April 2, 1968 G. M. PELHAM 3,375,588

DRAFTING MACHINE ATTACHMENT

Filed Dec. 13, 1965 2 Sheets-Sheet 1

Fig. 1.

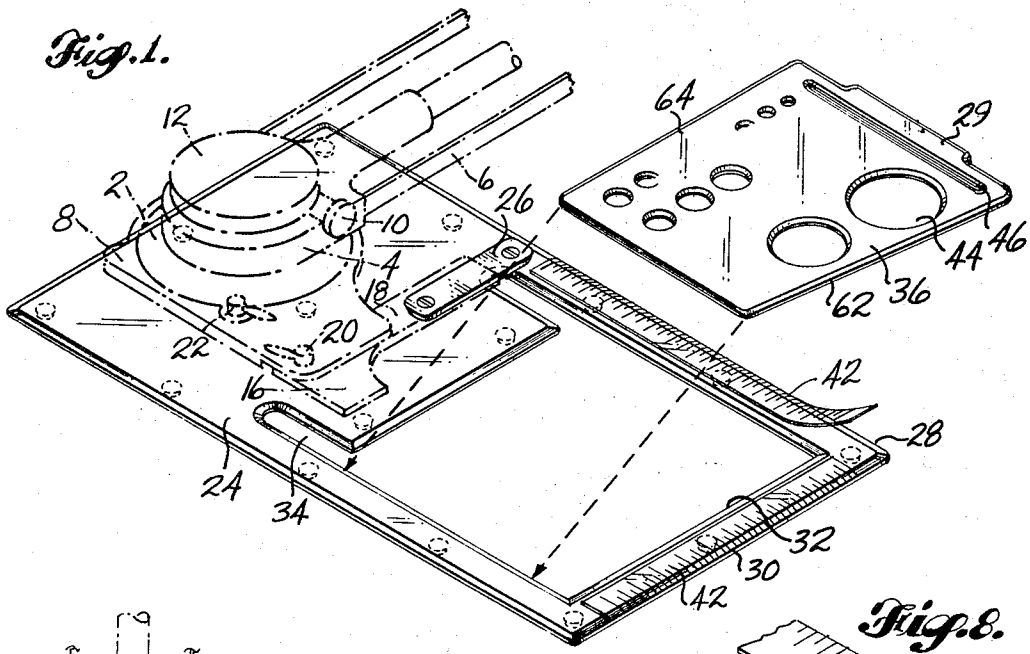
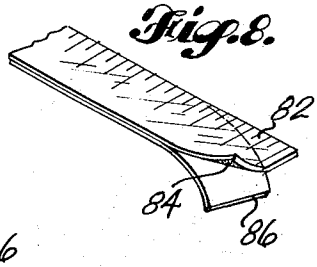


Fig. 8.



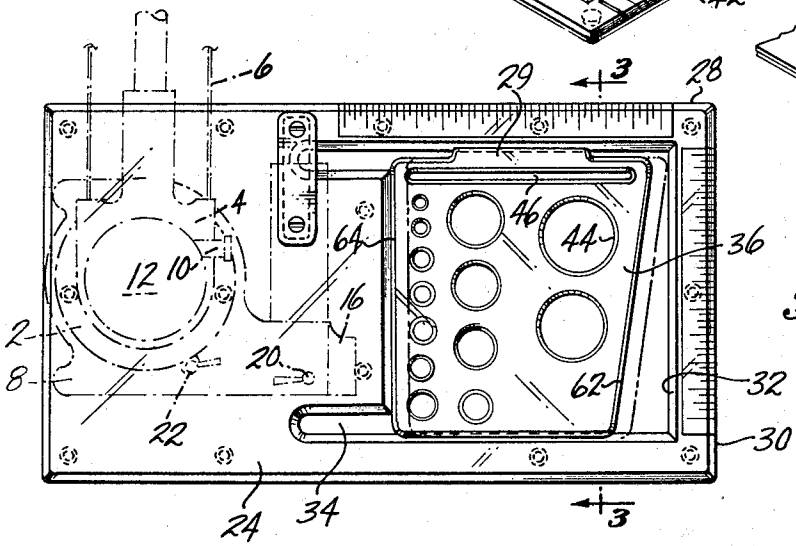
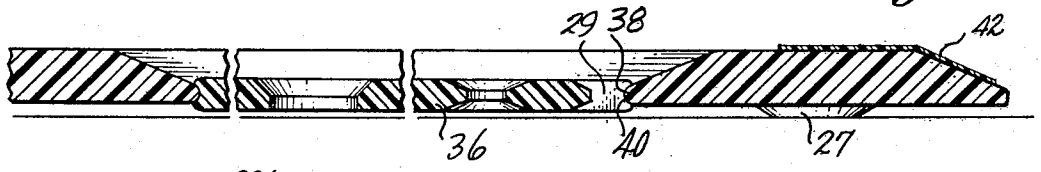


Fig. 2.

Fig. 3.



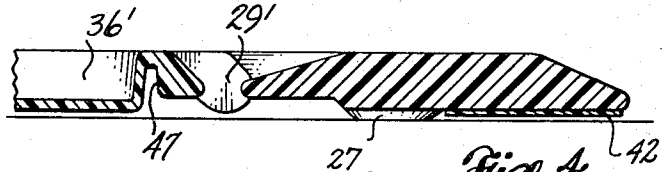


Fig. 4.

INVENTOR.
GEORGE M. PELHAM

BY
Orland M. Christensen
ATTORNEY

April 2, 1968 G. M. PELHAM 3,375,588

DRAFTING MACHINE ATTACHMENT

Filed Dec. 13, 1965 2 Sheets-Sheet 2

Fig. 5.

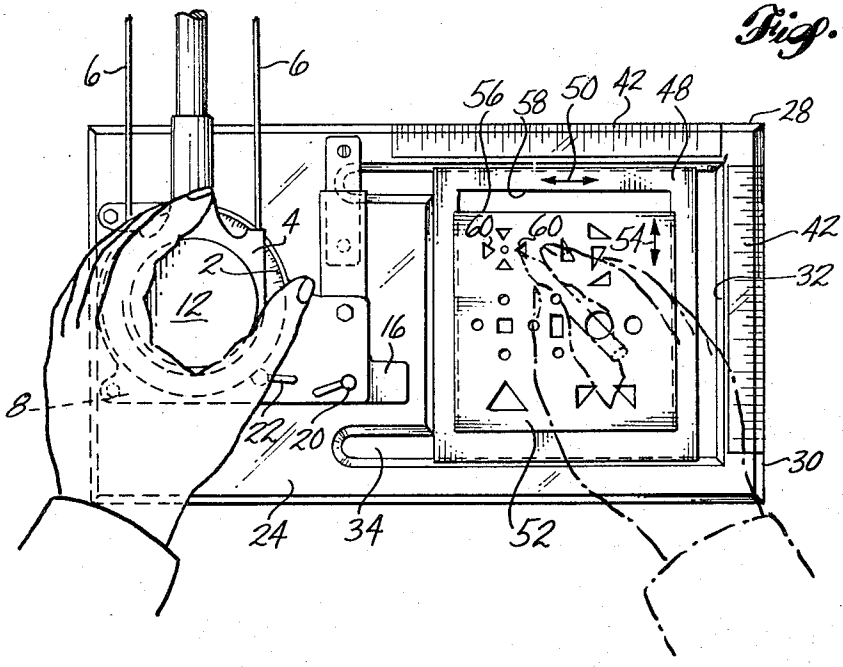
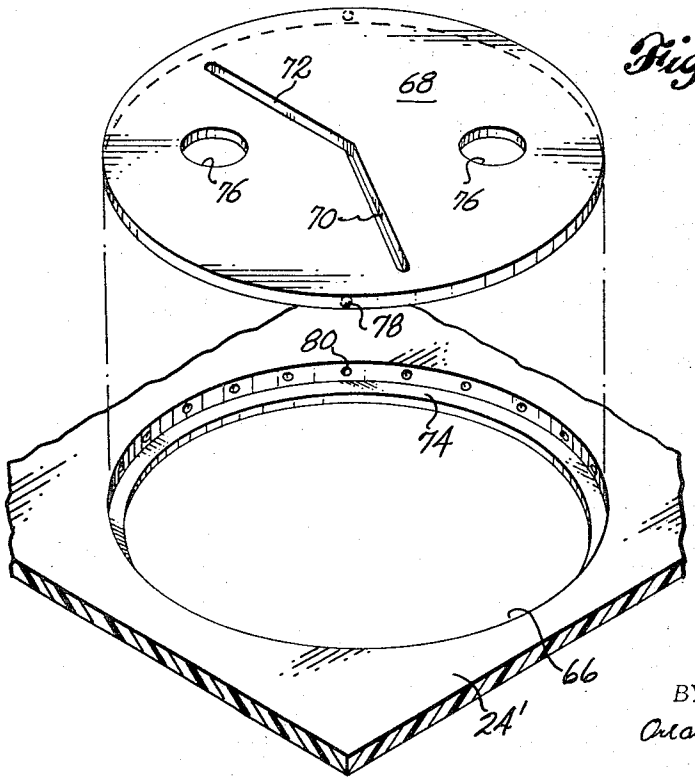


Fig. 6.



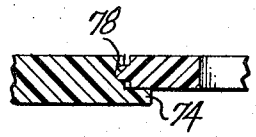


Fig. 7.

INVENTOR.
GEORGE M. PELHAM

BY
Orland M. Christensen
ATTORNEY

United States Patent Office

3,375,588

Patented Apr. 2, 1968

3,375,588

DRAFTING MACHINE ATTACHMENT

George M. Pelham, 7058 12th Ave. NW.,
Seattle, Wash. 98107

Filed Dec. 13, 1965, Ser. No. 513,307
5 Claims. (Cl. 33—79)

ABSTRACT OF THE DISCLOSURE

A drafting device is disclosed for use with a drafting board having a parallel motion drafting machine mounted thereon. The drafting device is attached to the machine and has a long plate-like body which is also wide in relation to its length from end to end thereof, and which rests face down on the surface of the board, so that one end portion thereof is interposed between the head assembly of the machine and the board and carries the weight of the assembly thereon. There are means on the upper side of the body for affixing it to the instrument carrier on the head assembly, and means on the underside thereof for easy sliding movement of the body on the surface of the board, so that the body moves in translation and rotation on the surface of the board, with the instrument carrier, when the carrier is driven in relation to the board. The other end portion of the body projects out over the surface of the board, free from the assembly, and is sufficiently rigid with respect to the weighted end portion thereof to maintain a flat, level posture on the surface of the board by virtue of the moment imparted to the body by the weight of the assembly. There are three edges on the projecting end portion of the body, two of which are parallel to one another and joined by the third edge which co-terminates at a right angle with each of the aforesaid two edges. Each of the three edges is of sufficient length to constitute an elongated ruling edge for drafting purposes, so that orthographic work can be carried out with the device alone, while isometric work is effected with the rotational feature of the instrument carrier. Preferably, the projecting end portion of the body also has an opening therethrough, opposite the board, to receive a template member for use with the device.

This invention relates to drafting devices of the nature of straight edges, templates, and the like. While the invention is suitable for use with a common T-square, it is particularly adapted as an attachment for a parallel motion drafting machine whereby it is shiftable in translation with the head of the machine over the surface of a drafting board.

Parallel motion drafting machines are of several types and, to my knowledge, the invention can be used with all of them. Reference can be made to U.S. Patents 2,900,728 and 3,153,284 for two such types. In each case, it will be noted that the machine includes a shiftable head assembly to which a device is attached for the draftsman's use. In a typical case, the device is that shown in the patents, namely, a pair of scales or rules arranged at right angles to one another. The scales or rules are carried on a so-called instrument carrier which is journaled coaxially with a reference member in the head assembly so as to be rotatably adjustable with respect to such member. The reference member is rotationally fixed with respect to the anchoring mechanism of the machine so as to maintain a fixed attitude with respect to the board when in translation. For purposes of such translation, it is necessary that the instrument carrier's attitude also be fixed. Accordingly, it is releasably engageable with the reference member to be driven with it when there is translation. Thus, when the head assembly is shifted in translation

over the surface of the board, the scales or rules are maintained in a fixed relationship to the board; and yet when it is desired to do so, the instrument carrier can be disengaged from the reference member and rotated about its axis to index the scales at any given angle. Ordinarily, auto stops are provided on the reference member at uniformly spaced angles to provide for positive indexing of the carrier. The interval between angles is usually 15°, and a control knob or wheel is furnished on the head assembly for rotating the carrier between stops.

According to conventional practice, the scales are used not only as rules for developing straight lines, but also as a reference against which to arrange those template members (and triangles) which the draftsman may have occasion to use. In general this practice is not attended with many problems. There is one aspect of it, however, which is troublesome: The scales are not altogether rigid under the pressure of the draftsman's pencil or pen and it is often necessary to steady them with the other hand when executing a stroke. As seen in the patents, each of them is cantilevered from the instrument carrier and there is no means other than one's hand for holding them flat on the drawing board and preventing them from undergoing lateral deflection. This is also true when using the scales as a reference for triangles and template members. Here again, the draftsman must use his other hand to steady the device and/or the scales while executing a stroke.

The necessity for using both hands when executing the steps of a drafting operation may not appear to be particularly troublesome at first blush. However, when one remembers that a draftman must also use one hand to operate the machine, that is, to shift the head over the board and to rotate the instrument carrier about its axis, then the necessity for using two hands to execute each stroke takes on greater significance. For, each time there is a change made, and then a stroke executed, it is necessary for him to shift one hand back and forth between the control knob and the working area of the board. To avoid this continual shifting of one hand, many draftsmen resort to using triangles with the scales, and some do so to the extent that they seldom rotate the scales from the normal position. This, of course, defeats the purpose of the machine, at least with regard to the rotational feature of the head.

Consequently, with this drawback in mind, one object of my invention is to provide a drafting device which, when attached to a parallel motion drafting machine, enables a draftsman to produce any graphic representation with which he may be concerned, by the use of a single hand and without the help of his other hand, throughout the entire operation. Thus, his other hand is free to operate the control knob on a continuous basis, for there is no necessity that it be removed at any time during the operation. Another object is to provide an attachment of this nature which can be used to speed up the drafting operation and to reduce its manipulative aspects to a minimum. It is also an object of the invention to provide an attachment which makes the operation more reliable and exact by introducing a greater degree of mechanical control into the positioning of the ruling edge. A still further object is to provide an attachment with these features which increases the versatility and usefulness of the machine by furnishing it with elements which are relatively shiftable with respect to the instrument carrier. Thus the machine can take on an added degree of relative motion which enables the final adjustment to be made at the ruling edge rather than in the head assembly. Other objects will become apparent from the description following, including certain which relate to a unique form of scale for use with the attachment. In the description, I

shall refer to certain embodiments of the invention and shall describe them in detail for purposes of illustrating the invention, but it should be understood that I do so with no intention of limiting it to these embodiments.

In brief, the invention realizes the above objects by providing an attachment which has a long, wide plate-like body that is intended to rest in parallel relationship on the surface of the board, to move in translation and rotation thereover, conjointly with the instrument carrier on the machine. The attachment is affixed to the carrier so that one end portion of its body extends under the head assembly and carries the weight of the assembly thereon. The remainder of its body projects out over the surface of the board from the assembly, and is sufficiently stiff with respect to its weighted portion, to maintain a flat, level posture on the board by virtue of the moment imparted by the weight of the assembly.

To carry out the drafting operation, there are two edges on the projecting portion of the attachment which are disposed at a right angle to one another and of sufficient length in each case to constitute an elongated ruling edge for drafting purposes. This is to say, the two edges are of sufficient length to provide the usual vertical and horizontal straight edges that are ordinarily furnished to a draftsman. In addition, the projecting portion of the attachment has an opening therethrough on a perpendicular to the surface of the board, which is adapted to receive a template member for use with the attachment, the particular member being a matter of whatever shape the draftsman has in mind, that is, a circle, a triangle, an ellipse, or any of the many shapes which enter into a graphic representation. The template member may also serve to produce straight lines in the same manner as the straight edges, but in adjustable relationship to such edges for reasons which will be explained hereinafter.

The template member may simply rest within the opening, so as to be fixed in position with respect to the straight edges; or it may be movably mounted in the opening so as to be shiftable between alternative positions therein. Preferably, the member is slidably engaged in the opening so that any movement of the attachment produces a corresponding movement in the template member when the carrier is shifted or rotated over the board. In this way, the draftsman can grip the control knob with one hand for purposes of manipulating the carrier, and can rely on the motion of the knob alone to position the template hole of his choice over the working area of the board. Moreover, if the template member is sufficiently tightly engaged in the opening, he can rely on it to not undergo deflection when he applies his pencil or pen, even though the member remains slidable under the greater pressure of his hand when he chooses to shift its position in the opening.

The invention will be better understood by referring to the accompanying drawings wherein I have illustrated the aforementioned embodiments. In each case, the template member is slidably engaged in the body of the attachment, but at the same time capable of flexure so as to allow it to be disengaged from the same.

In the drawings FIGURE 1 is a perspective view of a rectangular attachment which is equipped with a circle template device. The head assembly of the drafting machine is shown in phantom for clarity of illustration.

FIGURE 2 is a plan view of the attachment in FIGURE 1.

FIGURE 3 is a cross-sectional view of the attachment along the line 3—3 of FIGURE 2.

FIGURE 4 is a part cross-sectional view of a modified form of the attachment in FIGURES 1–3.

FIGURE 5 is a plan view of the attachment in FIGURES 1–3 as seen in use with a different form of template device.

FIGURE 6 is a part perspective view of a different form of attachment that employs a rotatable template device.

FIGURE 7 is a part cross-sectional view of the differing form of attachment seen in FIGURE 6.

And finally, FIGURE 8 is a part perspective view of an adhesively-applied scale which can be used, interchangeably, with any attachments made in accord with the invention.

The head assembly seen in FIGURE 1 is of known type and for this reason is illustrated in phantom only. It includes a reference member **2** which is shiftable in translation over the surface of the board, but restrained from rotation with respect to the board by a mechanical linkage mechanism which terminates in an anchoring mechanism (not shown) fixedly mounted on the board. The linkage mechanism comprises a system of pulleys and flexible bands, the terminal pulley and band of which can be seen at **4** and **6**, respectively. The head assembly also includes an instrument carrying member **8** which is journaled coaxially with the reference member so as to be rotationally adjustable with respect to the same, but which is also releasably engageable with the reference member so as to be rotatably driven thereby when in translation. The instrument carrier is adjusted with respect to the reference member by operating a push-button **10** which disengages it from the reference member and enables it to be rotated with respect thereto. A knob **12** is shown on top of the assembly for this purpose.

Mounted on the instrument carrier is a chuck **14** which typically has a pair of legs **16** and **18** that are arranged at a right angle to one another and provided with grooves to receive chuck plates on the instrument or device to be attached to the machine. For ease of adjusting the device with respect to some line or point on the board, the chuck is pivotally mounted on the carrier **8**, but capable of being locked in any chosen position by means of a wing nut **20**. The head assembly can also be locked in position by means of a second wing nut **22**.

In accord with the invention, only one leg of the chuck need be used in attaching the inventive device to the machine. The device itself is comprised of a rectangular plate **24** of transparent plastic resin material which has a suitably formed flange or chuck plate **26** secured to its upper side at a position somewhat centrally located of the plastic plate **24** so that the end portions of the latter are disposed to each side of the chuck plate. The plate **24** is also equipped with a plurality of buttons **27** on its underside which act as slides when it is in use. In attaching the device, the left hand portion of the plate **24** is slipped beneath the instrument carrier and rested on the board, with the head assembly on top of it so that the weight of the assembly tends to maintain its flatness on the board. The remainder of the plate **24** projects out from the assembly and provides a pair of scaled edges **28** and **30** which are disposed at a right angle to one another for drafting purposes. Each of the edges is rigidly fixed in relation to the assembly by virtue of the wide-spreading character of the plate, and the fact that each has a short moment arm about the machine head.

The projecting portion of the plate **24** also has a large opening **32** which is generally square in cross-sectional area, but extended to the left in the form of a pair of slots **34** that project in finger-like fashion from the corners of the opennig. In use, the opening serves as a frame and guide for a template member **36** which is formed from a sheet of flexible plastic resin material and sized to fit slidably into the opening when substantially coplanar therewith. In addition, the plate **24** also serves to support the template member, and for this purpose the edges of the opening **32** are shaped complementally with the edges of the member to provide a tongue-and-groove construction such as is seen in FIGURE 3. Referring to the figure, it will be noted that the edges of the opening are suitably beveled and rounded to take on a tongued cross-section **38** which is engageable with a

rounded recess **40** along the edges of the template member. The member is engaged in the opening by flexing it and releasing it in the opening after it has been inserted and suitably positioned therein. Flexure may be accomplished by bending the member cross-wise of its body, or by depressing the upper end portion **29** thereof. In this latter connection, it will be noted that the template member is relieved along its upper edge **29**, at both ends, so that only the center section of the edge engages with the adjacent edge of the opening. In addition, a transverse slot **46** is provided in the member just behind the edge **29**. The reduced length of edge **29** facilitates shifting of the member within the opening by reducing frictional contact between their edges. On the other hand, the slot **46** adds sufficient flexibility to the edge portion **29** so that it can be flexed in the body plane of the member and inserted and withdrawn conveniently with one hand in a simple "pop-in" or "pop-out" procedure.

As an alternative, the upper edge of the template member may be given a lipped cross-section such as is seen in FIGURE 4. In this instance, the member **36'** has a generally pan-shaped cross-section and is relieved at **47** behind its upper edge **29'** so that the edge can be depressed in the inward direction by bending about its rim.

For ordinary ruling purposes, the edges **28** and **30** are entirely suitable. However, for small scale work I find that it is preferable to use the upper and lower edges of the opening, including the extensions thereof provided by the slots **34** which project from the left-hand corners of the opening. In such a case the member **36** may be removed from the opening or, in the alternative, it may be rotated through 90° and reinserted between the right and left hand edges of the opening so that the upper and lower edges of the same are free for ruling purposes.

When it is desired to draw something other than a straight line, the draftsman must select from the holes **44** in the template member to satisfy his need. The holes in this case are circular and as such as representative of the various sizes and shapes of templates with which a draftsman is concerned. In this sense, then, the template member is only representative of a broad selection of such members which can be used on an interchangeable basis within the attachment.

Because the attachment is weighted down by the machine head and highly inflexible to deflection by the draftsman's tool, the draftsman can maintain one hand on the control knob at all times and has the other hand free for shifting the template member, exchanging it for another, or putting his pen or pencil to use. If he wishes to have a template member which is adjustable in both the horizontal and vertical directions, he can make use of a member such as is seen in FIGURE 5. In this case the member is in two parts, one of which serves as a slidable frame for the other. The sliding frame section is seen at **48** and as indicated by arrow **50** is slidable in the horizontal direction within the opening of the plate **24**. The template section is seen at **52** and is slidable in the vertical direction within the frame section. See arrow **54**. Between them, the two sections enable the draftsman to quickly align a template with the board below, and by introducing a further element of relative movement, the member enlarges considerably on the mobility and versatility of the basic machine.

The aforementioned embodiments also have additional advantages which can be explained with reference to the figures. Note for example in FIGURE 5 that the upper edge **56** of the template section provides a ruling edge that is adjustable with respect to the adjacent edge **58** of the frame section. I have found that these edges are particularly advantageous in forming pairs of lines to act as lettering guides on a drawing. The same is also true of the relatively shiftable edges of the frame section and the plate in FIGURE 5; and if the template member in FIGURE 2 is rotated through 90° and reinserted, it too can be used for this purpose in connection with the upper edge of the plate opening.

I have also found that the opposing edges of the plate opening, or the opening in the frame section of the template member in FIGURE 5, provide a pair of auto stops with which to automatically relate various template holes when drawing certain composite symbols in technical drafting. For example, the symbol for a particular type of valve in technical drafting is



that is, a pair of triangles joined at their apexes. In FIGURE 5 this symbol can be developed quite quickly and simply by shifting the frame section to the right after the right hand of the two triangles indicated at **60** is developed. Of course, the same is also true when developing guide lines for lettering if the shift allowed the template member is equated with the height of the lettering.

A still further advantage can be derived from the fact that one or two edges of the template member can be canted with respect to the edges of the opening. In FIGURE 2 for example, the right hand edge **62** of the template member is canted at a 7½° angle with respect to the lower edge of the opening. This enables the draftsman to increase twofold the number of indexing angles which can be developed from a conventional machine, which typically uses a 15° interval between auto stops. Of course, any other angle can be used and by canting the left hand edge **64** of the template member as well, it is possible to subdivide the auto stop intervals even further.

A third form of template member can be seen in FIGURE 6. In this case the plate **24'** is furnished with a circular opening **66** and the template member is designed to be angularly related to either the vertical or horizontal edge of the plate. The template member is in the form of a flat disc **68**, the interior of which is slotted along two diametrical lines **70** and **72** that intersect at a 60° angle with one another. To support the disc, the edge of the opening is rabbitted to form a seat **74** on which the disc can rest. The disc is constructed from a flexible plastic resin material and if desired, can be manually removed by means of a pair of holes **76** that are punched or bored through the upper and lower halves of the disc. In most cases, however, the disc remains in place on a permanent basis.

The disc is releaseably engaged in the opening by means of a pair of buttons **78** on its side walls which insert in complementary depressions **80** in the rabbitted wall of the opening. See FIGURE 7. Because of its flexibility, the disc is rotatable in the opening. Thus, by using the holes **76** to rotate the disc, the slots **70** and **72** can be oriented in any desired attitude with respect to the edges of the frame member. I have found that this form of template member is particularly useful in depicting isometric representations where the slot **70** can be arranged on the vertical after the attachment has been swung through a 30° angle for the isometric. With slot **70** so fixed, the slot **72** assumes the angle of the isometric along its other slope. In this way the draftsman can fix the attachment at the angle of the isometric and use the slots in place of triangles that would otherwise be necessary when the indexing action of the machine head is utilized in this fashion.

Referring once again to FIGURES 1–5, it will be seen that the scale **42** on the upper edge **28** of the plate **24** is provided, not directly on the edge in the sense of being imprinted or indented thereon, but instead by way of a strip **82** of flexible material laid along the length of the edge. According to an additional feature of my invention, I prefer to mark each of the ruling edges **28** and **30** in this fashion, in order that the scale may be replaced with another when so desired, such as when it is desired to change the type of scale, to increase or reduce its calibration, or to produce a new one. The strip is conveniently

a transparent plastic resin material, such as Mylar, and as seen in FIGURE 8, carries an adhesive backing **84**, by which it is applied to either the upper side or the under side of the plate after a protective cover strip **86** has been peeled away from the adhesive. The markings may be applied to the strip by a photographic process or by the silk screen printing process, each of which is well known. Because of the nature of the inventive attachment, a "band-aid" type of scale such as this, is particularly useful; however, it will be appreciated that the illustrated scale may also be employed with other drafting devices, such as with the rules shown in the above-mentioned patents.

It will also be appreciated that numerous other changes and additions can be made in and to the invention without departing from the scope and spirit of the same as defined in the claims following.

I claim:

1. A drafting device for use with a drafting board having a parallel motion drafting machine mounted thereon, comprising a long plate-like body which is also wide in relation to its length from end to end thereof, and which rests face down on the surface of the board in use, one end portion of the body having a continuously uninterrupted facial area thereon adapted to be interposed between the head assembly of the drafting machine and the board, and to carry the weight of the assembly thereon, and the other end portion of the body having three edges thereon, two of which are parallel to one another and joined by the third edge which co-terminates at a right angle with each of the aforesaid two edges, each of the three edges being of sufficient length to constitute an elongated ruling edge for drafting purposes, there being means on the upper side of the body for affixing it to the instrument carrier on the head assembly of the machine, and means on the underside thereof for easy sliding movement of the body on the surface of the board, so that in use the body moves in translation and rotation on the surface of the board, with the instrument carrier, when the carrier is driven in relation to the board, and an opening in the aforesaid other end portion of the body, to lie opposite the board, said opening having a plate-like template member received therein, which template member is substantially coplanar with the opening and engaged between the edges thereof so as to be supported on the body and non-movable with respect thereto when ruling through the template member, but characterized with sufficient flexibility in at least one edge portion thereof that it is insertable and removable into and from the opening by flexing the aforesaid portion thereof.

2. A drafting device according to claim **1** wherein the template member is shiftable between alternative positions in the opening of the body, by the application of a force in the plane of the opening which exceeds that used in ruling.

3. The combination according to claim **1** wherein the template member is slidably engaged between the edges of the opening so that it is supported on the body of the device and any movement of the device produces a corresponding movement in the template member when the carrier is shifted or rotated over the board.

4. The combination according to claim **2** wherein the body of the device has a plurality of stops about the edges of the opening corresponding to the respective positions of the template member.

5. The combination according to claim **1** wherein the template member is comprised of two plate-like sections, one of which is slidably engaged in the opening and the other of which is slidably engaged in a similar fashion in the one section.

References Cited

UNITED STATES PATENTS

1,145,922	7/1915	Rigaumont	33—112
1,154,673	9/1915	Van Ness	33—75
1,821,369	9/1931	Wetterstrand	33—174
2,428,699	10/1947	Ebert et al.	33—110
2,742,705	4/1956	Gelardi	33—137
2,842,849	7/1958	Amery	33—79
2,932,897	4/1960	Huber	33—137
3,103,747	9/1963	De La Sierra	33—174
3,279,074	10/1966	McQuaid	33—104

HARRY N. HAROIAN, *Primary Examiner.*

LEONARD FORMAN, *Examiner.*