Sept. 15, 1925. 1,553,613

H. C. HOLTHOFF

FEEDER

Filed March 15, 1920

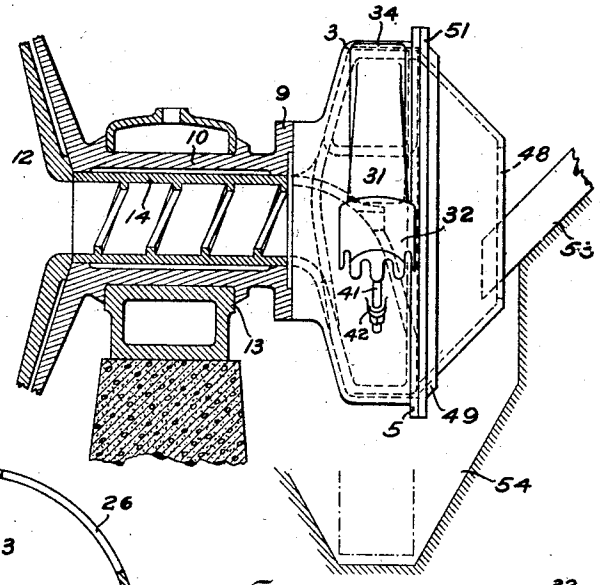


Fig. 1

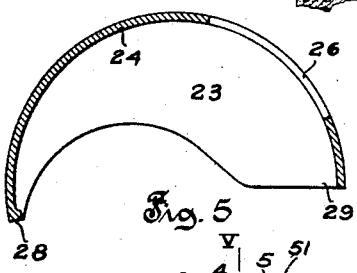


Fig. 5

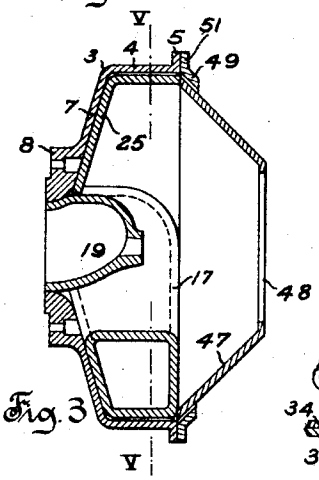


Fig. 3

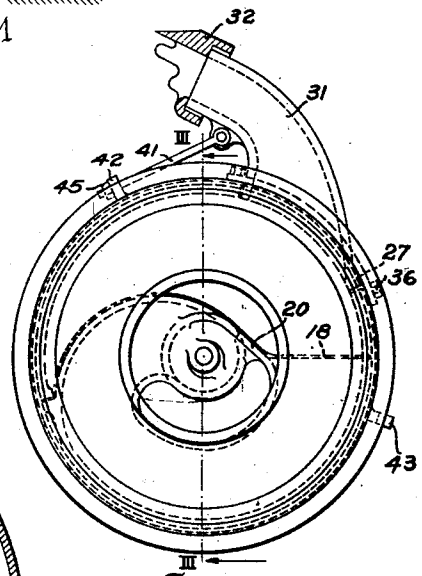


Fig. 2

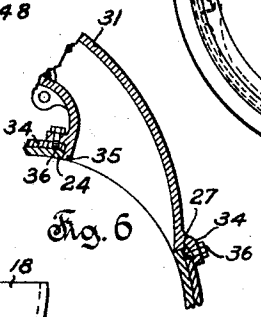


Fig. 6

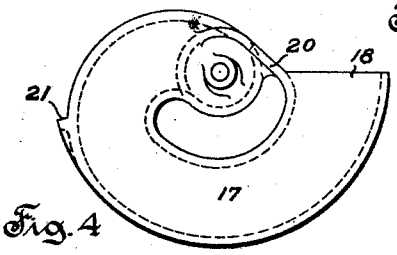


Fig. 4

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UNITED STATES PATENT OFFICE.

HENRY C. HOLTHOFF, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO ALLIS-CHALMERS MANUFACTURING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF DELAWARE.

FEEDER.

Application filed March 15, 1920. Serial No. 366,980.

To all whom it may concern:

Be it known that HENRY C. HOLTHOFF, a citizen of the United States of America, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, has invented a certain new and useful Improvement in Feeders, of which the following is a specification.

This invention relates in general to improvements in the construction of feeders, and has particular relation to rotatable feeders for conveying material to machines, such as tube and ball mills, etc., not only where material of a single or uniform character is fed to a mill but also where materials of different characters or from different sources are fed and commingled before being charged to the mill proper.

In feeders, especially where the material fed is comparatively hard and of a generally abrasive nature, such as a great many materials ordinarily fed to grinding or comminuting machines, there is considerable wear of the parts with which the working material comes in contact. This is especially true where the feeder embodies, as an essential part of the construction, a spiral conveyor located substantially within the casing of the feeder, and adapted to carry material from a point adjacent the periphery of the feeder to an axial or central discharge opening. A modern commercial type of feeder of this general character, known in the art as a combination feeder, is shown in the patent to Greenfield 1,214,776, Feb. 6, 1917. It will be obvious that with feeders of this general character, involving a drum portion and an interiorly located elevator or conveyor, the expense of maintenance is considerable, and this is the case independently of whether or not the external scoop is integral with the body portion of the feeder. Obviously, the replacement of the entire feeder as parts thereof wear, and this destructive wear may occur very rapidly, is a comparatively expensive proposition.

Again, with prior art designs of feeders of this type, the feeder was especially designed for a definite direction of rotation, the conveyor and scoop elements being so formed as to function properly only when the feeder was rotated in the particular direction. Obviously, this arrangement necessitated distinct feeders, and this item involved the expense of providing different patterns for the two feeders.

The present invention contemplates an improved design and construction of a feeder of this general character, wherein a sectional construction is used to the extent of simplifying certain features of the manufacture of the feeder and providing for the renewal and ready replacement of the essentially wearing parts, so as to materially reduce the cost of maintenance of the feeder, the design being such as to require the duplication of only a minimum number of parts and weight of material in order to provide for full reversibility as to direction of rotation of the feeder.

It is an object of this invention to provide a feeder of improved design embodying a sectional construction, whereby wearing parts are readily renewable.

It is a further object of this invention to provide a combination feeder of improved design and construction comprising readily removable interior elevator or conveyor and liner elements.

It is a further object of this invention to provide a combination feeder of improved design and construction embodying a renewable and replaceable external scoop and an interior elevator or conveyor and liner.

These and other objects and advantages are attained by this invention, various novel features of which will appear from the description and drawings, disclosing an embodiment of such invention, and will be particularly pointed out in the claims.

In the accompanying drawings:

Fig. 1 is a view in elevation of a feeder embodying features of the present invention, with parts of a rotary machine, with which the feeder is associated, shown in section, the replaceable parts being designed for anti-clockwise rotation of feeder.

Fig. 2 is an end elevation of the feeder shown in Fig. 1, the same being rotated through approximately 90° from the position of Fig. 1.

Fig. 3 is a vertical section through a feeder having replaceable parts designed for clockwise rotation.

Fig. 4 is an end elevation of the spiral elevator or conveyor of the feeder shown in Figs. 1 and 2.

Fig. 5 is a vertical sectional elevation of the lining element of the feeder of Figs. 1 and 2.

Fig. 6 is a sectional detail showing the attachment of the scoop to the body of the feeder.

In the embodiment of the invention disclosed, the feeder comprises a substantially drum-shaped casing or housing 3 having a substantially cylindrical peripheral portion 4 with an exterior flange 5 at its outer or open edge. At its opposite or inner edge, the casing is of general conical form, as indicated at 7, this cone-shaped part merging into a cylindrical portion 8 provided with apertures, as shown in Fig. 3, for the reception of screws or bolts used for connecting the casing to a flanged portion 9 of a hollow trunnion 10 which may form a part of a rotating mill, generally indicated at 12. 13 indicates a bearing within which the hollow trunnion 10 rotates, this hollow trunnion being provided with a liner 14 having helical ribs on its interior which are effective, during rotation of the trunnion, to convey material toward the mill 12.

The interior of the casing or housing 3 is provided with an elevating or conveying element 17 of generally spiral form and having an open inlet end 18 at its outer periphery and a discharge located at the center, as indicated at 19, the discharge portion being of generally tubular form and extending axially from the body portion of the spiral, and of such size as to fit fairly closely within the aperture of the cylindrical portion 8 of the casing. A considerable portion of the outer periphery of the conveyor or elevator extending from the discharge end 18 is concentric with the wall of the casing 3, as indicated in Figs. 2, 3 and 4, and is of such form and size as to fit comparatively closely within the casing or housing. The formation of the spiral is such that the passage therethrough is wholly walled or enclosed from the inlet 18 to the discharge 19. A web-like element 20, integral with the body portion of the spiral, serves to brace the inlet portion and to hinder the entrance of material to the space between the radially spaced portions of the conveyor conduit during the operation of the feeder.

21 indicates a lug or shoulder adjacent one end of that portion of the spiral which has its outer periphery concentric with the cylindrical part 4 of the casing 3. As indicated, the axially outer face of the spiral conveyor 17, when the same is in position within the housing 3, is preferably in approximately the same plane as the axially outer face of the flange 5; and the axially inner wall of the spiral is of general conical shape so as to fit against and fully engage with the interior of the cone-shaped portion 7 of the housing 3.

A liner 23 having a cylindrical portion 24 and a conical end wall 25 is removably located within the casing or housing 3 and is of such form and size as to act as a lining for that portion of the casing not occupied by the spiral conveyor or elevator 17, as indicated in Figs. 1, 2 and 3. The outer edge of the cylindrical portion 24 is substantially flush with the outer face of the spiral conveyor and the flange 5. This cylindrical portion 24 of the liner is provided with an aperture 26 of substantial size and adapted to be alined with a similar aperture 27 in the cylindrical portion 4 of the casing or housing 3. When the liner is in operative position in the casing, with the aperture 26 in alinement awith the aperture 27 in the casing, an abutment 28 at one circumferential edge of the liner is adapted to be in substantial engagement with the corresponding lug or shoulder 21 on the conveyor, while the other circumferential edge of the liner, designated as 29, is adapted to abut against or engage the axially inner wall of the inlet portion 18 of the conveyor.

31 indicates a curved scoop which may be provided with a readily detachable wearing head or shovel 32 of wear-resisting material. This scoop 31 is provided at its base with a curved flange 34 of such shape as to lie snugly against the exterior of the cylindrical portion of the casing or housing about the aperture 27, when the scoop is attached in operative position, and also with a tubular extension 35 of such size as to fit snugly within the aperture 27 and the alined aperture 26 in the liner 23. The scoop is detachably secured in position, as by means of bolts or screws 36. A tie rod 41, preferably pivotally connected to the scoop 31, assists in holding the latter in operative position, this tie rod being passed through an aperture in the appropriate one of two lugs 42, 43, on the housing 3 equidistant from the aperture 27, and being adjustably held in position, as by a nut 45. Through this arrangement, it will be apparent that the scoop 31 is readily detachable and may be secured in either of two positions, with the tie rod 41 attached to the appropriate one of the lugs 42, 43, thus accommodating for rotation of the feeder in either direction.

The open front of the casing or housing 3 is partially closed by a cone-shaped plate 47, preferably of wear-resisting material and having a central aperture 48. This cone-shaped element may rest at its inner edge upon the outer edge of the liner 23 and the spiral conveyor 17, and may be held in operative position by means of a cone-shaped follower ring or collar 49 of such shape as to closely engage the exterior of the element 47 and having a flange 51 which engages the flange 5 of the housing 3, bolts or other securing means being used to hold

the flange portions together and thus secure the element 47 in position.

53 represents a feed chute discharging into the interior of the housing through the opening 48 in the element 47. When installed, the feeder may be located directly over a pit or trough 54 designed to hold material to be picked up by the scoop 31 during rotation of the feeder.

During the normal operation of the mill 12, the feeder housing 3 is caused to rotate through its connection with the hollow trunnion 10. The parts of the feeder shown in Figs. 1 and 2 are designed for left-hand or anti-clockwise rotation, that is, considered with respect to a person standing to the right of and facing the feeder of Fig. 1.

The coarse material which may be considered as comprising raw material together with new grinding bodies, is fed through the feed chute 53 and the opening 48 in the element 47 to the interior of the housing 3. Other material which may be considered as relatively fine material, such as oversize from a classifier or similar device, is deposited in the trough or pit 54, and charges thereof are intermittently picked up by the scoop 31 and are eventually delivered therefrom into the interior of the housing 3, that is, within the space between the liner 23 and the exterior of the spiral elevator or conveyor 17. It will be apparent that the material fed from the chute 53 is also carried into the same space and commingled with the material picked up by the scoop 31. As the feeder rotates, this commingled material passes into the inlet 18 of the spiral conveyor 17 and is elevated thereby as the feeder rotates and approaches its uppermost position, the material gradually falling and being discharged through the discharge opening 19 into the liner 14 of the hollow trunnion 10. The material thus admitted to the liner 14 of the trunnion 10 is automatically conveyed by means of the helical ribs 15 on the liner and delivered to the body of the mill 12.

It will be apparent that the material received at the different points may be of either like or different natures. If all the material which it is desired to feed is at the level of the trough 54, the scoop 31 alone may then be utilized to supply the feeder, thereby avoiding the necessity of preliminarily elevating any material to a point from which it may be fed to the feeder through the chute 53, and, likewise, successful operation may also be secured when all the material is fed through the chute 53, the material being then properly elevated and conveyed by the spiral elevator 17, and delivered to the liner 14 of the hollow trunnion 10.

The permanent part of the feeder, that is, the housing 3, may be of comparatively light construction since this part is not subjected to the abrasive action of the material handled, being amply protected therefrom by the scoop 31, the liner 23 and the spiral elevator or conveyor 17. All of these latter parts are of simple form and may be of highly wear-resisting material, and may be readily removed and replaced by new parts in case wear should make such replacement necessary. Again, with the present invention, where the question of reversibility of rotation is concerned, instead of the necessity of providing an entirely new feeder, the same housing and cone plate 47 and scoop 31 may be used independently of the direction of rotation desired. Hence, in order to provide for rotation in the direction opposite to that for which the feeder was originally installed, it is necessary only to substitute for the liner 23 and the spiral conveyor 17 shown in Figs. 1 and 2, corresponding elements of generally similar shape, but designed for opposite rotation.

It will be apparent that, in accordance with this invention, a feeder is provided which is of comparatively simple construction and maximum efficiency in so far as expense of extended operation is concerned, these results being attained in considerable part through features of design and construction whereby essentially wearing parts are readily renewable, and reversibility as to direction of rotation is secured with comparatively little reorganization of the parts of the feeder.

It should be understood that it is not desired that the invention claimed be limited to the exact details of construction shown and described, for obvious modifications thereof will occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. A rotary feeder, comprising a casing having an inlet and an outlet, a closed conduit conveyor within and removable from said casing and having an inlet adjacent a peripheral wall of said casing and an outlet communicating with the outlet of the casing, said conveyor constituting a liner for a portion of the wall of said casing, and means constituting a liner for the portion of said wall unoccupied by said conveyor.

2. A rotary feeder, comprising a casing having a substantially axial outlet and an inlet remote from the axis, a removable conveyor in the form of a closed conduit located within said casing and having an axial discharge communicating with the outlet of the casing, said conveyor being operative to convey material from a point adjacent the peripheral wall of the casing to the axial discharge thereof during rotation of the feeder, and said conveyor con-

stituting a liner for a portion of the wall of said casing, and means constituting a liner for the portion of said wall unoccupied by said conveyor.

3. A rotary feeder, comprising a casing having an inlet and a substantially axial outlet, a conveyor within and removable from said casing, said conveyor being in the form of a closed conduit having an inlet at a point remote from its axis and an axial discharge and operative to convey material from a point adjacent the wall of the casing to the axial discharge thereof during rotation of the feeder, and said conveyor having a portion of its external wall in substantial engagement with the wall of said casing, and a removable liner for the portion of the casing wall unoccupied by said conveyor.

4. A rotary feeder, comprising a casing having a peripheral inlet and an axial discharge, and a removable conveyor within said casing having an inlet and an axial discharge co-operative with the discharge of said casing, a removable liner for the portion of said casing unoccupied by said conveyor, said lining having an aperture in alinement with the inlet of said casing, and an external scoop detachably secured to said casing and having a portion entering the aperture in said liner and effective to position said liner in said casing.

5. A rotary feeder, comprising a casing having an axial discharge and an inlet remote from the axis, a removable conveyor within said casing in the form of a closed conduit having an axial discharge co-operative with the discharge of said casing and an inlet adjacent the periphery of said casing, said conveyor having a portion of its radially outer wall in substantial engagement with a portion of the casing wall, a detachable liner for the portion of the casing wall unoccupied by said conveyor, said liner having a peripheral opening in substantial alinement with the inlet of the casing, and a scoop detachably secured in operative position about the inlet of said casing and having a tubular portion extending into the alined openings of said casing and liner.

6. A rotary feeder, comprising a casing having a peripheral inlet and an axial discharge, means within said casing for conveying material to the axial discharge, a reversible scoop on said casing for feeding material to said inlet, and means for detachably securing said scoop in operative position relative to said inlet for either direction of rotation of said casing, said securing means comprising securing elements on said casing substantially equidistant from said inlet, and an element on said scoop detachably connectible to either of the securing elements on said casing.

7. In combination, a rotatable drum-shaped casing having an inlet and an axial discharge adapted to receive a right or left hand conveyor element, said conveyor element being detachably secured in operative position within said casing and having an axial discharge and an inlet remote from the axis of rotation thereof and adapted to feed material from said inlet to said outlet during rotation of the conveyor in one direction, the discharge of said conveyor being in communication with the casing discharge, and means constituting a liner for the portion of the wall of said casing unoccupied by said conveyor.

8. In combination, a rotatable drum-shaped casing having a peripheral inlet and an axial discharge, a conveyor element in the form of a closed conduit having an axial discharge and an inlet remote from the axis, said conveyor element being detachably securable in operative position within said casing with the discharge thereof in communication with the casing discharge and being interchangeable with an element adapted for similar use when said casing is rotated in an opposite direction, and a reversible scoop detachably securable to said casing about the peripheral inlet thereof and operative to feed material thereto during rotation of the casing.

9. In combination, a rotatable drum-shaped casing having an inlet and an axial discharge and adapted to receive in operative position a right or left hand interchangeable conveyor element and a right or left hand interchangeable liner, said conveyor element detachably secured in operative position within said casing and being in the form of a closed conduit having an axial discharge and an inlet remote from the axis and operative to convey material to the discharge of said casing, and said liner element removably maintained in position in said casing and effective to act as a lining for the portion of the casing unoccupied by said conveyor element.

10. In combination, a rotatable drum-shaped casing having a peripheral inlet and an axial discharge adapted to receive in operative position a right or left hand interchangeable conveyor element and a right or left hand interchangeable liner, said conveyer element detachably secured in operative position within said casing and having an axial discharge and an inlet remote from the axis with the discharge arranged in axial alignment with the casing discharge, and the conveyor being operable to convey material from a point adjacent the wall of said casing to the axial discharge thereof, said liner element detachably secured in said casing and covering substantially the entire portion of the casing unoccupied by said conveyor element, said liner element having an aper-

ture in its peripheral wall alined with the peripheral inlet in said casing when the liner is in operative position therein, and a scoop connected with said casing about said peripheral inlet and the aperture in the lining element and operative to feed material to said casing during the operation of the feeder.

11. A feeder, comprising a rotatable casing having a unitary body portion with an axial discharge and a peripheral inlet, a removable spiral conveyor disposed within the body portion of said casing and having an axial discharge communicating with the discharge of said casing and an inlet adjacent the periphery of said casing, a removable closure element detachably held in position at the axial side of said casing remote from the discharge thereof, and effective to hold said conveyor against axial displacement from operative position, and a scoop attached to the body portion of said casing about the peripheral inlet thereof.

12. A rotatable feeder, comprising a casing having a peripheral inlet and an axial discharge, a removable conveyor within said casing having an axial discharge cooperative with the discharge of said casing, and a removable liner for the portion of said casing unoccupied by said conveyor, said liner having an aperture in alinement with the peripheral inlet of said casing.

13. A rotatable feeder, comprising a casing having an inlet and an axially disposed and reduced, tubular discharge, and a removable spiral conveyor within said casing having an inlet remote from its axis and an axially disposed tubular discharge telescopically fitting within the tubular discharge of said casing and constituting a lining therefore.

14. A rotatable feeder, comprising a casing having an inlet and an axially disposed, tubular discharge, a removable conveyor within said casing having an inlet remote from its axis and an axially disposed tubular discharge fitting within the discharge of said casing and constituting a lining therefor, and a removable element partially closing the side of said casing remote from the discharge thereof and adapted to hold said conveyor in position with its tubular discharge in operative position.

15. A rotatable feeder, comprising a casing having an inlet and an axially disposed discharge, a removable conveyor in the form of a closed conduit within said casing formed to prevent contact between material conveyed and the inner walls of said casing and having an inlet remote from its axis and an axially disposed discharge leading into the discharge of said casing, a removable liner for the portion of said casing unoccupied by said conveyor, and a removable element partially closing the side of said casing remote from the discharge thereof and adapted to hold said conveyor and said liner in operative position within said casing.

16. In a rotary feeder, a rotatable drum-shaped casing having an axial discharge, a cone-shaped cover element adapted to be secured to said casing at one axial side thereof, a scoop-like conveyor having a tubular hub portion communicating with the discharge of said casing and held in operative position in said casing with its axis in substantial alinement with the axis of said casing, said cone-shaped cover cooperating with said conveyer to maintain the latter against withdrawal from operative position in said casing.

17. The combination with a drum-shaped feeder comprising a drum-shaped feeder head and a cone cover adapted to be secured together, of a scoop having its hub secured at the hub or center of the feeder head, said cone cover cooperating with said scoop to maintain the latter against withdrawal from operative position relative to said casing.

18. In a rotary feeder, the combination with a drum-shaped casing comprising a drum-shaped feeder head and a cone cover detachably connected to said feeder head, the feeder head having a peripheral opening, of scoop means having internal and external portions, the external scoop portion being in substantially radial alinement with said internal scoop portion and communicating with said peripheral opening, and the discharge from the internal scoop portion being provided with a hub secured to the hub of the feeder head.

19. A rotary feeder, comprising a casing having a peripheral inlet and an axial discharge, means for conveying material from a point outside of said casing through said conveying means to the discharge of said casing, a removable liner for the portion of said casing unoccupied by said conveying means, said liner being apertured in alinement with the peripheral inlet of said casing, said conveying means comprising an external scoop detachably secured to said casing about the peripheral aperture therein, and having a portion co-operative with the wall of the peripheral aperture in said liner.

20. In a rotary feeder, the combination with a drum-shaped casing comprising a drum-shaped feeder head, the feeder head having a peripheral inlet and an axial discharge, of scoop means having internal and external portions removably associated with said feeder head and adapted to receive and pass material through the inlet in said feeder and to the axial discharge thereof, and a removable liner for the portion of the wall of said feeder head unoccupied by said scoop means.

In testimony whereof, the signature of the inventor is affixed hereto.

HENRY C. HOLTHOFF.