Sept. 1, 1931. A. C. ANDERSEN 1,821,605

APPARATUS FOR MEASURING THE CONTENTS OF MOISTURE IN CHEMICAL AND MECHANICAL WOOD PULP

Filed Sept. 29, 1927

Fig. 1.

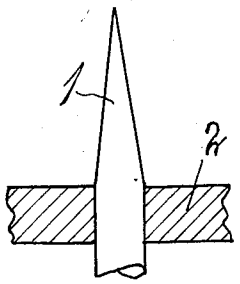


Fig. 2.

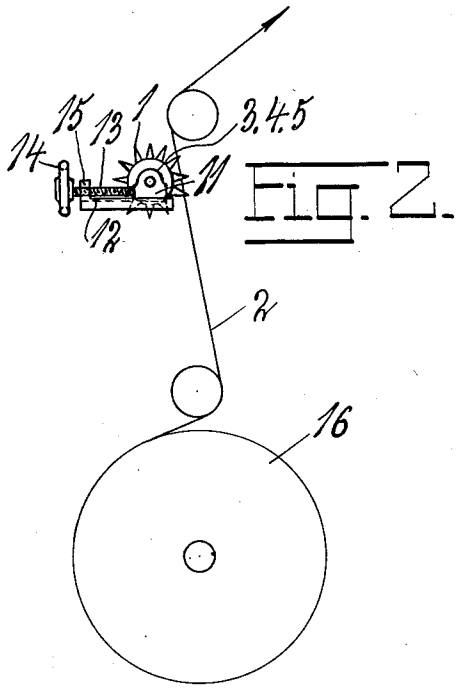


Fig. 3.

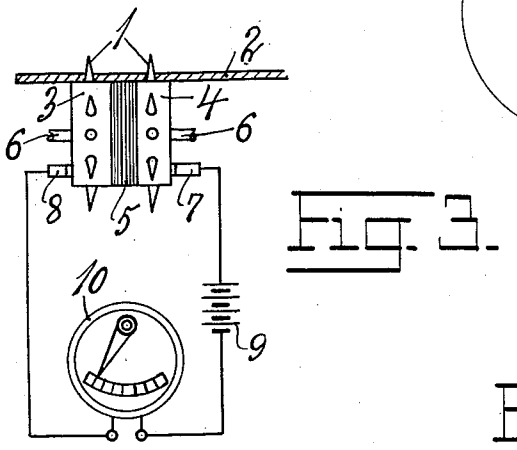
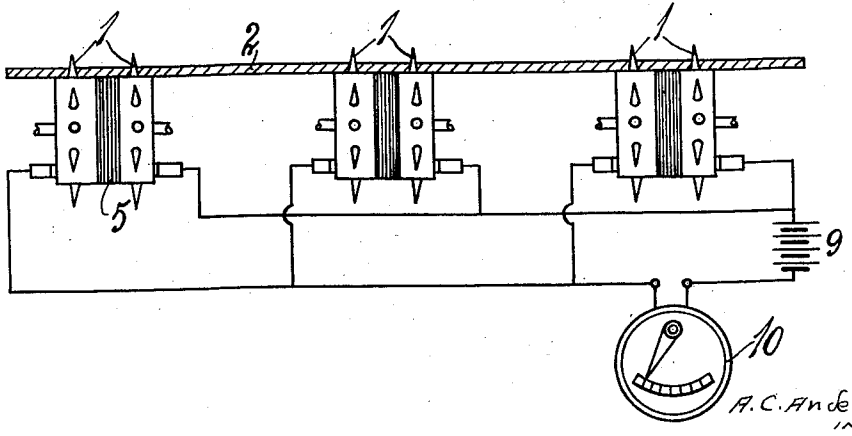


Fig. 4.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR MEASURING THE CONTENTS OF MOISTURE IN CHEMICAL AND MECHANICAL WOOD PULP

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It is a well known fact that it is very difficult to obtain exact measurements of the degree of moisture contained in chemical and mechanical wood pulp, and as the manufacturers are bound to rather narrow limits as to the degree of moisture, it would obviously be of great importance to provide means, whereby the manufacturer may be able to ensure himself of the content of moisture being inside the tolerated limits, but hitherto there has existed no method for determining this content in a practical and reliable manner.

The present invention relates to an apparatus for this purpose and is based upon the well-known fact, that the permeability of the pulp sheet to electricity is to a certain degree depended on its content of moisture, the conductivity of the pulp sheet being higher the greater is its content of moisture. However, in practice it has proved difficult to bring about between a measuring device and the pulp web a contact which might enable any useful result to be obtained, because—on account of the uneven surface of the pulp sheet or web—it was impossible to obtain a sufficiently even contacting area between the web and the member conducting the electricity to obtain useful results.

I have now made the observation that by using one or more needles or points which are pricked quite through the web, I am able to obtain practically constant contacting areas between the pulp web and the said contact needles or points, because the said contact areas in all cases will be equal to the circumference of the needle or point in question multiplied into the thickness of the web. My apparatus consists of a device having one or more points or needles made of electrically conducting material, said device being put in connection with an electric source of current and being adapted to prick through the pulp web in such a manner that the web throughout its thickness enters into contact with the side faces of the needle or needles. The electric current passes through the needles into the moist web and then again into another needle or set of needles or other parts of metal, the parts mentioned being included in an electric circuit including also a meter of electricity of any suitable kind, such as a galvanometer of well-known construction. According as the degree of moisture is high or low the galvanometer will show a low or high value, consequently the galvanometer can be made to show directly the percentage of moisture contained in the web.

In the annexed drawings I have illustrated one embodiment of my invention but it should be understood that the invention is not limited to the special example here shown but can be varied in several manners without departing from the spirit or the principle for which I claim protection.

Figure 1 shows to a highly enlarged scale the relative condition between a perforating needle or point and the pulp web.

Figure 2 illustrates diagrammatically the arrangement of the needle device in connection with an endless pulp web, and Figures 3 and 4 are diagrams showing the manner wherein the device is connected with the source of current and the galvanometer.

Assuming the needle or point 1 being pricked through the web 2 always to the same depth, it will be seen from Figure 1 that a specially good contact will always be formed all around the needle on an area which may be considered as being practically constant, if the needle has, as shown, a root portion with parallel sides making contact with the web.

The needle device may be constructed for instance as indicated in Figure 3 so as to form a rotating roller consisting of two metal discs 3, 4, placed side by side in axial alignment and spaced apart by a layer 5 of insulating material. The needles 1 are arranged in one or more rows evenly distributed on the circumference of the discs which may be mounted on pivots 6 and each provided with a sliding contact spring 7 and 8, respectively, connected to either side of an electric circuit including some suitable source of current, such as a battery 9, and a measuring apparatus, such as a galvanometer 10. From Figure 3 is clearly seen that the current passes from battery 9 to spring 7, disc 4, needle of same, pulp web 2, needle of disc 3, disc, spring 8 and galvanometer 10 back to battery. The galvanometer 10 conse-

quently will show a value depending upon the degree of moisture contained in the portion of the web 2 located at any time between the needles of discs 3 and 4.

The degree of moisture may in some cases be somewhat different in different places of the width of the web. In order to obtain a registration of the average degree of moisture, I may arrange a plurality of needle devices on one and the same cross line of the web 2 as indicated in Figure 4, wherein the devices are shown as connected in parallel to a common battery 9 and a common galvanometer 10. In both cases the galvanometer will show the average degree of conductivity of the web, and the galvanometer may be provided with an index showing the average moisture directly at any moment.

Each needle roller 3, 4, 5 may be mounted in bearings 11 (Figure 2) sliding in a frame 12. The bearings are adjustable in this frame by means of a screw 13 provided with a hand wheel 14 and passing through a nut 15 on the frame. Thereby the needle roller can be adjusted with regard to the pulp web 2 so as to be in co-operation with same or retracted therefrom preferably on the portion of the web located between the last drying cylinder 16 and the pair of scissors (not shown).

As mentioned above the apparatus 10 used is in this particular case a galvanometer, but obviously the apparatus used may be any suitable current measuring apparatus showing the intensity, voltage or other value of the current passing between the two rows of needles or passing through the web portion in question. As a source of current I may also use a dynamo driven by a motor.

Claims:

1. In an apparatus for determining the amount of moisture in webs of cellulose or the like by measuring the electric current passed through a web by means of a contact device, said contact device comprising circularly alined current conducting needles adapted to be thrust for their entire length through the web so that the surfaces thereof contact with the entire thickness of the web.

2. In an apparatus for determining the amount of moisture in webs of cellulose or the like by measuring the electric current passed through a web by means of a contact device, a shaft, the contact device being carried by the shaft and consisting of a pair of disks, a layer of insulating material on the shaft and disposed between the opposed faces of the disks, a row of circularly alined current conducting needles carried by each disk, said needles being of a length greater than the thickness of the web, said disks being rotated when the needles penetrate the full thickness of the web to cause the needles of each row to successively penetrate the web.

3. In a device as claimed in claim 2, wherein the shaft is supported in bearings, a frame slidably supporting the bearings, and a feed screw adjustable in the frame and connecting with the bearings, whereby the needles of the contact device can be moved into or out of penetrating engagement with the web.

In testimony whereof I have signed my name to this specification.

AXEL CHRISTIAN ANDERSEN.