Dec. 27, 1938. S. F. OSSING 2,141,664

GRINDER

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Fig. 1

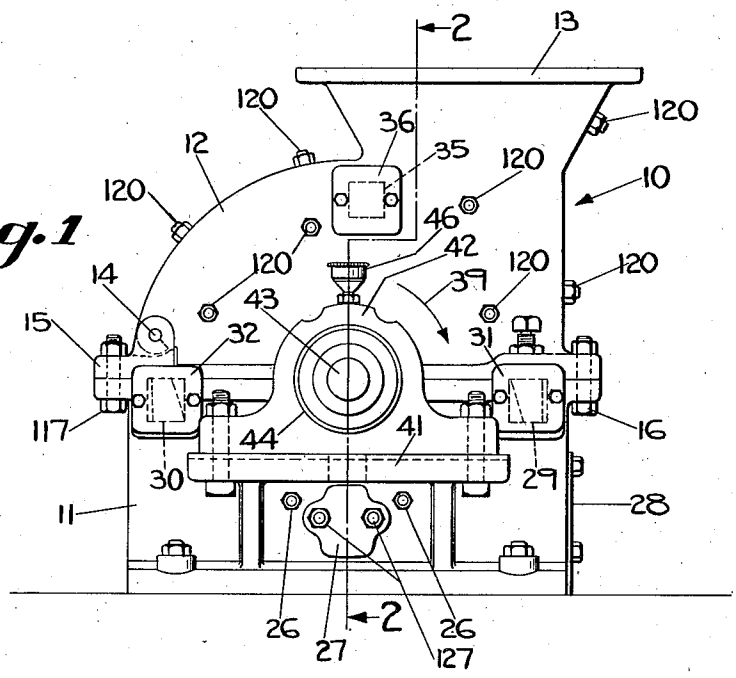
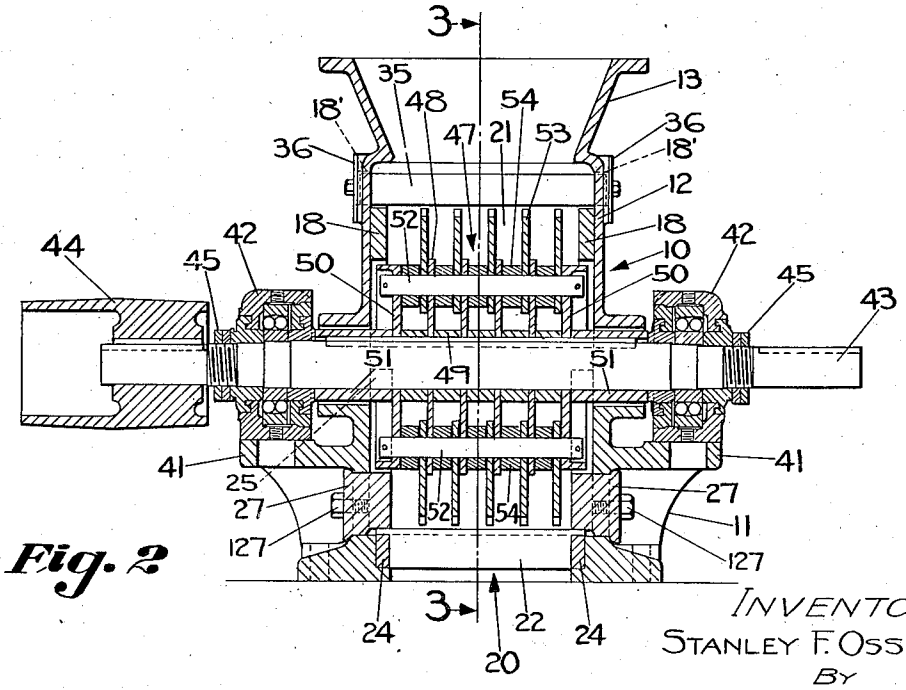


Fig. 2



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Fig. 3

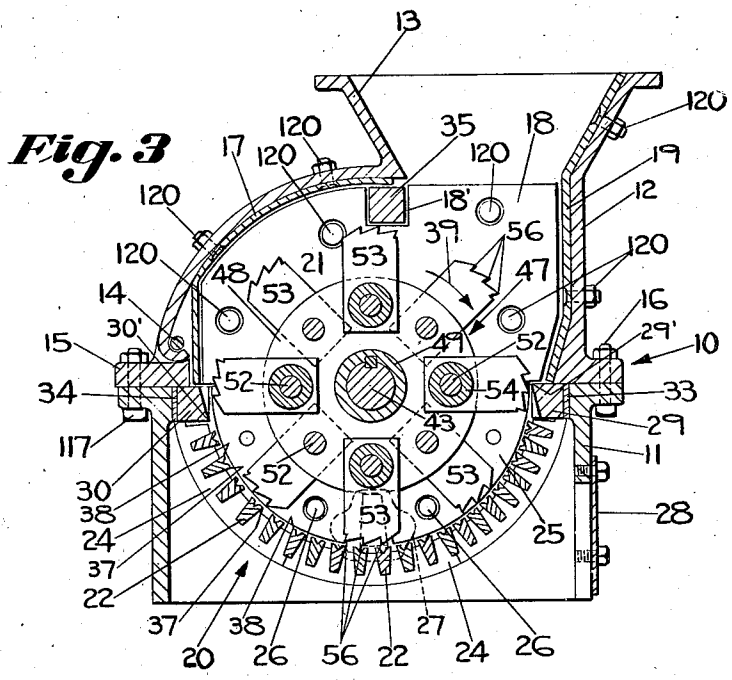


Fig. 4

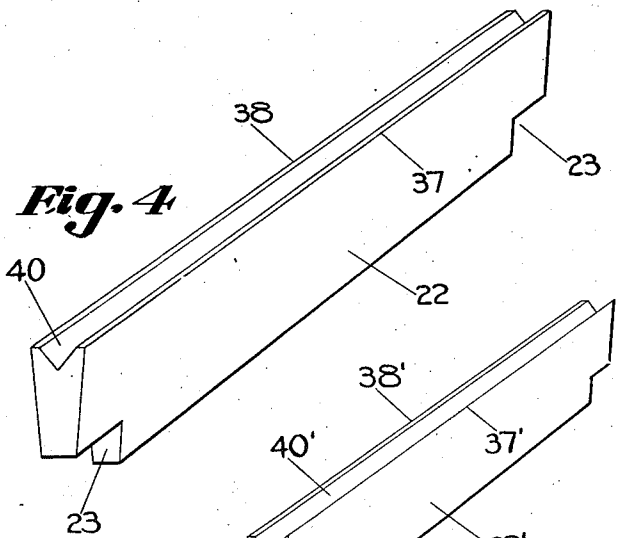
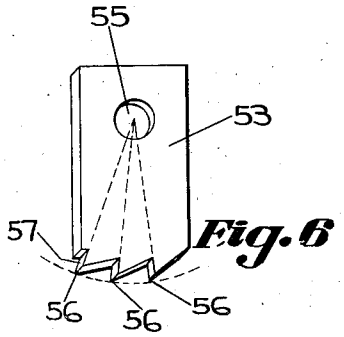


Fig. 5

Fig. 6



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UNITED STATES PATENT OFFICE

2,141,664

GRINDER

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Application December 28, 1936, Serial No. 117,845

1 Claim. (Cl. 83—11)

This invention relates to a grinder or shredder, and particularly to such a device which is adapted to grind sewage and to reduce particularly the fibrous material into short fibers.

An object of the invention is to provide a grinder of the above class which will very effectively reduce sewage and particularly fibrous material so the fibrous material will be readily washed from the grinder and will readily pass through sewage disposal apparatus, particularly the pumps of said apparatus.

Another object of the invention is to provide an improved form of swing hammer in a grinder of the above class.

Still another object of the invention is to provide an improved grating which will act to allow reduced material to pass from the grinding chamber in a progressive manner.

A further object is to provide a grinder mechanism to reduce fibrous materials in a green garbage mixture to a pulp so finely divided that the pulped garbage is rendered suitable for discharge into a sewage treatment plant.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a side elevational view of the grinder comprising my invention;

Fig. 2 is a transverse elevational sectional view taken on the line 2—2 of Fig. 1 looking in the direction of the arrows;

Fig. 3 is a sectional elevational view taken on the line 3—3 of Fig. 2 looking in the direction of the arrows;

Fig. 4 is a perspective view of one of the grating bars employed in my improved grinder;

Fig. 5 is a modified form of grating bar; and

Fig. 6 is an enlarged perspective view of a swing hammer comprising my invention.

In the development of sewage disposal apparatus, as well as the development of garbage disposal apparatus, the practice has been introduced of grinding sewage screenings and of grinding garbage and introducing it into the sewage stream to be treated by sewage disposal apparatus. It has been found that there is an appreciable amount of fibrous material in sewage screenings. A certain amount of fibrous material has also been encountered in garbage. The reduction of the sewage screenings and/or garbage, particularly due to the presence of the fibrous material, which may be in the forms of rags or cloth, has presented a serious problem because said fibrous material tends to clog the grinder and if it is passed through the grinder it tends to clog the mechanism of the sewage disposal apparatus, particularly the pumps.

The grinder herein disclosed is designed particularly to reduce sewage screenings or garbage, or both, and more particularly to reduce the fibrous material to relatively short threads whereby it will not clog the grinder but will pass readily through the grating thereof and will not clog any subsequent apparatus of the sewage disposal system.

As seen in Figs. 1, 2 and 3 of the drawings, said grinder comprises a casing 10 formed by a bottom casting 11 and a top member 12. The top member 12 is provided with an integral hopper 13 and is pivotally attached to the casting 11 at its rear end by a hinge 14 and a bracket 15. At its forward end the top member 12 is bolted to the casting 11 by bolts, one of which is seen at 16. It may also be mentioned that the bracket 15 is attached to the casting 11 by bolts, one of which is seen at 117. This hinged connection of the top member 12 provides for its swinging thereby providing access to the interior of the casing 10.

The top member 12 is provided with a plurality of removable and renewable liners comprising rear liner 17, flat side liners 18, 18, and front liner 19. Said liners 17, 18 and 19 are removably attached by appropriate nuts and bolts seen at 120. Liners 18, 18 terminate at the bottom of top member 12.

Co-operating with the liners 17, 18 and 19 of the top member 12 is a grating 20 carried by the bottom casting 11, to provide a reducing chamber 21.

As will be hereinafter explained in full detail, the grating 20 has the double function of providing a screen for properly reduced material and of cooperating with the rotor to reduce the material to a desirable fine state.

The grating 20 is formed by a plurality of transversely extending grating bars 22, the notched ends 23 of which are supported by a pair of arcuate supporting bars 24, 24, best seen in Fig. 2, which bars 24, 24 rest upon arcuate flanges in the casting 11 and are provided with tapering notches to receive the tapering side walls of the grating bars 22. Each of the supporting bars 24, 24 is preferably formed in a plurality of segments, as best seen in Fig. 3 of the drawings, to facilitate its removal.

To hold the grating bars 22 in place and also to provide a wearing liner for the lower portion of the reducing chamber 21, I provide on each side of the casting 11 a renewable and removable liner 25 which is attached to said casting 11 by

appropriate nuts and bolts 26. The outer periphery of said liner 25 rests upon the tops of the transversely extending grating bars 22 thereby holding them in their proper places.

To provide access to the lower portion of the reducing chamber 21 above the grating 20 I provide removable plugs 27, removably held in place by screws 127, the bottoms of which plugs rest upon a few of the bars 22 adjacent the bottom of the grating 20 at which the liner 25 is severed. At this position it will be evident that the grating bars 22 will be held down by the plugs 27 rather than by said liner 25.

To provide access to the lower surface of the grating 20 I provide a removable door 28 adjacent the front of said casting 11, as shown in Fig. 3.

To hold the supporting bars 24, 24 rigidly in place I provide at each end thereof a transversely extending bar, the bar at the front end being designated 29 and the bar at the rear end being designated 30. As clearly seen in Fig. 1 of the drawings, the bars 29 and 30 may be slid through one side of the casing 10 and covered by removable cover plates 31 and 32, respectively. Said bars 29 and 30 are, in turn, held down by the top member 12 and the bracket 15 which rest on the tops of them. Furthermore, the top member 12 and bracket 15 have inward projections forming overhanging abutments under which the bars 29, 30 extend. Appropriate spacers 33 and 34 are preferably provided behind the bars 29 and 30.

It is also to be noted that said bars 20 and 30 have a corner forming an acute angle which provides a cutting edge to cooperate with the rotor structure to aid the reduction of the material, as hereinafter described in more detail.

Extending transversely across the top of the reduction chamber 21 and carried by the top member 12 is a square bar 35 held in place by the square notches 18' in the side plates of member 12 and kept from moving endwise by removable cover plates 36, 36. This bar 35 cooperates with the rotor to prevent material from being thown out of reduction chamber 21 and also cooperates therewith to aid in the reduction of any material which reaches said bar 35 without being properly reduced. The elongated straight cutting edges 29' and 30' serve to assist in reduction and keep the smaller particles in the lower chamber 21.

Attention is now directed particularly to Figs. 3 and 4 and to the construction of the grating bars 22. Each of said grating bars 22 is preferably wedge-shaped, thereby to provide the minimum of clearance adjacent their top edges 37 and 38, (Fig. 4), to the end that any material which passes beyond said top edges will be free to pass entirely through said grating without clogging. The top edges 37 and 38 of each of the bars 22 provides a cutting edge.

As is clearly illustrated in Fig. 3 of the drawings, the spacing between the top edge 38 of each of the parallel grating bars 22 and the top edge 38 of the next adjacent grating bar 22, is progressively increased in the direction of rotation of the rotor designated by the arrow 39. This is provided to the end that there will be a progressive grading of the material which may pass through said grating 20.

In order to increase the cutting edges of each of the grating bars 22 said bars are provided with a top groove 40 which is preferably V-shaped and has its edges spaced from the edges 37 and 38. In a modified form of grating bar 22', seen in Fig. 5, a groove 40' provides a leading or receiving knife shearing and shredding edge 37' and a trailing or ejecting flat shearing and crushing edge 38'. In practice the grating 20 may be formed of bars 22 or 22' or a combination of said bars, but in any arrangement the teeth 56 have shearing edges which cooperate with the shearing edges 37, 38 or 37', 38', to shred the material.

Mounted upon a pair of end brackets 41, 41 formed integral with the casting 11 is a pair of anti-friction bearing boxes 42, 42 which support a transversely extending shaft 43 provided with a drive pulley 44. The shaft 43 will be held against axial movement by lock nuts 45, 45 which cooperate with the bearing boxes 42, 42. A grease cup 46 is also preferably provided for each of the anti-friction bearings carried by the boxes 42, 42.

Mounted upon the shaft 43 for rotation within the reducing chamber 21 is a rotor 47 which cooperates with the grating 20 and with the bars 29, 30 and 35 to effect a thorough reduction of material, particularly sewage screenings or garbage containing fibrous material. This reduction is effected principally by a high attrition action as it has been found in practice that it is very difficult to reduce fibrous material by a hammer action or by a cutting action alone. That is, while cutting takes place at the leading shearing edge 37 or 37', the material is moved by centrifugal force into the groove 40 or 40'.

Said rotor 47 is formed by a plurality of discs 48 which are keyed to the shaft 43 and spaced apart by keyed spacer rings 49. The rotor 47 also includes flanged end discs 50, 50, one adjacent each end, which are also keyed to the shaft 43, and which are held in intimate contact with an adjacent spacer ring 49 by end spacer rings 51, 51, the outer ends of which abut against appropriate bearings carried by bearing boxes 42, 42.

Extending transversely between the end discs 50, 50 and held in place by appropriate cotter pins is a plurality of pivot rods 52. Upon said pivot rods 52 are pivoted swing hammers 53. Said swing hammers 53 are held in their proper positions by spacer rings 54, one side of which abuts a disc 48 or 50, and the other side of which abuts a swing hammer 53.

As seen in Fig. 3 of the drawings, there are eight of said pivot rods 52. Alternate circumferential hammers 53 are spaced upon opposite sides of a disc 48. This, of course, provides for said alternate hammers 53 to rotate in different planes thereby insuring a complete absence of voids or dead spots in the reducing chamber 21. The hammers 53 will, of course, be free to swing about the axes of the rods 52 upon which they are pivoted and during rotation of the rotor 47, will cooperate with the grating 20 and the bars 29, 30 and 35 to effect a thorough reduction of the material. The construction of each of the hammers is best seen by reference to Fig. 6 of the drawings. Each of said hammers is provided with a hole 55 to pivot the hammer about a rod 52. The lower edge of the hammer 53 is provided with a plurality of teeth 56.

It is to be particularly noted that the leading face 57 of each of the teeth 56 lies in a plane which passes through the axis of the hole 55. In other words, the face 57 lies in a radial plane with respect to the axis of hole 55. In addition, the tip of each tooth 56 is the same distance from the axis of hole 55. As a consequence, in the swinging of any hammer 53 about a rod 52, the distance of any of the teeth 56 from the opposed grating bar 22 will not be less than a predetermined desired minimum. In practice

it is preferred that this minimum clearance between a tooth 56 and the grating bars 22 be approximately one-eighth to three-sixteenths of an inch.

In the operation of the device comprising my invention, material to be reduced, such as sewage screening or garbage is fed into the reduction chamber 21 by way of the hopper 13. The rotor 47 will be rotated in the direction of the arrow 39. The swing hammers 53, particularly by virtue of the plurality of the teeth 56, will cooperate with the grid bars 22 and with the bars 29, 30 and 35 to effect a thorough reduction of the material. The combination of the hammers 53 with the plurality of teeth 56 and the particular grid bars 22, which have not only the cutting edges 37, 38, but also the grooves 40 which provide additional cutting edges, is particularly efficient to reduce fibrous material, principally by an attrition action, into relatively short strands or strings.

Due to the particular spacing of the grid bars 22 which increases progressively from one end to the other in the direction of rotation of the rotor 47 as indicated by the arrow 39, there is a selective or grading action in the discharge of the reduced material through said grating 20, the finer particles being more readily discharged adjacent the forward portion of the grinding area and the larger particles being discharged adjacent the rear portion thereof.

It will be evident that the material will be retained in the reducing chamber 21 until it is sufficiently reduced to pass through the grating 20. It may also be noted that should any material tend to lodge in the upper part of the reducing chamber 21, the hammer 53 in cooperation with the bar 35, will be effective to reduce it.

It is thus evident that a grinder has been provided which is particularly adapted to reduce sewage screenings or garbage and is effective to reduce the fibrous material thereof into relatively short fibers which will readily clear the grinder and not choke or clog it, and which can be readily handled by apparatus of sewage disposal plants, including particularly the pumps, without choking or clogging said pumps.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

In a grinder, the combination with a split casing formed by complementary top and bottom sections, of a rotor in said casing, a grating forming the bottom of a reducing chamber and comprising axially extending bars which are spaced apart progressively increasing amounts, removable bars carried by said bottom section and resting on opposite ends of said grating to hold it in place, means on said top section having bearing contact with said bars, and means for removably clamping said top and bottom sections together, thereby clamping said bars in grid holding position.

STANLEY F. OSSING.