Oct. 26, 1948. W. F. BOKUM 2,452,427

CONDENSER

Filed March 7, 1946 5 Sheets-Sheet 1

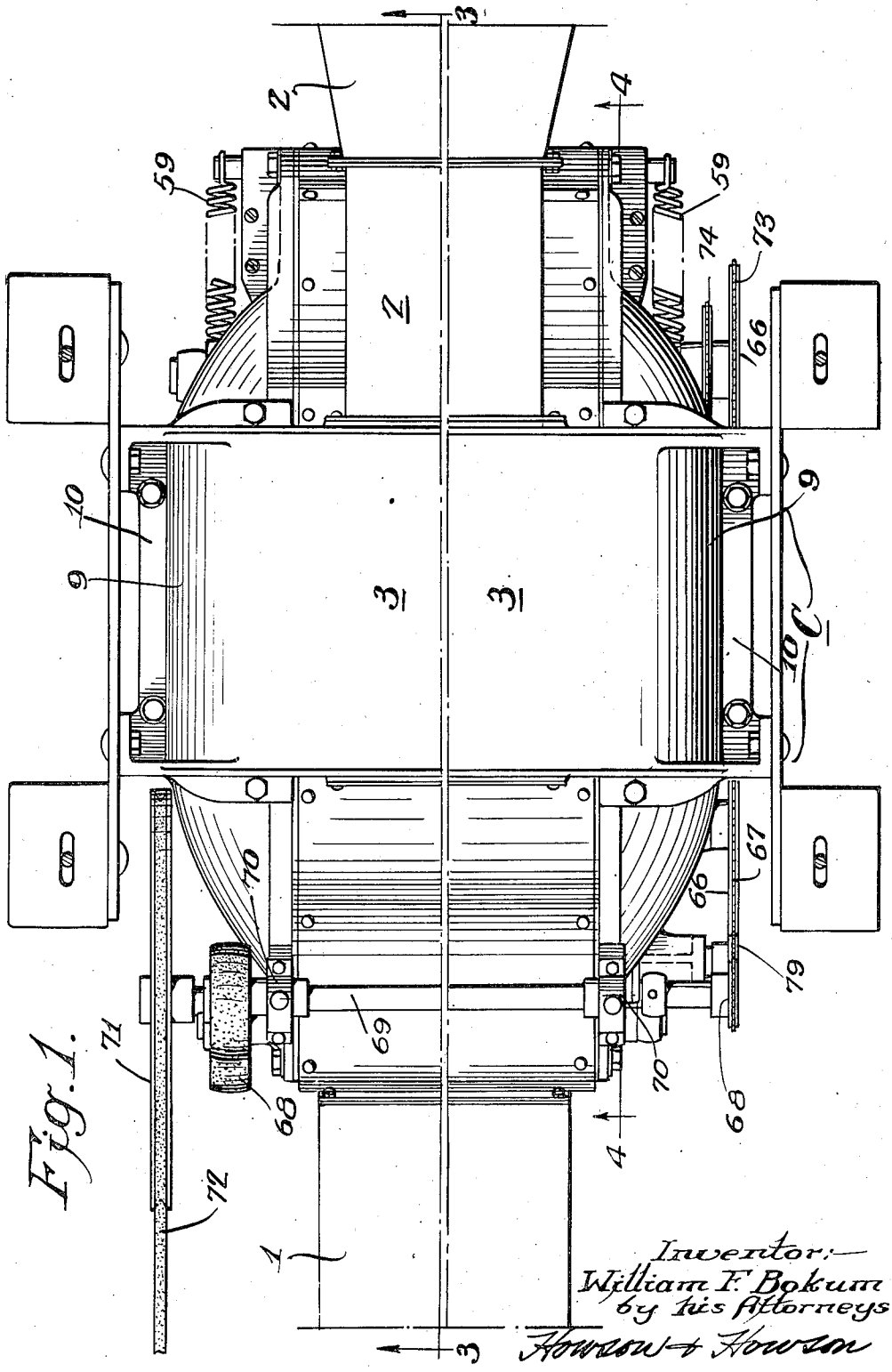


Fig. 1.

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CONDENSER

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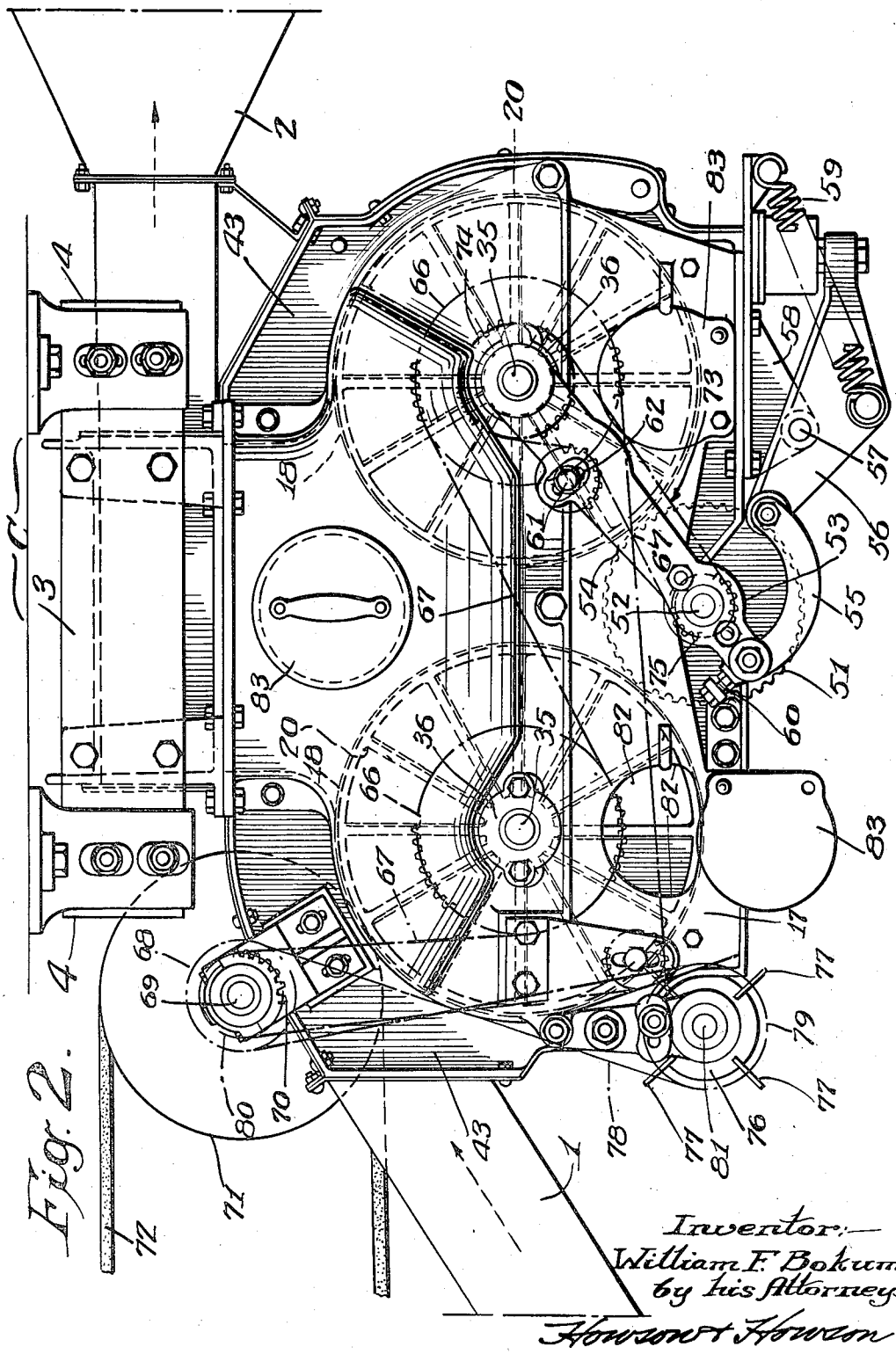


Fig. 2.

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CONDENSER

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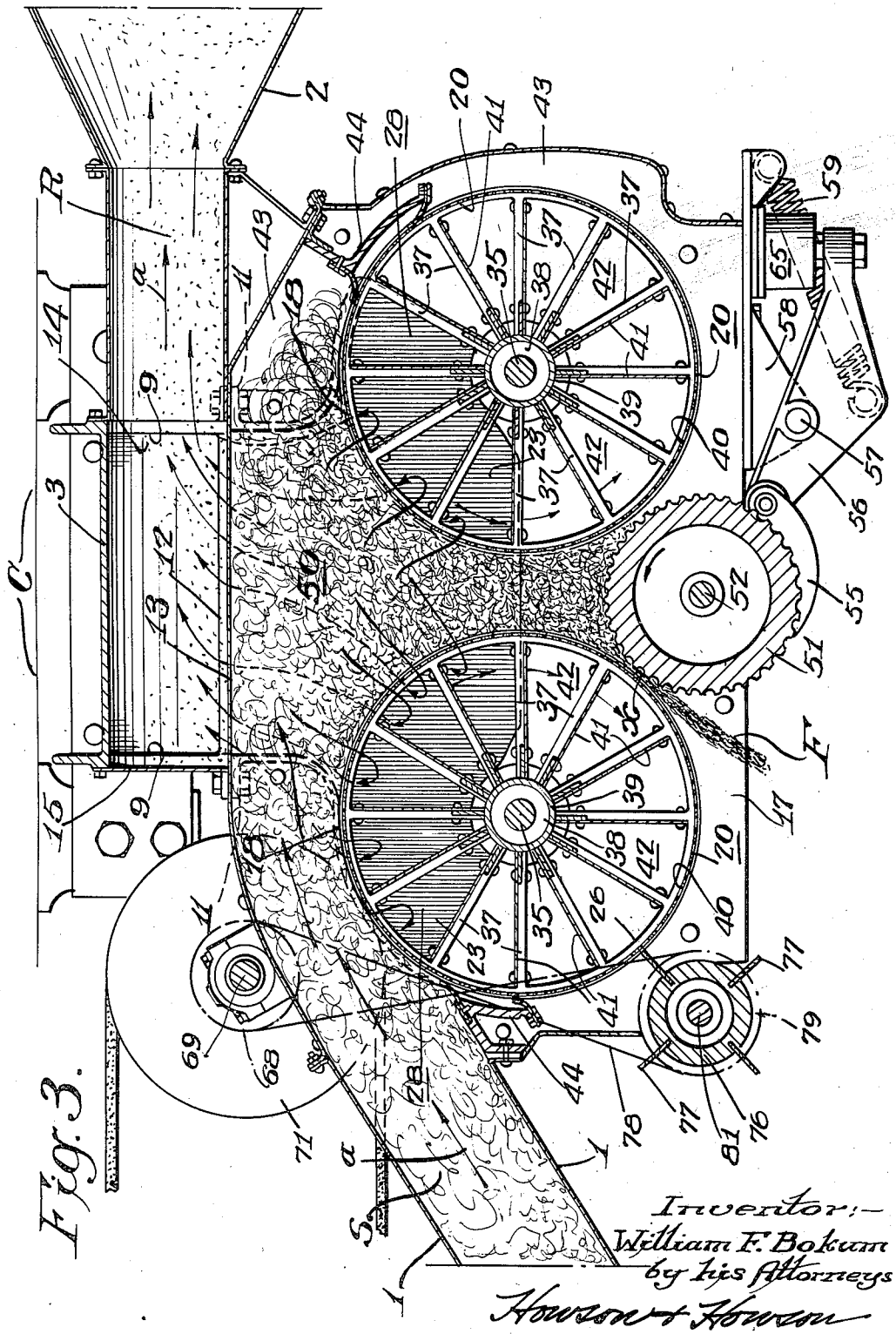


Fig. 3.

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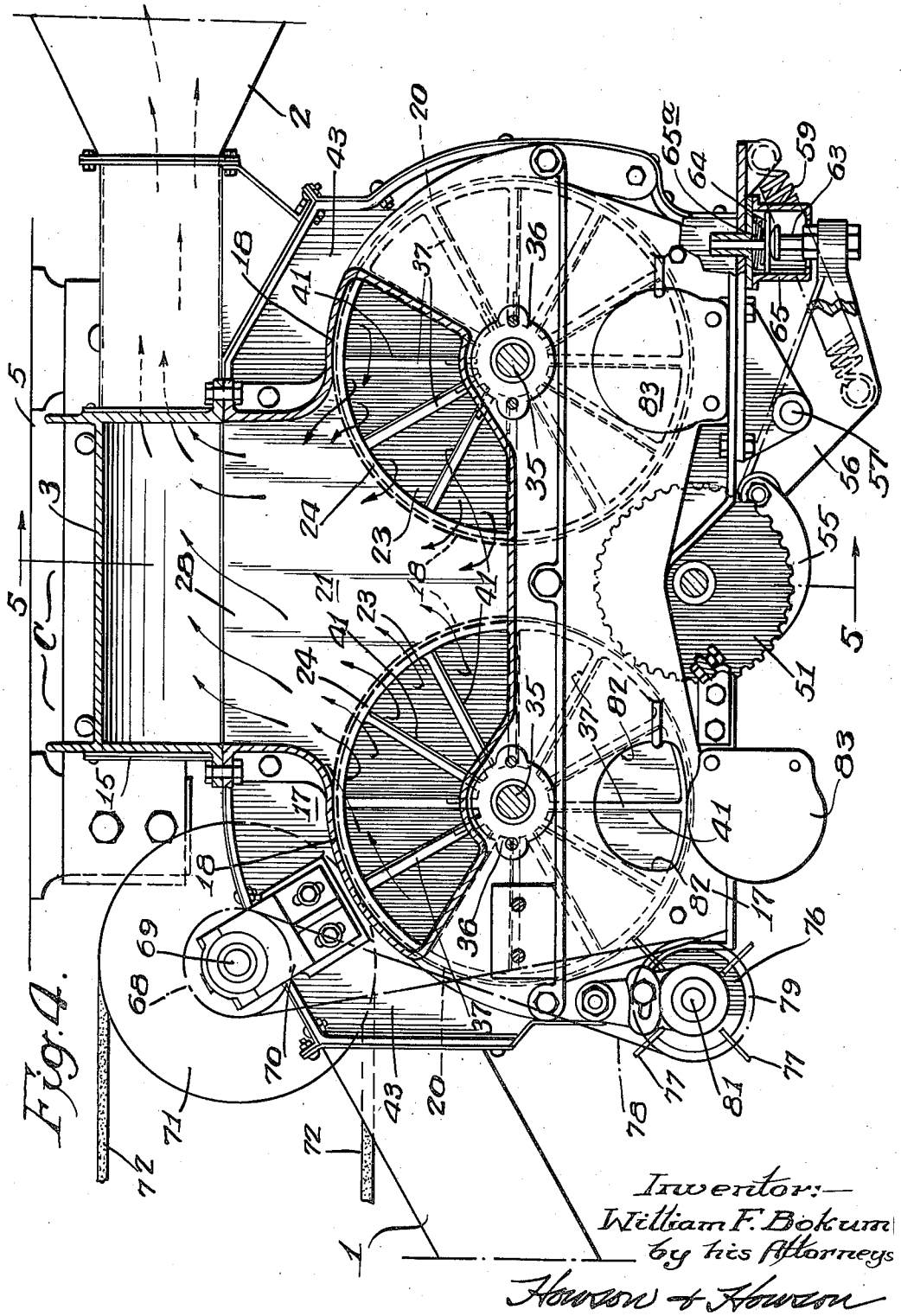


Fig. 4.

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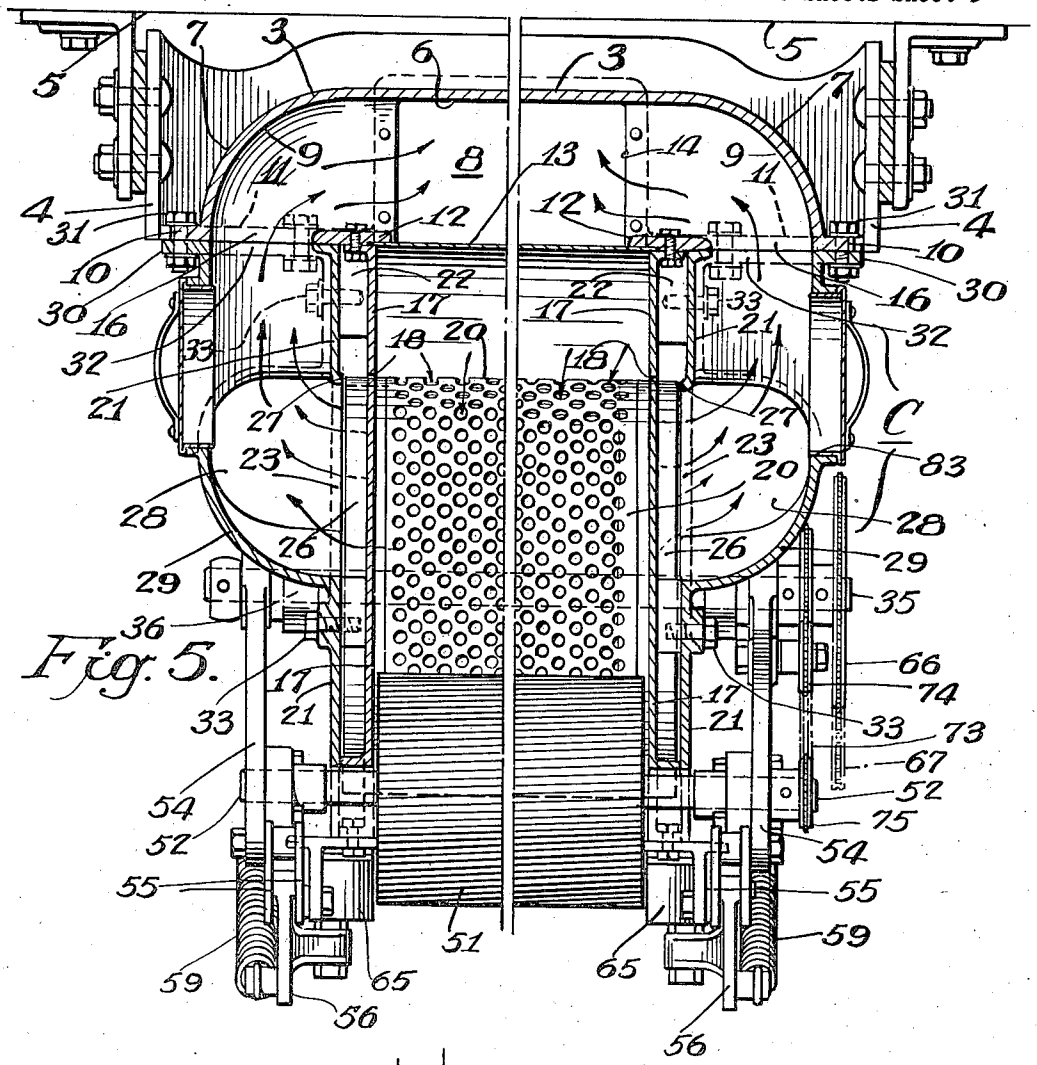


Fig. 5.

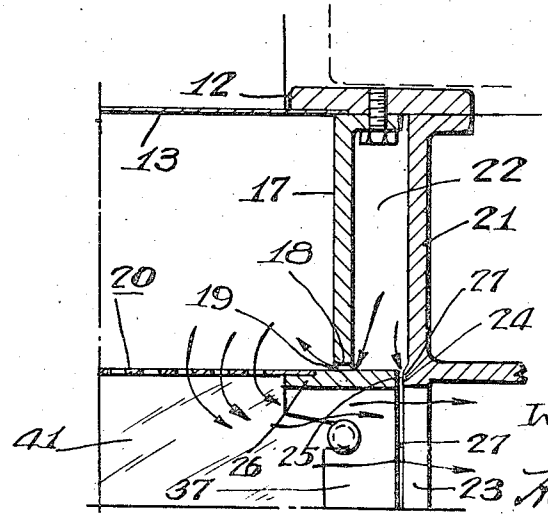


Fig. 6.

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Patented Oct. 26, 1948

2,452,427

UNITED STATES PATENT OFFICE

2,452,427

CONDENSER

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Application March 7, 1946, Serial No. 652,716

12 Claims. (Cl. 19—75)

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This invention relates to drum suction condensers commonly employed in textile mills handling fibrous stock in bulk, for removing fine broken particles of the fibres, dirt and other foreign matter from loose stock, in transit, as it is pneumatically conveyed from mixing pickers, willows or other preliminary processing machinery to the carding room stock bins or other predetermined locations in the mill.

Prior to the present invention, these condensers consisted of a single perforated drum rotatably mounted in a casing having an outlet port connected to the inlet port of an exhaust fan or blower which was adapted to draw air from the interior of the drum and thereby create a current of air through the perforated shell of the drum and the casing, to draw the stock into the casing and deposit it against the exterior cylindrical surface of the perforated rotating drum. As the drum revolved, a segmental imperforate valve plate or baffle which was non-rotatably mounted within the perforated drum, concentric to and relatively closely adjacent the inner surface of the cylindrical perforated shell of the drum, was adapted to cut off flow of the fibre-conveying air through a corresponding segmental fractional portion of the total area of the cylindrical shell of the drum to effect release of the stock held against that particular segmental area of the outer surface of the drum by the current of air passing through the perforated shell from the exterior thereof to the interior thereof, whereupon the stock released from the influence of the conveying current of air fell by gravity from the drum and out of the casing through a discharge opening formed in the bottom thereof.

In the prior condensers, the opposite ends of the perforated drum extended through circular openings of slightly larger diameter than the outside diameter of the drum and which were formed in a pair of laterally spaced parallel partitions located within the casing. These partitions normally directed the conveying current of air from the outside of the drum through the perforated shell of the drum to the interior thereof.

In order to prevent short circuiting of the conveying current of air through the working clearance maintained between the peripheral surface of the drum and the circular walls of the openings through which the respective ends of the drum projected, annular leather sealing rings of right angular cross section were fitted around the drum and secured to the aforesaid partitions, to keep the stock fibres from being drawn into

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the exhaust chamber of the casing directly from the space occupied by the fibres in the casing around the exterior of the drum, and to prevent sucking air through the exposed part of the drum.

In addition to the aforesaid annular sealing rings at the opposite ends of the drum, it was necessary to provide a pair of fixed sealing strips at one transversely extended edge of the segmental valve plate to engage the interior and exterior surfaces respectively of the drum; and to provide a similar interior sealing strip at the opposite transverse edge of the valve plate to engage the interior face of the perforated shell of the drum, to effect release of the fibres from the suction air current by which the fibres were held against the outer peripheral surface of the drum.

The aforesaid sealing rings and sealing strips effected a braking action on the drum, requiring greater power, and presented a constant source of annoyance from the point of maintenance, as they were subject to wear and required relatively frequent replacement. Replacement involved dismantling of a major portion of the condenser and consequent idleness of the system in which the condenser operated while the replacement was being effected.

Furthermore, the fibres would get lodged between the sealing rings and the rotating drums, and dirt and lint packed between the drum and the baffle inside the drum, adding friction and frequently causing fires.

The principal object of the present invention therefore is to provide a condenser which will not require the use of the aforesaid sealing rings, the segmental valve plate, or the internal sealing strips along the transverse edges of such a plate.

Another object of the present invention is to arrange the drum, the partitions through which the opposite ends of the drum respectively project, and the exhaust chambers at the opposite ends of the drum, with free air spaces between the partitions and adjacently disposed walls of the exhaust chambers, whereby the suction set up in the exhaust chambers will tend to draw free air inwardly through the working clearances between the peripheral surface of the drum and the circular walls of the openings in the partitions through which the ends of the drum project, and between the circular end edges of the drum and the marginal edges of exhaust ports formed in the aforesaid adjacently disposed walls of the exhaust chambers.

Another object of the present invention is to

divide the interior of the drum into a plurality of axially extending compartments open at their opposite ends respectively for successive registration with the aforesaid exhaust ports in the walls of the exhaust chambers which lie adjacent the opposite ends respectively of the drum, whereby the need for the interior segmental valve plate is eliminated.

Another object of the invention is to provide a pair of the perforated drums to rotate in opposite directions on laterally spaced parallel axes and adapted to deliver the cleaned fibre from a space intermediate the exterior surfaces of the two drums, under control of a fluted faced imperforate drum disposed between said perforated drums, below the axes of rotation thereof, with the fluted face of the imperforate delivery drum substantially tangent but spaced somewhat from the perforated peripheral surfaces of the two perforated screening drums.

Other objects and advantages of the present invention will become obvious from the following description of the structure and the illustrations of the accompanying drawings of which:

Fig. 1 is a plan view of the device;

Fig. 2 is a side elevation of the structure shown in Fig. 1;

Fig. 3 is a longitudinal sectional elevation taken on the line 3—3, Fig. 1;

Fig. 4 is a longitudinal sectional elevation taken on the line 4—4, Fig. 1;

Fig. 5 is a transverse sectional elevation taken on the line 5—5, Fig. 4; and

Fig. 6 is an enlarged sectional view of a portion of the structure shown in Fig. 5.

As shown in Fig. 3, the loose fibrous stock S, including fine particles of foreign matter, small particles of broken fibres, etc., enters one end of the condenser C, by way of a closed conduit 1. The cleaned fibre F is discharged from the bottom of the condenser C, and the refuse R is drawn out of and away from the opposite end of the condenser C by way of a closed conduit 2, which latter is connected to the air or suction side inlet of an exhaust fan or blower (not shown) by which a current of air is set up through the conduit 1, condenser C and conduit 2 for pneumatically conveying the stock S from a source of supply (not shown) such as a picker or a willow or some other conventional preliminary processing machinery, etc., to the condenser, and for pneumatically conveying the refuse R away from the condenser to a point of discharge where the refuse may be separated from the conveying air before the latter is exhausted into the atmosphere outside the building in which the apparatus is housed.

The condenser per se comprises a main top body structure 3 in the form of a casting or equivalent therefor, which is provided with any suitable hanger brackets 4, 4, by which the device as a whole may be suspended from an overhead structure 5, such as the ceiling or rafters, etc., of a building or any suitable framework.

The main body structure 3 is of a hollow character including a transversely extending top wall 6 which is curved downwardly at its opposite ends, as shown at 7, 7, to form side walls of a main or top suction exhaust chamber 8, said chamber being further defined by end walls 9, 9 (see Fig. 3).

The side walls 7, 7 and end walls 9, 9 terminate in a common plane in which are disposed side flanges 10, 10, end flanges 11, 11, and intermediate longitudinally extending bottom bars 12, 12.

The central exhaust suction chamber 8, is further defined by a bottom plate 13 which is secured along its longitudinal side edges, between the end walls 9, 9, to the undersides of the bars 12, 12.

The end walls 9, 9 of the suction exhaust chamber 8 are provided with ports 14, 14 respectively, one of which is directly connected to the exhaust conduit 2, while the other is closed by a plate 15 (Fig. 3), whereby the exhaust conduit 2 may be connected to either end of the device, or whereby a plurality of the devices may be coupled in tandem to a single exhaust conduit, if desired.

Between the side walls 7, 7 and the bars 12, 12, the bottom of the main body structure 3 is open to provide exhaust ports 16, 16 at each of the opposite sides of the main top exhaust chamber 8, for purposes hereinafter set forth.

Secured to the underside of and depending from the longitudinal bars 12, 12, is a pair of laterally spaced partition walls 17, 17, in which are formed a pair of circular openings 18, 18, through which extend the opposite ends respectively of the pair of perforated screening drums 20, 20, leaving an annular working clearance 19 between the peripheral surface of each drum 20 and the inner circular wall of the opening 18 in each partition 17, as shown clearly in the enlarged detail view of Fig. 6.

Also secured to the undersides of the longitudinal bars 12, 12, in laterally spaced relation to and disposed outside the partition walls 17, 17 are outside side walls 21, 21, leaving free air spaces 22, 22 between said partition walls 17, 17 and said outside side walls 21, 21, as clearly shown in Fig. 6.

Formed in the outside side walls 21, 21 are segmental exhaust ports 23, 23 which, as shown clearly in Fig. 6, communicate with the interiors of the drums 20, 20 through the open ends of said drums over the portions thereof indicated by the vertically shaded areas in Figs. 3 and 4 of the drawings. These open ends of the drums 20, 20 are, except for the areas of the ports 23, 23, closed by the side walls 21, 21, which lie closely adjacent the end edges of said drums with a working clearance therebetween.

The ports 23, 23, are provided with marginal face pads having finished inside surfaces 24 spaced slightly from outside finished end surfaces 25 formed on the end rims 26 of the screen drums 20, with a narrow working clearance 27 therebetween, as shown in Fig. 6.

The segmental ports 23 in the side walls 21 of the condenser communicate with auxiliary side exhaust chambers 28, 28, formed in enlarged hollow extensions 29, 29 of the outside side walls 21, 21, as shown in Fig. 5.

The upper ends of the hollow enlargements 29, 29 are provided with flanges 30, 30 which abut the flanges 10 and 11 of the top casting 3 and are secured thereto by bolts 31, 31, with the ports 16, 16 of the main top exhaust chamber 8 in communication with corresponding ports 32, 32 formed in the upper ends of the auxiliary side exhaust chambers 28, 28.

The outside side walls 21, 21 may be secured to the partition walls 17, 17 to maintain a rigid relationship therebetween as by bolts 33, 33, whereby the clearances 27, 27 between the drum ends and the side walls will remain constant and whereby rigid supports for the drums 20, 20 will be provided.

The drums 20, 20 are provided with shafts

35, 35 which are rotatably mounted in bearings 36, 36, formed in or carried by the side walls 21, 21 respectively.

As shown in Fig. 3, the end rim 26 at each end of each screen drum 20 is supported by flat thin spokes 37, 37 radiating from hubs 38, 38. Carried by and between the hubs 38, 38, of each drum 20 is a central tube 39 surrounding the shaft 35. Concentric with the tube 38 is a perforated screen cylinder 40 and extending from the tube 38 to the inside of the screen cylinder 40, and attached at their opposite ends to the spokes 37, 37 of each drum 20 is a series of radial plates 41, 41 which divide the interior of each drum 20 into a plurality of wedge shaped compartments 42, 42, which are open at each end for registration successively with the exhaust ports 23, 23 aforesaid, as the drums 20, 20 are rotated simultaneously.

The partition walls 17, 17 are provided with longitudinal extensions 43, 43 which, beyond the screen drums 20, 20 are rigidly connected by transverse frame bars 44, 44, as shown in Fig. 3; and the bottom plate 13 of the exhaust chamber 8 is extended longitudinally and secured to the top edges of the extensions 43, 43 of the partition walls 17, 17 to form a stock chamber 50, above the drums 20, 20, to one end of which is connected the feed conduit 1.

The bottom of the stock chamber 50 is formed by a rotatable fluted faced roll 51 which is secured to a shaft 52. The shaft 52 is mounted in bearings 53 formed in lever arms 54 which are loosely mounted on one of the screen drum shafts 35 for convenience.

The outer ends of the arms 54 are connected by links 55 to rocking levers 56, which latter are pivotally mounted at 57 on brackets 58 secured to the lower edges of the partition walls 17, or to the side walls 21, as desired.

Springs 59 tend to rock the levers 56 which through the links 55 tend to rock the levers 54 and move the fluted roll 51 toward one of the screen drums 20. Adjustable stop 60 carried by one or both of the partition walls 17 engages the free end of the lever 54 and regulates the depth of the delivery space X between the periphery of the delivery roll 51 and one of the screen rolls 20, as shown in Fig. 3.

If desired, the delivery space may be fixed by securing the arms 54 to the side walls 21 as by bolts 61 passing through segmental slots 62 formed in the arms 54.

Each of the levers 56 is extended at one end to receive a stud 63 (see Fig. 4) which engages a buffer plate 64 slidably mounted in a fixed cylinder 65 and which is resiliently backed by a spring 65a confined in said cylinder to cushion the movement of the arms 56 against any sudden movement thereof under the action of the springs 59 and whereby the fluted roll 51 will be held in resilient relation to the screen drum 20. The buffer springs also prevent any toggle locking condition from arising between the levers 54 and links 55.

The screen rolls 20, 20 may be driven by chain sprockets or pulleys 66, 66 secured to the shafts 35, 35, through a drive chain or belt 67 passing around the wheels 66, 66 and a similar driving wheel 68 secured to a transverse shaft 69. The shaft 69 is rotatably mounted in fixed bearings 70 and is provided with a driving wheel 71 which is connected to any suitable source of power, such as an electric motor (not shown) by a drive chain or belt 72.

The fluted delivery roll 51 is rotated by a chain or belt 73 passing around suitable drive wheels 74 and 75 secured to one of the shafts 35 and the shaft 52 respectively.

In order to remove from the face of the screen drum 20 which cooperates with the delivery roll 51 any fibre that may have adhered to the drum 20 as it rotates away from the fluted delivery roll 51, a rotary brush or paddle 76 may be provided and rotated to cause the outer edges of a series of paddle blades 77, 77 to make wiping contact with the surface of the screen drum 20 successively. This paddle roll 76 may be rotated by a belt 78 passing around drive wheels 79 and 80 secured respectively to the shaft 81 of the paddle 76 and the main drive shaft 69 aforesaid.

Suitable clean-cut or inspection ports 82, 82 normally closed by covers 83, 83 may be provided at convenient places on the device as desired.

The operation of the device would appear to be obvious from the foregoing description of the structure. Briefly, the suction device to which the exhaust conduit 2 is connected creates and maintains a current of air through the condenser in the direction of the arrows *a*, *a*, Fig. 3, which draws the stock S through the feed conduit 1 into the fibre chamber 50 above and between the drums 20, 20, and above the roll 51.

The passage of the conveying current of air from the chamber 50 through the perforated cylinders of the screen drums 20, into the interior of the compartments 42 of said drums which are in communication with the ports 23 of the side exhaust chambers 28 holds the stock on those portions of the peripheral faces of the drums 20 embraced by these registering compartments 42 of said drums and draws the fine particles of refuse through the perforations of the cylinders 40 into the compartments 42.

The suction in the side chambers 28 draws the refuse out of the ends of the compartments 42 into the chambers 28, and the suction in the main chamber 8 draws the refuse into that chamber from which it passes under the suction in the conduit 2.

As the drums 20, 20 rotate, the compartments 42 thereof successively pass out of registry with the ports 23 and the cleaned fibre lying on the faces of the drums adjacent such non-registering compartments is released to drop onto the delivery roll 51, as new increments of stock in the chamber 50 are brought under the influence of the air current as new compartments 42 of the drums 20 are moved into registry with the ports 23.

Upon reference to Fig. 6, it will be noted that under the conditions just described, all tendency of the air to escape outwardly from the stock chamber 50 into the exhaust chamber 28, around the ends of the drum is frustrated by the structure shown and the condition is actually reversed, i. e., free air is drawn into the stock chamber 50 through the clearance spaces maintained between the peripheral faces of the drums 20, 20 and the circular walls of the openings 18 in the partitions 17, 17 through which the ends of the drums 20, 20 respectively project.

It will be noted upon reference to Fig. 6, that instead of there being a direct connection formed between the stock chamber and the exhaust chambers, through the clearance spaces for the screen drum in the side walls of the condenser as existed in the condensers used prior to the

present invention, such direct communication is impossible with the construction illustrated in Fig. 6, due to the presence of the free air space 22 interposed between the partitions 17 and the exhaust chambers 28. Thus, instead of the stock conveying air short circuiting from the stock chamber into the exhaust chamber, as hereinbefore noted, the conveying air must pass from the stock chamber 50 through the perforated screen cylinders 40 of the drums 20, 20 before it can pass to the exhaust chambers 28, 28, and therefore no sealing rings are necessary.

I claim:

1. A fibrous stock condenser comprising a hollow cylindrical rotary screen drum having an open end affording communication with the interior of the drum, a stock chamber including a stock retaining wall having a circular opening of greater diameter than said drum through which the open end of the drum projects beyond said stock retaining wall, and an exhaust chamber including a defining wall spaced from said stock retaining wall with a free air space therebetween and provided with a communicating port in registry with said open end of said drum.

2. A fibrous stock condenser comprising a hollow cylindrical rotary screen drum, means dividing the interior of said drum into a plurality of axially extending compartments open at one end of the drum, a stock chamber including a stock retaining wall having a circular opening through which said end of said drum projects beyond said wall, and an exhaust chamber including a defining wall spaced from said stock retaining wall and provided with a communicating port adapted to register with the open ends of said drum compartments successively as said drum rotates in a predetermined direction.

3. A fibrous stock condenser comprising a pair of laterally spaced hollow cylindrical rotary screen drums, means dividing the interiors of said drums into a plurality of axially extending compartments open at each end of each drum, a stock chamber including a pair of laterally spaced parallel stock retaining walls having circular openings through which said ends of said drums respectively project beyond said walls, and exhaust chambers including defining walls spaced from said stock retaining walls and provided with communicating ports respectively adapted to register with the open ends of said drum compartments successively as said drums rotate in a predetermined direction.

4. A fibrous stock condenser comprising a pair of laterally spaced hollow cylindrical rotary screen drums, means dividing the interiors of said drums into a plurality of axially extending compartments open at each end of each drum, a stock chamber including a pair of laterally spaced parallel stock retaining walls having circular openings through which said ends of said drums respectively project beyond said walls, exhaust chambers including defining walls spaced from said stock retaining walls and provided with communicating ports respectively adapted to register with the open ends of said drum compartments successively as said drums rotate in a predetermined direction, and a main exhaust chamber above said stock chamber and communicating with the first said exhaust chambers.

5. A fibrous stock condenser comprising a pair of laterally spaced hollow cylindrical rotary screen drums, means dividing the interiors of said drums into a plurality of axially extending compartments open at each end of each drum, a stock chamber including a pair of laterally spaced parallel stock retaining walls having circular openings through which said ends of said drums respectively project beyond said walls, exhaust chambers including defining walls spaced from said stock retaining walls and provided with communicating ports respectively adapted to register with the open ends of said drum compartments successively as said drums rotate in a predetermined direction, a main exhaust chamber above said stock chamber and communicating with the first said exhaust chambers, a stock feeding conduit connected to said stock chamber, and an exhaust conduit connected to said main exhaust chamber.

6. A fibrous stock condenser comprising a hollow main body element, a pair of laterally spaced parallel longitudinally extending stock retaining walls depending from the bottom of said body element, a pair of laterally spaced parallel hollow cylindrical rotary screen drums disposed transversely to and extending through circular openings formed in said stock retaining walls, a pair of said walls depending from said body element in spaced relation to said stock retaining walls, a main exhaust chamber formed in said body element and communicating with a pair of side exhaust chambers formed in said side walls respectively, means dividing the interior of said drums into a plurality of axially and radially extending compartments open at the ends of said drums, and segmental ports formed in said side walls and affording communication between said side exhaust chambers and said drum compartments successively as said drums rotate.

7. A fibrous stock condenser comprising a hollow main body element, a pair of laterally spaced parallel longitudinally extending stock retaining walls depending from the bottom of said body element, a pair of laterally spaced parallel hollow cylindrical rotary screen drums disposed transversely to and extending through circular openings formed in said stock retaining walls, a discharge roll operating between said drums below the axes thereof to retain said stock against accidental discharge from the condenser, a pair of side walls depending from said body element in spaced relation to said stock retaining walls, a main exhaust chamber formed in said body element and communicating with a pair of side exhaust chambers formed in said side walls respectively, means dividing the interiors of said drums into a plurality of axially and radially extending compartments open at the ends of said drums, and segmental ports formed in said side walls and affording communication between said side exhaust chambers and said drum compartments successively as said drums rotate.

8. A fibrous stock condenser comprising a hollow cylindrical rotary screen drum having an open end affording communicating with the interior of the drum, a stock chamber including a stock retaining wall having a circular opening through which the open end of the drum projects beyond said stock retaining wall, and an exhaust chamber provided with a communicating port in registry with said open end of said drum, the junction of said drum open end and the communicating port of said exhaust chamber being spaced outwardly from said retaining wall and providing between the retaining wall and said junction a free air space operable to prevent air in said stock chamber from by-passing directly to the exhaust chamber without passing through said drum.

9. A fibrous stock condenser comprising a hollow cylindrical rotary screen drum having an open end affording communication with the interior of the drum, a stock chamber including a stock retaining wall having a circular opening through which the open end of the drum projects beyond said stock retaining wall with a circumferential annular working clearance space around the drum within said opening, and an exhaust chamber provided with a communicating port in registry with said open end of said drum, the junction of said drum open end and the communicating port of said exhaust chamber being spaced outwardly from said retaining wall and providing between the retaining wall and said junction a free air space from which free air may be drawn inwardly of the stock chamber through said annular work clearance and inwardly of the exhaust chamber through the junction thereof with the drum open end so that short-circuiting of air from said stock chamber directly to said exhaust chamber without passing through said drum is substantially precluded.

10. A fibrous stock condenser comprising a pair of laterally spaced parallel hollow cylindrical rotary screen drums having open ends respectively affording communication with the interiors of the drums, a stock chamber including a pair of laterally spaced stock retaining walls substantially at right angles to the axes of said drums and having circular openings through which the open ends of the drums project beyond said stock retaining walls, and exhaust chambers provided with communicating ports respectively in registry with said open ends of said drums, the junctions of said drum open end and the communicating port of said exhaust chambers being spaced outwardly from said retaining wall and providing between the retaining wall and said junction a free air space operable to prevent air in said stock chamber bypassing directly to the exhaust chambers without passing through said drum.

11. A fibrous stock condenser comprising a hollow cylindrical rotary screen drum, means dividing the interior of said drum into a plurality of axially extending compartments open at least at one end of the drum, a stock chamber including a stock retaining wall having a circular opening through which said end of said drum projects beyond said wall, and an exhaust chamber provided with a communicating port adapted to register with the open ends of said drum compartments successively as said drum rotates in a predetermined direction, the junction of the open ends of said drum compartments and the communicating port of said exhaust chamber being spaced outwardly from said retaining wall and providing between the retaining wall and said junction a free air space operable to prevent air in said stock chamber by-passing directly to the exhaust chamber without passing through said drum.

12. A fibrous stock condenser comprising a hollow cylindrical rotary screen drum, means dividing the interior of said drum into a plurality of axially extending compartments open at each end of the drum, a stock chamber including a pair of parallel laterally spaced stock retaining walls having circular openings through which the respective ends of said drum project beyond said walls, and a pair of exhaust chambers including defining walls provided with communicating ports respectively adapted to register with the open ends of said drum compartments successively as said drum rotates in a predetermined direction, the defining walls of said exhaust chambers being spaced outwardly from said stock retaining walls and providing between the retaining walls and said exhaust chamber walls free air spaces operable to prevent air in said stock chamber by-passing directly to the exhaust chambers without passing through said drum.

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