Nov. 17, 1970 J. P. NAUTA 3,540,964

METHOD FOR EXTRUDING MULTICOLORED SHEET MATERIAL

Original Filed Oct. 22, 1965 3 Sheets-Sheet 1

FIG. 1

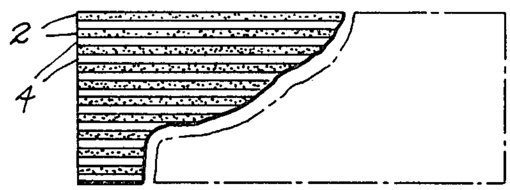


FIG. 2

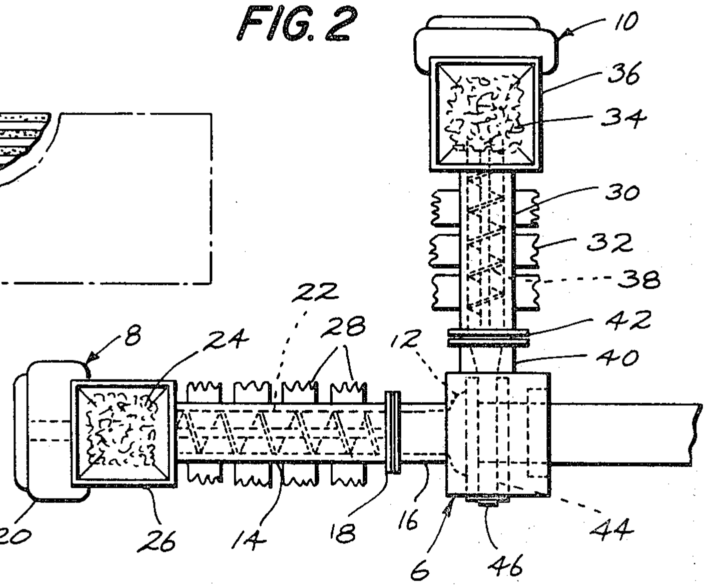


FIG. 4

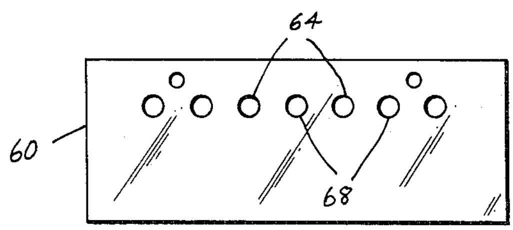


FIG. 3

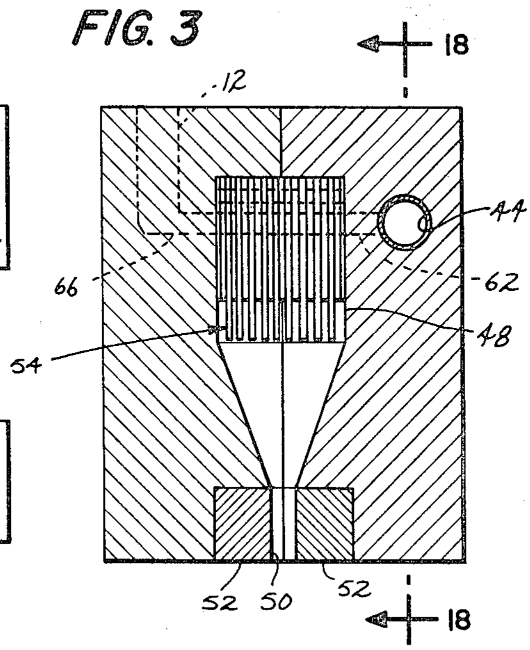


FIG. 5

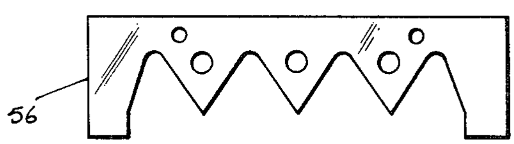
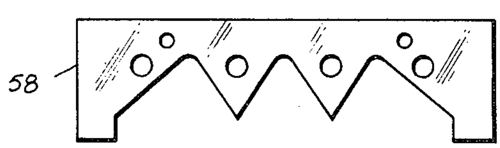


FIG. 6



INVENTOR.
JAN P. NAUTA
BY
Peter L. Costas
ATTORNEY

METHOD FOR EXTRUDING MULTICOLORED SHEET MATERIAL

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FIG. 7

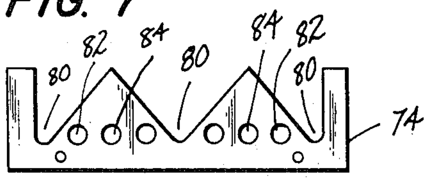


FIG. 11

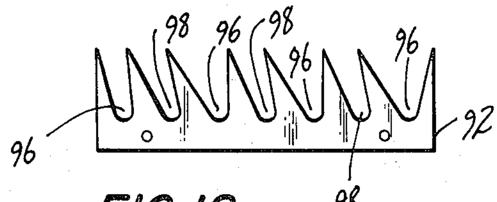


FIG. 8

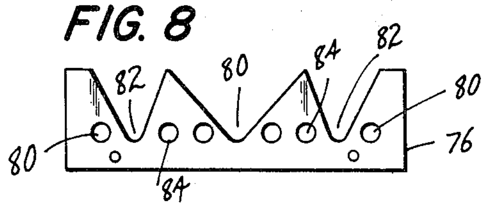


FIG. 12

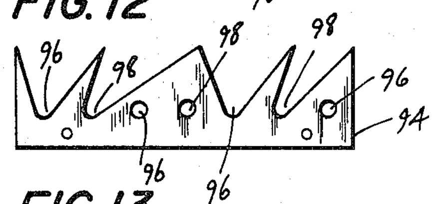


FIG. 9

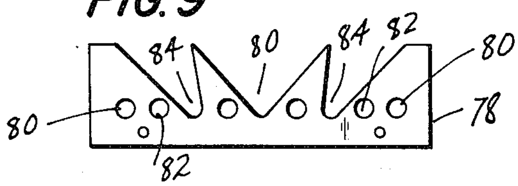


FIG. 13

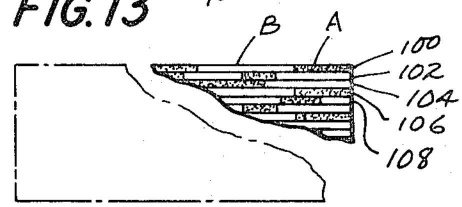


FIG. 10

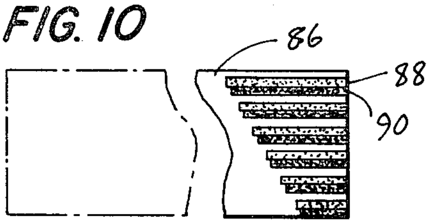


FIG. 14

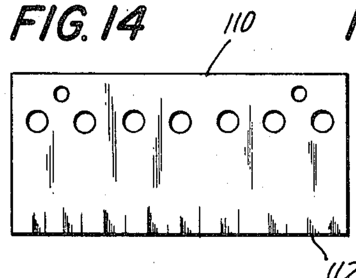


FIG. 15

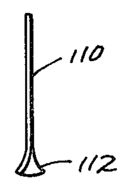


FIG. 16

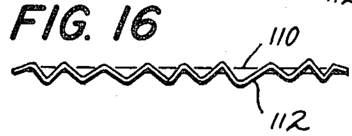
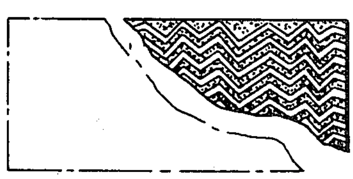


FIG. 17



INVENTOR.
JAN P. NAUTA
BY
Peter L. Costas
ATTORNEY

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FIG. 18

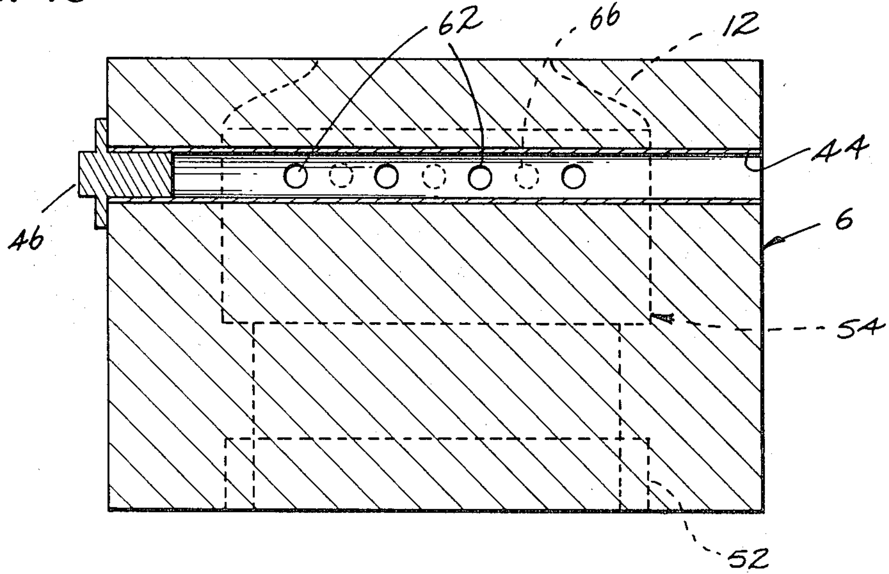


FIG. 19

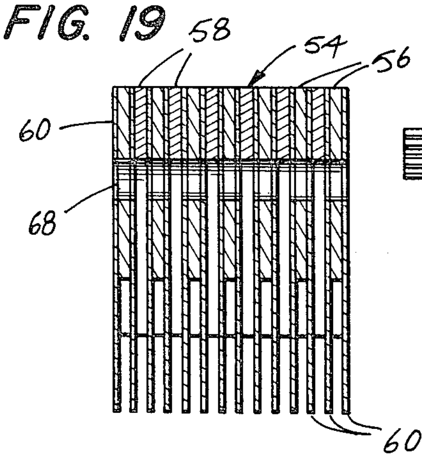


FIG. 20

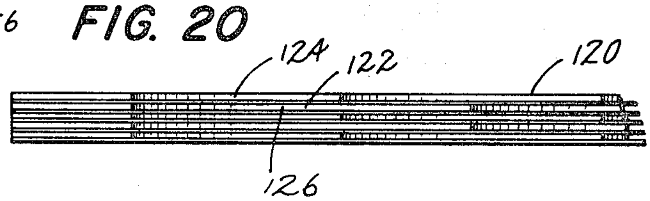


FIG. 21

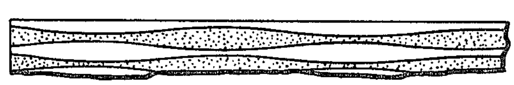


FIG. 22

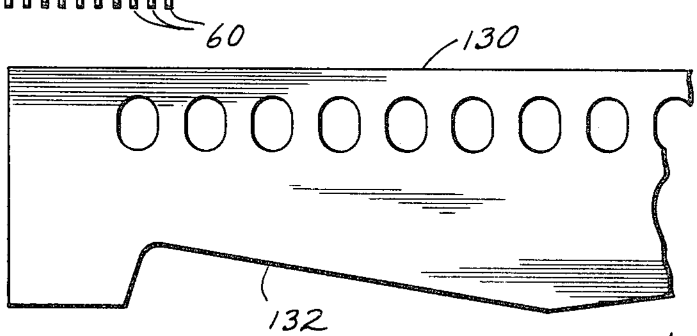
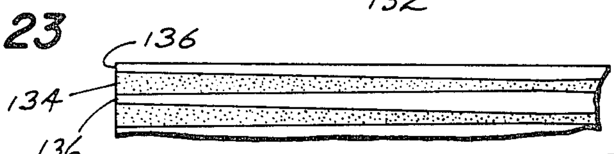


FIG. 23



INVENTOR.
JAN P. NAUTA
BY
Peter L. Costas
ATTORNEY

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METHOD FOR EXTRUDING MULTICOLORED SHEET MATERIAL

Jan P. Nauta, West Hartford, Conn., assignor to Rowland Products, Incorporated, Kensington, Conn., a corporation of Connecticut

Original application Oct. 22, 1965, Ser. No. 500,775, now Patent No. 3,443,278, dated May 13, 1969. Divided and this application Oct. 18, 1968, Ser. No. 768,740

Int. Cl. B29c 9/00

U.S. Cl. 156—244 6 Claims

ABSTRACT OF THE DISCLOSURE

A method is provided for extruding thermoplastic sheet material having differentially colored layers wherein differentially colored streams of the thermoplastic material are caused to flow in vertical layers and are combined in the extruder into a composite stream. The thermoplastic sheet material having differentially colored layers and in various patterns is also disclosed.

REFERENCE TO RELATED APPLICATION

The present application is a division of my copending U.S. application Ser. No. 500,775, filed Oct. 22, 1965, now U.S. Pat. No. 3,443,278, granted May 13, 1969.

BACKGROUND OF THE INVENTION

Oftentimes, the provision of extruded sheet material with differentially colored layers, or layers and bands, is desirable, particularly for novel decorative effects. Generally, such bands or layers of color extend parallel to the direction of extrusion, and a highly effective apparatus and method for making one form of differentially colored material are described in U.S. Pat. No. 2,985,556, granted May 23, 1961, to William P. Rowland, reissued as U.S. Pat. No. Re. 26,237, dated July 18, 1967.

The term "differentially colored material" is intended to encompass materials which are visually distinguishable from each other or a first color to provide a visual pattern effect and includes materials containing coloring matter such as dyes and pigments and materials which are substantially transparent to provide distinct coloration and the use of streams of the same color which have distinct optical properties such as by incorporation of optically modifying components such as aluminum flakes which produce variation in light refraction or transmission with resultant visual pattern effect.

It is an object of the present invention to provide a novel and attractive synthetic plastic sheet material having generally longitudinally extending layers of differentially colored material which may provide a wide variation in patterns.

It is also an object to provide a relatively simple and highly efficacious method of extruding synthetic plastic sheet material having longitudinally extending layers of differentially colored material which is adapted to wide variation in pattern design.

Still another object is to provide a method for making multilayered sheet material wherein the thickness of the layers may be varied across the width of the sheet material.

A specific object is to provide a method for making such synthetic plastic sheet material having differentially colored layers which is particularly adapted for convenient fabrication of eyeglass frames.

SUMMARY OF THE INVENTION

It has now been found that the foregoing and related objects and advantages may be readily attained in a meth-

od wherein there are provided a first stream of fluid thermoplastic material and a second stream of a differentially colored fluid thermoplastic material. The two streams are passed through separate manifolds in a color distributing stack having a multiplicity of spacing and flow elements so that the material from one stream is caused to flow through a flow element and the material from the other stream is caused to flow through another flow element spaced above the first mentioned flow element and separated therefrom by a spacing element. The thermoplastic material issuing from the flow elements combines in the extruder outwardly of the color distributing stack to provide a composite stream having differentially colored layers in at least a portion of the width thereof. The composite stream then is extruded to provide thermoplastic sheet material having differentially colored layers in at least a portion of the width thereof.

The method of the present invention desirably utilizes an extrusion apparatus comprising an extrusion die member having a chamber therein and an extrusion orifice in one surface thereof which communicates with the chamber, a first conduit for supplying a first stream of fluid synthetic thermoplastic material to the chamber at a first point spaced from the extrusion orifice and a second conduit for supplying a second stream of differentially colored fluid synthetic thermoplastic material to the chamber at a second point spaced from the first point and from the extrusion orifice with the conduits extending from surfaces other than that having the extrusion orifice.

A color distributing stack comprised of a multiplicity of spacer and flow elements is disposed within the chamber of the extrusion die member and has a plurality of manifolds extending therethrough adjacent the end thereof spaced from the extrusion orifice. Various of the manifolds communicate with one of the conduits and others communicate with the other conduit so as to provide flow of material from both of said conduits through the manifolds. The flow elements have at least one aperture or flow path therein extending from one of the manifolds to the other end of the stack adjacent the extrusion orifice to provide for flow therethrough, and at least two flow elements have overlying apertures extending from manifolds communicating with different conduits so as to provide superposed flow of thermoplastic material from both of the conduits in at least a portion of the stack. A spacer element separates the two flow elements from the manifolds for at least a portion of the distance to the end of the stack adjacent the extrusion orifice after which the superposed flowing materials from the two conduits may combine to produce a synthetic plastic sheet material having differentially colored layers in at least a portion of the width thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary end view of one embodiment of synthetic plastic sheet material extruded in accordance with the present invention;

FIG. 2 is a fragmentary plan view of an extruder assembly embodying the present invention;

FIG. 3 is a side sectional view to an enlarged scale of the extruder die assembly of FIG. 2;

FIG. 4 is a plan view of a spacing element in the color distributing stack of the extruder die assembly in FIG. 3;

FIG. 5 is a plan view of a flow element in the color distributing stack thereof;

FIG. 6 is a plan view of another flow element in the color distributing stack thereof;

FIGS. 7–9 are plan views of flow elements in another color distributing stack of the present invention;

FIG. 10 is a fragmentary end view of synthetic plastic sheet material extruded with a color distributing stack utilizing the flow elements of FIGS. 7–9;

FIGS. 11 and 12 are plan views of flow elements in another color distributing stack of the present invention;

FIG. 13 is a fragmentary end view of synthetic plastic sheet material extruded with a color distributing stack employing the flow elements of FIGS. 11 and 12;

FIG. 14 is a plan view of an alternative embodiment of spacer element;

FIG. 15 is a side elevational view thereof;

FIG. 16 is a front elevational view thereof;

FIG. 17 is a fragmentary end view of synthetic plastic sheet material extruded with a color distributing stack employing spacer elements of the type illustrated in FIGS. 14–16;

FIG. 18 is a sectional view along the line **18—18** of FIG. 3;

FIG. 19 is a side elevational view in section of the color distributing stack of FIG. 3 to a greatly enlarged scale;

FIG. 20 is a fragmentary front elevational view of another embodiment of color distributing stack of the present invention;

FIG. 21 is a fragmentary end view of synthetic plastic sheet material extruded with the color distributing stack of FIG. 20;

FIG. 22 is a plan view of another embodiment of spacing element for a color distributing stack; and

FIG. 23 is a fragmentary end view of synthetic plastic sheet material extruded with a color distributing stack employing the spacing element of FIG. 22.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Referring first in detail to FIG. 1 of the attached drawings, there is fragmentarily illustrated in end view synthetic plastic sheet material extruded in accordance with the present invention comprised of a plurality of layers **2** of a first color and layers **4** alternating therewith of a differentially colored material.

Referring next to FIGS. 2, 3, 18 and 19, therein illustrated is apparatus for extruding the sheet material of FIG. 1. Referring in particular to FIG. 3, an extruder assembly embodying the present invention is generally comprised of an extrusion die block assembly generally designated by the numeral **6**, a first extruder and conduit assembly generally designated by the numeral **8** and a second extruder and conduit assembly generally designated by the numeral **10**. The mainstream of plastic material to supply one of the layers **2, 4** is fed into the extrusion die assembly through the mainstream duct portion **12** of the extruder and conduit assembly **8**. Before entering the duct portion **12**, the plastic material passes through the heating section **14** of the conduit which is coupled to the intake section **16** by the collar assembly **18**. To supply and melt the plastic material a conventional extruder is provided wherein a motor **20** drives the feed screw **22** to draw synthetic plastic pellets **24** stored in the hopper **26** through the heating section **14** of the conduit wherein a series of heating elements **28** melts the pellets **24** into a fluid stream of synthetic thermoplastic material.

A stream of fluid synthetic thermoplastic material for the other of the layers **2, 4** is supplied to the extrusion die assembly **6** by the second extruder and conduit assembly **10** wherein the conduit similarly includes a heating section **30** wherein the heating elements **32** melt the pellets **34** in the hopper **36** to provide a fluid stream of synthetic thermoplastic material as the are moved along by the screw **38**. The intake section **40** is coupled to the heating section **30** through the collar assembly **42** and has a tubular portion **44** extending across the die assembly **6** which is locked within the die assembly by the flanged cap **46**.

Referring next to FIGS. 3 and 18, it can be seen that the die block assembly **6** has an elongated chamber **48** therein with a generally rectangular portion tapering to a reduced thickness adjacent an elongated extrusion orifice **50** defined by the die lips **52** in the front face of the extrusion block assembly **6**. The tubular portion **44** is disposed above the chamber **48** and the mainstream duct portion **12** fans out to an increased width and extends below the chamber **48**.

Seated and locked within the chamber **48** is a color distributing stack generally designated by the numeral **54** which is comprised of alternately disposed plate-like flow elements **56, 58** separated by plate-like spacer elements **60**. Extending downwardly from the tubular portion **44** of the extruder and conduit assembly **10** are a plurality of conduit portions **62** which communicate with manifolds or flow paths through the color distributing stack **54** defined by aligned apertures **64** in the flow elements **56, 58** and spacer elements **60**. Extending upwardly from the mainstream duct portion **12** are a plurality of conduit portions **66** which communicate with manifolds defined by the apertures **68** in the flow elements **56, 58** and spacer elements **60** and best seen in FIGS. 4–6. As can be seen, the manifolds defined by apertures **64, 68** alternate so as to provide adjacent flow paths for material from the two conduit assemblies **8, 10**.

The apertures **64** in the flow elements **56** are notched outwardly so that the apertures expand and the adjacent sides thereof converge toward the extrusion die orifice **50** to provide expanding paths for the synthetic plastic material flowing therethrough from the manifolds communicating with the tubular portion **44** of the conduit assembly **10**. The apertures **68** in the flow elements **58** are similarly notched outwardly to provide expanding paths for synthetic plastic material flowing therethrough from the manifolds communicating with the mainstream duct portion **12**. It can be seen that the expanding apertures in the flow elements **56, 58** alternate across the width of the color distributing stack. The flow elements **56, 58** and spacer elements **60** are pinned together in a stack against relative displacement by elongated fasteners **70** seated in the apertures **72** of the members **56, 58** and **60**.

Thus, in operation of this particular embodiment, molten material of a first color from the extruder and conduit assembly **10** enters into the extrusion die assembly **6** through the tubular portion **44**, and passes downwardly through the conduit portions **62** into the manifolds **64** of the color distributing stack **54**. As it flows through the flow elements **56**, it is allowed to flow outwardly through the notched-out apertures between the spacer elements **60**. Similarly, differentially colored molten thermoplastic material from the extruder and conduit assembly **8** flows into the mainstream duct portion **12** and upwardly through the conduit portions **66** into the manifolds **68** in the color distributing stack **54**. As it flows through the flow elements **58**, it is permitted to flow outwardly in the notched-out portions between the spacer elements **60**. As the streams of material flowing within the notched-out apertures of the flow elements **56, 58** pass outwardly of the spacer elements **60**, they combine into a multi-layered stream with alternating layers of differentially colored material. This stream is then directed by the configuration of the extrusion chamber **48** to the extrusion orifice **50** defined by the die lips **52** wherein its final configuration is established in terms of width and thickness, to produce sheet material substantially as illustrated in FIG. 1.

Referring now to FIGS. 7–10, flow elements of the type illustrated in FIGS. 7–9 are used to produce the sheet material of FIG. 10 wherein two layers containing differentially colored bands alternate with a third differentially colored material and also taper in width through the depth or thickness of the sheet material. The flow elements specifically illustrated in FIGS. 7–9 represent those utilized in fabricating the upper portion of the sheet material of FIG. 10. As can be seen, each of the flow elements **74, 76** and **78** has a multiplicity of apertures **80**, **82** and **84** across the width thereof which provide manifolds connecting to three conduits each carrying a differentially colored material. The flow element **74** has the apertures **80** therein communicating with conduits of the same color so that the layer formed thereby is of a single color as represented by the numeral **86** in FIG. 10.

The flow element **80** of FIG. 8 has the apertures **82** at either side thereof communicating with a conduit of a second color and the central aperture **80** therein communicating with the conduit for the same color as that utilized by the flow element **74**. In this manner, two bands of a second color represented by the numeral **88** in FIG. 10 are provided in the layer formed thereby with the first color disposed therebetween. The flow element **78** has the apertures **84** at either side thereof communicating with a conduit for a third color and the central aperture **80** communicating with the conduit for the first color utilized by the flow element **74**. Thus, this flow element provides two bands of a third color indicated by the numeral **90** in FIG. 10 to either side of a central portion of the first color.

In assembling the remaining portion of the color distributing stack, the flow element **74** of FIG. 7 is again repeated and the flow elements **76**, **78** of FIGS. 8 and 9 have the shape of the notched-out apertures **82**, **84**, respectively, modified to an increasing extent to reduce the width thereof and the width of the apertures **80** expanded to compensate for this reduction. Thus, the bands of the second and third colors are reduced in width through the depth of the sheet material as illustrated.

Referring now to FIGS. 11–13, the flow elements **92**, **94** of FIGS. 11 and 12 are used to fabricate the sheet material of FIG. 13. As can be seen, the flow element **92** has a series of notched-out apertures **96**, **98**, which alternate across the flow element and provide manifolds communicating with two conduits for differentially colored material. The flow element **94** has apertures **96**, **98** therein which also alternate across the width of the flow element but which are not all notched out so that flow is not obtained from all conduits. Both flow elements are asymmetric in terms of the notched-out apertures **96**, **98** and of the width of the apertures adjacent the extrusion die orifice so that reversal of the flow elements **92**, **94** will produce a different orientation of colored material issuing from the manifolds therein.

In forming the sheet material of FIG. 13, the layer **100** is provided by the flow element **94** as illustrated and the layer **102** is provided by the flow element **92** as illustrated. The layer **104** is provided by the flow element **94** in reversed position, the layer **106** is provided by the flow element **94** as illustrated and the layer **108** is provided by the flow element **92** in reversed position. Thus, layers have the color bands A, B varying in location across the width of the sheet material.

Referring now to FIGS. 14–17, the spacer element **110** has the edge portion **112** thereof to be disposed adjacent the extrusion die orifice corrugated as best seen in FIGS. 15 and 16 so as to provide undulations therein. These undulations produce disturbance in the flow of material from the flow elements thereabove and therebelow so as to produce a nonrectilinear layered structure of the type illustrated in FIG. 17.

Referring now to FIGS. 20 and 21, the flow elements **120**, **122** thereof have the notched-out apertures **124**, **126** therein opening to a relatively large width with respect to the thickness of the stock from which the elements are formed, and have spacer elements **128** therebetween. By controlling the pressure of the thermoplastic material in the conduits, the flow from adjacent apertures **124**, **126** in the adjacent flow elements **120**, **122** will produce lesser pressure in the expanded portions of the apertures **124**, **126**, than in the area in alignment with the manifold diameter. Accordingly, the aligned manifold portion of an aperture in one flow element will align with the widely divergent portion of an aperture in the adjacent flow element and the pressure of the material thereat will distort the uniformity of the thickness of that stream due to the lesser pressure in the stream thereabove or therebelow and produce undulations in the width of the layers as illustrated in FIG. 21.

Referring now to FIGS. 22 and 23, the spacer element **130** has its edge adjacent the extrusion die orifice provided with a recess **132** which is of maximum depth adjacent one side and tapers outwardly toward the extrusion die orifice. Such a spacer element when placed between flow elements apertured so as to provide the same color will create reduced resistance to flow of that color through those flow elements at the recessed portion and increase the amount and pressure of material issuing thereat. This increased flow will depend upon the depth of the recess at that point and the increased pressure of this colored stream will produce deflection in the streams of the differentially colored material disposed thereabove and therebelow to produce a sheet material as indicated in FIG. 23. As can be seen, the layer **134** of the first color provided by a pair of flow elements separated by the recessed spacer element **130** tapers to a reduced thickness toward the center of the sheet material and the layers **136** of the differentially colored material taper to a reduced thickness toward the side edge of the sheet material.

As can be seen from the foregoing specific illustrations and embodiments, a high degree of versatility is provided to the designer in terms of the patterns which can be extruded in accordance with the present invention. Multiple layers of the same color can be provided in one portion of the width of the sheet material while adjacent portions include alternating colors. In addition to truly colored or pigmented materials pearlescent and metallic components may be provided in a stream of the same color as that employed in an adjacent layer to provide unusual effects.

As shown in FIGS. 7–10, a band of color may be tapered in width through the depth of the sheet material to provide decreasing intensity of that color through the tapering portion. This type of material simulates the gradient density sheet material described and claimed in the U.S. Pat. No. 2,985,556, granted May 23, 1961, to William P. Rowland.

It will also be appreciated that motion may be superimposed upon the layered streams to further vary the disposition of the differentially colored portions and to upset or otherwise modify the positioning of the pearlescent and metallic flake materials within the body of the sheet material.

The spacer and flow elements may be fabricated so as to be relatively interchangeable in the color distributing stack to make various types of patterns, particularly when the notched-out apertures in the flow elements are asymmetric with respect to the width thereof. For making thicker layers, several flow elements having the same configuration of apertures may be superimposed with relatively thin spacer elements therebetween to minimize undue interference with the flow of synthetic plastic material thereabove and therebelow. By varying the configuration of the notched-out apertures in the flow elements, the width and disposition of the colored streams may be widely varied so long as provision is made for adequate flow of synthetic thermoplastic material to fill the aperture at its widest portion and minimize trailing at the edges between two differentially colored materials.

Although various arrangements may be employed such as providing all conduits above or below the stack, one convenient arrangement locates one conduit above and another conduit below the color distributing stack and both extend across the width thereof. The manifolds extend upwardly from the lower conduit and downwardly from the upper conduit in spaced relationship transversely of the color distributing stack, preferably in alignment to minimize variation in flow and pressure differentials. Such an arrangement normally will utilize a cross-head extruder arrangement wherein the main extruder feeds to the rear of the extrusion die and the conduit from the extruder expands inwardly to the color distributing stack and extends across the width thereof to enable the several manifolds to be fed therefrom. The cross-head extruder directly feeds to a conduit extending across the width of the color distributing stack and enables the several cooperating manifolds to be fed therefrom.

Generally, a multiplicity of manifolds will extend through the color distributing stack. Although as few as three manifolds may be employed with limitations on versatility, generally at least seven and preferably twelve or more are employed to obtain highly effective flow of the synthetic plastic material. Depending upon the extruders, the thickness of the flow elements, and the width and thickness of the sheet material, even more manifolds may be desirable for some installations. Generally, although adjacent manifolds may carry the thermoplastic material from different conduits, a series of adjacent manifolds may be fed by the same conduit for a monocolored portion of the width of the sheet material or for special effects where the distribution of the other color to that portion may be impeded for the desired pattern.

The flow elements and spacer elements are generally plate-like members assembled in a stack so as to provide spacer elements between one or more flow elements defining a layer. Although the spacer elements are generally unapertured, the flow elements are apertured as by notches or slots to provide paths therein from the manifolds to the edge adjacent the extrusion die orifice. To provide for a substantially uniform layer or width of a color encompassing two manifolds of that color separated by a manifold of another color, the slots or notches defining the apertures from the manifolds expand the width toward the edge adjacent the extrusion die orifice and desirably converge with adjacent slots or notches to minimize spacing therebetween.

It will be appreciated that more than two differentially colored synthetic plastic materials may be employed in accordance with the present invention by providing additional conduits and manifolds connected to the various conduits. In such a method and apparatus, various apertures in the flow elements communicate with the manifolds for the several colors and are so configured as to provide overlying flow of streams of differentially colored thermoplastic material from the various conduits in any desired arrangement. In accordance with one aspect of the invention, the flow from each of the conduits may be provided to the depth of the combined stream at a portion of the width thereof or various combinations of the several colors may be so combined to provide the full depth at any one point. In addition, layers containing more than one color may be formed by having the apertures in the flow elements configured to provide side-by-side flow of streams of molten thermoplastic material from more than one conduit. In this manner, various patterns of the differentially colored material through the depth and width of the sheet may be obtained.

It will be appreciated that the number of layers of differentially colored material may be varied widely. Although as few as three layers will provide the differentially colored layered effect of the present invention, generally it is desirable to provide four to ten layers. As many as twenty, and even more, layers may be provided depending upon the thickness of the material being extruded but factors of fluid dynamics in thin stream layers must be considered in determining the number of layers that may be employed for a given thickness of material.

Because of the effect of fluid dynamics and static flow across the surfaces of the spaces and flow elements, it is generally desirable to have a minimum thickness of about 0.03 inch for the stream of color between the spacer elements. However, as the thickness of the stream is increased over the range of the next 0.10 inch, the flow increases exceedingly rapidly so that it is often desirable to make a thick layer between thinner layers as a composite of several stream layers of that color separated by spacer elements to avoid excessive fluid pressure which would distort the differentially colored layers thereabove and therebelow. For example, a flow element of 0.047 inch thickness between spacer elements may produce a stream layer of 0.010 inch while a flow element of 0.063 inch thickness between spacer elements produces a stream of 0.038 inch. Thus, to produce a stream of 0.020 inch with greater control, it is desirable to employ two of the smaller flow elements separated by a spacer element, desirably of about 0.015 inch. Similarly, even thicker streams of a single color may be compiled by use of small thickness flow elements to obtain greater control of the thick streams.

The flow elements should have the flow apertures therein configured so as to supply sufficient molten material to avoid erratic edges between layers or adjacent bands of color depending upon the color formation desired. Where the sides of adjacent apertures in the flow elements converge toward the extrusion die orifice, the flow elements should provide a flow path of sufficient length to permit flow of sufficient material to such points of convergence for effecting uniformity of the thickness of the layer to such points and/or the flow elements should have a sufficiently high number of manifolds extending therethrough from the conduits so that a greater number of flow apertures of smaller width can be employed to effect the desired sufficiency of flow.

Although the spacer elements desirably extend to the end of the stack adjacent the extrusion die orifice, it may be desirable to have the spacers, or portions thereof, of greater or lesser length than the flow elements so that they extend beyond or terminate short of the end of the flow elements in at least portions thereof. By using shorter spacer elements, disturbance in the regularity of the adjacent stream layers may be effected by use of a stream of higher flow rate and various flow patterns in the differentially colored material or special effects can be superposed thereon. For example, by providing a pair of adjacent flow elements for a single color separated by a spacer element configured so that its edge adjacent the extrusion die orifice is recessed inwardly of the color distributing stack at one point and tapers outwardly therefrom over a portion of the width of the spacer element, it is possible to obtain sheet material having a layer of tapering thickness over a portion thereof. The stream of the color formed by the separated flow plates will be of greater width adjacent the deeply recessed portion of the recessed edge due to reduced resistance to flow along the surfaces of the spacer element and will taper to a reduced thickness as the recessed edge tapers outwardly. Similar effects can be obtained by recessed edge spacers above and below a flow element of slightly greater thickness than the flow elements of the encapsulating streams due to the reduced static pressures of the encapsulated stream, with the encapsulating streams of another color disposed thereabove and therebelow being of reduced dimension.

In another structure, the manifolds supplying the colors may be widely spaced across the width of the color distributing stack and the flow apertures thus caused to diverge considerably. When the thickness of the flow elements is sufficiently small in such a structure, the undulations in the width of the layers of colors will be apparent due to the effect of fluid dynamics since the velocity and flow volume of the differentially colored materials will be varying across the width of the sheet material. By crimping or otherwise deforming the edge of the spacer elements adjacent the extrusion die orifice, undulations in the differentially colored materials may also be provided through disturbance of the flow thereof.

Thus, it can be seen that the present invention provides a novel and attractive synthetic plastic sheet material having generally longitudinally extending layers of differentially colored material which may provide a wide variation in patterns. The present invention provides a relatively simple and highly efficacious method for producing such sheet material having longitudinally extending layers of differentially colored material.

By use of relatively economically and simply fabricated components in the method, the designer may create numerous pattern designs containing both multicolored layers and multicolored bands across the width of the sheet material. Such sheet material has a wide variety of applications and is particularly adapted to the fabrication of eyeglass frames wherein beveling of the edge portions thereof will expose the multicolored layers.

Having thus described the invention, I claim:

1. In the method of making synthetic thermoplastic sheet material having differentially colored layers in at least a portion thereof, the steps comprising: providing a first stream of fluid synthetic thermoplastic material; providing a second stream of differentially colored fluid synthetic thermoplastic material; passing said first and second streams through separate manifolds in a color distributing stack of a multiplicity of spacing and flow elements; causing material from one of said streams to flow from one manifold through a flow element; causing material from the other of said streams to flow from another manifold through another flow element above said first-mentioned flow element and separated therefrom by a spacing element with said material issuing from said flow elements combining to provide a composite stream outwardly of said stack having differentially colored layers in at least a portion of the width thereof; and extruding said composite stream to provide a synthetic thermoplastic sheet material having differentially colored layers in at least a portion of the width thereof.

2. The method of claim **1** wherein said material flowing from said one and another manifold expands in width as it passes through the color distributing stack.

3. The method of claim **1** wherein material is caused to flow in an adjacent path through one of said flow elements from manifolds communicating with both of said conduits so as to provide differentially colored bands within the same layer.

4. The method of claim **1** wherein the material flowing from one of said streams distorts the thickness of the material flowing from the other of said streams in at least a portion of the width thereof to provide differentially colored layers of varying thickness.

5. In the method of making synthetic thermoplastic sheet material having differentially colored layers in at least a portion thereof, the steps comprising: providing a first stream of fluid synthetic thermoplastic material; providing a second stream of differentially colored fluid synthetic thermoplastic material; providing a third stream of differentially colored fluid synthetic material thermoplastic material; passing said first, second and third streams through separate manifolds in a color distributing stack of a multiplicity of spacing and flow elements; causing material from one of said streams to flow from one manifold through one flow element; causing material from said second stream to flow from another manifold through another flow element above said first-mentioned flow element and separated therefrom by a spacing element; causing material from said third stream to flow from yet another manifold in yet another flow element separated from adjacent flow elements by spacing elements, said material issuing from said several flow elements combining to provide a composite stream outwardly of said stack having three differentially colored layers in at least a portion of the width thereof; and extruding said composite stream to provide synthetic thermoplastic sheet material having three differentially colored layers in at least a portion of the width thereof.

6. The method of claim **5** wherein material is caused to flow in adjacent paths through one of said flow elements from manifolds from each of said streams to provide three differentially colored bands in the same layer.

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BENJAMIN R. PADGETT, Primary Examiner

S. J. LECHERT, Jr., Assistant Examiner

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