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To Study Acoustic Tractor Beam

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ABSTRACT: High frequency Sound waves can form rotating packets of compressed air which can create energy in particles that can withstand gravity. Many ultrasound capture devices were developed according to this principle, which works when sound waves of the same frequency are on opposite sides and are placed on top of each other. That is, they need two sets of converters to float the particles. Acoustic beam tractor is an innovative technology that can be used to fix and use objects in air, water and human tissues with a large number of ultrasound emitters. It requires sound waves from the other side to detect particles. Acoustic beam technology is promising in a variety of fields. It can be used to harvest and decompose particles within the body such as kidney stones, clots, tissues and even target delivery drugs. The technology has some promising systems in the outer space, where they can stop large objects with gravity and prevent them from moving unmanageable.

KEYWORDS: transducers, trap, tweezers, tractor beam, acoustic hologram.

I. INTRODUCTION

When we stand in front of a powerful speaker we see power coming from sound waves. We can feel our bodies moving with a loud noise. Researchers have been studying these conditions in order to make good use of noise by building a tractor pole using sound waves.

Investigators have been using a number of different devices, such as the use of high magnetic fields and laser beams to extract objects. Ultra Sound waves can emit particles of various shapes and sizes through air, water and biological tissues . This allows us to move cells, compounds, or organisms without affecting them.

The goal of this technology is for high-frequency sound waves to emit acoustic energy into objects that can withstand gravity . Many ultrasound levitation devices are developed based on this system in which captured particles had to be fitted with acoustic elements. Acoustic levitation is well suited for the study of beverages that include aqueous solutions, natural ingredients, soft materials, polymers, and therapies around room temperature .

The Acoustic beam is a emerging technology that uses 64 microphones as shown in Fig (1), which can create very high and powerful sound waves, enabling the acoustic hologram to lift, move, rotate and hold small objects. By controlling the output of the speakers, the particles can be raised, held upright, moved and rotated. This method can be designed for a variety of programs. An acoustic beam tractor can be used to assemble electronic components or to take drug tablets or small surgical instruments with live tissue and cells. Devices using this technology may move tissues, liquids, chemical, and other substances within the body without physical contact

II. TRACTOR BEAM

A tractor's beam is a machine that has the ability to pull from one object to another. Since the 1990s, technology and research have worked hard to achieve it, and have had some success at a relatively low level . The technology allows users to open and move small particles without physical contact.

In Fig (1) shown below, to the left, the waves are marked as a broken yellow line from a normal light bulb or sound that tends to replicate the object shown as blue arrows and to move a bit. To the right the Waves from the new tractor pole are shown, those that return the sides of the object and return to the top. As a result, the particle is pulled to the source material. Fig (1) There are a number of different ways to do this - including lasers and small particles. Dental implants use a laser beam using a very powerful fixed laser that can hold the particles and move them towards the laser

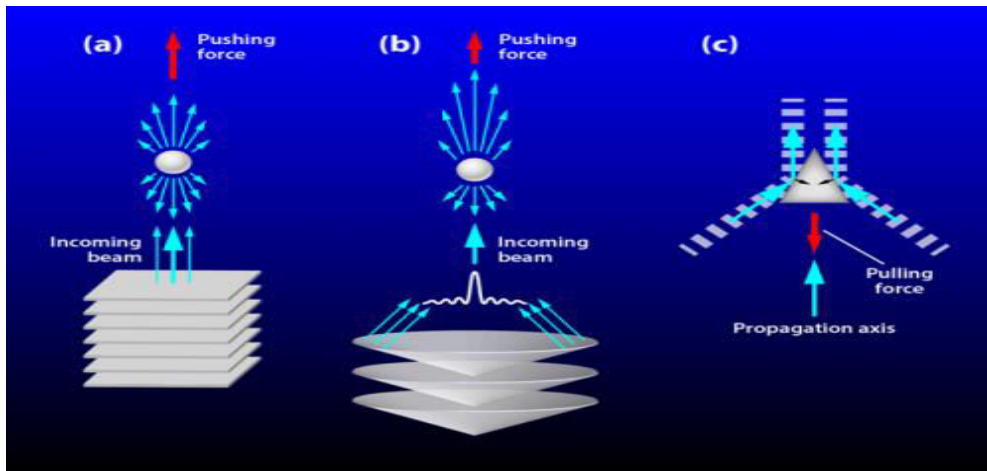


Fig.(1)

III. HOW ACOUSTIC TRACTOR BEAM WORKS

The Acoustic Tractor Beam can extract small objects and use them in space. High frequency sound waves help them accomplish this task. Even though the extraction technology already exists it is the first device to use a process that relies on sound waves found only on the side of the object used. A series of 64 microphones as shown in Fig (2), are arranged in such a way as to produce high-quality, high-frequency sound with microsecond-level accuracy [6]. The sound waves will create an acoustic hologram that can lift, move, rotate, and hold small objects in the air. Previous acoustic levitation systems used two or four sets of these transmitters and these transmitters had to rotate the system, but the models of the researchers allowed them to create the same power field using just one list. Figure (2) The tractor beam revolves around a noisy object and thus forms a magnetic field that keeps the object in its place. By controlling the sound waves, the team was able to rotate, move or hold an object almost instantly.

The acoustic hologram will take different forms such as tweezers, twistors and cages that use force on objects to extract and use them. How it actually works, Acoustic transducers (10 mm in diameter) driven at 16vpp and 40 KHz will produce acoustic waves that use radiation. These acoustic waves are beyond the scope of human hearing but can be heard on dolphins and dogs. The energy generated by these waves will also converge at various locations and produce acoustic traps that allow for the release of particles of various shapes and sizes by air, water, or biological waves. Clearly, Gor'kov's strength defines the field, its diverse empowerment. The work of Gor'kov Laplacian in one place is used to find the holding power at that time. Items (small area) are dragged to the region where Gor'kov Laplacian is located. that is, by promoting Gor'kov Laplacian as a function of class rotation in a particular area, it creates a great trap there. It produces three fine traps that seem to be ideal solutions for the same members on the same side.

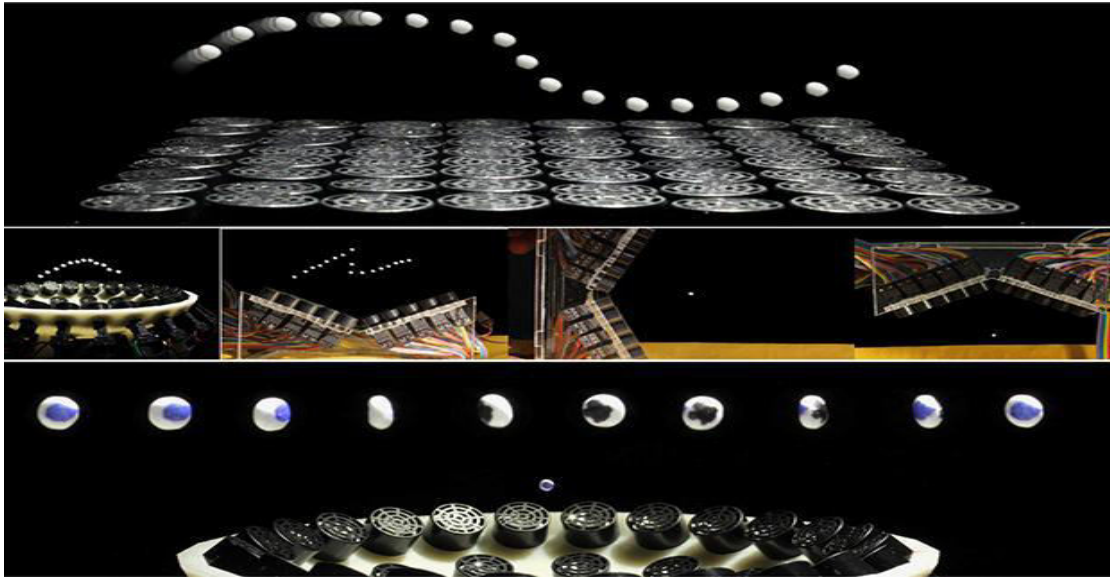


Fig:(2)

- 1) Bottle trap
- 2) Vortex trap
- 3) Twin trap

1) Bottle trap

Bottle traps appear throughout the system when large instruments are used in the direction of distribution. This snare surrounds the object from everywhere and keeps it in its place. These traps form a high amplitude cage around the capture point. In Figs (3), the acoustic tractor technology is demonstrated using a small balls of polystyrene, the same material used for packing peanuts.

fig (3)The device can output objects between 0.6 to 1 / 7th of an inch e.g. 4 mm thick. And the size of the allowable objects is determined by the frequency of the sound waves. That's the reason for lifting an object that needs to be smaller than the wavelength of nearby sound waves. If the frequency is low we can carry big things but it will start to bring it to a reasonable level.

2) Vortex trap

Vortex traps emerge when equal weights are used in a hemispherical cap or flat array. This structure will trap the objects in the middle. A particle trapped in this vortex trap spins around its own axis.

2) Twin trap

Twin traps are made to resemble the tweezers. Twin trap emerge when equal weights are specified in v-shape arrangements. These traps have two Finger – like cylindrical regions of high amplitude which tweezers the particle as shown in fig(3).

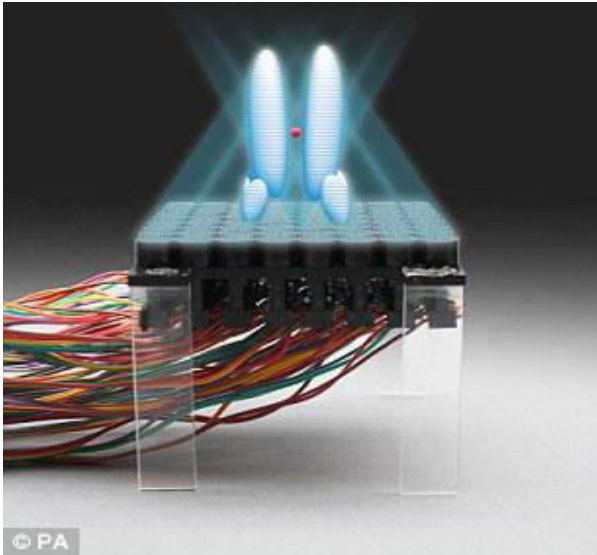
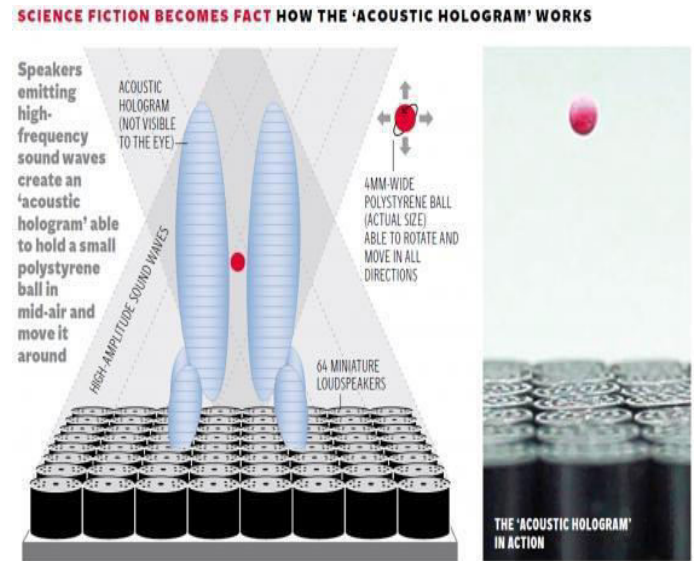


Fig:(3)



IV. APPLICATIONS

The most remarkable use of technology is to move small objects around and intersect with delicate objects without touching and disturbing them. There are many industrial systems where small processing can be used, for example, to handle sensitive or hazardous substances such as prescription drugs or explosives.

The use of acoustic beam technology is very high in various fields. Different types of holographic can be constructed using this technique to process an object, including toenails, cages and fingers.

The immediate application is expected to be on drugs such as drug delivery or weight loss surgical instruments with live tissue and cells. Since sound waves can travel through water and human tissues, the newest use of this technology will be for health. These acoustic waves can control particles within the body. This is why it is called in vivo deception, which means the removal and use of particles within the body. And these particles can be kidney stones, clots, tissues and even drugs for the distribution of targeted drugs. It is very interesting to think of using sound to decipher the inside of the human body without surgery. Doctors can quickly illustrate the action during in vivo practice since ultrasonic levitation does not interfere with magnetic resonance imagings.

Cancer treatment can be improved with acoustic holograms. Cancer treatment such as chemotherapy currently requires a full dose of medication - if this can be brought to your area it could be a major improvement. This is achieved by injecting the drug into a micro-capsule, which is opened by high power ultrasound. We can therefore move and store local micro-capsules (e.g., in a tumor) and remove them from time to time as needed. We can use very small doses, which can lead to a few side effects.

V. CONCLUSION

In this paper, we have discussed how sound waves can be used to extract tiny particles from the atmosphere. At present, it is proven that particles up to 10mm in diameter can float in space using ultrasound waves. The technology is expected to operate on very large objects with the help of very high frequency waves. Therefore, In the future the acoustic beam tractor can be used in the medical field for tissue removal, cancer treatment, delivery of drugs.

The problem is, noise between 140 and 150 decibels is dangerous to humans and should operate at more than 40 KHz. This can create camp-based assembly lines in the field of electronics, help administer drugs to the patient's body and can create a world controlled by noise. You may have created an area or region that is in opposition to gravity. But it is difficult to create a precise pattern of tractor sound waves. It is a great challenge to use the statistics that govern this behavior into a real world.



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