May 19, 1936. C. A. RIETZ 2,041,207

MACERATOR

Filed March 16, 1932

Fig. 1.

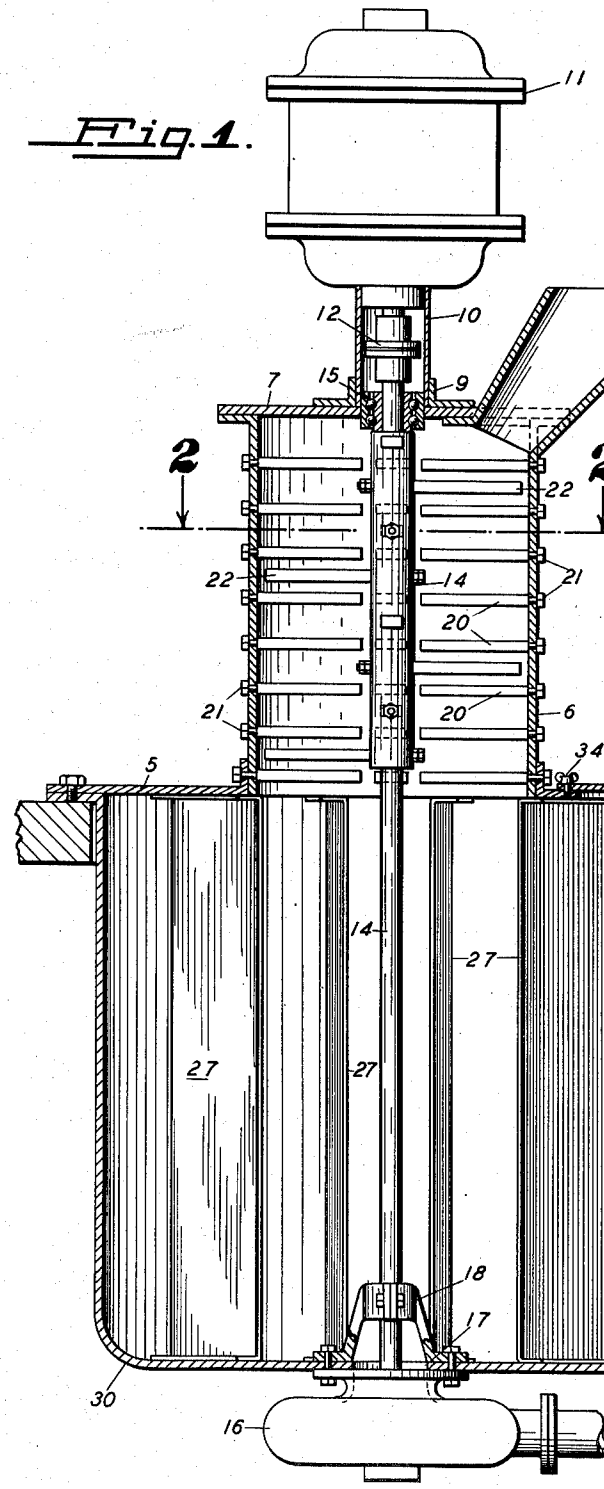


Fig. 2.

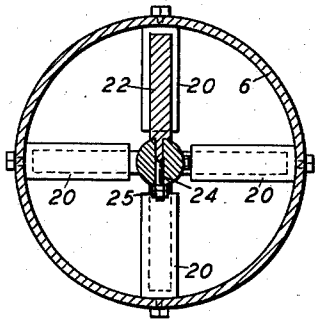
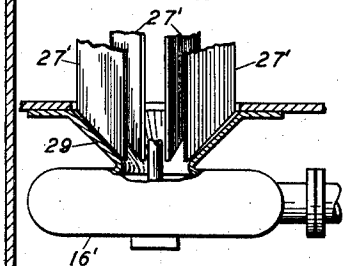


Fig. 3.



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MACERATOR

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10 Claims. (Cl. 146—192)

My invention relates to macerators or pulpers, which are used for reducing vegetables, canning plant refuse, and the like, to a fluid or semi-fluid mass which may be handled by a centrifugal pump.

Among the objects of my invention are: To provide a macerator which will effectively pulp materials of diverse characteristics, reducing them to substantially homogeneous liquids or semi-liquids; to provide a macerator which will completely pulp large quantities of material with relatively small applied power; to provide a macerator which will yield a tomato pulp of high color content; to provide a macerator which will not choke or block if the material to be treated be fed to it too rapidly; to provide a macerator which may readily be cleaned and sterilized; to provide a macerator of large capacity which requires small floor space; and to provide a machine which will macerate and pump the resulting pulp in a single operation.

Other objects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I do not limit myself to the embodiment of my invention herein described, as various forms may be adopted within the scope of the claims.

Referring to the drawing:

Figure 1 is a vertical sectional view through a macerator embodying my invention, the driving motor and the discharge pump being shown in elevation.

Figure 2 is a transverse sectional view of the macerator shown in Figure 1, the plane of projection being indicated by the line 2—2 of the first figure.

Figure 3 is a detail view showing a modification of the pump intake.

Considered broadly the macerator of my invention comprises a suitably driven vertical shaft surrounded by a substantially cylindrical housing. Projecting inward from the housing and outward from the shaft are a plurality of spaced beater-bars, and means are provided for feeding the material to be macerated into the housing above the bars. The material fed into the housing is completely macerated between the stationary and rotating bars, and falls into an accumulator tank mounted below the housing. A pump, preferably of the centrifugal type, is connected directly to the shaft carrying the beater-bars, its intake being connected to discharge the accumulator tank, and means are provided within the tank to prevent the rotation of the beater-bars and the pump impeller from setting up a forced vortex within the tank which would interfere with the action on the pump.

A macerator of the type described has many uses, particularly in the canning and chemical industries. Whole tomatoes may be fed into the machine and are at once reduced to a purée which may be handled by pumps without clogging, for conversion into tomato juice, catsup, or the like. Scrap and trimmings from various fruits and vegetables, such as peach peelings and pits, apple trimmings, tomato trimmings, and other material which must be disposed of, may be fed into the machine together with a suitable amount of water. Such scrap is reduced to a liquid of sludge consistency which may be pumped into a sewerage system and thus disposed of without difficulty. Any other materials which require complete maceration or mixing may be handled economically by the device.

Furthermore, when used as a tomato pulper, my machine effects a complete separation of the pulp and skin, releasing the coloring matter which lies immediately under the skin and giving a resultant product which is highly colored and hence has a high sale value.

A preferred form of my invention shown in the drawing comprises a preferably cylindrical tank 1 having a flange 2 at its upper edge by which it is suspended from the floor 3 of the building wherein the macerator is mounted. This form of suspension is, of course, optional. A cover 5 is bolted to the flange, and a cylindrical housing 6 extends upward from the cover, this housing being in turn provided with its own cover-plate 7. A flange 9 on the cover-plate 7 carries a vertical tube 10 which supports a driving motor 11, mounted with its shaft vertical.

The shaft of the motor is connected by a flexible coupling 12, within the tube 10, with a vertical shaft 14, which is journaled in a ball bearing 15, and extends axially of the housing and tank. The lower end of the shaft is directly connected to the impeller of a centrifugal pump 16 which is mounted to discharge the tank 1, its intake 17 being located centrally of the bottom of the tank. A bracket 18 may be provided to steady the lower end of the shaft above the pump impeller.

Projecting radially inward from the sides of the housing are a plurality of beater-bars 20, arranged, in the present instance, in horizontal sets of four bars each spaced 90° apart around the housing, with the several sets of bars alined to form vertical rows. The bars are rectangular in cross-section and are provided with a threaded

tang at one end, whereby they are secured to the housing by means of the nuts 21.

Mounted on the shaft 14 is a second series of beater-bars 22, which may be termed the rotary beater-bars. These bars are spaced helically along the shaft, so that they interleave with the stationary bars, one bar of the rotary series moving between each two horizontal sets of stationary bars.

The rotary bars are each secured to the shaft by a tang 24 and a lock-nut 25. The ends of the bars 22 should be spaced from the housing by about the same distance as the separation between the rotary and stationary bars, this spacing being dependent on the fineness of maceration desired.

A hopper 26 opens into the housing 6 above the beater bars, so that when material to be macerated is dumped into the hopper its fall through the housing will be interrupted by the rotating bars which will force it between the stationary ones. The speed of rotation being high, and the fall of the material through the housing being interrupted by both stationary and moving bars, each particle of the material traversing the housing will be beaten many times in the course of its fall. Experience has shown that peach pits, poured through the macerator together with a certain amount of water as a vehicle, are converted to a soupy emulsion which falls into the accumulator tank and is discharged by the pump 16. Softer material such as tomatoes are, of course, completely pulped by the device.

When material is fed to the macerator at normal speed, so that it passes through as fast as it is fed in, the device will operate satisfactorily even if the tank 1 be omitted and the pump 16 be mounted directly on the bottom of the housing 6. If, however, material be fed so rapidly as to choke the device, the rotating beater-arms will combine with the rotating pump impeller to set the entire mass within the macerator in rotation, thus forming a forced vortex which prevents the operation of the pump by admitting air into the intake.

The interposition of the accumulator tank between the pump and the beater mechanism separates the material within the beater from the intake of the pump and thus of itself reduces the tendency toward forming a vortex. In order to further reduce this tendency a plurality of baffles 27 are mounted vertically within the accumulator, these baffles serving not merely to prevent rotation of the mass within the accumulator, but also to strengthen and reinforce the latter.

This baffle structure may be modified as indicated in Figure 3, wherein the pump 16' is provided with a conical throat 29, the baffles 27' being brought down into the throat so that material flows into the pump through substantially radial channels and has no opportunity to form even small vortices.

In order to facilitate cleaning and sterilizing, the tank is provided with rounded corners 30, and one or more hand-holes 31 are formed in the cover 5 permitting the insertion of a hose for flushing out the tank, or of a steam hose for sterilization. A cover-plate 32 is secured over the hand-hole when not in use by means of thumb nuts 34 or other suitable fastenings.

It is to be noted that the efficacy of the apparatus is largely dependent on the fact that the material acted upon actually falls through the beater mechanism, discharging therefrom as fast as it can be fed in. This requires that the pump be directly connected to the beater, operating simultaneously therewith, if the device is to operate at anything approaching its actual capacity.

Although the device has been described in terms of its canning-plant use, it is equally available in the chemical industry, particularly in reducing the products of settling tanks and the like to sludges which can be handled by pumps. In this case the hopper may be the bottom of the settling tank itself, or it may be a pipe or tube leading therefrom.

In certain applications, where the material handled is light, water may be omitted in the process, in which case an air pump or centrifugal fan is used. In other cases where extremely heavy material is treated, other than the centrifugal type of pump may obviously be substituted to remove the material, screw or even belt conveyors being considered as "pumps" in this event.

I claim:

1. A macerator comprising a vertical shaft, a plurality of beater bars mounted along said shaft and projecting radially therefrom, a cylindrical housing surrounding said beater bars, a plurality of stationary beater bars projecting inward from said housing between said shaft beater bars, a hopper opening into said housing above the beater bars, means for driving said shaft, a pump directly connected to the bottom of said shaft to discharge from said housing, and baffle plates mounted on said housing interposed between said beater bars and said pump for preventing said beater bars from setting up a forced vortex above the centrifugal pump intake.

2. A macerator comprising a vertical shaft, a plurality of beater bars mounted along said shaft and projecting radially therefrom, a cylindrical housing surrounding said beater bars, a plurality of stationary beater bars projecting inward from said housing between said shaft beater bars, a hopper opening into said housing above the beater bars, means for driving said shaft, a pump directly connected to the bottom of said shaft to discharge from said housing, and an accumulator tank of a capacity at least as large as said housing interposed between the beater bars and the pump intake.

3. A macerator comprising a vertical shaft, a plurality of beater bars mounted along said shaft and projecting radially therefrom, a cylindrical housing surrounding said beater bars, a plurality of stationary beater bars projecting inward from said housing between said shaft beater bars, a hopper opening into said housing above the beater bars, means for driving said shaft, a pump directly connected to the bottom of said shaft to discharge from said housing, an accumulator tank mounted below the housing, and baffles positioned in the accumulator tank to prevent the formation of forced vortices.

4. A macerator comprising a vertical shaft, a plurality of beater bars mounted along said shaft and projecting radially therefrom, a cylindrical housing surrounding said beater bars, a plurality of stationary beater bars projecting inward from said housing between said shaft beater bars, a hopper opening into said housing above the beater bars, means for driving said shaft, a centrifugal pump directly connected to said shaft and having its intake coaxial therewith, and baffle plates mounted on said housing between said beater bars and the pump intake for preventing the formation of vortices.

5. A macerator comprising a vertical shaft, a

plurality of beater bars mounted along said shaft and projecting radially therefrom, a cylindrical housing surrounding said beater bar, a plurality of stationary beater bars projecting inward from said housing between said shaft beater bars, a hopper opening into said housing above the beater bars, means for driving said shaft, an accumulator tank mounted beneath said housing, a centrifugal pump having an intake opening from said accumulator tank and an impeller directly connected to said shaft, and vertical baffles mounted within the accumulator tank to prevent the formation of forced vortices by said impeller and said beater bars.

6. A macerator comprising a vertical shaft, a plurality of beater bars mounted along said shaft and projecting radially therefrom, a cylindrical housing surrounding said beater bars, a plurality of stationary beater bars projecting inward from said housing between said shaft beater bars, a hopper opening into said housing above the beater bars, means for driving said shaft, an accumulator tank mounted beneath said housing, a centrifugal pump having an intake opening from said accumulator tank and an impeller directly connected to said shaft, and vertical baffles mounted within the accumulator tank and extending into the pump intake.

7. Apparatus for making a wet pulp from materials of relatively high liquid content, which comprises a housing for the reception of said material, an inlet adjacent the top of said housing, a vertical shaft journaled in said housing, a plurality of horizontal beater bars on said shaft, a plurality of housing bars extending inwardly from said housing and interleaved with said beater bars, an exhaust pump connected to said shaft at the bottom of said housing, said housing having a substantial storage chamber between said beater bars and the inlet of said pump, and vanes extending from the walls of said storage chamber toward the axis of said chamber adjacent said inlet.

8. Apparatus for making a wet pulp from materials of relatively high liquid content, which comprises a housing for the reception of said material, an inlet adjacent the top of said housing, a vertical shaft journaled in said housing, a plurality of horizontal beater bars on said shaft, a plurality of housing bars extending inwardly from said housing and interleaved with said beater bars, said housing having a substantial storage chamber below said beater bars, means for removing pulp from the bottom of said chamber, and means adjacent the bottom of said chamber to restrict rotary motion of said pulp during the passage therethrough.

9. Apparatus for making a wet pulp from materials of relatively high liquid content, which comprises a housing for the reception of said material, an inlet adjacent the top of said housing, a vertical shaft journaled in said housing, a plurality of horizontal beater bars on said shaft, a plurality of housing bars extending inwardly from said housing and interleaved with said beater bars, said housing having a substantial storage chamber below said beater bars, a pump connected to an axially located inlet in the bottom of said chamber to remove the pulp therefrom, and means for restricting rotary motions of said pulp during passage through said chamber.

10. Apparatus for making a wet pulp from materials of relatively high liquid content, which comprises a housing for the reception of said material, an inlet adjacent the top of said housing, a vertical shaft journaled in said housing, a plurality of horizontal beater bars on said shaft, a plurality of housing bars extending inwardly from said housing and interleaved with said beater bars, said housing having a substantial storage chamber below said beater bars, a pump connected to an axially located inlet in the bottom of said chamber to remove the pulp therefrom, and means within the housing adjacent said inlet for restricting the formation of vortices around said inlet.

CARL A. RIETZ.