



# How to construct a smoker for beekeeping

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#### Summary

The smoker is an essential tool for any beekeeper. Since long time ago, smoke has been used to calm down the bees when handling beehives. This technology describes the materials, tools and procedures needed to manufacture a smoker.

#### Description

The smoker is a sturdy container resistant to high temperatures. Inside the smoker, organic matter will be burnt to produce smoke. Care should be taken to make sure, only abundant white cold smoke comes out of the smoker and not to burn the bees.

The smoke is used to calm down the bees and to make operations in the hive easier. For the bees, smoke is the alarm for fire: they think there is a forest fire and in preparation for leaving the hive, they begin to suck the nectar they have stored in the cells and lose their instinct to sting. This is a natural behaviour of the bees.

The most used smoker model consists of a bellows (blower) attached to a cylindrical metal body, which can carry a protective grid if desired, and that is connected through a hinge to a conical lid with a hole through which the smoke leaves the smoker (Figure 1). Inside the cylinder, there is a grid on which the fuel is placed. Through a hole in the cylindrical body, located below the base of the grid, the air produced by the blower is introduced into the combustion chamber. The most commonly used fuels are dry leaf litter, wood sawdust, dry grass, corncobs or another organic substrate harmless to bees.



# **1.** Material needed for the construction of the smoker

Nowadays it is possible to find smokers of different sizes, shapes and materials. All of them use the bellows principle. The most commonly used materials for the smoker body and lid are galvanized zinc sheet (26 mm gauge) and stainless steel. Other materials needed are wood, a piece of leather, nails, screws, a hinge and a spring. In addition, tools such as a cutter,

knife or scissors, hammer and protective gloves are necessary.

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Figure 2: Components of a smoker



#### 2. Parts of a smoker

- Combustion chamber: it is the largest part of the smoker, where combustion is carried out to produce the smoke.
- Grid: protects the bottom of the combustion chamber. It also prevents the passage of the flame through the air conductor tube (8) of the smoker and facilitates the uniform distribution of air from the bellows (blower).



Figure 3: Parts of a smoker

- Coupling ring: it is the piece that allows the coupling of the combustion chamber with the conical lid (4).
- Conical lid: the lid allows the accumulation of the smoke flow through an outlet at the top.
- Handle: facilitates opening the smoker especially when it is hot.
- Hinge: allows to open the smoker and close it easily.
- Hook: this piece allows to hang the smoker on the hive so that the beekeeper can have two hands-free to manipulate the hive.
- Air conducting tube: allows a better flow of air from the bellows to the combustion chamber (optional).
- Bellows support: these two metal parts keep the bellows and combustion chamber strongly together.
- Galvanized strip: used to seal the wooden plate of the bellows and the leather together, in order to prevent the leak of air.
- Vinyl or leather: flexible material of high strength used to exert air propulsion inside the smoker.
- Bellows holding screw: two screws that hold the bellows to the bellows support.

## 3. Description of the parts of a smoker

# 3.1 Conical Lid

The conical lid is made of a piece of metal with the dimensions and angles as indicated in figure 10.4. It can be welded or moulded with heat to achieve its complete bending and assembly. Three holes should be made in the part close to the base of the lid to attach the handle.

#### **3.2** Coupling ring

This piece allows the precise and adjusted coupling of the conical lid and the combustion chamber. It is made with a



lid without using more materials and to facilitate their union, three inflexions or bends must be made in the metal strip using pliers (see Figure 5). The coupling ring should be adjusted until it is fixed to the conical lid (see Figure 6).

Figure 4: Measurements of the conical lid



Figure 5: Coupling ring measurements



Figure 6: Coupling ring and a conical lid fixed





Figure 7: Hinge and hook for support



Figure 8: Parts and measurements of the cylinder



Figure 9: Measurements of the cylinder or combustion chamber





## 3.3 Hinge and hook for support

To hang the smoker a hinge and hook have to be incorporated. Three metal parts and a metal pin are required.

#### 3.3.1 Piece one

It is the upper support of the hinge, which joins the conical cover with the lower part of the hinge. This piece must have two holes to fix it to the conical cover, and the end must be rolled to fit the size of the pin.

## 3.3.2 Piece two

This is attached to the combustion chamber. It has two extensions of 1.8 cm x 0.8 cm that are rolled to be coupled with Piece one through the pin.

#### 3.3.3 Piece three

This is the hook to hang the smoker being a long metal piece with a rounded unsharpened edge. It has two holes to fix it to the conical cover.

## 3.4 The cylinder (combustion chamber)

The combustion chamber is composed of the base, the grid, the cylinder and the air conducting tube. The base is a circular metal piece with a diameter of 14.8 cm that is joined and fixed to the combustion chamber. The grid can be fixed or removable, and there has to be a space between the grid and the bottom of the cylinder to allow the access of air. The cylinder must be closed by overlapping of its two ends and fixing them using rivets to avoid the escape flames or smoker. The cylinder has a size of 42 cm x 24.5 cm and must be closed using two rivets. The inner diameter of the cylinder is 14.8 cm (diameter of the fuel grid) and must have inflexion in the upper part. This is where the coupling ring will be attached to the conical cylinder.

# **3.5** Air conducting tube connected to the combustion chamber

The air conducting tube guides the air from the bellows to the combustion chamber. It can be fixed to the combustion chamber with rivets or it can be welded.

## 3.6 Fuel grid

The fuel grid must have as many holes as possible with a diameter of 0.3 cm to allow the passage of air to the combustion. The grid can be removable (allows to clean the smoker better) or fixed (less handling is possible, and deterioration of the material is faster).

#### 3.7 Parts and measurements of the bellows

Once all the pieces below have been assembled, it is recommended to check the smoker operation before using it to work in the hive.

## 3.7.1 Bellows

Bellows are constructed with:

- two wooden bases of rectangular shape (12.7 cm x 19 cm x 1.3 cm);
- a conical spring of 9 cm of base (diameter) and 13 cm of height. (the spring can be the type used in furniture);
- two strips of galvanic sheets to join and seal the bellows; and
- a piece of leather that provides mobility to the bellows.

## 3.7.2 Bellows support

Two plates with the indicated measures are required for fixing the bellows and the combustion cylinder.

## 3.7.3 Piece of vinyl or leather

The leather (or vinyl) must be one piece. If extensions are needed, they must be done in the lower part of the bellows, and they must be reinforced to avoid air leaks.

Figure 10: Air conducting tube connected to the combustion chamber



Figure 11: Fuel grid





It is important that the piece is complete and without perforations.

Once all the pieces have been assembled, it is recommended to check the smoker operation before using it to work in the hive.

#### 4. Recommendations for using the smoker

The smoker is used to calm down the bees and reduce stinging behaviour of the bees, making the work in the hive easier.

It is important that the smoker is cleaned after each use and that the remaining of burning materials are properly extinguished after each use to avoid causing unintentional burning and to keep the smoker in good condition for as long as possible.

It is important that the smoker contains a sufficient amount of burning material, so it does not have to be opened and filled again in the middle of a hive inspection.

In addition, the material that burns must be organic matter and not oily materials. Although it seems easier to light these products, they can alter the bees and contaminate the honey.

A good way to light the smoker is using a piece of paper in the bottom of the smoker, and once it is burning, the organic matter should be slowly introduced as the amount of smoke increases. Many people add green leaves of aromatic plants such as Thyme (*Thymus vulgaris*) or Rosemary (*Rosmarinus officinalis*) to moisten, aromatize the smoke, and to decrease in the varroa load.

Another important point is that the amount of smoke used at the time of handling the hives should be as minimal as possible, so the bees do not choke. Also, using too much smoke can alter the taste of the honey. It is also important that the smoker always contains a sufficient amount of organic



Plate of 1 mm thick Hole in the center for screw of 1/4" x 1"

Figure 13: Measurements of the bellows support

Figure 14: Leather measurements



matter for burning and that no hot particles and/or ashes come out, as these can irritate and burn the bees.

Figure 15: Beekeepers using the smoker



#### 5. Validation

This technology was developed within the Pymerural Project, a collaboration between the government of Nicaragua and Honduras. The Swiss cooperation also sponsored the programme and offered technical support through the Swisscontact foundation.

This document is a translation of the original "Confección de ahumador para apicultor" (FAO-TECA technology number 8295)

#### 6. Agro-ecological zones

- Tropics, cool/cold/very cold
- Subtropics, all
- Temperate, cool

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