funnel **16** and is discarded. For example, if the second funnel **16** holds a maximum of 15 mL of water and the amount of water in the first funnel **12** is greater than 15 mL, all but 15 mL of the composited water spills over the sides of the second funnel **16** and is discarded.

The amount of sample water collected to be transferred into one of the vials **24** may be adjusted by selecting a desired funnel volume for the second funnel **16**. Thus, the collector **10** is a variable-amount collector. The volume of each of the sample vials **24** must be greater than that of the water sample from the second funnel **16**. Otherwise, water will overflow the sample vials **24** being filled and run down into the bottom of a container **56** (see FIG. **2**) that houses components of the carousel **22** and the controller **28**. The controller **28** can also be housed in a separate, watertight container (not shown) to allow changes to the controller **28** as samples are being collected.

The controller **28** closes the first valve **14** (FIG. **1**). The second funnel **16** is connected to the second valve **18**, which is normally closed. The controller **28** operates a second actuator **44** to open the second valve **18** to transfer the sample water in the second funnel **16** through the transfer line **20** (and an opening in the top of the container **56**) into one of the sample vials **24** in the carousel **22**. The carousel **22** and the transfer line **20** can be heated to just above freezing to prevent ice from forming in the transfer line **20**. The excess heat can be used to keep any water in the second funnel **16**, the first valve **14**, and the second valve **18** from freezing.

After the water sample has been transferred to one of the sample vials **24** (typically, the transfer takes about 10 to about 30 seconds), the controller **28** closes the second valve **18**.

The controller **28** activates an electric carousel drive motor **38** to rotate the multi-sample carousel **22** to the next vial **24**, which is empty, and the vial **24** just filled is sealed to prevent evaporation. The maximum amount of time any one of the vials **24** may be open is about 5 minutes.

The above operations are repeated until all the vials **24** have been filled.

Sensing that the last vial **24** has been filled (using, for example, a magnetic reed switch, an infrared (IR) optical interrupter detector, or a snap action switch located in the container **56** with the carousel **22**), the controller **28** turns off the collector **10**. At this point, the filled sample vials **24** have all been sealed to prevent evaporation until being removed from the collector **10**.

The filling of the sample vials **24** is described in greater detail by referring to FIGS. **2** through **4**. FIG. **2** shows the tops of the vials **24** in the carousel **22**, according to one embodiment of the present invention. In FIG. **2**, 96 20-mL vials **24** are arranged in three concentric rings, including an inner ring **50**, a middle ring **52**, and an outer ring **54**. Each ring contains 32 vials. As shown in FIG. **3**, the sealing plate **26** is placed on top of the carousel **22**, with the low-friction lower surface resting on top of the sample vials **24**. The sealing plate **26** includes three holes (each hole about ½-inch in diameter, for example) that correspond, respectively, to each ring of vials **24**. FIG. **4** shows these holes as an inner hole **70**, a middle hole **72**, and an outer hole **76**. The transfer line **20** is connected to one end of a vial filler **74**, which initially positions the transfer line **20** over the outer hole **76**. The sample vials **24** in the outer ring **54** are filled first. After each vial **24** in the outer ring **54** has been filled, the carousel **22** rotates to the next empty vial **24** in the outer ring **54**, which rotates the filled vial **24** underneath the sealing plate **26** to seal the filled vial **24**. After all the vials **24** in the outer ring **54** have been filled, a ring-changer motor **78** moves the vial filler **74** to position the transfer line **20** over the hole **72** for the middle ring **52**, while the portion of the vial filler **74** extending away from the transfer line **20** covers and seals the hole **76** for the outer ring **54**. The lower surface of the vial filler **74** is also a low-friction surface, such as a Teflon® sheet. After the vials **24** in the middle ring **52** have been filled, the ring-changer motor **78** moves the vial filler **74** to position the transfer line **20** over the hole **70** for the inner ring **50**, which covers and seals the hole **72** for the middle ring **52**. After the vials **24** in the inner ring **50** have been filled, the ring-changer motor **78** moves the vial filler **74** further inward to a final position, which covers and seals the hole **70** for the inner ring **50**. Thus, all of the vials **24** are sealed from the time each one is filled until the vials **24** are removed from the collector **10**. The number of vials and rings can be varied depending on the requirements of a specific application. Thus, more vials can be added for an extended collection period, such as 1 to 2 weeks.

An IR optical interrupter detector, for example, is used to indicate when each vial **24** is in the proper position for filling. Additional IR detectors can be used to indicate the vial number (i.e., 1 to 96 for the embodiment shown in FIG. **2**). Reed switches, for example, are used for sequencing the operation of the collector **10** (e.g., moving from one ring to the next).

Isotopic fractionation of each water sample is minimized or eliminated by pressing the mouth of each sample vial **24** against the flat, low-friction surface of the sealing plate **26** to seal the mouths of the sample vials **24**. Referring to FIG. **5**, the sealing plate **26** may include, for example, a 20-inch×20-inch Teflon® sheet **90** bonded to a %-inch flat aluminum plate **92**. In FIG. **5**, the Teflon® sheet **90** has not yet been bonded to the aluminum plate **92**. Each vial **24** is only exposed during the brief interval when a water sample is transferred into it. Pressure is applied to the bottom of each vial **24** by foam rubber **40** (see FIGS. **1** and **5**), for example, to press each vial **24** against the Teflon® sheet. Alternatively, a spring (not shown) may be used to press each vial **24** gently, but snuggly, against the low-friction surface **26**.

In addition to collecting precipitation samples, the collector **10** of the present invention can be used for collecting time-integrated water samples from wells, streams, or other dynamic sources. For these applications, a pump (not shown), such as a peristaltic pump, is used to draw water from a well or surface-water body. The flow rate is adjusted so that the first funnel **12** is only partially filled during each identical preset time interval. To maintain the integrating aspect of the collector **10**, the flow rate of the pump is set so that the pump slowly trickles water into the first funnel **12** continuously over the whole time interval, without the first funnel **12** overflowing.

By using plastic vials **24**, the collector **10** of the present invention may also collect samples for dissolved nitrate, which can subsequently be analyzed for concentration, nitrogen and oxygen relative isotope-amount ratios. Such measurements are useful in atmospheric and environmental investigations.

Referring to FIG. **6**, a screen **110** may be placed on top of or within the first funnel **12** to block debris from entering it. A cartridge heater and temperature sensor (not shown) can be mounted on the screen **110** to determine the time-integrated value of the relative amounts of oxygen and hydrogen isotopes in snow or hail. When the temperature is below 33° F., the temperature sensor closes, applying power to the cartridge heater, which melts any snow or hail on the screen **110**. Also, a shield, such as an inverted funnel **112**, may be placed over the second funnel **16** to shield it from debris or from water that might enter the second funnel **16** from a source other than the first funnel **12**.