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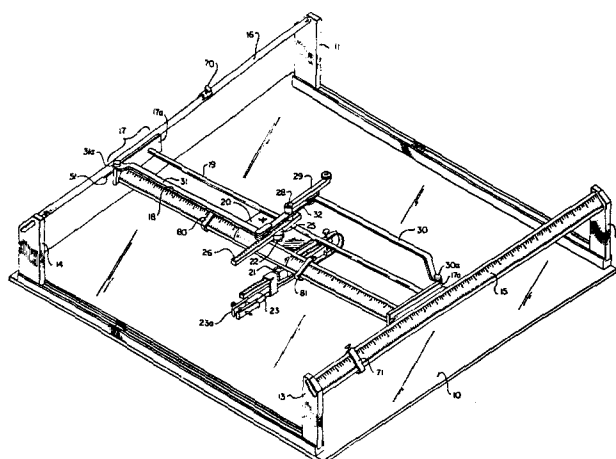
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⑤④ **Scribing device for forming arcuate figures.**

⑤⑦ A scribing device for scribing reproducible arcuate geometric figures is disclosed. The device has a sliding carriage or trolley which is movable along a pair of fixed opposed parallel rails. The trolley has a sliding platform which moves in relation to the trolley in a direction which is perpendicular to the fixed rails. The sliding platform has a rotatable post passing therethrough with a scribing arm transversely attached at its lower extremity. The scribing arm is generally movable with relation to the post so that a scribing tool at the end of the arm may scribe a circle when the post is rotated. The device of this invention is equipped with means for reciprocating the sliding platform in coordination with the rotation of the post so that perfect ellipses are formed. Also, by sequential movement of the sliding platform perpendicular to the fixed rails, partial rotation of the post and movement of the trolley along the fixed rails various other geometric figures may be formed in a reproducible manner.



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SCRIBING DEVICE FOR
FORMING ARCUATE FIGURES

Background of the Invention

Field: This invention relates to drafting or scribing devices for making geometric figures having arcuate portions and particularly to devices for making reproducible ellipses.

State of the Art: Numerous devices have been devised for the purpose of making ellipses. Such devices range from the rather simple string-type device of Clogston, et al disclosed in U.S. Patent 1,188,900 to the more mechanically elaborate device of Barker disclosed in U.S. Patent 2,623,286. Other devices for making ellipses are disclosed in U.S. Patent 3,224,098 to Terrell, U.S. Patent 4,148,144 to Stiles, U.S. Patent 2,233,990 to Stanfield, U.S. Patent 3,367,030 to Komorowski, et al and U.S. Patent 2,961,769 to Mowry.

Objects of the Invention

It is the object of the instant invention to provide a precision instrument for scribing various arcuate geometric figures.

It is another object of the instant invention to provide a device for making reproducible ellipses of various sizes in concentric, overlapping, or spaced relationship.

Another object of the instant invention is to provide a scribing device for making various figures such as racetrack ovals, rounded-corner rectangles and the like for use in the graphic arts.

Brief Description of the Drawings

FIG. 1 is a perspective view of the scribing apparatus of the instant invention;

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FIG. 2 is a plan view of the device of FIG. 1;
FIG. 3 is an elevational view of the device of
FIG. 1;

5 FIGS. 4(a) through 4(c) illustrate sequential
movement of elements of the device of FIG. 1 in scribing
an ellipse;

FIG. 5 illustrates a preferred embodiment of a
gliding element;

10 FIG. 6 illustrates a free-standing ellipse
making device; and

FIG. 7 illustrates a modified device.

Summary of the Invention

A unique device has now been invented which enables the scribing of a wide variety of arcuate, geometric
15 figures including circles, ellipses, squares and rectangles with rounded corners and racetrack ovals. The device
includes a rotatable post to which a lower cross-arm or
scribing bar is attached near the base. A pen, pencil or
scribing tool attached to the end of the arm is displaced
20 laterally from the base of the post. The scribing arm is
preferably movable to locate the pencil closer or farther
from said post. Rotation of the post causes said pen,
pencil or the like to scribe a circle. The post is
rotatably mounted in a sliding platform, preferably in a
25 sleeve fixed to the platform as a bearing member for the
post or axle. As the platform slides or reciprocates in
coordination with rotation of the post, perfect ellipses
may be formed. The device of the instant invention
includes means for coordinating the reciprocation of the
30 platform at the proper rate in relation to the rate of
rotation of the post to form perfect ellipses.

The sliding platform slides between a pair of
elongated, straight glide members which, together with the
sliding platform, form a sliding carriage or trolley
35 inasmuch as the glide members slideably engage a pair of

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opposed parallel rail members which are situated perpendicularly to the elongated glide members of the sliding carriage. Squares and rectangles with or without rounded corners may be formed by reciprocating the platform while the sliding carriage is held in a fixed position, then holding the sliding platform in a fixed position and moving the carriage along the fixed rails (perpendicular to path formed by sliding the sliding platform to and fro) to a given point, then sliding the sliding platform in the opposite direction to which it was first moved and then moving the carriage along the fixed rails in the direction opposite to that which the sliding carriage was first moved. Rotation of the pivot post at the end of each slide movement described above will produce a square or rectangle with rounded corners.

The fixed rails are elevated above a base member which has a planar surface to which a workpiece may be attached so that a figure may be scribed thereon. The fixed rails are positioned parallel to one another and parallel to the face of the base member by four support members or columns attached to the end of each fixed rail member and to the base member.

The structure of the device is such that the sliding platform always moves in a plane which is parallel to the planar surface of the base.

Description of the Illustrated Embodiment

Further description of the device may be facilitated by reference to the attached drawings. FIGS. 1, 2 and 3 illustrate a preferred embodiment of the invention wherein a base member 10, which has a flat planar upper surface and is square or rectangular in shape, has, at or near its four corners, a vertical corner bracket or column. These brackets 11, 12, 13 and 14 are attached to elevated parallel fixed rails 15 and 16. These fixed rails 15 and 16 are parallel to the upper surface of the base member

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and parallel to one another. The elevation or height of the fixed rails above the base member is generally preferred to be as small as practicable, preferably being in the range of about four to about eight inches for most purposes.

Between the fixed rails rides a sliding carriage or trolley 17. The sliding carriage sideably engages the fixed rails so that it moves in a direction parallel to said fixed rails. The fixed rails are straight and relatively rigid so that no lateral or canted movement of the trolley can occur as the trolley is moved to and fro along said fixed rails.

The fixed rails may be tubular with a cylindrical sleeve in bearing relationship about the tubular rail. Each end of the trolley may be affixed to a sleeve member whereby the trolley may then slide along the rails. The fixed rails 16 illustrated, however, are flat, elongated members (beams) of the type illustrated in FIG. 5. Further, the rails 16 are preferably fixed to the end support brackets at an angle of 45° to the vertical to improve rigidity of the rails with respect to the lateral and vertical forces imposed by operation of the trolley and sliding platform.

The trolley 17 is attached by end plates 17a to truck member 51 which glides within races provided beneath rail 16 (see FIG. 5 for illustration of member 51 and bearing races).

The trolley 17 comprises a pair of parallel elongated glide members 18 and 19. The elongated glide members 18 and 19 are straight and parallel to one another and attached to end plates 17a so that they are perpendicular to the straight fixed rails.

The ends of glide members 18 and 19 are fixed to end plates 17a so that the end edges of each member 18 and 19 are positioned 45° to the vertical. The upper, elongated edges of each member 18 and 19 are closer together

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than their lower, elongated edges, thus giving stability and rigidity to the trolley.

5 Positioned between the elongated glide members 18 and 19 is a sliding platform 20 which slides between the glide members in a direction perpendicular to the fixed rails when the trolley is held in a fixed position. The sliding platform 20 has a vertical post or axle 21 which rotates within an elongated sleeve or bearing member 22. The elongated sleeve preferably extends from the
10 sliding platform to the scribing bar 23, i.e., approximately coextensive with the length of post 21 to prevent any wobble at the ends of the post, as could occur with a short bearing.

15 A lower cross-arm or scribing bar 23 is positioned at the lower extremity of the rotatable post. The scribing bar may be moved so that the tool holder 23a is located near to or far from the post 21. As indicated herein before, the post with the scribing arm positioned so that the tool holder 23a, which is adapted to hold a
20 pencil, pen, stylus or knife edge, is displaced laterally from the post creates a circle upon rotation of the post. A hub 25 is attached to the top or upper extremity of the post 21. An offset arm 26 fits within a slot in the upper portion of hub 25. The offset arm is in a movable rela-
25 tion to slotted hub 25 and is held in various positions by setscrew 27. The offset arm fits within the slot of hub 25. Attached to one end of the offset arm is the pivot 28 of a crank arm 29.

30 A linkage assembly comprising two linkage arms 30 and 31 which are equal in length and about one-half of the length of the trolley are each affixed at one end at diagonally opposite corners of the trolley member to pins 30 and 31 and affixed at their other ends to a median connector 32 through which pivot 28 is attached centrally.

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It is preferred that linkage arms 30 and 31 be exactly one-half the length of the trolley inasmuch as that provides maximum movement of pivot 28. Longer or shorter arms limit the movement of pivot 28.

5 Preferably, the lateral displacement between arms 30 and 31, which is the length of the median connector 32, is about the width of the trolley. Also, arms 30 and 31 are preferably parallel to one another, i.e., the length of the median connector is equal to the distance
10 between pins 30a and 31a. The ratio of the length of arms 30 and 31 to the median connector is preferably at least about 1.5:1 and typically at least about 2:1. By main-
15 taining linkage arms substantially longer than the median connector 32, the path of pivot 28 during movement of the linkage arms will be in a straight path perpendicular to
rails 18 and 19 with only a slight hook at opposed extremes of travel of pivot 28.

Displacement of the median connector 32 from the hub 25 causes the sliding platform to reciprocate as crank
20 29 is revolved. The revolving of crank 29 simultaneously turns hub 25 and post 21. This coordination of the reciprocation of sliding platform 20 and the turning of scribing bar 23 results in the scribing of an ellipse.

25 The action of the device of the instant invention in scribing and ellipse is illustrated in the sequential drawings of FIGS. 4a, 4b, 4c, 4d and 4e wherein the action of the linkage assembly is illustrated.

30 In FIG. 4a, the linkage assembly is shown with linkage arms 30 and 31 in a parallel position and linkage connector 32 in an approximately perpendicular position to linkage arm 30 and 31. A crank 29 and scribing arm 23 are also parallel to linkage arms 30 and 31. The sliding platform 20 in the position shown in FIG. 4a is in an extreme right location. As the crank 29 is rotated clockwise (see
35 FIG. 4b), the tool holders is also rotated clockwise, however, through a shorter arc inasmuch as movement of the

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offset arm 26 displaces the rotational center of the crank located at pivot 28. In FIG. 4b, the pivot location of post 25 of the sliding platform is displaced slightly to the left from the position illustrated in FIG. 4a. In
5 FIGS. 4c, 4d and 4e, the continued motion of the scribing arm may be seen to scribe half of an elliptical figure. As crank 29 is continued through its clockwise rotation to its original position in FIG. 4a, a complete ellipse is scribed.

10 As may be seen in FIG. 4c, the sliding platform 20 is in a midpoint position between its extreme right position and the extreme left position attained in FIG. 4e. As may be seen in each of these figures, the crank 29, the offset arm 26 and the scribing arm 23 remain in a linear
15 position (in essentially the same vertical plane) throughout all phases or steps involved in the scribing motion.

Because of the adjustability of the offset arm in positioning pivot point 28 at a predetermined distance from the post 25 on the sliding platform, an ellipse
20 having various dimensions may be achieved. Also, inasmuch as the scribing arm 23 is extensible with respect to the post 21 (see FIGS. 1 through 3), further variability in the dimensions of the ellipse may be attained. For example, in FIGS. 4a through 4e, if an ellipse is desired
25 which is concentric with the first ellipse made, a slight adjustment in the extension of scribing arm 23 then permits the scribing of a concentric ellipse.

In FIGS. 4a through 4e, however, if the scribing arm 23 is maintained in the same extended position and the
30 offset arm 26 is adjusted so that pivot point 28 is nearer or farther from post 25 then an ellipse which has a slightly different shape will be scribed.

FIGS. 4a through 4e are drawn in register with a dotted line passing through pin 30a in each figure. Post
35 28 describes a path which is a straight line parallel to the dotted line.

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Typically the offset arm and the scribing arm will be scaled such that scale marks at one-half inch ^(1.27 cm) will be indicated as one inch ^(2.54 cm) marks since the rotation of a one-half inch offset actually scribes a figure having a one inch ^(2.54 cm) diameter. The scale setting on the tool holder or scribing arm 23 determines the vertical dimension of the ellipse. The scale setting on the offset arm 26 determines a horizontal dimension of the ellipse by repositioning the pivot point. (In describing an ellipse as being horizontal, it is meant that the major axis of the ellipse is parallel with rails 18 and 19.) Thus, setting the scale at four inches ^(10.16 cm) on the scribing arm, that is, the tool holder 23a will be actually two inches ^(5.08 cm) from the pivot post, and thereafter setting a two inch ^(5.08 cm) offset on the offset arm so that there is a one inch ^(2.54 cm) distance between the pivot point 28 and the post 25 (a two inch ^(5.08 cm) indication on the scale), a six inch ^(15.24 cm) wide ellipse will be made having a four inch ^(10.16 cm) vertical dimension. As heretofore indicated, only the tool holder scale on the scribing arm is adjusted to produce concentric shapes.

By repositioning the movable carriage or trolley, overlapping ellipses may be formed. In FIGS. 4a through 4e, the ellipse was formed by holding the trolley in a fixed position. The trolley movable, however, and by moving the trolley, for example one inch ^(2.54 cm) in either direction, an offset ellipse, i.e., intersecting ellipse, may be formed using the same settings on the offset arm 26 and the scribing arm 23. The movement of the sliding platform 20 and the trolley itself takes place within certain glide members.

A particularly useful glide member is illustrated in FIG. 5. The glide member 57 is an elongated rigid member which has a pair of parallel elongated outer bearing races which contact ball bearings 55 of the traveling ball bearing holding member 56. The truck member 51 and the ball bearing holding member 56 each are

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channel shaped and cross-sectional with the open channels of each facing one another. The truck member 51 fits within the ball bearing holding member so that the external races to the glide member contact the bearings of the ball bearing holding member 56. The ball bearing holding member 56 slides within the base or glide member 57. The ball bearings contact internal, parallel bearing races of the base member. A pair of stops 58 and 59 are provided to each end of the base member 57 to retain the ball bearing holding member within the base member. The stops 58 and 59 contact the ends of the ball bearing holding member.

Each row of ball bearings makes contact with the base member on one side and the sliding guide or truck member on the other side. Thus, whenever the ball bearing holding member moves relative to the base member the ball bearings rotate causing the glide member to move. Since the ball bearings maintain the alignment of the glide member it should fit snugly between parallel rows of the ball bearings. Also, the ball bearings should be sufficiently close together to support securely the glide member even when half the glide member is retained within the ball bearing holding member. The ball bearings are generally about one-sixteenth inch to ^(1.59 to 25.4 mm) one inch in diameter and spaced no greater than about three ^(7.62 cm) inches apart.

A rail member, such as rail 16, may include a cover member 16a, which preferably is marked with a scale, as illustrated in FIGS. 1 and 2. The cover member 16a may be merely a facade or it may be a structural member. Member 16a may be omitted, whereby the scale is placed on the reverse side of member 57. Rail members 18 and 19 are preferably also constructed similarly to the structure shown in FIG. 5.

FIG. 6 illustrates an ellipse-making apparatus which is free-standing, i.e., it has no planar base member. The free-standing device is supported by pedestals 60 and

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61 which have a pair of flat, elongated feet 60a and 61a which have flat, planar under surfaces adapted to rest securely upon a drafting or drawing table top. Four columns 62, 63, 64 and 65 support the carriage comprised of rails 18 and 19. End plates 17a are fixed to the end of rails 18 and 19. End plates 17a are fixed to the top of columns 62, 63, 64 and 65. The structure and components of the device of FIG. 6 are the same of those of the movable carriage or trolley 17 of FIG. 1, except for the pedestals.

The device of FIG. 6 can readily be used for making circles and ellipses, however, it cannot readily be used to make squares or rectangles with rounded corners or to make racetrack ovals. The device of FIG. 6 may be placed upon a workpiece in order to scribe a circle or ellipse on the workpiece. It can readily make concentric circles or ellipses, however, it is not well suited to make repeated figures which are merely offset from one another by a predetermined distance such as can be readily and accurately made by the movable trolley device of FIG. 1.

The scribing device described herein is particularly advantageous inasmuch as it is easy to use and can accurately reproduce various figures having arcuate portions. The device illustrated in FIG. 1 can accurately make concentric ellipses wherein the larger ellipse is only a centimeter larger and wherein the spacing between the two is visually even. Also, interlacing figures can be made by a predetermined movement of the trolley to various sequential positions. These types of functions are particularly useful in the graphic arts for preparation of commercial displays, such as advertising artwork.

The device of FIG. 1, for example, may be used by taping a sheet of paper onto the upper planar surface. Stops 70 and 71 may be moved until they are adjacent end plates 17a. The movable carriage is thus locked in place.

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Offset arm 26 and scribing arm 23 may be properly positioned to permit the scribing of an ellipse as crank 29 is turned. Moving the trolley one inch ^(2.54 cm) along the fixed rails, repositioning the stops and turning the crank causes an identical ellipse to be formed offset (overlapping) from the first by a distance of one inch (2.54 cm).

Stops 70 and 71 may be used in conjunction with stops 80 and 81 to form squares and rectangles with rounded corners. Arms 30 and 31, median connector 32, crank 29 and offset arm 26 are removed. The slotted hub 25 then receives a knob which has indexing means located 90° apart with two opposed indexing locations being parallel to rails 18 and 19, and the other two opposed index locations perpendicular to rails 18 and 19.

The device is positioned with the scribing arm 23 perpendicular to rails 18 and 19 and the trolley 17 adjacent stop 71 in the location shown in FIG. 1. Sliding platform 20 is adjacent stop 81, which is in the position shown in FIG. 1. The platform is moved from stop 81 to stop 80, thereby scribing a straight line. The knob on hub 25 is rotated 90° from one index position to the next, thereby scribing an arc of 90°. The trolley is then moved to the right to stop 70 as shown in FIG. 1. Again, the knob is turned 90°, scribing another 90° arc. The sliding platform is then moved from stop 80 to stop 81, the knob turned and another arc formed. The trolley is then moved from stop 70 to stop 71, the knob turned and the final arc formed to complete a rectangle with rounded corners.

This technique may be practiced by employing the invention including the modifications illustrated in FIG. 7. Knob 70 has indexing grooves 70a, 70b, 70c and 70d located on the outer cylindrical wall of the knob. These grooves are preferably semi-circular in cross-section and perpendicular to the base of the knob, i.e. vertical from the base to the top of the knob. Each elongated groove is 90° from adjacent grooves.

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Knob 70 is adapted to fit over hub 25 and has a projection (not shown) internally which mates with slot 25a to provide coaction between knob 70 and hub 25. A detent housing 71 houses a ball member or detent 72 which is spring loaded by spring 73. Approximately one-half the ball protrudes from the vertical face of the detent housing. Ball member 72 interacts with grooves to provide indexing means. Because the ball member is spring loaded, only slight torque or turning movement is required on the knob to unlatch it and rotate the knob so that the next adjacent groove interacts with the ball member.

Two of the opposed grooves, e.g. 70b and 70d are aligned with the projection which mates with slot 25a so that those grooves are aligned with slot 25a and with scribing arm 23.

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Claims

1. A scribing device for outlining arcuate geometric figures on a workpiece situated on a planar reference surface comprising:

- a pair of elongated glide members joined to one another in spaced, parallel relationship;
- legs attached to each end of said glide members to support same above a reference planar surface in a position parallel to said reference surface;
- a sliding platform positioned between said glide members and oriented in a plane substantially parallel to said reference planar surface;
- a vertical hollow sleeve fixed perpendicularly to said platform in a position substantially midway between said glide members, said sleeve extending below said platform;
- a vertical axle rotatably disposed within said vertical sleeve and extending above and below said sleeve;
- an upper cross-arm slideably attached to the upper end of said vertical axle, said arm oriented in a plane substantially parallel to a workpiece upon which an oval-shaped figure is to be scribed;
- a lower cross-arm (scribing arm) slideably attached to the lower end of said vertical axle and having tool holding means attached to an end thereof, said arm oriented in a plane substantially parallel to a workpiece upon which an oval-shaped figure is to be scribed;
- lower attachment means fixed to the lower end of said vertical axle to secure said lower cross-arm in various lateral positions with reference to said post;

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upper attachment means for attaching motive means to said upper cross-arm at various positions along the length of said arm;

motive means for rotating said upper cross-bar and for causing said platform to move lengthwise (parallel to and between said rails), said motive means comprising a pair of arms which are about half the length of said rails, the distal end of each arm removably attachable to a pivot pin, one said pivot pin secured near the end of one rail with the other pivot pin secured near the diagonally opposite end of the other rail, the proximate end of each arm secured to each end of a median arm which has a center bore;

2. A scribing device for outlining arcuate geometric figures comprising:

a pair of parallel rail members spaced from one another in a plane substantially parallel to a workpiece upon which an oval-shaped figure is to be scribed;

support members to support said parallel rail members in a plane above and horizontal to a workpiece upon which an oval-shaped figure is to be scribed;

a sliding carriage having a pair of elongated glide members which are fixed in a spaced relationship to one another and which slideably engage rail members in a manner to be perpendicular to and between said fixed rails;

a sliding platform positioned between said glide members and oriented in a plane substantially parallel to a workpiece upon which an oval-shaped object is to be scribed;

a vertical hollow sleeve fixed perpendicularly to said

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platform in a position substantially midway between said glide members, said sleeve extending below said platform;

a vertical axle rotatably disposed within said vertical sleeve and extending above and below said sleeve;

an upper cross-arm fixed near its midpoint to the upper end of said vertical axle, said arm oriented in a plane substantially parallel to a workpiece upon which an oval-shaped figure is to be scribed;

a lower cross-arm (scribing arm) slideably attached to the lower end of said vertical axle and having scribing means attached to an end thereof, said arm oriented in a plane substantially parallel to a workpiece upon which an oval-shaped figure is to be scribed;

lower attachment means fixed to the lower end of said vertical axle to secure said lower cross-arm in various lateral positions with reference to said post;

upper attachment means for attaching motive means to said upper cross-arm at various positions along the length of said arm;

motive means for rotating said upper cross-bar and for causing said platform to move lengthwise (parallel to and between said rails), said motive means comprising a pair of arms which are about half the length of said rails, the distal end of each arm removably attachable to a pivot pin, one said pivot pin secured near the end of one rail with the other pivot pin secured near the diagonally opposite end of the other rails, the proximate end of each arm secured to each end of a middle arm which has a center bore;

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crank means secured to said upper attachment means by a short shaft which passes through the bore of said center bore of said middle arm.

3. The scribing device of Claim 2 wherein said rails are flat, elongated members.

4. The scribing device of Claim 3 wherein the flat face of one rail is inclined towards the other rail, wherein each rail is inclined the same amount.

5. The scribing device of Claim 3 wherein each rail has its flat face inclined at an angle of about 45° to the vertical.

6. The scribing device of Claim 2 wherein said elongated glide members comprise an elongated rigid channel member having raceways therein and a ball bearing holding member and an internal guide member, said guide member and ball bearing holding member slideably movable with respect to said elongated rigid channel member.

7. The scribing device of Claim 2 wherein said fixed rails comprise an elongated rigid channel member having raceways therein and a ball bearing holding member and an internal guide member, said guide member and ball bearing holding member slideably movable with respect to said elongated rigid channel member.

8. The scribing device of Claim 2 wherein said supported members are attached to their base to a rigid, flat planar member upon the upper surface of which a workpiece may be laid upon which an arcuate figure may be scribed.

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9. The scribing device of Claim 2 wherein said vertical hollow sleeve is substantially as long as the vertical axle disposed therein.

10. A scribing device for scribing figures having regular curves (arcs) connected to straight lines comprising:

a pair of fixed parallel rail members spaced from one another and fixed to a base support, said rails disposed in a plane substantially parallel to a workpiece upon which plane geometric figure is to be scribed;

support means to support said parallel rail members in a plane above and parallel to the plane supporting said workpiece;

a sliding carriage (trolley) having glide members at each end which interact with said fixed rail members, said carriage comprising two spaced rails having a platform slideably engaging same, said platform having a vertical hollow sleeve fixed substantially centrally in said platform and extending below said platform, an axle disposed in said sleeve, a cross-arm attached to the upper terminus of said axle and a scribing arm attached to the lower end of said axle, said platform having indexing means interacting with said vertical axle to retard the rotation of said axle at predetermined intervals (angular displacement).

11. The scribing device of Claim 10 wherein said vertical axle is rotated by a removable cap which has vertical grooves spaced about the perimeter of said cap at angular spacing of 90°.

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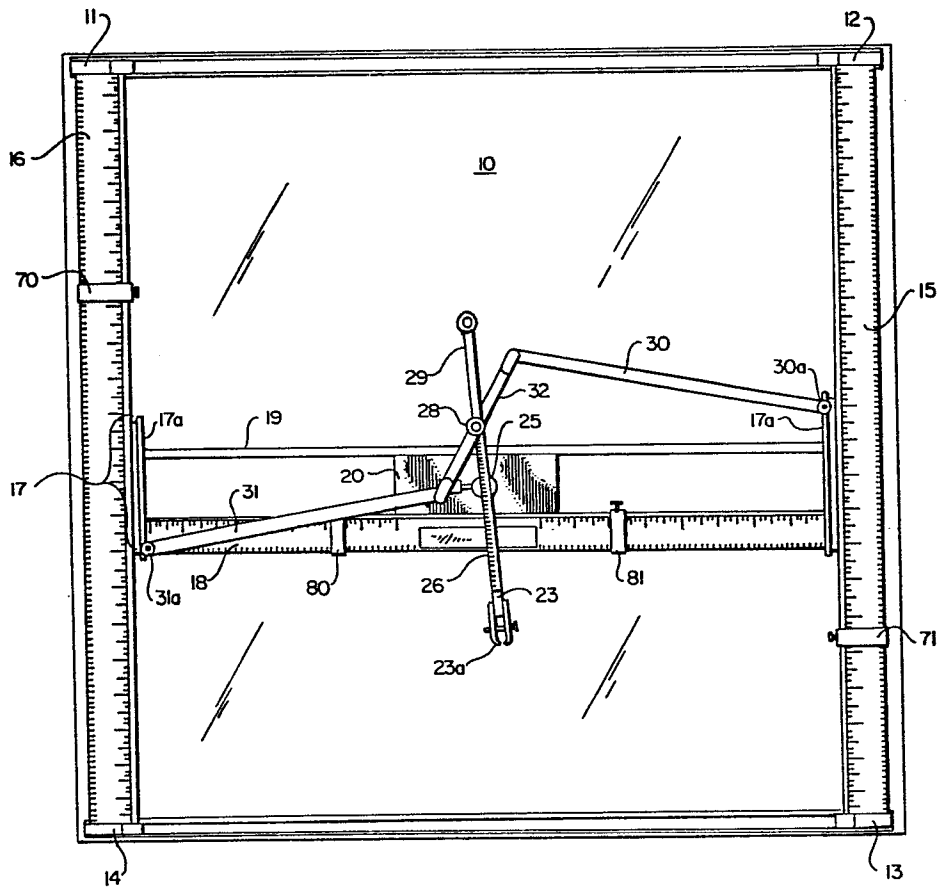


Fig. 2

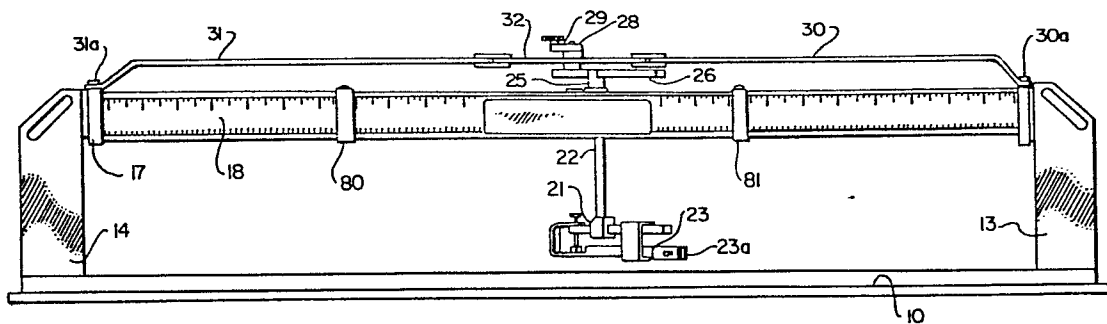


Fig. 3

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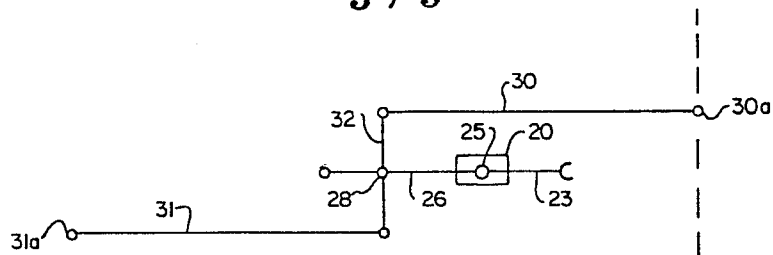


Fig. 4a

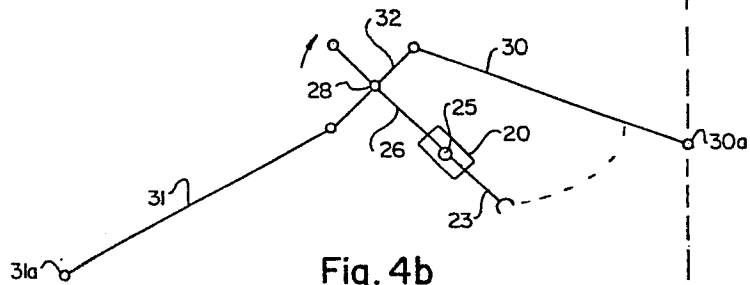


Fig. 4b

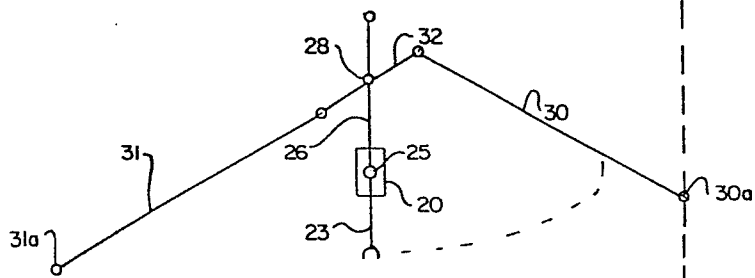


Fig. 4c

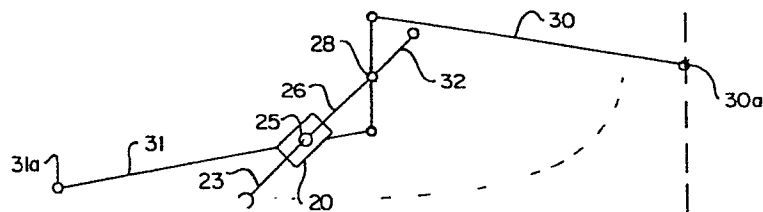


Fig. 4d

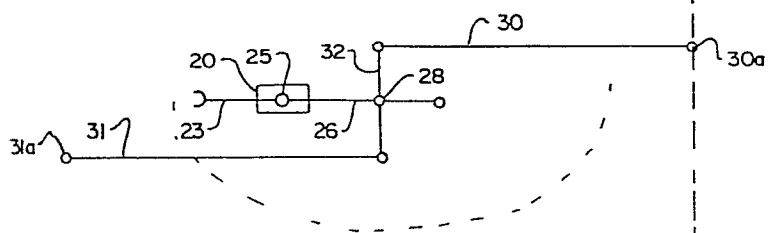
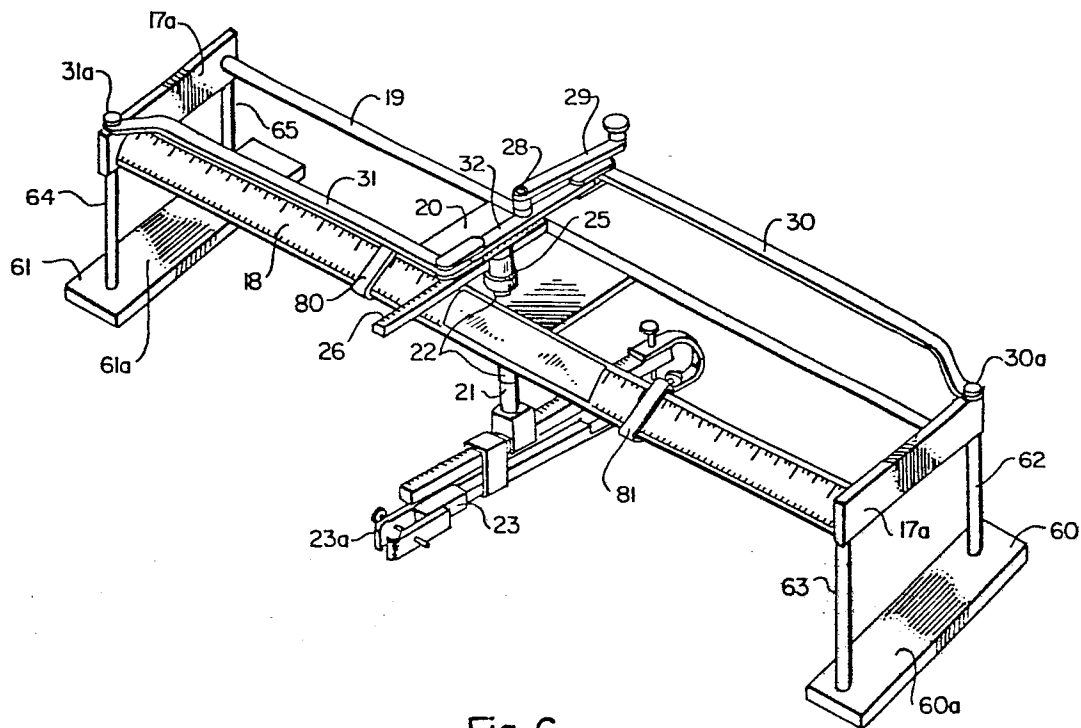
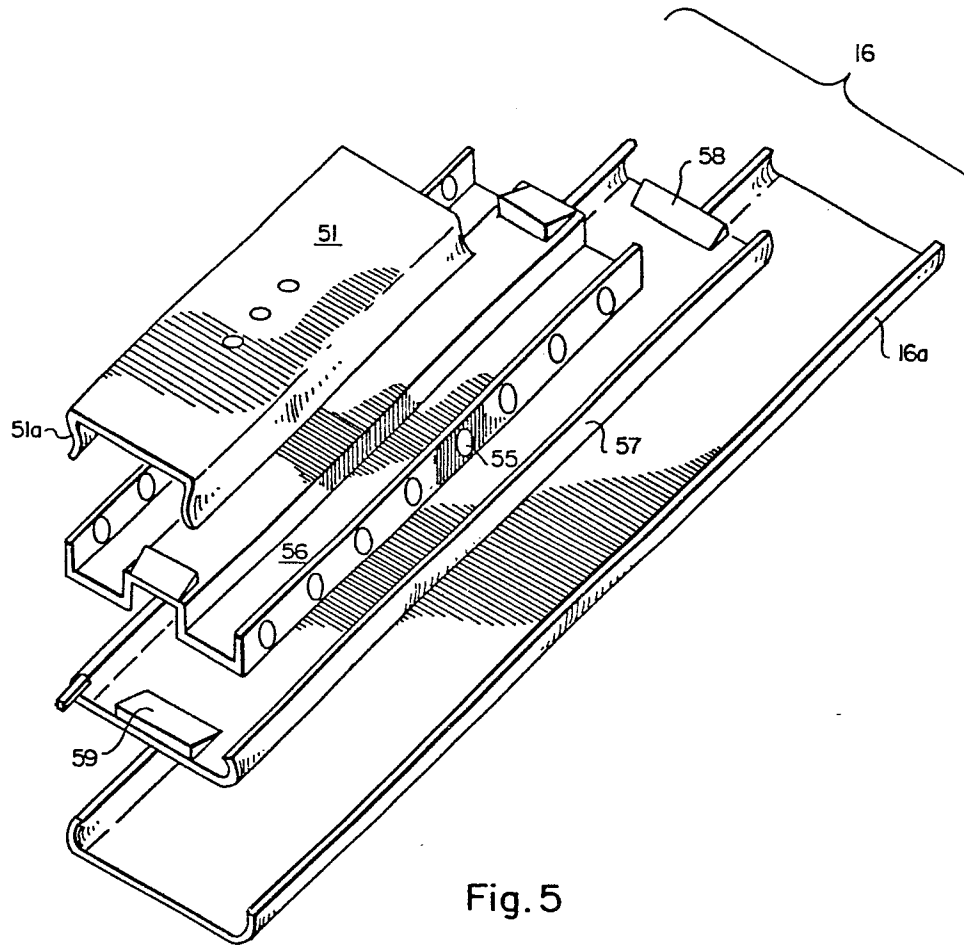


Fig. 4e

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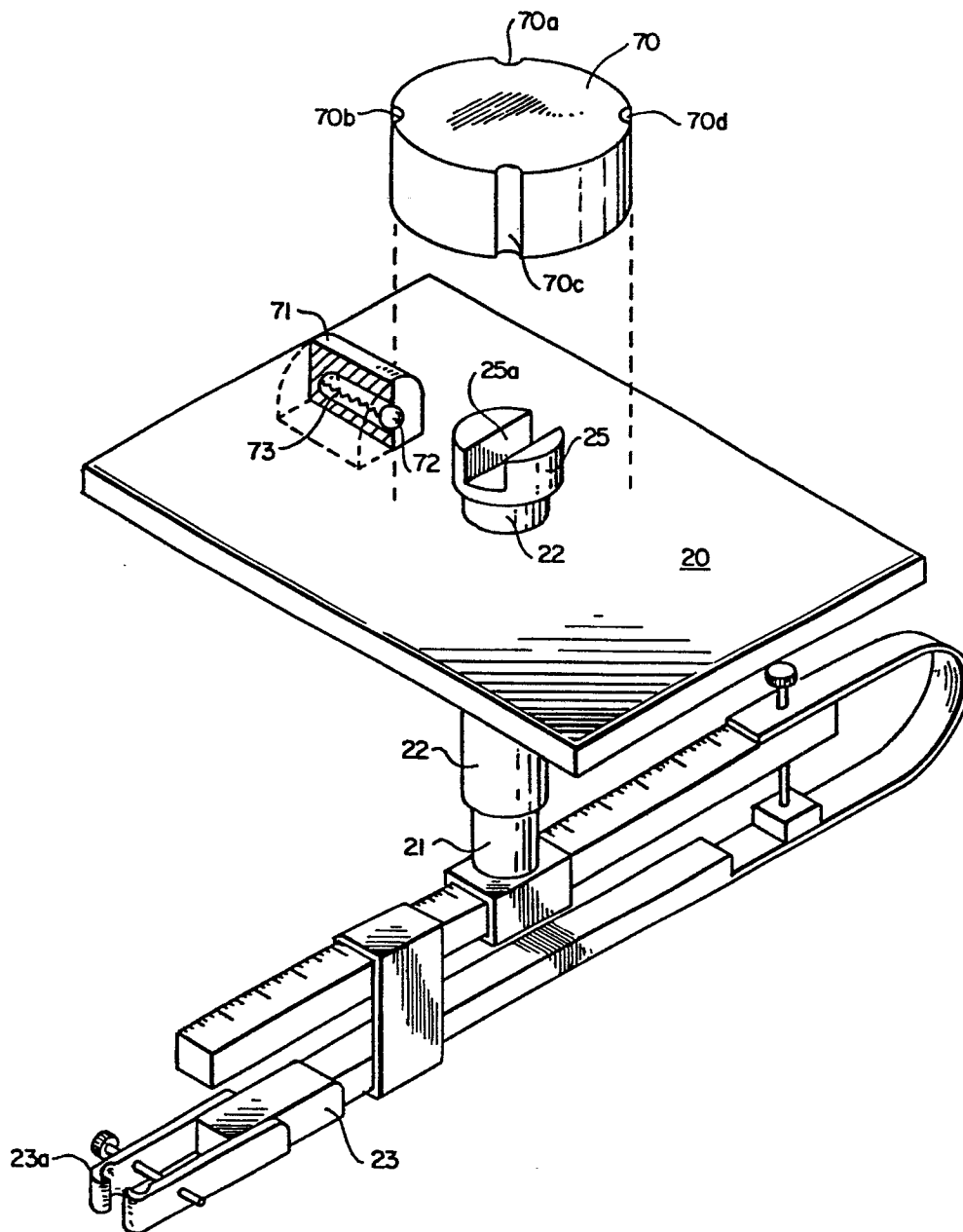


Fig. 7