RFID TAGS FOR MAINTAINIG WARRANTY AND REPAIR INFORMATION IN CONSUMER ELECTONIC APPLIANCE

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***Abstract*: RFID stands for radio frequency identification. Now a days it is widely used from cards to automated toll fees payment to transportation tracing. But this paper will give instruction/ over view about how RFID tags can be embedded in an electronic appliance and can be used by to maintain warranty record, AMC details, previous repair reports and customer information.**

RFID Principles: Many types of RFID exist, but at the highest level, we can divide RFID devices into two classes: active and passive.

Active tags require a power source—they're either connected to a powered infrastructure or use energy stored in an integrated battery. In the latter case, a tag's lifetime is limited by the stored energy, balanced against the number of read operations the device must undergo. One example of an active tag is the transponder attached to an aircraft that identifies its national origin [1].

Passive RFID is of interest because the tags don't require batteries or maintenance. The tags also have an indefinite operational life and are small enough to fit into a practical adhesive label. A passive tag consists of three parts: an antenna, a semi- conductor chip attached to the antenna, and some form of encapsulation. The tag reader is responsible for powering and communicating with a tag. The tag antenna captures energy and transfers the tag's ID (the tag's chip coordinates this process). The encapsulation maintains the tag's integrity and protects the antenna and chip from environmental conditions or reagents [5].

For our application Passive RFID is the best suited as it will be functional in spite of wear and tear and contact with moisture.

Working of RFID: - RFID methods utilize radio waves to accomplish this. At a simple level, RFID systems consist of three components: an RFID tag or smart label, an RFID reader, and an antenna. RFID tags contain an integrated circuit and an antenna, which are used to transmit data to the RFID reader (also called an interrogator). The reader then converts the radio waves to a more usable form of data. Information collected from the tags is then transferred through a communications interface to a host computer system, where the data can be stored in a database and analysed at a later time.[3]

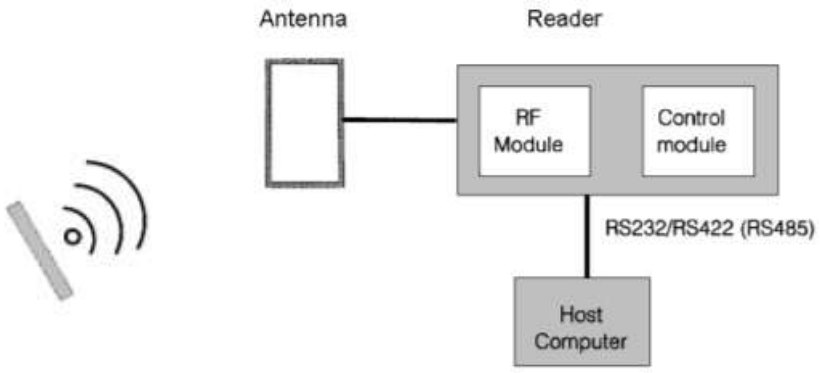

Fig:1 [2]

Implementation: - The manufacturer can put RFID tags in the electronic appliance with product information, RFID Unique id can be mapped with various appliances sold by manufacturer. When a seller sells a product an RFID editor can be used to write information about sale date, customer name and if warranty was extended by customer. If there is some problem with appliance the technician can easily scan RFID tag and obtain information about warranty and product details. The technician can even infer what kind of damage might happen to a product based on previous repair records. Eg: - if there is a Washing machine which is being used in an area where there is frequent voltage fluctuation, so if a 1st repair is done on Motor being damaged due to fluctuating voltage. If again product stops working; then the new technician will be easily able to identify if there is a problem with motor or not thereby making Debugging faster.

A portable mobile based RFID reader can be used.

Fig 2[6] Portable hand held RFID reader-writer

NOTE: -The Customer information, Product information, warranty and AMC details shall be stored in the RFID tag and not on an external Server.

Prototype with Arduino: -

Components needed: - 1) Arduino Uno R3. 2)RFID-RC522 module. 3)RFID TAGS

Code For writing information in RFID tag: - https://drive.google.com/file/d/1tivs6mePjJfsO5ABH36cDW2WussP6b-R/view?usp=sharing

Code For reading information: -
https://drive.google.com/file/d/1cdUSHNq6dkwmE86rWHphHP92iOefJW8b/view?usp=sharing

Problems faced and how to overcome: -

1. If RFID tag and sensor are not close enough for more than 6-10 seconds then reading/writing of RFID doesn't take place this can be overcome by designing the sensor module such that it forms a self-locking system.
2. Risk of RFID being overwritten by Unauthorised Sensors this can easily and cheaply be solved using Faraday's cage method in which will enclose the tag in a material which prevents outer radio frequency and when service technician arrives they can unscrew the enclosure update information screw it back again and place a warranty void sticker or else Smart RFID can be used Which can be implemented by "HASH LOCK APPROACH"

HASH LOCK APPROACH: - In this approach, a tag may be "locked" so that it refuses to reveal its ID until it is "unlocked." In the simplest scenario, when the tag is locked it is given a value (or meta-ID) y, and it is only unlocked by presentation of a key or PIN value x such that y = h(x) for a standard one-way hash function h. In the supermarket example, tags may be locked at checkout time. A consumer could provide a meta-ID y for the tags (perhaps on a loyalty card), and then transmit the unlocking PIN x via some special device (perhaps requiring physical contact) to unlock tags on returning home.[4]

The security pin can only be sent via a registered and an authorised device only.

Advantages: -

1. Easy to use approach as the customer doesn't have maintain huge document.
2. No need to Maintain expensive data base with warranty and AMC records for new startups.
3. Service record can easily be maintained without needing of expensive servers and occupying large file spaces.
4. The repair data can also be used and analysed to identify common problem in a appliance which can be rectified in the newer models.

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