June 1971

Brief 71-10159

NASA TECH BRIEF

NASA Pasadena Office

A Lightweight, High Output Soil Sampler

A conical sieve, self-feeding, continuous output particulate sampler, originally designed for collecting specimens of planetary surface materials, is equally useful on or under the Earth's surface or on the sea bottom.

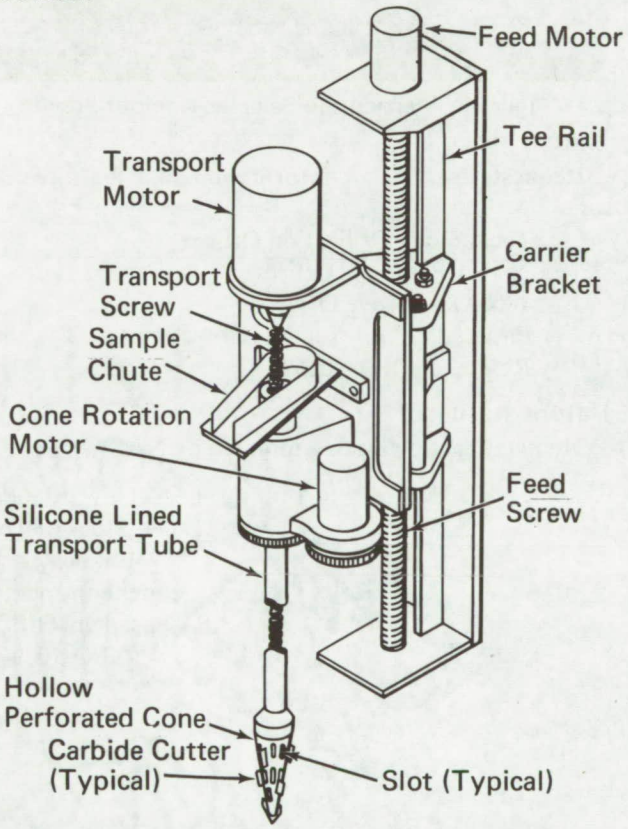

Figure 1. Conical Sieve Soil Sampler

As a means of collecting soil, rock, or sediment samples, the new device offers several advantages over conventional augers, rock bit drills, back-hoe scoops, and so on. A larger amount of sample can be obtained relative to the size and weight of the sampler, and sample material of a limited particle size can be continuously delivered. Finally, a silicone rubber liner in the transport tube nearly eliminates grinding or processing of the particulate during sampling, and reduces the required torque.

The tool has a conically shaped, slotted exterior. By drilling the tool into the surface, particulate samples of a predetermined size can be obtained. The size of the particles is a function of the width of the slots and the hardness of the tool's conical exterior. Carbide inserts extend outward beyond the conical surface to perform the grinding operations. The material entering the slots is carried by a helical transport screw, up through a hollow shaft on which the cone is mounted, and into a discharge area where the material is collected, examined and analyzed.

The sampler consists of two basic, easily separable units, the conical sieve sampler and the feed unit (see Fig. 1).

The conical sieve sampler is a $\pi/9$ rad (20°) hollow stainless steel cone with a carbide drill tip and six carbide cutters spaced around the OD. Forty-five 0.762 x 8.89 mm (0.03 x 0.35 inch) slots allow particles of 762μm and under to pass to the inside of the cone. The exposed intake section of the transport screw has a wire agitator attached (not shown), which keeps the sample material flowing into the screw threads. The material is carried up through the silicone liner of the transport tube by the screw, and discharged at the top into the sample chute.

The feed unit is supported on an aluminum tee rail. A carrier bracket with nylon bushings rides on the tee rail, impelled by a brass feed screw which is driven by its own electric motor. The

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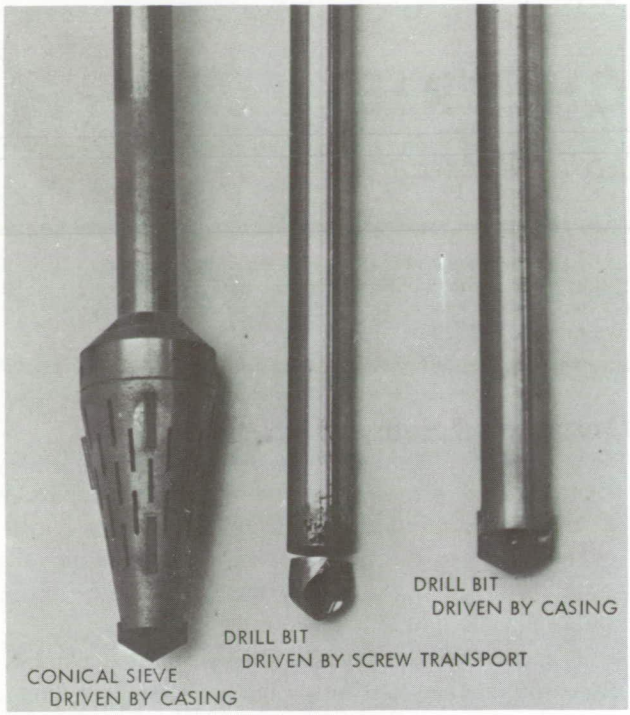

Figure 2. Sample Acquisition Probes

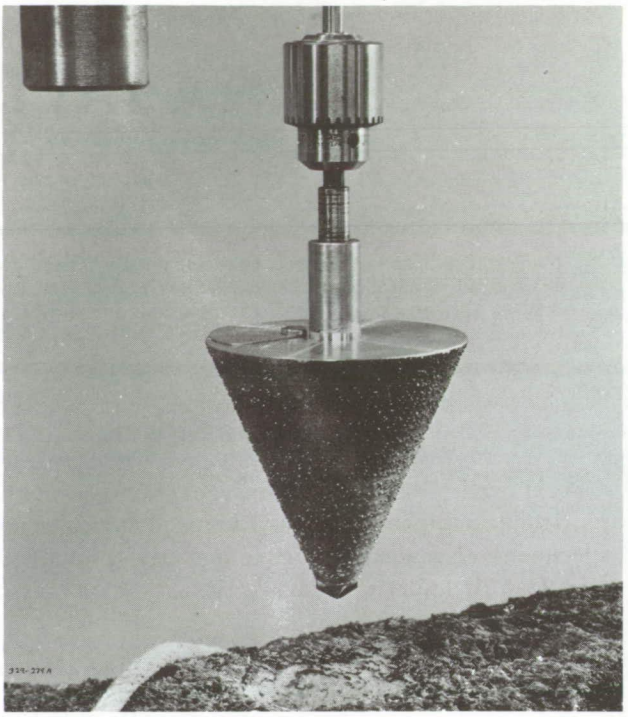

Figure 3. Particulate Sampler-Conical Sieve

combination of motor speed and thread pitch gives a feed rate of 5.08 cm (2 inches) per minute.

The sampler heat unit includes a transport motor, which runs the transport screw at 1800 rpm, and a cone rotation motor, which drives the transport tube and attached tool at 65 rpm. The drive system can feed the conical sieve tool to a depth of 60.96 cm (24 inches) and withdraw, in a complete cycle period of 25 minutes.

The breadboard model of the conical sampler employed a 27 volt power supply to operate the feed screw, transport, and cone tool drive motors at a total current load of 1.5 A. The total weight was 6.94 kg (15.3 pounds).

Note:

Requests for further information may be directed to:

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Patent status:

No patent action is contemplated by NASA.

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under contract to
NASA Pasadena Office
(NPO-10797)