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Measurement device design: Rain gauge

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Abstract

The need to size large hydraulic infrastructures, exploit extensive agricultural areas or simply arrange water assets for human consumption makes the evaluation of the available water resources essential. Water is a scarce resource that is poorly distributed both, spatially and temporally. Therefore, a set of hydrological networks that allow the evaluation of water quantity and quality is required. In order to achieve this, the first step is to retrieve reliable data on rainfall.

For thousands of years, man has tried to quantify rainfall in one way or another. The first recorded measurements were performed in India 400 years BC. In 1639, the benedictine Benedetto Castelli (1548-1643) born in Brescia [1], was the first in Europe to introduce, in a letter addressed to Galileo Galilei (1564-1642), the techniques for rainfall measurement employed to find out how much the water in the Trasimeno lake would increase. Since then, new measuring devices, techniques and procedures have been studied.

To carry out a correct evaluation of water resources, both in the small and large scale, disposing hydrological networks that involve a certain number of measuring devices becomes critical. Despite the great amount of studies that have been developed on measuring devices such as rain gauges, there are still many errors that remain in the measurements and that have not been ruled out yet, thus affecting the accuracy of the measurements.

In this sense, the design of a device that provides an accurate measurement of rainfall and also results affordable, could be the key to a product with great acceptance in the market.

The aim of this work is to present the design of a measurement device that provides accurate data and can be used in multiple ways: as an ordinary rain gauge, as a rain gauge recorder, or even allowing to carry on both functions simultaneously.

The methodology followed for its implementation has consisted in analyzing the techniques and procedures to be trailed at quantifying rainfall, conducting a market study and analyzing specifications to be in accordance to WMO (World Meteorological Organization) [2] [3] to then go through a conceptual design and finally complete the detailed design where materials are valued and simulation tests are performed in order to meet certain accuracy and economical requirements.

As a result of the work developed, the proposed design has led, after a long process, to be patented with previous examination: first to national level as ES2455940 B2 and, at the time, also to international level with the following international publication number WO 2013/098437 A2.

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