United States Patent [19]

Green

[11] **3,905,385**

[45] **Sept. 16, 1975**

[54] **STEAM TRAP**

[76] Inventor: **Edwin Laurence Green**, P.O. Box 1127, Twin Falls, Idaho 83301

[22] Filed: **Apr. 29, 1974**

[21] Appl. No.: **465,090**

[52] **U.S. Cl.** **137/187**; 137/392

[51] **Int. Cl.**[2] **F16T 1/00**

[58] **Field of Search** 137/187, 186, 183, 177, 137/172, 190, 392; 55/218

[56] **References Cited**

UNITED STATES PATENTS

1,603,092	10/1926	Morden	137/187
1,805,064	5/1931	Yarnall	137/190
1,930,224	10/1933	Crosthwait	137/190 X

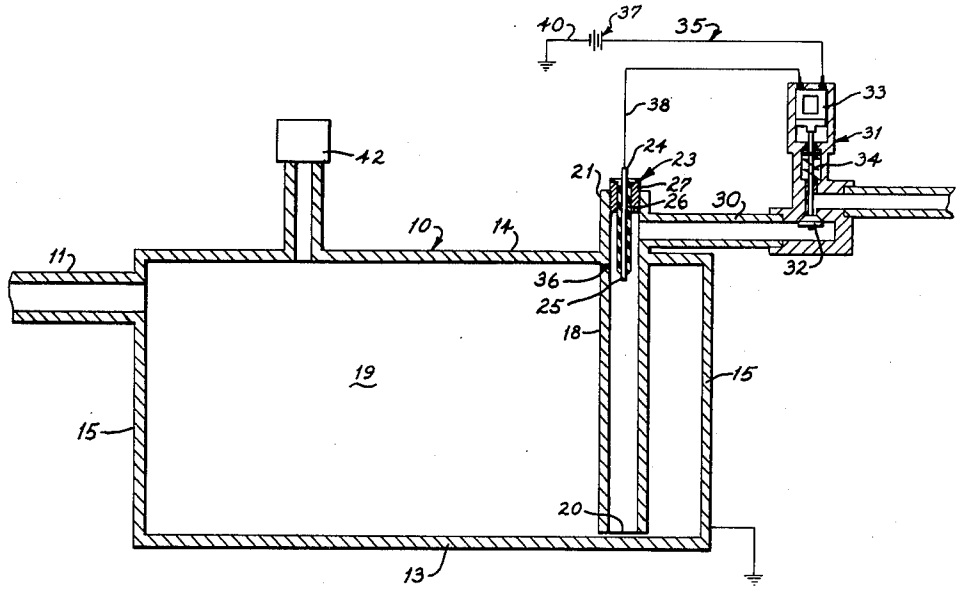
Primary Examiner—Alan Cohan

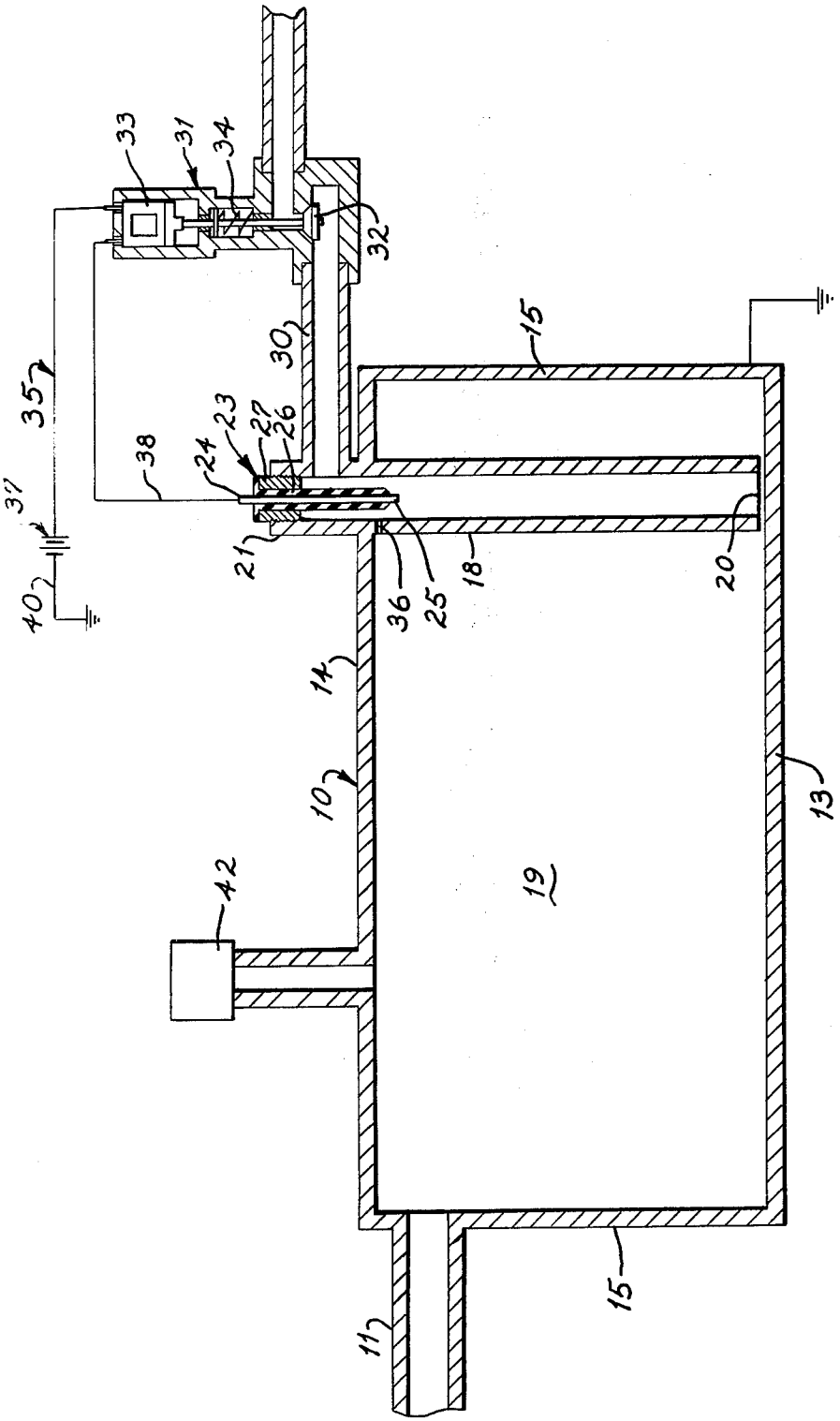
Attorney, Agent, or Firm—Wells, St. John & Roberts

[57] **ABSTRACT**

A steam trap to be utilized on exit tubing from steam appliances to permit return of condensed water to a boiler while simultaneously preventing return of pressurized steam. The trap comprises a sealed holding tank having a steam pipe leading from the appliance into the tank, and an upright standpipe extending vertically into the tank. The lower end of the standpipe includes a bottom opening through which the water condensate is free to pass. The upper end of the standpipe includes an electrode that is situated within the standpipe adjacent the top of the tank. A portion of the standpipe extends vertically above the top of the holding tank and is connected to a drainpipe. The pipe includes a solenoid-operated valve connected in an electrical circuit with the electrode. The electrode is located within the standpipe so that buildup of condensate within the holding tank must reach a certain level before the electrode is engaged by the accumulating condensate. Once engaged, the circuit is completed and the solenoid valve is actuated to open, allowing the condensate within the holding tank to be forced vertically through the standpipe and out the drainpipe. As the tank empties, the condensate leaves engagement with the electrode and the circuit is broken. This releases the solenoid valve and the pressurized steam is prevented from leaving the confines of the holding tank.

2 Claims, 1 Drawing Figure




33
31
34
32
30
35
38
24
23
27
26
37
40
21
36
25
18
20
15
14
10
13
42
19
11
15

STEAM TRAP

BACKGROUND OF THE INVENTION

The present invention is related to steam systems and more particularly condensing to mechanisms for recovering water condensate from steam systems. Such apparatus is commonly associated with steam appliances such as those used in dry cleaning operations. In such systems, a steam trap is required to enable return of condensed water to a boiler without permitting return of pressurized steam.

Most conventional steam traps utilize a mechanical float that operates a flap valve or small disc that raises in response to condensate level within a holding tank. Most conventional steam traps have very small exit orifices that prevent quick release of the collected condensate. Further, most of these devices permit steam to escape along with the condensate each time the trap opens. This is undesirable since steam pressure is sacrificed along with the heat value of the escaped steam.

A United States patent granted to Williams U.S. Pat. No. **2,368,509** discloses a water control discharge with an electrode contacted by collected water to operate a valve. The valve permits discharge of the collected water under steam pressure. The arrangement does not include an upright standpipe to assure discharge of a comparatively large volume of water under steam pressure and appears incapable of differentiating between escaping water condensate and steam exiting from the tank and associated steam system.

The apparatus of the present invention comprises a sealed holding tank connected to the steam system and having an upright standpipe extending downwardly into the holding tank to a bottom end adjacent the bottom of the holding tank. An upper end of this standpipe extends vertically outward from the holding tank and includes a drainpipe fixed thereto. The drainpipe includes a solenoid-operated valve that is connected in circuit to an electrode mounted within the standpipe and having an exposed tip adjacent to the top of the holding tank. As condensate reaches the level within the holding tank, the exposed electrode tip is engaged and a circuit completed to operate the solenoid valve to open the drainpipe and allow steam pressure to evacuate the holding tank of the water condensate. Once the exiting condensate leaves engagement with the exposed electrode tip, the solenoid valve automatically closes, preventing escape of steam from the holding tank and the steam system.

SUMMARY OF THE INVENTION

A steam trap is disclosed for separating pressurized steam from water condensate. The steam trap comprises an enclosed holding tank for receiving pressurized steam and water condensate from a steam pipe leading into the tank. An upright standpipe extends into the tank and includes a bottom opening adjacent the bottom of the tank and an upper end extending outwardly from the top of the tank. Sensing means is located within the standpipe adjacent the upper end thereof for sensing a prescribed level of condensate within the standpipe. A drainpipe openly communicates with the upper end of the standpipe and includes a valve means mounted thereon responsive to the sensing means for opening the drainpipe as the condensate reaches said prescribed level and closing the drainpipe when said condensate is full or not engaging the sensing means. The condensate is thereby automatically drained by force of said pressurized steam to the level of the bottom opening of the standpipe.

It is a first object of my invention to provide a steam trap for effectively allowing evacuation of water condensate from a steam system without allowing accompanied escape of pressurized steam.

It is another object to provide such a steam trap that will facilitate evacuation of substantially large amounts of condensate from a steam system in a relatively short period of time.

It is an additional object to provide such a steam trap that is very economical to utilize in conjunction with present steam systems.

A yet further object is to provide such a steam trap that is simple in construction and substantially maintenance free.

These and other objects and advantages will become apparent upon reading the following disclosure which, taken with the accompanying drawing, disclose a preferred form of my invention.

BRIEF DESCRIPTION OF THE DRAWING

A preferred form of the present invention is illustrated in the accompanying drawing which is a substantially diagrammatic representation of a longitudinal cross section of my invention and associated circuitry.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing in greater detail, a preferred form of my invention is shown basically comprising a holding tank **10**, a steam pipe **11** leading into the holding tank **10**, an upright standpipe **18** and an attached drainpipe **30** leading from the holding tank. A sensing means **23** is positioned within the standpipe **18** and is connected by a normally open electric circuit **35** to a valve means **31**. The sensing means **23** and valve means **31** are operative to detect a prescribed level of water condensate within the holding tank **10** and to allow the condensate to be drained from the holding tank under pressure from steam entering through pipe **11**.

The holding tank **10** is comprised of a sealed container formed with a bottom wall **13**, a top wall **14**, side walls **19** and end walls **15**. The steam pipe **11** openly communicates with the hollow interior of tank **10** by connection through one of the end walls **15**. The steam pipe **11** may be an integral portion of a steam system such as those commonly utilized in a dry cleaning operation. The attached steam system is not shown in the accompanying drawing. It may be understood however that steam and water condensate are directed under pressure from the steam system through the steam pipe **11** and into the holding tank **10**.

The standpipe **18** is located adjacent the end **15** opposite that connected to the steampipe **11**. Standpipe **18** is upright and extends vertically into the tank **10**, leading downward to a bottom opening **20** adjacent tank bottom wall **13**. Standpipe **18** further includes an upper end **21** that extends upwardly and outwardly from the top wall **14** of holding tank **10**. Standpipe **18** may be provided as an integral element of the holding tank **10**, as illustrated, or may be threadably engaged or otherwise attached to the holding tank in a position as illustrated in the drawing. The drainpipe **30** is similarly connected to the upper end **21** of standpipe **18** to

openly communicate with the hollow interior thereof. Thus, any condensate evacuated from holding tank **10** must first move upwardly from open end **20** to the drainpipe **30.** The level of opening **20** thereby determines the level of condensate after the evacuation process.

The sensing means **23** is basically comprised of an electrode **24** mounted within the upper end of standpipe **18** and extending downwardly into the holding tank **10.** The electrode **24** is partially encased by an insulator **26** so that only a small portion or tip **25** is exposed within the holding tank **10.** Sensing means **23** is attached to the standpipe **18** by means of a threaded plug **27** engaged within the otherwise open top end **21** of standpipe **18.** Electrode tip **25** defines a prescribed level at which the condensate is allowed to reach before the valve means **31** is operated to release the condensate through drainpipe **30** under steam pressure.

Valve means **31** may be comprised of a conventional valve plunger **32** mounted to a solenoid **33.** The plunger **32** is vertically movable between an open position wherein a passage is opened to allow free movement of the condensate through drainpipe **30,** and a normally closed position (illustrated in the drawing) maintained by a compression spring **34.**

Solenoid **33** is operated by sensing means **23** and a power means **37** in the form of a battery or other power source connected in the circuit **35.** Solenoid **33** is insulated to prevent electrical contact with drainpipe **30.** Therefore, connection is made to the power means **37** and sensing means **23** solely through means of connecting wires.

A first wire **38** extends from solenoid **33** to the electrode **24,** and a second wire **40** extends from the solenoid **33** to power means **37.** The holding tank **10** and pipes connected thereto are utilized by the circuit as a common ground. It may be noted in the drawing that valve means **31** is normally closed since the solenoid **33** and sensing means **23** are both insulated from the common ground. The circuit to valve means **31** is completed, however, once the water condensate reaches the level of exposed electrode tip **25.** When this occurs, the condensate becomes a conductor and solenoid **33** is operated to move plunger **32** to the open position, allowing condensate to be forced by steam pressure through drainpipe **20.**

The condensate will continue to be forced by steam pressure from the holding tank so long as it remains a conductor between electrode tip **25** and ground. Further, the position of bottom opening **20** of standpipe **18** facilitates removal of almost all of the condensate within holding tank **10** since it is located adjacent the bottom wall **13.** The condensate must drain to a level below the bottom opening **20** before steam is allowed to enter the standpipe **18.**

Any steam or air existing within the tank, before the condensate level begins to rise, is exhausted through a small escape aperture **36** located adjacent the top wall **14** of tank **10.** The escape aperture **36** extends through the standpipe and openly communicates between the hollow interior of the standpipe and the interior of holding tank **10.** Any air within standpipe **18** is thereby forced into the holding tank **10** as the condensate **12** rises.

It may be understood that the escape of steam from the holding tank **10** is prevented at the instant the condensate leaves engagement with the exposed electrode tip **25.** As the condensate disengages tip **25,** the circuit **35** is again opened and solenoid **33** is deactivated, allowing compression spring **34** to return plunger **32** to the closed position. This step is accomplished almost instantaneously so that no steam is allowed to escape the holding tank or associated steam system.

On occasion the device is temporarily disabled by an air lock within tank **10.** This can be remedied by adding an air vent **42** open to the interior of tank **10.** The air vent **42** is a pressure-operated valve, normally closed. It is pre-set to open at a pressure slightly greater than the operating steam pressure. If air in the tank **10** is compressed, vent **42** will open and allow the air (and steam) to escape momentarily, thereby making room for incoming condensate. Alternately, a small air line (not shown) running to the high point of the pipe **11** can also be used to bleed trapped air within tank **11.**

It may have become apparent from the above description and attached drawings that various modifications may be made therein without departing from the intended scope of this invention. It is for this reason that only the following claims are to be taken as definitions of my invention.

What I claim is:

1. A steam trap for separating pressurized steam from water condensate comprising:

an enclosed holding tank for receiving pressurized steam and water condensate from a steam pipe leading into the tank,

an upright standpipe extending into the tank and having a bottom opening adjacent the bottom of the tank;

sensing means within the standpipe and elevationally located within the tank for sensing presence of condensate at a prescribed level within the standpipe and tank;

a drainpipe openly communicating with said standpipe at a location elevationally above said prescribed level;

a relief aperture formed through said standpipe elevationally above said prescribed level for allowing escape of gas from within said standpipe as condensate raises therein:

valve means mounted on said standpipe for opening the drainpipe and closing said drainpipe; and

power supply means operatively interconnecting said sensing means and said valve means responsive to said sensing means for actuating said valve means to open said drainpipe as said condensate reaches said prescribed level and engages said sensing means, and to actuate said valve means to close said drainpipe when said condensate passes beyond the sensing means and becomes disengaged with said sensing means.

2. The invention set out in claim **1** wherein said power supply means is comprised of an electrical circuit with a source of electrical energy; and

wherein said sensing means comprises an electrode, connected to said electrical circuit and electrically insulated from said standpipe and tank and having an exposed tip at said prescribed condensate level; and

wherein said valve means includes a solenoid operated valve connected in said circuit to said source of electrical energy and to said electrode, said source of electrical energy being connected in said circuit to said condensate, whereby engagement of said condensate with said electrode completes said circuit and disengagement of said electrode and condensate opens said circuit to thereby operate said solenoid operated valve to open and close said drainpipe.

* * * * *