

United States Patent

Janson

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[54] SOLVENT RECLAIMER CONTROLS

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[56]

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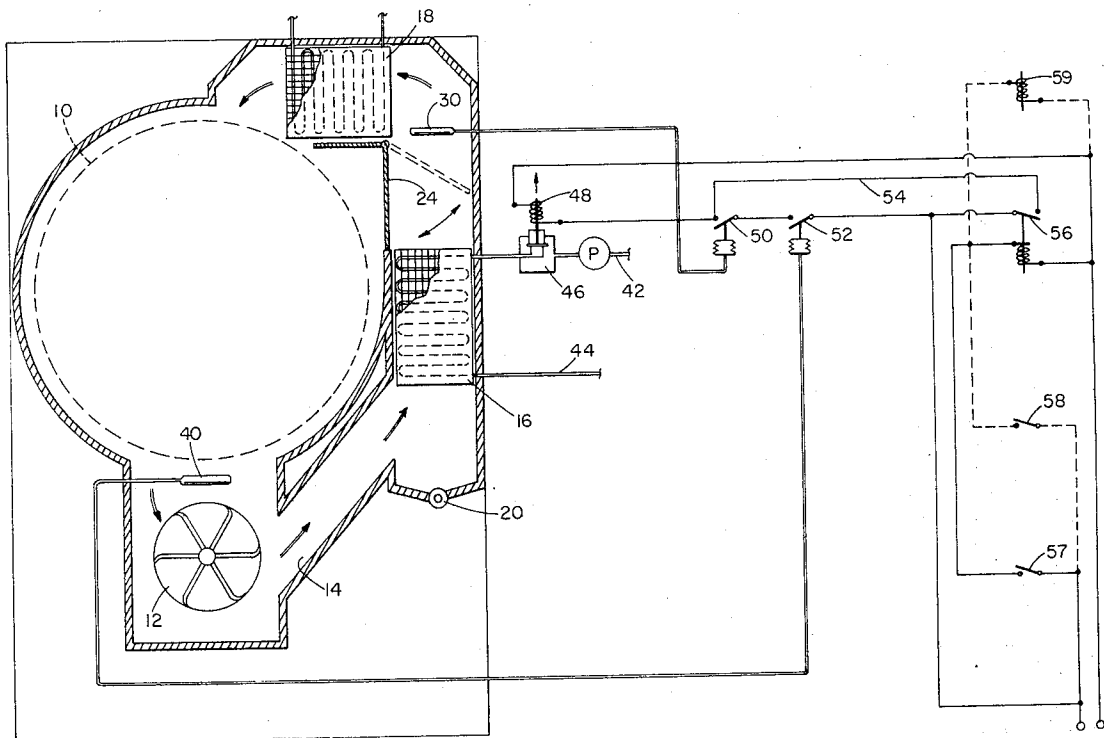
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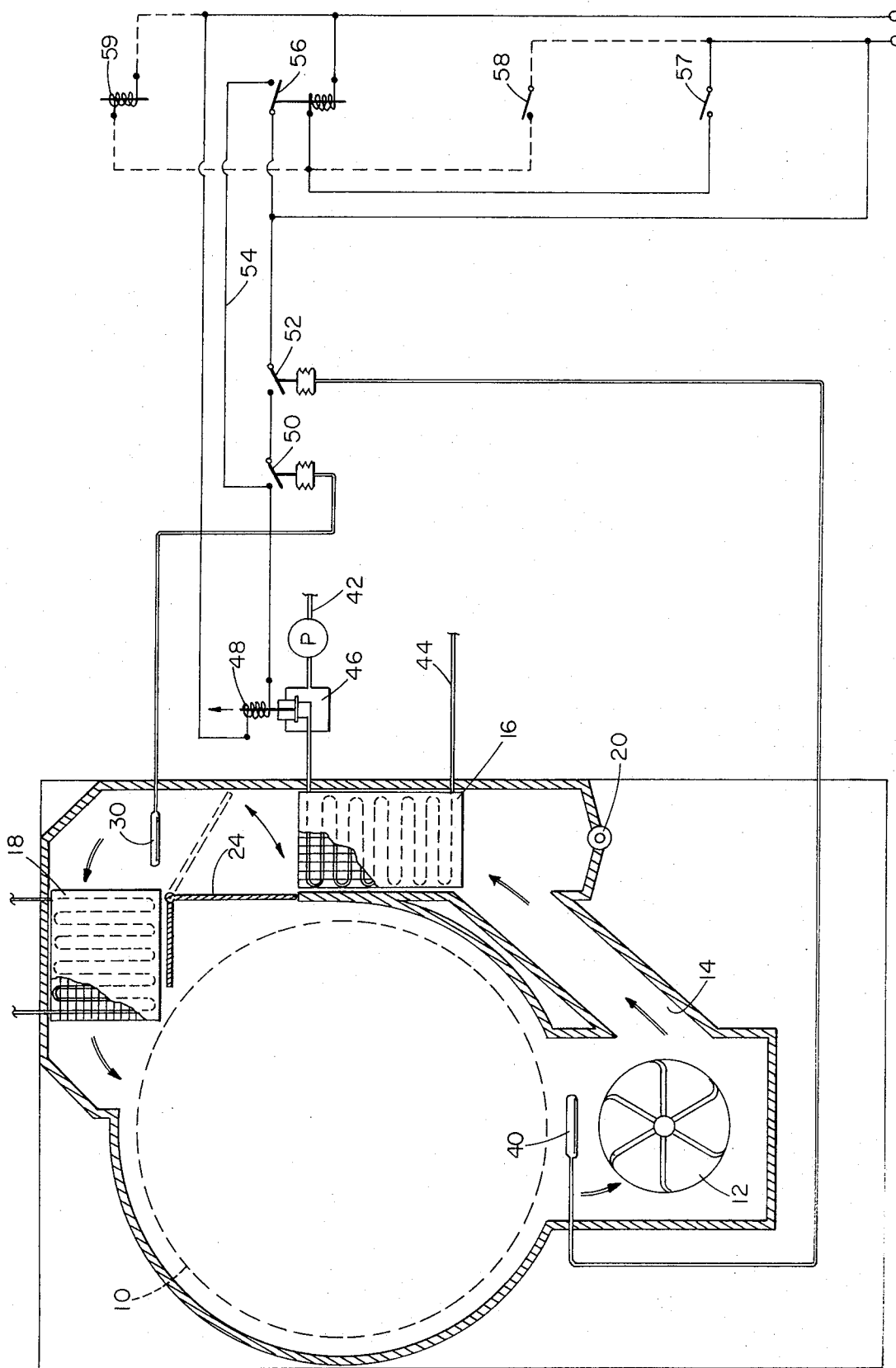
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ABSTRACT

Controls for a solvent recovery apparatus regulate the flow of coolant in a condenser coil responsive to the temperature of air circulating in a closed pathway through a tumbler.

2 Claims, 1 Drawing Figure





SOLVENT RECLAIMER CONTROLS

This invention relates to solvent recovery apparatus of the kind used by dry cleaning establishments to recover dry cleaning fluid. Such apparatus usually includes a revolving tumbler through which flows an air stream circulating in a closed circuit which also includes a fan, a condenser coil and a steam heater. A by-pass duct around the heater to permit selective flow of the air stream through the by-pass may also be employed.

Heretofore, the temperature of the air stream leaving the condenser coil depended upon the rate of flow of a coolant through the condenser coil which was controlled in response to the temperature of the coolant as it flowed away from the coil.

In accordance with the present invention more rapid solvent reclaiming is accomplished by regulating the flow of coolant in the condenser coil, not in response to its own outflow temperature, but in response to the temperature of the air stream as it leaves the condenser coil, starting, or increasing the rate of coolant flow when the temperature rises to a set temperature and stopping, or decreasing the rate, when the air temperature drops below that set temperature; together with overriding this control if the temperature of the air upstream from the condenser coil has not reached a set temperature above that of the air at the point of measurement downstream of the condenser coil.

By providing a solenoid valve at the condenser coil water inlet, responsive to an adjustable temperature control having its sensing element in the air stream leaving the coil, the temperature of the condenser coil can be maintained precisely at the desired level. Important benefits to the operating efficiency and economy of the machine are thereby secured, including conservation of steam and water and the saving of considerable time. Steam and water economy is realized in the reduction of the heating and cooling loads by not allowing the temperature of the condenser coil to fall below the minimum required for optimum performance. Time is saved in the shortening of the solvent recovery cycle by holding the condenser coil temperature at a level of maximum operating efficiency.

A solvent recovery apparatus in accordance with the invention is shown diagrammatically in the accompanying drawing wherein 10 is a rotating perforate tumbler, 12 is a recirculating fan duct 14 leading to a condenser coil 16 and thence to a steam heater coil 18. 20 is a drain outlet for condensed solvent.

A damper 24 is positioned to form, when pivoted into the dotted line position, flow path by-passing the heater coil 18.

Two temperature sensors are placed in the closed circuit, 30 being just downstream from the condenser coil 16 beyond the damper 24, and 40 being at the outlet of the tumbler.

The condenser coil 16 is cooled by circulation of water through inlet pipe 42 and out outlet pipe 44, by means of pump P.

Interposed in the inlet pipe 42 is a valve 46 operated by a solenoid 48 connected in an electrical circuit which includes a temperature control 50 operated by the sensor 30 and a temperature control 52 operated by the sensor 40.

Temperature controls 50 and 52 are electrically bypassed by circuit 54 so that though the switches of each of the temperature controls 50 and 52 are open, the valve 46 can still be maintained open by closing the by-pass circuit 54 through relay 56. Relay 56 is operated either from a manual switch 57 (whenever damper 24 is brought to its dotted line position) or, as shown in the dotted line circuit, by a relay 58 automatically closing circuit 54 and actuating a solenoid 59 to move the damper 24 to cool-down dotted line position, when the cool-down cycle is initiated.

The valve 46 being normally closed, at start up, there will be no water flow through the condenser coil until the temperature of the air leaving the coil rises to the level set on the temperature control sensor 30. Solenoid valve 46 then opens and allows water to flow through the coil. The water will continue to flow, cooling the coil, until the temperature of the air

stream leaving the coil falls below its set point. The contacts of the temperature control then open, breaking the circuit to the solenoid 48, causing valve 46 to close and interrupt the water flow through the coil. Thus, the temperature of the air stream leaving the condenser coil will be accurately maintained at the level set on the adjustable temperature sensor 30. An ideal setting for this control is about 90° F. which is just slightly below the dew point of the perchloroethylene solvent vapor, providing for optimum performance of the condenser coil.

Inclusion of the sensor 40 is a refinement useful during warm up because the solenoid valve 46 will remain closed keeping the water from flowing through the condenser coil until the temperature of the air stream leaving the tumbler chamber rises to the level set on this temperature control. When the contacts of this temperature control close, the circuit to the solenoid 48 is completed through the already closed contacts of the temperature control 50 causing the solenoid valve 46 to open and allow water to flow through the condenser coil. For the remainder of the drying cycle, as long as the temperature of the air leaving the drying chamber remains above the level set of this sensor 40, the solenoid valve 46 will be responsive to the sensor control 30. The start of the water flow through the condenser coil and the resultant extra load on the heater coil is thus delayed until the air temperature leaving the drying chamber reaches a predetermined level thereby accelerating the heating of the load of garments being dried and causing a faster release of their retained solvent. Predicated upon operational experience with this refinement, it appears that the ideal setting for sensor 40 is about 120° F.

During the reclaim cycle the condenser control by-pass relay 56 is de-energized and the circuit to the water solenoid valve 46 coil 48 is completed through temperature controls 50 and 52, responsive to sensors 30 and 40. On a manually-operated machine, when the heater by-pass damper 24 is opened, putting the machine in its cool-down cycle, the manual heater by-pass damper control switch 57 is closed (through suitable linkage), completing the circuit to the condenser control by-pass relay 56 and energizing it. The normally-open contacts of relay 56 now close, completing the circuit directly to the water solenoid valve coil 48, over the by-pass circuit 54.

On an automatically-operated machine, when the machine goes into its cool-down cycle, the automatic heater by-pass damper control switch 58 is closed (by the automatic control circuit) simultaneously completing the circuit (dotted lines) to the heater by-pass damper air cylinder solenoid valve 59 and the condenser control by-pass relay 56, again closing the by-pass circuit 54, as described above.

When the apparatus is put in cool-down cycle the two temperature sensors 30 and 40 are thus overridden by relay 56 completing a by-pass circuit to the solenoid 48 so that there will be uninterrupted water flow through the condenser coil during the cool down cycle regardless of the temperature of the air leaving the condenser coil, thereby accelerating the cooling down of the machine and its load of garments.

If the relative positioning of the heating coil 18, the heater by-pass damper 24, and the temperature sensor 30, is as shown, such that when the by-pass damper is set to have the air bypass the heating coil, the sensor is isolated from the air stream and, due to its proximity to the heating coil, remains above the temperature for which it is set, thereby automatically causing the solenoid valve 46 to remain open throughout the cool-down cycle, then it is unnecessary for the temperature control by-pass circuit to override this temperature sensor.

It is only when the setting of the by-pass damper however does not suffice to maintain the sensor 30 at a high temperature level, that it is necessary to have the temperature control by-pass circuit 54 to override the dominating sensor control 30.

What is claimed is:

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1. In solvent reclaiming apparatus having a tumbler and a closed duct system for directing an air stream in a closed circuit through said tumbler, including in said circuit, a fan, a condenser coil and means for heating air circulating through said duct system, means for causing coolant to flow through said condenser coil, means for regulating said flow of coolant responsive to the temperature of the air flowing through said closed duct system as it leaves said condenser coil, control means for cutting out operation of said regulating means while the temperature of the air in said stream as it emerges from said tumbler is below a set value during a warm-up cycle and means for cutting out operation of said regulating means even when the temperature of the air emerging from said condenser coil is below a value for which it is set normally to prevent flow of coolant through said condenser coil, to permit flow of coolant during a cool down cycle regardless of the temperature of

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the air emerging from the condenser coil.

2. In solvent reclaiming apparatus having a tumbler and a closed duct system for directing an air stream in a closed circuit through said tumbler, including in said circuit, a fan, a condenser coil and means for heating air circulating through said duct system, means for causing coolant to flow through said condenser coil, means for regulating said flow of coolant responsive to the temperature of the air flowing through said closed duct system as it leaves said condenser coil, a damper for directing said air into a pathway by-passing said heating means, and means overriding operation of said regulating means when said damper is set to direct through said by-pass pathway to permit flow of coolant through said condenser coil during a cool down cycle regardless of the temperature of the air emerging from the condenser coil.

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