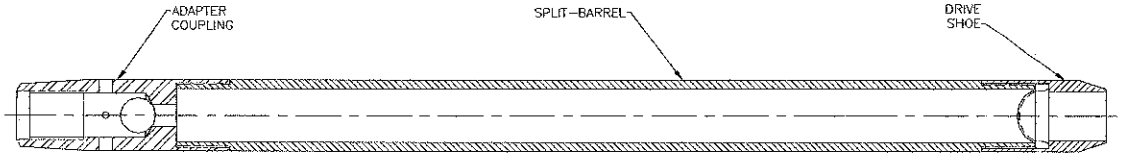
PATENT DISCLOSURE
Diedrich Locking Split Barrel
Patent #7,182,155

ABSTRACT

The present invention relates to split-barrel samplers, which are commonly used for retrieving geotechnical and environmental soil samples. A complete split-barrel sampler assembly consists of a drive shoe, a two-piece split-barrel, and an adapter coupling. The split-barrel is a tubular member, typically of round cross-section, which is split lengthwise to facilitate removal of soil samples. Both ends of the split-barrel are externally threaded. The drive shoe contains a tapered tip on one end for effectively cutting through soil and an internal thread on the opposite end for mating with the split-barrel. The adapter coupling contains an internal thread on one end for mating with the drill rod and an internal thread on the opposite end for mating with the split-barrel. The complete assembly is shown graphically in Figure 1.

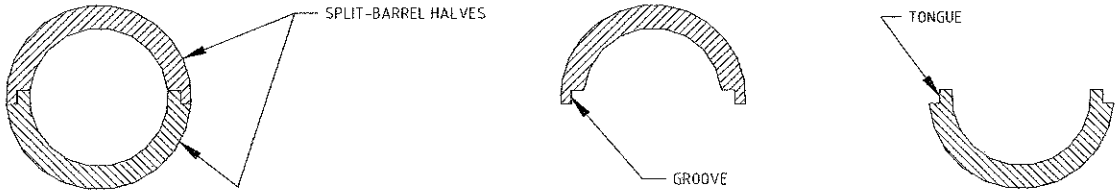
Figure 1. Cross-Sectional View of Split-Barrel Sampler Assembly



The split-barrel sampler assembly is advanced into the earth by pounding, vibrating, and/or pushing the upper end of the drill string to which the sampler is attached. The sampler is driven into the earth a distance approximately equal to the length of the split-barrel. The sampler is then pulled from the earth by removing the entire drill string. The drive coupling and drive shoe are removed from the split-barrel and the barrel halves are opened up to expose the sampled soil. It is very time-consuming to add drill rod for lowering the sampler to the sampling depth and, likewise, to remove drill rod for raising the sampler from the sampling depth. Therefore, it is desirable to use as long of a split-barrel as possible to minimize rod handling.

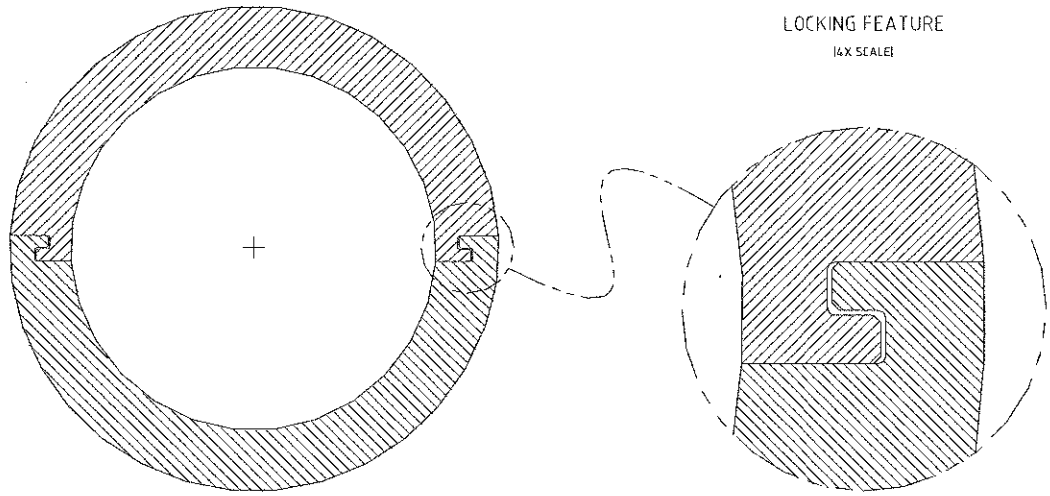
When the drive shoe and adapter coupling are threaded onto the ends of the split-barrel, they constrain the barrel halves from moving with respect to each other in all directions. However, at the middle of the split-barrel, there is little influence from these end constraints, especially for longer length barrels. Existing split-barrel designs utilize a tongue & groove feature that interlocks to prevent lateral movement of one barrel half with respect to the other. A cross-sectional view of a split-barrel incorporating this tongue & groove feature is shown in Figure 2. However, the tongue & groove feature does not prevent movement of corresponding barrel halves in a direction perpendicular to the splitting plane (a plane that divides the barrel into two halves). Consequently, as soil is driven into the sample barrel, the two halves may swell or bow apart from each other. Quite often the yield strength of the barrel halves is exceeded and permanent deformation occurs. The deformation of the barrel halves makes it difficult or impossible to remove the drive shoe and adapter coupling.

Figure 2. Cross-Sectional End View of Traditional Split-Barrel Sampler



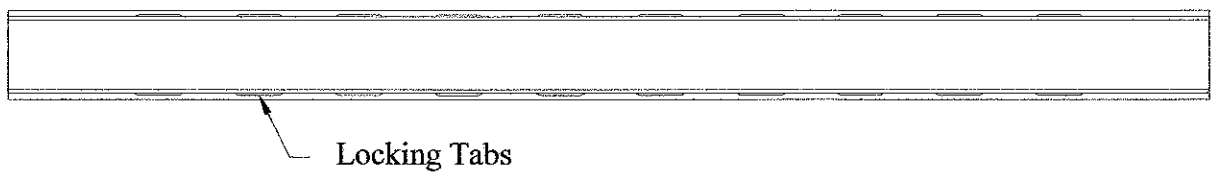
The intent of the present invention is to improve upon existing split-barrel design by incorporating a feature that constrains split-barrel halves from moving with respect to each other in a direction both parallel to and perpendicular to the splitting plane. This would prevent the above-mentioned permanent deformation of the sampler, greatly increasing its useful life. The new split-barrel design would have a tongue & groove feature full length to prevent motion parallel to the splitting plane. In addition, there would be a plurality of evenly spaced locking tabs that would prevent motion perpendicular to the splitting plane. A cross-sectional view through one of these locking features is shown in Figure 3.

Figure 3. Cross-Sectional End View of Locking Split-Barrel Sampler



A top view of one half of the split barrel shows typical spacing of the tabs.

Figure 4. Top View of Locking Split-Barrel Half



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