A Portable Record Player for Wax Cylinders Using a Laser-Beam Reflection Method

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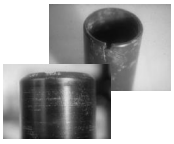
Fig.1 Pilsudski

Fig.2 Edison phonograph

Background

The wax phonograph cylinder invented by Thomas Edison in 1885 was the medium for recording sound until about 1930. In around 1900, using the Edison-type phonograph, a Polish anthropologist (B. Pilsudski) recorded the songs of the Ainu people in the most northern Japan on 65 wax cylinders. The wax cylinders were accidentally discovered in Poland and we were asked to reproduce them in 1984. Most of them, however, changed in quality by re-crystallization and had many cracks on their surfaces. The Pilsudski's wax cylinders were successfully reproduced by using a laser-beam reflection as well as a light stylus which we developed.

Fig.3 Pilsudski's 65 wax cylinders



Objectives and Results

Although a lot of wax cylinders, which may be historically valuable, have been preserved all over the world, most of them would change in quality like the Pilsudski's wax cylinders. We have developed a portable record player having both laser-beam reflection and light stylus methods. Our record player is light and small enough to be carried by a hand and it can reproduce sounds in real time from damaged wax cylinders as well as the undamaged. The portable record player is commercially available in Japan.

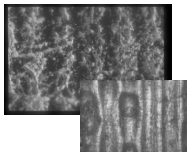


Fig.4 Crack (upper) and scratch (lower)

Fig.5 Re-crystallization (upper) and normal (lower)

<Laser-beam reflection method>

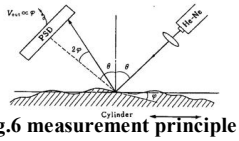


Fig.6 measurement principle

Fig7. PSD for laser-beam

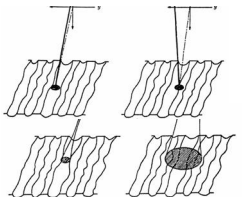
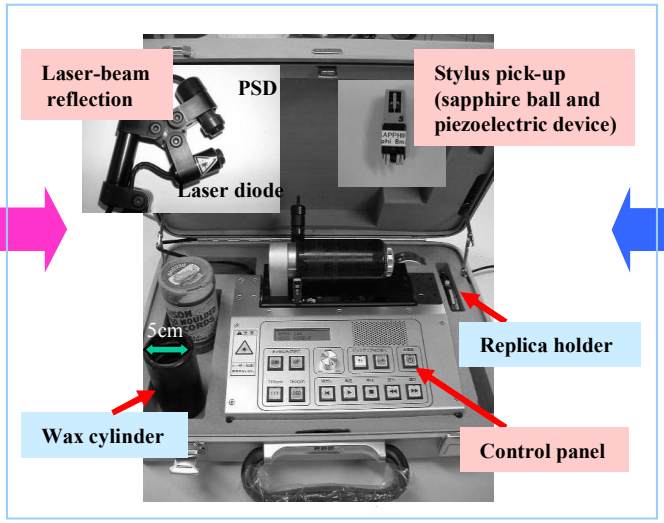


Fig8. Tracking error (upper) and overlapping (lower)

<Portable wax cylinder record player>



<Light stylus method and replica>

Fig.10 A wax cylinder and its replica made of resin

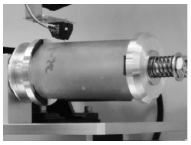


Fig.11 Replica holder

Fig.12 Stylus by PZT-sensor and sapphire ball

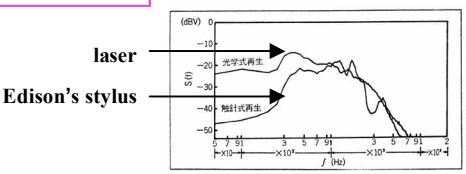


Fig9. Long-term spectrum of laser-beam method

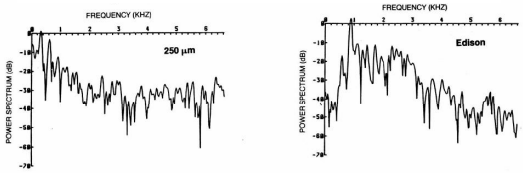


Fig.13 Left: our stylus, right: Edison's stylus

Table 1 Specifications

Items (weight and dimension)	Wax cylinder record player (3.4kg-weight, 45cm-width, 33cm-length, and 10.5cm-hight)	Stylus	PZT-sensor with a hemisphere sapphire ball (0.25mm diameter)
Play Method	Stylus and laser-beam reflection methods	Stylus Life	10 hours
Playable Type	2-minute, 55mm diameter, 105mm(H), 400 grooves	Laser Beam	Red laser diode Class 3R, beam spot 0.1 mm diameter
Rotary Speed	Preset: 144 or 160 r.p.m, Variable mode: 90-200 r.p.m.	Sound quality	Flat or High pass filter mode
Weight, material & dim. of case	2.0kg, Mg-alloy, 450mm(W), 330mm(L), 105mm(H),	Display of controller	LCD (black & white), 16 Letters within tow Lines
Conditions	Temperature (10-35℃), Humidity (20-80%)	Output	Two jacks of RCA (mono-oral)
Power Supply	90-246VAC (50/60Hz), 100V-65W	Accessories	Replica holder, two stylus-sensors

References

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