

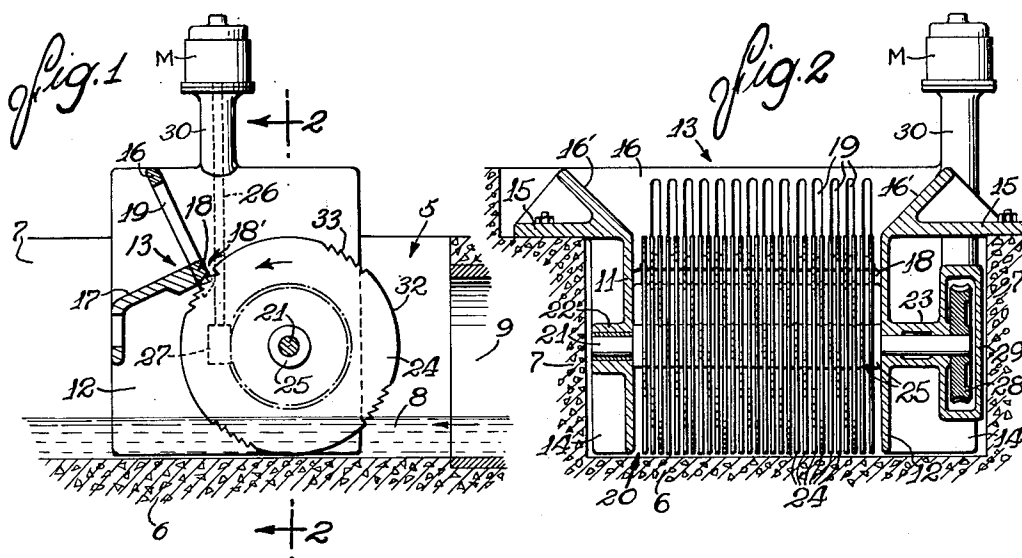
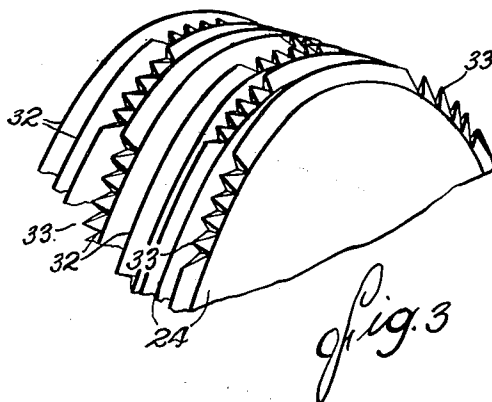
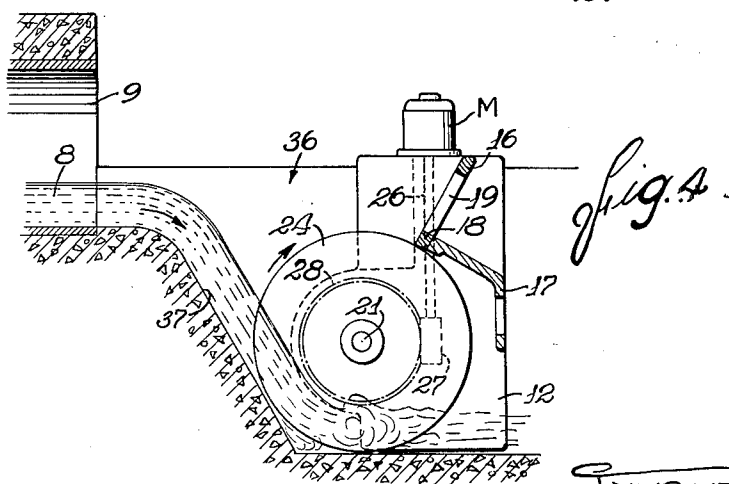
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COMMINUTING APPARATUS

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COMMUNUTING APPARATUS

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7 Claims. (Cl. 83—6)

This invention relates to apparatus for treating liquids such as sewage which frequently contain debris such as rags or other fibrous material and more particularly to improved apparatus for intercepting and comminuting the debris to facilitate subsequent handling and treatment of the sewage.

One object of the invention is to provide improved comminuting apparatus of the above general character which is relatively inexpensive to manufacture, economical to operate and yet extremely efficient and reliable in operation.

Another object is to provide comminuting apparatus embodying improved means for intercepting fibrous debris carried by a liquid and for comminuting the same above the surface of the liquid so as to offer a minimum of resistance to the flow of the liquid.

A further object is to provide improved apparatus of the above type embodying comminuting elements of novel and advantageous construction adapted to be produced at relatively low cost.

Other objects and advantages of the invention will be apparent from the following detailed description of the preferred embodiment illustrated in the accompanying drawing in which:

Figure 1 is a vertical sectional view of comminuting apparatus embodying the features of the invention shown as installed in a sewage channel, the view being taken longitudinally of the channel.

Fig. 2 is a transverse vertical sectional view of the apparatus taken along the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary perspective view showing details of the comminuting elements of the apparatus.

Fig. 4 is a vertical sectional view of the comminuting apparatus showing the same installed in a somewhat different type of sewage treating system from that shown in Fig. 1.

While the invention is susceptible of various modifications and alternative constructions, I have shown and will herein describe in detail a preferred embodiment thereof, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

By way of illustration the improved comminuting apparatus has been shown in Figs. 1 and 2

as installed in an open chamber or channel 5 of generally rectangular cross section having a horizontal bottom wall 6 and generally vertical side walls 7 of concrete or the like. Liquid sewage 8 discharged from a conduit 9 flows through the channel in the direction indicated by the arrow in Fig. 1 to sewage treating equipment (not shown) of the usual and well known type.

The comminuting apparatus in its preferred form includes a rigid frame comprising vertical end members 11 and 12 connected by a cross member 13 to form a rigid supporting structure for the operating elements of the apparatus. The end members as herein shown are in the form of heavy metal plates each having outwardly projecting stiffening flanges 14 on opposite side edges and a horizontal flange 15 on its upper edge. The horizontal flange is adapted to rest on a ledge formed by a recess adjacent the top of the side wall 7 of the channel to support the frame and may be bolted or otherwise rigidly secured to the wall.

The cross member 13 as herein shown is generally V shaped in cross section comprising a forwardly inclined apron portion 16 and a rearwardly and downwardly inclined body portion 17. The cross member may be cast integrally with the end members or may be welded or otherwise rigidly secured thereto at opposite ends with the apex of the apron and body positioned to present a rigid horizontal abutment 18 extending across the channel at a substantial distance above the normal level of the liquid flowing therethrough. The forward edge portion of the abutment is notched as indicated at 18' to form a comb like structure for purposes to be described hereinafter. The apron portion 16 of the cross member is slotted as at 19 and preferably extends entirely across the channel to intercept floating trash or debris when the channel is substantially filled as may occur under certain abnormal conditions. As shown in Fig. 2, the apron merges with similarly inclined webs 16' formed on the flanges 15 which direct the liquid toward the slotted part of the apron.

As shown in Fig. 2 the end members 11 and 12 of the frame are spaced apart with the flanges 14 fitting closely to the side walls of the channel thus defining a flow passage 20 between the members through which the sewage flowing through the channel is directed. Disposed in this passage to substantially fill the space between the bottom of the channel and the abutment 18 is a generally cylindrical comminuting device supported for rotation about a horizontal axis and having its

lower edge portion submerged in the sewage stream. This device is constructed to intercept the rags or other fibrous debris carried by the liquid, to withdraw the intercepted material and to crush, cut or tear it in cooperation with the abutment 18 as will be described in more detail hereinafter.

The comminuting device in its preferred form comprises a horizontal shaft 21 extending across the flow passage 20 below and somewhat forwardly of the abutment 18 but substantially above the normal flow level. The shaft is journaled in suitable bearings 22 and 23 carried on the respective end members 11 and 12. Nonrotatably mounted on the shaft are a series of generally circular comminuting elements in the form of disks 24 dimensioned so that their edges at one point lie closely adjacent the bottom of the channel 5 and at another point project into the notches 18' in the cross member or comb. The comminuting disks are uniformly spaced apart along the shaft as by spacing rings 25 interposed between the adjacent members. A sufficient number of these disks is provided to extend the series entirely across the flow passage 20 to form a rotating screen capable of intercepting any solid or semisolid bodies larger than a predetermined minimum size.

Any suitable means may be utilized to drive the shaft 21 and the comminuting elements carried thereby to cause the elements to carry the intercepted material above the level of the liquid and crush, cut or tear it against the comb formed by the notches 18. As herein shown the shaft is arranged to be driven by a motor M through a vertical shaft 26, a worm gear 27 and a worm wheel 28. The worm wheel is keyed to the shaft 21 and, together with the cooperating worm, is enclosed in a housing 29 (Fig. 2) constituting an extension of the bearing 23. A tubular casing 30 extending upwardly from this housing encloses the drive shaft 26 and supports the motor M for convenient access.

The comminuting disks 24 are relatively thin and flat, and each is formed to provide a peripheral cutting edge 32 interrupted at circumferentially spaced points by groups of radially projecting teeth 33. The teeth enable the members to grip the intercepted fibrous debris and carry it along to the abutment against which it is crushed, cut or torn in the rotation of the elements. The provision of the sharp cutting edges is highly advantageous in reduction of fibrous bodies such as rags which are relatively tough.

To insure prompt withdrawal of the intercepted debris from the liquid and thus keep the flow passage unrestricted, the comminuting disks 24 may be mounted on the shaft with the toothed and cutting sections arranged in staggered relation. More particularly it is preferred to arrange the disks on the shaft with the toothed sections of each disk positioned opposite the cutting sections of the adjacent members. Thus, while the toothed gripping section of one element is forcing a mass of intercepted material against the abutment 18, the cutting edge of the adjacent member may perform its cutting function. In this way the intercepted material is reduced to relatively small particles that either fall or are carried back to the liquid at the rear side of the elements.

Comminuting members in the form of disks such as those above described offer a minimum resistance to flow of the liquid through the passage and thus require a minimum of power for

operation. Moreover, the arrangement, whereby the intercepted material is carried above the liquid level for comminuting, avoids the building up of obstructions in the channel which would interfere with free flow of the liquid. The disks may be made of tough sheet metal and are easily capable of standing up under the severe shocks and strains imposed upon them in this environment. Moreover, such members can be manufactured at relatively low cost as the peripheral cutting edges may be quickly and easily ground in the desired form and the toothed portions stamped or otherwise cut out by means of simple tools.

In the modified installation shown in Fig. 4 the comminuting apparatus is disposed in a chamber 36 depressed a substantial distance below the outlet of the conduit 9. The sewage 8 in this instance, flows down a relatively steeply inclined wall 37 along which the comminuting device with its series of comminuting elements 24 is arranged transversely in closely spaced relation. These elements operate to intercept and comminute the debris exactly in the same manner above described, the intercepted material being ordinarily carried above the normal liquid level and crushed, torn or cut against the notched comb 18'. In some instances the cutting and tearing action of the comminuting members may result from forcing the debris against the bottom of the channel.

The particular arrangement shown in Fig. 4 is commonly employed in installations in which water from a storm sewer or the like is included with the ordinary sewage. At times, therefore, flow through the system may greatly exceed normal and may completely submerge the comminuting device. Such excess flow is readily accommodated by the slotted construction of the apron 16, the slots being spaced apart so that any buoyant trash or debris will be caught by the apron and will eventually work down to a point at which the comminuting elements can act thereon. In this way, passage of debris to the sewage treating equipment is effectually prevented while making the full capacity of the channel available for emergencies.

I claim as my invention:

1. Comminuting apparatus comprising, in combination, a horizontal shaft extending across a flow passage for liquid above the normal level of the liquid, a series of generally circular comminuting members mounted on said shaft in spaced relation with their lower edges immersed in the liquid, each of said members having a peripheral cutting edge interrupted at circumferentially spaced points by groups of radially projecting teeth, means for driving said shaft to rotate the immersed portions of the members counter to the flow of liquid in the passage, said teeth acting to engage debris carried by the liquid and to carry the same along with the rotating members, and a comb member extending across the passage above the liquid level positioned to coact with the teeth and cutting edges of the members in comminuting the debris.

2. In a system for handling liquid containing fibrous debris, the combination of a flow passage for the liquid, a comminutor comprising a plurality of generally circular comminuting members supported coaxially in spaced side-by-side relation across said passage with their axis disposed horizontally and their lower edges immersed in the liquid to intercept the debris, means for rotating said members in a direction to move the submerged portions of said members

reversely to the direction of liquid flow through said passage whereby to withdraw the intercepted debris from the liquid, and means cooperating with said members for comminuting the debris above the surface of the liquid.

3. In a system for handling liquid containing fibrous debris, the combination of a flow passage for the liquid, a comminutor comprising a plurality of disk shaped members supported coaxially in spaced side-by-side relation across said passage with their axis disposed horizontally and their lower edges only immersed in the liquid to intercept the debris, means for rotating said members in a direction to move the submerged portions of said members reversely to the direction of liquid flow through said passage whereby to remove the intercepted material from the liquid, and means cooperating with said members for comminuting the intercepted material above the surface of the liquid and for returning the comminuted mass to the liquid behind the members.

4. In a system for handling liquid containing fibrous debris, the combination of a flow passage for the liquid, a cylindrical comminuting device supported for rotation about a horizontal axis with only the lower portion submerged in the liquid, means on said device for intercepting the debris in said liquid, power driving means for rotating the device in a direction to move the submerged portions of said device opposite to the liquid flow through said passage whereby to remove the intercepted material from the liquid to permit unrestricted flow of the liquid, and means cooperating with said device above the level of the liquid for comminuting the material.

5. A comminutor for installation in a flow channel for liquids containing fibrous debris, the combination of a pair of end members spaced apart laterally to fit against the side walls of the channel and to define a flow passage for the liquid, a cross member connecting said end members to form a rigid unitary structure, a horizontal shaft journaled on said end members, a series of disk shaped comminuting members mounted on said shaft in substantially uniformly spaced

relation, only the lower edges of said members being submerged in the liquid in said flow passage to intercept the debris contained in the liquid flowing through said passage, and means for rotating said shaft and said members in a direction to move the submerged portions of said members reversely of the direction of liquid flow through said passage whereby to withdraw the intercepted material from the liquid, said cross member cooperating with said members to comminute the material.

6. Apparatus for treating liquid sewage containing debris comprising, a pair of vertical end members, a cross member connecting the upper ends of said end members to hold the same in parallel spaced relation and thereby define a flow passage for the sewage, a horizontally disposed shaft journaled at opposite ends in said end members, a series of comminuting members mounted on said shaft for partial submergence in the liquid flowing through said passage, said comminuting members being spaced apart to permit the liquid to flow through the passage but to intercept the debris therein, and a motor mounted on one of said end members operative to rotate said shaft and said comminuting members to move the submerged portions of the member in a direction opposite the flow through said passage whereby to withdraw the intercepted material from the liquid, said cross member cooperating with said comminuting members to reduce the withdrawn material to relatively small particles.

7. Comminuting apparatus for treating liquid sewage containing fibrous debris comprising, a rotatable shaft, a series of generally circular comminuting members mounted on said shaft each having its peripheral edge portion formed to present alternate toothed sections and arcuate cutting sections, and spacers interposed between the members to permit the passage of liquid therebetween while intercepting the debris in the liquid, said members being arranged with the toothed portions of each member positioned opposite the cutting edges of the adjacent members.

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