

[54] **PUMP STORAGE GRINDER**
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[52] **U.S. Cl.**.....**241/36, 241/46.02, 241/258**
[51] **Int. Cl.**.....**B02c 13/18**
[58] **Field of Search**.....**241/36, 46, 46.02, 46.06, 46.11, 241/46.17, 257 G, 257 R, 258, 259; 418/48, 417/424**

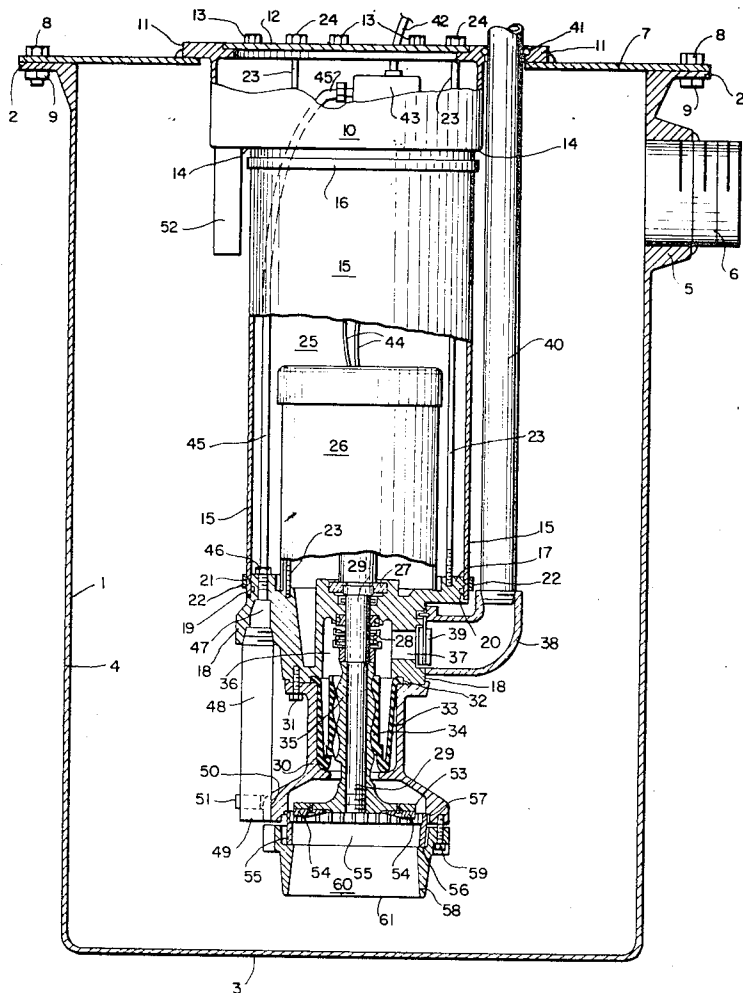
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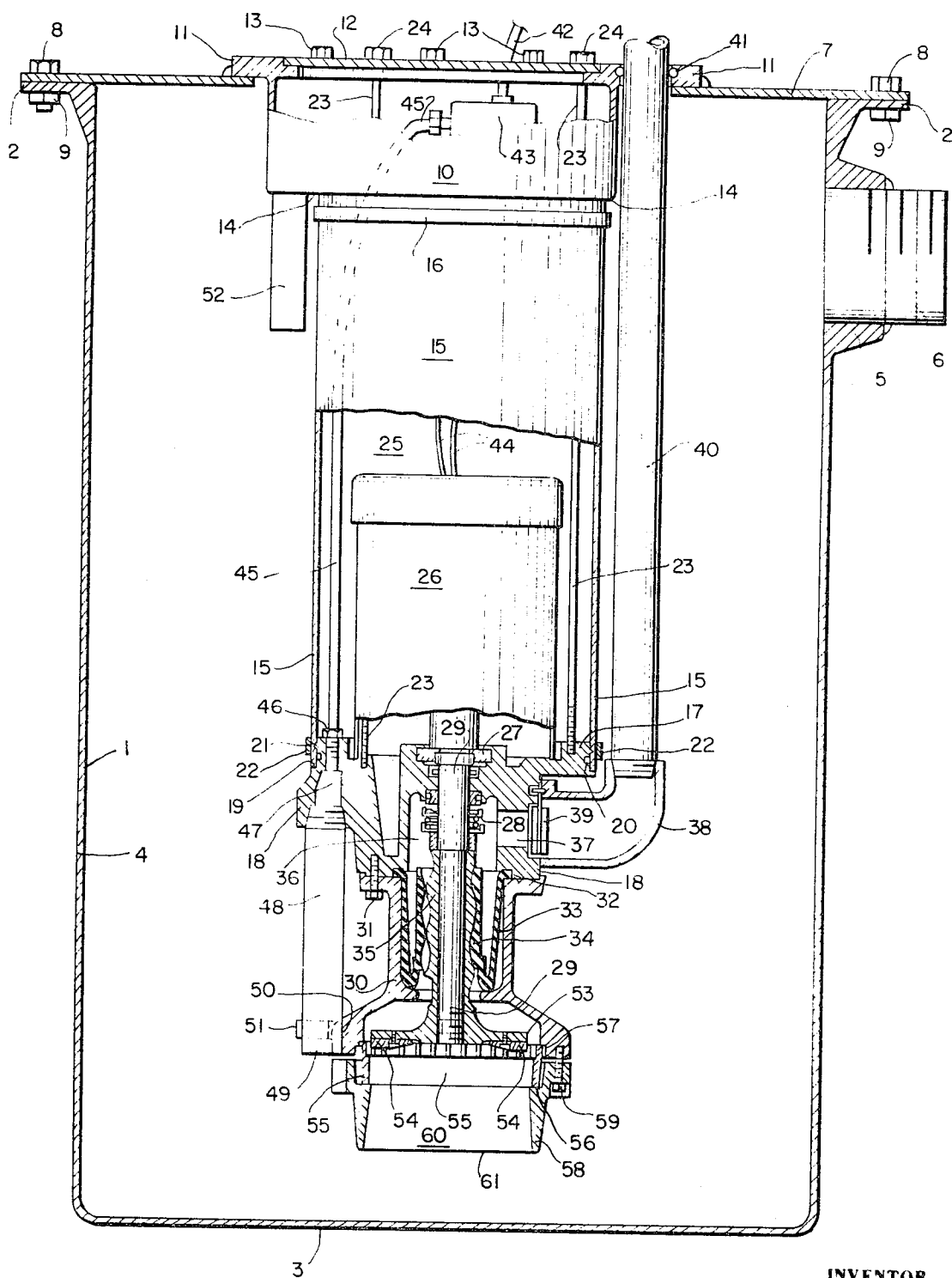
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[57] **ABSTRACT**
The pump storage grinder employs a tank having a sewage inlet and a removable top cover supporting a depending sealed housing having a motor and motor controls for driving a grinder or comminutor and pump externally of the chamber by means of a common motor shaft. The chamber is formed by a control housing integral with the cover, a tube and pump head, all held together by means of tension bolts secured between the pump head and cover. The motor shaft extends through the pump head to drive a resilient helical pump and a comminutor impeller disc with depending blades that cooperate with a comminutor ring held between a comminutor inlet shroud and a pump housing secured to the pump head. A pump discharge chamber is provided in the head with a one-way valved passage leading to a discharge conduit extending through the cover. The level responsive motor control is provided with a liquid pressure sensing tube extending through the chamber in communication with a depending pipe secured to the pump head and housing.

27 Claims, 3 Drawing Figures





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FIG. 1

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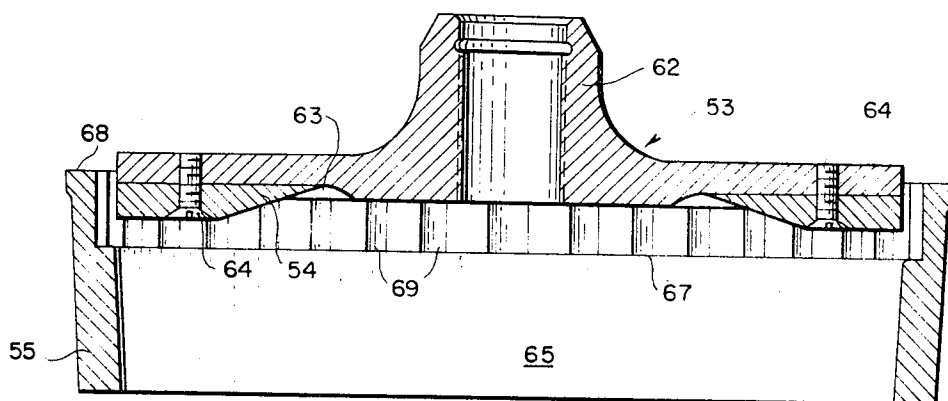


FIG. 2

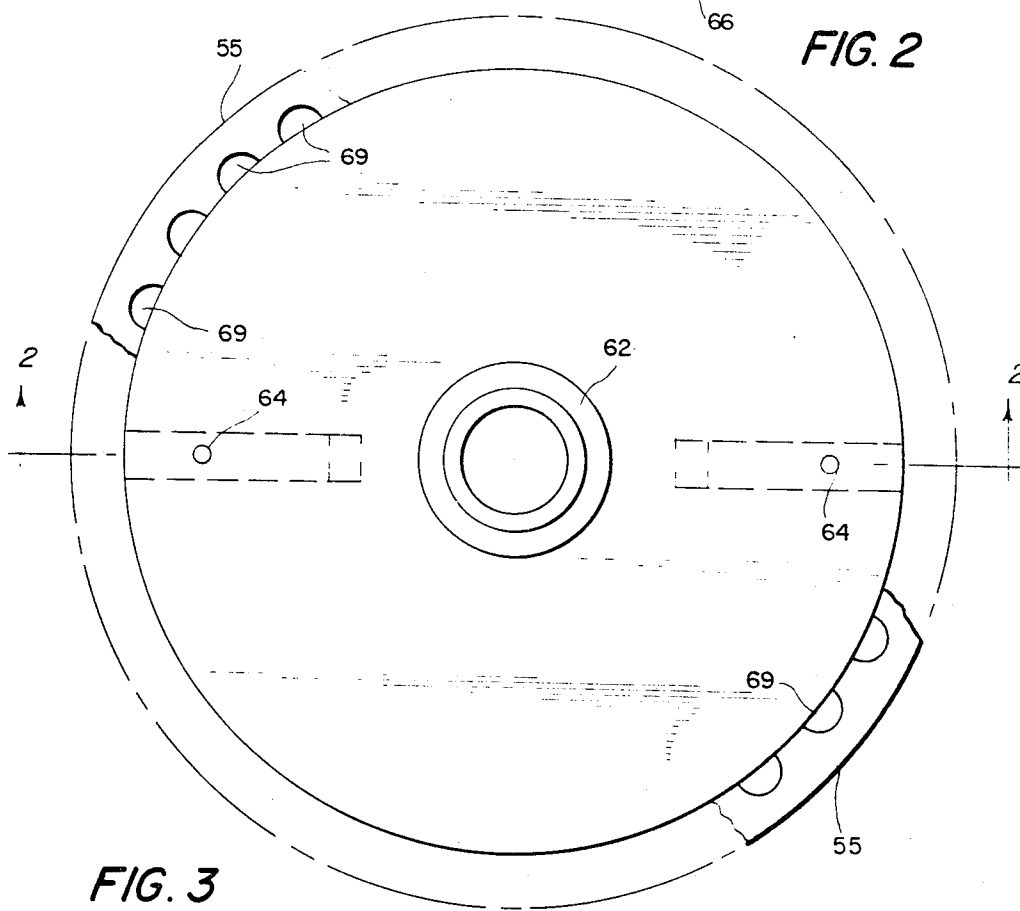


FIG. 3

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PUMP STORAGE GRINDER

BACKGROUND OF THE INVENTION

Sewage handling systems are known wherein sewage is pumped upwardly to a gravity feed pipe as in a lift station or through pressure pipes leading to a disposal site independently of ground elevation. Sewage pumps and sewage grinders are known, but there is a need for a compact sewage holding or storage device that will periodically pump sewage with a high pressure according to automatic operation, and which will be economical to mass produce and operate over long periods of time without servicing.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a pump storage grinder for pressurized sewage systems of the like, which will meet the above-mentioned needs.

According to the present invention, a sewage holding and storage tank has an inlet and a separate cover, with the cover supporting a depending sewage grinder-pump unit. A control housing is integral with the cover and together with a motor containing tube and pump head having packing and motor shaft bearings form a sealed chamber. The control housing, tube and pump head are telescopically engaged and drawn together by means of tension bolts extended between the cover and pump head. A small cover plate will provide access to the sealed chamber without requiring the removal of the main cover.

A one-piece pump housing or casing is secured directly to the pump head and contains therein a resilient helical pump driven by the motor shaft. An inlet shroud for the comminutor is directly secured to the lower end of the pump housing to clamp a comminutor ring between opposed shoulders of the pump housing and inlet shroud. An imperforate impeller disk with opposed blades is mounted on the terminal lower end of the motor shaft to cooperate with the comminutor ring.

The pump head is provided with a discharge chamber having a radial discharge passage leading to a discharge conduit extending through the cover. A one-way valve is clamped between the pump head and discharge conduit to prevent backflow of sewage into the holding tank.

Automatic operation of the pump-grinder is obtained by means of motor controls having a pressure sensing passage opening adjacent the inlet shroud to sense the liquid head at this point and thus the terminal liquid level within the holding tank.

BRIEF DESCRIPTION OF THE DRAWING

Further objects, features and advantages of the present invention will become more clear from the following detailed description of the drawing, wherein:

FIG. 1 is a cross-sectional view taken on a vertical plane extending through the central axis of a pump storage grinder employing the features of the present invention;

FIG. 2 is an enlarged cross-sectional view of the impeller and comminuting ring as they are shown in FIG. 1; and

FIG. 3 is a top plan view of FIG. 2, with line 2—2 showing where the cross-section of FIG. 2 would be taken with respect to the structure of FIG. 3.

DETAILED DESCRIPTION OF THE DRAWING

The pump storage grinder of FIG. 1 includes a single piece upwardly opening cup-shaped receptacle 1, which may be metallic, having an outwardly extending peripheral flange 2 at its open end, a bottom 3, a substantially cylindrical side wall 4, and boss 5 having an inlet pipe 6 welded or otherwise rigidly secured thereto. The inlet pipe 6 is provided with a coupling at its outer end, which may be threaded, for connection to a pressurized or gravity sewage line for discharge of sewage directly into the receptacle 1. An annular cover 7 is sealingly clamped to the flange 2, with the inter-position of an annular gasket (not shown in detail) by means of a plurality of

peripherally spaced bolts 8 extending through aligned holes in the cover 7 and flange 2, which bolts 8 have nuts 9 threaded thereon.

As an integral part of the cover 7, a one-piece motor control housing 10 is welded at its peripheral outwardly extending flange 11 to form a rigid unit. A small removable cover plate 12 is releasably secured by means of conventional fasteners 13 to the inner periphery of the annular cover 7.

The depending motor control housing 10 has a downwardly facing annular shoulder 14 in abutting engagement with a cylindrical tube 15 telescopically received on a depending cylindrical coupling portion (not shown) of the control housing 10, the details of which coupling are identical to the later described coupling for the lower end of tube 15. A tension band 16 provides sealing clamping pressure to this telescopic coupling.

The other end of the tube 15 is telescopically received on a cylindrical coupling portion 17 of a pump head 18 for abutting engagement with an upwardly facing annular shoulder 19 of the pump head 18. An O-ring seal 20 is provided between the coupling portion 17 and the adjacent internal surface of the tube 15. To further assure a sealing coupling, the coupling portion 17 is provided with a triangular cross-section ridge 21, which will bite into the adjacent internal surface of the tube 15; preferably, the tube 15 is constructed of a synthetic material, for example, a polymer. The seal caused by the ridge 21 is assured by a constricted band 22. The sealing structure 17, 19, 20, 21, 22 is a mirror image of the above-described sealing structure including elements 14, 16.

The weight of and forces transmitted to the pump head 18 are carried by a plurality of tension bolts 23 threaded or otherwise secured at their lower end to the pump head 18 and at their upper end to the flange 11 of the cover 7 by means of nut heads 24. Because of this structure, the tube 15 is needed only for sealing purposes and may therefore be of a relatively weak, light and inexpensive structure. In this manner, the cover 7, control housing 10, cover plate 12, tube 15, and pump head 18 form a sealed chamber 25 for housing therein a motor and motor controls as will hereinafter be described in more detail.

To drive the pump and comminutor or grinder, there is provided a motor 26, of conventional commercially obtained structure supportingly mounted to the upper surface of the pump head 18. The left hand shown tension bolt 23 extends outside of the motor casing and its lower portion appears in FIG. 1 for purposes of illustration only by a deviation of the cross-section line and cutting away the lower portion of the motor 26. A conventional bearing 27 and sealing means or packing 28 mounts the motor shaft 29 in the pump head 18 to complete the seal for the chamber 25.

The pump includes a one-piece metallic pump housing or casing 30 rigidly secured directly to the bottom of the one-piece pump head by means of bolt type fasteners 31. A mounting flange 32 for the resilient pump casing is peripherally clamped between opposed shoulders of the pump head 18 and pump housing 30. An outer annular wall 33 of the resilient casing depends from the flange 32 and at its terminal end is integrally connected with an inner casing wall 34, which elements 32, 33 and 34 are constructed in one piece of rubber or other resilient material. The internal surface of the inner wall 34 is provided with a helical thread or groove that cooperates with helically threaded member 35 carried by the motor shaft 29 to form a helical pump in a known manner.

The pump discharges fluid upwardly into an annular discharge chamber 36 formed in the pump head 18 around the motor shaft 29 externally of the sealed chamber 25. A radially extending discharge port 37 leads from the discharge chamber 36 to a discharge elbow 38 that is suitably and releasably secured to the pump head 18 with the mounting portion of a one-way flapper valve 39 clamped therebetween. The flapper valve 39 is the same as that disclosed in application Ser. No. 573, "PSG-02 Check Valve," filed Jan. 5, 1970, of common assignee, the disclosure of which is incorporated herein in its entirety by reference. A vertically extending pipe 40 passes

upwardly through the cover 7 with the inter-position of a sealing Ouring 41. The pipe 40 and elbow 38 together form a discharge conduit.

Power for the motor 26 is obtained from an input wire 42 that extends through the cover 7 to a motor control 43, which will actuate the motor 26 through wires 44 in response to the attainment of a predetermined level of fluid within the receptacle 1. The motor control 43 is supported on a suitable shoulder (not shown) provided on the inside of the motor control housing 10. To sense the fluid level within the receptacle 1, the motor control 43 is provided with a flexible pipe 45 extending downwardly through the sealed chamber 25 to where it is sealingly attached by means of a threaded pipe coupling 46 to a passage 47 formed in the pump head 18, which passage 47 is threaded to receive a vertically extending pipe 48 that opens at 49 substantially flush with the lower edge of the pump housing 30. The lower end of the pipe 48 is secured to the lower end of the pump housing 30 by means of an outwardly opening and axially extending slot 50 in the side wall of pump housing 30 and a clamping band 51 secured at its terminal ends to the pump housing 30.

For venting the receptacle 1 to the atmosphere, the control housing 10, preferably a casting, is formed with a depending pipe 52 that provides a fluid passage opening at one end to the inside of the receptacle 1 and its opposite end above the cover 7. The passage formed within pipe 52 is not in communication with the sealed chamber 25.

The comminutor of the present invention employs an imperforate impeller disk 53 drivingly secured to the lower terminal end of the motor shaft 29. At least two diametrically opposed impeller blades 54 are secured to the downwardly facing surface of the disk 53 to pick up and impell fluid radially outwardly as the shaft 29 rotates. An impeller stator or ring 55 is clampingly received between opposed shoulders 56 and 57 of an annular inlet shroud 58 and the pump housing 30, respectively. The one-piece metallic inlet shroud 58 is directly secured to the lower end of the pump housing 30 by means of a plurality of peripherally spaced bolt type fasteners 59. The inlet shroud 58 has a continuously smooth internal surface 60 that extends completely around the exposed inside of the shroud from the lower-most terminal edge 61 upwardly and inwardly to the shoulder 56.

As shown more clearly in FIG. 2, the impeller disk 53 is provided with a hub 62 to rigidly secure it to the impeller shaft. The impeller blades 54 are respectively mounted within radially extending slots 63 by means of headed screw fasteners 64. As a variation, the blades 54 may be formed in one piece with the impeller disk 53 by casting or they may be integrally attached by welding or the like. As seen, the outer terminal edge of each blade 54 is axially flush with the periphery of the impeller disk 53.

The comminutor ring 55 has a continuously smooth internal surface 65, which as shown in FIG. 1 substantially forms a continuation of the shroud surface 60. The surface 65 continuously extends from the lower terminal edge 66 upwardly and tapered outwardly to a transition line 67. Upwardly from the transition line 67 to the upper terminal edge 68 of the ring 55, there is formed a cutting surface consisting of a plurality of peripherally uniformly spaced axially extending semi-circular cross section slots 69, which cooperate with the rotating blades 54 to comminute sewage material passing therebetween. From FIG. 2, it is seen that the slots 69 extend from below the blades 54 upwardly past the blades to approximately the mid-point of the adjacent periphery of the disk 53. Also, it is seen that the internal surface of the ring 55, including the surface 65 and cutting surface having the slots 69 extends outwardly or is substantially axially aligned with the periphery of the disk 53, that is, there is no inward overlapping that would tend to catch woven material or the like. With this construction, any solid material or woven fabric material would be picked up by the blades 54 and freely rejected downwardly if it could not pass between the impeller disk 53 and ring 55. Thereafter, the rejected material would again be

sucked upwardly for additional rejections until it is either completely passed upwardly to the pump or reduced in size until it falls to an inaccessible portion of the bottom 3 of the container 1. Thus, the comminutor will not clog.

Since the operation of the pump storage grinder has been described along with its specific structure, there will be no specific discussion of the operation, which has been fully disclosed above. Further variations, modifications and embodiments are contemplated according to the broader aspects of the present invention and the specifically described structure is that of a preferred embodiment and there is no intention to be expressly limited thereto.

It is important that the load created by the submerged cutter elements of the comminutor moving water and refuse be kept to a minimum. If not, the result can be an over-sized motor adding cost, over-heating of the motor, or such a large current drain that it cannot be handled by conventional home branch circuit. The cutter bars or blades must be kept to a minimum height below the level of the impeller disk to keep this load low. On the other hand, it has been found that the cutter blades cannot be reduced below a certain minimum or the characteristic swirling action created by the impellers ceases and there are no currents attending to draw materials into the cutter. This is particularly critical with the impeller of the present invention that is imperforate and has material sucked upwardly around it. Experience has shown the optimum height of the cutter bars, as measured in the vertical direction of FIG. 1 parallel with the axis of shaft 29, below the adjacent plane surface of the impeller disk to be between 0.200 and 0.250 inch as the best compromise between low load and adequate swirling action. With the construction of FIG. 2 where the cutter blades 54 extend into slots formed in the cutter disk, the above-mentioned critical height would be the actual height of the cutter blades minus the depth or height of the slots 63, that is, the net height of the cutter blades. As a specific example, each cutter blade would have an overall height of 0.138 to 0.313 inch, a radial extent from the center line of the screw 64 to the outer edge of 0.509 to 0.505 inch, an overall radial extent of 1.258 to 1.250 inches, a circumferential width of 0.375 to 0.372 inch, and its bevelled surface extending at approximately 15° to the radial direction. As a specific illustration of the dimensions for the impeller disk, the disk would have a diameter of between 5.69 to 5.61 inches, a disk height (excluding the hub) of 0.527 to 0.463 inch with the depth of the slot 63 being between 0.097 and 0.093 inch. According to the more specific form of the invention, the above-mentioned height range for the extent of the cutter blades downwardly from the adjacent lowermost point of surface of the impeller disk being between 0.200 and 0.250 inch is critical; the above-mentioned specific examples being within this range and being a preferred embodiment. Also, it has been found that the cutter bars must be essentially flush with the edge of the impeller disk for optimum performance. If the cutter bars or blades project over the edge of the disk items such as cloth and plastic tend to wrap around the cutter blade causing objectionable load and vibration and very slow processing of the items. If the bars are recessed back from the edge of the disk, grinding does not occur. Also, for the optimum rejecting and reprocessing of hard materials such as metal, or non-metallic flexible items such as cloth or plastic, it is critical that the grinding mechanism be mounted in the inverted position, that is, that the inlet for the comminutor face downwardly. The above-mentioned items would plug the grinder if the grinder were not in the inverted position, or at the least greatly reduce its efficiency.

I claim:

1. Apparatus for comminuting and pumping semi-fluid material, comprising: a single piece upwardly opening cup-shaped receptacle having an outwardly extending peripheral flange at its open end provided with a plurality of flange holes extending in the axial direction of the receptacle; an inlet pipe extending through said receptacle, freely opening into the interior of said receptacle and having a coupling exteriorly of

said receptacle; a single piece annular cover peripherally overlying said receptacle flange and having holes axially aligned with said flange holes; an annular gasket between said flange and said annular cover; fastener means extending through said aligned holes to clamp said annular cover and said flange sealingly together; a one-piece generally annular control housing having an annular outer flange peripherally overlapping the inside of said annular cover and further having a depending annular wall extending into said receptacle; an outlet pipe extending through one of said control housing annular flange and said annular cover; a cover plate releasably secured to and closing the upper end of said control housing; said control housing having a downwardly extending cylindrical coupling portion and a downwardly facing shoulder; a tube having an upper end abutting against said shoulder and telescopically engaging said cylindrical coupling portion; seal means between said tube and said cylindrical coupling portion; band means surrounding and clamping said tube radially tightly against said cylindrical coupling portion; a one-piece generally annular head telescopically engaging at its upper end with the lower end of said tube and having sealing means therebetween; a plurality of bolt means, each engaging said control housing at one of its ends and engaging said head at its other end for tightly clamping said tube between said head and said control housing; an electric motor within said tube and having a rotatable shaft extending vertically downwardly and through said head; bearing means rotatably receiving said shaft and mounting said motor on said head; sealing means for preventing the passage of fluid upwardly through said head into said tube; said cover plate, said control housing, said tube, said head, said motor shaft, and said sealing means forming a sealed motor and control chamber within said receptacle; an outlet passage extending radially through said head portion exteriorly of said sealed motor and control chamber; conduit means extending between said outlet passage and said outlet pipe; one-way valve means clamped directly between said conduit means and said head for allowing fluid flow only outwardly from said head; a one-piece annular pump housing rigidly secured to the lower end of said head and having said motor shaft extending axially therethrough; a resilient internally helically threaded annular pump casing clamped between said pump housing and said head; helical thread means drivingly on said motor shaft within said pump casing for cooperation therewith during rotation of said motor shaft to form means for pumping fluid upwardly through said pump housing portion, into said head, through said outlet passage, through said one-way valve means through said conduit means, and outwardly through outlet pipe; said pump housing having an annular lower impeller casing portion; an imperforate impeller disc drivingly secured to said motor shaft below said pumping means and within said impeller casing; an annular inlet shroud having a lower continuously smooth internal peripheral wall being rigidly secured below and to said pump housing; a comminuting ring tightly clamped between said pump housing and said inlet shroud; said comminuting ring having an inner annular wall substantially axially aligned with the periphery of said impeller disc; said inner annular wall consisting essentially of a lower continuously smooth wall portion and a second upper comminuting wall portion composed of a plurality of peripherally arranged axial comminuting slots; a plurality of impeller blades on the lower face of said impeller disc extending downwardly and generally radially aligned with said comminuting slots; said comminuting slots extending from a distance substantially below said impeller blades axially upwardly for a distance substantially above said impeller blades; pressure actuated control means for starting and stopping said motor and being contained within said control housing; sealed conduit means extending from said pressure actuated control means downwardly and opening adjacent said inlet shroud, but upwardly from the lower terminal edge of said inlet shroud so that fluid sucked in by said pumping means will have an axial velocity component away from said conduit means opening for preventing

clogging; and a fluid vent pipe extending through said control housing portion to provide free air passage from the upper portion of said receptacle to the exterior of said receptacle.

2. Apparatus for comminuting and pumping semi-fluid material comprising: a tank having an upper open end; cover means releasably and sealingly mounted to the periphery of said upper open end; a plurality of substantially vertical tension bolts extending through said cover means downwardly into said tank for a substantial distance; a comminutor, a pump, and a motor directly driving said comminutor and pump being arranged such that fluid is pumped upwardly through said comminutor from said tank and then through said pump; chamber means extending from said upper open end downwardly into said tank and sealingly containing therein said motor, said motor being mounted upwardly from the lower terminal end of said tension bolts; the terminal lower end of said bolts being secured to said chamber means for carrying the entire weight of said chamber means, motor, pump and comminutor in tension from said cover.

3. The apparatus of claim 2, including motor means carried in the upper portion of said chamber means for actuating said motor in response to the level of fluid within said tank.

4. The apparatus of claim 3, wherein said cover means is annular; and a cover plate being releasably and sealingly mounted within said annular cover means to provide access to said motor controls and together with said annular cover means completely sealing the upper end of said tank.

5. The apparatus of claim 2, wherein said tank is of a one-piece construction with a bottom wall, a substantially cylindrical side wall, and an outwardly extending upper flange; said cover means being releasably secured to said upper flange; and an inlet pipe sealingly extending through said side wall and having an outer coupling end and a free inner end for discharging directly into said tank.

6. The apparatus of claim 2, including an outlet pipe sealingly extending through said cover means; and said pump having a discharge directly fluid connected to said outlet pipe.

7. The apparatus of claim 6, wherein said pump includes a one-piece pump head having said discharge; said outlet pipe being directly secured to said pump head; and including a resilient flapper one-way valve clampingly secured directly between said outlet pipe and said pump head.

8. The apparatus of claim 2, wherein said pump includes a one-piece pump head forming the lower portion of said chamber means; said motor being mounted directly on the upper end of said pump head and having a shaft extending vertically downwardly through said pump head; and bearing and packing means being operatively mounted between said pump head and said motor shaft.

9. The apparatus of claim 8, wherein said pump includes an outer one-piece casing being directly releasably secured to and below said pump head.

10. The apparatus of claim 9, wherein said pump includes a pump impeller secured to the periphery of said motor shaft within said pump casing; and said comminutor including an imperforate impeller disk secured to the terminal lower end of said motor shaft, a comminutor ring operatively surrounding said impeller disk, and a one-piece inlet shroud releasably secured directly to the lower end of said pump casing with said comminutor ring clampingly retained between said inlet shroud and said pumping casing.

11. A grinder-pump unit comprising: a motor having a vertical axis of rotation; vertically downwardly extending motor drive shaft means; a hollow pump head below said motor and surrounding said motor shaft means; bearing and packing means supportingly and sealingly connected to said shaft means between said pump head hollow interior and said motor; a pump casing extending below and secured directly to said pump head; a comminutor inlet shroud extending below and directly secured to said pump casing; pump means extending between said motor shaft means and said pump casing; comminutor impeller means secured to lower terminal end of said motor shaft means below said pump means; stationarily

mounted cooperating comminutor stator means secured between said pump casing and said inlet shroud; said pump head including an annular discharge chamber surrounding said motor shaft means upwardly of said pump means and said pump casing, and an outlet passage radially extending through said pump head above said pump casing into said annular discharge chamber; said pump means being a helical pump having a resilient material relatively fixed portion comprising an outwardly extending mounting flange clampingly secured directly between said pump head and said pump casing, an outer annular wall integrally depending from said mounting flange and extending away from the adjacent surface of said pump casing to a lower terminal end, an inner annular wall portion integrally extending upwardly from said outer annular wall terminal end, said inner annular wall having a helical thread on its internal surface surrounding said motor shaft means; and cooperating helical thread means on said motor shaft means interengaging with said helical thread during rotation of said motor shaft means to pump fluid upwardly therebetween.

12. The apparatus of claim 11, including a discharge pipe directly and releasably secured to said pump head in fluid communication with said outlet passage; and a resilient flapper valve clampingly sealed between said discharge pipe and said pump head for valving said discharge outlet.

13. The apparatus of claim 11, wherein said pump head is of a one-piece construction, said pump casing is of a one-piece construction and said inlet shroud is of a one-piece construction.

14. The apparatus of claim 11, wherein said comminutor impeller includes an imperforate impeller disk and at least one impeller blade secured to the lower face of said impeller disk and extending downwardly therefrom with a radially outer terminal end substantially flush with the outer periphery of said impeller disk; and said comminutor stator means is a cutter ring having an internal annular wall consisting essentially of a first lower annular continuously smooth surface and a second annular cutting surface of a plurality of uniformly peripherally spaced identical axially extending slots.

15. The apparatus of claim 14, wherein said impeller blades are of substantially the same thickness as said impeller disk, as measured in the vertical direction; said axially extending slots extending from below said impeller blades vertically upwardly to terminate above said impeller blades, but below the adjacent upper surface of said impeller disk; said cutter ring internal annular wall being outward of the periphery of said impeller disk.

16. The apparatus of claim 11, wherein said pump head has an axially extending passage; said pump casing having at its lower end an outwardly facing slot substantially axially aligned with said pump head axially extending passage; a pipe having an upper end threadingly received in said pump head axially extending passage and a lower free end engaging within said pump casing slot; a strap secured at one end to said pump casing on one side of said slot to extend tightly around said pipe to the other side of said slot and having its other end secured to said pump casing; and automatic control means communicating through said pipe for actuating said pump means in response to fluid level.

17. A comminutor, comprising: a one-piece annular inlet shroud having a free terminal lower end, an upwardly facing annular shoulder, and an annular internal surface extending completely from said terminal lower end to said annular shoulder; a comminutor ring having an internal diameter substantially the same as the internal diameter of said shroud internal surface and resting on said annular shoulder; a substantially annular impeller housing having a downwardly facing annular shoulder substantially aligned with said upwardly facing annular shoulder and being releasably secured to said inlet shroud for clamping therebetween said comminutor ring; a shaft extending through said impeller housing and having drive means at its upper end; a comminutor impeller drivingly secured to the lower terminal end of said shaft within said im-

pellor housing for cooperation with said comminutor ring; said comminutor impeller including an imperforate disc having a peripheral edge closely adjacent to the inner periphery of said comminutor ring; and pump means driven by rotation of said shaft for sucking fluid upwardly through said inlet shroud and only between said imperforate impeller disc and said comminutor ring.

18. The apparatus of claim 17, wherein said inlet shroud annular inlet surface is continuously smooth; and said comminutor ring includes an inner wall consisting essentially of a first continuously smooth annular surface substantially forming a continuation of said inlet shroud internal surface and a second upper cutter surface having a plurality of peripherally uniformly spaced axially extending slots.

19. The apparatus of claim 18, including at least one impeller blade mounted on the lower surface of said impeller disc and extending downwardly in radial opposition with said slots.

20. A comminutor, comprising: a one-piece annular inlet shroud having a free terminal lower end, an upwardly facing annular shoulder, and a continuously smooth annular internal surface extending completely from said terminal lower end to said annular shoulder; a comminutor ring having an internal diameter substantially the same as the internal diameter of said shroud internal surface and resting on said annular shoulder; a substantially annular impeller housing having a downwardly facing annular shoulder substantially aligned with said upwardly facing annular shoulder and being releasably secured to said inlet shroud for clamping therebetween said comminutor ring; a shaft extending through said impeller housing and having drive means at its upper end; a comminutor impeller drivingly secured to the lower terminal end of said shaft within said impeller housing for cooperation with said comminutor ring; said inlet shroud and said comminutor ring having their internal annular surfaces substantially axially aligned in the vertical direction; and the internal surface of said inlet shroud flaring slightly radially outward from said shoulder to its terminal lower end, and the internal surface of said comminuting ring consisting of a first lower continuously smooth annular surface and a second upper bladed

21. A sewage installation, comprising a closed tank having an upper removable cover and an inlet pipe below said cover for discharging sewage directly into said tank; a sewage grinding and pumping unit supportingly mounted only on and depending from said unit having housing means forming a substantially sealed chamber with respect to the inside of said tank; motor and motor control means mounted within said sealed chamber; a downwardly opening comminutor and upper pump mounted externally from and below said housing means; and said cover including a first annular portion rigidly supporting said unit and a second cover mounted for removal to expose the interior of said sealed chamber.

22. The apparatus of claim 21, wherein said pump has a discharge side; and including a discharge pipe extending from the discharge side of said pump upwardly through said cover.

23. The apparatus of claim 21, wherein said tank and housing means include a free sewage area below said unit and annularly surrounding said unit from the bottom of said tank continuously upwardly the full length of said unit to said cover.

24. The apparatus of claim 21, wherein said motor includes a motor shaft extending through said housing means and having mounted directly thereon a pump impeller and a lower comminuting impeller.

25. A sewage installation, comprising a closed tank having an upper removable cover and an inlet pipe below said cover for discharging sewage directly into said tank; a sewage grinding and pumping unit supportingly mounted only on and depending from said cover entirely within said tank; said unit having housing means forming a substantially sealed chamber with respect to the inside of said tank; motor and motor control means mounted within said sealed chamber; a downwardly opening comminutor and upper pump mounted

externally from and below said housing means; said housing means including a one-piece control housing integral with said cover and having therein said motor control means; said housing means further including a tube telescopically engaging said control housing and depending therefrom; and said housing means further including a pump head telescopically engaging the lower end of said tube.

26. The apparatus of claim 25, including sealing means at each of said telescopic connections and means extending between and tightly clamping said pump head and said control housing together axially with said tube interposed.

27. A sewage installation, comprising a closed tank having an upper removable cover and an inlet pipe below said cover for discharging sewage directly into said tank; a sewage grinding and pumping unit supportingly mounted only on and depending from said cover entirely within said tank; said unit having housing means forming a substantially sealed chamber with respect to the inside of said tank; motor and motor con-

trol means mounted within said sealed chamber; a downwardly opening comminutor and upper pump mounted externally from and below said housing means; said comminutor including a stationary comminuting ring and a rotatably mounted impeller disc within said ring; said pump being operable to pump fluid upwardly between said impeller disc and said comminuting ring; said impeller disc being imperforate to pumped fluid and having at least two diametrically opposed downwardly extending impeller blades; each of said impeller blades having an outer edge substantially axially flush with the outer periphery of the impeller disc; said impeller disc having a lowermost at least annular planar surface extending substantially to its outer periphery and being perpendicular to the axis of rotation; each of said impeller blades having a height, as measured in the axial direction, beyond said impeller disc planar surface within the range of 0.200 – 0.250 inch.

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