Feb. 25, 1958 H. B. VAN HOOK 2,824,703

DISPOSAL APPARATUS

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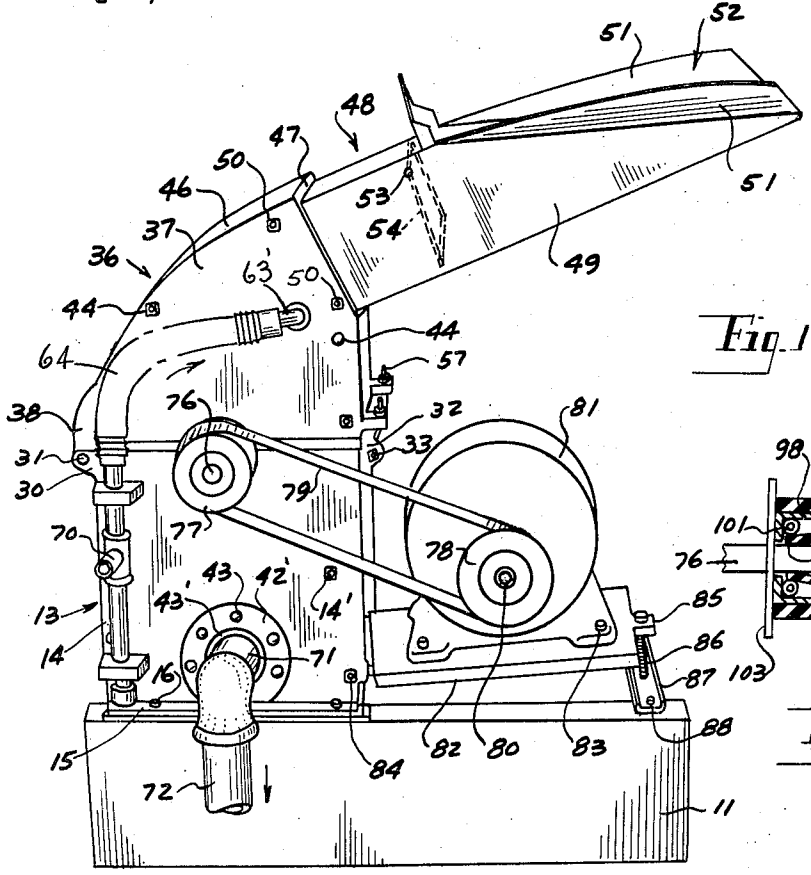


Fig. 1

Fig. 11

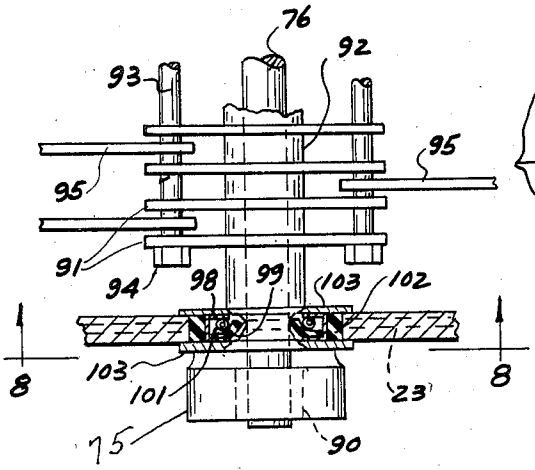


Fig. 7

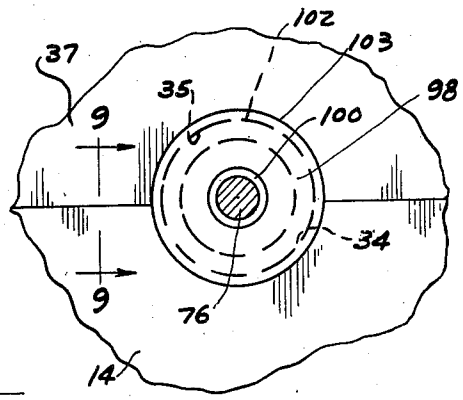


Fig. 8

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DISPOSAL APPARATUS

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Fig 2

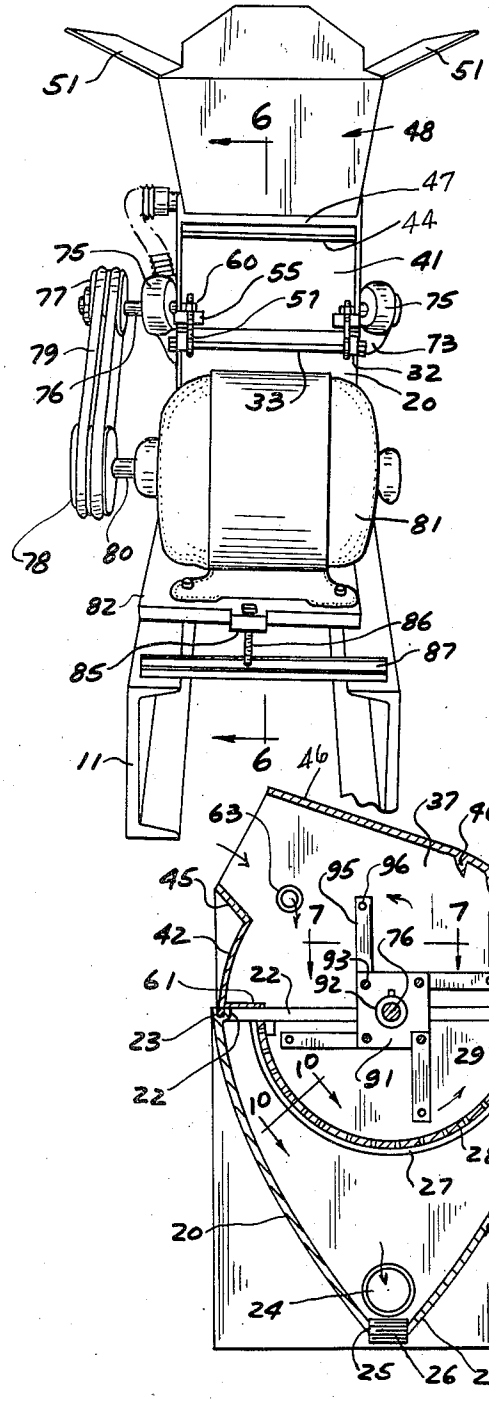


Fig 3

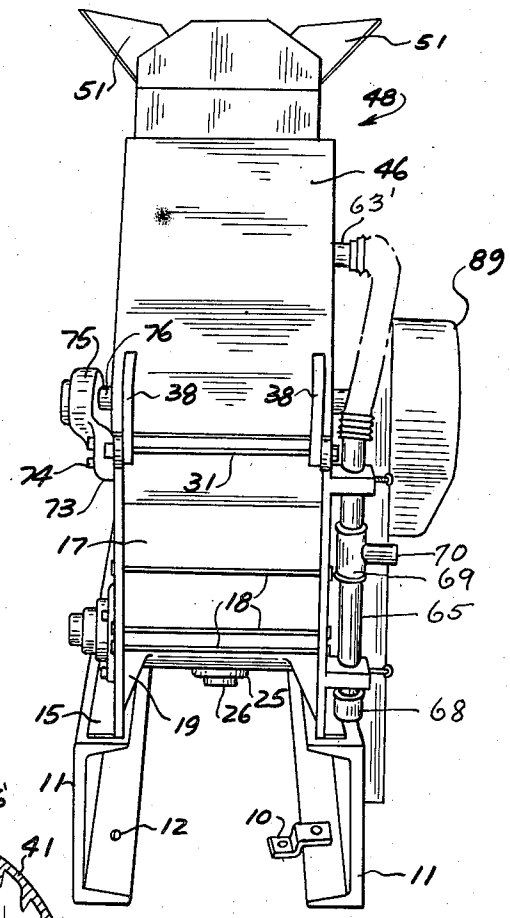


Fig 6

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DISPOSAL APPARATUS

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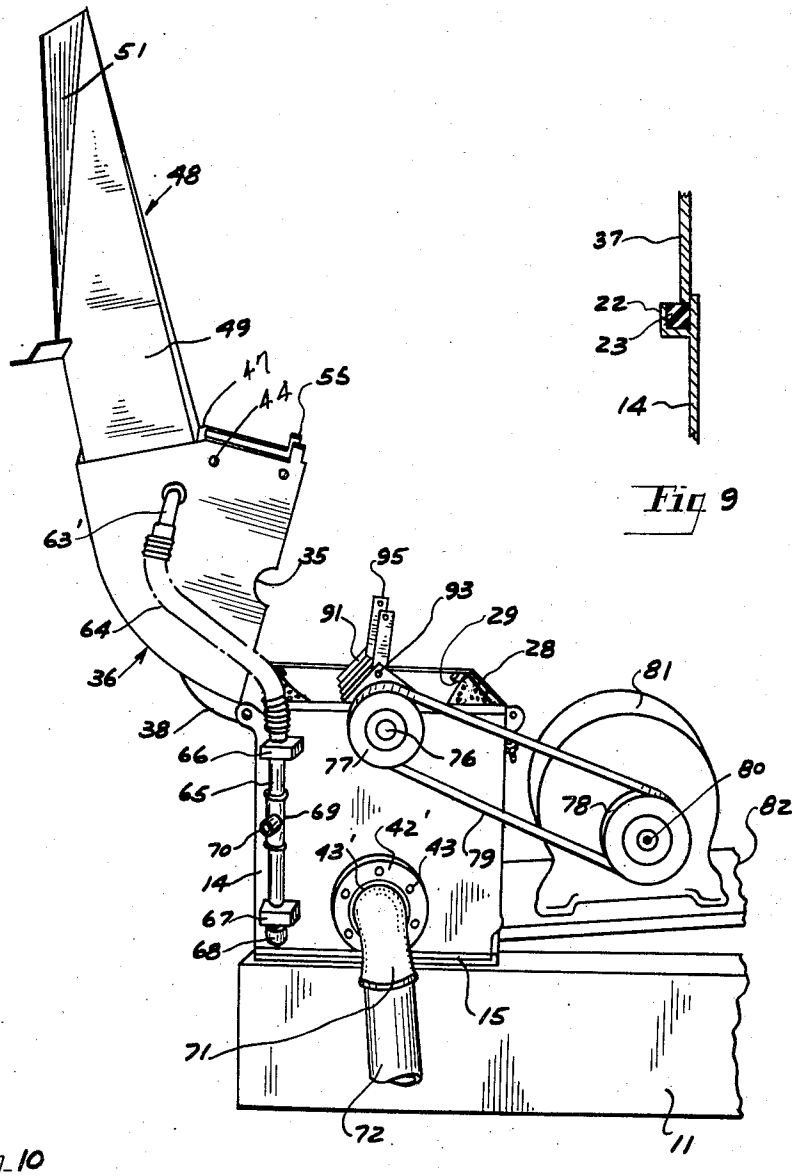
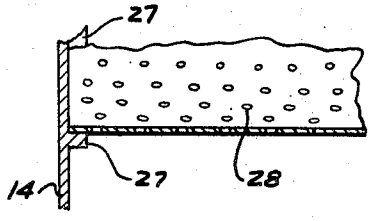


Fig 4

Fig 9

Fig 10



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DISPOSAL APPARATUS

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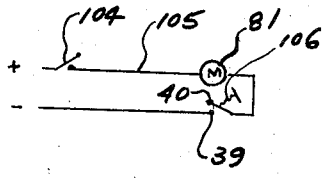


Fig. 12

Fig. 5

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United States Patent Office 2,824,703 Patented Feb. 25, 1958

2,824,703

DISPOSAL APPARATUS

Harry B. Van Hook, Detroit, Mich.

Application August 8, 1955, Serial No. 527,027

5 Claims. (Cl. 241—46)

This invention relates to a refuse disposal apparatus and more particularly a device for pulverizing, grinding or shredding waste matter.

It is the object of the present invention to provide a novel form of refuse disposal apparatus which incorporates a power driven hammer-mill in conjunction with and upon the interior of a sealed chamber and arranged in spaced relation to a screen mounted within an enclosed housing, together with means for delivering water through the said housing and for carrying the ground and shredded material outwardly through a suitable drain.

It is the object of the present invention to provide in a refuse disposal apparatus a novel housing construction and a hinged removable cover therefor, together with means for securing the cover when closed, and wherein the hinge and the securing means are interchangeable to permit the securing of the cover in one of two 180 degree related positions.

It is the further object of the present invention to provide a novel form of grinding chamber, together with a series of variously spaced drain outlets in the bottom thereof, with all but one of said outlets closed by a suitable plug whereby upon proper location of the apparatus the most convenient drain may be utilized.

It is the further object of the present invention to provide a novel screen assembly and support therefor within the grinding chamber in spaced relation to the hammer-mill which is adapted to extend around substantially 180 degrees of the bottom portion of the hammer-mill.

It is the further object of the present invention to provide a novel screen support within the body of the apparatus and which will facilitate easy removal thereof for cleaning or replacement.

It is the further object of the present invention to provide a safety switch upon the body of the apparatus cooperable with the cover when closed to assure that the motor drive for the hammer-mill will be de-activated until the said cover is closed.

It is the further object of the present invention to provide a convenient water connection upon the body of the disposal apparatus, together with a flexible conduit for delivering the water supply to the hinged cover and which remains connected there-with upon hinged opening of the said cover.

It is the further object of the present invention to form a webbing construction across the open end portion of the cover which, when closed, retainingly engages the free ends of the screen against displacement.

It is the further object of the present invention to provide a novel and sharpened corrugated construction upon a portion of the interior surface of the cover for cooperation with the hammer-mill for more fully grinding the material within the grinding chamber.

It is the further object of the present invention to provide a slotted peripheral boss upon the body of the disposal apparatus adapted to receive a suitable sealing element for cooperative registry with the lower open end of the cover when closed.

It is the still further object of the present invention to provide a novel bearing support construction for the hammer-mill shaft, together with a suitable sealing means nested within opposed arcuate slots formed in the registering side walls of the body and cover, the said sealing means being adapted to sealingly engage the hammer-mill shaft upon its interior and upon its exterior engage adjacent portions of the walls of the body and cover for hermetically sealing the interior of the grinding chamber.

These and other objects will be seen from the following specification and claims in conjunction with the appended drawings in which:

Fig. 1 is a perspective front view of the present disposal apparatus.

Fig. 2 is a perspective right side elevational view thereof.

Fig. 3 is a perspective left side elevational view thereof.

Fig. 4 is a perspective fragmentary front elevational view corresponding to Fig. 1 showing the cover in open position.

Fig. 5 is another perspective view on a slightly enlarged scale and fragmentarily shown illustrating the interior construction of the hammer-mill and the screen mounting.

Fig. 6 is a section taken on line **6—6** of Fig. 2.

Fig. 7 is a fragmentary section on enlarged scale taken on line **7—7** of Fig. 6.

Fig. 8 is a fragmentary section taken on line **8—8** of Fig. 7.

Fig. 9 is a section taken on line **9—9** of Fig. 8.

Fig. 10 is a fragmentary section taken on line **10—10** of Fig. 6.

Fig. 11 is an elevational section on an enlarged scale illustrating the shaft and body seal shown in Fig. 7; and

Fig. 12 is a diagrammatic wiring diagram.

It will be understood that the above drawings illustrate merely a preferred embodiment of the invention, and that other embodiments are contemplated within the scope of the claims hereafter set forth.

Referring to the drawings, in one preferred embodiment of the invention there is provided a stationary support for the present disposal apparatus which consists of a pair of upright longitudinally extending beams **11**, whose bottom flanges are suitably apertured as at **12** to permit securing thereto of a series of spaced hold-down brackets **10**, if desired, one of which is shown in Fig. 3 for illustration.

Disposal apparatus body

The present apparatus includes a body which consists of a pair of upright parallel spaced side walls **14** of substantially rectangular shape which terminate at their lower longitudinal edges in the right angularly related outturned mounting flanges **15** adapted for positioning upon the horizontally disposed top flanges of the beams **11**, as shown in Figs. 1 and 3, and adapted for securing thereon as by the fasteners **16**, Fig. 1.

The said body also includes the intermediate front and rear walls **17** and **20** which are arranged in opposed relation and which are downwardly and inwardly converging towards their lower ends as shown in Fig. 6, and are joined together forming the bottom wall **21** which is provided with a central threaded outlet aperture **25** into which is removably secured plug **26**.

As shown in Fig. 3, the rear wall **17** is suitably secured as by welding along its opposed upright longitudinal edges to interior wall portions of the side walls **14** as at points **9** for illustration, Fig. 6. Additionally, an assembled relation is further maintained between walls **14** and the rear wall **17** as by a plurality of transverse rods **18**, Fig. 3, which extend between and interconnect the opposing side walls **14**. Rear wall **17** at its lower end also includes the reinforcing webbing **19** which is suitably joined to the interior of side walls **14** as by welding. Upon the outer side of the arcuate front wall **20** there are also provided one or more reinforcing cross bars or rods **14'**, as designated in Fig. 1.

The body of the present apparatus and which includes the curved front and rear wall portions **17** and **20**, as

well as the spaced upright side walls **14**, terminate in the horizontally disposed upper open end which includes the peripheral continuous boss **22** which has formed in its top surface a continuous groove adapted to supportably receive the preferably rubber sealing element **23** and which upon closure of the cover **36** generally designated in Fig. 1, is adapted for cooperatively sealing engagement with the open end thereof, as indicated in Fig. 6, to thereby define with the said body and the cover an interior grinding and shredding and pulverizing chamber, hereafter described.

Adjacent the lower end of each of the side walls **14** and upon the interior of the body there are formed a pair of transverse outlet apertures **24**, one of which is shown in Fig. 6. Upon the outside of wall **14** adjacent aperture **24** there is provided the flanged plate **42'**, Fig. 4, secured to side wall **14** as by the studs or rivets **43** and which plate has an annular central internally threaded portion **43'** adapted to threadedly receive a suitable drain pipe fitting, such as element **71** shown in Fig. 5 adapted for connection to a suitable sewer drain as by the drain pipe **72**, Figs. 1 and 4.

While there has been described three drain outlets at the bottom of the body, it is contemplated that plugs will be threaded into at least two of said outlets. Accordingly, any of the three outlets may be used, depending upon the particular environment or working conditions confronted in the installation of the disposal apparatus.

Semi-circular or U-shaped ledges or shoulders **27** are formed upon the interior surface of each of the upright side walls **14** spaced inwardly of front and rear walls **17** and **20** which are adapted to supportably receive the outer arcuate edges of the unitary screen **28**.

Spaced bosses **29** are mounted upon interior portions of walls **14** at their upper ends spaced inwardly of shoulders **27** and cooperable with said shoulders for receiving therebetween the upper free end portions of screen **28**.

Accordingly, upon opening of the cover **36** to the position shown in Fig. 5, the screen **28** is free to be manually withdrawn from either side of the body.

Extending rearwardly from upper portions of the side walls **14** at their upper ends and adjacent the open end of the said body are a pair of bosses **30** which are transversely apertured to receive therethrough the shaft **31** which provides a horizontal hinge support for the spaced depending apertured bosses **38** which extend downwardly from a corresponding rear end portion of cover **36**.

Projected from the opposite sides of the side walls **14** at their upper ends are a pair of parallel spaced bosses **32** which are transversely apertured to receive therebetween the bolt or shaft **33**.

As shown in Fig. 8, in the upper surfaces of side walls **14** and centrally thereof there are provided a pair of semi-circular recesses **34** adapted for cooperative registry with a similar pair of semi-circular recesses **35** formed in the upright side walls **37** of cover **36**.

Cover construction

The present cover construction for the disposal apparatus herein generally indicated at **36** has a pair of upright side walls **37** in spaced relation and in vertical registry respectively with the upright side walls of the body **13**. The bosses **38** which project from the side walls **37** of the cover are transversely apertured to cooperatively receive the hinge pin **31** carried upon the body **13** of the present apparatus.

A safety limit switch **39** is mounted within a portion of the top wall of the open end of body **13** and is flush therewith and includes a spring-biased contact element **40** adapted for registry with a corresponding side wall **37** when the cover **36** is closed over the body as in Fig. 1, to thereby close the electrical circuit from a suitable power source to an electric motor **81** which drives the hammer-mill in the manner hereafter described and which, through a suitable lead wire **105** and a control switch **104**, is so interconnected to a source of electrical energy as to effect an operation of the mechanism of the hammer-mill only when the said cover is in closed position. This prevents an accidental starting of the turn-mill while someone is inspecting the body of the apparatus or has a hand down into a portion thereof, and this will prevent accidents.

The said cover **36** includes a pair of upwardly and inwardly curved opposing front and rear walls **41** and **42**, respectively, whose lower ends substantially merge with and form a continuation of the opposed front and rear walls **17** and **20**, respectively, to thereby define between said body and cover an interior pulverizing, grinding and shredding chamber to function in the manner hereafter described. Here, also, the respective opposing front and rear walls **41** and **42** are suitably interconnected at their marginal edges with their side walls **37** as at points **37'**, for example, by welding.

There is an additional reinforcing bar **44**, as shown in Fig. 5, which extends across and between side walls **37** of the cover for further reinforcing the complete assembly.

Towards its upper end the front wall **42** of the cover terminates in the outturned straight wall portion **45** which cooperates with a corresponding straight wall portion **46** at the upper end of the arcuate rear wall portion **41** of the cover to thereby define with the said side walls **37** an inlet **47** adjacent the top portion of the cover and to one side thereof, as shown in Fig. 6.

In the preferred embodiment of the invention there is shown an elongated hopper or trough **48**, one end of which is snugly projected into the inlet **47** and secured therein by a series of transverse bolts and nuts **59**. The hopper **48** includes in the preferred embodiment herein the upright side walls **49** which at their upper ends terminate in the angularly and outwardly diverging walls **51** defining a hopper inlet **52**. In this connection, the said hopper is one form of hopper construction which might be employed with the present grinding apparatus, it being understood that any suitable hopper may be employed for this purpose, such as will project the material through the opening **47** at the upper end of cover **36**.

Referring to Fig. 1, there is shown in dotted lines a rectangularly shaped gate **54** arranged within the hopper and which is transversely pivoted at its upper end as at **53** within the upper portion of the hopper to thereby provide a hinged obstruction with respect to the inlet **47** and to normally prevent the outward splashing of water during the operation of the grinding apparatus. When the material is introduced through the hopper inlet **52**, naturally the gate **54** will be swung inwardly temporarily and by gravity will return to a substantially upright position.

Upon the forward end of the cover and projecting forwardly of the front wall **42** are a pair of spaced horizontally disposed bosses **55** which are bifurcated at **56** and are adapted to cooperatively receive the shank **58** of the eye-bolts **57** which are swivelled upon the rod **33** as in Fig. 5. When the cover is closed as shown in Fig. 1, the said eye-bolts, with cooperating washers **59** and nuts **60**, are adapted to removably secure the said cover in closed position.

It is contemplated that the hinge bar **31**, as well as the locking bar **33**, may be used interchangeably with respect to the cover **36** and accordingly, the said cover may be mounted upon the body in one of two 90 degree related positions, as desired. For example, under certain conditions it may be desired that the inlet to the hopper face in one direction, rather than the other.

The said cover when in closed position is provided with a horizontally disposed lower open end adapted for registry with the correspondingly disposed open end of the body. Formed across the open end of the cover and adjacent its opposite front and rear walls there are provided a pair of transverse webbing elements or plates **61** and **62** which extend radially inward in opposed relation and are adapted as shown in Fig. 6, to partially overlie free upper ends of the screen **28** to retain the same against accidental displacement and to thus secure the screen in the position shown. This webbing furthermore prevents material from dropping into the space forwardly or rearwardly of the said screen **28** and to thereby assure that all material dropped through the inlet of the cover will be projected onto the hammer-mill and the said screen.

A suitable water inlet opening **63** is formed through the side wall **37** of the cover as indicated in Fig. 6, and is adapted to receive the pipe elbow **63'** which is suitably secured to the said wall as by threading thereinto, and which elbow has secured at its outer end one end of the flexible conduit **64**.

The opposite end of said conduit is projected over the open end of the upright pipe **65** which is mounted within the spaced laterally projecting bosses **66** and **67** secured upon one of the side walls **14** of the body. The pipe **65** at its lower end is closed by the element **68**. Water inlet pipe **70** adapted for connection to its source of water pressure is joined to the upright water pipe **65** by the intermediate conventional T fitting **69**.

Mounted upon the exterior of the side walls **37** of the said cover, as by the fasteners **74**, Fig. 3, are a pair of laterally arranged bearing supports **75** which carry suitable bearing elements **90**, through which is journaled and supported the transverse shaft **76** forming a part of the present hammer-mill construction. Said shaft extends through the registering opposed semi-circular recesses **34** and **35**, Fig. 8, formed in adjacent portions of the vertically aligned side walls **37** and **14**, respectively, of the cover and body. However, a suitable sealing means, hereafter described, in conjunction with Fig. 7 is interposed between the said shaft and the portions of the said side walls which define recesses **34** and **35** for sealingly engaging the same and for preventing moisture from coming out from the grinding chamber when in operation, as more fully described hereafter.

Upon the interior of cover wall **41** are a series of sharp corrugations or ridges adapted to cooperate with the hammer-mill construction for further breaking up the particles of material.

Power drive mechanism

Secured upon one end of shaft **76** there is provided in the preferred embodiment of the invention a double pulley **77** which is interconnected with a corresponding pulley **78** on the shaft **80** of electric motor **81** by the pulley belt **79** to thereby establish a driving relation to the shaft **76** which forms a part of the conventional hammer-mill construction shown in Fig. 5.

Motor **81** is suitably secured as by bolts **83** to the angularly adjustable plate **82** whose one end is positioned between lower portions of walls **14** and pivotally connected thereto as at **84**, Fig. 1. The opposite end of motor mounting plate **82** has a central boss **85** through which is threaded the depending bolt **86** adapted for adjustable and supporting engagement with the transverse channel **87** secured by the fasteners **88** to portions of the support beams **11**.

Accordingly, by manual adjustment of bolt **86**, it is possible to regulate the inclination of motor support **82** and accordingly, the tension within the pulley belt **79**.

As shown in Fig. 3, the protective shield **89** is positioned over the pulley belt **79** and the respective pulleys **77** and **78** and which is suitably secured to portions of the body **13**. However, this shield is omitted from the other illustrations in the drawings.

Hammer-mill construction

The present hammer-mill construction is of a conventional type and includes a series of preferably square plates **91** which are suitably keyed or otherwise secured to shaft **76**, as shown in Figs. 5 and 6, and arranged in longitudinally spaced relation upon shaft **76** with a series of spacer washers **92** interposed between the said plates.

Upon the four corners of each of the plates **91** there are projected therethrough the elongated shafts **93**, which respectively interconnect the said plates at their outer corners and also provide a mounting for the apertured inner ends of the respective elongated rectangularly shaped hammer plates **95**, suitable bolts being employed as at **94**, Fig. 7, for securing the said shafts **93** with respect to plates **91**. As shown in Figs. 6 and 7, the said hammers **95** are arranged loosely upon the said shafts **93** and at their outer ends have similar transverse apertures **96** whereby the said hammer plates may be removed and rearranged end to end as the outer portions shown in Fig. 6 become worn. This construction of a hammer-mill is conventional and no specific claim is made to the internal construction of a hammer-mill itself, except as it forms an element of the combination of structures hereinabove described for making up the complete disposal apparatus.

As shown in the drawing, the hammer plates **95** are secured at their inner ends respectively to the respective parallel spaced transverse mounting shafts **93** and thus project outwardly from the four corners of the respective mounting plates **91** and are adapted during power rotation of shaft **76** for crushing and grinding impingement upon the material which has been introduced through the cover into the grinding chamber above the screen **28**.

It has been found that upon operation of the present hammer-mill construction that the material so introduced within the cover will be broken up into finely divided particles and will be in most cases flushed through the apertures formed in screen **28** and washed downwardly into the bottom of the body **20—17** and out one of the outlets as the outlet **24** for conduction through the pipe connection **71** and **72** through a suitable trap and to a sewer or other drain.

As shown in Fig. 11, there is a special type of seal which has general utility but which in the preferred embodiment of the invention is positionable within the opposed recesses **34** and **35** in the central portions of the registering side walls of the body and cover to provide an effective seal of the interior of the grinding chamber from the exterior of the present device.

The assembly thereof is illustrated further in Figs. 7 and 8.

Seal construction

The present seal includes the annular preferably metallic body **98** having opposed inwardly directed annular flanges. Positioned within said body is a flexible yielding annular seal **99** formed of rubber or equivalent sealing material and which is retained within the said body between its flanges and which has an outer converging annular wall portion **100** which is adapted for wiping engagement with the outer surface of shaft **76**, for illustration, which is shown in dotted lines in Fig. 11, but which is also shown in assembly in Fig. 7.

A coiled spring **101**, in a conventional type of construction, is positioned within body **98** and inwardly of the rubber seal **99** normally urging the converging portion **100** thereof into contact with shaft **76**.

Mounted upon the exterior of body **98** there is also provided an annular flexible ring **102** of a rubber or equivalent construction, and this element is adapted to cooperatively engage the wall portions in the side walls **14** and **37** which define the opposed recesses **34** and **35** to thereby establish a sealing relation between the shaft,

as well as between the body of the seal and the said walls which form parts of the body and cover of the present mechanism, and to thereby assure an effective seal of the internal grinding chamber.

Mounted upon the outer ends of body **98** are a pair of discs **103**, which are of greater diameter than the rubber ring **102** and which are adapted to overlie and to operatively and retainingly engage against the respective inner and outer wall portions of the side walls **14** and **37** which define the said recesses **34** and **35**.

In the preferred embodiment of the invention the said rings **103** are suitably secured to the said body **98** as by cementing or by brazing, or may be secured in any other convenient manner for this purpose.

Thus there is provided a self contained and very effective seal, which, while having general utility, is particularly adapted for use in conjunction with the present disposal apparatus for sealing the interior of the grinding chamber from the exterior thereof.

The diagrammatic wiring illustration of Fig. 12 shows fragmentarily a coiled spring **106** for normally maintaining the switch element **40** or plunger, shown in Fig. 5, in an open condition. It is contemplated that upon closing of the cover **36** the said plunger **40** will be projected into engagement with the contact **39** forming a part of the electrical circuit **105** to thereby automatically close the circuit so that when the starting switch **104** is closed, the motor **81** will be energized for driving the hammer-mill construction.

Having described my invention, reference should now be had to the claims which follow for determining the scope thereof.

I claim:

1. A seal adapted to engage a rotative shaft extending through an apertured wall, comprising an annular metallic body having opposed inwardly directed radial annular flanges, an internal annular seal of flexible material mounted within said body adapted for peripheral sealing engagement with said shaft, an annular flexible seal mounted upon the exterior of said body for sealing engagement with the edges of the wall which bound its aperture, and a pair of spaced discs mounted upon and secured to opposite sides of said body, of greater diameter than said outer seal adapted to retainingly engage opposite sides of said apertured wall.

2. In a refuse disposal apparatus, a body having a horizontally disposed upper open end and opposed downwardly and inwardly converging front and rear walls interconnected at their lower ends forming the bottom of said body, there being an outlet in said body adjacent its bottom adapted for connection to a drain, an arcuate screen supportably nested within and below said open end spaced from said front and rear walls and extending laterally across said body, a power operated hammer-mill rotor partially within said open end journaled and supported thereon inwardly of said screen, a cover hingedly mounted upon the body with a lateral inlet and having a horizontally disposed lower open end registering with the open end of the body and secured thereon, completing with said body an enclosed pulverizing, grinding and shredding chamber, said body and cover including vertically registering side walls, there being opposed semi-circular slots formed in said registering side walls, spaced bearings centrally mounted upon the upper end of the body outwardly of said slots, said hammer-mill rotor including a driven shaft extending through said slots and bearings, a sealing ring mounted in said slots including flexible inner and outer annular sealing elements respectively engaging said shaft and the slot defining portions of said side walls, and means on opposite sides of said ring retainingly engaging opposite sides of the corresponding side walls.

3. In a refuse disposal apparatus, a body having a horizontally disposed upper open end and opposed downwardly and inwardly converging front and rear walls interconnected at their lower ends forming the bottom of said body, there being an outlet in said body adjacent its bottom adapted for connection to a drain, an arcuate screen supportably nested within and below said open end spaced from said front and rear walls and extending laterally across said body, a power operated hammer-mill rotor partially within said open end journaled and supported thereon inwardly of said screen, a cover hingedly mounted upon the body with a lateral inlet and having a horizontally disposed lower open end registering with the open end of the body and secured thereon, completing with said body an enclosed pulverizing, grinding and shredding chamber, said body and cover including vertically registering side walls, there being opposed semi-circular slots formed in said registering side walls, spaced bearings centrally mounted upon the upper end of the body outwardly of said slots, said hammer-mill rotor including a driven shaft extending through said slots and bearings, a sealing ring mounted in said slots including flexible inner and outer annular sealing elements respectively engaging said shaft and the slot defining portions of said side walls, and opposed annular discs secured upon opposite sides of said ring of greater diameter than said slots retainingly engaging opposite sides of the corresponding side walls.

4. The disposal apparatus of claim 2, a water intake pipe mounted on said body adapted for connection with a source of water under pressure, there being a water inlet formed in said cover towards its upper end, and a flexible conduit interconnecting said pipe and water inlet.

5. In a refuse disposal apparatus, a body having a horizontally disposed upper open end, opposed sidewalls and opposed downwardly and inwardly converging front and rear walls interconnected at their lower ends forming the bottom of said body, there being an outlet in said body adjacent its bottom adapted for connection to a drain, substantially semi-circular ledges in said side walls inwardly of said front and rear walls, an arcuate screen nested upon said ledges and extending laterally across said body, bosses extending inwardly from said side walls adjacent opposite upper ends of said ledges and spaced inwardly therefrom, the opposite upper free ends of said screen being retainingly positioned between said bosses and ledges, a power operated hammer-mill rotor partially within said open end journaled and supported thereon inwardly of said screen, and a cover hingedly mounted upon the body with a lateral inlet and having a horizontally disposed lower open end registering with the open end of the body and secured thereon, completing with said body an enclosed pulverizing, grinding and shredding chamber, said screen, on opening of the cover, being upwardly slidable over said ledges for removal from the body.

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