Aug. 13, 1968 C. H. LITTLE ET AL 3,396,679

DRAFTING-DIGITIZING APPARATUS

Original Filed March 4, 1963 4 Sheets-Sheet 1

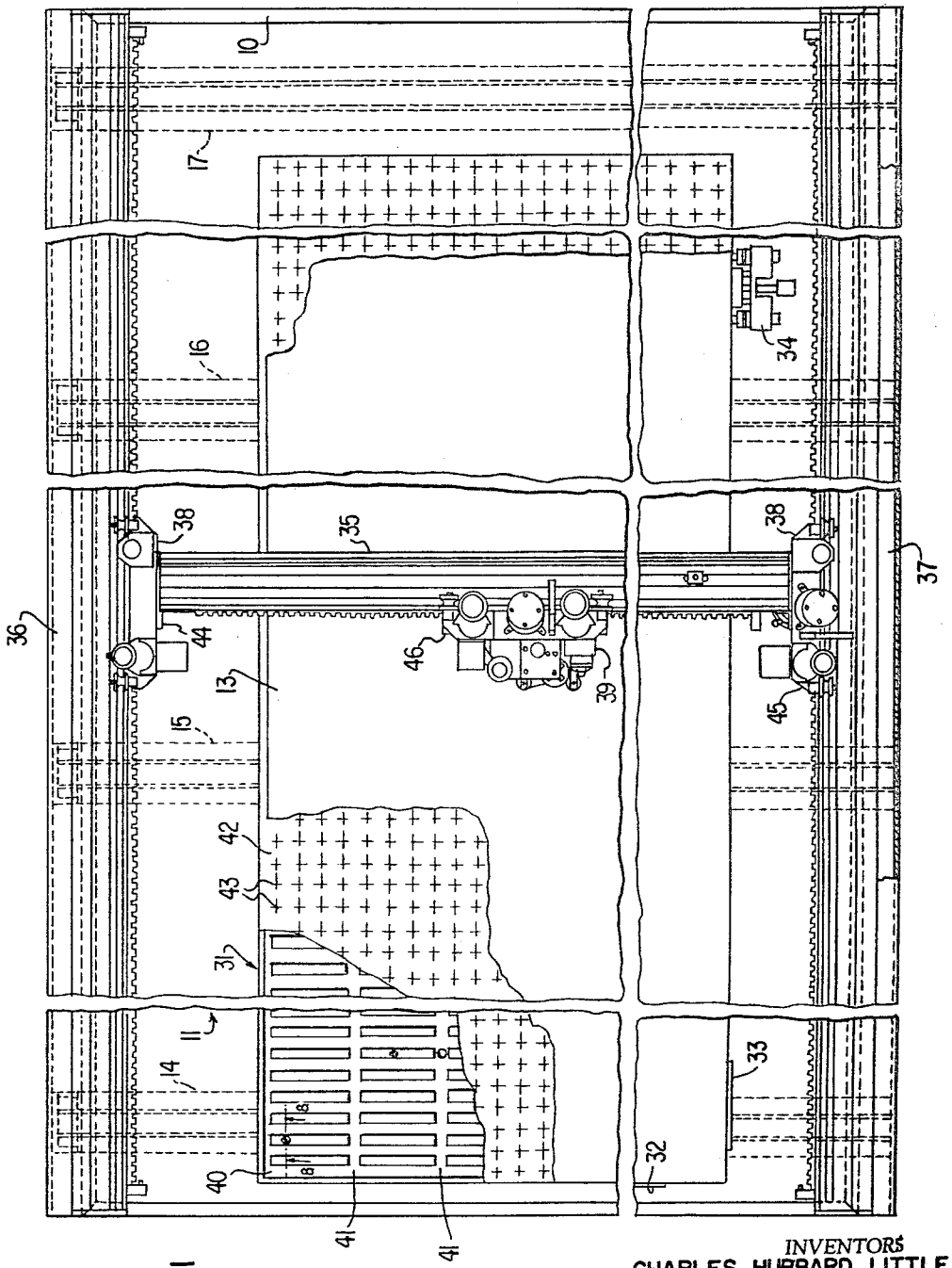


FIG. 1

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DRAFTING-DIGITIZING APPARATUS

Original Filed March 4, 1963 4 Sheets-Sheet 2

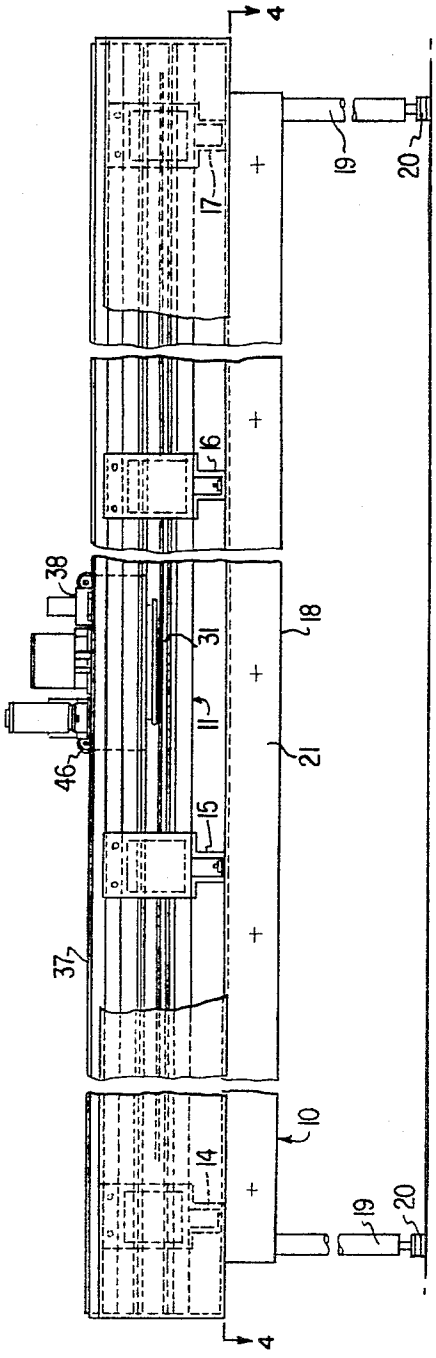


FIG. 3

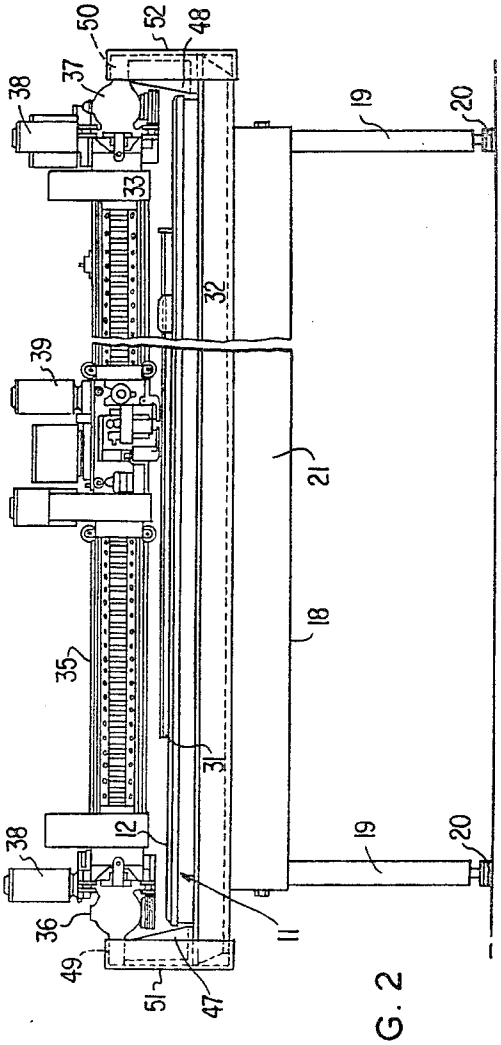


FIG. 2

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DRAFTING-DIGITIZING APPARATUS

Original Filed March 4, 1963

4 Sheets-Sheet 3

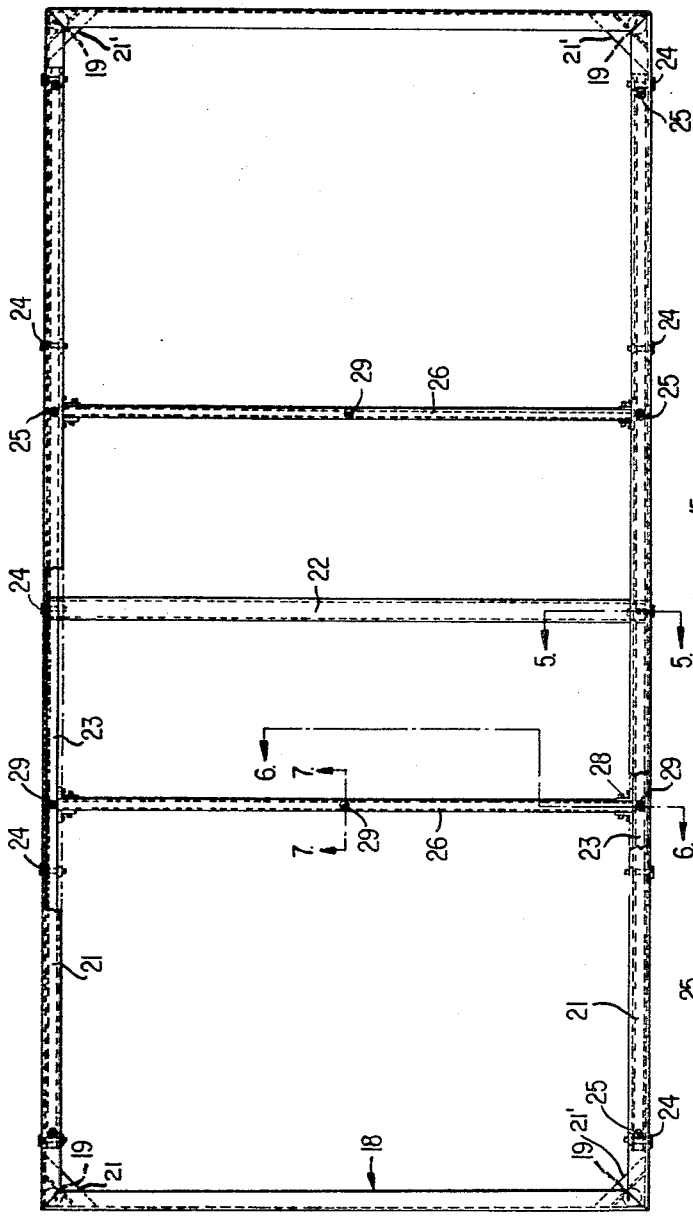


FIG. 4

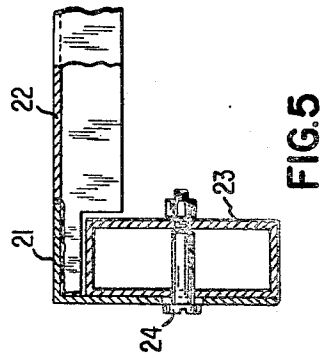


FIG. 5

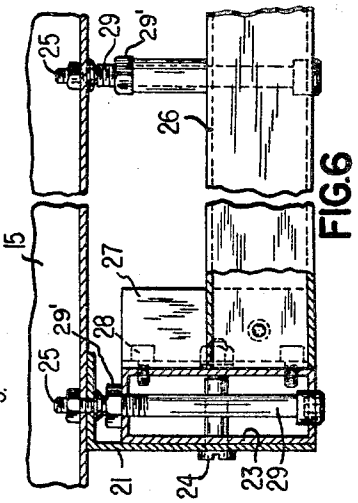


FIG. 6

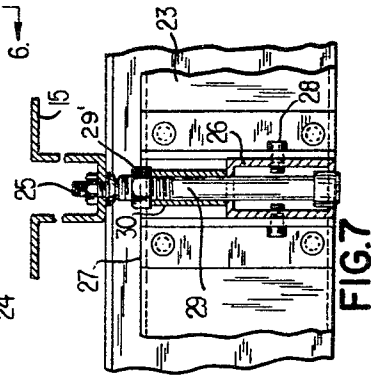


FIG. 7

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DRAFTING-DIGITIZING APPARATUS

Original Filed March 4, 1963 4 Sheets-Sheet 4

FIG. 8

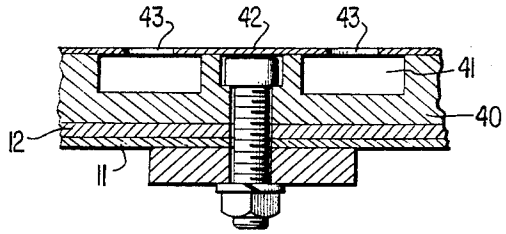
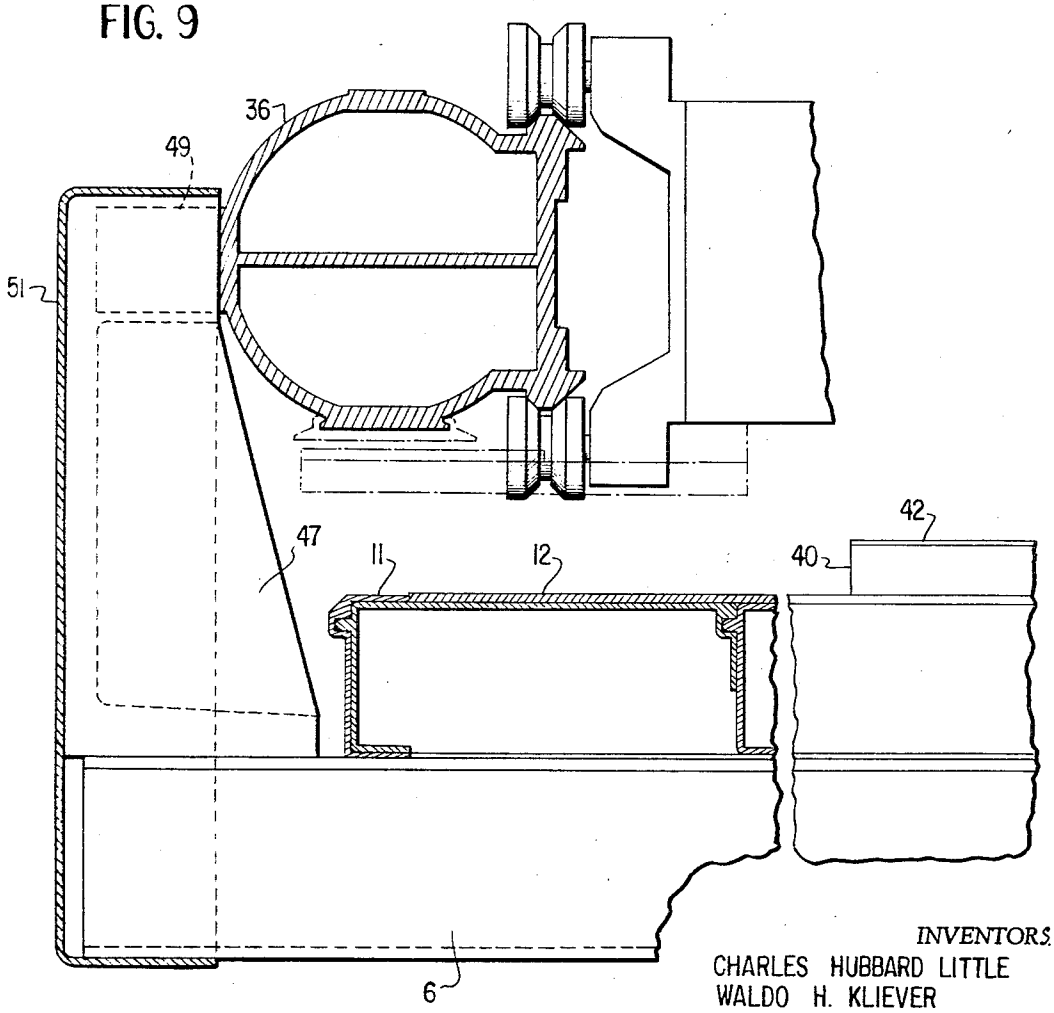


FIG. 9



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DRAFTING-DIGITIZING APPARATUS

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Original application Mar. 4, 1963, Ser. No. 262,590. Divided and this application Feb. 21, 1966, Ser. No. 528,877

2 Claims. (Cl. 108—144)

ABSTRACT OF THE DISCLOSURE

A table assembly for supporting automatically controlled drafting-digitizing apparatus and sheet-like material such as drawing paper on which the said apparatus performs drafting-digitizing operations. The assembly includes a table top which includes, in part, a sheet material hold-down means. The assembly is provided with level adjusters for adjusting the level of the table top at the end portions of the assembly and additionally at portions intermediate of said end portions.

The present invention relates to a work holder to be utilized by drafting machines and the like apparatus.

This application is a division of our copending application Ser. No. 262,590, filed Mar. 4, 1963, now abandoned.

It is the principal object of this invention to provide a novel and improved work holder for supporting a sheet-like article on which lines, characters and the like may be drawn or are drawn and for supporting automatic apparatus of the graphic type.

It is another object of this invention to provide a new and improved work holder for supporting a sheet-like article on which lines, characters and the like may be drawn or are drawn, and on which automatic apparatus of the graphic type is supported whereby the level of the work holder may be adjusted to bring the level of the sheet-like article into planar relationship with the graphic apparatus.

It is another object of this invention to provide a new and improved table of lightweight and sturdy construction to be used with graphic apparatus where the table is provided with novel leveling apparatus, and where it is also provided with a sheet-like article hold-down means.

It is a further object of this invention to provide a new and novel supporting structure for an automatic drawing machine or the like, having a rigid, reinforced sub-frame assembly with means for leveling the sub-frame relative to the supporting surface upon which it is located, and having a drawing surface or the like, including hold-down means, superposed on and supported by the sub-frame assembly with means provided in said sub-frame for tilting the drawing surface relative to said sub-frame assembly.

Further objects and advantages of the invention will be apparent to those skilled in the art to which it relates from the following description of the preferred embodiment described with reference to the accompanying drawings forming a part of this specification, in which similar reference characters designate corresponding parts, and in which:

FIGURE 1 is a plan view of an automatic graphic machine and the table supporting the machine forming a part of the preferred embodiment of the present invention;

FIGURE 2 is an elevational view, with portions broken away, of the apparatus and table shown in FIGURE 1, looking from the lower side of FIGURE 1;

FIGURE 3 is an elevational view of the apparatus and table shown in FIGURE 1 looking from the left side of FIGURE 1;

FIGURE 4 is a view approximately on the line 4—4 of FIGURE 3;

FIGURE 5 is a view approximately on the line 5—5 of FIGURE 4;

FIGURE 6 is a view approximately on the line 6—6 of FIGURE 4;

FIGURE 7 is a view approximately on the line 7—7 of FIGURE 4;

FIGURE 8 is a view approximately on the line 8—8 of FIGURE 1; and

FIGURE 9 is an enlarged view of the table beams and supporting brackets looking at the left end of FIGURE 3.

The preferred apparatus of the present invention comprises a table assembly including a hold-down apparatus for supporting an automatically controlled machine where the machine is used to perform operations upon a sheet-like article; the sheet-like article is also supported by the work holder. The sheet-like article may be drawing paper or the like and may or may not have a drawing, etc. on its surface. The controlled machine may be used to draw on the sheet-like article or it may be used for line following operations relative to characters, lines and the like carried on said sheet-like article. The table assembly comprises a reinforced sub-assembly or frame supported on a plurality of vertically extending adjustable leg members. The sub-assembly consists of a rectangular apron that may be reinforced by a plurality of transversely extending channel members and supports a plurality of spaced apart lightweight aluminum girders. Some of the aluminum girders are attached to the sub-assembly in such a manner that they may be tilted at either end thereof and in addition they may be tilted at their midpoint. They are utilized for supporting a table top and the automatic graphic apparatus. The table top may be made out of any lightweight material. In the preferred embodiment, it is used for supporting a hold-down device of the vacuum type, and for supporting the sheet-like article upon which drawing or line following operations are to be performed.

Referring to the drawings, the table assembly **10** shown, includes a fabricated prestressed aluminum table top **11** or work support provided with a flat linoleum surface **12** to which a drawing material **13** or the like, to be marked, scribed or engraved, etc. may be secured by tape or other conventional means. The table top **11** may be supported in any position, for example, horizontal or vertical, by any appropriate means. The top **11** is shown as supported in a horizontal position upon a plurality of aluminum channel members or cross girders **14**, **15**, **16**, **17** secured to a suitable sub-table structure or assembly **18** including legs **19** fitted to the corners and being provided with table leveling adjusters and vibration absorbing pads **20**. The sub-table **18** comprises a rectangular frame **21**, sometimes referred to as "apron," formed of heavy aluminum angles reinforced at the corners by angle braces **21'**. The table shown is slightly more than twice as long as it is wide and the table top **11** overhangs the sub-table **18** a small amount. The frame **21** may be reinforced by one or more transverse channels **22** suitably connected thereto as shown in

FIGURE 5. Each of the long sides of the apron **21** is provided with an extruded aluminum truss bar **23**, the cross-sectional shape of which is rectangular. The tops of the truss bars are spaced a short distance below the inwardly projecting top flanges of the apron and are substantially as long as the side of the apron which they adjoin. The ends of the truss bars are connected to the vertical flange of the apron adjacent thereto by bolts **24** extending through aligned holes in the bars and apron and in which they engage, preferably without undue looseness. A plurality of similar bolts are spaced intermediate the end bolts, but the holes in the apron through which these bolts extend are slightly elongated vertically.

The table top **11** is placed upon the apron **21** of the sub-table with the girders **14–17** resting upon the top of the long sides of the apron **21** and bolted to the top flange thereof by bolts **25** having round heads located at the underside of the top flange of the apron and spaced above the underlying truss bar. Lock washers may be interposed on the bolts between the underside of the girders and the top of the apron and/or underneath the heads or nuts. The two longitudinally extending truss bars are connected by extruded aluminum tie bars **26**, also rectangular in cross section and connected to angles **27** by suitable recess headed screws **28**, which angles are in turn connected to the truss bars by similar screws. One of the tie bars **26** is located underneath each of the two girders **15** and **16** of the table top **11**.

The truss and tie bars **23** and **26** are provided with vertically extending recess headed bolts or jackscrews **29** used for leveling the table top **11**. Each screw **29** extends vertically through the bar in which it is supported and is provided at its upper end with a nut **29'** which can be used to raise or lower the screw in its respective bar. The upper ends of the jackscrews **29** abut the head of one of the bolts **25**, previously referred to. Since the tie bars **26** are shown only about half as deep as the truss bars **23**, tubular spacers **30** are interposed between the top walls of the tie bars and the nuts of the jackscrews or bolts carried thereto.

With the table top **11** bolted to the sub-table **18** and the bolts **24** slightly loosened so that relative movement can take place between the parts of the apron **21** and the truss bars **23** between the end bolts **24**, the jackscrews **29** may be rotated relative to their nuts to raise and lower the upper ends thereof and thus level the work surface of the table top **11** in the area intermediate the table leg end portions and relative to the vertical position of the top **11** at said end portions. Of course, the top **11** may be first adjusted and leveled at the end portions of the assembly by adjusting the vertical height of the legs **19** through vertical positioning of the adjusting and vibration absorbing pads **20**. The bolts **24** are thereafter tightened. The construction just described provides a relatively light table structure requiring merely four legs, but the top working surface of which can be made and maintained level. In the present instance the top **11** is provided with an all aluminum vacuum chuck **31** placed thereon and having paper engaging and locating fixed corner stops **32, 33** on the lower right-hand corner of the chuck and an adjustable stop **34** attached to its lower right-hand edge. As will be understood, the drafting paper **13**, shown on the chuck **31**, may be moved or positioned by the adjustable stop **34** to orient a drawing on the table so that it will be in the plane of a plurality of trackways **35, 36, 37**. The trackways are utilized to support a pair of movable assemblies **38, 39**, which assemblies in turn support drafting equipment and the like.

Referring to FIGURES 1 and 8, the vacuum chuck **31** shown, comprises a cast aluminum sub-base **40** having air grooves **41** milled therein in the form of a grid and a cover plate **42** or sheet of anodized aluminum which serves to provide the drawing or work receiving surface. The ends of the grooves in the sub-base are closed and the grooves are connected to a suitable vacuum pump not shown. The cover sheet has a plurality of small holes **43** drilled therein and which communicate with the grooves milled in the sub-base. In the embodiment shown, the holes are spaced on 1½" centers and have a diameter of .025". The chuck is adapted to hold drawings smaller than the area provided with holes by using masks to mask off or close the holes not covered by the drawing. A vacuum actuated circuit control is provided for stopping the operation of the apparatus if the vacuum fails.

The automatically controlled drafting apparatus comprising the movable assemblies **38, 39** with their respective motive power means and other instruments mounted on carriages **44, 45** and **46** are shown in FIGURES 1, 2, 3 and 9. The carriages **44** and **45** are supported on the pair of runway beams **36** and **37** where the beams are supported by the table **10**. The beams **36** and **37** are secured to the table **10** by a plurality of longitudinally spaced brackets **47, 48** respectively, detachably bolted to opposite ends of the channel members **14–17** at the sides of the table top along which they extend and to planar ribs **49, 50** along the left and right-hand side of the beams **36** and **37** as they are viewed in FIGURES 2 and 9. The brackets **47, 48** and the outer sides of the beams **36** and **37** are protected by movable covers **51, 52**, respectively, suitably connected to the table.

From the foregoing description of the preferred embodiment of the invention and alternative constructions mentioned, it will be apparent that the objects of the invention heretofore enumerated and others have been accomplished. While the preferred embodiment of the invention has been described in considerable detail, it is to be understood that alternative constructions and arrangements may be employed, for example, materials mentioned relative to the construction of the table may be substituted for other materials that are light in weight and yet produce a sturdy rigid construction and although in the preferred embodiment the work holder has been shown and described as being in a horizontal attitude, it is to be understood that it can be placed in any attitude necessary for the production of automatic operations on a drawing.

It is the intention to hereby cover all embodiments of the invention which come within the practice of those skilled in the art to which it relates and the appended claims.

Having described our invention, we claim:

1. In a drafting-digitizing machine, a table for supporting an article to be marked, said table comprising a substructure including an elongated rectangular frame member, leg members connected to said frame member adjacent to each of the corners thereof, a table top structure having an upper work surface supported on said frame member; and screw means carried by and spaced along the long sides of said frame member and operatively connected to said table top structure for adjusting the relative vertical position of portions of said frame member and said table top structure whereby the work surface of said table top structure may be leveled.

2. In a drafting-digitizing machine, a table assembly for supporting an article to be marked comprising: an elongated rectangular frame member supported on leg members, said leg members being located at the corners of said frame member; truss bar members extending lengthwise along the long sides of said frame member, each of said truss bars being rigidly attached by its ends to said frame member such that the truss bar ends are restrained against vertical movement relative to said frame member, each of said truss bars being additionally attached to said frame member at points intermediate of said truss bar ends for vertical movement relative to said frame member; at least two tie bars supported by and extending between said truss bars, said tie bars being supported in spaced-apart relationship relative to the central portion of said frame member; a tabletop structure including a sheet-like material supporting top surface sup-

ported by a plurality of transversely extending members attached to said frame member, at least two of said top surface supporting members being attached in superposed relationship to said tie bars; and screw means carried by said truss bar members and said tie bar members and spaced one from another and operatively connected to said top surface supporting members for adjusting the relative vertical position of portions of said table top structure relative to said bar members and relative to the corners of said table.

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