

Proposal of Magnetically Levitated Mover Using High Tc SC Coils

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ABSTRACT

In this paper, new type of magnetically levitated mover based on repulsion forces by induced current between high T_c superconducting (SC) coils and PMs is proposed. Induced current in SC coil is different from that in normal copper coil. Thus, the static and dynamic characteristics of both the SC coil and the levitated mover are discussed.

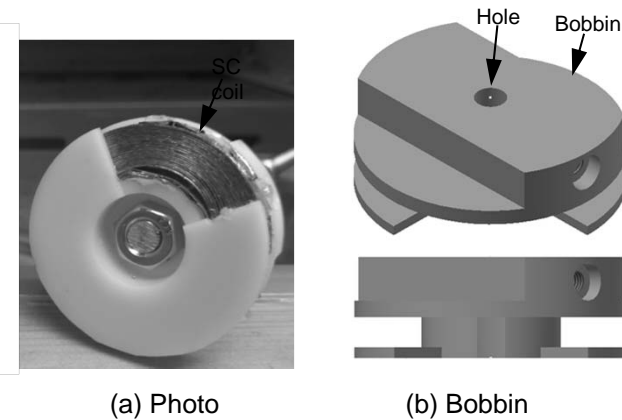


Fig.1. SC coil-(A) showing (a) photo and (b) illustration of plastic bobbin.

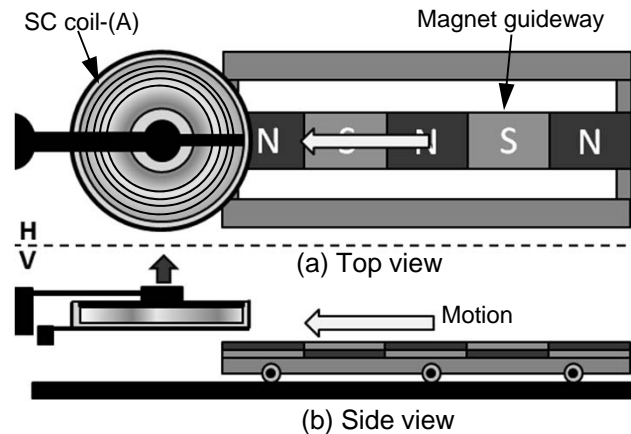


Fig.2. Experimental setup showing (a) top view and (b) side view.

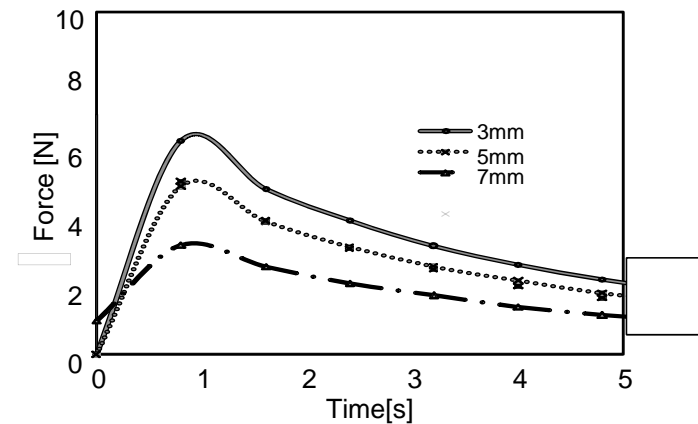


Fig.3. Relationship between repulsion force and time just after a magnet guideway stops under the SC coil.

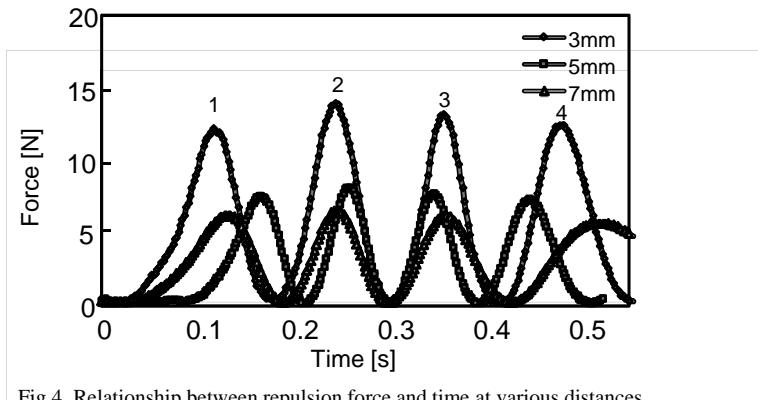


Fig.4. Relationship between repulsion force and time at various distances of 3 mm, 5 mm and 7 mm.

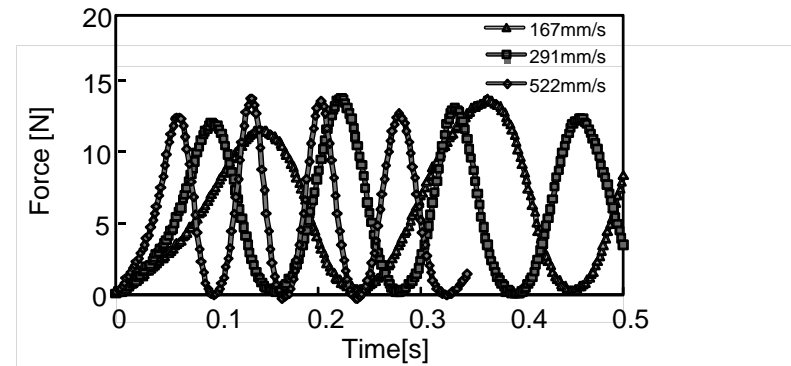


Fig.5. Relationship between repulsion force and time at various speeds of 167 mm/s, 291 mm/s and 522 mm/s.

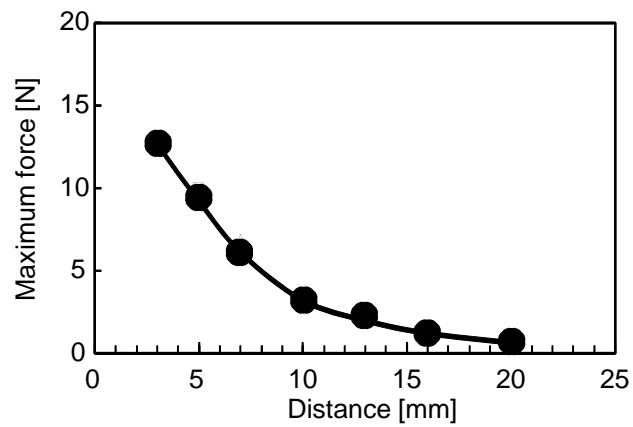


Fig.6. Relationship between maximum repulsion force and distance

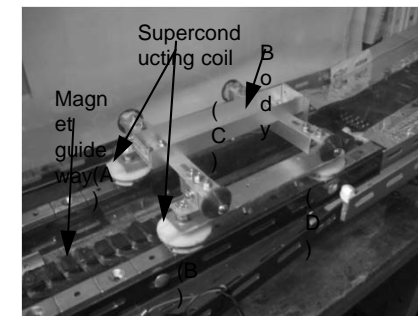


Fig.7. Photo of magnetically levitated mover with four SC coil-(A), (B), (C) and (D) on the magnet guideway.

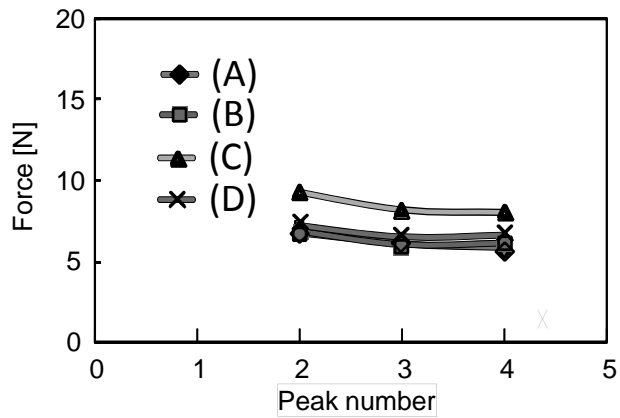


Fig.8. Relationship between repulsion force of superconducting coil and peak number for SC coil-(A), (B), (C) and (D).

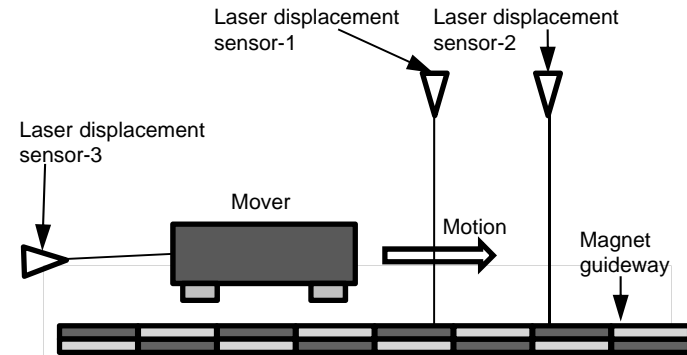


Fig.9. Experimental setup for measuring repulsion force between levitated mover and magnet guideway.

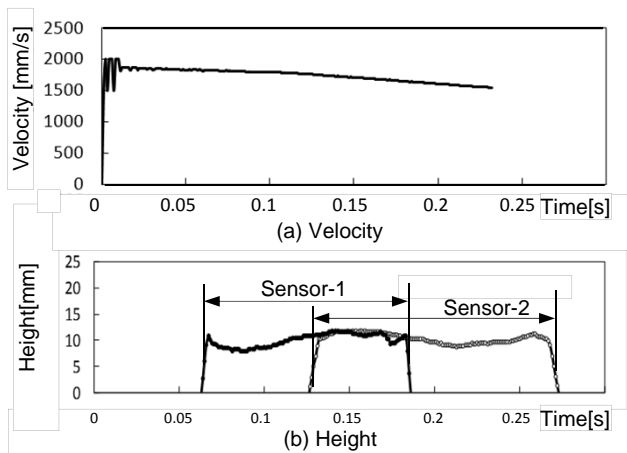


Fig.10. Relationship between (a) mover velocity and time and between (b) levitation height and time at an initial speed of $\approx 1,800$ mm/s.

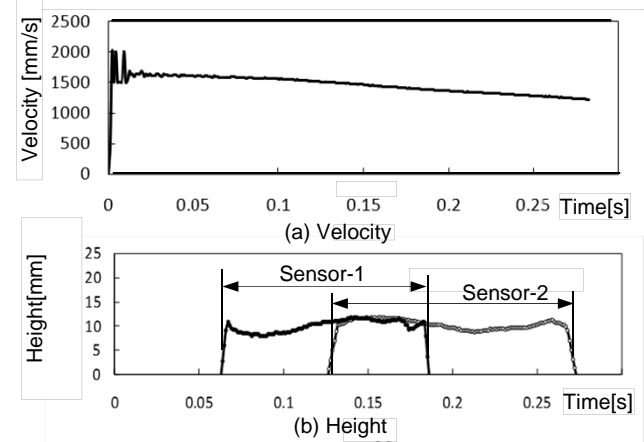


Fig.11. Relationship between (a) mover velocity and time and between (b) levitation height and time at an initial speed of $\approx 1,600$ mm/s.

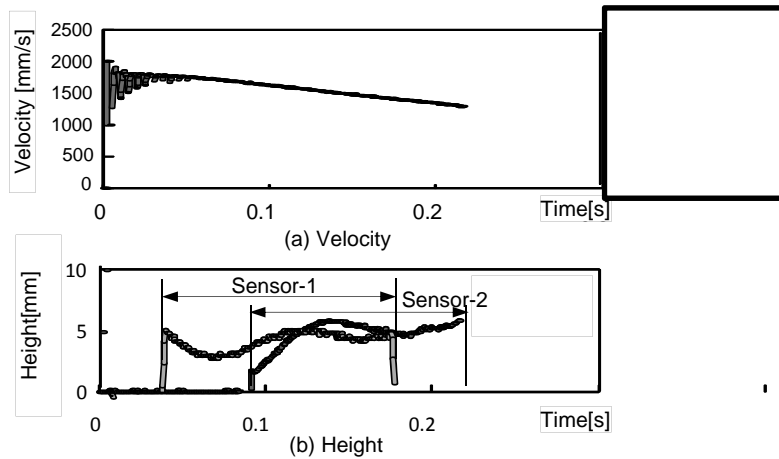


Fig.12. Relationship between (a) mover velocity and time and between (b) levitation height and time at an initial speed of $\approx 1,800$ mm/s with a load weight of 1.5 kg.

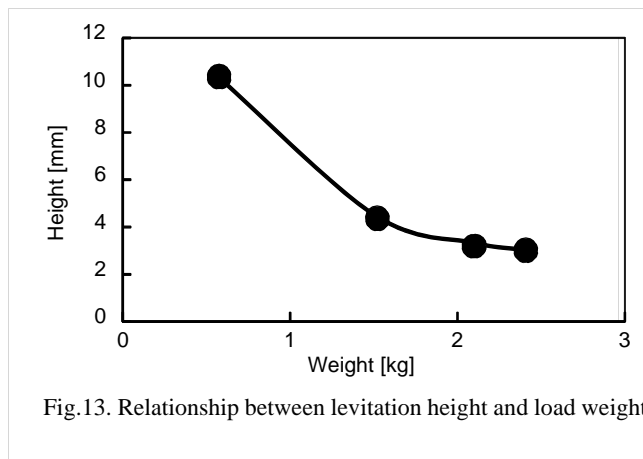


Fig.13. Relationship between levitation height and load weight.

CONCLUSION

- ✓ The basic experiments using the SC coil-(A) show that the repulsion force decreases gradually and the repulsion force depends on the distances between SC coil and guideway.
- ✓ The speed of levitated mover keeps almost constant and decreases gradually with increasing time.
- ✓ It is found that the levitation height of mover doesn't depend on the speed but on the load weight.
- ✓ It means that levitated mover runs along the guideway while keeping the levitated mover horizontal.