

Oct. 25, 1966

C. R. SOUTHWICK

3,281,516

PROCESS FOR MAKING FACING FOR SIDING

Filed June 18, 1963

2 Sheets-Sheet 1

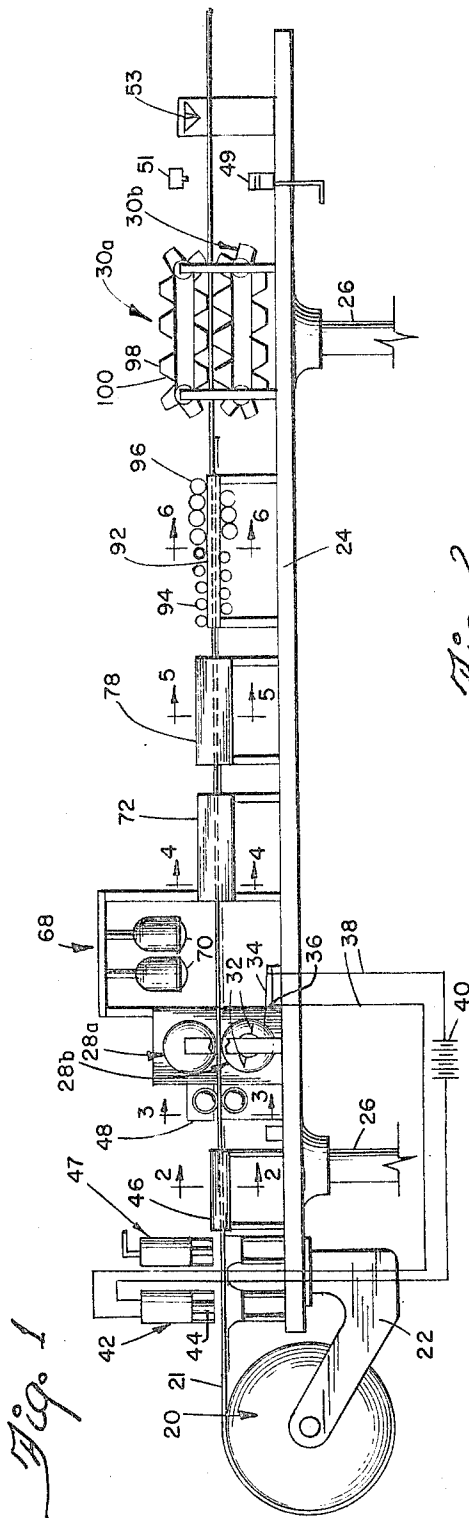


Fig. 2

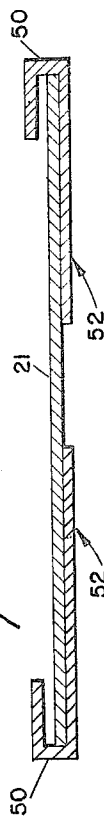


Fig. 4

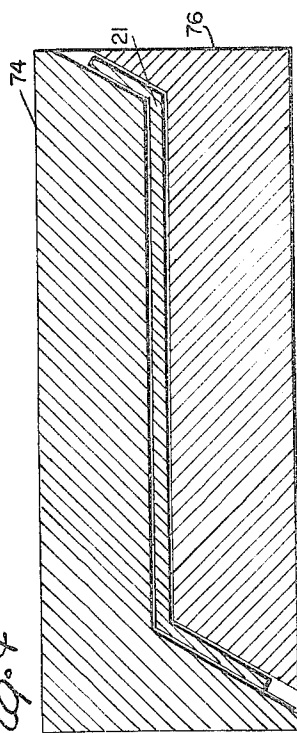
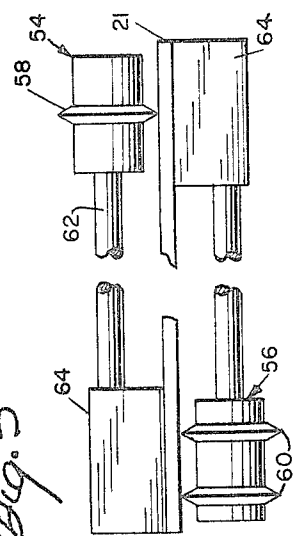


Fig. 3



INVENTOR,
Charles Russell Southwick
BY
*Pendleton, Furness,
Seibold & Williams
Attys.*

Oct. 25, 1966

C. R. SOUTHWICK

3,281,516

PROCESS FOR MAKING FACING FOR SIDING

Filed June 18, 1963

2 Sheets-Sheet 2

Fig. 5

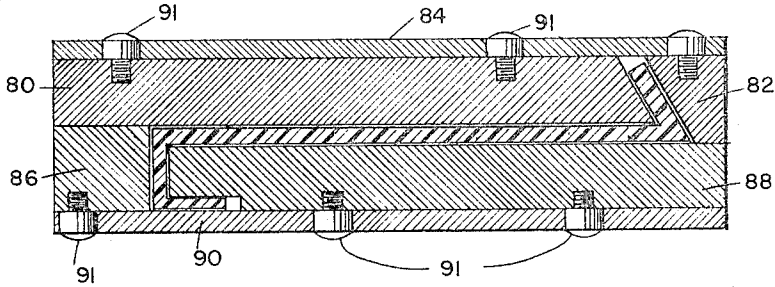


Fig. 6

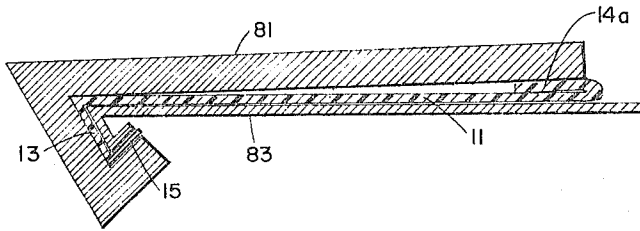


Fig. 8

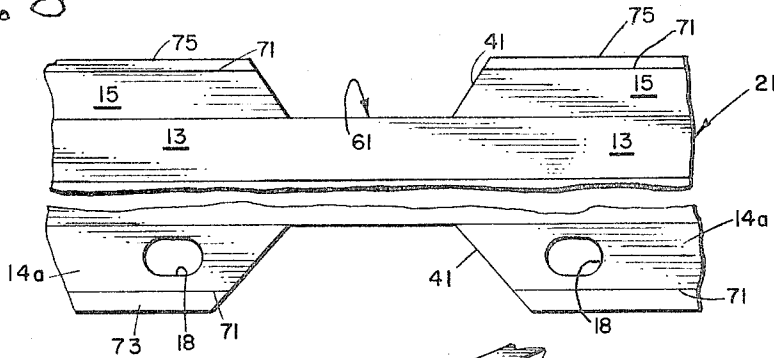
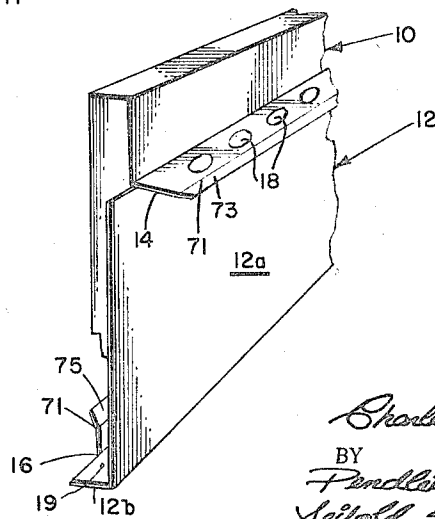


Fig. 7



INVENTOR.

Charles Russell Southwick

BY

*Fendleton, Mauney,
Seibold & Williams.
Attys.*

1

3,281,516

PROCESS FOR MAKING FACING FOR SIDING
Charles Russel Southwick, Chicago, Ill., assignor to United States Gypsum Company, Chicago, Ill., a corporation of Illinois

Filed June 18, 1963, Ser. No. 288,687

5 Claims. (Cl. 264—285)

This invention relates to a process for forming a thin plastic sheet into desired cross-sectional configuration. More particularly, this invention relates to a process for forming a plastic facing for a siding member, such as is disclosed in the copending application of Charles R. Norman, Jr., Serial No. 288,674, filed June 18, 1963, now Patent No. 3,237,361.

As disclosed in Norman U.S. Patent No. 3,237,361, a novel siding construction adapted for arrangement in overlapping relation on a supporting framework comprises a thin plastic sheet disposed over surface portions of a rigid boardlike core. Proper functioning of such siding requires that the plastic facing be formed in a precise manner so as to cover the normally-exposed front surface of the rigid core as well as a core transverse nailing area or "fastener band."

The plastic facing extends about the bottom edge and terminates at the core rear surface in the form of an upwardly and outwardly extending detent flap. The facing disposed over the front part of the siding has a terminal edge portion which is bent to form a downwardly and outwardly extending pendent flap. When arranged in overlapping arrangement in the normal position of use, the pendent flap of a lower siding member is received in interlocking relation in a pocket defined in part by the detent flap of an overlying siding member. The interlocking flaps assist the nails or other securing means which affix the siding members to a supporting framework in resisting wind and other forces tending to pull the siding members from the framework. The interlocking flaps also provide an efficient seal protecting the underlying framework from wind and water.

It is necessary that the plastic facing for the siding above described be properly formed in a uniform manner. Facing uniformity is essential so that siding sections may be readily interlocked in overlapping relation. Proper facing formation is, of course, also essential in order to provide an attractive and uniform siding appearance.

The apparatus and process steps hereinafter described are employed in the fabrication of the above-described novel plastic facing which may readily be applied to a rigid core for purposes of forming siding. The apparatus combination hereinafter described efficiently forms a continuous plastic sheet into a desired, precise configuration with a minimum number of processing steps. The apparatus is relatively simple in nature and may readily be adjusted for purposes of forming plastic facing of various dimensions to be employed in the manufacture of siding of various sizes.

It is an object of this invention to provide novel process steps whereby a plastic sheet is processed into a siding facing in a minimum amount of time with a minimum expenditure of mechanical effort.

It is a further object of this invention to provide a continuous process for producing plastic facings of precise construction in a completely automatic manner.

The above and other objects of this invention will become more apparent from the following description when read in the light of the accompanying drawing and appended claims.

In one embodiment of this invention a continuous sheet of plastic, such as vinyl, possessing good weather-resistance characteristics is passed from a supply roll by

2

means of pull-through rolls into a punch station. Aligned apertures are formed in the plastic sheet in the punch station along the longitudinal edge portions of the sheet to permit passage of fasteners during erection of the ultimately formed siding and to provide for the passage of moisture from between the facing and core in the final siding product. The punched plastic sheet is then guided between embossing rolls which emboss continuous, longitudinally extending fold lines in the plastic to facilitate bending of the plastic sheet into desired cross-sectional configuration.

The plastic sheet is then moved beneath heat lamps which warm the sheet prior to the plastic sheet being moved through a preformer which effects a gradual longitudinal bending of the plastic sheet along the fold lines embossed therein. Upon emergence from the preformer, the plastic sheet is pulled through a heated former for imparting a substantially permanent cross-sectional configuration to the plastic sheet conforming to the configuration it possesses upon exiting from the preformer. The sheet is then passed between opposed plates of an overbender which insures a final, desired, angular relationship between portions of the sheet normally covering the siding core bottom edge and exposed front surface. The plastic sheet is first heated and then cooled while passing through the overbender, after which it may be cut into appropriately sized sections for application to a boardlike core, as will hereinafter be discussed in detail.

For a more complete understanding of this invention, reference will now be made to the drawing wherein:

FIGURE 1 is a side elevational view of one embodiment of the apparatus of this invention which is employed for carrying out process steps for forming a plastic facing;

FIG. 2 is a sectional view of the guide means utilized in the apparatus of FIG. 1 taken on line 2—2 of FIG. 1 and illustrated on an enlarged scale;

FIG. 3 is a fragmentary elevational view of the embossing rollers of FIG. 1 taken on line 3—3 of FIG. 1 and illustrated on an enlarged scale;

FIG. 4 is a sectional view of a portion of a preformer die disposed adjacent the die entrance taken on line 4—4 of FIG. 1 and illustrated on an enlarged scale;

FIG. 5 is a sectional view of a former die taken on line 5—5 of FIG. 1 and illustrated on an enlarged scale;

FIG. 6 is a sectional view of overbender apparatus taken on line 6—6 of FIG. 1 and illustrated on an enlarged scale;

FIG. 7 is a fragmentary perspective view of a siding member employing plastic facing made in accordance with the process of this invention in which the core is partially broken away; and

FIG. 8 is a top plan view of a fragment of a sheet partially processed by the apparatus of FIG. 1 and illustrated on an enlarged scale.

In the following description of the various views of the drawings, different reference numerals identify comparable sheet and shingle portions so as to more clearly indicate the processing stage of the facing member referred to.

Referring now more particularly to FIG. 1, a somewhat schematic representation of one form of apparatus which may be employed in carrying out the method steps for forming plastic siding is illustrated in side elevational view. As above noted, plastic siding formed in accordance with the process steps hereafter described by means of the apparatus which will also be hereafter described, is that which is employed with a rigid core for purposes of forming weather-resistant siding. Such siding is disclosed in detail in Norman United States Patent No. 3,237,361. FIG. 7 is a fragmentary perspective view illustrating siding made in accordance with the invention of the copending Norman application.

The siding comprises a rigid boardlike core 10 which may be an insulation board having a density of between about 22-30 pounds per cubic foot. The board may have a thickness of $\frac{3}{8}$ to $\frac{1}{2}$ inch and a thin plastic facing 12 is disposed on the board exterior surface portions. The facing 12 may be adhesively secured to core 10 by means of adhesive applied to the core portion engaging face surface portion 12a and a bottom edge surface portion 12b.

Facing 12 has a pendent flap 14 downwardly disposed on the front siding surface and an upwardly disposed detent flap 16 outwardly projecting at the rear of the siding. In the normal course of use, the pendent flap 14 of a siding member interlocks with a detent flap 16 by being inserted in a pocket formed in part by the detent flap of an overlapping siding member when the siding members are arranged on a supporting framework surface.

Securing means traverse apertures 18 in the pendent flap and function to secure each siding member to the supporting framework after the siding has been arranged in overlapping and interlocking relationship with an underlying siding member. Apertures 18 enable nails to traverse the pendent flap, without affecting its interlocking abilities, an underlying thickness of the facing, as well as the core 10 in the course of securing the siding to a supporting framework. The plastic facing must be formed so that the opposed terminal edge portions thereof define flaps 14 and 16 and so that the two surface portions 12a and 12b of predetermined dimensions may be secured to an outwardly disposed face portion of the core board 10, as well as the bottom edge thereof. To enable the illustrated siding of FIG. 7 to function efficiently, flap portions 14 and 16 are disposed at slight acute angles of about 10 degrees relative to adjacent main siding surfaces.

In order to further facilitate the interlocking action of the facing flaps in the course of siding erection, it is desirable to outwardly bend a distal longitudinal edge portion of each flap 14 and 16. Such bending may be effected by means of embossing rolls which slightly bend distal longitudinal edge portions of the flaps in desired directions, as will hereinafter be explained in greater detail.

The apparatus of FIG. 1 is adapted to process plastic in sheet form so that the facing 12 of FIG. 7 is the resultant product. Facing 12 may then be readily, adhesively or otherwise, secured to a core board 10. The plastic facing 12 is formed from a roll of thin sheet plastic, such as vinyl, having a thickness of approximately .02 inch. FIG. 1 illustrates a roll 20 of rigid vinyl sheeting having a width such as is adequate to provide a facing, such as facing 12 illustrated in FIG. 7. Roll 20 is rotatably mounted on a supporting bracket 22, which is in turn secured to an elongate platform 24 maintained in elevated position on supporting standards 26.

Sheet plastic 21, upon being pulled from roll 20, forms an elongate strip which in FIG. 1 moves to the right as the result of pulling action effected by pull-through rolls 28a and 28b, as well as the pull-through belt sections 30a and 30b. The pull-through rolls comprise cylindrical rolls, transversely disposed to the path of the sheet 21, which engage opposed surface portions thereof. Upper roll 28a is rotatably driven in a counterclockwise direction and lower roll 28b is driven in a clockwise direction so that the engaged plastic sheet may be pulled to the right.

Secured to the hub of lower roll 28b are projecting fingers 32 which contact switch arm 34 in the normal course of rotation of the lower roll 28b. When the projecting fingers 32 engage switch arm 34, the latter arm is pivoted into engagement with a contact 36 closing a circuit which includes conduits 38, a suitable power source 40 and a solenoid of a solenoid-driven punch 42. When the circuit is closed, a solenoid of punch portion 44 of the solenoid-driven punch 42 is energized to move the punch in opposition to a spring return, not shown. The punch,

driven by the solenoid, penetrates longitudinal edge portions of the underlying moving sheet so as to form apertures, such as nail-receiving apertures 18 adjacent one longitudinal edge of sheet 21 and weep holes 19 adjacent the opposed sheet longitudinal edge as illustrated in facing 12 of FIG. 7.

The weep holes 19 allow drainage of any water which may collect in the lower portion of the siding members between the facing and core. The nail-receiving apertures 18 are preferably spaced on $\frac{1}{4}$ inch centers and each aperture 18 is approximately $\frac{3}{8}$ inch long. The weep holes are of smaller size and preferably spaced about 18 inches apart.

As will be seen from FIG. 7, the detent flap 16 and the pendent flap 14 are both cut back from the facing longitudinal ends and the flap terminal ends are cut to slant inwardly. The slanting-edge flap construction provides clearance between adjoining pieces in edge-to-edge relation when forming a horizontal course of siding. Formation of the flap edges is effected by means of a second punch 47 (see FIG. 1) similar to punch 42, which forms truncated V-shaped notches 41 (see FIG. 8) in the moving sheet 21. The notch-forming punch, for purposes of greater accuracy, is preferably actuated by a solenoid which is activated by a photoelectric cell 49 (see FIG. 1) positioned the desired distance from the punch so as to provide the desired interval between notches 41. The photoelectric cell 49 may be actuated by light emanating from lamp 51 passing through a previously formed notch which has been formed in the sheet 21. The cell 49 energizes the punch 47 with the assistance of a photocell relay (not illustrated), the construction of which is well known in the art. Slight changes on the position of the photoelectric cell may be necessary at different sheet speeds because of the slight delay in the operation of the punch. The photoelectric cell can also operate a cut-off knife 53 to divide the continuous sheet 21 into siding sections of desired length after the sheet has been formed into desired cross section.

The moving plastic sheet, following the formation of apertures 18, weep holes 19 and edge notches 41, enters a guide station 46 which places the moving sheet in proper registration relative to the entrance of embossing station 48. It will be noted from FIG. 2 that the guide station utilizes opposed guide portions 52 having U-shaped guide edges 50 which slidably engage the longitudinal edges of the moving sheet 21. The opposed guide portions 52 are laterally adjustable so that plastic sheets of varying width may be accommodated therein and guided thereby.

The embossing station 48 includes embossing rollers 54 and 56 (see FIG. 3) having affixed thereto single embossing rib 58 and twin embossing ribs 60, respectively. Connected to each embossing roller by means of a rod 62 is a resilient back-up roller 64 which enables the rotatably engaged embossing ribs 58 and 60 to penetrate to a desired degree into the moving sheet 21 without danger of severing the same. It will be apparent from FIG. 3 that the twin ribs 60 form fold lines which will enable the flap portion 16 and the edge-covering portion 12b of the facing 11 of FIG. 7 to be formed. It is equally apparent that the fold line embossed in moving sheet 21 by rib 58 will function as a bending axis for forming pendent flap 14 of FIG. 7.

A second set of embossing rolls and back-up rolls (not illustrated) similar to embossing rolls 56 and 58 and back-up rolls 64, respectively, illustrated in FIG. 3, may be employed in order to form a slight outward bend in opposed distal longitudinal edge portions of the sheet 21. Such bends facilitate siding assembly into overlapping relationship. The second set of embossing rolls, each of which contains a single embossing rib, and back-up rolls are disposed in a relationship with sheet 21 opposite to that shown in FIG. 3 so as to enable the distal longitudinal edge portions of the ultimately formed pendent flap and detent flap to outwardly project in a desired direc-

tion, as illustrated in FIG. 7. Inasmuch as the structure of the second embossing station is obvious from FIG. 3, the same has not been illustrated.

Bending axes 71 for flap longitudinal edge portions are illustrated in FIGS. 7 and 8. In FIG. 7, axes 71 in flaps 14 and 16 provide the outwardly bent terminal edges 73 and 75 which facilitate interlocking of the siding flaps in the normal course of siding erection. In FIG. 8, bending axes 71 are illustrated in the sheet 21 prior to entering apparatus for bending the sheet into desired cross section.

Following the embossing of the longitudinal fold lines or bending axes in the moving sheet 21, it is passed between pull-through rolls 28b and 28a. The sheet is then moved into heating station 68 having disposed therein heating lamps 70 or other equivalent heating means for purposes of heating the sheet and rendering the same sufficiently plastic so that it may be readily formed into desired cross section in preformer 72.

As will be apparent from FIG. 4 preformer station 72 comprises opposed die portions 74 and 76 having complementary surfaces which gradually bend the engaged moving sheet into desired cross-sectional configuration along the fold lines embossed in the sheet by means of the embossing rolls 54 and 56. The cross-sectional configuration of sheet 21 is thus gradually changed from that shown in FIG. 4, which is approximately the configuration which the sheet 21 is forced to assume upon entering the preformer station to the cross-sectional configuration of FIG. 5. The sheet configuration shown in FIG. 5 is substantially the same as the cross-sectional configuration of the moving sheet upon emergence from the preformer station 72. Also, a comparison of the sheet cross section of FIG. 5 with the cross section of facing 12 of FIG. 7 will disclose that the two cross sections are substantially the same.

After passing through the preformer station 72, the moving sheet 21 enters the heated former station 78. Station 78 is composed of upper die members 80 and 82 (see FIG. 5) secured to an upper anchor plate 84, and lower die members 86 and 88 secured to lower anchor plate 90 by means of fasteners 91. The various die portions may have electrical resistance wires disposed therein, or the station 78 may be otherwise suitably heated to the desired temperature necessary to impart a substantially permanent set in the sheet moving through station 78.

Following passage through the former station 78, the sheet enters overbend station 92, the initial portion of which is heated by heating coil 94 and the terminal portion of which is cooled by cooling coils 96 situated along the top and bottom. It is the function of the overbend station to effect compression of the longitudinal edge 14a of the moving sheet which will be formed into pendent flap portion 14 of the facing 12 of FIG. 7 against the longitudinal sheet portion 11 from which facing portion 12a, illustrated in FIG. 7, will be formed. A desired cross section is imparted to sheet 21 in the overbend station 92 by means of the bent plate 81 in which smaller plate 83 is partially received at one end portion.

In station 92 longitudinal sheet portion 13, from which facing portion 12b of FIG. 7 will be formed, is also bent into an acute angular relationship with central sheet portion 11, see FIG. 6. The degree of overbend for the desired right-angle relationship between portions 12b and 12a of the plastic facing 12 is governed by the temperature the plastic attains while heated. If cold, an overbend of about 35 degrees is needed, while at a temperature of 150° F. a 10 degree overbend is sufficient. An overbend of about 15 degrees is commonly used in carrying out this invention. It is necessary to cool the sheet in the overbender or the subsequent pulling by the pull-through belt sections 30a and 30b will distort the plastic. Following passage through the overbend station, sheet edges 14a and 15, respectively, of the sheet 21 will, due to the spring-back, be angularly disposed at the desired angles relative to the contiguous sheet portions.

The sheet 21 now possesses the desired cross-sectional configuration of the siding into which it will be formed. Flat surface portions 98 of grippers 100 of the pull-through belts 30a and 30b will engage planar surface portion 11 of the sheet 21 in the course of driving the film to the right as upper pull-through belt section 30a moves counterclockwise and lower pull-through 30b belt section moves clockwise.

The sheet 21 is then cut at the midpoint of the notched portion 61 of reduced width into the desired longitudinal sections upon emergence from the pull-through section. This may be accomplished either by a hand cutter or by automatic cut-off knives, such as knife 53, well known in the art. The ends of the various facing sections formed from the sheet 21 may be appropriately trimmed if necessary at their longitudinal terminal ends so as to facilitate overlapping of the facings of adjacent horizontally disposed siding members to assist in the presentation of a unitary siding appearance.

The sections of facing similar to facing 12 of FIG. 7 which are formed from the continuous sheet 21 may then be placed over a core board by means of a manually-operated jig which assures proper relative positioning between the plastic facing and the core. Prior to such arrangement, adhesive is added to the desired portions of the core board to be engaged by the plastic. The assembled product may then be conveyed flat and endwise under pressure sealing rolls which rotatably engage the completed siding. The siding may be stacked and kept under slight pressure until the adhesive has set, after which the siding is ready for packaging and shipment.

It is apparent from the foregoing description that the apparatus stations described assure proper processing of a continuous sheet so that the same may be readily modified from a continuous plastic sheet composed of polyvinyl chloride or other desired thermoplastic into a cross section of precise configuration. The resulting facing is adapted to engage a rigid core so that the resulting assembly may function as an improved siding member. The preforming and forming stations assure proper folding of the various film portions along the embossed fold lines.

The above-described sequence of steps is conducted in such a manner that the sheet is not merely stretched so as to allow the same to return to an original configuration as a result of a molecular alignment which gives rise to an elastic memory. The various sheet processing steps above described assure a final product of the precise configuration desired so that the same will function properly when secured to a rigid core member. The provided apparatus may obviously be adjusted to process thermoplastic sheets of varying width as may be necessary in the manufacture of siding facings of various dimensions. A vinyl sheet approximately .02 inch thick should not be heated to a temperature greater than about 150° F. Obviously, the ascertaining of optimum working temperatures for other vinyl sheet thicknesses and other thermoplastic sheets is well within the ability of the skilled workman.

Apparatus adjustments may obviously be made in a ready manner by changes in spacings and die sizes. The film processing is conducted in a completely automatic manner and because of the constant control of the film formation into the desired cross section, a consistently uniform product is assured.

Without further elaboration, the foregoing will so fully explain the character of my invention that others may, by applying current knowledge, readily adapt the same for use under varying conditions of service, while retaining certain features which may properly be said to constitute the essential items of novelty involved, which items are intended to be defined and secured to me by the following claims.

I claim:

1. In a continuous process for forming a flat thermoplastic sheet into a desired cross-sectional configuration,

the steps comprising continuously moving said sheet along a path parallel to the sheet longitudinal axis, embossing fold lines in said sheet in the course of movement thereof, parallel to the axis of movement, so as to define opposed sheet marginal portions spaced apart by intervening contiguous sheet portions; heating said sheet, forming said heated sheet into substantially said desired cross-sectional configuration by passing said sheet between unheated forming members having opposed surfaces which slidably engage opposed surfaces of said sheet; passing said sheet between opposed heated members, said heated members having opposed surfaces which slidably engage opposed surfaces of said sheet without substantially altering the sheet cross-sectional configuration possessed upon exiting from between said unheated forming members; the heat applied to said thermoplastic sheet by said heated members rendering permanent in said sheet the configuration substantially imparted thereto by said unheated forming members, and passing said sheet into an overbender and overbending said sheet marginal portions into angular relationships with said contiguous sheet portions whereby the angles defined between said sheet marginal portions and said contiguous sheet portions are less than those present in said sheet desired cross-sectional configuration.

2. The process of claim 1 in which said plastic sheet comprises a vinyl sheet about .02 inch thick and is heated to a temperature of about 150° F.

3. The process of claim 1 in which said plastic sheet comprises a vinyl sheet about .02 inch thick which is

not heated in said overbender, and wherein one of said sheet marginal portions enters the overbender in right-angle relationship relative to a contiguous sheet portion and is overbent in said overbender about 35 degrees.

4. The process of claim 1 in which said plastic sheet comprises a vinyl sheet about .02 inch thick which is heated in said overbender to a temperature of about 150° F., and wherein one of said sheet marginal portions enters the overbender in right-angle relationship relative to a contiguous sheet portion and is overbent in said overbender about 10 degrees.

5. The process of claim 1 in which said plastic sheet comprises a vinyl sheet about .02 inch thick, and wherein one of said sheet marginal portions enters the overbender in right-angle relationship relative to a contiguous sheet portion and is overbent in said overbender about 10 to 35 degrees.

References Cited by the Examiner

UNITED STATES PATENTS

2,289,177	7/1942	Chandler	264—156
2,779,388	1/1957	Quoss	264—285
2,848,751	8/1958	Vernon	264—285
2,952,037	9/1960	Ruck et al.	
3,024,496	3/1962	Colombo	264—286

ROBERT F. WHITE, *Primary Examiner*.
S. A. HELLER, *Assistant Examiner*.