling or treatment of hot materials. Such apparatus, hereinafter termed "of the class referred to," is typified by rotary dryers and/or heaters, of the continuous and batch types, for solid materials such as sand and stone. More particularly the invention is concerned with apparatus of this character in which the vessel is rotated bodily about its axis during the processing of the hot material, being supported or cradled during this period by fixed external rollers or equivalent.

As has been indicated, a rotary dryer for stone is a typical instance of apparatus of this character and therefore, for convenience of exposition, the following description will be confined to a particular version of such a machine in which the vessel is in the form of a cylinder cradled on rollers on a supporting frame or chassis and rotated by a driving pinion which meshes with a toothed ring around the cylinder or by a chain and chain wheel drive; the stone to be dried is fed in at one end of the cylinder and travels along the latter, the axis of which is slightly inclined to assist this travel, through a heating zone provided by oil or gas burners projecting into the cylinder. In confining the description to this particular application, it will be appreciated that the invention is not limited to this single use and that it is intended to cover other analogous applications.

In rotary dryers of the kind specified, flat bands or strips of hard metal in the form of cylindrical rings are usually arranged around the periphery of the cylinder to provide wear tracks and bearings for engagement with the supporting rollers. These rings are variously known as roller paths, tracks or tyres; for convenience they will hereinafter be referred to generically by the first of these names.

It will be appreciated that these roller paths, not being directly exposed to the hot materials in the interior of the cylinder, are heated up to a lesser degree than the cylinder wall so that there is a degree of differential expansion between these two. Were the paths to be fastened flat against the wall of the cylinder, there would obviously be distortion, buckling or fracture of one or the other under the heating effect, and various expedients have been adopted to avoid these contingencies. Thus, for example, the ring is usually made of larger diameter than the outer diameter of the cylinder and fastened to the latter in such a way as to be spaced from it.

For example, in one specific case resilient blades are attached respectively to the roller path and the drum at spaced intervals around these. The function of these blades is to bend and take up the greater increase in diameter of the cylinder in relation to the roller path; a further attribute of this particular arrangement is that it allows air to circulate between the roller path and the cylinder and therefore promotes cooling.

Experience is, however, that the methods so far adopted to mitigate the differential expansion effects, have had their unsatisfactory features. For example in the case of the resilient blades referred to above, it is found that the tensional strains induced in the blades during the rotation of the cylinder is an all too frequent cause of fracture.

An object of the invention is an improved method of

fastening of a roller path to a cylinder or other hollow heat-treatment vessel in an apparatus of the class referred to.

A further object is the arrangement of flexible connections between the roller path and the vessel incorporating cooperating wedge surfaces carried respectively by the vessel and the roller path and capable of relative sliding movement to compensate for differential expansion between the roller path and vessel.

In practice there will be a plurality of fastening assemblies arranged at intervals around the exterior of the vessel each including linked wedge pieces which are capable of relative sliding movement, in the event of differential expansion between the roller path and the vessel, to allow for automatic modification of the radial distance between the path and the adjacent exterior of the vessel.

A fastening means in accordance with the invention, and an application thereof, are illustrated by way of example in the accompanying drawings in which:

FIGURE 1 is a diagrammatic cross section through part of a rotary dryer cylinder, showing a roller path secured by fastening means in accordance with an embodiment of the invention.

FIGURE 2 is a side view of one fastening of the multiple fastening assemblies seen in FIGURE 1.

FIGURE 3 is a cross section on the line III—III of FIGURE 2.

The structure diagrammatically seen in FIGURE 1 is a cross section through a hollow cylindrical vessel **1** assumed to be a dryer for solid ballast material. The drawing also depicts the typical environment of such a drying vessel, on a bedframe or chassis, of which one cross girder is seen at **2**. The cylinder **1** is rotated about its axis by means (not shown, being common in the art), for instance a pinion meshing with a toothed ring around the vessel. To allow for this rotation the vessel is cradled on rollers **3** supported by plummer blocks on the girders **2**, and for this purpose the drying vessel **1** is equipped with a circular annular metal bearing ring **4** (i.e., a roller path) at the location of the supporting rollers **3**. It will be understood that a plurality of roller paths **4** will be provided at intervals along the length of the vessel **1**, as will corresponding bearing rollers **3**.

As has been pointed out above, the vessel **1** and the roller paths **4** are subject to differential expansion, and it is for this reason that a ring of compensating fastening assemblies are arranged between these two integers around the periphery of the vessel **1**. Each of these fastening assemblies is designated **5**, and is illustrated in detail in FIGURES 2 and 3, to which reference will now be made. Each assembly, in fact, comprises a double sliding-wedge arrangement includes a pair of spaced parallel and like wedge pieces **6**, **6'** welded to a plate **7**, itself welded to the periphery of the vessel **1**, and a cooperating pair of wedge pieces **8**, **8'**, welded to the roller path **4**.

It will be observed that each of the wedge pices referred to is in the form of a plate of near-triangular shape and the pieces are assembled with the inclined surfaces of **6** and **8**, and **6'** and **8'**, respectively in sliding contract. In FIGURE 2 it is seen that the sliding contact joint **9** between these wedge surfaces is oblique to the radius of the cylindrical vessel **1**, i.e., intersects both the periphery of the vessel **1** and the roller path **4**. Provided in each of the wedge pieces **6**, **6'** is a slot **10** which runs parallel to the joint **9** and this is destined to receive a pin **11** on a link piece **12** which is also in the form of a flat plate, is slidingly accommodated between the wedge pieces **6**, **6'**, and is welded to the pieces **8**, **8'**. At each end the pin **11** is provided with a washer **13** which is retained by a cotter

pin 14, at the outer sides of the wedge pieces 6, 6'. The whole assembly is therefore linked loosely together, and it will be observed that differential expansion between the vessel 1 and the roller path 4 is taken up by a guided sliding of the wedge pieces on one another.

1 claim:

1. In an apparatus of the class referred to a rotary heating vessel, a roller path surrounding the rotary heating vessel, means fastening the roller path to the heat-processing vessel, comprising a plurality of fastening assemblies spaced around the exterior of said vessel, each said assembly including relatively-movable wedge pieces rigidly secured respectively to the vessel and the roller path, said wedge pieces having cooperating wedge surfaces relatively mutually slidable in response to differential expansion between the vessel and the roller path and link means coupling said relatively-movable parts together so as to permit limited relative sliding but prohibit separation transverse to the direction of relative sliding.

2. In an apparatus of the class referred to, a rotary heating vessel, a roller path surrounding the rotary heating vessel, means fastening the roller pin to the heat-processing vessel comprising a plurality of fastening assemblies spaced around the exterior of said vessel, each said assembly including at least one first wedge piece secured to said vessel, at least one second wedge piece secured to said roller path, said first and second wedge pieces having cooperating inclined surfaces in sliding contact along a line intersecting both the outer periphery of said vessel and the inner periphery of the roller path and relatively slidable in response to differential expansion between the vessel and the roller path and a link piece movable with one of said first and second wedge pieces and engaged, with freedom for relative sliding, with the other of said first and second wedge pieces.

3. Fastening means according to claim 2, in which the link piece is secured to the wedge piece with which it is movable and has a transverse pin engaged in a slot in the other of said wedge pieces.

4. In an apparatus of the class referred to, a rotary heating vessel, a roller path surrounding the rotary heating vessel, means fastening the roller path to the heat-processing vessel comprising a plurality of fastening assemblies spaced around the exterior of said vessel, each said assembly including two cooperating wedge devices, each wedge device being in the form of a pair of spaced parallel wedge plates rigidly secured respectively to the vessel and to the roller path, each plate of one of said pairs having an elongated slot therein, and a link plate secured to one of said pairs of wedge plates and extending between the other said pair of wedge plates, said link plate having a pin passing therethrough and into the aforesaid slots.

5. In an apparatus of the class referred to, a rotary heat processing vessel a roller path surrounding the heat processing vessel, means fastening the roller path to the heat processing vessel comprising relatively-movable wedge parts one wedge part being rigidly affixed respectively to the said vessel and the said roller path, said wedge parts having cooperating wedge surfaces relatively and mutually slidable in a direction transverse to the axis of the heat processing vessel in response to differential expansion between the vessel and the roller path.

6. An apparatus as claimed in claim 5 including a means for coupling the relatively-movable wedge parts together so as to permit relative sliding movement but prohibit separation of the wedges in a direction transverse to the direction of relative sliding.

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