United States Patent

[11] 3,592,205

[72] Inventor **Richard H. Sheppard**
Palos Verdes Penninsula, Calif.

[21] Appl. No. **861,577**
[22] Filed **Sept. 29, 1969**
[45] Patented **July 13, 1971**

[73] Assignee **Purex Corporation, Ltd.**
Lakewood, Calif.

[54] **WASHING APPARATUS WITH SLUDGE SEPARATOR**
14 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **134/104,** 134/107, 134/109, 134/182, 134/193
[51] **Int. Cl.** **B08b 3/10,** B08b 15/00
[50] **Field of Search** 134/104, 107, 109, 182, 193, 194

[56] **References Cited**

UNITED STATES PATENTS

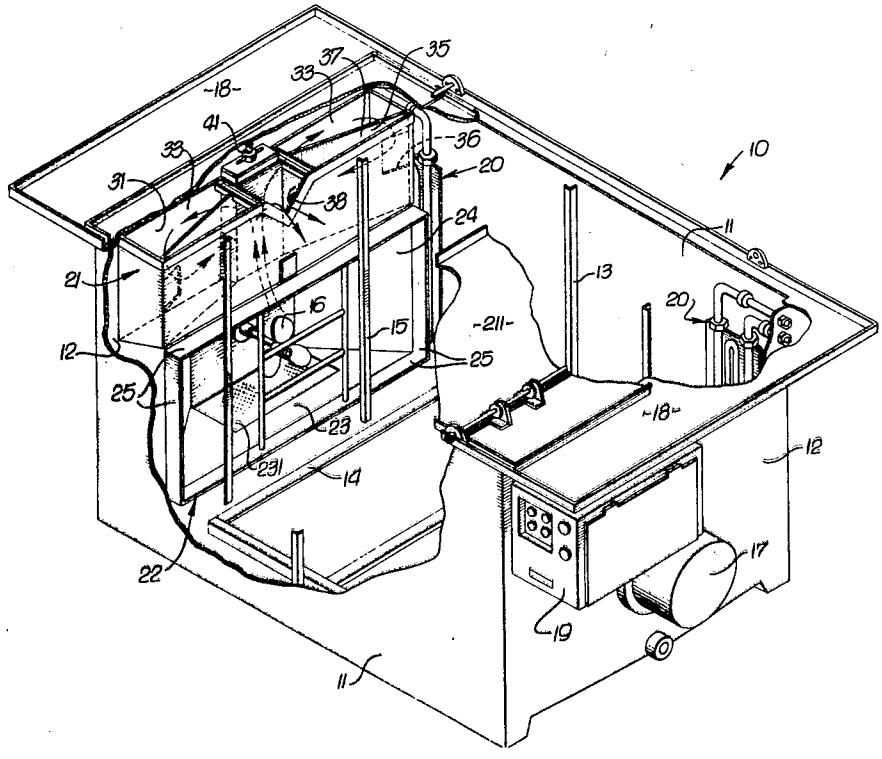
1,826,015	10/1931	Morton	134/104 X
2,720,771	10/1955	Lewis	134/182 X
2,960,991	11/1960	Bland	134/193 X
2,970,819	2/1961	Kleebauer	134/194 X

FOREIGN PATENTS

516,556	1/1940	Great Britain	134/194
597,765	2/1948	Great Britain	134/109
446,166	3/1949	Italy	134/193

Primary Examiner—Robert L. Bleutge
Attorney—White and Haefliger

ABSTRACT: Apparatus for the cleaning of mechanical or structural parts by circulation of cleaning solution within a tank having cavitated end walls which house circulating propellers and wherein sludge is entrapped in one or a pair of relatively small volume containers receiving side streams of propeller-displaced cleaning solution, these containers being manually removable from the tank without interruption of the parts cleaning operation. The invention also provides improvements in the tank and propeller housing constructions and benefits resulting from association within the tank of the propeller housing with vertical end walls of the tank.

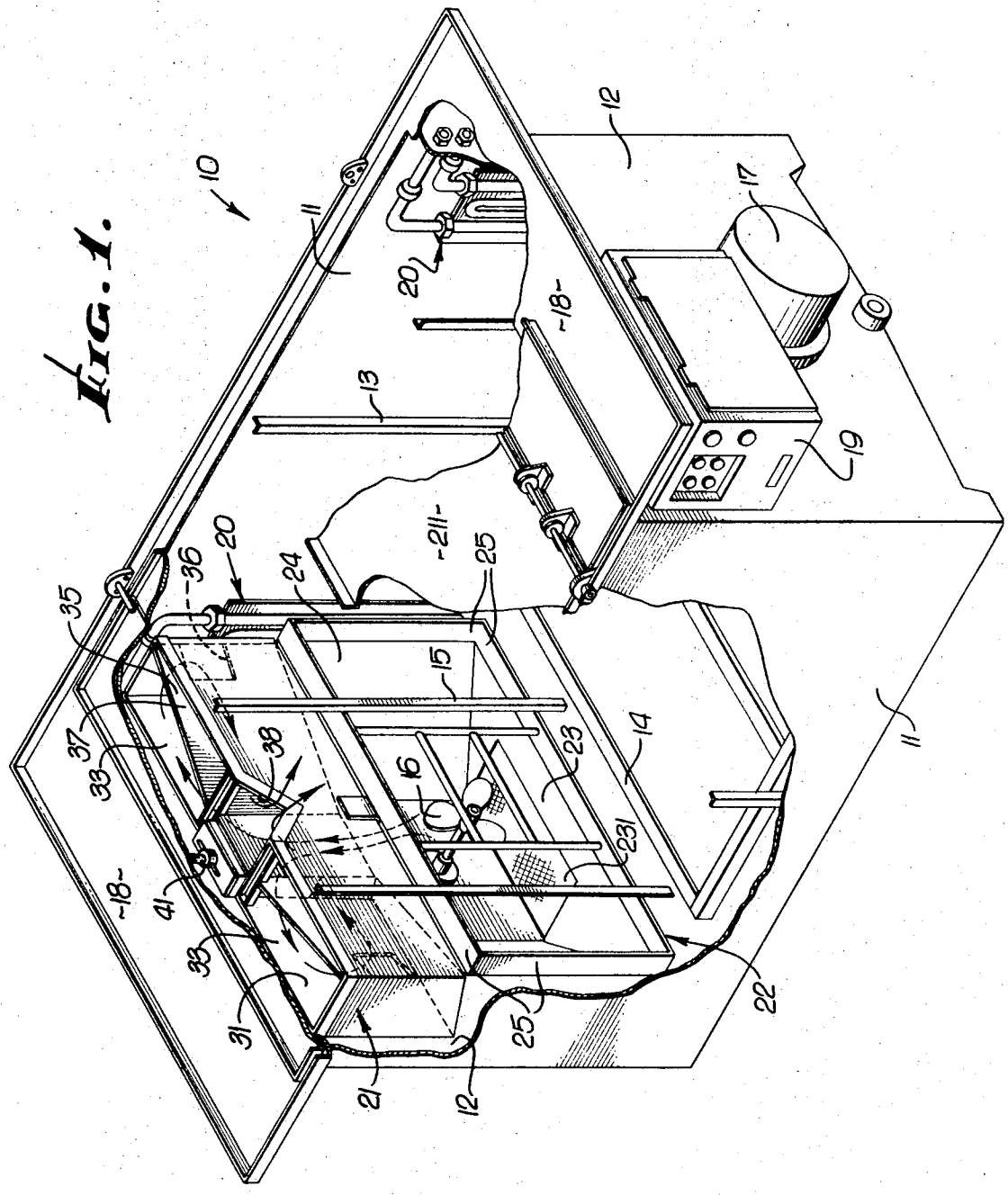


PATENTED JUL 13 1971

3,592,205

SHEET 1 OF 2

FIG. 1.



INVENTOR.
RICHARD H. SHEPPARD
By White & Haefliger
ATTORNEYS.

FIG. 2.

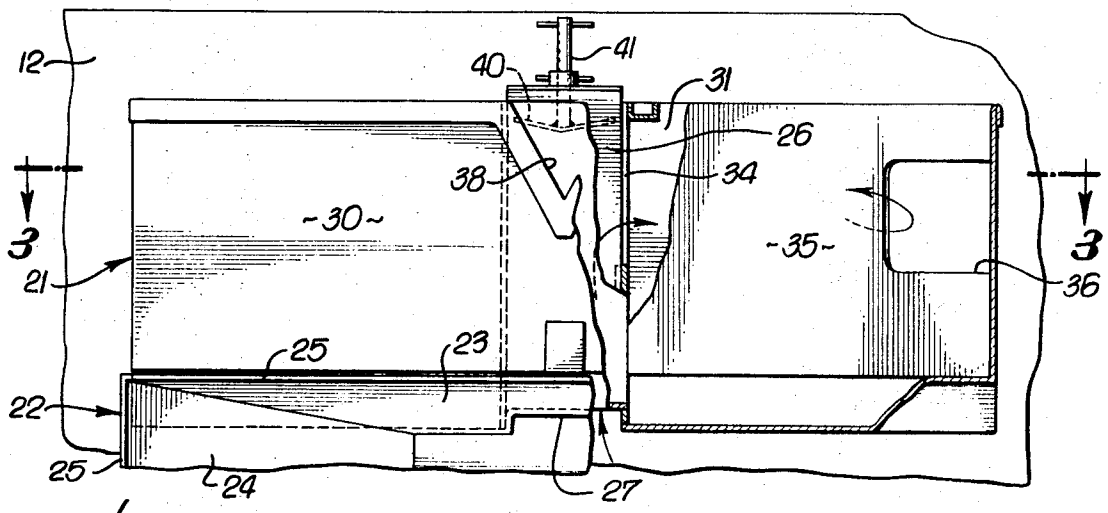


FIG. 3.

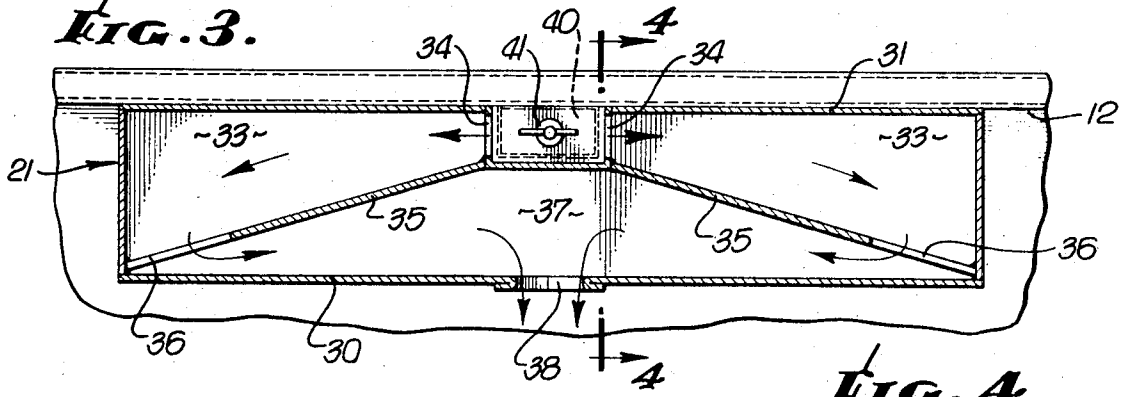


FIG. 4.

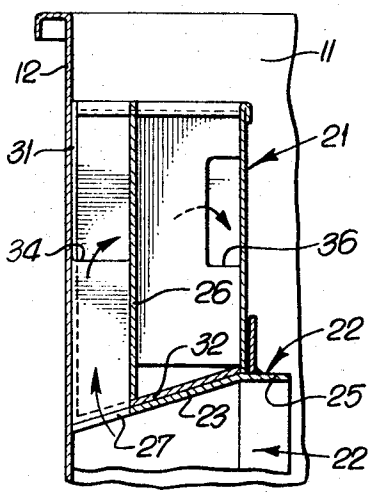
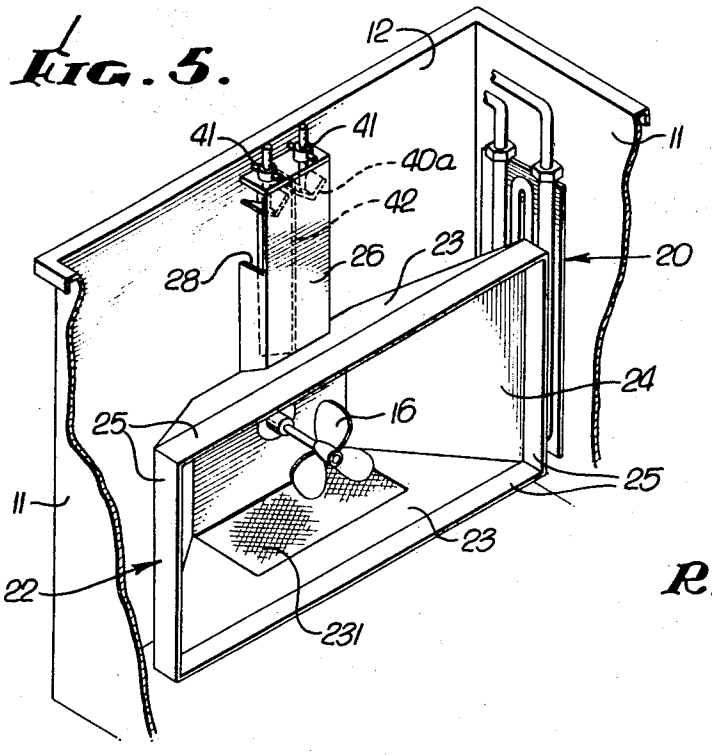


FIG. 5.



INVENTOR.
RICHARD H. SHEPPARD
By White & Haefliger
ATTORNEYS.

WASHING APPARATUS WITH SLUDGE SEPARATOR

BACKGROUND OF THE INVENTION

The invention is particularly concerned with equipment for cleaning mechanical or structural parts by their immersion in cleaning solution within a tank equipped with opposed propellers operating to agitate and displace the solution in flow patterns and velocities conducive to efficient removal of dirt, grease and the like from the parts surfaces and which in the past has been allowed to accumulate as sludge in the bottom of the tank. One characteristic of such equipment has been cavitation of the end walls of the tank for accommodation of the propellers as illustrated in the Bland U.S. Pat. Nos. 2,960,991; 3,048,277 and 2,990,302.

In the parts cleaning operation of such equipment, it becomes necessary even with sludge entrapment provisions within the bottom of the tank, to discontinue operations particularly because of redeposition of contamination on the parts surfaces, and undertake the time consuming job of sludge removal from the tank when the sump is full.

SUMMARY OF THE INVENTION

One major object of the invention is to provide for sludge removal without limitations by sludge accumulations within the tank and in a manner obviating necessity for shutdowns of the cleaning operation by reason of sludge accumulations. The invention can eliminate the need for more expensive separate external sludge removal systems, i.e. pumps, tanks and filters etc.

The invention particularly contemplates the use of one or a pair of relatively small volume containers in the nature of sludge traps accommodated in the tank to receive what may be termed side streams of the propeller-displaced tank solution in a manner such that in the course of side stream flow through and return to the tank liquid from the container, sludge is separated from the side stream to a degree maintaining the tank solution at an acceptably low sludge concentration. Removability of the relatively small volume sludge trap container may be accomplished without interruption of the cleaning functions of the solution being circulated in the tank.

Structurally contemplated is departure from the use of cavitated end walls of the tank proper as typified in the Bland patents, by mounting the propeller housing inside the tank inwardly from its vertical planar end walls, such accommodation of the housing inside the tank providing support for the sludge container on and in overlying relation to the housing, and also economizing the tank construction by reason of eliminating need for watertight welds around propeller housing and of the accommodation afforded solution heaters at the tank corners within spacings laterally beyond the propeller housings. Eliminating the sump from the tank bottom permits a significant reduction in overall tank height.

More specifically, the invention provides for the stated association of the sludge container upon the propeller housing with the chamber configuration being such as to receive upwardly directed flow of the propeller displacement and sufficient retention of the solution to allow for sludge dropout before return of the side stream to the tank liquid. Thus the sludge collects incrementally in the container until such time as to warrant clean out, for which purpose the container is manually removable from the tank and by reason of its relatively small capacity, can be cleaned and returned to the tank in a short period of time.

The various features and details of the invention will be more fully understood from the following description of an illustrative embodiment shown by the accompanying drawings:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view showing in perspective the treating solution tank, certain parts of which are broken away to more clearly reveal the inside constructions;

FIG. 2 is an inside elevation showing the removable sludge container and its association with the top of the propeller housing;

FIG. 3 is a cross section on line 3–3 of FIG. 2;

FIG. 4 is a vertical section taken on line 4–4 of FIG. 3; and

FIG. 5 is a fragmentary showing in perspective of one of the propeller housings and associated tank and walls, the sludge container being removed.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to the FIG. 1 assembly, the tank generally indicated at **10** and of rectangular configuration having vertical side and end walls **11** and **12**, is used to contain a cleaning solution suitable for the removal of dirt, grease and other contaminations from the surfaces of industrial parts, typically machine and engine components immersed in the solution along with supporting racks, baskets or other carriers, not shown, for which the tank may have interior adaptations as indicated at **13**, **14** and **15** with which the invention is not concerned. The tank solution has agitated displacement in flowing contact with the parts surfaces by means of propellers **16** at opposite ends of the tank, the propellers being driven by motors within their housings **17** mounted to the end walls **12**. As explained and depicted in the Bland U.S. Pat. No. 2,990,302, various solution flow patterns and velocities may be maintained within the tank by different directional and speed operation of the propellers **16** having various sizes to match motor sizes. One of the end walls **12** may mount beneath the top extension **18** a control unit **19** for the various tank facilities including the propellers **16** and also solution heaters generally indicated at **20** and positioned within one or more of the tank corner locations. Inwardly from one of the extensions **18** the tank may carry a hinged cover, one fragmentized section **211** appears in FIG. **1**.

As previously indicated, in the past sludge resulting from cleaning of the parts has been allowed to accumulate in the bottom of the tank, a normal rate of accumulation being such as to require cleaning of the tank at about one week intervals following continuous operation. The invention is intended to obviate the usual tank cleaning necessities by the provision of relatively small removable containers in the nature of sludge traps, generally indicated at **21**, and positioned at either or both ends of the tank above the propellers **16** so as to receive what may be termed side streams of the cleaning solution being circulated from and returned to the body of liquid in the tank.

The propeller accommodation in accordance with the invention departs from the conventional by positioning the propellers within recessed housings at both ends of the tank and shown most clearly in FIG. **5** to be of essentially frustopyramidal shape having top and lateral sides **23** and **24** which diverge inwardly of the tank from junctures with the end walls **12** about the motor **17**, these divergent sides terminating at rectangular flange **25** which serves to direct the propeller displacement into the tank liquid at the propeller depth. The housing may be cut out, perforated or screened at **231** on the bottom to prevent trapping of heavy sludge between the agitation housing and the tank bottom. A generally rectangular duct **26** extends upwardly from end opening **27**, see FIG. **4**, in the top wall **23** of the propeller housing and in such a proximity to the propeller that its rotation displaces the treating solution side stream upwardly and outwardly through the elevated side openings **28** into the container **21**, as will now appear.

The sludge trap **21** is a hollow removable container having front and rear sides **30** and **31** with a flat or inclined bottom **32** resting upon and conforming to the slope of the upper propeller housing wall **23** upon which the container **21** is supported. The container **21** is positioned in centered relation to the duct **26** so as to receive the propeller displacement into compartments **33** through the container openings **34** at the rear of baffles **35** extending angularly or diagonally within the

container compartments as particularly illustrated in FIG. 3. These baffles contain openings **36** through which the flow passed and reverses within the compartment **37** in returning over a flat or V-shaped weir **38** to the tank liquid. Thus the side stream flow courses as depicted by the arrows in FIG. **1**, is from the propeller **16** upwardly through the duct **26**, thence outwardly through openings **28** into registering chamber openings **34**, the flow thence being through compartments **33**, openings **36** into compartment **37** and over the weir **38**.

As will be understood, the tank liquid may stand at different levels in the tank but with propeller **16** submerged so that the side stream will be displaced through the container **21** as described. Depending upon the type of tank solution, propeller size, and the type, size and weight of sludge particles, it may be desirable to be able to variably control the rate of solution delivery into the container **21**. For this purpose I may mount at the top of duct **26** a valve **40** positioned within the duct chamber and operable by adjustable stem with lock pins **41** to raise or lower the valve and thus control the outflow through the container openings **34**. Should it be desirable to differentially vary the flow rate into the container chambers **21** as illustrated in FIG. **5**, a pair of such valves **40***a* may be provided within the duct passages at opposite sides of a flow divider **42** within the duct.

As will be understood, the sludge contamination in the tank liquid is constantly depleted by the side stream displacements into the containers **21** wherein their capacities allow for sludge settling and accumulation with the compartments **33** and **37**, the flow return to the tank liquid consequently having low level contamination. From time to time as sludge accumulates in the containers, the latter are manually removable from the tank without disturbing the propeller operations, and are returnable to the tank after short cleaning intervals.

As indicated in the foregoing, accommodation of the propeller housing **22** within the tank affords certain advantages in addition to support for the removable sludge container. As compared with what has been a conventional practice of cavitating the ends of the tank as recessed accommodations for the propellers, greater structural economies result from bringing the housing inside the vertical end wall **12** of the tank thus making possible the use of planar sheet metal components. Of particular benefit is the reduced tank dimension (width) required for the accommodation of one or more solution heaters **20**, which may be of either steam coil or electrical, or gas immersion burner tube heater types. Instead of the tank ends themselves being given extended cavitation as the propeller housings and thus requiring greater tank width for the solution heater accommodation, the present construction permits reduction of both the propeller housing and tank widths with ample space in one or more corners of the tank beyond the housings for the heater accommodation.

Eliminating the sump from the tank bottom permits e.g. 6 inches to 12 inches reduction in tank height. Heavy structural components which previously made up the tank bottom type sump in order to support the weight of the part basket are eliminated in favor of the lighter nonload bearing sludge containers which are removable from the top.

I claim:

1. Parts cleaning equipment comprising a relatively large volume cleaning liquid tank for reception of soiled parts, a propeller in the tank and operable to displace the liquid against parts submerged in the liquid, a relatively small volume sludge trap container positioned near the propeller to receive a side stream of tank liquid being displaced thereby and forming a sludge settling chamber from which the side stream returns to the tank liquid, said trap container being separable from the tank for removal of its sludge accumulation.

2. Cleaning equipment according to claim **1**, in which said chamber is partially submerged in the tank liquid and is removable through the top of the tank.

3. Cleaning equipment according to claim **1**, including a duct through which said side stream is elevated by the propeller above the tank liquid level for delivery into said container.

4. Cleaning equipment according to claim **1**, in which said propeller is contained within a recessed housing projecting into the tank from an end wall thereof and said container receives said side stream through a passage in the wall of said housing.

5. Cleaning equipment according to claim **4**, in which said container is removably supported on said housing.

6. Cleaning equipment according to claim **5**, in which said container includes sludge settling chambers above opposite sides of said housing.

7. Cleaning equipment according to claim **6**, in which said side stream is delivered to the container through a duct extending upwardly between said chambers.

8. Cleaning equipment according to claim **7**, including valve means for variably controlling side stream flow through said duct.

9. Cleaning equipment according to claim **7**, including means for selectively controlling delivery through said duct of separate portions of the side stream to said chambers.

10. Cleaning equipment according to claim **4**, in which said housing is of truncated pyramidal shape having a top side which supports said container.

11. Cleaning equipment according to claim **10**, in which the container bottom has angular conformity with said top side of the housing.

12. Cleaning equipment according to claim **11**, including a duct extending upwardly through said top side and through which said side stream is elevated by the propeller to flow into chambers in the container at opposite sides of said duct.

13. Cleaning equipment according to claim **12**, including also means for variably controlling the side stream flow through said duct.

14. Cleaning equipment according to claim **12**, including also tank liquid heating means in a corner of the tank beyond said housing.