RESEARCH ARTICLE

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External Portable Cooling System for Mobile Phones

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ABSTRACT

Basically, a cooler word depicts the meaning of cool or relief from heat. Same as above a phone cooler cool down the phone or gives relief from heat which is radiated due to continuous use of phone. The working principle of the cooler is so easy to understand. Now- a-days power dissipation levels in mobile phones are continue to increase due to gaming, higher power apps and increased functionality associated with internet. With this power dissipation level, products such as mobile phones will require active cooling to ensure that the comfort and reliability perspectives. The current cooling methodologies of natural convection and radiation limit the power dissipation within a mobile phone to between 1-2 w depending on size.

In this paper, the external portable mobile phone cooling system has proposed. This system does not need any changes in designing of mobile phone. It can be used for any types of mobile phone. The proposed cooling system is portable and reliable in cooling phones. The result of this project shows up to phone heating can be controlled in any condition without any external higher power source.It has very less limitations. If the model is connected to phone to provide input power to it the fan and cool it, it will result in drainage of battery of phone. It will not so comfortable to use it for long time less than two hours.

Keywords- Phone Cooling, Battery, Motherboard, Fan, Thermal Pad, DC motor.

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INTRODUCTION

Now-a-days, mobile devices are widely being used for making calls, net browsing, gaming and social communication. For advance application and functions mobile require a processor. It consists of different chips for other assistive application and all of them dissipate power. The thermal management of phone become essential task. There are many solutions for thermal management of phone, but some solution creates issues that can affect nature and type of solution. Many researchers have discussed thermal challenges of handheld phone devices. Thermal modelling and thermal control techniques are available in market for management of power. The solution for thermal management, some hardware and software power optimization found in [2]. To increase reliability, temperature prediction and integration of design centric analysis is required [3]. Mechanical stack up and Temperature Limits are the most important challenges in phone device. Mechanical stack up is thermal engineering in designing. Z-stack up is consists of good thickness and have mechanical rigidity. Temperature limit is thermal solution provided in phone. The study on thermal limiting factors should do carefully. Certain limitations should be kept on the junction temperature. This temperature depends on

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package and design of mobile. Due to thickness, air moving devices cannotinstallwithin phone. Conductivity of casing is very important for transferring heat. The heat of chips travels through stack up and then reaches to outer casing. The thermal power management is important in both large scale application and phone with less effort [4]. For achieving satisfactory thermal management, different cooling methods can be used and are depends on the level of heat to be dissipated, operating environment and use of phone [5]. Various solutions on thermal power management have given in literature. The cooling system for mobile phone has studied in [6]. In [7], it is suggested that thermal coolers are controllable and compact which extract heat by flowing cooling current.

A centrifugal fan has implemented into Nokia phone and its performance is measured in terms of surface temperature, aerodynamic characteristics and allowable phone heat dissipation [8]. The greedy techniques have used in cooling system which lead to fast elevation of temperature on other system components. This proposal causes considerably suboptimal performance over increased durations of phone activity [9]. Different passive thermal management schemes are conversed for a high power component in a handheld electronic device [10]. Detail an analysis of fan exit angle given in this research work. In mobile phone, power dissipation level increase when phone are used for game playing and heavy social media uses. Therefore, mobile phone requires portable, comfortable, reliable and easy installing cooling system.

In this paper, the portable cooling systems have proposed. The following are objectives of this research work.

- This project idea was a truly a best solution for the problem faced by every youngster. By discussing about the project, we studied about the various thermal processes.
- The main objective to build such a wonderful project was just to overcome the problems with heating of phone.
- The overheating of phone may cause battery damage, it can damage the internal parts on motherboard which are soldered, and it may also to a blast which can harm severely.
- Our model can cool the phone at a suitable temperature; it is too cheap and easy to carry.
- The proposed cooling systems do not require any modification of design of mobile. It is external cooling system which is useful for any kind of phone. Rest of paper is organized as below. Section 2 describes methodology of the proposed cooling system for mobile. In section 3, detail explanation of proposed cooling system has given. In section 4, papers have concluded with future scope.

METHODOLOGY OF PROPOSED MOBILE PHONE COOLING SYSTEM

Methodology

The methodology of proposed mobile phone Cooling system is given as below. All cooler models will be using active fan cooling. The fan will direct air at the back of the phone. The air will dissipate the heat. An external powerbank will be used as the power source.

- In addition to the fan, heatsinks and thermal pads have been added to the other two models to increase their effectiveness.
- Thermal pads will help to increase the thermal conductivity between the phone's surface and the heatsink. Their flexibility and softness will eliminate any gaps between the contacts hence increasing the surface area in contact.
- The fins of the heatsinks will help distribute heat over a larger surface area so that more heat can be dissipated by air.

Materials and Thermal Analysis of the Proposed Cooling System

Following raw material and resources have used for implementation of the proposed cooling system. The fan model is very cheap and efficiently too good as compared to other models. This model is made up of;

- Fan (which runs on a DC motor)
- Case, to hold a phone in comfortable position Micro usb port, which connects the fan and phone or any external input power source.

Thermal analysis of the proposed cooling system is given as:

The phone cooler is a cooling device which uses the process of conduction and convection to cool the heat dissipated by the phone. The model can be classified into three different types:

- Fan model
- Fan with heat sink and thermal pad
- Blower style fan with heat sink and thermal pad

PROPOSED MOBILE COOLING SYSTEM

Using a fan for cooling is a simple method. Adding a thermally conductive material and increasing the

surface area of it helps heat dissipate heat much faster and increases the efficiency of the cooling solution. The cooling solution should not be bulky and annoying. It should be easy to carry and use less power as input. Three models have discussed in Figure 1 to 3. The 1st model is basic in which fan is attached to the back of the phone with a case and it is inputted power by an adaptor which is connected phone. Figure 1 shows the model 1 proposed cooling system. The 2nd on has a heat sink on back of phone with thermal pad between the heatsink and phone. Thermal pads are used for better thermal conductivity. Figure 2 shows the model 2of proposed cooling system.The 3rd is similar as above but has a blower fan which will be attached onside of heatsink. Figure 3 shows the model 3 of proposed cooling system.

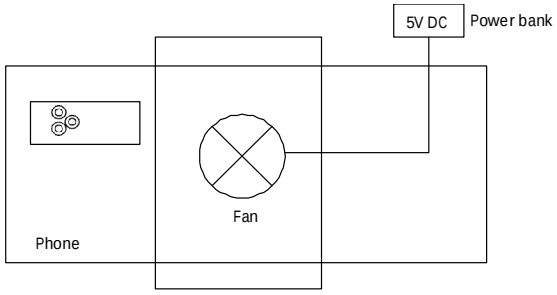

Figure 1: The proposed 1 model for phone cooling system

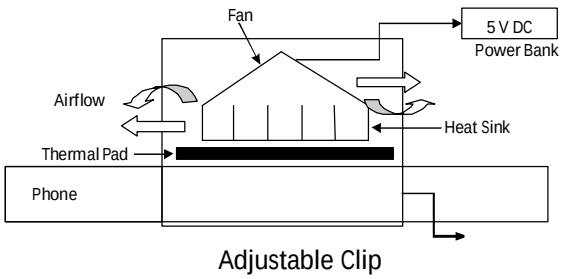

Figure 2: The proposed 2nd model for phone cooling system

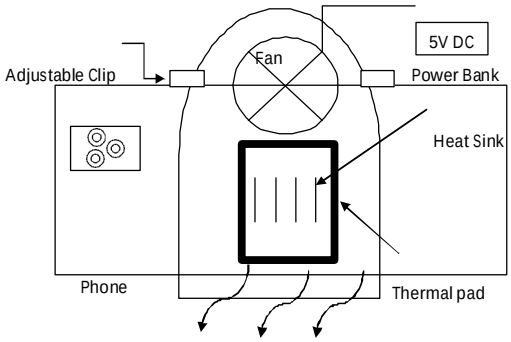

Figure 3: The proposed 3st model for phone cooling system

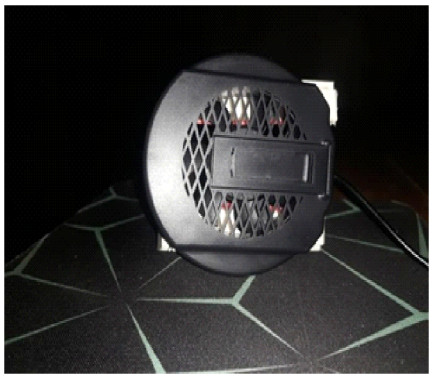

Figure 4: Fan on mobile phone

Specification of Model

In table 1, the specification of proposed mobile phone is given.

Table-1: Specification of cooling system

Details	Specification
Length	70mm
Width	70mm
Height	40mm
Weight	60g
Fan	50mm
Power input port	USB
Input voltage & current	5V 2A
Colour	Black

The manufacturing cast is given below. The fan model will cost nearly about Rs.600.The fan model with heat sink and thermal pad has a total cost of Rs.1450.The blower fan with heat sink and thermal pad has an expensive range of 1500. In Figure 5, the final product of mobile phone cooling system is depicted.

Figure 5: Mobile Phone with the proposed cooling system

The limitations of the proposed cooling system are given below. It has very less limits.

- If the model is connected to phone to provide input power to it the fan and cool it, it will result in drainage of battery of phone.
- It will not so comfortable to use it for long time (<2hrs).

TESTING AND RESULT

The cooler was put through thorough testing and here are the results. The phone used was a Samsung J7 Pro (5 years old) which has a battery-overheating problem. The cooler performed well. In table 2, the specification of proposed mobile phone is given.

Table-2: Temperature of various types of phones

Task	Ambient Temperature	Phone Temperature
Idle	36	36
Light Gaming	36	36.5
Demanding Game	36	38
3D mark benchmark	36	39.2

CONCLUSIONS

Recently, mobile devices are widely being used for making calls, net browsing, gaming and social communication. It consists of different chips for other assistive application and all of them dissipate power. The thermal management of phone become essential task. There are many solutions for thermal management of phone, but some solution creates issues that can affect nature and type of solution. Many researchers have discussed thermal challenges of handheld phone devices. Thermal modelling and thermal control techniques are available in market for management of power. It was a great experience in making such wonderful model and learning about the different mechanisms. We learnt about the different thermal process and learnt to make devices by managing the manufacturing cost.

In this paper, the external portable mobile phone cooling system has proposed. This system does not need any changes in designing of mobile phone. It can be used for any types of mobile phone. The proposed cooling system is portable and reliable in cooling phones.It has very less limitations. If the model is connected to phone to provide input power to it the fan and cool it, it will result in drainage of battery of phone. It will not so comfortable to use it for long time less than two hours.

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