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(54) **CARPENTER TOOLS**

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(57) **ABSTRACT**

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A carpenter square includes a triangular body having a first edge, a second edge, and a third edge, wherein the first, second, and third edges cooperate to define a perimeter edge of the triangular body. A fence is pivoted to the first edge for movement among first, second, and third positions. In the first position, the fence is normal to the triangular body in a first direction. In the second position, the fence is normal to the triangular body in a second direction opposite the first direction. In the third position, the fence is coplanar to the triangular body.

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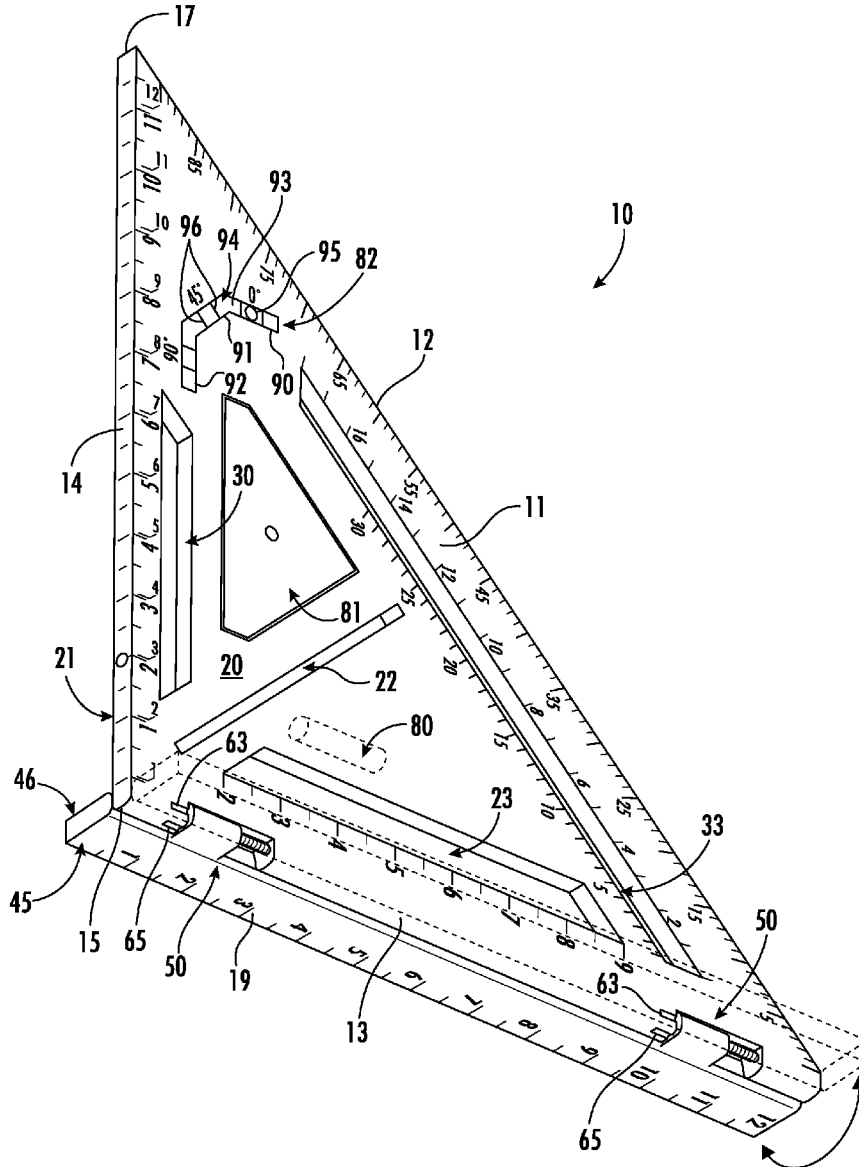
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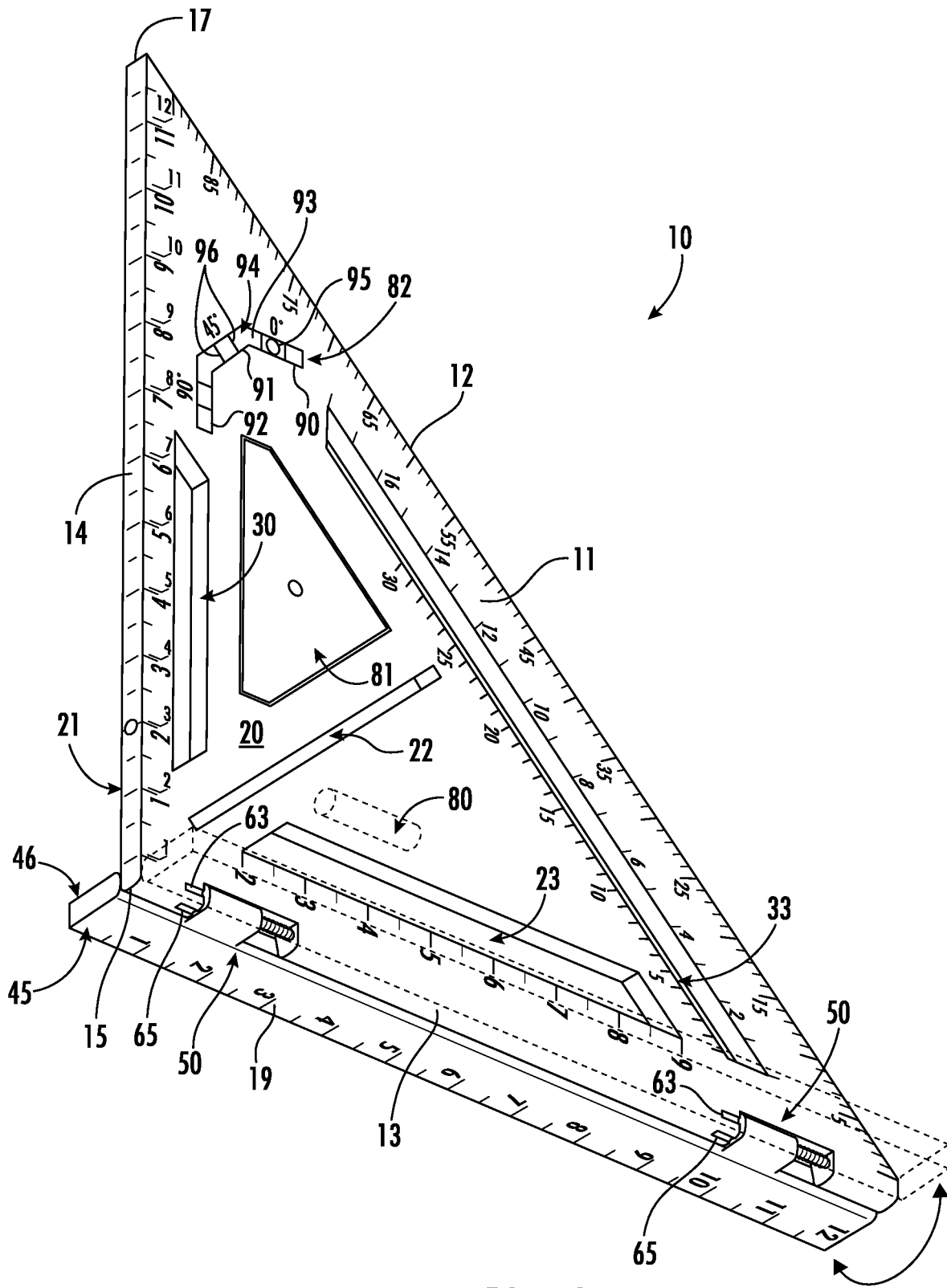


FIG. 1C

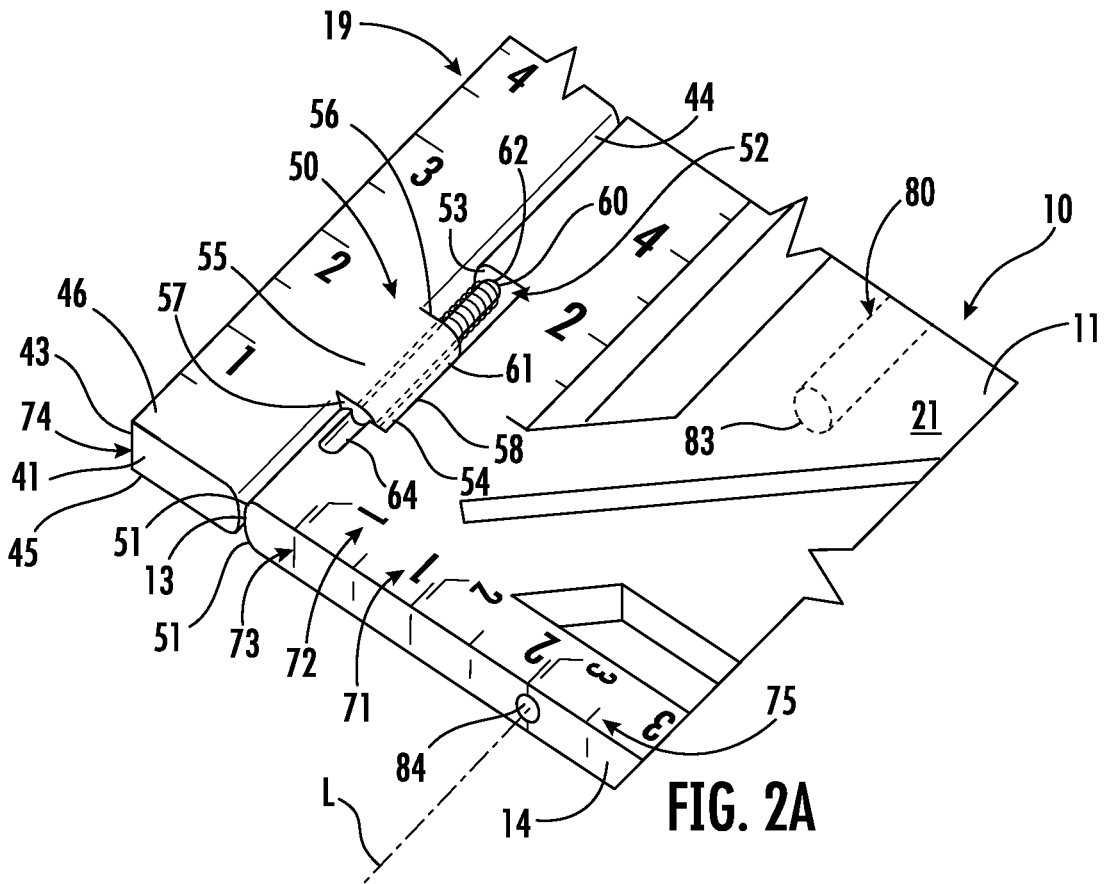


FIG. 2A

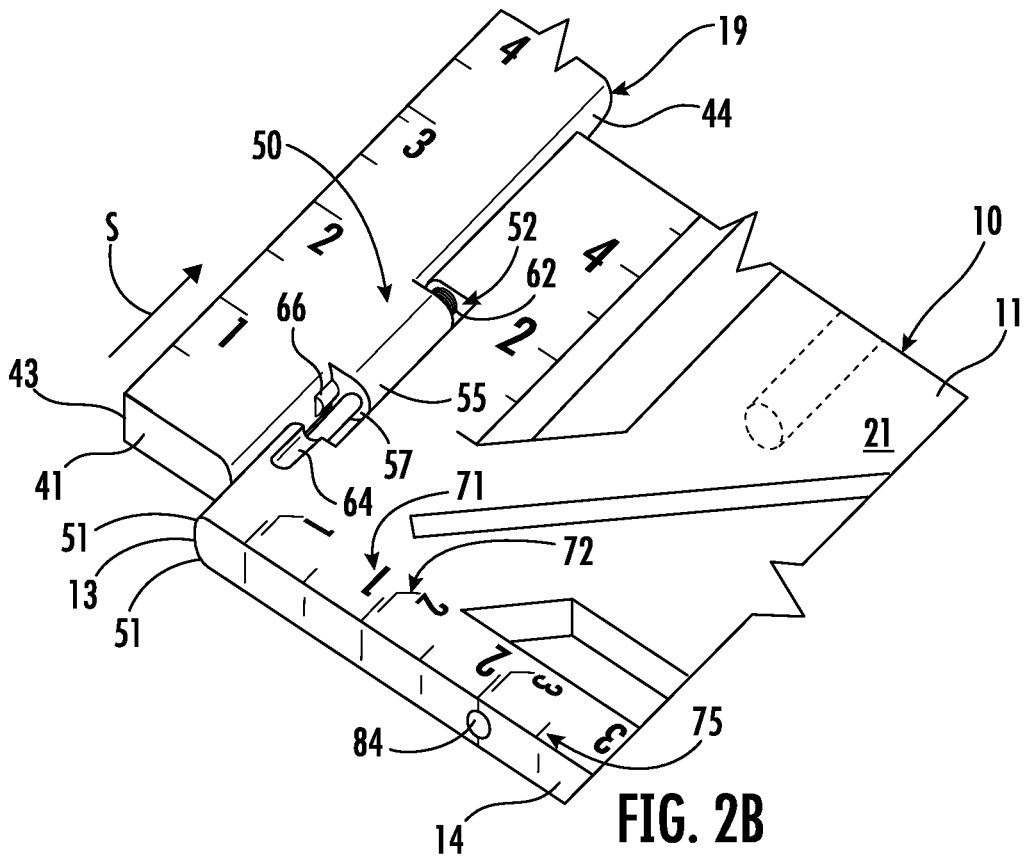


FIG. 2B







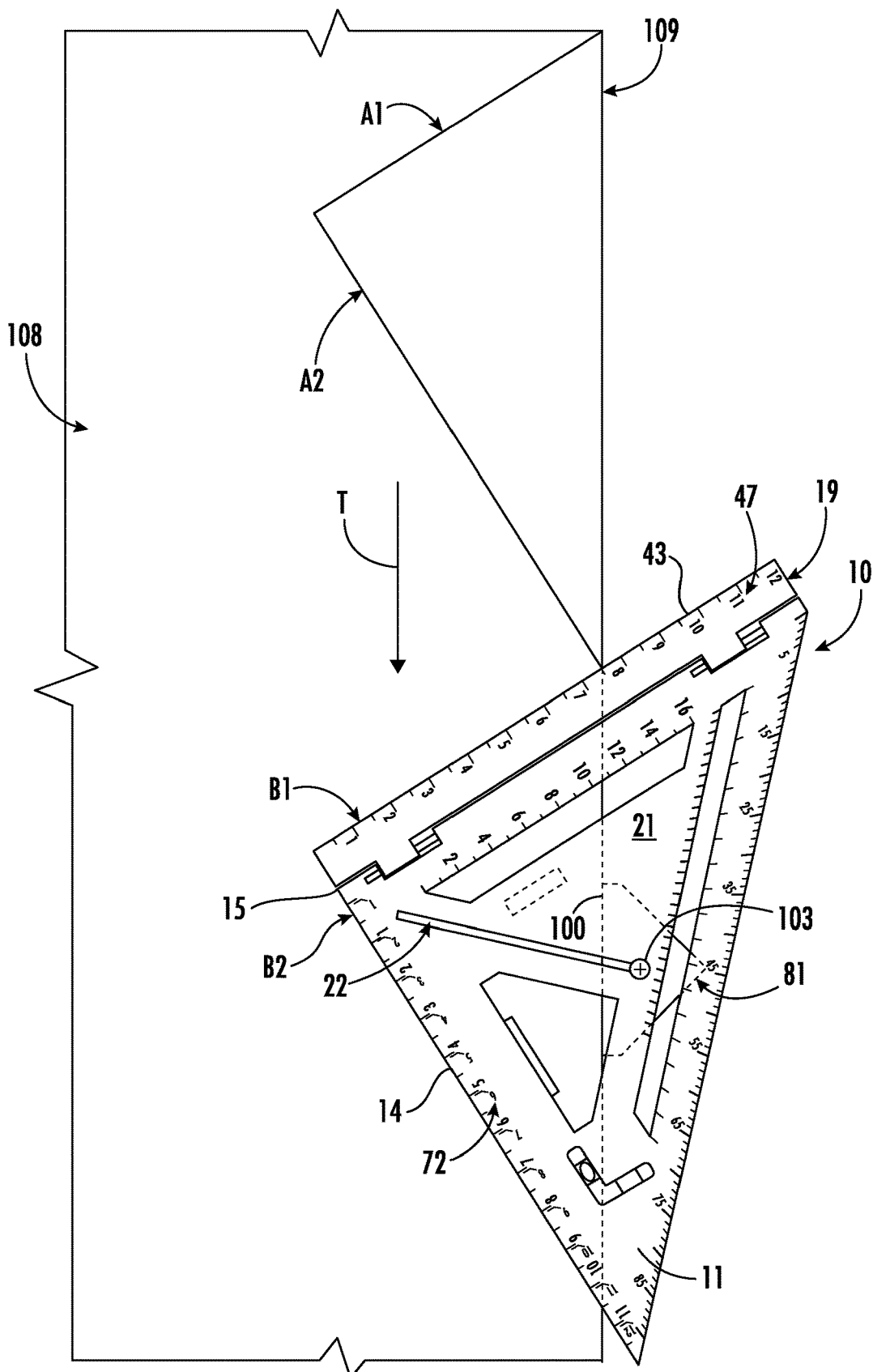


FIG. 3C





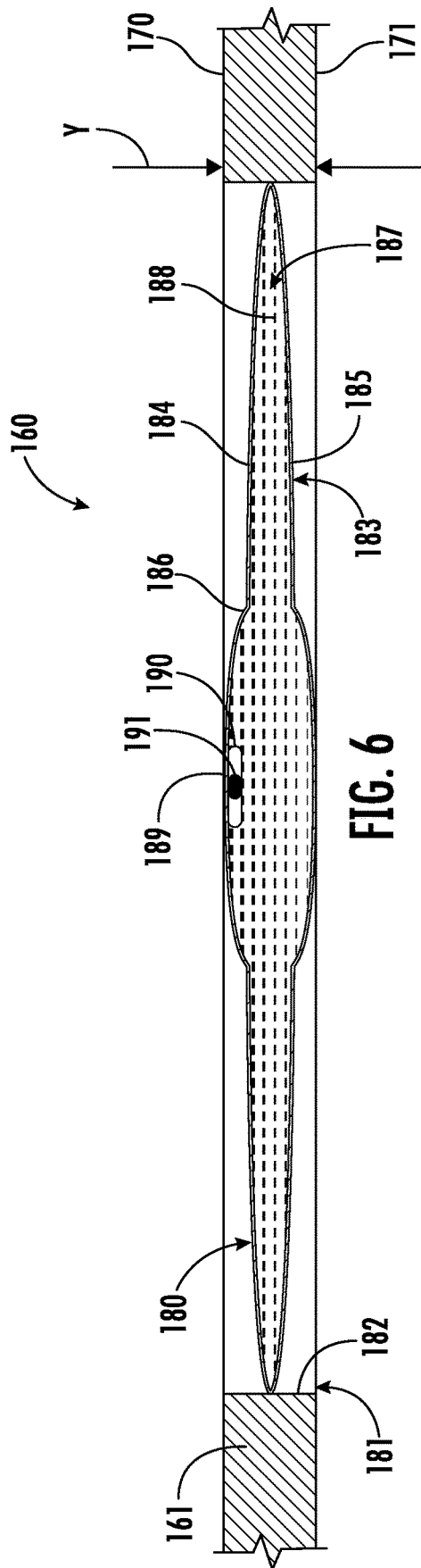
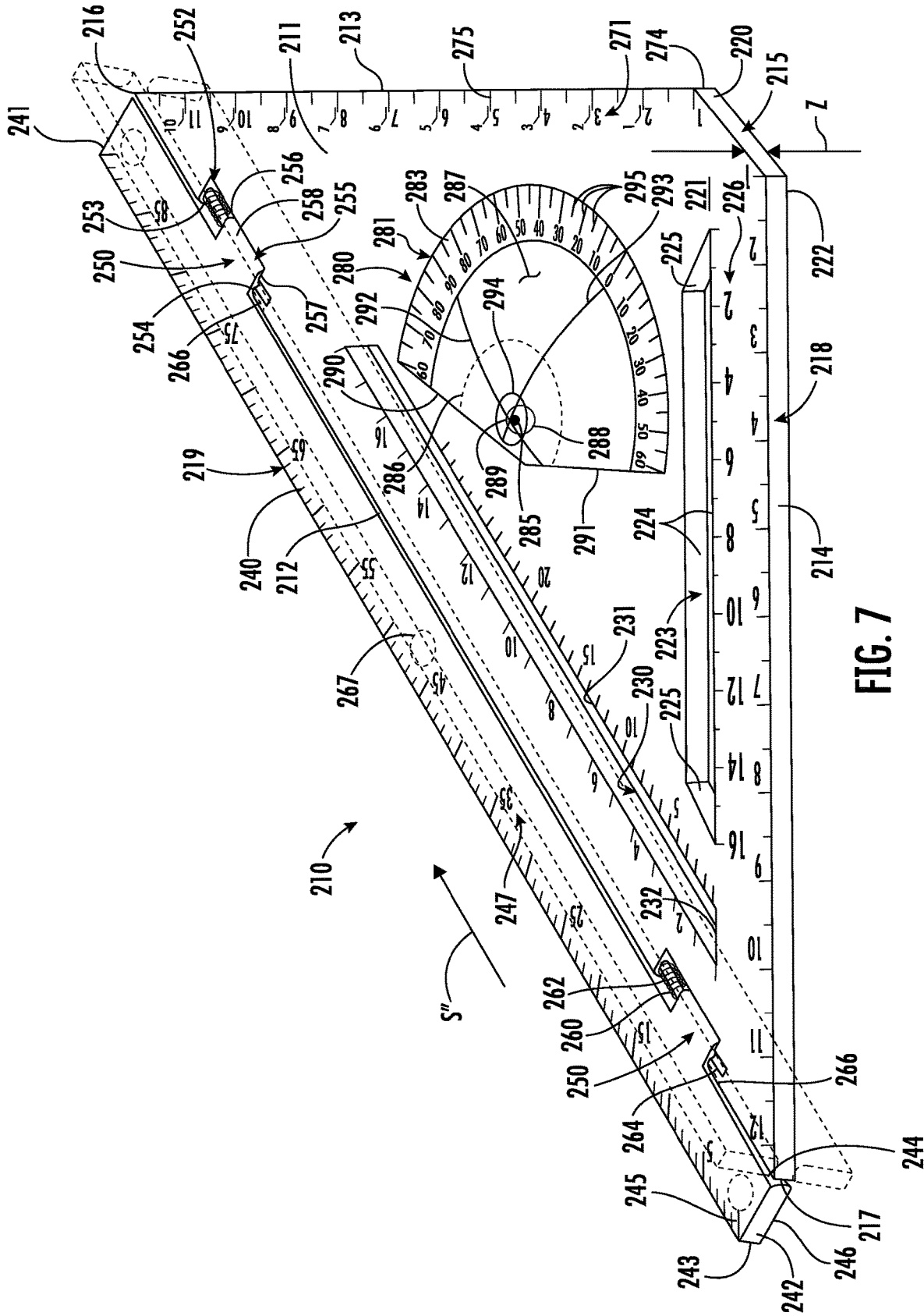


FIG. 6



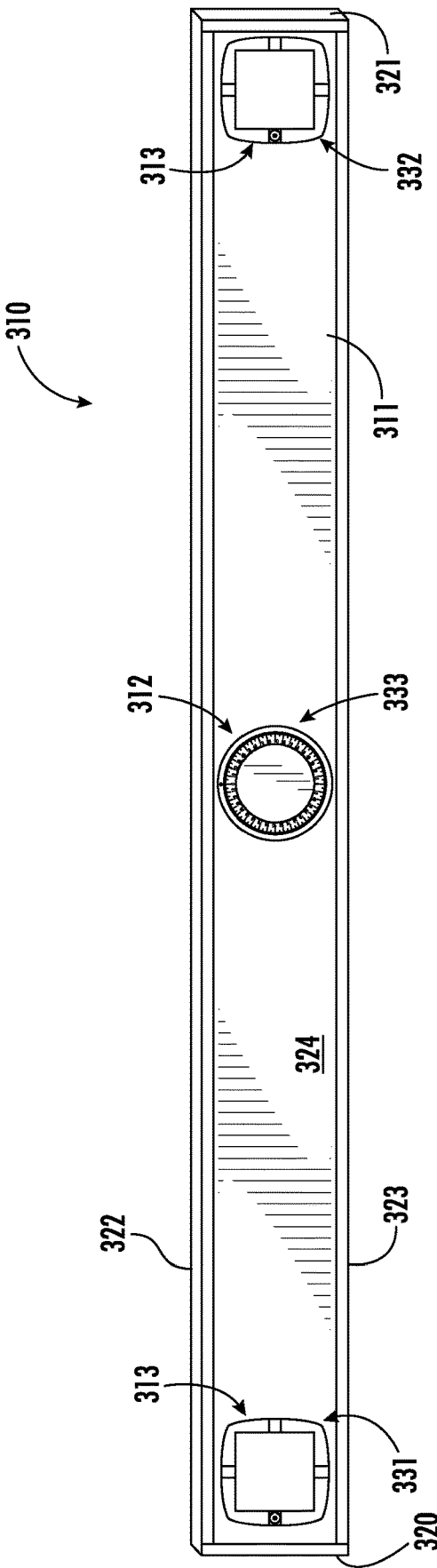


FIG. 8

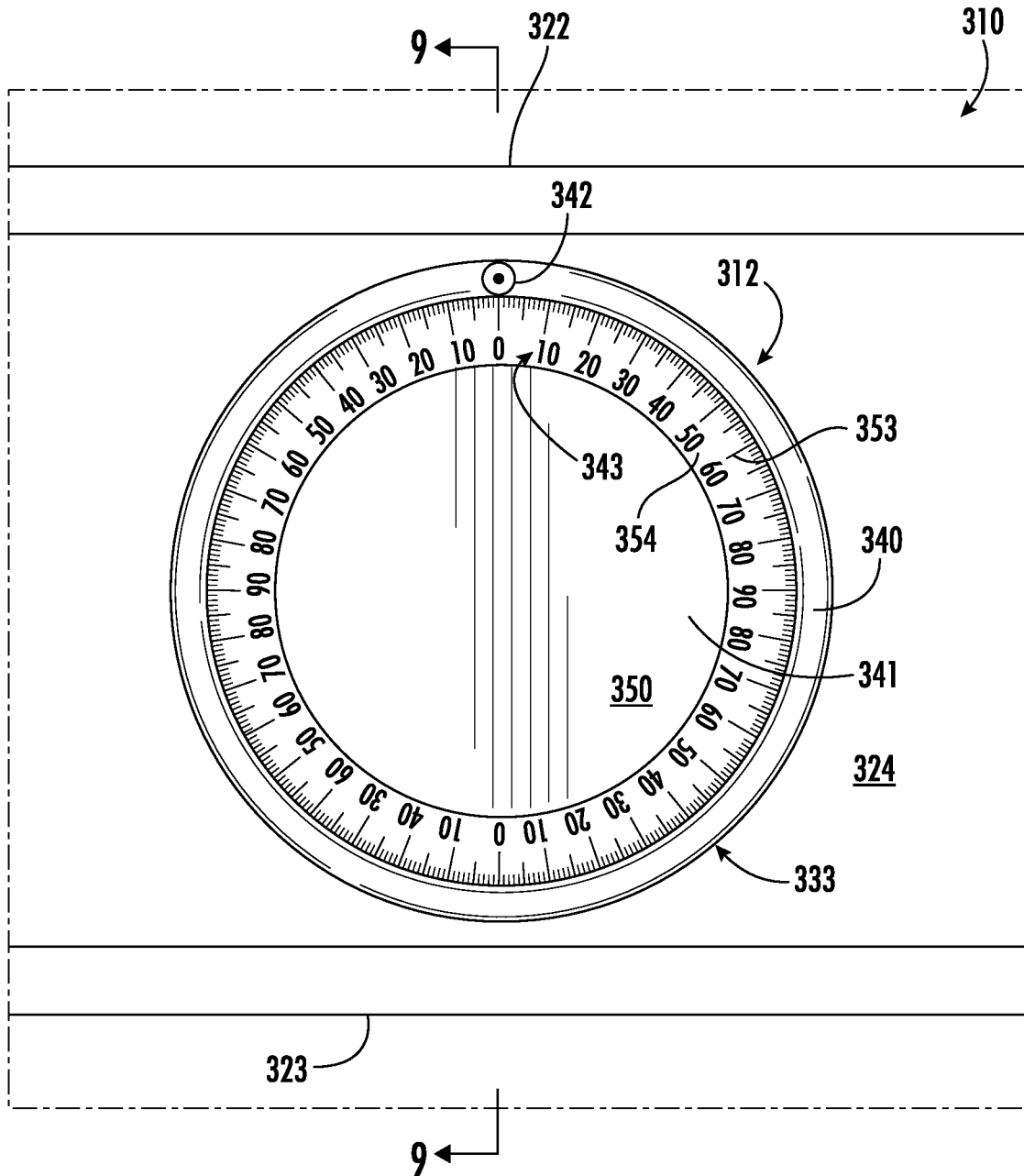


FIG. 9A

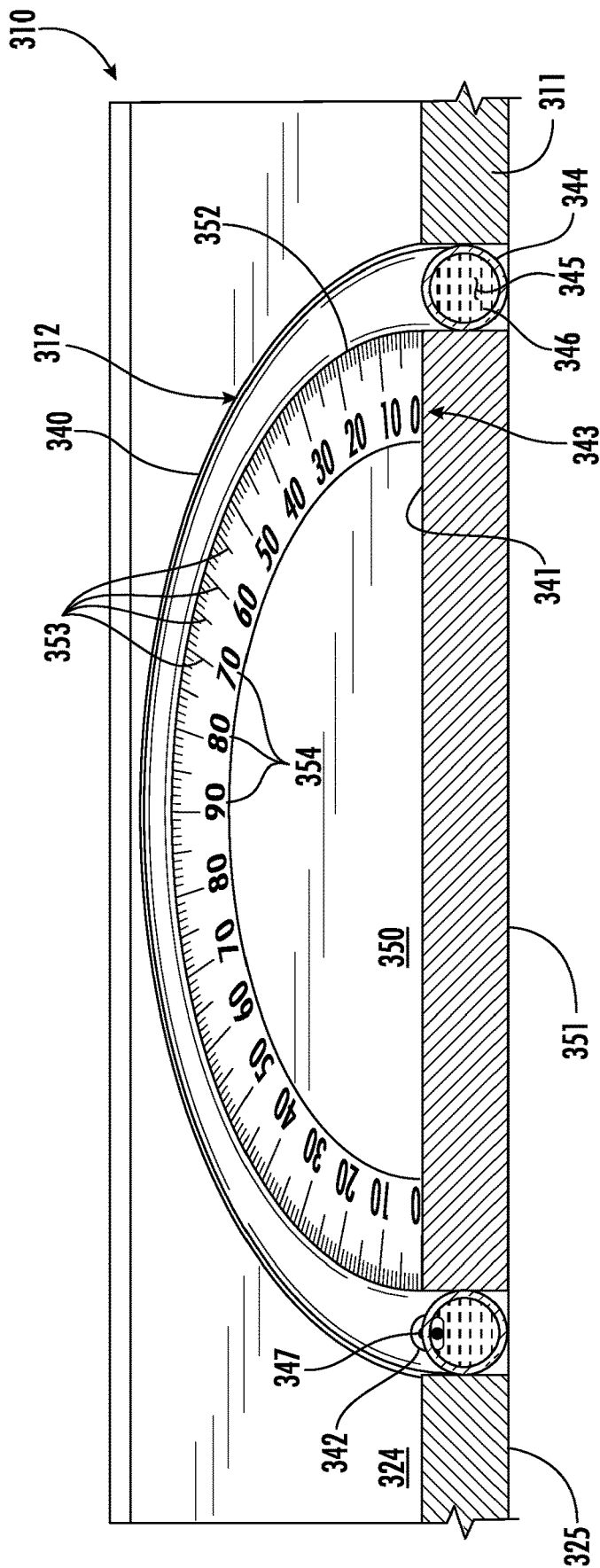


FIG. 9B

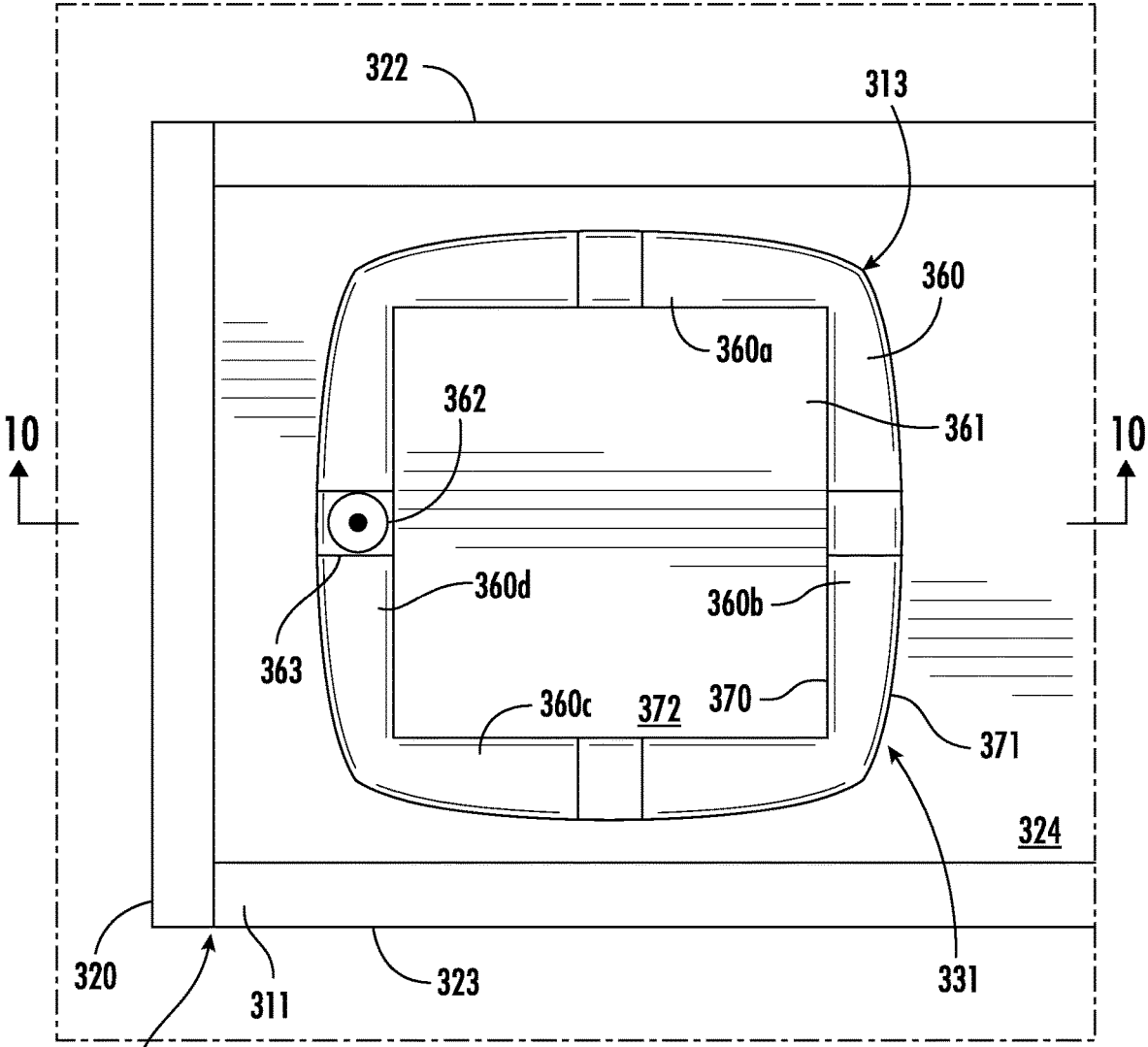


FIG. 10A

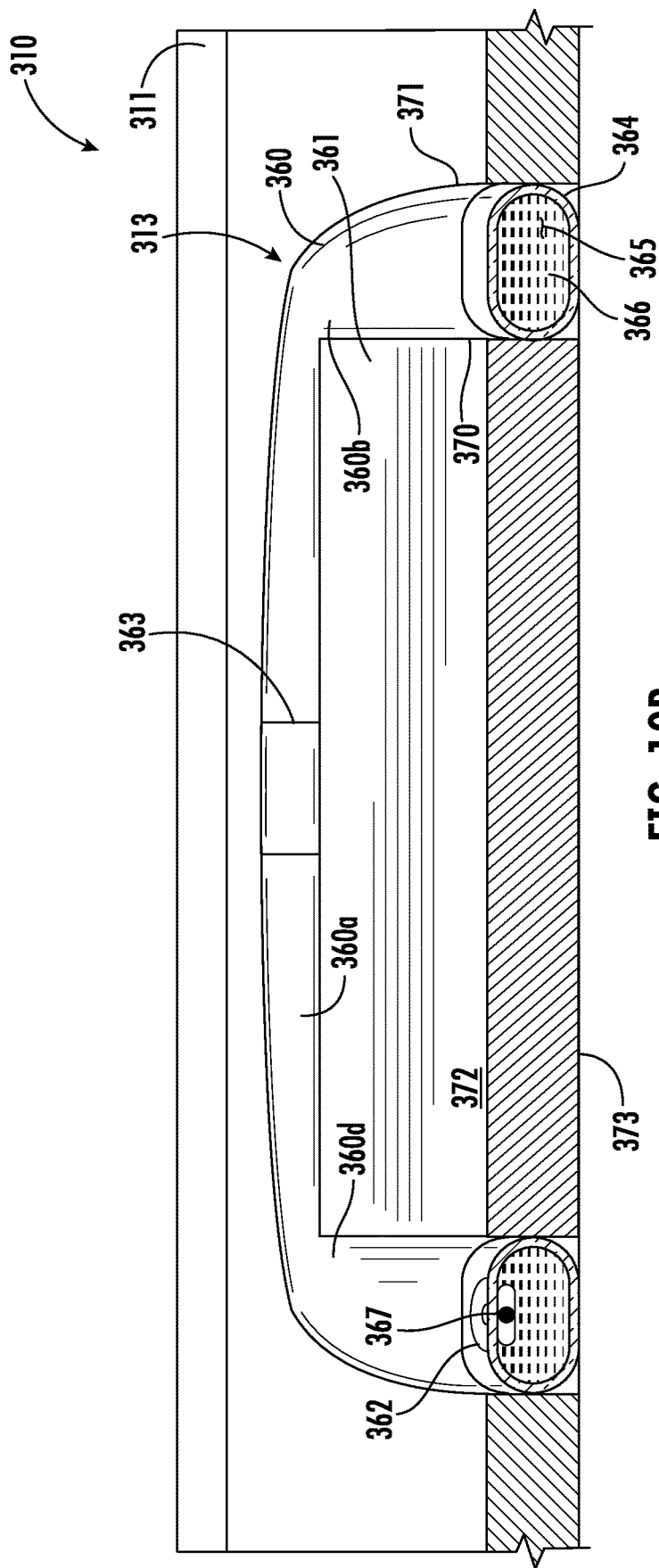


FIG. 10B

## CARPENTER TOOLS

### FIELD

**[0001]** The present specification relates generally to hand tools, and more particularly to carpenter squares.

### BACKGROUND

**[0002]** Carpenters and other tradesmen use a variety of tools in their lines of work. Some tools are specifically designed for certain jobs, while other tools are useful in a wide range of applications. One tool that is frequently used is a carpenter's square or carpenter square.

**[0003]** Conventionally, a carpenter square is a triangular piece of plastic or metal having two short sides extending out from a right corner and a longer hypotenuse side between the two short sides. One of the short sides has a fence, which is a length of material fixed to the side but aligned normal to the body of the square. The fence thus projects outwardly from both sides of the square, which makes it very easy to lay the square against a straight edge of a workpiece and draw lines at a right angle to the straight edge.

**[0004]** The carpenter square is a staple tool in any tradesman's quiver. Yet, all tools are subject to improvement, and the carpenter square has had relatively few and minor changes since it was introduced. There is a need to improve the carpenter square.

### SUMMARY

**[0005]** According to an embodiment described herein, carpenter square includes a triangular body having a first edge, a second edge, and a third edge, wherein the first, second, and third edges cooperate to define a perimeter edge of the triangular body. A fence is pivoted to the first edge for movement among first, second, and third positions. In the first position, the fence is normal to the triangular body in a first direction. In the second position, the fence is normal to the triangular body in a second direction opposite the first direction. In the third position, the fence is coplanar to the triangular body.

**[0006]** In an embodiment, the triangular body includes opposed first and second body faces, and the fence includes opposed first and second fence faces. In the third position, the first body face and the first fence face are coplanar to each other, and the second body face and the second fence face are coplanar to each other. In an embodiment, the carpenter square includes a first set of measurements along the second edge, the first set of measurements corresponding to a first zero location offset from the first edge, and a second set of measurements along the second edge, the second set of measurements corresponding to a second zero location offset from the first zero location. In an embodiment, the fence is mounted to the triangular body at a hinge assembly, and the hinge assembly includes a notch in the triangular body. A tab projects from the fence and is mounted in the notch for swinging movement within the notch between three positions corresponding to the first, second, and third positions of the fence with respect to the triangular body. In an embodiment, the tab moves between a neutral stance, in which the tab is toward a side of the notch, and an advanced stance, in which the tab is away from the side of the notch. The neutral stance of the tab disables movement of the fence among the first, second, and third positions, and the

advanced stance of the tab enables movement of the fence among the first, second, and third positions.

**[0007]** In an embodiment, the fence is mounted to the triangular body at a hinge assembly, and the hinge assembly includes a notch in the triangular body, a pin mounted in the notch, a groove formed into the body in communication with the notch, a tab projecting from the fence and fit over the pin for swinging movement within the notch, and a tongue on the tab which is complementary to the groove. The tab moves between a neutral stance, in which the tab is toward a side of the notch and the tongue is received in the groove, and an advanced stance, in which the tab is away from the side of the notch and the tongue is removed from the groove. A spring biases the tab toward into the neutral stance. In an embodiment, a jig block carried in the triangular body is removable therefrom and applicable to a face thereof, wherein when the jig block is applied to the face and an edge of the jig block is placed against an edge of a workpiece, the first and second edges of the carpenter square overlie the workpiece and define cut lines corresponding to rise and run lines of a stair stringer. In an embodiment, a slit is formed through the triangular body, and the jig block is configured to be secured in a location along a length of the slit.

**[0008]** In an embodiment, the carpenter square includes a bubble level having a closed sidewall defining first, second, and third sections in fluid communication with each other, and a float within the closed sidewall for indicating an angular measurement, the float freely moveable among the first, second, and third sections. The first section is parallel to one of the first and second edges, the second section is transverse to the first section at forty-five degrees, and the third section is transverse to the second section at forty-five degrees and is normal to the first section. In an embodiment, the carpenter square includes a bubble level having a closed sidewall defining tubular first and second sections in fluid communication with each other, a float within the closed sidewall for indicating an angular measurement, the float freely moveable between the first and second sections. The first section is parallel to one of the first and second edges, and the second section is normal to the first section. In an embodiment, the carpenter square includes a bubble level having a closed tubular sidewall and a float within the closed tubular sidewall, the float for indicating an angular measurement. The closed tubular sidewall curves arcuately from one end to an opposed end, and level lines are marked on the closed tubular sidewall to indicate zero- and ninety-degree measurements. In an embodiment, the carpenter square includes a bubble level having a reservoir having a disc shape, a perimeter, and a top, and a float within the reservoir. Angular measurements are marked along the perimeter, such that when the carpenter square is placed on one of the first, second, and third edges, the float rises toward one of the angular measurements. Axis lines extend over the reservoir and intersect at the top, such that when the carpenter square is laid on a face of its triangular body, the float rises toward the top. In an embodiment, the bubble level includes an interrupting edge which severs the disc shape without interrupting the top of the reservoir.

**[0009]** In an embodiment, the carpenter square includes a laser carried in the triangular body and having a laser beam directed through an opening in one of the first, second, and third edges. In an embodiment, the carpenter square includes

an extension of the triangular body, wherein the extension is a rectangular leg projecting contiguously along the second edge.

[0010] In an embodiment, the third edge is a hypotenuse edge, the first edge is shorter than the hypotenuse edge, and the second edge is shorter than the hypotenuse edge. In an embodiment, the first edge is a hypotenuse edge, the second edge is shorter than the hypotenuse edge, and the third edge is shorter than the hypotenuse edge. In an embodiment, the second and third edges are joined by a diagonal edge defining an open corner of the carpenter square.

[0011] The above provides the reader with a very brief summary of some embodiments described below. Simplifications and omissions are made, and the summary is not intended to limit or define in any way the disclosure. Rather, this brief summary merely introduces the reader to some aspects of some embodiments in preparation for the detailed description that follows.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Referring to the drawings:

[0013] FIGS. 1A, 1B, and 1C are elevation and perspective views of an embodiment of an improved carpenter square having a fence mounted for swinging movement;

[0014] FIGS. 2A-2D are enlarged perspective views of the fence of the improved carpenter square of FIG. 1A, showing the fence moving between positions;

[0015] FIGS. 3A-3C are perspective and plan views of an embodiment of an improved carpenter square having a jig block for laying out a cut pattern on a workpiece;

[0016] FIG. 4 is a perspective view of an embodiment of an improved carpenter square having a fence mounted for swinging movement;

[0017] FIG. 5 is a perspective view of an embodiment of an improved carpenter square having a fence mounted for swinging movement;

[0018] FIG. 6 is a section view taken along the line 6-6 in FIG. 5; and

[0019] FIG. 7 is a perspective view of an embodiment of an improved carpenter square having a fence mounted for swinging movement;

[0020] FIG. 8 is a perspective view of an improved carpenter level having round and square bubble levels;

[0021] FIG. 9A is an enlarged view of the round bubble level of FIG. 8;

[0022] FIG. 9B is a section view of the round bubble level taken along the line 9-9 from FIG. 9A;

[0023] FIG. 10A is an enlarged view of the square bubble level of FIG. 8; and

[0024] FIG. 10B is a section view of the square bubble level taken along the line 10-10 from FIG. 10A.

#### DETAILED DESCRIPTION

[0025] Reference now is made to the drawings, in which the same reference characters are used throughout the different figures to designate the same elements. Briefly, the embodiments presented herein are preferred exemplary embodiments and are not intended to limit the scope, applicability, or configuration of all possible embodiments, but rather to provide an enabling description for all possible embodiments within the scope and spirit of the specification. Description of these preferred embodiments is generally made with the use of verbs such as “is” and “are” rather than

“may,” “could,” “includes,” “comprises,” and the like, because the description is made with reference to the drawings presented. One having ordinary skill in the art will understand that changes may be made in the structure, arrangement, number, and function of elements and features without departing from the scope and spirit of the specification. Further, the description may omit certain information which is readily known to one having ordinary skill in the art to prevent crowding the description with detail which is not necessary for enablement. Indeed, the diction used herein is meant to be readable and informational rather than to delineate and limit the specification; therefore, the scope and spirit of the specification should not be limited by the following description and its language choices.

[0026] FIGS. 1A-1C illustrate a carpenter square 10. The square includes a body 11 having three edges. The square 10 has: 1) a hypotenuse edge 12 opposite a right corner 15; 2) a short first edge 13 extending between the right corner 15 and a first corner 16 formed by and between the short first edge 13 and the hypotenuse edge 12; and 3) a short second edge 14 extending between the right corner 15 and a second corner 17 formed by and between the short second edge 14 and the hypotenuse edge 12. These three edges cooperate to define a perimeter edge 18 of the body 11 of the square 10 itself.

[0027] Pivoted to the first edge 13 is a fence 19. The fence 19 is a roughly rectangular piece of material coextensive to the first edge 13. The fence 19 pivots between preferably three indexed positions. In a first position of the fence 19, shown in solid line in FIG. 1C, the fence 19 is normal to the body 11 in a first direction (into the paper, or away from the reader). In a second position of the fence 19, shown in broken line in FIG. 1C, the fence 19 is normal to the body 11 in a second direction, opposite the first direction (out of the paper, or toward the reader). In a third position, the fence 19 is coplanar to the body 11, as shown in solid line in both FIGS. 1A and 1B.

[0028] When the fence 19 is in the first or second positions, a carpenter can lay the fence 19 flat on a surface and against a straight edge and mark lines on the surface. The normal arrangement of the fence 19 to the body 11 of the square 10 makes quick alignment of the square 10 easy. If the carpenter desires to lay the body 11 of the square 10 entirely on the workpiece and at least partially inboard from the straight edge, however, he need only move the fence 19 to the third position, such that the fence 19 is aligned coplanar to the body 11 and the entirety of the square 10 can be laid flat on the workpiece.

[0029] The body 11 of the square 10 is generally triangular, because the perimeter edge 18 generally has three major sides or lengths. The first and second edges 13 and 14 meet at the right corner 15, and the second edge 14 and hypotenuse edge 12 meet at the acute second corner 17. The first edge 13 and hypotenuse edge 12 meet at the first corner 16, which is acute, but is blunted or truncated by a short fourth edge. As such, the perimeter edge 18 technically has four sides or four edges, but the very short side at the first corner 16 is so small that the three major sides of the edges 12, 13, and 14 dominate the appearance of the square 10 such that the body 11 generally is triangular. In this way, the square 10 somewhat peculiarly has a triangular body 11 defined by a perimeter edge 18 with four sides.

[0030] The body 11 is preferably constructed from a material or combination of materials with rugged, strong,

durable, and hard material characteristics. Preferably, the body 11 is made from metal, hard wood, plastic, or like materials offering these characteristics.

[0031] The body 11 has a first face 20 and an opposed second face 21. The faces 20 and 21 are flat and parallel to each other, spaced apart by a width W of the body 11, as shown in FIG. 1B. The faces 20 and 21 are marked with a plurality of indications and measurements. Moreover, slots and slits are formed through the body 11 entirely from one face 20 through to the other face 21. For example, in the embodiment shown in FIGS. 1A-1C, a medial slit 22 extends diagonally through the body 11. The medial slit 22 is linear or straight. The medial slit 22 has a first end just inboard from the right corner 15, extends generally at a forty-five-degree angle with respect to both the first and second edges 13 and 14, and terminates at an opposed second end well inboard of the hypotenuse edge 12. In other embodiments, the medial slit 22 has other shapes, orientations, and arrangements, and the embodiment shown in FIGS. 1A-1C is not limiting. The medial slit 22 may be useful for making markings on the workpiece below the square 10, but is especially useful with a jig block for laying out cut patterns, as is described below.

[0032] Two slots, each wider than the medial slit 22, are formed inboard of the first and second edges 13 and 14. Referring primarily to FIG. 1A, a first slot 23 is parallel to and inboard of the first edge 13. The first slot 23 has opposed major sides 24 and opposed diagonal minor ends 25. The major sides 24 are both parallel to the first edge 13, and the major side 24 proximate to the first edge 13 is larger than the major side 24 distal to the first edge 13. The minor ends 25 are diagonal and directed inward at approximately forty-five degrees, such that the minor end 25 proximate the second edge 14 is canted away from the second edge 14 and the minor end 25 distal to the second edge 14 is canted toward the second edge 14. Thus, the first slot 23 has the appearance of an isosceles trapezoid. The first slot 23 is open such that a pencil can be passed through the first slot 23 to make markings on a workpiece underneath the first slot 23. Along the major edge 24 which is proximate the first edge 13 of the square 10, the first face 20 is marked with measured indicators 26. In this embodiment, the measured indicators 26 are inch and half-inch markings, measured from the second edge 14. Since the first slot 23 is offset from the second edge 14, the first of the measured indicators is a two-inch marking. In other embodiments, the first slot 23, if existent, has other shapes, orientations, and arrangements.

[0033] A second slot 30 is parallel to and inboard of the second edge 14. The second slot 30 has opposed major sides 31 and opposed diagonal minor ends 32. The major sides 31 are both parallel to the second edge 14, and the major side 31 proximate to the second edge 14 is larger than the major side 31 distal to the second edge 14. The minor ends 32 are diagonal and directed inward at approximately forty-five degrees, such that the minor end 32 proximate the first edge 13 is canted away from the first edge 13 and the minor end 32 distal to the first edge 13 is canted toward the first edge 13. Thus, the second slot 30 has the appearance of an isosceles trapezoid. Like the first slot 23, the second slot 30 is open such that a pencil can be passed through it to make markings on a workpiece underneath. In other embodiments, the second slot 30, if existent, has other shapes, orientations, and arrangements.

[0034] Another slot, a hypotenuse slot 33, is formed inboard of the hypotenuse edge 12. The hypotenuse slot 33 is parallel to and inboard of the hypotenuse edge 12. The hypotenuse slot 33 has opposed major sides 34 and opposed diagonal minor ends 35. The major sides 34 are both parallel to the hypotenuse edge 12, and the major side 34 proximate to the hypotenuse edge 12 is larger than the major side 34 distal to the hypotenuse edge 12. The minor ends 35 are diagonal and directed inward at approximately forty-five degrees, such that the minor end 35 proximate the first edge 13 is parallel to the first edge 13 and the minor end 35 proximate to the second edge 14 is parallel to the second edge 14. Thus, the hypotenuse slot 33 has the appearance of an isosceles trapezoid. The hypotenuse slot 33 is also open such that a pencil can be passed through it to make markings on a workpiece underneath. Along both major edges 34, the first face 20 is marked with measured indicators 36. In other embodiments, the hypotenuse slot 33, if existent, has other shapes, orientations, and arrangements.

[0035] The fence 19 is hinged to the body 11 to move between the three indexed positions. Although in other embodiments, the fence 19 pivots between an alternate number of positions, the embodiment shown here pivots between three for ease and clarity of understanding. After reading this description, one having ordinary skill in the art will readily appreciate how the fence 19 moves among an alternate number of positions in such other embodiments.

[0036] The fence 19 has a body 40 which is generally rectangular prismatic and which extends between two opposed ends 41 and 42. The ends 41 and 42 are flat and parallel to each other, and both are parallel to the second edge 14. The body 40 of the fence 19 includes a fence edge 43 extending between the two ends 41 and 42. The fence edge 43 is straight and uninterrupted by notches, projections, divots, or other features which would prevent the fence edge 43 from defining a straight line. Opposite the fence edge 43, the body 40 includes an inner edge 44 directed toward the first edge 13 of the body 11 of the square 10. Like the first edge 13, the inner edge 44 is interrupted by hinge assemblies which couple the fence 19 to the body 11 of the square 10. Both the first edge 13 and the inner edge 44 are slightly rounded with fillets or chamfers so that the fence 19 smoothly pivots with respect to the body 11 without interruption or catching.

[0037] The body 40 of the fence 19 has a first face 45 and an opposed second face 46. The faces 45 and 46 are flat and parallel to each other, spaced apart by the same width W that defines the width of the body 11 of the square 10. When the fence 19 is arranged in its third position, the first face 45 of the fence 19 is registered with and coplanar to the first face 20 of the body 11, and the second face 46 is registered with and coplanar to the second face 20 of the body 11. The first and second faces 45 and 46 are both marked with measured indicators 47 along the fence edge 43. The measured indicators 47 on the first and second faces 45 and 46 are the same, starting at the first end 41 and increasing in number toward the opposed end 42. The fence edge 43 also carries measured indicators 48 which are registered with the measured indicators 47. However, while the measured indicators 47 preferably include tick or hash marks as well as numbers, the measured indicators 48 preferably only include hash marks due to the limited space available on the fence edge

43. The carpenter can easily sight the numbers on the adjacent first or second face 45 or 46 to identify the measurement.

[0038] The fence 19 mounts to the body 11 of the square 10 at preferably two hinge assemblies 50 including structural features and elements on both the fence 19 and the body 11. Referring now to the enlarged views of FIGS. 2A-2D, the hinge assembly 50 proximate the second edge 14 is shown. The two hinge assemblies 50 are identical in structure and differ only in location, and as such, the reader will understand that the description of this hinge assembly 50 applies equally to the description of the other hinge assembly 50. In other embodiments, there may be fewer or more hinge assemblies 50. FIGS. 2A-2D illustrate the opposite side of the square 10 from that shown in FIGS. 1A-1C, namely, FIGS. 2A-2D show the second face 21 instead of the first face 20.

[0039] The first edge 13 has rounded chamfers or fillets 51 at both the first and second faces 20 and 21. The fillets 51 allow the fence 19 to pivot when it moves among positions. Inboard of the second edge 14, a notch 52 interrupts the first edge 13. The notch 52 is blind and extends into the body 11 of the square 10, terminating at an inner wall, which extends between two sides 53 and 54 of the notch 52. The notch 52 defines a receiving space complementary to a tab 55 on the fence 19 which fits into the notch 52.

[0040] The tab 55 is an integral, unitary, monolithic projection of the body 40 at the inner edge 44 of the fence 19. The tab 55 has two opposed ends 56 and 57 normal to the inner edge 44 and an inner edge 58 extending between the ends 56 and 57. Like the inner edge 44 of the fence 19 itself, the inner edge 58 is rounded. The distance between the ends 56 and 57 is approximately half to two-thirds of the distance between the sides 53 and 54 of the notch 52, and so the tab 55 fits easily within the notch 52.

[0041] The tab 55 is mounted on a pin or axle 60. Preferably, a bore 61 extends entirely through the tab 55 between its ends 56 and 57. The axle 60 is mounted between the sides 53 and 54 of the notch 52 and is closely received in the bore 61, such that the tab 55, and the fence 19 connected to it, are mounted for pivotal, swinging movement about an axis defined by the axle 60. A compression spring 62 is fit over the axle 60 and compressed between the end 56 of the tab 55 and the side 53 of the notch 52. The compression spring 62 biases the tab 55 toward the other side 54 of the notch 52, defined as a neutral stance. In the neutral stance, the tab 57 disables movement of the fence 19 among its three positions. In the neutral stance, the end 57 of the tab 55 is in contact against the side 54 of the notch 52, as shown in FIG. 2A. In the neutral stance, the fence 19 is maintained in a coextensive alignment with the body 11 of the square, as shown in FIG. 1A; the end 41 is registered with the second edge 14, and the end 42 is registered with the first corner 16.

[0042] While the neutral stance disables movement of the fence 19 among its three positions, the tab 55 is moveable out of this neutral stance into an advanced stance, shown in FIGS. 2B and 2C. In the advanced stance, the tab 57 enables movement of the fence 19 among its three positions. To move the fence 19 and tab 55 out of the neutral stance and into the advanced stance, the carpenter simply grasps the body of the fence 19 and slides it upward, along the first edge 13 of the square 10, along the arrowed line S in FIG. 2B. Sliding the fence 19 in this manner compresses the

spring 62, and so the carpenter must use force to move the fence 19 to the advanced stance.

[0043] An engagement assembly prevents accidental movement of the tab 55 out of the third position. When the tab 55 is in the neutral stance, the fence 19 is prevented, or disabled, from being moved into the first or second positions. Only when the tab 55 is in the advanced stance is movement enabled such that the fence 19 can be moved to the first or second positions. A groove 64 depends slightly into the second surface 21 of the body 11. The groove 64 is formed into the body 11 in communication with the notch 52, extending from the notch 52 across the second face 21 of the body 11 toward the second edge 14. An identical groove 63 (FIGS. 1A and 1B) extends into the first surface 20 on the other side of the body 11, and another groove 65 (FIG. 1B) is formed into the first edge 13 itself. Each of the grooves 63-65 are roughly semi-cylindrical cavities.

[0044] A tongue 66 complementary to the groove 64 is carried on the fence 19. The tongue 66 is a semi-cylindrical protrusion formed on the inner edge 44 of the fence 19. The tongue 66 has a longitudinal axis which is parallel to the first edge 13 of the fence 19. The tongue 66 has a proximal end, which is formed integrally and monolithically to the end 57 of the tab 55, and the tongue 66 extends along the inner edge 44 from the end 57 to a distal end of the tongue 66, presenting a semi-cylindrical convex surface outward between the proximal and distal ends. The tongue 66 is sized and shaped to be received snugly within each of the grooves 63-65 formed in the body 11 of the square 10.

[0045] As the tab 55 moves among the first, second, and third positions of the fence 19, the tongue 66 moves into and out of the grooves 63-65 to temporarily lock the fence 19 in the first, second, and third positions. When the fence 19 is in the first position, the groove 64 receives the tongue 66, and interaction of the tongue 66 with the groove 64 prevents pivotal movement of the fence 19 with respect to the body 11. When the fence 19 is in the second position, the groove 63 receives the tongue 66, and interaction of the tongue 66 with the groove 63 prevents pivotal movement of the fence 19 with respect to the body 11. And when the fence 19 is in the third position, the groove 65 receives the tongue 66, and interaction of the tongue 66 with the groove 65 prevents pivotal movement of the fence 19 with respect to the body 11.

[0046] When the fence 19 is in each of the first, second, and third positions, if the carpenter attempts to pivot the fence 19 to another position, the tongue 66 contacts the side of the respective groove 63-65 and is prevented from pivotal movement. Thus, each time the tongue 66 is received within one of the grooves 63-65, the fence 19 cannot be moved unless the tab 55 is first moved out of the neutral stance. As such, in this embodiment, the first, second, and third positions of the fence 19 are defined, discrete, and indexed positions. In this embodiment, the fence 19 can only be placed and temporarily locked into one of these three indexed positions. Other embodiments have a fewer or greater number of positions, indexed or otherwise. The fence 19 is temporarily locked because inadvertent or accidental movement out of the position is effectively prevented, yet a carpenter can easily and purposefully move the fence 19 out of position by overcoming the spring force of the compression spring 62 and sliding the fence 19 upward into the advanced stance of the tab 55. As such, the tongue 66 and the

grooves 63-65 define an engagement assembly or spring detent assembly for locking and releasing the fence 19.

[0047] When the carpenter desires to move the fence 19 into another position, such as from the third position to the first position, as shown in FIGS. 2A-2D, he first slides the tab 55 out of the neutral stance and into the advanced stance, as shown from FIG. 2A to FIG. 2B. This causes the tongue 66 to slide longitudinally out of the groove 65. The spring 62 exerts a bias on the tab 55 back to the neutral stance, and so the carpenter must hold the fence 19 to prevent it from returning to the neutral stance. While still grasping the fence 19 in the advanced stance, the carpenter pivots the fence 19 to the side by moving it along the arcuate arrowed line P of FIG. 2C. When moved into the position shown in FIG. 2C, the tongue 66 is registered with but longitudinally offset from the groove 64. The carpenter can then release the fence 19 and allow the spring 62 to bias the fence 19 back to the neutral stance, along the arrowed line S' as shown in FIG. 2D. When the fence 19 moves back to the neutral stance, the tongue 66 is received by and engages with the groove 64 on the second face 21. The fence 19 is now temporarily locked into the first position.

[0048] The fence 19 is preferably made from the same material as the body 11 of the square 10. Referring briefly to FIG. 1A, in some embodiments, the fence 19 includes magnetic elements, examples of which are shown in broken line with the reference character 67. The magnetic elements 67 shown in FIG. 1A are circular, disc-shaped magnets and are encased within the body 40 of the fence 19. In other embodiments, the magnetic elements 67 may be offset within the body 40 or flush to one of the first or second faces 45 and 46. The embodiment shown here has three magnetic elements 67 spaced apart along the length of the fence 19. The magnetic elements 67 are useful for aligning and holding the square during metalwork. Some embodiments of fence 19 have fewer magnetic elements 67 than shown here, some have more, and some have no magnetic elements 67 at all.

[0049] Referring again to FIGS. 2A-2D, the square 19 has a dual measurement system. Measurements can be made from the fence 19 along the second edge 14 when then fence 19 is in any of the first, second, or third positions. The second edge 14 has two sets of measurements indicators, or two sets of measurements. A first set 71 of measurement indicators is marked along the second edge 14. This first set 71 is identifiable in FIG. 1A because the measurement numbers (1, 2, 3, etc.) are oriented with their tops to the bottom-left in the drawing. The first set 71 has a zero location 73 from which the rest of the indicators in the first set 71 are measured and to which the first set 71 corresponds. This zero location 73 corresponds to the location of the first face 45 or the second face 46 of the fence 19, when the fence 19 is pivoted to the second position or the first position, respectively. When the fence 19 is so pivoted, the face of the fence 19 which is directed toward the body 11 of the square 10 defines the plane from which measurements are made, because that face defines an inside corner which is placed against an edge of a workpiece. As such, when the fence 19 is in either the first or second position, the first set 71 of measurement indicators are useful for measuring.

[0050] When the fence 19 is in the third position, however, the zero location 73 is no longer relevant. A second set 72 of measurements indicators is marked along the second edge 14 and is useful in this situation. The second set 72 has a zero

location 74 from which the rest of the indicators in the second set 72 are measured and to which the second set 72 corresponds. This zero location 74 corresponds to the fence edge 43 of the fence 19 when pivoted to its third position. When the fence 19 is so arranged, the square 10 can be laid flat against a flat workpiece and the fence edge 43 defines the plane from which measurements are made, because the fence edge 43 would be placed along a line, edge, or like marker.

[0051] The first and second sets 71 and 72 of measurement indicators share the same hash marks 75. The hash marks 75 thus can be read with either the first or the second sets 71 and 72 of measurement indicators, depending on the arrangement of the fence 19. However, the numbered markings for the first and second sets 71 and 72 are different. The second zero location 74 is offset from the first zero location 73, and so the numbered markings for the second set 72 of measurement indicators is offset from the first set 72 of measurements indicators.

[0052] The body 11 of the square 10 carries at least three other structures which are useful. Referring to FIG. 1A, near the middle of the body 11, the body 11 carries a laser 80 and a jig block 81, and near the second corner 17, the body carries a bubble level 82. The bubble level 82 is preferably a feature of the carpenter square 10, but is not necessarily a feature of it. Moreover, other embodiments of the bubble level may be used, as described later. Moreover, this bubble level 82 and those embodiments described later may also be incorporated into other types of levels, such as a torpedo level, carpenter's or box level, post level, and others.

[0053] Referring to FIG. 1A and also to FIG. 2A, the laser 80 is preferably carried within the body 11 of the square and directs a laser beam out of the square 10 parallel to the first edge 13. The laser 80 includes a laser transmitter, shown in broken line within the body 11. It has an emitter end 83 directed toward the second edge 14. The laser 80 transmitter is carried in a hold within the body 11 of the square 10, and a bore extends entirely from that hold to the second edge 14. The bore is not shown in the figures, to preserve the clarity of the drawings, but the open termination of the bore is shown on the second edge 14 as an opening 84, as best shown in FIG. 2A. The laser 80 emits a laser beam (identified in dash-dash line with the reference character L) through the bore and out the opening 84. The laser 80 is oriented, and the bore is registered with that orientation, such that the laser beam L is parallel to the first edge 13 and thus also to the fence 19. This allows a carpenter to set or hang the square 10 on its fence 19 or one of the first or second faces 45 and 46 atop a workpiece and direct the laser beam L parallel to that workpiece. Further, the laser 80 is preferably registered with one of the unit markings of the first and second sets 71 and 72 of measurement indicators, to allow for easier offset measurement calculations when sighting with the laser 80.

[0054] Referring now to FIG. 1C primarily, one embodiment of the bubble level 82 is shown. The bubble level 82 shown is a single hollow tube having preferably three sections: a horizontal section 90, a diagonal section 91, and a vertical section 92. The sections 90, 91, and 92 are joined in communication with each other to define the tube as a single unitary tubular element. However, each section is oriented distinctly with respect to the others to allow the carpenter to find level in different ways.

[0055] The tube of the bubble level **82** has a closed sidewall **93**. The sidewall **93** is preferably tubular and transparent. In some embodiments, the sidewall **93** is cylindrical, while in others it is rectangular prismatic, and in other embodiments it has other shapes. The sidewall **93** is carried in a hold **94** which is open to both the first face **20** and the second face **21** so that the bubble level **82** can be viewed from both sides of the square **10**. The tube is filled with a fluid, such as water, alcohol, or glycol, and that fluid is preferably colored to provide contrast with a bubble **95** in the fluid. The sidewall **93** is closed at both ends so that the fluid does not leak.

[0056] The horizontal section **90** is aligned parallel to the first edge **13** and normal to the second edge **14**. It extends from a closed end of the tube to the diagonal section **91**. The tube has a discrete and angular transition from the horizontal section **90** to the diagonal section **91**. The diagonal section **91** is normal to the hypotenuse edge **12** and is angled at forty-five degrees with respect to both the first and second edges **13** and **14**. The diagonal section **91** extends from the horizontal section **90** to the vertical section **92**. The tube has a discrete and angular transition from the diagonal section **91** to the vertical section **92**. The vertical section **92** is parallel to the second edge **14** and normal to the first edge **13**. Because the diagonal section **91** is in fluid communication with both of the horizontal and vertical sections **90** and **92**, the bubble **95** can move among each section **90**, **91**, and **92** easily as the carpenter handles the square **10**.

[0057] Each section **90**, **91**, and **92** has a pair of level lines **96**. The level lines **96** are marked in the center of each section, spaced apart at a distance just greater than the diameter of the bubble **95**. When the first edge **13** of the square **10** is placed against an object and the bubble **95** is between the lines **96** without touching the lines **96**, the bubble level **82** indicates that the surface of the object has a particular measurement. If the bubble **95** touches one of the lines, then the surface of the object is off that particular measurement, such as by 2% or another value. If the bubble **95** is further outside the lines, then the surface of the object is further off that particular measurement.

[0058] In use, the carpenter places the first edge **13** or the fence edge **43** against the surface of an object. Depending on the object's orientation, one of the sections **90**, **91**, and **92** will likely be of interest. If, for example, the surface is near horizontal, such as on the top of a beam, then the carpenter will refer to the horizontal section **90** of the bubble level **82**. The bubble **95** will float to the horizontal section **90** and settle somewhere in or near the lines **96** in the horizontal section **90**. This will tell the carpenter how close to level the beam is. If, on the other hand, the carpenter wants to check for plumb on a post supporting the beam, he will place the first edge **13** (or the fence edge **43**) against the side of the post with the second edge **14** up and then refer to the vertical section **92** of the bubble level **82**. Re-arranging the square **10** in this way causes the bubble **95** to move into the vertical section **92** and settle somewhere in or near the lines **96** in the vertical section **92**. The carpenter now knows how close to plumb the post is in that direction. Finally, if the carpenter wants to check a brace extending more or less diagonally from the post to the beam, he will place the first edge **13** (or the fence edge **43**) against the upper or lower face of the brace and refer to the diagonal section **91** of the bubble level **82**. Re-arranging the square **10** in this way causes the bubble **95** to move into the diagonal section **91** and settle some-

where in or near the lines **96** in the diagonal section **91**. The carpenter now knows how close to forty-five the diagonal actually is between the post and the beam. This single bubble level **82** allows three different measurements.

[0059] An alternate bubble level is shown in the embodiment of the square **10** depicted in FIGS. 3A-3C. The bubble level **86** is similar to the bubble level **82** and shares many of the same structural elements and features. As such, the description of the bubble level **86** adopts the same reference characters used just above to describe the bubble level **82**, but marks them with a prime symbol ("'") to distinguish them from those of the bubble level **82**. The bubble level **86** is a single hollow tube having preferably two sections: a horizontal section **90'** and a vertical section **92'** joined in communication with each other to define the tube as a single unitary tube. The two sections are oriented distinctly with respect to each other to allow the carpenter to find level in different ways.

[0060] The tube of the bubble level **86** has a closed sidewall **93'**. The sidewall **93'** is preferably transparent. In some embodiments, the sidewall **93'** is cylindrical, while in others it is rectangular prismatic, and in other embodiments it has other shapes. The sidewall **93'** is carried in a hold **94'** which is open to both the first face **20** and the second face **21** so that the bubble level **86** can be viewed from both sides of the square **10**. The tube is filled with a fluid, such as water, alcohol, or glycol, and that fluid is preferably colored to provide contrast with a bubble **95'** in the fluid. The sidewall **93'** is closed at both ends so that the fluid does not leak.

[0061] The horizontal section **90'** is aligned parallel to the first edge **13** and normal to the second edge **14**. It extends from a closed end of the tube to the a right corner formed with the vertical section **92'**. The tube has a discrete and angular transition from the horizontal section **90'** to that vertical section **92'**. The vertical section **92'** is parallel to the second edge **14** and normal to the first edge **13**. The bubble **95'** can move between the sections **90'** and **92'** easily as the carpenter handles the square **10**.

[0062] Referring still to FIGS. 3A-3C, this specification describes the use and operation of the jig block **81**. The jig block **81** converts the square **10** into a jig which quickly and easily lays out a pattern of lines for marking cuts along an edge of a workpiece, such as for making the patterned cuts of a stair stringer from a 2x12 piece of lumber. The jig block **81** is a thin piece of material, preferably made from the same material as the body **11** of the square **10**, which has a long edge **100** and a through-hole **101**. The jig block **81** is held in place in the body **11** until needed, at which time the carpenter removes the jig block **81**, secures it to the medial slit **22**, and uses the entire square to lay out a pattern of cut lines.

[0063] The jig block **81** is carried in a hold **102** in the body **11** of the square **10**. The hold **102** is an empty space sized and shaped to snugly receive and hold the jig block **81**. In embodiments, the hold **102** has inner edges which are tiered so that the jig block **81** can be removed only through one side of the hold **102** and one side of the square **10**. In other words, in those embodiments, the size of the hold on one side of the square **10** is slightly smaller than the size of the hold on the other side of the square **10** (and slightly smaller than the jig block **81** itself), such that the jig block **81** cannot be removed through the smaller side but rather only through the larger side.

[0064] The jig block **81** has a long edge **100**. The long edge **100** is straight and uninterrupted by notches, projections, divots, or other discontinuities. The embodiment of the jig block **81** shown in these drawings has four other edges, arranged to form a shape roughly similar to a baseball home plate. Other shapes are suitable, so long as the jig block **81** has a long edge **100**. The jig block **81** itself is thin and no thicker than the thickness of the body **11** of the square **10** so that the jig block **81** can be stored in the square and not impede the use of the square **10** when the jig block **81** is so stored.

[0065] In use, the jig block **81** is removed from the hold **102**. In some embodiments, the jig block **81** is magnetic and is magnetically secured in the hold **102**. In other embodiments, a small turn screw disposed at the edge of the hold **102** selectively locks and releases the jig block **81**. In other embodiments, the jig block **81** is simply snugly fit and held in the hold **102**. Regardless of how the jig block **81** is held, it is removed from the hold **102**. The jig block **81** is taken up by hand and placed against one of the first and second faces **20** and **21**. In FIG. 3B, as an example only, the jig block **81** is placed against the first face **20**. The jig block **81** is oriented such that its long edge **100** is generally directed toward the right corner **15** and its through-hole **101** is registered with the medial slit **22**. The carpenter takes a set screw **103** and passes it through the through-hole **101** and the medial slit **22**. In some embodiments, the set screw **103** may screw directly into the medial slit **22** but, more preferably, a nut is placed over the free end of the set screw **103** and is tightened thereon, thereby binding the jig block **81** against the body **11** of the square **10**. In embodiments, the set screw **103** is stored in or on the square **10**. For example, FIG. 3A shows the set screw **103** in broken line secured in a small threaded bore **104** extending into the hypotenuse edge **12**, which is less frequently used as a marking edge. In other embodiments, the set screw **103** may be stored in a bore on the jig block **81** itself.

[0066] Once the jig block **81** is attached to the face **20** of the square **10**, the square **10** is taken up by hand, inverted, and placed over a workpiece **108** such as a piece of lumber, as shown in FIG. 3C. The workpiece **108** has an outer edge **109** along which cuts are to be made. To place the entire face **20** of the square on top of the workpiece **108**, the carpenter must move the fence **19** to its third position, flat and coplanar with respect to the body **11** of the square **10**.

[0067] In FIG. 3C, the jig block **81** is underneath the square **10** and so is shown substantially in broken line. The carpenter manipulates the square **10** so that the long edge **100** is placed in direct and continuous contact with the outer edge **109** of the workpiece **108**. This causes the right corner **15** and much of the body **11** of the square **10** to become disposed over the workpiece **108**.

[0068] The carpenter then adjusts the jig block **81** to ensure the square **10** marks out a desired pattern. The carpenter will have a predetermined pattern to cut. For example, if he is cutting a stringer, he will need to know the rise and run, such as 7.5 inches and 11 inches. With the long edge **100** of the jig block **81** against the workpiece **108**, the carpenter loosens the set screw **103** slightly so that the square **10** can be moved with respect to the jig block **81**. The carpenter moves the square **10** to achieve the desired rise and run. This may require sliding the square **10** so that the jig block **81** moves up or down along the medial slit **22**. It may

also require rotating the body **11** of the square **10** while the jig block **81** is maintained against the outer edge **109**.

[0069] When the carpenter has aligned the square **10** on the workpiece such that the outer edge **109** crosses the desired rise and run measurements, he tightens the set screw **103**. Note that the carpenter uses the measured indicators **47** along the fence **19** and the second set **72** of measured indicators along the second edge, because the fence **19** is in its third position and the carpenter must use of the offset second set **72**.

[0070] With the square **10** properly dialed, the carpenter can now quickly lay out cut lines. He makes his first set of lines **A1** and **A2** as shown at the top of FIG. 3C. Lines **A1** and **A2** prescribe two cuts made at a right angle with the desired rise and run measurements. The carpenter then translates the square down the workpiece **108** along arrowed line **T** to a second position. The second position, shown in FIG. 3C as occupied by the square begins at the termination of line **A2**, where line **A2** meets the outer edge **109**. The carpenter then marks lines **B1** and **B2** along the fence edge **43** and the second edge **14**, respectively. He then continues to translate the square **10** and mark successive lines, quickly laying out the needed cut pattern.

[0071] FIG. 4 illustrates another embodiment of a carpenter square **110**. The carpenter square **110** is similar in many ways to the square **10** and shares many of the same structural elements and features as the square **10**. As such, the square **110** adopts the same reference characters to describe the same features, but marks them with a prime ("'") symbol to distinguish the structural elements and features of the square **110** from the square **10**. For example, while the square **10** has a fence **19**, the square **110** has a fence **19'**. The fences **19** and **19'** are identical in every respect, but because the fence **19'** is part of the square **110**, its reference character is marked with the prime symbol. Because structures such as these have already been described with respect to the square **10**, this specification generally does not describe them further with respect to the square **110**. Other structures which have not already been introduced or are different bear unique reference characters.

[0072] The square **110** includes a body **111** which is generally triangular in shape with a long leg contiguously extending from one side. The square **110** has: 1) a hypotenuse edge **112** opposite a right corner **15'**; 2) a short first edge **13'**; and 3) a long second edge **114**. The fence **19'** is pivoted to the first edge **13'** and, like the fence **19**, pivots among three positions. In FIG. 4, the first and second positions of the fence **19'** are shown in broken line, normal to the body **111**, and the third position is illustrated in solid line. The fence **19'** is pivoted to the body **111** with the engagement assemblies of the tabs **55'**, axles **60'**, springs **62'**, tongues **66'**, and grooves **63'-65'**. The tongues **66'** and grooves **63'-65'** are not marked in the drawings but the reader will understand their location, structure, and function from the description above of the identical tongues **66** and grooves **63-65**.

[0073] The body **111** of the square **11** and the fence **19'** are both preferably constructed from a material or combination of materials with rugged, strong, durable, and hard material characteristics. Preferably, the body **11** is made from metal, hard wood, plastic, or like materials offering these characteristics. The body **11** has a first face **120** and an opposed second face **121**, which is marked and opposite the first face **120** but not shown in FIG. 4. The faces **120** and **121** are flat

and parallel to each other, spaced apart by a width X of the body 111, as shown in FIG. 4. The faces 120 and 121 are marked with a plurality of indications and measurements.

[0074] Moreover, slots and slits are formed through the body 111 entirely from the first face 120 through to the other second face 121. The body 111 includes the medial slit 22', the first slot 23', the second slot 30', and the hypotenuse slot 33'. These slots are useful for making markings through the square 110 and for attaching the jig block 81' to the square 110 when the carpenter desires to lay out a cut pattern.

[0075] Unlike the square 10, the square 110 has an extension, or a leg 124, projecting from one corner. The leg 124 is a roughly rectangular piece of material which is integrally and monolithically formed to the body 111 as part of the body 111. The second edge 114 is long, extending continuously along the main portion of the body 111 as well as the leg 124. The leg 124 extends from the main portion of the body 111 to a blunt terminal edge 125. The terminal edge 125 is linear, straight, and parallel to the first edge 13'. In other embodiments, the terminal edge 125 has other shapes.

[0076] The leg 124 defines a contiguous extension of the second edge 114, as it commonly shares and extends the second edge 114. That second edge 114 has two sets of measurements indicators. A first set 131 of measurement indicators is marked along the second edge 114. This first set 131 is identifiable in FIG. 4 because the measurement numbers (1, 2, 3, etc.) are oriented with their tops to the left in the drawing. The first set 131 has a zero location 133 from which the rest of the indicators in the first set 131 are measured and to which the first set 131 corresponds. This zero location 133 corresponds to the location of the first face 45' or the second face 46' of the fence 19', when the fence 19' is pivoted to the second position or the first position, respectively. When the fence 19' is so pivoted, the face of the fence 19' which is directed toward the body 111 of the square 110 defines the plane from which measurements are made, because that face is placed against an edge of a workpiece. As such, when the fence 19' is in either the first or second position, the first set 131 of measurement indicators are useful for measuring.

[0077] When the fence 19' is in the third position, however, the zero location 133 is no longer relevant. A second set 132 of measurements indicators is marked along the second edge 114 and is useful in this situation. The second set 132 has a zero location 134 from which the rest of the indicators in the second set 132 are measured and to which the second set 132 corresponds. This zero location 134 corresponds to the fence edge 43' of the fence 19' when pivoted to its third position. When the fence 19' is arranged, the square 110 can be laid flat against a flat workpiece and the fence edge 43' defines the plane from which measurements are made, because the fence edge 43' would be placed along a line, edge, or like marker.

[0078] The first and second sets 131 and 132 of measurement indicators share the same hash marks 135. The hash marks 135 thus can be read with either the first or the second sets 131 and 132 of measurement indicators, depending on the arrangement of the fence 19'. However, the numbered markings for the first and second sets 131 and 132 are different. The second zero location 134 is offset from the first zero location 133, and so the numbered markings for the second set 132 of measurement indicators is offset from the first set 132 of measurements indicators.

[0079] Unlike the second edge 14 of the square 10, which preferably extends roughly twelve inches, the leg 124 extends the second edge 114 to preferably sixteen inches. In other embodiments, the length may be longer or shorter. The reader will understand that none of the lengths described herein are critical, and that the scope of disclosure for each embodiment covers different lengths, both short and long. For example, the square 110 may only be a few inches long or may be two feet or more in length.

[0080] Like the square 10, the square 110 preferably carries a laser 80', a jig block 81', and a bubble level 140. The bubble level 140 is different from the bubble level 82, however. The bubble level 140 is one embodiment of a bubble level. The bubble level 140 is a hollow tube having a continuous arcuate shape. The arc extends preferably one-hundred eighty degrees, though in other embodiments it may be shorter or longer. In this embodiment, the arc extends from one end 147, proximate to the hypotenuse edge, up and around toward the leg 124, and then back to down to an opposed end 148, proximate to the second edge 114. Different portions of this arc allow the carpenter to find level in different ways.

[0081] The tube of the bubble level 140 has a closed sidewall 141. The sidewall 141 is preferably transparent. In some embodiments, the sidewall 141 is cylindrical, while in others it is rectangular prismatic, and in other embodiments it has other shapes. The sidewall 141 is carried in a hold 142 which is open to both the first face 120 and the second face 121 so that the bubble level 140 can be viewed from both sides of the square 110. The tube is filled with a fluid, such as water, alcohol, or glycol, and that fluid is preferably colored to provide contrast with a float 143 in the fluid. The float 143 is preferably a bubble in the fluid, but in other embodiments the float is a small, transparent, and rigid sphere or capsule. The tube is closed at both ends 147 and 148 so that the fluid does not leak. The sidewall 141 curves arcuately from one closed end 147 to the other closed end 148.

[0082] The embodiment shown in FIG. 4 includes three pairs of level lines. A first set 144 of level lines is marked proximate to the end 147 of the bubble level 140 which is proximate the hypotenuse edge 112. The first set 144 of level lines are marked through the tube in a radial direction and are spaced apart at a distance just greater than the diameter of the float 143. A second set 145 of level lines is marked halfway between the ends of the bubble level 140. The second set 145 of level lines are marked through the tube in a radial direction and are spaced apart at a distance just greater than the diameter of the float 143. A third set 146 of level lines is marked proximate to the end of the bubble level 140 which is proximate the second edge 114. The third set 146 of level lines are marked through the tube in a radial direction and are spaced apart at a distance just greater than the diameter of the float 143.

[0083] The bubble level 140 shown in this embodiment of the square 110 is just one embodiment. Other carpenter squares according to the scope of this disclosure may include other bubble levels described herein, such as the bubble level 82 or the bubble levels described later. Likewise, while the embodiment shown in FIG. 4 includes a jig block 81', other embodiments do not include the jig block 81', and while the FIG. 4 embodiment includes a laser 80', other embodiments do not. The scope of this disclosure and

the embodiments described includes all permutations of the various structural elements and features of all embodiments disclosed herein.

**[0084]** The first, second, and third sets **144**, **145**, and **146** of level lines are useful for measuring different inclinations of object surfaces. In use, the carpenter places the first edge **13'** or the fence edge **43'** against the surface of an object. If that surface is near horizontal, such as on the top of a beam, then the carpenter will refer to the first set **144** of level lines. The float **143** will float to the top of the bubble level **140** and settle somewhere in or near that set **144** of level lines. This tells the carpenter how close to level the beam is. If the float **143** touches one of the lines, then the surface of the object is off that particular measurement, such as by 2% or another value. If the float **143** is further outside the lines, then the surface of the object is further off that particular measurement.

**[0085]** If, on the other hand, the carpenter wants to check for plumb on a post supporting the beam, he will place the first edge **13'** (or the fence edge **43'**) against the side of the post with the second edge **114** up and then refer to the side of the bubble level **140**. Re-arranging the square **110** in this way causes the float **143** to settle somewhere in or near the third set **146** of lines. The carpenter now knows how close to plumb the post is in that direction.

**[0086]** Finally, if the carpenter wants to check a brace extending more or less diagonally from the post to the beam, he will place the first edge **13'** (or the fence edge **43'**) against the upper or lower face of the brace and refer to the second set **145** of level lines of the bubble level **140**. Re-arranging the square **110** in this way causes the float **143** to settle somewhere in or near that second set **145** of lines. The carpenter now knows how close to forty-five the diagonal actually is between the post and the beam. This single bubble level **140** allows three different measurements.

**[0087]** FIGS. **5** and **6** illustrate another embodiment of a carpenter square **160**. The carpenter square **160** is similar in many ways to the square **10** and shares many of the same structural elements and features as the square **10**. As such, the square **160** adopts the same reference characters to describe the same features, but marks them with a double prime ("''") symbol to distinguish the structural elements and features of the square **160** from the square **10**. For example, while the square **10** has a fence **19**, the square **160** has a fence **19''**. The fences **19** and **19''** are identical in every respect, but because fence **19''** is part of the square **160**, its reference character is further designated with the prime symbol. Because structures such as these have already been described with respect to the square **10**, this specification generally does not describe them further with respect to the square **160**.

**[0088]** The square **160** is particularly useful for the metalworker or metal craftsman. The square **160** includes a body **161** which is generally triangular in shape and has three major edges. The square **160** has: 1) a hypotenuse edge **12''** opposite a right corner **15''**; 2) a short first edge **13''**; and 3) a short second edge **14''**. These three edges cooperate to define a perimeter edge **18''** of the body **161** of the square **160** itself. Within the perimeter edge **18''**, carried in the body **161**, is an embodiment of a bubble level **180** which the metalworker can use to determine a measurement within a range of angles.

**[0089]** The roughly rectangular fence **19''** is pivoted to the first edge **13''** and, like the fence **19**, pivots among the three

positions. In FIG. **5**, the first and second positions of the fence **19''** are shown in broken line, normal to the body **161**, and the third position is illustrated in solid line. The fence **19''** is pivoted to the body **161** with the engagement assemblies of the tabs **55''**, axles **60''**, springs **62''**, and tongues **66''** and grooves **63''-65''** (not shown in FIG. **5**).

**[0090]** Both the body **161** of the square **160** and the fence **19''** are preferably constructed from a material or combination of materials with rugged, strong, durable, and hard material characteristics. Preferably, the body **161** is made from metal, hard wood, plastic, or like materials offering these characteristics. The body **161** has a first face **170** and an opposed second face **171**, as shown in FIG. **6**. The faces first and second faces **170** and **171** are flat and parallel to each other, spaced apart by a width **Y** of the body **161**, as shown in FIG. **6**. FIG. **6** is a section view taken along the line **6-6** in FIG. **5**.

**[0091]** The first and second faces **170** and **171** are marked with a plurality of indications and measurements. Moreover, slots and slits are formed through the body **161** entirely from the first face **170** through to the other second face **171**. The body **161** includes the first slot **23''** and the hypotenuse slot **33''**. These slots are useful for making markings through the square **160**.

**[0092]** The second edge **14''** has two sets of measurements indicators. A first set **71''** of measurement indicators is marked along the second edge **14''**. This first set **71''** is identifiable in FIG. **5** because each of the measurement numbers (1, 2, 3, etc.) is oriented with its top to the left in the drawing. The first set **71''** has a zero location **73''** from which the rest of the indicators in the first set **71''** are measured and to which the first set **71''** corresponds. This zero location **73''** corresponds to the right corner **15''** and to the location of the first face **45''** or the second face **46''** (not shown) of the fence **19''**, when the fence **19''** is pivoted to the second position or the first position, respectively. When the fence **19''** is so pivoted, the face of the fence **19''** which is directed toward the body **161** of the square **160** defines the plane from which measurements are made, because that face is placed against an edge of a workpiece. As such, when the fence **19''** is in either the first or second position, the first set **71''** of measurement indicators are useful for measuring.

**[0093]** When the fence **19''** is in the third position, however, the zero location **73''** is no longer relevant. A second set **72''** of measurements indicators is marked along the second edge **14''** and is useful in this situation. The second set **72''** has a zero location **74''** from which the rest of the indicators in the second set **72''** are measured and to which the second set **72''** corresponds. This zero location **74''** corresponds to the fence edge **43''** of the fence **19''** when pivoted to its third position. When the fence **19''** is so arranged, the square **160** can be laid flat against a flat workpiece and the fence edge **43''** defines the plane from which measurements are made, because the fence edge **43''** would be placed along a line, edge, or like marker.

**[0094]** The first and second sets **71''** and **72''** of measurement indicators share the same hash marks **75''**. The hash marks **75''** thus can be read with either the first or the second sets **71''** and **72''** of measurement indicators, depending on the arrangement of the fence **19''**. However, the numbered markings for the first and second sets **71''** and **72''** are different. The second zero location **74''** is offset from the first zero location **73''**, and so the numbered markings for the

second set 72" of measurement indicators is offset from the first set 72" of measurements indicators.

[0095] In this embodiment of the square 160, the three edges 12", 13", and 14" define the body 161 as having a triangular formation. However, the scope of the embodiment of square 160 is not so limited. For example, in other embodiments, the square 160 includes a leg similar to the leg 124 of the square 110.

[0096] Like the square 10, the square 160 preferably carries a bubble level, but the bubble level 180 shown in FIGS. 5 and 6 for the square 160 is different from the bubble level 82 of the square 10. The bubble level 180 is one embodiment of a bubble level. Referring now to both FIG. 5 and FIG. 6, the bubble level 180 defines a flying saucer-shaped reservoir filled with a fluid and a single float or bubble for finding measurements.

[0097] The bubble level 180 has a central hub and an annulus encircling the hub, and the float floats freely between the hub and the annulus depending on the orientation of the square 160. The bubble level 180 is set into a hold 181 in the body 161 of the square 160. The hold 181 is a generally cylindrical bore formed through the body 161 from the first face 170 through to the second face 171, defining an inner wall 182. The bubble level 180 is fit snugly into the hold 181, but in some embodiments, the bubble level 180 is secured in the hold 181 not just with a snug fit but with adhesive or some other fastener.

[0098] The bubble level 180 is formed from a thin sidewall 183 which is preferably symmetric about a central plane parallel to the first and second faces 170 and 171. The sidewall 183 has a first wall 184 and a second wall 185, which are preferably symmetric to each other. The first and second walls 184 and 185 meet at the inner wall 182 and bound and define a reservoir having a disc shape. Extending radially inward from the inner wall 182, the first and second walls 184 and 185 expand outwardly away from each other, until an inflection point 186. The inflection point 186 is a generally circular boundary between the annulus (outside the inflection point 186) and the hub (inside the inflection point 186). Within the inflection point, the first and second walls 184 and 185 each define a truncated or severed sphere, having only a rounded portion which is less than a semi-sphere. Together, the first and second walls 184 and 185 cooperate to define a roughly egg-shaped space at the hub, within the inflection point 186. In other embodiments, this hub has other shapes.

[0099] Within the inflection point 186, the first and second walls 184 and 185 both rise to a top 189 which is flush with or just inboard of the first and second faces 170 and 171, respectively. As such, the bubble level 180 is bound within the body 161 by the first and second faces 170 and 171. In other embodiments, the hold 181 and/or the bubble level 180 extend beyond these faces 170 and 171, but scratching damage to the bubble level 180 may be possible in such other embodiments.

[0100] The walls 184 and 185 are preferably transparent, such that the metalworker can look through the bubble level 180 from either side of the square 160 and view an interior 187 of the bubble level 180. The interior 187 is substantially filled with a fluid 188, but for a float 190. The float 190 is a small, rigid, and preferably transparent sphere with a small marking 191 such as a dot. The marking 191 is centrally located within the float 190, such that the float 190 has spherical symmetry with respect to the marking 191. The

float 190 is preferably otherwise empty. It has a density which is lower than the surrounding fluid 188, and the float 190 rises to the relative top of the fluid 188 depending on the orientation of the square 160. In other embodiments of the bubble level 180, the float 190 may instead be a simple bubble in the fluid 188.

[0101] The bubble level 180 includes various indications. The bubble level 180 has a bullseye formed by a horizontal line 192 and a vertical line 193 at a right angle to the horizontal line, each extending entirely across the diameter of the sidewall 183 and through the top 189 of the sidewall 183, on both sides. The horizontal line 192 is parallel to the first edge 13", and the vertical line 193 is parallel to the second edge 14". A circular line 194 is centered at the intersection of the horizontal and vertical lines 192 and 193. When the square 160 is laid flat (as in FIG. 6), such that its second face 171 is against a horizontal surface, the float 190 rises to the top 189 and settles somewhere within or near the circular line 194. This tells the metalworker how close to level the horizontal surface actually is. If the float 190 touches part of the circular line 194, then the horizontal surface is off level, such as by 2% or another value. If the float 190 is further outside the circular line 194, then the horizontal surface is further off.

[0102] The bubble level 180 also allows the metalworker to check a surface for any angle. Radial hash marks 195 are scribed on the annulus of the sidewall 183 just inboard of the inner wall 182 of the hold 181. The hash marks 195 are angular measurements, with a zero angle corresponding to the hash mark 195 at the end of the vertical line 193 which is proximate the second corner 17". In FIG. 5, the float 190 has risen to toward this zero angle, indicating that the first edge 13" is level. If the first edge 13" is laid on a surface that is, for example, angled at seventeen degrees, the float 190 will rise to the hash mark 195 corresponding to seventeen degrees (or to a space between hash marks corresponding to sixteen and eighteen degrees, or to some other space between hash marks flanking seventeen degrees).

[0103] In the embodiment shown in FIGS. 5 and 6, the bubble level 180 occupies a large portion of the middle of the body 161 of the square 160. Because of the size of the bubble level 180, the square does not include a medial slit 22, a second slot 30, a laser 80, or a jig block 81. In other embodiments, however, the bubble level 180 is smaller or larger, as needed for the particular implementation and work to be done with the square 160. And in such other embodiments the square 160 includes a medial slit 22, a second slot 30, a laser 80, a jig block 81, or some combination of those elements. Indeed, other carpenter squares according to the scope of this disclosure may include other bubble levels described herein. The scope of this disclosure and the embodiments described includes all permutations of the various structural elements and features of all embodiments disclosed herein.

[0104] FIG. 7 illustrates a carpenter square 210. The square includes a body 211 having three edges. The square 210 has: 1) a hypotenuse edge 212 opposite a welder's corner 215; 2) a short first edge 213 extending between the welder's corner 215 and a first corner 216 formed by and between the short first edge 213 and the hypotenuse edge 212; and 3) a short second edge 214 extending between the welder's corner 215 and a second corner 217 formed by and between the short second edge 214 and the hypotenuse edge

**212.** These three edges cooperate to define a perimeter edge **218** of the body **211** of the square **210** itself.

**[0105]** Pivoted to the hypotenuse edge **212** is a fence **219**. The fence **219** is a roughly rectangular piece of material coextensive to the hypotenuse edge **212**. The fence **219** pivots between preferably three indexed positions. In a first position of the fence **219**, shown in broken line in FIG. 7, the fence **219** is normal to the body **211** in a first direction (upward along the paper, or toward the top of the page). In a second position of the fence **219**, also shown in broken line in FIG. 7, the fence **219** is normal to the body **211** in a second direction, opposite the first direction (down along the paper, or toward bottom of the page). In a third position, shown in solid line in FIG. 7, the fence **219** is coplanar to the body **211**.

**[0106]** Like the fence **19** of the square **10**, when the fence **219** is in the first or second positions, a carpenter can lay the fence **219** against a straight edge and mark lines. The normal arrangement of the fence **219** to the body **211** of the square **210** makes quick alignment of the square **210** easy. If the carpenter desires to lay the body **211** of the square **210** entirely on the workpiece and at least partially inboard from the straight edge, however, he need only move the fence **219** to the third position, such that the fence **219** is aligned coplanar to the body **211** and the entirety of the square **210** can be laid flat on the workpiece.

**[0107]** The body **211** of the square **210** is generally triangular, because the perimeter edge **218** generally has three major sides or lengths. The first and second edges **13** and **14** meet at the welder's corner **215**, the first edge **213** and the hypotenuse edge **212** meet at the acute first corner **216**, and the second edge **214** and hypotenuse edge **212** meet at the acute second corner **217**.

**[0108]** The first and second edges **213** and **214** are normal to each other and nearly meet at the welder's corner **215**. The welder's corner **215** is a notch or open corner, formed by a diagonal edge between the first edge **213** and the second edge **214**. The welder's corner **215** defines an open space just offboard the body **211** of the square **210** which can receive a weld between two metal pieces. In other words, a metalworker can place the square **210** against two metal pieces that are arranged normal to each other, and if the welder's corner **215** is placed over the weld between the two pieces of metal, the square **210** sits flush against the two pieces of metal. This allows the metal worker to use the square **210** in situations where other carpenter's squares would be blocked from a close fit by the weld. The person having ordinary skill in the art will recognize that the welder's corner still defines a right corner, since the first and second edges **213** and **214** are normal to each other. The diagonal edge **220** is part of the perimeter edge **218**, but is very short, and is so small that the three major sides of the edges **212**, **213**, and **214** dominate the appearance of the square **210** such that the body **211** generally is triangular.

**[0109]** The body **211** is preferably constructed from a material or combination of materials with rugged, strong, durable, and hard material characteristics. Preferably, the body **211** is made from metal, hard wood, plastic, or like materials offering these characteristics.

**[0110]** The body **211** has a first face **221** and an opposed second face **222** (not visible in FIG. 7). The first and second faces **221** and **222** are flat and parallel to each other, spaced apart by a width *Z* of the body **211**. The first and second faces **221** and **222** are marked with a plurality of indications

and measurements. Moreover, slots and slits are formed through the body **211** entirely from the first face **221** through to the other second face **222**. For example, in the embodiment shown in FIG. 7, two slots are formed inboard of the first and second edges **213** and **214**.

**[0111]** A first slot **223** is parallel to and inboard of the second edge **214**. The first slot **223** has opposed major sides **224** and opposed diagonal minor ends **225**. The major sides **224** are both parallel to the second edge **214**, and the major side **224** proximate to the second edge **214** is larger than the major side **224** distal to the second edge **214**. The minor ends **225** are diagonal and directed inward at approximately forty-five degrees, such that the minor end **225** proximate the first edge **213** is canted away from the first edge **213** and the minor end **225** distal to the first edge **213** is canted toward the first edge **213**. Thus, the first slot **223** has the appearance of an isosceles trapezoid. The first slot **223** is open such that a pencil can be passed through it to make markings on a workpiece underneath, especially as the square **210** is slid along the workpiece. Along the major side **224** which is proximate the second edge **214** of the square **210**, the first face **221** is marked with measured indicators **226**. Here, the measured indicators **226** are inch and half-inch markings, measured from the second edge **214**. Since the first slot **223** is offset from the first edge **213**, the first of the measured indicators is a one-inch marking, because the end of the first slot **23** which is proximate to the first edge **213** is one inch from the first edge **213**. In other embodiments, the first slot **223**, if existent, has other shapes, orientations, and arrangements.

**[0112]** Another slot, a hypotenuse slot **230**, is formed inboard of the hypotenuse edge **212**. The hypotenuse slot **230** is parallel to and inboard of the hypotenuse edge **212**. The hypotenuse slot **230** has opposed major sides **231** and opposed diagonal minor ends **232**. The major sides **231** are both parallel to the hypotenuse edge **212**, and the major side **231** proximate to the hypotenuse edge **212** is larger than the major side **231** distal to the hypotenuse edge **212**. The minor ends **232** are diagonal and directed inward at approximately forty-five degrees, such that the minor end **232** proximate the first edge **213** is parallel to the first edge **213** and the minor end **232** proximate to the second edge **214** is parallel to the second edge **214**. Thus, the hypotenuse slot **230** has the appearance of an isosceles trapezoid. The hypotenuse slot **230** is also open such that a pencil can be passed through it to make markings on a workpiece underneath. Along both major sides **231**, the first face **221** is marked with measured indicators **233**. In other embodiments, the hypotenuse slot **230**, if existent, has other shapes, orientations, and arrangements.

**[0113]** The fence **219** is hinged to the body **211** to move between the three indexed positions, similar to the fence **19**. Although in other embodiments, the fence **219** pivots between an alternate number of positions, the embodiment shown here pivots between three for ease and clarity of understanding. After reading this description, one having ordinary skill in the art will readily appreciate how the fence **219** moves among an alternate number of positions in such other embodiments.

**[0114]** The fence **219** has a body **240** which is generally rectangular prismatic, and which extends between two opposed ends **241** and **242**. The ends **241** and **242** are flat and parallel to each other, and both are oriented at forty-five degrees to each of the first and second edges **213** and **214**.

The body 240 of the fence 219 includes a narrow fence edge 243 extending between the two ends 241 and 242. The fence edge 243 is straight and uninterrupted by notches, projections, divots, or other features which would prevent the fence edge 243 from defining a straight line. Opposite the fence edge 243, the body 240 includes an inner edge 244 directed toward the first edge 213 of the body 211 of the square 210. Like the first edge 213, the inner edge 244 is interrupted by hinge assemblies which couple the fence 219 to the body 211 of the square 210. Both the first edge 213 and the inner edge 244 are slightly rounded so that the fence 219 smoothly pivots with respect to the body 211 without interruption or catching.

[0115] The body 240 of the fence 219 has a first face and a second face 245 and 246. The faces 245 and 246 are flat and parallel to each other, spaced apart by the same width Z that defines the width of the body 211 of the square 210. When the fence 219 is arranged in its third position, the first face 245 of the fence 219 is registered with and coplanar to the first face 221 of the body 211, and the second face 246 is registered with and coplanar to the second face 221 of the body 211. The first and second faces 245 and 246 are both marked with measured indicators 247 along the fence edge 243. The measured indicators 247 on the first and second faces 245 and 246 are the same, starting at the second end 242 and increasing in number toward the opposed end 241. The fence edge 243 also carries measured indicators which are registered with the measured indicators 247. However, while the measured indicators 247 preferably include tick or hash marks as well as numbers, the measured indicators on the fence edge 243 preferably only include hash marks due to the limited space available on the fence edge 243, similar to those on the fence edge 43 of the square 10. The carpenter can easily sight the numbers on the adjacent first or second face 245 or 246 to identify the measurement.

[0116] The fence 219 mounts to the body 211 of the square 210 at preferably two hinge assemblies 250 including structural features and elements on both the fence 219 and the body 211. In fact, the fence 219 mounts to the body 211 of the square 210 in the same way that the fence 19 of the square 10 mounts to the body 11, except that the fences 19 and 219 mount to respectively different edges—the first edge 13 and the hypotenuse edge 212. The two hinge assemblies 250 are identical in structure and differ only in location, and as such, the reader will understand that the description of this hinge assembly 250 applies equally to the description of the other hinge assembly 250. The reference characters are marked onto either of the hinge assemblies 250 to prevent cluttering of the drawing. In other embodiments, there may be fewer or more hinge assemblies 250.

[0117] Inboard of the hypotenuse edge 214, a notch 252 interrupts the first edge 213. The notch 252 is blind and extends into the body 211 of the square 210, terminating at an inner wall, which extends between two sides 253 and 254 of the notch 252. The notch 252 defines a receiving space complementary to a tab 255 on the fence 219 which fits into the notch 252.

[0118] The tab 255 is an integral, unitary, monolithic projection of the body 240 inner edge 244 of the fence 219. The tab 255 has two opposed ends 256 and 257 normal to the inner edge 244 and an inner edge 258 extending between the ends 256 and 257. Like the inner edge 244 of the fence 219 itself, the inner edge 258 is rounded. The distance between the ends 256 and 257 is approximately half to two-thirds of

the distance between the sides 253 and 254 of the notch 252, and so the tab 255 fits easily within the notch 252.

[0119] The tab 255 is mounted on a pin or axle 260. Preferably, a bore 61 extends entirely through the tab 255 between its ends 256 and 257. The axle 260 is mounted between the sides 253 and 254 of the notch 252 and is closely received in the bore 261, such that the tab 255, and the fence 219 connected to it, are mounted for pivotal, swinging movement about an axis defined by the axle 260. A compression spring 262 is fit over the axle 260 and compressed between the end 256 of the tab 255 and the side 253 of the notch 252. The compression spring 262 biases the tab 255 toward the other side 254 of the notch 252, defined as a neutral stance. In the neutral stance, the end 257 of the tab 255 is in contact against the side 254 of the notch 252. In the neutral stance, the fence 219 is maintained in a coextensive alignment with the body 211 of the square, as shown in FIG. 7; the end 241 is registered with the first corner 216, and the end 242 is registered with the second corner 217.

[0120] The tab 255 is moveable out of this neutral stance into an advanced stance. The advanced stance is not shown, but the user, having read the description of the movement of the tab 55 of the square 10 with respect to FIGS. 2A-2D, will understand the discussion below is analogous. To move the tab 255 out of the neutral stance and into the advanced stance, the carpenter simply grasps the body of the fence 219 and slides it upward, along the hypotenuse edge 213 of the square 210, along the arrowed line S" in FIG. 7. Sliding the fence 219 in this manner compresses the spring 262 between the end 256 and the side 253, and so the carpenter must use force to move the fence 219 to the advanced stance.

[0121] An engagement assembly prevents accidental movement of the tab 255 out of the third position. When the tab 255 is in the neutral stance while in the third position, the engagement assembly prevents the fence 219 from moving into the first or second positions. Only when the tab 255 is in the advanced stance can the fence 219 be moved to the first or second positions. As seen in FIG. 7, a groove 264 depends slightly into the second face 222 of the body 211. The groove 264 is in communication with the notch 252, extending from the notch 252 across the second face 222 of the body 211 toward the second edge 214. An identical groove extends into the first face 221 on the other side of the body 211, and another identical groove is formed into the first edge 213 itself. The grooves are individually and collectively identified with the reference character 264, and the reader will understand their structure, location, and function from the description of like grooves 63-65. Each of the grooves 264 are roughly semi-cylindrical cavities.

[0122] A tongue 266 complementary to the grooves 264 is carried on the fence 219, and is shown in FIG. 7 in broken, hidden line. The tongue 266 is a semi-cylindrical protrusion formed along the inner edge 244 of the fence 219. The tongue 266 has a longitudinal axis which is parallel to the first edge 213 of the fence 219. The tongue 266 has a proximal end, which is formed integrally and monolithically to the end 257 of the tab 255, and the tongue 266 extends along the first edge to a distal end, presenting a semi-cylindrical convex surface outward between the proximal and distal ends. The tongue 266 is sized and shaped to be received within each of the grooves 264 formed in the body 211 of the square 210. The tongue 266 and the grooves 264 are identical to the tongue 66 and grooves 63-65 shown in

FIGS. 2A-2D, but for location on the square 210, and the drawings of FIGS. 2A-2D should inform one having ordinary skill in the art, together with this description, of the structure and location of the tongue 266 and grooves 264.

[0123] As the tab 255 moves among the first, second, and third positions of the fence 219, the tongue 266 moves into and out of the grooves 264 to temporarily lock the fence 219 in the first, second, and third positions. When the fence 219 is in the first position, the groove 264 in the first face 221 receives the tongue 266, and interaction of the tongue 266 with that groove 264 prevents pivotal movement of the fence 219 with respect to the body 211. When the fence 219 is in the second position, the groove on the second face 222 receives the tongue 266, and interaction of the tongue 266 with that groove 264 prevents pivotal movement of the fence 219 with respect to the body 211. And when the fence 219 is in the third position, the groove 264 on the hypotenuse edge 212 receives the tongue 266, and interaction of the tongue 266 with that groove 264 prevents pivotal movement of the fence 219 with respect to the body 211.

[0124] When the fence 219 is in each of the first, second, and third positions, if the carpenter attempts to pivot the fence 219 to another position, the tongue 266 contacts the side of the respective groove and is prevented from pivotal movement. Thus, each time the tongue 266 is received within one of the grooves 264, the fence 219 cannot be moved unless the tab 255 is first moved out of the neutral stance. As such, in this embodiment, the first, second, and third positions of the fence 219 are defined, discrete, and indexed positions. In this embodiment, the fence 219 can only be placed and temporarily locked into one of these positions. Other embodiments have a fewer or greater number of positions, indexed or otherwise. The fence 219 is temporarily locked because inadvertent or accidental movement out of the position is effectively prevented, yet a carpenter can easily and purposefully move the fence 219 out of position by sliding the fence 219 upward into the advanced stance of the tab 255. As such, the tongue 266 and the grooves 264 define an engagement assembly or spring detent assembly for locking and releasing the fence 219.

[0125] When the carpenter desires to move the fence 219 into another position, such as from the third position to the first position, he first slides the tab 255 out of the neutral stance and into the advanced stance. This causes the tongue 266 to slide longitudinally out of the groove 264 in the hypotenuse edge 212. The spring 262 exerts a bias on the tab 255 back toward the neutral stance, and so the carpenter must hold the fence 219 to prevent it from returning to the neutral stance. While still grasping the fence 219 in the advanced stance, the carpenter pivots the fence 219 to the side. When so pivoted, the tongue 266 is registered with but longitudinally offset from the groove 264. The carpenter can then release the fence 219 and allow the spring 262 to bias the fence 219 back to the neutral stance, in an opposite direction from the arrowed line S". When the fence 219 moves back to the neutral stance, the tongue 266 is received by and engages with the groove 264 on the first face 221. The fence 219 is now temporarily locked into the first position.

[0126] The fence 219 is preferably made from the same material as the body 211 of the square 210. In some embodiments, the fence 219 includes magnetic elements 267, examples of which are shown in broken line in three locations in the fence 219. The magnetic elements 267

shown in FIG. 7 are circular, disc-shaped magnets and are encased within the body 240 of the fence 219. In other embodiments, the magnetic elements 267 may be offset within the body 240 or flush to one of the first or second faces 245 and 246. The embodiment shown here has three magnetic elements 267 spaced apart along the length of the fence 219. The magnetic elements 267 are useful for aligning and holding the square during metalwork. Some embodiments of fence 219 have fewer magnetic elements 267 than shown here, some have more, and some have no magnetic elements 267 at all.

[0127] The square 19 has a dual measurement system. Two different measurements can be made along the first edge 213. The first edge 213 has two sets of measurement indicators. A first set 271 of measurement indicators is marked along the first edge 213. This first set 271 is identifiable in FIG. 7 because the measurement numbers (1, 2, 3, etc.) are oriented with their tops to the left in the drawing. The first set 271 has a zero location from which the rest of the indicators in the first set 271 are measured and to which the first set 271 corresponds. This zero location corresponds to the intersection of lines registered with the first and second edges 213 and 214 in the welder's corner 215.

[0128] Alternatively, a second set 272 of measurements indicators is marked along the first edge 213. The second set 272 has a zero location 274 from which the rest of the indicators in the second set 272 are measured and to which the second set 272 corresponds. This zero location 274 corresponds to the intersection of the first edge 213 and the diagonal edge 220.

[0129] The first and second sets 271 and 272 of measurement indicators share the same hash marks 275. The hash marks 275 thus can be read with either the first or the second sets 271 and 272 of measurement indicators, depending on the arrangement of the fence 219. However, the numbered markings for the first and second sets 271 and 272 are different. The second zero location 274 is offset from the first zero location, and so the numbered markings for the second set 272 of measurement indicators is offset from the first set 272 of measurements indicators.

[0130] Like the square 10 and the square 160, the square 210 preferably carries a bubble level 280, but the bubble level 280 is different from the bubble levels 82 and 180. The bubble level 280 is one embodiment of a bubble level, though it shares many similarities to the bubble level 180.

[0131] The bubble level 280 has a central hub like the bubble level 180, but has a semi-annulus encircling the hub instead of a fully circular annulus. A float floats freely between the hub and the semi-annulus depending on the orientation of the square 210. The bubble level 280 is set into a hold 281 in the body 211 of the square 210. The hold 281 is a bore formed through the body 211 from the first face 221 through to the second face 221. The bubble level 280 is fit snugly into the hold 281, but in some embodiments, the bubble level 280 is secured in the hold 281 not just with a snug fit but with adhesive or some other fastener.

[0132] The bubble level 280 is formed from a thin sidewall 283 which is preferably symmetric about a central axis parallel to the first and second faces 221 and 222. The sidewall 283 has an upper wall (shown in FIG. 7, but similar to the first wall 184 of the bubble level 180) and a lower wall (under the upper wall, similar to the second wall 185 of the bubble level 180), which are preferably symmetric to each

other. The upper and lower walls meet at the inner wall of the hold **281**. Extending radially inward from the inner wall, the upper and lower walls expand outwardly away from each other, until an inflection point **286**. The inflection point **286** is a generally circular boundary between the annulus (outside the inflection point **286**) and the hub (inside the inflection point **286**). Within the inflection point **286**, the upper and lower walls each define a truncated or severed sphere, having only a rounded portion which is less than a semi-sphere. Together, the upper and lower walls cooperate to define a roughly egg-shaped space at the hub, within the inflection point **286**. In other embodiments, this hub has other shapes.

[0133] Within the inflection point **186**, the first and second walls **184** and **185** both rise to a top **289** which is flush with or just inboard of the first and second faces **221** and **222**, respectively. As such, the bubble level **280** is bound within the body **211** by the first and second faces **221** and **222**. In other embodiments, the hub or top **289** may extend beyond these first and second faces **221** and **222**, but scratching damage to the bubble level **280** may be possible in such other embodiments.

[0134] The sidewall **283** is preferably transparent, such that the metalworker can look through the bubble level **280** from either side of the square **210** and view an interior **287** of the bubble level **280**. The interior **287** is substantially filled with a fluid, but for a float **288**. The float **288** is a small, transparent, and rigid sphere or capsule with a small marking **285** such as a dot. The marking **285** is centrally located within the float **288**, such that the float **288** has spherical symmetry with respect to the marking **285**. The float **288** is preferably otherwise empty. It has a density which is lower than the surrounding fluid, and the float **288** rises to the relative top of the fluid depending on the orientation of the square **210**. In other embodiments of the bubble level **280**, the float **288** may instead be a simple bubble in the fluid.

[0135] Unlike the bubble level **180**, the bubble level **280** is severed and incomplete. Instead of the sidewall **283** extending completely around in a continuous full circle, two interrupting edges **290** and **291** sever the annulus, each extending inward from the perimeter of the bubble level **280** to meet at a corner which is offset from the center of the bubble level **280**. This corner is preferably directed generally toward the welder's corner **215**. The edges **290** and **291** preferably do not run through the top **289**.

[0136] The bubble level **280** includes various indications. The bubble level **280** has a bullseye formed by a horizontal line **292** and a vertical line **293** at a right angle to the horizontal line, each extending entirely across the diameter of the sidewall **183** and through the top **289** of the sidewall **183**, on both sides. The horizontal line **292** is parallel to the hypotenuse edge **212**, and the vertical line **293** is normal to the hypotenuse edge **212**. A circular line **294** is centered at the intersection of the horizontal and vertical lines **292** and **293**. When the square **210** is laid flat, such that its second face **221** is against a horizontal surface, the float **288** rises to the top **289** and settles somewhere within or near the circular line **294**. This tells the metalworker how close to level the horizontal surface actually is. If the float **288** touches part of the circular line **294**, then the horizontal surface is off level, such as by 2% or another value. If the float **288** is further outside the circular line **294**, then the horizontal surface is further off.

[0137] The bubble level **280** also allows the metalworker to check a surface for any angle. Radial hash marks **295** are scribed on the annulus of the sidewall **283** just inboard of the inner wall of the hold **281**. The hash marks **295** are angular measurements, with a zero angle corresponding to the hash mark **295** at the end of the vertical line **293** which is proximate the second corner **217**. If the first edge **213** is laid on a surface that is, for example, angled at seventeen degrees, the float **288** will rise to the hash mark **295** corresponding to seventeen degrees (or to a space between hash marks **295** corresponding to sixteen and eighteen degrees, or to some other space between hash marks **295** flanking seventeen degrees).

[0138] In the embodiment shown here, the bubble level **280** occupies a large portion of the middle of the body **211** of the square **210**. Because of the size of the bubble level **280**, the square **210** preferably does not include a medial slit **22**, a second slot **30**, a laser **80**, or a jig block **81**. In other embodiments, however, the bubble level **280** is smaller or larger, as needed for the particular implementation and work to be done with the square **210**. And in such other embodiments, the square **210** includes a medial slit **22**, a second slot **30**, a laser **80**, a jig block **81**, or some combination of those elements. The scope of this disclosure and the embodiments described includes all permutations of the various structural elements and features of all embodiments disclosed herein.

[0139] FIGS. 8-10B illustrate a carpenter level **310**. The carpenter's level **310** is exemplary of any of several elongate levels, such as a box level, mason's level, torpedo level, post level, and other like levels. The carpenter level **10** here is long, such as four feet in length, but in other embodiments is only a few inches long or eight feet long.

[0140] The carpenter level **310** includes a frame **311** carrying a round bubble level **312** and two square bubble levels **313**. The carpenter level **310** is useful for finding level, plumb, and all angles of measurement.

[0141] The frame **311** is elongate, extending between two opposed ends **320** and **321** which are preferably blunt and parallel to each other. The frame **311** has long top and bottom edges **322** and **323**, and long front and back faces **324** and **325**. The back face **325** is shown in FIG. 9B but not in FIG. 8. The top and bottom edges **322** and **323** are normal to the ends **320** and **321** and to the faces **324** and **325**. The ends **320** and **321**, the top and bottom edges **322** and **323**, and the front and back faces **324** and **325** cooperate to give the frame **311** a generally box-like or rectangular prismatic appearance.

[0142] The frame **311** includes three holds: a first or left hold **331**, and a second or right hold **332**, and a third or intermediate hold **333**. The holds **331**, **332**, and **333** are voids in the frame **311** which receive and hold the bubble levels **312** and **313**. The hold **331** is proximate to the end **320** and is referred to as a left hold **331** only for convenience and without the scope of the disclosure. The hold **332** is proximate to the other end **321** and is referred to as a right hold **332** only for convenience and without limiting the scope of the disclosure. The hold **333** is located in an intermediate position between the ends **320** and **321**, preferably but not necessarily halfway between the ends **320** and **321**. It is referred to as an intermediate hold **333** only for convenience and without limiting the scope of the disclosure.

[0143] FIG. 9A is an enlarged view of the round bubble level **312** set into the intermediate hold **333**. The bubble level **312** is circular in shape and includes an annular

perimeter tube and a plurality of hash marks to indicate a relative angular displacement of the box level 310.

[0144] Referring to both FIG. 9A and FIG. 9B, the bubble level 312 includes a tube 340 surrounding a middle 341. A float 342 moves around the tube 340 to the top-most location, and markings 343 on the middle 341 allow the carpenter to identify the angular displacement of the box level 310.

[0145] The tube 340 has a thin sidewall 344 which is preferably symmetric about a central axis extending normal through the box level 310. The sidewall 344 is preferably transparent and preferably circular in cross-section, as shown in FIG. 9B. In other embodiments, the sidewall 344 has other shapes and configurations. The outer diameter of the sidewall 344 is equal to or less than the thickness of the frame 311 between the front and back faces 324 and 325, such that the sidewall 344 is unlikely to be scratched by surface contact on the front and back faces 324 and 325.

[0146] The sidewall 344 bounds and defines an annular interior 345 of the bubble level 312. The interior 345 is substantially filled with a fluid 346 but for the float 342. The float 342 is a small, rigid, and preferably transparent sphere with a small marking 347 such as a dot. The marking 347 is centrally located within the float 342, such that the float 342 has spherical symmetry with respect to the marking 347. The float 342 is otherwise preferably empty. It has a density which is lower than the surrounding fluid 346, and the float 342 rises to the relative or local top of the fluid 346 depending on the orientation of the box level 310. In other embodiments of the bubble level 312, the float 342 may instead be a simple bubble in the fluid 346.

[0147] The tube 340 surrounds the middle 341. The middle is a disc-shaped solid frame element, seated within the tube 340. Like the frame 311 of the level 310, it has opposed front and back faces 350 and 351. The front and back faces 350 and 351 are preferably coplanar to the corresponding front and back faces 324 and 325 of the frame 311, such that the middle 341 has the same thickness as the frame 311. In other embodiments, the middle 341 is thinner than the frame 311, and the front and back faces 350 and 351 are closer together than pictured here in FIG. 9B.

[0148] The middle 341 has a perimeter 352 which is in contact with an inner side of the tube 340. Along the perimeter, but on the front and back faces 350 and 351, the middle 341 is marked with the markings 343. The markings 343 include radial hash marks 353 scribed into or onto the front and back faces 350 and 351 just inboard of the perimeter 352. The hash marks 353 are angular measurements, with a zero angle corresponding to the two opposed hash marks 353 proximate the top and bottom edges 322 and 323. Some of the hash marks 353 are marked with numerical references 354 so that the carpenter can quickly and easily identify the angle.

[0149] In the embodiment shown in FIG. 8, the bubble level 312 occupies an intermediate location in the box level 310. In other embodiments, it can be located in other parts of the box level 310. Or, it can be switched with the square levels 313.

[0150] FIG. 10A is an enlarged view of the square bubble level 313 set into the first hold 331, proximate the end 320. The square bubble level 313 in the second hold 332 is identical to the bubble level 313 in the first hold 331 in every respect but location. As such, description here will be made only with respect to the bubble level 313 in the first hold

331, with the understanding that it applies equally to the bubble level 313 in the second hold 332. The bubble level 313 is very roughly square in shape and includes an annular perimeter tube and a plurality of hash marks to indicate a relative angular displacement of the box level 310.

[0151] Referring to both FIG. 10A and FIG. 10B, the bubble level 313 includes a tube 360 surrounding a middle 361. A float 362 moves around the tube 360 to the top-most location, and markings 363 on the tube 360 allow the carpenter to identify the angular displacement of the box level 310. The tube 360 is generally square in shape and has four sections 360a, 360b, 360c, and 360d.

[0152] The tube 360 has a thin sidewall 364 which is preferably transparent and preferably oval in cross-section, as shown in FIG. 10B. In other embodiments, the sidewall 364 has other shapes and configurations. The sidewall 364 has a dimension which is equal to or less than the thickness of the frame 311 between the front and back faces 324 and 325, such that the sidewall 364 is unlikely to be scratched by surface contact on the front and back faces 324 and 325.

[0153] The sidewall 364 bounds and defines a roughly square interior 365 of the bubble level 313. The interior 365 is substantially filled with a fluid 366 but for the float 362. The float 362 is a small, rigid, and preferably transparent sphere or disk with a small marking 367 such as a dot. The marking 367 is centrally located within the float 362, such that the float 362 has symmetry with respect to the marking 367. The float 362 is otherwise preferably empty. It has a density which is lower than the surrounding fluid 366, and the float 362 rises to the relative or local top of the fluid 366 depending on the orientation of the box level 310. In other embodiments of the bubble level 313, the float 362 may instead be a simple bubble in the fluid 366.

[0154] The tube 360 surrounds the middle 361. The tube 360 has a continuous inner edge 370 bounding the middle 361 and an opposed continuous outer edge 371. The continuous inner edge 370 is square: it includes four linear edges of the same length each parallel to one other linear edge and perpendicular to two other linear edges. This defines the middle 361 as a square-shaped element. However, the continuous outer edge 371 is only roughly square. The outer edge 371 is slightly convex outward between the four corners of the outer edge 371. Although the float 362 appears large in FIG. 10A, the corners are large enough that the float 362 can move between the four sections 360a-360d of the tube 360 without impediment. FIG. 10B shows a preferred size of the float 362 more clearly, without magnification of the transparent sidewall 364.

[0155] The float 362 moves freely throughout the bubble level 313 in response to movement of the box level 310. Each of the four sections 360a-360d of the square bubble level 313 has two spaced-apart markings 363 which are level lines. The sections 360a and 360c are parallel to the top and bottom edges 322 and 323, the sections 360b and 360d are parallel to the ends 320 and 321. In each section 360a-360d, the outer edge 371 is furthest from the inner edge 370 between the markings 363, such that the markings 363 represent a local top of each section 360a-360d. The markings 363 are spaced apart from each other at a distance just greater than the outer dimension of the float 362. When the top or bottom edge 322 or 323 is placed against an object and the float 362 is between the markings 363 in the section 360c or 360a, respectively, the bubble level 313 indicates that the surface of the object has particular measurement, such as

level. If the float 362 touches one of the markings 363, however, then the surface of the object is off that measurement, such as by 2% or another value. And if the float 362 is further outside the markings 363, then the surface of the object is even further off that measurement.

[0156] The middle 361 is a solid square frame element, seated within the tube 360. Like the frame 311 of the level 310, it has opposed front and back faces 372 and 373. The front and back faces 372 and 373 are preferably coplanar to the corresponding front and back and faces 324 and 325 of the frame 311, such that the middle 361 has the same thickness as the frame 311. In other embodiments, the middle 361 is thinner than the frame 311, and the front and back faces 372 and 373 are closer together than pictured here in FIG. 10B.

[0157] In the embodiment shown in FIG. 8, the bubble levels 313 occupy locations proximate the ends 320 and 321 in the box level 310. In other embodiments, either or both of the levels 313 can be located in other parts of the box level 310. Or, it can be switched with the round level 312. Further, it should be understood that the bubble levels 312 and 313 could be incorporated into the carpenter squares 10, 110, 160, and 210 described above, either by replacing or adding the level features in those squares, and such incorporation is considered to be within the scope of this disclosure. Moreover, the levels and other features, such as the laser or jig, described with respect to the carpenter square 10, 110, 160, and 210 could be incorporated into the box level 310 (or other similar levels, such as a box level, mason's level, torpedo level, post level, and other like levels) without departing from the scope of this disclosure. The scope of this disclosure and the embodiments described includes all permutations of the various structural elements and features of all embodiments disclosed herein.

[0158] A preferred embodiment is fully and clearly described above so as to enable one having skill in the art to understand, make, and use the same. Those skilled in the art will recognize that modifications may be made to the description above without departing from the spirit of the specification, and that some embodiments include only those elements and features described, or a subset thereof. To the extent that modifications do not depart from the spirit of the specification, they are intended to be included within the scope thereof.

What is claimed is:

1. A carpenter square comprising:

a triangular body including a first edge, a second edge, and a third edge, wherein the first, second, and third edges cooperate to define a perimeter edge of the triangular body;

a fence pivoted to the first edge for movement among first, second, and third positions;

in the first position, the fence is normal to the triangular body in a first direction;

in the second position, the fence is normal to the triangular body in a second direction opposite the first direction; and

in the third position, the fence is coplanar to the triangular body.

2. The carpenter square of claim 1, wherein:

the triangular body includes opposed first and second body faces, and the fence includes opposed first and second fence faces; and

in the third position, the first body face and the first fence face are coplanar to each other, and the second body face and the second fence face are coplanar to each other.

3. The carpenter square of claim 1, further comprising: a first set of measurements along the second edge, the first set of measurements corresponding to a first zero location offset from the first edge; and

a second set of measurements along the second edge, the second set of measurements corresponding to a second zero location offset from the first zero location.

4. The carpenter square of claim 1, wherein the fence is mounted to the triangular body at a hinge assembly, the hinge assembly comprising:

a notch in the triangular body; and

a tab projecting from the fence and mounted in the notch for swinging movement within the notch between three positions corresponding to the first, second, and third positions of the fence with respect to the triangular body.

5. The carpenter square of claim 4, wherein:

the tab moves between a neutral stance, in which the tab is toward a side of the notch, and an advanced stance, in which the tab is away from the side of the notch;

the neutral stance of the tab disables movement of the fence among the first, second, and third positions; and the advanced stance of the tab enables movement of the fence among the first, second, and third positions.

6. The carpenter square of claim 1, wherein the fence is mounted to the triangular body at a hinge assembly, the hinge assembly comprising:

a notch in the triangular body, a pin mounted in the notch, and a groove formed into the body in communication with the notch;

a tab projecting from the fence and fit over the pin for swinging movement within the notch, and a tongue on the tab which is complementary to the groove;

the tab moves between a neutral stance, in which the tab is toward a side of the notch and the tongue is received in the groove, and an advanced stance, in which the tab is away from the side of the notch and the tongue is removed from the groove; and

a spring biasing the tab toward into the neutral stance.

7. The carpenter square of claim 1, further comprising a jig block carried in the triangular body which is removable therefrom and applicable to a face thereof, wherein when the jig block is applied to the face and an edge of the jig block is placed against an edge of a workpiece, the first and second edges of the carpenter square overlie the workpiece and define cut lines corresponding to rise and run lines of a stair stringer.

8. The carpenter square of claim 7, further comprising:

a slit formed through the triangular body; and

the jig block is configured to be secured in a location along a length of the slit.

9. The carpenter square of claim 1, further comprising a bubble level including:

a closed sidewall defining first, second, and third sections in fluid communication with each other;

a float within the closed sidewall for indicating an angular measurement, the float freely moveable among the first, second, and third sections;

the first section is parallel to one of the first and second edges;

the second section is transverse to the first section at forty-five degrees; and  
 the third section is transverse to the second section at forty-five degrees and is normal to the first section.

**10.** The carpenter square of claim **1**, further comprising a bubble level including:

a closed sidewall defining tubular first and second sections in fluid communication with each other;  
 a float within the closed sidewall for indicating an angular measurement, the float freely moveable between the first and second sections;  
 the first section is parallel to one of the first and second edges; and  
 the second section is normal to the first section.

**11.** The carpenter square of claim **1**, further comprising a bubble level including:

a closed tubular sidewall and a float within the closed tubular sidewall, the float freely moveable within the closed tubular sidewall for indicating an angular measurement;  
 the closed tubular sidewall curves arcuately from one end to an opposed end; and  
 level lines marked on the closed tubular sidewall indicate zero- and ninety-degree measurements.

**12.** The carpenter square of claim **1**, further comprising a bubble level including:

a reservoir having a disc shape, a perimeter, and a top;  
 a float within the reservoir;  
 angular measurements marked along the perimeter, such that when the carpenter square is placed on one of the first, second, and third edges, the float rises toward one the angular measurements; and  
 axis lines extending over the reservoir and intersecting at the top, such that when the carpenter square is laid on a face of its triangular body, the float rises toward the top.

**13.** The carpenter square of claim **12**, wherein the bubble level includes an interrupting edge which severs the disc shape without interrupting the top of the reservoir.

**14.** The carpenter square of claim **1**, further comprising a laser carried in the triangular body and having a laser beam directed through an opening in one of the first, second, and third edges.

**15.** The carpenter square of claim **1**, further comprising an extension of the triangular body, wherein the extension is a rectangular leg projecting contiguously along the second edge.

**16.** The carpenter square of claim **1**, wherein the third edge is a hypotenuse edge, the first edge is shorter than the hypotenuse edge, and the second edge is shorter than the hypotenuse edge.

**17.** The carpenter square of claim **1**, wherein the first edge is a hypotenuse edge, the second edge is shorter than the hypotenuse edge, and the third edge is shorter than the hypotenuse edge.

**18.** The carpenter square of claim **17**, wherein the second and third edges are joined by a diagonal edge defining an open corner of the carpenter square.

**19.** A carpenter square comprising:

a triangular body including a hypotenuse edge opposite a right corner, a first edge extending between the right corner and the hypotenuse edge, and a second edge extending between the right corner and the hypotenuse edge opposite the first edge;

a fence pivoted to the first edge for movement among first, second, and third positions;

a first set of measurements along the second edges, the first set of measurements corresponding to a first zero location defined by the fence in the first or second positions; and

a second set of measurements along the second edge, the second set of measurements corresponding to a second zero location defined by the fence in third position, the second zero location offset from the first zero location.

**20.** A carpenter square comprising:

a triangular body including a hypotenuse edge opposite a right corner, a first edge extending between the right corner and the hypotenuse edge, and a second edge extending between the right corner and the hypotenuse edge opposite the first edge;

a fence pivoted to the first edge for movement among first, second, and third positions;

in the first position, the fence is normal to the triangular body in a first direction;

in the second position, the fence is normal to the triangular body in a second direction opposite the first direction; and

in the third position, the fence is coplanar to the triangular body.

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