Jan. 27, 1970 E. J. HOWARD 3,492,182

MANUFACTURE OF STREET SIGNS AND THE LIKE

Filed Feb. 16, 1967 2 Sheets-Sheet 1

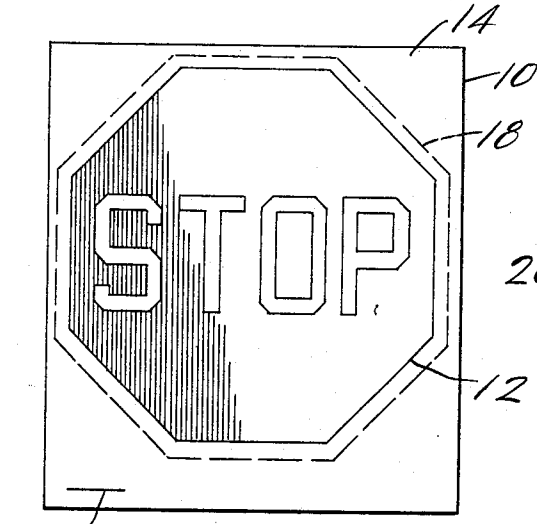


FIG-1-

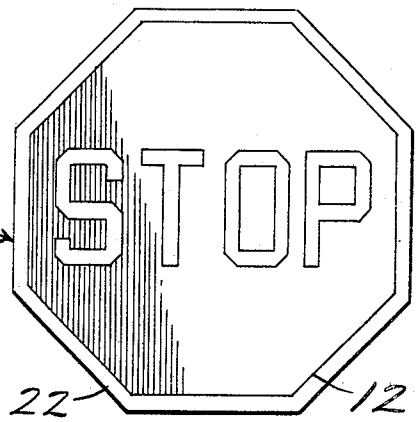


FIG-2-

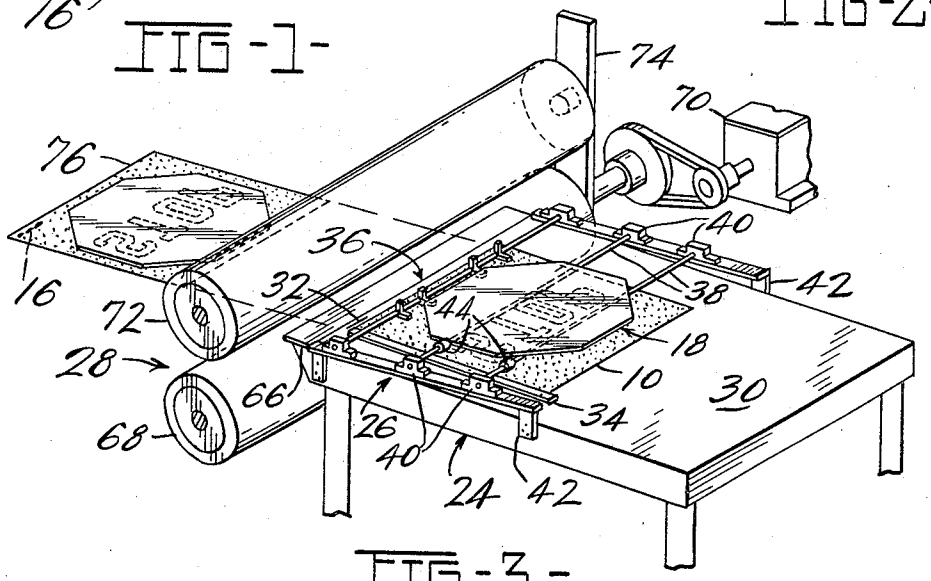


FIG-3-

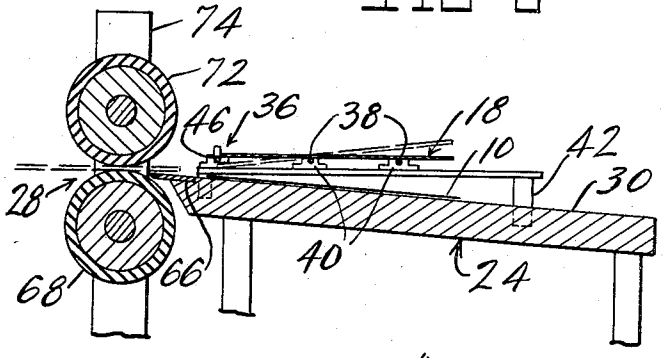


FIG-4-

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MANUFACTURE OF STREET SIGNS AND THE LIKE

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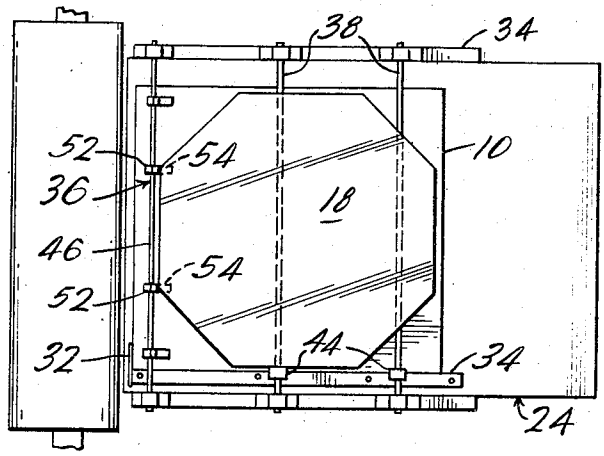


FIG-5-

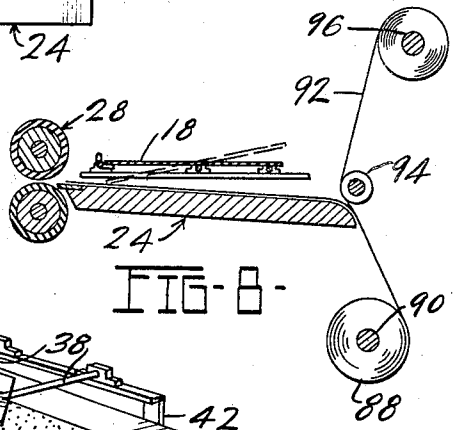


FIG-8-

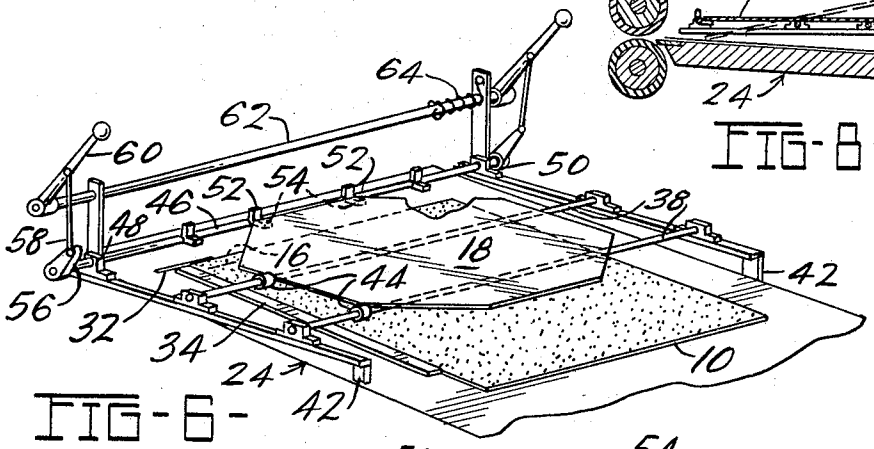


FIG-6-

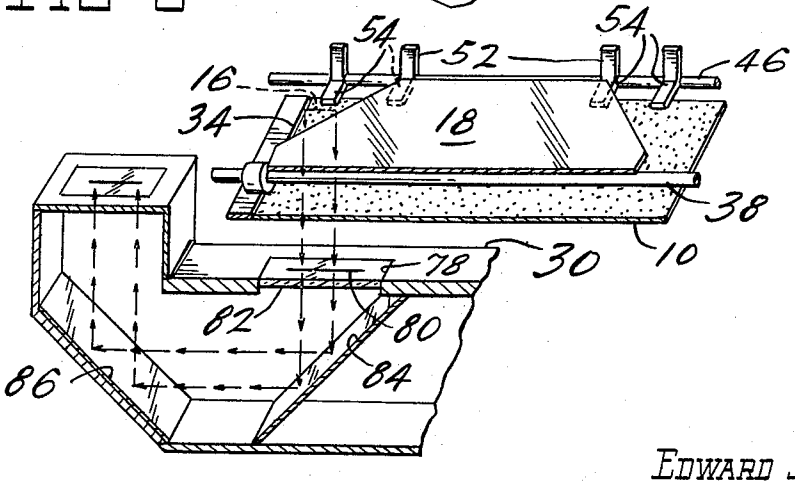


FIG-7-

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3,492,182

MANUFACTURE OF STREET SIGNS AND THE LIKE

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Int. Cl. B44c 1/24
U.S. Cl. 156—230 10 Claims

ABSTRACT OF THE DISCLOSURE

The invention is directed to the manufacture of street signs consisting of an aluminum sign blank and reflective sheeting affixed to the blank by pressure-sensitive adhesive which unyieldingly adheres to a surface with which it comes into contact. The apparatus assures precise assembling of the blank and reflective sheeting in a unique manner to prevent inaccurate contact between the two and subsequent scrapping of the reflective sheeting.

This invention relates to a method and apparatus for manufacturing a street sign or the like consisting of a sign blank and a flexible, reflective sheet.

Street signs, including traffic regulating signs and informative signs, are commonly made of sign blanks consisting of aluminum plates with reflective sheets adhered thereto in the form of flexible plastic sheeting having a highly reflective surface. The surfaces of such signs are readily visible, both at night and in the daytime; the signs are also highly durable and rust resistant. Street signs and similar signs made in limited production with only one or two signs carrying a particular name or other indicia are also readily adapted for this type of manufacture, wherein the indicia can be applied to the reflective sheeting by a silk screen process.

In the manufacture of signs of this general type, it has been common to supply the reflective sheeting in long rolls, in the order of one hundred feet, and in widths up to four feet. A pressure-sensitive, contact type of adhesive is employed on the back of the reflective sheet, which adhesive provides instant adhesion between the reflective sheet and substantially any surface with which it comes into contact. The pressure-sensitive adhesive is protected by appropriately coated paper, or the adhesive can be catalyst-activated with a catalyst or activator applied just before the reflective sheet is brought into contact with the sign blank.

Machines are commonly employed to facilitate application of the reflective sheeting from the roll to the sign blanks. Accordingly, the roll is supported by the machine and is unwound, after which either the protective paper is removed from the pressure-sensitive adhesive or catalyst is applied to the catalyst-activated adhesive. The sheeting is then guided between a pair of pressure rolls with the adhesive facing downwardly. At the same time, sign blanks are placed on a table below the sheeting and fed between the pressure rolls and into contact with the adhesive side of the sheeting. After the pressure rolls apply the sheeting in firm and uniform contact with faces of the sign blanks, the blanks with the continuous sheeting attached are cut apart and the sheeting trimmed to complete the assembly. Suitable indicia are then applied to the assembled blank sign.

In the manufacture of the continuous rolls of reflective sheeting, a sizable amount of scrap results because of tears or imperfections in the sheeting, resulting in relatively short lengths of the sheeting and incomplete rolls thereof. These shorter lengths of the sheeting are commonly cut by the manufacturer of the sheeting into pieces and

sold as separate sign sheets which are individually applied to sign blanks, rather than by the continuous process. The individual sign sheets are also suitable for limited production of signs or for signs of particular shapes wherein an excess amount of scrap would result if the signs were made from continuous rolls of the reflective sheeting. The indicia are usually applied to such individual sheets before assembling with the sign blank. Also, the individual sheets are usually only slightly larger than the sign blanks. These two factors require that the individual reflective sheets be applied precisely to the sign blanks to assure that the sheet and the indicia will be properly positioned on the blank.

With the contact adhesive used with the reflective sheeting, if the sheeting and blank are improperly positioned at the time of contact therebetween, resulting in the necessity of separating the two, then the reflective sheet will usually be irreparably damaged due to the nature of the adhesive. The reflective sheeting is expensive, e.g. costing several dollars for a sheet the size of a stop sign, so that it is essential that the sheet and blank be accurately assembled to avoid prohibitive expenses.

In view of the above, with individual sign sheets employed in place of continuous rolls, a thermosetting adhesive is applied to the reflective sheets rather than the contact type of adhesive. With the thermosetting adhesive, the sheet can be placed in contact with the sign blank and moved around to assure precise positioning of the two, without the problem of instant adhesion. Unfortunately, the thermosetting adhesive requires time and heat for achieving permanent adhesion between the sheet and the blank. When the sheet and blank are properly positioned, the assembly is placed in a machine which applies pressure to the sheet and the blank and applies heat thereto in the order of 190°–220° F. for a period of time in the order of five minutes. When the time has expired, the machine is opened and the assembled blank and sheet are removed after which the sheet is trimmed to complete the sign. This process requires a considerable amount of handling of the sign blank and sheet by an operator and a considerable amount of time due to the period in which the heat must be applied. The rate of production therefore is slow and the process is unsuitable where any volume of signs is required.

The present invention relates to the manufacture of street signs and the like particularly where individual reflective sheets are employed for the sign blanks. In accordance with the invention, the individual sheets can be applied precisely to the sign blanks with contact adhesive on the sheets. With this arrangement, the signs can be manufactured with many of the advantages achieved by the continuous type of operation and with none of the disadvantages resulting from employing a thermosetting adhesive.

In accordance with the invention, the reflective sign sheet with the contact adhesive facing upwardly is laid on a supporting surface adjacent a pair of pressure rolls. Means are provided to place the sheet in a precise position, for which purpose the sheet can have a reference mark imprinted thereon. The metal sign blank is then supported in spaced relation above the sheet and means are provided for positioning the sign blank both transversely and longitudinally presisely with respect to the reflective sheet therebelow. An edge of the blank toward the pressure rolls is then brought into contact with a corresponding portion of the reflective sheet and the two are then fed between the rolls with subsequent portions of the sheet and sign blank brought into contact as movement through the rolls continues. Appropriate edge portions of the sheet can then be trimmed, if necessary.

With the apparatus according to the invention, it is

also possible to employ rolls of the reflective sheeting with the indicia applied thereto prior to assembly with the sign blanks. With this arrangement, when the indicia are applied to the roll positions, a small reference mark also is applied to the roll at a predetermined position with respect to the indicia. The roll can then be unwound onto the supporting surface in front of the pressure rolls and precisely positioned by means of the reference mark. The sign blanks are then sequentially applied to the back of the sheeting, as before, and the combination moved through the pressure rolls, after which the sign blank is trimmed. With this arrangement, the indicia often can be applied more rapidly than by being applied to the individual sign assemblies subsequent to the application of the reflective sheeting to the sign blanks.

It is, therefore, a principal object of the invention to provide an improvement in the manufacture of street signs and the like.

Another object of the invention is the manufacture of street signs and the like utilizing contact adhesive to affix pre-shaped sheets of reflective sheeting to metal sign blanks.

A further object of the invention is to provide means for facilitating assembly of reflective sheets and metal sign blanks with a contact adhesive.

Other objects and advantages of the invention will be apparent from the following detailed description of preferred embodiments thereof, reference being made to the accompanying drawings, in which:

FIG. 1 is a front view of an individual reflective sign sheet prior to being applied to a metal sign blank, with the sign blank shown in dotted lines therebehind;

FIG. 2 is a front view of a completed street sign after the reflective sheet has been applied to the sign blank and trimmed;

FIG. 3 is a somewhat schematic view in perspective of apparatus according to the invention for applying reflective sheeting to sign blanks;

FIG. 4 is a vertical, sectional view of the apparatus of FIG. 3;

FIG. 5 is a plan view of the apparatus of FIG. 3;

FIG. 6 is a detailed view in perspective of a portion of the apparatus of FIG. 3;

FIG. 7 is a fragmentary perspective view, with parts in section, of slightly modified details of the invention; and

FIG 8 is a schematic vertical sectional view of apparatus utilizing the details of FIG. 7.

Referring to FIG. 1, a street sign, in this instance a stop sign, is shown partially assembled. The sign includes a reflective sheet **10** which can be a flexible, reflective plastic material known as Scotchlite and sold by Minnesota Mining and Manufacturing Company. In the specific embodiment shown, a hexagonal area designated **12** has a red coating except for the letters STOP, with the red coating applied by a silk screen process, for example. The red coating preferably is translucent so that the reflective characteristic of that portion of the sheeting covered by the coating will still be partially retained. Of course, the letters STOP as well as portions designated **14** of the sheet **10** outside the periphery of the hexagonal area are uncoated and retain the complete highly reflective characteristic of the sheet **10**. At the time the coating **12** is applied, a reference mark **16** can also be applied to the sheet in predetermined relationship with respect to the coating **12**. The sheet **10** has contact adhesive on the rear face thereof, with this adhesive protected or covered by a suitable backing sheet to prevent contact of the adhesive with another surface. The protective sheet is suitably coated to prevent excessive adherence with the adhesive. When the protective sheet is removed, the reflective sheet **10** is applied to a metal, preferably aluminum, sign blank, designated **18** in FIG. 1, this sign blank being located behind the sheet and ready to be adhered thereto. After the sheet and blank are brought together, smoothly and uniformly, that portion of the sheet extending beyond the blank is trimmed to complete a sign **20** as shown in FIG. 2, with a margin **22** extending around the coating **12**. The sign **20** is then ready to be assembled in a suitable manner to a post or other support in a desired location.

Whenever the sheet **10** is cut closely to the size and shape of the blank **18**, or where, as shown, indicia are applied to the sheet **10** prior to assembling with the blank **18**, it is essential that the sheet and blank be precisely positioned relative to one another prior to bringing the two into contact. The apparatus shown in FIGS. 3–6 is effective in achieving proper assembling of the reflective sheet and sign blank. Basically, this apparatus includes a table **24** for supporting the sheet **10** and with means for positioning the sheet **10** precisely thereon. The apparatus also includes supporting means **26** on the table **24** for supporting and positioning a sign blank thereabove. Finally, the apparatus includes pressure means **28** for aiding in adhering the sheet and sign blank together when they are properly positioned.

The table **24** has a suitable supporting surface **30** which preferably slopes downwardly slightly away from the pressure means **28**. The table has, in this instance, a suitable positioning mark **32** (FIGS. 3 and 5) to enable the operator to align the sheet **10** precisely longitudinally thereon by aligning the mark **32** and the front edge of the sheet. The mark can be applied directly to the surface **30** or can be on a separate sheet or plate to enable longitudinal adjustment thereof. The table **24** also has a side guide bar **34** which enables the sheet **10** to be positioned precisely transversely of the table by placing a side edge of the sheet in contact with the guide bar **34**.

The sign blank supporting means **26** comprises a front stop bar **36** to be discussed subsequently and rear supporting rods **38** which are mounted on the table **24** by suitable bearing blocks **40** and a frame **42** which blocks enable the supporting rods **38** to rotate. The supporting rods **38** have collars **44** adjacent one side thereof and preferably positioned above the guide bar **34** to enable the sign blank **18** to be positioned precisely transversely of the table by being moved against at least one of the collars, depending on the length of the sign blank. Especially for shorter sign blanks, only one of the supporting rolls **38** need be employed.

The stop means **36** enables the sign to be positioned precisely longitudinally of the table **24** and longitudinally of the sign sheet **10**. A preferred form of the stop means is shown in detail in FIG. 6. In this instance, the stop means includes a stop bar **46** extending across the table **24** and supported thereon by bearing blocks **48** and **50**. The bar **46** has at least two stops **52** thereon which engage the front edge of the sign blank **18** and place it in a precise longitudinal position. The stops **52** have notches **54** therein which actually receive and support the front edge of the sign blank. When the blank is positioned precisely longitudinally of the table, the stops **52** can be rotated downwardly to enable the front edge of the sign blank **18** to be deposited on a predetermined front portion of the sign sheet **10** therebelow. For this purpose, the stop bar **46**, as shown, has an arm **56** extending from one end thereof with this arm being connected by a link **58** to an operating lever **60** which rotates the arm **56** and the bar **46** when moved in a clockwise direction, as shown in FIG. 6. The lever **60** is mounted on an axle **62** having a coiled spring **64** for automatically returning the lever **60** to the upper, sign blank receiving position, as determined by a stop (not shown), when released. The operating lever **60** can be located on both sides of the table **24** to enable operation from either side thereof. Experienced operators can employ a stop bar **46** or the like without the notches stops **52**. In such an instance, the sign blank is brought by the operator to a position against the stop,

and then the forward edge tilted downwardly by hand into contact with the stop sign sheet.

After the forward edge portions of the sheet **10** and the sign blank **18** are brought into contact with one another, at which time the small area of contact will be precise because of the individual precise positioning of the sign sheet and the blank, the forward edges of the two can be moved by hand toward the pressure means **28** and onto a supporting lip **66** of the table **24**. The pressure means **28** includes a lower, rubber, pressure roll **68** driven by a suitable motor **70** and an upper roll **72** which is located directly above the roll **68** and in or nearly in contact therewith. These rolls are supported by a suitable stand **74** bridging the table **24**.

As the sign sheet **10** and the blank **18** are moved into engagement with the rolls, they are fed therethrough at a slow rate of speed by the drive motor **70**. During the movement of the blank and sheet through the rolls, it is essential that the rear portions of the blank and sheet away from the rolls do not come into contact prior to reaching the rolls. In such an instance, the sheet would be ruined since such contact would cause the intermediate portions of the sheet to wrinkle and the contacting portion of the sheet could not be removed without damage. By having the table surface **30** sloping away from the horizontal and from a plane perpendicular to a plane through the axes of the rollers, the adhesive surface of the sheet **10** remains below the blank even after the blank moves off the front supporting rod **38**. When the rear edge of the sign blank **18** moves in front of the front rod **38** and ceases to be supported thereon, it will only move down to a horizontal plane perpendicular to the roller axes and will, therefore, still remain slightly spaced above the rear portion of the sign sheet **10** until moving substantially into the bite of the pressure rolls **68** and **72**.

After the sheet and blank are fed through the pressure rolls, the assembly is received on a discharge or receiving surface **76**. The operator can then trim the excess material from the sheet **10** to complete the sign **20**, as shown in FIG. 2.

The aparatus of FIGS. 7 and 8 is particularly effective in the manufacture of signs from continuous rolls of the reflective sheeting to which indicia are applied at predetermined intervals suitable for subsequent application to sign blanks. In this instance, the sign blanks must be applied precisely with respect to the indicia but, unlike the individual reflective sheets, there is no transverse edge on the continuous roll by means of which the reflective sheeting can be positioned longitudinally of the table. To accomplish the positioning of the continuous rolls, the locating marks **16** on the sign sheet of FIG. 1 are applied automatically when the coating **12** is applied by the silk screen or other process. Hence, for every one of the indica **12**, there is a mark **16** on the sheeting in a predetermined relationship.

Since the mark **16** is face down on the table surface, means must be provided to enable the operator to see the mark and align it with longitudinal positioning means on the table. To achieve this, as shown in FIG. 7, an opening **78** is provided in the surface **30** of the table **24** with a positioning mark **80** placed across the opening transversely of the table. The mark can be in the form of a wire across the opening or, as shown, can be inscribed on a glass panel **82** in the opening. When the locating mark **16** on the sheeting is directly over the mark **80**, the sheeting and indicia thereon are in proper longitudinal position. In order to ascertain this, suitable mirror means shown as two 45° mirrors **84** and **86** in this instance are employed below the table to enable the operator to visually ascertain when the marks are in alignment.

When the marks are aligned, the sheeting is allowed to remain in place while the sign blank **18** is positioned thereabove. The forward edge portion of the sign blank **18** is then moved downwardly into contact with the sheet and the two moved forwardly between the pressure rolls **68** and **72**, as before. After the blank and sheeting have moved between the rolls, the sheeting can be cut immediately behind the blank and then trimmed in the usual manner. The blanks may be sufficiently close together that an end portion of one will still be between the pressure rolls when the next one is positioned and moved into contact with the sheeting.

As shown in FIG. 8, a roll **88** of flexible reflective sheeting is mounted to the rear of and below the supporting table **24** on a suitable axle **90**. As a combination of the flexible sheeting and protective paper **92** are unwound from the roll, the protective paper **92** is stripped therefrom around a rod **94** and rolled onto another axle **96**. The continuous reflective sheeting is then carried along the table until the positioning marks are in alignment, at which time the sheeting is stopped. The sheeting, in this instance, can be fed by hand or can be suitably mechanically driven.

As discussed previously, the apparatus according to the invention enables precise and safe positioning of the sheeting and sign blanks to enable sheeting with indicia thereon to be accurately positioned with respect to the blanks. Hence, the sheeting can be cut closely to the size and shape of the sign blank or the indicia can be applied first, without the slow process of using thermosetting adhesive and without possibility of prematurely and inaccurately contacting the sign blank with the adhesive.

While the invention has been described specifically with regard to flexible reflective sheets, it is equally applicable where other flexible sheets are employed. For example, flexible sheets which are not particularly reflective are often used for "No Parking" signs.

I claim:

1. Apparatus for effecting the assembling of a sign which comprises a metal sign blank of predetermined shape and a flexible sheet adhered thereto by pressure-sensitive adhesive on one side, with an outer surface on the other side, said apparatus comprising a pair of pressure rolls, means for rotating at least one of said rolls, means forming a flat supporting surface at one side of said rolls and with at least an edge portion of said supporting surface lying substantially in the plane of the bite of the rolls, said supporting surface means having guide means at one side thereof extending substantially perpendicularly to the longitudinal extent of said pressure rolls for positioning a flexible sheet thereon with the outer side downwardly and with the pressure-sensitive adhesive side facing upwardly, said supporting surface means further having marking means for positioning said flexible sheet longitudinally of the table at a predetermined distance from said pressure rolls, second supporting means above said supporting surface means for supporting and positioning a sign blank above said flexible sheet, said second supporting means including elongated means extending transversely across said supporting surface means and having means for transversely positioning said sign blank thereon at a predetermined position relative to said flexible sheet, stop means forwardly of said elongate means toward said pressure rolls to receive and position said sign blank longitudinally of said supporting surface means and at a predetermined position relative to said flexible sheet, said stop means enabling a forward edge portion of the sign blank to be tilted downwardly into contact with a forward portion of the flexible sheet, and receiving means on the opposite side of said pressure rolls for receiving the combined flexible sheet and sign blank after passing through the rolls.

2. Apparatus according to claim **1** wherein said supporting surface means slopes downwardly from a plane through the bite of the rollers and which plane is perpendicular to a plane through the axes thereof.

3. Apparatus according to claim **1** characterized by said elongate means comprising a rod extending transversely of the supporting surface means and said transverse positioning means comprises a collar on said rod.

4. Apparatus according to claim 1 characterized by said stop means comprising a rod extending transversely of said supporting surface and parallel to the axes of the pressure rolls.

5. Apparatus according to claim 4 characterized further by means for rotating said rod, and means on said rod to receive and position a forward edge of said sign blank and rotatable with said rod to deposit the forward edge of said sign blank on the flexible sheet therebelow.

6. Apparatus according to claim 1 characterized further by said marking means including an opening in said supporting surface and a mark extending across said opening.

7. Apparatus according to claim 6 characterized further by mirror means enabling an operator to view said mark from above said surface and to position a mark on the flexible sheet precisely on said surface mark.

8. Apparatus according to claim 1 characterized further by means for supporting a continuous roll of the flexible sheeting at a location spaced from said surface, and means for stripping a protective sheet from said flexible sheet prior to the placement of said sheet on said surface.

9. A method for making a street sign or the like comprising placing a flexible sheet on a flat supporting surface with a pressure-sensitive adhesive on said sheet facing upwardly, positioning said flexible sheet precisely on said surface in a predetermined position both longitudinally and transversely thereof, supporting a sign blank above said flexible sheet in a predetermined position both transversely and longitudinally of said sheet, moving an edge of said sign blank downwardly into contact with an edge portion of the flexible sheet while maintaining the remaining portion of said sign blank spaced from said sheet, moving the combined sheet and sign blank in a predetermined direction while applying pressure sequentially and transversely over said sheet and blank to adhere the two together while continuing to maintain the remaining portions of said sheet and blank spaced apart, until the pressure is applied to the entire sheet and blank, and subsequently trimming excess flexible sheeting material from the edges of the sign blank.

10. Apparatus for effecting the assembling of a street sign which comprises a metal sign blank of predetermined shape and a flexible, reflective sheet adhered thereto by means of pressure-sensitive adhesive located on one side of said sheet, said sheet having an outer reflective surface on the other side, said apparatus comprising a pair of pressure rolls, one mounted directly above the other, means for rotating at least one of said rolls, supporting means located at one side of said rolls for supporting a reflective sheet with the reflective side downwardly and with the pressure-sensitive adhesive side facing upwardly, and with an edge portion lying substantially at the level of the bite of said pressure rolls, means associated with said supporting means for positioning the reflective sheet in a predetermined position, second supporting means above said first supporting means and positioning a sign blank above said reflective sheet, said second supporting means having means for transversely positioning said sign blank at a predetermined position relative to said reflective sheet, and including means for supporting a substantial portion of said sign blank but not an edge portion thereof toward said rolls to enable said edge portion to be tilted downwardly toward said reflective sheet, and stop means between said supporting means and said pressure rolls to receive and position said sign blank longitudinally at a predetermined position relative to said reflective sheet.

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SAMUEL FEINBERG, Primary Examiner

U.S. Cl. X.R.

156—249, 538, 556, 582, 584