

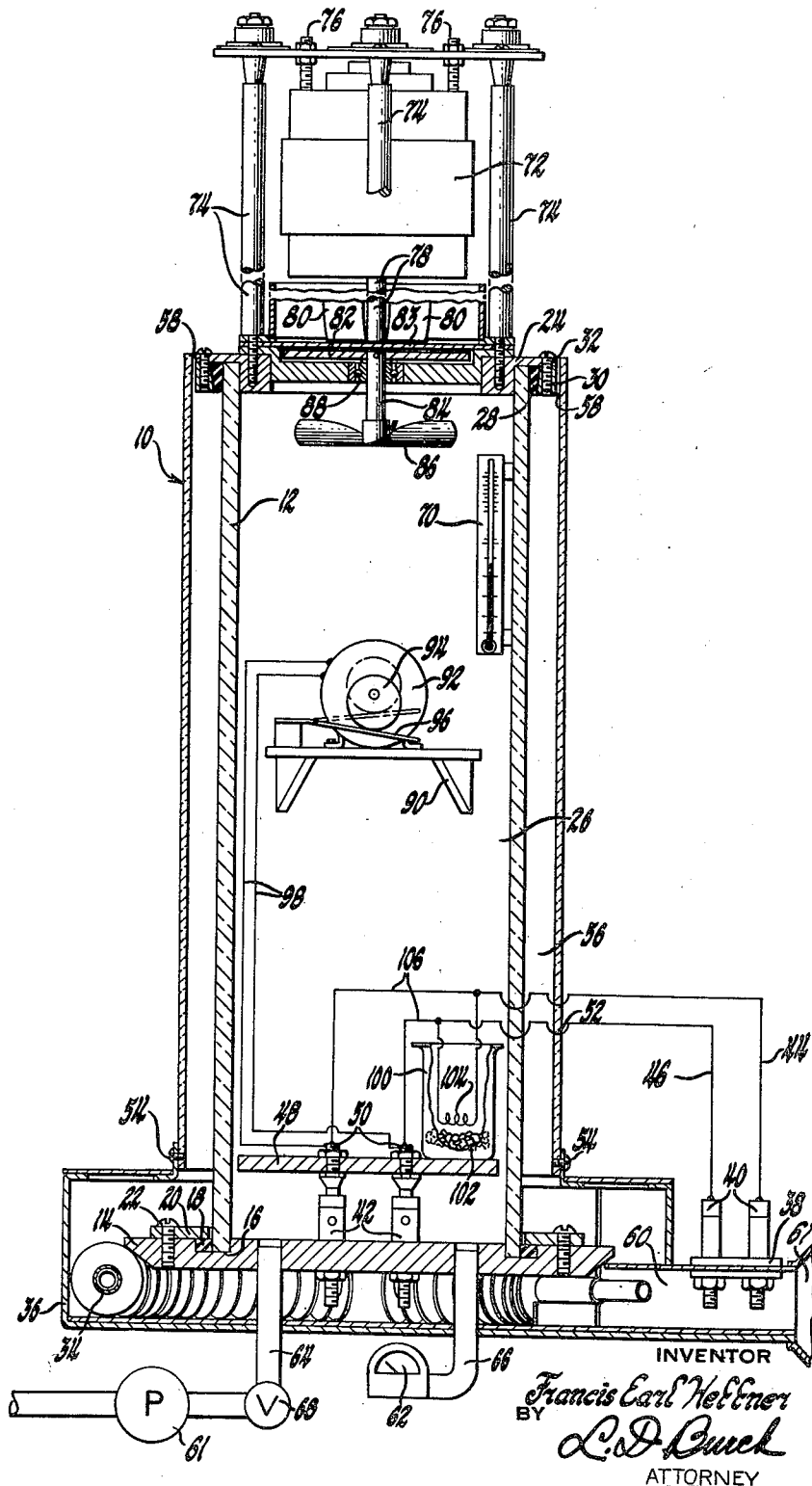
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TEST CHAMBER

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TEST CHAMBER

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This invention relates to a device in the form of a test chamber for simulating an humidified atmospheric condition within which may be tested instruments, apparatus, materials, material surface finishes and the like.

It is often desirable in research and testing laboratories to be able to create a given atmospheric humidity condition within which a new development may be tested. Unless test facilities are available in the laboratory these developments must be subjected to actual atmospheric conditions for extended periods of time in order to meet with all conditions to which the new development will be subjected in actual use. Heretofore humidity chambers have generally comprised a closed chamber having provisions made for saturating the air within the chamber with water vapor or for mixing a known percentage of water vapor with a quantity of dry air. Accurate control of these conditions in such chambers is most important and in the past has been most difficult to maintain.

Relative humidity being a measure of the ratio of water vapor pressure at a given barometric condition to the maximum water vapor pressure attainable at the same barometric condition without precipitation, the measurement of humidity is independent of air pressure except in arriving at the water vapor pressure. It is therefore now proposed to provide a chamber within which a barometric condition may be established which readily enables the calculation of the water vapor pressure which will cause precipitation and wherein the water vapor pressure present is directly measurable. A chamber is provided within which the air pressure is reduced to zero. The water vapor pressure causing precipitation at zero air pressure is directly dependent upon the temperature within the chamber. Water vapor is then introduced and the pressure within the chamber consequently is the pressure of the water vapor present. A comparison of this pressure with the saturation pressure, obtained from a steam table or by calibration, gives a humidity reading. The means for evacuating air and introducing water vapor may be associated together for automatically maintaining any desired humidity condition. The chamber is formed of transparent material to allow visual inspection within the chamber and is provided with means to prevent fogging the chamber's surface. The simulated humidity condition is readily obtained, easily determined, and requires no complicated controls, gauges, measurements, or extensive calculation.

In the drawing is shown a humidity test chamber embodying the principles of the invention.

The humidity chamber assembly 10 includes a transparent cylindrical sleeve 12 received upon a base plate 14 within an annular groove 16 formed therein. A resilient sealing ring 18 is positioned within the annular groove 16 around the outside of the end of the cylindrical sleeve 12. An annular retainer plate 20 is disposed about the sleeve 12 and over the sealing ring 18. The retainer plate 20 is secured to the base plate 14 by fastening means 22 and is adapted to compress the sealing ring 18 into sealing

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engagement within the annular groove 16. A cover plate 24 is positioned over the other end of the cylindrical sleeve 12 to close off the sleeve and form the test chamber 26. A resilient sealing ring 28 is disposed about the upper end of the sleeve 12 and is compressed into sealing engagement with the sleeve by a retainer ring 30 secured to the cover plate as by fastening means 32.

The base plate 14 is received upon a baffled heater coil 34 arranged in an annular configuration within the base housing 36. A terminal block 38 is secured to the base housing 36 and is provided with a plurality of binding posts 40, two of which are shown. A plurality of other binding posts 42 are secured to the base plate 14 and are adapted to be connected to the terminal block binding posts 40 as by electrical leads 44 and 46. The base plate binding posts 42 are adapted to support a shelf 48 within the chamber 26 which is provided with plug-in connections 50 connected to the binding posts 42.

An outer transparent cylindrical sleeve 52 is secured to the base housing 36 as by fastening means 54 and is disposed concentrically about the inner sleeve 12. The spaced relation of the two sleeves 12 and 52 provides an annular air space 56 extending the full length of both sleeves and terminating in an annular outlet 58 around the cover plate 24. An opening 60 is provided through the base housing 36 through which forced air may be directed from an outside source as by blower means 63. The forced air supplied by blower means 63 is adapted to pass over the heater coil 34, warming the air, and to be conveyed through the annular passage 56 between the cylindrical sleeves 12 and 52 and out the outlet opening 58.

A vacuum pump 61 and a pressure gauge 62 are connected to the test chamber by passage members 64 and 66 secured within the base plate 14. A cutoff valve 68 is disposed within the one passage member 64 for isolating the chamber 26 from the pump 60 when desired. A thermometer 70 is mounted within the chamber 26 and is secured to the sleeve 12. An electrical motor 72 is vertically mounted upon the cover plate 24 and is secured thereto as by tie rods 74. Screws 76 are also provided to hold the motor 72 in a centered position. The motor shaft 78 is adapted to drive magnetic pole pieces 80. The magnetic influence of the rotating pole pieces 80 is adapted to cause rotation of the disk 82 secured to the shaft 84 of the fan 86. The fan shaft 84 is journaled within a bearing 88 mounted centrally within the cover plate 24. A plate 83 is secured to the cover plate 24 for separating the pole pieces 80 from the disk 82 and to thereby enable maintaining the sealed condition of the chamber 26.

An optional work shelf 90 may be provided within the chamber 26 and is secured to the inner wall of the sleeve 12. In the drawing a motor 92 is shown mounted upon the work shelf 90 and adapted to drive an eccentric 94 for flexing a spring member 96 for test purposes. The motor 92 is adapted to be connected by electrical leads 98 to the plug-in connections 50 of the shelf 48.

Disposed upon the shelf 48 within the sealed chamber 26 is a beaker 100 containing ice water 102 therein. A heater coil 104 is disposed within the beaker 100 and is connected by electrical leads 106 to the plug-in connection 50.

In making use of the test chamber 10 the material or device to be tested is placed within the chamber 26 and the cover plate 24 is secured in place. In the present instance there is shown a spring member 96 which is to be flexed for test purposes. All air is evacuated from the chamber 26 by the vacuum pump 60. As the air is evacuated towards a zero air pressure condition the ice water 102 will commence to vaporize. However the ice water being at a low temperature the air may be evacuated from the chamber 26 without excessive evaporation. The

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heater coil 104 is energized through the electrical leads 106. The water vapor passed off within the sealed chamber 26 is uniformly dispersed by means of the fan 86. The simulated humidity condition within the chamber is determinable by the thermometer 70 indicating saturation pressure and the pressure gauge 62 indicating actual water vapor pressure. The simulated condition may be varied by operation of the vacuum pump 61 or continued vaporization of the water 102 retained within the beaker 100. The forced air passing over the heater coil 34 and through the annular passage 56 clears all condensation off from the transparent sleeve 12 and enables visual inspection of the work being performed within the test chamber 26.

I claim:

1. A test chamber within which a humidified atmospheric condition is adapted to be simulated and which includes a transparent walled member having said chamber formed therein, said chamber being adapted to be closed off from the atmosphere, a housing provided about said walled member and including a transparent shell disposed in spaced relation to said walled member, means for evacuating substantially all air from said chamber, controllable means for releasing water vapor directly within said chamber, pressure indicating means connected to said chamber for measuring the water vapor pressure therein, and means for determining the saturation water vapor pressure attainable within said chamber, said water vapor pressure and saturation water vapor pressure being comparable to determine the relative humidity within said chamber.

2. A test chamber within which a humidified atmospheric condition is adapted to be simulated and which includes a transparent walled member having said chamber formed therein, said chamber being adapted to be closed off from the atmosphere, a housing provided about said walled member and including a transparent shell disposed in spaced relation to said walled member, means for evacuating substantially all air from said chamber, controllable means for releasing water vapor directly within said chamber, pressure indicating means connected to said chamber for measuring the water vapor pressure therein, and means for determining the saturation water vapor pressure attainable within said chamber, said water vapor pressure and saturation water vapor pressure being comparable to determine the relative humidity within said chamber, and means for removing condensate from the outer surface of said transparent walled member to enable visual inspection within said chamber.

3. A test chamber within which a humidified atmospheric condition is adapted to be simulated and which includes a transparent walled member having said chamber formed therein, said chamber being adapted to be closed off from the atmosphere, a housing provided about said walled member and including a transparent shell disposed in spaced relation to said walled member, means for evacuating air from said chamber, means for releasing water vapor directly within said chamber, pressure indicating means connected to said chamber for measuring the water vapor pressure therein, means for determining the saturation water vapor pressure attainable within said chamber, said water vapor pressure and said saturation water vapor pressure being comparable to determine the relative humidity within said chamber, and means for supplying forced air between said shell and said walled member for removing condensate collecting therebetween and to enable visual inspection through said transparent shell and walled member to within said chamber.

4. A humidity test chamber within which materials and apparatus may be disposed for test and which includes a transparent walled member formed to provide a chamber adapted to be closed off from the atmosphere, a housing disposed about said walled member, said housing including a transparent shell disposed in spaced rela-

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tion about said walled member, means for evacuating air from said chamber, means for releasing water vapor within said chamber, means for uniformly distributing said water vapor within said chamber, heating means disposed within said housing, means adapted to be connected to said housing for forcing air over said heating means and between said walled member and said shell to remove condensation collecting on said walled member and to enable visual inspection within said chamber through said shell and walled member, a pressure gauge connected to said chamber for indicating the water vapor pressure therein, and means for determining the saturation water vapor pressure attainable within said chamber, said water vapor pressure and saturation water vapor pressure being comparable to determine the relative humidity within said chamber.

5. A test chamber within which a humidified atmospheric condition is adapted to be simulated and which includes a walled member having said chamber formed therein, said chamber being adapted to be closed off from the atmosphere, means for evacuating the air from said chamber, a container disposed within said chamber, a receptacle for a mixture of ice and water disposed within said container, means for vaporizing said water to release water vapor within said chamber, pressure indicating means connected to said chamber for measuring the water vapor pressure therein, and means for determining the saturation water vapor pressure attainable within said chamber, said water vapor pressure and saturation water vapor pressure being comparable to determine the relative humidity within said chamber.

6. A test chamber within which a humidified atmospheric condition is adapted to be simulated and which includes a walled member having said chamber formed therein, said chamber being adapted to be closed off from the atmosphere, means for evacuating the air from said chamber, a container for ice disposed within said chamber, means for melting said ice to water for vaporizing said water to release water vapor within said chamber, pressure indicating means connected to said chamber for measuring water vapor pressure therein, and means for determining the saturation water vapor pressure attainable within said chamber, said water vapor pressure and saturation water vapor pressure being comparable to determine the relative humidity within said chamber.

7. A test chamber within which a humidified atmospheric condition is adapted to be simulated and which includes a walled member having said chamber formed therein, said chamber being adapted to be closed off from the atmosphere, means for evacuating the air from said chamber, a container disposed within said chamber, a receptacle for a mixture of ice and water disposed within said container, a heater coil disposed within said ice and water mixture, means for energizing said coil for melting said ice and for vaporizing said water to release water vapor within said chamber, pressure indicating means connected to said chamber for measuring water vapor pressure therein, and means for determining the saturation water vapor pressure attainable within said chamber, said water vapor pressure and saturation water vapor pressure being comparable to determine the relative humidity within said chamber.

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