

March 6, 1945.

H. G. GROEHN

2,371,047

DIE FIXTURE

Filed Nov. 9, 1942

3 Sheets-Sheet 1

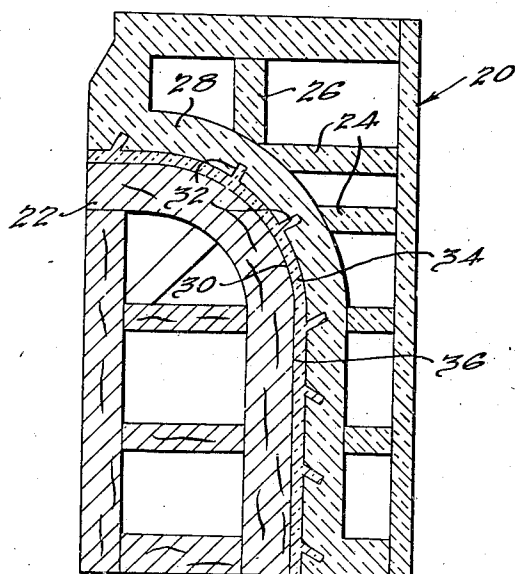
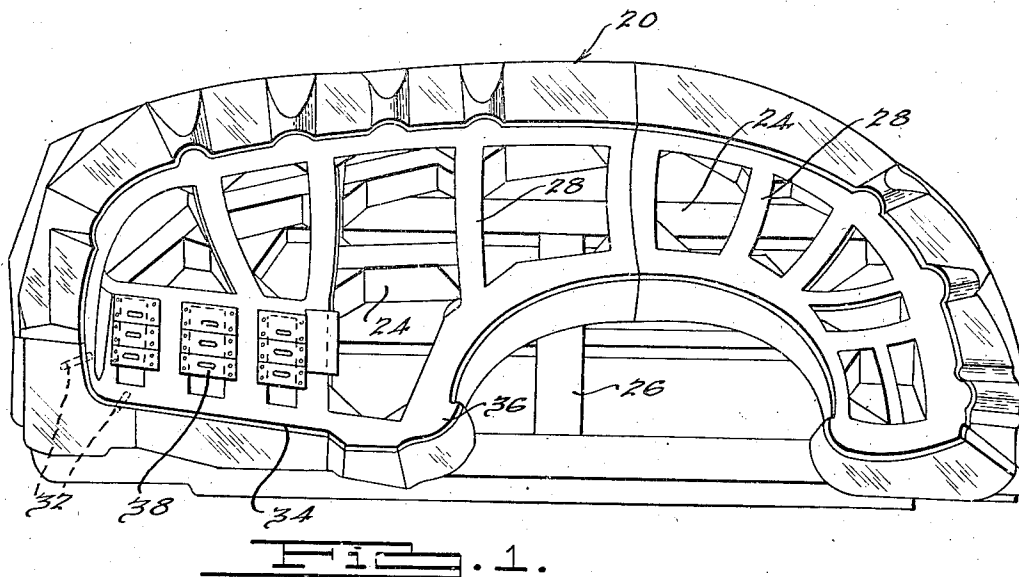


FIG. 2.

INVENTOR
BY *Harvey G. Groehn.*
A. E. Wilson.
ATTORNEY

March 6, 1945.

H. G. GROEHN

2,371,047

DIE FIXTURE

Filed Nov. 9, 1942

3 Sheets-Sheet 2

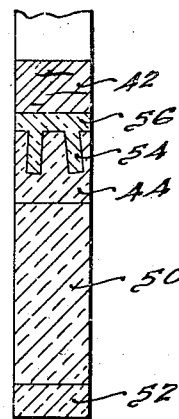
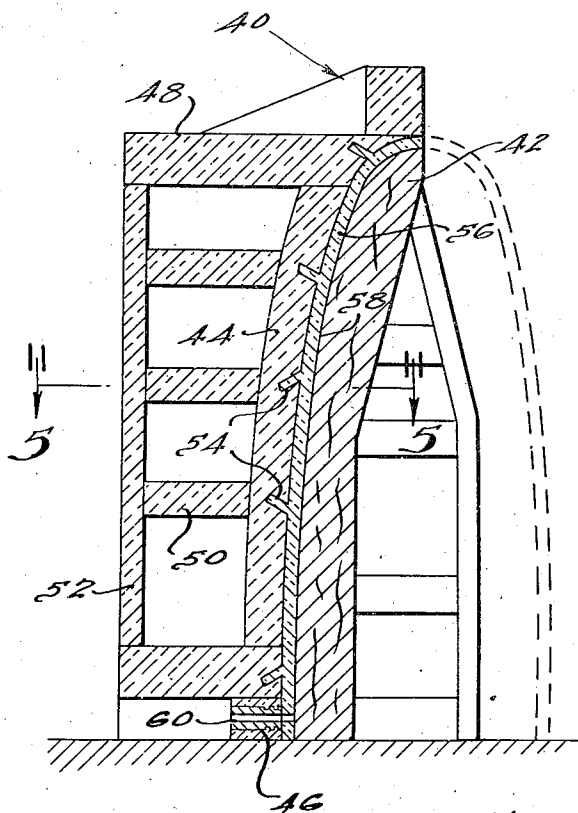
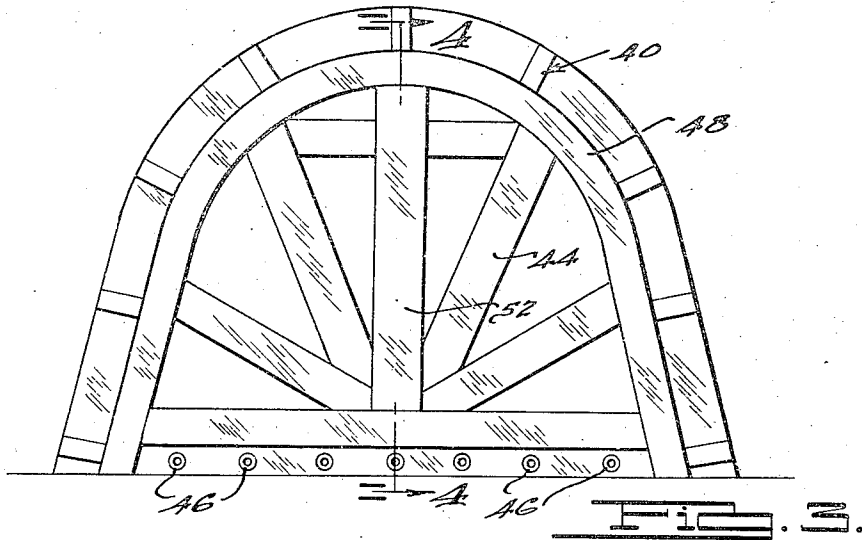


FIG. 4.

FIG. 5.

INVENTOR
Harvey G. Groehn.
BY A. C. Wilson.
ATTORNEY

March 6, 1945.

H. G. GROEHN

2,371,047

DIE FIXTURE

Filed Nov. 9, 1942

3 Sheets-Sheet 3

FIG. 6.

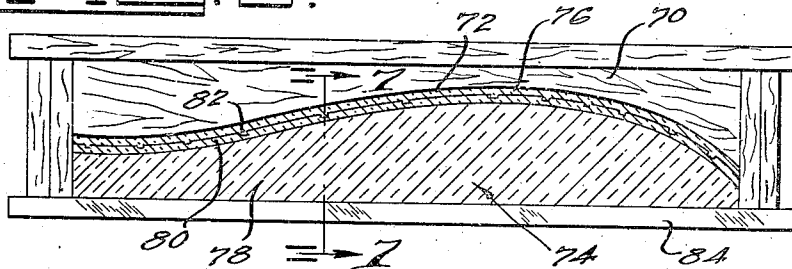


FIG. 7.

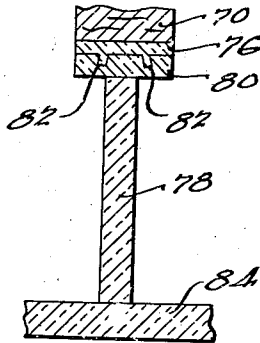


FIG. 8.

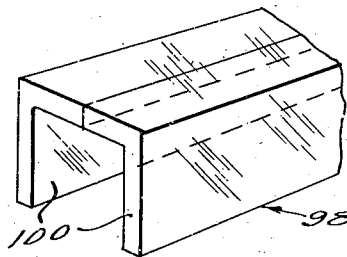
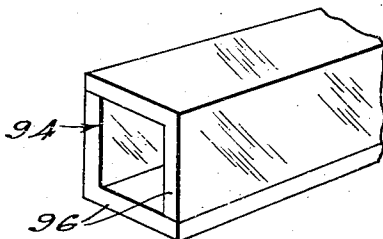
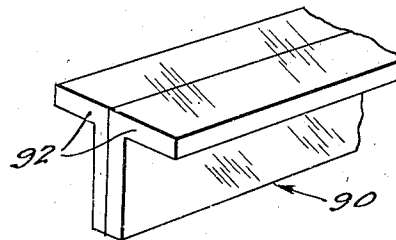
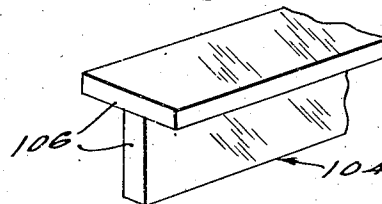
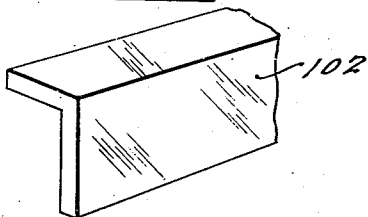


FIG. 10.

FIG. 11.

FIG. 11.

FIG. 12.



INVENTOR
Harvey G. Groehn.
BY *A. E. Wilson*
ATTORNEY

UNITED STATES PATENT OFFICE

2,371,047

DIE FIXTURE

Harvey George Groehn, Beverly Hills, Calif., assignor to Castaloy Corporation, Detroit, Mich., a corporation of Michigan

Application November 9, 1942, Serial No. 464,952

1 Claim. (Cl. 22—202)

This invention relates to fixtures and more particularly to fixtures used in industry for checking the shapes and contours of dies and other structural members employed in the formation of parts by stamping and other operations. The invention is adaptable for fixtures of all types such, for example, as drilling, assembling, spotting fixtures, et cetera, and the reproduction of master models and the formation of templates used in the contouring, fabricating, or formation of sheet metal and other parts used for industrial purposes.

Heretofore in the formation of fixtures of these types it was customary to form such fixtures by separately contouring small units or subassemblies of a larger fixture accurately conforming to the shape and contour of a master model. These individual pieces or assemblies were thereafter fastened together to form a complete fixture embodying the shape and contour of the original master model. A great deal of hand and machine work was involved in the formation and assembly of fixtures of these types, and inaccuracies of considerable magnitude were involved because of the physical impossibility of workmen forming a plurality of separate identical pieces.

My previously issued patent, No. 2,256,247, granted September 16, 1941, discloses a method of fabricating fixtures of the general type comprehended within this invention by superimposing on a master model of a fixture to be reproduced, a wood framework generally conforming to the shape and contour of the surface of the master model. This wood framework need not accurately conform to the shape and contour of the master model being reproduced but may be spaced from the surface of the master model to be duplicated a distance varying from approximately $\frac{1}{4}$ " to $\frac{1}{2}$ ". The space between the edges of the wood members forming this framework and the surface of the master model was masked off in any convenient manner, for example by means of masking or adhesive tape, and a moldable substance such, for example, as an alloy of the Woods metal group was introduced into the masked-off space to provide on the wood framework a working surface accurately conforming to the working surface of the master model.

In this manner accurate reproductions of the working surface of a model could be provided on a checking fixture. In view of the fact that it was not necessary that the framework of which the checking fixture was formed accurately conform to the surface of the model being repro-

duced, great savings were effected and more accurate and more reliable fixtures of all types were provided. These fixtures have been used in exceptionally large quantities in many industrial operations and have permitted rapid acceleration of industrial operations required in tooling up for the production of any article of commerce.

Fixtures of the type disclosed in my Patent No. 2,256,247 possess the disadvantage that a wood framework must be fabricated having surfaces generally conforming to the contours of the master model, the surface of which it is desired to reproduce on the duplicated fixture. In the production of relatively large fixtures, particularly those of varied contour, such for example as are encountered in the aircraft and automotive industries, considerable care must be exercised in the formation of the wood members of the framework, and they must be positioned adjacent the surface of the master model being reproduced within fairly close limits. This work of forming and positioning the wood framework is complicated by the fact that it is impossible to see the surface of the master model at the time the wood framework is being formed and positioned thereon.

This invention is directed to other important improvements in the formation of fixtures employed for checking, drilling, spotting, assembling, and so on, wherein a framework formed of transparent plastic materials may be readily superimposed on or adjacent a master model, the surface of which it is desired to reproduce.

This transparent framework may be readily built up of strips of plastic material to conform with the general contour of the model to be reproduced. The members of the plastic framework may be readily attached together by means of fusing operations caused by certain chemicals whereby the framework embodying the desired configuration may be readily and economically formed. In view of the fact that the members of which the framework is formed are transparent, it is possible to cut the members to the desired shape and attach them in place on the master model and observe the work of building the framework as it progresses, to insure that the surface of the framework is disposed a desired distance from the working surface of the model being reproduced.

After the framework has thus been formed and positioned adjacent the surface of the master model, the space between the edges of the members constituting the framework and the surface

of the master model may be masked off in any convenient manner and a moldable substance such for example as an alloy of the Woods metal group introduced into the masked-off space to provide on the surface of the framework a reciprocal working surface accurately conforming to the reverse contour of the model being reproduced.

The alloy working surface embodying the reverse contour of the model being reproduced may be suitably secured to the plastic framework by positioning alloy retaining means such for example as apertures in the members of which the framework is formed.

An object of this invention is to provide a fixture having a transparent body portion and a moldable working surface formed directly from the surface of the model being reproduced.

Another object is to provide a checking fixture having a plastic framework provided with an alloy working surface accurately conforming to the shape and contour of a master model.

A further object of the invention is to provide a checking fixture formed from strips of plastic material deformed to provide a framework generally conforming to the surface of a master model and having a working surface formed from a moldable substance applied between the plastic framework and the surface of a master model.

Yet another object resides in the provision of an improved method of readily forming a framework by rendering plastic substances yieldable as by the application of heat and thereafter deforming the members into alignment with the surface of a master model and accurately attaching the members together to provide a rigid framework generally conforming to the contour of the model to be reproduced.

Yet another object is to provide a novel method of forming a fixture framework by cementing together plastic strips embodying varying contours to form a rigid framework.

Another object is to provide a transparent checking fixture having an alloyed working surface.

A further object is to provide a transparent checking fixture having a working surface accurately conforming to the shape and contour of a master model adapted for checking trim lines, pierced holes, flange lines, spotting the shape or contour of apertures or structural members from one member to another and locating the position and dimensions of apertures or structural members.

Yet a further object is to provide a duplicate fixture accurately conforming to the shape and contour of the master model which may be advantageously used for Kellering pads and spotting punches.

Other objects and advantages of this invention will be apparent from the following detailed description considered in connection with the accompanying drawings, submitted for purposes of illustration only, and not intended to define the scope of the invention, reference being had for that purpose to the subjoined claim.

In the drawings wherein similar reference characters refer to similar parts throughout the several views:

Fig. 1 is a perspective view of a checking fixture for a motor vehicle fender embodying the present invention.

Fig. 2 is a sectional view through the checking fixture of Fig. 1 showing it as applied to a master

model, the surface of which it is desired to reproduce on the checking fixture.

Fig. 3 is a side elevation of a checking fixture for a stabilizer tip for an airplane fin.

Fig. 4 is a sectional view taken substantially on the line 4—4 of Fig. 1 looking in the direction of the arrows and showing the checking fixture mounted in position on a master model of the airplane fin.

Fig. 5 is a sectional view taken substantially on the line 5—5 of Fig. 4 looking in the direction of the arrows.

Fig. 6 is a sectional view illustrating the formation of a checking fixture framework directly from the working surface of a contoured member to be reproduced in reverse.

Fig. 7 is a sectional view taken substantially on the line 7—7 of Fig. 6 looking in the direction of the arrows.

Figs. 8 to 12 are perspective views illustrating several different structural shapes which may be fabricated from stock plastic materials of conventional shapes or contours.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the embodiment of Figs. 1 and 2, it will be noted that a checking fixture 20 may be formed from a master model 22 of a rear fender for a motor vehicle. The fixture 20 may, for example, include a plurality of longitudinally-extending members 24 interconnected by a plurality of transversely-extending members 26 to provide a skeleton framework. Attached to the skeleton framework are contoured members 28 generally conforming to the contoured surface 30 of the master model 22.

The members 24, 26, and 28 of the fixture 20 may be formed of any suitable plastic material such for example as Lucite, Plexiglass, etc. The contoured members 28 may be heated as in an oven to make them flexible or pliable and may thereafter be readily deformed to embody the general contour of the working surface 30 of the master model, the surface of which it is desired to embody in reverse on the fixture 20.

After the members 28 have been contoured to embody the desired shape, they may be securely attached to the structural members 24 and 26 forming the skeleton framework. These members may be secured together in any desired manner as by cementing with any suitable substance such as acetic acid. It will be understood that any means of securing the members 24, 26, and 28 together may be used, as fusing the plastic materials by the application of heat or positively fastening them as by the use of structural members, such as screws, bolts, or other fasteners projecting into the members.

The members 28 embodying the general contour of the working surface 30 of the master model 22 may be provided with apertures or recesses 32 preferably extending at angles to each other.

After the skeleton framework conforming generally to the shape and contour of the working surface 30 of the master model 22 has been

formed, the space between the edges of the contoured members 28 and the surface 30 of a master model may be masked off in any convenient manner as by the use of masking tape, adhesive tape, paper, or any other suitable means to isolate the space between the contoured members 28 and the surface 30 of the master model 20.

A moldable substance 34 such, for example, as an alloy of the Woods metal group may be introduced into the masked-off space to provide on the fixture 20 a negative working surface 36 accurately conforming to the surface 30 of the master model 22. The moldable substance 34 having the checking surface 36 may be bonded to the contoured members 28 of the checking fixture by flowing a portion of the moldable substance 34 into the apertures 32 to securely attach the substance 34 to the contoured members 28. It will be apparent that any other suitable means of securing the substance 34 to the checking fixture 20 may be employed, such for example as nails or staples projecting into the plastic members of the framework.

Plates 38 for indicating the position of structural members or the location of apertures, etc., may be positioned on the working surface 30 of the model 22 and secured to the working surface 36 of the fixture 20 by being embedded in the moldable substance 34.

It will be apparent that since the plastic framework need only conform generally to the contour of the working surface 30 of the master model 22, it is not necessary that the plastic material employed be of the first quality. Cheap materials embodying certain inaccuracies which would render them unusable for other purposes may thus be employed whereby greater economies may be effected in the fabrication of fixtures of this type.

Since the plastic materials employed are transparent, it is possible to readily check the position of the contoured members 28 with reference to working surface 30 of the master model 22 to assure proper results in the formation of the fixture and to minimize the amount of moldable substance or alloy 34 utilized in providing the working surface 36 on the fixture 20.

Any moldable substance capable of flowing and solidifying or hardening under temperature and pressure conditions which are not injurious to the surface 30 of the master model 22 may be employed to provide on the checking fixture 20 the working surface 36. Various examples of desirable materials are alloys of the so-called Woods metal group, and the Cerro alloys, such for example as Cerrobend. Plastic materials either of the thermosetting or thermoplastic type may also be employed for this purpose.

Figures 3 to 5 illustrate the invention as applied to the formation of a checking fixture 40 directly from a master model 42 of a stabilizer tip for an airplane. The master model 42 preferably is a solid member formed of wood or any other suitable substance and has an uninterrupted surface. The checking fixture 40 to be formed preferably has a skeleton framework formed of structural members having surfaces conforming to the shape and contour of the uninterrupted surface of the master model 42.

The checking fixture 40 may take any desired form, but preferably embodies a skeleton framework having angularly related members 44 contoured to correspond generally with the confronting contoured surface of the master model 42. The members 44 may radiate angularly from the

center of a base member 46 generally following the contour of the adjacent surface of the master model 42. An outer curved member 48 suitably attached to the ends of the members 44 and 46 may be provided to correspond with the outer contour of the master model 42.

The members 44, 46, and 48 may be securely bonded together by a framework consisting of horizontally and vertically extending members 50 and 52 to provide a substantially rigid self-supporting fixture.

These members may be formed of any suitable plastic materials or any substance capable of being deformed in one direction and bonded to another member to build up a framework to support a checking surface conforming to the contour of the master model.

Apertures 54 may be extended into the portions of members 44, 46, and 48 adjacent the surface of the master model 42 to form locking means for the substance 56 to provide on the members 44, 46, and 48 a working surface accurately conforming to the contour of the master model 42. The space between the edges of the members 44, 46, and 48 and the surface of the master model 42 may be masked off in any suitable manner and a molten alloy or substance introduced into this masked-off space to provide the fixture 40 with a working surface 58 accurately conforming with the contoured surface of the master model 42 as pointed out above in connection with the embodiment of the invention illustrated in Figs. 1 and 2.

Suitable drill bushings 60 may be positioned in apertures in the base member 46 and securely bonded thereto by the moldable substance 56. The checking fixture 40 will thus embody the drill bushings to accurately locate the position of drilled holes.

Referring now to Figs. 6 and 7, a master model 70 having a contoured working surface 72 is illustrated. A checking fixture 74 having a working surface 76 accurately conforming to the contoured surface 72 is desired. A strip 78 of plastic material is cut to conform generally to the contour of the surface 72. A flat strip of plastic material 80 is treated as by heating to make it flexible, and it is positioned on top of the strip 78. The strip 80 may be secured to the strip 78 in any suitable manner as by means of acetic acid to cement the two members together.

The plastic strip material 80 is provided with apertures 82 in its upper surface, and the space between the master model 70 and the edges of the plastic material 80 are masked off as previously indicated. The moldable substance 76 is then introduced into the masked-off space to provide on the plastic strip 80 an alloy working surface accurately conforming to the shape and contour of the working surface of the master model 70. The fixture 74 may be provided with a suitable base 84, and if desired, additional reinforcing structural members may be provided to strengthen the checking fixture 74 or to make it more rigid.

Various structural shapes may be built up from plastic materials of standard dimensions to provide suitable frameworks or bases for supporting the alloy working surface of the checking fixture. As illustrated in Fig. 8, a reinforced T section 90 may be formed by positioning two angle sections 92 adjacent each other and cementing or otherwise securing the members together. As shown in Fig. 9 a rectangular-shaped section 94 may be formed from a pair of angular sections 96.

Fig. 10 illustrates a U-shaped member 98 formed by securing together flanged sections of a pair of angle members 100. Fig. 11 illustrates the use of an angle section 102, and Fig. 12 illustrates the formation of a T section 104 from two flat strips 106.

These various structural shapes or contours may be secured together in any suitable manner as by the use of chemicals or upon application of heat to cause fusing of the members to provide frames or supporting bases for the checking fixtures and to facilitate the use of plastic materials to provide rigid frameworks having the alloy or molded working surfaces applied thereto to form substantially rigid checking fixtures which may be repeatedly used for checking the shape and contour of structural members or for any other use for which fixtures of this type are capable.

It will be understood that this invention comprehends the use of any transparent substance capable of being deformed to follow the general contour of a master model, and attached to another structural member either of the same or a different substance. Plastic materials either of the thermoplastic or thermosetting types may be employed. The framework of the checking fixture being transparent materially reduces the time required in the making and fitting of such fixtures, since it is possible to render a transparent piece of material flexible, bend it into alignment with the surface of the master model and attach it to its supporting framework or base.

The framework for the checking fixture can be disposed adjacent the surface of the master model so that a substantially uniform layer of alloy or metal may be introduced between the framework and the master model to provide the working surface of the checking fixture. Less alloy or metal may thus be employed in the formation of the fixtures, and more uniform fixtures are provided.

If desired, plastic contoured members for carrying the alloy working surface of the checking fixture may be mounted on frame members of wood or any other suitable material. The location of

flange and trim lines, pierced holes and structural members may be readily located by the use of transparent strips of a desired size to accurately locate on the moldable substance of the checking fixture, the location of the line aperture, etc.

The alloy or metal employed to provide the working surface of the checking fixture has large surface area per unit of volume. This, coupled with the fact that the substance or alloy melts at a low temperature, assures that the plastic or other substance of the framework will not be subjected to sufficient heat to cause it to distort, and the surface of the master model will not be subjected to sufficient heat to cause it to burn or injure its surface.

I claim:

The method of making a fixture having a contoured working surface accurately conforming with the working surfaces of a master wood model which comprises cutting strips of transparent plastic material of sufficient size to overlie spaced portions of the master model, applying heat to said strips to render them yieldable, bending the strips to conform with the contour of said portions of the master model, positioning said strips adjacent the contoured surface of the master model to provide a substantially uniform space having large surface area per unit of volume between the confronting surfaces of the strips and master model by observing the position of said confronting surfaces through the transparent strips, securing said strips together by building up a framework of plastic members engaging certain of the exposed surfaces of said contoured strips, fusing the members of the framework to the contoured strips, positioning alloy retaining means in the surface of the contoured strips, masking off the space between said strips and the contoured surface of the master model, and completing the fixture by introducing a moldable substance into the masked off space to provide on the contoured strips a working surface accurately conforming with the contoured working surface of the master model.

HARVEY GEORGE GROEHN.