IMPROVED MICROWAVE HYPERTHERMIA DEVICE

IITM Technology Available for Licensing

Problem Statement

- A conventional hyperthermia device generally employs an applicator which enables heat transfer to the target tissue. The commonly used heating mechanisms are acoustic and electromagnetic (EM) techniques.
- **Fig. 1** illustrates an exemplary prior art hyperthermia device using an applicator (microwave antenna) coupled to the tissue through a surface cooling temperature controlled water bolus.
- Clinically available hyperthermia antennas at **434 MHz are bulky with fixed effective heating areas**. Hence, their ability to treat varying size tissue is limited.
- Irrespective of the applicator used for hyperthermia devices, heat is delivered to the target tissue through a coupling medium often referred as the bolus. However, to maintain uniform volume during treatment, the circulating temperature controlled fluid (typically 37°C - 42°C) inside the bolus is required.
- Based on the foregoing, there is a need exists for an improved hyperthermia device which is compact and provides a better solution.

Technology Category/ Market

Category - Lifesciences, Medical devices
Applications - Hyperthermia devices, Radiation therapy, Clinical thermal therapy, Cancer Treatment
Industry - Thermal Therapy Devices

Market - The global hyperthermia devices market is expected to reach **USD 621 million by 2028**, with a **CAGR of 5.4%** during 2023-2030.

TRL (Technology Readiness Level)

TRL 3: Proof of concept (PoC) stage

Intellectual Property

- IITM IDF Ref. **1165**
- **IN 430235 - Patent Granted**
- **PCT/IN2015/000125**

Fig.1. illustration of hyperthermia heat delivery.

Technology

- An improved microwave hyperthermia device with **compact heating applicator** and **inline degassing for bolus circulation.**
- A family of 434 MHz patch antenna (3x3x1 cm till 10X10X2cm) with varying effective heating area for treating tissue disease of varying extent.
- The bolus water circulation (Fig. 4) proposed for the **434 MHz patch antennas is a smart closed loop system** capable of **removing dissolved micro air bubbles real time** during hyperthermia treatment.
- The patch antenna comprises of a **radiating patch mounted on a low loss dielectric substrate** which is housed inside a metal cavity and has a low loss superstrate on the patient contacting side (Fig 2 & 3).
- **Temperature and flow sensors** embedded in the fluid flow path can measure the temperature and flow of fluids which can be further sampled and fed to the control unit/computer for process control.
- A **closed loop application** running on the control unit/computer sends the control signals to the pump and water heater **to circulate degassed temperature controlled water at a constant flow rate**.

Research Lab

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Industrial Consultancy & Sponsored Research (IC&SR)

Key Features/ Value Proposition

1

- Improved microwave hyperthermia device with **compact heating applicator model** when compared to dielectric loaded waveguide and horn antennas at 434 MHz (10x10x10 cm).

2

- **Miniaturized microwave antennas for power transmission** to the tumor/target tissue for uniform volume heating.

3

- The different sized patch applicator with **varying effective heating area** accommodates varying extent tissue diseases.

4

- **Eliminates the issues with power coupling and motion artifacts** during thermal therapy using MR thermometry for volumetric dose calculation by using D20 as a coupling medium.

Advantages

- **Can be used with MR compatible thermal therapy devices.**
- Single microwave source and power sensor to monitor and control power delivered during treatment.
- Smaller applicator and lower system cost for heating antenna.
- **No need for disposable gas permeable degasser.**
- Since it is completely closed loop and automated, system running cost is lower.

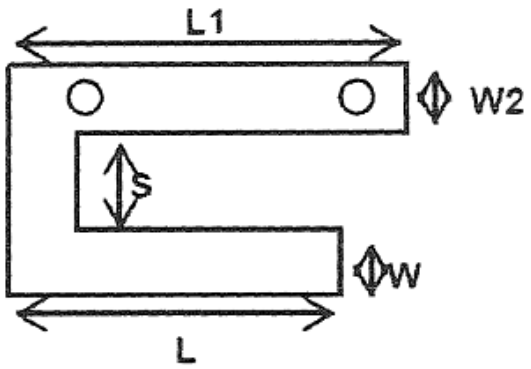

FIG. 2. illustrates the top view of a folded 434 MHz patch antenna for microwave hyperthermia device.

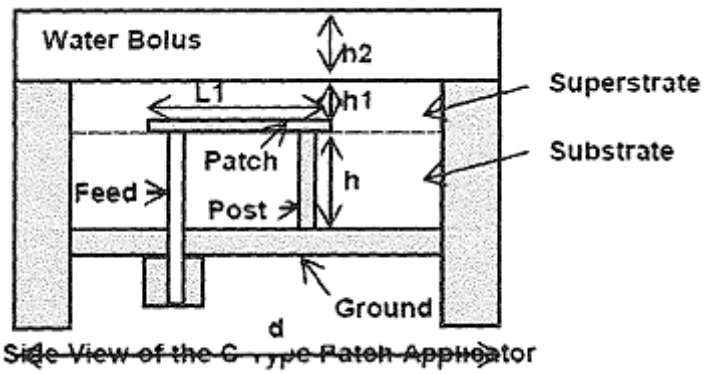

FIG.3. illustrates a side view of the folded 434 MHz patch antenna 300 for microwave hyperthermia device.

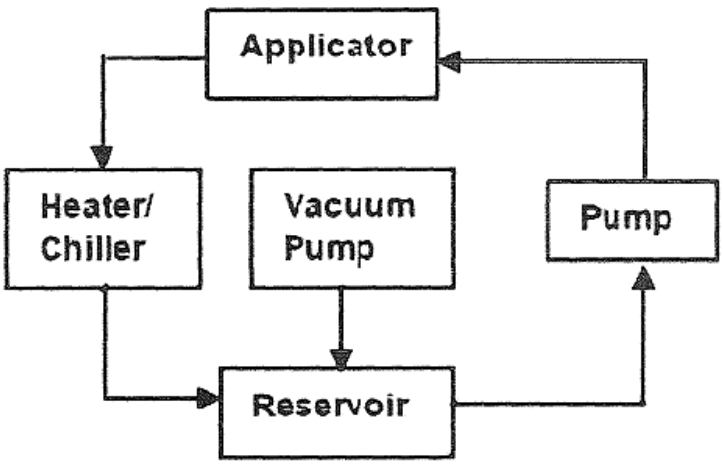

FIG. 4. illustrates a low cost inline degassing for bolus circulation in the hyperthermia device.

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