United States Patent [19]

Geertson

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[54] **BEE BOARD CLEANER**

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[52] **U.S. Cl.** ..... **6/12 M;** 15/104.1

[51] **Int. Cl.** **A01k 51/00**

[58] **Field of Search** ..... 6/1, 12 R, 12 A, 12 M; 15/3, 88, 104.1, 104.2

[56] **References Cited**

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Attorney, Agent, or Firm—Klarquist, Sparkman, Campbell, Leigh, Hall & Whinston

[57] **ABSTRACT**

Rotated spiral extractors are urged toward a bee board and are flexible so that they excurse and some find and enter holes in the bee board to ream out the holes. Others of the extractors which are so positioned so that they do not find holes for any given setting of the bee board merely spin against the near face of the bee boards while those extractors finding holes are pushed into the holes and retracted therefrom. Each extractor is driven by an overload clutch. The extractors are arranged in sloping rows and advancement of the bee board is in such increments that the entire face of the bee board is covered in one pass of the bee board past the extractors.

15 Claims, 6 Drawing Figures

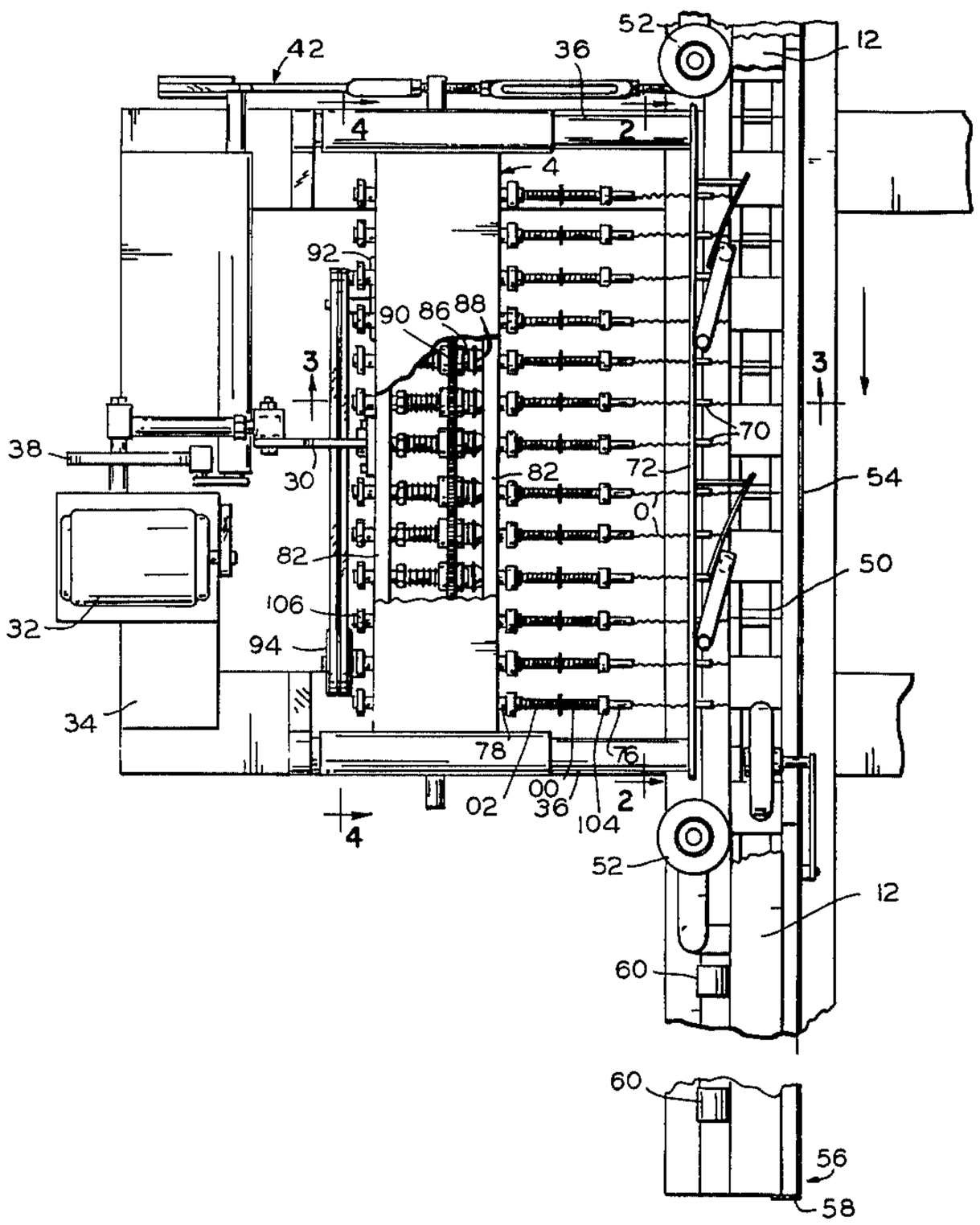


FIG. 1

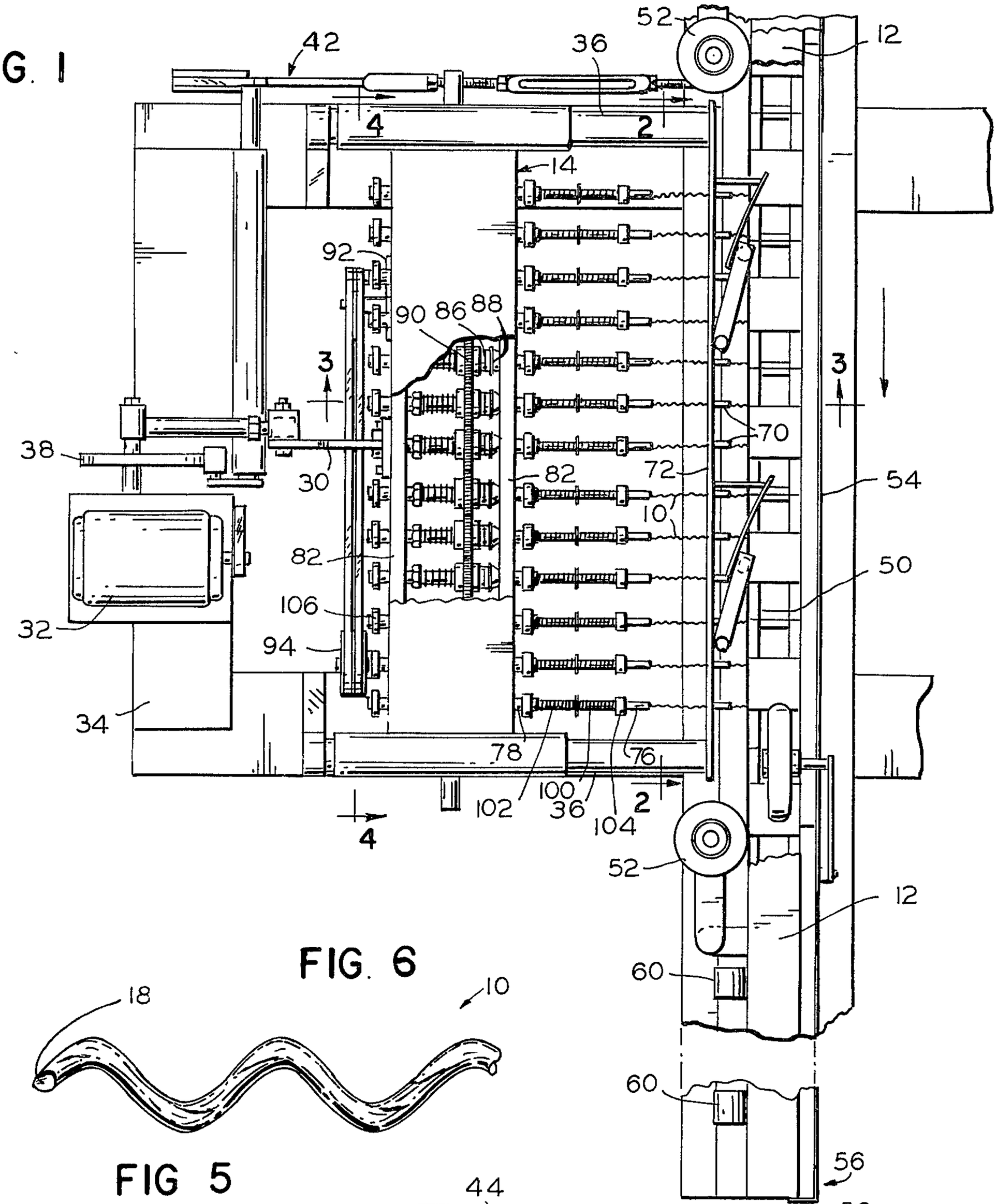
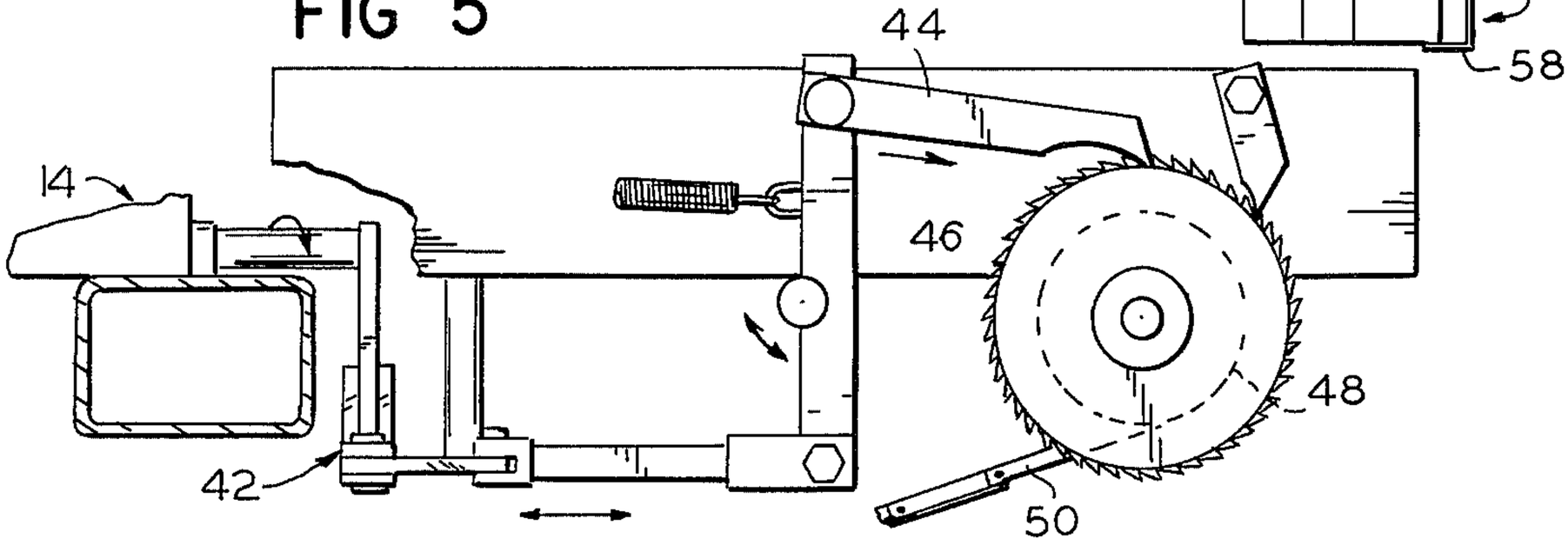


FIG. 6

FIG 5



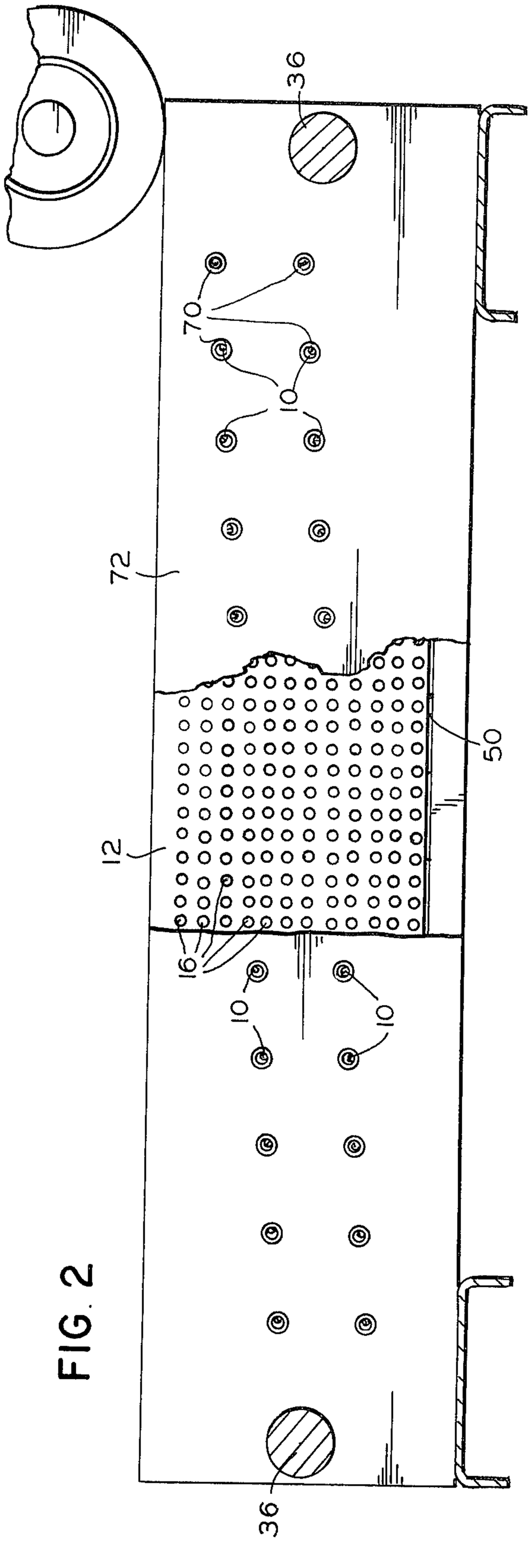


FIG. 2

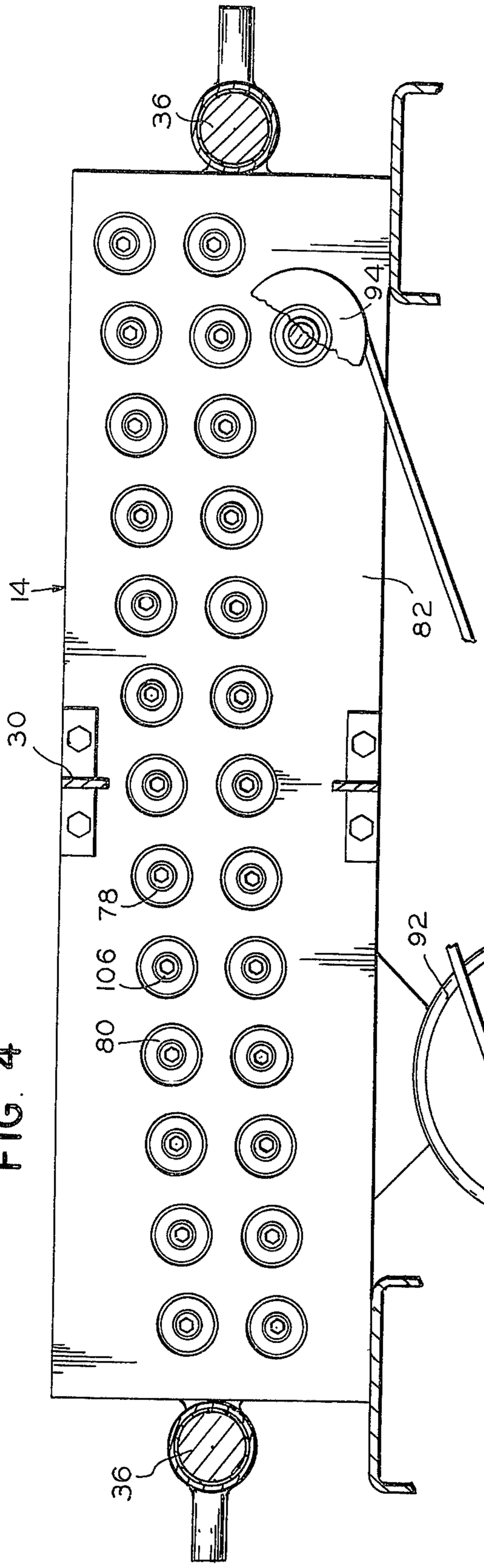
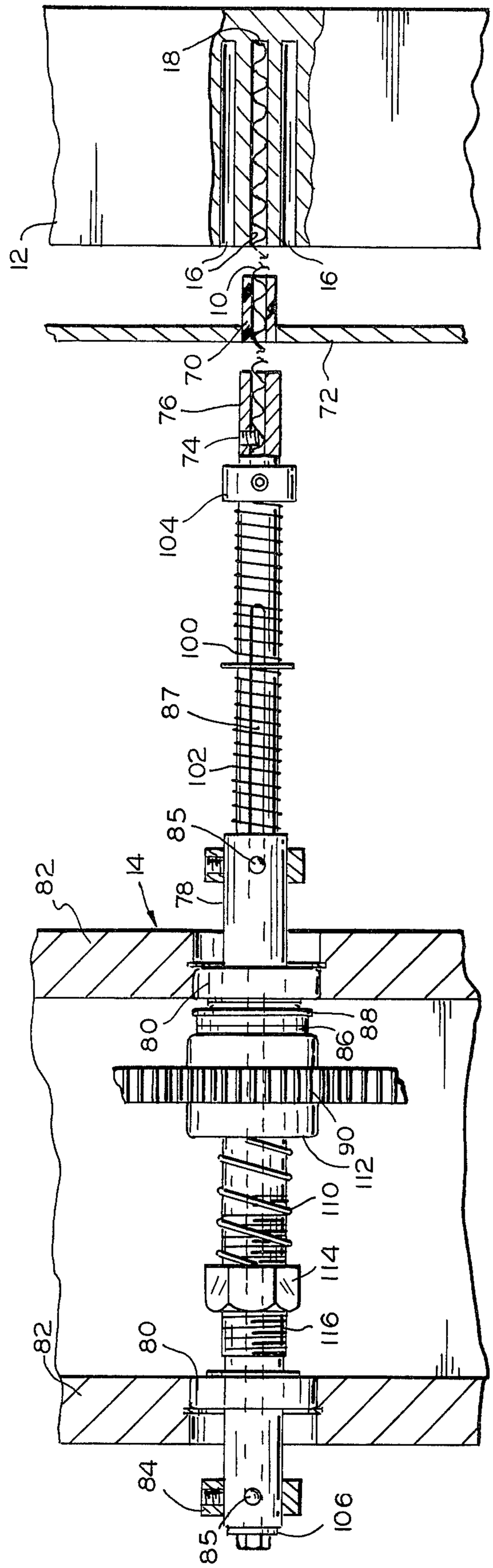


FIG. 4

FIG. 3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BEE BOARD CLEANER

This invention relates to a bee board cleaner, and has for an object thereof the provision of a bee board cleaner adapted to rapidly clean bee boards.

Another object of the invention is to provide a bee board cleaner in which a rotated, flexible rotated extractor excurses to find and clean a hole misaligned ralative to the axis of rotation thereof.

Another object of the invention is to provide a bee cleaner having a plurality of resiliently reciprocated, rotating extractors arranged in a pattern such that when a bee board having holes in the face thereof is fed step-by-step past the extractors, the extractors cover the adjacent face of the board in such small increments that the extractors enter and clean all the holes.

In the drawings;

FIG. **1** is a top plan view of a bee board cleaner forming one embodiment of the invention;

FIG. **2** is an enlarged vertical sectional view taken along line **2—2** of FIG. **1**;

FIG. **3** is an enlarged vertical sectional view taken along line **3—3** of FIG. **1**;

FIG. **4** is an enlarged, vertical sectional view taken along line **4 4** of FIG. **1**;

FIG. **5** is an enlarged, fragmentary, top plan view of a portion of the bee board cleaner of FIG. **1**; and,

FIG. **6** is an enlarged, fragmentary, side elevation view of a portion of an extractor of the bee board cleaner of FIG. **1.**

A bee board cleaner forming one specific embodiment includes a plurality of flexible, spiral extractors or reamers **10** of wire individually rotated and individually urged toward a bee board **12** in a feed stroke and positively retracted by a reciprocated gear box or carriage **14.** The extractors, while being spring like in appearance, are quite stiff in longitudinal compression. The bee board is of wood, has a multitude of holes **16** arranged in rows, and the spacing of the holes in the rows and the spacing of the rows from each other varies from manufacturer to manufacturer thereof, and the bee board cleaner is adapted to clean the bee boards of all such patterns or of random patterns inasmuch as the free end portions of the spiral extractors are not perfectly straight and excurse or revolve relative to their respective longitudinal axes. This gives free ends **18** of the extractors a hunting action as they engage the bee boards and most of the extractors find, enter and ream one of the holes **16** in each feed stroke of the gear box to loosen and extract deposits of pollen, dead larva, dead predators, etc. blinding the holes. The free ends **18** are rounded or blunt so that they do not dig into the wood, which is important both to prevent catching in the holes and to avoid damage to the board and themselves in hunting and in merely engaging the face of the board as occurs when no hole is found by an extractor during a feed stroke. As illustrated in FIG. **2,** the extractors are arranged in rows sloping across the board so that the extractors cover closely spaced horizontal swaths, of which extremes of excursion or floating of the ends **18** overlap vertically. The bee board is ad vanced horizontally in short steps sufficiently short that all holes are found and reamed in a single pass. The holes are normally about 3/16th in. in diameter and the board is advanced in steps of 3/16th in. in one successful constructed embodiment. The board was advanced 3/16th in. between reciprocations, the gear box was reciprocated 35 times per minute and the extractors were rotated at two thousand revolutions per minute. Some of the holes may, of course, be reamed or drilled twice in a single pass of the bee board.

The gear box **14** is reciprocated by a crank drive **30** (FIG. **1**) driven by an electric motor drive **32** mounted on base frame **34** and slides along guide rods **36.** The crank drive includes a cam **38** (FIG. **5**) which drives a cam follower **40** to drive a linkage system **42** to drive a pawl **44** to step a ratchet **46** keyed to a sprocket **48.** This steps a conveyor chain **50** to step the bee boards past the extractors while the extractors are back away from the bee board in front of them. Presser rolls **52** keep the board against a rear guide rail **54.** A hopper **56** holds a stack of the bee boards of which the lowest is advanced out from under the stack by the conveyor chain. The hopper includes angle members **58** and U-shape leaf spring pressers **60** urging the bee boards against angle members.

The extractors **10** extend slidably and rotatably through guide bushings **70** (FIG **3**) of teflon, nylon or other tough bearing material and mounted in fixed plate **72.** Set screws **74** clamp and key the end portions of the extractors in elongated holders or spindles **76** which extend through drive sleeves **78** journaled in radial and-thrust bearings **80** carried by gear box walls **82.** Collars **84** fixed to the drive sleeves **78** hold splining balls **85** in holes in the sleeves **78,** and the balls project into splining grooves **87** extending along the holders **76** to spline the holders to the drive sleeves. The drive sleeves are rotated through overload slippable clutches having driven discs **88** fixed to the drive sleeves and friction discs **86** frictionally driven by hubs of gears **90** rotatable on the drive sleeves. The gears **90** mesh with each other to form upper and lower trains, and are driven by an electric motor **92** (FIG. **4**) and a belt and pulley drive **94** to gear trains in the gear box, both the motor **92** and the drive **94** being carried by the gear box.

The holders **76** are urged lightly toward the right, as viewed in FIGS. **1** and **3,** by springs **100** and **102** pressing against collars **104** and the ends of the drive sleeves **78.** Collars **106** fixed to the left hand ends of the holders **76** limit movement of the holders **76** to the right. Adjacent holders **76** are rotated in opposite directions by their associated gears **90,** and are oppositely spiraled or are handed so that each extractor is rotated in a screwing in direction. Springs **110** press thrust bearings **112** toward the right as viewed in FIG. **3,** nuts **114** being screwed on threaded portions **116** of the sleeves **78** and forming adjustable stops for the springs **110.** The bearings **112** press the gears **90** toward the right to press the rings **86** together and against the collars **88.**

Preferably, before the bee boards are cleaned, they are placed in a kiln or oven and are heated to about 160° F. for 24 hours to kill predators and predator eggs or larva in the boards.

What is claimed is:

1. In a bee board cleaner,

an elongated reamer,

means for rotating the reamer on its longitudinal axis,

and means for resiliently pressing the reamer to a bee board having holes therein, the reamer entering one of the holes if the forward end of the reamer is substantially aligned therewith and merely engaging the adjacent face of the bee board if not substantially aligned with said one of the holes.

2. The bee board cleaner of claim 1 wherein the reamer has a blunt end.

3. The bee board cleaner of claim 1 wherein the reamer is flexible and the forward end portion thereof is somewhat misaligned with said longitudinal axis so that the forward end portion excurses to aid in finding one of the holes in the bee board.

4. The bee board cleaner of claim 3 wherein the reamer is a spiral wire.

5. The bee board cleaner of claim 3 including guide means spaced from the adjacent face of the bee board aligned with said axis and through which the reamer is slidable.

6. In a bee board cleaner,
an elongated flexible reamer having a main portion and a slightly angular forward end portion,
means for rotating the reamer on the longitudinal axis of the main portion whereby the forward end portion revolves,
and feed means for advancing the reamer toward a bee board having a hole therein which may be somewhat misaligned relative to said longitudinal axis, whereby the revolving forward end of the reamer will enter the hole if the hole is within the area covered by the revolving forward end of the reamer.

7. The bee board cleaner of claim 6 wherein the reamer is a spiral.

8. The bee board cleaner of claim 7 wherein the reamer is a stiff wire.

9. The bee board cleaner of claim 6 wherein the feed means is resilient to permit the reamer to engage the adjacent face of the bee board, if the hole is too greatly misaligned, and not damage the bee board or the reamer.

10. In a bee board cleaner,
means for placing a bee board having randomly spaced holes therein in a predetermined position,
laterally floating elongated reaming means,
drive means for rotating the reaming means,
and feed means for urging the reaming means toward the bee board.

11. The bee board cleaner of claim 9 wherein the drive means includes overload clutch means.

12. The bee board cleaner of claim 10 wherein the laterally floating reaming means comprises a flexible spiral reamer.

13. The bee board cleaner of claim 9 wherein the laterally floating reaming means comprises a flexible spiral reamer.

14. In a bee board cleaner,
positioning means for advancing a bee board along a predetermined path,
a plurality of laterally floating elongated reamers,
means for rotating the reamers,
and feed means for urging the reamers toward the bee board whereby those of the reamers aligned sufficiently with holes in the bee board enter and clean the holes and those of the reamers not sufficiently aligned with the holes to start to enter the holes merely spin on the adjacent face of the bee board.

15. The bee board cleaner of claim 13 wherein the positioning means advances the bee board step-by-step and the feed means.

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