May 2, 1950 J. D. BENNETT 2,506,538

MEANS FOR PROTECTING WELL DRILLING ROTARIES AGAINST BLOWOUTS

Filed Feb. 24, 1947 2 Sheets-Sheet 1

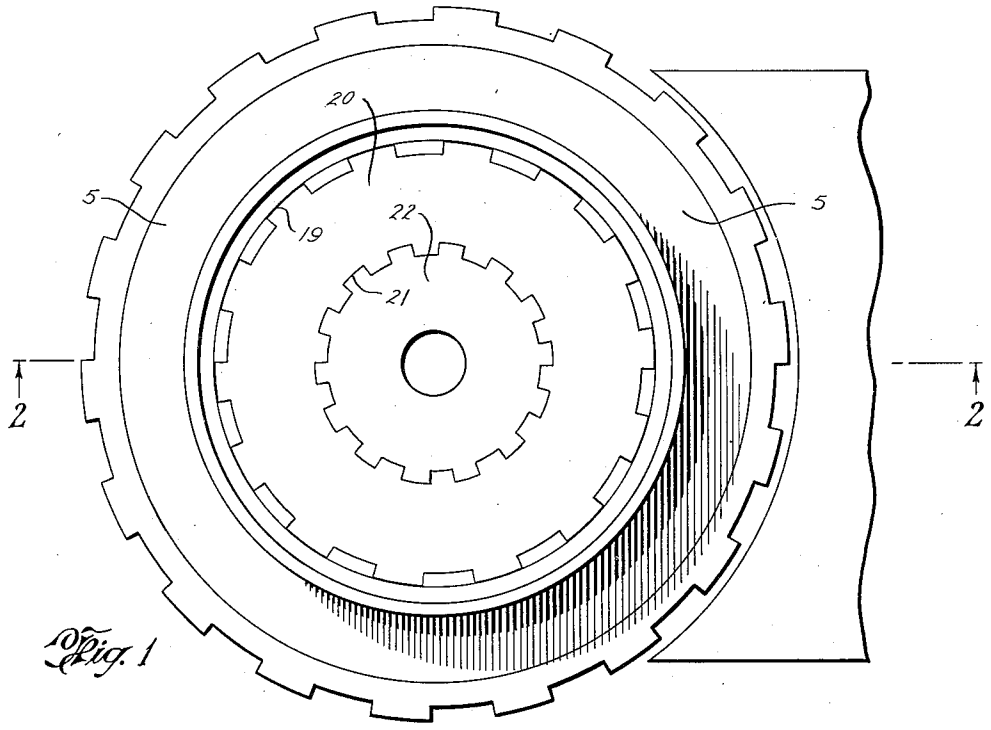


Fig. 1

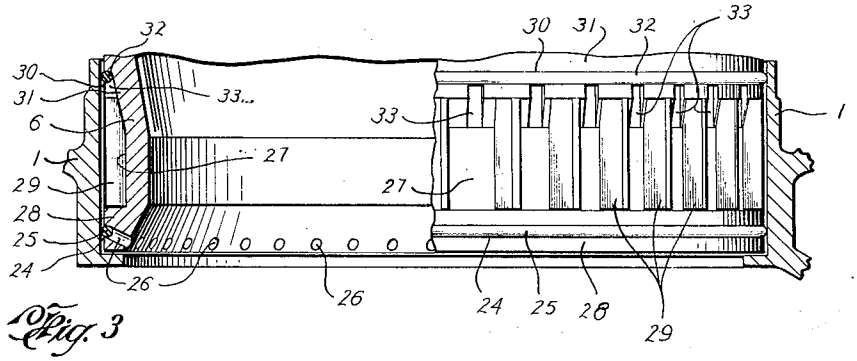


Fig. 3

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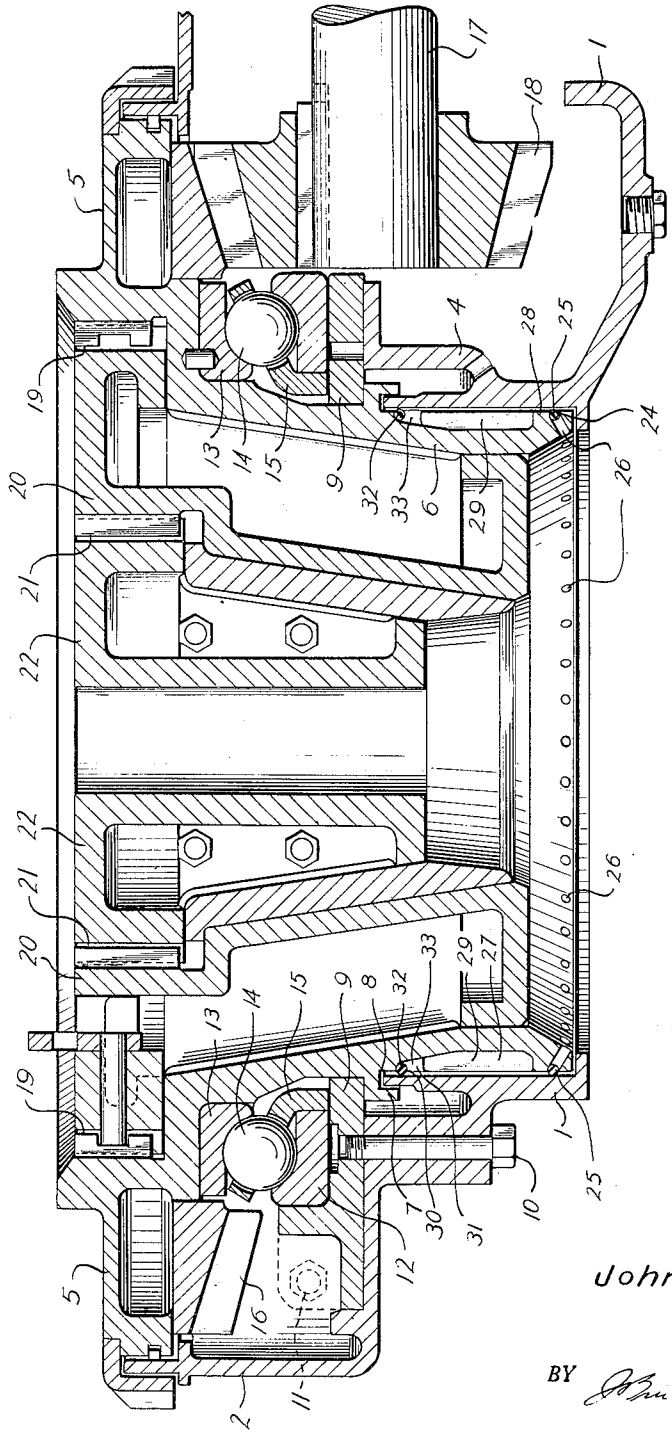


Fig. 2

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MEANS FOR PROTECTING WELL DRILLING ROTARIES AGAINST BLOWOUTS

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Application February 24, 1947, Serial No. 730,581

15 Claims. (Cl. 255—23)

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The invention concerns a novel arrangement for protecting the interior of a rotary against mud and water thrown upwardly against the rotary from the well being drilled.

This application is a continuation-in-part of applicant's copending application, Serial No. 729,154, filed February 17, 1947.

Occasionally during well drilling operations pockets of gas are encountered below the surface, the gas being released to the surface under tremendous pressure and momentarily flooding the derrick with mud and water. At such times the rotary, being positioned directly over the surface of the well, is exposed to the upflowing stream of mud, water and gas which tends to penetrate thru even the smallest openings in the under side of the rotary and to collect in the interior thereof. Upon entering the interior of the rotary the mud and water may come in contact with the driving gears and bearings and interfere with the operation of the rotary. It is an object of the invention to provide protection against the condition described.

The invention will be understood from the following description and accompanying drawing.

Fig. 1 is a top view of a portion of a rotary embodying the invention.

Fig. 2 is a sectional view in elevation, taken on line 2—2 of Fig. 1, showing a portion of a rotary immediately adjacent the rotary table.

Fig. 3 is a fragmentary view in elevation, partly in section, of a portion of the apparatus shown in Fig. 2.

Referring to the drawing, a base is provided, only a portion of which is shown. The base is shaped generally like a rectangular box and has side and end walls, a top and a bottom. A circular well is formed in the base adapted to receive a rotary table. The well is of smaller diameter at the bottom than at the top and is formed by an annular wall 1 which extends upwardly from the bottom, an annular wall 2 which extends downwardly from the top, and a horizontally extending ring 3 which connects the annular walls 1 and 2. The horizontally extending ring 3 is depressed adjacent the periphery of the upwardly extending wall 1 and extends outwardly and upwardly from a point near the top thereof to form an annular gutter 4.

A rotary table is provided which has a circular top 5 and a depending annular wall 6, the depending annular wall 6 being of smaller diameter than the top 5. The lower end of the depending annular wall 6 is disposed within the upwardly extending annular wall 1. A ring 7 extends outwardly from the depending wall 6, above the upwardly extending wall 1, and has an annular groove 8 in the under side thereof adapted to receive the top of the upwardly extending wall 1. A retaining ring 9 extends inwardly from the horizontally extending ring 3, above the annular gutter 4, and is adapted to slidably engage the outwardly extending ring 7 to retain the rotary table in the base. The retaining ring 9 is removably secured to the horizontally extending ring 3 by a series of bolts 10.

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The retaining ring 9 is formed in two halves which are adapted to be fastened together by bolts, one of which is indicated by the numeral 11, after they are placed in position about the depending wall 6 above the outwardly extending ring 7. An outer race ring 12 is secured to the upper side of the retaining ring 9 and an inner race ring 13 is secured to the under side of the table top 5. Ball bearings 14, having a spacing ring 15, are positioned between the race rings 12 and 13 and are adapted to rotatably support the rotary table. This arrangement is described and claimed in my copending application, Serial No. 729,154.

A ring gear 16 is secured to the under side of the table top 5 adjacent its periphery. A horizontally disposed drive shaft 17 is rotatably mounted in the base. A pinion gear 18 is secured to one end of the drive shaft 17 and is rotatable therewith. The pinion gear 18 projects thru an opening in the upper part of the well surrounding the rotary table and is adapted to engage the ring gear 16 to rotate the rotary table.

The rotary table is provided with a central opening 19 adapted to receive a Kelly drive, a pair of slips or a bushing. The drawing shows a bushing 20 inserted in the opening 19, the bushing 20 in turn having a central opening 21 adapted to receive a Kelly drive or a pair of slips of smaller diameter than the opening 19. A Kelly drive 22 is shown inserted in the opening 21. A removable insert 23, positioned in the opening 21, provides a bearing surface for the lower end of the Kelly drive 22 and for a pair of slips.

Mud and water which may be thrown upwardly against the rotary from the well being drilled, and which may enter the space between the upwardly extending wall 1 and the depending wall 6, is prevented from entering the interior of the rotary by the arrangement hereinafter described.

An annular groove 24 is formed in the exterior surface of the depending wall 6 about the periphery thereof. An elastic O ring 25 is disposed within the annular groove 24, the elastic O ring

25 being adapted to seal the space between the depending wall 6 and the upwardly extending wall 1. A plurality of circumferentially spaced channels 26 are formed in the depending wall 6 adjacent the lower end thereof, the channels 26 extending diagonally upwardly and outwardly from the interior surface of the depending wall 6 and communicating at their outer ends with the annular groove 24. The arrangement is such that when a blowout occurs the fluid pressure applied to the under side of the rotary will tend to force the elastic O ring 25 outwardly into sealing engagement with the upwardly extending wall 1. When the pressure is discontinued the elastic O ring 25 will return to its original position in the annular groove 24.

An annular cavity 27 is formed in the exterior surface of the depending wall 6 about the periphery thereof, the annular cavity 27 being positioned above the annular groove 24 and separated therefrom by an annular portion 28 of the depending wall 6. A plurality of radially extending, circumferentially spaced ribs 29 divide the annular cavity 27 into segments, the outermost extremities of the ribs 29 being disposed adjacent the upwardly extending annular wall 1. Small amounts of mud and water which are not retained below the elastic O ring 25, and which may pass upwardly thru the space between the depending wall 6 and the upwardly extending wall 1, will be collected in the annular cavity 27 and will not be permitted to penetrate into the interior of the rotary.

Mud and water collecting in the annular cavity 27 will be thrown outwardly by centrifugal force against the upwardly extending wall 1 and ultimately will be discharged from the rotary. The interior surface of the upwardly extending wall 1 adjacent the annular cavity 27 will be continuously scraped clean by the action of the ribs 29.

An annular groove 30 is formed in the exterior surface of the depending wall 6 about the periphery thereof, the annular groove 30 being positioned above the annular cavity 27 and separated therefrom by a portion 31 of the depending wall 6. An elastic O ring 32 is disposed within the annular groove 30, the elastic O ring 32 being adapted to seal the space between the depending wall 6 and the upwardly extending wall 1. A plurality of circumferentially spaced channels 33 extend upwardly from the annular cavity 27 and communicate at their upper ends with the annular groove 30. Fluid pressure applied to the under side of the rotary will tend to force the elastic O ring 32 outwardly into sealing engagement with the upwardly extending wall 1, and when the pressure is discontinued the elastic O ring 32 will return to its original position in the annular groove 30.

The invention as described herein may be modified in various ways without departing from the spirit and scope thereof.

I claim:

1. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular groove formed in the exterior surface of the depending wall about the periphery thereof, an elastic O ring disposed within the annular groove and adapted to seal the space between the depending

wall and the upwardly extending wall, and a plurality of circumferentially spaced channels extending outwardly from the interior surface of the depending wall and communicating at their outer ends with the annular groove, the arrangement being such that fluid pressure applied to the under side of the rotary will tend to force the elastic O ring outwardly into sealing engagement with the upwardly extending wall.

2. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular groove formed in the exterior surface of the depending wall about the periphery thereof, an elastic O ring disposed within the annular groove and adapted to seal the space between the depending wall and the upwardly extending wall, and a plurality of circumferentially spaced channels extending diagonally upwardly and outwardly from the interior surface of the depending wall and communicating at their outer ends with the annular groove.

3. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular cavity formed in the exterior surface of the depending wall about the periphery thereof and a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments, the arrangement being such that mud and water passing upwardly thru the space between the depending wall and the upwardly extending wall will be collected in the annular cavity.

4. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular cavity formed in the exterior surface of the depending wall about the periphery thereof and a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments, the outermost extremities of the ribs being disposed adjacent the upwardly extending annular wall and the arrangement being such that mud and water collecting in the annular cavity will be thrown outwardly by centrifugal force against the upwardly extending wall and the interior surface of the upwardly extending wall adjacent the annular cavity will be scraped clean by the action of the ribs.

5. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising a pair of annular grooves formed in the exterior surface of the depending wall about the periphery thereof and positioned one above the other, elastic O rings disposed with-

in the annular grooves and adapted to seal the space between the depending wall and the upwardly extending wall, an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, the annular cavity being positioned between the annular grooves and separated therefrom by portions of the depending wall, and a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments.

6. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising a pair of annular grooves formed in the exterior surface of the depending wall about the periphery thereof and positioned one above the other, elastic O rings disposed within the annular grooves and adapted to seal the space between the depending wall and the upwardly extending wall, a plurality of circumferentially spaced channels extending outwardly from the interior surface of the depending wall and communicating at their outer ends with the lower annular groove, an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, the annular cavity being positioned between the annular grooves and separated therefrom by portions of the depending wall, a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments, and a plurality of circumferentially spaced channels extending upwardly from the annular cavity and communicating at their upper ends with the upper annular groove.

7. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular groove formed in the exterior surface of the depending wall about the periphery thereof, an elastic O ring disposed within the annular groove and adapted to seal the space between the depending wall and the upwardly extending wall, a plurality of circumferentially spaced channels extending outwardly from the interior surface of the depending wall and communicating at their outer ends with the annular groove, an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, the annular cavity being positioned above the annular groove and separated therefrom by an annular portion of the depending wall, and a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments.

8. In a well drilling rotary comprising a base having an upwardly extending wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments, an annular groove formed in the exterior surface of the depending wall about the periphery thereof, the annular groove being positioned above the annular cavity and separated therefrom by a portion of the depending wall, an elastic O ring disposed within the annular groove and adapted to seal the space between the depending wall and the upwardly extending wall, and a plurality of circumferentially spaced channels extending upwardly from the annular cavity and communicating at their upper ends with the annular groove.

9. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, an annular groove formed in the exterior surface of the depending wall about the periphery thereof, the annular groove being positioned above the annular cavity and separated therefrom by a portion of the depending wall, an elastic O ring disposed within the annular groove and adapted to seal the space between the depending wall and the upwardly extending wall, and a plurality of circumferentially spaced channels extending upwardly from the annular cavity and communicating at their upper ends with the annular groove, the arrangement being such that fluid pressure applied to the under side of the rotary will tend to force the O ring outwardly into sealing engagement with the upwardly extending wall.

10. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular groove formed in the exterior surface of the depending wall about the periphery thereof, an elastic ring disposed within the annular groove and adapted to seal the space between the depending wall and the upwardly extending wall, and a plurality of circumferentially spaced channels extending outwardly from the interior surface of the depending wall and communicating at their outer ends with the annular groove, the arrangement being such that fluid pressure applied to the under side of the rotary will tend to force the elastic ring outwardly into sealing engagement with the upwardly extending wall.

11. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising a pair of annular grooves formed in the exterior surface of the depending wall about the periphery thereof and positioned one above the other, elastic rings disposed within the annular grooves and adapted to seal the space between the depending wall and the upwardly extending wall, an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, the annular cavity being positioned between the annular grooves and separated therefrom by portions of the depend-

ing wall, and a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments.

12. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising a pair of annular grooves formed in the exterior surface of the depending wall about the periphery thereof and positioned one above the other, elastic rings disposed within the annular grooves and adapted to seal the space between the depending wall and the upwardly extending wall, a plurality of circumferentially spaced channels extending outwardly from the interior surface of the depending wall and communicating at their outer ends with the lower annular groove, an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, the annular cavity being positioned between the annular grooves and separated therefrom by portions of the depending wall, a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments, and a plurality of circumferentially spaced channels extending upwardly from the annular cavity and communicating at their upper ends with the upper annular groove.

13. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular groove formed in the exterior surface of the depending wall about the periphery thereof, an elastic ring disposed within the annular groove and adapted to seal the space between the depending wall and the upwardly extending wall, a plurality of circumferentially spaced channels extending outwardly from the interior surface of the depending wall and communicating at their outer ends with the annular groove, an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, the annular cavity being positioned above the annular groove and separated therefrom by an annular portion of the depending wall, and a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments.

14. In a well drilling rotary comprising a base having an upwardly extending wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly

extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, a plurality of radially extending, circumferentially spaced ribs dividing the annular cavity into segments, an annular groove formed in the exterior surface of the depending wall about the periphery thereof, the annular groove being positioned above the annular cavity and separated therefrom by a portion of the depending wall, an elastic ring disposed within the annular groove and adapted to seal the space between the depending wall and the upwarly extending wall, and a plurality of radially spaced channels extending upwardly from the annular cavity and communicating at their upper ends with the annular groove.

15. In a well drilling rotary comprising a base having an upwardly extending annular wall and a rotary table having a depending annular wall, the depending wall being disposed within the upwardly extending wall, means for protecting the interior of the rotary against mud and water thrown upwardly against the rotary from the well being drilled comprising an annular cavity formed in the exterior surface of the depending wall about the periphery thereof, an annular groove formed in the exterior surface of the depending wall about the periphery thereof, the annular groove being positioned above the annular cavity and separated therefrom by a portion of the depending wall, an elastic ring disposed within the annular groove and adapted to seal the space between the depending wall and the upwardly extending wall, and a plurality of circumferentially spaced channels extending upwardly from the annular cavity and communicating at their upper ends with the annular groove, the arrangement being such that fluid pressure applied to the under side of the rotary will tend to force the elastic ring outwardly into sealing engagement with the upwardly extending wall.

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