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Iron Man Suit - Synchronizing the Nanotech and Arc Reactor

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Abstract - The main objective of this paper is to explain these sci-fi gadgets, and to compare their science and technology outside of Marvel cinematic universe. On detail, we analyse the depth of real science on this fictitious armoured suit. Also, this paper draw developments in design of prototypes of the suits in mark series along with Arc reactor powering it.

Key words: Arc reactor, Repulsor beams, Nanobots, Swarm robotics, Artificial intelligence.

1. INTRODUCTION

Mechanical engineers of this era, mostly driven to the field of engineering because of the stout influence by Iron man movies. Anyway, practical engineering is wide away from science in the movies. In the Marvel cinematic universe, Iron man suits are exo-suit, powered by a combination of electric motors, pneumatics and hydraulics. The most intriguing fragment is that the suit is powered by a fictional Arc reactor. The Iron suit Mark LXXXV is the latest version of the model Mark L. This final iron man armour appeared on Avengers Endgame in 2019. It is a more durable and efficient because of Nano structure enhanced design. Today, all around the world studies are going on to reach that extreme to make a real iron man suit. The reality is that it is possible to develop a weaponized suit that supplements the strength and arsenal of an individual. But to make something close to ironman suits with features like arc reactors and tiny rocket engines to fly, goes insane!

2. PREDECESSORS OF THE MARK LXXXV

Iron Man suitcase armour is also powered heavy-metal set pieces. It is suit is built as a base for experimenting on newer and better transport features for Iron Man Suits, so that user would be able to don them faster than before. It specializes in smoother transport, and it is collapsed into a suitcase and can be deployed anywhere, allowing user access to the suit especially in a civilian environment[1]. The major developments shown in the Marvel cinematic universe, comprise of many models of different capabilities. The important and eye-catching predecessors are listed below, starting with the Mark I.

Fig-1: Blue print of Mark I

The Mark I was first built suit in MCU, built to help Stark escape from forced captivity. The suit was made from the lesser resources, including pieces of scrap metal and other machine parts. The suit increased Stark's strength and durability, enabling him to escape from the armed terrorist. Multiple layers of metal from missile casings made the suit resistant to firing and strengthened its power to attack. The engine powered a pair of external, belt driven mechanisms in the suit's legs that helped support the vast weight of the metal suit[2]. Comparable instruments in the suit's arms and legs assisted him to move around and increased the strength for actions. Next is the iconic Mark 3, which fix the icing problem of the Mark 2 by using a gold titanium alloy, including a series of miniaturized weapons and become the first suit to use palm repulsors as a weapon. The mark 5 was the first suit designed with portability. It was lighter than all other previous suits and was even able to fold itself into the appearance of a briefcase. The Mark 7 was a big step for Iron man movies, offering automatic deployment and faster assembling as well as new and upgraded weapons. The Iron legion of suits, from Mark 8 to 41. All with their own unique features and speciality, which appeared in Iron man 3. The mark 44 better known as the 'Hulk buster', was designed to restrain the hulk. This colossal suit was powered by eleven Arc reactors. Mark 46 was the suit used in the movie civil war, interestingly it also borrows from Hulk buster and contains multiple Arc reactors to power different parts of the suits giving it even greater strength. The mark L was a major step up. It was the first suit to utilize nanotech, both as a means of quickly donning the suit and for further use in combat.

The nanites are able to reposition themselves into different weapons.

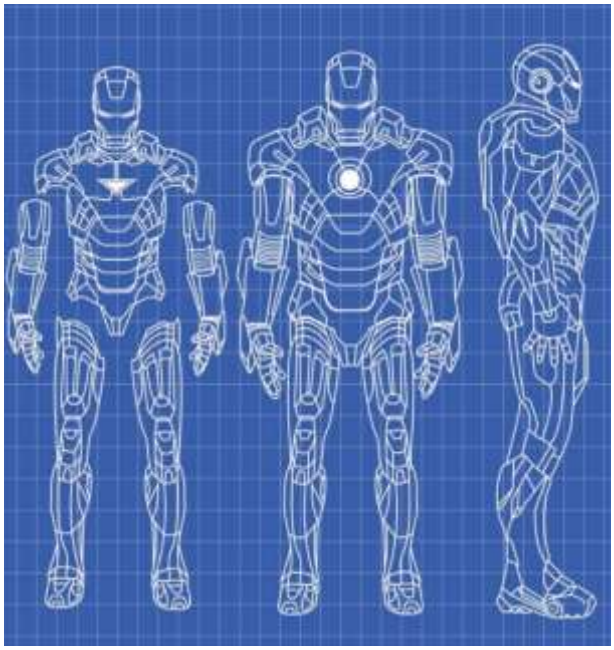

Fig-2: Different types of Mark models.

3. ARC REACTOR

The Arc Reactor is a fusion reactor. Fusion encompasses the nuclear reaction between two lighter nuclei to form a heavier one. But later the movie uses a Tesseract core as a cleaner energy source to retain the Arc reactor after Palladium toxicity. In the circular part of the Arc Reactor, there are highly energized units moving in a spherical path due to magnetic field acting, and thus producing energy through collisions. Palladium isotopes possess discrete nuclear properties, therefore the Arc reactor produces additional energy making it self-sustainable.

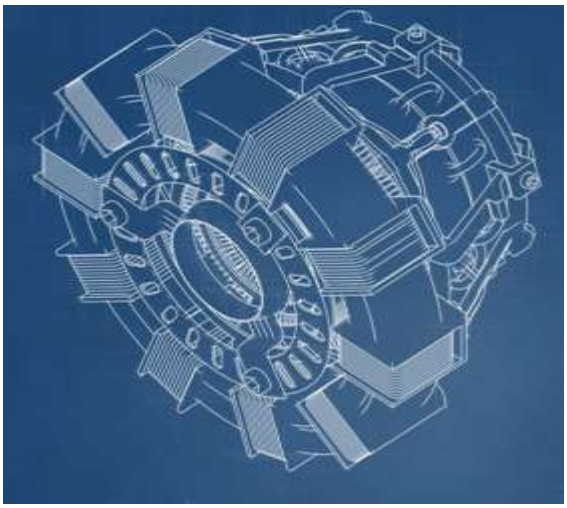

Fig-3: Sketch diagram of Arc reactor

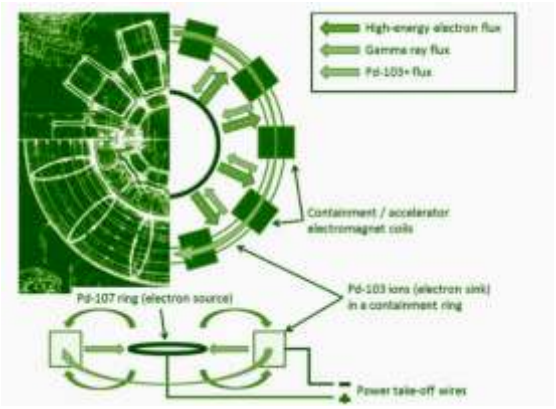

Fig-4: Miniature arc reactor[3]

Due to its ability to absorb hydrogen, Palladium is accountable for cold nuclear fusion. Also, producing electricity with generation of minimal heat dissipation, resulting in more efficiency. The maneuver of the Arc Reactor is primed through the ionization of palladium through an electric arc, while the Gamma rays created, attached with the collisions of the particles produces a potential difference, thus producing current to flow in the reactor. However, it needs a tremendous amount of magnetic field to endure the reactor. The main drawback is that if we are producing that much energy in such a small place, it creates heats which is a fundamental law of thermodynamics and that heat would melt everything. This is one of the challenge in localizing energy and then distributing it, we require lots of coolant. This Arc reactor enables Iron man to shoot beam from his hands, which is known as the repulsor beams. The repulsors beams are the type of arsenal that uses particle beam technology to repel the opponent away as well as leaving burns, mortal wounds, and even gaping holes[4]. It operates by enchanting spare electrons and converting it to muons, which can deeply penetrate.

Fig-5: Arc reactor from Marvel movies.[5]

4. NANOTECH

Iron man suits are continuously evolved over time. Having less technological capability at the beginning, becoming virtually capable of doing anything imaginable in its latest version. In the latest film, the suit is said to be composed of numerous titanium nanoparticles that collectively morph into multiple different forms, when required. The capabilities of the suit include shape changing, self-assembling and made up of numerous fundamental units working together. To compare the nano suit with science and technology of present time and to see how close we are to achieving this, one should dive in the world of material technology to unpack the developments in shape changing materials. Through Nanotechnology, we can produce remarkable products which are light weight. In the new age materials, nearly every physical properties from thermal to electrical conductivity and even flame resistance can be enhanced. Shape changing alloys were found in 1960s. Nitinol, which is an alloy of nickel and titanium is the most widely known material with shape changing capability. Later, notable developments occurred in field of shape changing material on electric or magnetic stimulus. An example of this is origami robots which was developed at MIT. The robots changed their fold when electricity is passed. At MIT scientist was successful in making the M blocks which can change configuration based on the task assigned to them. The Nanotechnology is possible but it is in the embryonic stage. The swarm robotics that focus on the collective behaviour of autonomous robots. Scientist has been able to produce swarm of robots that are not only ground based but also aerial. Programming is the key in making them work together in addition to their individual functionality. We haven't reach the level of nanobots which are the machines that would range from 0.1 to 10 micrometre, so nanobots science is still hypothetical. When we look a nanotechnology in iron man suits, we are still decades away from making something even close to it. The suit in the movie showcases different strands of technology coming together namely robotics, material science and artificial intelligence.

5. CONCLUSION

If Iron man was not fictional, the most probable technology to be used in making the suit is 3D printing. A light weight, bullet proof iron man suit can be 3D printed using titanium, which is absolutely possible. The suit can be fabricated in very small thickness to reduce weight, so that we can attach a jet pack. Most parts of the suit can be 3D printed using titanium, some with nylon and glass fibres and also possible to include flexible parts in the suit. It is not possible to power the suit by Arc reactor which cannot be possible in real science, powerful battery sources or external supply can be provided. Science fiction has led the way in helping to materialize and realize many concepts that is useful toady. In many cases, these ideas inspired by comic books and movies drive the researchers. In future, there will be suits protecting them as well as provide them with enhanced abilities.

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