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METHOD AND APPARATUS FOR DETERMINING THE CONSISTENCY OF PULP SUSPENSIONS

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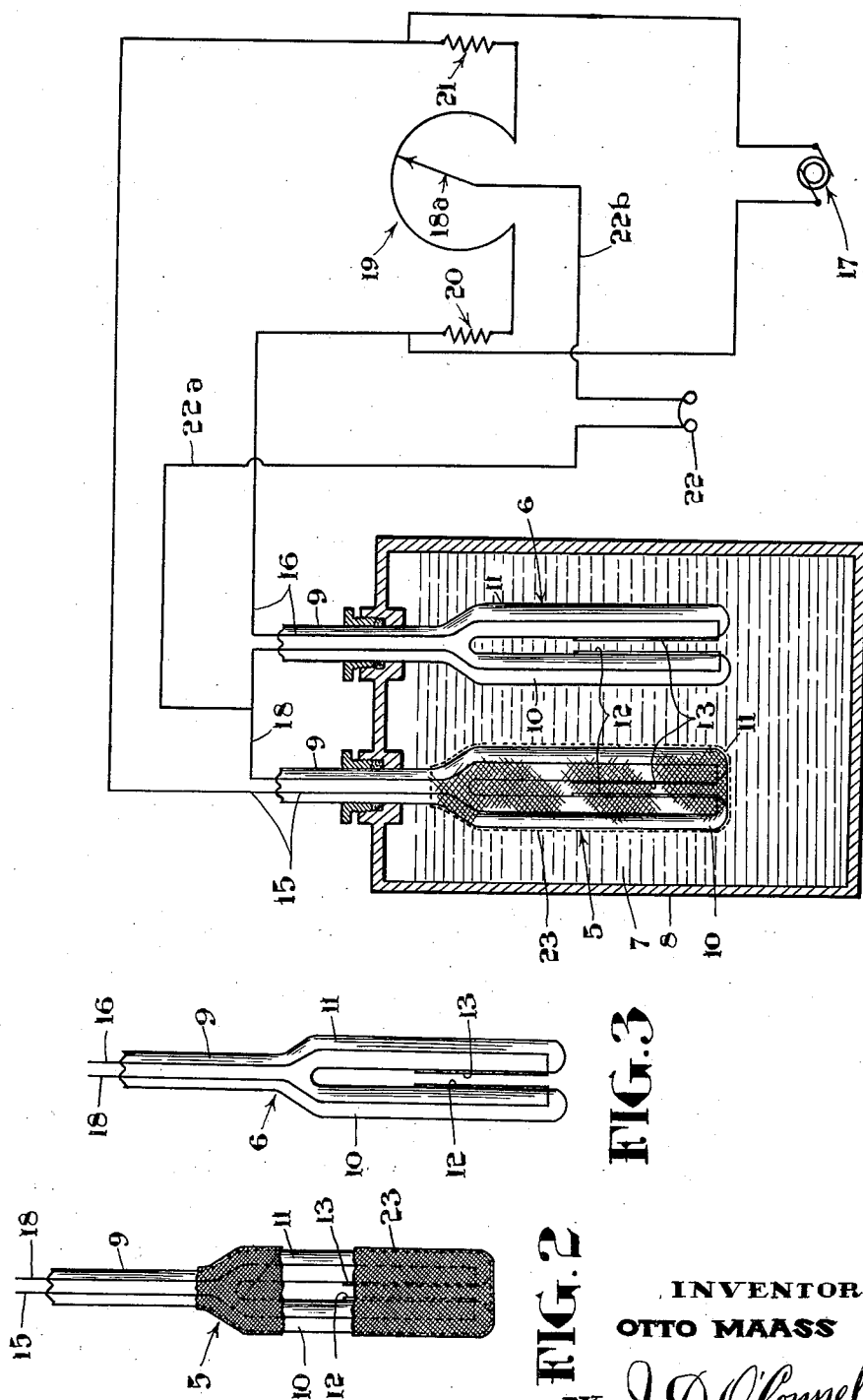


FIG. 1

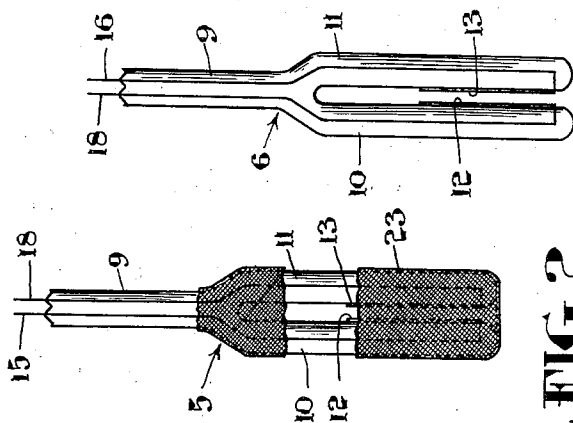


FIG. 2

FIG. 3

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METHOD AND APPARATUS FOR DETERMINING THE CONSISTENCY OF PULP SUSPENSIONS

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3 Claims. (Cl. 175-183)

This invention relates to a method and apparatus for determining the consistency of aqueous suspensions such, for example, as pulp suspensions used in the manufacture of pulp and paper products.

According to this invention a pair of electric cells are immersed in the same pulp suspension so that both cells are subjected to the same temperature variations and are equally affected by changes in the conductivity and other characteristics of the liquid component of said suspension. The electrodes of one cell are protected by a screen to exclude pulp constituents from the space between these electrodes while permitting the liquid component of the suspension to have free access to such space. The electrodes of the remaining cell are left unprotected so that both the liquid and the pulp constituents have free access to the space between these unprotected electrodes. The two cells are balanced against each other or otherwise included in a suitable electrical net work so that the ratio of the resistance between the electrodes of the protected cell (a) to the resistance between the electrodes of the unprotected cell (b) may be readily determined as a measure of the consistency of the suspension. In this connection it will be understood that the volume of conducting liquid (water) between the protected electrodes remains constant due to exclusion of the pulp constituents whereas the volume of conducting liquid between the unprotected electrodes is diminished by the presence of the non-conductive pulp constituents. Consequently, the value of the resistance ratio a/b of the two cells varies according to the amount of pulp present in the suspension.

One form of apparatus which may be used in accordance with this invention is illustrated in the accompanying drawing, in which—

Fig. 1 is a diagrammatic representation of a simple embodiment of the present invention as used for determining the consistency of a pulp suspension flowing through a conduit of a pulp circulating system.

Fig. 2 is an enlarged view of the protected cell, showing the arrangement of the electrodes and the electrode protecting screen.

Fig. 3 is an enlarged view of the unprotected cell.

Referring more particularly to the drawing, 5 and 6 designate electric cells immersed in a pulp suspension 7 flowing through a conduit 8, said conduit representing part of a pulp circulating system used in a pulp or paper mill.

The exact structure of the cells 5 and 6 is not a vital feature of this invention and may be modified to suit the exigencies of particular installations. As here shown, each cell comprises a pyrex tube 9 having its lower portion branched to provide opposing laterally spaced legs 10 and 11. A platinum electrode 12 is secured to the inner surface of the leg 10 of each cell directly opposite a similar electrode 13 secured to the inner surface of the companion leg 11. The electrode 12 of cell 5 and the electrode 13 of cell 6 are connected by conductors 15 and 16 to opposite sides of a suitable high frequency alternating current source 17. The remaining electrode 13 of cell 5 is directly connected to the remaining electrode 12 of cell 6 by conductor 18. A Kohlrausch slidewire arrangement 19 is connected across the conductors 15 and 16 in series with suitable resistances 20 and 21, said resistances being located at opposite sides of the slidewire arrangement. Suitable earphones appearing at 22 are connected between the cells and the slidewire pointer 18a by means of conductors 22a and 22b.

The principal feature of this invention consists in excluding the pulp constituents from the space between the electrodes of cell 5 while permitting both the pulp and liquid components of the suspension to have free access to the space between the electrodes of cell 6. This is conveniently accomplished by providing a suitable pulp excluding screen 23 around the legs 10 and 11 of cell 5, as shown to advantage in Fig. 2. This screen may consist of a wrapping of gauze, woven wire cloth, or other water permeable material of sufficiently fine mesh to prevent passage of the pulp constituents through the interstices thereof.

Since the pulp constituents are excluded from the space between the electrodes of cell 5 it follows that the ratio of the resistances of the two cells will vary according to the concentration of pulp in the space between the electrodes of cell 6. This variation may be noted by using the earphones and moving the pointer 18a over the slidewire scale divisions until the null point is reached, that is, the point at which no sound is audible in the earphones. The reading thus obtained may be checked against a standard reading taken with the same volume of conducting liquid present between the electrodes of both cells.

The sensitivity of the apparatus described herein is materially increased by the provision of the resistances 20 and 21 which serve to magnify any change in the ratio of the resistances of

the two cells due to a change in consistency of the pulp suspension 7. If, for example, the slide-wire has a resistance of 6 ohms and 10 ohms resistance are introduced on either side of it by means of the resistances 20 and 21 the total resistance of the slidewire system is thus increased to 26 ohms of which the slidewire contributes only 6. Therefore, any small change in the ratio of the resistance of cells 5 and 6 is indicated by a relatively large swing of the pointer 18a over the scale divisions of the slidewire.

In this apparatus the use of an alternating current source 17 is resorted to in order to minimize polarization. The main advantage of this invention is that it makes possible the provision of a very simple apparatus capable of making accurate, instantaneous determinations of pulp concentrations. Another advantage is that the apparatus may be readily inserted in any system where circulation of pulp is taking place and gives readings which are not affected by variations in the liquid components of the suspension such, for example, as variations in temperature and concentration of dissolved salts. The sensitivity of the apparatus is such that differences in concentration of 0.01% are readily detected and measured.

Having thus described my invention, what I claim is:—

1. A method of determining the consistency of a pulp suspension which comprises immersing two pairs of electrodes in said suspension, excluding pulp constituents of the suspension from the space between the electrodes of one pair so that the resistance of the path between such elec-

trodes is determined solely by the conductivity of the liquid component of the suspension whereas the resistance of the path between the electrodes of the remaining pair is determined by the consistency of the suspension, and noting the ratio of the resistances of said paths.

2. A method of determining the consistency of a pulp suspension which comprises immersing two pairs of electrodes in said suspension, excluding pulp constituents of the suspension from the space between the electrodes of one pair so that the resistance of the path between said electrodes is determined solely by the conductivity of the liquid component of the suspension whereas the resistance of the path between the electrodes of the remaining pair is determined by the consistency of the suspension and balancing the electrodes of one pair against the electrodes of the companion pair in a suitable electrical net work including means for indicating variations in the ratio of the resistances of said paths.

3. Apparatus for determining the consistency of a pulp suspension comprising a pair of cells immersed in said suspension, a liquid permeable screen serving to exclude pulp constituents from the space between the electrodes of one cell while permitting the liquid component of the suspension to have free access to such space, the electrodes of the remaining cell being left unprotected so that the suspension forms a conducting path therebetween having a resistance determined by the consistency of the suspension and means for indicating the ratio of the resistances of said paths.

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