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Brief 71-10481

NASA TECH BRIEF

Ames Research Center

Distribution and Metering System for Soil Samples

The problem:

To design a remotely operated, lightweight system for accurately distributing metered volumes of soil samples into a series of test cells.

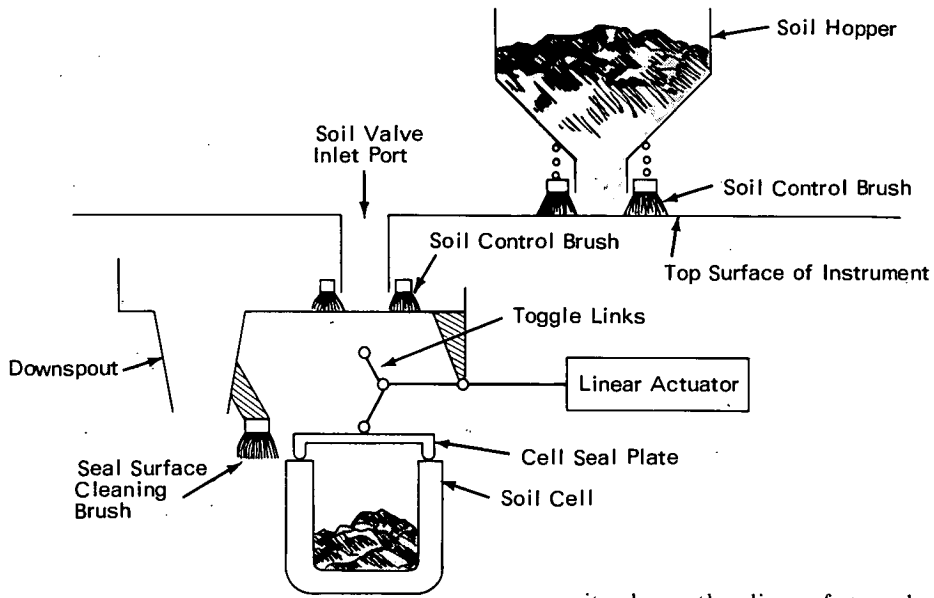
The solution:

An electromechanical assembly with a movable hopper that can be commanded to put soil samples into the inlet sorts of a series of sampling valves.

How it's done:

The hopper accepts a 10 cc soil sample and distributes it on command to the various soil valve inlet ports (see fig.). The hopper follows any random sequence of commands, including repeated servicing of any of the valve inlet ports, and retains any undistributed portion of the original 10 cc sample. A dump port is also available to the hopper for rejecting undistributed sample portions.

When the hopper is commanded to service a given valve inlet port, a reversible motor and lead screw move it along the line of travel, closing a series of microswitches used as position indicators. When the microswitch selected by the command control is closed, the motor stops. The inlet ports are sized to account for the small amount of over-travel inherent in this type of device. If a "fill" command is given, a 3 sec dc pulse is applied to the power solenoid, causing the hopper to move over the inlet port and allowing soil to fall into the port. A compressed helical spring returns the hopper to its original position, ready for command to another inlet port. (A dashpot and snubbers are included in the system to control accelerations.)



(continued overleaf)

As the hopper moves away from the inlet port, its soil control brush sweeps across the port, leveling the soil content with the top surface of the instrument to keep the soil volume accurately defined. The soil is held in the inlet port until the soil valve is commanded to operate. The linear actuator then unloads the toggle mechanism and breaks the seal formed between the soil cell and its seal plate. The plate is lifted clear of the lapped surfaces on the cell and is then translated, opening the cell. Simultaneously, the actuator moves the downspout to a position between the valve inlet port and the cell, allowing the defined volume of soil sample to drop into the cell. To close the cell, a reverse sequence is followed, after the seal surfaces have been swept.

Notes:

1. In the breadboard instrument, the soil valve inlet ports were fabricated to contain from about 0.1 to 1 cc of soil sample.
2. Loss of sample from the hopper during excursion was found to be negligible, particularly when the particle size of the soil was greater than 0.05 mm.
3. Carryover of one sample into another and bridging in passageways are also negligible.
4. Requests for additional information may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California 94035
   Reference: TSP71-10481

Patent status:

No patent action is contemplated by NASA.

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