US006214299B1

(12) **United States Patent**
Holladay et al.

(10) **Patent No.: US 6,214,299 B1**
(45) **Date of Patent: Apr. 10, 2001**

(54) **APPARATUS AND METHOD FOR PRODUCING ANTIMICROBIAL SILVER SOLUTION**

(76) Inventors: **Robert J. Holladay**, 490 E. 1200 N., Logan, UT (US) 84341; **Herbert Christensen**, 816 Cottonwood Cir.; **William D. Moeller**, 70 W. Canyon Crest Rd., Suite D, both of Alpine, UT (US) 84004

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/323,310**

(22) Filed: **Jun. 1, 1999**

(51) **Int. Cl.**[7] **B01J 19/08**
(52) **U.S. Cl.** **422/186.21**
(58) **Field of Search** 422/186.21, 186.26; 205/571, 742, 760

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,653,893	9/1953	Romans	167/14
3,615,789	10/1971	Schaller	106/135
3,655,412	4/1972	Kumai et al.	106/1
4,043,932	8/1977	Fresenius et al.	252/95
5,017,295	5/1991	Antelman	210/764
5,073,382	12/1991	Antelman	424/604
5,078,902	1/1992	Antelman	210/764
5,266,534	11/1993	Atsumi et al.	501/1
5,342,528	8/1994	Adachi et al.	210/668
5,516,519	5/1996	Oka et al.	424/405
5,785,972	7/1998	Tyler	424/195.1

OTHER PUBLICATIONS

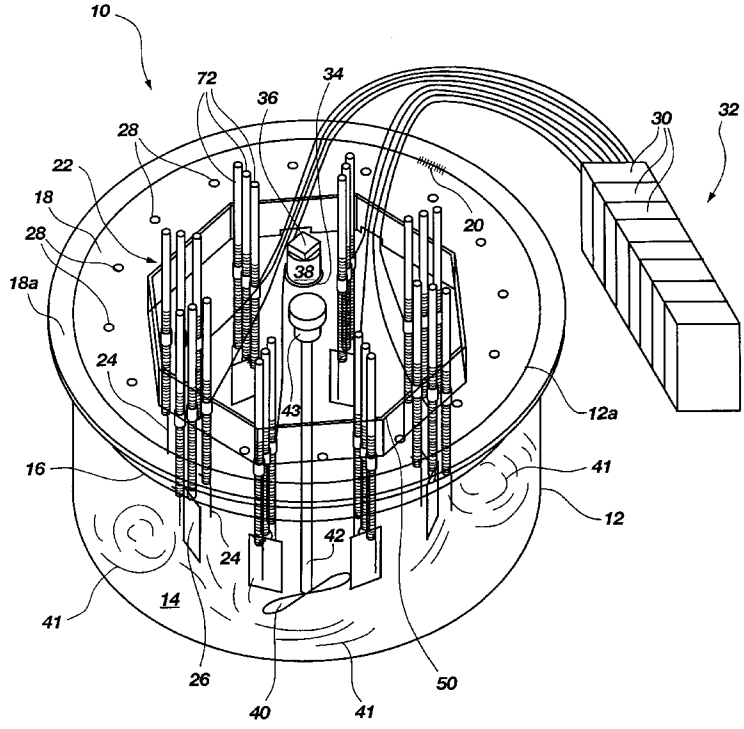
Ultra Professional Instructions for making Premium 'AC' Colloidal Silver with your HVAC 'Ultra Professional' System No Month/Year Given.

Primary Examiner—Kathryn Gorgos
Assistant Examiner—Thomas H Parsons
(74) *Attorney, Agent, or Firm*—Clayton, Howarth, and Cannon, P.C.

(57) **ABSTRACT**

An apparatus and method for producing colloidal silver. A large-volume container, such as a fifteen gallon container, includes a hinged lid on which a rotational impeller is mounted along with several sets of electrodes that are electrically connected to a power transformer. The container is partially filled with water, and when the lid is closed, the sets of electrodes are disposed in communication with the water in a predetermined arrangement, and the impeller resides submerged in the water. Certain of the electrodes constitute silver wire. The power transformers convey current to the electrodes, preferably alternating current, at voltages sufficient to cause silver particles to separate from the silver wire and enter the solution in a stable, suspended state. The impeller is rotated, preferably continuously, to prevent the suspended silver from remaining in upper levels of the water, thereby dispersing the silver particles more uniformly throughout the volume of water.

54 Claims, 3 Drawing Sheets



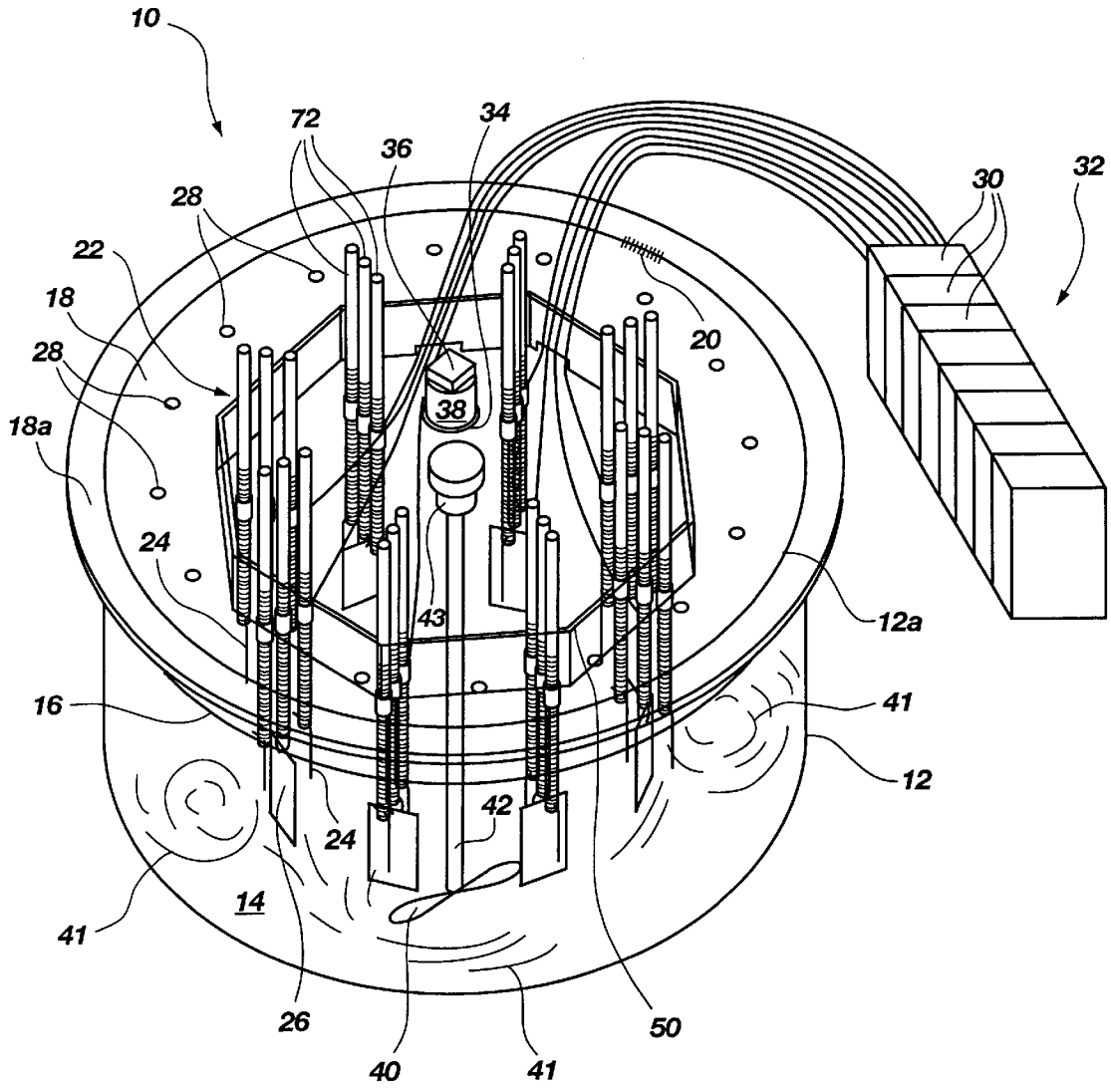

10
72
34
36
28
30
32
22
18
20
28
38
18a
24
12a
43
16
41
12
42
24
14
41
26
50
40
41

Fig. 1

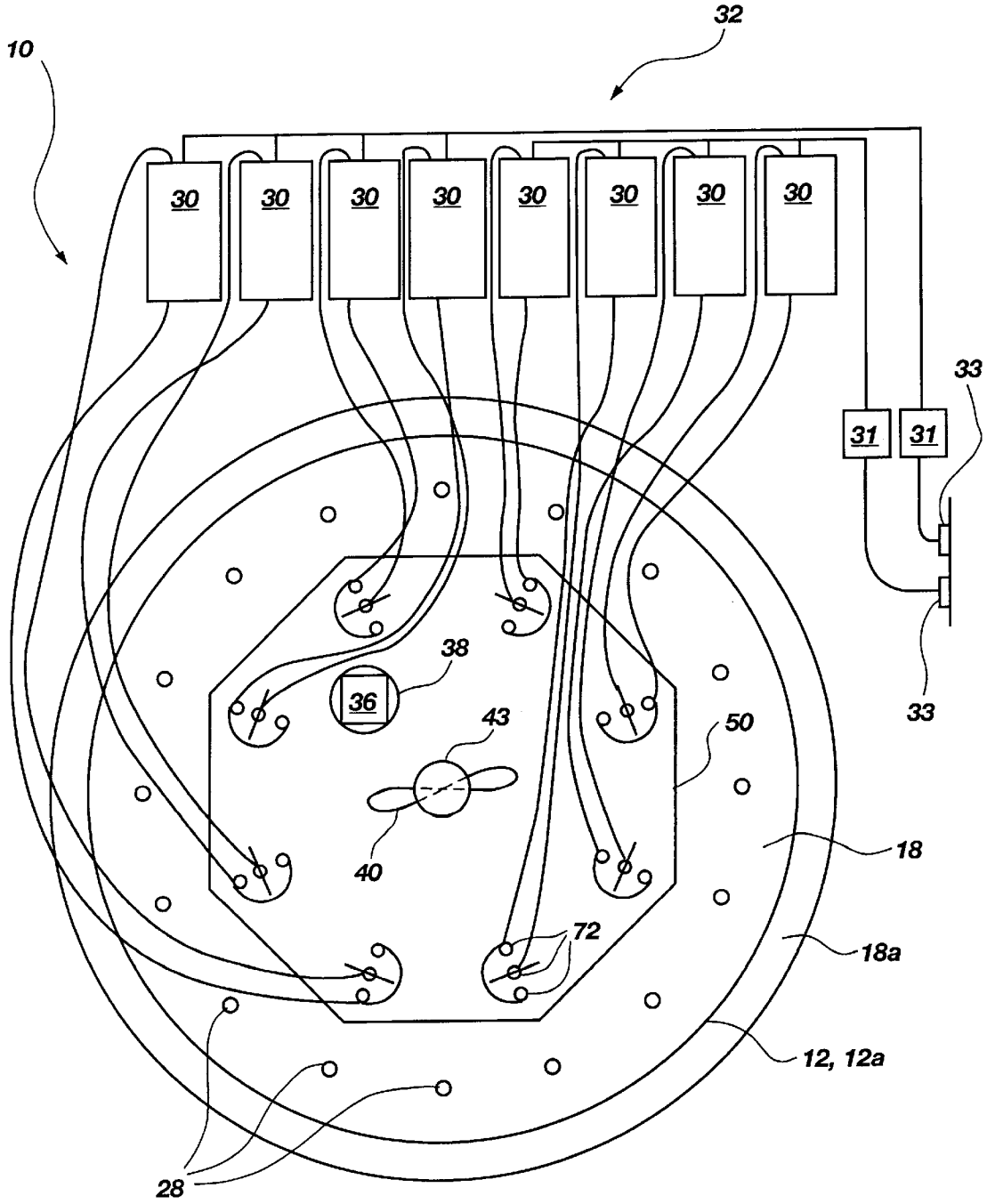

10
32
30
30
30
30
30
30
30
30
31
31
33
33
38
36
43
50
40
18
72
18a
12, 12a
28

Fig. 2

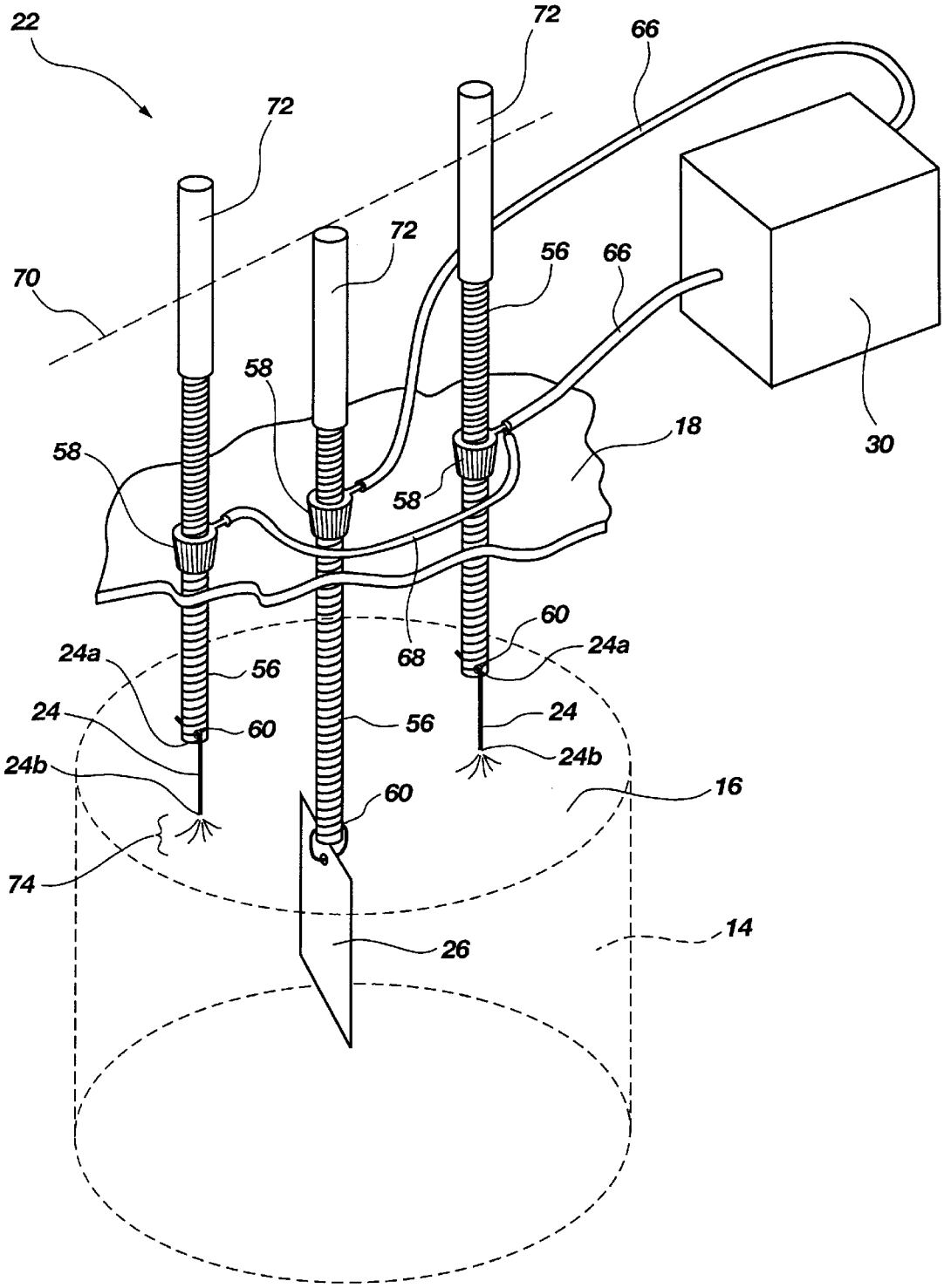

22
72
72
72
66
70
56
66
58
58
58
18
30
60
24a
56
68
24a
24
56
60
56
24
24b
24b
60
16
74
14
26

Fig. 3

APPARATUS AND METHOD FOR PRODUCING ANTIMICROBIAL SILVER SOLUTION

BACKGROUND OF THE INVENTION

1. The Field of the Invention

The present invention relates generally to colloidal silver, and more particularly, but not exclusively, to a device and method for producing a more stable solution of suspended silver, and in greater batch quantities and at higher rates of production per batch than are presently available.

2. Description of Related Art

It is well known that silver has germicidal properties. In fact, silver was employed as a germicide and antibiotic before modern antibiotics were developed. In previous centuries, users would shave silver particles into their drinking water, or submerge whole silver pieces in the drinking water, for the purpose of ingesting the silver by drinking the water.

Of current interest are apparatus and methods for providing a more effective and stable solution of silver. It is desired to provide colloidal silver to be taken orally for medicinal purposes, as well as to be applied topically and otherwise, for the purpose of enhancing the health of the individual.

There may be many reasons why administering silver suspended in solution would enhance an individual's health. It is possible that such a solution operates to inhibit the growth of bacteria, viruses, and other unwanted organisms, as well as eradicating such existing bacteria, viruses, and other organisms. It is also possible that a solution of silver can have an anti-inflammatory effect, sufficient to reduce symptoms of asthma. Silver in solution might also act in a similar fashion to a homeopathic remedy. These are just a few of the possible reasons why silver in solution, such as colloidal silver, is effective at enhancing health.

Attempts have been made in the prior art to produce silver-based solutions, including colloidal silver, some of which have been more successful than others. Many of the presently available silver-based products, however, are unstable and lose the silver to precipitation. A true colloid operates to maintain the colloidal particles in suspension over a period of several years, and perhaps indefinitely. Many of the silver products fail to maintain the silver particles in suspension, either because the silver solution is not a true colloid or because it is otherwise unstable. When the suspension of the silver particles fails, the particles fall to the bottom of the solution, thereby reducing the solution's concentration of silver and rendering it less effective.

Several U.S. patents describe various ways of making a silver-based solution, including U.S. Pat. Nos. 2,653,893 (granted Sep. 29, 1953 to Romans), 5,342,528 (granted Aug. 30, 1994 to Adachi et al., 4,043,932 (granted Aug. 23, 1977 to Fresenius et al.), 5,078,902 (granted Jan. 7, 1992 to Antelman), 5,266,534 (granted Nov. 30, 1993 to Atsumi et al.), 5,516,519 (granted May 14, 1996 to Oka et al.), 3,655,412 (granted Apr. 11, 1972 to Kumai et al.), 3,615,789 (granted Oct. 26, 1971 to Schaller), 5,785,972 (granted Jul. 28, 1998 to Tyler). Other literature includes "Instructions For Making Premium 'AC' Colloidal Silver," published by CS PRO Systems, Route 7, Box 510GG, San Antonio, Tex. 78264 (date of first publication unknown). These references fail to teach or suggest a process by which stable, colloidal silver may be produced in larger batch quantities and at increased rates of production. Even so, the patents and publications listed above in this paragraph, because of their background relevance, are incorporated herein by reference in their entirety.

The prior art is thus characterized by several disadvantages that are addressed by the present invention. The present invention minimizes, and in some aspects eliminates, the above-mentioned failures, and other problems, by utilizing the methods and structural features described herein.

BRIEF SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a method and apparatus for producing a silver-based solution.

It is another object of the present invention, in accordance with one aspect thereof, to provide such a method and apparatus for producing colloidal silver.

It is an additional object of the present invention, in accordance with one aspect thereof, to provide such a method and apparatus that is capable of increasing the quantity of silver-based solution produced per batch.

It is a further object of the present invention, in accordance with one aspect thereof, to provide such a method and apparatus that is capable of producing a silver-based solution at a significantly increased rate.

The above objects and others not specifically recited are realized in a specific illustrative embodiment of an apparatus and method for producing colloidal silver. A large-volume container, such as a fifteen gallon container, includes a hinged lid on which a rotational impeller is mounted along with several sets of electrodes that are electrically connected to a power transformer. The container is partially filled with water, and when the lid is closed, the sets of electrodes are disposed in communication with the water in a predetermined arrangement, and the impeller resides submerged in the water. Certain of the electrodes constitute silver wire. The power transformers convey current to the electrodes, preferably alternating current, at voltages sufficient to cause silver particles to separate from the silver wire and enter the solution in a stable, suspended state. The impeller is rotated, preferably continuously, to prevent the suspended silver from remaining in upper levels of the water, thereby dispersing the silver particles more uniformly throughout the volume of water.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by the practice of the invention without undue experimentation. The objects and advantages of the invention may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the invention will become apparent from a consideration of the subsequent detailed description presented in connection with the accompanying drawings in which:

FIG. **1** is a perspective, schematic view of an apparatus for producing colloidal silver, made in accordance with the principles of the present invention;

FIG. **2** is a plan view of the apparatus of FIG. **1**; and

FIG. **3** is a perspective, break-away schematic view of one of the sets of the electrodes of the apparatus of FIG. **1**.

DETAILED DESCRIPTION OF THE INVENTION

For the purposes of promoting an understanding of the principles in accordance with the invention, reference will

now be made to the embodiments illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended. Any alterations and further modifications of the inventive features illustrated herein, and any additional applications of the principles of the invention as illustrated herein, which would normally occur to one skilled in the relevant art and having possession of this disclosure, are to be considered within the scope of the invention claimed.

Applicants have discovered that the production of a silver-based solution, such as colloidal silver, is greatly enhanced by taking certain measures, such as agitating the solution at a constant, continuous rate during production, and adjusting the height of the silver electrodes during production, as well other steps that are discussed below in more detail.

Referring now to FIGS. **1–2**, there is shown a apparatus for producing a silver-based solution, the apparatus being designated generally at **10**. The apparatus **10** includes a cylindrical, water-tight container **12**, for containing a quantity of fluid therein, preferably water **14**, said water **14** having an upper surface **16**. A lid **18** is provided, preferably connected to the container **12** by a suitable hinge **20**.

The apparatus **10** includes several sets **22** of electrodes, eight sets being shown in the embodiment of FIG. **1**. Each set **22** preferably includes a pair of upper electrodes **24** connected to each other in parallel, and a lower, center electrode **26**. The reference numerals **22**, **24** and **26** include lead lines pointing to only one of the eight sets **22** of electrodes for simplicity, but it is to be understood that there are eight sets **22** of electrodes **24** and **26** in FIG. **1**.

Each set **22** of electrodes is electrically connected to a power transformer, and each set of electrodes most preferably has its own separate transformer **30**. The set of power transformers **30** is referred to as a transformer bank **32**. Each transformer **30** produces alternating electrical current at a suitable voltage, presently 10,500 volts, and conveys the current to each pair of upper electrodes **24** in alternating tandem with the center electrode **26**, such that the upper electrodes reach a level of +10,500 volts at the same time the center electrode **26** reaches a level of −10,500 volts, and vice versa.

Each set **22** of electrodes is preferably spaced apart from all of the other sets **22** of electrodes by a distance of at least five inches, such that an electrode **24** of one set **22** of electrodes would reside at least five inches away from an electrode **24** of all other sets **22** of electrodes.

The container **12** includes an upper lip **12***a* upon which the lid **18** rests. The lid **18** is preferably configured and dimensioned to be larger in all lateral directions than the upper lip **12***a,* such that the lid **18** includes a perimetric overhang **18***a* extending around the entirety of the upper lip **12***a* of the container **12**. The lid **18** further includes a plurality of air inlet openings **28** formed therein. An air outlet opening **34** is also formed in the lid **18**, and an air fan **36** is positioned adjacent to the air outlet opening **34** in a manner such that operation of the fan **36** draws relatively humid air from the container **12** out through the air outlet opening **34** and into atmosphere, thereby causing the surrounding, relatively dryer air to be drawn from atmosphere into the container **12** through the air inlet openings **28**. An optional air outlet channel **38** is provided and is attached to the lid **18** to surround the air outlet opening **34**, and the air fan **36** is mounted on top of the air outlet channel **38**.

An impeller **40** is rotatably attached to the lid by impeller rod **42**. The impeller **40** preferably resides in a lower half of the container **12** when the lid **18** is closed upon the upper lip **12***a* of the container **12**. A suitable motor **43** operates the impeller **40** as known to those skilled in the relevant art.

The container **12** and lid **18** are preferably formed from transparent material, such as a plastic having suitable strength. The apparatus **10** further includes a non-conductive housing **50** disposed on top of the lid **18** for covering any live conductive components that feed current to the electrodes **24** and **26**, to thereby prevent unsafe human contact with any such conductive components. The non-conductive housing **50** is preferably made from a transparent plastic.

Referring now more particularly to FIG. **3**, there is shown a perspective, break-away schematic view of one of the sets **22** of electrodes shown in FIG. **1**. The pair of upper electrodes **24**, and the lower, center electrode **26**, are each held in place with a conductive electrode holder **56**. The electrode holders **56** are preferably male threaded conductive rods. Conductive, female-threaded mounts **58** are fixedly attached to the lid **18**, for mating with the male-threaded holders **56** in threaded engagement. The mounts **58** are electrically connected to the transformer **30** as shown by electrical leads **66**. The two outer mounts **58** that correspond to the upper electrodes **24** are electrically connected in parallel by a parallel connector **68**. The electrode holders **56** include transverse throughbores **60** formed in distal ends thereof as shown, through which upper ends of the upper electrodes **24** are placed, and through which a conductive connector **62** is placed for connecting the lower, center electrode **26**, respectively.

The electrode holders **56** are positioned and arranged such that each holder **56** operates to hold only one electrode **24** or **26**. Each set of electrodes corresponds to a set of holders **56**, such that each set of holders **56** is spaced apart from all of the other sets of holders **56** by a distance of at least five inches.

The workings of the invention are brought about by forming an electrical circuit with the components described above, in which the circuit would not be closed except for the provision of fluid **14**, preferably water having some degree of conductivity to it. The conductivity of the fluid **14** is of course relatively low, making the resistance relatively high at the points where the upper electrodes **24** interface with the fluid **14**. The upper electrodes **24** are preferably silver wires, in which case the resistance produced by using the conductive fluid **14** to close the circuit operates to disrupt the silver electrodes **24** and cause particles of silver to separate from the electrodes **24** and enter the fluid **14** in suspension, preferably colloidal suspension. In this manner, as the silver particles are gradually separated from the upper electrodes, the fluid **14** gradually becomes a solution of suspended silver to be taken orally or topically as needed to enhance the personal health of the user. The silver solution fluid **14** may of course be taken or administered in any manner desired.

The positioning of the electrodes **24** and **26** has significance. The inventors have found that production is probably optimized by positioning the upper electrodes **24** such that their distal ends **24***b* reside above the surface **16** of the fluid **14**, and with the lower, center electrode **26** being at least partially submerged within the fluid **14**, if not fully submerged. The lower, center electrode **26** is preferably a planar conductive member, thereby providing a large amount of surface area to reduce the concentration of electrical resistance produced by it. The three electrode holders **56** are

preferably disposed in a row along a relatively straight line **70**, and it is preferable to position the lower, center electrode in a substantially perpendicular orientation with respect to the line **70**.

Non-conductive handles **72** are securely attached to upper end of the electrode holders **56** to enable users to turn the electrode holders **56**. The handles **72** preferably extend through the housing **50** such that all exposed portions of the electrode holders **56** residing above the lid **18** are contained within the housing **50** to thereby prevent unsafe human contact with such exposed, electrically live portions of the electrode holders **56**.

The distal ends **24***b* of the upper electrodes **24** are preferably maintained above the surface **16** of the fluid **14** at a distance within a range of 0 inches to 1 inch, and more preferably within a range of 0 inches to 3/16 inch. It will be appreciated that the length of the silver-wire upper electrodes **24** becomes gradually reduces as silver particles are disrupted and separated from the distal ends **24***b*, thereby increasing the distance by which the distal ends **24***b* reside above the surface **16**. When the distal ends **24***b* are too high above the surface **18**, "arcing" occurs, which is accompanied by an electrical arc that is produced between the distal end **24***b* and the surface **16** of the fluid **14**.

Applicants have discovered the colloidal silver produced while arcing occurs for significant periods is at least aesthetically contaminated, and may by contaminated in other ways as well. Suspended silver solution produced by the methods described herein, when utilizing a clear, clean water as the fluid **14**, retains a clear, sparkling and desirable appearance when produced without significant periods of arcing. In contrast, when arcing is permitted to occur for significant periods during production of the suspended silver solution, the resulting solution takes on an unpalatable, translucent appearance exhibiting a gray or dark green color.

Applicants have solved the problem of arcing by providing the male-threaded electrode holders **56** disposed in threaded engagement with the female-threaded mounts **58**. Users of the apparatus **10** may simply observe the position of the silver-wire upper electrodes **24**, and a particular electrode **24** becomes too short, the user can simply twist the corresponding handle **72** in the appropriate rotational direction to cause the electrode holder **56**, and hence the corresponding electrode **24**, to move closer to the surface **16** of the fluid **14**. In this manner, an appropriate distance **74** can be maintained between the distal ends **24***b* and the surface **16** of the fluid **14**, sufficient to prevent arcing from occurring.

It will be appreciated that the apparatus **10** may be operated as described herein to produce colloidal silver. Further, since opinions may differ as to what constitutes a true colloid and what does not, applicants note that the silver-based solution produced by the apparatus **10** has been found to possess all of the several known benefits of silver, including bactericidal benefits and anti-inflammatory benefits. Accordingly, the phrases "silver-based solution," "solution of suspended silver," "silver suspended in solution," and equivalent phrases, as used herein, shall be construed broadly to refer to colloidal silver as well as suspended silver that may not constitute a colloid by some definitions.

It will be appreciated that the container **12** may be referred to as a containing means for containing a quantity of fluid **14** therein such that said fluid **14** includes a free upper surface **16**. The upper electrodes **24** may be described as an upper, silver electrode made of silver element and having a first end and a second end.

The electrode holders **56** and the female-threaded mounts **58** may be described collectively as a holding means for (i) holding the first end **24***a* of the silver upper electrode **24**, and (ii) holding the second, distal end **24***b* of the silver electrode **24** within 0.5 inches of the free upper surface **16** of the fluid **14** when said fluid **14** is contained within the container **12**.

The power transformers **30** are controlled by one or more timers **31** as shown in FIG. **2**, said timers **31** being electrically connectable to a standard "AC" outlet shown schematically at **33**. Each power transformer **30** may be described as a power means electrically connected to the holding means (mounts **58** and electrode holders **56**) and to the lower electrode **26** for (i) conveying electrical current through said holding means to the upper, silver electrodes **24** and to said lower electrode **26** in a manner sufficient to produce a voltage difference between said upper and lower electrodes **24** and **26**, and (ii) thereby causing particles of silver to separate from the silver electrodes **24** and enter the fluid **14**.

The impeller **40** may be referred to as a dispersing means for dispersing the silver particles more evenly throughout the fluid **14** such that a higher quantity of suspended silver particles in solution can be produced per batch. As shown most clearly in FIG. **1**, rotational movement of the impeller **40** causes the fluid **14** to flow in internal currents **41** that swirl around the container **12** and cause the dispersing of the silver particles. The impeller **40** may further be described as a means for agitating the fluid **14** at a substantially continuous and substantially constant rate.

Without the agitating, dispersing effect of the impeller **40**, the suspended silver particles would tend to remain in an upper layer of the fluid **14**. As the silver particles become more concentrated within that upper layer, the conductivity of the fluid in contact with the upper electrodes **24** increases substantially, thereby reducing the electrical resistance, which reduces the rate of production of suspended silver particles. The agitation of the fluid **14** prevents the suspended silver particles from aggregating in the upper level of the fluid **14**, and disperses them generally uniformly through the fluid **14**, with the result that more suspended silver can be produced per batch, and at a faster rate.

It will be appreciated that any method of agitating the water could be utilized in lieu of the impeller **40** as desired. For example, a circulation pump (not shown) could be utilized in an appropriate manner known to those skilled in the relevant field to cause the fluid **14** to be pumped in a circulating flow, along a flowpath that could either be confined to the container **12** or might alternatively extend beyond the container **12**. A further alternative would be to place an air hose into the fluid **14** to dispense air bubbles throughout the fluid **14**, thereby agitating the fluid for the benefits described above.

The impeller **40** is preferably disposed in a central location of a horizontal dimension of the container **12**. The motor **43** is selected, based upon the viscosity of the fluid **14** and the size of the container **12**, to be capable of rotating the impeller **40** at a rotational velocity sufficient to agitate substantially all of any fluid residing in the container **12**.

It will be appreciated that the electrode holders **56**, with their throughbores **60**, constitute a means for holding the first end **24***a* of the upper, silver electrode **24** in a substantially fixed position in a vertical dimension with respect to said electrode holders **56**.

The air fan **36** may be replaced with an air blower, or any other suitable device capable of causing the airflow described herein by operation of the fan **36**. The fan **36** may

be described as a humidity-reducing means for reducing humidity of air residing within the container **12** above the fluid **14**.

In accordance with the features and combinations described above, a preferred method for producing a solution containing silver comprises the steps of:

(a) placing a silver electrode in close proximity to a body of water;

(b) conveying electrical current through the silver electrode to thereby separate particles of silver from said silver electrode in a manner sufficient to cause production of suspended silver particles in solution within the water; and

(c) agitating the water during said production of suspended silver particles in solution to thereby disperse the silver particles into a more uniform concentration within said water such that a higher quantity of suspended silver particles in solution can be produced per batch.

An additional and alternative, preferred method for producing a solution containing silver comprises the steps of:

(a) establishing an electrical circuit comprising a current source, and a first conductor electrically connected to said current source and a second conductor electrically connected to said current source, wherein said first conductor resides spaced apart from said second conductor, wherein the first conductor is made of silver element;

(b) closing the circuit by placing the first conductor and the second conductor in communication with a fluidic resistor;

(c) operating the current source to supply alternating current simultaneously to the first conductor and the second conductor such that voltage is increasing and decreasing within the first and second conductors in alternating tandem to thereby cause silver particles to separate from the first electrode and enter the fluidic resistor and become disposed in suspension within said fluidic resistor; and

(d) selectively adjusting the first electrode by moving it toward the fluidic resistor as said first electrode decreases in length due to gradual separation of silver particles therefrom to thereby prevent arcing from occurring between said first electrode and said fluidic resistor.

It is to be understood that the above-described arrangements are only illustrative of the application of the principles of the present invention. Numerous modifications and alternative arrangements may be devised by those skilled in the art without departing from the spirit and scope of the present invention and the appended claims are intended to cover such modifications and arrangements. Thus, while the present invention has been shown in the drawings and fully described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred embodiment(s) of the invention, it will be apparent to those of ordinary skill in the art that numerous modifications, including, but not limited to, variations in the processes, size, materials, shape, form, function and manner of operation, assembly and use may be made without departing from the principles and concepts set forth herein.

What is claimed is:

1. An apparatus for producing a solution containing silver, said apparatus comprising:

a containing means for containing a quantity of fluid therein such that said fluid includes a free upper surface;

at least one upper, silver electrode made of silver element and having a first end and a second end;

holding means for (i) holding the first end of the silver electrode, and (ii) holding the second end of the silver electrode within 0.5 inch of the free upper surface of the fluid when said fluid is contained within the containing means;

a lower electrode;

a power means electrically connected to the holding means and to the lower electrode for (i) conveying electrical current through said holding means to the upper, silver electrode and to said lower electrode in a manner sufficient to produce a voltage difference between said upper and lower electrodes, and (ii) thereby causing particles of silver to separate from the silver electrode and enter the fluid; and

dispersing means for dispersing the silver particles more evenly throughout said fluid such that a higher quantity of suspended silver particles in solution can be produced per batch.

2. The apparatus of claim **1**, wherein the dispersing means comprises agitating means for agitating said fluid, said agitating means being positioned to reside at least partially submerged within the fluid when said fluid is contained in the containing means.

3. The apparatus of claim **2**, wherein the agitating means further comprises an impeller rotatably disposed in a lower half of the containing means.

4. The apparatus of claim **3**, wherein the impeller is disposed in a central location of a horizontal dimension of the containing means.

5. The apparatus of claim **3**, wherein the agitating means further comprises a means for rotating the impeller at a rotational velocity sufficient to agitate substantially all of any liquid residing in the containing means.

6. The apparatus of claim **2**, wherein the agitating means further comprises means for agitating the fluid at a substantially continuous and substantially constant rate.

7. The apparatus of claim **1**, wherein the holding means further comprises means for holding the first end of the upper, silver electrode in a substantially fixed position in a vertical dimension with respect to said holding means.

8. The apparatus of claim **1**, wherein the containing means further comprises a water-tight container having an upper opening, and a lid removably disposed over said upper opening.

9. The apparatus of claim **8**, wherein the lid is configured and dimensioned to span the upper opening of the container across all lateral directions such that said lid further comprises a perimetric overhang extending around an entire perimeter of the upper opening of the container.

10. The apparatus of claim **8**, wherein the container further comprises a rim defining the upper opening, said rim terminating in an upper perimeter that is substantially common to a single plane, and wherein the lid further comprises a substantially planar member.

11. The apparatus of claim **8**, wherein at least a portion of the lid is transparent and includes a plurality of openings formed therein to permit air to flow into and from the container.

12. The apparatus of claim **1**, further comprising humidity-reducing means for reducing humidity of air residing within the containing means above any fluid disposed in said containing means.

13. The apparatus of claim **12**, wherein the humidity-reducing means comprises an air fan.

14. The apparatus of claim **12**, wherein the humidity-reducing means comprises airflow means for causing air to flow into and from the containing means.

15. The apparatus of claim 1:

wherein the containing means further comprises a lid having an opening formed therein;

wherein the holding means comprises an electrode holding member disposed within the opening formed in the lid, and a positioning means for (i) holding said electrode holding member within the opening formed in the lid at a desired position, and (ii) selectively moving said electrode holding member upwardly or downwardly within the hole formed in the lid.

16. The apparatus of claim 15, wherein the electrode holding member comprises an electrically conductive, male-threaded cylindrical member, and wherein the positioning means comprises an electrically conductive female-threaded member fixedly secured to the lid within the hole formed in the lid, and wherein the male-threaded cylindrical member is threadably engaged within the female-threaded member such that rotating the male-threaded cylindrical member in a first rotational direction operates to move said male-threaded cylindrical member downwardly, and rotating the male-threaded cylindrical member in a second, opposing rotational direction operates to move said male-threaded cylindrical member upwardly.

17. The apparatus of claim 16, wherein the male-threaded cylindrical member includes an axis, and a distal end, and a through-bore formed in said distal end in a transverse direction with respect to the axis, and wherein the first end of the upper, silver electrode is disposed within the through-bore of said male-threaded cylindrical member.

18. The apparatus of claim 1, wherein the lower electrode is disposed at a lower position with respect to the upper, silver electrode.

19. The apparatus of claim 18, wherein the lower electrode comprises a planar member.

20. The apparatus of claim 1, wherein the holding means comprises at least one electrically conductive electrode holder, and an electrically non-conductive handle member disposed on an upper end of the at least one electrically conductive electrode holder.

21. The apparatus of claim 20, wherein the containing means comprises a lid, and wherein the electrically conductive electrode holder extends through a hole formed in said lid, such that a conductive portion of said electrode holder resides above the lid, the apparatus further comprising:

an electrically non-conductive housing disposed on the lid and covering any exposed conductive portion of the electrode holder, said housing having an opening formed in an upper portion thereof and wherein the electrically non-conductive handle member extends upwardly through said opening formed in the housing.

22. The apparatus of claim 1, wherein the power means further comprises a means for conveying alternating current simultaneously through the upper, silver electrode and through the lower electrode such that voltage is increasing and decreasing in the upper, silver electrode and in the lower electrode in alternating tandem.

23. The apparatus of claim 1, wherein the solution comprises silver in suspension.

24. The apparatus of claim 1, wherein the solution comprises colloidal silver.

25. An apparatus for producing a solution containing silver, said apparatus comprising:

a containing means for containing a quantity of fluid therein such that said fluid includes a free upper surface;

at least one upper, silver electrode made of silver element and having a first end and a second end;

holding means for (i) holding the first end of the silver electrode, and (ii) holding the second end of the silver electrode within 0.5 inch of the free upper surface of the fluid when said fluid is contained within the containing means;

a lower electrode;

a power means electrically connected to the holding means and to the lower electrode for (i) conveying electrical current through said holding means to the upper, silver electrode and to said lower electrode in a manner sufficient to produce a voltage difference between said upper and lower electrodes, and (ii) thereby causing particles of silver to separate from the silver electrode and enter the fluid; and

dispersing means for dispersing the silver particles among several different levels of depth of the fluid in a manner sufficient to avoid formation of a warmer uppermost layer.

26. The apparatus of claim 25, wherein the power means further comprises a means for conveying alternating current simultaneously through the upper, silver electrode and through the lower electrode such that voltage is increasing and decreasing in the upper, silver electrode and in the lower electrode in alternating tandem.

27. The apparatus of claim 25, wherein the solution comprises silver in suspension.

28. The apparatus of claim 25, wherein the solution comprises colloidal silver.

29. The apparatus of claim 25, wherein the dispersing means comprises agitating means for agitating said fluid, said agitating means being positioned to reside at least partially submerged within the fluid when said fluid is contained in the containing means.

30. The apparatus of claim 29, wherein the agitating means further comprises an impeller rotatably disposed in a lower half of the containing means.

31. An apparatus for producing a solution containing silver, said apparatus comprising:

a containing means for containing a quantity of fluid therein such that said fluid includes a free upper surface;

at least one upper, silver electrode made of silver element and having a first end and a second end;

holding means for (i) holding the first end of the silver electrode, and (ii) holding the second end of the silver electrode within 0.5 inch of the free upper surface of the fluid when said fluid is contained within the containing means;

a lower electrode;

a power means electrically connected to the holding means and to the lower electrode for (i) conveying electrical current through said holding means to the upper, silver electrode and to said lower electrode in a manner sufficient to produce a voltage difference between said upper and lower electrodes, and (ii) thereby causing particles of silver to separate from the silver electrode and enter the fluid; and

adjusting means actuable from a position external to the containing means for selectively moving the upper, silver electrode upwardly and downwardly.

32. The apparatus of claim 31, further comprising:

dispersing means for dispersing the silver particles more evenly throughout said fluid such that a higher quantity of suspended silver particles in solution can be produced per batch.

33. The apparatus of claim 31, wherein the containing means comprises a lid having a hole formed therein, and wherein the holding means comprises an electrode holding member disposed within the opening formed in the lid, and wherein the adjusting means further comprises a means for (i) holding said electrode holding member within the opening formed in the lid at a desired position, and (ii) selectively moving said electrode holding member upwardly or downwardly within the hole formed in the lid.

34. The apparatus of claim 33, wherein the electrode holding member comprises an electrically conductive, male-threaded cylindrical member, and wherein the adusting means further comprises an electrically conductive female-threaded member fixedly secured to the lid within the hole formed in the lid, and wherein the male-threaded cylindrical member is threadably engaged within the female-threaded member such that rotating the male-threaded cylindrical member in a first rotational direction operates to move said male-threaded cylindrical member downwardly, and rotating the male-threaded cylindrical member in a second, opposing rotational direction operates to move said male-threaded cylindrical member upwardly.

35. The apparatus of claim 34, wherein the male-threaded cylindrical member includes an axis, and a distal end, and a through-bore formed in said distal end in a transverse direction with respect to the axis, and wherein the first end of the upper, silver electrode is disposed within the through-bore of said male-threaded cylindrical member.

36. An apparatus for producing a solution containing silver, said apparatus comprising:

a containing means for containing a quantity of fluid therein such that said fluid includes a free upper surface;

a plurality of pairs of upper, silver electrodes made of silver element, each pair of electrodes being electrically interconnected in parallel and each electrode having a first end and a second end;

holding means for (i) holding the first ends of the silver electrodes, and (ii) holding the second ends of the silver electrodes within 0.5 inch of the free upper surface of the fluid when said fluid is contained within the containing means;

a plurality of lower electrodes disposed such that each lower electrode reside closer to one pair of upper, silver electrodes than to all other pairs of upper, silver electrodes, respectively, such that a pair of upper, silver electrodes and at least one lower electrode comprises a set of electrodes;

a power means electrically connected in series to the holding means and to the lower electrodes for (i) conveying current to said upper electrodes and to said lower electrodes in a manner sufficient to produce a voltage difference between the upper electrodes and the lower electrode in each set of electrodes, and (ii) thereby causing particles of silver to separate from the upper, silver electrodes and enter the fluid.

37. The apparatus of claim 36, wherein the power means further comprises a means for conveying alternating current simultaneously through the pair of upper, silver electrodes and through the lower electrode in each set of electrodes, respectively, such that voltage is increasing and decreasing in the pair of upper, silver electrodes and in the lower electrode in alternating tandem.

38. The apparatus of claim 36, wherein each set of electrodes is spaced apart from all of the other sets of electrodes by a distance of at least five inches.

39. The apparatus of claim 36, wherein the holding means comprises a plurality of holding members positioned and arranged such that each holding member operates to hold only one electrode, and wherein each set of electrodes corresponds to a set of holding members, and wherein each set of holding members is spaced apart from all of the other sets of holding members by a distance of at least five inches.

40. The apparatus of claim 36, wherein the solution comprises silver in suspension.

41. The apparatus of claim 36, wherein the solution comprises colloidal silver.

42. The apparatus of claim 36, further comprising:

dispersing means for dispersing the silver particles more evenly throughout said fluid such that a higher quantity of suspended silver particles in solution can be produced per batch.

43. The apparatus of claim 42, wherein the dispersing means comprises agitating means for agitating said fluid, said agitating means being positioned to reside at least partially submerged within the fluid when said fluid is contained in the containing means.

44. The apparatus of claim 43, wherein the agitating means further comprises an impeller rotatably disposed in a lower half of the containing means.

45. An apparatus for producing a solution containing silver, said apparatus comprising:

a containing means for containing a quantity of fluid therein such that said fluid includes a free upper surface;

at least one upper, silver electrode made of silver element and having a first end and a second end;

holding means for (i) holding the first end of the silver electrode, and (ii) holding the second end of the silver electrode within 0.5 inch of the free upper surface of the fluid when said fluid is contained within the containing means;

a lower electrode;

a power means electrically connected to the holding means and to the lower electrode for (i) conveying electrical current through said holding means to the upper, silver electrode and to said lower electrode in a manner sufficient to produce a voltage difference between said upper and lower electrodes, and (ii) thereby causing particles of silver to separate from the silver electrode and enter the fluid;

wherein the holding means further comprises means for holding the first end of the silver member in a substantially fixed position in a vertical dimension with respect to said holding means.

46. An apparatus for producing a silver solution containing silver, said apparatus comprising:

a containing means for containing a quantity of fluid therein such that said fluid includes a free upper surface;

at least one upper electrode;

at least one silver member made of silver element and having a first end and a second end;

holding means for (i) holding the first end of the silver member in contact with the upper electrode, and (ii) holding the second end of the silver member within 0.5 inch of the free upper surface of the fluid when said fluid is contained within the containing means;

a lower electrode;

a power means electrically connected to the upper electrode and to the lower electrode for (i) conveying

current to said upper electrode and to said lower electrode in a manner sufficient to produce a voltage difference between said upper and lower electrodes, and (ii) thereby causing particles of silver to separate from the silver member and enter the fluid;

dispersing means for dispersing the silver particles among different levels of depth of the fluid in a manner sufficient to enable the silver solution to be produced in single-batch quantities having a depth greater than six inches per batch without significant reduction in concentration of the silver solution.

47. The apparatus of claim **46**, wherein the dispersing means further comprises means for dispersing the silver particles among different levels of depth of the fluid in a manner sufficient to enable the silver solution to be produced in single-batch quantities having a depth greater than twelve inches per batch without significant reduction in concentration of the silver solution.

48. The apparatus of claim **46**, wherein the dispersing means further comprises means for dispersing the silver particles among different levels of depth of the fluid in a manner sufficient to enable the silver solution to be produced in single-batch quantities having a depth greater than twenty-four inches per batch without significant reduction in concentration of the silver solution.

49. An apparatus for producing a silver solution containing silver, said apparatus comprising:

a containing means for containing a quantity of fluid therein such that said fluid includes a free upper surface;

at least one upper electrode;

at least one silver member made of silver element and having a first end and a second end;

holding means for (i) holding the first end of the silver member in contact with the upper electrode, and (ii) holding the second end of the silver member within 0.5 inch of the free upper surface of the fluid when said fluid is contained within the containing means;

a lower electrode;

a power means electrically connected to the upper electrode and to the lower electrode for (i) conveying current to said upper electrode and to said lower electrode in a manner sufficient to produce a voltage difference between said upper and lower electrodes, and (ii) thereby causing particles of silver to separate from the silver member and enter the fluid; and

dispersing means for dispersing the silver particles among different levels of depth of the fluid in a manner sufficient to enable the silver solution to be produced in single-batch quantities greater than five gallons per batch without significant reduction in concentration of the silver solution.

50. The apparatus of claim **49**, wherein the dispersing means further comprises means for dispersing the silver particles among different levels of depth of the fluid in a manner sufficient to enable the silver solution to be produced in single-batch quantities greater than ten gallons per batch without significant reduction in concentration of the silver solution.

51. The apparatus of claim **49**, wherein the dispersing means further comprises means for dispersing the silver particles among different levels of depth of the fluid in a manner sufficient to enable the silver solution to be produced in single-batch quantities greater than fifteen gallons per batch without significant reduction in concentration of the silver solution.

52. An apparatus for producing a solution containing silver, said apparatus comprising:

means for removing silver particles from objects made of silver element and disposing said silver particles in suspension in a fluid solution; and

means for agitating the fluid solution to thereby disperse the silver particles more evenly throughout said fluid.

53. An apparatus for producing a solution containing silver, said apparatus comprising:

a containing means for containing a quantity of fluid therein such that said fluid includes a free upper surface;

at least one upper, silver electrode made of silver element and having a first end and a second end;

holding means for (i) holding the first end of the silver electrode, and (ii) holding the second end of the silver electrode within 0.5 inch of the free upper surface of the fluid when said fluid is contained within the containing means;

a lower electrode;

a power means electrically connected to the holding means and to the lower electrode for (i) conveying electrical current through said holding means to the upper, silver electrode and to said lower electrode in a manner sufficient to produce a voltage difference between said upper and lower electrodes, and (ii) thereby causing particles of silver to separate from the silver electrode and enter the fluid;

dispersing means for dispersing the silver particles more evenly throughout said fluid such that a higher quantity of suspended silver particles in solution can be produced per batch;

wherein the dispersing means comprises agitating means for agitating said fluid, said agitating means being positioned to reside at least partially submerged within the fluid when said fluid is contained in the containing means;

wherein the agitating means further comprises an impeller rotatably disposed in a lower half of the containing means;

wherein the impeller is disposed in a central location of a horizontal dimension of the containing means;

wherein the agitating means further comprises a means for rotating the impeller at a rotational velocity sufficient to agitate substantially all of any liquid residing in the containing means;

wherein the holding means further comprises means for holding the first end of the upper, silver electrode in a substantially fixed position in a vertical dimension with respect to said holding means;

wherein the containing means further comprises a watertight container having an upper opening, and a lid removably disposed over said upper opening;

wherein the lid is configured and dimensioned to span the upper opening of the container across all lateral directions such that said lid further comprises a perimetric overhang extending around an entire perimeter of the upper opening of the container;

wherein the container further comprises a rim defining the upper opening, said rim terminating in an upper perimeter that is substantially common to a single plane, and wherein the lid further comprises a substantially planar member;

humidity-reducing means for reducing humidity of air residing within the containing means above any fluid disposed in said containing means;

wherein the humidity-reducing means comprises an air fan;

wherein the humidity-reducing means comprises airflow means for causing air to flow into and from the containing means;

wherein at least a portion of the lid is transparent and includes a plurality of openings formed therein to permit air to flow into and from the container;

wherein the holding means comprises at least one electrode holding member disposed within the opening formed in the lid, and a positioning means for (i) holding said electrode holding member within the opening formed in the lid at a desired position, and (ii) selectively moving said electrode holding member upwardly or downwardly within the hole formed in the lid;

wherein the at least one electrode holding member comprises at least one electrically conductive, male-threaded cylindrical member, and wherein the positioning means comprises an electrically conductive female-threaded member fixedly secured to the lid within the hole formed in the lid, and wherein the male-threaded cylindrical member is threadably engaged within the female-threaded member such that rotating the male-threaded cylindrical member in a first rotational direction operates to move said male-threaded cylindrical member downwardly, and rotating the male-threaded cylindrical member in a second, opposing rotational direction operates to move said male-threaded cylindrical member upwardly;

wherein the male-threaded cylindrical member includes an axis, and a distal end, and a through-bore formed in said distal end in a transverse direction with respect to the axis, and wherein the first end of the upper, silver electrode is disposed within the through-bore of said male-threaded cylindrical member;

wherein the lower electrode is disposed at a lower position with respect to the upper, silver electrode;

wherein the lower electrode comprises a planar member;

wherein the holding means further comprises an electrically non-conductive handle member disposed on an upper end of the male-threaded, electrically conductive cylindrical member;

wherein the male-threaded, electrically conductive cylindrical member extends through a hole formed in the lid, such that a conductive portion of said electrically conductive cylindrical member resides above the lid, the apparatus further comprising:

an electrically non-conductive housing disposed on the lid and covering any exposed conductive portion of any electrode holders disposed on the lid, said housing having an opening formed in an upper portion thereof and wherein the electrically non-conductive handle member extends upwardly through said opening formed in the housing;

wherein the power means further comprises a means for conveying alternating current simultaneously through the upper, silver electrode and through the lower electrode such that voltage is increasing and decreasing in the upper, silver electrode and in the lower electrode in alternating tandem;

wherein the agitating means further comprises means for agitating the fluid at a substantially continuous and substantially constant rate.

54. An apparatus for producing a solution containing silver, said apparatus comprising: a containing means for containing a quantity of fluid therein such that said fluid includes a free upper surface; at least one upper, silver electrode made of silver element and having a first end and a second end; holding means for (i) holding the first end of the silver electrode, and (ii) holding the second end of the silver electrode within 0.5 inch of the free upper surface of the fluid when said fluid is contained within the containing means; a lower electrode; and a power means electrically connected to the holding means and to the lower electrode.

* * * * *