



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Design, Analysis and Development of Tennis Court Dryer Machine

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Mechanical Engineering Technology (Maintenance Technology) with honours

by

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DECLARATION

I hereby, declared this report entitled “Design, Analysis and Development of Tennis Court Dryer Machine” is the results of my own research except as cited in references.

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Date : 14/12/2017

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelors of Mechanical Engineering Technology (Maintenance Technology). The member of the supervisory is as follow:

.....

(HERDY RUSNANDI)

ABSTRAK

Kebanyakan gelanggang tenis terletak di kawasan yang terdedah dengan cuaca luar. Apabila gelanggang berada di kawasan luar, ia akan terdedah kepada cuaca yang mana gelanggang akan basah selepas hujan. Tenis adalah sukan yang tidak sesuai di main ketika gelanggang basah. Ini kerana bermain di permukaan basah dapat meningkatkan peluang untuk mendapat kecederaan. Mesin pengering gelanggang tenis telah diciptakan untuk menjadikan pengeringan permukaan tenis menjadi lebih mudah. Di samping itu, pengeringan permukaan gelanggang tenis dengan menggunakan kaedah manual akan mengambil masa yang lebih lama dan memerlukan lebih banyak tenaga manusia untuk mengeringkan permukaan kawasan tersebut. Dengan menggunakan penarik air dan penyembur angin untuk mengeringkan gelanggang, penarik di depan akan menolak air di dalam gelanggang ke luar gelanggang. Penyembur angin akan dipasang di bahagian belakang skuter dan paip PVC digunakan untuk mengedarkan udara ke permukaan yang didorong. Permukaan tenis yang basah boleh dikeringkan cepat dengan menggunakan mesin ini kerana ia akan mengurangkan masa untuk mengeringkan gelanggang dengan hanya memandu mesin melalui permukaan yang basah. Dengan itu, pemain tenis boleh bermain tenis tanpa melambatkan permainan. Mesin ini akan menjalani proses fabrikasi dan bahagian fabrikasi akan dipasang untuk membentuk sebagai satu produk lengkap. Mesin pengering gelanggang tenis yang telah lengkap akan menjalani proses pengujian. Data pengeringan permukaan gelanggang tenis telah di ambil semasa proses ujian dan masa untuk mengeringkan permukaan dengan menggunakan mesin berbanding kaedah manual telah berkurang sebanyak 50%. Selain itu, mesin ini juga mengurangkan penggunaan tenaga manusia.

ABSTRACT

Normally most of tennis courts are situated at outdoor area. When the court is at outdoor area, it will be exposed to weather, which is the court will be wet after raining. Tennis is a sport which is not suitable to play when the court is wet. It is because playing on wet surface can increase the chance of injury. Tennis court dryer machine was developed to make drying tennis court surface become easier. Besides that, drying tennis court surface by using manual method will take longer time and need more manpower to dry the surface area. By using the squeegee and blower to dry the court, the squeegee in the front will push water inside the court to the edge of the court. The blower will be placed at backside of scooter and PVC pipe is used to distribute air to the driven surface. Wet tennis court surface can be dried by using this machine as it will reduce time to dry by just driving the machine through the wet surface. Hence, tennis players can play tennis game without delaying the game. This machine will undergo fabrication process and the part fabricated will be assemble to form as one complete product. The complete tennis court dryer machine is then going proceed to testing process. Data of drying the tennis court surface was taken during the testing process and the time to dry tennis court by using machine compared to by using manual was reduced 50%. Besides that, this machine also reduced human effort.

DEDICATION

Special dedication to my beloved parents and siblings who always be in my heart,

ROSLI BIN ABDULLAH

JANEDAH BINTI OSMAN

MUHAMMAD BUKHARI AL BAKRI BIN ROSLI

MUHAMMAD BAIHAQI AL BAKRI BIN ROSLI

MUHAMMAD THAUFIQ AL BAKRI BIN ROSLI

To my supportive and kind supervisor,

HERDY RUSNANDI

To my lovely and beautiful English teacher,

NOOR MIRZA SYAMIMI BINTI HJ MORTADHA

For their

Pray, Care, Sacrifice, Encouragement and Best Wishes

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Alhamdulillah to Allah SWT for giving me the opportunity to complete my final year project entitled “Design, Analysis and Development of Tennis Court Dryer Machine” on time. I would like to thank my late parents for I know that their care, pray and love is always be with me from the start till the end. They will always be there on the top of my heart.

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CHAPTER 1

INTRODUCTION

1.1 Background

Tennis is played on a rectangular flat surface. Basically, tennis court is made of hard material. A tennis court dimension under an international certified standard by the International Tennis Federation (ITF) is 23.77 meters long and its' width is 8.23 meters for single matches and for the double matches is 10.97 meters width. Every type of court has different effect of ball bounce.

Normally most of tennis court are situated at outdoor area. When the court is at outdoor area, it will be exposed to weather, which is the court will be wet after raining. Tennis is a sport which is inappropriate to play when the court is wet, because it increase the chance of injury if steps is taken at mistake and major injury might be happen while playing in wet condition court surface. Therefore playing in that condition can make the ball perishable and racquet string easily broke, causing the bounce feel of ball change drastically and it will interrupt the game when playing on that condition.

The tennis court dryer machine are attach to scooter as a moving mechanism. By having these product combined together, this project is design in CATIA to make it easy to define the function. Moreover, it will make player's task easier as they will need to handle only one machine. This machine is very easy to handle and portable as the user can assemble and disassemble the product according to their needs of using the machine. The dryer will be place at the front of the machine and blower will be place at the back of machine will be connect with PVC pipe.

Combination of these two mechanism will shorten the time taken to dry the court. Moreover, the size of this product is very suitable to be insert in the car which make it easy to lift and thus easy to handle.

1.1 Problem statement

Nowadays most of the tennis court are situated outdoor. Therefore the court will be wet after rain. Tennis player must dry the court by using manual dryer like squeegee to dry the court and it will take long time to dry all surface. More human effort needed to dry the court especially in tournament event. Most of tennis tournament event will be postpone if court is wet and it will take a long time to dry tennis court surface. Normally it takes more than 1 hour to dry the surface area of the tennis court.

Tennis court drying machine in the market is very expensive and area surface of dryer is too small. Existing machine in market such as water vacuum and product which is specifically designed to absorb water have a limited capacity to absorb water. Besides that, existing machine are hard to handle and it also heavy to transfer in and out of the tennis court.

1.3 Objective

- Design, analysis and development tennis court dryer machine
- To develop low cost and portable tennis court machine

1.4 Scope

- To study dryer system

- Design part of dryer machine
- Analysis the part of dryer system
- Fabrication of dryer machine
- Assemble, test and evaluate the prototype part of dryer product

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Tennis sport has been played a long time ago. In Malaysia, tennis has become one of the popular sport and the amount of player increase year by year. The tennis court structure consist of a built-up court surface layer. A subsurface moisturizing and drainage system of the court surface provides a highly resistant to any washing away of surface materials. Controlling surface moisture also provides a consistent playing surface with no loss of surface materials due to wind. (Herman F.Burkstaller 1989). Tennis ball is defined to identify criteria for size, weight, deformation, and bounce criteria to be approved for regulation play. Balls must have masses in the range 56.0–59.4 g (1.98–2.10 ounces).

2.1 Previous Product

2.1.1 Rubber Squeegee

From figure 2.1.1 shows a rubber squeegee. The rubber squeegee shows below is made of aluminum, replaceable rubber blade, 2 durable wheels in front. It is easy and convenient for water removal and ball collection. It works especially well around pools, on driveways, golf greens and any flat or hard surfaces. It comes with one blade for replacement and replacement rubber blade. The product usually used to dry court.



Figure 2.1.1 Rubber Squeegee “Dry Court”

(Source: <http://www.tennisballmachine.co.uk/access/index.html>)

2.1.2 Universal Absorbing Roller Special

Figure 2.1.2 below shows a universal absorbing roller special. This product has absorbing drum with foam rubber covering, hot-galvanized frame and drum body. The huge absorbent capacity of this roller is possible to make a court playable in a very short period of time. Replacement absorbing drum and replacement sponge is provided. However, it still needs human effort to push the machine around the tennis court to dry the court surface.



Figure 2.1.2 Universal Absorbing Roller Special

(Source: <http://www.tennisballmachine.co.uk/access/index.html>)

2.1.3 Roller Dryer

Tennis players are well aware of the problems associated with drying tennis courts after a rain. It is important to make sure that all of the water has been cleared from a tennis court in order to allow the tennis players to play thereon. The prior art device universally used is called a "squeegee" which comprises a hard rectangular rubber strip mounted on a metal bracket. A long pole is secured to the bracket. The squeegee is sliding moved over the tennis court to push the water off from the court's surface. The squeegee has the hard rubber strip which is destructive to the court's textured surface, and a considerable effort is required to push it forward. Since in practice tennis courts do not have an ideal flat surface, it results that even after many passes with a squeegee, pockets of water will remain in spaced-apart depressions on the tennis court. This invention relates to medium-weight rollers for removing water from and simultaneously drying hard surfaces such as tennis courts. The roller's outer sleeve is made from a partially-open cell foam which is only slightly water-absorbing. The foam must have density and porosity values falling within critical ranges. The roller establishes a seal thereby moving the water and simultaneously drying the tennis court without leaving a layer of water behind it.

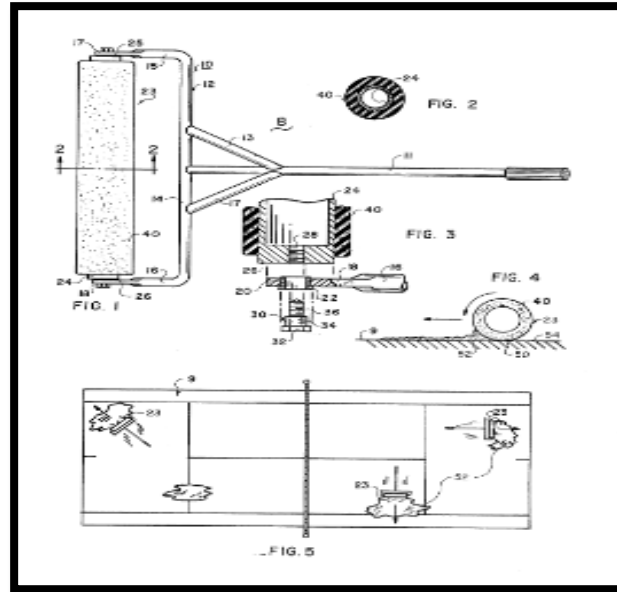


Figure 2.1.3 Roller Dryer

(Source: <https://www.google.com/patents/US3967339A>)

2.1.4 Portable Wiping Machine

Removing water from a wet surface which may be manually moved over by using portable wiping machine and it includes a large drum whose cylindrical surface is perforated and covered with water absorbing material, such as a sponge. The sponge is compressed by its rolling contact over the surface and the expansion of the sponge portion as it leaves the surface will absorb the water. A sponge compressing roller is yieldingly held in contact with the top of the drum and a water receiving tray is fixedly mounted within the drum interior in a position to catch water squeezed from the sponge. A water retaining tank is supported by the machine and water is received from the tray. The tank can be emptied of water as desired.

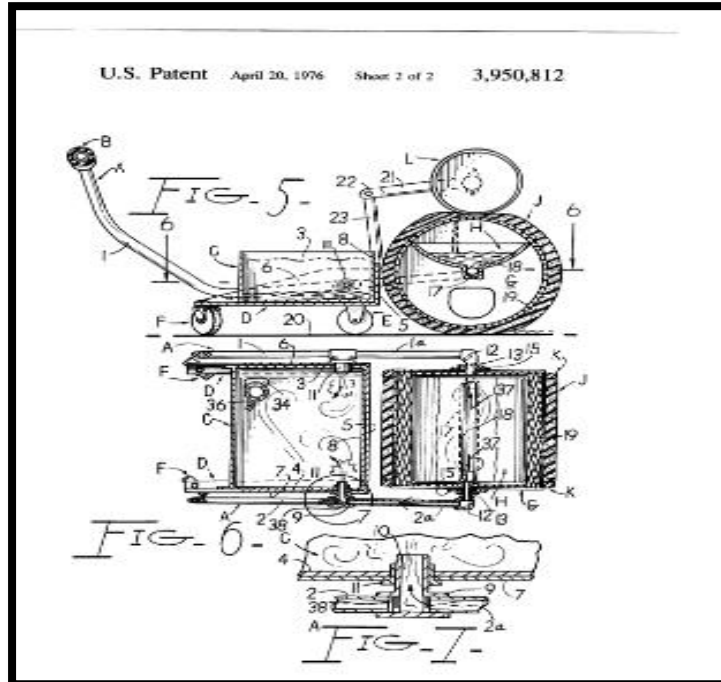


Figure 2.1.4 Portable Wiping Machine

(Source: <https://www.google.com/patents/US3950812A>)

2.1.5 Machine for Removing Water from Outdoor Surfaces

The invention relates generally to a machine for removing water from outdoor surfaces and, more particularly, to a drying unit using a combination of vacuum and water displacement to remove water from an irregular outdoor surface. Absorption techniques rely on sponge-like materials that are typically rolled across the surface to be dried, enabling the sponge to absorb the water. The water must then be squeezed out of the sponge-like material, but as conventional squeezing techniques can not remove all of the water from these materials. (George A Carter, 2000)

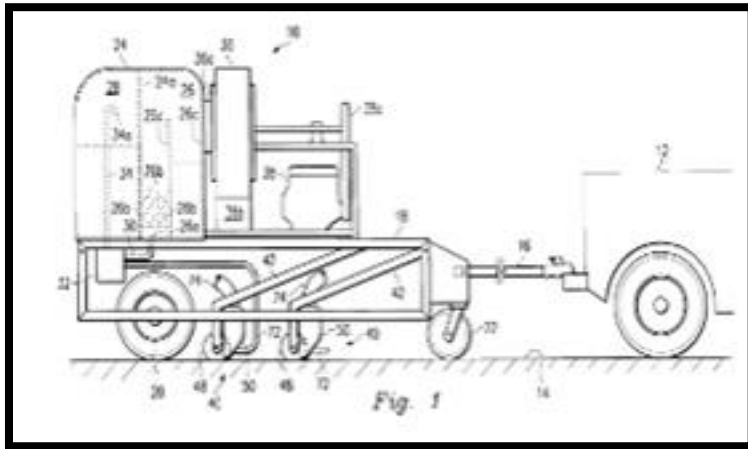


Figure 2.1.5 Machine for Removing Water from Outdoor Surfaces

(Source: <https://www.google.com/patents/US6049943>)

2.1.6 Automatic Tennis Court Drying Machine

An apparatus and method for automatically drying a tennis court or other flat surface after rainfall is provided. A robotic vehicle cooperates with a sensing unit preferably mounted on a fence adjacent the court or other paved surface. A sensing unit detects the onset and cessation of rain and then waits a predetermined amount of time. After waiting, the sensing unit transmits a signal to the robotic vehicle which actuates the vehicle. The robotic vehicle includes an on-board controller which is internally programmed with a map of the court including obstructions. The robotic vehicle automatically sponge rolls the entire court. A thermal imaging camera connected to the sensing unit then scans the court to determine if any wet spots remain. The location of any remaining wet spots is recorded and transmitted to the on-board controller of the robotic vehicle. The robotic vehicle then returns to the location of the wet spots and automatically sponge rolls and fan dries those remaining wet spots. The robotic vehicle then returns to a storage unit on or adjacent the paved surface where it is recharged and waits for further use. (William Brobeck, 2007)