ULTRASONIC AIR BLANKET REFLECTOR

RELATED APPLICATION

The present application claims the benefit of U.S. Provisional Patent Application 61/482,093, which was filed on May 3, 2011, entitled "ULTRASONIC AIR BLANKET REFLECTOR" and invented by J. Michael Goodson. This prior application is expressly incorporated herein by reference.

FIELD OF THE INVENTION

This invention relates generally to tanks for ultrasonic processing, and relates more particularly to a reflective structure added to a tank to improve reflection and decrease absorption of ultrasonic energy by the tank.

BACKGROUND OF THE INVENTION

Ultrasonic cleaning processes typically use metal tanks that contain a liquid and parts to be cleaned. Ultrasonic energy is supplied to the tank by ultrasonic transducers, which may be attached to or immersed in the tank. The walls and floor of the tank are typically 0.25 inch or 8 gauge or 10 gauge stainless steel. The walls and floor of the tank absorb some of the ultrasonic energy produced by the ultrasonic transducers, which decreases the amount of ultrasonic energy that can be employed in the cleaning processes.

It is known that ultrasonic vibrations used to excite liquids bounce off metal if there is air on the other side of the metal and the metal is relatively thin. For example with air on the other side of 14 gauge steel, ultrasonic activity has been measured to bounce off nine times more effectively than with 0.25 inch steel. The ultrasonic vibrations are reflected rather than absorbed by a thin metal panel backed with air. However, it is not practical to fabricate tanks out of 14 gauge metal because relatively thicker materials are needed for structural integrity and durability.

SUMMARY OF THE INVENTION

According to an aspect of the present invention, there is provided a processing apparatus comprising: a stationary tank having at least one wall, wherein the tank defines an interior for containing a liquid and one or more parts to be processed; one or more ultrasonic transducers for providing ultrasonic energy to the interior of the tank; an air blanket reflector located adjacent to and in closest proximity with an adjacent wall of the

tank and directly mounted to the adjacent wall for reflecting ultrasonic energy that would otherwise hit the adjacent wall, wherein the adjacent wall of the tank has a uniform thickness, wherein the air blanket reflector includes a first face panel oriented toward the interior of the tank and a cavity containing no liquid located between the face panel and the adjacent wall of the tank, wherein the first face panel is substantially parallel to the adjacent wall of the tank, wherein the first face panel has a uniform thickness and has a uniform surface exposed to the interior of the tank, and wherein the uniform thickness of the first face panel is less than the uniform thickness of the adjacent wall of the tank.

There is also disclosed~~The present invention is~~ an air blanket reflector that is placed inside an ultrasonic tank, at or near the walls of the tank, for reflecting ultrasonic energy. The air blanket reflector has a relatively thin metal plate, such as 14 gauge stainless steel, facing the interior of the tank and an air-filled cavity on the opposite side of the thin metal plate.

There is also disclosed~~More specifically, the invention is~~ a processing apparatus that includes (1) a tank for containing a liquid and one or more parts to be processed, where the tank has one or more walls; (2) one or more ultrasonic transducers for providing ultrasonic energy to the interior of the tank; and (3) an air blanket reflector located adjacent to one or more walls of the tank. The air blanket reflector includes a face panel oriented toward the interior of the tank and a cavity containing no liquid located between the face panel and the wall of the tank. The thickness of the face panel is less than the thickness of the walls of the tank.

The features and advantages described in the specification are not all inclusive, and particularly, many additional features and advantages will be apparent to one of ordinary skill in the art in view of the drawings, specification and claims hereof. Moreover, it should be noted that the language used in the specification has been principally selected for readability and instructional purposes, and may not have been selected to delineate or circumscribe the inventive subject matter, resort to the claims being necessary to determine such inventive subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view of a corner of a tank with a fixed air blanket reflector according to the invention.

Figure 2 is a perspective view of a tank with air blanket reflectors attached to or mounted at the walls of the tank.

Figure 3 is a sectional view of a corner of a tank with a removable air blanket reflector according to the invention.

Figure 4 is a sectional view of the removable air blanket reflector.

Figure 5 is a perspective view of the removable air blanket reflector.

Figure 6 is a perspective view of the removable air blank reflector shown in section.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The drawings depict various preferred embodiments of the present invention for purposes of illustration only. One skilled in the art will readily recognize from the following discussion that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the invention described herein.