



US005730165A

# United States Patent [19]

[11] Patent Number: **5,730,165**

**Philipp**

[45] Date of Patent: **Mar. 24, 1998**

## [54] TIME DOMAIN CAPACITIVE FIELD DETECTOR

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[21] Appl. No.: **578,464**

[22] Filed: **Dec. 26, 1995**

[51] Int. Cl.<sup>6</sup> ..... **F16K 31/02**; E03C 1/05; G01R 27/26

[52] U.S. Cl. .... **137/1**; 251/129.04; 4/623; 239/24; 324/677; 324/678

[58] Field of Search ..... 251/129.04; 4/623; 239/24; 222/52; 324/677, 678; 137/1

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Primary Examiner—John Rivell

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## [57] ABSTRACT

A capacitive field sensor, which may be used for the control of a water supply valve in a basin or fountain, employs a single coupling plate to detect a change in capacitance to ground. The apparatus comprises a circuit for charging a sensing electrode and a switching element acting to remove charge from the sensing electrode and to transfer it to a charge detection circuit. The time interval employed for the charging and discharging steps can vary widely. Usually at least one of the charge or discharge pulses is on the order of a hundred nanoseconds, and is shorter in duration than a characteristic conduction time for a body of water disposed about the sensing plate. Thus, the sensor can detect the presence of a user near a controlled faucet without being subject to measurement artifacts arising from standing water. In a controller for a water basin, a short charge or discharge pulse duration may be used when the controlled valve is closed, and a longer duration, which allows conduction through the water, may be used when the valve is open. The long duration measurement can detect the continued presence of the user as long as the user's hand remains in the stream of water.

**63 Claims, 7 Drawing Sheets**

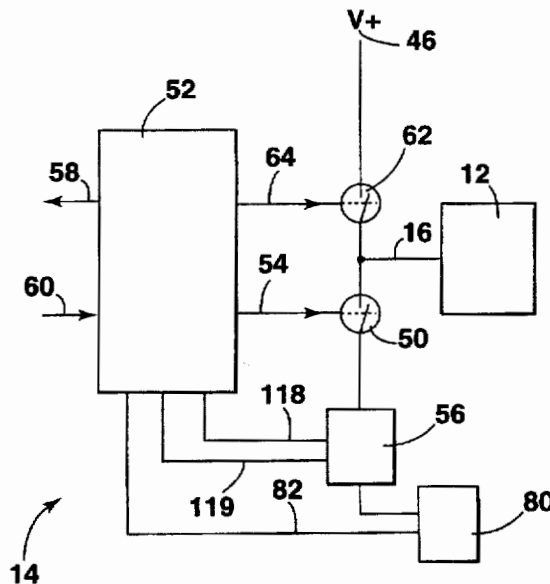


Figure 1

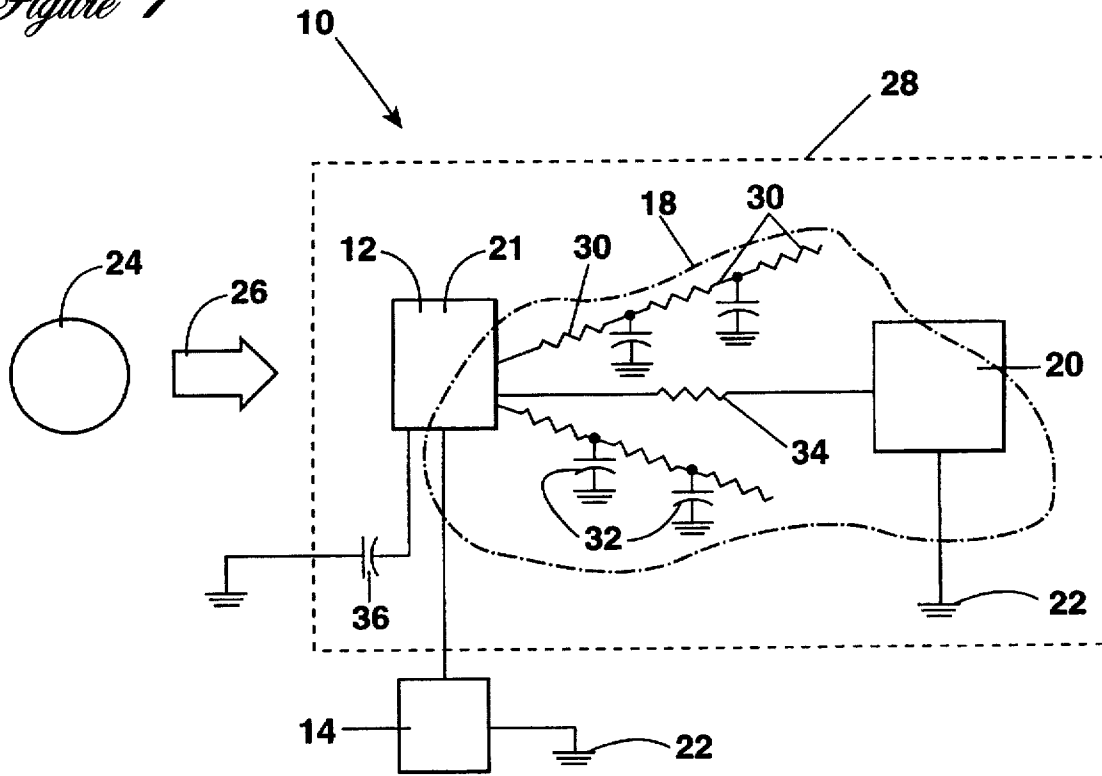


Figure 2

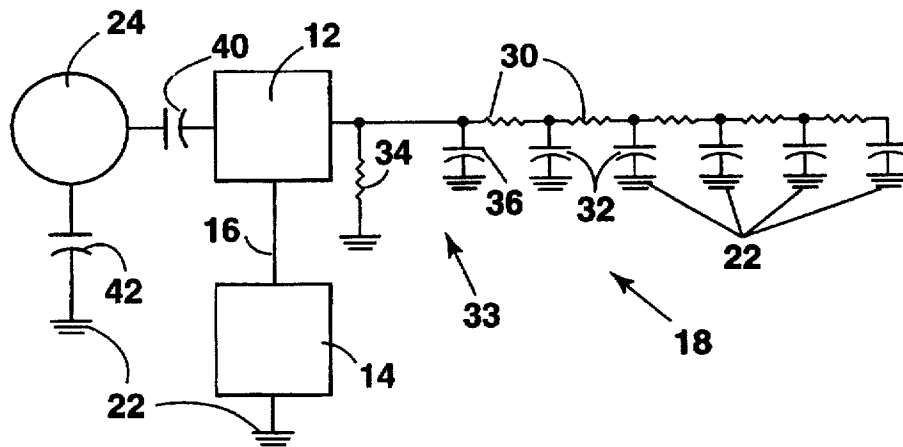


Figure 3

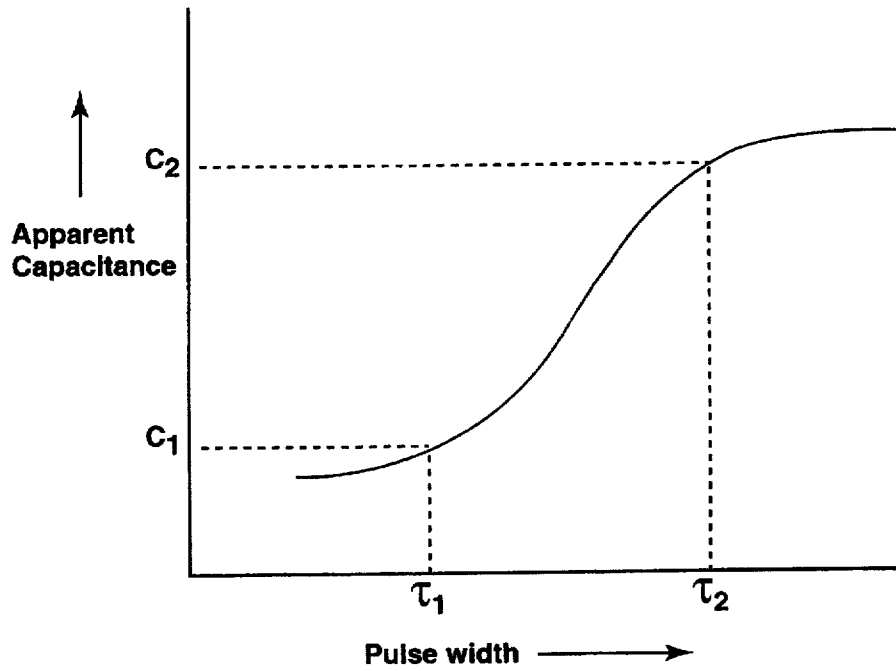


Figure 4

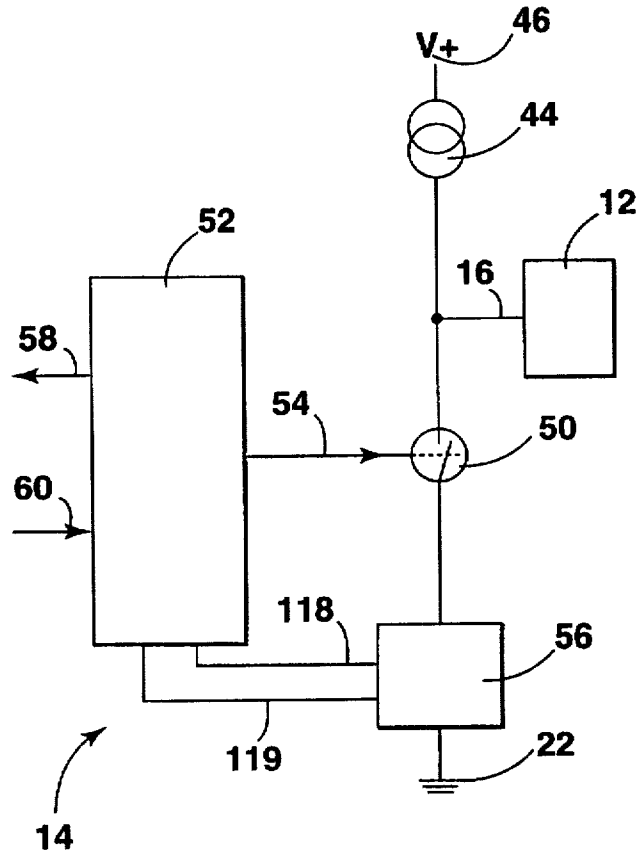


Figure 5

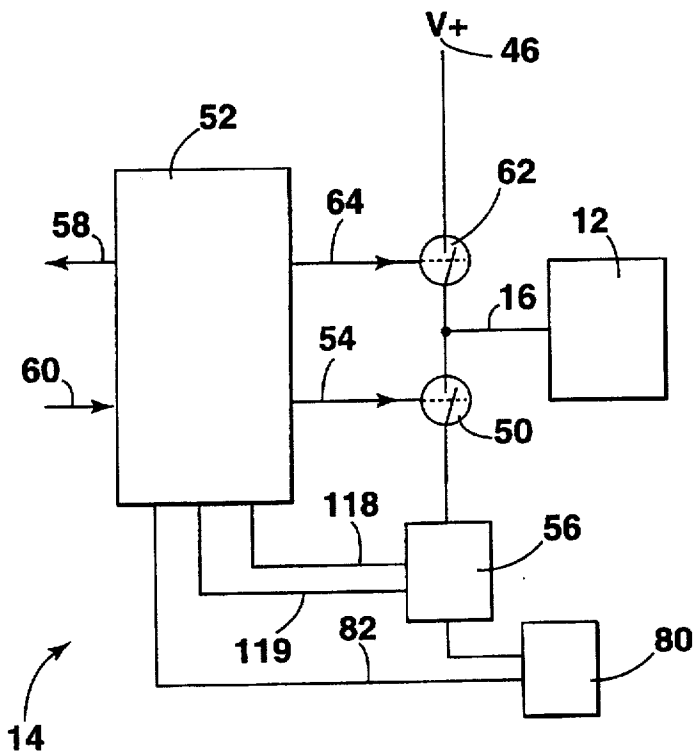


Figure 6

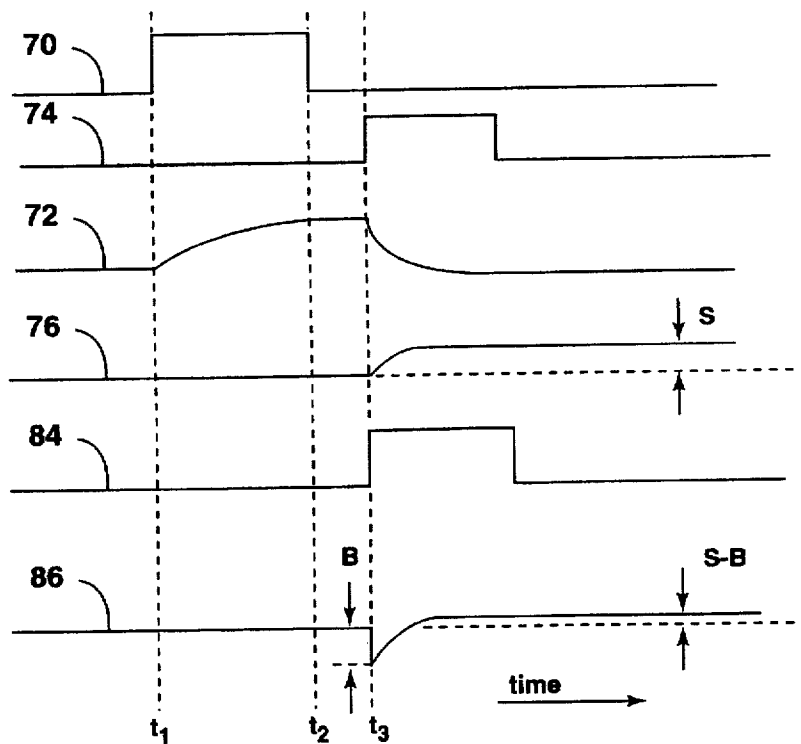
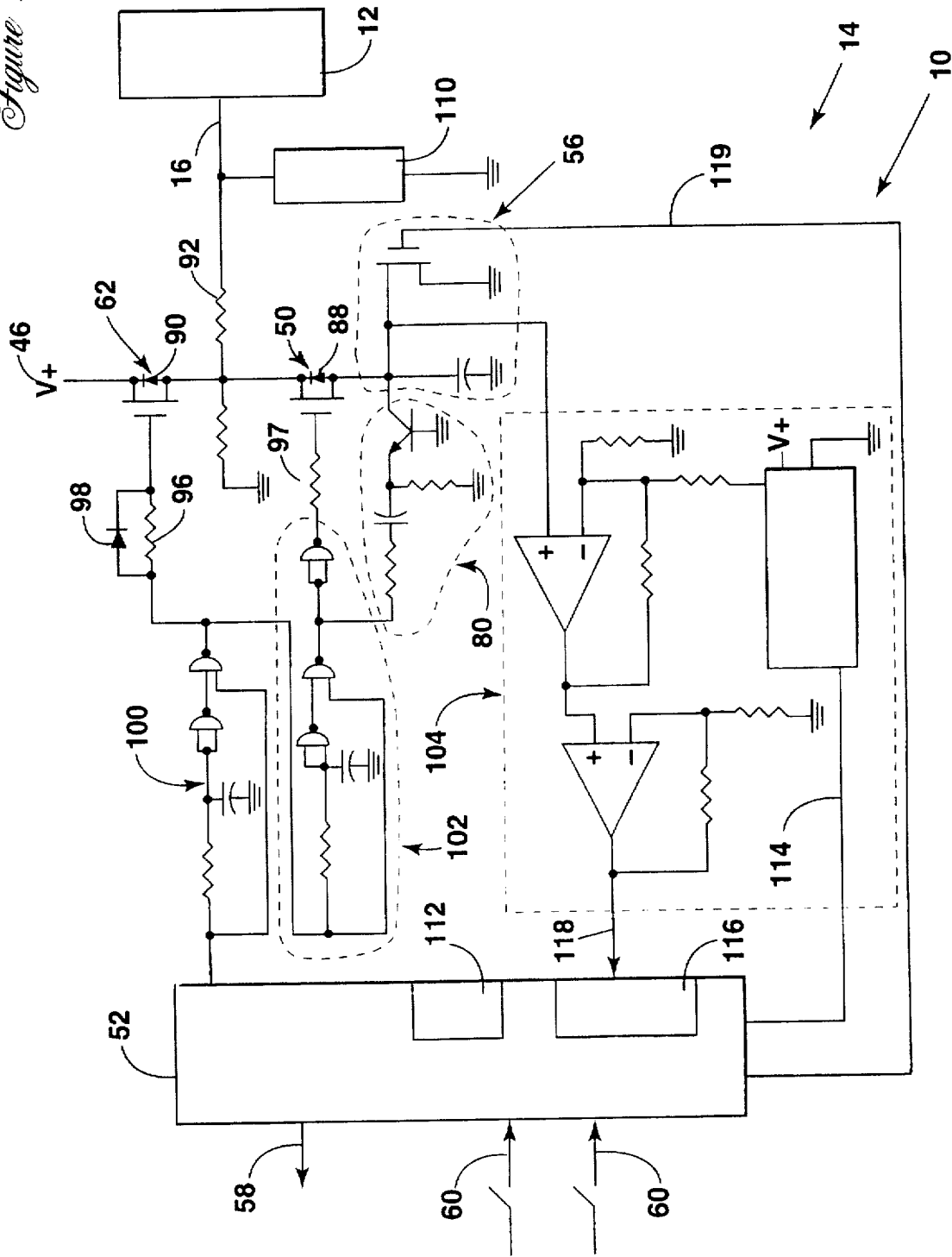


Figure 7



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