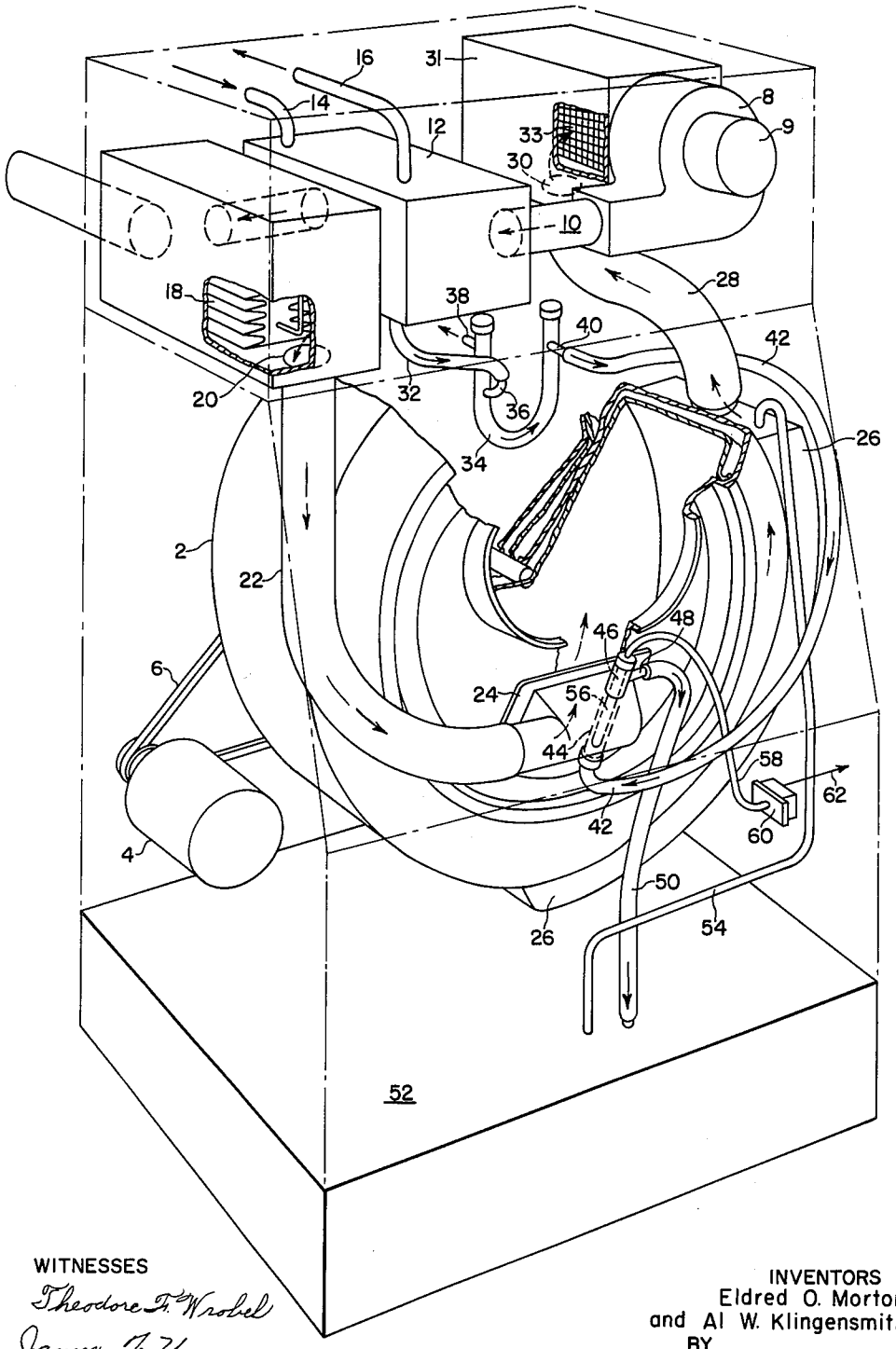
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AUTOMATIC DRY CLEANER

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WITNESSES

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AUTOMATIC DRY CLEANER

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The present invention relates to automatic dry cleaner apparatus, and more particularly to automatic dry cleaner apparatus having dry-turn off sensing devices incorporated therein.

In presently known dry cleaning apparatus, especially the coin operated, automatic type, there is a problem of ascertaining when the material within the dry cleaner is dry and then turning off the dry cleaner. The end of the drying cycle may be approximated by a timing mechanism and the dry cleaner turned off after a predetermined time. However, for different types of material being dry cleaned a compromise time must be selected with the possibility of either over or under drying of the materials. These undesirable end results may be deleterious to the materials and create customer dissatisfaction.

It is therefore an object of the present invention to provide new and improved dry cleaner apparatus which provides a controlled dry period.

It is a further object of the present invention to provide new and improved dry cleaning apparatus which has a controlled time period which is consistent, reliable and of relatively low-cost.

It is a still further object of the present invention to provide new and improved dry cleaning apparatus in which the degree of dryness of the material within the dry cleaner is sensed to provide an indication to end the drying cycle.

Generally, the present invention provides dry cleaning apparatus in which a thermal-sensing device is normally cooled by condensed cleaning fluid during the drying cycle until substantially all of the cleaning fluid is removed from material being cleaned, with the device overheating at this time to provide an indication that drying cycle should be terminated.

These and other objects and advantages of the present invention will become more apparent when considered in view of the following specification and drawings, in which the single figure is a pictorial view of the dry cleaning apparatus of the present invention.

Referring to the figure, a dry cleaning unit shown having a dry cleaning tub 2, which is rotatable about its horizontal axis by a main motor 4 driven by a V-belt 6. The tub 2 is cut away to show its internal structure and wherein is placed material that is to be dry cleaned. During the dry cleaning cycle, the material within the tub is washed with a cleaning fluid or solvent, perchloroethylene being the most common. After the clothes have been washed with the cleaning fluid, the tub 2 is mechanically rotated to centrifugally remove most of the solvent. Next, the dry cleaner goes into a drying cycle. The material within the tub is dried by rotating the tub at low speed and passing hot air through the material. As the drying process continues more and more of the cleaning fluid is extracted from the material until a finished dry and cleaned product is obtained.

A blower 8 is provided to supply a flow of air. The blower 8 is driven separately by a blower motor 9. The blower provides a supply of air through its outlet duct 10, which opens into a condenser 12. The condenser 12 is of the finned-tube type and is cooled with water entering at the inlet 14 and being extracted at the outlet 16. The supply of air on passing through the condenser 12 enters a heater 18. The heater 18 is of the electric coil type and serves to heat the air on passing therethrough to a temperature sufficient to dry the material within the tub 2. The now heated air passes through an orifice 20 in the bottom of the heater 18 and passes into an inlet hot air duct 22. The inlet hot air duct 22 leads into an inlet air casing 24, which opens into the interior of the tub 2. The hot air passing from the heater 18, through the duct 22 and into the tub from the inlet air casing 24 dries clothes within the tub 2 by evaporating cleaning solvent therefrom. The air is then removed from the tub 2 through a tub exhaust passage 26 locating on the right periphery of the tub 2. The air containing vaporized cleaning fluid passes from the tub exhaust passage 26 into an exhaust duct 28 and thence through an orifice 30 in a lint trap housing 31 and through a lint trap 33 disposed therein. The lint trap 33 serves to capture any lint particles appearing in the drying air supply.

Air containing the cleaning fluid vapor is then blown by the blower 8 back into the condenser 12, where a condensate of water and cleaning solvent is formed. The condensate passes out through a bottom duct 32 into a water separating U-tube 34 at an inlet 36. The condensate is separated in the U-tube 34 with water passing out an outlet 38 to a drain and with the condensed cleaning fluid passing downwardly in the U-tube 34 and being expelled from an outlet 40 into a downwardly extending tube 42.

Since cooling water is used in the condenser 12 the condensate leaving the condenser 12 is of a relatively low temperature compared to the temperature of the air passing into the tube 2. The cold cleaning fluid passes through the tube 42 and flows upwardly into a tube 44, which is connected at its bottom end to the tube 42. The tube 44 extends substantially vertically through the inlet air casing 24 and comes out at the top of the casing 24 to be connected at its top end to a T-member 46. From one outlet 48 of the T-member 46, a return tube 50 provides a passage for the cleaning fluid down into a storage tank 52 for subsequent use in the next dry cleaning operation. An equalizer tube 54 is connected between the storage tank 52 and the top of the tub exhaust passage 26 to avoid any pressure build up within the storage tank 52.

Connected into the other outlet of the T-member 46 is a thermostat temperature sensing bulb 56 which extends downwardly into the tube 44 inside of the inlet air casing 4. The temperature sensing thermostat bulb 56 is thus directly in the path of the cleaning fluid as it passes through the tube 44. Being inside of the inlet air casing 24, the thermostat bulb 56 is surrounded by heated air passing from the duct 22 into the casing 24. However, during the drying portion of the dry cleaning cycle the bulb is cooled by the cleaning fluid as is passes over it as long as there is sufficient cleaning fluid condensed and passed through the return system. The thermostat sensing bulb 56 is connected through a capillary tube 58 to a thermostat switch 60, which is disposed on the wall of the dry cleaner structure, for example. The temperature sensing thermostat bulb 56, for example, is of the type filled with liquid or gas that expands with temperature and builds up pressure. This pressure is transmitted through the capillary tube 58 to a diaphragm which changes shape under pressure to actuate the switch 60, which causes a timing mechanism to start and run out the remainder of the sequence cycle. The thermostat switch 60 has an output 62 which is connected to a timing mechanism, not shown.

In most dry cleaning apparatus, a sequence timer, controls the various cycles of the dry cleaning operation. The sequence timer is driven by a small synchronous

motor. In the usual dry cleaner, the time of drying is predetermined and after this time the apparatus is turned off regardless of the condition of the material within the dryer whether it be under or over dried. In the present application, however, at the beginning of the drying cycle the synchronous motor would be turned off with the drying cycle continuing under the control of the thermostat switch **60**. Drying continues as long as a sufficient flow of cooling cleaning fluid passes over the thermostat bulb **56**. The flow of cleaning fluid cools the thermostat bulb **56** so that it does not give an output signal through the tube **58** to the switch **60**. However, as the material becomes dry, with the cleaning fluid being evacuated from the material, less and less condensed cleaning fluid is passed over the thermostat bulb **56**. When the flow of cleaning fluid drops to a certain level or stops, a sudden increase of temperature occurs in the area of the thermostat bulb **56**. This is due to the heated air in the casting **24** being around the tube **44** and the bulb **56** therein, which causes a sudden heating action. The increase in temperature causes the bulb **56** to respond and give an indication to the switch **60**. The switch **60** in turn gives an indication at its output **62** to start the synchronous motor in the timing mechanism. The timing mechanism turns off the apparatus after a predetermined time when the clothing will be dry.

The functioning as explained above provides an adjustable drying period in that the drying cycle will continue until a large percentage of the cleaning fluid is evacuated from the material within the dry cleaner. The diminishing of cooling cleaning fluid over the thermostat bulb has been found to give a highly reliable indication that the material within the dry cleaner has sufficiently dried and a rapid increase in temperature of the order of 10° per minute has been noted at the thermostat bulb area. It should be considered, of course, that the indication of the thermostat bulb **56** could be used directly to activate the thermostat switch **60** and turn off the drying cycle. However, in practice, it has been found more desirable to use the switch **60** to control the timer and then after a short predetermined time to turn the dry cleaning apparatus off and reset the timer for the next dry cleaning operation.

Although the present invention has been described with a certain degree of particularity it should be understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the scope and spirit of the present invention.

We claim as our invention:

1. In dry cleaning apparatus the combination of: a dry cleaning tub; means providing an input air passage for directing air to said tub; an input air casing opening into said tub for passing air into said tub; means providing a passage for passing cleaning fluid through said input air casing; and a temperature sensing device disposed in said passage to give an indication when a predetermined temperature is exceeded.

2. In dry cleaning apparatus the combination of: a dry cleaning tub to contain material to be cleaned with a cleaning fluid; means providing an input air passage for directing heated air to said tub; an input air casing opening into said tub for passing heated air from said input air passage into said tub; means defining a cleaner passage for passing cleaning fluid through said input air casing; a temperature sensing device disposed in said cleaner passage within said input air casing to be cooled by condensed cleaning fluid and being disposed adjacent to the supply of heated air passing within said input air casing; and a switching device responsive to said sensing device to give an indication when there is an insufficient flow of cleaning fluid to cool said sensing device.

3. In dry cleaning apparatus the combination of: a dry cleaning tub to contain material to be cleaned with a cleaning fluid; means defining an input air passage for directing air to said tub; an input air casing opening into said tube for passing air from said input air passage into said tub; a cleaner duct for passing cleaning fluid through said input air casing; a thermostat bulb disposed in said cleaner duct within said input air casing to be cooled by cleaning fluid and being disposed adjacent to heated air passing within said input air casing; and a switching device responsive to said bulb to give an indication when said bulb exceeds a predetermined temperature.

4. In dry cleaning apparatus operative to automatically turn-off, the combination of: a dry cleaning tub to contain material to be cleaned with a cleaning fluid; air supply means for providing heated air; condensing means for condensing cleaning fluid from said air; an input air duct for directing heated air to said tub; an input air casing opening into said tub for passing heated air from said input air duct into said tub; a cleaner duct for passing the condensed cleaning fluid through said input air casing; a temperature sensing device disposed in said cleaner duct to be cooled by the condensed cleaning fluid; and a temperature responsive device responsive to said sensing device to give an indication when there is an insufficient flow of condensed cleaning fluid to cool said sensing device.

5. In dry cleaning apparatus operative to automatically turn-off, the combination of: a dry cleaning tub to contain material to be cleaned with a cleaning fluid; a blower for providing a supply of air through said material; a condenser disposed in the path of said supply of air for condensing cleaning fluid from said air; a heater for heating said supply of air; an input air duct for directing the heated supply of air to said tub; an input air casing opening into said tub for passing the heated air from said input air duct into said tub; a cleaner duct for passing the condensed cleaning fluid through said input air casing, a temperature sensitive device disposed in said cleaner duct within said input air casing and responsive to rapid change in temperature in said duct due to lack of condensate occurring when the clothes have dried, to indicate the dry condition of the clothes.

6. In dry cleaning apparatus operative to automatically turn-off, the combination of: a dry cleaning tub to contain material to be cleaned with a cleaning fluid; a blower for providing a supply of air through said material; a condenser disposed in the path of said supply of air for condensing cleaning fluid from said air; a heater for heating said supply of air; an input air duct for directing the heated supply of air to said tub; an input air casing opening into said tub for passing the heated air from said input air duct into said tub; a cleaner duct for passing the condensed cleaning fluid through said input air casing, a thermostat temperature sensing bulb disposed in said cleaner duct within said input air casing to be cooled by the condensed cleaning fluid and being disposed adjacent to the supply of heated air passing within said input air casing; and a switching device responsive to said bulb to give an indication when there is an insufficient flow of condensed cleaning fluid to cool said bulb, with said bulb exceeding a predetermined temperature due to the heated air and thereby indicating the material within said tub is dry.

References Cited by the Examiner

UNITED STATES PATENTS

3,002,287	10/1961	Smith	34—77 X
3,032,887	5/1962	Whyte et al.	34—77 X
3,100,144	8/1962	Berenbaum et al.	34—53 X
3,186,106	6/1965	Cobb et al.	34—77 X

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