

Jan. 8, 1957

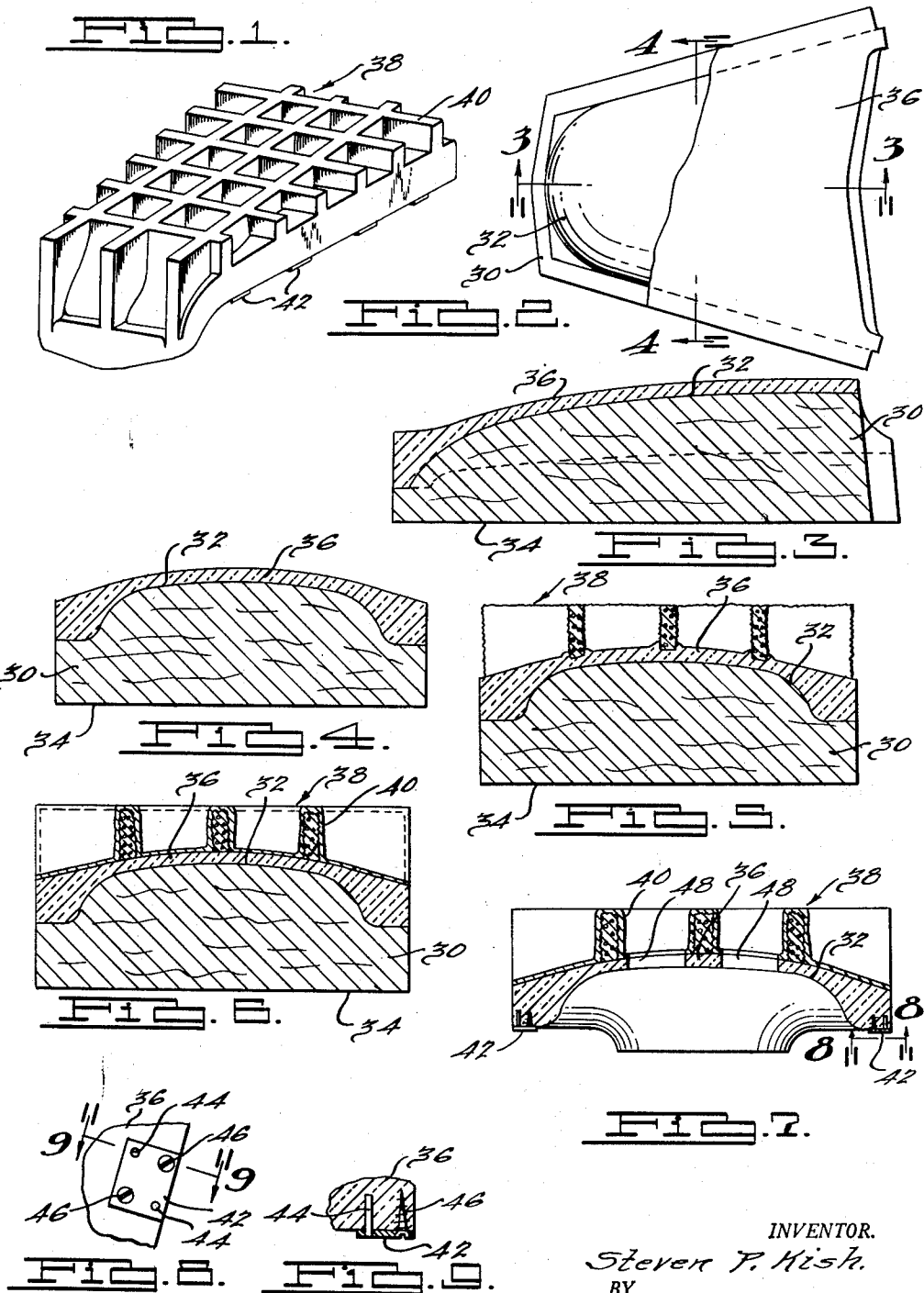
S. P. KISH

2,776,453

METHOD OF MAKING CHECKING FIXTURES

Filed July 28, 1952

2 Sheets-Sheet 1



INVENTOR.
Steven P. Kish.
BY
Harness, Dickey & Pierce
ATTORNEYS.

Jan. 8, 1957

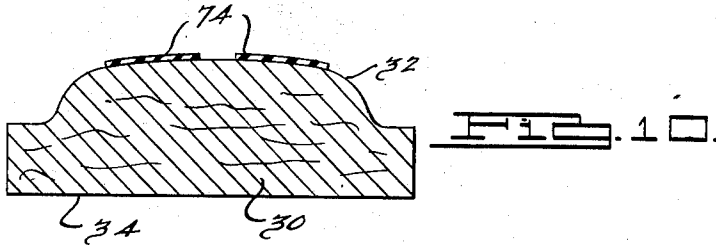
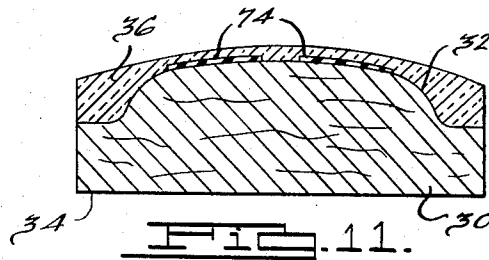
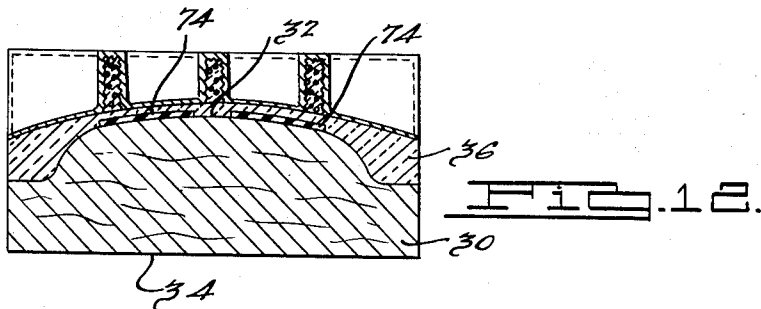
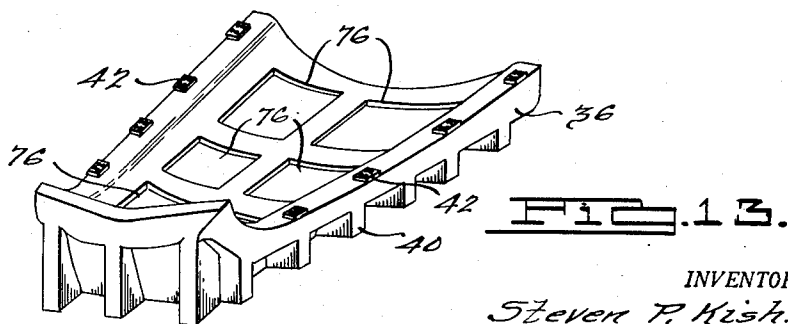
S. P. KISH

2,776,453

METHOD OF MAKING CHECKING FIXTURES

Filed July 28, 1952

2 Sheets-Sheet 2



INVENTOR.
Steven P. Kish.
BY
Harold Dickey & Pierre
ATTORNEYS.

1

2,776,453

METHOD OF MAKING CHECKING FIXTURES

Steven P. Kish, Lansing, Mich., assignor to Kish Plastic Products, Inc., Lansing, Mich., a corporation of Michigan

Original application September 27, 1949, Serial No. 118,113, now Patent No. 2,632,922, dated March 31, 1953. Divided and this application July 28, 1952, Serial No. 301,327

10 Claims. (Cl. 18—59)

This invention relates broadly to new and useful improvements in surface-reproduction fixtures such as female duplications, checking fixtures, spotting fixtures, and the like.

This application is a division of my copending application Serial No. 118,113, filed September 27, 1949, now Patent No. 2,632,922.

An important object of the present invention is to provide an improved method of making surface-reproduction fixtures of the above-mentioned character.

Another object of the invention is to provide an improved method of making a surface-reproduction fixture which is strong and rigid, light in weight, and weather-resistant.

Still another object of the invention is to provide an improved method which permits reproduction fixtures to be made faster and less expensively than heretofore.

Yet another object of the invention is to provide a checking fixture of improved construction having sections that can be readily broken away for application of feeler gauges and the like and according to the exigencies of the particular situation.

A further object of the invention is to provide a spotting fixture of improved construction that is essentially strong and light in weight and that can be readily handled in use.

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

In the drawings forming a part of this specification and wherein like numerals are employed to designate like parts throughout the same:

Fig. 1 is a perspective view showing a combination female duplication and checking fixture embodying the invention;

Fig. 2 is a top plan view showing the first step in making the fixture of Fig. 1;

Fig. 3 is a longitudinal, sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a transverse, sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a transverse, sectional view similar to Fig. 4 but showing the second step in making the fixture of Fig. 1;

Fig. 6 is a transverse, sectional view similar to Fig. 5 but showing the third and last step in making the fixture;

Fig. 7 is a transverse, sectional view similar to Fig. 6 but showing the fixture modified to make a checking fixture;

Fig. 8 is a fragmentary, bottom plan view looking in the direction of the arrows 8—8 in Fig. 7;

Fig. 9 is a fragmentary, transverse, sectional view taken on the line 9—9 of Fig. 8;

Fig. 10 is a transverse, sectional view through a model showing the first step in making a modified spotting fixture embodying the invention;

2

Fig. 11 is a transverse, sectional view similar to Fig. 17 but showing the second step in making the fixture;

Fig. 12 is a transverse, sectional view similar to Fig. 18 but showing the third step in making the fixture;

Fig. 13 is a perspective view showing the finished spotting fixture.

For a detailed description of the invention, reference is first had to Figs. 1—9 which illustrate a combination female duplication and checking fixture which reproduces in negative form a model 30 of an automobile hood. In this connection it will be understood that the particular form of the fixture is not important and that an automobile hood is here selected merely by way of illustration. The model 30 may be made of wood or any other suitable material according to conventional practice. The top surface 32 of the model conforms exactly to the finished hood and the bottom surface 34 is essentially flat to properly support the model.

In making the fixture embodying the present invention the top surface 32 of the model 30 is coated with any conventional parting compound and a layer of plastic material 36 is applied thereto. Any suitable, organic plastic material can be used for the shell 36. Phenol- and urea-formaldehyde resins are typical examples of such plastic materials. These resins are readily obtainable and are relatively inexpensive. Moreover, these resins can be made into a relatively stiff mix that will not slump or flow readily. Thus, the mix can be easily paddled or otherwise applied to the model and, once applied, it will retain its form until cured. Any suitable or conventional means for curing the resin may be employed. However, I prefer to employ resins that can be set or hardened by acid or similar means in order to expedite the setting operation and to eliminate the necessity of using forms when applying the plastic to the model.

Most resins of the type here under consideration shrink somewhat during curing, and the shrinkage varies directly as the volume or thickness of the resin. Accordingly, it is desirable to maintain the layer 36 relatively thin so that any shrinkage that may occur during curing will be insignificant. However, if the shell 36 is maintained sufficiently thin so that shrinkage during curing does not affect the finished form of the fixture, the shell alone is not sufficiently strong and rigid to maintain its shape in use. This is true particularly in the case of very large fixtures of the type here shown. Not only is there a danger that the shell 36, if used alone, will flex or warp in time or under normal conditions of handling and abuse, but there is a distinct possibility that the plastic will actually crack or break, thus destroying the fixture.

I have discovered that the above undesirable contingencies can be entirely avoided by building up a strengthening and reinforcing lattice framework on the back or reverse surface of the shell 36. Of course, the shell 36 can be made up of successive layers until sufficiently thick so that it maintains its form exactly under all conditions of use and so that it possesses sufficient strength to withstand normal handling and abuse; however, a shell of such thickness is cumbersome and awkward to handle and is excessively heavy. For all practical purposes, a strengthening and reinforcing lattice framework on the back of the shell 36 imparts the necessary strength and provides the necessary rigidity and resistance to flexure or warping. This framework may comprise a solid resin structure built up from the same resin or plastic material used for the shell 36 either by paddling or by pouring into a mold or form. However, a solid resin framework of this type adds considerable undesirable weight to the fixture.

As an alternative and more desirable expedient therefore, I have now devised a construction that is pre-

eminently satisfactory in all respects. Specifically I employ an inner core for the lattice framework, which core is of lightweight, rigid, cellular material. Expanded polystyrene manufactured and sold by the Dow Chemical Company under the name Styra-foam is a typical example of such a material. Expanded polystyrene is essentially strong and rigid and is exceedingly light in weight. Moreover, the cellular nature of this material assures a proper adherent bond between the core and the plastic material. In this connection, I preferably coat the core with the same plastic material employed for the shell 36 for added strength and to assure solid anchorage of the core to the shell.

In Fig. 5 I show a suitable lattice framework 38 of expanded polystyrene superposed on the back or reverse surface of the shell 36. The polystyrene can be molded or cut into lattice bars of suitable size and shape and the individual bars can be joined to form a strong, rigid framework by adhesive or equivalent means. The framework 38 conforms generally to the outline of the shell 36 and the lattice bars are formed so that the undersurface of the frame conforms generally to the contour of the shell. In use, the framework 38 is pressed into the shell 36 while the latter is still in a plastic or moldable condition so that the bottom edges of the lattice bars are actually embedded in the shell. When this procedure is followed the plastic material conforms exactly to and complements the rough cellular exterior surface of the framework to assure a solid adherence bond between the shell 36 and the framework 38.

After the framework 38 has been applied to the shell 36 in the manner hereinabove described, the outer surface of the framework and preferably the exposed adjacent surfaces of the shell 36 are coated with a thin layer of plastic material 40, as shown in Fig. 6. The same plastic material 40 preferably is used for the coating 40 as was used for the shell 36. In practice, the coating 40 may be applied either before or after the layer 36 was hardened or set. When either procedure is followed, the coating 40 fuses to or integrates directly with the shell 36 in such manner as to form in effect a one-piece construction. The nature of the material used is such that there are no joints or interfaces between the shell 36 and the coating 40. In practice, these two materials actually blend together. The coating 40 will not thereafter separate or peel off the shell 36 under any conditions of exposure or use. The outer coating 40 may be essentially thin, so that it adds very little to the total weight of the fixture. At the same time, the coating 40 completely covers the porous, lightweight core 38 and bonds with the shell 36 in such manner as to hold the core solidly and permanently affixed to the shell.

After the plastic shell 36 and the coating 40 have hardened or set, the fixture is stripped from the model 30. Small metal plates 42 may be fastened on the undersurface of the shell 36 along the marginal edges thereof to define the trim lines of the model. In conventional practice the trim lines usually are defined by scribe lines on the top surface of the model, and these lines are picked up or reproduced in minute detail by the plastic shell 36. Thus, it is merely necessary to locate the plates 42 so that the inner edges thereof extend along the scribe lines reproduced on the plastic. In the form of the invention shown, each plate 42 is positioned on the plastic shell by locating pins 44 and is fastened securely thereto by screws 46. Plastic materials of the type herein recommended can be drilled to receive the pins 44 and drilled and tapped to receive the screws 46.

The finished product produced according to the procedure hereinabove described is pre-eminently satisfactory in every respect. The plastic shell 36 accurately reproduces in every detail the top surface of model 30; and, when the plastic is applied to the model in a relatively thin layer substantially as shown in the drawings (Fig. 4), it does not change its shape appreciably during setting or

curing. Thus, after the shell 36 has set, it conforms exactly to the surface being reproduced. The superposed lattice framework so strengthens and reinforces the shell 36 that the latter will maintain its shape exactly for an indefinite period. The plastic material does not warp when the fixture is exposed to dampness or weathering in contrast to more conventional wood models heretofore used. Also, the fixture is not affected by salt-water conditions and thus can be shipped overseas without danger of warpage or deterioration. This is in sharp contrast to wood models which deteriorate with such rapidity when exposed to salt-water conditions that it is almost impossible to ship them overseas. The plastic surface is adequately hard so that it is not easily dented or pitted as are the fixtures conventionally used employing facings of woods, metals and the like. In addition, the instant construction is sufficiently light in weight so that even large fixtures can be readily handled manually in use. This factor alone is of great importance and achieves a considerable economy, since it saves time normally required to handle and maneuver the fixture in use. Also, this factor eliminates much of the handling and hoisting equipment heretofore required for large fixtures. Even large body fixtures constructed in the manner hereinabove described can be handled manually and without the aid of mechanical hoists or slings.

The fixture hereinabove described is useful primarily as a female reproduction of the model 30. However, the unique construction and formation of the fixture possesses another inherent advantage which permits the same to be readily converted to a checking fixture. This is exceedingly important, since the conversion can be made on the job by the user. Specifically, the fixture can be adapted for use as a checking fixture by breaking or cutting away any of the shell portions between the lattice bars to define holes 48 (Fig. 7) through which feeler gauges or the like can be inserted. These holes are required particularly where the metal is bent sharply or abruptly and thus is most apt to spring back or otherwise distort.

Different operators may require or desire the holes 48 to be in different locations, and the instant construction permits the operator to place the holes according to his own belief and in accordance with the exigencies of the particular situation. Also, the instant construction permits the operator to acquire a number of female reproductions which he can use as such or he can convert all or part of the reproductions to checking fixtures as required. Moreover, the holes 48 can be located differently in different checking fixtures made from identical female reproductions so as to afford maximum efficiency in use. It should be noted that the holes 48 do not appreciably weaken the fixture since most of the strength and rigidity is afforded by the lattice framework. The efficacy of the framework is of course in no way affected by the presence of holes 48.

The pads 74 may be formed from any sheet material such as sheet wax, sheet plastic, rubber and the like. Also, these pads 74 can be formed from any suitable molding material such as clay or the like. Further, any desired number of pads may be employed and the pads may be of any desired size and shape. All of the pads 74 here shown are generally rectangular in form but this is not critical. Further, if necessary or desirable, some of the pads 74 may be different in shape than other of the pads. Usually, the pads 74 are placed on the model 30 at points where the latter bends or curves abruptly. In any event, the pads 74 preferably are coated with parting compound or the like so that they are readily removable from the plastic shell 36 when the latter is separated from the model 30.

As perhaps best shown in Fig. 13, the pads 74 leave dish-shaped areas or depressions 76 in the undersurface of the fixture. When the fixture is used to spot formed sheet-metal parts the depressions 76 accommodate spring-back

5

which usually occurs in the metal in areas where the metal is bent sharply or abruptly.

Except for the features specifically referred to above, it will be readily apparent that the instant fixture has the same inherent characteristics and advantages as the form of the invention first described, and in this connection it will be observed that this fixture also can be adapted readily for use as a checking fixture by breaking or cutting away any of the shell portions between the lattice bars.

Having thus described the invention, I claim:

1. The method of making a checking fixture comprising covering the entire surface to be reproduced with a layer of hardenable plastic resin material; placing a lattice core of rigid plastic material having substantially the same coefficient of thermal expansion as the plastic material on the plastic layer while the latter is still in a moldable condition; coating the exposed surfaces of the core and the surfaces of said plastic layer adjacent to said core with additional hardenable plastic material so that the core is entirely covered by the plastic material and so that the plastic coating is bonded to and integrated with said core and said plastic layer; hardening said plastic material; and removing portions of said plastic layer in certain of said lattice openings as required for application of feeler gauges at critical points on the surface to be checked by the fixture.

2. The method of making a spotting fixture comprising placing a plurality of individual pads at predetermined points on a surface to be reproduced; covering the surface to be reproduced and the pads with a layer of hardenable plastic material; placing a lightweight, rigid core of cellular material on the plastic layer while the latter is still in a moldable condition and pressing the core against the plastic to embed the undersurface of the core therein; coating the exposed surfaces of the core and the top surface of said plastic layer with additional hardenable plastic material so that the core is entirely covered by the plastic material and so that the last-mentioned plastic material is bonded to said plastic layer; hardening said plastic material; and separating the plastic layer from the surface reproduced thereby and removing the pads from the undersurface of said plastic layer.

3. The method of making a spotting fixture comprising placing a plurality of individual pads at predetermined points on a surface to be reproduced; covering the surface to be reproduced and said pads with a layer of hardenable plastic material; placing a rigid core on the plastic while the latter is still in a moldable condition and pressing the core against the plastic to embed the undersurface of the core therein; coating the exposed surfaces of the core and the surfaces of said plastic layer with additional hardenable plastic material so that the core is entirely covered by the plastic material and so that the last-mentioned plastic material is bonded to said plastic layer; hardening said plastic material; separating the plastic layer from the surface reproduced thereby; and removing the pads from the undersurface of said layer of plastic material.

4. The method of making a spotting fixture comprising placing a plurality of individual pads at spaced predetermined points on a surface to be reproduced; covering the surface to be reproduced and said pads with a shell of hardenable plastic material so that the pads are embedded in the undersurface of said shell; placing a polystyrene core on said plastic shell while the latter is still in a moldable condition; coating the exposed surfaces of the core and the top surfaces of said shell with additional hardenable plastic material so that the core is entirely covered by the plastic material and so that said additional plastic material is bonded to and integrated with said plastic shell; hardening said plastic material; separating the shell from the surface reproduced thereby; and removing the pads from the undersurface of said shell.

6

5. The method of making a checking fixture comprising covering the entire surface to be reproduced with a layer of hardenable plastic resin material; placing a lattice of rigid material on the plastic layer while the latter is still in a moldable condition; hardening the plastic material to bond the lattice to said plastic layer; and removing portions of said plastic layer in certain of said lattice openings as required for application of the feeler gauges at critical points on the surface to be checked by the fixture.

6. The method of making a checking fixture comprising covering a surface of predetermined form with a layer of plastic resin material; placing a lattice of rigid material on said plastic layer; bonding the lattice to said plastic layer; and removing portions of said plastic layer in certain of said lattice openings as required for application of feeler gauges at critical points on the surface to be checked by the fixture.

7. The method of making a checking fixture comprising covering the surface to be reproduced with a layer of hardenable plastic material; placing a lattice of rigid material on the plastic layer while the latter is still in a moldable condition; bonding the lattice to the plastic layer by covering at least portions of the lattice and of the plastic layer with additional plastic material; hardening said plastic material; and removing portions of said plastic layer in certain of said lattice openings as required for application of feeler gauges at critical points on the surface to be checked by the fixture.

8. The method of making a checking fixture comprising covering the surface to be reproduced with a layer of hardenable plastic material; placing a lattice of rigid material having substantially the same coefficient of thermal expansion as the plastic material on the plastic layer while the latter is still in a moldable condition; bonding the lattice to said plastic layer by coating at least portions of said lattice and of said plastic layer with additional plastic material; hardening said plastic material; and removing portions of said plastic layer in certain of said lattice openings as required for application of feeler gauges at critical points on the surface to be checked by the fixture.

9. The method of making a spotting fixture comprising placing a plurality of individual pads at predetermined points on a surface to be reproduced; covering the surface to be reproduced and said pads with a layer of hardenable plastic material; placing a rigid reinforcing framework on the plastic while the latter is still in a moldable condition; bonding said framework to said plastic layer; hardening said plastic material; separating the plastic layer from the surface reproduced thereby; and removing the pads from the under surface of said plastic layer.

10. The method of making a spotting fixture comprising the placing of a plurality of individual pads at predetermined points on a surface to be reproduced; covering the surface to be reproduced and said pads with a layer of hardenable plastic material; placing a reinforcing latticework of a material having substantially the same coefficient of thermal expansion as said plastic material on said plastic layer; bonding said latticework to said plastic layer; hardening said plastic material; separating the plastic layer from the surface reproduced thereby; and removing the pads from the under surface of said layer of plastic material.

References Cited in the file of this patent

UNITED STATES PATENTS

1,018,458	Vogt	Feb. 27, 1912
1,913,747	Copeman	June 13, 1933
2,460,242	Renaud	Jan. 25, 1949
2,516,091	Renaud	July 18, 1950
2,593,456	James	Apr. 22, 1952
2,694,228	Mathis	Nov. 16, 1954