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A. R. ELLIS ETAL
ARTIFICIAL HONEYCOMB
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3,182,339

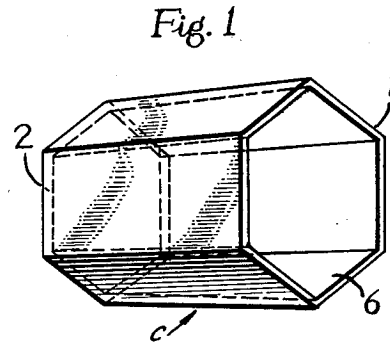
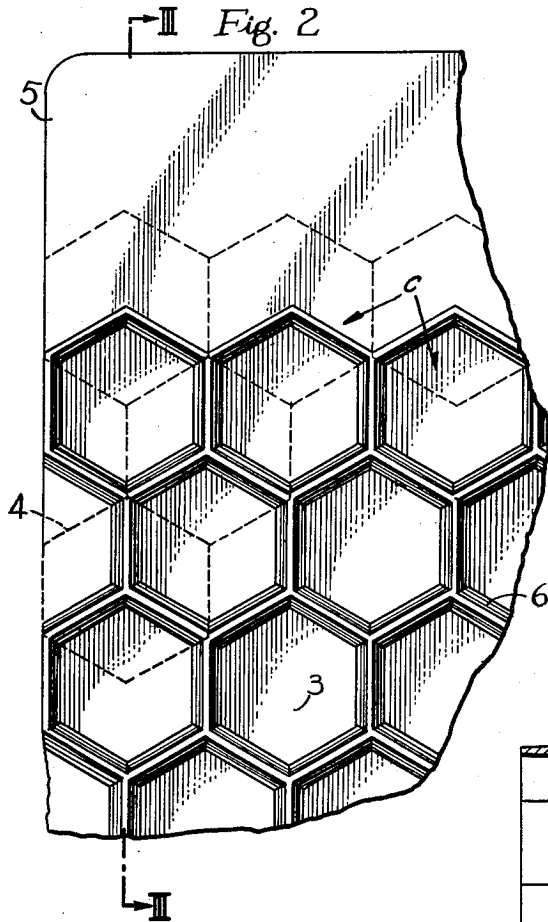


Fig. 3

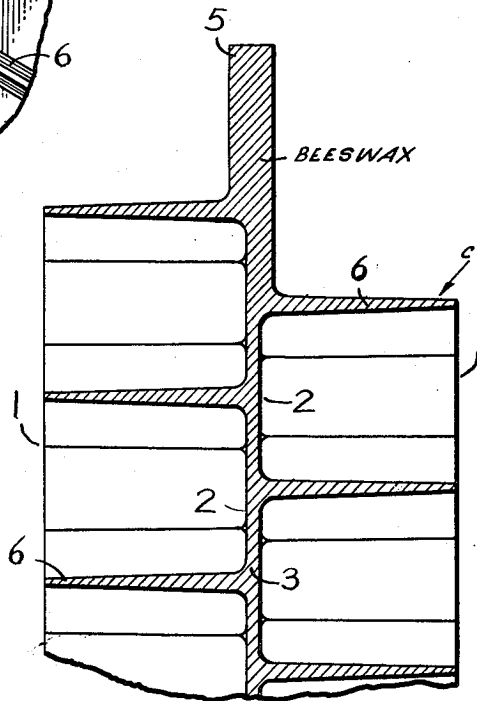
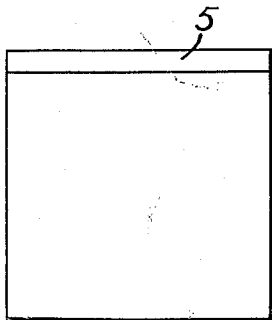


Fig. 4



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ARTIFICIAL HONEYCOMB

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4 Claims. (Cl. 6—11)

This is a continuation-in-part of our patent application Serial No. 135,391 filed July 11, 1951, now abandoned.

At present it is common practice in beekeeping to place sheets of foundation wax into frames which are then placed in recesses in beehives for the purpose of aiding the bees by giving it a basis on which to build the honeycomb. The foundation wax sheets generally have embossed surfaces containing small recesses which have the precise area and shape of the apertures in the honeycomb which is manufactured by the bee itself. The bee commences work on the foundation wax sheets and builds up a honeycomb, the cells of which correspond to the recesses in said foundation wax sheets.

A great quantity of energy and honey, however, go into the construction of the natural honeycomb, so that the honey obtained from the natural honeycomb is actually but a fraction of the actual output of the bee.

Many artificial honeycombs have also been proposed in the past, e.g. honeycombs built up from stacks of corrugated strips, mostly metal strips, crimped at the back and soldered, glued or welded together to form a honeycomb composed of hexagonal cells partly closed at the back. Attempts have also been made to produce artificial honeycombs from cast metal, or from wax or waxlike substances.

The above-described earlier attempts, if truly successful, would have been a major break through in the art of beekeeping. In practice they were rendered useless by one or both of the following difficulties: failure to be mass producible at a reasonable cost; and failure to be accepted by the bee as a substitute for the natural product, either because of a dislike of the material or because of wrong shapes or dimensions of the cells. Bees are well known to be so particular about the size and shape of the cells that they will even refuse to accept foundation sheets if the mere outlines of cells imprinted thereon are wrong.

It is an object of the invention to provide an artificial honeycomb which can be manufactured economically and is acceptable to bees.

It is a further object to provide a honeycomb which would minimize the energy and the consumption of honey normally used by the bee in the construction of honeycombs, thus allowing a greater surplus of honey to be stored in the hive.

This is achieved in accordance with the invention by means of an artificial honeycomb acceptable to honey bees comprising a slab entirely of wax, made up of hexagonal cells adjoining one another on all sides of the hexagons in imitation of the essentially complete cells of a natural honeycomb, the longitudinal axes of the cells being transverse to the plane of the face of the slab, the individual cells being closed at the back and open in front and tapering very slightly from the open front towards the back.

According to a further feature of the invention the slab is integral with at least one marginal flange of the same material as the remainder of the slab for fitting the honeycomb to a beehive frame, said flange being normal to the longitudinal axes of the cells.

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Further features of the invention will be described in the following by way of example with reference to the accompanying drawings:

In the drawings FIG. 1 represents a perspective view of a single cell of the honeycomb;

FIG. 2 represents a front elevation of part of an artificial honeycomb slab in accordance with the invention;

FIG. 3 represents a cross sectional view taken along line III—III in FIG. 2; and

FIG. 4 illustrates diagrammatically the outlines of a single complete honeycomb slab.

Referring to the drawings, each honeycomb slab is a die-molded wax structure molded in one integral piece from beeswax or a wax or waxlike substance so similar to natural beeswax that it is acceptable to the honey bee.

Referring first to FIG. 1, the slab is essentially composed of a multitude of cells C such as the one illustrated in the drawing, each cell being hexagonal, being open at the front 1, tapering inside from the open front 1 towards the rear 2 of the cell. This very slight taper is sufficient to allow the die to be released off the molded article at the end of the molding operation, yet is so slight that the bee does not object. Since the longitudinal axes of the individual cells are all essentially parallel, the taper is produced by giving the cell walls 6 themselves a corresponding taper. This taper is slightly over exaggerated in the drawings, which are not to scale, for the sake of clarity. In actual fact the taper of the cell walls is between $\frac{1}{2}^\circ$ to 1° , more particularly approximately $40'$ in the preferred example. A slightly stronger taper may still be acceptable. However, we advise against a taper exceeding 2° .

Referring now to FIGS. 2 and 3 of the drawing, each slab comprises two layers of cells arranged back to back, having the back walls 3 of the layers of cells in common. As is clearly shown the two layers of cells are arranged in staggered relationship, the dotted lines 4 in FIG. 2 representing cells on the opposite side of the slab to that shown in the drawing.

On one marginal side of the slab a marginal mounting flange 5 is provided, approximately four times as thick as the back wall 4 of the cells, the flange being in line with the said back wall and accordingly normal to the longitudinal axes of the honeycomb cells. As will be apparent from FIG. 3 the height of the flange depends on the side of the slab from which it is measured. If measured on the right hand side in FIG. 3, the flange is between $\frac{3}{8}$ " and $\frac{1}{4}$ ", say $\frac{5}{16}$ " high. Such a flange will give adequate support to the slab when mounted in a standard beehive frame.

The exact dimensions of the honeycomb cells can be varied in accordance with the strain of bee for which the honeycombs are intended. In accordance with one example the internal diameter at the front of the cells is 0.198" measured between opposite corners of the hexagon or 0.1875" measured between opposite sides of the hexagon. In another example the corresponding measurements are 0.195" and 0.175" respectively. The depth of the cells in one example is 0.263" and 0.210" in another example. The exact depth of the cells of the artificial honeycomb is not too critical since the bee in the process of closing the cell prefers to build the outermost part of the cell wall, that is the actual rim of the mouth of each cell on its own. Any small discrepancies with regard to the depth of the cell as compared with the natural product can then be compensated for by the bee itself without much additional expenditure of energy.

All in all in putting the present invention into practice the aim should be to produce a product as closely as possible corresponding to the natural honeycomb produced by the honey bee itself. For this reason and for reasons

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of economy the cell walls should be as thin as possible without excessive fracturing in the course of the molding process and subsequent release of the mold from the molded product (assisted if necessary by the pre-treatment of the mold with a release agent known as such). In practice, the thickness of the cell wall is best chosen between 0.02 inch and 0.03 inch. We have found a cell wall thickness of 0.025" at the mouth of the cell suitable for the purpose. In the preferred example the cell walls are 0.028" thick near the base of the cell wall. The thickness of the rear wall of the cell is preferably of the same order of magnitude as the average thickness of the cell walls.

Referring to FIG. 4, showing diagrammatically the outlines of a complete slab, the length of the side of the slab including the top flange 5 is $4\frac{29}{64}$ ". The width of the slab is $4\frac{3}{32}$ ". These dimensions are thus chosen that four slabs may be inserted side by side into one shallow standard beehive frame. Flange 5 then acts as a key ensuring uniformity and eliminating any error when inserting the combs. Slabs of the same construction may also be used in so-called deep frames.

The invention is not to be confined to any strict conformity to the showings in the drawings but changes or modifications may be made therein so long as such changes or modifications mark no material departure from the spirit and scope of the appended claims.

What we claim is:

1. An artificial honeycomb acceptable to honey bees comprising a slab entirely of wax, made up of hexagonal cells adjoining one another on all sides of the hexagons in imitation of the essentially complete cells of a natural honeycomb, the longitudinal axes of the cells being transverse to the plane of the face of the slab, the individual cells being closed at the back and open in front and

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tapering very slightly throughout from the open front towards the back, said tapering of the cells resulting from a complementary tapering of the side walls of the cell, and said side walls tapering by not more than 2°.

2. The artificial honeycomb as claimed in claim 1 in which the cells are at least 0.21" deep, the cell walls are between 0.02" and 0.03" thick, the cell walls have side walls having a taper of between $\frac{1}{2}$ ° and 1° and the bottom of each cell is essentially flat.

3. The artificial honeycomb as claimed in claim 1 including a single marginal flange on one side only, said flange being of the same material as the remainder of the slab and adapted to fit the honeycomb to a beehive frame, and said flange being normal to the longitudinal axis of the cell.

4. The artificial honeycomb as claimed in claim 3 which comprises two layers of honeycomb cells arranged rear to rear in staggered relationship having a back wall in common, said marginal flange being provided in alignment with said back wall.

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