

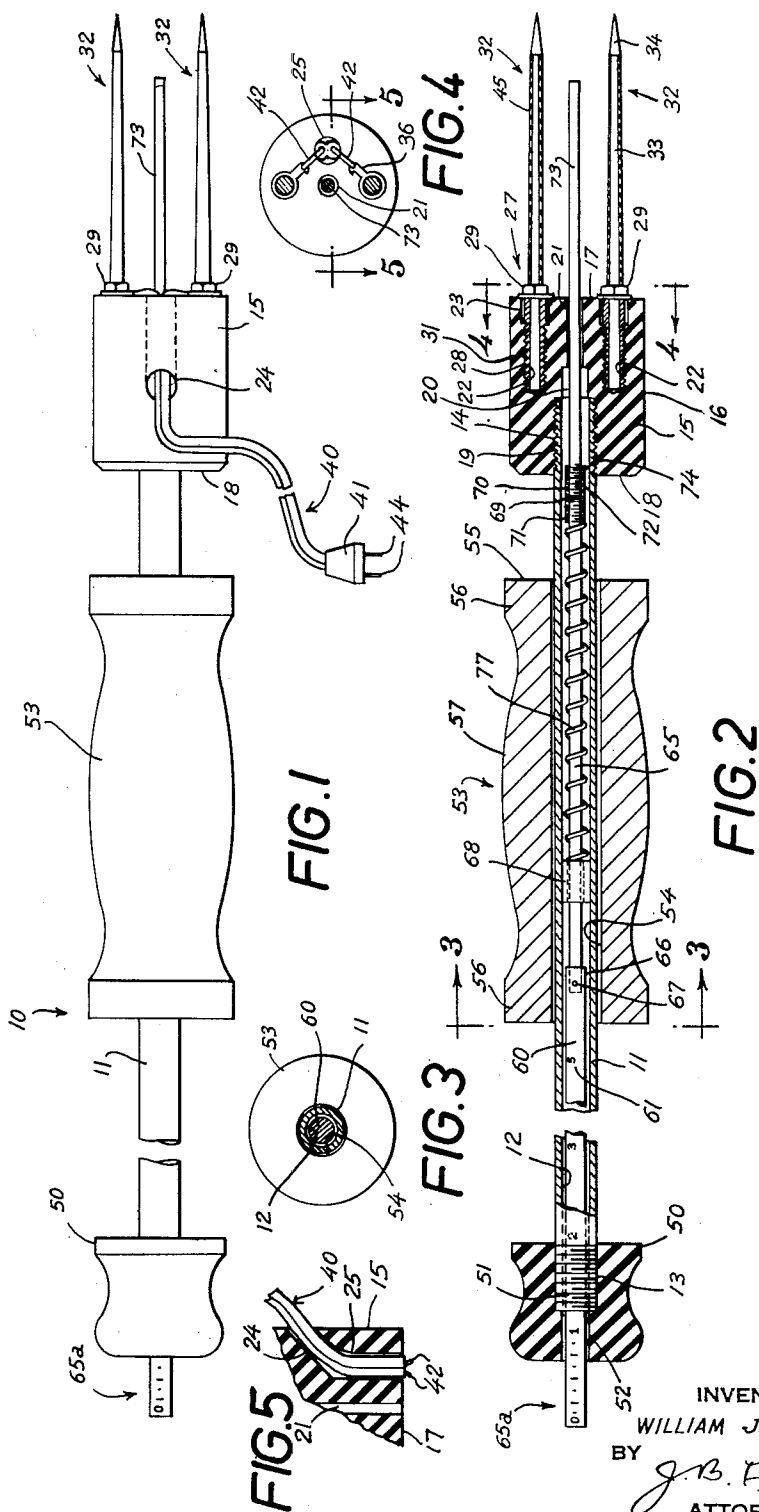
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W. J. DELMHORST

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ELECTRODE ASSEMBLY FOR MOISTURE METERS

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INVENTOR
WILLIAM J. DELMHORST
BY *J. B. Felsheim*
ATTORNEY

UNITED STATES PATENT OFFICE

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ELECTRODE ASSEMBLY FOR MOISTURE METERS

William J. Delmhorst, Boonton, N. J.

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This invention relates to electrode assembly for moisture meters.

Moisture meters have been known, operated electrically to determine the moisture content of wood, densely baled material, or the like material, said meters operating on the principle of measuring electric resistances which is controlled by the moisture content in the material to be tested. A meter of such kind is shown and described in my Patent No. 2,272,239 issued on February 10, 1942.

The present invention relates to an electrode or contactor, the means for making contact with the wood or other material to be tested, and said electrode being provided with a cable connected to a plug which may be connected to the meter for electrically connecting the prongs to desired electrodes on the meter.

Electrodes as heretofore constructed comprised a pair of prongs which were driven into the wood. These prongs were metal and contacted the wood throughout their length to the depth of penetration. However, when wood or other material is wet on or near the surface, a moisture meter provided with all metal contact pins, tends to read the moisture content of the wettest fibres in contact with the pins, and therefore does not represent the true moisture content of the material since the resistance measured is always that of the wet fibres, no matter how deep the pins penetrate the material.

It is hence an object of the present invention to provide an electrode comprising a pair of prongs, pins or needles, the shanks of which are coated with an electric insulating material so that only the points of the needles are exposed. With such construction when the needles are forced into the wood, the resistance will be measured at the points of furthest penetration of the wood. By penetrating the needles to different depths, two measurements at two different depths or levels can be obtained and these readings can be extrapolated. From the two readings at two levels a curve may be made to predict what other readings would be at other depths.

Another object of the present invention is to provide in an electrode of the character described, highly improved means to indicate the depth to which the needles have been penetrated into the wood or other material being tested.

Still another object of this invention is to provide a highly improved electrode of the character described having improved means for forcing the needles into the wood and for re-

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moving the needles from the wood without danger of breaking the needles.

Yet a further object of this invention is to provide a strong and durable electrode of the character described which shall be relatively inexpensive to manufacture, easy to assemble, and which shall yet be practical and efficient to a high degree.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims.

In the accompanying drawings in which is shown various illustrative embodiments of this invention,

Fig. 1 is a side elevational view of an electrode embodying the invention;

Fig. 2 is a longitudinal cross-sectional view thereof;

Fig. 3 is a cross-sectional view taken on line 3-3 of Fig. 2;

Fig. 4 is a cross-sectional view taken on line 4-4 of Fig. 2, and

Fig. 5 is a cross-sectional view taken on line 5-5 of Fig. 4.

Referring now in detail to the drawing, 10 designates an electrode embodying the invention. The same comprises a hollow shaft or tube 11 which may be made of steel or the like material. The shaft 11 is formed with an axial through opening 12. It is provided adjacent its outer ends with external screw threads 13 and 14, respectively. Screwed to the forward threaded portion 14 is a head 15 made of electric insulating material such as ethyl cellulose or other synthetic plastics or phenol condensate products. The member 15 is in the shape of a cylindrical block having a cylindrical outer surface 16 and end surfaces 17 and 18.

Extending inwardly from the end surface 18 is an axial screw threaded opening 19 into which the threaded portion 14 of the hollow shaft 11 is screwed. Extending from the threaded opening 19 is a smooth opening 20 coaxial therewith, and extending therefrom is an axial through opening 21 of smaller diameter. The opening 21 extends to the end surface 17.

The block 15 is furthermore formed with a pair of blind openings 22 parallel to one another and disposed on opposite sides of the axial opening 21 and in a diametric plane passing through

the axis of the block 15. The rear portions of the openings 22 are screw threaded as shown in Fig. 2 of the drawing. Said openings 22 are counterbored at their forward ends as at 23. The block 15 is furthermore formed with an inclined drilled opening 24 extending from the outer surface of the block forwardly and towards the axis of the block, and extending from the openings 24 is an opening 25 parallel to the axis and extending to the forward end surface 17 of the block. The opening 25 may be drilled from one end of the block 15 to meet the drilled opening 24. The openings 24 and 25 lie in a plane passing through the axis of the block and at right angles to a plane passing through the axes of the openings 22.

Screwed to each of the threaded openings 22 is a cap screw 27 having a threaded shank 28 and a polygonal or nut head 29 at its forward end. Each cap screw is formed with a through opening into which is force fitted the rear end 31 of a prong, pin or needle 32. Said prong or needle 32 comprises a reduced shank 33 extending from the rear end portion 31. The portion 33 may taper, decreasing in diameter towards the front end. At the forward end of the shank 33 however, is a conical point 34. The base of the conical point 34 is larger in diameter than the forward end of the shank 33 by an amount greater than the thickness of the insulation.

Surrounding the shank of each cap screw and contacting surfacely and the undersurface of the nut portion 29 is a solder lug 36. The solder lugs 36 have extensions inclined towards the axis of the opening 25. A duplex cable 40, to one end of which is attached a plug connector 41, enters the opening 24, passes through the openings 25, and the leads 42 of the cable are soldered to the extensions of the solder lugs 36. The needles or prongs are thus electrically connected to the blades 44 of the plug connector 41. The solder lugs are clamped to head 15 by the cap screws. The connectors may be varied. It is important that the pins are insulated from each other with a high resistance insulation and that each of them are electrically connected to the metering circuit.

Surrounding the tapered shanks 33 of each of the prongs or needles 32 is a coating 45 of electric insulating material, such as vinylite or phenolic resin, or the like material. Said coating may be baked on. The coating or layer 45 is preferably hard. It may be about .005 inch in thickness. It extends from the nut 29 to the base of the point 34. The diameter of the base of conical point 34 is preferably greater than the outer diameter of coating 45 adjacent said base. The point thus acts as a pilot hole and the insulation will be protected from extensive wear.

Screwed onto the rear end portion 13 of the tube 11 is a handle knob 50. It may be made of wood, synthetic plastic such as ethyl cellulose, or of any other suitable material. It is preferably hard or rigid. It is formed with an internally screw threaded portion 51 engaging the threaded portion 13 of the tube. It is also formed with an axial through opening 52 communicating with the opening 51. Slidably mounted on the tube is a sliding hammer 53. The hammer 53 is formed with a through opening 54, loosely receiving the tube 11. The hammer 53 may be shaped so that it may be grasped by the hand. It is considerably shorter than the tube 11. It has flat ends 55. It has enlarged ends

56 and intermediate longitudinal curved portion 57 shaped like the handle. The hammer 53 may be grasped in the hand and moved back and forth on the tube for the purpose hereinafter appearing. The hammer 53 may be made of cast iron or any other suitable metal.

Slidably mounted within the rear end of the tube 11 is a rod 60 on which is imprinted or engraved a scale 61. The scale may be in inches and sub-divisions thereof. The rod 60 may be round, flat, or of any other suitable cross-sectional shape.

Attached to the forward end of the rod 60 is a connector rod 65. The rod 60 may be formed with a socket 66 to receive the rear end of the rod 65. The rod 65 is of smaller diameter than the rod 60. It may be pinned to the rod 60 by a transverse drive screw or pin 67 passing through registering openings in said rod 65 and in the rod 60. The rod 65 is coaxial with respect to the rod 60, the latter being loosely slidable within the tube.

Surrounding the rod 65 and adapted to be contacted by the forward end of the rod 60 is a brass bushing 68. The bushing 68 is force fitted within the tube 60. The rod 65 loosely passes through said bushing.

The forward end of the rod 65 is screw threaded as at 69. Screwed thereto is an internally threaded coupling bushing 70. Surrounding the rod 65 and contacting the rear end of the bushing 70 is a lock nut 71, screwed on to the threaded portion 69 of said rod. Screwed to the coupling member 70 is the rear threaded end 72 of a push rod 73. Screwed on to the threaded portion 72 and contacting bushing 70 is another lock nut 74. The push rod 73 passes through opening 21 and is located between the prongs or needles 32. It will now be understood that the scale 60, connector rod 65 and push rod 73 are all interconnected and move together and form a depth gauge 65a for measuring depth of penetration of the needles.

Surrounding the rod 65 and interposed between the lock nut 71 and the bushing 68 is a coil compression spring 77.

It will be noted that when the gauge 65a is moved to the right so that the left end of the scale 60 is at the rear surface of the knob 50, the forward end of the push rod will be substantially at the tip of the points 34.

The operation and use of the electrode disclosed herein will now be explained. The plug connector 41 is connected to an electric moisture meter. The prongs 32 are then forced into a piece of wood so that the points 34 penetrate the wood to one depth. This may be accomplished by placing the points on the wood and then grasping the hammer 53 and reciprocating it to strike the head or plug 15. The guided blows minimize breakage of the electrode pins or prongs.

Due to the fact that the prongs 33 are covered with insulating material a true reading at the depth of penetration is possible. If the pins 33 are uncoated, and if the wood is wetter at the outside, the uncoated needle does not give an accurate measurement, because no matter how deep you penetrate the resistance is always measured at the outside and you do not get moisture measurements at the inside of the wood because the reading indicated by the moisture meter will be that of wet fibres at the surface. However, with the device embodying the present invention

it is possible to get accurate moisture measurements at various depths.

The device can be used on wood, densely baled material such as paper and the like material. The electrode may be easily removed by driving the hammer against the knob 50 thereby eliminating contact pin breakage.

The gauge 65a indicates the depth of penetration of the pins or needles 32, and such depth may be read directly on the scale 61 on the rod 60. The amount of projection of the scale 60 beyond the knob 50 is equal to the penetration of the contact pins or needles. The forward end of the push rod 73 contacts the outer surface of the wood being penetrated, and the further the penetration the more the rod 60 is pushed rearwardly beyond the knob 50. If the penetration is one inch, the scale will read 1" at the rear surface of the knob. It will be noted that the spring 77 pressing against the lock nut 71 serves to press the scale 60 forwardly so that the forward end of the rod 60 contacts the bushing 68. As the gauge is pushed back the spring is compressed and the rod 60 moves away from the bushing 68. When the electrode is removed from the wood the spring 73 pushes the gauge forward again to its initial position.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention I claim as new and desire to secure by Letters Patent:

1. An electrode of the character described comprising a tube, a knob fixed to the rear end of the tube, an insulating head fixed to the forward end of the tube, a pair of pointed pins attached to the head and projecting forwardly therefrom and disposed on opposite sides of said tube, a cable electrically connected to said pins and a hammer slidable on the tube and between the knob and the head, and a gauge slidable within said tube and passing through openings in the knob and in the head, and located between said pins, and provided with a scale to indicate depth of penetration of the pins.

2. An electrode of the character described comprising a tube, an insulating head at one end thereof, a pair of pins attached to said head and disposed on opposite sides of said tube, a penetration gauge slidably mounted in said tube and between said pins, said head having an opening from which said gauge projects.

3. An electrode of the character described comprising a tube, an insulating head at one end thereof, a pair of pins attached to said head and disposed on opposite sides of said tube, a penetration gauge slidably mounted in said tube and between said pins, said head having an opening from which said gauge projects, and spring means for moving said gauge in one direction.

4. An electrode of the character described comprising a tube, an insulating head at one end thereof, a pair of pins attached to said head and disposed on opposite sides of said tube, a penetration gauge slidably mounted in said tube and between said pins, said head having an opening from which said gauge projects, spring means

for moving said gauge in one direction, and stop means to limit movement of said gauge in said direction.

5. An electrode of the character described comprising a tube, an insulating head at one end thereof, a pair of pins attached to said head and disposed on opposite sides of said tube, a penetration gauge slidably mounted in said tube and between said pins, said head having an opening from which said gauge projects, spring means for moving said gauge in one direction, stop means to limit movement of said gauge in said direction, and a scale at one end of said gauge.

6. An electrode of the character described comprising a tube, an insulating head at one end thereof, a pair of pins attached to said head and disposed on opposite sides of said tube, a penetration gauge slidably mounted in said tube and between said pins, said head having an opening from which said gauge projects, spring means for moving said gauge in one direction, stop means to limit movement of said gauge in said direction, a scale at one end of said gauge, a knob attached to the rear end of said tube, and a hammer slidably mounted on the tube and between said head and knob.

7. An electrode of the character described comprising an elongated straight member, an insulating head at one end of the member, a knob at the other end of said member, a hammer slidable on said straight member and disposed between said head and knob, and a pair of penetrating pins attached to said head and projecting forwardly therefrom, and means slidable relative to said straight member for measuring the depth of penetration of the pins and disposed between said pins.

8. An electrode of the character described comprising an elongated straight member, an insulating head at one end of the member, a knob at the other end of said member, a hammer slidable on said straight member and disposed between said head and knob, and a pair of penetrating pins attached to said head and projecting forwardly therefrom, and means slidable relative to said straight member for measuring the depth of penetration of the pins and disposed between said pins, and spring means to move said gauge in one direction.

9. An electrode of the character described comprising an elongated straight member, an insulating head at one end of the member, a knob at the other end of said member, a hammer slidable on said straight member and disposed between said head and knob, and a pair of penetrating pins attached to said head and projecting forwardly therefrom, and means slidable relative to said straight member for measuring the depth of penetration of the pins and disposed between said pins, and spring means to move said gauge in one direction, and stop means to limit movement of said gauge in said direction.

10. An electrode of the character described comprising a tube, a knob attached to the rear end of the tube and formed with an axial through opening communicating with the tube, a head of insulating material attached to the opposite end of said tube and formed with an axial through opening communicating with said tube, a pair of pins fixed to the head on opposite sides of the through opening therein, and projecting therefrom and having pointed forward ends, a hammer slidable on the tube and between said head and knob, a gauge comprising a scale slid-

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able within the tube and adapted to project from the rear end thereof, a connector rod attached to the forward end of said scale rod, a push rod attached to the forward end of said connector rod and projecting through the through opening in said head, a fixed stop within said tube, a collar on said connector rod, and a spring interposed between said fixed stop and collar and surrounding said connector rod.

11. An electrode of the character described comprising a tube, a knob attached to the rear end of the tube and formed with an axial through opening communicating with the tube, a head of insulating material attached to the opposite end of said tube and formed with an axial through opening communicating with said tube, a pair of pins fixed to the head on opposite sides of the through opening therein, and projecting therefrom and having pointed forward ends, a hammer slidable on the tube and between said head and knob, a gauge comprising a scale slidable within the tube and adapted to project from the rear end thereof, a connector rod attached to the forward end of said scale rod, a push rod attached to the forward end of said connector rod and projecting through the through opening in said head, a fixed stop within said tube, a collar on said connector rod, and a spring interposed between said fixed stop and collar and surrounding said connector rod, said head being formed with an opening, a cable having a plug connector at one end and extending into said opening and means to connect the wires of said cable to said pins.

12. An electrode of the character described comprising a tube, a knob attached to the rear end of the tube and formed with an axial through opening communicating with the tube, a head of insulating material attached to the opposite end of said tube and formed with an axial

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through opening communicating with said tube, a pair of pins fixed to the head on opposite sides of the through opening therein, and projecting therefrom and having pointed forward ends, a hammer slidable on the tube and between said head and knob, a gauge comprising a scale slidable within the tube and adapted to project from the rear end thereof, a connector rod attached to the forward end of said scale rod, a push rod attached to the forward end of said connector rod and projecting through the through opening in said head, a fixed stop within said tube, a collar on said connector rod, and a spring interposed between said fixed stop and collar and surrounding said connector rod, said head being formed with an opening, a cable having a plug connector at one end and extending into said opening and means to connect the wires of said cable to said pins, said pins having reduced shanks covered by a coating of electric insulating material, and said pins having forward enlarged pointed ends said pointed ends of said pins being exposed, said pins being made of electric conductive material.

WILLIAM J. DELMHORST.

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