MAGNETIC CONTROL OF A HARD DRIVE'S INTERNAL MILLIMETER-SIZED BEAM

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Abstract-

This research making after critical review pf ontrol actuator devices and modelling milimetric arm cantilver analytical behavior. An experiment designed to learn more about how an actuator put in a laptop hard drive operates. A appropriate coil, likewise driven by a DC/DC converter, influences and exerts force on the actuator's actuation. The acquired response is impacted by interference induced by room illumination, and the findings demonstrate that the micrometric arm is considerably influenced by the action of the converter. However, the data acquired permits us to suggest this instrument for microfluidic uses.

Keywords- Actuators; switches; magnetic; beam cantilever; experiment.

1. Introduction

Since 1959, Richard Feynman has claimed that "there is plenty of room at the bottom"—his original theory that led to the microsystem where miniaturized devices showed interest—even though there was no clear-cut actual use at the time. Why are so many electronics now made in such tiny sizes? Because systems miniaturization is an endeavor to reduce bulk, cost, and energy consumption while enhancing performance, regardless of the application. In truth, micro electromechanical system is a new discipline that has emerged as a result of advancements in microelectronics technology. In actuality, the majority of MEMS are either micro sensors or micro actuators [1,2}, the latter of which can work as when an electrical control results in a mechanical displacement. The purpose of this research is to identify frequency and interference phenomena by studying the motion of a beam cantilever that is fed by magnetic solenoid and driven by DC/DC current [3,4].

2. Protocol for laboratory tests

We do an initial trial with submillimeter arm. The goal of this research is to comprehend how the action-and-reaction magnetic mechanism works [5,6,7]. We used a broken internal hard drive for this experiment; we adjusted the arm's location first, and then we moved it using an external magnetic coil. The ultimate objective of this moving arm device is to execute a micro size object selection inside the disc or to produce turbulent mixing fluids.

In this experiment, we moved the arm using a coil powered by electrical current "DC" and detected the movement using a light sensor and a laser "PHYWE" (He Ne - Gas laser 1mW; 632.8nm). We used a Blok "DC/DC" power supply for this experiment, and we monitored the voltage of the laser light as a function of time in the figure in (a). As seen in Fig .1, the hard drive's arm has the following measurements: 40 mm, 11 mm, and 0.4 mm.

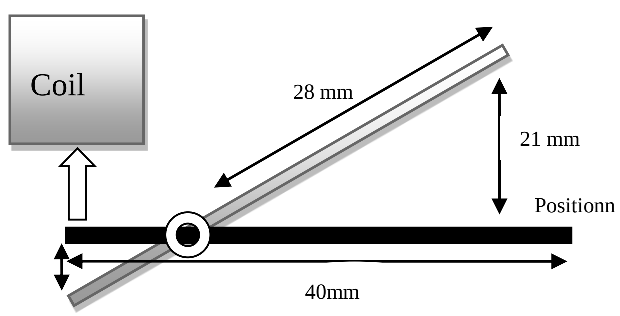


Fig.01 Schematic of the arm model and coil

Table 01.
Device characteristics and specifications

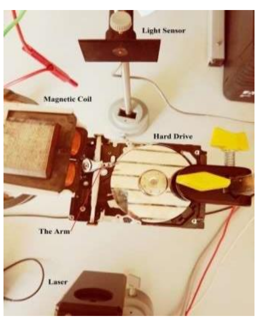
The magnetic coil		The internal millimeter-sized beam	
Property	Value	Property	Value
Voltage	50 V	Length	40 mm
Intensity	0.2 A	Width	11 mm
Resistance	50 Ω	Thickness	0.4 mm
		Weight	267 mg

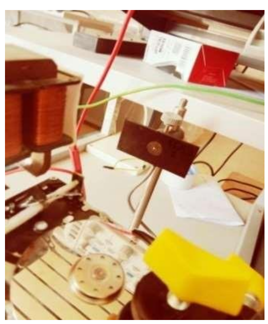
3. **Discussion and results**

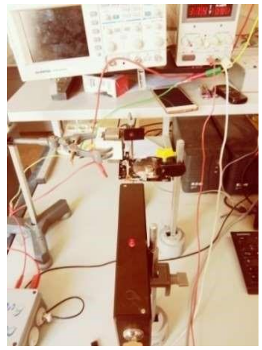
The following are the results of the arm vibration signal from the laser light descriptor Table 02. The "DC/DC" converter's hashing signal input results in the square signal.

Table 02.
Results of frequencies system

Coil frequency (Hz)	0.50	1	3.00	5.00	7.00
Actuator frequency Hz	0.49	0.99	.3.01	4.91	6.49
position 2 frequency Hz	13.16	12.19	14.28	12.82	39.29
Coil Intensity A	0.25	0.23	0.20	0.18	0.15







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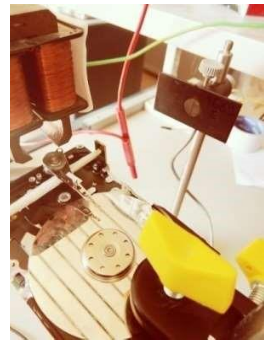

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Fig.02 Top view of the experiment protocol

The output frequency is the same as the input signal frequency, and the voltage output signal is regular, but the maximum and minimum voltage values deviate from the input signal.

In the uptown and bottom of the square signals, we see a disturbance in the arm vibration signal for "0.1; 0,5; 01; 03; 05; 06 and 07 Hz" frequency. This phenomenon is due to arm flexibility. We intend to analyze dynamic response and contrast it with another arm material composition since the rigidity of the material enhances the magnetic response of the arm.

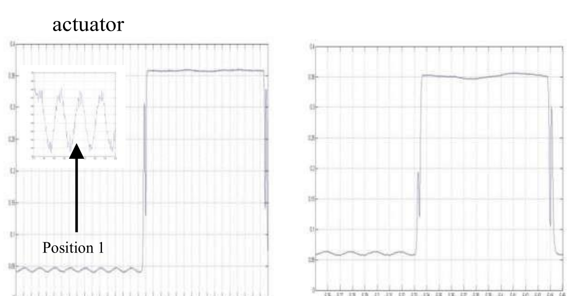

Fig.03 Voltage output signal vibration arm diagram, one period f = 03 Hz and 05 Hz

The two frequencies of the arm and the coil are generally identical, with position 1 indicating that there is nothing to pick up and the frequency being stable at "50 Hz," and position 2 indicating that the sensor has been excited by the laser light, with the frequency changing to "100 Hz" as shown in the photos above. When we changed the frequency of the Blok "DC/DC" and turned on the power supply as we demonstrated in the photos above, we noticed that if we increased the frequency of the coil the arm would move

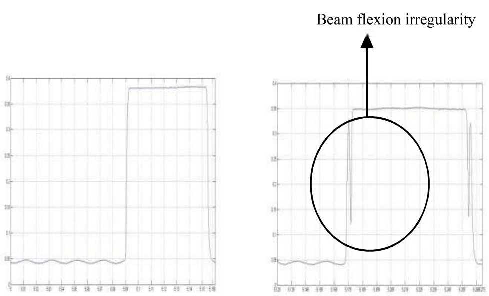

Fig.04: Voltage output signal vibration arm diagram, one period f = 06 Hz and 07 Hz

The frequency of the arm and the frequency of the coil are completely confused when we change the frequency of the Blok "DC/DC" and turn on the power supply as shown in the figures above, and in position 1 is to indicate that the sensor is nothing to pick up, the frequency is always stable "50 Hz," but in position 2 when the sensor was excited by the light of the laser, the freq.

4. Conclusion

We observe that the coil's intensity is decreasing while the actuator's fundamental frequencies are increasing. As a consequence of limb deformation, aberrant signal emission is produced. For the sake of microsystems, we must select an adaptive solenoid and reduce the limb size. Both the "Coil Frequency" and the "Actuator Frequency" are expressed in Hertz (Hz), and the values for these two frequencies are often quite near to one another. It seems that the dynamics of the system cause the actuator frequency to lag behind the coil frequency by a little margin.

The numbers for "Position 2 Frequency" shift drastically between coil frequencies. This indicates that "Position 2" in the system is affected by the frequency of the coil. The maximum frequency measured at "Position 2" was 39.29 Hz, which was much over the coil frequencies. As coil frequency rises, "Coil Intensity" drops. This suggests that variations in the system's impedance contribute to a reduction in coil intensity at higher frequencies. The findings show that there is a correlation between "Position 2" in the system, the coil frequency, and the actuator frequency. Understanding the underlying dynamics and consequences of these discoveries on the functioning of the system may need more investigation and testing.

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