

July 29, 1958

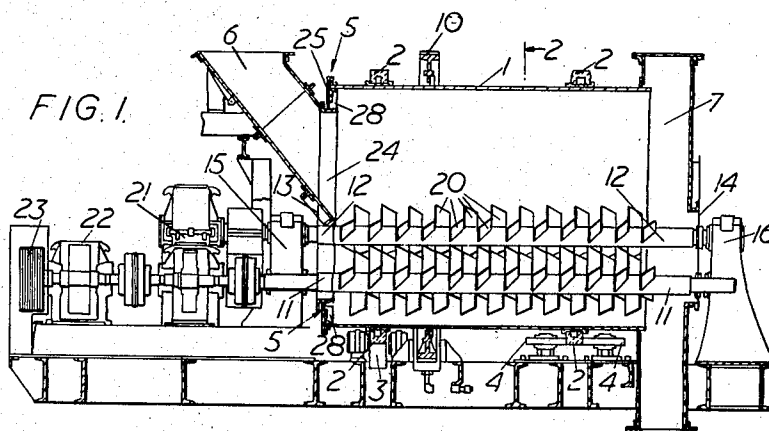
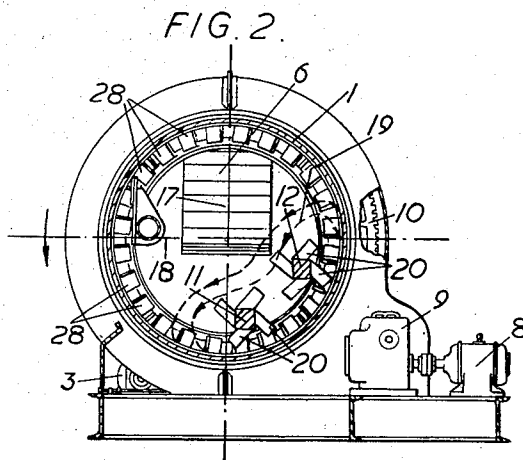
P. HOWDEN

2,845,254

ROTARY DRUM MIXERS AND LIKE APPARATUS

Filed Jan. 13, 1956

2 Sheets-Sheet 1



Inventor

PETER HOWDEN

By

Watson, Cole, Grindler & Watts
Attorneys

July 29, 1958

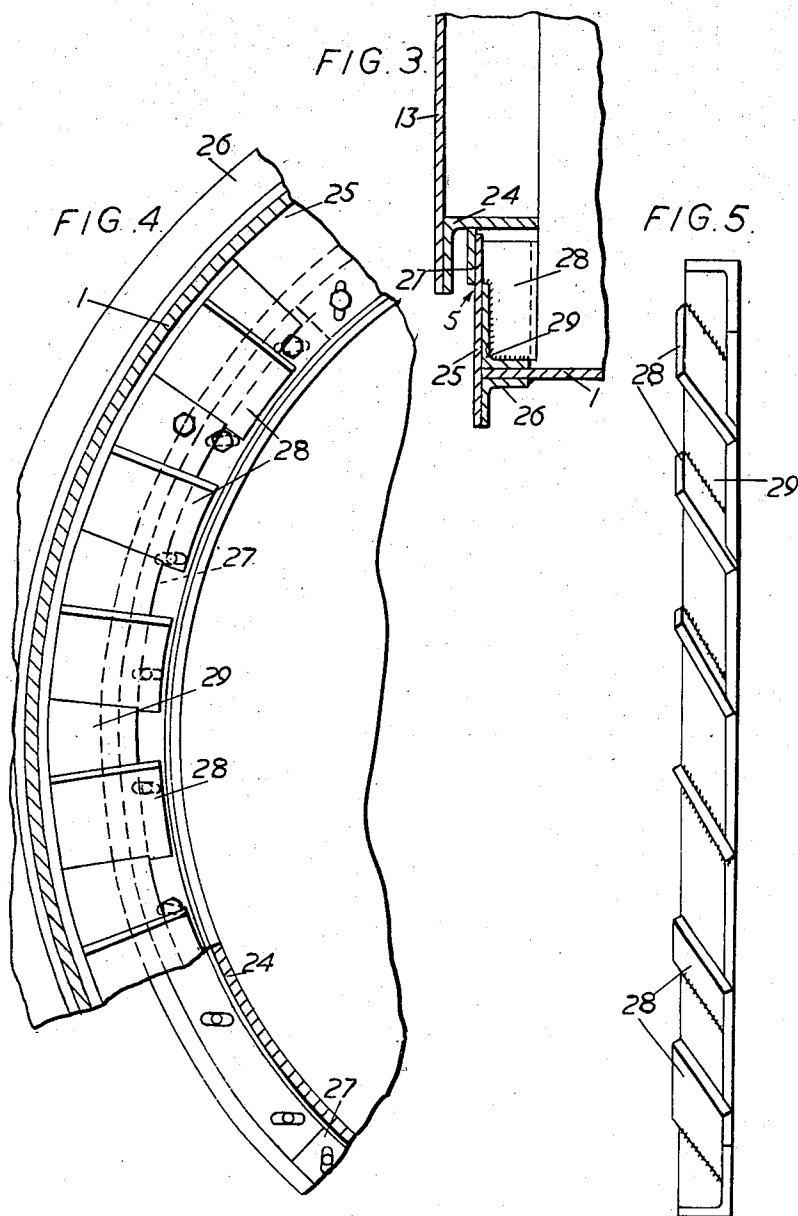
P. HOWDEN

2,845,254

ROTARY DRUM MIXERS AND LIKE APPARATUS

Filed Jan. 13, 1956

2 Sheets-Sheet 2



Inventor

PETER HOWDEN

By

Watson, Cole, Grindle & Watson
Attorneys

1

2,845,254

ROTARY DRUM MIXERS AND LIKE APPARATUS

Peter Howden, Misterton, via Doncaster, England, assignor to Ernest Newell & Company, Misterton, via Doncaster, England

Application January 13, 1956, Serial No. 559,050

Claims priority, application Great Britain
December 8, 1955

14 Claims. (Cl. 259—3)

This invention relates to rotary drum mixers, for mixing powdered and granular materials with or without liquids, and like apparatus such as, for example, rotary driers, rotary coolers and other rotary machines where material is fed into one end of a rotatable drum and progressed to the other end as it undergoes treatment.

In apparatus of the above kind, the drum is rotatably supported on rollers for movement about a horizontal axis and driven by a motor through gearing engaging a toothed ring secured to the other periphery of the drum. One end of the drum is closed by a stationary plate structure incorporating a feed chute leading into the interior of the drum, the other end of the drum projecting into a discharge chute.

With the drum rotatable about the stationary end plate structure, it is necessary to guard against excess leakage of the material in the drum through the working clearance between the drum and the end plate. At the same time, because of the size and built-up nature of the apparatus it is found inconvenient to provide for fine running clearances between the drum and the end plate. It has been usual, therefore, to provide on the end face of the drum an inwardly projecting annular flange arranged to run between a pair of flanges projecting outwardly from a cylindrical portion of the plate structure to form a rough kind of labyrinth seal.

Such construction, however, has not been entirely satisfactory, particularly when treating fine materials or when water is being used, this being especially so with drum mixers employing one or more rotatable paddle scrolls arranged towards the bottom of the drum and serving to disturb the material otherwise than by the mere rotation of the drum.

It is an object of the invention, therefore, to provide an improved seal construction between the drum and the stationary plate structure in such apparatus.

According to the present invention, there is provided an end seal construction for a rotary drum apparatus of the kind referred to, comprising an inwardly projecting annular flange secured to an end face of the drum and adapted to receive with slight clearance an annular member projecting from the stationary end plate structure axially into the drum, and a series of deflecting blades extending inwardly from the inner periphery of the drum in spaced circumferential relationship with their tips lying close to the outer surface of the annular member, the blades having their faces inclined inwardly from the end of the drum and rearwardly with respect to the direction of rotation of the drum.

The deflecting blades will normally extend widthwise over the length of the inwardly projecting portion of the annular member, and inwardly (i. e., "radially") by an amount corresponding approximately with the depth of the material normally lying in the bottom of the drum. The circumferential spacing will depend on the size of the drum, but with a drum of about 7'0" diameter in a drum mixer using rotatable scrolls, 24 blades equally

2

spaced and 7" or 8" long radially have been found satisfactory.

In order to provide a smaller clearance between the annular flange and the annular member than is practical by a simple clearance hole in the flange, a series of arcuate strips may be secured to the outside face of the flange with bolts entering slots to permit final radial adjustment of the strips during assembly.

While applicable to rotary drum apparatus of the variety mentioned above, the invention has been found particularly useful as applied to rotary drum mixers employing more than one rotatable paddle scroll as described in U. S. application Serial No. 358,340, filed May 29, 1953, now Patent No. 2,726,068, granted December 6, 1955.

The invention will, therefore, now be described in greater detail with reference to the accompanying drawings, as applied to such an apparatus having two paddle scrolls.

In the drawings:

Figure 1 is a part-sectional elevation of a rotary drum mixer generally constructed as described in the specification mentioned above;

Figure 2 is a sectional view taken on the line 2—2 in Figure 1;

Figure 3 is a fragmentary sectional elevation of a portion of the drum and end plate structure, drawn to a larger scale;

Figure 4 is a fragmentary sectional elevation showing a portion of Figure 2 drawn to a larger scale; and

Figure 5 is a scrap plan showing a portion of Figure 4.

The drum 1 is provided with the usual tyres 2 resting on rollers 3 and guided by rollers 4. It is closed at one end by a stationary plate structure generally referred to by reference numeral 5 incorporating a feed chute 6, and projects at the other end into a discharge chute 7, from which the mixed material drops, for removal by conveyor belt or otherwise, any steam, water vapor, or gas being exhausted upwardly. The drum is driven by a motor 8 through worm gearing 9 and a toothed girth ring 10.

Two scrolls shafts 11, 12 of square section inside the drum, pass through sealing plates 13, 14 in the closing plate 5 and in the far side of the chute 7, to be carried by bearing housings 15, 16 at positions in relation to the cross-section of the drum 1 clearly shown in Figure 2. With the drum rotatable anti-clockwise in that figure, the lower shaft 11 is offset to the right of the vertical centre line 17, and the upper shaft lies somewhat below the horizontal centre line 18 and is substantially offset to the right of the vertical centre line, so that both lie immersed in the material 19 that is lifted up the right-hand side of the drum to a height somewhat above the line 18 before it cascades towards the bottom of the drum. Each face of the square section of each shaft 11, 12 carries paddles 20, obliquely pitched to propel the material 19 towards the discharge end.

At the feed end, the shafts 11, 12 are driven by a common gear-box 21 from a reduction gear 22 driven by a motor (not shown) through a belt sheave 23, which enables the rate of rotation of the scrolls to be selected as may be required in relation to the rate of rotation of the drum. The common gear-box 21 drives the shafts 11, 12 at appropriately different speeds, the lower shaft 11, say, rotating about 50% faster than the upper shaft 12, although the upper scroll could be the one to rotate faster.

As seen more particularly in Figures 3, 4 and 5, the plate structure 5 carries a flanged annular member 24 which projects into the drum 1 with slight clearance between itself and the bore of an annular flange 25 secured to the face of the drum 1 at that end by a hoop

26 of angle section. Secured by bolts to the outer face of the flange 25 are a series of arcuate sealing strips 27 each formed with inwardly directed slots for final adjustment of the strips so that together they leave only a slight clearance between their inner edges and the outer surface of the annular member 24.

Arranged around the inside of the periphery of the drum 1 near the feed end are a series of spaced deflecting blades 28 extending inwardly from the drum periphery with their tips lying close to the surface of the annular member 24. The faces of the blades 28 are inclined inwardly at an angle of 30° from the end of the drum 1 and rearwardly with respect to the direction of rotation of the drum.

The blades 28 are formed from sheet steel and welded to the inside surfaces of a series of arcuate supports 29 of angle section the flanges of which are secured to the inner periphery of the drum 1 and the inner surface of the annular flange 25, respectively, to position the blades. The blades 28 extend inwardly to the same extent as the annular member 24 which, in this example, is about 4". They also extend towards the centre of the drum by an amount corresponding approximately with the depth of the material 19 in the bottom of the drum 1.

As the drum 1 rotates, the material in the drum is engaged by the blades 28 in succession, and due to the inclination of the latter, the material is continuously forced back into the drum as it tends to leak through the small clearance between the blades and the annular member 24. In this manner, a very satisfactory seal is obtained.

What I claim is:

1. An end seal construction for a rotary drum apparatus of the kind comprising a rotary drum and a stationary end plate structure incorporating a feed opening, said end seal construction comprising an inwardly projecting annular flange secured to an end face of the drum, an annular member projecting from the stationary end plate structure axially into the drum with slight clearance between its outer surface and the annular flange, and a series of deflecting blades extending inwardly from the inner periphery of the drum in spaced circumferential relationship with their tips lying close to the outer surface of the annular member, the blades having their faces inclined inwardly from the end of the drum and rearwardly with respect to the direction of rotation of the drum.

2. An end seal construction as in claim 1, wherein the deflecting blades extend widthwise over the length of the inwardly projecting portion of the annular member.

3. An end seal construction as in claim 2, wherein the deflecting blades extend radially inwardly by an amount corresponding approximately with the depth of the material intended normally to lie in the bottom of the drum.

4. An end seal construction as in claim 3, wherein the deflecting blades are inclined inwardly at an angle of about 30° from the end of the drum.

5. An end seal construction as in claim 4, comprising a series of arcuate blade supports of angle section the flanges of which are secured respectively to the inner periphery of the drum and the inner surface of the annular flange, the deflecting blades being formed from sheet metal and being welded to the inside surfaces of the angle sections.

6. An end seal construction as in claim 5, comprising a series of arcuate strips formed with transverse slots and secured to the outside face of the annular flange by bolts passing through the slots to permit radial adjustment of the strips.

7. An end seal construction for a rotary drum having a stationary end plate structure at an end thereof, said construction comprising an inwardly projecting annular flange secured to an end face of the drum and adapted to receive with slight clearance an annular member pro-

jecting from the stationary end plate structure axially into the drum, and a series of deflecting blades extending inwardly from the inner periphery of the drum in spaced circumferential relationship with their tips lying close to the outer surface of the annular member, the blades having their faces inclined inwardly at an angle of substantially 30° from the end of the drum and rearwardly with respect to the direction of rotation of the drum.

8. An end seal construction for a rotary drum having a stationary end plate structure at an end thereof, said construction comprising an inwardly projecting annular flange secured to an end face of the drum and adapted to receive with slight clearance an annular member projecting from the stationary end plate structure axially into the drum, a series of arcuate blade supports of angle section the flanges of which are secured respectively to the inner periphery of the drum and the inner surface of the annular flange, and a series of deflecting blades formed from sheet metal and welded to the inside surfaces of the angle sections in spaced circumferential relationship with their tips lying close to the outer surface of the annular member, the blades having their faces inclined inwardly from the end of the drum and rearwardly with respect to the direction of rotation of the drum.

9. An end seal construction for a rotary drum having a stationary end plate structure at an end thereof, said construction comprising an inwardly projecting annular flange secured to an end face of the drum and adapted to receive with slight clearance an annular member projecting from the stationary end plate structure axially into the drum, a series of deflecting blades extending inwardly from the inner periphery of the drum in spaced circumferential relationship with their tips lying close to the outer surface of the annular member, the blades having their faces inclined inwardly from the end of the drum and rearwardly with respect to the direction of rotation of the drum, and a series of arcuate strips formed with transverse slots and secured to the outside face of the annular flange by bolts passing through the slots to permit radial adjustment of the strips.

10. A rotary drum apparatus comprising a rotatable drum, a stationary end plate structure incorporating a feed opening, means for driving the drum, an inwardly projecting annular flange secured to an end face of the drum, an annular member projecting from the stationary end plate structure axially into the drum with slight clearance between its outer surface and the annular flange, and a series of deflecting blades extending inwardly from the inner periphery of the drum in spaced circumferential relationship with their tips lying close to the outer surface of the annular member, the blades having their faces inclined inwardly from the end of the drum and rearwardly with respect to the direction of rotation of the drum.

11. A rotary drum apparatus as in claim 10, wherein the deflecting blades extend radially inwardly by an amount corresponding approximately with the depth of the material intended normally to lie in the bottom of the drum, and have their faces inclined inwardly at an angle of substantially 30°.

12. A rotary drum apparatus comprising a rotatable drum, a stationary end plate structure incorporating a feed opening, means for driving the drum, an inwardly projecting annular flange secured to an end face of the drum, an annular member projecting from the stationary end plate structure axially into the drum with slight clearance between its outer surface and the annular flange, a series of deflecting blades extending inwardly from the inner periphery of the drum in spaced circumferential relationship with their tips lying close to the outer surface of the annular member, the blades having their faces inclined inwardly from the end of the drum and rearwardly with respect to the direction of rotation of the drum, and a series of arcuate strips formed with

5

transverse slots and secured to the outside face of the annular flange by bolts passing through the slots to permit radial adjustment of the strips.

13. A horizontal rotary drum mixer, comprising a rotary drum, a stationary end plate structure at the inlet end of the drum incorporating a feed opening, a discharge opening at the outlet end of the drum, at least one paddle scroll disposed longitudinally of the drum within the position occupied during rotation of the drum by the material to be mixed and adapted to move the mixed material from the inlet to the outlet of the drum, means for driving the drum, means for driving the paddle scroll in the same direction as that of the drum at a tip speed substantially in excess of the peripheral speed of the drum, an inwardly projecting annular flange secured to an end face of the drum, an annular member projecting from the stationary end plate structure axially into the drum with slight clearance between its outer sur-

6

face and the annular flange, and a series of deflecting blades extending inwardly from the inner periphery of the drum in spaced circumferential relationship with their tips lying close to the outer surface of the annular member, the blades having their faces inclined inwardly from the end of the drum and rearwardly with respect to the direction of rotation of the drum.

14. A horizontal rotary drum mixer as in claim 13, comprising a series of arcuate strips formed with transverse slots and secured to the outside face of the annular flange by bolts passing through the slots to permit radial adjustment of the strips.

References Cited in the file of this patent

UNITED STATES PATENTS

2,072,886	Hollis	Mar. 9, 1937
2,420,217	Allen	May 6, 1947