Humidity Indicator For Potted Plants

Compared to our barking, mewing and twittering friends, the potted plants are the most conten ted lot. They need the minimum of care, mostly just the regular watering is the main part of it. Too less or too much humidity will soon see the end of your green pride.

It is often not too easy to recognise the humidity contents of the garden soil from its looks. On the surface, if may be dry, but just a few centimetres below the surface it may hold sufficient humidity. Thanks to our electronics, it is not essential to dig in the pot in order to see, whether everything is in order.

Functional description:

If you see figure 1 closely, you will certainly wonder, why we are using the term "Electronics" here for such a simple circuit. There are none of those usual electronic components like resistors, capacitors, nor the semi-conductors! There is just one moving coil meter connected to two electrodes.

For a moment, one would doubt whether it will work at all? In fact it does work! A little background knowledge of physics is enough to find out why it works.

Both the electrodes, together with the humid soil, make a battery, the so called "Galvanic Cell". The conditions under which this battery works are that the two electrodes must be of two different metals, the soil must be moist and must contain some salts.

The higher the humidity in the soil, the higher is the current produced by this circuit. However, if you have already started thinking of using this type of batteries to reduce your electricity bills, you must immediately curb your thoughts. The current thus produced is just a few microamps and not even enough to light up the smallest bulb, even to a faint glow.

This requires a very sensitive meter to measure such a low current. An instrument with about 50 to 100 micro amperes full scale range should be adequate. A volume control indicator from an old tape recorder may serve the purpose.

The Electrodes:

The two electrodes can be formed by using a copper clad board etched in the form shown in figure 2 and a screw driver. Soldering the lead wires to the PCB is no problem, however, soldering a wire to the screw driver will turn out to be a futile excercise. The lead wire must be tied around the screw driver shaft and twisted tightly. Figure 2 also shows a suggestion for the assembly of our humidity meter. This type of design makes it easy for inserting the electrodes into the soil. To avoid corrosion of electrodes they must be properly cleaned after every humidity check. The length of the electrodes must at least reach upto half the depth into the soil.

Calibration:

Due to the large expected variations in all the parameters, data for absolute calibration of our instrument is almost impossible. Here, the only method applicable is "trying out!" This can be done as follows:

Take a pot with soil which is just watered to a sufficient degree, corresponding to an expected ideal condition. Now insert the electrodes into the soil and observe the meter deflection. If the needle deflects in the negative direction, then the instrument polarity must be reversed. Which of the electrode acts as the

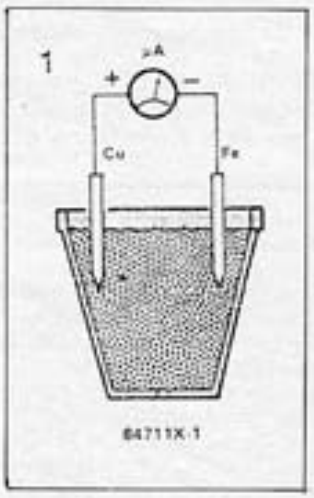

Figure 1:
The somewhat unusual "Circuit" of the humidity meter. It consists only of two electrodes and one meter, and of course, a pot full of soil. A current flows in the circuit if the soil is humid enough.

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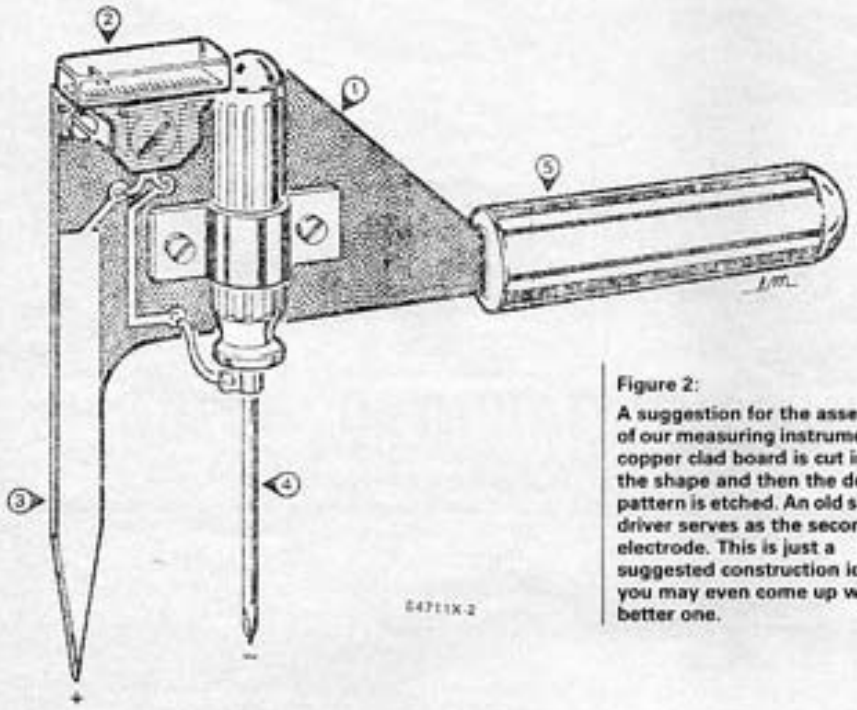

Figure 2:
A suggestion for the assembly of our measuring instrument. A copper clad board is cut into the shape and then the desired pattern is etched. An old screw-driver serves as the second electrode. This is just a suggested construction idea, you may even come up with a better one.

1. **Copper clad Board, cut to desired shape**
2. **Meter (50 or 100 micro amp full scale)**
3. **Copper tracks**
4. **Screw Driver**
5. **Handle.**

positive electrode depends upon the valancy of both the materials of electrodes. A short note appears at the end, on this subject.

If the needle of the meter deflects upto at least half the scale, it is a good indication. However, if there is very less or no movement at all, try changing the electrodes, or try using a more sensitive meter. When you are successful in getting a sufficient deflection, mark that as the maximum deflection. Your "humidity meter" is now ready to use. At this point, we also would like to warn you against putting this "meter" to any serious use, as the measurement has no absolute calibration.

Note:

If a metal is immersed in an acqueous salt solution, then positive ions are released by the metal. The metal thus becomes negatively charged. If two different metals are thus immersed in the same solution, depending on how easily the metals can release the ions, the two different metals get charged to different levels. (For example, copper and zinc.) This creates a potential difference between the two metals. If they are now externally connected with a conducting wire, a current will flow from one metal to the other, through that external wire. Ideally this current will continue to flow till one or both the metals are completely dissolved in the solution. The metals are classified according to their valancy, in the "Electro-Chemical-Series". The sequence is Platinum – Copper – Iron – Zinc – and so on. Every metal in the series is able to give out more ions than the previous one, and thus the metal in comparison with the next one always forms the positive pole of the battery.