



(86) Date de dépôt PCT/PCT Filing Date: 2001/10/12

(87) Date publication PCT/PCT Publication Date: 2003/04/24

(45) Date de délivrance/Issue Date: 2008/08/26

(85) Entrée phase nationale/National Entry: 2004/02/27

(86) N° demande PCT/PCT Application No.: US 2001/042723

(87) N° publication PCT/PCT Publication No.: 2003/033225

(51) Cl.Int./Int.Cl. *B23Q 5/56* (2006.01),
B23D 47/04 (2006.01), *B23Q 3/18* (2006.01),
B27B 29/00 (2006.01), *B27B 31/00* (2006.01),
B27C 5/04 (2006.01), *B27C 5/06* (2006.01),
B27G 19/02 (2006.01), *B27G 21/00* (2006.01)

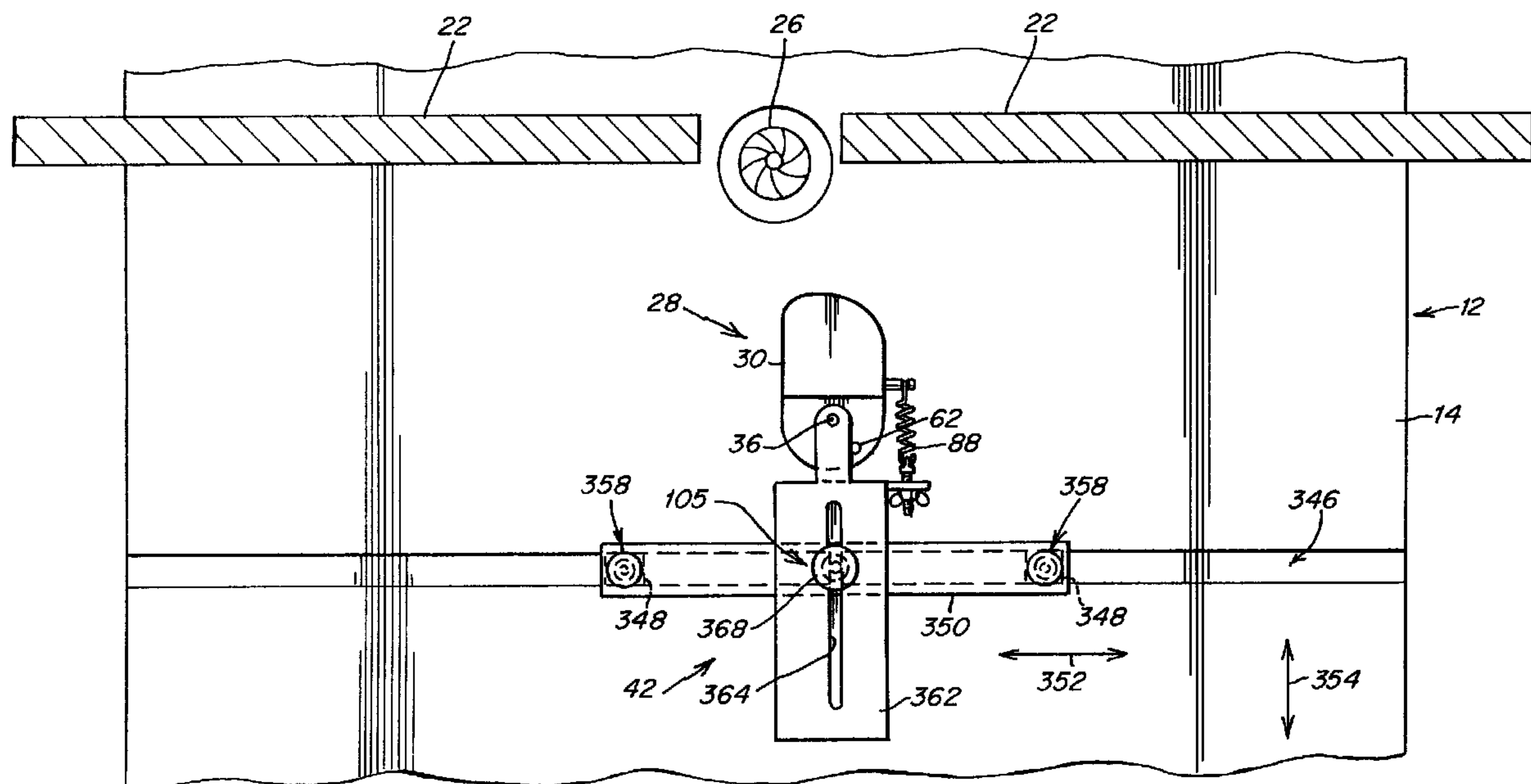
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(54) Titre : DISPOSITIF DE POSITIONNEMENT ET DE RETENUE ANTI-RECU

(54) Title: POSITIONING/HOLD-DOWN AND ANTI-KICKBACK DEVICE



(57) Abrégé/Abstract:

A combination workpiece positioning, hold-down and anti-kickback device for a work table (12) having a fence (22) against which a workpiece (24) is guided, includes a non-rotatable positioning member (28) having an arcuate cam surface (32) at one edge for engaging a side surface of a workpiece on the work table; an adjustment device (38) for moving the positioning member in lengthwise and transverse directions; a pivot (36) pivotally; a spring (88) connected between the positioning member and the adjustment device for biasing the positioning member in a pivot direction into engagement with the side surface of the workpiece; a variable tensioning device (94); a non-rotatable hold-down member (128) having a second arcuate cam surface (132) at one edge for engaging an upper surface of the workpiece; an adjustment device (138); a pivot (136) pivotally mounting the hold-down member to the second adjustment device; a second spring (188) connected between the hold-down member and the adjustment device (194); of a second variable tensioning device for variably adjusting the biasing force of the second spring.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
24 April 2003 (24.04.2003)

PCT

(10) International Publication Number
WO 03/033225 A1

(51) International Patent Classification⁷: **B27B 31/00**

(21) International Application Number: PCT/US01/42723

(22) International Filing Date: 12 October 2001 (12.10.2001)

(25) Filing Language: English

(26) Publication Language: English

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(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

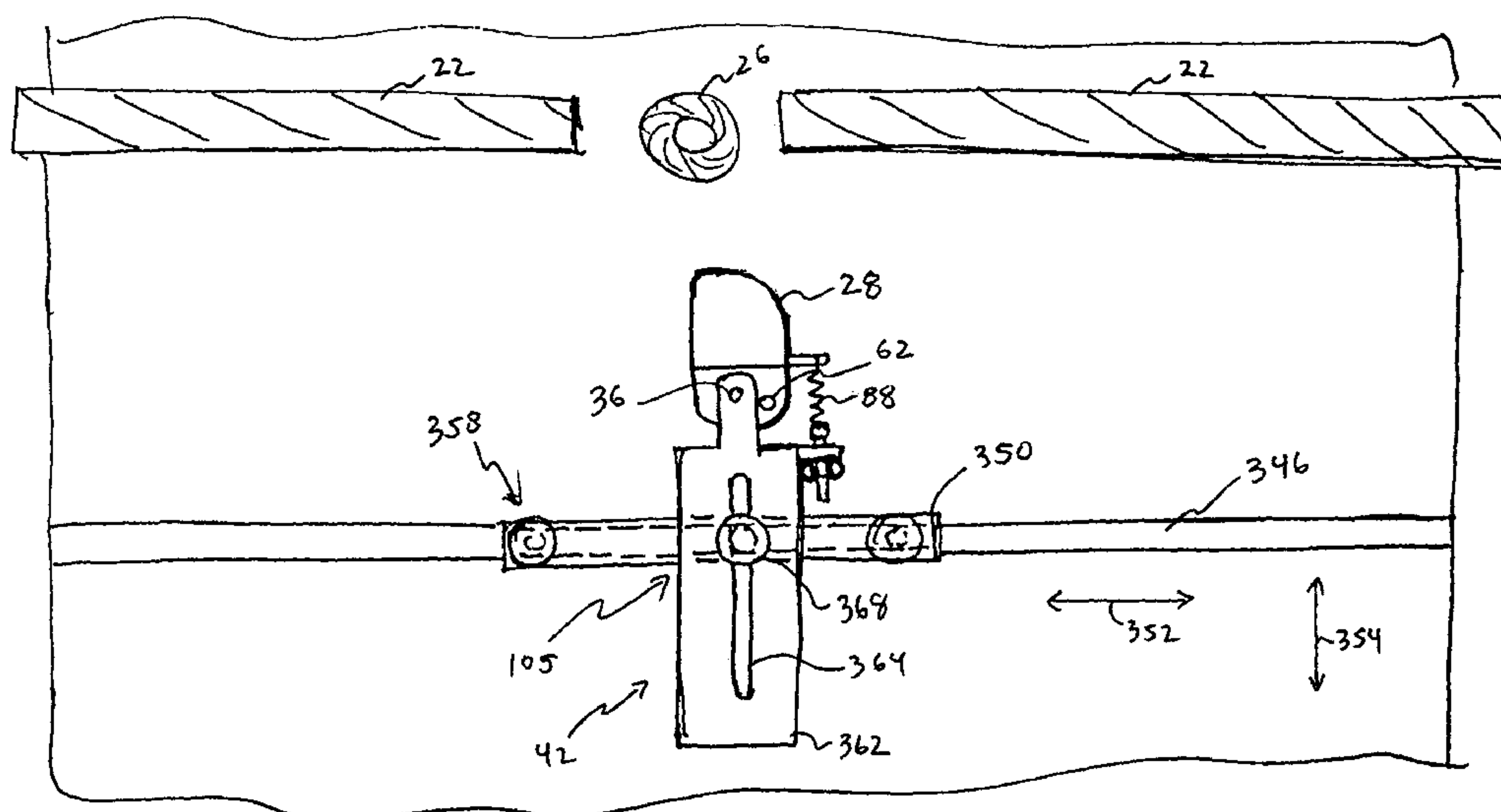
Published:

— with international search report

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: POSITIONING/HOLD-DOWN AND ANTI-KICKBACK DEVICE



(57) Abstract: A combination workpiece positioning, hold-down and anti-kickback device for a work table (12) having a fence (22) against which a workpiece (24) is guided, includes a non-rotatable positioning member (28) having an arcuate cam surface (32) at one edge for engaging a side surface of a workpiece on the work table; an adjustment device (38) for moving the positioning member in lengthwise and transverse directions; a pivot (36) pivotally; a spring (88) connected between the positioning member and the adjustment device for biasing the positioning member in a pivot direction into engagement with the side surface of the workpiece; a variable tensioning device (94); a non-rotatable hold-down member (128) having a second arcuate cam surface (132) at one edge for engaging an upper surface of the workpiece; an adjustment device (138); a pivot (136) pivotally mounting the hold-down member to the second adjustment device; a second spring (188) connected between the hold-down member and the adjustment device (194); of a second variable tensioning device for variably adjusting the biasing force of the second spring.



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POSITIONING/HOLD-DOWN AND ANTI-KICKBACK DEVICE

BACKGROUND INFORMATION

The present invention relates generally to work tables for power tools and the like, and is more particularly directed to a combination workpiece positioning/hold-down and anti-kickback device for a work table.

A work table for a woodworking device, such as a power saw, router and the like, generally includes a horizontal tabletop on which the workpiece is supported and a fence secured to the tabletop and extending in the direction of movement of the workpiece. The workpiece is moved on the upper surface of the tabletop and is guided along the fence, during a cutting or other woodworking action.

Featherboard and other devices are known for pressing the workpiece against the fence during such movement, and various hold-down devices are known for pressing the upper surface of the workpiece to hold the workpiece down on the tabletop. These devices have some of the following desirable features.

One such desirable feature is the ability to prevent kick-back of the workpiece during a woodworking operation.

Another desirable feature is the adjustment of the positioning or hold-down member in lengthwise, transverse and vertical directions relative to the workpiece. Still another desirable feature is the ability to variably adjust the biasing force of the positioning or hold-down member against the workpiece. The applicant is not aware, however, of any devices that include all of these features in a simple arrangement.

OBJECTS AND SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a combination workpiece positioning/hold-down and anti-kickback device that overcomes inherent disadvantages of known workpiece positioning/hold-down devices.

It is another object of the present invention to provide a combination workpiece positioning/hold-down and anti-kickback device that presses the side and/or top surface of the workpiece, while preventing kick-back thereof.

It is still another object of the present invention to provide a combination workpiece positioning/hold-down and anti-kickback device in which the positioning or hold-down member is adjustable in lengthwise, transverse and vertical directions relative to the workpiece.

It is yet another object of the present invention to provide a combination workpiece positioning/hold-down and anti-kickback device in which the biasing force of the positioning or hold-down member against the workpiece is variably adjustable.

In accordance with one form of the present invention, a combination workpiece positioning and anti-kickback device for a work table having a fence against which a workpiece is guided, includes a positioning member having a main body, and an arcuate cam surface at one edge of the main body for

engaging a side surface of a workpiece on the work table; an adjustment device for moving the positioning member relative to the workpiece, the adjustment device including a lengthwise adjustment assembly movable in a lengthwise direction of movement of the workpiece along the work table for adjusting the position of the positioning member in the lengthwise direction, and a transverse adjustment assembly movable in a direction transverse to the lengthwise direction for adjusting the position of the positioning member in the transverse direction, the transverse adjustment assembly being movably connected to the lengthwise adjustment assembly; a lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction; a transverse releasable locking device for releasably locking the transverse adjustment assembly relative to the work table at a desired location in the transverse direction; a pivot which pivotally mounts the positioning member to the adjustment device for pivoting movement; a spring connected between the positioning member and the adjustment device for biasing the positioning member with a biasing force in a first pivot direction about the pivot such that the arcuate cam surface is biased in a direction opposite to a feed direction of the workpiece and into engagement with the side surface of the workpiece; and a variable tensioning device for variably adjusting the biasing force of the spring, wherein the lengthwise adjustment assembly includes at least first and second lengthwise adjustment members, the first lengthwise adjustment member being received within an interior portion of the second lengthwise adjustment member.

In accordance with another form of the present invention, a combination workpiece positioning and anti-kickback device for a work table having a fence against which a workpiece is guided, includes a positioning member having a main body, and an arcuate cam surface at one edge of the main body for engaging a side surface of a workpiece on the work table; an

adjustment device for moving the positioning member relative to the workpiece, the adjustment device including a lengthwise adjustment assembly movable in a lengthwise direction of movement of the workpiece along the work table for adjusting the position of the positioning member in said lengthwise direction, and a transverse adjustment assembly movable in a direction transverse to said lengthwise direction for adjusting the position of the positioning member in the transverse direction, the transverse adjustment assembly being movably connected to the lengthwise adjustment assembly; a lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction; a transverse releasable locking device for releasably locking the transverse adjustment assembly relative to the work table at a desired location in the transverse direction; a pivot which pivotally mounts the positioning member to the adjustment device for pivoting movement; a spring connected between the positioning member and the adjustment device for biasing the positioning member with a biasing force in a first pivot direction about said pivot such that said arcuate cam surface is biased in a direction opposite to a feed direction of said workpiece and into engagement with the side surface of the workpiece; and a variable tensioning device for variably adjusting the biasing force of the spring, wherein the lengthwise adjustment assembly includes a lengthwise adjustment member operatively engaged within a guide track of the work table.

In accordance with another form of the present invention, a combination workpiece hold-down and anti-kickback device for a work table having a fence against which a workpiece is guided, includes a hold-down member having a main body, and an arcuate cam surface at one edge of the main body for engaging an upper surface of a workpiece on the work table; an adjustment device for moving the hold-down member relative to the workpiece, the adjustment device including a lengthwise

adjustment assembly movable in a lengthwise direction of movement of the workpiece along the work table for adjusting the position of the hold-down member in the lengthwise direction, and a vertical adjustment assembly movable in a vertical direction transverse to the lengthwise direction for adjusting the position of the hold-down member in the vertical direction, the vertical adjustment assembly being movably connected to the lengthwise adjustment assembly; a lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction; a vertical releasable locking device for releasably locking the vertical adjustment assembly relative to the work table at a desired location in the vertical direction; a pivot which pivotally mounts the hold-down member to the adjustment device for pivoting movement; a spring connected between the hold-down member and the adjustment device for biasing the hold-down member with a biasing force in a first pivot direction about the pivot such that the arcuate cam surface is biased in a direction opposite to a feed direction of the workpiece and into engagement with the upper surface of the workpiece; and a variable tensioning device for variably adjusting the biasing force of the spring, wherein said vertical adjustment assembly includes a vertical adjustment member operatively coupled to said lengthwise adjustment assembly, said vertical adjustment member including an aperture whose length extends in a direction which is non-parallel with respect to a longitudinal length of the lengthwise adjustment assembly, and a clamping device engaging said vertical adjustment member so as to releasably fix a height of the hold-down member with respect to the work table.

In accordance with another form of the present invention, a combination workpiece positioning, hold-down and anti-kickback device for a work table having a fence against which a workpiece is guided, includes a first positioning member having a main body, and a first arcuate cam surface at

one edge of the main body for engaging a side surface of a
workpiece on the work table; a first adjustment device for
moving the first positioning member relative to the workpiece,
the adjustment device including a first lengthwise adjustment
5 assembly movable in a lengthwise direction of movement of the
workpiece along the work table for adjusting the position of
the positioning member in the lengthwise direction, and a
first transverse adjustment assembly movable in a direction
transverse to the lengthwise direction for adjusting the
10 position of the positioning member in the transverse
direction, the transverse adjustment assembly being movably
connected to the lengthwise adjustment assembly; a first
lengthwise releasable locking device for releasably locking
the lengthwise adjustment assembly relative to the work table
15 at a desired location in the lengthwise direction; a first
transverse releasable locking device for releasably locking
the transverse adjustment assembly relative to the work table
at a desired location in the transverse direction; a first
pivot which pivotally mounts the positioning member to the
20 adjustment device for pivoting movement; a first spring
connected between the positioning member and the adjustment
device for biasing the positioning member with a biasing force
in a first pivot direction about the pivot such that the
arcuate cam surface is biased in a direction opposite to a
25 feed direction of the workpiece into engagement with the side
surface of the workpiece; a first variable tensioning device
for variably adjusting the biasing force of the spring; a
non-rotatable hold-down member having a main body, and a
second arcuate cam surface at one edge of the main body for
30 engaging an upper surface of a workpiece on the work table; a
second adjustment device for moving the hold-down member
relative to the workpiece, the second adjustment device
including a second lengthwise adjustment assembly movable in
the lengthwise direction for adjusting the position of the
35 hold-down member in the lengthwise direction, and a vertical
adjustment assembly movable in a vertical direction transverse
to the lengthwise direction for adjusting the position of the

hold-down member in the vertical direction, the vertical
adjustment assembly being movably connected to the lengthwise
adjustment assembly; a second lengthwise releasable locking
device for releasably locking the second lengthwise adjustment
5 assembly relative to the work table at a desired location in
the lengthwise direction; a vertical releasable locking device
for releasably locking the vertical adjustment assembly
relative to the work table at a desired location in the
vertical direction; a second pivot which pivotally mounts the
10 hold-down member to the second adjustment device for pivoting
movement; a second spring connected between the hold-down
member and the second adjustment device for biasing the
hold-down member with a biasing force in a second pivot
direction about the second pivot such that the second arcuate
15 cam surface is biased in a direction opposite to the feed
direction of the workpiece and into engagement with the upper
surface of the workpiece; and a second variable tensioning
device for variably adjusting the biasing force of the second
spring, wherein the lengthwise adjustment assembly includes at
20 least first and second lengthwise adjustment member, and the
first lengthwise adjustment member being received within an
interior portion of the second lengthwise adjustment member.

In accordance with another form of the present invention
a combination workpiece positioning, hold-down and
25 anti-kickback device for a work table having a fence against
which a workpiece is guided, includes a first positioning
member having a main body, and a first arcuate cam surface at
one edge of the main body for engaging a side surface of a
workpiece on the work table; a first adjustment device for
30 moving the first positioning member relative to the workpiece,
the adjustment device including a first lengthwise adjustment
assembly movable in a lengthwise direction of movement of the
workpiece along the work table for adjusting the position of
the positioning member in said length-wise direction, and a
35 first transverse adjustment assembly movable in a direction
transverse to said lengthwise direction for adjusting the

position of the positioning member in the transverse direction, the transverse adjustment assembly being movably connected to the lengthwise adjustment assembly; a first lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction; a first transverse releasable locking device for releasably locking the transverse adjustment assembly relative to the work table at a desired location in the transverse direction; a first pivot which pivotally mounts the positioning member to the adjustment device for pivoting movement; a first spring connected between the positioning member and the adjustment device for biasing the positioning member with a biasing force in a first pivot direction about said pivot such that said arcuate cam surface is biased in a direction opposite to a feed direction of said workpiece into engagement with the side surface of the workpiece; a first variable tensioning device for variably adjusting the biasing force of the spring; a hold-down member having a main body, and a second arcuate cam surface at one edge of the main body for engaging an upper surface of a workpiece on the work table; a second adjustment device for moving the hold-down member relative to the workpiece, the second adjustment device including a second lengthwise adjustment assembly movable in said lengthwise direction for adjusting the position of the hold-down member in said lengthwise direction, and a vertical adjustment assembly movable in a vertical direction transverse to said lengthwise direction for adjusting the position of the hold-down member in the vertical direction, the vertical adjustment assembly being movably connected to the lengthwise adjustment assembly; a second lengthwise releasable locking device for releasably locking the second lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction; a vertical releasable locking device for releasably locking the vertical adjustment assembly relative to the work table at a desired location in the vertical direction; a second pivot which pivotally mounts the

hold-down member to the second adjustment device for pivoting movement; a second spring connected between the hold-down member and the second adjustment device for biasing the hold-down member with a biasing force in a second pivot direction about said second pivot such that said second arcuate cam surface is biased in a direction opposite to the feed direction of said workpiece and into engagement with the upper surface of the workpiece; and a second variable tensioning device for variably adjusting the biasing force of the second spring, wherein said vertical adjustment assembly includes a vertical adjustment member operatively coupled to said lengthwise adjustment assembly, said vertical adjustment member including an aperture whose length extends in a direction which is non-parallel with respect to a longitudinal length of the second lengthwise adjustment assembly, and a clamping device engaging said vertical adjustment member so as to releasably fix a height of the hold-down member with respect to the work table.

In accordance with another form of the present invention, a combination workpiece positioning, hold-down and anti-kickback device for a work table having a fence against which a workpiece is guided, includes a first positioning member having a main body, and a first arcuate cam surface at one edge of the main body for engaging a side surface of a workpiece on the work table; a first adjustment device for moving the first positioning member relative to the workpiece, the adjustment device including a first lengthwise adjustment assembly movable in a lengthwise direction of movement of the workpiece along the work table for adjusting the position of the positioning member in said length-wise direction, and a first transverse adjustment assembly movable in a direction transverse to said lengthwise direction for adjusting the position of the positioning member in the transverse direction, the transverse adjustment assembly being movably connected to the lengthwise adjustment assembly; a first lengthwise releasable locking device for releasably locking

the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction; a first transverse releasable locking device for releasably locking the transverse adjustment assembly relative to the work table at a desired location in the transverse direction; a first pivot which pivotally mounts the positioning member to the adjustment device for pivoting movement; a first spring connected between the positioning member and the adjustment device for biasing the positioning member with a biasing force in a first pivot direction about said pivot such that said arcuate cam surface is biased in a direction opposite to a feed direction of said workpiece into engagement with the side surface of the workpiece; a first variable tensioning device for variably adjusting the biasing force of the spring; a hold-down member having a main body, and a second arcuate cam surface at one edge of the main body for engaging an upper surface of a workpiece on the work table; a second adjustment device for moving the hold-down member relative to the workpiece, the second adjustment device including a second lengthwise adjustment assembly movable in said lengthwise direction for adjusting the position of the hold-down member in said lengthwise direction, and a vertical adjustment assembly movable in a vertical direction transverse to said lengthwise direction for adjusting the position of the hold-down member in the vertical direction, the vertical adjustment assembly being movably connected to the lengthwise adjustment assembly; a second lengthwise releasable locking device for releasably locking the second lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction; a vertical releasable locking device for releasably locking the vertical adjustment assembly relative to the work table at a desired location in the vertical direction; a second pivot which pivotally mounts the hold-down member to the second adjustment device for pivoting movement; a second spring connected between the hold-down member and the second adjustment device for biasing the hold-down member with a biasing force in a second pivot

direction about said second pivot such that said second
arcuate cam surface is biased in a direction opposite to the
feed direction of said workpiece and into engagement with the
upper surface of the workpiece; and a second variable
5 tensioning device for variably adjusting the biasing force of
the second spring wherein said first lengthwise adjustment
assembly includes a lengthwise adjustment member operatively
engaged within a guide track of the work table, wherein said
first lengthwise adjustment assembly includes a lengthwise
10 adjustment member operatively engaged within a guide track of
the work table.

The above and other objects, features and advantages of
the present invention will become readily apparent from the
following detailed description of the preferred embodiments
15 thereof, which is to be read in connection with the
accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of the combination workpiece
positioning/hold-down and anti-kickback device according to
20 the present invention;

Fig. 2 is a front elevational view, partly in section, of
the combination workpiece positioning/hold-down and
anti-kickback device, as viewed along line 2-2 of Fig. 1;

Fig. 3 is an end elevational view, partly in section, of
25 the combination workpiece positioning/hold-down and
anti-kickback device, as viewed along line 3-3 of Fig. 2;

Fig. 4 is a cross-sectional view of the combination
workpiece positioning/hold-down and anti-kickback device,
taken along line 4-4 of Fig. 2;

30 Fig. 5 is a cross-sectional view of the combination
workpiece positioning/hold-down and anti-kickback device,
taken along line 5-5 of Fig. 2;

Fig. 6 is a top plan view, partly in section, of the combination workpiece positioning/hold-down and anti-kickback device, as viewed along line 6-6 of Fig. 1;

Fig. 7 is an end elevational view, partly in section, of the combination workpiece positioning/hold-down and anti-kickback device, as viewed along line 7-7 of Fig. 6;

Fig. 8 is a cross-sectional view of the combination workpiece positioning/hold-down and anti-kickback device, taken along line 8-8 of Fig. 7; and

Fig. 9 is a cross-sectional view of the combination workpiece positioning/hold-down and anti-kickback device, taken along line 9-9 of Fig. 7;

Fig. 10 is a top plan view, partly in section, of a modified embodiment wherein locking teeth 56, 70 are replaced with mutually engaging linear gear racks;

Fig. 11 is an end elevational view, partly in section, of the modified embodiment of Fig. 10;

Fig. 12 is a cross-sectional view of the modified embodiment shown in Figs. 10 and 11, taken along line 12-12 in Fig. 11;

Fig. 13 is a perspective view of the combination workpiece positioning/hold-down and anti-kickback device according to another embodiment of the present invention;

Fig. 14 is a front elevational view, partly in section, of the combination workpiece positioning/hold-down and anti-kickback device, as viewed along line 14-14 of Fig. 13;

Fig. 15 is an end elevational view, partly in section, of the combination workpiece positioning/hold-down and anti-kickback device, as viewed along line 15-15 of Fig. 14;

Fig. 16 is a cross-sectional view of the combination workpiece positioning/hold-down and anti-kickback device, taken along line 16-16 of Fig. 13;

Fig. 17 is a cross-sectional view of the combination workpiece positioning/hold-down and anti-kickback device, taken along line 17-17 of Fig. 16;

Fig. 18 is a cross-sectional view of the combination workpiece positioning/hold-down and anti-kickback device, taken along line 18-18 of Fig. 17;

Fig. 19 is a cross-sectional view of the combination workpiece positioning/hold-down and anti-kickback device, taken along line 19-19 of Fig. 17;

Fig. 20 is a top plan view, partly in section, of a modified embodiment of the present invention;

Fig. 21 is cross-sectional view of the modified embodiment of Fig. 20 taken along line 21-21 of Fig. 20;

Fig. 22 is a top plan view, partly in section of another modified embodiment of the present invention; and

Fig. 23 is a perspective view of the combination workpiece positioning/hold-down and anti-kickback device according to the embodiment shown in Fig. 22.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings in detail, a combination workpiece positioning/hold-down and anti-kickback device 10 according to the present invention is designed for a use with a work table 12 having a tabletop 14 with an upper surface 16 and opposite transverse sides 18 and 20. As is conventional, a fence 22 is secured at one edge of work table 12. During operation, a workpiece 24, such as a piece of wood, is positioned on upper surface 16 and against fence 22. Then, a woodworking operation is performed by a woodworking tool such as a saw, router 26 and the like, while workpiece 24 is moved in the lengthwise direction 27 of work table 12, against fence 22.

In order to press workpiece 24 against fence 22, combination workpiece positioning/hold-down and anti-kickback device 10 includes a positioning member 28 having a main body 30 with a generally oblong shape, and an arcuate cam surface 32 at one shorter edge of main body 30 for engaging a side surface of workpiece 24 on work table 12. Positioning member

28 can be made of a plastic material, a Teflon (trademark) like material, or the like. In accordance with the present invention, as will be described in more detail below, main body 30 is oriented substantially in a direction 34 transverse to lengthwise direction 27. Further, arcuate cam surface 32 has a curvature with an increasing radius in a direction opposite to the direction 27 of movement of workpiece 24 along work table 12 such that smaller radius portions 32a of arcuate cam surface 32 extend closer toward workpiece 24 than larger radius portions 32b of arcuate cam surface 32. This means that, as positioning member 28 is pivoted about a fixed pivot pin, as will be described hereinafter, engagement with smaller radius portions 32a provides a stronger biasing action.

A pivot pin 36 which is fixed to main body 30 at a side opposite from arcuate cam surface 32, is pivotally mounted to an adjustment device 38 for moving positioning member 28 relative to workpiece 24. Specifically, adjustment device 38 includes a lengthwise adjustment assembly 40 movable in lengthwise direction 27 for adjusting the position of positioning member 28 in lengthwise direction 27, and a transverse adjustment assembly 42 movable in transverse direction 34 for adjusting the position of positioning member 28 in transverse direction 34, with transverse adjustment assembly 42 being movably connected to lengthwise adjustment assembly 40.

Lengthwise adjustment assembly 40 includes a first guide track 44 extending in lengthwise direction 27 and a second guide track 46 extending in lengthwise direction 27, second guide track 46 being collinear with first guide track 44, with a gap 48 between first and second guide tracks 44 and 46. Positioning member 28 is located in gap 48. Each guide track 44 and 46 includes two spaced apart and parallel grooves 50 and 52 therein, the purpose for which will become apparent from the discussion hereinafter. Further, side plates 54 are secured to sides of guide tracks 44 and 46 at adjacent ends of

guide tracks 44 and 46, with upper edges of side plates 54 having short locking teeth 56 thereon.

Lengthwise adjustment assembly 40 further includes a guide rail 58 mounted on top of guide tracks 44 and 46 and interconnecting guide tracks 44 and 46. In this regard, guide rail 58 lies above gap 48, with pivot pin 36 being pivotally mounted in a recess 60 at the underside of guide rail 58. In addition, guide rail 58 includes a downwardly extending stop pin 62 which limits the angular pivoting range of positioning member 28.

Guide rail 58 includes two spaced apart and parallel, lengthwise extending rods 64 and 66 secured to an underside thereof by countersunk screws 67 (Fig. 8), and which slidably extend within grooves 50 and 52, respectively, to prevent transverse movement of guide rail 58 relative to guide tracks 44 and 46.

Further, guide rail 58 includes side plates 68 at opposite ends thereof, each having locking teeth 70 at the lower edge thereof which engage with locking teeth 56 of side plates 54 of first and second guide tracks 44 and 46, to prevent relative lengthwise movement therebetween when guide rail 58 is clamped to guide tracks 44 and 46, as will be described hereinafter.

In order to provide such clamping operation, a lengthwise releasable locking device 72 is provided, which effectively releasably locks lengthwise adjustment assembly 40 relative to work table 12 at a desired location in lengthwise direction 27. Specifically, lengthwise releasable locking device 72 includes two releasable clamping devices 74 for releasably clamping guide rail 58 to first and second guide tracks 44 and 46 at a desired location therealong.

As best shown in Fig. 8, each releasable clamping device 74 includes a bolt 76 extending through a vertically oriented hole 78 in each guide track 44 and 46. The lower end of hole 78 can have a hexagonal recess 80 therein for receiving the hexagonal bolt head 76a. Guide rail 58 includes two aligned through slots 82 at opposite ends thereof, each through slot 82 extending in lengthwise direction 27. Each bolt 76 thereby extends through hole 78 and a respective through slot 82, and then to a position above guide rail 58, where it threadedly receives a nut 84 thereon. A clamping head 86 is secured to nut 84.

Thus, as clamping head 86 is rotated, nut 84 is caused to rotate, whereby clamping head 86 moves down in order to press guide rail 58 onto guide tracks 44 and 46, and thereby releasably lock guide rail 58 to guide tracks 44 and 46. In such condition, guide rail 58 and guide tracks 44 and 46 form a unitary assembly.

With this arrangement, assuming that guide tracks 44 and 46 are fixed in position, as will be discussed hereinafter, guide rail 58 can move in lengthwise direction 27. Since positioning member 28 is pivotally mounted to guide rail 58, positioning member 28 is also moved in lengthwise direction 27 for adjusting the position thereof.

A coil spring 88 is connected between positioning member 28 and adjustment device 38 for biasing positioning member 28 with a biasing force in a first pivot direction 90 about pivot pin 36 such that arcuate cam surface 32 is biased in a direction opposite to feed direction 27 of workpiece 24 and into engagement with the side surface of workpiece 24.

In this regard, an eyelet 92 is secured to the side edge of positioning member 28 which is opposite arcuate cam surface 32, with one end of spring 88 secured to eyelet 92. The opposite end of spring 88 is secured to a threaded rod 94

which forms part of a variable tensioning device 96 for variably adjusting the biasing force of spring 88. Rod 94 extends through an opening 98 in an L-shaped bracket 100 which is secured to the side edge of guide rail 58, and a wing nut 102 is threaded to the end of rod 94 extending out through opening 98. As a result, positioning member 28 is pivoted in pivot direction 90 about pivot pin 36 with a biasing force which is variably adjustable by tightening or loosening wing nut 102.

In order to move positioning member 28 in transverse direction 34, that is, closer to or farther away from workpiece 24, adjustment device 38 includes transverse adjustment assembly 42 which is movable in transverse direction 34. Transverse adjustment assembly 42 includes a first abutment 104 in the form of an L-shaped bracket fixed to the lower surface of first guide track 44 for engaging one transverse side 18 of work table 12 and a second abutment 116 for engaging the opposite transverse side 20 of work table 12.

In order to lock first and second abutments 104 and 116 against work table 12, and thereby releasably lock positioning member 28 in a desired transverse position, a transverse release locking device 105 includes an overcenter clamp 106 fixed to the lower surface of second guide track 46, with overcenter clamp 106 having a handle 108 pivotally secured to a linkage 110 that is slidably mounted to the lower surface of second guide track 46 by a holder 112. A threaded rod 114 is threadedly secured to the end of linkage 110, and second abutment 116 is secured to the opposite end of threaded rod 114.

With this arrangement, threaded rod 114 is turned so as to move second abutment 116 closer to or farther away from handle 108 in lengthwise direction 27. This is performed until abutments 104 and 116 loosely abut against transverse sides 18 and 20 of work table 12. Then, handle 108 is pivoted

to a closed position, thereby moving threaded rod 114 away from it, whereby first and second abutments 104 and 116 tightly engage tabletop 14. In this manner, positioning member 28 can be moved toward or away from workpiece 24, and
5 be secured in a desired transverse position.

In operation, the position of positioning member 28 in lengthwise direction 27 is first adjusted by lengthwise adjustment assembly 40. Thereafter, the position of positioning member 28 in transverse direction 34 is adjusted
10 by transverse adjustment assembly 42. Wing nut 102 is then rotated to adjust the spring biasing force.

When workpiece 24 is moved in feed direction 27, for example, for a router operation, spring 88 rotates arcuate cam surface 32 of positioning member 28 into engagement with the
15 side of workpiece 24 with a light spring tension. Thus, workpiece 24 is pushed against fence 22 to obtain exact positioning of workpiece 24. It is to be pointed out that the material of positioning member 28 and the spring force on positioning member 28 do not damage workpiece 24, even if
20 workpiece 24 is made from a soft wood material, such as pine.

As workpiece 24 is moved in the feed direction 27, there may be a tendency for router 26 to impart a force to workpiece 24 which tends to push it in a direction away from fence 22, that is, to provide a kick-back. With the present invention,
25 however, this results in positioning member 28 being rotated further in pivot direction 90. As a result, because of the curvature of arcuate cam surface 32, there is a stronger force applied to workpiece 24, which acts against such kick-back in order to prevent or minimize the same. This occurs even
30 through positioning member 28 is made of a plastic material, a Teflon (trademark) like material, or the like, and may be somewhat slippery.

In order to press workpiece 24 down from above, combination workpiece positioning/hold-down and anti-kickback device 10 includes a hold-down member 128 having a main body 130 with a generally oblong shape, and an arcuate cam surface 132 at one shorter edge of main body 130 for engaging an upper surface of workpiece 24 on work table 12. Hold-down member 128 can be made of a plastic material, a Teflon (trademark) like material, or the like. In accordance with the present invention, as will be described in more detail below, main body 130 is oriented substantially in a vertical direction 134 transverse to lengthwise direction 27. Further, arcuate cam surface 132 has a curvature with an increasing radius in a direction opposite to the direction 27 of movement of workpiece 24 along work table 12 such that smaller radius portions 132a of arcuate cam surface 132 extend closer toward workpiece 24 than larger radius portions 132b of arcuate cam surface 132.

A pivot pin 136 which is fixed to main body 130 at a side opposite from arcuate cam surface 132, is pivotally mounted to an adjustment device 138 for moving hold-down member 128 relative to workpiece 24. Specifically, adjustment device 138 includes a lengthwise adjustment assembly 140 movable in lengthwise direction 27 for adjusting the position of hold-down member 128 in lengthwise direction 27, and a vertical adjustment assembly 142 movable in vertical direction 134 for adjusting the position of hold-down member 128 in vertical direction 134, with vertical adjustment assembly 142 being movably connected to lengthwise adjustment assembly 140.

Lengthwise adjustment assembly 140 includes a guide track 144 extending in lengthwise direction 27. Guide track 144 is formed by a generally tubular member 145 of a square cross-section and having a slot 147 running the length at the upper surface thereof. Lengthwise adjustment assembly 140 further includes a guide rail 158 slidably mounted on top of guide track 144.

In order to provide such sliding movement and to also provide a clamping operation, a lengthwise releasable locking device 172 is provided, which effectively releasably locks lengthwise adjustment assembly 140 relative to work table 12 at a desired location in lengthwise direction 27. Specifically, lengthwise releasable locking device 172 includes a releasable clamping device 174 for releasably clamping guide rail 158 to guide track 144 at a desired location therealong.

As best shown in Fig. 3, releasable clamping device 174 includes a bolt 176 extending through slot 147 and a hole 178 in guide rail 158, with bolt head 176a being received in guide rail 144. The opposite end of bolt 176 extends into guide rail 158 where it is engaged with a clamp 177 having a rotatable handle 179 (shown in Figs. 1, 2 and 5). When handle 179 is rotated in one direction, bolt 176 is pulled up, so that bolt head 176a engages with guide track 144 so as to releasably lock guide rail 158 to guide track 144. When handle 179 is rotated in the opposite direction, bolt 176 is lowered, thereby permitting sliding movement of guide rail 158 on guide track 144 to adjust the lengthwise position thereof.

In order to move hold-down member 128 in vertical direction 134, that is, closer to or farther away from workpiece 24, adjustment device 138 includes vertical adjustment assembly 142 which is movable in vertical direction 134. Vertical adjustment assembly 142 includes two vertically oriented rods 181 extending upwardly from guide rail 158 in parallel, spaced apart relation. A guide block 183 is slidably mounted along vertically oriented rods 181.

As best shown in Fig. 4, guide block 183 has two T-shaped slots 185 extending in vertical direction 134. A vertical releasable locking device 205 includes a releasable clamp 207 secured to guide block 183 for releasably engaging vertically oriented rods 181. Specifically, a bolt 209 extends through

each T-shaped slot 185 such that the respective rod 181 is captured in the T-shaped slot 185 between the bolt head 209a and guide block 183. A clamp head 211 threadedly receives the free end of bolt 209 extending through T-shaped slot 185.

5 When clamp head 211 is tightened, bolt head 209a clamps the respective rod 181 against guide block 183 to releasably lock guide block 183 in a desired vertical position. When clamp head 211 is loosened, bolt head 209a no longer clamps the rod 181, so that guide block 183 is free to move along rods 181.

10 A coil spring 188 is connected between hold-down member 128 and adjustment device 138 for biasing hold-down member 128 with a biasing force in a first pivot direction 190 about pivot pin 136 such that arcuate cam surface 132 is biased in a direction opposite to feed direction 27 of workpiece 24 and
15 into engagement with the upper surface of workpiece 24.

In this regard, an eyelet 192 is secured to a side edge of hold-down member 128 which is transverse to arcuate cam surface 132, with one end of spring 188 secured to eyelet 192. The opposite end of spring 188 is secured to a threaded rod
20 194 which forms part of a variable tensioning device 196 for variably adjusting the biasing force of spring 188. Rod 194 extends through an opening 198 in an L-shaped bracket 200 which is secured to guide block 183, and a nut 202 is threaded to the end of rod 194 extending out through opening 198. As a
25 result, hold-down member 128 is pivoted in pivot direction 190 about pivot pin 136 with a biasing force which is variably adjustable by tightening or loosening nut 202.

In operation, the position of hold-down member 128 in lengthwise direction 27 is first adjusted by lengthwise
30 adjustment assembly 140. Thereafter, the position of hold-down member 128 in vertical direction 134 is adjusted by vertical adjustment assembly 142. Nut 202 is then rotated to adjust the spring biasing force.

When workpiece 24 is moved in feed direction 27, for example, for a router operation, spring 188 rotates arcuate cam surface 132 of hold-down member 128 into engagement with the upper surface of workpiece 24 with a light spring tension. Thus, workpiece 24 is pushed down. It is to be pointed out that the material of hold-down member 128 and the spring force on hold-down member 128 do not damage workpiece 24, even if workpiece 24 is made from a soft wood material, such as pine.

As workpiece 24 is moved in the feed direction 27, there may be a tendency for router 26 to impart a force to workpiece 24 which tends to push it in a direction opposite the feed direction 27, that is, to provide a kick-back. With the present invention, however, this results in hold-down member 128 being rotated further in pivot direction 190. As a result, because of the curvature of arcuate cam surface 132, there is a stronger force applied to workpiece 24, which acts against such kick-back in order to prevent or minimize the same. This occurs even through hold-down member 128 is made of a plastic material, a Teflon (trademark) like material, or the like, and may be somewhat slippery.

Thus, in accordance with the present invention, the side and upper surface of workpiece 24 are held or biased, while preventing kick-back thereof. Further, positioning member 28 is adjustable in lengthwise and transverse directions relative to workpiece 24, while hold-down member 128 is adjustable in lengthwise and vertical directions relative to workpiece 24. In addition, the biasing force of the positioning or hold-down member against workpiece 24 is variably adjustable.

Figs. 10-12 illustrate a modified embodiment wherein the locking teeth 56, 70 and the side plates are eliminated so as to provide smooth mating (facing) surfaces for guide tracks 44, 46 and guide rail 58. Locking of the members 46, 58 relative to each other is achieved by providing a linear gear rack 150 in each of grooves 50 (of Fig. 1) of each of members

44, 46 and by providing a mating linear gear rack section 160 in the upper clamping part 58 which clamps against the lower gear rack 150. See Fig. 12.

Referring to Figs. 10-12, the modified embodiment is explained in more detail. As shown in Figs. 10 and 11, a linear gear rack, such as a spur gear rack manufactured by Boston Gear (part No. L505-4) having a pitch of 24 teeth per inch and a width of about 1/4 inch is mounted in mounting groove 164 of each of members 44, 46. The linear gear rack 150 is stationary relative to the respective guide tracks 44, 46. A clamping member 74, which clamps upper guide rail 58 to lower guide rail 46 (see Fig. 12) is provided for tightening the clamping between the upper and lower guide rails 46, 58 and for mutually engaging the teeth of the lower gear rack 150 with the teeth of the upper gear rack 160. The area 170 in Fig. 12 shows the mutually engaged teeth of the upper and lower gear racks 160, 150, respectively. The clamping member 74 in Fig. 12 is similar to the clamping arrangement of Fig. 8, and a detailed description thereof is not given. To move the guide rails 58, 46 relative to each other, the clamping member 74 is loosened, the upper guide rail 58 is lifted so as to bring the teeth of the upper linear gear rack 160 out of engagement with the teeth of lower linear gear rack 150, so that the parts 46, 58 can be moved horizontally relative to each other. After proper location, the clamp member 74 is tightened so as to bring the teeth of the gear rack sections 150, 160 back into engagement with each other, thereby locking member 58 relative to member 46.

The linear gear rack sections 150, 160 are maintained in position by use of screws shown in Fig. 12. Other attachment could be used, such as nails rivets, adhesives, etc.

The reference numerals in Figs. 10-12 which are the same as in Figs. 1-9 represent the same or similar articles as in Figs. 1-9.

As seen in Fig. 11, the lower gear rack section 150 extends horizontally only from point A to point B so as to have a length L, which is substantially shorter than the length of the upper linear gear rack section 160. It is not necessary for the lower linear gear rack section 150 to extend for the full length of the upper gear rack section 160. As seen in the right hand side of Fig. 11, the upper gear rack section has a length L2 which is much greater than length L1 of the upper gear rack section.

As should be clear, the groove 50 shown in Fig. 1 is rounded, whereas the groove for accepting the lower gear rack section 150 is rectangular to accept the gear rack section. Similarly, the upper groove in member 58 is made rectangular so as to accept the upper gear rack section 160. A benefit of the modified arrangement of Figs. 10-12 is that the locking mechanism is now internal and the user would be less likely to snag a sleeve or other clothing or otherwise contact exposed sawtooth sections, as is possible in the embodiment of Figs. 1-9.

Referring now to Figs. 13-19, wherein reference numerals which are the same as in Figs. 1-12 represent the same or similar articles as in Figs. 1-12, a modified embodiment of the combination workpiece positioning and anti-kickback device 310 for a work table 12 is shown. In this alternative embodiment the lengthwise adjustment assembly 40 includes first, second and third lengthwise adjustment members 312, 314, 316. The first lengthwise adjustment member 312 is disposed in a gap between the second and third lengthwise adjustment members 314, 316. The second and third lengthwise adjustment members are preferably hollow or have at least an aperture therein such that at least a portion of the first lengthwise adjustment member 312 is slidably received in each of the second and third lengthwise adjustment members 314, 316.

Positioning member 28 is coupled to the first lengthwise adjustment member 312 via a pivot pin 36. The position of the positioning member 28 with respect to the work table 12 and workpiece 24 is adjustable by changing the orientation of the first lengthwise adjustment member 312 in relation to the second and third lengthwise adjustment members 314, 316. That is, if the positioning member 28 needs to be positioned with respect to the work table 12 at a point which is closer to the second lengthwise adjustment member 314, the first lengthwise adjustment member is slidably engaged to a greater extent within the interior portion of the second lengthwise adjusting member 314 and to a lesser extent within the interior portion of the third lengthwise adjusting member 316. Likewise, if the positioning member 28 needs to be positioned with respect to the work table 12 at a position which is closer to the third lengthwise adjustment member 316, the first lengthwise adjustment member is slidably engaged to a greater extent within the third lengthwise adjustment member 316 and to a lesser extent within the interior portion of the second lengthwise adjusting member.

The first lengthwise adjustment member 312 includes a plurality of apertures 318 (preferably holes or notches) along at least one side of its length. Coupled to each of the second and third lengthwise adjustment members is a lengthwise releasable locking device 72 which includes a locking pin 320 (see Figs. 16 and 19) having a spring 322, which biases the locking pin 320 in engagement with the first lengthwise adjustment member 312, and a knob 324. As a result, when the first lengthwise adjustment member 312 is properly oriented within the second and third lengthwise adjustment members 314, 316 such that the pin is aligned with apertures 318, the locking pins 320 releasably engage the apertures disposed on the first lengthwise adjustment member. The first lengthwise adjustment member 312 is then prevented from movement within the second and third lengthwise adjustment members 314, 316.

The combination workpiece positioning and anti-kickback device of Figs. 13-19 also includes a transverse adjustment assembly 42. In this embodiment, the transverse adjustment assembly 42 includes transverse releasable locking devices 105 which include first and second clamping devices 326 which are respectively coupled to and near respective ends of the second and third lengthwise adjustment members and corresponding ends of the work table 12. In order to secure the transverse position of the lengthwise adjustment assembly 40, the first and second clamping devices 326, which preferably include a knob 328 having a threaded member 330 are tightened. This secures the transverse position of the lengthwise adjustment assembly on the work table.

In the alternative embodiment shown in Figs. 13-19, the device also includes a hold-down member 128 which provides a force on a top surface of the workpiece 24 to ensure that the workpiece remains in contact with the table top 14 of the work table 12. The hold-down member includes a lengthwise adjustment assembly 140 and a vertical adjustment assembly 142 as shown in Fig. 13. The lengthwise adjustment assembly is similar to that which is shown in Fig. 1 except that its longitudinal length is shorter due to the configuration of the vertical adjustment assembly as explained below.

Lengthwise adjustment assembly 140 includes a guide track 144 extending in lengthwise direction 27. Guide track 144 is formed by a generally tubular member 145 of a square cross-section and having a slot 147 running the length at the upper surface thereof. Lengthwise adjustment assembly 140 further includes a guide rail 158 slidably mounted on top of guide track 144.

In order to provide sliding movement and to also provide a clamping operation, a lengthwise releasable locking device 172 is provided, which effectively releasably locks lengthwise adjustment assembly 140 relative to work table 12 at a desired

location in lengthwise direction 27. Specifically, lengthwise releasable locking device 172 includes a releasable clamping device 174 for releasably clamping guide rail 158 to guide track 144 at a desired location therealong.

5 As best shown in Fig. 15, releasable clamping device 174 includes a bolt 176 extending through slot 147 and a hole 178 in guide rail 158, with bolt head 176a being received in guide rail 144. The opposite end of bolt 176 extends into guide rail 158 where it is engaged with a clamp 177 having a
10 rotatable handle 179. When handle 179 is rotated in one direction, bolt 176 is pulled up, so that bolt head 176a engages with guide track 144 so as to releasably lock guide rail 158 to guide track 144. When handle 179 is rotated in the opposite direction, bolt 176 is lowered, thereby
15 permitting sliding movement of guide rail 158 on guide track 144 to adjust the lengthwise position thereof.

 The vertical adjustment assembly 142 includes a vertical adjustment member 332 operatively coupled to the lengthwise adjustment assembly 140. The vertical adjustment member 332
20 can be integral and contiguous with the lengthwise adjustment assembly 140. The vertical adjustment member 332 is preferably oriented in non-parallel relation with respect to the work table 12, and preferably is perpendicular or substantially perpendicular to the work table 12. The
25 vertical adjustment member 332 includes a longitudinal aperture 334 along its length which extends through the hold-down member. The hold-down member 128 is coupled to a mounting plate 336 by a pivot pin 136. The pivot pin is fixed to the main body 130 of the hold-down member 128 at a side
30 opposite the arcuate cam surface. The hold-down member 128 is coupled to the vertical adjustment member 332 by a clamping device 338 which extends through the longitudinal aperture 334 of the vertical adjustment member 332 and the mounting plate 336. In operation, the clamping device 338 is loosened and
35 its shaft is moved within the longitudinal aperture 334 such

that the height of the hold-down member is fully adjustable in relation to the work table. When the desired height of the hold-down member is attained, the clamping device is tightened to secure the height thereof.

5 Referring now to Figs. 20 and 21, wherein reference numerals which are the same as in Figs. 1-12 represent the same or similar articles as in Figs. 1-12, an alternative embodiment of the lengthwise releasable locking device 172 and transverse releasable locking device 105 of the combination
10 workpiece positioning an anti-kick back device is shown. The first lengthwise adjustment member 312 slidably engages an interior portion of the second and third lengthwise adjustment members 314, 316 as described in connection with Figs. 13-19. In this alternative embodiment however, threaded rods 340 are
15 extended through an end of each of the second and third lengthwise adjustment members 314, 316. The end of each of the second and third lengthwise adjustment members 314, 316 through which the threaded rods 340 extend is distal with respect to the positioning member 28. The threaded rods
20 include at one end thereof a knob 342 which enables the threaded rod to be rotated by hand. The opposite end of the threaded rod includes a nut 344 which is fixed on the rod to indicate a maximum displacement of the first lengthwise adjustment member 312 in each lengthwise direction within the
25 second and third lengthwise adjustment members 314, 316.

The position of the first lengthwise adjustment member 312 with respect to the second and third lengthwise adjustment members 314, 316 is altered by rotating at least one of the knobs 342 of the threaded rods 340 which extend within the
30 interior portion of the second and third lengthwise adjustment members and which engage the first lengthwise adjustment member. The rotation of the threaded rods alters the position of the first lengthwise adjustment member and correspondingly the positioning member 28, which is coupled thereto, with
35 respect to the workpiece.

Referring now to Figs. 22 and 23, wherein reference numerals which are the same as in Figs. 1-12 represent the same or similar articles as in Figs. 1-12, another alternative embodiment of the lengthwise adjustment assembly is shown. In this embodiment the work table 12 includes a groove 346 which is slidably engaged by a rail 348 disposed on one side of a lengthwise adjustment member 350. The rail of the lengthwise adjustment member 350 slidably moves within the groove 346 in a longitudinal direction 352, but is prevented from substantial movement in the transverse direction 354. The groove 346 preferably includes a lip 356 (Fig. 23) at a top portion thereof. A clamping device 358 having a block 360 disposed within the groove is coupled to the lengthwise adjustment member 350. When the clamping device is tightened, the block engages the lip 356 of the groove 346. As a result, movement of device in the lengthwise adjustment member 350 in the longitudinal direction 352 is prevented.

Coupled to the lengthwise adjustment member 350 is a transverse adjustment assembly 42 which is movable in a direction 354 transverse to the lengthwise direction 352. The transverse adjustment assembly adjusts the position of the positioning member 28 in the transverse direction. The positioning member is preferably coupled to one end of a transverse adjustment member 362. The coupling of the positioning member 28 to the transverse adjustment member 362 via pivot pin 36 and the biasing of the positioning member with spring 88 is similar to that previously described and for brevity will not be repeated here.

The transverse adjustment member 362 preferably includes an elongated aperture 364 which extends along the longitudinal length of the transverse adjustment member 362 and therethrough. A transverse releasable locking device 105 is included such as the threaded rod, having a knob 368 at one end thereof, as shown in Fig. 23. In this embodiment the lengthwise adjustment member 350 includes an aperture 368 for

receiving an end of the threaded rod 366. The threaded rod extends through the elongated aperture 364 of the transverse adjustment member 362 and engages the aperture 368 of the lengthwise adjustment member 350. When in a non-locked position, the locking device 105 enables movement of the transverse adjustment member while the threaded rod remains engaged in the elongated aperture 364 and the aperture 368. When in the locked position, the transverse releasable locking device 105 maintains the position of the transverse adjustment member 362 with respect to the lengthwise adjustment member 350 and, if the lengthwise adjustment member 350 is secured to the work table 12 via clamping device 358, the orientation of the positioning member 28 with respect to the work table 12.

Having described a specific preferred embodiment of the invention with reference to the accompanying drawings, it will be appreciated that the present invention is not limited to that precise embodiment and that various changes and modifications can be effected therein by one of ordinary skill in the art without departing from the scope or spirit of the invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A combination workpiece positioning and anti-kickback device for a work table having a fence against which a workpiece is guided, comprising:

5 a positioning member having a main body, and an arcuate cam surface at one edge of the main body for engaging a side surface of a workpiece on the work table;

an adjustment device for moving the positioning member relative to the workpiece, the adjustment device including:

10 a lengthwise adjustment assembly movable in a lengthwise direction of movement of the workpiece along the work table for adjusting the position of the positioning member in said lengthwise direction, and

15 a transverse adjustment assembly movable in a direction transverse relative to said lengthwise direction for adjusting the position of the positioning member in the transverse direction, the transverse adjustment assembly being movably connected to the lengthwise adjustment assembly;

20 a lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction;

25 a transverse releasable locking device for releasably locking the transverse adjustment assembly relative to the work table at a desired location in the transverse direction;

a pivot which pivotally mounts the positioning member to the adjustment device for pivoting movement;

30 a spring connected between the positioning member and the adjustment device for biasing the positioning member with a biasing force in a first pivot direction about said pivot such that said arcuate cam surface is biased in a direction opposite to a feed direction of said workpiece and into engagement with the side surface of the workpiece; and

35 a variable tensioning device for variably adjusting
the biasing force of the spring,

 wherein said lengthwise adjustment assembly includes at
least first and second lengthwise adjustment members, the
first lengthwise adjustment member being received within an
40 interior portion of the second lengthwise adjustment member.

 2. The combination workpiece positioning and anti-
kickback device according to claim 1, wherein said first
lengthwise adjustment member includes a plurality of apertures
along at least one side thereof and wherein the lengthwise
5 releasable locking device comprises a retractable pin
operatively coupled to said second lengthwise adjustment
member for releasably engaging one of the plurality of
apertures of the first lengthwise adjustment member such that
the first lengthwise adjustment member is releasably coupled
10 to the second lengthwise adjustment member and such that the
positioning member is situated at a desired lengthwise
location on the work table.

 3. The combination workpiece positioning and anti-
kickback device according to claim 1, wherein said lengthwise
adjustment assembly further comprises a third lengthwise
adjustment member, the first lengthwise adjustment member
5 being received within an interior portion of the third
lengthwise adjustment member.

 4. The combination workpiece positioning and anti-
kickback device according to claim 3 wherein said first
lengthwise adjustment member includes a plurality of apertures
along at least one side thereof and wherein the lengthwise
5 releasable locking device comprises a retractable pin
operatively coupled to said third lengthwise adjustment member
for releasably engaging one of the plurality of apertures of
the first lengthwise adjustment member such that the first
lengthwise adjustment member is releasably coupled to the

10 third lengthwise adjustment member and such that the
positioning member is positioned at a desired location.

5 5. The combination workpiece positioning and
anti-kickback device according to claim 3, wherein said third
lengthwise adjustment member is collinear with said second
lengthwise adjustment member with a gap between said second
and third lengthwise adjustment members in which said first
lengthwise adjustment member is located.

6. The combination workpiece positioning and
anti-kickback device according to claim 1, wherein:

said transverse adjustment assembly includes:

5 a first abutment secured to said second
lengthwise adjustment member for engaging one transverse side
of the work table; and

a second abutment secured to said third
lengthwise adjustment member for engaging an opposite
transverse side of the work table; and

10 said transverse releasable locking device includes:

a first and second releasable clamps
respectively secured to said second and third lengthwise
adjustment members for moving said first and second abutments
into releasable engagement with the work table; and

15 a threaded rod which respectively connects the
first and second abutments to the first and second releasable
clamps with an adjustable distance therebetween.

7. The combination workpiece positioning and
anti-kickback device according to claim 1, wherein said main
body is oriented substantially in said transverse direction,
and said arcuate cam surface has a curvature with an
5 increasing radius in a direction opposite to the direction of
movement of said workpiece along the work table such that
smaller radius portions of said arcuate cam surface extend
closer toward the workpiece than larger radius portions of
said arcuate cam surface.

8. The combination workpiece positioning and anti-kickback device according to claim 1, wherein said main body has an oblong shape.

9. The combination workpiece positioning and anti-kickback device according to claim 1, wherein said pivot pivotally mounts the positioning member to the lengthwise adjustment member for pivoting movement.

10. The combination workpiece positioning and anti-kickback device according to claim 1, further comprising a stop disposed on said lengthwise adjustment assembly for limiting pivotal movement of said positioning member.

11. The combination workpiece positioning and anti-kickback device according to claim 1, wherein said variable tensioning device includes a threaded tensioning rod connected between said spring and said lengthwise adjusting assembly, and threadedly connected with said lengthwise adjustment assembly for variably changing the biasing force of the spring.

12. The combination workpiece positioning and anti-kickback device according to claim 1, further comprising a positioning adjustment member including a threaded rod extending through an interior portion of the second lengthwise adjustment member and being operatively engaged with the first lengthwise adjustment member for altering and fixing a position of the first adjustment member with respect to the second adjustment member.

13. A combination workpiece positioning and anti-kickback device for a work table having a fence against which a workpiece is guided, comprising:

a positioning member having a main body, and an arcuate cam surface at one edge of the main body for engaging a side surface of a workpiece on the work table;

an adjustment device for moving the positioning member relative to the workpiece, the adjustment device including:

10 a lengthwise adjustment assembly movable in a lengthwise direction of movement of the workpiece along the work table for adjusting the position of the positioning member in said lengthwise direction, and

15 a transverse adjustment assembly movable in a direction transverse to said lengthwise direction for adjusting the position of the positioning member in the transverse direction, the transverse adjustment assembly being movably connected to the lengthwise adjustment assembly;

20 a lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction;

25 a transverse releasable locking device for releasably locking the transverse adjustment assembly relative to the work table at a desired location in the transverse direction;

 a pivot which pivotally mounts the positioning member to the adjustment device for pivoting movement;

30 a spring connected between the positioning member and the adjustment device for biasing the positioning member with a biasing force in a first pivot direction about said pivot such that said arcuate cam surface is biased in a direction opposite to a feed direction of said workpiece and into engagement with the side surface of the workpiece; and

35 a variable tensioning device for variably adjusting the biasing force of the spring,

 wherein said lengthwise adjustment assembly includes a lengthwise adjustment member operatively engaged within a guide track of the work table.

14. The combination workpiece positioning and anti-kickback device according to claim 13, wherein the lengthwise adjustment member includes a guide rail slidably engagable in said guide track of said work table.

15. The combination workpiece positioning and anti-kickback device according to claim 13, wherein said lengthwise releasable locking device includes a releasable clamping device which engages the guide track to releasably fix the lengthwise adjustment member to the work table at a desired location therealong.

16. The combination workpiece positioning and anti-kickback device according to claim 13, wherein said transverse adjustment assembly comprises:

5 a traverse adjustment member operatively coupled to the lengthwise adjustment member, the positioning member being operatively coupled to the transverse adjustment member.

17. The combination workpiece positioning and anti-kickback device according to claim 16, wherein the transverse adjustment member includes an aperture whose length extends in a direction which is non-parallel with respect to
5 the guide track, and a clamping device engaging the lengthwise adjustment member to releasably fix the transverse adjustment member to the lengthwise adjustment member.

18. The combination workpiece positioning and anti-kickback device according to claim 17, wherein at least a portion of the clamping device is engaged within the aperture of said transverse adjustment member.

19. The combination workpiece positioning and anti-kickback device according to claim 13, wherein said main body is oriented substantially in said transverse direction, and said arcuate cam surface has a curvature with an increasing
5 radius in a direction opposite to the direction of movement of

said workpiece along the work table such that smaller radius portions of said arcuate cam surface extend closer toward the workpiece than larger radius portions of said arcuate cam surface.

20. The combination workpiece positioning and anti-kickback device according to claim 13, wherein said main body has an oblong shape.

21. The combination workpiece positioning and anti-kickback device according to claim 13, wherein said pivot pivotally mounts the positioning member to the lengthwise adjustment member.

22. The combination workpiece positioning and anti-kickback device according to claim 13, further comprising a stop on said lengthwise adjustment assembly for limiting pivotal movement of said positioning member.

23. The combination workpiece positioning and anti-kickback device according to claim 13, wherein said variable tensioning device includes a threaded tensioning rod connected between said spring and said lengthwise adjusting assembly, and threadedly connected with said lengthwise adjustment assembly for variably changing the biasing force of the spring.

24. A combination workpiece hold-down and anti-kickback device for a work table having a fence against which a workpiece is guided, comprising:

a hold-down member having a main body, and an arcuate cam surface at one edge of the main body for engaging an upper surface of a workpiece on the work table;

an adjustment device for moving the hold-down member relative to the workpiece, the adjustment device including:

a lengthwise adjustment assembly movable in a lengthwise direction of movement of the workpiece along the

work table for adjusting the position of the hold-down member in said lengthwise direction, and

a vertical adjustment assembly movable in a vertical direction transverse to said lengthwise direction for adjusting the position of the hold-down member in the vertical direction, the vertical adjustment assembly being movably connected to the lengthwise adjustment assembly;

a lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction;

a vertical releasable locking device for releasably locking the vertical adjustment assembly relative to the work table at a desired location in the vertical direction;

a pivot which pivotally mounts the hold-down member to the adjustment device for pivoting movement;

a spring connected between the hold-down member and the adjustment device for biasing the hold-down member with a biasing force in a first pivot direction about said pivot such that said arcuate cam surface is biased in a direction opposite to a feed direction of said workpiece and into engagement with the upper surface of the workpiece; and

a variable tensioning device for variably adjusting the biasing force of the spring,

wherein said vertical adjustment assembly includes a vertical adjustment member operatively coupled to said lengthwise adjustment assembly, said vertical adjustment member including an aperture whose length extends in a direction which is non-parallel with respect to a longitudinal length of the lengthwise adjustment assembly, and a clamping device engaging said vertical adjustment member so as to releasably fix a height of the hold-down member with respect to the work table.

25. The combination workpiece hold-down and anti-kickback device according to claim 24 wherein at least a portion of the clamping device is engaged within said aperture

of said vertical adjustment assembly, and wherein said clamping device operatively engages said hold-down member.

26. The combination workpiece hold-down and anti-kickback device according to claim 24, wherein said main body is oriented substantially in said vertical direction, and said arcuate cam surface has a curvature with an increasing radius in a direction opposite to the direction of movement of said workpiece along the work table such that smaller radius portions of said arcuate cam surface extend closer toward the workpiece than larger radius portions of said arcuate cam surface.

27. The combination workpiece hold-down and anti-kickback device according to claim 24, wherein said main body has an oblong shape.

28. The combination workpiece hold-down and anti-kickback device according to claim 24, wherein said lengthwise adjustment assembly includes a guide track extending in said lengthwise direction, and a guide rail movable in said guide track in said lengthwise direction, with said vertical adjustment assembly being mounted to said guide rail.

29. The combination workpiece hold-down and anti-kickback device according to claim 28, wherein said lengthwise releasable locking device includes a releasable clamping device for releasably clamping the guide rail to the guide track at a desired location therealong.

30. The combination workpiece hold-down and anti-kickback device according to claim 24, wherein said pivot pivotally mounts the hold-down member to the vertical adjustment member for pivoting movement.

31. The combination workpiece hold-down and anti-kickback device according to claim 24, further comprising a stop on said vertical adjustment assembly for limiting pivotal movement of said hold-down member.

32. The combination workpiece hold-down and anti-kickback device according to claim 24, wherein said variable tensioning device includes a threaded tensioning rod connected between said spring and said vertical adjustment assembly, and threadedly connected with said vertical adjustment assembly for variably changing the biasing force of the spring.

33. A combination workpiece positioning, hold-down and anti-kickback device for a work table having a fence against which a workpiece is guided, comprising:

a first positioning member having a main body, and a first arcuate cam surface at one edge of the main body for engaging a side surface of a workpiece on the work table;

a first adjustment device for moving the first positioning member relative to the workpiece, the adjustment device including:

a first lengthwise adjustment assembly movable in a lengthwise direction of movement of the workpiece along the work table for adjusting the position of the positioning member in said lengthwise direction, and

a first transverse adjustment assembly movable in a direction transverse to said lengthwise direction for adjusting the position of the positioning member in the transverse direction, the transverse adjustment assembly being movably connected to the lengthwise adjustment assembly;

a first lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction;

a first transverse releasable locking device for releasably locking the transverse adjustment assembly relative

25 to the work table at a desired location in the transverse direction;

a first pivot which pivotally mounts the positioning member to the adjustment device for pivoting movement;

30 a first spring connected between the positioning member and the adjustment device for biasing the positioning member with a biasing force in a first pivot direction about said pivot such that said arcuate cam surface is biased in a direction opposite to a feed direction of said workpiece into engagement with the side surface of the workpiece;

35 a first variable tensioning device for variably adjusting the biasing force of the spring;

a hold-down member having a main body, and a second arcuate cam surface at one edge of the main body for engaging an upper surface of a workpiece on the work table;

40 a second adjustment device for moving the hold-down member relative to the workpiece, the second adjustment device including:

a second lengthwise adjustment assembly movable in said lengthwise direction for adjusting the position of the hold-down member in said lengthwise direction, and

45 a vertical adjustment assembly movable in a vertical direction transverse to said lengthwise direction for adjusting the position of the hold-down member in the vertical direction, the vertical adjustment assembly being movably connected to the lengthwise adjustment assembly;

50 a second lengthwise releasable locking device for releasably locking the second lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction;

55 a vertical releasable locking device for releasably locking the vertical adjustment assembly relative to the work table at a desired location in the vertical direction;

a second pivot which pivotally mounts the hold-down member to the second adjustment device for pivoting movement;

60 a second spring connected between the hold-down member and the second adjustment device for biasing the

hold-down member with a biasing force in a second pivot direction about said second pivot such that said second arcuate cam surface is biased in a direction opposite to the feed direction of said workpiece and into engagement with the upper surface of the workpiece; and

a second variable tensioning device for variably adjusting the biasing force of the second spring,

wherein said first lengthwise adjustment assembly includes at least first and second lengthwise adjustment members, the first lengthwise adjustment member being received within an interior portion of the second lengthwise adjustment member.

34. A combination workpiece positioning, hold-down and anti-kickback device for a work table having a fence against which a workpiece is guided, comprising:

a first positioning member having a main body, and a first arcuate cam surface at one edge of the main body for engaging a side surface of a workpiece on the work table;

a first adjustment device for moving the first positioning member relative to the workpiece, the adjustment device including:

a first lengthwise adjustment assembly movable in a lengthwise direction of movement of the workpiece along the work table for adjusting the position of the positioning member in said lengthwise direction, and

a first transverse adjustment assembly movable in a direction transverse to said lengthwise direction for adjusting the position of the positioning member in the transverse direction, the transverse adjustment assembly being movably connected to the lengthwise adjustment assembly;

a first lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction;

a first transverse releasable locking device for releasably locking the transverse adjustment assembly relative

25 to the work table at a desired location in the transverse direction;

a first pivot which pivotally mounts the positioning member to the adjustment device for pivoting movement;

30 a first spring connected between the positioning member and the adjustment device for biasing the positioning member with a biasing force in a first pivot direction about said pivot such that said arcuate cam surface is biased in a direction opposite to a feed direction of said workpiece into engagement with the side surface of the workpiece;

35 a first variable tensioning device for variably adjusting the biasing force of the spring;

a hold-down member having a main body, and a second arcuate cam surface at one edge of the main body for engaging an upper surface of a workpiece on the work table;

40 a second adjustment device for moving the hold-down member relative to the workpiece, the second adjustment device including:

a second lengthwise adjustment assembly movable in said lengthwise direction for adjusting the position of the hold-down member in said lengthwise direction, and

45 a vertical adjustment assembly movable in a vertical direction transverse to said lengthwise direction for adjusting the position of the hold-down member in the vertical direction, the vertical adjustment assembly being movably connected to the lengthwise adjustment assembly;

50 a second lengthwise releasable locking device for releasably locking the second lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction;

55 a vertical releasable locking device for releasably locking the vertical adjustment assembly relative to the work table at a desired location in the vertical direction;

a second pivot which pivotally mounts the hold-down member to the second adjustment device for pivoting movement;

60 a second spring connected between the hold-down member and the second adjustment device for biasing the

hold-down member with a biasing force in a second pivot direction about said second pivot such that said second arcuate cam surface is biased in a direction opposite to the feed direction of said workpiece and into engagement with the upper surface of the workpiece; and

a second variable tensioning device for variably adjusting the biasing force of the second spring wherein said first lengthwise adjustment assembly includes a lengthwise adjustment member operatively engaged within a guide track of the work table,

wherein said vertical adjustment assembly includes a vertical adjustment member operatively coupled to said second lengthwise adjustment assembly, said vertical adjustment member including an aperture whose length extends in a direction which is non-parallel with respect to a longitudinal length of the second lengthwise adjustment assembly, and a clamping device engaging said vertical adjustment member so as to releasably fix a height of the hold down member with respect to the work table.

35. A combination workpiece positioning, hold-down and anti-kickback device for a work table having a fence against which a workpiece is guided, comprising:

a first positioning member having a main body, and a first arcuate cam surface at one edge of the main body for engaging a side surface of a workpiece on the work table;

a first adjustment device for moving the first positioning member relative to the workpiece, the adjustment device including:

a first lengthwise adjustment assembly movable in a lengthwise direction of movement of the workpiece along the work table for adjusting the position of the positioning member in said lengthwise direction, and

a first transverse adjustment assembly movable in a direction transverse to said lengthwise direction for adjusting the position of the positioning member in the

transverse direction, the transverse adjustment assembly being movably connected to the lengthwise adjustment assembly;

20 a first lengthwise releasable locking device for releasably locking the lengthwise adjustment assembly relative to the work table at a desired location in the lengthwise direction;

25 a first transverse releasable locking device for releasably locking the transverse adjustment assembly relative to the work table at a desired location in the transverse direction;

a first pivot which pivotally mounts the positioning member to the adjustment device for pivoting movement;

30 a first spring connected between the positioning member and the adjustment device for biasing the positioning member with a biasing force in a first pivot direction about said pivot such that said arcuate cam surface is biased in a direction opposite to a feed direction of said workpiece into engagement with the side surface of the workpiece;

35 a first variable tensioning device for variably adjusting the biasing force of the spring;

a hold-down member having a main body, and a second arcuate cam surface at one edge of the main body for engaging an upper surface of a workpiece on the work table;

40 a second adjustment device for moving the hold-down member relative to the workpiece, the second adjustment device including:

45 a second lengthwise adjustment assembly movable in said lengthwise direction for adjusting the position of the hold-down member in said lengthwise direction, and

a vertical adjustment assembly movable in a vertical direction transverse to said lengthwise direction for adjusting the position of the hold-down member in the vertical direction, the vertical adjustment assembly being movably
50 connected to the lengthwise adjustment assembly;

a second lengthwise releasable locking device for releasably locking the second lengthwise adjustment assembly

relative to the work table at a desired location in the lengthwise direction;

55 a vertical releasable locking device for releasably locking the vertical adjustment assembly relative to the work table at a desired location in the vertical direction;

 a second pivot which pivotally mounts the hold-down member to the second adjustment device for pivoting movement;

60 a second spring connected between the hold-down member and the second adjustment device for biasing the hold-down member with a biasing force in a second pivot direction about said second pivot such that said second arcuate cam surface is biased in a direction opposite to the
65 feed direction of said workpiece and into engagement with the upper surface of the workpiece; and

 a second variable tensioning device for variably adjusting the biasing force of the second spring wherein said first lengthwise adjustment assembly includes a lengthwise
70 adjustment member operatively engaged within a guide track of the work table,

 wherein said first lengthwise adjustment assembly includes a lengthwise adjustment member operatively engaged within a guide track of the work table.

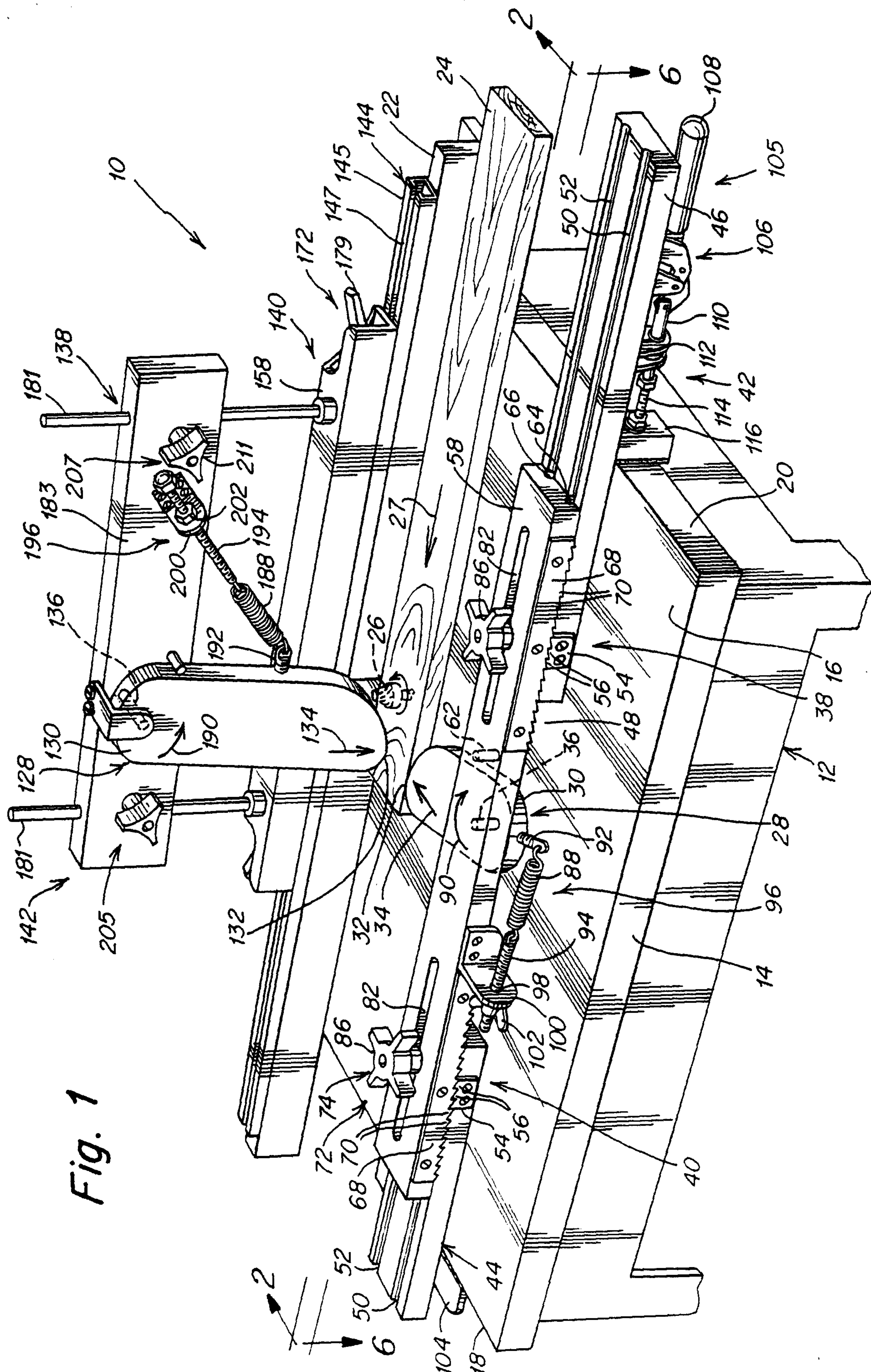


Fig. 1

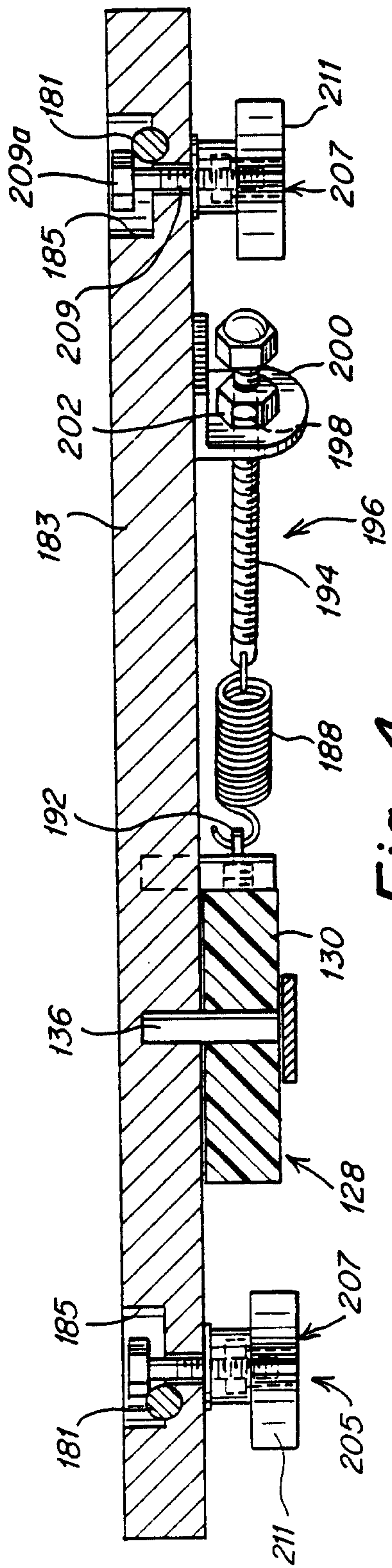


Fig. 4

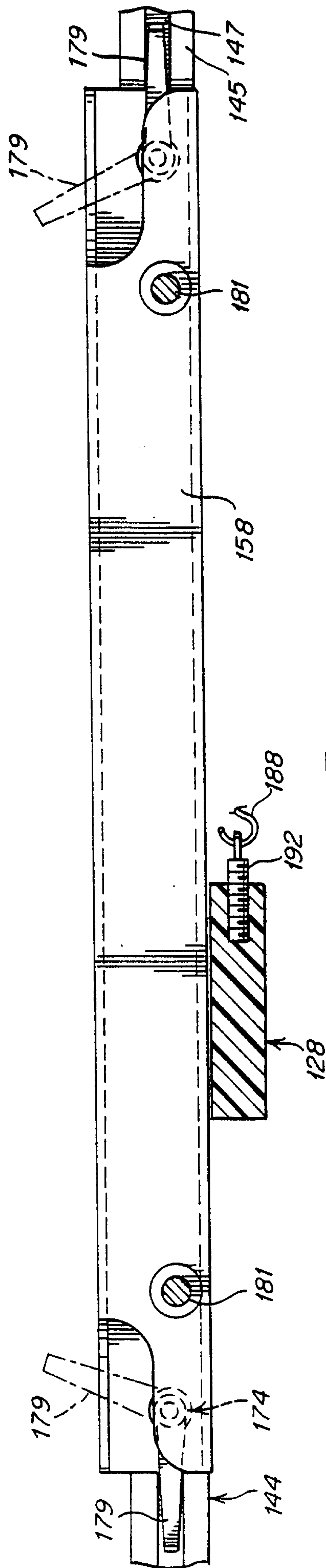


Fig. 5

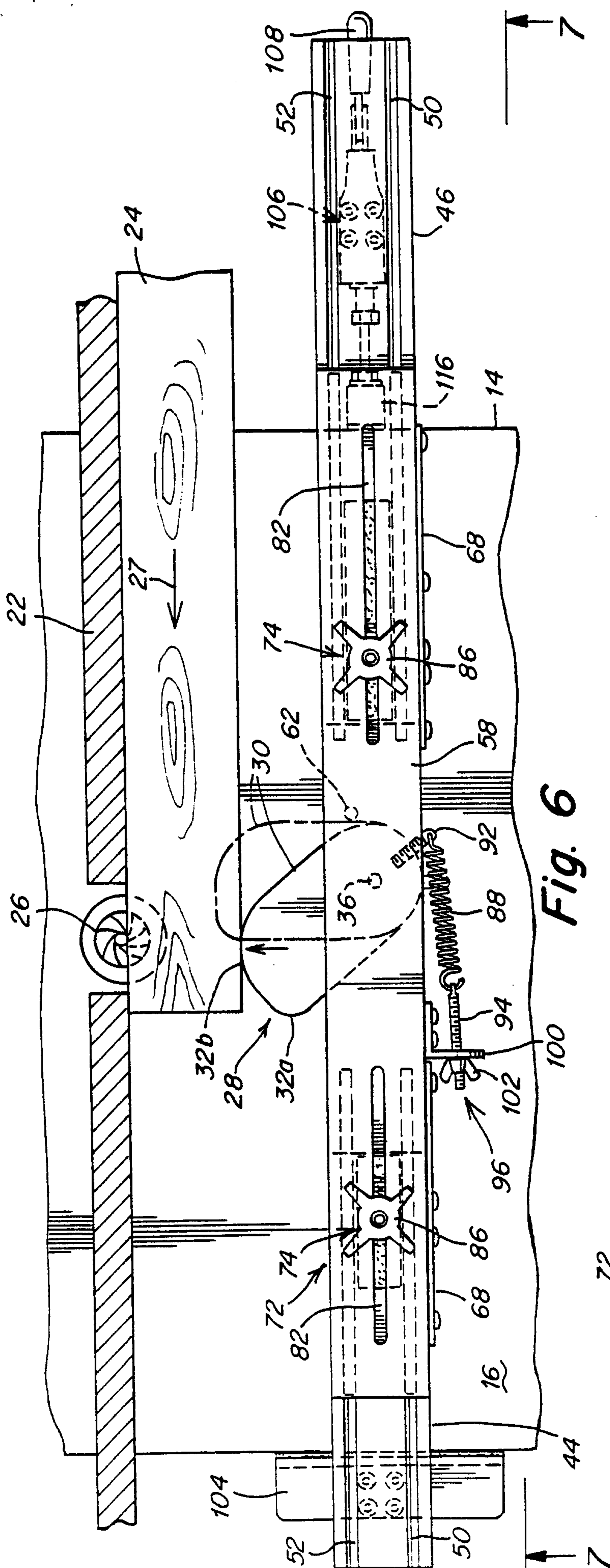


Fig. 6

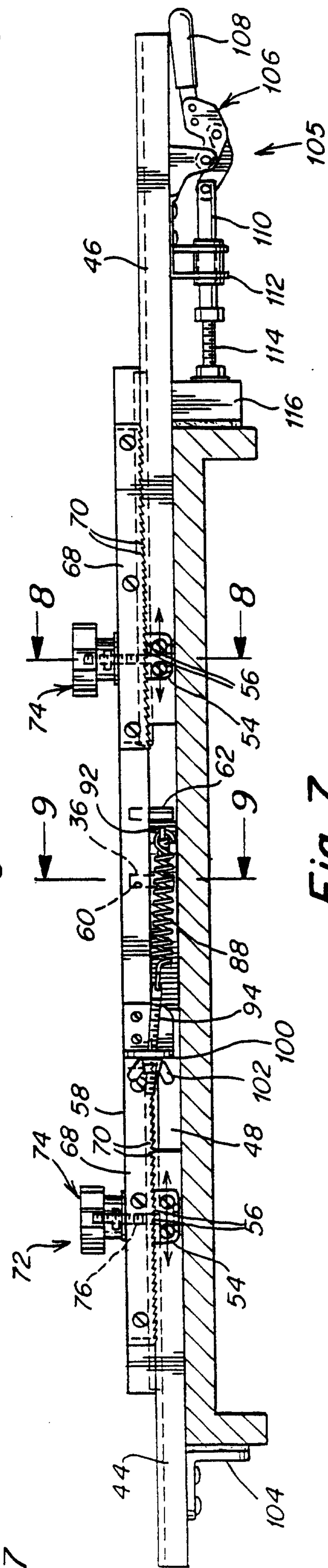


Fig. 7

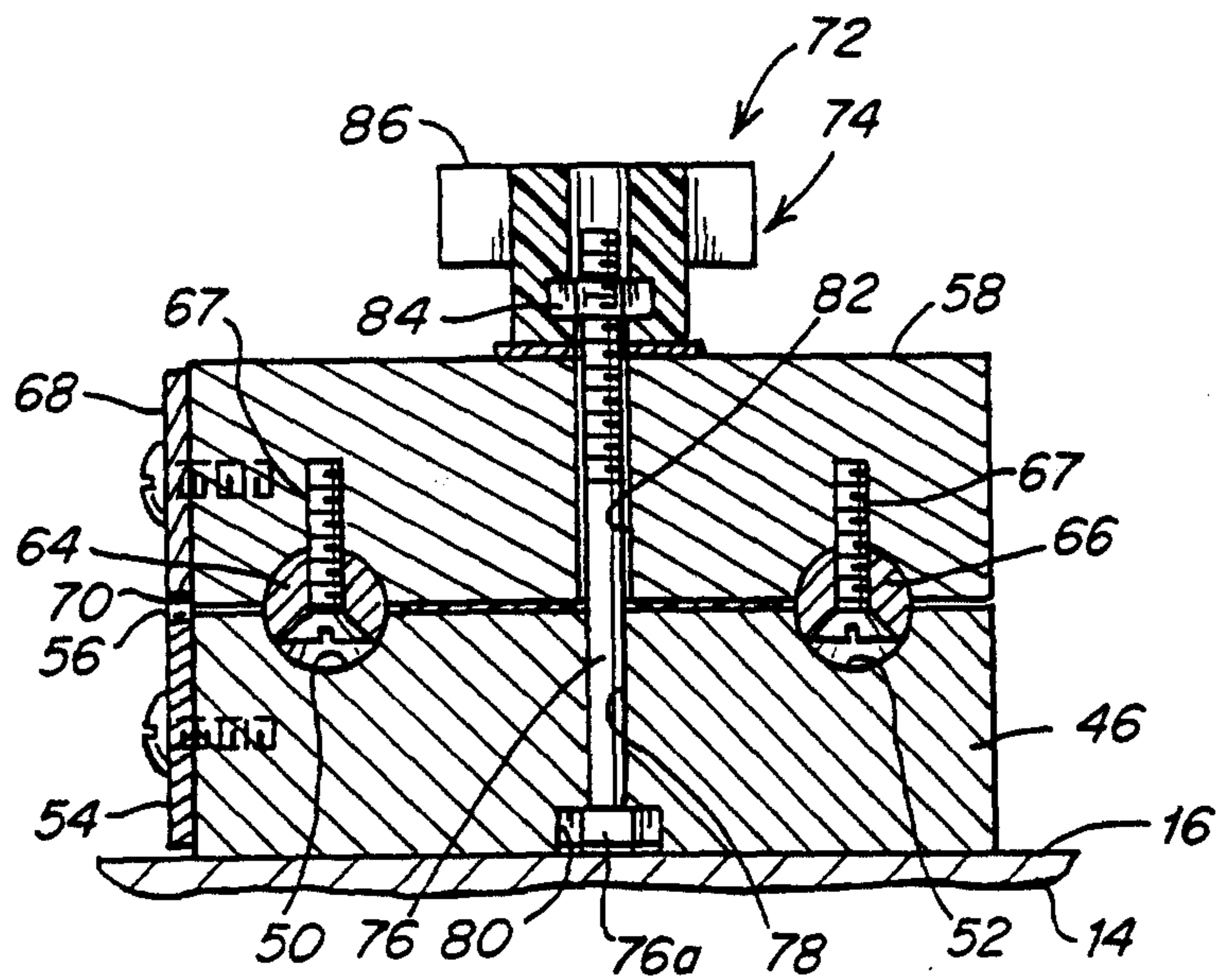


Fig. 8

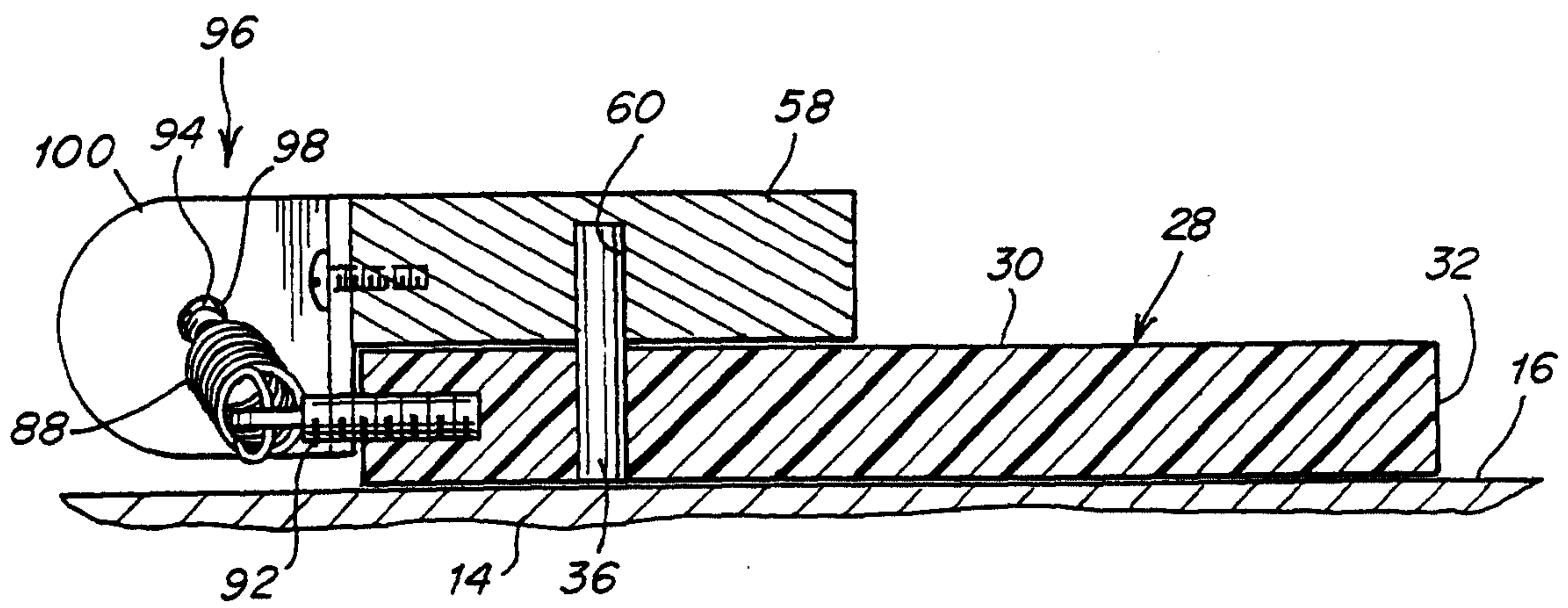


Fig. 9

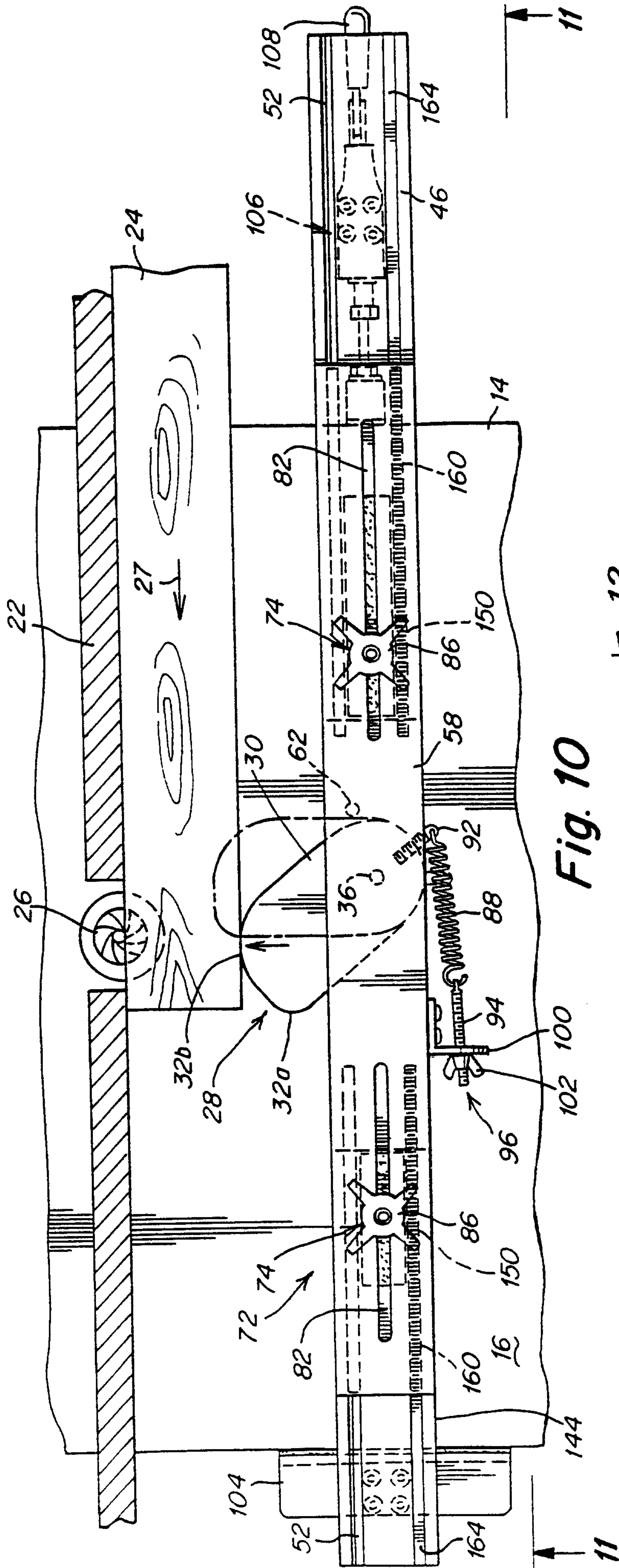


Fig. 10

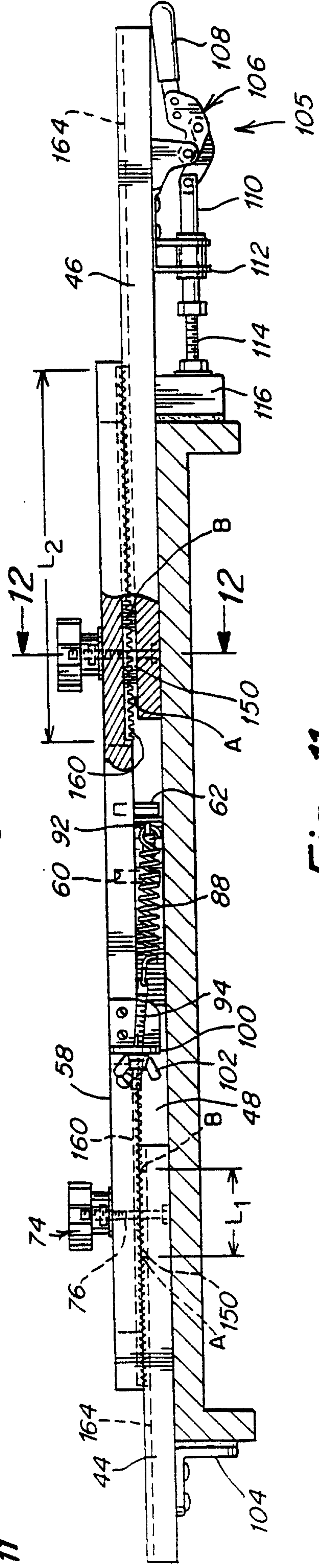


Fig. 11

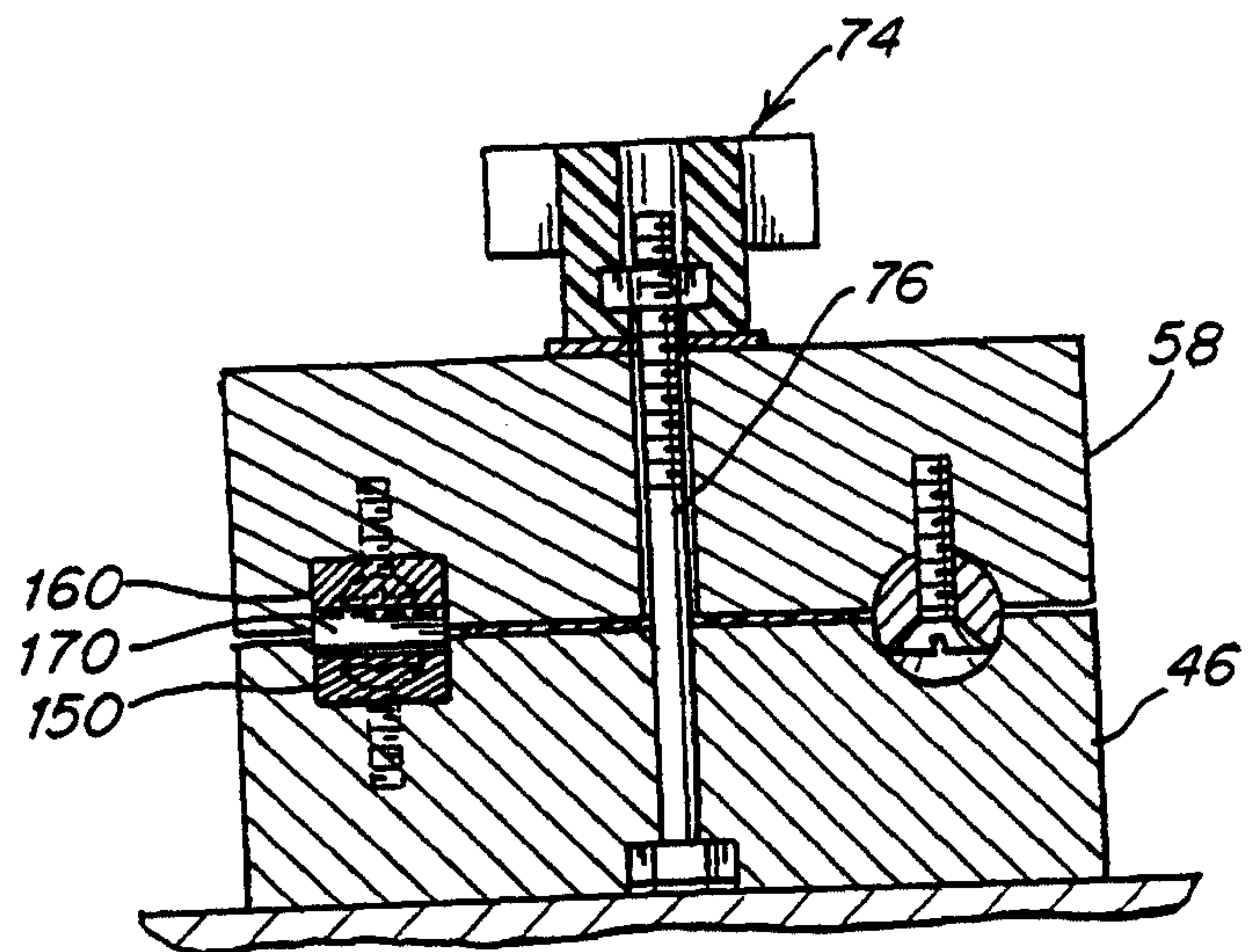
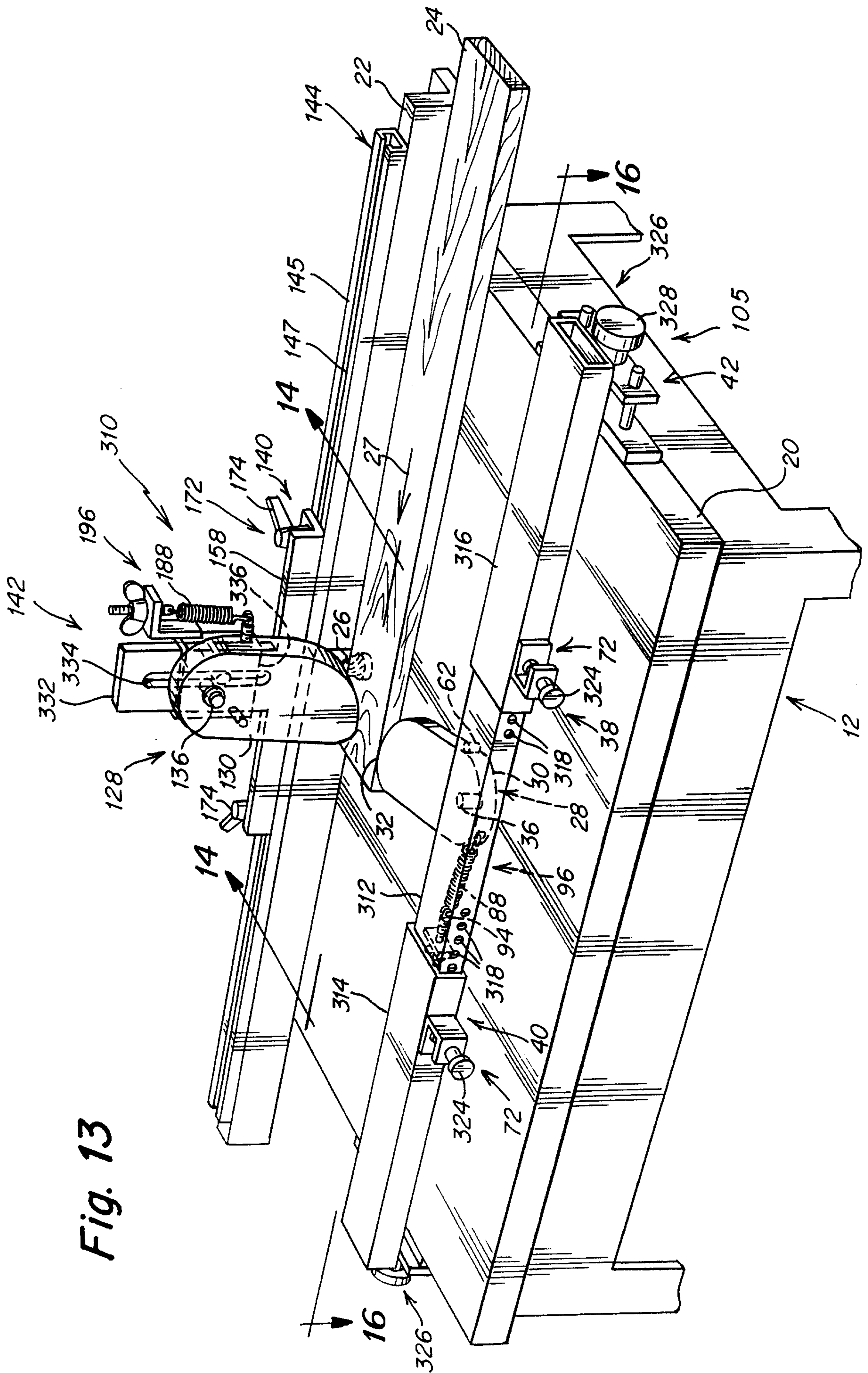


Fig. 12



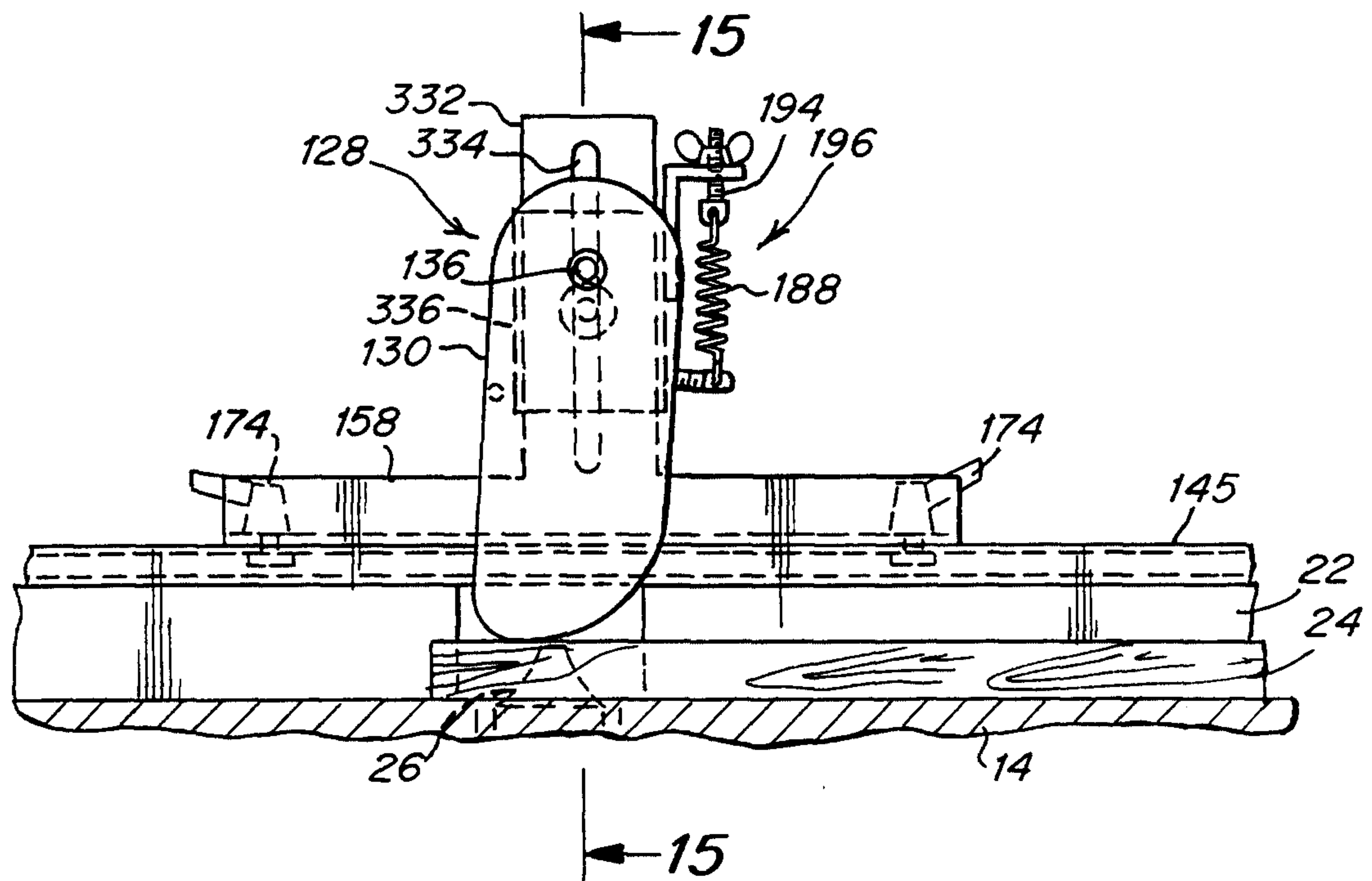


Fig. 14

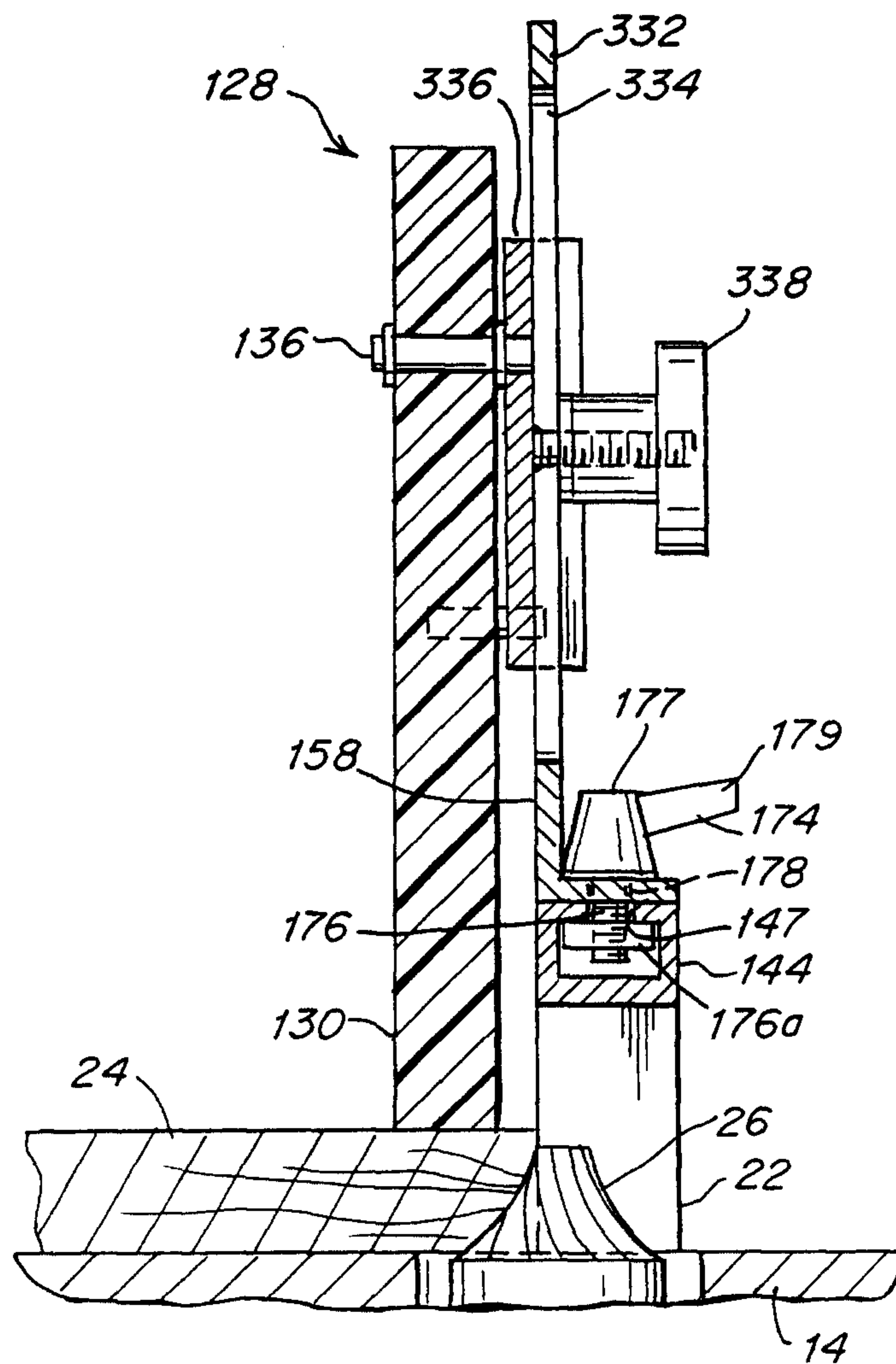


Fig. 15

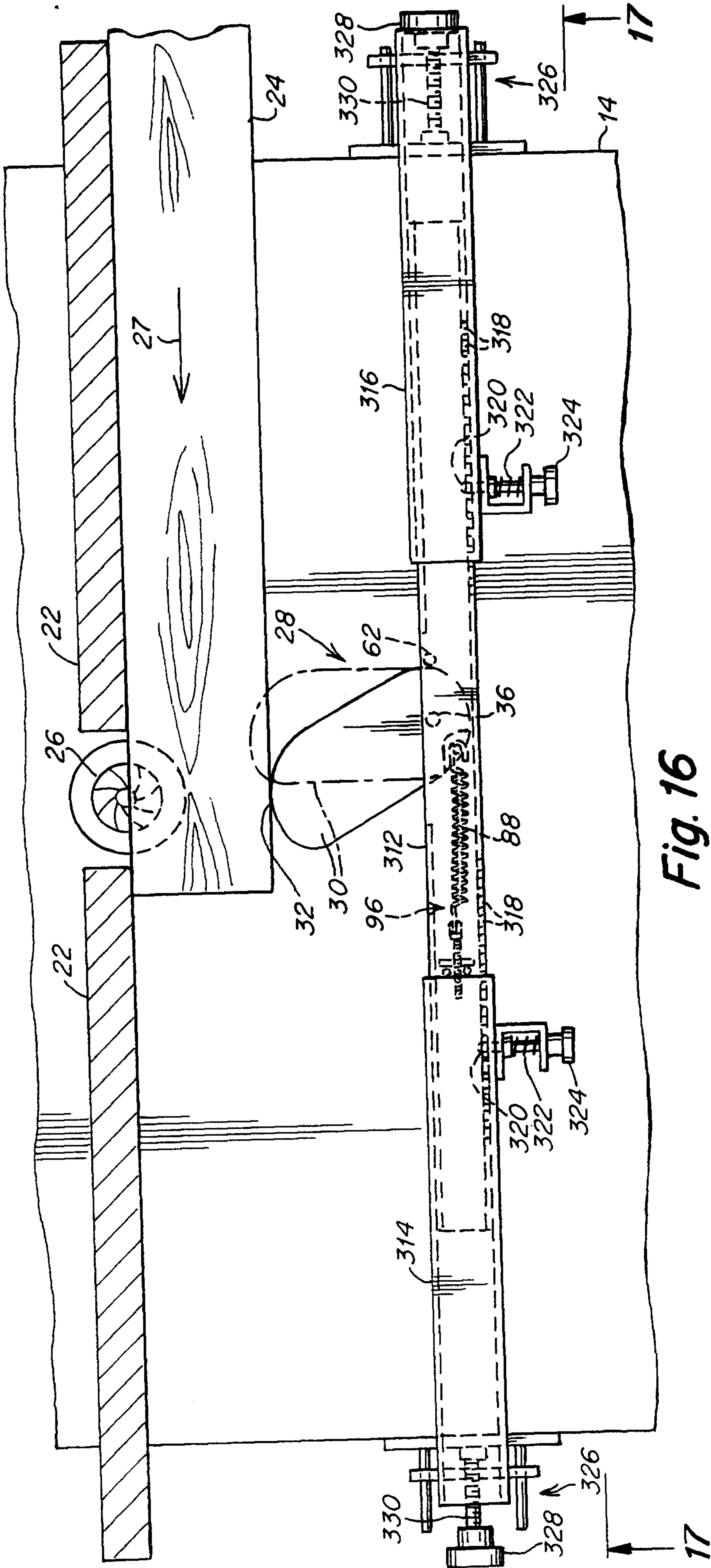


Fig. 16

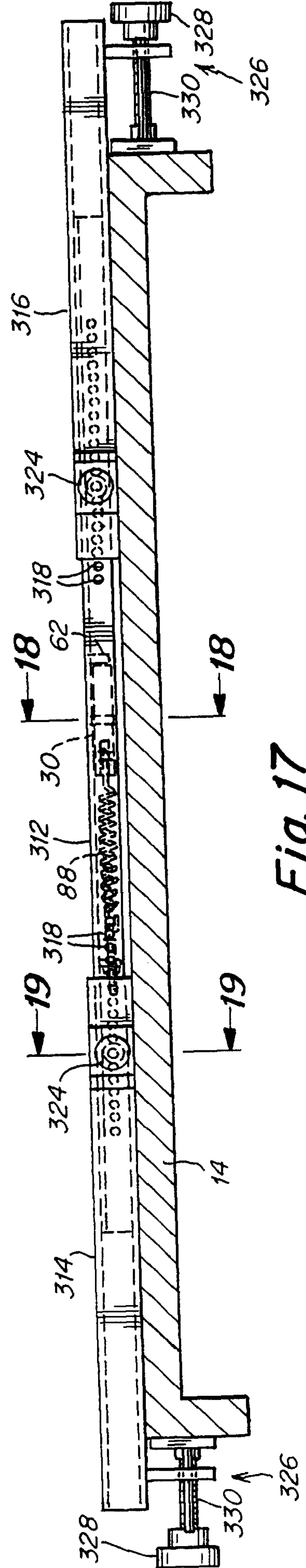


Fig. 17

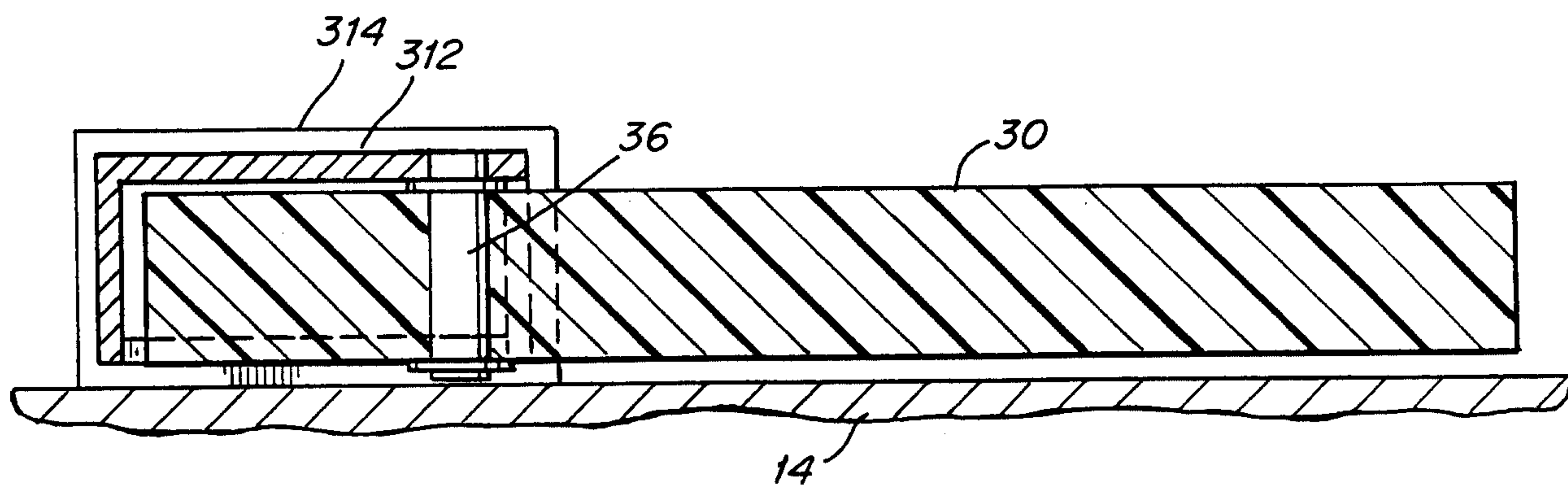


Fig. 18

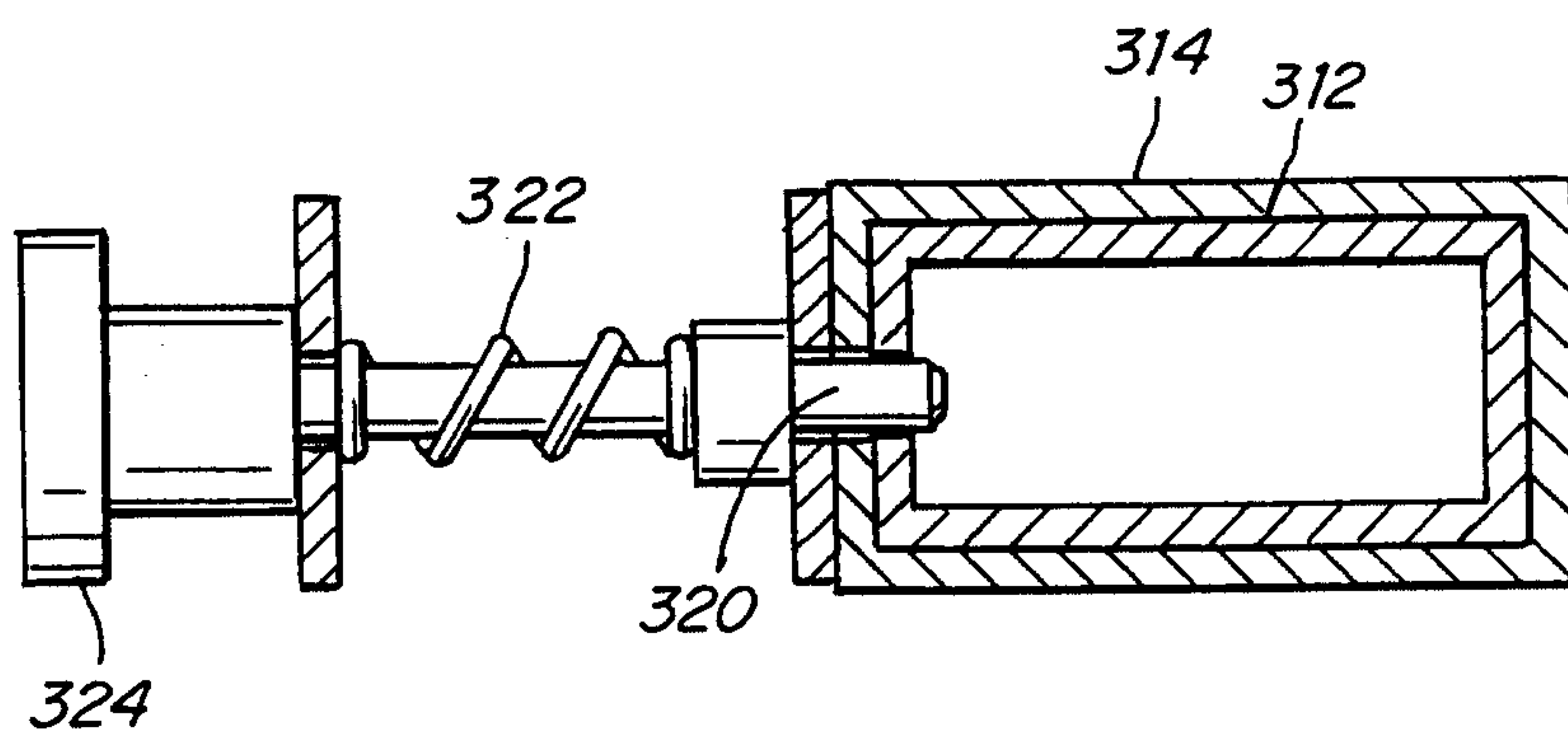


Fig. 19

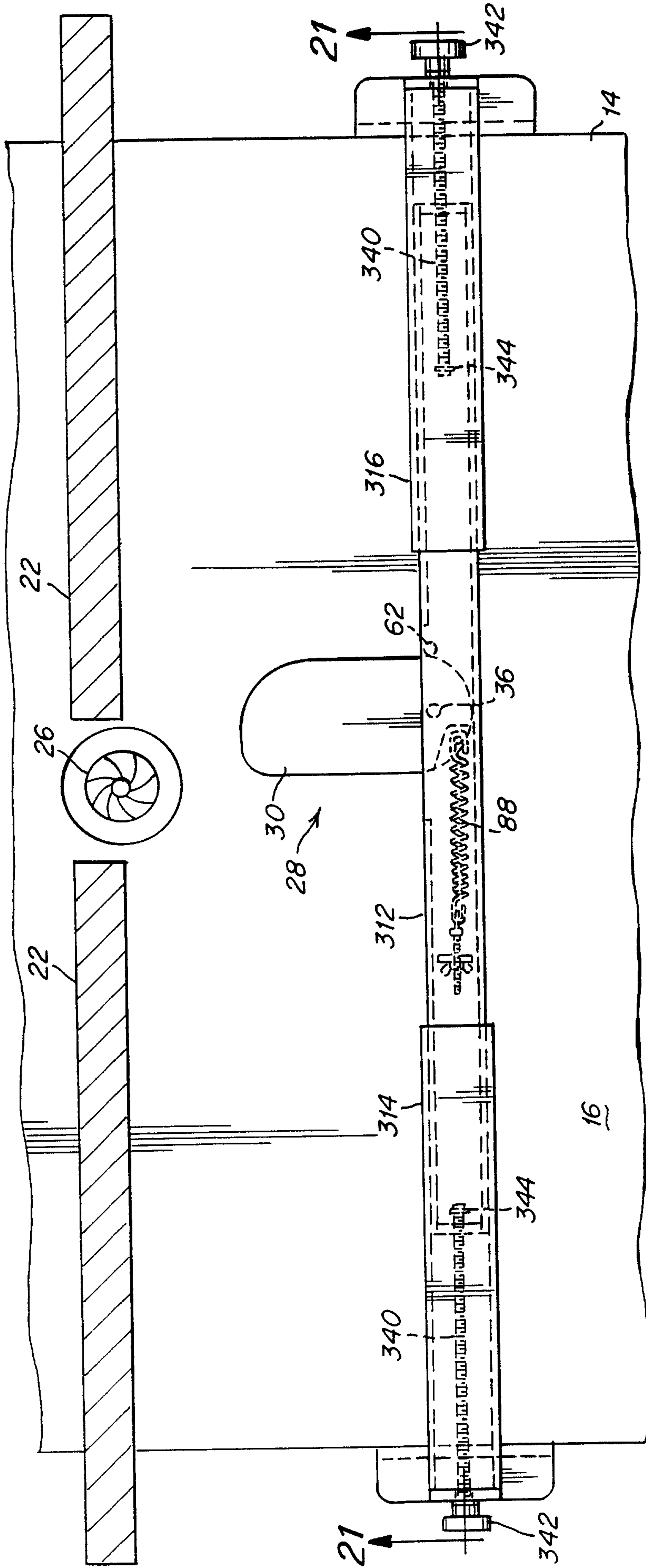


Fig. 20

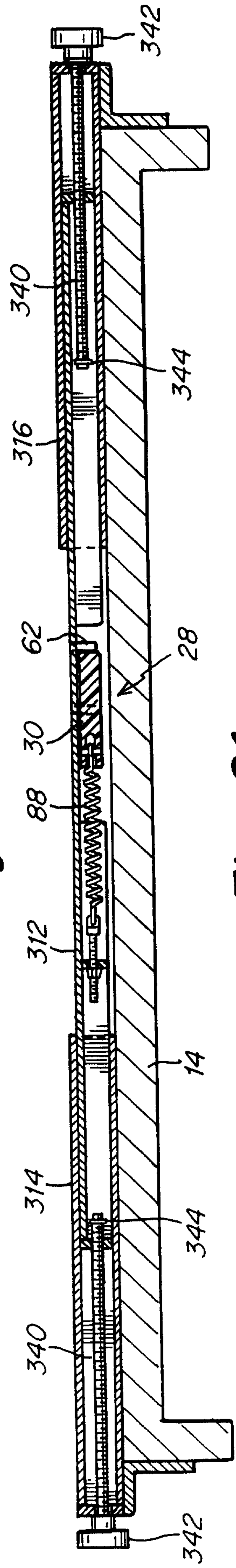


Fig. 21

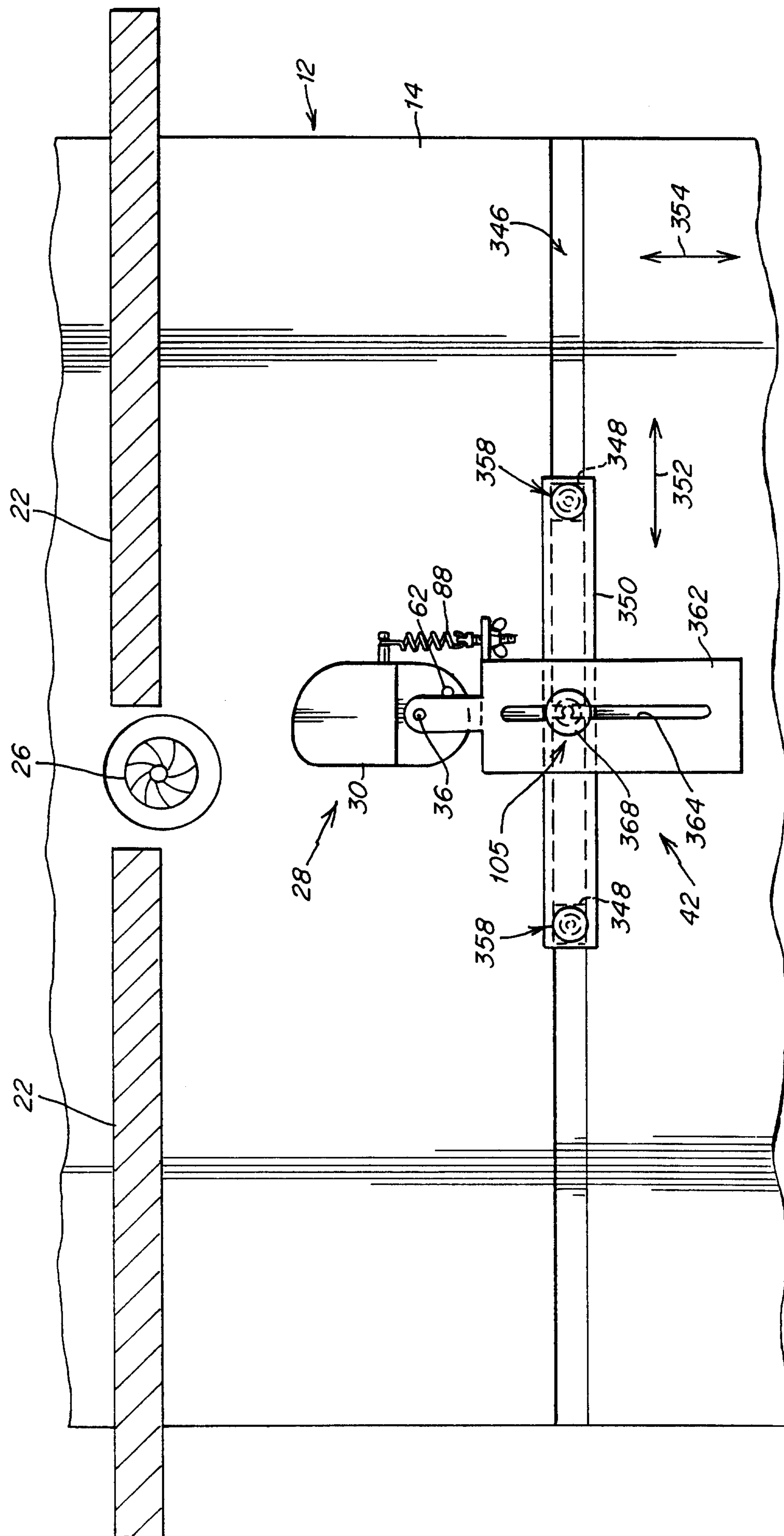


Fig. 22

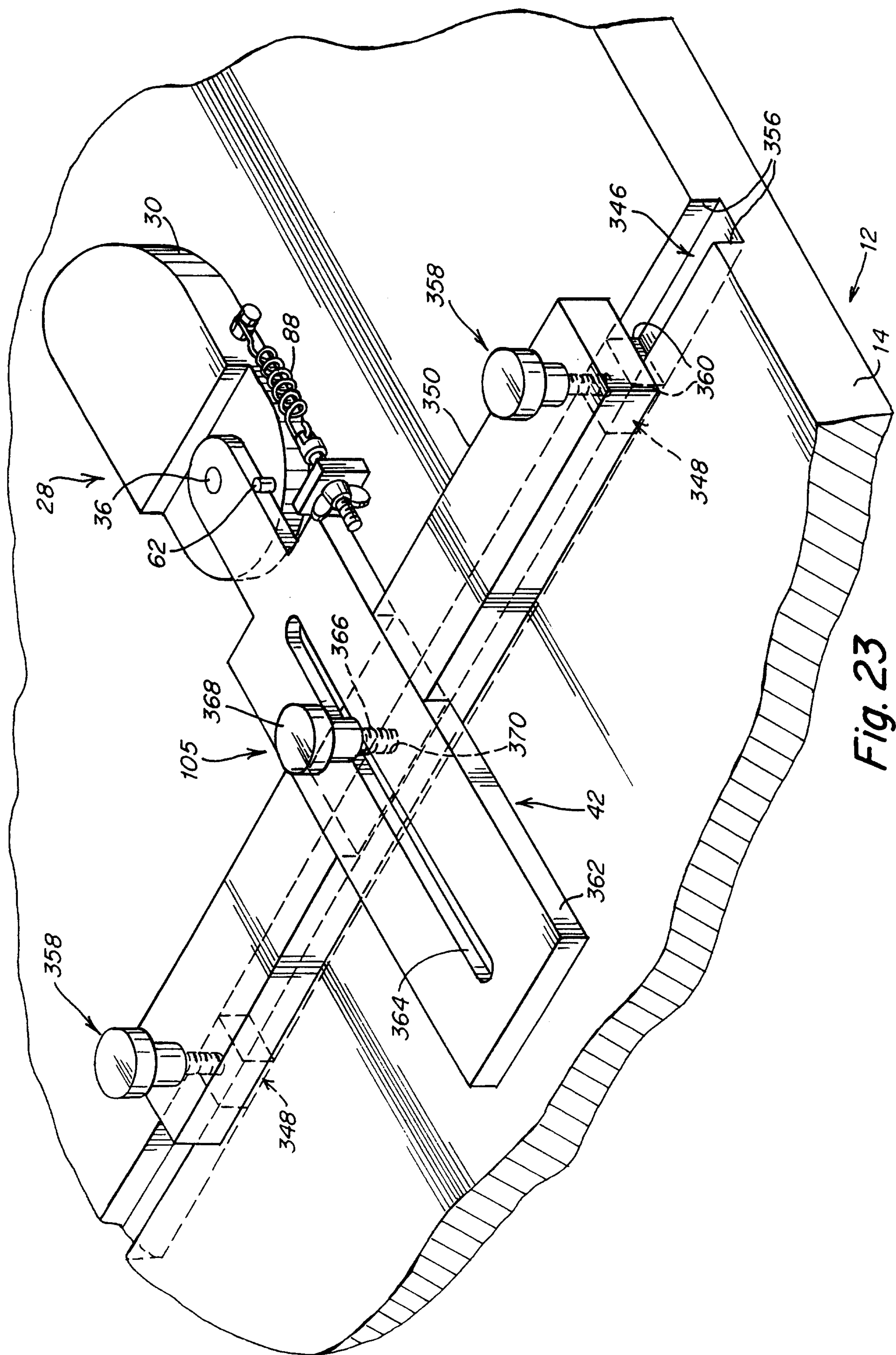


Fig. 23

