POLITEKNIK
MALAYSIA
SEBERANG PERAI

STRETCHABLE BEEHIVE

AHMAD AMIRUL SYAFIQ BIN AHMAD BADRI
SAIFULLAH AL-HAQ BIN ISNIN
NOOR FARHANA BINTI ISMAIL
NOOR FAZANA BINTI MUHD RIJAL
NUR DALILA HANIM BINTI ROSLI

JABATAN KEJURUTERAAN MEKANIKAL
POLITEKNIK SEBERANG PERAI

SESI JUN 2017

DECLARATION FINAL REPORT SUBMISSION

DECLARATION FROM STUDENTS (GROUP LEADER)

PLEASES TICK (/)

[/] e have made all the necessary amendments based on comments and suggestions given by the supervisor and panel.

[/] Format for report writing is in accordance with the format guidelines.

[/] We have the approval of the report from the supervisor.

[/] This report is the property of PoliteknikSeberangPerai.

StudendSignature :  Date : 03 / 10 / 2017

Student's Name : AHMAD AMIRUL SYAFIQ BIN AHMAD BADRI Matrix Number : 100MP15F1043

CERTIFIED BY SUPERVISOR

Comments :

Signature of Supervisor:  Date: 13.10.2017

Office Cop :

SOMASHANA A/L PRAKASAM
Pensyarah,
Jabatan Kejuruteraan Mekanikal
Politeknik Seberang Perai,
Pulau Pinang.
Tel: 04-5383322 Ext. 5051

ACKNOWLEDGEMENT

This project consumed huge amount of work, research and dedication. Still, implementation would not have been possible if we did not have a support of many individuals and organizations. Therefore, we would like to extend our sincere gratitude to all of them.

We are highly indebted to Mr Somashana A/L Prakasam for the guidance and constant supervision as well as for providing necessary information regarding the project and also for his support in completing the project. We would like to express our gratitude towards our parents and group members for their kind co-operation and encouragement which help us in completion of this project. We would like to express our special gratitude and thanks to outsides who are giving us such attention, time and good cooperation.

We are also grateful to Mr Lee Chee Me the project coordinator of this project for 5th semester students for provision of expertise, and technical support in the implementation. Without his superior knowledge and experience, the Project would like in quality of outcomes, and thus his support has been essential. Nevertheless, we express our gratitude toward friends for their kind co-operation and encouragement which help us in completion of this project.

Finally, we also wish to express our sincere appreciation to my colleagues and the people involved directly and indirectly in providing support and encouragement for this project. Finally, we hope this project produced beneficial to beekeepers and to the small-scale honey entrepreneurs in the future.

Abstract

Our beehive will focus on improvement for beekeeper's work and satisfaction by providing something unique and a never seen before beehive.

Why are we creating the unique beehive design for beekeepers? Because nowadays fortunately, honey is very popular in market either in Malaysia or oversea so we decided to make the beehive can expand as long as it can. A beehive is a facility where the beekeeper has used it to get the honey directly from honeybees through a frame in the box. After that, the frame will be taken out from our 'stretchable beehive' to extract the honey. We designed and created a stretchable beehive purposely to focus mainly on beekeeper's work such as make it more easier for beekeeper to store more honey a lot better than before which can stored the honey referring to the frame they had put. We have designed in a way that no one has done it before. This is also helps the beekeeper to be a successful entrepreneur at once by selling best at it.

Abstrak

Sarang lebah kami fokuskan untuk kemajuan kepada pekerjaan penternak lebah dan kepuasan menyediakan sesuatu yang unik dan sarang lebah yang tidak pernah dilihat sebelum ini.

Kenapa kami mencipta sarang lebah yang unik kepada penternak lebah? Semenjak kebelakanganini, madu makin dikenali dalam pasaran samada di Malaysia mahupun luarnegara jadi kami bercadang untuk membuat sarang lebah itu boleh direngangkan seberapa luas asalkan ia stabil. Sarang lebah ialah satu kemudahan dimana penternak lebah menggunakan ia untuk mendapatkan madu secara terus dari pada madu lebah melalui bingkai didalam kotak tersebut. Selepas itu, bingkai akan dibawa keluar daripada *'Stretchable Beehive'* kami untuk diekstrak madu tersebut. Kami telah mereka dan membina *'Stretchable Beehive'* bertujuan untuk focus secara amnya dengan membuatkan pekerjaan penternak lebah lebih mudah untuk menyimpan lebih banyak madu daripada sebelumnya berdasarkan bingkai yang telah mereka letakkan. Kami telah mereka kaedah yang tidak pernah dilakukan sebelum ini. Ia juga membantu penternak lebah untuk menjadi usahawan yang berjaya sekaligus melariskan hasil jualan di pasaran.

CONTENTS

CHAPTER 1

INTRODUCTION

1.0 Introduction

A beehive is an enclosed structure in which some honey bee species of the subgenus Apis live and raise their young. Though the word beehive is commonly used to describe the nest of any bee colony, scientific and professional literature distinguishes nest from hive. Nest is used to discuss colonies which house themselves in natural or artificial cavities or are hanging and exposed. Hive is used to describe purpose-built structures used by humans to house a honeybee nest. Several species of Apis live in colonies, but only the western honey bee (Apis mellifera) and the eastern honey bee (Apis cerana) are kept in hives by humans [citation needed]. A bee's nest is comparable to a bird's nest built with a purpose to protect the dweller.

The beehive's internal structure is a densely packed group of hexagonal cells made of beeswax, called a honeycomb. The bees use the cells to store food (honey and pollen) and to house the brood (eggs, larvae, and pupae).

Beehives serve several purposes: production of honey, pollination of nearby crops, housing supply bees for therepy treatment, and to try to mitigate the effects of colony collapse disorder. In America, hives are commonly transported so that bees can pollinate crops in other areas. A number of patents have been issued for beehive designs.

Honey extraction is the central process in beekeeping of removing honey from honeycomb so that it is isolated in a pure liquid form.

Normally, the honey is stored by honey bees in their beeswax honeycomb; in framed bee hives, the honey is stored on a wooden structure called a frame. The honey frames are typically harvested in the late summer, when they will be most filled with honey. On a completely filled frame, the cells will be capped over by the bees for storage; that is, each cell containing honey will be sealed with a capping made of beeswax.

1.1 Background of Problem

Figure 1.1

The old technique of harvesting hive concept give us a lot benefits such as it can be used as a substitute for sugar in many food and drinks. It is also help in creating smooth, beautiful skin. However all over the benefits that has list down are complicated. For an example, the old technique of harvest take too many steps such as need to suit up, light a big smoke, get a big bee brush and scrap the wax and last but not least whole frame will be entered into the accelerator where the honey get extracted. That was a standard procedure for centuries. The existing product in the market usually use many procedures but now we come out with the better way which using gravity.

Gravity is the force that attracts a body toward the center of the earth, or toward any other physical body having mass. For most purposes Newton's laws of gravity apply, with minor modifications to take the general theory of relativity into account. However, the problem that we faced on this project is material that we will use might not suitable for honeybees.

1.2 Problem Statement

Problem statement is a concise description of the issues that need to be addressed by a problem solving team and should be presented to them (or created by them) before they try to solve the problem. When bringing together a team to achieve a particular purpose on provide them with problem statement. Why were we created the stretch ability on stretchable beehive? Because it is the easiest way to gain capacity of the beehive that can increase of the honey production. . It also reduce cost of buying the beehive if the capacity of the frame in the beehive is not enough for the bees.

System that based on source that we used particularly is a simple mechanism which is related to drawer mechanism which can as alternative source to produce more honey . Based on the demonstration, this system can be operating in a good condition. However, the current beehive is less efficient because the capacity the beehive can't be added if they want to gain

more frame in the beehive. Thus, the older technique is less efficient compared to our 'Stretchable Beehive.'

On the other hands, it is also need to use smoke to tame the bees. For old technique, usually the beekeeper will use big smoke to tame the bees compared to ours. It is because the beekeeper needs to lift up the whole frame to scrap the wax and then go to the next step, accelerator where the honey will be extract. Our mini harvesting hive provides less smoke basically we spray the smoke only when needed.

1.3 Objective

The objective of this project is to produce the ergonomic product that capable for task which meets the criteria below:

a) To increase the production of honey using a single beehive.

b) To increase the usage of space for beehive.

1.4 Scope of Project

Scope project is an important element to make sure the project can be finished like how the schedule runs. So, the scope of our project has to be followed to prevent the project out from the objectives. Scopes of the project are:

a) This hive only provided for honeybees

Focusing on honeybees where they can store the nectar into the comb and produce honey from there.

b) This hive must be place at farm

Farm is selected as the best place for honeybees because we don't want the bees to disturb people as it can harm them.

c) There is no specific time to harvest the honey until it reached the limit set

Since we use our own hive, it is easier for honeybees to produce in there means that we can get the results faster than a specific time.

1.5 Definition of Terms

Terms that can describe our project more details in this study are:

a) Screw

- A basic component to be used as the screw functional to attach the pinewood together to build the whole body of the hive

b) Pallet wood

- Pinewood is used to build the body of the hive

c) Engsel

- Connects two solid material which is drawer and the body

1.6 Conclusion

The plan of stretchable beehive is to make the innovation from the old technique by reducing space and money for getting honey results. This is because the more space for the beehive the more money will be needed to get the results. In chapter one, we have made our study to use natural source to produce new life. Design, installation and maintenance considerations for getting the results and the conditions of the built. In the following chapter, our group will attribute the arisen problems by using appropriate theories, concept and research.

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

In this chapter, we have done some research and all aspects required by our project to produce 'Stretchable Beehive'. Our group has also discovered several of innovations that can be applied to our products to ensure quality products are produced at a reasonable cost. This title is also important to give us guidance on the course of this project and what we will do in the next semester.

2.1 STUDIES ON EXISTING PROJECTS

In this chapter researcher describes the literature review and the research that has been made for this project. Other than that there is a study of the components used in this project. By doing a study on a few type of beehive before, there is a difference in every project that has been made. The first different is the design of the previous beehive and the previous beehive cannot be stretch compare to our beehive it can be stretch. Although there are differences in the way of functional improvement many of which have similar uses.

2.2 STUDY ON DESIGN

Our group has selected two types of design after making a number of studies and references on the internet and finding books that can help us in selecting our project design. Two designs were selected by our team which is a Langstroth's Hive and stretchable beehivewhich both can be manually controlled by hand.

2.2.1 LANGSTROTH HIVE

In modern beekeeping, a Langstroth hive is any vertically modular bee hive that accepts frames that are locally referred to as "Langstroth" frames. The actual dimensions of so-called Langstroth frames differ by region or manufacturer. These modern Langstroth hives have little in common with Rev. L. L. Langstroth's bee hive that was originally patented in 1852 and manufactured until approximately 1920.

Historically, a "Langstroth hive" is the hive that was designed by Rev. L. L. Langstroth in 1852. The historical Langstroth hive had a portico entrance, integrated floor and non-removable brood box, a single removable honey box (using the same frame size as the brood box) that sat inside an outer box that extended from the brood box, and a hinged roof. L. L. Langstroth's famous book on beekeeping went through several editions until about 1900, but in all of them the hive that is illustrated is the same as the original design. The original Langstroth frame dimensions are no longer in use.

Similar designs the standard beehive used in many parts of the world for beekeeping. The advantage of this hive is that the bees build honeycomb into frames, which can be moved with ease. The frames are designed to prevent bees from attaching honeycombs where they would either connect adjacent frames, or connect frames to the walls of the hive. The movable frames allow the beekeeper to manage the bees in a way which was formerly impossible. Other inventors, notably François Huber in 1789, had designed hives with frames (the so-called leafe or book hive), but Langstroth's hive was a practical movable frame hive, which overcame the tendency of the bees to fill empty spaces with comb and to cement smaller spaces together with propolis. In contrast to August von Berlepsch's frame-movable side-opened hive (May 1852, Germany), Langstroth's hive was top-opened, as was the Bevan top-bar hive (1848, UK). These combined adaptations led to the Langstroth hive design being preferred by beekeepers over all others, and his hive is used throughout the world.

Figure 2.1 Figure 2.2

Figure 2.1 and Figure 2.2 shows a previous beehive that contain double-storey. In the first storey can be put 5-7 frame. The previous beehive using more wood. The previous beehive have a high cost.

THE STRETCHABLE BEEHIVE

Figure 2.3

The stretchable beehive can gain more honey just by using a single beehive. Next, it also reduce the total of wood. It can placed 7 until 15 frame. The cost is lower than previous beehive because it made by less total of wood.

DESIGN

The Langstroth bee hive is made up from top to bottom of:

- telescoping cover or migratory cover
- inner cover
- one or more hive bodies or honey supers made of wood, polystyrene, or other plastic
- (optional) queen excluder between brood box and honey supers
- eight to ten frames, made of wood or plastic, per hive body or honey super
- (optional) foundation made of wax and wires or plastic
- bottom board, with optional entrance reducer

Outer cover

This is a wooden or polystyrene cover that fits on the top of the hive. In higher latitudes (further north in the Northern Hemisphere; further south in the Southern Hemisphere), a cover which telescopes down around the inner cover and an inch or so down over the top super, called a telescoping cover, is usually used. Many commercial beekeepers use what is known as a migratory cover, a solid cover which does not extend beyond the sides of a hive body.

Inner cover

The inner cover provides a barrier between the telescoping cover and the bees. In more temperate climates, a plastic foil may be used as an inner cover. Plastic foil should not be used to winter bees under, as trapped condensation would cause the hive to become wet, and bees can be lost due to freezing when temperatures fall during the night. In areas with a hot summer, a solid inner

cover with a communication hole provides dead-air space for insulation against both heat and cold. This prevents the bees from gluing the top cover to the top bars of the super under it. When an inner cover is used, the top cover is more easily removed from the hive. Notches in the frame of the solid inner cover and telescoping cover can serve as an upper entrance for the bees. A communication hole in the middle allows bees to reach emergency food placed above by the beekeeper if it becomes required.

Hive body and hive super

Hive bodies and hive supers are four-sided boxes with standardized inside dimensions. There are generally four different sizes. Outside box dimensions vary depending on the type of material used. Polystyrene boxes have much larger outside dimensions than boxes made out of wood. Deep and medium hive bodies are provided to serve as the brood chamber, the part of the hive where the queen lays eggs and the bees care for the larvae. Medium, shallow and comb honey supers are used for honey stores and to harvest the honey. The inside width is 14–11/16 inches (373 mm) and the inside length is 18–5/16 inches (465 mm). The frames rest on a rabbeted side along both ends of each box.

The deep hive body is normally used only for brood, as it becomes too heavy to handle manually if it becomes filled with honey. Commercial operations usually use one- or two-deep hive bodies for brood, and additional shallow hive components for honey supers. Some hobbyists prefer to standardize on all mediums. Shallow supers are not ideal for the brood chamber of the hive because the bees need to form a single compact sphere during the cold winter months — a sphere that can expand and contract without being divided by a horizontal plane in the middle caused by the gaps between combs in multiple hive bodies.

Advantages

- **Interchangeable Parts**

Langstroth hives use standard sized hive parts to allow for interchangeability with other hives. This feature of non-unique hive parts allows for mass production, and therefore cheaper prices.

- **Availability**

Langstroth hives are the most common design of retailed hives. Because of this, it is relatively easy to acquire the proper parts to fit them.

- **Increased Honey Harvesting**

Because honey is often extracted from reusable comb only small amounts of wax is lost during honey production. This means that the same comb, when properly stored, may be used season after season, not needing to be replaced by the bees, and is therefore more efficient.

- **Expansion and Contraction**

Because of their modular design, Langstroth hives are perfect for expansion and contraction of particular hives. Hives can be made larger to fit more bees, or smaller to fit fewer depending on seasonal population.

Disadvantages

- **Complex Design**

Langstroth hives require exact measurements and must conform to rather precise standards. These standards ensure that parts are actually interchangeable between hives. Attention must also

be taken to consider bee space. If bee space is not properly observed it is not uncommon to have parts glued together with propolis or connected with burr comb.

- **Decreased Wax Harvesting**

Though wax may be harvested from Langstroth style hives, especially inthe form of old comb, generally the only wax collected is that in the from of wax capping during honey harvesting and that of burr comb. Most beekeepers prefer to preserve their wax comb so that it may be reused for as many seasons as possible. If wax production is desired a top bar hive may better suited than a Langstroth hive.

- **Heavy Lifting**

Langstroth hives are known for heavy lifting when it comes time to harvest honey. Some beekeepers choose to use smaller Beekeeping/Honey Supers, but often they too may becomedifficult to lift when filled with ripe honey.

- **Difficult Management**

Langstroth hives may be more difficult to manage compared to other hive designs, such as the top bar hive, as the entire hive must be opened in order to do even minor management. This difficulty of management is most easily expressed with having to remove the cover, and alerting the entire hive by way of a suddenly well-lit hive where it was once quite dark. Difficulty also arises during inspection of the brood chamber, the supers must be removed, and so likely would the top most brood chamber, to make a satisfactory hive wide inspection.

2.2 Studies on Material

Our group has done some research on materials to be used for the production the project "Honey Harvesting Hive." After doing some research, we find that it is easier to produce our project, if all the components are using the same type of material. Additionally,we have selected a few raw materials to compare before selecting the best material to use. The materials that we were using are:

Material	Use	Advantages
	A basic component to be used as the screw functional to attach the pallet together to build the whole body of the hive	• Strength • Resistant to rust • Variety • Removal
	Pallet is used to build the body of the hive	• Resist shrinking and swelling • Low cost • Develop a nice, rustic patina from age and use.
	Engsel is used to attach the body	• Connect two solid object • Flexible material

Table 1

2.3 RELATED THEORY

2.3.1 INTRODUCTION

A beehive is an enclosed structure in which some honey bee species of the subgenus Apis live and raise their young. Though the word beehive is commonly used to describe the nest of any bee colony, scientific and professional literature distinguishes nest from hive. Nest is used to discuss colonies which house themselves in natural or artificial cavities or are hanging and exposed. Hive is used to describe purpose-built structures used by humans to house a honeybee nest. Several species of Apis live in colonies, but only the western honey bee (Apis mellifera) and the eastern honey bee (Apis cerana) are kept in hives by humans[citation needed]. A bees nest is comparable to a bird's nest built with a purpose to protect the dweller.

The beehive's internal structure is a densely packed group of hexagonal cells made of beeswax, called a honeycomb. The bees use the cells to store food (honey and pollen) and to house the brood (eggs, larvae, and pupae).

Beehives serve several purposes: production of honey, pollination of nearby crops, housing supply bees for apitherapy treatment, and to try to mitigate the effects of colony collapse disorder. In America, hives are commonly transported so that bees can pollinate crops in other areas. A number of patents have been issued for beehive designs.

This introductory paper provides readers with a basic understanding of the current state of beehives evolution including:

disorder. In America, hives are commonly transported so that bees can pollinate crops in other areas. A number of patents have been issued for beehive designs.

This introductory paper provides readers with a basic understanding of the current state of beehives evolution including:

- A basic introduction to various beehives design and evolution
- Overview of the benefits and cost factors of beehive
- Identification of the major design consideration
- Case study

2.3.2 A BRIEF HISTORY OF BEEHIVE

Prior to the middle of the 1800's, most bee hives in North America and Europe were simple shelters for the bees. Skeps, log gums and box hives were common types of hives in this period. Bees attached their wax combs to the hive's roof and walls, just like they do in wild hives. Today we refer to these types of hives as fixed-comb hives. Skeps were made from grass straw, and often had sticks inside to provide support for the honey combs. Beekeepers inspected skep hives from the bottom. Box hives were simple shelters to house a swarm of bees.

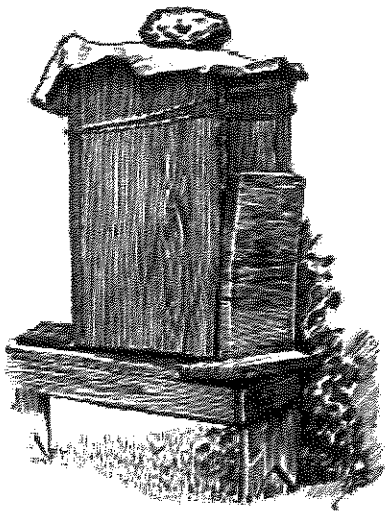

Figure 2.2

Log gums were made from hollow logs, fitted with a roof. Sometimes a box or container was added on top of a log gum or box hive for the bees to store honey. It was also hard to get honey from these hives without damaging or destroying the bee colony and getting the bees upset (they sting, you know!).

Some hives in the 1800's used clever designs that discouraged queens from laying eggs in some parts of the hive, so honey could be harvested without damaging the colony. These beekeepers knew that queens tended not to lay eggs in more than one area in the hive, so they made side and top compartments with passageways for the bees. Center brood nest and side honey compartments. Hive with honey compartments. The hives shown here have a place for the brood nest in the center, and places for honey storage on the sides. This is a kind of queen excluder that relied on the behavior of bees instead of a physical barrier. Today, we know that pheromones influence organization within a bee hive. Some skeps and box hives from the 1800's also had a second container, or "super" for the bees to store honey such as the one at right. Nutt Collateral Hive. The "Nutt Collateral Hive" at right is a particularly fancy hive that used the concept of a pheromone-based queen excluder. The use of supers and separate honey

compartments allowed the beekeeper to remove honey without destroying the colony. Supers were sometimes put on top of log sections, or "gums", so that honey could be harvested easily.

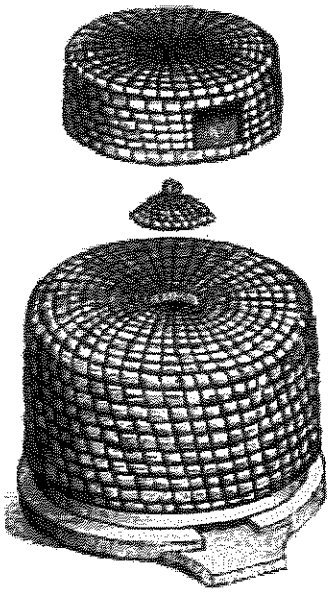

Figure 2.3

In these hives, it was hard to know when the bees had a problem with disease, or when they became queen less or were starving. The beekeeper could not inspect each comb to see what was wrong.

Fixed-comb hives like the ones above were popular until the 1850's, and yielded 10-15 pounds per colony each year, according to Root's ABC book from 1895. Of course, many things helped increase honey yields since then, including the Italian bee.

It was known for a long time that bees liked to build their honey combs about 1 and 3/8 inches apart. Honey comb is about one inch wide, so this left a 3/8 inch passageway between the combs.The bee space concept was apparent in this hive. Some beekeepers built hives that forced the bees to build combs along "top bars" that were spaced about 1 and 3/8 inches apart. Top bars

allowed the beekeeper to carefully remove combs for inspection without damaging them. These are called movable comb hives. This hive from Greece in the 1600's (right) uses this concept.

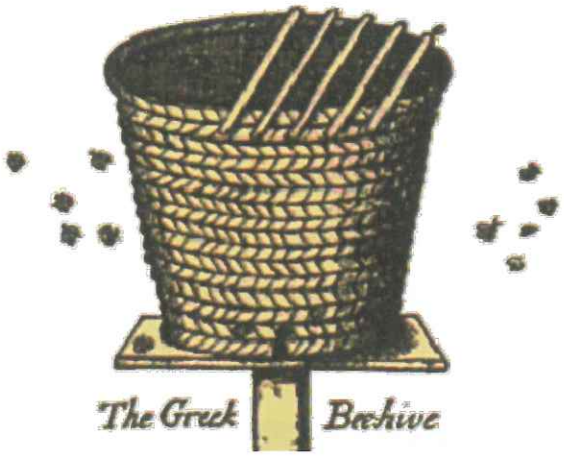

Figure 2.4

Movable comb hives allow beekeepers to start new colonies easily by dividing a hive. They also allow beekeepers to inspect the health of colonies, find the queen, and even cut honey comb without destroying the brood nest. Bees in movable comb colonies were disturbed less than bees in fixed-comb hives, so beekeepers received fewer stings!

Many movable comb hive inventions used "frames" for the bees to build their combs inside. Huber's leaf hive. The Leaf Hive, invented in Switzerland in 1789 by Francis Huber, was a fully movable frame hive. The combs in this hive were examined like pages in a book. A.I. Root and E.R. Root credit Huber with inventing the first movable frame hive. Huber's contribution was also acknowledged by Lorenzo Langstroth, inventor of the hive style that is most commonly used today:

"The use of the Huber hive had satisfied me, that with proper precautions the combs might be removed without enraging the bees, and that these insects were capable of being tamed

to a surprising degree. Without knowledge of these facts, I should have regarded a hive permitting the removal of the combs, as quite too dangerous for practical use."

- L.L. Langstroth in Langstroth on the Honey-Bee, 1860.

The Quinby frame sides were 1 and 3/8 inch wide.Quinby's hive was secured with a cord.The Quinby closed-end frame hive had many good features of a movable-frame hive. The side bars of the Quinby frame (at right) also formed the walls of the hive. Some successful beekeepers were using this hive as late as the 1890's.

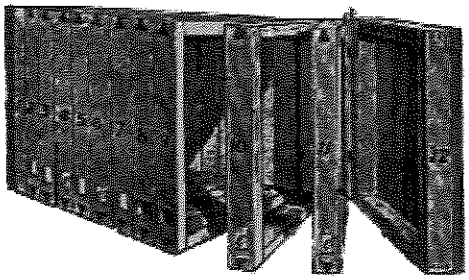

Figure 2.5

Skeps, log gums and box hives remained most common style of bee hives, despite these movable comb inventions in the 1700's and early 1800's.

Langstroth's hive was fitted with a comb honey super.Comb foundation was also invented in the 1850's.A major improvement in hive design was made in 1851 by Lorenzo Langstroth. He built a hive with frames that hung from the top ends of the hive, leaving a 3/8 inch space between all sides of the frames and the hive body. His clever design used the principle that bees usually do not build comb in 3/8 inch passageways. If the space is bigger than 3/8 of an inch, the bees will build comb. If it is less than 1/4 inch, they will attach propolis. Langstroth's frames were easily handled without breaking the comb. Today we refer to the 3/8 inch passageways as a "bee-space." This practical hive is the direct ancestor of the modern hive that is most popular today.