April 19, 1966 E. FAZEKAS 3,247,046

STAINED WINDOW AND METHOD OF MAKING THE SAME

Filed Nov. 21, 1962 2 Sheets-Sheet 1

FIG. 1



FIG. 2



FIG. 3

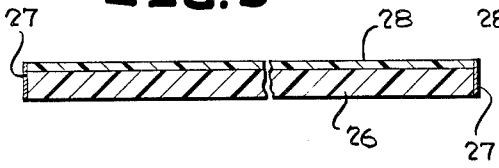


FIG. 4

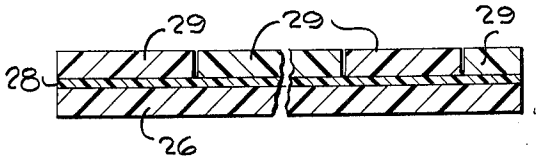


FIG. 5

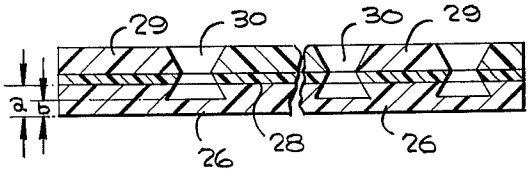


FIG. 6

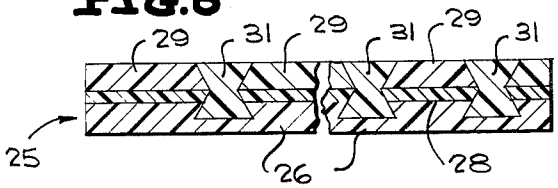


FIG. 7

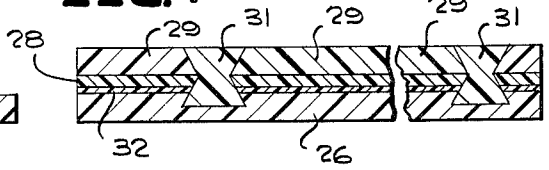
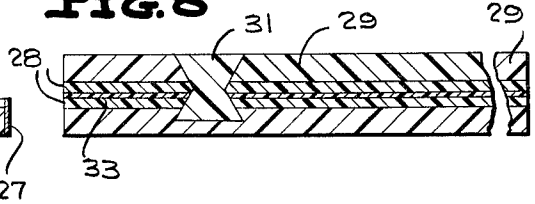


FIG. 8



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April 19, 1966 E. FAZEKAS 3,247,046

STAINED WINDOW AND METHOD OF MAKING THE SAME

Filed Nov. 21, 1962 2 Sheets-Sheet 2

FIG. 9

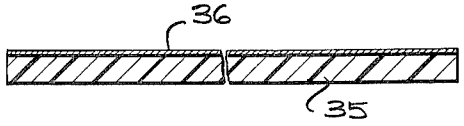


FIG. 10

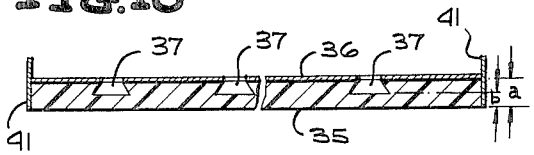


FIG. 11

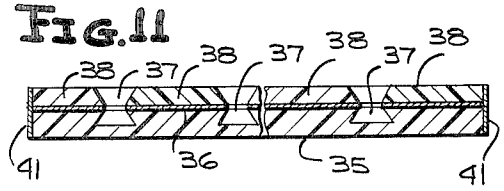


FIG. 12

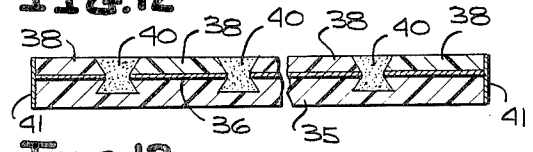


FIG. 13

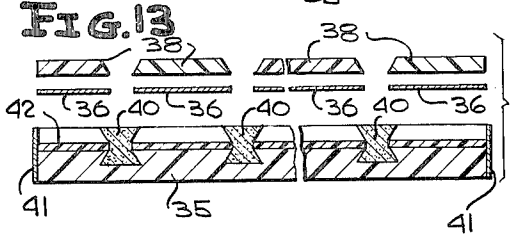


FIG. 14

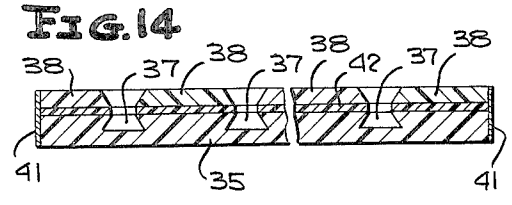


FIG. 15

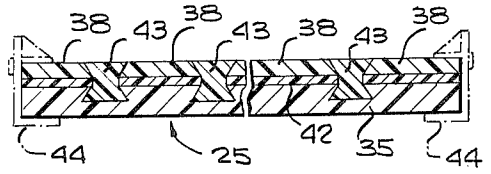


FIG. 16

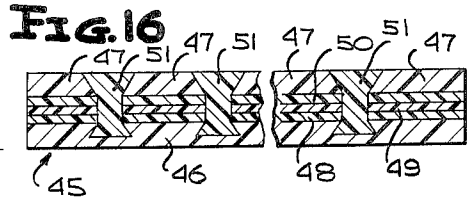


FIG. 17

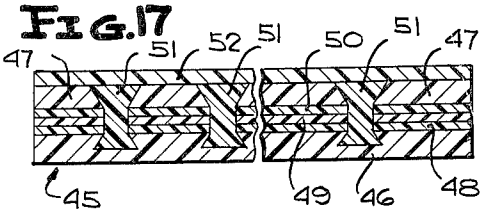


FIG. 18

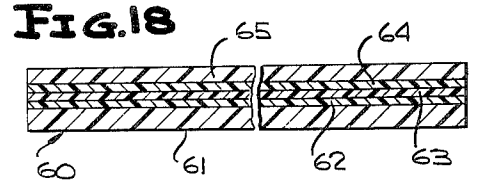


FIG. 19

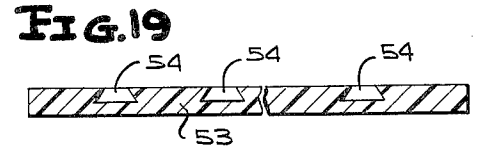


FIG. 20

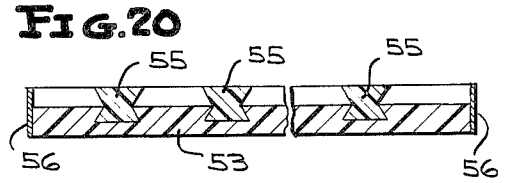
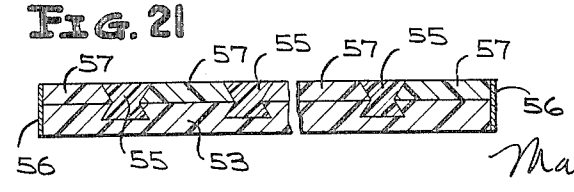


FIG. 21



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3,247,046

STAINED WINDOW AND METHOD OF MAKING THE SAME

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Filed Nov. 21, 1962, Ser. No. 239,234
7 Claims. (Cl. 161—5)

This invention relates in general to new and useful improvements in stained window construction, and more specifically to novel stained windows formed of plastic materials and the method of making the same.

The preparation of stained glass is an old and well known art. In forming a stained glass window, the window is first broken up into the desired colors after which the colored glass is arranged in mosaic pattern and the figure or design is painted thereon. The painted designs are then set, such as by firing, after which the glass is placed in an iron frame with horizontal bars running across the frame at certain intervals to reinforce the glass mosaic. Lead strips are then placed between the fragments of glass and the entire plate is baked in an oven. During which time the painted-on designs are definitely set. The cutting of the glass into fragments follows a prescribed law and the number of bars across the frame is fixed for a particular sized window. Accordingly, following the known stained glass art, the design often has to be broken in uncomplementary spots. Also, the reinforcements break the design and make the window extremely heavy. Because of the expense of the original construction, the window is oftentimes protected by a wire screen or additional glass which is of further expense and weight.

In accordance with this invention, it is proposed to provide a simulated stained glass window which will match the known type of stained glass windows in appearance and which will have sufficient strength so that very large unbroken windows on the order of 10′ x 12′ may be formed without the usual undesirable horizontal reinforcing bars.

Another object of this invention is to provide a novel simulated stained glass window which is of a light-weight construction so as to greatly reduce the necessary strength of the supporting frame therefor.

Another object of this invention is to form stained windows of colored plastic wherein the window may be more quickly formed of less expensive materials so that the resultant window is much more inexpensive than the conventional stained glass windows.

Still another object of this invention is to provide a novel stained window which is formed of plastic and which is internally reinforced by simulating the conventional lead strips of stained glass windows through the use of plastic and metal combination epoxy, such as conventional plastic steels, whereby larger otherwise unsupported window areas may be formed.

A further object of this invention is to provide a novel stained window construction wherein the window is formed of a plastic backing sheet having colored pieces of plastic overlying the same, and there being a developed photographic emulsion between the colored pieces and the backing sheet to provide for a desired design in the colored window.

Still another object of this invention is to provide a novel method of forming a simulated window of plastic materials wherein a plastic backing sheet is provided and the customary design of lead strips for a stained window are formed in the backing sheet, colored plastic is disposed in overlying relation to the backing sheet in accordance with the design, and the grooves are filled with a high strength plastic metal to simultaneously simulate lead strips and reinforce the assembly of the backing

sheet and the plastic pieces, with the shape of the groove providing a lock for added assurance to the adherence of the plastic sheets.

Another object of this invention is to provide a novel method of forming a stained window wherein the window is formed of plastic material as opposed to glass and the process is relatively simple as opposed to the manufacture of stained glass window.

Yet another object of this invention is to provide a novel stained window which is formed of plastic materials and which have color characteristics corresponding to stained glass windows and at the same time may be readily formed at a cost much less than that of stained glass.

A further object of this invention is to provide a novel method of forming a stained window wherein the window is formed of plastic materials and includes a backing sheet and colored plastic pieces which may either be cut and set in place or which may be cast in place.

A still further object of this invention is to provide a novel method of forming stained windows wherein the principal materials of construction are plastic pieces and wherein a developed photographic emulsion is provided, the photographic emulsion being disposed on either a backing sheet of the window, individual colored plastic pieces, or on a separate film embedded within the window construction whereby life-like characteristics may be incorporated into the window utilizing photographic methods.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by a reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view of a stained window formed in accordance with this invention and showing the over-all details thereof.

FIGURES 2–6 are fragmentary sectional views taken through various components of a stained window and show one method of forming the stained window of FIGURE 1.

FIGURE 7 is a transverse sectional view similar to FIGURE 6 and showing a slightly modified form of window construction.

FIGURE 8 is a transverse sectional view similar to FIGURE 6 and showing still another modified form of window construction.

FIGURES 9–15 are transverse sectional views with intermediate portions broken away through the various components utilized in another method of forming the window of FIGURE 1 and sequentially show the steps of forming such a window.

FIGURE 16 is a horizontal sectional view similar to FIGURE 15 and shows a slightly modified form of window construction.

FIGURE 17 is another sectional view similar to FIGURE 15 and shows still another modification of the window of FIGURE 15.

FIGURE 18 is a transverse sectional view with an intermediate portion omitted of still another form of window construction wherein the reinforcing has been omitted.

FIGURES 19–21 are transverse sectional views with intermediate portions omitted and showing the various steps followed in the forming of the window of FIGURE 1 utilizing still another method.

Referring now to the drawings in detail, it will be seen that there is illustrated in FIGURE 1 a stained window formed in accordance with this invention and which has been actually made and installed in a church. The stained window is generally referred to by the numeral 25 and is of a one panel construction although it is greater

than life-size and many times the size of a permissible stained window formed utilizing the stained glass art.

Referring now to FIGURES 2–6 in particular, it will be seen that there are illustrated the steps of one method of forming the window **25**. In accordance with this method, a desired size of translucent or transparent or patterned plastic sheet **26** is provided. The peripheral edges of the sheet **26** are built up with tape **27** or like material to define a dam to a desired depth. Then a liquid plastic **28** is poured onto the surface of the backing sheet **26** to the desired depth, as is illustrated in FIGURE 3.

Before the liquid plastic **28** has been poured onto the backing sheet **26**, heavy sheets of plastic which may be white and other colors have been cut to provide plastic pieces **29** in accordance with the design of the window. These pre-cut plastic pieces are carefully set on the liquid plastic **28** in their proper positions, making sure that air bubbles are eliminated. The assembly shown in FIGURE 4 is then permitted to cure, during which curing time the liquid plastic penetrates the adjoining surfaces of the backing sheet **26** and the colored pieces **29** to bond the same together into one rigid thermoset piece of plastic.

The assembly of FIGURE 4, after having been cured, is routed along the lines of the predetermined pattern to provide double dovetail cross-sectional grooves **30** which pass entirely through the colored pieces **29**, the layer of liquid plastic **28** and into the backing sheet **26**. As is clearly shown in FIGURE 5, assuming the backing sheet has a depth *a*, the grooves **30** are routed so that the remaining thickness of the backing sheet is a thickness *b* with *b* being substantially one-half *a*.

The grooves **30**, after having been formed in accordance with the desired pattern, are then filled with a plastic metal **31** which, when hard, both simulates the lead strips of a conventional type of stained glass window and serves as an integral reinforcement for the stained window **25**. The window **25** described above may be formed with the backing sheet **26** formed of acrylic or polymethylmethacrylate plastics, fiberglass or other material reinforced plastic, or like plastics, which are readily available on the market. The liquid plastic **28** may be of various compositions. Known compositions to be suitable include a solution of unsaturated polyester dissolved in styrene monomer made by Rohm & Haas. To these materials then may be added promoters such as a cobalt accelerator including cobalt naphthenate,, or a catalyst such as MEK peroxide which is 60% methylethyl, ketone peroxide in dimethyl phthalate. The plastic metal **31** is preferably a commercially available epoxy and a typical example is that made by Devcon Company named Plastic Steel which is composed of 80% steel and 20% plastic epoxy using a hardener with a promoter and catalyst. A similar material is sold by Borden.

When it is desired to incorporate a design in the window **25** other than that possible utilizing only the colored pieces of plastic **29** and the plastic metal **31**, the backing sheet **26** may be provided with a surface applied photographic emulsion **32** which has been developed, the emulsion **32** having been placed on the backing sheet **26** and developed prior to the application of the liquid plastic **28**. It is to be noted that the plastic metal **31** passes through the emulsion **32**. It is also to be understood that although no sub-coat has been illustrated between the backing sheet **26** and the emulsion **32**, such a subcoat may be provided. It is also to be understood that the emulsion **32** may be a similar layer so as to provide the black and white only or may be of multiple layers to provide for color.

Another modification of the basic window construction is illustrated in FIGURE 8 wherein a design other than that provided by the colored pieces of plastic **29** is obtained by inserting between two layers of the liquid plastic **28** a developed photographic film **33**. The photographic film **33** may be of the black and white type or may be of of a colored type. It is to be noted that the plastic metal strips **31** pass through the film **33**.

With respect to the modification set forth above in FIGURES 7 and 8, it is to be understood that the photographic emulsion **32** of the photographic film **33** may be either of the over-all type or may be limited to specific areas, such as the facial areas of the window.

Reference is now made to FIGURES 9 through 15 wherein there is illustrated the steps of another method of forming a window, such as the window **25**. In accordance with this method, a backing sheet **35** of translucent or transparent plastic and of the desired size is provided. The desired design is drawn on tracing paper **36** which is applied over the backing sheet **35** utilizing some type of removable adhesive, such as rubber cement. The backing sheet **35** is then machine grooved to provide grooves **37** in the upper surface thereof in accordance with the desired design. It is to be noted that it is shown in FIGURE 10 that the backing sheet has a thickness *a* and that the grooves **37** are of a depth so that the remaining thickness of the backing sheet is *b*. The depth *b* will range from 50% to approximately 70% of the depth *a*.

After the grooves **37** have been formed, pieces of colored plastic **38**, which have been cut and arranged in accordance with the desired design, are placed into overlying relation with respect to the tracing paper **36** and in between the grooves **37**. The grooves **37** and the spaces between the colored pieces **38** are then filled with a suitable clay or glazing compound **40**. This compound, if desired, may be a plastiline. The colored plastic pieces **38** and the tracing paper **36** are then removed, as is shown in FIGURE 13. The backing sheet **35** is now surrounded with a border tape **41** if it has not been previously so provided so that a slight dam is made surrounding the periphery of the backing sheet **45**. A thin layer of liquid plastic, such as the liquid plastic **28** is then poured into overlying relation to the backing sheet **35**. This liquid plastic, which is referred to by the numeral **42**, is poured into each of the spaces defined by the material **40**. The colored plastic pieces **38** are then immediately returned to the backing sheet **35** in overlying relation to the liquid plastic **42** and without the trapping of air bubbles. The assembly is permitted to cure for a time, such as 24 hours at room temperature. The liquid plastic **42** rigidly bonds the backing sheet **35** and the colored pieces **38** together as a unit. The material **40** disposed within the grooves **37** and between the colored pieces **38** is then removed, as is shown in FIGURE 14. The grooves previously occupied by the material **40** are replaced by a suitable plastic metal **43**, such as those hereinabove described. The completed window, which may be the window **25**, is then suitably mounted in a prepared frame **44**.

In the frame mount of FIGURE 16 in particular, there is illustrated a slightly modified form of window construction which may be made either in accordance with the method shown in FIGURES 2 through 6 or in accordance with the method shown in FIGURES 9 through 15. The window construction of FIGURE 16, which is referred to by the numeral **45**, includes a plastic backing sheet **46** and colored pieces of plastic **47**. Intermediate the backing sheet **46** and the colored pieces **47** is a suitable subcoat layer **48** over which is disposed a photographic emulsion layer **49**, which photographic emulsion has been developed. A layer **50** of bonding material overlies the layer of photographic emulsion **49**. The bonding material may be provided with a conventional ultraviolet retardant. At this time it is pointed out that although only one layer of photographic emulsion **49** has been illustrated, such as would be suitable for black and white, numerous such layers may be provided to provide colored photography. It is also pointed out at this time that the emulsion layer **49** could be part of photographic film as opposed to being deposited directly on the backing sheet **46**. The entire window **45** is provided with a design of

grooves into which there has been placed plastic metal **51**, such as the plastic metal **31** or **43**.

Referring now to FIGURE 17, it will be seen that the window **45** may be protected by the addition of a transparent resin layer **52** overlying the entire window of FIGURE 16. This plastic layer is preferably a hard weather resistant resin.

At this time it is pointed out that the individual colored pieces of plastic described hereinabove need not be of the same color throughout. The individual colored pieces of plastic may be stained as desired to provide for the necessary contrast and shading. Further, if it is so desired, in lieu of placing the photographic emulsion on the backing sheets, the photographic emulsion may be applied in the afore-described manner to the rear surfaces of the individual colored pieces of plastic.

Reference is now made to another method of forming a window, such as the window **25**. This method is best illustrated in FIGURES 19, 20 and 21 and reference is first made to FIGURE 19 wherein there is illustrated a backing sheet **53** which is formed of a translucent or transparent plastic material. The upper surface of the backing sheet **53** is provided with grooves **54** of a desired design in accordance with the design of the window. After the backing sheet **53** has been grooved, as shown in FIGURE 19, plastic metal **55** is deposited in the grooves **54** and built up therefrom to provide a series of small dams, as is clearly shown in FIGURE 20. Further, tape is applied around the peripheral surface of the backing sheet **53**, the tape being referred to by the numeral **56**. It is desired that the plastic metal **55** and the tape **56** be of a common height.

After the suitable dams have been formed by the application of the tape **56** and the plastic metal **55**, liquid colored plastic **57** is poured into the individual areas in accordance with the color requirements of the over-all design.

At this time it is pointed out that the plastic metal described hereinabove not only serves a decorative purpose and functions as a rigid reinforcement, including the lock for added assurance to the adherence of the plastic sheets, but also serves to slow down the normal cold flow of the plastic material to maintain the shape of the window. This is a very desirable feature from a practical standpoint where the shape of the window is to be maintained for a long period of time.

With respect to the coloring of the individual plastic pieces, it is to be understood that only a limited number of colors are obtainable. Further, in the forming of a stained window, it is not desired that all sections thereof be of the same color throughout the individual section. It has been found that clear and colored plastics may be colored by a simple, yet permanent coloring process. In accordance with this invention, a removable mask may be applied to the plastic piece and the mask removed when it is desired to color the plastic. The plastic is then placed in a color bath and kept in the bath from one-half minute to five minutes or more depending upon the desired density of color. The plastic is then washed and the design in color of the plastic piece is achieved in the area where it was not masked and produces a sharp edge design where the mask ended. The dye penetrates vertically into the plastic and the color density and shading is varied in accordance with the depth of penetration.

It is also possible to simulate stained glass windows by a photographic process. Accordingly, reference is made to a window construction illustrated in FIGURE 18 and generally referred to by the numeral **60**. The window **60** includes a transparent or translucent backing sheet **61** to which there is applied a sub-coat layer **62**. A conventional type of photographic emulsion **63** is applied over the sub-coat **62** and developed. A conventional sealing coat **64** is applied over the photographic emulsion **63** to seal the same and effect a bonding thereof to an overlying transparent sheet **65** of plastic. If desired, the sealing layer **64** may have incorporated therein an ultraviolet retardant. Although only one layer of photographic emulsion **63** has been illustrated so as to provide for a black and white coloring, if it is desired to provide for colors, there will be the usual numerous layers of photographic emulsion.

A plastic window formed in accordance with this invention weighs about one-third to one-half as much as a stained glass window. Therefore, even should the plastic window be unreinforced, a much larger plastic window panel may be applied than is possible with a stained glass window.

It is to be understood that the stained windows formed in accordance with this invention are completely sealed and are not subject to deterioration from the elements by internal attack. It is also to be understood that unlike stained glass windows, which requires light to pass therethrough, plastic windows will reflect a certain amount of light so as to have a pleasing appearance from the interior of the building and the exterior thereof.

Although only preferred embodiments of the invention have been specifically set forth herein, it is to be understood that minor variations may be made in the invention, as defined by the appended claims.

I claim:

1. A stained window comprising a translucent plastic backing sheet, an intermediate layer of translucent plastic, and overlying colored pieces of translucent plastic bonded to said plastic backing sheet by said intermediate layer of plastic, and combined reinforcing and divider strips of high strength plastic metal extending between and bordering said colored pieces of plastic, said divider strips simulating conventional leaded strips and being interlocked with both said backing sheet and said colored pieces to provide an integral reinforcing whereby a large unsupported window as compared to stained glass is possible, the connection between said divider strip and said backing sheet being in the form of grooves in said backing sheet and said divider strips filling and being interlocked said grooves.

2. A stained window in accordance with claim **1** wherein a developed photographic emulsion is disposed between said backing sheet and said colored plastic pieces.

3. The stained window of claim **1** wherein said intermediate plastic layer is utilized as a carrier for an ultraviolet retardant.

4. The stained window of claim **1** wherein said colored pieces are cast in place.

5. A method of forming a stained window comprising the steps of providing a rigid translucent plastic backing sheet, forming grooves in one face of the backing sheet, filling the grooves with a high strength plastic metal projecting above the backing sheet to provide a plurality of dams with said plastic metal forming divider strips and reinforcing for the entire window, forming a peripheral dam around the periphery of the backing sheet, and then pouring liquid colored translucent plastic into areas defined by the dams in accordance with the desired pattern.

6. A method of forming a stained window comprising the steps of providing a rigid translucent plastic backing sheet, bonding colored translucent plastic pieces to the backing sheet in accordance with the desired pattern, forming grooves between the colored plastic pieces and down into the surface of the backing sheet in accordance with the pattern, and then filling the grooves with a plastic metal.

7. A method of forming a stained window comprising the steps of providing a rigid translucent plastic backing sheet, forming grooves in one face of the backing sheet, forming dams in and above the grooves and around the periphery of the backing sheet, pouring a liquid translucent plastic into areas defined by the dams, applying preformed colored translucent plastic pieces to the liquid plastic, removing the dams, and applying a high strength

plastic metal in the grooves and between the colored plastic pieces with the plastic metal forming divider strips between the colored plastic pieces and reinforcing the entire window.

References Cited by the Examiner

UNITED STATES PATENTS

1,800,763	4/1931	Warga	161—5
1,813,901	7/1931	Bayne	156—63
2,095,402	10/1937	Stark	161—5
2,143,744	1/1939	Sohn	161—7
2,511,552	6/1950	Stuempges	161—5 XR
2,573,482	10/1951	Peik	161—53 X
2,982,042	5/1961	Gick	161—5

2,994,150	8/1961	Navarre	161—2
3,012,285	12/1961	Marcus.	
3,061,500	10/1962	Kreier	156—245
3,064,380	11/1962	Baut et al.	161—4
3,097,080	7/1963	Weir.	

FOREIGN PATENTS

619,652	5/1961	Canada.
1,197,567	6/1959	France.
1,265,562	5/1961	France.
6,328	3/1893	Great Britain.

JACOB H. STEINBERG, *Primary Examiner.*

ALEXANDER WYMAN, *Examiner.*