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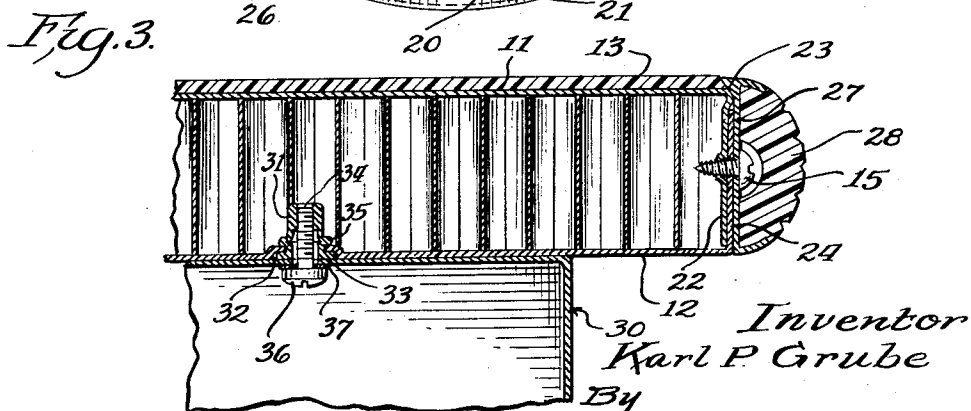
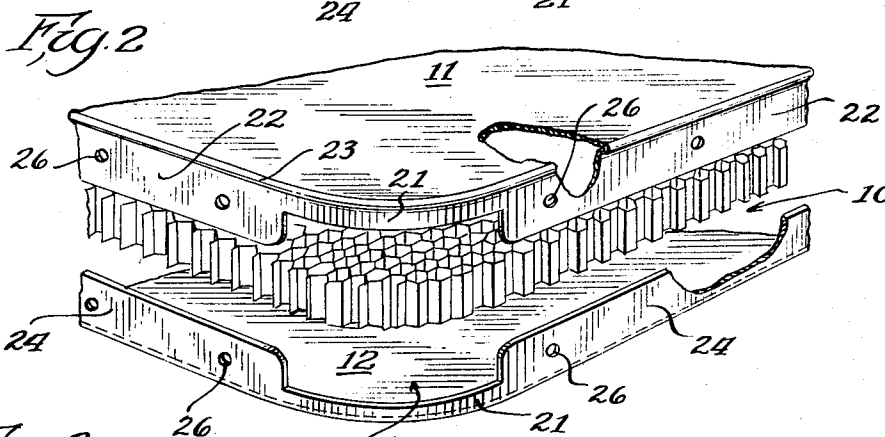
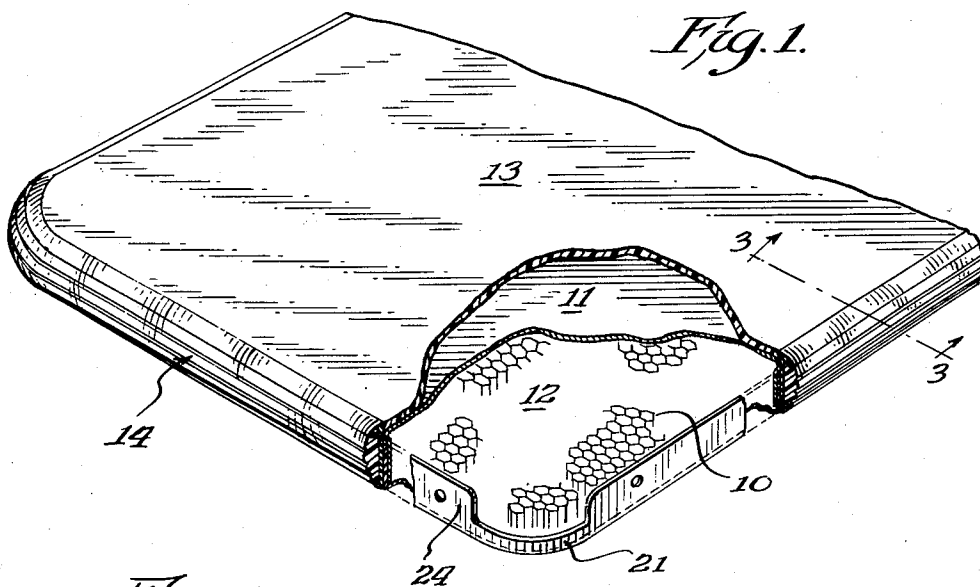
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2,911,274

DESK TOP CONSTRUCTION

Filed April 20, 1956

2 Sheets-Sheet 1



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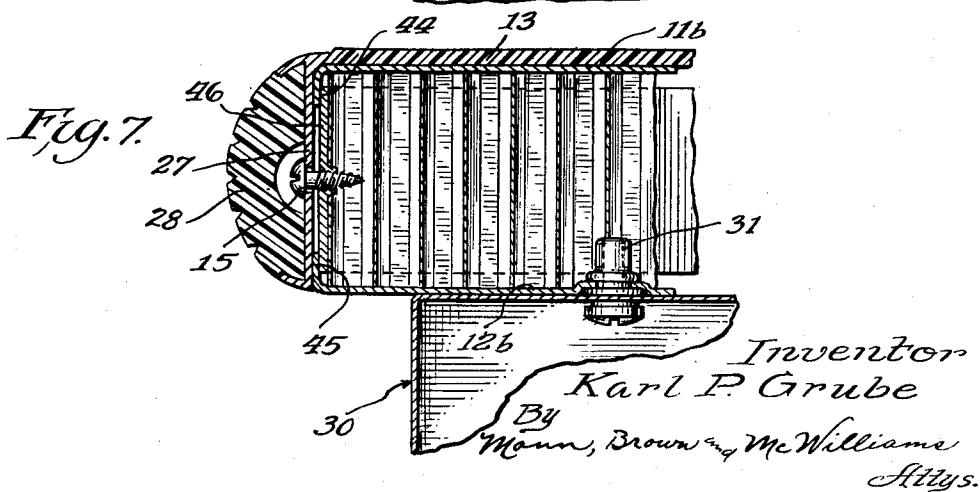
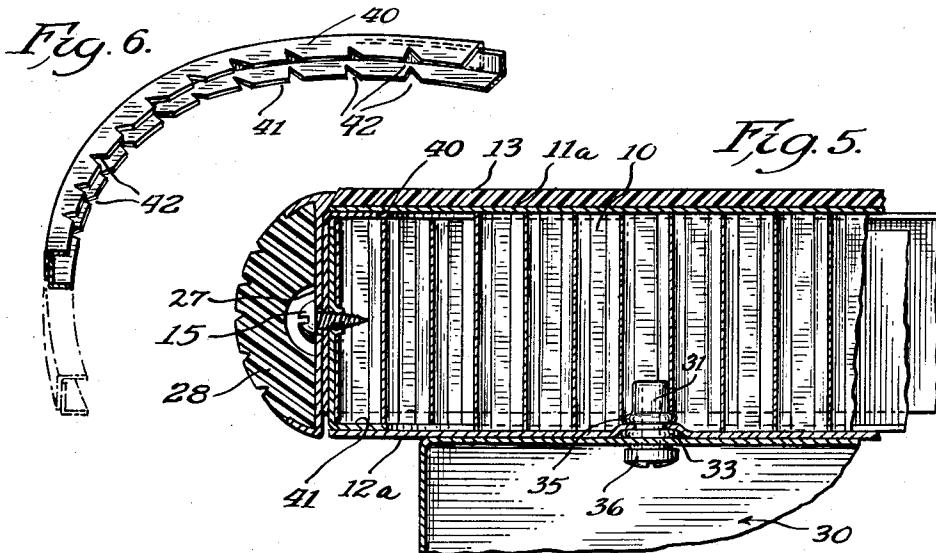
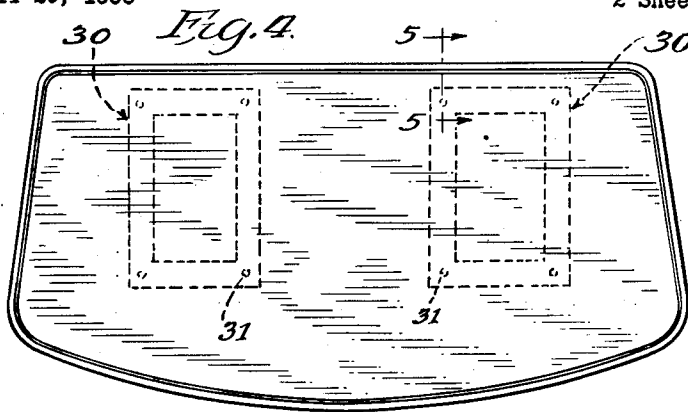
K. P. GRUBE

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DESK TOP CONSTRUCTION

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2 Sheets-Sheet 2



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2,911,274

DESK TOP CONSTRUCTION

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Application April 20, 1956, Serial No. 579,554

8 Claims. (Cl. 311-106)

This invention relates to a desk top employing a "sandwich" type construction, and more particularly is concerned with the specific constructional features and methods employed in providing a sandwich arrangement for use as a desk top in order to achieve uniform quality desk tops over a wide range of sizes and shapes.

In the prior art a wide variety of desk top arrangements are known, with each arrangement emphasizing certain features of construction at the sacrifice of others. For example, such tops, when made of wood, have ordinarily been constructed in one piece or in laminar form, or, if made of metal, of hollow form employing internal spaced reinforcing members, and such designs emphasize one or more specific advantages, such as low cost, light weight, high strength, high rigidity, flatness, etc., while compromising other features not considered important to some given application. Thus, the desk art has not developed a universally applicable desk top construction.

Accordingly, it is the principal object of the invention to overcome the deficiencies of the prior art arrangements and provide a single desk top construction that exhibits a maximum strength to weight ratio; that is of uniform cross sectional configuration; that is uniformly rigid; that provides a uniform and permanent flat upper surface; that is durable, fire-resistant and pest resistant; and that lends itself to low cost mass production techniques.

Prior art desk tops involve a variety of different construction and production techniques whereas the universal applicability of the construction of the present invention to desk and table tops of various external configurations allows standardized production techniques to be employed. This possibility for standardization that is offered by the invention contributes to additional savings in manufacturing costs and minimizes the plant equipment required.

Generally speaking, the sandwich construction for the desk top of this invention consists of top and bottom metal plates or pans spaced apart by a filler composed of a cellular paper arrangement which in cross section preferably simulates a honey comb. Special techniques and methods are employed to make this construction suitable to the production of an economical high quality desk and great care is taken in bonding the plates or pans to the filler in order to achieve a permanent and uniform adhesion. In the case of desks of conventional shape, the edge construction and ornamentation may be applied according to conventional practices. However, in the case of desk tops of irregular shapes which present difficult manufacturing problems as respects the edge construction, simplified constructions and methods have been developed that offer important opportunities for standardization and its accompanying economy of manufacture.

This sandwich construction employing a filler of uniform cross sectional configuration is arranged for use with blind fasteners of sturdy construction and superior holding power which secure the desk top to its supporting structure.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same.

Fig. 1 is a fragmentary perspective view of one corner of a desk and illustrates the desk top construction of this invention, the corner portion of the desk top being broken away to more clearly illustrate the form of the several elements comprising the desk top;

Fig. 2 is an enlarged exploded view of the corner portions of the elements of the desk top;

Fig. 3 is an enlarged fragmentary sectional view illustrating details of the desk top construction and is taken on the line 3-3 of Fig. 1;

Fig. 4 is a plan view of a desk having an oversized and irregularly contoured top;

Fig. 5 is an enlarged fragmentary sectional view illustrating the details of the desk top shown in Fig. 4 and is taken on the line 5-5 of Fig. 4;

Fig. 6 is a fragmentary perspective view of the formed angles employed in the edge construction of Fig. 5; and

Fig. 7 is a detailed view similar to Fig. 5 but illustrating a modified form of edge construction.

Basically, the desk top consists of a filler 10 of cellular structure that preferably resembles a honey comb and which may be formed from kraft paper impregnated with a phenolic resin and rigidly bonded between two flat sheets or pans of steel. Of course, other types of honey comb or cellular structures may be used. The filler whether in one piece or several may be cut to shape by a band saw or in any other convenient way. This impregnated paper type of filler is moisture and fire resistant and is not subject to deterioration.

The top and bottom sheets are of any suitable sheet metal material, and preferably of 22 gauge steel, and are designated 11 and 12, respectively. As indicated, a top covering 13 is bonded to the flat outer surface presented by top sheet 11. Any conventional covering material may be employed for this top covering 13 and by way of a specific example, linoleum or Textolite are frequently used. The edges of the steel sheets are provided with marginal overlapping flanges, and are masked by a suitable decorative edging 14 which is fastened in place by suitable sheet metal screws 15 which, preferably, also secure the flanges together.

This basic arrangement fulfills the requirements of all known desk top applications. In addition, this single arrangement offers vastly superior physical characteristics and is capable of replacing all of the many and varied desk top constructions presently employed. The resultant standardization made possible by the present invention offers important economies in the desk manufacturing art.

Among the many highly advantageous physical characteristics is the fact that the present desk top construction exhibits a substantially higher strength to weight ratio than any of the prior art arrangements. The desk top of the invention is approximately sixteen times as rigid as a conventional steel desk top of the same weight. The weight of a honey comb sandwich type desk top (60" x 30") is only 48 pounds whereas the weight of a conventional steel reinforced desk top of the same dimension is about 60 pounds. Furthermore, a honey comb top will sustain a load of about 2000 pounds over a 60" span whereas only 900 pounds are required to buckle a conventional steel reinforced top over the same span. Not only are desk tops embodying the light weight honey comb sandwich type construction easier to handle, but they also effect a considerable savings in freight and shipping charges.

Another feature which renders this construction par-

ticularly effective in the production of desk tops, is the fact that its cross section is everywhere uniform such that no special reinforcing problems arise in the production of irregularly shaped tops. Similarly, all areas of the desk top are equally well adapted for attachment to the supporting pedestal. This uniform construction results in a highly desirable inherent rigidity for the top structure which is so important in oversize desk tops which have become increasingly popular in recent years. In addition, this inherent rigidity prevents machines supported on the desk top from jumping or moving about on the top during operation, as so often happens with conventional steel reinforced tops.

Probably the most important single requirement of a desk top is that it be flat and the honey comb sandwich type construction is particularly efficacious in achieving this goal. Apart from the obvious desirability of providing a flat writing surface, the absolute flatness of the honey comb construction improves the bonding between the top covering 13 and the upper surface of the top pan 11. In this connection it should be noted that the rigidity and flatness of the honey comb top renders this top readily adaptable to the use of a squeeze roll press for applying the top covering material to the top pan. It has been observed that conventional steel reinforced tops eventually develop waves or high spots directly over the reinforcing members, but this objectionable characteristic can never arise due to the more uniform supporting action built into the present arrangement.

The desk tops of the present invention are constructed according to the following procedures:

A. Adhesive is applied to the contacting surfaces of the paper honey comb and the top and bottom pans. Preferably a roller coater is employed for applying adhesive to the honey comb structure while the adhesive may be sprayed on to the metal pans.

The adhesive preferably employed is of the class called synthetic rubber adhesive (solvent). The adhesive consists of a mixture of neoprene and resin dissolved in a ketone solvent such as acetone, methyl ethyl ketone, etc. This combination produces high initial tack and strength after the solvent has been driven off. The resin then affords much higher strength upon aging while the neoprene lends the characteristic of toughness without embrittlement.

B. In production of limited quantities these parts may then be hung up overnight to allow the adhesive to dry. However, the arrangement is readily adapted to mass production techniques and in such an instance an infra red drying oven is employed to reduce the adhesive drying time to a matter of minutes.

C. The principal parts of the desk top are then assembled, preferably, in inverted relationship. Thus, the requisite number of honey comb pieces are properly located on top of the inner surface of the top pan and the bottom pan is then applied to complete the sandwich. Of course a single appropriately contoured honey comb piece may be used if desired.

D. In the production of limited quantities of desk tops the assemblage is heated in a steam heated hydraulic platen press for approximately five minutes. In a mass production arrangement, this operation may be accomplished by means of an infra red oven for heating and a squeeze pressure roll machine for bonding the parts together under pressure.

E. After the bonding operation the tops are stacked on a flat surface and suitably covered for assuring uniform cooling. After they have been cooled, they are ready for the final assembly operations of applying the top covering which as previously pointed out may also be accomplished by means of a squeeze roll press and finally the edging is secured to the assembled top.

Depending upon the configuration of the desk top, slightly different edge constructions are employed. Referring now to Figs. 1-3, wherein a desk top of generally

rectangular shape is shown, it will be seen that the top and bottom steel pans may be formed from steel sheets of appropriate shape. The straight sided sheet metal pans are formed with arcuate cutouts 20 at their corners. In forming the rounded corners on the top and bottom pans, the straight sides are first bent down to form right angle flanges and then suitable drawing dies are employed to form the arcuate corner flanges 21. The flange portions 22 of the top pan are formed with a rib or bead 23 so that when the parts are assembled, the flange portions of the top pan nest within the flange portions 24 of the bottom pan with the upper edges of the bottom flanges closely adjacent to the bead 23 (see Fig. 3).

The manner of arranging and forming the flanges has only been briefly described herein but is generally similar to that shown and described in United States Patent No. 2,646,327 to F. A. Saaf.

After the sandwich has been completely assembled, as described, with the parts bonded together and a top covering of linoleum or other suitable material applied, the edge molding 14 is secured to the flanges. For this purpose the flange portions are formed with registering apertures 26 at spaced points about the periphery of the desk top and the molding is secured through these apertures.

The molding consists of a channel shaped retaining member 27 which preferably is a flexible strip of extruded aluminum adapted for mounting and retaining an ornamental covering strip 28 which may be of extruded or molded pliant material such as a vinyl plastic. The screws 15 engage in the apertures 26 to fasten the retaining member 27 to the overlapping flanges 22 and 24, and then the ornamental strip 28 is fitted into place and it serves to mask the fastening screws.

The present invention employs a highly effective arrangement for attaching the desk top to the supporting structure 30 as shown in Fig. 3 wherein a headed fastener 31 is inserted in a countersunk opening 32 in the bottom pan and is mounted with its head 33 in flush relation with the bottom pan 12. These punched and embossed openings 32 for the fasteners 31 are formed when the pan is flat. The fastener 31 is applied to the desk top assembly by a special tool (not shown) which exerts compression between the head 33 and a threaded bore 34 formed in the fastener to upset the shank of the fastener and form a retaining shoulder 35. Thus the bottom pan 12 is gripped between the head 33 and shoulder 35 of the fastener. The threaded bore 34 subsequently receives an attaching screw 36 that is passed through the supporting structure 30 and held therein by a suitable washer 37. While the specific fastener shown herein is not new per se, its use in the disclosed manner in connection with the desk top construction of the present invention offers unique advantages. It will be apparent that the honey comb structure yields as required in response to the concentrated forces developed in the region of the countersunk openings, without interfering with the firm bonding of the filler 10 to the top and bottom pans 11 and 12.

The arrangement allows a blind fastener to be connected with equal facility at any desired point on the bottom pan and this is a particularly important factor in the case of desks having tops of unusual configuration. When spaced reinforcing members of the prior art are employed in a desk top construction, care must be given to their location in order to insure that the desk top may be attached to the supporting structure in proper relationship.

The flanged edge construction of Figs. 1-3 is well suited to desk tops of conventional shape. However, attractively contoured desk top configurations, such as shown at 38 in Fig. 4, involving a continuously curving edge surface have become increasingly popular and the problem of economically producing such configurations is for the first time achieved by means of the honey comb structure. In addition, the honey comb sandwich type

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arrangement due to its uniform rigidity and high strength permits such arrangements to overhang the supporting structure by appreciable amounts without fear of damage when the overhanging portion is used to support people or office machines. The basic arrangement and construction of the sandwich is similar to that outlined hereinbefore, however, special techniques are employed for the edge construction.

A preferred form of edge construction is shown in Fig. 5 wherein it will be seen that the top and bottom members 11a and 12a, respectively, are perfectly flat and have no integral depending flanges. Thus, they may readily be die cut into any desired shape or size. In order to provide a curved edge construction, formed angles are preferably spot welded to the top and bottom sheets. As indicated in Fig. 6, the horizontally disposed flanges 40 and 41 of these angles are formed with a plurality of notches 42 in order to permit the angle to be bent to any desired curved shape. After forming, these horizontal flanges are then secured to the marginal edges of the top and bottom sheets as indicated in Fig. 5. Again the arrangement is such that the top sheet with its edge flanges nests within the edge flanges of the bottom sheet and the flanges are formed with registering apertures, either before or after welding, that receive the mounting screws 15 for the retaining strip.

It will be apparent that this construction is applicable to desk tops of any desired contour. Here again, a headed blind fastener 31 having an upsettable portion forming a gripping shoulder 35 is employed for attaching the top to its supporting structure 30.

In lieu of employing continuous angles, a plurality of appropriately spaced individual brackets may be secured about the periphery of the sheet metal members 11a and 12a to receive the edge molding. In this connection, it should be noted that it is not impractical to provide only one of the pans with depending flanges for mounting the edge molding since the adhesive together with the edge construction can be depended upon to maintain the sandwich unitary.

An alternative arrangement for providing edges on curved desk tops is illustrated in Fig. 7 wherein the top and bottom pans 11b and 12b are shown as including integral rolled over flange portions 44 and 45, respectively. Angle edging machines for this purpose are well known in the art and are readily able to form right angle flanges on plates having curved marginal areas. One such hand operated angle edger is known as Model F produced by the Maplewood Manufacturing Company of Chicago, Illinois.

In the construction of Fig. 7 the top and bottom sheets are flanged prior to the assembly of the sandwich and, also prior to their assembly, a continuous flexible strip 46 is inserted between the marginal edges of the top and bottom flanges. This strip is of a greater height than the vertical spacing between the opposed flanges and as the molding strip 27 is applied suitable holes are drilled through the strips 27 and 46 to receive self tapping screws 15 to hold the molding or retaining strip 27 in place.

Thus it will be seen that the objects of the invention have been accomplished in that the standardized honey comb filler structure provides high strength, light weight, economical desk tops regardless of the configuration desired. In addition, the tops may readily be provided with a decorative edging and they accommodate sturdy fasteners for facilitating their attachment to the supporting structure, as shown in Fig. 4.

It should be understood that the description of illustrative forms of the invention are for the purpose of complying with Section 112, Title 35 of the United States Code and that the appended claims should be construed as broadly as the prior art will permit.

I claim:

1. A desk top comprising a pair of flat sheet metal pans, at least one of said pans including an inturned mar-

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ginal flange, a composite cellular filler structure interposed between said pans with bonding material securing the filler structure to the pans, a layer of desk top material overlying the exterior of the upper one of said pans with bonding material adhering substantially the entire expanse of said layer to said upper pan, and a flexible molding overlying and masking the marginal flange and including attachment means engaging said flange to secure said flexible molding in place.

2. In combination, a supporting structure including a substantially flat surface having spaced openings, a desk top including top and bottom flat sheet metal pans and an interposed composite cellular filler structure secured thereto by bonding material, a layer of desk top material overlying the exterior of said upper pan with bonding material adhering substantially the entire expanse of said layer to said upper pan, said bottom metal pan having spaced inwardly embossed portions formed with openings arranged for registration with the openings in said flat plate, said filler structure being yieldable in response to the localized pressures in the region of said embossed portions, mounting fasteners disposed in the openings in the bottom pan and each including a head and deformable shoulder means gripping the embossed portions surrounding the openings in the bottom pan with the head lying flush with the outer surface of the bottom pan, said fasteners having threaded bores, and threaded attachment means passing through the openings in the flat surface of said supporting structure and said bottom pan and engaged between said flat surface and the threaded bores of said fasteners to secure the desk top to the supporting structure.

3. A desk top comprising a pair of flat sheet metal pans and an interposed composite cellular filler structure secured thereto by bonding material, each pan including inturned marginal flanges arranged in overlapping nesting relationship and formed with registering openings, a layer of desk top material overlying the exterior of the upper one of said pans with bonding material adhering substantially the entire expanse of said layer to said upper pan, and a flexible molding overlying and masking the marginal flanges and including attachment means engaging the openings in said flanges to secure said flexible molding in place.

4. A desk top comprising a pair of flat sheet metal pans, each including inturned marginal flanges, a composite cellular filler structure and a surrounding attachment strip interposed between said pans and spacing said flanges apart a distance less than the width of the attachment strip, bonding material securing said filler structure to said pans, a layer of desk top material overlying the exterior of the upper one of said pans with bonding material adhering substantially the entire expanse of said layer to said upper pan, and a flexible molding overlying and masking the marginal flanges and attachment strip and including attachment means engaging said strip such that said strip abuts against said flanges and holds said flexible molding in place.

5. A desk top comprising a pair of sheet metal pans each including inturned marginal flanges, a reinforcing structure and a surrounding strip interposed between said pans and spacing said pans apart a distance less than the width of the attachment strip, means for securing said reinforcing structure to said pans, and a flexible molding overlying and masking the marginal flanges and attachment strip and including attachment means passing between said flanges and engaging said strip such that said strip abuts against said flanges and holds said flexible molding in place.

6. A contoured desk top of irregular shape comprising a pair of flat sheet metal pans and an interposed composite cellular structure secured thereto by bonding material, a layer of desk top material overlying the exterior of the upper one of said pans with bonding material adhering substantially the entire expanse of said layer to

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said upper pan, each pan having intumed marginal flanges comprising formed angles secured to the pans proper and arranged in overlapping nesting relationship, said overlapping flanges having registering openings, and a flexible molding overlying and masking the flanges and including attachment means engaging the openings in said flanges to secure said flexible molding in place.

7. The method of constructing a desk top of any desired contour which comprises forming top and bottom metal plates of the desired contour, providing laterally extending marginal flange means on at least one of said plates, shaping a composite cellular filler structure substantially coextensive with said plates to the desired contour, bonding the top and bottom plates to the filler structure to provide a desk top having a uniform cross sectional construction of the desired contour, shaping a layer of desk top material substantially coextensive with the upper plate, bonding substantially the entire expanse of said layer to the exterior of said upper plate, and securing a flexible edging at spaced points to the marginal flange means to mask the same.

8. The method of constructing a desk top of any desired contour which comprises forming top and bottom metal pans of the desired contour and inwardly embossing and aperturing the bottom pan at spaced points, providing inwardly extending marginal flange means on at least one

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of said pans, shaping a composite cellular filler structure substantially coextensive with said pans to the desired contour, pressure bonding the top and bottom pans to the filler structure such that the filler yields in response to the localized pressures in the region of the embossed points and said pans are disposed in parallel relation, attaching headed fasteners to said embossed portions with the heads thereof in flush relation with said bottom pan, shaping a layer of desk top material substantially coextensive with the upper pan, pressure bonding substantially the entire expanse of said layer to the exterior of said upper pan, and securing a flexible edging at spaced points to the marginal flange means to mask the same.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,911,274

November 3, 1959

Karl P. Grube

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 20, for "plate" read -- surface --; column 7, line 22, for "construcing" read -- constructing --.

Signed and sealed this 26th day of April 1960.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents