Jan. 4, 1938. E. K. LONG 2,104,047

APPARATUS FOR PREDICTING AIR RESISTANCE OF FIBROUS ARTICLES

Filed April 23, 1935 2 Sheets-Sheet 1

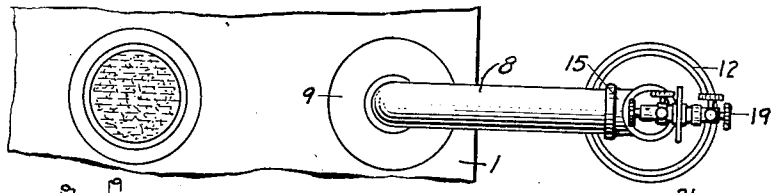


FIG. 2

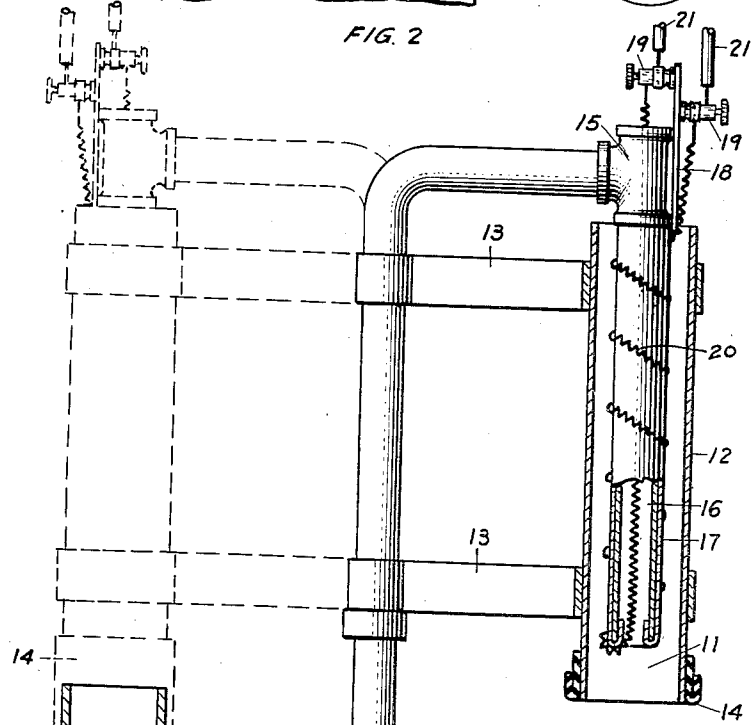
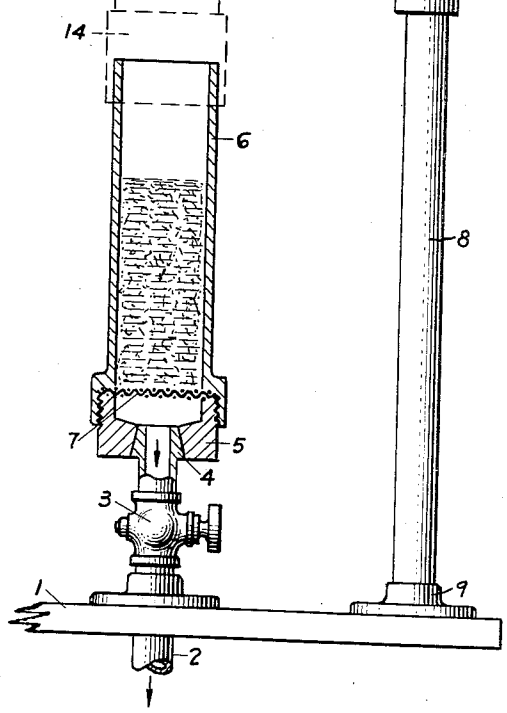


FIG. 1



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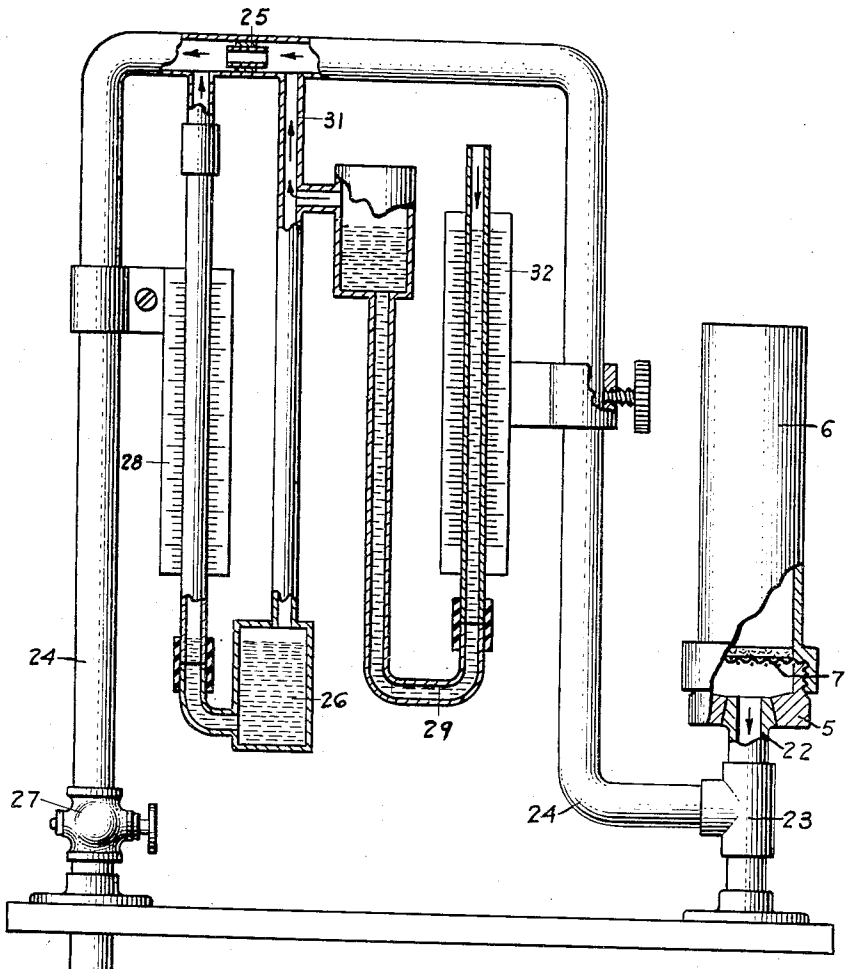


FIG. 3

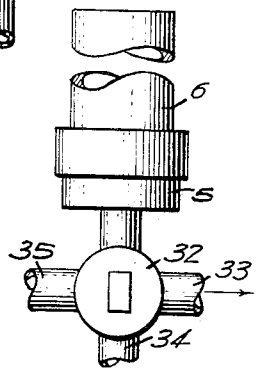


FIG. 4

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APPARATUS FOR PREDICTING AIR RESISTANCE OF FIBROUS ARTICLES

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Application April 23, 1935, Serial No. 17,830

1 Claim. (Cl. 73—51)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to him of any royalty thereon.

This invention relates to an apparatus for predetermining the resistance of articles made of pulp or fiber to air flow therethrough. For various uses, and particularly when the final product is to be used as an air filter for gas masks, it is very desirable that the air resistance of the pulp during treatment thereof be ascertained prior to completion of the treatment. By ascertaining the air resistance during treatment, it is possible to accurately foretell the air resistance of the final product, and the treatment may be varied to secure a final product having a known air resistance.

The canisters used for purifying contaminated air to make the air fit for breathing contain a filter element through which the air must pass. In some cases these filter elements are made of pulp or fibrous stock similar to that used in making paper. Filter elements used for this purpose must not have a high resistance to flow of air therethrough, since otherwise breathing resistance becomes too high. The present invention relates to the measurement of air resistance of paper stock used for making filters used in gas mask canisters, although not limited thereto.

One object of this invention is to provide an apparatus for readily and accurately determining the air resistance of pulp stock.

Another object of this invention is to provide an apparatus for accurately forecasting the air resistance of a final product formed of pulp stock by a test conducted during the treatment of the stock.

These and other objects of the invention will be apparent from the following description and appended claim, with the understanding that the several elements and steps herein described may be varied in construction, proportion and arrangement without departing from the spirit of the invention nor exceeding the scope of the appended claim.

In the drawings,

Fig. 1 is an elevation partly in section of the drying apparatus.

Fig. 2 is a plan thereof.

Fig. 3 is a part elevational part sectional view, of the apparatus showing the dried pad in testing position.

Fig. 4 is a broken elevation of a modification.

Referring to Figures 1 and 2, a suitable base 1 supports pipe 2 connected to a source of vacuum such as a suction pump. A valve 3 controls suction through pipe 2, the upper end of the pipe terminating in a tapered fitting 4. Fitting 4 is adapted to fit into a correspondingly tapered opening in the base 5 of a pulp stock holder comprising a tube 6 threaded on base 5. A fine mesh wire screen 7 is removably secured between base 5 and tube 6.

The base 1 further supports an upright standard 8 which may be rotated in base 9, the standard carrying an electric heater 11 comprising an outer brass tube 12 of substantially the same size as tube 6. Tube 11 is supported from standard 8 by brackets 13 and carries a rubber hose 14 at its lower end whereby tubes 6 and 12 may be easily connected as shown by dotted lines in Fig. 1. The standard 8 supports a T fitting 15 into which is threaded a brass tube 16 having an insulating sleeve 17 thereon, the sleeve extending up into the lower end of tube 16.

An insulating bar 18 is mounted on T fitting 15 and supports the electrical terminals 19 connected to wires 21 leading to a source of electric current. A heater wire 20 such as "Nichrome" is connected to the terminals, the wire extending downwardly within tube 16 and then is wrapped around the outer insulating tube 17.

The operation of this part of the invention is as follows. A sample of the pulp stock is taken from the beater, Jordan, or stock chest and diluted to the consistency and temperature desired. The tester is assembled by placing the screen 7 against base 5 and screwing tube 6 in place. The tester is then placed on tapered fitting 4, after which the diluted stock is stirred very thoroughly and a sample withdrawn and poured into the top of tube 6. The electric heater 11 is then swung over to the dotted line position Fig. 1, tubes 6 and 12 are connected by rubber hose 14, and suction valve 3 is opened and the electric current turned on.

The suction draws off the excess water and the incoming air is heated by the electric heater to rapidly dry the stock. The test sample of stock forms as a pad on top of screen 7.

The tester tube 6 is then removed from fitting 4, the electric heater being turned out of the way, and the test pad of stock and screen 7 are removed and separated. The dried pad is carefully weighed at once before it can be affected by atmospheric humidity. If the weight is not within predetermined desired limits the dilution of the stock is altered accordingly and a new test taken.

When the weight is correct, the test pad is re-

placed on screen 7 and assembled with base 5 and tube 6. Base 5 is then placed on tapered fitting 22 mounted on T fitting 23 on base 1. A pipe 24, preferably bent into U shape as seen in Fig. 3, is connected to T 23, the other end of the pipe being connected to a source of vacuum.

The test pad is now ready to measure its resistance to air flow at a predetermined rate of flow. For measuring these quantities, the pipe 24 has a restriction 25 therein with a manometer 26 connected into pipe 24 on opposite sides of the restriction. Manometer 26 will measure the rate of flow of air through the test pad, in well known manner. For testing filters for use with gas mask, the rate of flow is adjusted to 85 liters per minute by a valve 27, the rate of flow being indicated on a suitably calibrated scale 28.

The resistance of the test pad to air flow therethrough is simultaneously measured by a manometer 29 having one end connected to pipe 24 and its other end open to atmosphere. For convenience, the two manometers are connected to pipe 24 by a common pipe 31. Manometer 29 is read from scale 32.

In operation several tests are made for each batch of stock and the weights and resistances are averaged. A slight correction is made in the resistance for any variation from a standard weight. In using the tester, a chart is preferably made up plotting the resistance of a group of finished filters against the test pad resistance of each filter. Such a chart will show a straight line graph. This chart may be used to accurately predict the resistance of a finished filter made up from a batch of pulp by the resistance of the test pad.

This test may be applied to the preparation of any paper stock or similar material where the porosity or texture of the finished material is important. The test apparatus is simple and cheap and the entire test may readily be conducted by relatively unskilled workmen. One important advantage is that the test may be rapidly conducted while the pulp stock is still in an intermediate state of treatment, so that the treatment may be readily varied in accordance with the data obtained from the test.

In Figure 4, there is shown a modification wherein the cylinder 6 containing the test pad need not be transferred from the drying position to the testing position as in the previously described form. In Fig. 4, the cylinder 6 is mounted on base 5 which in turn is connected to a four-way, three position valve 32. This valve has connected thereto a pipe 33 leading to a source of vacuum, pipe 34 open to atmosphere, and pipe 35 corresponding to pipe 24, Fig. 3, and connected to the tester.

In this form of my invention, the valve 32 may be positioned to connect the tester to atmosphere while closing the vacuum pipe 33; to connect the cylinder 6 with vacuum pipe 33 for drying; and to connect cylinder 6 to test pipe 35. The operation of this form is the same as previously described except that valve 32 is operated instead of moving cylinder 6 from fitting 4 to fitting 22.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth by way of illustration as it is apparent that many changes and variations may be made therein by those skilled in the art without departing from the spirit of the invention or exceeding the scope of the appended claim.

I claim:

Apparatus for rapidly drying and testing the air resistance of sample test pads of fibrous material comprising a suction conduit having a ground tapered end, a cup-shaped base having a correspondingly ground tapered opening in its bottom for air-tight fit over the end of said conduit, a mesh screen extending across the rim of said cup-shaped base and adapted to hold the wet pulp for drying into a test pad and the test pad, a pipe threaded on said cup-shaped base and holding said screen over the rim of the cup-shaped base, a manometer connected to said suction conduit for measuring air flow therethrough, a second manometer for measuring the resistance to air flow of said test pad, and means to adjust the flow of air through said conduit and test pad.

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