

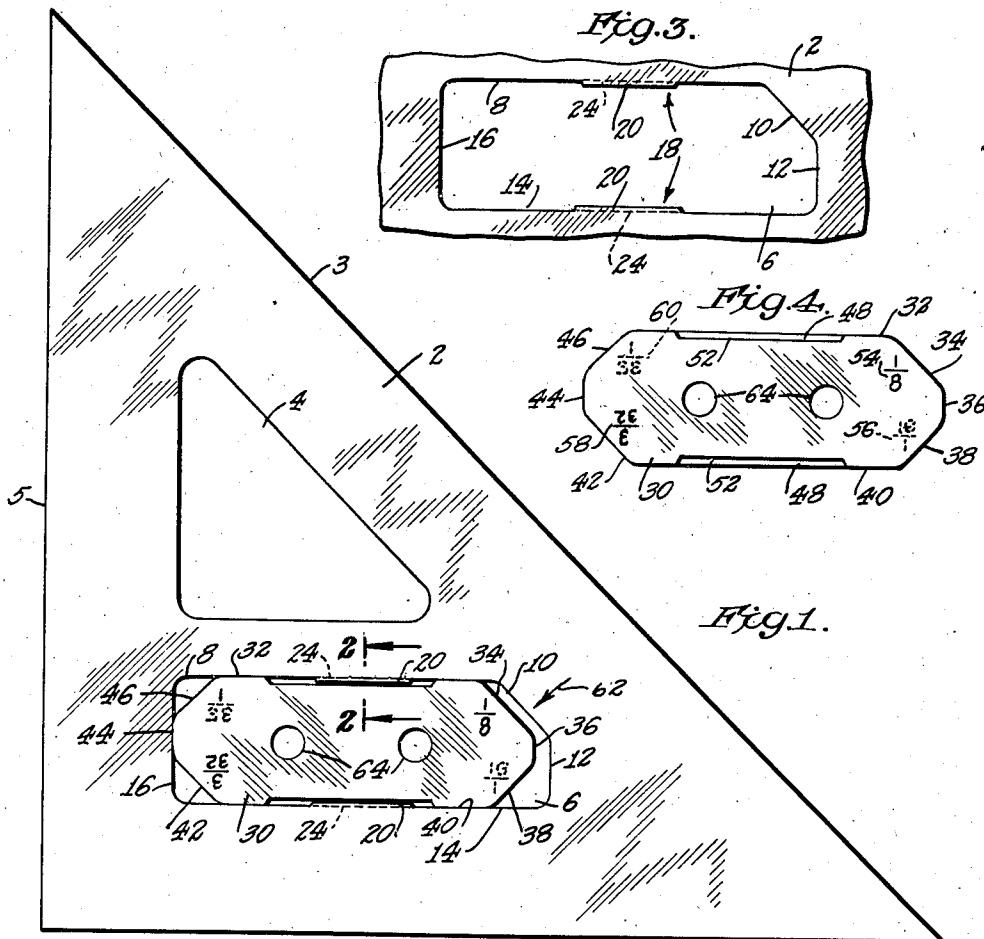
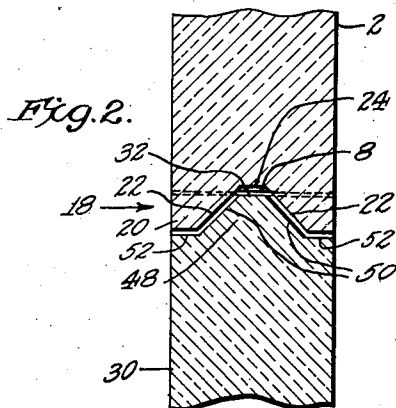
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H. F. EBERT ET AL

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DRAFTING INSTRUMENT

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INVENTORS
HOWARD F. EBERT
ADOLF W. KEUFFEL
BY
J. Russell J. J. J.
ATTORNEY

UNITED STATES PATENT OFFICE

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DRAFTING INSTRUMENT

Howard F. Ebert, Omaha, Nebr., and Adolf W. Keuffel, Essex Fells, N. J., assignors to Keuffel & Esser Company, Hoboken, N. J., a corporation of New Jersey

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1

This invention relates to drafting instruments and more particularly to instruments for drawing spaced parallel lines such as cross-section lines sometimes also called cross-hatching.

Nearly all mechanical drawings of parts or assemblies include cross-section views to clarify intricate structures and particularly to show the relationship of various parts in assemblies. Parts which are shown in section are section lined or cross hatched by drawing a series of lines usually at 45° to the right or to the left of the base line of the drawing. By means of various combinations of full lines, broken lines, light and heavy lines, it is possible to indicate the type of material which is shown in sectional view according to standards adopted by the various engineering societies.

Cross section lining will enhance the appearance of the drawing only if like lines are of uniform weight and uniformly spaced over the entire drawing. To accomplish this effect without mechanical means requires constant care and attention on the part of the draftsman and consumes a large part of the draftsman's time.

The object of the present invention is to provide a drafting instrument which will enable the draftsman to make uniformly spaced lines rapidly and with a minimum amount of concentration on the draftsman's part.

Another object of the present invention is to provide a drafting instrument for section lining consisting of a minimum number of parts so that the instrument can not get out of working order yet will give a plurality of predetermined spacings as may be required by the draftsman.

A further object of the invention is to provide a drafting instrument for section lining in the form of a standard drafting instrument which nearly every draftsman requires as part of his regular tools.

A still further object of the invention is to provide a drafting instrument for section lining which can be used in any position on a drawing and does not require the insertion of thumb tacks or fastening devices through the face of the drawing.

Another object of this invention is to provide a drafting instrument for section lining which is inexpensive to manufacture so that its cost will not be appreciably more than the standard instrument which the draftsman always requires.

It is a particular object of this invention to provide in a drafting instrument for drawing spaced parallel lines, a body with a ruling edge, an aperture in said body with at least two spaced

2

apart elements, means oscillatably mounted in said aperture having a plurality of pairs of co-operating elements in similar relative positions but at different distances apart coacting with said spaced apart elements of said aperture so that a different maximum relative movement is obtained for each of a plurality of positions of orientation of the oscillatable means within said aperture.

Still another object of the invention is to provide in a drafting instrument for drawing spaced parallel lines, a body with a ruling edge, an aperture in said body with at least two spaced apart elements, and a pair of substantially parallel guiding walls, grooved projections on said parallel walls, means oscillatably mounted in said aperture having a plurality of pairs of cooperating elements in similar relative positions but at different distances apart and having a pair of substantially parallel edges, ridges on said parallel edges to form a snap fit with said grooved projections, the said elements of said oscillatable means and said elements of said aperture coacting so that a different maximum relative movement is obtained for each of a plurality of positions of orientation of the oscillatable means within said aperture.

These and other objects and advantages of the invention will be apparent from the following detailed description read in connection with the drawings in which

Fig. 1 is a view in plan showing a 45° triangle embodying the present invention;

Fig. 2 is a portion of Fig. 1 in section along the line 2—2 looking in the direction of the arrows;

Fig. 3 is a fragmentary view in plant of a portion of Fig. 1 with a part removed to show details of construction; and,

Fig. 4 is a view in plan of one of the parts shown in Fig. 1.

This invention for a drafting instrument to draw spaced parallel lines is adaptable to many types of drafting instruments of any desired shape although it is most conveniently applied to one of the draftsman's regular tools such as a triangle. Accordingly, the invention is illustrated in an embodiment as applied to the draftsman's conventional 45° triangle which as is well known can be made of transparent sheet plastic such as Celuloid, Vinylite, Lucite or opaque materials such as wood, metal, etc. The conventional triangle 2 illustrated in Fig. 1 has the usual exterior ruling edges 3, 5 and 7 and may be made in any convenient dimensions such as 6 inches or 8 inches

3

along the base 7 or altitude 5. Within the body may be provided the usual triangular cut-out 4 which serves to lighten the weight of the instrument, to assist in its manufacture, to provide means for picking up the instrument from a smooth surface such as a drawing and to prevent warping or curling of the instrument. The triangular cut-out portion 4 is spaced slightly differently from that in the usual conventional triangle to provide room for another aperture 6 illustrated as generally rectangular in shape with the longer edges parallel to one side of the triangle such as the base 7.

The aperture 6 includes in the form illustrated in Fig. 1 walls 8, 10, 12, 14 and 16 of which all except 10 are the walls of a rectangle and wall 10 is a diagonal across one corner which may be considered as oblique to one side and one end. The two longer parallel sides 8 and 14 as illustrated in Fig. 3 are provided with projections 18 from these walls the details of which are shown in Fig. 2. A groove with walls 22 and bottom 24 is cut substantially in the center of the projections 18 forming lips 20. The grooved projections 18 along a limited portion of the sides 8 and 14 serve to retain shuttle 30 in aperture 6 by cooperation with ridges on the edges of shuttle 30 which is illustrated in greater detail in Fig. 4.

Referring again to Fig. 3 it will be noted that at one end of aperture 6 is a vertical wall 16 and at the opposite end a diagonal or oblique wall 10. These two elements are spaced apart a distance to cooperate with the shuttle in a manner hereinafter described for permitting relative movement of a predetermined amount between the triangle and the shuttle for the purpose of providing spaced lines in the manner hereinafter further described.

The shuttle 30 as illustrated in Fig. 4 is generally rectangular in outline and has relatively long parallel sides 32 and 40 which serve as guide edges. It also has end edges 36 and 44 and oblique edges 34, 38, 42 and 46. Each of the long parallel side edges 32 and 40 of the shuttle 30 is of such relative dimensions as to slide smoothly along the walls 8 and 14 of the aperture. Longitudinal ridges 48 (see Fig. 2) are formed by cutting away portions of the side edges 32 and 40 to provide walls 50 and shoulders 52 of the ridges which cooperate with the grooved projections 18 from the body and serve as retaining means for the shuttle 30. The shuttle 30 is thus oscillatably mounted in the triangle 2.

Indicia 54, 56, 58 and 60 are provided on the shuttle indicating the spacing to be obtained when the shuttle is in particular positions by reference to an index arrow 62. Holes 64 or other means in the shuttle serve as finger grips for the spacing operation in the manner hereinafter described.

Referring to Fig. 4 the indicia 54 reads " $\frac{1}{8}$ " which as will be seen from Fig. 1 is adjacent the index arrow 62. This indicia indicates that the relative movement permissible between the triangle proper 2 and the shuttle 30 is a fixed distance equal to the horizontal distance between two 45° lines spaced $\frac{1}{8}$ inch apart. This permissible movement is due to the fact that the spacing between the spaced apart elements of the aperture 6, namely, the side wall 16 and the oblique wall 10, is greater by the predetermined amount than the corresponding distance between cooperating elements on the shuttle and particularly the distance from end edge 44 to the oblique edge 34 of the shuttle. These relative dimensions are such that the perpendicular dis-

4

tance between successive lines drawn at the hypotenuse will be $\frac{1}{8}$ inch apart. Obviously, the relative dimension could be such that the indicia gives the distance apart of successive lines drawn along the altitude or vertical side of the body member. The shuttle when in the position shown in Figure 1 may be moved a distance equal to $\frac{1}{8}$ of an inch times the secant of 45° to the right before the oblique edge 34 of the shuttle 30 will engage the oblique or diagonal wall 10 of the triangle.

In order to permit drawing parallel lines along the hypotenuse 3 with a perpendicular spacing of $\frac{3}{8}$ of an inch, the shuttle is removed from the triangle by snapping it out of the aperture as can be readily done because of the flexibility of the triangle and particularly the web portion between the triangular aperture 4 and the shuttle aperture 6. When the shuttle has been removed from the aperture, it is rotated 180° about an axis perpendicular to the plane of the shuttle and then reinserted in the aperture 6. When thus reoriented and reinserted, the indicia 58 reading " $\frac{3}{8}$ " will be adjacent the index arrow 62. The edge 36 of the shuttle will be against the wall 16 of the aperture and the oblique edge 42 of the shuttle 30 will be parallel with the oblique wall 10 of the aperture. Because of the relative dimensions between the end edge 36 and oblique edge 42 of the shuttle 30 with respect to the corresponding dimension between the wall 16 and the wall 10 of the aperture 6, the relative movement in inches of the shuttle with respect to the triangle will be a distance equal to $\frac{3}{8}$ of an inch times the secant of 45°.

If another of the possible line spacings is desired such as $\frac{1}{16}$ of an inch, the shuttle is snapped out of the aperture and turned over then put in such a position that the indicia 56 " $\frac{1}{16}$ " is adjacent the index arrow 62 and then the shuttle as now oriented is snapped into place. If line spacing of $\frac{1}{2}$ of an inch is desired, the indicia 60 is by similar operation placed opposite the index arrow 62.

It will be evident that any desired number of line spacings may be secured with this combination by varying the position and characteristics of the several elements involved. Instead of employing a diagonal wall 10 and an oblique edge 34 in cooperation with a wall and edge 16 and 44, respectively, the diagonal edge 10 might, for example, be stepped and suitable cooperating stepped members provided at each of the corners of the shuttle. Other modifications of this general arrangement will be evident to those skilled in the art.

The shuttle as illustrated in Fig. 1 is transparent but it will be clear that this as well as the triangle may be made from an opaque material in which case the indicia for each position of the shuttle and the index arrow can be stamped on both sides of the shuttle and triangle, respectively. While in the preferred embodiment the shuttle 30 and aperture 6 are provided with cooperating members to retain the shuttle in position, the advantages of this construction may be dispensed with without sacrificing other advantages of the shuttle arrangement.

In operation, the draftsman placed the device with one edge such as the base 7 against a suitable straightedge. By placing the thumb firmly on the shuttle it is held in position against the drawing; the other fingers of the left hand may then be used to move the triangle proper so that the oblique wall 10 of the aperture 6 engages the

5

edge 34 of the shuttle. While in this position the draftsman would draw a line with a pencil or ruling pen held in his right hand along an edge of the triangle such as the hypotenuse 3. To draw a second line at the preselected distance from the first, the draftsman presses against the triangle with his fingers and with his thumb moves the shuttle to the left as viewed in Fig. 1 so that the edge 44 of the shuttle engages the wall 16 of the triangle, then holding the shuttle in position against the drawing, the triangle is moved with the fingers until the oblique wall 10 of the aperture 6 engages the edge 34 of the shuttle 30. The second line properly spaced from the first line may now be drawn along the edge 3 of the triangle and the operation repeated as many times as is necessary to provide the desired number of spaced parallel lines.

It will thus be seen that this invention provides a drafting instrument for readily drawing spaced parallel lines with any of a plurality of desired spacings.

We claim:

1. In a drafting instrument for drawing spaced parallel lines, a body with a ruling edge, an aperture in said body with at least two spaced apart elements, means which may be oriented with respect to said spaced apart elements oscillatably mounted in said aperture having a plurality of pairs of cooperating elements in similar relative positions but at different distances apart coacting with said spaced apart elements of said aperture so that a different maximum relative movement is obtained for each of a plurality of positions of orientation of the oscillatable means within said aperture.

2. In a drafting instrument for drawing spaced parallel lines, a body with a ruling edge, an aperture in said body with at least two spaced apart elements, means which may be oriented with respect to said spaced apart elements oscillatably mounted in said aperture having a plurality of pairs of cooperating elements in similar relative positions but at different distances apart coacting with said spaced apart elements of said aperture so that a different maximum relative movement is obtained for each of a plurality of positions for orientation of the oscillatable means within said aperture and means to retain said oscillatably mounted means within said aperture.

3. In a drafting instrument for drawing spaced parallel lines, a sheet like body, a pentagonal aperture in said body, four walls of said aperture forming parts of a rectangle with a fifth wall at an oblique angle, an octagonal unitary shuttle oscillatably mounted in said aperture, four edges of said shuttle substantially parallel to the four right angle walls of said aperture, the other four edges of said shuttle in oblique positions each differently spaced with respect to the corresponding parallel edges to coact with the oblique wall of said aperture to limit the maximum relative lateral movement between said shuttle and said body, a different maximum relative movement being obtained when each of the oblique edges of said shuttle is in juxtaposition with the oblique wall of said aperture.

4. In a drafting instrument for drawing spaced parallel lines, a body with a ruling edge, an aperture in said body with at least two spaced apart elements, and a pair of substantially parallel guiding walls, means which may be oriented with respect to said spaced apart elements oscillatably mounted in said aperture having a plurality

6

of pairs of cooperating elements in similar relative positions but at different distances apart and having a pair of substantially parallel edges to guide the oscillatable means within the aperture, said cooperating elements on said oscillatably mounted means coacting with said spaced apart elements of said aperture so that a different maximum relative movement is obtained for each of a plurality of positions of orientation of the oscillatable means within said aperture.

5. In a drafting instrument for drawing spaced parallel lines, a body with a ruling edge, an aperture in said body with at least two spaced apart elements, means which may be oriented with respect to said spaced apart elements oscillatably mounted in said aperture having a plurality of pairs of cooperating elements in similar relative positions but at different distances apart, cooperating grooves and ridges on walls of said aperture and edges of said oscillatable means to form a snap fit, the said elements of said oscillatable means and said elements of said aperture coacting so that a different maximum relative movement is obtained for each of a plurality of positions of orientation of the oscillatable means within said aperture.

6. In a drafting instrument for drawing spaced parallel lines, a body with a ruling edge, an aperture in said body with at least two spaced apart elements, and a pair of substantially parallel guiding walls, grooved projections on said parallel walls, means which may be oriented with respect to said spaced apart elements oscillatably mounted in said aperture having a plurality of pairs of cooperating elements in similar relative positions but at different distances apart and having a pair of substantially parallel edges, ridges on said parallel edges to form a snap fit with said grooved projections, the said elements of said oscillatable means and said elements of said aperture coacting so that a different maximum relative movement is obtained for each of a plurality of positions of orientation of the oscillatable means within said aperture.

7. In a drafting instrument for drawing spaced parallel lines, a body with a ruling edge, an aperture in said body with at least two spaced apart elements, one of said elements being an oblique wall, means which may be oriented with respect to said spaced apart elements oscillatably mounted in said aperture having a plurality of pairs of cooperating elements in similar relative positions but at different distances apart, one of each of said pairs being an oblique edge, said elements of said oscillatable means and said elements of said aperture coacting so that a different maximum relative movement is obtained for each of a plurality of positions of orientation of the oscillatable means within said aperture.

8. In a drafting instrument for drawing spaced parallel lines, a body, an aperture in said body with at least two spaced apart elements and having a pair of substantially parallel walls, a second aperture in said body having at least one wall substantially parallel to one of the said parallel walls of the first said aperture to form a flexible web between the two apertures, means which may be oriented with respect to said spaced apart elements oscillatably mounted in first said aperture having a pair of substantially parallel edges and a plurality of pairs of cooperating elements in similar relative positions but at different distances apart, cooperating grooves and ridges on walls of first said aperture and on edges of said oscillatable means to form a snap fit, the said

7

elements of said oscillatable means and said elements of said aperture coacting so that a different maximum relative movement is obtained for each of a plurality of positions of orientation of the oscillatable means within said aperture.

9. In a drafting instrument for drawing spaced parallel lines, a body in the form of a 45° triangle, an aperture in said body with at least two spaced apart elements and having a pair of substantially parallel walls substantially parallel to one of the edges of said triangle, a second aperture in said body having at least one wall substantially parallel to said parallel walls of the first said aperture to form a flexible web between the two apertures, means which may be oriented with respect to said spaced apart elements oscillatably mounted in the first said aperture having a pair of substantially parallel edges and a plurality of pairs of cooperating elements in similar relative positions but at different distances apart,

8

cooperating grooves and ridges on the walls of the first said aperture and on the edges of said oscillatable means to form a snap fit, the said elements of said oscillatable means and said elements of said aperture coacting so that a different maximum relative movement is obtained for each of a plurality of positions of orientation of the oscillatable means within said aperture.

HOWARD F. EBERT.
ADOLF W. KEUFFEL.

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