United States Patent

Broderick

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[54] **APPARATUS FOR CONTOURING A HONEYCOMB CORE**

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[73] Assignee: **Martin Marietta Corporation,** New York, N.Y.

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[21] Appl. No.: **38,460**

[52] **U.S. Cl.**.....**72/307,** 72/465

[51] **Int. Cl.**.....**B21d 11/00**

[58] **Field of Search**.....72/307, 312, 313, 314, 315, 72/385, 386, 465; 29/163.5 R

[56] **References Cited**

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3,104,694	9/1963	Broderick et al.	72/465
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Primary Examiner—Lowell A. Larson

Attorney—James B. Eisel and Gay Chin

[57] **ABSTRACT**

A reciprocating ram carries a plurality of spaced, downwardly projecting prongs which enter a transversely aligned row of honeycomb core cells, deforming the cells from one end to cause the honeycomb core to curve in concave fashion toward the prongs. The honeycomb core billet is released when the prongs are fully inserted to allow self-realignment prior to incrementing the billet to bring the next alternate row of cells into prong receiving position. Pawl and ratchet feed means and a releasable hold down bar operate cyclicly to facilitate production of the curvature.

14 Claims, 9 Drawing Figures

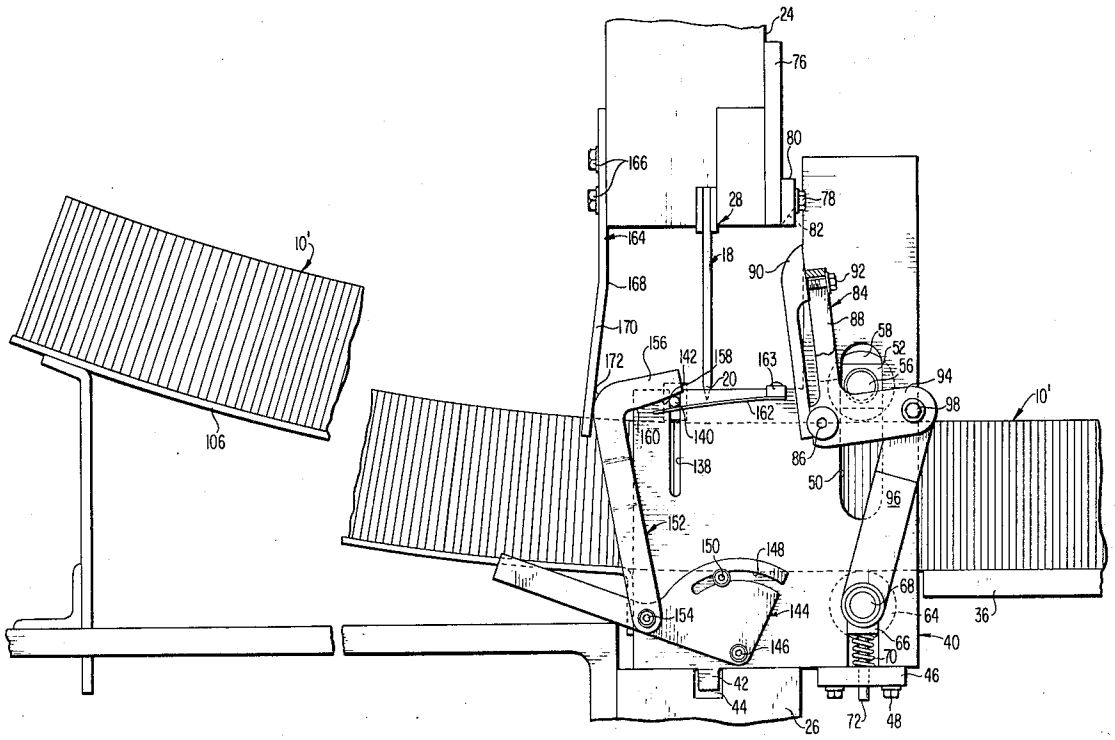


FIG. 6

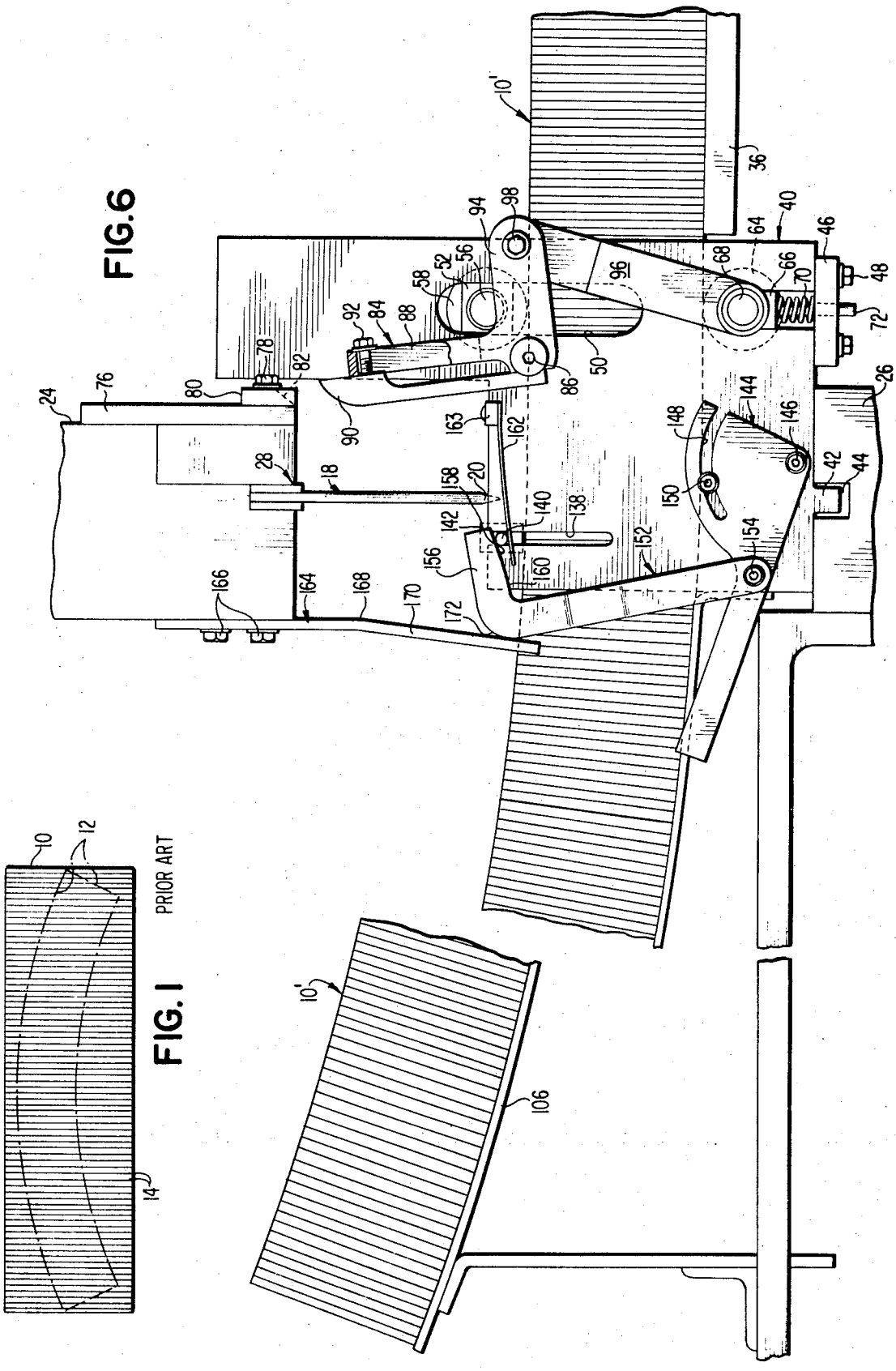


FIG. 1 PRIOR ART

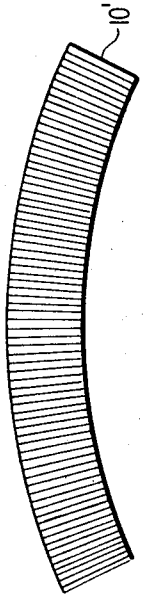


FIG. 2

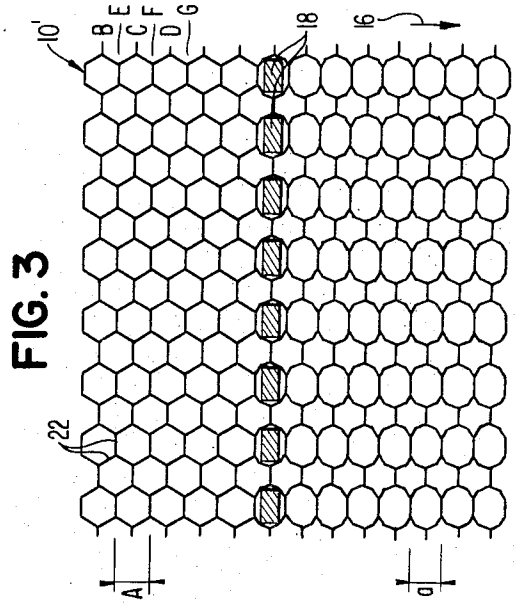


FIG. 3

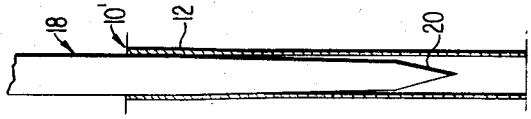


FIG. 4

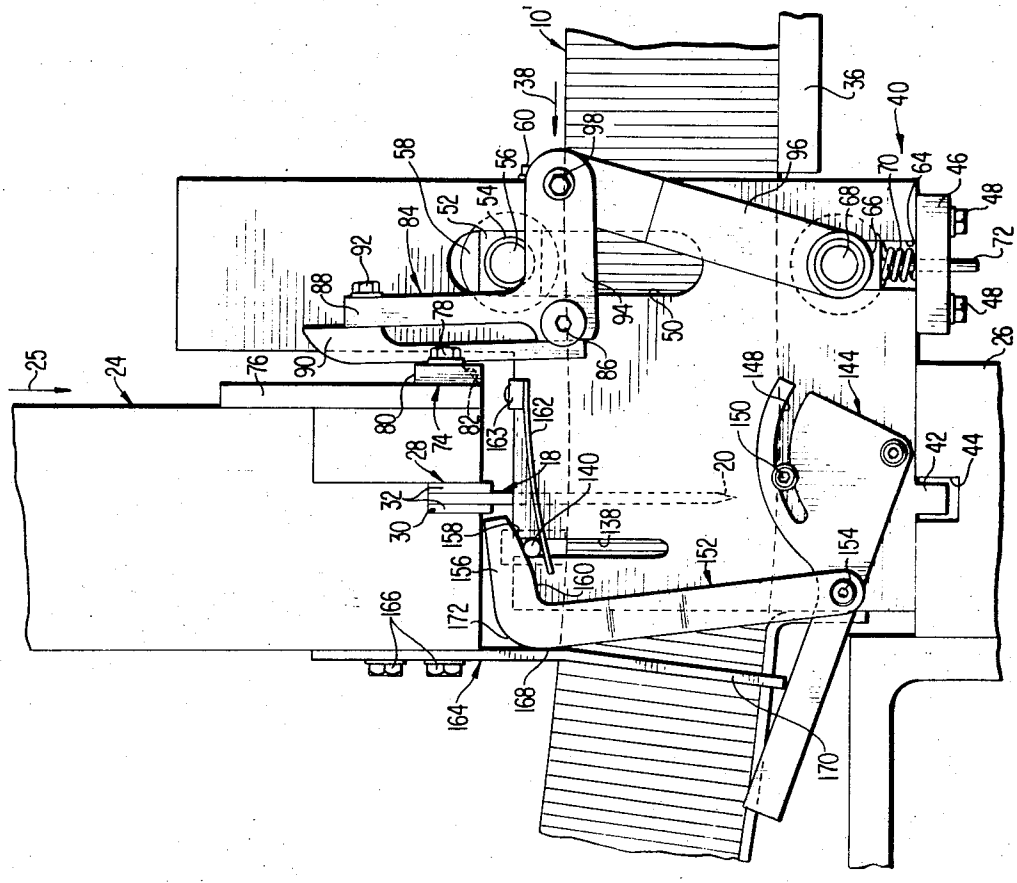


FIG. 5

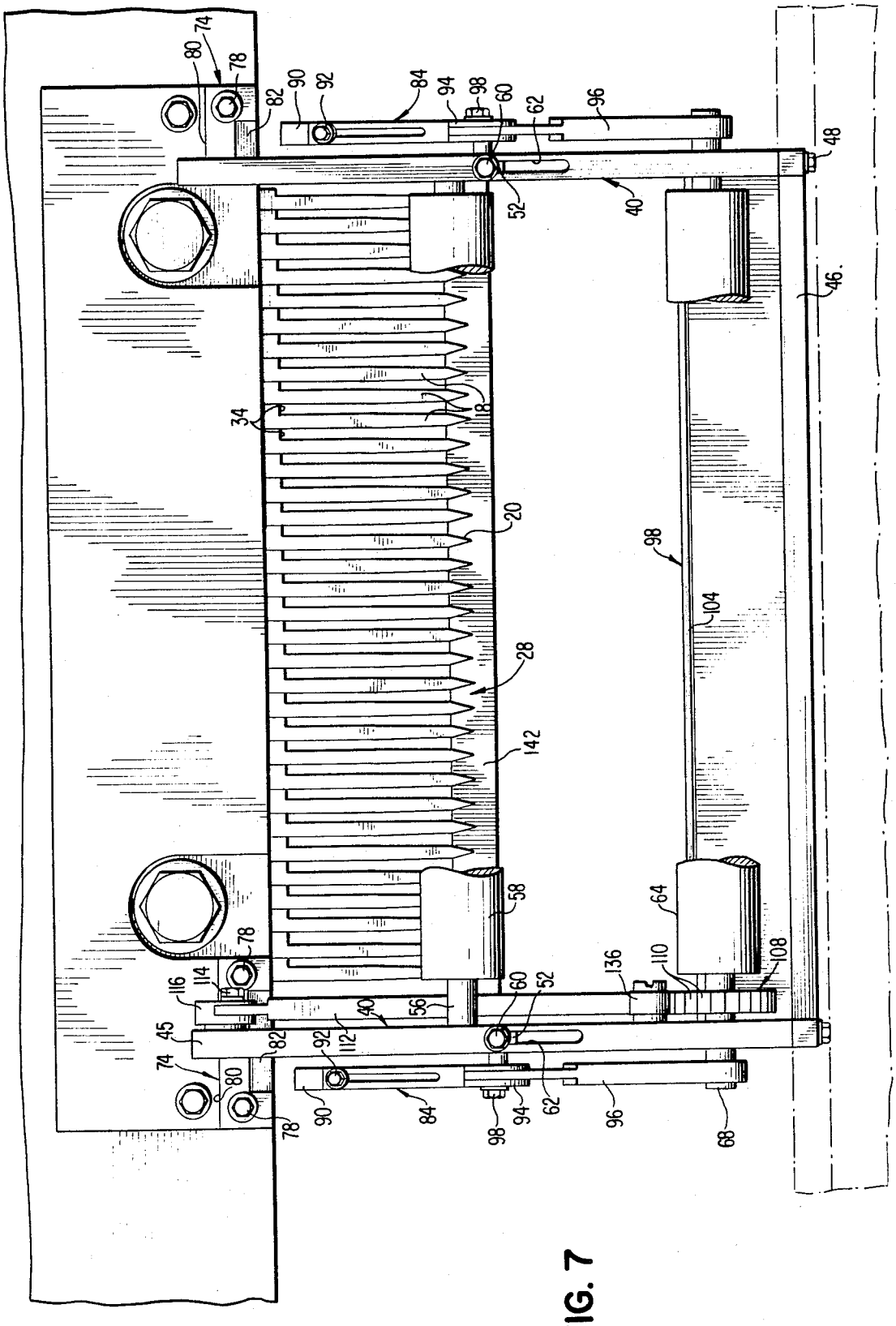

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FIG. 7

FIG. 9

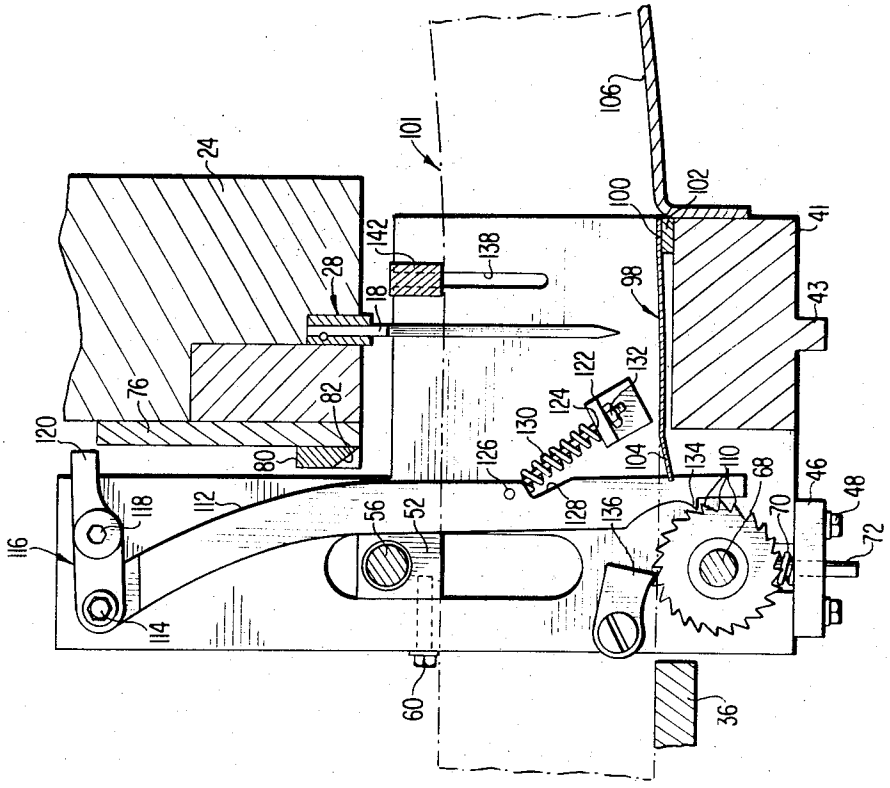
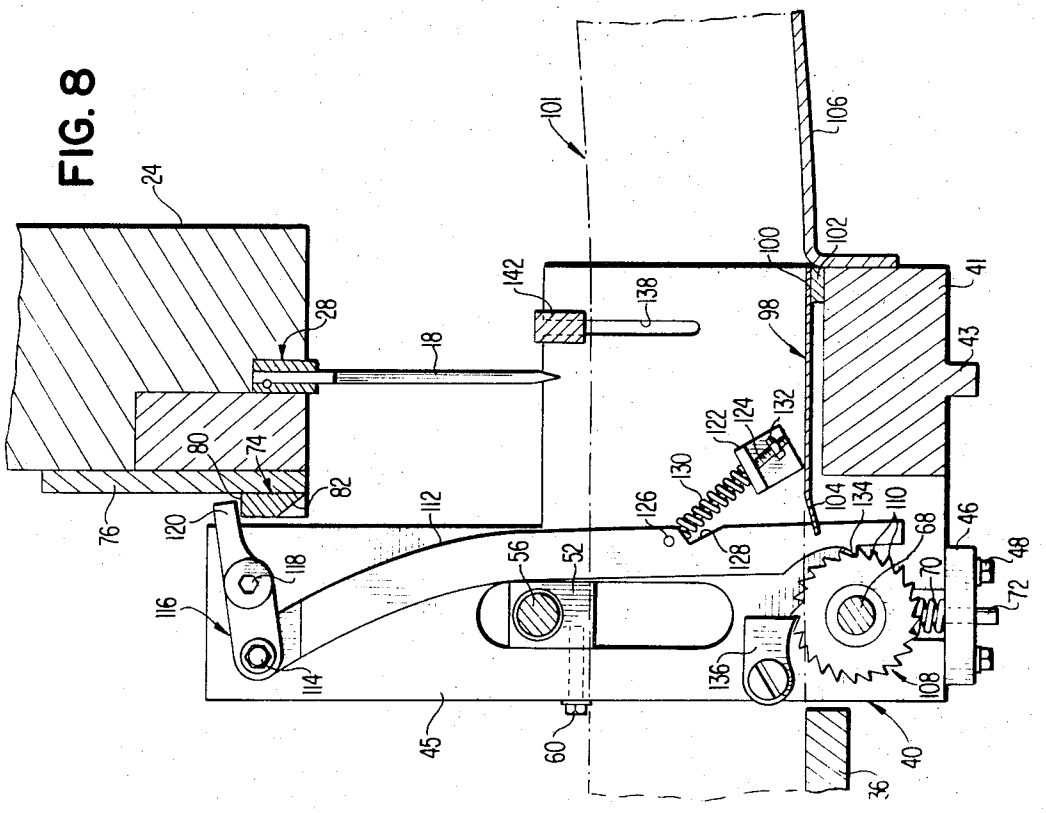

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FIG. 8


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APPARATUS FOR CONTOURING A HONEYCOMB CORE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of contouring honeycomb core material into a desired curvature, and more particularly to an improved apparatus for self-feeding of a honeycomb core billet while insuring alignment between the reciprocating prongs causing deformation of the cells and the individual cells receiving the same.

2. Description of the Prior Art

Lightweight, honeycomb core material is widely used in industry because of its high strength to weight ratio and is especially useful in the manufacture of aircraft. The honeycomb core material is manufactured by several procedures which create rows of regular cells, generally hexagonal in cross section or of modified hexagonal cross section.

In order to modify the shape of the honeycomb core billet so that the honeycomb may be useful where a curved or compound contour is required, attempts have been made to employ pressure, heat, or a combination of the two in conjunction with a hydraulic press and die of appropriate configuration to cause the billet to take a definite set conforming to the configuration of the die. Alternatively, the honeycomb material has been filled with a liquid capable of solidification to define a block which is then milled into the desired configuration, after which, the solidified material is again melted to remove the same.

The problems associated with these methods of contouring either leave a crushed portion to the billet resulting in a localized area which is relatively weak or, alternatively, the axis of the honeycomb cell is, for at least portions of the billet, at some angle other than at right angles to the direction of applied force which also greatly weakens the structural unit.

Prior U.S. Pat. Nos. 3,104,694 and 3,225,582, of which I was a co-inventor, cover a unique method for forming contours in billets of honeycomb core material involving the steps of inserting a cell deforming tool into each cell of a row of cells until the tines of the tool have modified to a desired degree the adjacent cell to a limited extent from one side only of the honeycomb core. The tools are then removed and, in a continuing sequence, modify other alternate rows of cells of the core in a pre-established order. The effect is to foreshorten one side of the billet with respect to the other and to thereby conform the core to a desired curved contour.

SUMMARY OF THE INVENTION

The present invention is directed to an apparatus in the form of a reciprocating ram or the like carrying a plurality of spaced, tapered prongs, which are rectangular in cross section and which enter rows of aligned cells and deform the cell walls for a distance less than the full depth of the honeycomb core cell and means responsive to removal of the prongs during the upstroke of the ram to automatically increment the honeycomb billet along a path at right angles to the plane of the prongs.

The feed path for the billet is defined by an upper idler roller rotatable about a fixed axis while a bottom feed roller is spring biased against the bottom of the honeycomb billet but released therefrom at the bottom of the ram stroke to allow the honeycomb billet to reconform to the inserted prongs, insuring alignment of the next alternately succeeding row of cells with the prongs on the next downstroke.

The bottom feed roller carries a ratchet wheel which is acted upon by a spring biased pawl reciprocated during the removal of the prongs as the ram moves upwardly, thus incrementing the honeycomb to a position in which alternate rows of cells are always aligned with the transversely extending row of prongs carried by the ram during subsequent downstroke. A hold down bar overlies the top of the honeycomb billet on the side of the prongs opposite from that of the idler roller and resists upward movement of the billet during removal of the core cell deforming prongs.

A cantilever mounted plate supports that portion of the billet lying underneath the reciprocating prongs and bends appropriately, to further induce a concave curvature, primarily caused by deforming the cells inwardly from one side only to a limited cell depth. Oscillating, L-shaped arms contact the hold down bar and pivot to an extent limited by cam plates fixed to the rear side of the reciprocating ram to allow a slight release of the hold down bar after some upward movement of the prongs from the deformed cells. Angularly adjustable sectors pivotably support the L-shaped arms to allow the limited release of the hold down bar for honeycomb billets of various thickness.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a rectangular honeycomb core billet illustrating in dotted lines the useful curved portion of the same when removed by prior art methods;

FIG. 2 is an elevational, side view of the rectangular honeycomb core billet contoured by the improved apparatus of the present invention;

FIG. 3 is a top plan view of a portion of the billet employed with the apparatus of the present invention, illustrating the deforming effect of the inserted prongs;

FIG. 4 is a sectional view of one honeycomb cell with one of the deforming prongs of the apparatus of the present invention inserted therein;

FIG. 5 is a side elevational view of one embodiment of the improved honeycomb core billet contouring apparatus of the present invention with the prongs inserted within the core cells;

FIG. 6 is a similar side elevational view to that of FIG. 5 with the deforming prongs removed from the underlying honeycomb core billet;

FIG. 7 is a front elevational view, partially in section, of the apparatus shown in FIGS. 5 and 6;

FIG. 8 is an elevational view, in section, of a portion of the apparatus illustrated in FIGS. 5 through 7, with the prongs fully withdrawn from the honeycomb core cells;

FIG. 9 is a similar view to FIG. 8 with the ram at its lowermost position with the prongs inserted within a row of honeycomb cells to a partial depth thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, curvature is provided to a honeycomb billet **10** or the like of rectangular configuration, by machining the same along the dotted lines **12** to thus provide the desired curvature to the same. It is readily apparent that, instead of the honeycomb core cells **14** extending generally perpendicular to their outer surfaces and thus constituting a structurally sound assembly, this effect occurs only at the center of the curved billet, a decided deficiency. Further, all of the material exterior of the dotted lines **12** becomes scrap greatly increasing the cost of the finished curved billet.

Reference to FIG. 2 illustrates a modified billet **10'** given a decided curvature identical to that of billet **10** of the prior art, but necessitating only an original rectangular billet of a thickness corresponding to that of the finished product.

In similar fashion to my previous U.S. Pat. Nos. 3,225,582 and 3,104,694, this is achieved by deforming alternate rows of the honeycomb core cells to a partial depth, from a given side, as illustrated in FIGS. **3** and **4**. In this respect, the honeycomb core **10'** is formed of alternately aligned rows of honeycomb core cells, such as rows B, C, D, etc., in the direction of feed of the material illustrated by arrow **16**, these rows being separated by laterally offset parallel rows of honeycomb core cells, E, F, and G.

The invention is directed to an apparatus for stepping the honeycomb core billet **10'** in a longitudinal direction, arrow **16**, by inserting cell deforming prongs within alternate rows thereof.

Reference to FIG. 3 illustrates the use of a plurality of prongs **18** which are rectangular in cross section, and taper inwardly from the top to the bottom. Prongs **18** have pointed tips **20**, FIG. **4** and having dimensions such, that the individual prongs tend to distort the side walls of the individual cells **22** to cause alternate rows of cells to change from pure hexagonal cross section, into a modified form more approximating a circle. In achieving this deformation, it is readily apparent when viewing FIG. **3**, that cell spacing in the direction of movement of the billet through the machine, is appreciably altered. Thus, the axial width in the direction of core movement at the top or entry end of the prongs **18** is reduced from an initial dimension A to a new dimension *a*, which effect, since it occurs only to one side of the honeycomb core is to produce a concave curvature to the honeycomb core billet on the deformed side thereof.

The machine or apparatus for automatically curving a preformed honeycomb core having cells which are hexagonal in cross section is illustrated in FIG. **5**. The machine is a modified brake or reciprocating power punch of standard construction and mechanically actuated, to cause a ram **24** to reciprocate in the direction of arrow **25** toward and away from the stationary base **26**. In the illustrated embodiment of the invention, a standard four foot power brake is modified to the extent that the reciprocating ram **24** has depending therefrom a comb-like, prong assembly **28** which is best illustrated in FIG. **7**. The ram is provided with a rectangular recess **30** which receives a pair of plates **32** which sandwich the individual tapered and pointed prongs **18** which in turn are notched at **34** to provide the necessary spacing therebetween; the lateral spacing of the same and number being of course dependent upon the cell configuration of the honeycomb core billets **10'** being processed by the machine.

The prong assembly **28** may be readily coupled to and removed from the reciprocating ram **20** by bolts or the like. It is noted, that with the ram **24** in its lower or bottom stroke position, the tapered tips **20** of the individual prongs **18** do not quite reach a plane defined by the top of table or feed support surface **36** at the feed end of the machine. In this respect, FIG. **5**, the honeycomb core billet **10'** is fed inwardly from right to left in the direction of arrow **38**. Coupled to base **26** are a pair of upstanding, spaced side plates **40** which are located on the base **26** by tabs **42** which are positioned within transversely extending grooves **44**. At the forward end of the machine, a transverse plate **46** is coupled to respective side plates **40** by screws **48** to aid in maintaining the side plates **40** in proper, vertically spaced position.

Side plates **40** carry vertically extending, elongated slots **50** which receive slidable bearing blocks **52**, in turn carrying bearings **54** which support respective ends of idler roller mounting shaft **56**. Thus, the idler roller **58** lies across and above the incoming billet **10'** to be contoured. The billets **10'** may be of various heights since slot **50** permits vertical adjustment of the upper idler roller **58**. In this respect locking screws **60** extend through elongated slots **62**, FIG. **7**, and are threadably received by bearing blocks **52** for locking the idler roller **58** at various positions to define the gap between idler roller **58** and the powered drive roller **64** which underlies billet **10'**.

The side plates **40** are also slotted at **64** to receive bearing blocks **66** which in turn support the drive roller shaft **68**. In this case, the bearing blocks **66** are biased upwardly by coil springs **70** mounted on guide pins **72**. The lower end of the coil springs **70** bear upon the transverse plate **46**. A transversely extending cam plate **74** is coupled to the front surface extension **76** of the reciprocating ram **24** by means of mounting screws **78**, the cam plate **74** having a flat upper surface **80** and a tapered bottom surface **82**. Further, each of the side plates **40** carry an L-shaped lever **84** by pivotably coupling the same on a mounting pin **86** carried by the plate **40** just to the rear of slot **50**. The L-shaped lever **84** is provided with a vertical portion **88** to which is coupled an adjustable cam follower **90** by mounting screw **92**, while the horizontal leg **94** of the L-shaped lever has pivotably coupled thereto a second lever or arm **96** via pin **98**. The lower end of lever **96** is in turn pivotably carried by the lower roller shaft **68**. With this arrangement, as the ram **24** moves downwardly to its lowermost position as seen in FIG. **5**, the cam follower **90** contacts the tapered or inclined bottom surface **82** of cam plate **74** causing the L-shaped lever **84** to pivot clockwise, in turn driving shaft **68** downwardly against the bias of spring **64** and moving the bottom roller **64** out of contact with the bottom of billet **10'**. Since at this time, the prongs **18** are fully inserted within their respective cells **22** and having completed distortion of the same, the trailing end of the billet **10'** from the prongs **18** outwardly is free to relax, and thus inherently align the next succeeding transverse row of

cells in an optimum position, for receiving the deforming prongs 18 upon step-wise feeding of billet 10' forward a distance equal to the dimension A, FIG. 3.

This automatic release of the trailing end of the billet 10' and allowing it to seek a relaxed condition prior to incremental feeding of the same to a position of alignment of the next alternate row of cells with the now removed row of prongs 18, constitutes an important aspect of the present invention since, honeycomb core billets are not manufactured with great precision insofar as the spacing and dimensions of the individual core cells 22 are concerned. Further since the tapered ends 20 of the individual prongs 18 may initially enter the cells 22 with some longitudinal or transverse misalignment with the true center of its cell, the cells are automatically realigned during penetration of the prongs within the same.

Another important aspect of the invention resides in the means for supporting that portion of the billet 10' which is in position to receive the descending prongs 18. In this respect, the rectangular block 40 which is keyed at 42 and which spaces and supports side plates 40 along with bar 46, carries at the rear end thereof, in cantilever fashion, a thin bent metal plate 98. The rear end 100 of plate 98 is fixed to the top of block 40 by an intervening mounting strip 102 and its leading edge 104 is bent downwardly or inclined so as to readily receive the leading end of the billet 10' once it leaves table 36 and enters the gap between rollers 58 and 64. With the plate 98 being cantilever mounted and being spaced slightly above the upper surface of block 41 in the general plane of the reciprocating prongs 18, during depression of the prongs within the individual cells 22 and enlargement of the same, a relatively large compressive force is exerted upon this localized portion of the billet 10'. This causes the cantilever support plate 98 to bend in concave fashion which further aids in contouring the billet itself in a manner such that the leading end curves upwardly on curved rear support plate 106, FIG. 9. The curvature which the cantilever support plate 98 takes in response to insertion of the prongs 18 in the honeycomb core billet 10' is illustrated in dotted lines in FIG. 9.

Another important aspect of the invention resides in the means for automatically incrementing the billet in the feed direction of arrow 16 after removal of the prongs 18 from the now deformed row of core cells 22. In this respect, FIGS. 8 and 9 illustrate the means for accomplishing this purpose. The drive roller support shaft 68 carries a ratchet drive wheel 108 affixed thereto, the periphery being provided with ratchet teeth 110. The wheel 108 is mounted on shaft 68 inside of left hand support plate 40, FIG. 7, between the support plate 40 and the left hand end of the drive roller 64. The left hand plate 40 on the inside thereof further carries on extension portion 45, a pivotable pawl 112, the end of which is pivotably coupled to a cam follower or lever 116 by a coupling bolt 114. In turn, lever 116 is pivotably mounted to plate extension 45 intermediate of its ends by a mounting pin 118, and the extreme tip end 120 of the lever is positioned in the path of cam plate 74 such that the upper edge 80 of cam plate 74 impacts the tip 120 of lever 116 pivoting the same counter-clockwise, FIGS. 8, 9 to move pawl 112 downwardly.

Bracket 122, fixed to the inside surface of left hand plate 40, FIG. 7, is L-shaped and carries a rod 124, the upper end 126 of which is pivotably coupled to pawl 122 intermediate of its ends. The pawl 112 is notched at 128 and a coil spring 130 surrounding rod 128 has one end impinging the pawl at notch 128 and the other end abutting bracket 122. Rod 124 is threaded at its lower end and receives a nut 132 such that the compression of the spring may be adjusted to some extent. The spring 130 therefore tends to bias the pawl projection 135 into contact with one of the teeth 110 of the ratchet wheel 108 and to bias lever 116 clockwise. A gravity operated pivotable stop 136 prevents retrograde movement of the drive roller 60.

In operation of the feed mechanism, during the major portion of the up stroke of the ram 24, the billet 10' remains motionless. However, when, as illustrated in FIG. 8, the top 80 of the cam plate 74 impacts the tip end 120 of pivotable lever 116, this causes rotation of lever 116 counter-clockwise and drives pawl 112 against the bias of coil spring 130 which rotates the ratchet wheel 108 since projection 134 impinges against one of the teeth 110 to drive the wheel clockwise, FIG. 8. The ram 24 is now at the top of its stroke, and during the next stroke, the spring 130 returns the pawl 112 and lever 116 to the position shown in FIG. 9. Meanwhile, the gravity operated stop 136, which rides over one of the teeth 110 while the projection 134 drives another clockwise, falls into the gap between that tooth and the succeeding tooth and prevents retrograde movement of the roller 64.

It is noted, that during the incremental movement or advancement of the billet 10' a distance A which represents the distance between alternate rows of core cells, the lower driven roller 64 is biased upwardly by coil springs 70 sandwiching the billet between the idler roller 58 and the driven roller 64 so as to accurately insure frictional advancement of the billet between the rollers. The diameter of the ratchet wheel 108, the diameter of the drive roller 64 and the extent of reciprocation of pawl 112 are so set as to increment the billet 10' the required distance A for alignment of the spaced prongs 18 with the center line of the next succeeding alternate row of cells.

Another aspect of the present invention is directed to the means for insuring that the prongs 118 may be readily removed from the deformed cells 22 during the upstroke of the ram 24 without further deformation to the cells, and at the same time provide minimum resistance to the incremental movement of the billet 10' during automatic feeding of the same in response to raising of the ram. In this respect, the side plates 40 are further slotted at 138, rearwardly of slots 50, so as to receive support pins 140 which extend outwardly from the ends of rectangular hold down bar 142 which lies across and above the billet 10' at the exit end of the machine. Further, the hold down bar 142 is just to the rear of the reciprocating deforming prongs 18 and extends completely across the top of billet 10' with its bottom surface generally planar with the bottom of adjustably fixed idler roller 58.

In order to facilitate removal of pins 18 from the deformed core cells 22 during upward movement of ram 24, it is important that the hold down bar 142 bear tightly upon the top of the billet 10' adjacent to the

point of removal of prongs 18. However, it is equally as important to allow release of the hold down bar when the prongs 18 are fully removed so as not to interfere with the incremental feed movement of the same billet. In this respect, the plates 40 have adjustably mounted thereon a sector shaped member or plate 144 pivotably supported via mounting screw 146. Each sector plate 144 carries an arcuate slot 148 which receives an adjustment screw 150 which in turn is threadably received by plate 40. An L-shaped hold down lever 152 has one end pivotably coupled to adjustable sector plate 144 by a pin 154, while the right angle extension 156 of the same defines a curved cam surface 158 at its outer end and a generally flattened inner surface 160 adjacent thereto. The surfaces 158 and 160 ride on the hold down bar pin 140 which in turn is spring biased by either a coil spring, or, in this case, by a cantilever spring 162 which is fixed to plate 40 by mounting 163 and exerts a force tending to move the hold down bar away from billet 10', the force being resisted by the L-shaped lever 152 and in particular surfaces 158 and 160.

On the rear of the ram 24, there is fixed thereto an angled cam plate or strip 164 by means of mounting screws 166, the strip 164 being angled at 168 such that portion 170 at the outer end is inclined from the vertical. The variable effect of the hold down bar may be readily seen by contrasting the positions of the elements relating to the same in FIGS. 5 and 6. The bent camming strip 164 is adapted to ride on the curved edge 172 of the L-shaped lever 152 in such a manner, that as the ram descends from the position shown in FIG. 6 to the position of FIG. 5, the lever 152 rides on the inclined portion 170 of strip 165 causing it to rotate clockwise which in turn causes the curved camming surface 158 to force mounting pin 140 and the hold down bar downwardly in the direction of arrow 174 against the bias of the cantilever spring 162 during descent of the same. The pressing of the hold down bar 142 against the top of billet 10' enhances the contouring of the billet which is principally the result of cell deformation by the individual prongs 18. In this respect, reference to FIGS. 8 and 9 further illustrates the fact that the hold down bar 142 overlies the curved flexible support plate 98 just in front of its cantilever mount. When the prongs 18 reach their fully inserted position within the individual cores 22, the curved side edge 172 of lever 152 reaches bend 168 of camming strip 164 and for the remaining portion of the down stroke, lever 152 ceases to rotate clockwise about pivot pin 154. However, contact between strip 168 and lever 152 maintains the hold down in rigid position against the top of billet 10' such that during the next upstroke of ram 24 and removal of the prongs 18, the force required to physically detach the prongs 18 from the now deformed cells 22 is fully resisted by the hold down bar 142 which is restrained momentarily from moving upward in slot 138 due to the presence of the L-shaped lever 152. However, each cantilever spring 162 forces mounting pins 142 to move upwardly within slot 138 as the ram 24 proceeds towards top dead center causing the levers 152 to pivot counterclockwise, with the curved edge 172 riding on the inclined portion 170 of control strip 164. With the ram 24 at top stroke position there is no physical restraint by hold down bar 142 on the contoured portion of billet 10', thus facilitating incremental feeding of the same by operation of pawl and ratchet means 112–108.

Because the machine is adapted to receive billets of various thicknesses or heights, sector plates 144 may be readily adjusted to control the position of arm 152 with respect to the camming or operating strip 164 to insure that the correct action takes place for billet 10' of various thickness. Loosening of screws 150 allow each sector plate 144 to pivot about pin 146. While, the biasing means comprises a cantilever spring for illustrative purposes only, it is obvious that the biasing means acting on the hold down bar may take any appropriate form, such as a coil spring or the like.

What is claimed is:

1. A honeycomb core billet contouring machine comprising: means for positioning a honeycomb core billet in the path of movement of a plurality of spaced prongs, means for causing said prongs to enter an aligned row of cells and radially expand the cells for a distance less than their full depth, said prongs being tapered over a substantial part of their inserted portion, and means for incrementing said billet along a path at right angles to the plane of said prongs to bring the next alternate row of cells into prong receiving position.

2. The machine as claimed in claim 1 further comprising: means responsive to the removal of said prongs from said row of cells for automatically effecting incrementing of said billet.

3. The machine as claimed in claim 1 wherein said plurality of spaced prongs are carried by a reciprocating ram, and said means for effecting said incremental feed comprise a drive roller mounted for rotation about its axis and in peripheral contact with said billet, a ratchet wheel operatively coupled to said drive roller, and a pawl member, said incremental feed means being responsive to removal of said prongs from said honeycomb cell for incrementing said wheel.

4. A machine as claimed in claim 1 further comprising: a drive roller in contact with said billet, an idler roller on the side of said billet opposite said drive roller, means for biasing one of said rollers in contact with said honeycomb billet, and means responsive to penetration of said prongs within said honeycomb core cells for releasing said biased roller to allow relaxation of the non-deformed portion of said honeycomb to insure subsequent alignment of the next succeeding alternate row of honeycomb core cells with said deforming prongs subsequent to incrementing of the billet.

5. The machine as claimed in claim 4 wherein said reciprocating ram carries a first cam, and said machine further includes means for supporting an L-shaped cam follower in the path of movement of said first cam, and an arm pivotably coupled to said L-shaped cam follower and to said biased roller for effecting movement of said roller away from said billet when said ram moves toward bottom stroke position and said cam strikes said cam follower.

6. The machine as claimed in claim 3 further comprising: an idler roller on the side of said billet opposite said drive roller, means for biasing said drive roller in contact with said honeycomb billet, and means responsive to penetration of said prongs within said honeycomb core cells for releasing said biased drive roller to allow relaxation of the non-deformed portion

of said honeycomb to insure subsequent alignment of the next succeeding alternate row of honeycomb core cells with said deforming prongs subsequent to removal of said prongs and incrementing of the billet.

7. The machine as claimed in claim 6 wherein said reciprocating ram carries a first cam and said machine further includes means for supporting an L-shaped cam follower in the path of movement of said first cam, and an arm pivotably coupled to said L-shaped cam follower and to said biased drive roller for effecting movement of said roller away from said billet when said ram moves toward bottom stroke position and said cam strikes said cam follower.

8. The machine as claimed in claim 1 further comprising: a hold down bar extending transversely across the top of said billet and adjacent to the path of said reciprocating prongs, biasing means tending to move said hold down bar away from said billet, and means responsive to movement of said ram toward the bottom of its stroke for locking said hold down bar rigidly against the top of said billet against said biasing means.

9. The machine as claimed in claim 8 wherein said ram includes at least one hold down cam rigidly coupled thereto having a vertical intermediate portion and an inclined terminal portion, and said machine further includes a pivotable L-shaped cam follower for each cam, said cam follower having a cam surface contacting said hold down bar whereby during initial descent of said ram, said inclined portion of said hold down cam causes said cam follower to variably increase the compressive force acting on said hold down bar while, during the final descent of said ram, the bar is maintained in relatively fixed position due to contact between said cam follower and the vertical intermediate portion of said hold down cam.

10. The machine as claimed in claim 9 wherein a pair of side plates have vertically elongated slots for adjustably positioning one of said rollers to allow honeycomb billet material of various thicknesses to be inserted between said rollers, and said machine further comprises a sector shaped plate positioned on each side plate and means for pivotably coupling each hold down bar cam follower to a respective adjustable sector plate for facilitating force application and removal of said hold down bar on said billet material for billets of various thicknesses.

11. The machine as claimed in claim 1 further comprising a deflectable spring metal plate underlying said reciprocating prongs to facilitate concave curving of said billet toward said prongs.

12. A machine for contouring honeycomb core billet comprising:

a. a row of prongs spaced to register with the cells in each alternate row of the honeycomb billet;

b. reciprocating means for inserting and withdrawing said prongs into and from the cells;

c. said prongs having, along at least a portion of their length, a cross section such that when said prongs are inserted into the cells they deform the walls of the cells for a distance less than the full depth of the cells;

d. means for incrementally advancing the billet past said row of prongs to align successive alternate rows of cells with said row of prongs on successive down strokes of said prongs, said means including means for gripping said billet; and

e. means for repetitively releasing said gripping means while said prongs are inserted in the cells to permit adjustment of the relative alignment of the billet with said row of prongs.

13. The machine of claim 12 further including means for intermittently clamping the billet against upward motion when said prongs are being withdrawn.

14. The machine of claim 12 in which said prongs are of tapered configuration.

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