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A HYBRID MODEL OF INDUCTION STOVE

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Abstract

This work focuses on execution of a mixture model of induction stove which works under DC Supply. An Induction stove is an especially made out of an electromagnetic kind of energy for house hold reason (as a warming element).With this advancement, up to 90% of the energy changed over into warmth energy, appeared differently in relation to around 74% for traditional electric systems and 40% for gas. The thought of induction stove has been exhibited years earlier yet in the meantime is has not won the trust of the all inclusive community since it has a couple issues of energy usage and change. In this work it has been conveyed with an idea to become such a "cream model of induction stove" which should have the ability to crush these issues.

Keywords: Induction Stove, Hybrid Model, DC Induction stove, Electromagnetic Induction.

I. INTRODUCTION

Induction cooking is frequently viewed as a standout amongst the most proficient innovations for stovetop cooking. This innovation depends on the standard of magnetic induction, in which eddy currents are energized in a ferromagnetic cookware when in the nearness of a oscillating magnetic field. These impelled current scatter heat by the Joule impact, creating the warmth for cooking specifically in the cooking vessel[7]. All things considered, less warmth is lost in wasteful heat conduction between warming component and cookware. An ordinary induction cooker is made out of an exchanging power gadgets circuit that conveys high-recurrence current to a planar loop of wire installed in the cooking surface. The cookware is attractively coupled to the curl by the wavering attractive field, closely resembling the coupling in the middle of essential and optional loops of a transformer. Current flow in the cooking vessel because of the low resistance of the metal, with force dissemination given by I^2R . The resistance of the vessel is reliant on the attractive permeability (μ) and resistivity (ρ) of the cookware, and in addition the frequency of

excitation. To create adequate warmth for cooking, cookware must be utilized that has generally high permeability and resistivity. Ordinary induction cookers work at exchanging frequency between 25 kHz and 50 kHz. In the induction cookers are just ready to couple with ferromagnetic cookware, for example, cast iron and some amalgams of stainless steel. Subsequently, cutting edge instigation cooking innovation is not good with cookware produced using copper, aluminium and non-attractive combinations of stainless steel. Induction cooking is regularly viewed as a standout amongst the most effective cooking innovations. With this innovation, up to 90% of the energy expended is exchanged to the sustenance, contrasted with around 74% for conventional electric frameworks and 40% for gas. The idea of induction stove has been presented year's prior This innovation has turned out to be very famous in European nations, where there is no lack of the power yet its reception in the India has been less energetic because of a tremendous shortage of force. A few business sector obstructions exist for this innovation, including high first cost, the necessity of attractive cookware, and lower saw unwavering quality. Existing business stoves have a weaknesses, particularly with regards to use in creating territories. For one thing, albeit high efficiencies of 90% are well inside of handle, numerous business offerings don't achieve 80% proficiency, likely on the grounds that they were composed in nations with shoddy, solid mains control .No current stoves have worked in instruments of managing chestnut outs or power outages [6]. On the off chance that a family depended on an induction stove in one of numerous urban areas in the entire without top notch power, they would be notable cook their suppers all the time. Assume cooking tea or rice on the induction stove if there is a sudden power interference then entire thing going to be squandered. The versatile which are found after the induction stove which is such a great amount of achievable when contrasted with induction stove even a cloth picker have 2-3 mobiles. Its mean the induction stove still has not dependable and doable.

In this work it have been concocted a thought to grow such a "half breed model of induction stove" which ought to have the capacity to conquer these issues. The build up an Induction Stove which is capable of operation with AC [5] and also DC Power Supply was presented here. A backup power unit to the Induction Stove which will spare our sustenance's with no power interference.

In this way the new model is more dependable and environment benevolent. Later on angle it will turn out to be so fruitful. We realize that non renewable wellspring of energy are restricted following 2-3 decades the entire thing will rely on upon the renewable wellspring of energy. When we can run this induction stove with dc power supply then in future we associate the induction stove with the nearby planetary group, where there is no power utilization cost and power interference.

1.1 Literature Survey

O. Luc'ia, et.al in their paper entitled "Series resonant multi inverter for multiple induction heaters" in *Trans. Power Electronics*. [4] Recommended that Multiple-heap and numerous source frameworks are generally present in the present innovation. These frameworks require controlling either the supplied voltage or energy to a few burdens with various prerequisites all the while. As a result, the expense and size of the force stage may increment past as far as possible for specific applications. Considering various inductor stacks, a novel arrangement resounding multi inverter topology is proposed to acquire a financially savvy and high-control thickness arrangement.

H. W. Koertzen, J. A. Ferreira, and J. D. van Wyk in their paper entitled "comparative study of single switch induction heating converters using novel component effectivity concepts"[2] proposed an arrangement of criteria for contrasting adversary single-switch incitement warming force converter topologies are presented. Three single-switch topologies are looked at utilizing a transmission proficiency study supported by broad recreation and test estimation. The force taking care of ability of segments is contrasted and the dynamic force conveyed by the force converter.

O. Luc'ia, J. M. Burd'io, I.Mill'an, J. Acero, and L. A. Barrag'an et.al entitled "Efficiency oriented design of ZVS half-bridge series resonant inverter with variable frequency duty cycle control" [3] suggested that the effectiveness of zero voltage exchanging half-connect arrangement resounding inverter can be diminished under certain heap conditions because of the high exchanging frequencies required. The proposed variable frequency obligation cycle (VFDC) control is planned to enhance the productivity in the medium and low yield power levels in light of the diminished exchanging frequencies. The study performed in this letter incorporates, in an initial step, a hypothetical investigation of force equalization as an element of control parameters. Moreover, confinements because of snubber capacitors and dead time, and variability of the heaps have been considered. A short time later, a proficiency examination has been completed to decide the ideal operation point. Exchanging and conduction misfortunes have been figured to look at the general productivity change.

R. L. Steigerwald *Transet.all* entitled "A comparison of half-bridge resonant converter topologies" [8] suggested that the half-connect arrangement thunderous, parallel-resounding and mix arrangement parallel full converters are analyzed for use in low-yield voltage power supply applications. It is demonstrated that the blend arrangement parallel converter, which tackles the alluring attributes of the immaculate arrangement and the unadulterated parallel converter, evades the primary burdens of each of them. Examinations and breadboard results demonstrate that the blend converter can keep running over a vast info voltage range and an extensive burden run (no heap to full load)

while keeping up brilliant proficiency. A valuable investigation system in light of established AC complex examination is presented.

Carlos Sagues Blazquiz and Gonzalo Lopez-Nicolas, "Reset observers and temperature control for induction hobs," suggested that the paper introduces a novel high [1] recurrence delicate exchanging power transformation circuit [1] for high-control prompting warming (IH) applications, for example, the accompanying: (1) heat treatment of metals; (2) boiling point water; and (3) superheated steam makers. This high-recurrence power transformation circuit can work from single-stage or three-stage frameworks to deliver high current for high-control IH applications under the standards of delicate exchanging operation. It can direct its air conditioning yield power from the appraised quality to a low power level. A double mode control plan in view of high-recurrence beat width balance (PWM), in synchronization with the utility recurrence positive and negative half-cycles.

II. Existing System

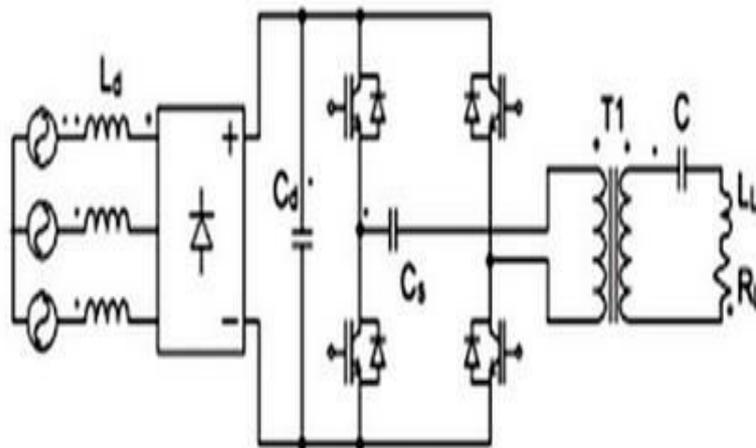


Fig.1. Circuit Diagram of induction stove.

A few business items were inspected to figure out what topologies were well known by and by and to investigate existing answers for induction cooking. The majority of the business arrangements utilize the half-convert ZVS arrangement resonance inverter. The induction framework shown in fig.2.comprises of a three-stage diode rectifier, a solitary stage voltage-encouraged inverter utilizing four IGBTs, and an series resonant circuit with a coordinating transformer. Resonance force converters are generally utilized as a part of induction warming applications because of their high productivity and high-control thickness which permits getting solid and superior usage. There are numerous burden of the current induction stove which incorporate Lower proficiency is accomplished at low-medium yield power levels because of the higher exchanging frequency.

III. Proposed System

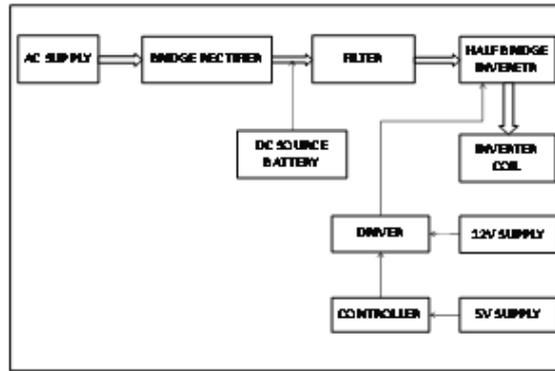


FIG.2.PROPOSED SYSTEM BLOCK DIAGRAM.

The proposed hybrid model of induction stove is shown in fig.2.

AC Supply: A single phase ac supply of 230 v, 50hz was provided.

Bridge Rectifier

An bridge rectifier is a course of action of four or more diodes in a scaffold circuit setup which gives the same yield polarity to either input polarity. It is utilized for changing over Alternating current (AC) information into an immediate current (DC) yield. The essential use of bridge rectifiers is to change an AC supply into DC power. Every single electronic gadget require direct current, so bridge rectifiers are utilized inside the power supplies of all electronic gear. Bridge rectifiers are likewise utilized for identifying the sufficiency of regulated radio signals. The signal might be opened up before it is identified. On the off chance that it is not, then a low voltage drop diode or a diode biased with a settled voltage must be utilized. Rectifiers are additionally used to supply energized voltage for welding applications. Control of the output current is required in such circuits, and this might be accomplished by supplanting a percentage of the diodes in a scaffold rectifier with thyristor, which are diodes whose voltage yield can be directed by exchanging on and off with stage let go controllers.

Filter: It is a circuit which perform signal handling capacity, uniquely to expel undesirable frequency segment from the signal to improve needed ones or both. It converts the throbbing dc power supply into a steady dc power.

Half bridge inverter:

It change over DC power supply into AC power supply. It requires a half extension inverter on the grounds that the induction loop chip away at the AC supply as it were. It is otherwise called inverter leg. It comprises of two exchanging gadgets (S1 and S2) with two hostile to parallel diodes (D1 and D1) to suit the arrival of the current to the DC transport when required. This happens when the heap power variable is other than solidarity. With a specific end

goal to produce a mid-point (0) to associate the arrival way of the heap, two equivalents worth capacitors (C1 and C2) are associated in arrangement over the DC information. The outcome is that the voltage V_{dc} is part into two equivalent sources over every capacitor with voltage of $V_{dc}/2$. The suspicion here is that the estimation of the capacitors is adequately expansive to guarantee a hardened DC voltage source. This just implies their voltage potential stays unaltered amid the operation of the circuit. This likewise implies the capability of the mid-point (0) is steady as for both positive and negative DC transport rails at all times ($V_{dc}/2$) and $V_{dc}/2$ individually).

Inverter Coil: An inverter gives us a high voltage exchanging current from a low voltage direct present. An alternator would have a loop of wire with a pivoting magnet near it. As one post of the magnet approaches the curl, a present will be delivered in the loop. This present will develop to a greatest as the magnet passes near the curl, subsiding as the attractive post moves encourage away. However when the inverse post of the magnet approaches the curl, the current incited in the loop will stream the other way. As this procedure is rehased by the persistent pivot of the magnet, a rotating current is created.

DC Power Supply: For the dc power supply lead acetate battery of 12v/1.2amp/hr was used.

IV. Proposed Circuit & It's Operation

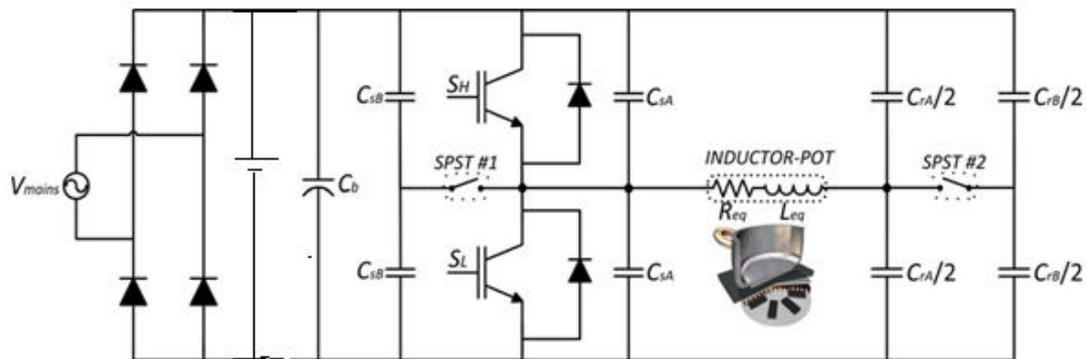


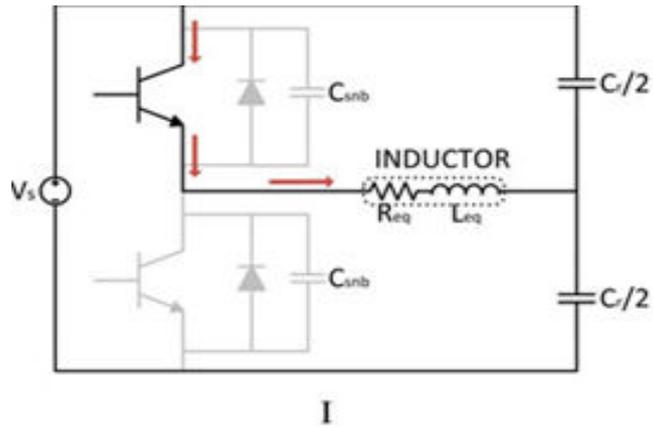
Fig.3.Circuit Diagram of Resonant Converter.

The proposed framework shown in fig.3.addresses the issues by undertaking the outline of a high proficiency induction stove fuelled by 12V DC. To build up an Induction Stove this is capable of operating with Ac and additionally Dc Power Supply.

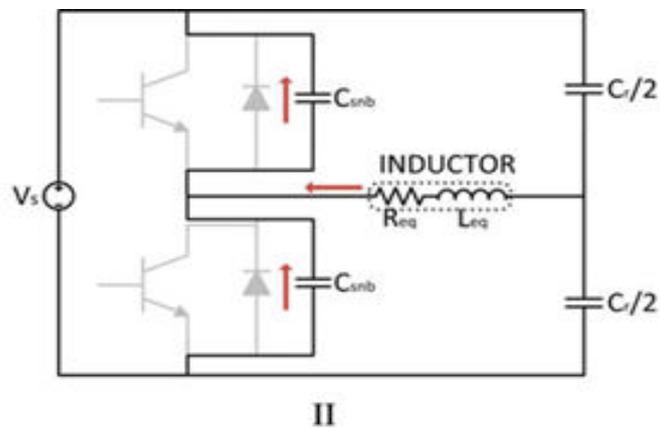
This speaks to a formerly un-looked into range as there are as of now no business induction stoves or writing accessible in the educated community with respect to prompting stoves controlled from a low voltage DC power source .To conquer the current framework impediment, double mode-operation full converter is proposed which promote enhances productivity in the low yield power range because of the diminished exchanging misfortunes.

Mode of Operation

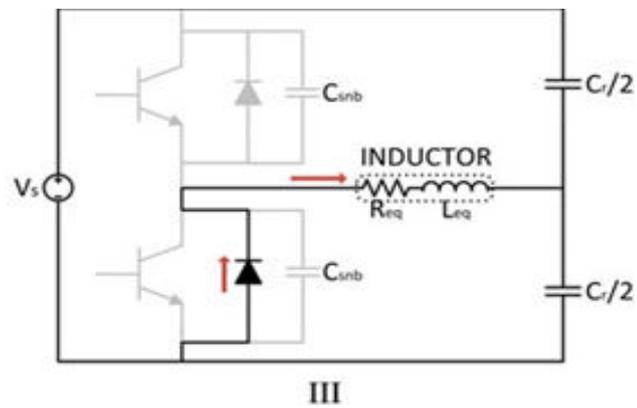
I. Mode 1



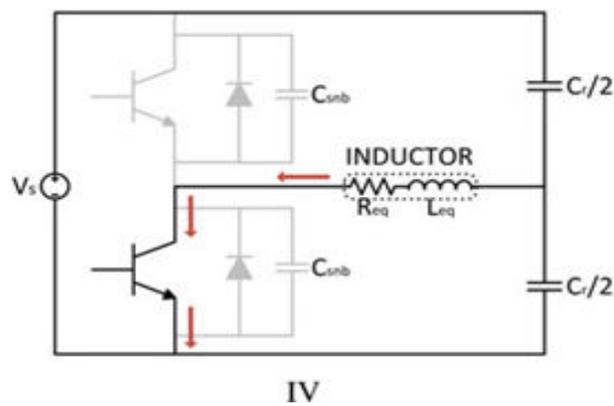
II. Mode 2

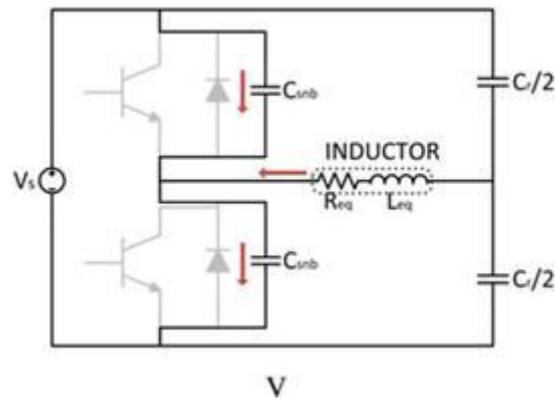
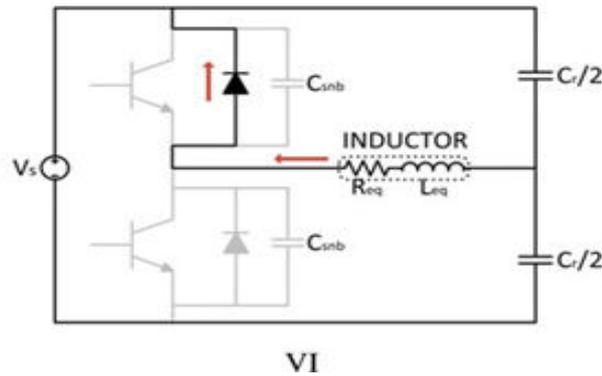


III. Mode 3



IV. Mode 4



V. Mode 5**VI. Mode 6**

During the first state I, the load current is positive and it is supplied by the high-side transistor. When high-side transistor is deactivated, the switch-off current is used to charge/discharge the snubbed capacitors. The high-side snubbed capacitor is charged to the supply voltage, whereas the low-side snubbed capacitor is discharged. In state III, the load current is also positive, and thus, it is supplied by the low-side diode. When the load current becomes negative (state IV), it is supplied by the low-side transistor. As soon as the low-side transistor is deactivated (state V), the load current charges the low-side snubbed capacitor to the supply voltage, whereas the high-side snubbed capacitor is discharged. When both snubbed capacitors are charged / discharged, the negative load current flows through the high-side diode (state VI). Finally, when the load current reaches zero, the load current is supplied by upper transistor (state I). Class-D operation mode uses configurations I to VI, whereas in class-DE operation mode, the configurations II and V, i.e. snubbed capacitors charge/discharge, are extended avoiding the use of configurations III and VI diode conduction. Moreover, in the case of class-DE operation mode, the entire negative current is provided by the snubbed capacitance, and anti-parallel diode does not conduct. Therefore, $T_{diode}=0$, $T_{IGBT}=T_{on}$. Consequently, the current distribution in the class-DE operation mode is partly derived to the snubbed capacitor, reducing conduction losses. As small snubbed capacitors are used in the class-D operation mode, the output current can be considered constant during the charge intervals.

V. Result

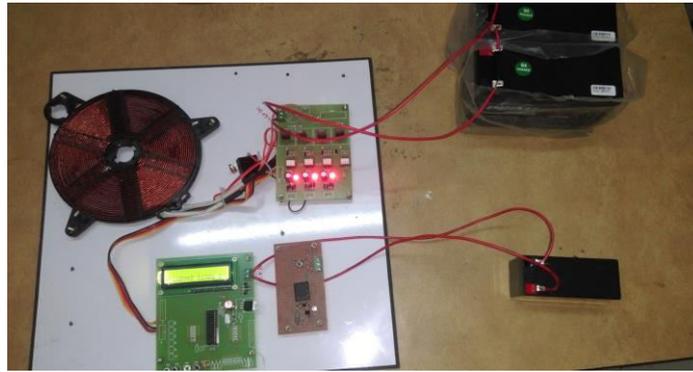


Fig.4. Induction Stove with DC Power Supply.

In the present scenario the induction stove is only working on ac power supply. When the power getting interrupted during cooking time it creates problem and the food are going to be wasted and irritating the person who is cooking.

In this project DC induction stove to prevent above mentioned problem and also to increase the efficiency and energy utilization was proposed whose hardware model is shown in fig.4. The hybrid model of DC induction stove is shown in fig 3. One 12V, 1.2Ah battery which gives supply to the controller circuit which will control all the system. Another two 12V, 7.2Ah battery is used to provide power supply to the inverter section. A backup power supply has been introduced to the induction stove when the ac power is cut off from the induction stove. By using this setup the power fluctuations and power shut down problems can be overcome especially in the countries like India where power shutdown is very frequent.

VI. Conclusion.

At first the Induction stove is dealing with AC supply and if there is any force intrusion the induction stove quit working. so that this proposed framework keep running with AC and also DC power supply .If there is a force intrusion then a back force framework will accessible which run this induction stove constantly with no issue. With this new strategy consistent cooking should be possible if in the event of force disappointment which was not at first conceivable.

VII.Future Aspect

The new proposed framework will more powerful for future when contrasted with present time. As indicated by present energy scenario generally the force is produced with non renewable wellspring of energy which is restricted however in future the force will created mostly by renewable wellspring of energy like sun powered energy ,wind energy. When the induction stove works with DC power supply then this framework can be interfaced with close planetary system which will help individuals to use power devour for cooking in a successful and effective way.

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