Feb. 15, 1955 S. J. SMITH 2,702,042

ARTICLE CLEANING AND DRYING MACHINE

Filed Jan. 23, 1948 4 Sheets-Sheet 1

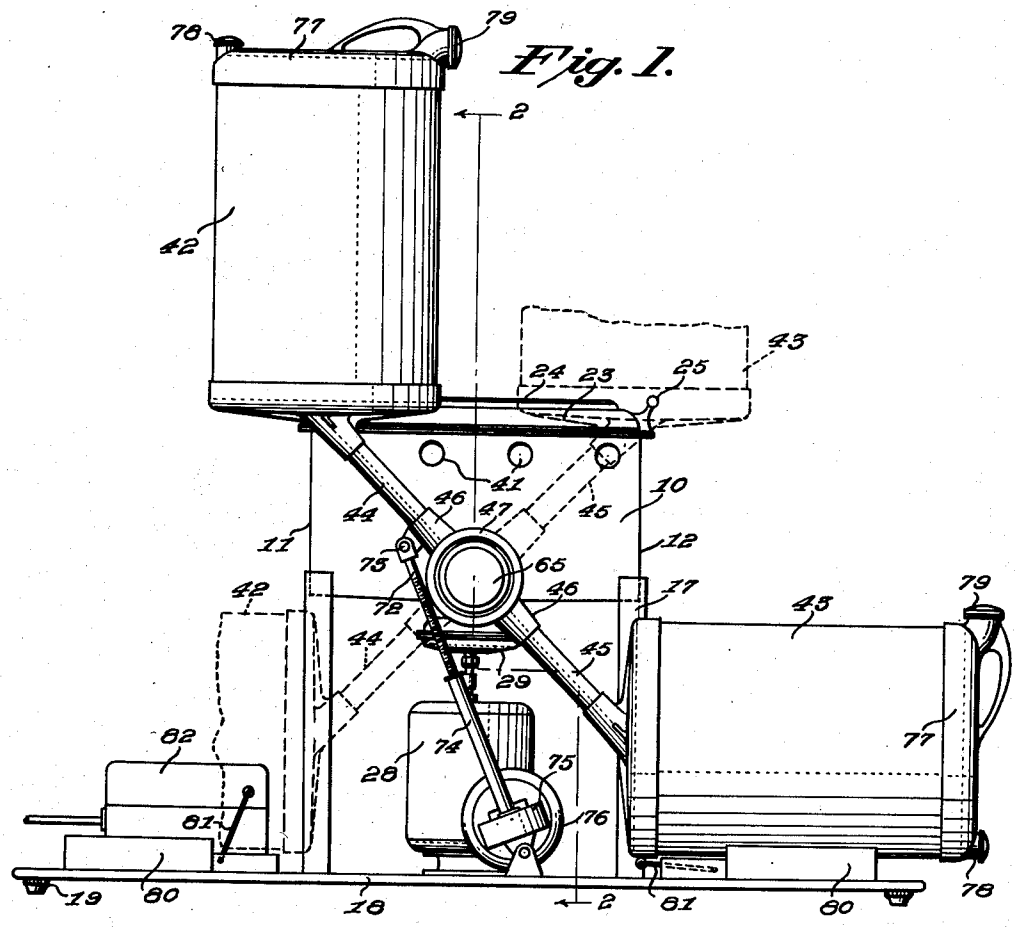


Fig. 1.

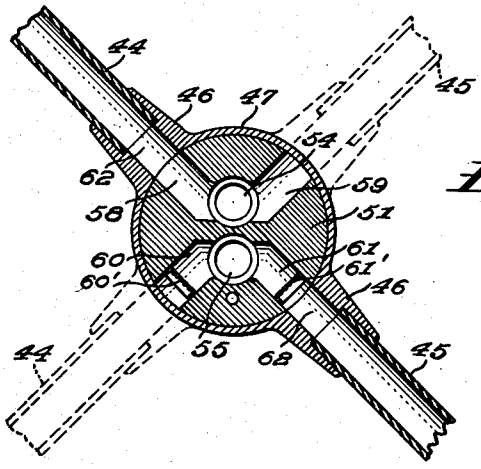


Fig. 3.

INVENTOR.
Sigmund J. Smith
BY

Feb. 15, 1955 S. J. SMITH 2,702,042

ARTICLE CLEANING AND DRYING MACHINE

Filed Jan. 23, 1948 4 Sheets-Sheet 2

Fig. 2.

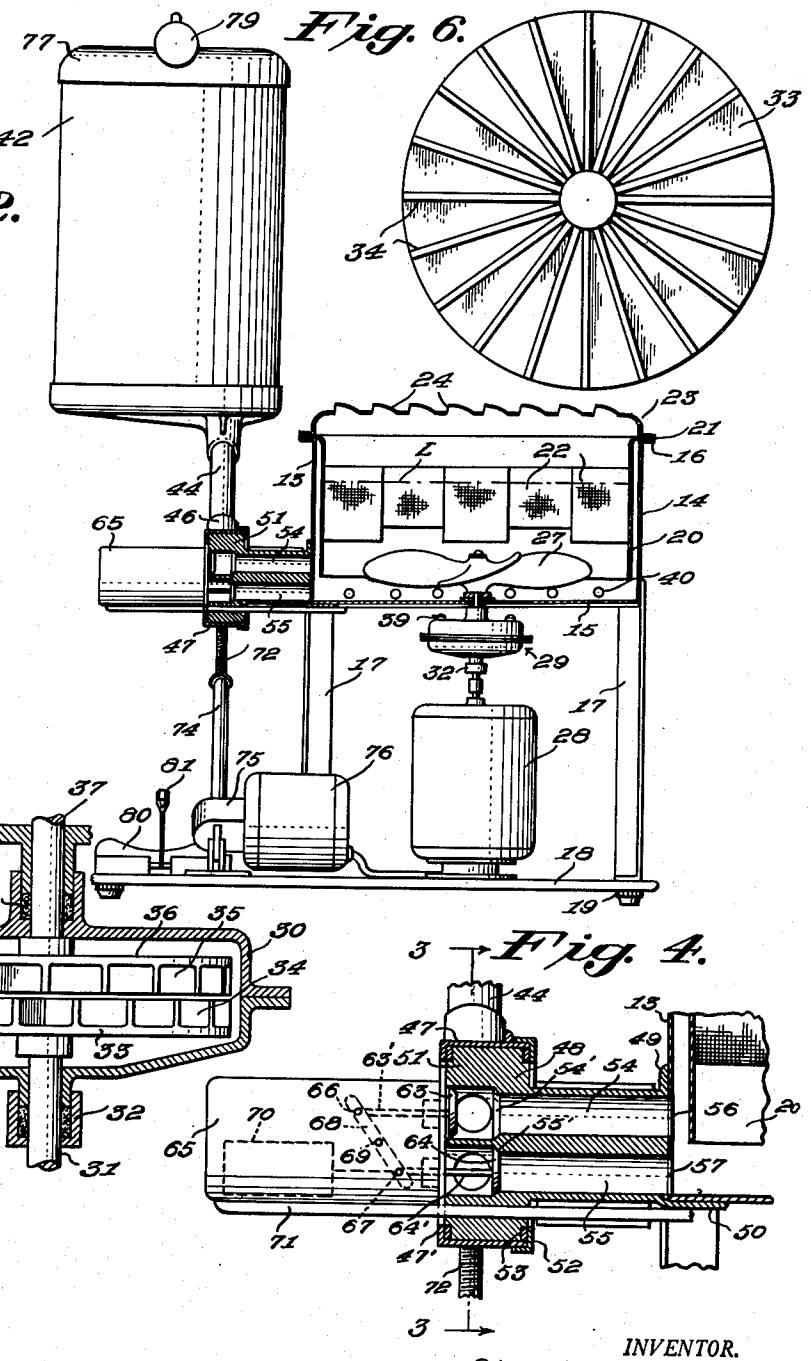


Fig. 6.

Fig. 5.

Fig. 4.

INVENTOR.
Sigmund J. Smith
BY

Feb. 15, 1955 S. J. SMITH 2,702,042

ARTICLE CLEANING AND DRYING MACHINE

Filed Jan. 23, 1948 4 Sheets-Sheet 3

Fig. 7. - SYSTEM OFF -

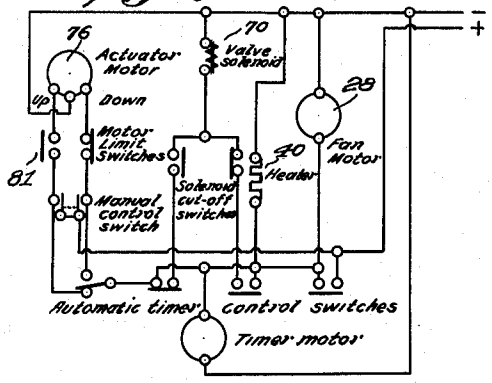


Fig. 10. - RINSING POSITION -

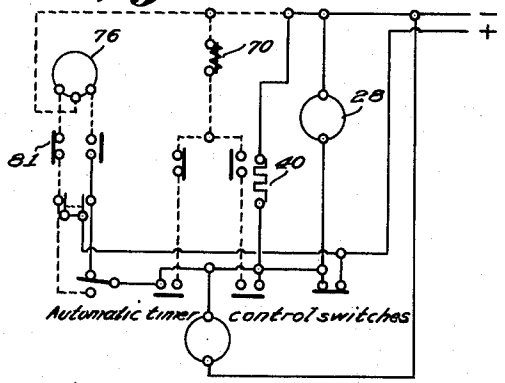


Fig. 8. - WASH -

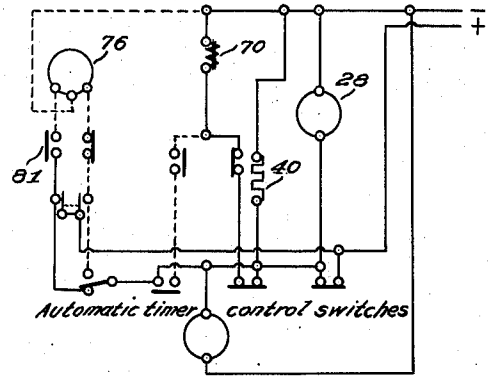


Fig. 11. - RINSE -

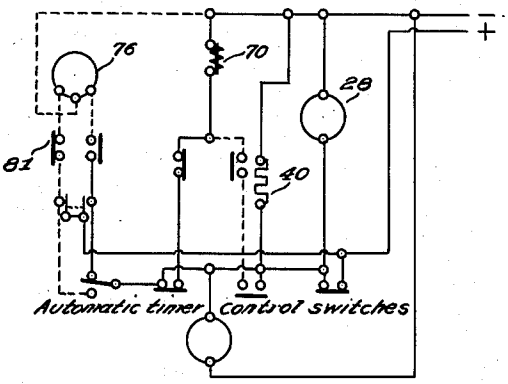


Fig. 9. - END WASH -

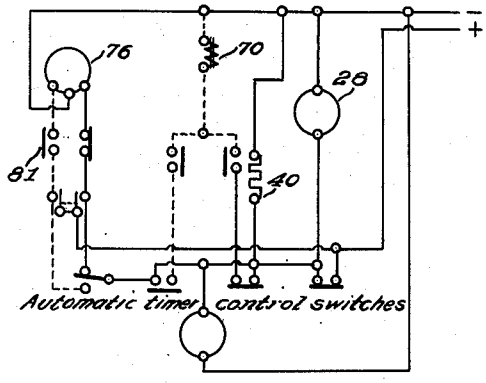
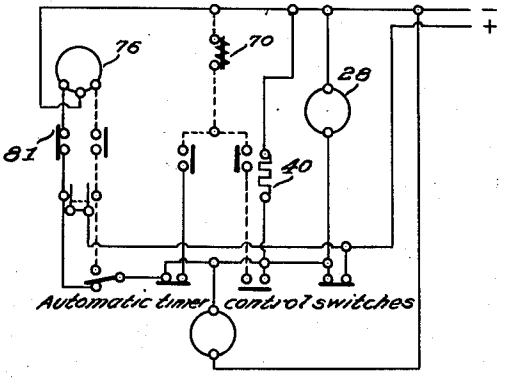


Fig. 12. - BEGIN DRY -



INVENTOR.
Sigmund J. Smith
BY
Lester E. Clements

Feb. 15, 1955 S. J. SMITH 2,702,042

ARTICLE CLEANING AND DRYING MACHINE

Filed Jan. 23, 1948 4 Sheets-Sheet 4

Fig. 13.

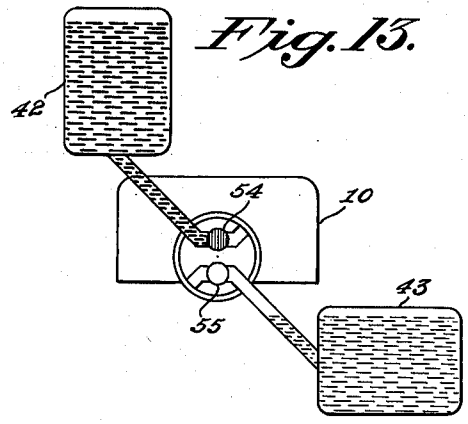


Fig. 16.

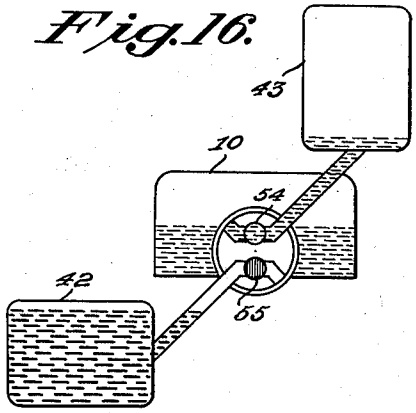


Fig. 14.

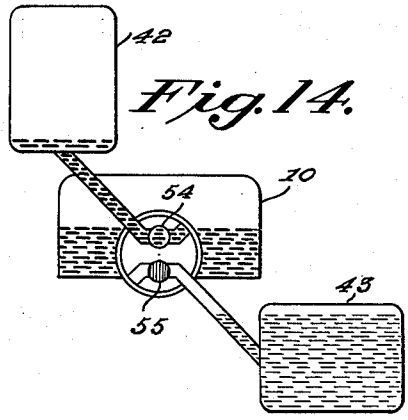


Fig. 17.

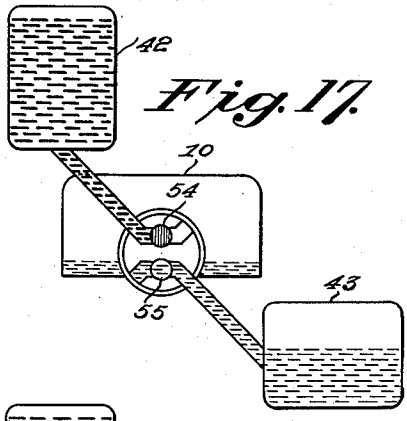


Fig. 15.

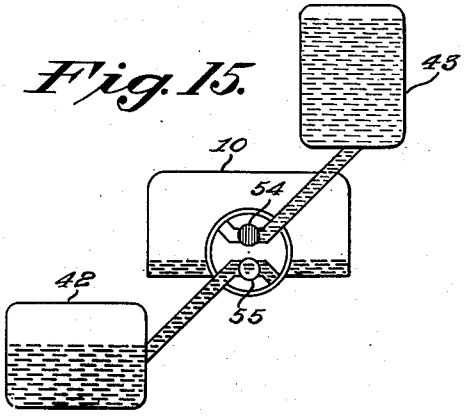
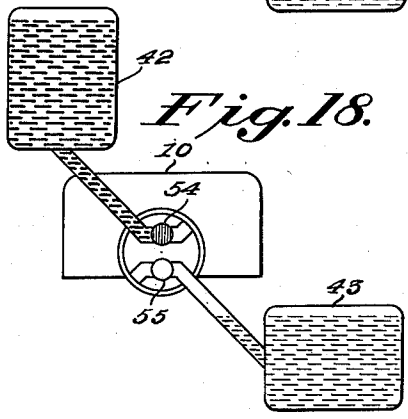


Fig. 18.



INVENTOR.
Sigmund J. Smith
BY
Ladas & Clements

United States Patent Office 2,702,042
Patented Feb. 15, 1955

2,702,042

ARTICLE CLEANING AND DRYING MACHINE

Sigmund J. Smith, Hagerstown, Md.

Application January 23, 1948, Serial No. 4,037

17 Claims. (Cl. 134—56)

This invention relates to an automatic instrument cleaning and drying machine. The invention, while being suitable for cleaning various forms of articles, is particularly adapted for the cleaning of delicate instruments such as watches, by subjecting same to successive washing, rinsing and drying operations while supported in a stationary position.

The practice heretofore in general use for the cleaning of watches, for instance, involved various forms of manual as well as automatic machines employing associated apparatus, all of which required the handling and rehandling of a watch from one station in the cleaning process to another, and a still further movement of the watch at each station, usually a spinning movement. In such machines of the prior art, with which applicant is familiar, the watch must be placed within a suspended basket or like supported perforated container after which the basket is submerged in a tank of cleaning or other solution. At such times the basket is subjected to vigorous movements relative to the tank or other containers employed at the various stations to effect the desired cleaning, rinsing or drying operation thereon.

While a watch may be well cleaned and dried in the devices of the prior art just discussed, the process is slow and damage is often inflicted upon the delicate watch works, making such devices time-consuming as well as expensive to operate and maintain.

A primary object of the present invention is, therefore, to provide an instrument cleaning and drying apparatus embodying a single treating chamber for stationary support of one or a plurality of instruments therein, and associated washing solution and rinsing solution supporting tanks mounted for movement relative to the chamber for discharging their contents in succession into the treating chamber with subsequent draining of the respective solutions therefrom and into the proper tanks, together with propeller means in the treating chamber for agitating the respective fluids therein and also for drying the instruments after draining of the rinsing solution from the chamber.

Another object of the invention is the provision of such an apparatus including a treating chamber and relatively movable cleaning solution and rinsing solution tanks having clockwork controlled mechanism to move the tanks to and from discharging and receiving positions and to control the timed relation of the flow of the solutions to and from the treating chamber and said tanks according to predetermined set conditions.

A further object of the invention is to provide a watch cleaning machine with a washing solution receiving chamber having a perforated watch supporting tray therein for submersion of the watches in the solution, and a motor driven propeller also disposed within the chamber and wherein a fluid friction transmission is disposed between the motor and propeller, whereby the propeller has a solution churning and propelling movement substantially slower than that of the motor when the propeller is submerged in the fluid, and a substantially increased rate of movement upon draining of the solution from the chamber for serving as a fan to dry the watches supported on the tray.

A still further object of the invention is the provision of a watch cleaning machine wherein watches are stationarily supported while being successively subjected to the action of washing and rinsing solutions, and wherein the machine includes separate washing and rinsing solution supporting tanks for successive draining of the

solutions into and out of a treating chamber, and wherein filter means is provided for cleaning the solution upon being drained from the treating chamber.

A still further object of the invention is the provision of a watch cleaning machine which may be pre-set for desired operating conditions after which it is wholly automatic in operation to subject watches stationarily supported on a tray therein to successive washing, rinsing and drying operations and wherein separate washing and rinsing solutions are supported, dispersed and maintained for use in successive cleaning operations.

A still further object of the invention is the provision of a watch cleaning machine which is relatively simple in construction, durable, efficient in operation and which is capable of manufacture and maintenance at relatively low cost.

Other objects and advantages of the invention will become apparent in the course of the following detailed description taken in connection with the accompanying drawings, wherein—

Fig. 1 is an end elevational view of the improved machine in accordance with a preferred structural embodiment thereof, certain of the parts being shown in another operative position in dotted lines;

Fig. 2 is a vertical sectional view in the planes of the broken line 2—2, on Fig. 1;

Fig. 3 is a vertical sectional view in the plane of line 3—3 on Fig. 4;

Fig. 4 is an enlarged view of a portion of the structure shown in Fig. 2 which controls the flow of washing and rinsing solutions to and from the treating chamber, the view being partially in side elevation and partially in vertical section;

Fig. 5 is an axial vertical sectional view of a fluid friction transmission for the propeller embodied in the machine;

Fig. 6 is a plan view of one of the two cooperating fluid friction discs embodied in the transmission shown in Fig. 5;

Figs. 7 to 12 inclusive are electrical circuit diagrams disclosing various switch arrangements in the successive phases of a cleaning operation by the machine; and

Figs. 13 to 18 inclusive are diagrammatic views showing the flow of washing and rinsing fluid to and from the treating chamber in the successive phases of a cleaning operation.

Referring now in detail to the drawings, the machine includes a washing tank or chamber **10** which is preferably rectangular in plan and comprises opposed side walls **11** and **12** and other opposed side walls **13** and **14** disposed at right angles to the first walls. This chamber further includes a bottom wall **15**. The top of the chamber is open and the side walls terminate at the top of the tank in out-turned flanges **16**. The chamber **10** is suitably supported by uprights **17** which engage the corners of the chamber adjacent its bottom wall **15** and the uprights at their lower ends rest on a base **18** provided with leveling feet **19**.

While the space between chamber **10** and base **18** is shown open, suitable cover plates may be provided to conceal and protect certain structures within said space which are later referred to. The chamber **10** is adapted to successively contain washing and rinsing solutions which are alternately admitted thereto and drained therefrom by means which will be later described. It is important that the articles to be cleaned and dried are stationarily supported within the chamber for all operations thereon. For this purpose a removable, four-sided liner **20** is provided which includes an out-turned top flange **21** removably seated on the top flanges **16** of the chamber **10**. This liner **20** suitably supports a wire mesh tray **22** in which the articles to be washed are deposited. The tray may be partitioned or otherwise shaped or constructed to provide a plurality of pockets or tray cells, as shown particularly at **22** in Fig. 2. A dished cover **23** supported at its margin on the liner flange **21** is provided with a plurality of ventilation louvres **24** which overlie the tray **22**. The cover which is preferably hinged is further provided with a lifting handle **25**.

The washing and rinsing solutions should fill the chamber **10** to the level represented by the dot and dash

line "L" in Fig. 2 at which position the mesh or perforated tray member **22** and the articles resting therein are substantially submerged in the solution. A propeller **27** is rotatably supported within the lower portion of the chamber **10**, centrally of its sides and adjacent the bottom wall **15**, as is clearly indicated in Fig. 2. It is desired that this propeller have a dual function, so as to act as a relatively low speed agitator when the chamber **10** is filled with a washing or a rinsing solution, as indicated in Fig. 2, and as a relatively high speed drying fan when the rinsing solution is drained from the chamber. To this end the propeller **27** is driven through the medium of a variable speed mechanism by a motor **28** supported on the base **18**. Since the propeller should automatically have a relatively low rate of speed when acting as an agitator, and a relatively high rate of speed when acting as a drying fan, a fluid frictional transmission **29** is interposed between the propeller **27** and its driving motor **28**.

The friction transmission **29** is of a hydraulic type and includes a two-part housing **30** which is filled with a light oil. The motor shaft **31** projects through a packing gland **32** into the housing where it has a horizontally disposed disk **33** suitably secured to its inner end. The disk **33** is provided on its face opposite to the shaft with a plurality of radially disposed flutes **34**, as is more clearly shown in Fig. 6. These flutes **34** are opposed by a second series of similar flutes **35**, radially disposed on the adjacent face of a second disk **36** to whose opposite face is suitably secured the lower end of the propeller shaft **37**. This shaft **37** passes through a packing gland **38** in the upper section of the housing and carries the propeller **27** at its upper end. The housing may be provided with one or more filling connections as indicated at **39** in Fig. 2.

With this transmission mechanism, the propeller **27** will be rotated substantially at the rate of speed of the motor when the chamber **10** is drained and only air surrounds the propeller. The propeller will thus act as a fan for drying the articles supported in the tray **22**. When, however, the chamber **10** is filled with either washing or rinsing solutions, to the required level L as indicated in Fig. 2, the fan will encounter greater resistance to rotation. This resistance will cause a greater differential between the rotation of shafts **31** and **37** as will be permitted by the mobile fluid which acts as the frictional driving medium between the two disks **33** and **36**.

Suitably disposed within the chamber **10** are immersible resistance type heating coils **40** whose function is to maintain the washing and rinsing solutions at proper temperatures for most effective cleaning action. The louvres **24**, together with vents **41** in the upper side walls of the chamber provide for proper circulation of air between the lining **20** down over the heater elements **40** and through the tray **22** when the propeller acts as a drying fan.

The washing solution is initially contained within a movable tank **42** and the rinsing solution is initially contained in a similar movable tank **43**. These tanks are connected by a hollow support by which they are operatively connected to one end of the chamber **10** so as to alternately transfer their contents through the means of valve controlled ports, later referred to, to and from the chamber **10**. These tanks **42** and **43** are in open connection at their bottom ends with the opposite ends of a hollow rockable support comprising axially alined tubes or conduits **44** and **45** respectively, the adjacent ends of which extend into bosses **46** which are unitary with a sleeve **47** and diametrically disposed relative thereto.

The sleeve **47** is rotatably supported on a cylindrical casting **48** which projects horizontally from the side wall **13** of the chamber **10** adjacent the bottom wall **15**, and the casting is suitably secured to the casing **10** as by means of a flange **49** secured to side wall **13** and an extension **50** disposed beneath and suitably secured to the bottom wall **15**. The casting also includes an enlarged cylindrical head **51** which in effect provides a pivot for the sleeve **47**. A sleeve retainer **52** is disposed opposite a flange **47'** on the sleeve and suitable bearing rings **53** are supported in countersunk seats adjacent the opposite sides and periphery of the casting head **51**.

The casting **48** is further provided with upper and lower horizontally disposed bores or passages **54** and **55**,

which as indicated in Fig. 3 are disposed in a vertical diameter of the casting. The inner ends of passages **54** and **55** communicate with the interior of the chamber **10** through the respective openings **56** and **57** in the side wall **13**. The outer end of passage **54** communicates with a pair of diverging ports **58** and **59**, and the outer end of passage **55** communicates with a pair of diverging ports **60** and **61**, the ports **58** to **61** being disposed 90° apart about the casting head **51**. The sleeve bosses **46** are provided with ports **62** for alternate alinement with the diametrically opposed ports **58**, **61** and **60**, **59**, as will be apparent upon inspection of Fig. 3. The ports **60**, **61** are provided with filter screens **60'**, **61'** for a purpose later to appear.

The outer ends of passages **54** and **55** are provided with valve seats **54'** and **55'** which are adapted to be engaged by valves **63** and **64** whose stems **63'** and **64'** extend into a housing **65** at the outer end of casting **48** and have their ends pivotally connected at **66** and **67** to a rock lever **68**. The rock lever is pivotally supported at its center **69** for rocking operation to alternately open and close the valve ports **54'** and **55'** by a solenoid **70** having a wire connection **71** to an automatic control unit, later referred to.

The solution tanks **42** and **43** are indicated in their two operative positions in Fig. 1, the washing position being shown in solid lines, and the rinsing position in dotted lines. Power mechanism is provided for moving the tanks to and from these positions, the tanks being rotated about the casting head **51** through an angle of 90°. This mechanism comprises a reversible screw jack type actuator including an externally threaded rod **72** having one end pivotally connected at **73** to one of the sleeve bosses **46**, and the body of the rod threaded into a rotatable internally threaded tubular member **74** which is rotated in opposite directions by the transmission means **75** operatively connected with the electric motor **76**.

The solution tanks **42** and **43** are each provided with a cover **77** provided with a drain connection **78** and a filler connection **79**. A tank cradle **80** is supported on the base **18** for reception of each of the tanks **42** and **43** in their lower positions, and a limit switch **81** is housed in each cradle for controlling the tank actuator and solenoid in a manner more fully referred to hereinafter.

An electric clock-work actuated multiple switch controlling device **82** is provided for sequentially controlling the electric circuits for the heating coils, propeller motor, solution tank actuating motor and valve solenoid, and while such device is not shown in detail, its structure and operation are well known. Such devices are being manufactured by several companies for time control of multiple circuit electrical devices such as herein disclosed, and an example of such a device as is indicated herein at **82** is shown and described in Patent No. 2,155,271, April 18, 1939.

The electric circuits controlling the sequential operations of the several elements above described under the timed control of the device **82** are shown in Figs. 7 to 12 inclusive, while the corresponding timed movements of the washing and rinsing solutions is illustrated in Figs. 13 to 18 inclusive.

In the operation of the improved cleaning machine as above described the tank **42** is filled with a washing solution, and the tank **43** is filled with a rinsing solution. The tanks are initially disposed relative to the treating chamber **10** as indicated in Fig. 1, the tank **42** being vertically disposed, and the tank **43** horizontally disposed and resting in its cradle **80** with its limit switch **81** depressed in off position. The cover **23** is raised and the watches or other articles desired to be cleaned are deposited in the trays **22**.

The machine is now set into operation by means of a switch controlling the motor included in the multiple switch controlling device, which device in its movement operates a plurality of control switches which are indicated in Figs. 7 to 12, later referred to. At this stage of operation which is diagrammatically illustrated in Fig. 8, the solenoid **70** is in circuit whereby the valve **63** is opened as indicated in Figs. 2 and 4, and the washing solution in tank **42** flows by gravity into the treating chamber **10**, the valve **64** being closed at this time. As is indicated in Fig. 8 the propeller motor and heating coils are also in circuit and thus a washing of the watches

proceeds wherein the washing solution is agitated by the propeller **27** and thus brought into intimate movable contact with the watches in the trays **22**.

The washing operation automatically proceeds for a predetermined period as governed by the time controller **82**. After a washing operation for a predetermined time interval the actuator down-circuit is closed, (Fig. 9), whereby the screw jack actuator moves the tanks **42** and **43** to the dotted positions in Fig. 1, with the washing solution tank **42** down on its supporting cradle **80** and the rinsing solution tank **43** in raised vertical position. At this stage, the solenoid **70** is off with the lower valve **64** open and the upper valve **63** closed, whereby the washing solution drains from the treating chamber **10** back into the washing solution tank **42**. The propeller motor and heating coils, however, remain in circuit at this stage.

The circuit and switch arrangement before the rinsing operation begins is indicated in Fig. 10, wherein the actuator motor **16** is off as are also the solenoid and heating coils, the propeller motor, however, remaining in circuit. In the rinsing operation as indicated in Fig. 11, the solenoid **70** is on whereby the valve **63** is opened and the rinsing solution flows from tank **43** into the treating chamber **10**. The propeller motor and heating coils are also on.

After the rinsing operation for a predetermined period of time the drying operation begins as indicated in Fig. 12, wherein the actuator moves the solution tanks to their initial positions, as in Fig. 1. The solenoid is now off, the rinsing solution draining back into the tank **43** and the motor **28** is on, the propeller functioning as a fan for drying the articles in the tray **22**. At the end of the drying operation the propeller motor circuit is broken, thereby stopping the machine with the switches disposed as in Fig. 7. The filter screens **60'** and **61'** serve to filter the washing and rinsing solutions upon draining back into the tanks **42** and **43**, whereby these solutions are capable of continued use.

The limit switches **81** function to break the actuator circuit when either tank enters a cradle. These limit switches also act to hold solenoid impulses until the ports in the sleeve **47** clear those in the casting head **51** thereby preventing the solutions from becoming mixed.

In Figs. 13 to 18 inclusive are diagrammatically illustrated the positions of the solution tanks **42, 43**, relative to the treating chamber **10**, in the several successive phases of a cleaning operation. The alternate open and closed positions of the ports **54** and **55** which control the flow of the solutions into and out of the treating chamber are also shown with the changes in position of the washing solution, indicated by heavy lines and the rinsing solution by light lines.

In Fig. 13 the solution tanks **42, 43** are shown in their initial positions in readiness for a washing operation, the port **54** being closed, and this position corresponds to that of Fig. 7.

According to Fig. 14 which corresponds to Fig. 8, the machine has been set into operation, the port **54** being opened and port **55** closed. As shown, the washing solution is drained from tank **42** into the treating chamber **10**, while tank **43**, containing the rinsing solution, rests in its lower horizontal position.

According to Fig. 15 which corresponds to Fig. 9, the washing has been completed and the washing solution tank **42** has been lowered while the rinsing solution tank **43** has been elevated, and port **54** is closed while port **55** is open to permit flow of the washing solution from the treating chamber **10** back into the washing solution tank **42**.

According to Fig. 16, which corresponds with Fig. 10, port **54** has been opened and port **55** closed, and the rinsing solution now flows from tank **43** into the treating chamber **10**.

Fig. 17 shows the completion of the rinsing operation, the tanks **42, 43** having been moved to their original positions of Fig. 13 and the port **55** opened to permit draining of the rinsing solution back into its supporting tank **43**.

Fig. 18 which corresponds to Fig. 12 shows the initial position of the solution tanks as well as the ports. The machine has now progressed to the drying position where there is no solution in the treating chamber **10**.

It will be seen from Figs. 13 to 18 that the screw jack actuator for the solution tanks operates twice during each cleaning cycle; the rinsing solution tank being raised for draining the washing solution back into the washing solution tank and for draining of the rinsing solution from the rinsing solution tank into the treating chamber, as is respectively indicated in Figs. 15 and 16. The rinsing solution tank is in all other phases of the cleaning cycle in lowered horizontal position while the washing solution tank is in raised vertical position, as indicated in Figs. 13, 14, 17 and 18.

The improved machine is wholly automatic when once set into operation and the watches or other articles in the tray **22** are subjected to the successive washing, rinsing and drying operations, above described, without movement thereof or any effort on the part of an operator. After the cleaning cycle, the cover **23** is raised and the liner **20** with tray **22** is removed from the chamber **10**. The cleaned articles may then be removed and the tray reloaded with other articles to be cleaned, and the operations repeated.

While I have disclosed my invention in accordance with a single specific embodiment thereof, such is to be considered as illustrative only, and not restrictive, the scope of the invention being defined in the subjoined claims.

I claim:

1. In a watch cleaning machine, a stationary treating chamber having inlet and outlet passages adjacent the bottom thereof, a washing solution supporting tank and a rinsing solution supporting tank, supporting means for said tanks providing for unison movement thereof to and from positions wherein the tanks are alternately disposed above and below the treating chamber, conduit and port means providing communication between said tanks and the inlet passage when either tank is in uppermost position for gravity flow of its solution into the treating chamber, conduit and port means providing communication between said tanks and the outlet passage when either tank is in lowermost position, for gravity flow of the solution from the washing chamber into the lowermost tank, and valve means for simultaneously opening the inlet passage and closing the outlet passage and vice-versa, when said tanks are above and below the treating chamber.

2. The structure according to claim 1 together with a perforated watch-supporting tray removably supported in said treating chamber for stationary support and submersion of watches in the washing and rinsing solutions in the chamber.

3. The structure according to claim 1 together with a motor operable fan disposed within the treating chamber for drying the watches after drainage of the rinsing solution from the chamber, said chamber having a top cover provided with openings, and other openings in the side walls of the chamber whereby an air draft is provided within the chamber upon operation of said fan.

4. The structure according to claim 1 together with motor operated means for moving said tanks into and from said positions, a solenoid for controlling said valve means, and an electric clockwork controlling device for operating said motor operated means and said solenoid in a predetermined sequence.

5. In a watch cleaning machine, a stationary treating chamber, a cylindrical member supported in horizontal position adjacent the bottom of the chamber, vertically disposed horizontal inlet and outlet passages in the member and communicating with the chamber adjacent its bottom wall, a pair of ports extending radially of the cylindrical member and communicating with the inlet passage, a second pair of ports extending radially of the cylindrical member and communicating with the outlet passage, said ports all being in right angular relation and each one of said first ports being alined with one of said second ports in diametrical relation to the cylindrical member, said ports all opening through the outer wall of the cylindrical member, a sleeve rotatably supported on the cylindrical member and being provided with a pair of diametrically disposed bosses each provided with a port for alinement with one of said first ports in either one of two positions of the sleeve 90° apart, a tube having its inner end secured in each of said bosses and communicating with the port therein, a washing solution supporting tank carried by the outer end of one tube and in communication through its bottom therewith, a rinsing solution tank carried by the outer end of the other tube and communicating through its bottom therewith, said tanks being normally disposed with the washing solution tank being disposed above the treating chamber and

the rinsing solution tank below the treating chamber and with the respective tubes in communication with the inlet and outlet ports through one of said first ports, said sleeve being rotatable to rotate the tanks through an angle of 90° with the rinsing solution tank above the treating chamber and the washing solution tank below the chamber, and valve means for alternately opening and closing the inlet and outlet passages for gravity flow of washing solution into the chamber, gravity flow of the washing solution from the chamber into the corresponding tank, gravity flow of the rinsing solution into the chamber, and gravity flow of the rinsing solution from the chamber into the corresponding tank.

6. The structure according to claim 5 wherein said tanks are of elongated cylindrical form with their axes at right angles, and wherein in either rotated position of the tanks the uppermost one is vertically disposed and the lowermost one horizontally disposed.

7. The structure according to claim 5 together with a drying fan disposed within the chamber adjacent its bottom wall, and a motor disposed beneath the chamber and operatively connected with the fan.

8. In a watch cleaning machine, a stationary treating chamber having inlet and outlet passages adjacent its bottom wall, a washing solution supporting tank and a rinsing solution supporting tank, means rotatably supporting the tanks for alternate movement to positions above and below the chamber, conduit and port means establishing communication between the tanks and passages for time interval and sequential gravity flow of washing solution from the corresponding tank into the chamber in one position of the tanks, gravity flow of the washing solution from the chamber into the corresponding tank in another position of the tanks, gravity flow of the rinsing solution from the corresponding tank into the chamber in said other other position of the tanks, and gravity flow of the rinsing solution from the chamber into the corresponding tank in the first position of the tanks, actuator means for rotating the tanks to and from said positions, and valve means operative to alternately open and close said passages for flow of the solutions into and from said chamber.

9. The structure according to claim 8 together with a watch supporting mesh tray removably supported in said chamber, and a heating coil disposed within the chamber adjacent the bottom wall thereof.

10. The structure according to claim 8 wherein said valve means are controlled by a solenoid, a reversible screw jack actuator for rotating said tanks to and from said positions, a heating coil in said chamber adjacent the bottom wall thereof, a combined solution agitating and drying propeller disposed within said chamber adjacent the bottom wall thereof, and clockwork operated multiple switch means for operating said solenoid, actuator means, heating coil and propeller in predetermined time interval sequence.

11. In a watch cleaning machine, a stationary washing chamber having inlet and outlet passages adjacent its bottom wall, a washing solution supporting tank, and a rinsing solution supporting tank, means rotatably supporting said tanks for alternate positions thereof above and below the chamber, conduit connections between the tanks and passages when in said positions, valve means disposed between said passages and conduit connections, a motor operated reversible actuator for moving said tanks to and from said positions, a circuit including said actuator, a solenoid for operating said valve means, an electric heating coil in said chamber, a motor operated propeller in said chamber, and an electric clockwork controlled multiple switch controlling device for operating said actuator, solenoid, heating coil and propeller in predetermined time interval sequence.

12. A structure according to claim 11 wherein a hydraulic transmission is operatively disposed between the propeller and its motor, said transmission comprising a motor driven fluted disk disposed in an oil containing housing, and a second fluted disk opposed to the first disk and connected to the propeller, whereby the disks are capable of differential movement with the propeller moving at relatively low speed when submerged in a solution in the chamber and at a relatively high speed when the chamber is drained of solution in which instance the propeller functions as a drying fan.

13. A structure according to claim 11 wherein said conduit connections comprise ports in said supporting means for alinement with conduits communicating with said tanks when in said positions and for disalinement therewith when being rotated from one position to the other, and limit switches operable by the tanks in their lowermost positions for breaking the actuator circuit and for holding the solenoid impulses until the conduits are disalined with the ports.

14. In a watch cleaning machine, a stationary washing chamber having a bottom wall and an open top and having inlet and outlet passages communicating therewith adjacent the bottom wall, movable tank means for alternately loading the chamber with washing solutions and draining same therefrom through said passages, a horizontally disposed propeller within said chamber adjacent the bottom wall, a propeller actuating motor disposed beneath the chamber, and a hydraulic transmission beneath the chamber and operatively connected with the motor and the propeller.

15. The structure according to claim 14 together with a heating coil in said chamber between the bottom wall thereof and said propeller, a watch supporting mesh tray removably supported in said chamber above said propeller, and a swingable cover normally closing the open top of the chamber.

16. In a watch cleaning machine, a stationary treating chamber having a bottom and side walls, a cylindrical member projecting from one side wall adjacent the bottom wall and having an inlet and outlet passage communicating with the chamber, said passages being horizontally disposed with the inlet passage above the outlet passage, a pair of upwardly diverging ports in the member communicating with the inlet passage and opening through the outer wall of the cylindrical member, a pair of downwardly diverging ports communicating with the outlet passage and opening through the outer wall of the member, a tubular sleeve rotatably supported on the cylindrical member and having a pair of ports therein, said sleeve being rotatable through an angular range for alinement of one port therein with one of the upwardly diverging ports at one extreme of rotation thereof while the other port therein is alined with one of the downwardly diverging ports, the respective sleeve ports alining with the other of the downwardly diverging and upwardly diverging ports in the other extreme of rotation of the sleeve, a pair of tubular members supported at adjacent ends thereof by said sleeve and communicating with the ports therein, a washing solution supporting tank carried by the other end of one of the tubular members and in communication therewith, and a rinsing solution supporting tank carried by the other end of the other tubular member in communication therewith.

17. The structure according to claim 16 wherein said bottom wall inclines downwardly toward said outlet passage, and valve means in said cylindrical member operative for alternately opening and closing communication between said passages and said upwardly and downwardly diverging ports.

References Cited in the file of this patent

UNITED STATES PATENTS

1,139,313	Stevens	May 11, 1915
1,409,571	Putman	Mar. 14, 1922
1,426,400	McCarty	Aug. 22, 1922
1,508,828	Wholey	Sept. 16, 1924
1,630,684	Woodward	May 31, 1927
1,927,943	Long	Sept. 26, 1933
2,102,819	Ronci	Dec. 21, 1937
2,155,273	Jones	Apr. 18, 1939
2,195,123	Pabst	Mar. 26, 1940
2,235,501	Kuhns	Mar. 18, 1941
2,255,493	Pfalzgraff	Sept. 9, 1941
2,258,215	Paulson	Oct. 7, 1941
2,345,733	Day	Apr. 4, 1944
2,346,562	De Long	Apr. 11, 1944
2,416,475	Friedman	Feb. 25, 1947
2,429,090	Burt-Wells	Oct. 14, 1947
2,446,693	Davis	Aug. 10, 1948
2,514,100	Spaulding	July 4, 1950
2,523,019	Henderson	Sept. 19, 1950
2,645,235	Wheeler	July 14, 1953