

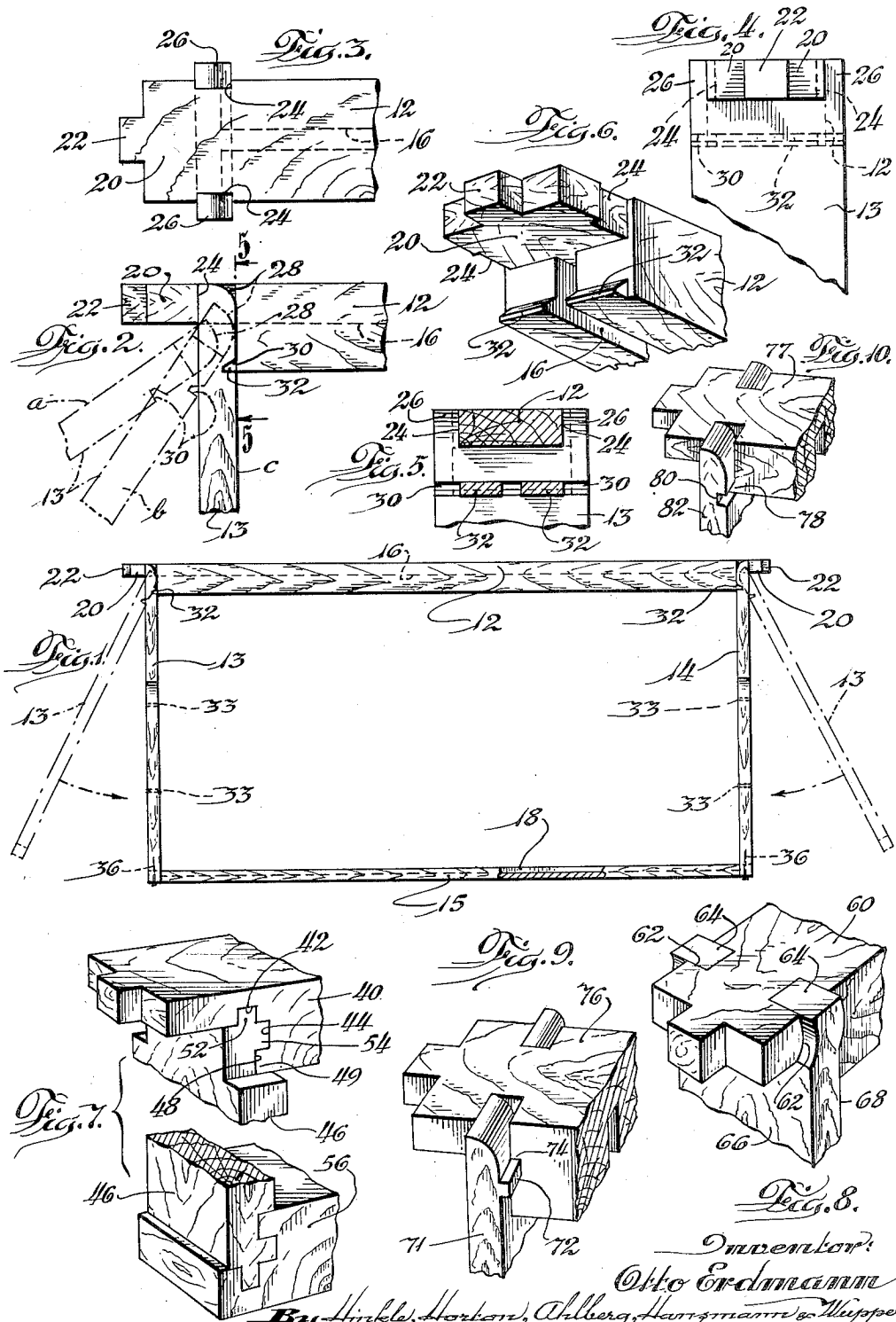
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BEEHIVE COMB FRAME CONSTRUCTION

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BEEHIVE COMB FRAME CONSTRUCTION

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My invention relates generally to frames for beehives such as are used to support the foundation and the honey stored thereon.

Many beekeepers frequently transport their beehives from one locale to another and this is usually done by truck. The beehives and the component parts thereof are therefore subjected to considerable vibration and violent jolts. The weight of the foundation together with the honey stored thereon in a single frame may be as much as ten pounds and it is therefore important that the frames be strong and well constructed.

Beehive frames are customarily sold unassembled and the purchaser thereof is required to fit the parts of the frame together and secure them by nailing, and it is therefore important that the parts of the frames be so constructed that they may be easily and quickly assembled. In the past it has been customary to construct the frames so that the parts could be interfitted by mortise and tenon joints requiring but a single nail at each joint. This nailing operation frequently resulted in splitting or otherwise damaging the wooden frame parts with consequent weakening of the frame structure, and occasionally in damage sufficiently severe to make the frame unusable.

It is therefore a primary object of my invention to provide a beehive frame construction the parts of which may be easily and quickly assembled and in which a minimum of nailing is required, or in which the nailing operation is completely eliminated.

A further object is to provide an improved beehive frame in which the strain carrying joints between the parts are of such construction that the forces due to vibration and shock in transporting the loaded frame are transmitted from the end bars to the top bar directly without the use of nails.

Other objects will appear from the following description, reference being had to the accompanying drawings, in which:

Fig. 1 is a side elevational view of a complete frame, a portion of the lower bar being shown in section;

Fig. 2 is an enlarged fragmentary side elevational view illustrating the manner in which the end bars are secured to the top bar;

Fig. 3 is a fragmentary plan view of the joint between the top bar and one of the end bars;

Fig. 4 is an end elevational view of the joint between one of the end bars and the top bar;

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 2;

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Fig. 6 is a perspective view looking upwardly at one end of the top bar;

Fig. 7 is a fragmentary perspective view of a modified form of the invention illustrating the joints between one end bar and the top and bottom bars;

Fig. 8 illustrates a further modification of the invention, being a perspective view of the joint between an end bar and the top bar.

Fig. 9 is a perspective view of an additional modified form of joint between the top bar and one of the side bars; and

Fig. 10 is a perspective view of a joint between the top bar and side bar of a hive frame.

As best shown in Fig. 1 the beehive frame comprises a top bar 12, left and right side end bars 13 and 14, and a lower bar 15. The top bar 12 is provided with a longitudinal groove 16 and the bottom bar 15 is provided with a similar longitudinal groove 18 for the reception of the comb foundation. The upper bar 12 has its extremities 20 extending beyond the end bars 13 and 14 to rest upon the frame supports which form parts of the hive. Each of these extremities has a reduced width end portion 22 to limit the area of contact, or near contact, with the side walls of the beehive.

The top bar 20 is provided with a pair of vertical grooves 24 for the reception of the upwardly projecting portions 26 of the end bars 13 and 14, these end portions having a substantially quarter round upper end surface 28, as best shown in Fig. 2.

A short distance below the upper ends of each of the side bars there is provided a transverse wedge shaped notch or groove 30 which is adapted to receive wedge shaped projections 32 formed on the top bar 12. These projections 32 extend into the space defined by the planes of the sides of the grooves 24. By virtue of this arrangement the end bars 13 and 14 may be connected to the top bar 12 by inserting the projecting parts 26 thereof into the grooves 24 in the manner illustrated in Fig. 2, commencing the operation by moving the parts to the relative positions shown in dot-dash line *a*, swinging the end bar counterclockwise to the position which is shown in dot-dash lines at *b*, and completing the assembly by moving the end bar 13 to the position illustrated by the full lines *c*. In the latter position the wedge shaped projections 32 will have been engaged in the groove 30, and the projections 26 of the end bar will have engaged in the grooves 24 so that the end bar will be locked to the top bar 12 against movement except for clockwise

swinging and sliding movement in the direction opposite that by which the joint between these parts was made.

After both end bars 13 and 14 have thus been attached to the top bar 12 the ends of lower bar 15 are inserted in complementary notches formed in the lower ends of the end bars 13 and 14 and are secured in this position by a pair of nails 36. It will be observed that these nails serve mainly to hold the end bars 13 and 14 against outward swinging movement and that the weight of the foundation and honey supported thereon is carried mainly by the projections 32, the force being applied to the upper inclined surfaces of these projections. The end bars 13, 14 are provided with holes 33 for the reception of wires by which the foundation is supported in part.

It has been found that the projections 32 may be of relatively small dimensions and still be adequate to support the required load. This has been found by break-down, or ultimate strength, tests which show that upon sufficient overloading the fracture does not occur at the base of the wedge shaped projections 32 but rather a considerable distance above the projections 32. That is, the end of the bar 12 (in which the grain is longitudinal) will split near its horizontal center plane. This is probably due in part to the fact that portions of the end bar 13 above the notch 36 frictionally engage the walls of the grooves 24 and the end surfaces of the bar 12 which are in the same plane as the inner walls of the grooves 24 are maintained in firm contact by the bottom bar 15, since the end bars 13 and 14 are flexed inwardly slightly in securing them to the bottom bar 15.

From the foregoing it will be clear that in assembling the frame, the two end bars 13 and 14 are easily slipped and swung into place and that the assembly of the frame is completed merely by nailing bottom bar 15 to the lower ends of the end bars. The time necessary for the assembly of a frame of this construction is therefore materially reduced and at the same time the joints between the upper ends of the end bars 13 and 14 and the top bar 12 are approximately 40 per cent stronger than in frames of conventional constructions.

A modified form of the invention is shown in Fig. 7 wherein the top bar 40 of the frame is provided with a downwardly facing mortise groove 42 and an outwardly facing groove 44 for the reception of the upper end of the end bar 46, the latter having a groove 48 for the reception of projecting part 49 of the top bar 40, a projection 52 for reception in the groove 42, and a projection 54 for receipt in the groove 44. The end bar 46 is joined to the lower bar 56 by a similar joint. In assembling a frame having joints of the construction shown in Fig. 7, it is necessary merely to slide the end bar transversely of the top bar 40 and of the bottom bar 56 to bring the parts into vertical alignment. The friction between the contacting surface is sufficient to hold the parts assembled. The co-operating parts of the joints are preferably so dimensioned that a very slight, substantially unnoticeable bowing of the end pieces 46 takes place when the end bars 46 are assembled to the upper and lower bars 40 and 56, thus more certainly to hold the parts assembled because of increased friction. It is also desirable, if the wood employed for the end bars will have a tendency to warp, that the strains

due to such incipient warping will tend to tighten rather than loosen the joints.

In the construction shown in Fig. 8, the top bar 60 is provided at its ends with long radius arcuate grooves 62 for the reception of the two upper upwardly projecting portions 64 of the end bars 66, which are conformed to fit into the grooves 62. The frame of Fig. 8 is assembled in the same manner as described above with reference to the frame of Figs. 1 to 6. The surface 68 of the upper part of the end bar 66 frictionally engages the end of the top bar 60 and the arcuate surfaces of the grooves 62 prevent downward movement of the end bar 66 relative to the top bar 60.

Further modification of the joint may be made as shown in Fig. 9 wherein the end bar 71 is provided with a transverse generally rectangular projection 72 which engages in a transverse notch 74 formed in the end face of the top bar 76. In other respects the construction is similar to that of Figs. 1 to 6.

A further modification is illustrated in Fig. 10, this modification being similar to that shown in Figs. 1 to 6 except that the top bar 77 is provided with a generally rectangular transverse projection 78 which engages in a groove 80 formed in the end bar 82.

The modified forms of the invention shown in Figs. 7, 8, 9 and 10 provide strong joints between the end bars and the top bar, and in the construction shown in Fig. 7 between the end bars and the bottom bar, but in each form of the invention the parts of the frame may be assembled very rapidly, the form shown in Fig. 7 without any tools whatsoever and the remaining forms of the invention merely by driving two nails into the joints between the bottom bar and the end bars. In all forms of the invention the joint formed between the top bar and the end bars is substantially stronger than the corresponding joints in frames of conventional construction and the frames are thus better able to withstand vibration and shock to which they are frequently subjected in the course of transporting the beehives and also in handling the frames during the process of extraction.

While I have shown particular embodiments of my invention it will be apparent that numerous variations and modifications thereof may be made without departing from the underlying principles of the invention. I therefore desire by the following claims to include within the scope of the invention all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

1. A beehive frame comprising a top bar, a pair of side bars, and a bottom bar, the top bar having aligned vertical grooves in its sides near each end thereof and having horizontal projections extending partially into the space defined by the planes of the sides of the grooves, the upper end of each side bar having a pair of projections fitting into the grooves in the top bar and having a groove receiving one of said projections of the top bar, and means securing the lower ends of the side bars to the ends of the bottom bar.

2. The combination set forth in claim 1, in which the pairs of projections on the side bars which fit in the vertical grooves of the top bar have substantially quarter round upper ends.

3. A beehive frame comprising a top bar, a pair of side bars, and a bottom bar, the top bar having

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spaced aligned arcuate generally vertical grooves in its sides near each end thereof, the upper end of each side bar having a pair of projections complementary to and fitting in the grooves in the top bar, and means securing the bottom bar to the lower end of each side bar.

4. A wooden beehive frame comprising a top bar having near each end thereof a pair of generally vertical grooves in its sides, a pair of side bars each having a pair of tongues at its upper end fitting snugly in the generally vertical grooves in the top bar, said side bars and the top bar near its ends having a generally horizontal tongue and groove connection forming the only positive means to resist downward movement of the side bars with respect to the top bar, and a bottom bar having its ends secured to the lower ends of the side bars.

5. A pendant type wooden beehive frame having a top bar, a pair of side bars, and a bottom bar to be joined together to provide a hollow rectangle, the joints between the side bars and top bar comprising integral parts of the bars providing complementary horizontal and vertical inter-engaging grooves and projections which may be disengaged only by swinging the side bars out-

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wardly relative to the top bar, the horizontal projections being the sole positive means preventing severance of the joints by downwardly directed forces applied to the side bars, and means securing the lower ends of the side bars to the ends of the bottom bar respectively, thereby to prevent the side bars from being swung outwardly and thus to maintain the joints between the upper ends of the side bars and the ends of the top bar.

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