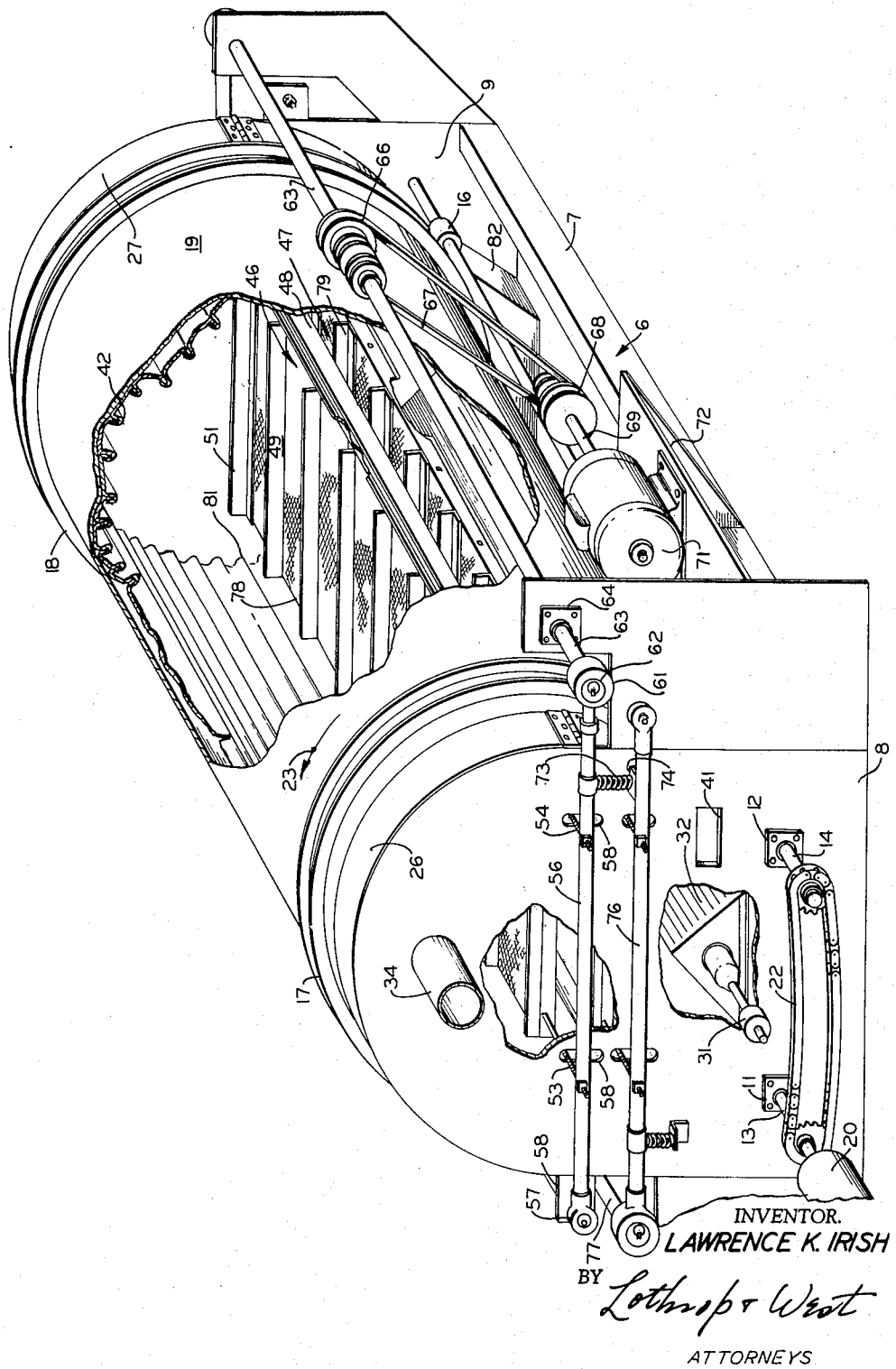
Nov. 8, 1960 L. K. IRISH 2,959,407

VIBRATING SCREEN DRYER

Filed March 10, 1958



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United States Patent Office 2,959,407 Patented Nov. 8, 1960

2,959,407

VIBRATING SCREEN DRYER

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Filed Mar. 10, 1958, Ser. No. 720,258

2 Claims. (Cl. 263—33)

My invention relates to means primarily useful for drying relatively small particles such as seed or sand and is especially concerned with a dryer effective to remove superficial or contained moisture from such material in an effective fashion.

An object of the invention is to provide a dryer so constituted as to expose the dried material to the drying agent, such as hot air, in a uniform and comprehensive fashion.

Another object of the invention is to provide a vibrating screen dryer in which the material being dried is tumbled about and reoriented repeatedly in order that the drying is not only effective, but is evenly accomplished.

Another object of the invention is to provide a vibrating screen dryer having a substantial capacity for the volume of the mechanism.

Another object of the invention is to provide a compact, a simple, vibrating screen dryer in which the material being dried can be repeatedly cycled until the desired degree of dryness has been attained.

Another object of the invention is to provide a vibrating screen dryer in which the drying medium such as hot air or gas is economically utilized.

Another object of the invention is to provide a self contained vibrating screen dryer particularly effective for the purpose.

A still further object of the invention is to provide a vibrating screen dryer economical to manufacture and operate and readily serviced and maintained.

Other objects, together with the foregoing, are attained in the embodiment of the invention and described in the accompanying description and illustrated in the accompanying drawing in which:

The figure is an isometric view of a vibrating screen dryer constructed in accordance with the invention, certain portions of the exterior being broken away to disclose important parts of the interior.

While a vibrating screen dryer according to the invention can be fabricated in a number of different forms, depending somewhat upon the surrounding circumstances and the capacities desired and also the especial material to be dried, it has successfully been incorporated as shown herein primarily for use in drying seed. In this instance there is provided a frame **6** made up of the customary structural metal shapes and including side members **7** and a forward end member or head **8** and a rearward end member or head **9**. Suitably mounted in the two heads **8** and **9** on appropriate anti-friction bearings **11** and **12**, is a pair of mounting shafts **13** and **14** between their ends carrying supporting rollers **16**.

Resting on the rollers are wearing tires **17** and **18** circumscribing the periphery of a circular cylindrical drum **19**. The metal drum is mounted with its axis slightly inclined to the horizontal inasmuch as the shafts **13** and **14** are similarly inclined, the end of the drum adjacent the head **9** being somewhat lower than the end

of the drum adjacent the head **8**. The drum is thus rotatably mounted. It is rotated by a suitable motor **20** connected through a chain **22** to both of the shafts **13** and **14** so that the shafts are both rotated in a fashion to revolve the drum **19** in the direction of arrow **23** in the figure. The two ends of the revolving drum are themselves open, but they are substantially closed by a stationary but removable extension band **26** on the heads **8** and a similar band **27** on the head **9** so that a virtually air tight enclosure is provided.

In order that the interior of the drum may be supplied with a drying agent, the frame **6** serves as a mounting for a suitable burner **31**. This conveniently is a liquid petroleum gas burner having unobjectionable products of combustion and discharges through the head **8** into a substantially triangular combustion duct **32**. The duct is arranged with its apex uppermost to shed any material falling thereon and extends from the head **8** substantially throughout the entire length of the drum **19** terminating just short of the head **9** at the opposite end thereof. The duct **32** is made of good heat transmitting material so that it serves not only as a director for the products of combustion of the burner **31**, but also as a conductor and radiatior of heat derived from the products of combustion.

In order that the products of combustion discharging at the far end of the duct **32** may be appropriately circulated there is also provided in the head **8** a duct **34** leading to an exhaust fan (not shown) so that the spent products of combustion near the upper portion of the drum **19** are suitably withdrawn. When the burner **31** and the exhaust mechanism connected to the duct **34** are put in operation, there is provided a substantially complete return circuit for the products of combustion through the interior of the drum **19**.

Material to be dried is introduced into the interior of the drum through a charging opening **41** provided in the head **8**. Usually a conduit of a suitable sort is provided to extend from a material supply point through the opening **41** and into the interior of the drum. So that the received material can be properly handled, the interior of the drum **19** for its entire length is lined with an interior layer of metal (or, in some instances, insulating material) which is contoured to provide a number of axially extending fins **42** projecting radially from the interior periphery of the drum **19** for a short distance.

Material introduced through the feed opening **41** and falling on the interior of the drum is trapped between successive fins **42** and is picked up by the rotation of the drum and carried to an elevated location. The material then falls by gravity or spills from the fins and descends through the warm and dry atmosphere maintained within the drum. The drying material does not fall all the way to the bottom of the drum, but rather falls on to the uppermost one of a pair of similar superposed screens **46** and **47**.

The upper screen **46**, for example, includes a frame **48** made of structural shapes over which a foraminous or screen layer **49** is provided. At intervals in the length of the substantially rectangular screen **46** there are disposed upstanding baffles **51**. The screen **46** is appropriately supported at the ends in that the frame **48** is extended by rods **53** and **54** piercing a pitman arm **56**. There is another pitman arm at the far end, the assembly at one end of the machine adjacent the head **8** being substantially duplicated adjacent the head **9** at the other end. The rods **53** and **54** extend through enlarged openings **57** and **58** in the head **8** and partake of the motion of the pitman arm **56**.

One end of the pitman arm is connected by a flexible joint **57** to a bracket **58** outstanding from the head **8**.

Preferably the joint **57** includes a substantial rubber sleeve or grommet permitting vibratory motion of sufficient extent. The other end of the pitman arm **56** is enlarged to provide a strap **61** encompassing an eccentric **62** mounted on the end of a drive shaft **63** carried by a journal **64** in the head **8**. A similar assembly is provided at the other end of the machine. The shaft **63** between its ends is provided with a pulley **66** joined by a belt **67** to a drive pulley **68** on the shaft **69** of a motor **71** secured to a bracket **72** on the frame **6**.

With this mechanism, when the motor **71** is energized the shaft **63** is revolved and through the eccentric shaft **61** causes the pitman arms **56** to partake of a vibratory motion. Because of the large degree of freedom provided by the joint **57** at the remote end of the pitman arm, the vibratory action is imparted to the screen **46**. In some instances, the motion is enhanced by a spring **73** abutting the pitman arm **56** and also abutting a bracket **74** outstanding from the head **8**.

In an entirely similar fashion, the screen **47** at each end is mounted on a pitman arm **76** similarly mounted and driven by a shaft **77** at the far side of the machine, being rotated by an independent motor like the motor **71**.

Grain or seeds which fall from the rising fins **42** in the drum and drop through the warm air therein are intercepted on the upper screen **46** and are vibrated and turned and tossed by the slightly slanted screen being confined axially by the baffles **51**. Since the screen **46** is preferably also slanted slightly toward the far side of the drum **19**, the material eventually discharges over the far edge **78** of the upper screen **46** and falls by gravity onto the subjacent lower screen **47**. This is extended to project laterally beyond the edge **78** of the upper screen so as to intercept the falling material longitudinally slanted.

The screen **47** is also inclined downwardly toward the rising side of the drum **19**. The seeds or other materials that have fallen onto the lower screen **47** are vibrated, tossed and turned as they traverse the screen until they fall over the adjacent edge **79** thereof and then drop back to the inside of the drum **19**. When the material again contacts the drum it is again lodged between successive fins **42** and is again carried toward the top until it falls by gravity thus completing a cycle.

Because the drum **19** as well as the screens **46** and **47** are slightly inclined from a high end adjacent the head **8** toward a low end adjacent the head **9** the material in falling and although confined from time to time by the baffles **51** tends gradually to work toward the remote end of the drum **19**. Material by the time it reaches the far end is thoroughly dried and is ultimately discharged over the end **81** of the drum. It falls into a duct **82** disposed at the lower end of the band **27** and falls through the discharge opening therein for subsequent collection or use.

The vibrating screen dryer, as described, provides a means for repeatedly cycling material to be dried so that it periodically falls freely through the drying atmosphere and is agitated and turned and reoriented so that it is dried quite evenly. In its traverse through the drum and over the vibrating screens the material is subjected not only to conducted heat from the flowing products of combustion, but also is subjected to a convection current locally set up within the revolving drum **19** and especially also to heat radiated from the duct **32**.

All forms of heat transfer, therefore, are effective in raising the temperature of the material so as to drive off any accompanying moisture. The evolved moisture together with the products of combustion are continually discharged through the exhaust duct **44** so that a fresh atmosphere is always presented to the material being dried.

The ends of the revolving drum **19** are reasonably well sealed by means of the bands **17** and **18** which can be removed, at least partially if desired, for inspection or renewal, since a relatively close sometimes friction fit is maintained with the drum to preclude excessive atmospheric leakage. Since each of the shafts **63** and **77** is driven by a separate motor, the speed of operation of each of the screens **46** and **47** can be separately set or adjusted in order that a different turning and mixing action can be provided on each.

Pursuant to the invention there has been provided a vibrating screen dryer effective to make economical use of the heat available to effectuate drying in a uniform fashion of the material passing through the dryer. Furthermore, there is provided a mechanism which is simple to manufacture and maintain and one which makes economical use of the space involved and which generally attains all of the objects of the invention.

What is claimed is:

1. A vibrating screen dryer comprising a frame, a drum, means for mounting said drum on said frame for rotation about an axis inclined to the horizontal, a burner on said frame at the high end of said drum, a duct extending from said burner through a part of said drum, an exhaust duct on said frame communicating with the high end of said drum, means on said frame for rotating said drum, longitudinally extending radial fins mounted on and extending from the inside of said drum, means on said frame affording a material inlet to the high end of said drum, means on said frame affording a material outlet from the lower end of said drum, an upper screen in said drum above said duct and inclined from the high end of said drum toward the lower end thereof and inclined transversely of said drum, a lower screen in said drum between said upper screen and said duct and inclined from the high end of said drum toward the lower end thereof and inclined transversely of said drum in a direction opposite to the transverse inclination of said upper screen, the transversely higher edge of said lower screen being beneath the transversely lower edge of said upper screen and in the path of material falling therefrom, means for mounting said upper and lower screens on said frame for vibratory movement, and means on said frame for vibrating said screens.

2. A device as in claim 1, in which both of said screens have transversely extending upstanding baffles.

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