# United States Patent

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[72] Inventors **Lawrence A. Werth**
**6070 Hubbell, Dearborn Heights, Mich. 48127;**
**David W. De Remo, 14047 Artisian, Detroit, Mich. 48223**



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[54] **FILTER CLEANING APPARATUS**
**9 Claims, 4 Drawing Figs.**


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[51] **Int. Cl.** ..... **B08b 3/02,** B08b 3/08, B08b 3/10
[50] **Field of Search** ..... 134/84–86, 88, 90, 91, 94, 102, 105, 57 R



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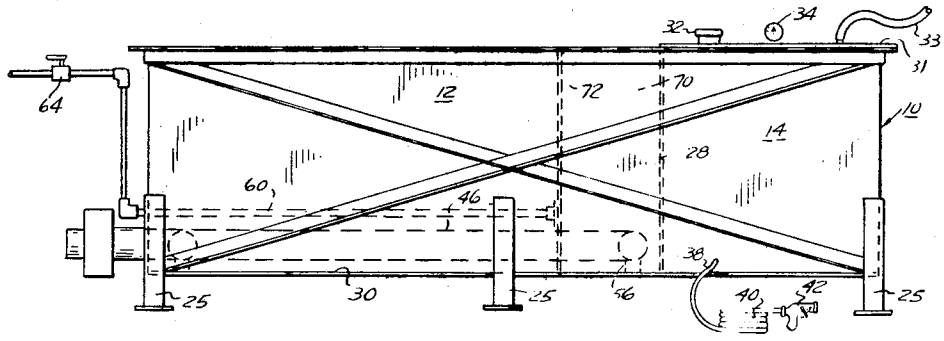
*Primary Examiner*—Robert L. Bleutge
*Attorney*—Hauke, Gifford & Patalidis



**ABSTRACT:** An apparatus for cleaning filters and the like having a pair of containers in a side-by-side relationship, one of the containers having a liquid solvent heated to a predetermined temperature for cleaning filters submerged therein; the other container being a storage tank adapted to dispense a pressurized solution for spray rinsing the cleaned filters; the two containers having a common partition adapted to transfer heat from the liquid solvent holding container to the storage tank for maintaining the temperature of the rinsing solution at a value less than the predetermined temperature of the liquid solvent. In a second embodiment, a dip rinse container is disposed intermediate the liquid solvent holding container and the storage tank, the dip rinse container and the storage tank having the common partition for the transfer of heat to the storage tank while the liquid solvent holding container and the dip rinsing container utilize a common heating means.

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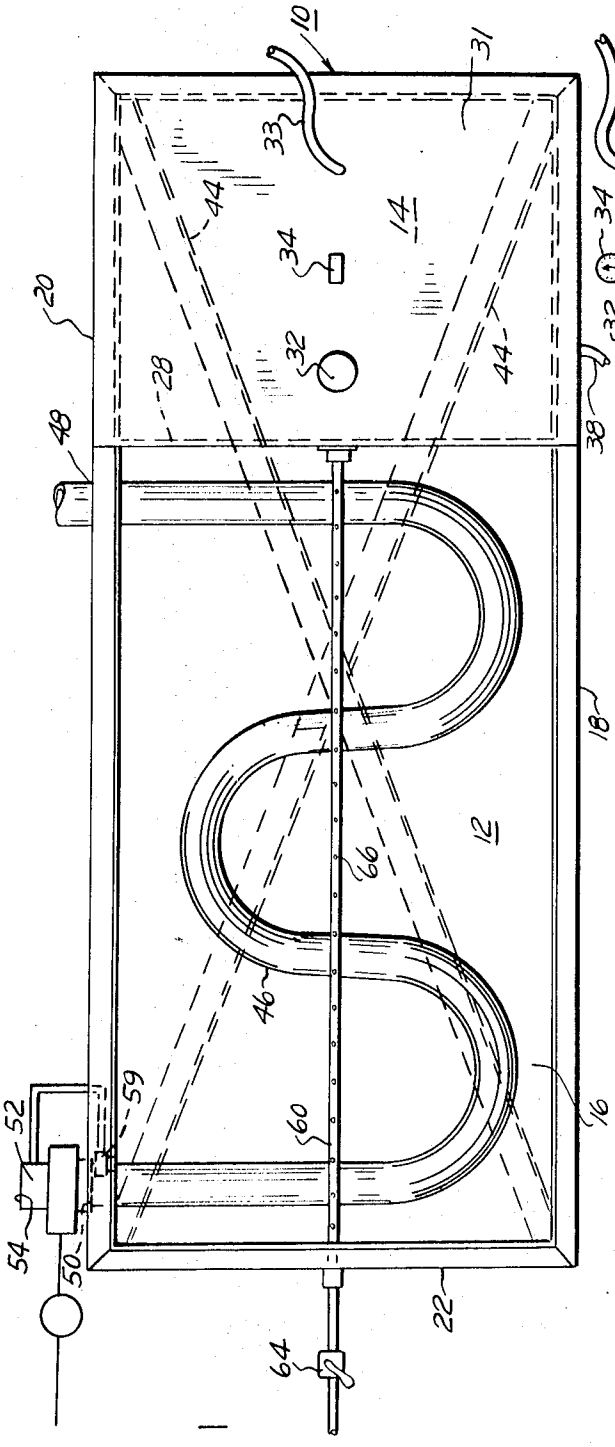



FIG. 1

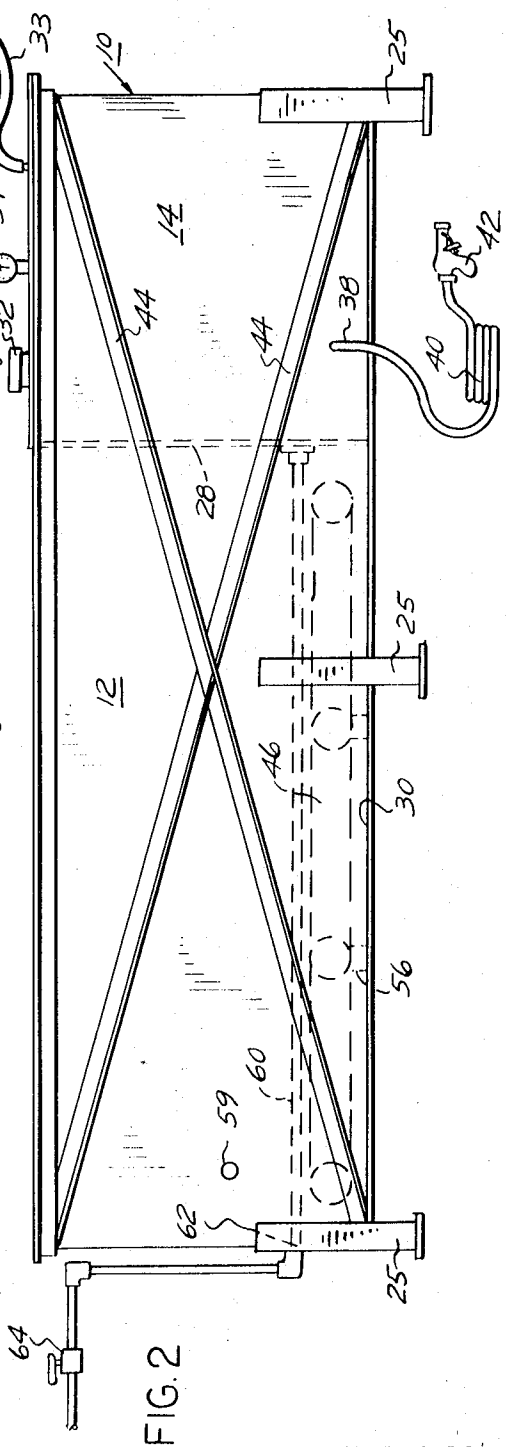



FIG. 2

INVENTORS
LAWRENCE A. WERTH
DAVID W. DE REMO

BY Hauke, Gifford & Patalidis
ATTORNEYS

FIG. 3

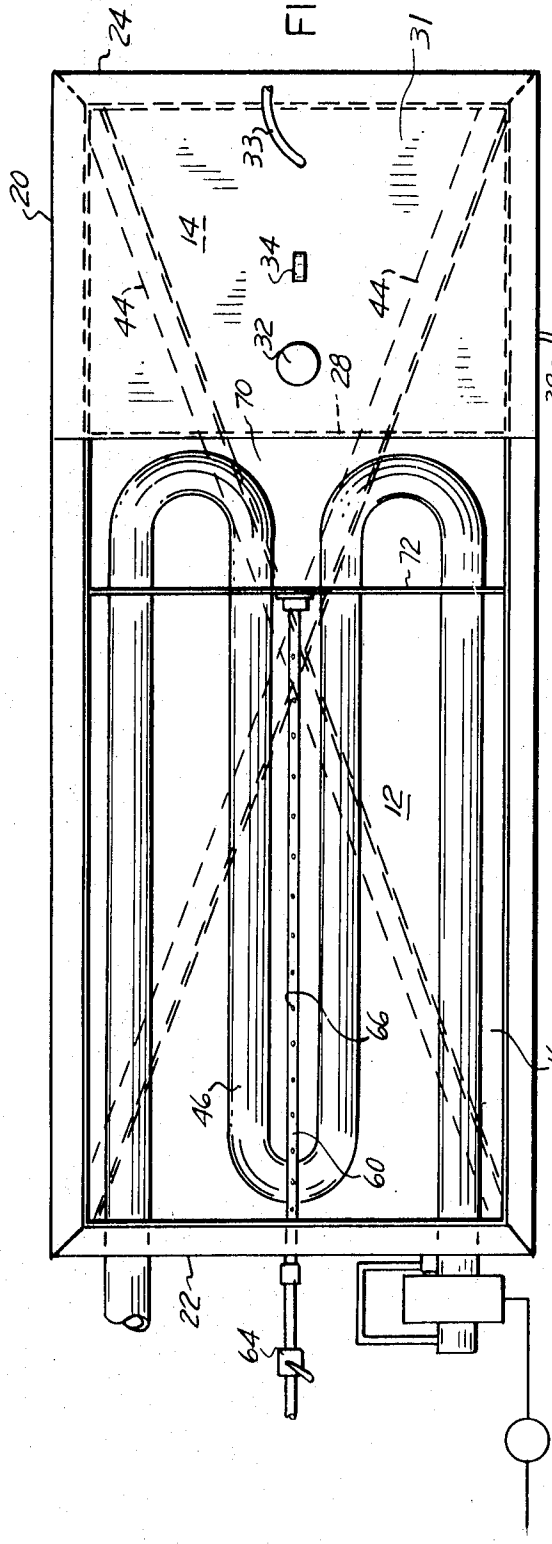
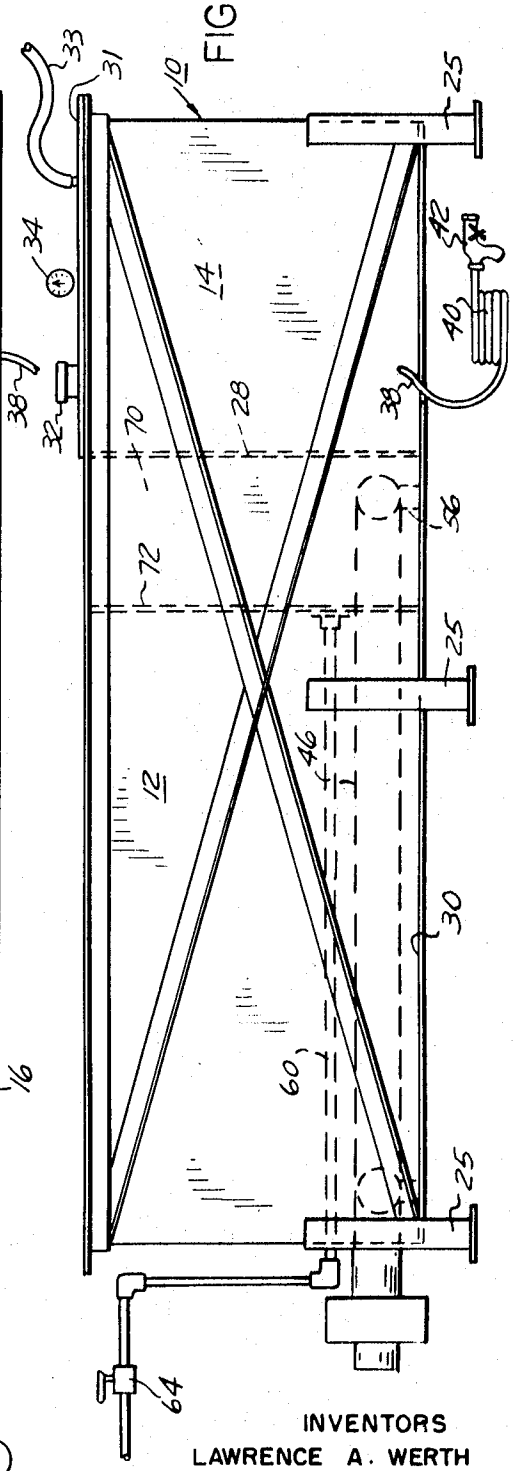



FIG. 4




INVENTORS
LAWRENCE A. WERTH
DAVID W. DE REMO

BY Hauke, Gifford, & Patalidis

ATTORNEYS

# FILTER CLEANING APPARATUS

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to apparatus for cleaning objects and more particularly to apparatus for cleaning filters which have become contaminated with cooking grease, dirt, food particles and the like.

2. Description of the Prior Art

Heretofore no attempt has been made to treat and wash filters of the type utilized in combination with commercial cooking apparatus, such as in restaurants and the like. Such filters are adapted to filter grease and food particles admitted to the atmosphere by such cooking apparatus. Normally, such filters are disposed of when they have become clogged and are replaced with a new filter, and since such filters are relatively expensive it would be desirable to provide apparatus for cleaning clogged filters to extend their useful life to four or five times that of the disposable-type filter.

Other related prior art apparatus have been employed to remove grease and the like from objects and generally are comprised of a plurality of open compartments each containing different solvents and rinsing solutions; the object to be cleaned being successively dipped into each tank to remove the grease and other foreign materials contained thereon. In certain prior art apparatus one of the open compartments is directly heated while the adjacent open compartments are maintained at a predetermined temperature by heat transferred through common partitions separating the several compartments. Other apparatus illustrate the several compartments as each being directly heated by one or more heating elements; however, none of the related prior art devices illustrate a liquid solvent holding compartment having a common partition with an enclosed storage tank containing a rinsing solution which is maintained at a predetermined temperature by heat transferred from the open compartment prior to the use of the rinsing solution.

## SUMMARY OF THE INVENTION

The present invention, which will be subsequently described in greater detail, comprises an apparatus for cleaning objects such as filters and the like, having a pair of fluid containers connected to one another by a common partition. One of the containers is provided with a liquid solvent heated to a predetermined temperature for cleaning the objects submerged therein, while the other container is an enclosed storage tank that can selectively dispense a pressurized rinsing solution for spraying the clean filters to remove the liquid solvent therefrom. The pressurized solution within the storage tank is maintained at some lower temperature by the heat transferred from the liquid solvent holding tank through the aforementioned common partition.

It is therefore an object of this invention to provide a novel means for storing and heating a rinsing solution at some predetermined temperature without the necessity of direct heating.

It is also an object of this invention to provide a filter-cleaning apparatus having a cleaning compartment and a storage compartment arrangement which is not only of a compact construction and inexpensive to manufacture, but is of such a design that it is economical in operation.

Other objects, advantages and applications of the present invention will become apparent to those skilled in the art when the accompanying description of some examples of the best modes contemplated for practicing the invention is read in conjunction with the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

The description herein makes reference to the accompanying drawings wherein like reference numerals refer to like or equivalent parts and in which:

FIG. 1 is a longitudinal plane view of a preferred apparatus employing the present invention;

FIG. 2 is a top view of the apparatus illustrated in FIG. 1;



FIG. 3 is a view similar to FIG. 1 illustrating a modification of the invention; and

FIG. 4 is a top view of the modified apparatus illustrated in FIG. 3.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The cleaning apparatus illustrated in FIG. 1 comprises a vessel **10** which is subdivided transversely into two containers **12, 14**, the container **12** being adapted to hold a liquid solvent **16** such as a metal stripper in which a plurality of filters (not shown) are submerged for the purpose of removing grease and other contaminating particles in a manner to be described in greater detail hereinafter. The container **14** is an enclosed storage tank adapted to hold a rinsing solution comprised of a rust inhibitor and a drying agent, which likewise will be described in greater detail hereinafter.

The vessel **10** is of a generally rectangular shape, the longer sides **18, 20** being welded at adjacent corners to the shorter sides **22, 24**. A plurality of legs **25** are welded to the corners and midsections of the longer sides **18, 20** to support the vessel **10** at a sufficient distance above the ground floor to protect the same as the solvent and rinsing solutions are heated in a manner to be described hereinafter.

The cleaning container **12** and the storage container **14** are separated by a common partition **28**, the peripheral edges of which are welded to the abutting longer sides **18** and **20** and the vessel bottom **30**, which likewise is welded to the lower peripheral edges of longer and shorter sides **18, 20, 22** and **24**.

The storage container **14** is enclosed by a top plate **31**, the peripheral edges of which are welded to the abutting portions of the longer sides **18, 20** and the shorter side **24** and the partition **28**. The top plate **31** carries a removable cap **32** which is adapted to permit refill of the storage container **14** with the rinsing solution as the same is removed therefrom during normal operation thereof. An air inlet nozzle **33** and a pressure gauge **34** are also carried on the upper surface of the top plate **31** and their mode of operation will be described subsequently. Proximate the bottom portion of the storage container **14** there is provided an outlet nozzle **38** which is adapted to attach thereto a flexible conduit, such as a rubber hose **40**, having a spray nozzle **42** attached to the opposite end thereof.

The vessel **10** is preferably 10 feet long, 4 feet wide and 3 feet deep, and since both the cleaning container **12** and the storage container **14** are adapted to be respectively filled with a liquid solvent and a rinsing solution, the sidewalls **18, 20, 22** and **24** are subjected to a considerable outwardly directed pressure force. To insure the structural integrity of the vessel **10**, a plurality of support members **44** extend diagonally across each of the wall members **18, 20, 22** and **24** and the bottom **30** of the vessel **10** and are secured to their abutting wall members by any suitable means such as welding.

The liquid solvent **16** in the cleaning container **12** is heated to a predetermined temperature, preferably between 160°–190° F., by means of a heating conduit **46**, which is disposed in the lower portion of the cleaning container **12** and is fully submerged within the liquid solvent. The heating conduit **46** is of a generally W-shape having a circular cross section, the opposite ends being supported to the wall member **20** by any suitable means such as welding. Apertures **48, 50** extending through the longer sidewall member **20** carry the heating conduit **46** externally of the vessel **10**. That portion of the heating conduit **46** extending through the aperture **50** is connected to a burner **52** which is adapted to heat air entering the inlet **54** of the conduit **46** and is further provided with a blower which forces the air through the conduit **46** to its outlet formed at the aperture **48**. The burner **52** may be of any suitable type, such as gas- or oil-burning furnace. The outlet **48** of the heating conduit **46** is attached to any suitable exhaust to carry the flue externally of the building in which the apparatus is disposed. In order to insure proper heating of the solvent disposed within the cleaning container **12**, the conduit **46** should have an outer diameter of approximately 4½ inches. The conduit is

supported against vertical movement by a plurality of supports indicated by the numeral **56**.

The temperature of the liquid solvent within the container **12** is automatically maintained between a temperature range of 160°–190° F. by providing a temperature-sensing means such as a thermocouple **59** extending into the interior of the cleaning container **12** and attached to the burner **52**. The burner **52** may be provided with suitable means to initiate the same in response to signals received from the thermocouple **59** in a manner well known in the art of controlling such burner operation.

As will be explained hereinafter, the liquid solvent **16** is agitated in order to insure the removal of the grease and other foreign matter lodged within the filters. Such agitation is provided by the admission of a plurality of airstreams from an air pipe **60** disposed proximate the bottom portion of the cleaning container **12** above the heating conduit **46**. The air pipe **60** extends longitudinally across the container **12** and is supported at opposite ends by any suitable support means secured to the common partition **28** and extends through an aperture **62** formed in the shorter sidewall **22**. Suitable sealing means must be provided between the outer periphery of the air pipe and the aperture **62** to prevent the leakage of liquid solvent therethrough. The air pipe **60** extends from the vessel **10** and is connected to any suitable supply of the air, such as an air pump or a tank of compressed air. A shutoff valve **64** is provided externally of the vessel **10** within the air pipe **60** to terminate the supply there when the same is not required.

The storage container **14** is adapted to be pressurized by supplying compressed air through the air inlet **33**. In the same manner as the air pipe **60**, compressed air may be supplied to the storage container by any one of a plurality of means, such as from a pump or a compressed air tank. A pressure gauge **34** is provided to indicate that the rinsing solution is being maintained at a proper pressure. Compressed air within the storage container **14** acts to force the rinsing solution therein through the outlet nozzle **38**, and via the hose **40** and spray nozzle **42**, the filters may be sprayed to remove the liquid solvent therefrom after the same have been removed from the cleaning container **12**. Although not illustrated, other methods may be utilized for providing a pressure spray from the spray nozzle **42**, such as providing a pressure pump intermediate the outlet nozzle **38** and the spray nozzle **42** in lieu of using pressurized air within the storage container **14**.

The common partition **28** is of such a thickness as to permit the transfer of heat from the liquid solvent within the cleaning container **12** to the rinsing solution within the storage **14** such that the rinsing solution therein is maintained at a temperature between 120°–125° F. It can, thus, be seen that the rinsing solution may be heated and maintained at a predetermined temperature without the use of separate heating means while the same is simply being stored during the cleaning process of the filters which are disposed within the cleaning container **12**.

In operation, the cleaning container **12** is filled to a predetermined level with the metal stripper liquid solvent. The cleaning container **12**, which is approximately 6 feet long, 4 feet wide and 3 feet in depth, is adapted to receive approximately 60 filters for cleaning at one time. The liquid solvent is preheated to a temperature ranging between 160°–190° F. and the filters are submerged therein. During the 90 second period, the shutoff valve **64** is turned on so as to provide a source of air pressure into the air pipe **60** which in turn ejects a plurality of air streams through nozzles **66** axially spaced along the peripheral surface of the air pipe **58** and each of which is disposed in such a manner as to direct a vertical stream of air upwardly from the bottom portion of the cleaning container **12**. At the specified temperature range and with the proper agitation of the liquid solvent by the aforementioned airstreams, the filters are cleaned of the grease and other foreign matter lodged therein in approximately 90 seconds. After the filters have been cleaned, the same are removed and sprayed with the rinsing solution by means of the spray nozzle **42** so as to remove the liquid solvent remaining thereon while at the same time providing a rust inhibitor and drying agent to the exposed surfaces of each filter. Since the rinsing solution is heated, the drying agent will tend to evaporate rather rapidly leaving a dried filter with a protective rust inhibitor coating thereon in a relatively short period of time.

FIGS. **3** and **4** illustrate a modification of the invention in having a dip container **70** disposed intermediate the container **12** and the storage container **14** and respectively having common partitions **72**, **28** with the cleaning container **12** and the storage container **14**. The dip container **70** is adapted to be filled with a rinsing solution, and preferably the same solution which is retained in the storage container **14**. The modified form of the invention illustrated in FIGS. **3** and **4** is substantially the same as the embodiment disclosed in FIGS. **1** and **2** with the additional features of the dip tank **70** and the heating conduit **46** which now extends transversely of the cleaning container **12** and has its inlets and outlets extending through the shorter wall surface **22**. The burner **52** is attached to the inlet side of the conduit **46** at an aperture **74** formed within the wall **22** while the outlet side thereof extends through an aperture **76**. The heating conduit **46** of the embodiment illustrated in FIG. **3** extends through the partition wall **72** and into the dip container **70** such as to provide direct heating of the rinsing-solution container therein. Suitable sealing means such as weld disposed between the outer periphery of the conduit **46** and the inner periphery of apertures **78** prevent fluid communication between the chambers **12** and **70**, and thus prevents the direct mixing of the liquid solvent and the rinsing solution while permitting passage of the heating conduit **46** between the containers **12** and **70**.

The rinsing solution contained within the storage container **14** is maintained between the temperature range 120°–125° F. by means of the heat transferred between the rinsing solution contained within the dip container **70** in the same manner as hereinbefore described in the description of the embodiment disclosed in FIGS. **1** and **2**. In operation the filters are cleaned within the cleaning container **12** in the same manner as described hereinbefore. After the prescribed period of cleaning time (90 seconds of immersion within the agitation metal stripper at a temperature between 160°–190° F.) the clean filters are removed from the cleaning container **12** and are dip rinsed within the dip container **70** to remove substantially all of the solvent and at the same time to coat the filter with the rust inhibitor and drying agent to facilitate the drying thereof. The dip rinse may be utilized on those filters not having a very fine mesh. Such dip rinsing alone should suffice to remove all of the solvent contained on the filter. In those cases in which a finer mesh is utilized within the filters, the same are spray rinsed with the pressurized rinsing solution contained within the storage container **14** in the same manner as hereinbefore described in the description of the embodiments illustrated in FIGS. **1** and **2**. It should be noted however that it is preferably to spray rinse all the filters as the use of the dip container alone will require more frequent changes of rinsing solution therein over a shorter period of time as the same becomes contaminated by the removal of solvent and other materials from the filters upon dipping therein.

Having thus described the invention, what is claimed is as follows:

**1**. An apparatus for cleaning objects comprising:

a container having two compartments, the first one of which is adapted to hold a liquid solvent for cleaning objects submerged therein;

means associated with said one compartment for maintaining said liquid solvent at a predetermined temperature;

the second compartment adapted to store a rinsing solution therein, said first and second compartments having partitions to transfer heat from said first compartment to said second compartment to maintain the temperature of said rinsing solution at a value less than said first-mentioned predetermined temperature;

means connected with said second-mentioned compartment for forcibly spraying said objects with said rinsing solution upon removal of said objects from said liquid solvent; a third compartment having a rinsing solution therein, said third compartment being adapted to rinse said objects when submerged therein, said third compartment being positioned between said first- and second-mentioned compartments and having means associated therewith for maintaining said rinsing solution contained in said third compartment at substantially the same temperature as said liquid solvent, said second-mentioned and said third compartments having a common partition adapted to transfer heat from said third compartment, thereby maintaining the temperature of said second-mentioned compartment rinsing solution at a value less than the temperature of said liquid solvent; said means for maintaining said rinsing solution contained in said third compartment at said predetermined temperature comprises a heating conduit submerged in said first-mentioned compartment proximate the bottom portion of said first-mentioned compartment, and means for circulating the heated medium through said conduit.

2. The combination as defined in claim 1, wherein said second-mentioned compartment is enclosed and includes means for pressurizing the rinsing solution stored therein.

3. The combination as defined in claim 2, wherein said second-mentioned compartment is supplied with compressed air to maintain said rinsing solution pressurized.

4. The combination as defined in claim 1, including means associated with said first-mentioned compartment for agitating said liquid solvent.

5. The combination as defined in claim 4, wherein said agitating means comprises a perforated wall member disposed proximate the bottom portion of said first-mentioned compartment and means for introducing pressurized air through said perforated wall member whereby air is distributed through said liquid solvent to agitate the same.

6. The combination as defined in claim 5, wherein said perforated wall member is an elongated cylindrically shaped pipe having a plurality of axially spaced holes extending therethrough, said pressurized air being directed from the interior of said pipe through said holes and into said liquid-filled first-mentioned compartment.

7. The combination as defined in claim 1, including sensing means responsive to the temperature of said liquid solvent to control the circulation of said heated medium.

8. The combination as defined in claim 7, wherein said heated medium is a hot gas.

9. The combination as defined in claim 1, including sensing means responsive to temperature of said liquid solvent to control the circulation of said heated medium through said conduit passing through said first-mentioned and third compartments.